



Bajaj Hindusthan Sugar Limited Viability Study

Final Report

6 September 2017

Mott MacDonald
Mott MacDonald House
44/45
Street No - 14
MIDC Area
Andheri – East
Mumbai 400 093,
Maharashtra
India

T +91 (0)22 3083 5000
F +91 (0)22 2825 3779
mottmac.com

Bajaj Hindusthan Sugar
Limited

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Executive summary

Mott MacDonald Private Limited (MM) has been mandated by State Bank of India, Lucknow (SBI), the lead lender, to conduct a detailed techno-economic viability study with the objective of overall review and assessment of feasibility of the business plan of Bajaj Hindusthan Sugar Limited (BHSL). The lenders propose to implement S4A Scheme to realign repayments with expected cashflows.

The core issues that MM has addressed in this report are to (a) assess the operating and financial performance of the company; (b) identify and evaluate the strengths and weaknesses of the company; (c) gauge the external business environment and opportunities/threats to BHSL; (d) review viable business plan and assess the operational, market and financial risks involved; (e) identify the reasons for the recent resources crunch and classify idle assets; (f) conduct breakeven and sensitivity analysis; and (g) analysis of existing level of company's debt structure and prepare a roadmap strategy for BHSL's focus areas including production efficiency, technological advancement, marketing & distribution, organizational restructuring etc

Headquartered in Lucknow, BHSL is the flagship Company of the Shishir Bajaj Group and is one of the largest sugar and ethanol manufacturing company in Asia. It was incorporated in the year 1931 as a sugar and cement manufacturing company with its first plant at Golagokarannath, UP. At present, the Company has grown to have 14 sugar factories (136,000 TCD), six distilleries (800 KLD), and 14 co-generation plants (449 MW). BHSL also produces molasses, bagasse and press mud which are by-products and sells the surplus quantity in market.

Over the past few years, BHSL incurred operational losses resulting into erosion of considerable net worth of the company. At year end of 2016-17, the Company has overdue instalments of bank loan and interest and dues to farmers for cane purchase. BHSL has thus approached the consortium of lenders to consider the S4A scheme to overcome the ongoing financial problem and restore the normal activities.

The key reasons for Company to undergo restructuring under the previously-approved SBI-led Joint Lenders Forum (JLF lenders) are:

- Immediate payment of Cane arrears
- Strain in EBITDA Margin due to high cane procurement cost and decline in sugar prices
- Non-Settlement of Sugar Promotion Policy (SPP) Claim
- Non-implementation of Rangarajan Committee recommendations
- Increase in interest obligations and debt pile up

In this report, MM has conducted an in-depth analysis of how it is not only BHSL that is financially stressed, but Indian sugar mills in general are under huge financial stress due to significant losses and increasing cane arrears. Total estimated debt of sugar industry was estimated to be Rs 50,000 Crore at the end of SS 2015-16; around a fifth of the same is expected to be cleared off in SS 2016-17.

India is the world's largest sugar consumer and second largest sugar producer. Six states – Maharashtra, UP, Karnataka, TN, AP, Telangana, & Gujarat – account for 90% of India's sugar production. The country has close to 750 sugar mills and is an off and on importer of sugar with imports mainly from Brazil. Indian sugar industry has previously displayed a 5-year sugar production cycle, with 3 years of surplus sugar, followed by 2 years of deficit. India's SS 2016-17

sugar production is likely to decline by 7.3% mainly because a severe fall in production expected in Maharashtra, the top sugar producing state in the country. Although there is a net surplus, but with draught in western part, cane acreage is expected to decline further. However, in Uttar Pradesh, sugar production is expected to rise owing to improvement in cane yield because of better variety, which will be offset by the decline in sugar recovery.

In terms of distilling industry, India produces conventional bioethanol mostly from sugar molasses and partly from grains. The country has around 330 distilleries which can produce over 4 billion litres of rectified spirit (alcohol) per year. Of this total, about 162 distilleries have the capacity to distil over 2 billion litres of conventional ethanol. Ethanol production from domestic molasses will add to top line of ailing sugar industry and improve their overall financials. With onset of E10 programme in coming years' huge opportunities in terms of investment and growth can be ascertained. MM also notes that a mandatory EBP is necessary that will prove to benefit not only sugar and oil market but also will be a positive step towards greener initiatives.

The sugar price mainly depends upon the sugarcane pricing. India has the lowest retail price of sugar in comparison to other key sugar consuming countries and has highest cane price. Declining trend of sugar prices and consistent increase in the FRP declared by the government have resulted in moderation in operating margins of sugar mills and delay in payment to farmers for sugarcane procured by the sugar manufacturers. Cane FRP is usually fixed by GOI and it has grown at a CAGR of 10.59% while average sugar price at paltry 2.8%. Higher SAP (highest in UP at INR 305/quintal) than FRP (INR 255/quintal) has further led to year on year rise in cane price arrears. MM notes the pricing regime to be unfair towards company's overall business and emphasizes on the implementation of Rangarajan committee's recommendations.

The UP sugar industry is mainly clustered around the Western UP as this region has access to abundant water resources through the perineal rivers that make the soil fertile for the water-intensive sugarcane production. The eastern UP, on the other hand, has fertile soil belt but is heavily dependent on the monsoons for yielding high sugarcane production. BHSL's plants in the eastern UP belt, which are the main culprits for the company's sub-optimal performance levels, have primarily been victims of the poor cane availability conditions in the region. However, an interesting trend in UP is that although area under cane cultivation has been declining in Uttar Pradesh over the past 5 years, the average yield has been steadily increasing. This recent sugar production boost is on account of cultivators using high yielding varieties of cane. This trend is likely to get further enhanced going forward.

Meanwhile, UP sugar industry is reaming under a slew of challenges including: a) losing out in competition with other leading producers like Maharashtra due to its high cost of production on account of highest SAP ex-gate sugarcane prices, b) High Cost of Production, c) UP being a landlocked area, transporting sugar to warehouses/ports for exports increases the input cost for the millers making it unviable to sell the product outside the country, d) Threat from Local Crusher Units, e) cane farmers indulging in crop swapping to other crops that have shorter cultivation duration and safer payment terms, and f) governing Bodies' Policy Volatility wherein policies for the sugar industry change due to changes in UP's State governing parties cause a severe impact on .

However, government initiatives are picking up and are expected to offer some respite to the sugar industry, particularly the millers. Some of these initiatives include encouraging Cane Development Programmes, availability of High Yielding cane seed varieties, Cane management activities to make available clean and mature cane to the factories, and most importantly, initiative to adopt Rangarajan sugarcane pricing formula.

Over the next 2-5 years, consumption is set to continue outpacing production in many countries, thus creating huge new markets for imports. However, at the same time, it can be inferred that reduced global sugar stocks would impact the markets' ability to respond to adverse climatic conditions. This is likely to increase the price volatility in coming months and shall prevail for couple of sugar years. India's sugar consumption pattern is expected to improve with rise in income and per capita consumption. Though the production is expected to grow, the demand is set to outstrip the supply pattern; thereby, impacting the closing sugar stocks for subsequent years, but help in maintaining sugar prices in the range of Rs.3650-4000/quintal. This is a welcomed news for BHSL.

BHSL has 14 sugar processing facilities the operational parameters of which are summarised in the table below:

Table 1: Site Summary (SS 2016-17)

Particular	Location in UP	Crushing	Recovery	Crushing Days	Sugar Produced Year 2016-17	Selling price sugar	Manpower Details	Power Generation	Power to grid	PPA	O and M cost	Plant area
U.O.M		Lakh Qntls	% cane	Nos	Lakh Qntls	Rs/ Qntls	Nos	Lakh KW	Lakh KW	Rs/ Kw-h	Rs/ Qntls	Acres
Golagokarannath	Central	181.08	11%	162	20.6	3,555	835	473	0	NA	3.5 to 4	184
Palia Kalan	Central	123.75	10%	138	11.9	3,574	608	636	191	4.79	3.5 to 4	173
Kinauni	Western	146.85	10%	164	14.0	3,584	863	736	221	4.79	3.5 to 4	197
Thana Bhawan	Western	110.99	10%	163	11.3	3,548	463	595	226	4.79	3.5 to 4	80
Budhana	Western	129.77	10%	169	13.1	3,542	496	796	355	4.79	3.5 to 4	86
Bilai	Western	107.8	11%	155	11.8	3,557	516	668	285	4.79	3.5 to 4	91
Gagnauli	Western	62.22	10%	149	6.0	3,552	489	300	28	4.79	3.5 to 4	184
Khambharkhera	Central	119.2	11%	145	13.3	3,502	515	732	349	4.79	3.5 to 4	203
Barkhera	Central	71.12	10%	124	7.2	3,600	466	420	197	4.79	3.5 to 4	134
Maqsoodpur	Central	68.26	11%	134	7.3	3,575	316	492	205	5.35	3.5 to 4	124
Pratappur	Eastern	10.82	9%	42	1.0	3,538	434	37	0	N.A	3.5 to 4	66
Rudauli	Eastern	37.83	9%	79	3.5	3,576	432	227	0	4.79	3.5 to 4	159
Kunderkhi	Eastern	73.02	9%	83	6.9	3,543	434	684	374	5.45	3.5 to 4	196
Utrala	Eastern	55.55	9%	86	5.2	3,529	398	499	242	5.62	3.5 to 4	163

Source: MM Analysis

Through the site visits at BHSL's 14 plants, MM conducted a detailed technical assessment to conclude that all facilities of BHSL appear to be in a well-maintained condition and can be expected to operate at the current performance levels in the near future. The mills are DC driven as well as steam driven. DC driven mills lead to optimum utilisation of plant area. The staff of all the factories is qualified, experienced, and technically sound. The major problem is underutilization of plant capacities. In the sense, the plant capacities are being operated for less number of days and with less plant load.

It is important to note that, the reason for such low utilisation factor in eastern UP is unavailability of cane which is affecting the production of sugar manufacturers. The utilization of power plant and distillery is dependent on sugar cane availability as bagasse and molasses, which are by-products of sugar production are used as inputs for power plant and distillery. Therefore, when

the sugar cane availability is less, distilleries and power plant would be operational for lower number of days. Since plant capacity is not adequately utilized, the specific energy (power & bagasse) consumptions are higher.

Furthermore, the short term and medium-term plans of BHSL offer a positive outlook for the company. Some of the key initiative being undertaken by BHSL include:

- Cane Development to increase the operational efficiency: The results of past cane development are encouraging as the recovery has improved from around 9% to 10.30 %. The improvement in EBITDA levels in recent years is majorly on account of improvement in sugar recovery after factoring impact of sugar realisation increase. Allocation of more cane area to improve the capacity utilisation, particularly in eastern UP units.
- Utilisation of Maximum Molasses for production of more Alcohol/Ethanol to continue improving distillation process's contribution to the bottom line of the Company due to better margins.
- Realisation of Sugar Promotion Policy claim (the cumulative amount receivable under the said claim is about Rs. 1,200 Crore)

Financial Analysis

Estimated Production corresponding to the installed capacity for the proposed business plan will be as mentioned in Table 2.

Table 2: Production Level

(Lac Qtl. / year)					
Particulars	Sugar	Molasses	Bagasse	Press Mud	Alcohol (Lac BL)
Golagokarannath	18.93	8.31	49.64	6.65	172.65
Palia	11.88	6.19	36.96	4.95	156.09
Kinauni	12.68	6.66	39.81	5.33	403.89
Thanabhawan	10.42	5.12	30.59	4.10	-
Budhana	12.14	6.03	36.02	4.82	-
Bilai	11.73	5.34	31.93	4.28	-
Gagnauli	6.02	3.10	18.53	2.48	192.70
Khambarkhera	13.33	5.96	35.61	4.77	269.93
Barkhera	7.25	3.56	21.24	2.84	-
Maqsoodpur	7.37	3.41	20.39	2.73	-
Pratappur	0.96	0.54	3.23	0.43	-
Rudauli	3.48	1.89	11.30	1.51	191.81
Kunderkhi	6.89	3.65	21.81	2.92	-
Utraula	5.24	2.78	16.59	2.22	-
Total	128.31	62.55	373.65	50.04	1387.07

Source: MM Analysis

- MM estimates a production of 128.31 lac quintal/year of sugar.
- Alcohol production is estimated to be 1387 lac litres/year.
- Production levels of molasses, bagasse and press mud are estimated to 62.55, 373.65 and 50.04 lac quintal/year, respectively.

Based on future market scenario, Consultants understand that all produced items will be absorbed in the market. Revenue projections are mentioned in Table 3.

Table 3: Revenue

(in INR Cr.)

Particulars	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24
Free Sugar	4729.90	4897.25	4944.34	4850.17	4850.17	4803.08	4803.08
Molasses	13.13	13.13	13.13	13.13	13.13	13.13	13.13
Bagasse	46.05	47.35	47.55	47.55	47.55	47.55	47.55
Press Mud & Others	15.51	15.51	15.51	15.51	15.51	15.51	15.51
Alcohol	580.94	565.04	556.49	555.59	555.59	555.59	555.59
Power	126.87	126.87	126.87	126.87	126.87	126.87	126.87
Other Revenue	30.00	30.00	30.00	30.00	30.00	30.00	30.00
Total	5542.39	5695.16	5733.90	5638.82	5638.82	5591.73	5591.73

Source: MM Analysis

- Revenue from operations is generated from the sale of sugar, alcohol, power and by-products.
- Sale of sugar is a major source of revenue for the Company and contributes about 85% of the turnover.
- While most of the power generated by BHSL was used for captive consumption, the surplus power was sold to the Uttar Pradesh state grid.
- Industrial alcohol is sold in the local market directly to end users, mainly alcohol-based chemical plants. Ethanol is sold to oil companies for blending with gasoline.
- Based on the revenues and operating cost streams, the resulting projected operating profit statement is indicated in Table 4.

Table 4: Projected Operating Statement

(in INR Cr.)

Particulars	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24
Revenue							
Free Sugar	4729.90	4897.25	4944.34	4850.17	4850.17	4803.08	4803.08
Molasses	13.13	13.13	13.13	13.13	13.13	13.13	13.13
Bagasse	46.05	47.35	47.55	47.55	47.55	47.55	47.55
Press Mud & Others	15.51	15.51	15.51	15.51	15.51	15.51	15.51
Alcohol	580.94	565.04	556.49	555.59	555.59	555.59	555.59
Power	126.87	126.87	126.87	126.87	126.87	126.87	126.87
Other Revenue	30.00	30.00	30.00	30.00	30.00	30.00	30.00
Total	5542.39	5695.16	5733.90	5638.82	5638.82	5591.73	5591.73
Variable Expenditure							
Raw material consumed	4009.16	4009.16	4009.16	4009.16	4009.16	4009.16	4009.16
Transportation Cost	22.57	21.11	21.11	21.11	21.11	21.11	21.11
Change in Stock	47.67	173.14	208.31	124.86	124.88	83.21	83.23
Power & Fuel Cost	16.55	16.49	16.49	16.49	16.49	16.49	16.49
Stores Consumed	42.24	42.00	41.96	41.96	41.96	41.96	41.96
Packing Cost	46.52	46.52	46.52	46.52	46.52	46.52	46.52
Insurance	4.55	4.55	4.55	4.55	4.55	4.55	4.55
Rent rate & Taxes	4.80	4.80	4.80	4.80	4.80	4.80	4.80

Particulars	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24
Selling commission	8.55	8.78	8.86	8.70	8.70	8.61	8.61
Selling & Distribution	50.89	51.39	51.43	50.76	50.76	50.45	50.45
Total Variable	4253.51	4377.95	4413.19	4328.91	4328.93	4286.86	4286.88
Fixed Expenditure							
Repair & Maintenance cost	60.66	60.49	60.47	60.47	60.47	60.47	60.47
Manpower Cost (Salaries & Wages)	233.49	233.49	233.49	233.49	233.49	233.49	233.49
Other Expenses (Gen. & Admin.)	49.44	49.44	49.44	49.44	49.44	49.44	49.44
Total Operating Expenses	4597.10	4721.37	4756.59	4672.31	4672.33	4630.26	4630.27
EBITDA	945.29	973.79	977.32	966.52	966.49	961.47	961.46
EBITDA Margin	17.06%	17.10%	17.04%	17.14%	17.14%	17.19%	17.19%

Source: MM Analysis

MM conducted a sensitivity analysis to examine the major risks associated with the Project. Based on the perceived major risks associated with the Project, the risk scenarios have been considered as under –

- Case-I: Increase in sugar cane price by 1.5%
- Case-II: Decrease in selling price of sugar by 1.4%
- Case-III: Decrease in production by 3.1%
- Case IV: Decrease in sugar recovery rate by 0.14%
- Case V: Decrease in sugar recovery rate by 0.09% and sugar sales price to 3650

Table 5: Sensitivity Cases

Particulars	Base Case	Case I	Case II	Case III	Case IV	Case V
Average Revenue ¹	5,633.22	5,633.22	5,565.47	5,478.11	5,572.63	5,568.11
Average Operating Expenses ²	4,668.60	4,725.31	4,668.60	4,544.60	4,667.49	4,667.89
Average EBITDA ³	964.62	907.92	896.86	933.51	905.14	900.22
Average EBITDA Margin ⁴	17.12%	16.12%	16.12%	17.04%	16.24%	16.17%
Cash DSCR ⁵	1.24	1.17	1.16	1.17	1.17	1.16
Min Cash DSCR ⁶	1.10	1.01	1.00	1.00	1.01	1.00

Source: MM Analysis

MM concludes that:

- The project is most sensitive to variation in selling price.
- MM observes that, based on the cash DSCR calculated by SBI Capital (refer Footnote), the Company would be able to maintain an average cash DSCR of above 1, even in the sensitivity scenarios considered above.

Post S4A: As per the business plan of the Company submitted with Mott MacDonald, the Company is expecting sufficient cash flows to run its business efficiently and service its debts. After implementation of S4A, the interest burden of company will get reduced significantly

¹ FY 2017-18 to FY 2023-24

² FY 2017-18 to FY 2023-24

³ FY 2017-18 to FY 2023-24

⁴ FY 2017-18 to FY 2023-24

⁵ DSCR has been calculated by the SBI Capital and only recorded by MM.

⁶ DSCR has been calculated by the SBI Capital and only recorded by MM.

resulting in saving of EBITDA for debt repayments. The repayment of sustainable debt over a period will reduce the debt burden resulting in more improved cash flows for the Company

Considering the future expected improvement in market scenario, the Company expects generation of sustainable cash flows and accordingly the financial statement continue to be presented on a going concern basis, which contemplates realization of assets and settlement of liabilities in the normal course of business.

Based on our Techno Economic Viability Study in the "Base Case Scenario", the Consultants understand that the Cash flows generated from operations after the committed capital expenditure and finance charges, are expected to be adequate for servicing the Sustainable debt (Part A - 54.55%), subject to the operational performance of the Company as per the assumptions/ descriptions mentioned herein this Report.

1 Introduction

1.1 Project Background

Bajaj Hindusthan Sugar Limited ('BHSL' or 'the Company') is the flagship Company of the Shishir Bajaj Group ('the Group') and is one of the largest sugar and ethanol manufacturing company in India. It was incorporated in the year 1931 as a sugar and cement manufacturing company.

The lenders propose to implement S4A Scheme to realign repayments with expected cashflows.

A detailed "Techno-Economic Viability Report" study of BHSL's business is required with objective of overall review and assessment of feasibility of the business plan of BHSL. In this context, the Lead Banker – State Bank of India, Lucknow (SBI) – has appointed Mott MacDonald India ("MM" or "the Consultants") for the Techno-Economic Viability Study.

1.2 About BHSL

BHSL, erstwhile known as Bajaj Hindusthan Ltd. was incorporated on November 24, 1931. It was initially incorporated as Hindusthan Sugar Mills Limited (HSML) and the first plant was set up at Golagokarannath, District Lakhimpur Kheri in the Terai region of Uttar Pradesh (UP). BHSL is amongst the largest sugar companies in Asia.

The Company has 14 sugar factories, six distilleries, and 14 co-generation plants, the details of which are as follows:

- 14 Sugar Mills – Capacity of 136,000 TCD
- 6 Distilleries (Ethanol and Spirits) – Capacity of 800 KLD
- 14 Co-generation plants – Capacity of 449 MW

BHSL also produces molasses, bagasse and press mud which are by-products and sells the surplus quantity in market.

1.1 Mott MacDonald -- Opening opportunities with connected thinking

1.1.1 Turning obstacles into sustainable infrastructure and development solutions

We are a global engineering, management and development consultancy focused on guiding our clients through many of the planet's most intricate challenges. Improvement is at the heart of what we offer: better economic development, better social and environmental outcomes, better businesses, and a better return on investment.

We work best in partnership, helping our clients to establish the steps needed to meet their strategic ambitions, using analytical front-end advice that helps fund, plan, design, deliver and sustain their goals.

1.1.2 Advice that adds advantage

Our engineers, project and programme managers have taken lead roles in the world's highest profile infrastructure and development projects. Yet design and management are just the tip of a deep iceberg. Our clients have access to the vast knowledge of internationally recognised environmentalists, planners, economists, project finance advisors, cost consultants, business strategists and more.

1.1.3 Connecting with your world

Mott MacDonald's universe of creative thinkers is centred around our clients. Whatever your needs or ambitions and wherever in the world you are, we can align the right combination of expertise.

Working with us, you get the advantages of size and stability that come from a US\$ 2 billion organization. We employ over 16,000 people, delivering projects in Africa, Asia Pacific and Australasia, Europe, the Middle East, North and South America, and South Asia – 150 countries in all. But you get the kind of openness, friendliness and personal commitment you might associate with a much smaller business.

1.1.4 Doing what is right

Being employee-owned frees us to choose the work we take on and focus on the issues that are important to our clients – and us. We are not in the business to make the most profit for external shareholders: we want to do a great job for our clients, our communities and our people. We are independent in thought and action, which means we advise what is genuinely right for our clients, not what is easy.

We insist on the highest standards of integrity in all we do. We were the first consultancy firm to be certified to BS 10500, the UK's anti-bribery management standard, recognised as the most stringent in the world.

1.1.5 Improving people's lives

Our definition of sustainability is creating solutions and outcomes that bring long-term benefits for our clients and their communities. We have learned and shown that sustainable thinking delivers real value for our clients, for the communities we work in and for our own business, regardless of the sector or the challenges.

Many of our people joined their professions and us to make a difference. Working with governments, development banks and NGOs alongside blue-chip companies, we have a direct positive impact on the lives of the poor and disadvantaged, in emerging and developed countries alike. Projects to improve health and longevity, education, to build climate resilience and to recover from natural disasters such as earthquakes and flooding are all in our portfolio, and will always be.

1.2 Mott MacDonald in India

For over 45 years Mott MacDonald has been at the forefront of management, engineering and development consultancy in India. With over 1200 staff engaged in planning, developing and delivering projects from six (Ahmedabad, Bangalore, Chennai, Hyderabad, Mumbai and Noida) principal offices and over 45 project offices, we are working on a range of projects in the industry, transport, water, buildings, energy, environment, health, education, communications, climate resilience and institutional development sectors.

We provide an array of key services in the entire project development cycle for India's major markets – from business case planning to design engineering, project management and post commissioning assistance. We do this through innovative thinking and by mobilising cross-sector, international perspectives, drawing on the immense talent and energy of our people – designers, engineers, project and programme managers, management consultants, environmentalists, planners, economists, business strategists, infrastructure finance advisors, public private partnership experts, cost consultants, low carbon specialists, technology experts, safety advisors, health and education specialists, development policy advisors and more.

Our Indian business is the Group's lead focus of industrial expertise, especially in chemicals, pharmaceuticals, automobiles, FMCG and textiles where we lead the field in business case planning, business conceptualization, strategy, financial and demand modelling, engineering design, project management, and procurement and validation services.

Finding opportunities in complexity, turning obstacles into elegant, sustainable solutions, we aim to add value at every stage, for our clients – national and local governments, public and private utilities, industrial and commercial companies, investors, developers, banks and financial institutions, international as well as bilateral funding agencies and private entrepreneurs.

With our best technical skills and thought leaders bringing international best practice to enhance value for our clients, stakeholders and society, we respond to even the shortest lead times with a fast track, quality-focused approach on landmark Indian projects like Delhi Metro, Delhi International Airport, Dedicated Freight Corridor, Sustainable Urban Transport Project, Karnataka Urban Development and Coastal Environmental Management Project, Uttarakhand Urban Sector Development Investment Program, over 1000 industrial and many a social development projects.

1.2.1 Contact Details of Main Offices

Table 6: MM Main Offices in India

Sr. No.	Main Offices	Address	Phone/Fax
1	Ahmedabad-Sakar II	50, Sakar II, Near Ellisbridge, Ahmedabad, Gujarat - 380 006	+91 (0) 79 26575550 / 99 +91(0) 79 2657 5558 (F)
2	Bangalore	2305, Kodigehalli Main Rd, Sahakar Nagar, Sanjeevini Nagar, Bengaluru, Karnataka 560092	+91 080 39973548
3	Chennai-Tamarai Tech Park	16-20, South Block, Tamarai Tech Park, Jawaharlal Nehru Road, Guindy, Chennai, Tamil Nadu - 600 032	+91 (0)44 3054 2700 +91 (0)44 3054 2772 (F)
4	Delhi-NOIDA	5/6th Floor, Logix Techno Park, Tower C, Plot 5, Sector 127, Noida, Uttar Pradesh 201301	+91(0) 120 254 3582 +91(0) 120 254 3562 (F)
5	Hyderabad-Begumpet	Level 4, Regus Business Center, Gumidelli Commercial Complex, 1-10-39 to 44, Old Airport Road, Begumpet – 500 016. Telangana, India.	+91(0) 40 6704 3710
6	Mumbai-Goregaon-Prism Tower (Head Office)	7th Floor, A Wing, Prism Tower, Mindspace - Goregaon, Mumbai-400 062. Maharashtra	+91 (0)22 3981 0100 +91 (0)22 3981 0212 (F)

Source: MM

Mott MacDonald globally follows STEP system for delivering projects. The same will be adopted for delivering the Project. Under the STEP system, the Project Manager and Project Principal are responsible for successful delivery of the Project. In case there is a need for escalation, the contact details are provided in table below.

Table 7: Organisation Profile and contact details

Name	Mott MacDonald Private Limited
Parent Company	Mott MacDonald, UK
Registered Address	Mott MacDonald Private Limited, 44 Dr. R. G. Thadani Marg, Worli, Mumbai 400 018, India
Address for Correspondence	Mott MacDonald House, 44/45, Street No-14 MIDC Area, Andheri East Mumbai - 400093 T +91 (0) 22 3981 0100
Number of Years of Existence	45 years
Contact Name	Mr. Gajanan Bochare

	Business Head – Corporate Advisory
Phone	+91(0) 22 3981 2174
Email	gajanan.bochare@mottmac.com

Source: MM

1.2.2 Why Mott MacDonald???

MM in India is well placed to take up the assignment and brings in the following advantages to the Project –

- MM has local presence but use global processes for project delivery
- We have robust project management systems and processes
- MM in India has in-house team of about 1200 professionals, engaged in planning, developing and delivering projects across many sectors – from Advisory, Buildings, Energy, Industry, Water and Environment to Transport, Urban Infrastructure and Social Development
- MM has in-house design team for any technical support.
- MM in India has licensed software to offer services to their Client as per international standards
- MM in India is an ISO 9001 and ISO 14001 certified company. MM India adopts systems which are developed globally by Mott MacDonald, UK
- The Health Safety and Environment (HSE) policy of MM in India is guided by the HSE policy adopted by Mott MacDonald, UK
- MM has robust Ethics policy together with strong Implementation of systems and processes. MM is BS10500 certified.
- MM in India has been operating for the past four decades and is well versed with the environment, regulatory, construction and contractual issues which may affect the Project.

1.3 Ethics Policy

The Group Board is committed to promoting the highest standards of ethical behaviour and requires employees to act according to our ethical principles. Offering, giving, solicitation or acceptance of any bribe, whether cash or any other inducement or engaging in any other corrupt practice is strictly prohibited.

We undertake appropriate due diligence in evaluating business partners to assess risk and avoid dealing with prospective partners where there is any suspicion of corruption. We seek contractual arrangements with major suppliers that allow us to withdraw from the contract in the event of unethical business practices.

1.4 Study Objective

The lenders propose to implement S4A Scheme to realign repayments with expected cashflows. A detailed Techno-Economic Viability (TEV) study of BHSL's business is required with objective of overall review and assessment of feasibility of the business plan of BHSL. The Scope of Work for TEV Study is elaborated in subsequent sections.

1.4.1 Management Aspects

- Profile of the Company
- Profile of the Promoters
- Medium and long term plans of management.

- Organization structure and review the adequacy of manpower requirement for the business plan. Manpower scenario and related challenges.
- Various business processes - marketing, procurement, sales etc. and its functions.
- Identification of key managerial factors
- Opinion on organization structure changes required, if any, to support the envisaged growth

1.4.2 Technical Aspects

- Key product categories.
- Sales mix in terms of domestic and export sales.
- Raw material availability, usage, source and price
- Current capacity and utilization level. Detail analysis and validation of the division wise existing facilities, their current production capacity & utilization level
- Company's recovery rate across 14 locations viz-a-viz their competitors / industry standard
- Technical assessment – details of plant & machinery in use and useful life of the assets of the Company.
- Assessment of processing capacity. Review of manufacturing process for each unit for different product categories.
- Prepare technical viability documents covering revenue & cost assumptions for each division.
- Comments on the technical capability & infrastructure of the Company to achieve the projected revenues.
- Analyse the regular maintenance CAPEX required, if any, in order to sustain the current operations & future projections of the Company
- Analysis of mandatory CAPEX for distilleries units for ~ Rs. 80 crore to be spent in compliance with order of Pollution Control Board and its likely impact, if not spent.
- Company's productivity level compares to the industry standards.
- Utilities consumption level against the industry norms.
- Comments on various other manufacturing parameters being achieved vis-a-vis the industry norms
- Statutory approval and regulatory approvals for the manufacturing units.

1.4.3 Industry Prospects

- Current status of global and Indian sugar industry.
- Expected emerging macro trends to impact Company's performance.
- Future domestic and export demand trends of sugar industry;

1.4.4 Market Potential

- Present market scenario. Future market projections. Study the trend in consumption, i.e. demand supply scenario, based on geography & Industry segment for various products manufactured by the Company.
- Prepare a market overview and competition analysis
- Study of the historical trends of production, domestic consumption and macro level Industry analysis.

1.4.5 Financial Aspects

- Understand and validate the key assumptions on market and financial parameters. Analyse historical prices of key raw materials and make projections for the future.
- Prepare financial viability (EBIDTA) document covering assumptions, profitability statement, cash flow statement from operations,
- Prepare estimated cash flow from operation for next 6 months based on the last 6 months' cash flow from operations and comment on sustainability of debt.
- Company's performance since JLF restructuring.

Cash flow analysis of the Company and reasons behind the cash flow variances vis-a-vis RESTRUCTURING assumptions and projections. Analysis and comments on deviations in actual numbers and performance of the Company from those projected in TEV study for previous JLF restructuring, with key reasons.

- Undertake a sensitivity and scenario analysis (on key variables) and assess impact on the financials of BHSL.
- Overview of current financial position of BHSL
- Existing position of loan taken from the bank
- Review the supply side arrangements of the Company including procurement of critical components & comment on its suitability and provide suggestions for improvement if required, to achieve smooth order executions.
- Provide detailed break up of operating cost for each product type including but not limited to labour, raw material, repairs & maintenance, consumables, utilities, selling & distribution expenses etc. Provide detailed assumptions & calculations for the same.
- Study the present inventory levels
- Note elaborating the Subsidy Scheme notified by State Government / Central Government. Assessments of subsidy already claimed and balance to be claimed over the forecast period.
- To evaluate the financial viability (EBIDTA Level) & future prospects of the Company. Financial viability (EBIDTA Level) with & without (or very low) receipt of Govt. subsidy in near future.
- Sensitivity analysis on the projected revenues and profitability (EBIDTA).
- All item-wise Statutory payments (including Salary / Wages) overdue as on date.
- The gaps in the present operational set-up and scope of improvement along with its financial implications.

1.4.6 Business Prospects

- Company's competitive positioning
- Projected growth scenario for the Company
- Prepare a Risk Matrix and a brief on mitigation measures
- Prepare a SWOT analysis of the Company
- Identification of any non-core assets for selling off / divesture
- Compliance status of each facility on the prescribed standard/specifications & guidelines given by Government or any other statutory body or association as applicable

1.4.7 Future Roadmap

- Analysis of existing level of company's debt structure

- Roadmap strategy for the Company in terms of Key areas such as - Production efficiency, Technological advancement, Marketing & Distribution, Organizational restructuring etc.

1.5 Approach and Methodology

The methodology to be adopted for the assignment is outline below and deliberated in detail in following sections:

Table 8: MM Approach

Activities	Description	Sources / Remarks
PROJECT INITIATION		
Project Briefing	Kick-off meeting	
Data collection	Information Checklist	
SITE VISIT		
	Technical Assessment for all 14 units	Three teams of technical experts visited BHSL's facilities in western, central and eastern UP, respectively, during June 6 th - 9 th . The teams evaluated the plants on technical and performance parameters
BUSINESS OPERATIONS REVIEW		
Organisation and Management review	Review of Board Composition and committees	BHSL Annual Reports, Investor Presentations, Management discussion and analysis
Business overview	Review of business processes (Marketing, procurement, sales, etc.) and manpower scenario	
Operational performance review	Segment results and historical financial analysis	
Issues and challenges	Historical background and opinion on the required changes in the organizational structure for the required growth	
MARKET ASSESSMENT		
Industry analysis	Value chain of products, including raw materials, process intermediates and end-use into various sectors	Indian Sugar Mills Association (ISMA), Directorate of Economics and Statistics (DES), Annual Reports of Major Sugar Manufacturers, The World Bank, MM Proprietary data base.
Current market scenario	Current status of global and Indian sugar industry Study the trend in Demand-Supply (D-S) scenario based on geography & industry segments. Review historic pricing trend of raw materials and intermediates against the costs to company	
Raw material scenario		
Market outlook	Expected emerging macro trends to impact Company's performance; Future domestic and export demand trends of sugar industry	
Competitive Outlook	Competitive landscape, peer comparison, SWOT, Map regional competition, with benchmarking on strengths, concerns, opportunities, and threats	
TECHNICAL ASSESSMENT		

Activities	Description	Sources / Remarks
Plant configuration	Products manufactured, capacity, major infrastructure	Site visits to plant sites as per list given below. Review of operations, Company documents, observations during site visits.
Location assessment	Accessibility to major ports, highways, airports, raw material sources	
Organogram and manpower assessment	Skills and adequacy of manpower	
Technology assessment	Review of process technology, plant and machinery, quality of vendors, utilities and ancillary units	
Consumption norms	Product wise raw material and utilities consumptions	
Statutory compliances	Status of factory licenses, permits, approvals, certifications and environmental compliances	
BUSINESS PLAN REVIEW		Inputs from Market, Technical and financial assessment
Capacity utilisations	Rationalisation of all business segments and estimate the practical capacity utilisations, revenues, costs and working capital requirement considering market, technical and financial constraints	
Revenue and cost projections		
Profitability margins		
Working capital assessment		
RISK ASSESSMENT		
Operating	Preparation of a Risk Matrix and a brief on mitigation measures	Inputs from Market, Technical and financial assessment and discussion with the Company on mitigation measures
Market		
Financial	Identification and review of any non-core assets for selling off / divesture	
Legal and Regulatory	Compliance status of each facility on the prescribed standard / specifications & guidelines given by Government or any other statutory body or association as applicable	

Source: MM Analysis

The visits to 14 operating plant sites across the business segments were conducted during June 6th, 2017 to June 9th, 2017.

Table 9: Details of Site Visit

Sr. No.	Site	Plant Facility
1	Golagokarnnath	Sugar Mill, Distillery, Co-gen Power Plant
2	Palia Kalan	Sugar Mill, Distillery, Co-gen Power Plant
3	Kinauni	Sugar Mill, Distillery, Co-gen Power Plant
4	Thana bhavan	Sugar Mill, Co-gen Power Plant
5	Budhana	Sugar Mill, Co-gen Power Plant
6	Bilai	Sugar Mill, Co-gen Power Plant
7	Gangnauli	Sugar Mill, Distillery, Co-gen Power Plant
8	Khambarkhera	Sugar Mill, Distillery, Co-gen Power Plant
9	Barkhera	Sugar Mill, Co-gen Power Plant
10	Maqsoodpur	Sugar Mill, Co-gen Power Plant
11	Pratappur	Sugar Mill, Co-gen Power Plant
12	Rudhauri	Sugar Mill, Distillery, Co-gen Power Plant
13	Kunderkhi	Sugar Mill, Co-gen Power Plant
14	Utraulla	Sugar Mill, Co-gen Power Plant

Source: MM

During the site visits, the Consultant team observed the operations, condition of plant and machinery, discussed with the plant management and collected information available at site.

1.6 Flash Report

A Flash Report dated 13th June, 2017, was presented which provided an early assessment of the key functions and operations of the Company along with a snapshot of the current market assessment and industry drivers. The study is based on the information provided by BHSL, secondary market research, and primary information collected during site visits. The information collected and key issues identified during the first 2 weeks of the assignment and reported in the Flash Report; have been further validated, analysed in the Draft Report. Hence the Draft report and its observations supersede the same in the Flash Report.

1.7 Key Caveats

MM have not considered following parameters during assessment of techno-economic viability of the project:

- All the subsequent sections are restrained to the scope of work mentioned in the Section 1.3
- Change in government regulations on import of price of sugarcane, market pricing of free sugar and import-export restrictions and its impact on the movement of raw material and pricing
- Government regulated minimum support price for agriculture produce (especially sugarcane) and its impact on the raw material pricing.
- Changes in the import duty and export regulations on free and refined sugar.
- The industry is also affected by factors like global demand, monsoon, crude prices, prices of other cash crops etc
- Changes in sugar consumption pattern and food habits including packaged foods, health and nutritional considerations
- Changes in distribution channels from dealers, organised retail, super markets, general/department stores, public distribution system
- Entry of the leading global food processing companies and innovative food products.
- Advancement in end user technology leading to lower production cost for the sugar.
- Commodity price fluctuations and its implication on the plantations, crop production, blending level of biodiesel, trading and speculative market.
- While commenting on the market section MM has conducted secondary research from reputed and reliable data sources.
- Future market projections are estimated after considering the past trends and consistent macro-economic indicators.
- Any change in these macro-economic indicators in the future may have an impact on future projections.
- Post EBITDA financial analysis has been provided by SBI Capital/BHSL and MM have only recorded the same in the Report.
- MM has relied upon the information provided by the Company to conduct the study and are limited by the accuracy of the data provided

2 Historical Performance

2.1 Introduction to historical performance

The Joint Lenders Forum (JLF lenders) led by State Bank of India had approved the corrective action plan for restructuring of credit facilities on December 03, 2014 under JLF route in accordance with the applicable framework and guidelines issued by Reserve Bank of India. The cut-off date for restructuring under JLF route was July 31, 2014. The reasons for Company undergoing restructuring under JLF as mentioned in MRA were:

- Immediate payment of Cane arrears
- Strain in EBITDA Margin due to high cane procurement cost, decline in sugar prices and excess supply in the market.
- Non-Settlement of Sugar Promotion Policy (SPP) Claim
- Non-implementation of Rangarajan Committee recommendations
- Increase in interest obligations and debt pile up

The Company had proposed to sell its power business and the entire sales consideration was proposed to be used for part repayment of its certain secured loans. However as stated by the management the Co Gen Assets sales could not be completed- due to delay in receipt of approval and Sanctions.

In past few years the Company incurred operational losses resulting into erosion of considerable net worth of the company. As at year end of 2016-17, the Company has overdue installment of bank loan and interest and dues to farmers for cane purchase. Considering the future expected improvement in market scenario, the Company expects generation of sustainable cash flows and accordingly the financial statement continue to be presented on a going concern basis, which contemplates realization of assets and settlement of liabilities in the normal course of business.

The financial statements of the Company for FY 2016-17 have been prepared to comply with the Indian Accounting Standards ('Ind AS') notified under Companies (Indian Accounting Standards) Rules, 2015 read with section 133 of the Companies Act, 2013. Upto the year ended March 31, 2016, the Company has prepared its financial statements in accordance with the requirement of Indian GAAP, which includes Standards notified under the Companies (Accounting Standards) Rules, 2006 and considered as "Previous GAAP". These financial statements are the Company's first Ind AS compliant financial statements and are covered by Ind AS 101 - First time adoption of Indian Accounting Standards. The date of transition to Ind AS is April 1, 2015.

2.2 Review of Past Operating Performance

Operational performance of the Company during the period FY 2012-13 to FY 2016-17 has been as detailed in Table 10: Figures for the year ended 31st March 2014 comprises of period of 18 months from October 1, 2012 to March 31, 2014 and therefore not comparable with other years.

Table 10: Income Statement

(All figures in ₹ Crore)

Particulars	Sept-12 Audited	Mar-14 18 months Audited	Mar-15 Audited	Mar-16 Audited	Mar-17 Audited
REVENUE					
Revenue from Operations	4,262.63	6,644.25	4,531.46	4,683.23	4384.59
EXPENSES					
Cost of Materials Consumed	3,366.01	7,815.33	3,704.54	3,127.29	4037.88
Changes in inventories of finished goods, work-in-progress and stock in trade	(57.97)	(2,075.88)	432.75	281.23	(1032.80)
Employee benefit Scheme	191.93	316.24	179.67	198.95	233.49
Other Expenses	304.90	666.14	372.72	282.59	290.52
Total	3,804.87	6,721.83	4,689.68	3,890.06	3,529.09
Earnings before Interest and Finance cost, Tax, Depreciation & Amortisation [EBITDA]	457.76	(77.58)	(158.22)	793.17	855.50
Other Income	106.15	49.81	38.66	155.98	162.27
Finance costs	536.41	948.57	741.55	848.38	802.07
Depreciation, amortisation, impairment expenses	348.82	531.72	239.94	223.98	214.12
Profit/(Loss) before exceptional and extraordinary items and tax	(321.32)	(1,508.06)	(1,101.05)	(123.21)	1.58
Exceptional/Extraordinary Items			3.83		
PBT after Exceptional/ Extraordinary Items	(321.32)	(1,508.06)	(1,097.22)	(123.21)	1.58
Provision for Tax	(86.75)	25.06		(3.42)	(5.82)
PAT	(234.57)	(1,533.12)	(1,097.22)	(119.79)	7.40

Source: BHSL Annual Report

2.2.1 Analysis of Operating Revenue

Product-wise sales quantity, value and per unit realization details are given Table 11:

Table 11: Revenue from Operations

Particulars	Year ended March 31, 2015				Year ended March 31, 2016				Year ended March 31, 2017			
	Un it	Qty	Value (₹ Crore)	Realisati on Rs./MT/K L/ MW	Unit	Qty	Value (₹ Crore)	Realisati on Rs./MT/K L/ MW	Un it	Qty	Value (₹ Crore)	Realisa tion Rs./MT/ KL/ MW
Sugar	MT	12,39,186	3,728.71	30,090	MT	1,296,466	3,649.58	28,150	MT	1,046,122	3,923.05	37,501
Alcohol/Ethanol	KL	1,09,389	435.21	39,785	KL	142,846	594.41	41,612	KL	1,09,820	461.97	42,066
Molasses	MT	33,684	14.81	4,394	MT	117,968	26.97	2,286	MT	10,058	2.76	2,744
Power	MW	3,29,277	154.76	4,700	MW	266,106	133.1	5,002	MW	2,67,257	126.88	4,747
Total			4,333.49				4,404.06				4,514.66	
Other operating revenue/trading			360.59				478.56				103.98	
Gross Sales			4,694.08				4,882.62				4,618.64	
Less Excise duty			162.62				199.39				234.05	
Net Sales			4531.46				4,683.23				4,384.59	

Source: BHSL Annual Report

- The revenue from operations is generated from the sale of sugar, alcohol, power, by-products (Molasses, Bagasse, press mud and others) and traded goods.
- Sale of Sugar is a major source of revenue for the Company and contributes about 75% of turnover. The Company manufactures and sells sugar under the three categories i.e. free sugar, levy sugar and refined sugar. Majority of the sales from sugar is generated domestically with free sugar sale
- While most of the power generated by BHSL continued to be used for captive consumption to run its plants, the surplus power was sold to the Uttar Pradesh state grid.
- Industrial alcohol was sold in the local market directly to end users, mainly alcohol-based chemical plants. Ethanol was sold to oil companies, who use it for blending with gasoline.
- The Company also earns revenue from sale of by-products such as molasses, bagasse, press mud and others.
- During the year ended March 31, 2017, the Company's revenue from operations was Rs.4384.59 crore as against Rs.4683.23 crore in FY 2015-16.
- The other operating revenue of FY 2015-16 includes government subsidies financial assistance of Rs.329.99 crore received from Govt. of UP on cane purchased linked to avg. selling price of sugar and its by product during the period Oct 2014 to May 2015
- Revenue projections were made in restructuring package to estimate the cash flows in view of economic recovery and sector growth expected. However, the same were not achieved as estimated as has been detailed in subsequent subsections

2.2.2 Cost Structure Assessment

Cost assessment of the Company for the past five years has been as observed from Table 12.

Table 12: Cost Structure of BHSL (% of Turnover)

Particulars	Sept-12 Audited	Mar-14 18 months Audited	Mar-15 Audited	Mar-16 Audited	Mar-17 Audited
Cost of materials consumed/ Inventory changes	77.61%	86.38%	91.30%	72.78%	68.54%
Employee benefits expense	4.50%	4.76%	3.96%	4.25%	5.33%
Other Expenses	7.15%	10.03%	8.23%	6.03%	6.63%
Finance costs	15.51%	16.97%	19.62%	17.96%	18.29%
Depreciation/ amortisation	8.18%	8.00%	5.29%	4.78%	4.88%
Total	112.96%	126.14%	128.40%	105.80%	103.66%

Source: MM Analysis

The subsequent sub-section provides details of the expenditure incurred by the Company under various heads during the period under review:

2.2.2.1 Cost of Raw Material Consumed

Raw Material consumption cost as a % of turnover increased to 72% in FY 2015-16 and was 69% of turnover in FY 2016-17 as detailed in Table 13.

Table 13: Cost of Raw Material Consumed

(All figures in ₹ Crore)

Particulars	Sept-12 Audited	Mar-14 18 months Audited	Mar-15 Audited	Mar-16 Audited	Mar-17 Audited
- Sugarcane	3,121.09	7,338.94	3,450.41	3,098.02	4,008.32
- Molasses	37.50	94.99	33.96	21.75	21.77
- Bagasse	23.95	4.62		0.18	-
- Others	5.20	12.78	8.10	7.34	7.79
Purchase of Traded Goods	161.13	364.00	212.07		
Total RM Cost	3,366.01	7,815.33	3,704.54	3,127.29	4037.88
Changes in Inventory	(57.97)	(2,075.88)	432.75	281.23	(1032.80)
Total RM Cost including inventory changes	3,308.04	5,739.45	4,137.29	3,408.52	3005.08
% of Turnover	77.61%	86.38%	91.30%	72.78%	68.54%

Source: BHSL & MM

Sugarcane is the major raw material in the production of sugar and accounts for around 70-75% of the cost of production. Thus, financial performance of the Company is highly co-related to cane prices. The cost of raw material as a percentage of turnover has decreased over the years.

2.2.2.2 Employee Benefits Expense

Employee costs increased marginally from Rs.191.93 crore in FY 2011-12 to Rs.233.49 crore by FY 2016-17 and has been about 5% of turnover during the period.

2.2.2.3 Finance Cost

Finance cost increased from Rs.661.28 crore in FY 2011-12 to Rs.802.07 in FY 2016-17. Interest and finance charge increased to 18% of turnover in FY 2016-17.

2.2.2.4 Other Expenses

Other expenses incurred on stores and consumables, power and fuel, repairs, rent etc. are as detailed in Table 14.

Table 14: Other Expenses

Particulars	Sept-12 Audited	Mar-14 18 months Audited	Mar-15 Audited	Mar-16 Audited	Mar-17 Audited
Stores, spares and packing materials consumed (Rs. Crore)	112.68	215.44	110.68	91.28	88.93
Power and fuel (Rs. Crore)	21.39	28.77	12.28	10.92	15.38
Repairs (Rs. Crore)	56.82	106.71	113.54	67.51	67.31
Other Expenses (Rs. Crore)	114.01	315.22	136.22	137.85	118.90
Total (Rs. Crore)	304.90	666.14	372.72	307.56	290.52
% of Turnover					
Stores, spares and packing materials consumed	2.64%	3.24%	2.44%	1.95%	2.03%
Power and fuel	0.50%	0.43%	0.27%	0.23%	0.35%
Repairs	1.33%	1.61%	2.51%	1.44%	1.54%
Other Expenses	2.67%	4.74%	3.01%	2.94%	2.71%
Total	7.15%	10.03%	8.23%	6.57%	6.63%

Source: BHSL & MM

As compared to previous years the Company has managed to control the other expenses.

2.2.2.5 Depreciation Expense

- Depreciation on tangible fixed assets has been provided based on the useful life prescribed in Schedule II of the Companies Act, 2013. Intangible assets represented by computer software is being amortized over a period of five years. Leasehold land is amortized over the lease period. Depreciation on assets added, sold or discarded is been provided on pro-rata basis.
- Depreciation cost has been about 5% of turnover in the past three years.

2.2.3 Operating Margin Analysis

Trend of profit margin (as percentage of turnover) during the period 2012-13 to 2016-17 is indicated in Table 15.

Table 15: Profitability Ratios

Particulars	Sept-12 Audited	Mar-14 18 months Audited	Mar-15 Audited	Mar-16 Audited	Mar-17 Audited
EBIDTA (Rs. Crore)	457.76	(77.58)	(158.22)	793.17	855.50
EBIDTA Margin (%)	10.74%	-1.17%	-3.49%	16.94%	19.51%
PBT (Rs. Crore)	(321.32)	(1,508.06)	(1,097.22)	(123.21)	1.58
PBT Margin (%)	-7.54%	-22.70%	-24.21%	-2.63%	0.04%
PAT (Rs. Crore)	(234.57)	(1,533.12)	(1,097.22)	(119.79)	7.40
PAT Margin (%)	-5.50%	-23.07%	-24.21%	-2.56%	0.17%

Source: BHSL & MM

- EBIDTA margins for the Company improved in FY 2016-17. The Company reported marginal profits in FY 2016-17 which was due to interest income of Rs.152.26 crore and other income of Rs.10.01 crore.
- Relatively high variable cost, working capital-intensive nature of operations and the Company's debt-funded exposure are affecting the liquidity of the Company. Effective management of working capital, reduction in debt, support from group companies and ability to reduce the variable cost will be important to achieve the activities planned.

2.3 Assessment of Past Financial Position

The financial position of the Company during the period under review is reflected through the synopsis of Balance Sheet Table 16.

Table 16: Balance Sheet

(All figures in ₹ Crore)

Particulars	Sept-12 Audited	Mar-14 18 months Audited	Mar-15 Audited	Mar-16 Audited	Mar-17 Audited
EQUITY AND LIABILITIES					
Shareholders' funds					
(a) Share capital	63.94	63.94	81.02	111.68	110.07
(b) Reserves and surplus	4,030.34	2,495.30	1,725.75	2,247.56	3,833.44
	4,094.28	2,559.24	1,806.77	2,359.24	3,943.51
Non-current liabilities					
(a) Long-term borrowings	1,500.69	2,509.57	7,111.34	6,345.98	5,459.79
(b) Deferred tax liabilities (Net)	-	-	-	-	653.13
(c) Other Long term liabilities		179.40			8.73
(d) Long-term provisions	31.84	41.36	26.58	29.02	40.23
	1,532.53	2,730.33	7,137.92	6,375.00	6,161.88
Current liabilities					
(a) Short-term borrowings	3,286.30	3,076.14	146.21	36.45	242.74
(b) Trade payables	236.40	2,815.92	2,789.84	2,195.72	2,785.87
(c) Other current liabilities	1,034.96	1,337.04	102.04	766.17	1,493.05
(d) Short-term provisions	12.83	9.74	93.79	120.64	175.81
Total Current Liabilities	4,570.49	7,238.84	3,131.88	3,118.98	4,697.47
Total	10,197.30	12,528.41	12,076.57	11,853.22	14,802.86
ASSETS					
Non-current assets					
(a) Fixed assets	5,419.50	4,986.71	4,889.82	4,669.26	7,728.17
(i) Tangible assets	0.35	0.13			
(ii) Capital work-in-progress	7.40	8.14	8.26	18.74	36.05
	5,427.25	4,994.98	4,898.08	4,688.00	7,764.22
(b) Non-current investments	1,600.36	2,431.05	2,281.71	2,281.71	1,108.30
(c) Long-term loans and advances	92.11	60.57	48.08	40.64	21.79
(d) Other non-current assets	1.68	1.40	3.66	3.83	4.93
Total Non-current assets	7,121.40	7,488.00	7,231.53	7,014.18	8,899.24
Current assets					
(a) Current investments					
(b) Inventories	558.24	2,673.50	2,179.29	1,924.12	3,009.52
(c) Trade receivables	192.02	225.48	168.99	308.72	165.58
(d) Cash and Bank Balances	180.30	128.24	88.07	117.09	81.50
(e) Short-term loans and advances	1,735.82	1,491.11	1,773.83	1,913.61	1,855.71
(f) Other current assets	409.52	522.08	634.86	575.50	791.31
Total Current Assets	3,075.90	5,040.41	4,845.04	4,839.04	5,903.62
Total	10,197.30	12,528.41	12,076.57	11,853.22	14,802.86

Source: BHSL Annual Report

Reconciliation of balance sheet as at March 2016 and April 1, 2015 between IndAS and Previous GAAP is given in Table 17.

Table 17: Reconciliation

(All figures in ₹ Crore)

Particulars	As at 31st March 2016			As at 1st April 2015		
	Previous GAAP	Effect of transition to Ind AS	As per Ind AS balance sheet	Previous GAAP	Effect of transition to Ind AS	As per Ind AS balance sheet
Assets						
Non-current assets						
Property, plant and equipment	4,669.26	3,267.90	7,937.16	4,889.82	3,267.90	8,157.72
Capital work-in-progress	18.74	-	18.74	8.26	-	8.26
Other intangible assets	0.00	-	0.00	0.00	-	0.00
Investments	2,281.71	(1,149.22)	1,132.49	2,281.71	(1,128.76)	1,152.95
Other non-current financial assets	3.83	-	3.83	3.66	-	3.66
Other non-current assets	19.92	-	19.92	24.27	-	24.27
Sub total	6,993.46	2,118.68	9,112.14	7,207.72	2,139.14	9,346.86
Current assets						
Inventories	1,924.12	0.00	1,924.12	2,179.29	0.00	2,179.29
Trade receivables	308.72	(8.56)	300.16	168.99	(3.21)	165.78
Cash and cash equivalents	41.17	-	41.17	59.93	-	59.93
Bank balances	78.10	-	78.10	29.95	-	29.95
Loans	1,719.52	(8.69)	1,710.83	1,573.09	(8.69)	1,564.40
Current tax asset (net)	20.72	-	20.72	23.81	-	23.81
Other current assets	767.41	-	767.41	833.79	-	833.79
Sub total	4,859.76	(17.25)	4,842.51	4,868.85	(11.90)	4,856.95
Total assets	11,853.22	2,101.43	13,954.65	12,076.57	2,127.24	14,203.81
EQUITY AND LIABILITIES:						
Equity						
Equity share capital	111.68	(3.29)	108.39	81.02	(3.29)	77.73
Other equity	2,247.56	1,601.83	3,849.39	1,725.75	1,714.38	3,440.13
Sub total	2,359.24	1,598.54	3,957.78	1,806.77	1,711.09	3,517.86
Liabilities						
Non-current liabilities						
Financial liabilities						
Borrowings	6,345.98	(126.18)	6,219.80	7,111.34	(116.70)	6,994.64
Provisions	29.02	-	29.02	26.58	-	26.58
Deferred tax liabilities (net)	-	665.52	665.52	-	679.06	679.06
Other non-current liabilities	9.18	-	9.18	9.79	-	9.79
Sub total	6,384.18	539.34	6,923.52	7,147.71	562.36	7,710.07
Current liabilities						
Financial liabilities						
Borrowings	36.45	(36.45)	-	146.21	(146.21)	-
Trade payables - Micro and small enterprises			-			-
Trade payables - Others	2,195.72	-	2,195.72	2,789.84	-	2,789.84
Other financial liabilities	693.02	-	693.02	31.76	-	31.76
Other current liabilities	63.97	-	63.97	60.49	-	60.49
Provisions	120.64	-	120.64	93.79	-	93.79
Sub total	3,109.80	(36.45)	3,073.35	3,122.09	(146.21)	2,975.88

Particulars	As at 31st March 2016			As at 1st April 2015		
	Previous GAAP	Effect of transition to Ind AS	As per Ind AS balance sheet	Previous GAAP	Effect of transition to Ind AS	As per Ind AS balance sheet
Total Equity and Liabilities	11,853.22	2,101.43	13,954.65	12,076.57	2,127.24	14,203.81

Source: BHSL

2.3.1 Net Worth of the Company

The Company's authorised capital consists Equity Shares having par value of Rs.1 each. The authorised, issued, subscribed and paid up capital of the Company is as detailed in Table 18.

Table 18: Capital Structure 31st March 2017

Category	No. of Shares held	Rs. Crore
Authorized Share Capital		
Equity Share Capital (Rs.1 each)	2,710,000,000	271.00
Issued,		
Equity Share Capital (Rs.1 each)	1,179,231,364	117.92
Issued, Subscribed and Paid up Capital		
Equity Share Capital (Rs.1 each)	1,133,559,942	113.36
Total Issued Subscribed and Paid up Capital	1,133,559,942	113.36
Less: Interest in BHSL Securities Trust and Shares held by ESOP Trust		3.29
		110.07

Source: BHSL Annual Report

- The subscribed and paid up capital of the Company as on March 31, 2017 consist of 1,133,559,942 Equity shares having par value of Rs.1 each. 494,160,031 Equity Shares have been issued for consideration other than cash to lender banks on conversion of Funded Interest Term Loan (FITL) as per Master Restructuring Agreement. The promoter group holds about 26% equity stake in the Company.
- Due to year on year losses reported during the period under review there has been continuous erosion in the net worth of the Company.
- Reserves and surplus as on March 31, 2017 of Rs.3833.44 crore comprise of Share premium of Rs.4185.31 crore, accumulated losses of Rs.610.41 crore, general reserve of Rs.155.95 crore, equity component of compound financial instrument of Rs.135.78 crore. Total Net worth of the Company as of 31st March 2017 was of Rs.3943.51 crore.

2.3.2 BHSL's Debt Profile

The JLF lenders had approved the corrective action plan for restructuring of credit facilities on December 03, 2014 under JLF route in accordance with the applicable framework and guidelines issued by Reserve Bank of India. The cut-off date for restructuring under JLF route is July 31, 2014.

The Promoters were required to bring promoter contribution amounting to Rs.200 crore in phased manner till September 2015 in the form of equity capital/ preference capital/unsecured loan/other similar instruments. An amount of 200 crore has been brought by promoters as unsecured loan within the stipulated period.

As per MRA, interest payable on the term loan for the period from August 01, 2014 to July 31, 2016 would be converted into Funded Interest Term Loan (FITL). 70% of FITL shall be converted

in to equity. The shareholders approved the preferential issue of shares to lenders through postal ballot. Part of the FITL, has been converted into equity by allotment of 47,74,17,863 equity shares to lenders till March 31, 2016 at a premium of Rs.20.77 per share. The balance 1,67,42,168 shares have been allotted to lenders on April 06, 2016 at the premium of Rs.20.77 per share

The Company accesses multiple avenues to raise funds during the period as detailed in Table 19,

Table 19: BHSL's Debt Obligation 31st March 2017

(All figures in ₹ Crore)

Particulars	Sept-12 Audited	Mar-14 18 months Audited	Mar-15 Audited	Mar-16 Audited	Mar-17 Audited
(a) Long-term borrowings	1,500.69	2,509.57	7,111.34	6,219.80	5,459.79
(b) Current maturities of Long Term Loan	921.01	688.96	26.36	691.18	1,304.66
Total Long Term Borrowings	2,421.70	3,198.53	7,137.70	6910.98	6,764.45
Short Term Borrowings					
(a) Short Term Borrowings FITL	3,286.30	3,076.14	146.21	-	242.74
Total Debt Obligation	5,708.00	6,274.67	7,283.91	6910.98	7,007.19
Total Net worth	4,094.28	2,559.24	1,806.77	3849.39	3,943.51
Total Debt-Equity Ratio	1.39	2.45	4.03	1.75	1.78
TOL/TNW Ratio	1.49	3.90	5.68	2.53	2.75

Source: BHSL Annual report

Table 20: Maturity Profile of Long Term Borrowings March 2017

(All figures in ₹ Crore)

Particulars	Interest (%)	Outstanding as at March 31, 2017	Current Maturities (0-1 Year)	2nd Year	3rd Year	4th Year	Beyond 4 Years
Term loans (Secured)							
From Banks	11.75%	6,646.57	1,287.92	1,052.18	943.67	916.83	2,445.97
From others - Sugar Development Fund (SDF)	4.00%-8.25%	34.37	16.74	8.47	6.69	2.47	-
Total - Secured		6,680.94	1,304.66	1,060.65	950.36	919.30	2,445.97
Term loans (Unsecured)							
Loan from promoters		82.68					82.68
Department of Commercial Tax of Uttar Pradesh		0.83	-	0.56	0.27		
Total - Unsecured		83.51	-	0.56	0.27	-	82.68
Grand Total		6,764.45	1,304.66	1,061.21	950.63	919.30	2,528.65

Source: BHSL Annual Report

- BHSL mobilized funds from secured term loans from banks, ECB from International Finance Corporation, term loans from Sugar Development Fund (SDF) and unsecured loans from Department of Commercial Taxes (DCT) of Uttar Pradesh.
- Total Secured borrowings was of Rs.6680.94 crore and unsecured loans from promoters and DCT of Rs.83.51 crore.
- Total Outside Liabilities to Total Net-worth ratio was on a higher side however in 2016-17 TOL-TNW ratio reduced to 2.75 times.

- Post Restructuring the Company could not perform as projected in the approved Restructuring scheme. To improve operations and viability, the Company has approached lenders for implementation of S4A scheme.

2.3.3 Other Long Term Liabilities

As of March 31, 2017, the long-term liabilities were of Rs.8.73 crore towards deposits from agent/customers. Deferred tax liability was of Rs.653.13 crore. Non-current provisions towards gratuity and leave encashment was of Rs.40.23 crore.

2.3.4 Fixed Assets and CWIP

Table 21 below indicates the historical trend of fixed assets and CWIP.

Table 21: Fixed Assets

(All figures in ₹ Crore)

Particulars	Sept-12 Audited	Mar-14 18 months Audited	Mar-15 Audited	Mar-16 Audited	Mar-17 Audited
Gross Block	7201.42	7294.65	7288.95	10558.50	10559.07
Less Depreciation	1781.92	2307.94	2399.13	2621.34	2830.90
Net Block	5,419.50	4,986.71	4,889.82	7937.16	7728.17
Intangibles assets under development	0.35	0.13			
Capital Work in Progress	7.40	8.14	8.26	18.74	36.05
Turnover/Fixed Assets Ratio	0.79	1.33	0.93	0.59	0.56

Source: BHSL Annual Report

The depreciated value of the block was of Rs.7728.17 crore and capital work in progress of Rs.36.05 crore. Of the total net block, Plant and Machinery was of Rs.2930.95 crore, Buildings of Rs.999.76 crore, freehold land of Rs.3713.30 crore along with other fixed assets.

2.3.5 Investments and Loans and Advances

2.3.5.1 Non-Current Investments

Non-Current Investments during the period under review are as mentioned in Table 22

Table 22: NonCurrent Investments

(All figures in ₹ Crore)

Particulars	Sept-12 Audited	Mar-14 Audited	Mar-15 Audited	Mar-16 Audited	Mar-17 Audited
Non-current Investments	1,600.36	2,431.05	2,281.71	1132.49	1,108.30

Source: BHSL Annual Report

Amount of investments in 2016 and 2017 are net of provision of diminution in value of investments (as per Ind AS).

The Company has total non-current investments of Rs.1108.30 crore in FY 2016-17 of which Rs.770.13 crore were with Lalit Power Generation Company and 240.83 crore in debentures of Phenil Sugars Limited.

2.3.5.2 Short Term Loans and Advances

The Company has short term loans and advances of Rs.1855.71 crore. Unsecured loans and advances to related parties account for majority of the total short term loans and advances. As on March 31, 2017, Rs.1419.89 crore is given to related parties.

2.3.6 Current Assets and Liabilities

2.3.6.1 Current Liabilities

Total Current liabilities and provisions increased from 3073.35 crore in FY 2015-16 to Rs.4697.47 crore as on 31st March 2017 of which Rs.2785.87 crore is towards trade payables and other liabilities of Rs.1493.05 crore as explained in the subsequent subsections.

2.3.6.2 Sundry Creditors

BHSL had sundry creditors of Rs.2785.87 crores as on March 31, 2017 which includes cane dues to farmers as has been detailed in Table 23.

Table 23: Trade Payables

(All figures in ₹ Crore)

Particulars	Sept-12 Audited	Mar-14 18 months Audited	Mar-15 Audited	Mar-16 Audited	Mar-17 Audited
Trade Payables	236.40	2,815.92	2,789.84	2,195.72	2,785.87
Trade Payables days	26	132	275	256	252

Source: BHSL Annual Report

2.3.6.3 Other Current Liabilities and Provisions

BHSL had other Current Liabilities of nearly Rs.1493.05 crore as on March 31, 2017, of which Rs.1369.64 crore is towards current maturities of long term loan and accrued interest and Rs.123.41 crore towards, statutory dues, security deposits, advances from customers and other liabilities.

Provisions of Rs.175.81 crore in FY 2016-17 is towards Gratuity of Rs.5.15 crore, leave encashment of Rs.4.19 crore and provision for excise duty of Rs.166.47 crore

2.3.6.4 Statutory Dues

Statutory dues as on 31st March 2017 based in the information provided by the Management is as stated in Table 24

Table 24: Statutory Dues

Particulars	Rs in Cr
Excise duty	22.53
Commercial tax / VAT / CST / Entry Tax / WCT	2.07
Service tax	1.16
TDS	1.97
PF and Superannuation	2.95
Total	30.68
Salary & Wages	16.10

Source: BHSL

As informed by the management the statutory dues and salaries and wages have been paid in April 2017

2.3.6.5 Inventories

Inventory increased from Rs.1924.12 in FY 2015-16 to Rs.3009.52 crore in FY 2016-17 with finished goods inventory of about 90% of total inventory. Inventory is higher due to higher crushing and longer crushing season.

Table 25: Inventories

(All figures in ₹ Crore)

Particulars	Sept-12 Audited	Mar-14 18 months Audited	Mar-15 Audited	Mar-16 Audited	Mar-17 Audited
Finished Goods Inventory	426.68	2410.48	1907.07	1736.58	2718.21
Other Inventory	131.56	263.02	272.22	187.54	291.31
Total Inventory	558.24	2,673.50	2,179.29	1,924.12	3009.52
Trade Inventory Days	61	125	215	225	272

Source: BHSL Annual Report

Table 26: Inventory Details as on 31st March 2017

Sugar	UoM	Quantity	Rate	Excise	Total	Rs in Cr
Finished white sugar - at Plant	Lac qtl	73.09	3,299.31	195.00	3,494.31	2,554.09
Finished white sugar - at Depot	Lac qtl	1.97	3,114.00	195.00	3,309.00	65.12
		75.06			3,489.45	2,619.21
BISS	Lac qtl	0.21	2,994.91	195.00	3,189.91	6.79
Sugar in process (WIP)	Lac qtl	1.00	3,145.15	-	3,145.15	31.46
Molasses						
Molasses	Lac qtl	31.13	400.00	75.00	475.00	147.85
Molasses in process (WIP)	Lac qtl	0.92	320.00	-	320.00	2.94
Bagasse						
Bagasse	Lac qtl	18.24	200.00	-	200.00	36.48
At Distillery division						
Alcohol	Lac BL	342.89	25.77	0.05	25.82	88.54
Molasses	Lac qtl	2.52	400.00		400.00	10.08
At Power Division						
Banked power	Lac kWh	167.88	2.18		2.18	3.67
Bagasse	Lac qtl	0.72	200.00		200.00	1.44
						2,948.46
Raw Material						2.10
Stores, spares & packing materials						58.96
Stock in trade [Rs. 49,674/-]						0.00
Material in transit (Stores) [Rs. 17241]						0.00
						3,009.52

Inventory days continues to be high and Inventory management needs focus as there is opportunity for improvement.

2.3.6.6 Trade Receivables

The receivables period is almost stable other than FY 2015-16 as depicted in the Table 27.

Table 27: Trade Receivables

(All figures in ₹ Crore)

Particulars	Sept-12 Audited	Mar-14 18 months Audited	Mar-15 Audited	Mar-16 Audited	Mar-17 Audited
Total Trade Receivables	192.02	225.48	168.99	300.16	165.58
Trade Receivable Days	16	12	13	23	14

Source: BHSL Annual Report

2.3.6.7 Other Current Assets

Other current assets are towards claims/ refund recoverable in cash or in kind or for value to be received as depicted in the Table 27.

Table 28: Other Current Assets

(All figures in ₹ Crore)

Particulars	Sept-12 Audited	Mar-14 18 months Audited	Mar-15 Audited	Mar-16 Audited	Mar-17 Audited
Claims / refund recoverable in cash or in kind or for value to be received	401.84	518.24	632.99	571.16	569.90
Duty drawback receivable	7.20	2.81	0.06	2.16	0.06
Interest accrued	0.48	1.03	1.81	-	
Advances to suppliers/ MAT				214.81	221.35
Total	409.52	522.08	634.86	788.13	791.31

Source: BHSL Annual Report

2.3.6.8 Net Current Assets

Total current assets of the Company increased from Rs.4842.51 Crore in FY 2015-16 to Rs.5903.62 Crore as on March 31, 2017. This was mainly because of increase in inventory. However, cash and bank balance reduced over the period. Movement in Current liabilities and Current Assets during the period under review is as detailed in Table 29.

Table 29: Net Current Assets

(All figures in ₹ Crore)

Particulars	Sept-12 Audited	Mar-14 18 months Audited	Mar-15 Audited	Mar-16 Audited	Mar-17 Audited
Current Assets					
Inventories	558.24	2,673.50	2,179.29	1,924.12	3,009.52
Sundry Debtors	192.02	225.48	168.99	300.16	165.58
Cash	180.30	128.24	88.07	119.27	81.50
Short term loans and advances	1,735.82	1,491.11	1,773.83	1,710.83	1,855.71
Other Current Assets	409.52	522.08	634.86	788.13	791.31
Total Current Assets	3,075.90	5,040.41	4,845.04	4,842.51	5,903.62
Current Liabilities					
Short term borrowings	3,286.30	3,076.14	146.21	-	242.74
Current Maturities of term loan	921.01	688.96	26.36	691.18	1304.66
Trade Payables	236.40	2,815.92	2,789.84	2,195.72	2785.87
Other Current Liabilities	113.95	648.08	75.68	65.81	188.39
Provisions	12.83	9.74	93.79	120.64	175.81

Particulars	Sept-12 Audited	Mar-14 18 months Audited	Mar-15 Audited	Mar-16 Audited	Mar-17 Audited
Total Current Liabilities	4,570.49	7,238.84	3,131.88	3,073.35	4,697.47
Net Current Assets	(1,494.59)	(2,198.43)	1,713.16	1,769.16	1,206.15
Current Ratio	0.67	0.70	1.55	1.58	1.26
Quick Ratio	0.54	0.32	0.85	0.94	0.62

Source: BHSL Annual Report

Working capital requirements of the Company are high. Management needs to keep a check on liquidity.

2.3.7 Trend in Sources and Application of Funds

The trend in change of complexion of source of funds during FY 2012-13 to FY 2016-2017 is indicated in Table 30.

Table 30: Sources and Application of Funds

Particulars	Sept-12 Audited	Mar-14 18 months Audited	Mar-15 Audited	Mar-16 Audited	Mar-17 Audited
Sources of Funds					
Shareholders' Funds	40.15%	20.43%	14.96%	28.36%	26.64%
Long Term Debt	14.72%	20.03%	58.89%	44.57%	36.88%
Non-Current liabilities	0.31%	1.76%	0.22%	5.04%	4.74%
Current Liabilities	44.82%	57.78%	25.93%	22.02%	31.73%
Application of Funds					
Net Block & CWIP	53.22%	39.87%	40.56%	57.01%	52.45%
Long Term Investments	15.69%	19.40%	18.89%	8.12%	7.49%
Current Assets	0.92%	0.49%	0.43%	0.17%	0.18%
Non-Current Assets	30.16%	40.23%	40.12%	34.70%	39.88%

Source: BHSL Annual Report

2.3.8 Cash Flow Statement

Table 31 below indicates a cash flow statement for BHSL.

Table 31: Cash Flow Statement

(All figures in ₹ Crore)

Particulars	Sept-12 Audited	Mar-14 18 months Audited	Mar-15 Audited	Mar-16 Audited	Mar-17 Audited	Total
Net Cash Generated from Operating Activities – A	(467.55)	1,069.64	(347.73)	376.89	713.22	1,344.47
						-
Net Cash used in Investing Activities – B	(1,105.31)	(483.42)	(193.19)	(7.67)	(17.63)	(1,807.22)
Net Cash from Financing Activities - C	1,168.09	(638.61)	475.08	(387.98)	(706.67)	(90.09)
Net increase / (decrease) in cash & cash equivalent (A+B+C+D)	(404.77)	(52.39)	(65.84)	(18.76)	(11.08)	(552.84)

Particulars	Sept-12 Audited	Mar-14 18 months Audited	Mar-15 Audited	Mar-16 Audited	Mar-17 Audited	Total
Cash and cash equivalents at the beginning of the year	582.93	178.16	125.77	59.93	41.17	582.93
Cash and Cash equivalents at the end of the year	178.16	125.77	59.93	41.17	30.09	30.09

Source: BHSL Annual Report

- There has been net cash deficit year on year, however there was sufficient opening cash balance which absorbed the deficit every year. The cash flows from the operating activities were not sufficient to fund the cash outflows from investing and financing activities of the Company.
- The cash flow requirement for the Company will be high and thus cash flow will continue to remain critical in future as well.

2.3.9 Contingent Liabilities and Commitments

The Company has certain contingent liabilities/ guarantees and commitments not provided for as on 31st March 2017 has been as detailed in Table 32:

Table 32: Contingent Liabilities and Commitments

Particulars	Rs. Crore
Contingent liabilities:	
In respect of disputed demands/claims against the Company not acknowledged as debts:	
Central excise matters	33.03
Trade tax matters	69.58
Recompense payable (refer note 40(b))	100.66
Other claims	55.03
	258.30
Corporate Guarantees	
The company has furnished guarantees/ securities on behalf of subsidiary / associate company	968.13
Erstwhile Bajaj Ecotec Products Ltd. (merged with the Company) has procured imported as well as indigenous capital goods under Export Promotion and Capital Goods Scheme (EPCG). The Export obligation pending against such EPCG licenses	38.90
Interest payable on promoter's loan is not determinable	
Commitments	
Estimated amount of contracts remaining to be executed on capital account and not provided for (net of advances)	18.10

Source: BHSL Annual Report

- The Company has extended corporate guarantees for borrowings in the subsidiaries. These subsidiaries are in different stages of development.
- The group is also subject to legal proceedings and claims which would arise in the ordinary course of the business.
- The Company did not expect any outflow of economic resources in respect of the above and therefore no provision was made in respect thereof

The Consultants have not scrutinized the nature of contingent liabilities and are unable to quantify any amount which may cause additional burden to the Company. Future cash outflows in respect of the above will be determinable only on receipt of judgments/ decisions pending with various forums/ authorities. The future liability arising out of the crystallization of these contingent liabilities will have to be taken in consideration.

2.4 MRA Projections vs Actual

At the request of the Company, the Joint Lenders' Forum (JLF Lenders) led by State Bank of India approved the corrective action plan for restructuring of existing credit facilities on December 03, 2014 under JLF route in accordance with the applicable framework and guidelines issued by Reserve Bank of India. Accordingly, a Master Restructuring Agreement (MRA) has been signed on December 30, 2014 among the Company and JLF lenders, by virtue of which the restructured facilities are governed by the provisions specified in the MRA. The cut-off date for restructuring under JLF route was July 31, 2014.

2.4.1 JLF Restructuring Package - Summary

Table 33: Debt Restructuring Summary

Facility	Repayment	Rs crore	Current Status
Term Loan 1	31 structured quarterly instalments from Sept.' 16 to Mar' 24	2,705.94	Servicing post S4A
Term Loan 3 (Fresh TL)		158.85	
WCTL 1		3,373.46	
WCTL 2		294.29	
FITL on TL 1, WCTL 1 & WCTL 2 (for Aug 1, 2014 to July 31, 2016)	Conversion into Equity	1,108.42	Already converted into Equity
	19 structured quarterly instalments from Sept.' 16 to Mar' 21	474.04	Regular servicing being done by Company (Interest + Principal)
		1,583.46	
Proposed Working Capital	Fund-based (CC)	1,310	N.A.
	BG	329.04	
	LC / BG (Sub Limit)	150	
Interest Rate	12.50% p.a. linked to base rate of SBI		
Sacrifice	As per the Package	557.75	N.A.
Promoters Contribution	Fresh Equity agst Lenders Sacrifice	200.00	Already infused by Promoters

Source: BHSL

2.4.2 Recovery of Investments and Loans & Advances:

Further, BHSL had proposed to bring back its investments in its associate/ subsidiary companies as a part of JLF package amounting to Rs.1,081.13 crore during FY 2017 to FY 2018. The Company also proposed to recover loans and advances amounting to Rs.1,385.69 crore during FY 2017 to FY 2019. Detailed breakup is given in Table 34.

Table 34: Recovery of Investments & Advances

(All figures in ₹ Crore)

Particulars (Rs crore)	FY17	FY18	FY19	Total
Recovery of Investments				
BHSL Securities Trust	311.00	-	-	311.00
Lalitpur Power Generation Company Ltd	-	770.13	-	770.13
Recovery of Loans and Advances				
Bajaj Power Generation Pvt Ltd	600.00	300.00	154.96	1054.96
Loan to Others	142.23	188.5	0.00	330.73

Particulars (Rs crore)	FY17	FY18	FY19	Total
Total (Part A)	1053.23	1,258.63	154.96	2,466.82

Source: BHSL

2.4.3 Additional Equity Infusion:

The promoter proposed to infuse funds amounting to Rs.1200 crore through dilution of equity stake / unsecured loans during FY 2019 to FY 2022. The details of which are given in Table 35.

Table 35: Equity Infusion

(All figures in ₹ Crore)

Particulars (Rs crore)	FY 19	FY 20	FY 21	FY 22	Total
Equity Infusion (Part B)	300.00	250.00	500.00	150.00	1,200.00

Source: BHSL

2.4.4 Current Performance vis-à-vis JLF Restructuring:

Comparison of financial numbers: Current Performance vis-à-vis JLF Restructuring

Table 36: Current / JLF Performance

Particulars	FY 2014-15		FY 2015-16		FY 2016-17	
	JLF Proj.	Actual	JLF Proj.	Actual	JLF Proj.	Actual
Cane crushed (Lac qtl)	1,169	1,211	1,327	1,092	1,384	1,251
Sugar Recovery rate (%)	9.37%	9.38%	9.37%	10.32%	9.37%	10.23%
Sugar Price (Rs / qtl)	3,110	2,912	3,297	2,703	3,494	3,556
Net Revenue (incl other income) (Rs. Crore)	5,123.66	4,570.12	5,238.98	4,689.20	5,709	4,546.86
EBITDA (incl other income) (Rs. Crore)	867.43	(119.56)	949.87	800.57	1,183	1,017.77
EBITDA %	16.93%	-2.62%	18.13%	17.07%	20.72%	22.38%
PAT (Rs. Crore)	(203.32)	(1,097.22)	(324.00)	(114.28)	(140)	7.40

Source: BHSL & MM

- Total actual revenue of BHSL for FY 2015-16 was Rs.4,689.20 crore as compared to Rs.5,238.98 crore as per JLF projections and in FY 2016-17 actual revenue was Rs.4,546.86 crore in comparison to JLF projections of Rs.5,709 crore. The actual revenue was comparatively less as compared with JLF projections mainly due to lower quantity of cane crushed in FY 2016/ 2017 as compared with assumption considered in JLF projections.
- Actual EBITDA (incl other income) for FY 2015-16 and 2016-17 was not in line with the JLF projections but there was improvement as compared to the previous years.

2.5 Subsidiaries and Associates

As on March 31, 2017, the Company had the following Subsidiaries and Associates, all of them are presently unlisted;

- Subsidiaries;
 - Bajaj Aviation Private Limited (BAPL) – (Holding 100%)
 - Bajaj Power Generation Private Limited (BPGPL) – (Holding 100%)
 - Bajaj Hindusthan (Singapore) Private Limited (BHSPL) – (Holding 100%)
 - PT. Batu Bumi Persada, Indonesia – (step down subsidiary being 99.00% subsidiary of BHSPL)

- PT. Jangkar Prima, Indonesia – (step down subsidiary being 99.88% subsidiary of BHSPL)
- Associates;
 - Bajaj Ebiz Private Limited – (Holding 49.50%)

2.6 Conclusion

- The Joint Lenders Forum (JLF lenders) led by State Bank of India had approved the corrective action plan for restructuring of credit facilities on December 03, 2014 under JLF route in accordance with the applicable framework and guidelines issued by Reserve Bank of India. The cut-off date for restructuring under JLF route is July 31, 2014.
- Revenue projections were made in Restructuring package to estimate the cash flows in view of economic recovery and sector growth expected. However, the same were not achieved as estimated.
- During the year ended March 31, 2017, the Company's revenue from operations was Rs.4384.59 crore as against Rs.4683.23 crore in FY 2015-16 which also includes the government subsidies. Sale of Sugar is a major source of revenue for the Company and contributes about 75% of turnover.
- Raw Material consumption cost as % of turnover increased to 72% in FY 2015-16 and was 69% of turnover in FY 2016-17. Sugarcane is the major raw material in the production of sugar and accounts for around 65-70% of the cost of production.
- EBIDTA margins for the Company improved in FY 2015-16. The Company reported marginal profits in FY 2016-17 which was due to interest income of Rs.152.26 crore and other income of Rs.10.01 crore.
- The subscribed and paid up capital of the Company as on March 31, 2017 consist of 1,133,559,942 Equity shares having par value of Rs.1 each.
- Due to year on year losses there has been continuous erosion in the net worth of the Company.
- Total Secured borrowings was of Rs.6680.94 crore and unsecured loans from promoters and DCT of Rs.83.51 crore as on 31st March 2017.
- The Company has total non-current investments of Rs.1108.30 crore. Short term loans and advances were of Rs.1855.71 crore in FY 2016-17 of which advances to related parties account for majority (Rs.1419.89 crore) of the total short term loans and advances.
- BHSL had sundry creditors of Rs.2785.87 crores as on March 31, 2017 which includes cane dues to farmers. This translates into nearly 252 days of revenue, which is high when compared to industry benchmarks.
- Inventory increased from Rs.1924.12 in FY 2015-16 to Rs.3009.52 crore in FY 2016-17.
- There has been net cash deficit year on year, however there was sufficient opening cash balance which absorbed the deficit every year.
- The Company has certain contingent liabilities/ guarantees and commitments not provided for as on 31st March 2017.
- The Company has approached the consortium of lenders to consider the S4A scheme in order to overcome the ongoing financial problem and restore the normal activities.

3 Organisation and Management

3.1 Management and Administration

The Shishir Bajaj Group, promoted by Mr. Shishir Bajaj, is one of the leading industrial groups in India and was founded by Late Mr. Jamnalal Bajaj in the 1930's. The Group is primarily engaged in sugar, industrial alcohol production, bagasse based co-generation of power, medium density fibre board and particle board manufacturing and power generation from thermal power plants. BHSL, the flagship company of the Group, is headed by Mr. Kushagra Bajaj, Chairman and Managing Director having experience in Sugar and FMCG Industries. He is responsible for overall operations of the Company and is supported by a team of experienced professionals in various fields.

The Company's shares are listed on The Bombay Stock Exchange Limited (BSE) and National Stock Exchange of India Limited (NSE)

3.2 Corporate Governance

Since BHSL is a listed company clause 49 of SEBI, the rule of Corporate governance, is applicable to this Company. The Corporate governance defines as combination of process established and executed by Board of Directors that are represented in the Organisation structure and how it is managed toward achieving the goals of the company. The rule of Governance in Corporate sector gained much importance at the beginning of 2k after several accounting frauds became known which was responsible for fall of many corporate giant like Enron. global leader in power sector.

The Corporate Governance broadly refers to the Rules, process, and laws by which the business is operated, regulated, and controlled. The key aspects of Corporate Governance include transparency of Corporate Structure, Operation accountability of managers and Board of Directors to its shareholders and other stakeholders. In last decades after several accounting scams and market frauds came to light in different parts of the world the strict guidelines of corporate governance were issued and its implementation are regularly analysed to prevent recurrence such unwanted situation in corporate sector. In India Satyam is the best example of accounting frauds which robbed the wealth of many of its stakeholders.

Initiatives were taken, by many corporate and statutory entities including CII, SEBI with active support from the Government of India, to frame the guidelines for Governance of Corporates in clean and transparent manner. The Government of India had constituted various committees including Kumar Mangal am committee, Naresh Chandra Committee, Narayan Murthy Committee from time to time for framing/revising Corporate Governance guidelines. In 2009, the Ministry of company affairs published 'the Corporate Governance voluntary guidelines 2009' which was voluntary in nature but it revealed the willingness of the Government to ensure transparent practices in corporate world. In new Companies Law 2013, the Corporate Governance matter has been focussed with important rules regarding its board of Directors, appointment of directors, various committees, and sub-committees etc. The Companies Act 2013 prescribes the appointment criteria of Independent Directors.

The Act stipulates certain conditions need to be fulfilled before appointing any person as an independent director which states that any person who is to be appointed as Independent Director must be, in the opinion of the board, among others, be a person of integrity and must possess

relevant expertise and experience. The persons, moreover should not be related with the promoters or directors of the company or has any pecuniary interest with the company.

The most important aspect of appointment of Independent Directors includes, among others, ability to bring several benefits by such directors to the Company. These benefits include the improvement of internal process, bring out mismanagement and fraudulent activities, if any, in the company and protect the interest of shareholders, especially minority shareholders. Some other contribution from Independent Directors include 1) offset the management lapses in a company, 2) enforce the practice of legal and ethical behaviour at the company, 3) help the management in framing long term policy and goal of the company with their specialized knowledge & skill 4) help the company to grow and 5) involve the public as stakeholders of the company for its sustainable growth.

The other important aspect of corporate governance is administrative authority or power of the key officials. It is important to review whether the power is centralised or delegated among the officials who are responsible to implement the corporate policy to achieve its short as well as long term goals. It will, in fact, decide the success of time bound restructuring process.

3.2.1 Board of Directors

3.2.1.1 Composition of Board

The composition of Board of Directors of BHSL as on June 06, 2017 is given in Table 37

Table 37: Composition of Board of Directors

Sr. No.	Name	Designation	Qualification	Experience
1	Mr. Kushagra Bajaj	Chairman & Managing Director	BSc (Eco, Pol Sc & Fin), Pittsburgh, USA, MSc (Marketing) Chicago, USA	Mr. Kushagra Bajaj has over a decade of experience in sugar and FMCG industries, all of which have been with BHSL and its group companies.
2	Mr. Madhav Laxman Apte	Independent Director	B.A.	Mr. Apte was former Sheriff of Mumbai, former President of Maharashtra Chamber of Commerce, Bombay Chamber of Commerce, Indian Sugar Mills Association and Cricket Club of India. He was also a former member of Indian Cotton Mills Federation and former Chairman of Textiles Committee
3	Mr. Ravindrakumar V. Ruia	Independent Director	B. Com	Mr. Ruia was a Committee member at the Bombay Mill Owner's Association, Indian Cotton Mills Federation and Bombay Textile Research Association. He is director of Dawn Apparels Private Limited
4	Mr. Dinesh Kumar Shukla	Independent Director	B.A. and Master's Degree in Social Work	Mr. D.K. Shukla retired as an Executive Director of Life Insurance Corporation of India (LIC) in February 2003. During his tenure with LIC, he occupied positions like Regional Manager and was in charge of 3 LIC divisions. Mr. Shukla served as a nominee director for Life Insurance Corporation of India (LIC) upto November 2008 and was re-inducted in the Board with effect from December 21, 2008 as an Independent Director.
5	Mr. Alok Krishna Agarwal	Independent Director	LLB	Mr. Agarwal is the founder of Juris Consultus, Law office (now known as Sheldon Law Firm). He is a member of Supreme Court Bar Association and life

Sr. No.	Name	Designation	Qualification	Experience
				member of the Indian Council of Arbitration.
6	Mr. Ashok Kumar Gupta	Executive Director	M.Com	Mr. Gupta has more than 41 years' experience in the sugar industry. He has earlier worked in Dhampur Sugar Mills and Upper Daob Sugar Mills.
7	Mr. Vipulkumar S. Modi	Independent Director	Bachelor of Law & Master of Law	Mr. Modi is an Advocate and Proprietor of Vipul Modi Associates since 1995. He is an associate editor of "Law Herald".
8	Mr. Ashok Mukand	Nominee Director (SBI)	B.Sc	Mr. Ashok Mukand has been appointed as a Director, nominated by State Bank of India since September 2015. Mr. Mukand joined SBI on December 14, 1970. He had served SBI in various senior positions like CGM, LHO Kolkata and DMD & CFO, Corporate Centre, Mumbai.
9	Mr. Mukeshkumar S. Dave (w.e.f. 11.05.2017)	Nominee Director (PNB)	B.Com (Hons.) and C.A.I.I.B.	Mr. Mukeshkumar S. Dave has joined Punjab National Bank (PNB) in 1984 and served in various senior positions like Circle Head-DGM-Circle office Noida, MD & CEO of Druk PNB Bank Ltd., Bhutan, AGM, HO-IBB Division, AGM-DELHI EC House, Chief Manager, Brady House, Mumbai, Senior Manager, ZO-Gujarat and Manager Sohrana Branch, UP. Mr. Dave is presently designated as DGM-Circle Head, NCR Noida Circle of PNB.
10	Ms. Shalu Bhandari (w.e.f. 17.09.2016)	Independent Director	FCS	Ms. Bhandari is a Practising Company Secretary operating in Mumbai since 2002.

Source: BHSL

The Board of Directors of Bajaj Hindusthan Sugar has a blend of Executive and Non- Executive Directors. The board consists of 6 non executive directors, 2 nominee directors and 2 executive directors and. The Chairman and Managing Director of the board is an Executive Director. All the Non-Executive Directors are professionals and bring their professional expertise and experience to the Management of the Company.

3.2.1.2 Board Meetings

The Board oversees the entire functioning of the Company and is involved in strategic decision-making on a collective basis. The gap between any two meetings has been less than four months in FY 2015-16. During FY 2015-16, the board of directors met eight times on May 28, 2015, July 08, 2015, August 13, 2015, September 14, 2015, November 04, 2015, January 07, 2016, January 21, 2016 and February 03, 2016. Out of the aforesaid, six Board Meetings were held through video conferencing facility.

Table 38: Board Meetings

Name	Board Meetings held/ attended	Whether attended, previous AGM held on September 14, 2015
Mr. Kushagra Bajaj	08/04	No
Mr. M.L. Apte	08/07	No
Mr. R.V. Ruia	08/06	No
Mr. D. K. Shukla	08/06	Yes

Name	Board Meetings held/ attended	Whether attended, previous AGM held on September 14, 2015
Mr. Alok Krishna Agarwal	08/06	Yes
Mr. Vipulkumar S. Modi	02/02	No
Mr. Ashok Mukand	04/03	No
Mr. Binod Kumar	02/01	No
Mr. Ashok Kumar Gupta	08/06	Yes
Mrs. Kiran Anuj	08/06	No

Source: BHSL

3.2.2 Meeting of Independent Directors

As stipulated by the Code of Independent Directors under the Companies Act, 2013 and the SEBI (LODR) Regulations 2015, a separate meeting of the Independent Directors of the Company during the calendar year 2015 was held on February 12, 2015 to review the performance of Non-Independent Directors (including the Chairman) and the Board as whole. The Independent Directors also reviewed the quality, content and timeliness of the flow of information between the Management and the Board and its Committees.

3.2.3 Committees of the Board

The Board is responsible for constituting, assigning, co-opting and fixing of terms of service for committee members of various committees. The Chairman of the Board, in consultation with the Company Secretary and the Committee Chairman, determines the frequency and duration of the committee meetings. Recommendations of the Committees are submitted to the Board for approval. The quorum for meetings is as per Companies Act, 2013 and SEBI (LODR) Regulations. Board Committees and the members as of March 31, 2016 is mentioned in Table 39.

Table 39: Board Committees as of March 31, 2016

Committee	Members (Category)
Audit Committee	Mr R. V. Ruia, Chairman (Independent, Non-Executive) Mr. D. K. Shukla (Independent, Non-Executive) Mr. Alok Krishna Agarwal (Independent, Non-Executive)
Nomination and Remuneration Committee	Mr. D. K. Shukla (Independent, Non-Executive) Mr. M. L. Apte (Independent, Non-Executive) Mr. R. V. Ruia (Independent, Non-Executive) Mr. Alok Krishna Agarwal (Independent, Non-Executive)
Shareholders' Relationship Committee	Mr. R. V. Ruia, Chairman (Independent, Non-Executive) Mr. M. L. Apte (Independent, Non-Executive) Mr. Kushagra Bajaj (Chairman & Managing Director)
Corporate Social Responsibility Committee	Mr. Kushagra Bajaj, Chairman (Chairman & Managing Director) Mr. Alok Krishna Agarwal (Independent, Non-Executive) Mr. Ashok Kumar Gupta, Director (Group Operations) Mrs. Kiran Anuj (Non-Independent, Non-Executive)

Source: BHSL

3.2.3.1 Audit Committee

The Audit Committee was constituted in 1989. The Company re-constituted the Audit Committee in accordance with Section 177 (2) of the Companies Act, 2013 on September 25, 2014. During the financial year ended March 31, 2016, the Audit Committee met six times on May 28, 2015,

August 13, 2015, September 14, 2015, November 04, 2015, January 01, 2016 and February 03, 2016. The gap between any two meetings has been less than four months. Out of the aforesaid, four Audit Committee meetings were held through video conferencing facility.

Table 40: Attendance at Audit Committee meetings

Name of Committee Members	Category	Meetings held/ Attended
Mr. R. V. Ruia, Chairman	Independent, Non- Executive	06/05
Mr. D. K. Shukla	Independent, Non- Executive	06/06
Mr. Alok Krishna Agarwal	Independent, Non- Executive	06/05

Source: BHSL

Mr. Kushagra Bajaj, Chairman and Managing Director, is permanent invitee to the Audit Committee Meetings. In addition, the heads of the Finance and Internal Audit functions, representatives of Statutory Auditors, Cost Auditors and other executives as are considered necessary, generally attended these meetings. The Company secretary acts as the Secretary to the Audit Committee.

3.2.3.2 Nomination and Remuneration Committee

The Remuneration Committee was constituted in 2003. Pursuant to the provisions of Section 178 of the Companies Act, 2013, the Board of Directors at its meeting held on September 25, 2014, had reconstituted the Nomination and Remuneration Committee of four non-executive Directors. During the financial year ended March 31, 2016, the Nomination and Remuneration Committee met two times on My 28, 2015 and January 01, 2016. Attendance at Nomination and Remuneration Committee meetings is given in Table 41

Table 41: Composition at Nomination and Remuneration Committee

Name of Committee Members	Category	Meetings Held/ Attended
Mr. D. K. Shukla, Chairman	Independent, Non-Executive	02/01
Mr. M. L. Apte	Independent, Non-Executive	02/02
Mr. R. V. Ruia	Independent, Non-Executive	02/02
Mr. Alok Krishna Agarwal	Independent, Non-Executive	02/00

Source: BHSL

3.2.3.3 Shareholders Relationship Committee

The Committee is headed by Mr. Ruia, Independent Director. During the financial year ended March 31, 2016, the Stakeholders Relationship Committee met four times on May 28, 2015, August 13, 2015, November 04, 2015 and February 03, 2016. The attendance of each Committee Member is provided in Table 42.

Table 42: Shareholders Relationship Committee Meetings

Name of Committee Members	Category	Meetings Held/ Attended
Mr. R.V. Ruia, Chairman	Independent, Non-Executive	04/04
Mr. M.L. Apte	Independent, Non-Executive	04/04
Mr. Kushagra Bajaj	Chairman & Managing Director	04/01

Source: BHSL

3.2.3.4 Corporate Social Responsibility Committee

The Company constituted a Corporate Social Responsibility Committee (CSR) as required under Section 135 of the Companies Act, 2013 as mentioned in annual report of FY 2015-16. The Committee is headed by the Board Chairman, Mr. Kushagra Bajaj. No meeting of the Committee was held during the financial year ended March 31, 2016.

3.3 Key Management Personnel

The brief profiles of the key managerial personnel handling the day to day affairs of BHSL are given in Table 43

Table 43: Key Management

Name	Designation	Qualification	Experience (years)
Mr. Kushagra Bajaj	Chairman and Managing Director	BSc (Eco, Pol Sc & Fin), Pittsburgh, USA, MSc (Marketing) Chicago, USA	15
Mr. Ashok Gupta	Director (Group Operations)	M.Com	42
Mr. Pradeep Parakh	Group President (GRC) & Company Secretary	B.Com(H), FCA, FCS	26
Mr. Ved Prakash Agrawal	Chief Financial Officer	B.Com, FCA	36

Source: BHSL

3.4 Manpower

Location wise on roll strength as on 31st March 2017 and the Grade structure is as given in **Table 44** and **Table 45**

Table 44: Manpower

Sl. No.	Zone	Location	OWB	OWB (Trainee)	Retainer	WB/ Operative	Trainee	Temp.	Fix Term	Retainer	Total
1	Central	Barkhera	88	1	3	371	3	0	0	0	466
2	Central	Gola	123	4	1	594	0	64	0	5	791
3	Central	Gola Distillery	28	1	1	22	0	1	0	0	53
4	Central	Khambharkhera	98	0	2	357	2	0	0	0	459
5	Central	Khambharkhera Distillery	50	6	0	0	0	0	0	0	56
6	Central	Maqsoodapur	88	0	1	230	1	0	0	0	320
7	Central	Palia	130	0	0	426	2	29	0	0	587
8	Central	Palia Distillery	45	2	0	1	0	0	0	0	48
9	East	Kundarkhi	105	0	1	317	14	0	0	0	437
10	East	Pratappur	56	0	0	193	0	0	0	0	249
11	East	Rudhauri	89	0	0	253	0	0	0	0	342
12	East	Rudhauri Distillery	69	3	4	9	5	0	0	0	90
13	East	Utrala	100	1	3	296	2	0	0	0	402
14	Office	Lucknow/Allahabad	60	1	0	0	0	0	0	0	61
15	Office	Mumbai	41	0	0	0	0	0	0	0	41
16	Office	Noida	21	1	0	0	0	0	0	0	22
17	West	Bilai	90	1	2	390	0	0	36	0	519
18	West	Budhana	79	1	2	388	12	0	18	0	500
19	West	Gangnauli	73	1	1	285	3	0	60	1	424
20	West	Gangnauli Distillery	49	1	1	5	0	0	0	0	56
21	West	Kinauni	107	1	1	523	93	0	40	0	765

Sl. No.	Zone	Location	OWB	OWB (Trainee)	Retainer	WB/ Operative	Trainee	Temp.	Fix Term	Retainer	Total
22	West	Kinauni Distillery	83	2	2	0	0	0	0	0	87
23	West	Thanabhawan	92	1	2	333	10	0	7	0	445
Total			1764	28	27	4993	147	94	161	6	7220

Source: BHSL

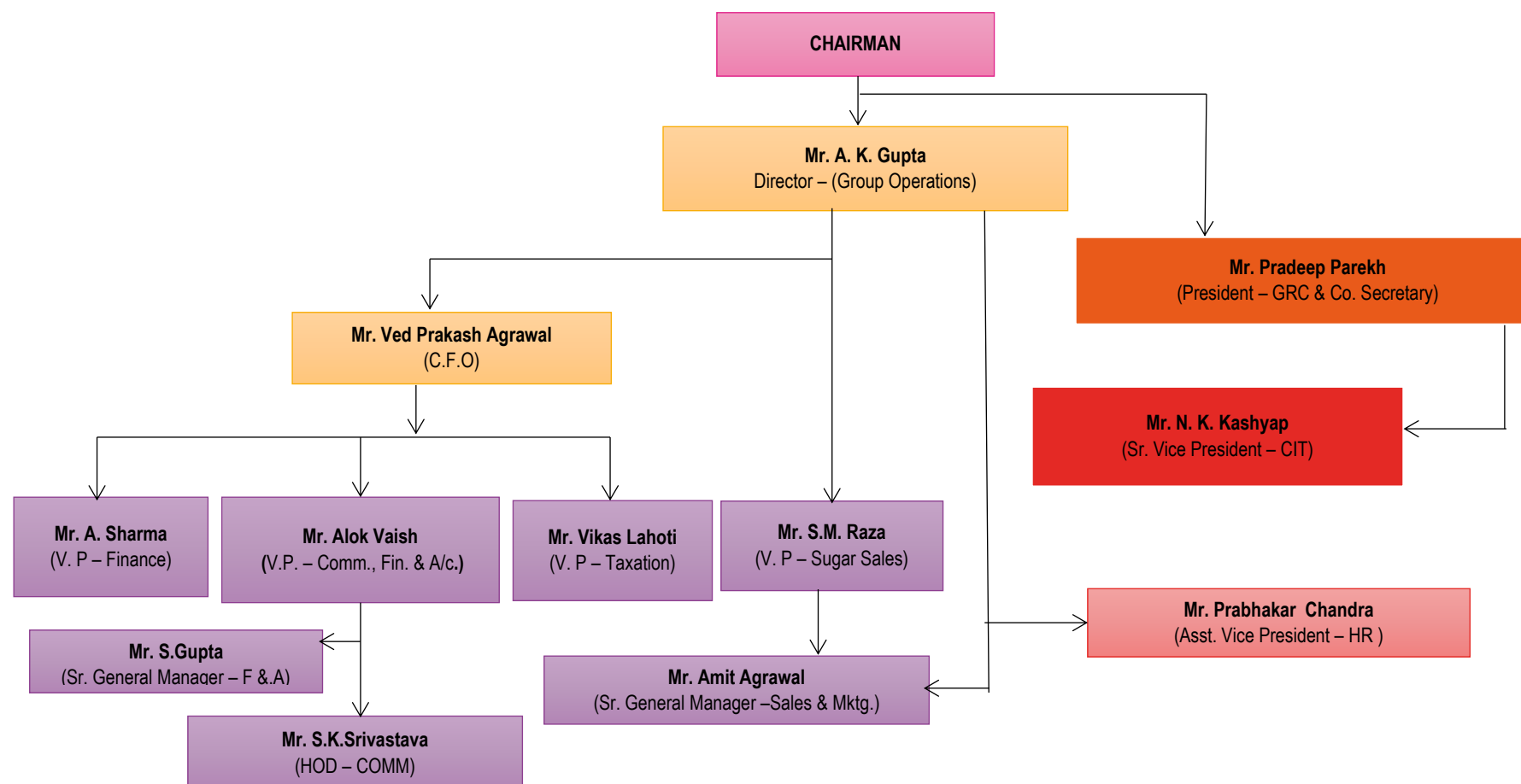
Table 45: Grade Structure

Grade	Designation
SM	Director / President
M-1	Sr.Vice President/Vice President/Asst. Vice President
M-2	Sr.General Manager / General Manager
M-3	Sr.Dy.General Manager / Dy.General Manager
M-4	Asst.General Manager/Sr. Manager/ /Manager/ Addl.Manager
P-1	Dy.Manager
P-2	Assistant Manager
P-3	Sr.Officer/ Officer
P-4	Assistant Officer
P-5	Assistant

Source: BHSL

3.5 Organization Structure

Figure 1: Organization Structure



Source: BHSL

4 Industry Analysis

4.1 Sugar Industry Overview

India is the second largest producer and the largest consumer of sugar in the world. The industry supports over 50 million farmers, along with workers and entrepreneurs, in addition to a host of wholesalers and distributors spread across the country. The sector also leverages the opportunities created by global shifts in sugar trade as well as the emergence of sugarcane as a source of renewable energy, through ethanol and cogeneration.

The table below illustrates the key features of sugar industry.

YoY Sugar Season (SS)		<ul style="list-style-type: none"> 1st October - 30th September
Main Raw Material	<ul style="list-style-type: none"> Sugarcane Sugar Beet 	<ul style="list-style-type: none"> In India, the use of sugar beet as a raw material is minimal and hence MM has considered only sugarcane for market assessment in this report.
	Sugarcane Cultivation	<ul style="list-style-type: none"> In India, sugarcane is planted thrice a year in October (autumn), February-March (spring) and July (adsali), depending on the geographical location. On an average, it takes 16-18 months for sugarcane harvesting
Demand Drivers		<ul style="list-style-type: none"> Population growth Change in eating habits and lifestyles Consumer preference for sugar versus alternate sweeteners Demand for sugar from industrial consumers such as soft drinks, confectioneries, etc. Impact of growing awareness about saturated sugars in food products
Supply Factors		<ul style="list-style-type: none"> Climatic factors: sugarcane is grown in tropical regions and requires abundant rainfall Sugarcane is a water-intensive crop, hence strong and extensive irrigation and canal network is essential Technical factors including: <ul style="list-style-type: none"> agronomic practices for sugarcane production; duration of the season (longer the duration, the higher would be the output); sugar recovery rate depending on the sucrose content and the crushing duration (ideal is 12 hours)
Capacity Utilization Determinants		<ul style="list-style-type: none"> the amount of sugarcane available for crushing, the crushing capacity of the mill, the actual amount of sugarcane crushed in a day and the duration of the crushing season.

Several features, which are very specific to sugarcane as a feedstock (such as a high volume-weight ratio, the need to be crushed within 24 hours of harvest to obtain optimum recoveries), require sugar mills to be near sugarcane farms. The duration of the crushing season is also mainly dependent on the location of the mill. Hence, Indian sugar mills are set up in cane growing states such as Uttar Pradesh, Maharashtra, Tamil Nadu, Karnataka, Andhra Pradesh and Gujarat. These six states together account for around 85-90 per cent of the sugarcane production in the country.

Meanwhile, a typical sugar cycle lasts for 5-7 years as lower sugarcane and sugar production results in an increase in sugar prices and higher and prompt payments to farmers, which, in turn, leads to an increase in area under cane cultivation. An increase in cane acreage then leads to higher sugar production, decline in sugar prices, lower profitability for mills and consequently delayed payments to farmers, which, in turn, results in area under cane cultivation coming down.

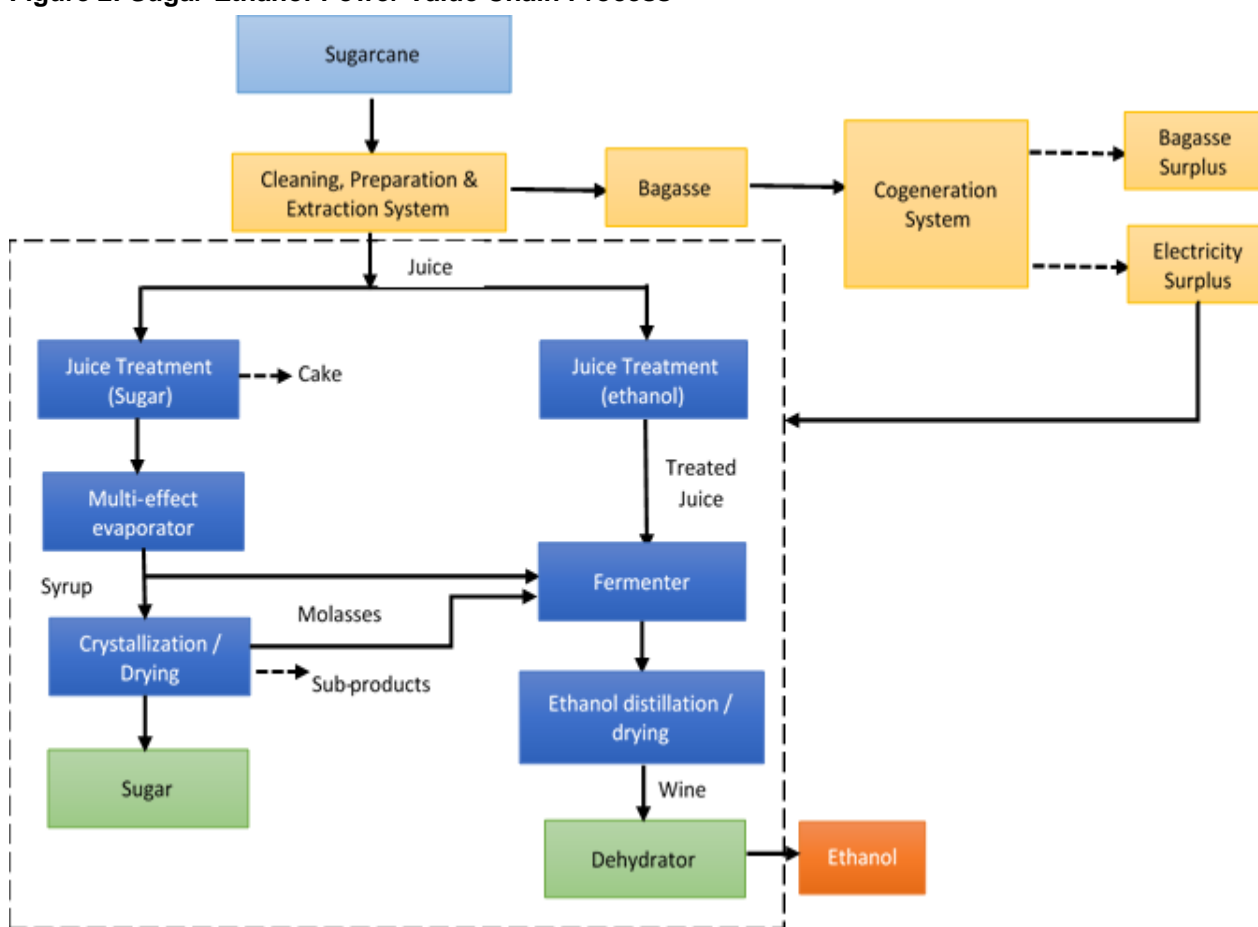
The following sections will analyse sugar industry dynamics.

4.2 Sugar-Ethanol-Cogen Value Chain

Sugarcane, the prime ingredient for raw sugar production, and its cultivation plays a critical role in the entire value chain of sugar industry. Sugarcane contains water (73-76%), soluble solids (10-16%), and dry fiber or bagasse (11-16%). It takes a series of physical and chemical processes that to make the two main products, ethanol and sugar.

Figure below shows a schematic of one process for sugar and ethanol production along with the option to produce electricity (or co-generation power).

Figure 2: Sugar-Ethanol-Power Value Chain Process



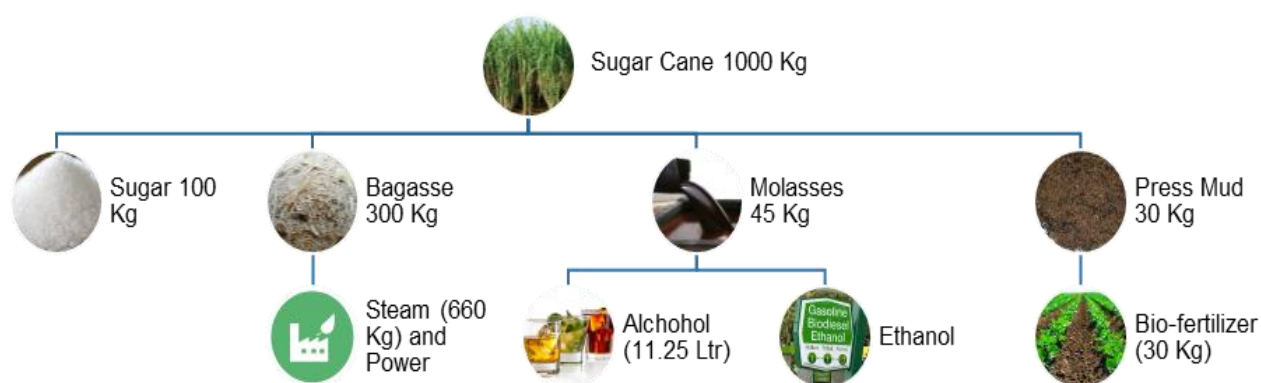
Source: MM Analysis

- Sugarcane is cultivated and harvested usually by farmers. These are then transported quickly (within 24 hrs) by trucks or carts to mills for further crushing. This comprises of the typical value chain - Agro Commodity Chain.
- The cane is crushed and milled with water. This produces two products:
 - juice with 10-15% solids from which the sucrose is extracted. The juice contains undesired organic compounds that could cause what is called sugar inversion (hydrolysis of sugar into fructose and glucose). This leads to the clarification step in order to prevent sugar inversion.

- Dry fibre or Bagasse, which is then fed into the cogeneration system to produce steam which can be converted thus to electrical form and used for internal consumption or exported to Grid.
- In the clarification step, the juice is heated to 70°C and treated with lime and sulfuric acid, which precipitates unwanted inorganics.
- The next step for ethanol production is the fermentation step, where juice and molasses are mixed so that a 10-20% sucrose solution is obtained. The fermentation is exothermic; therefore, cooling is needed to keep the reaction under fermentation conditions. Yeast is added along with nutrients (nitrogen and trace elements) to keep yeast growing. Fermentation can take place in both batch and continuous reactors.

Crushing is important and the canes must be crushed as soon as it is harvested for any time-delay of more than 8 to 12 hours will lead to huge inventory and further will spoil sugar and molasses production. Sugarcane crushing yields by products such as molasses (which is extremely useful for distilleries) and wastes such as bagasse which can be used in co-generation plants. A typical snapshot of by-products is depicted in the figure below:

Figure 3: Sugar by-products (typical industry norms)



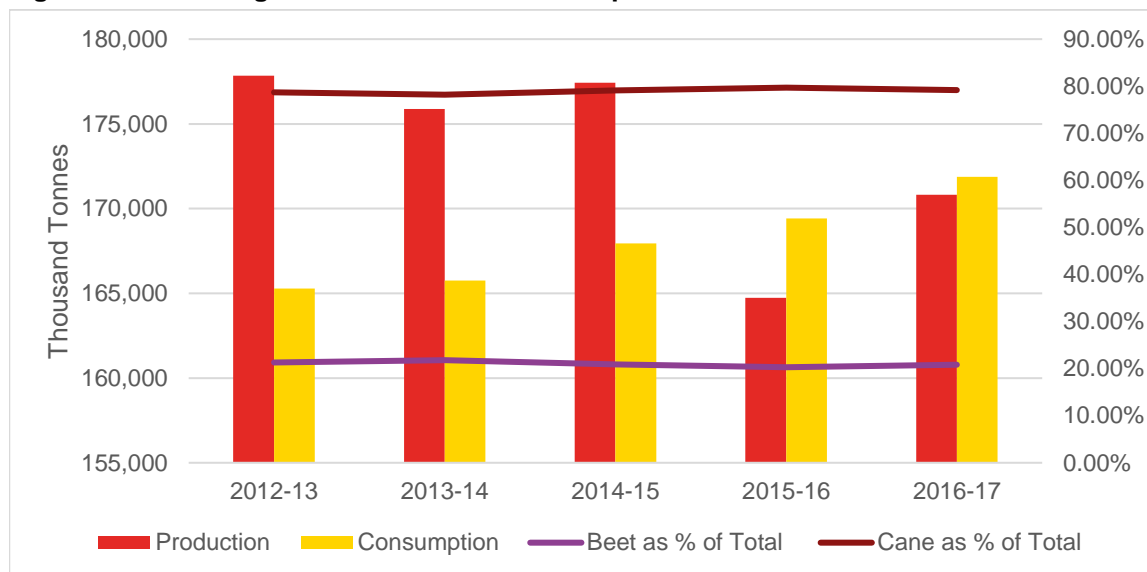
Source: ISMA

Products like ethanol can act as bio-fuel and reduce the spirit consumption from conventional sources. Many emerging opportunities in form of power export and bio-fertilizers can be leveraged from additional revenues.

4.3 Global Market Scenario

Brazil, India, China and the USA are the amongst the major sugar producing countries globally. Figure 4 depicts global sugar production and consumption, as well as the beet and sugarcane proportions to produce the sugar:

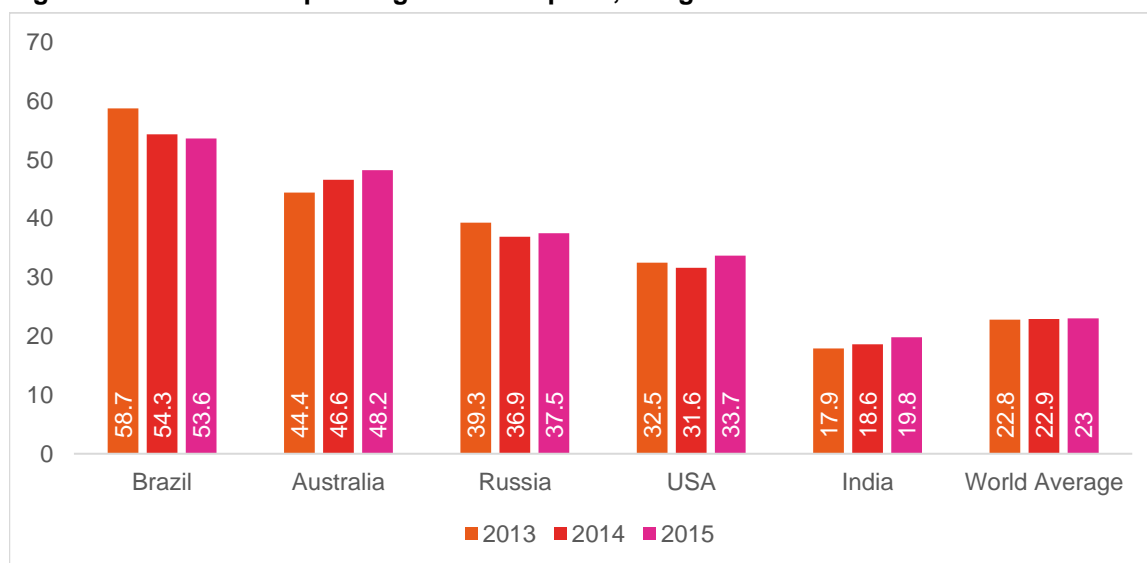
Figure 4: Global Sugar Production and Consumption



Source: ISMA, USDA

- Globally sugar production has been growing at a CAGR of around 2.8% since 2012-13 and stood at around 170 million tonnes in SS 2016-17. Global consumption for the same period grew at a CAGR of 2.2% and stood at 171 MT in SS 2016-17.
- After 4 consecutive years of net surplus, the Sugar Season (SS) 2015-16 was the first year to witness a sizeable deficit.
- Meanwhile, the world average per capita sugar consumption was recorded at 23 kgs (during SS 2015-16). At 19.8 kg, India has the lowest per capita sugar consumption. The figure below shows the trend in the global per capita sugar consumption during the past three seasons.

Figure 5: Global Per Capita Sugar Consumption, in Kgs

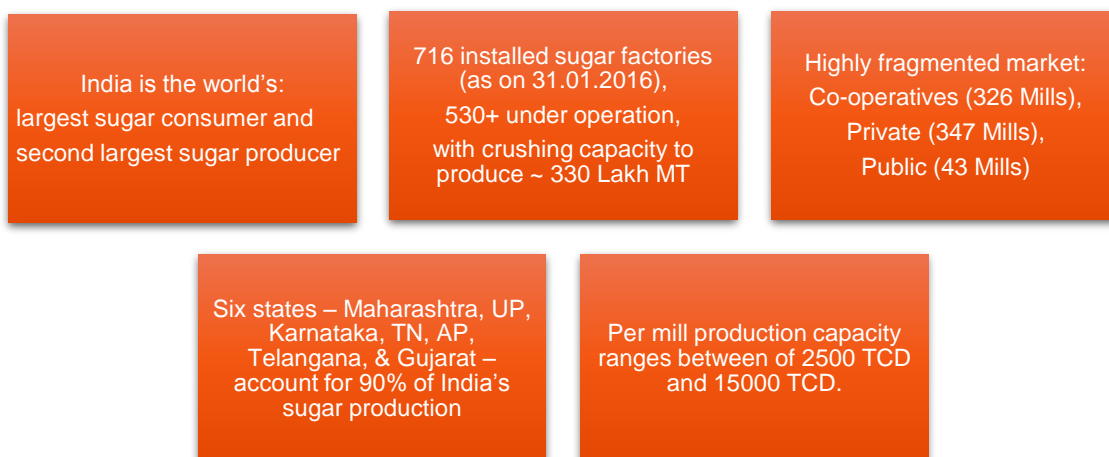


Source: ISMA

4.4 Domestic Market Scenario

India is the world's largest sugar consumer and the second largest sugar producer. Almost 90 percent of the sugar produced in India is from the six cane growing states, namely; Maharashtra, Uttar Pradesh, Karnataka, Tamil Nadu, Andhra Pradesh, Telangana, and Gujarat. The following is a snapshot of the Indian sugar industry.

Figure 6: Snapshot of Sugar Industry in India



Source: ISMA and MM Analysis

Some key features of Indian sugar industry are as under:

- **Highly fragmented:** The sugar industry in India is highly fragmented. Of the 716 mills, approximately 538 sugar factories are operational (as on 30.09.2016). Of these, around 40 per cent of mills are co-operative while private accounts for the balance share. The concentration of co-operative mills/factories is higher in states such as Gujarat (84 per cent of total factories operating in SS 2014-15), Maharashtra (56 per cent) and minimal in other states like Uttar Pradesh (19 per cent) and Karnataka (23 per cent), where most of the mills are owned by private players.
- **Limited foreign players' presence:** The presence of foreign players in Indian sugar industry is limited, given the nature of industrial regulations. EID Parry, in a 51-49 joint venture with Cargill (US), has a sugar refinery (capacity of 1 MMTPA) at Kakinada. In September 2011, Olam International, a global commodity trader, also acquired 100 per cent stake in Hemarus Industries Limited (HIL) with a sugar capacity of 3,500 TCD located in Kolhapur, Maharashtra.
- **Cyclical production cycle:** Typically, sugarcane and sugar production in India have tended to follow a cyclical pattern, wherein production increases for 2 years, then declines for the next 2 years, and recovers thereafter.
- **Crushing seasonality:** Crushing season usually begins from November-December and continues till April. Generally, the crushing season is longer in South India, especially Tamil Nadu, as this part of India receives two monsoons (the southwest as well as the northeast monsoons).

In India, cost of production is very high making the industry uncompetitive and exports unviable. About 50-55 per cent of sugar consumption is estimated to be in the indirect form (i.e. in sweets (mithai), processed foods, soft drinks, chocolates etc.). India has seen surplus sugar production for past six consecutive years, breaking the cyclical nature of three years of surplus production followed by two deficit years.

The following table provides a synopsis of the 3-year trend in sugar production/consumption in India.

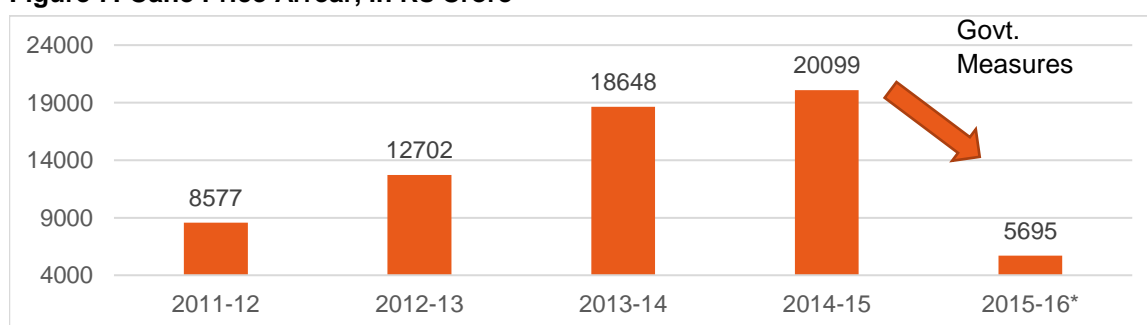
Table 46: Trend in Domestic Sugar Market

Particulars	2014-15	2015-16	2016-17 (E)
Sugar Production	28.3 MT	25.1 MT	23.3 MT
Sugar Consumption	24.2 MT	25.6 MT	26 MT
Sugarcane Production (July-June)	366 MT	336 MT	330 MT

Source: ISMA

- Although there is a net surplus, but the production has declined over the past few year mainly due to extended dry weather in Maharashtra and Karnataka. With draught in western part, cane acreage is expected to decline further. Consequently, production is expected to fall further by 8.6 million tonnes in current year.
- During SS 2016-17,
 - The Fair and Remunerative Price (FRP) has been fixed at Rs 2300/MT
 - In Uttar Pradesh, sugar production is expected to rise to ~7.2 million tonnes owing to improvement in cane yield on account of better variety, which will be offset by the decline in sugar recovery.
 - In Karnataka, sugar production is expected to decline in SS 2016-17 on account of decline in cane acreage, as well as yield.
 - In Maharashtra, production is expected to decline by a steep 36-38% owing to a sharp fall in the planting of sugarcane and 3-5% y-o-y fall in yield due to low water availability.
 - Though the domestic production is expected to be less than domestic consumption of around 26 million tonnes, healthy stocks can be expected to suffice the deficit.
- Sugar Mills are under huge financial stress due to significant losses and increasing cane arrears. The cane arrears are as below.

Figure 7: Cane Price Arrear, in Rs Crore



Source: ISMA; *Parliamentary note by MoSF on August 2016

- The decline in the arrear are due to a slew of measures taken by GoI like FRP fixation, Sugar Development Fund etc. (detailed out in the later section)
- Total estimated debt of sugar industry was estimated at around Rs 50,000 Crore at the end of SS 2015-16; around a fifth of the same is expected to be cleared off in SS 2016-17.

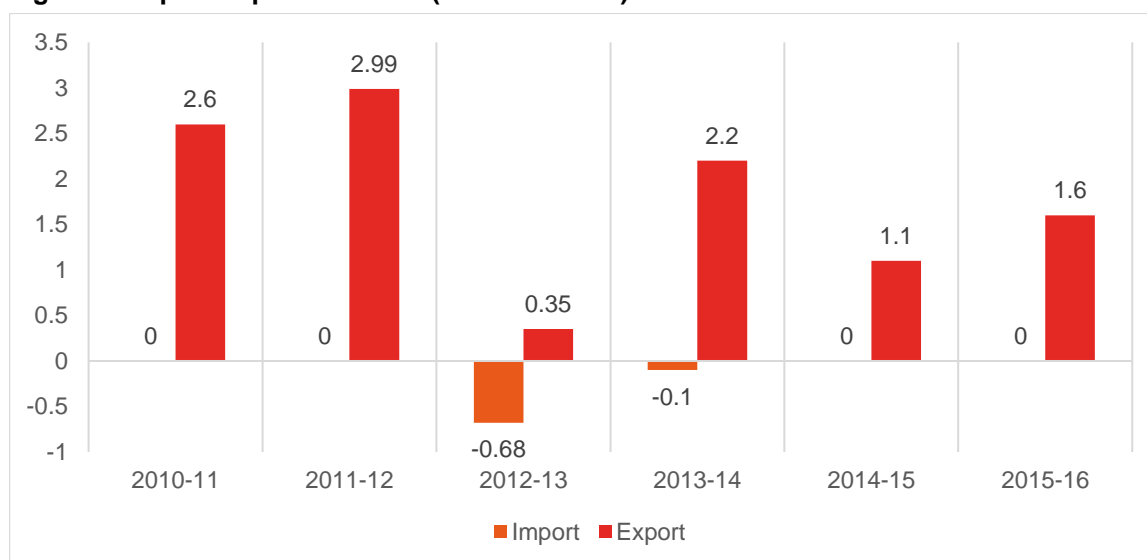
4.5 Trade Scenario

India has been, both, a net importer and exporter of sugar in the past. Some of India's major sugar trading nations are:

- Imported from: Brazil, USA, China, Australia, and South Africa
- Exported to: EU, Persian Gulf, Myanmar, Somalia, Sudan, Indonesia, Sri Lanka, Saudi Arab, Bangladesh

A brief about the import export scenario is stated in the figure below.

Figure 8: Import Export Scenario (million tonnes)

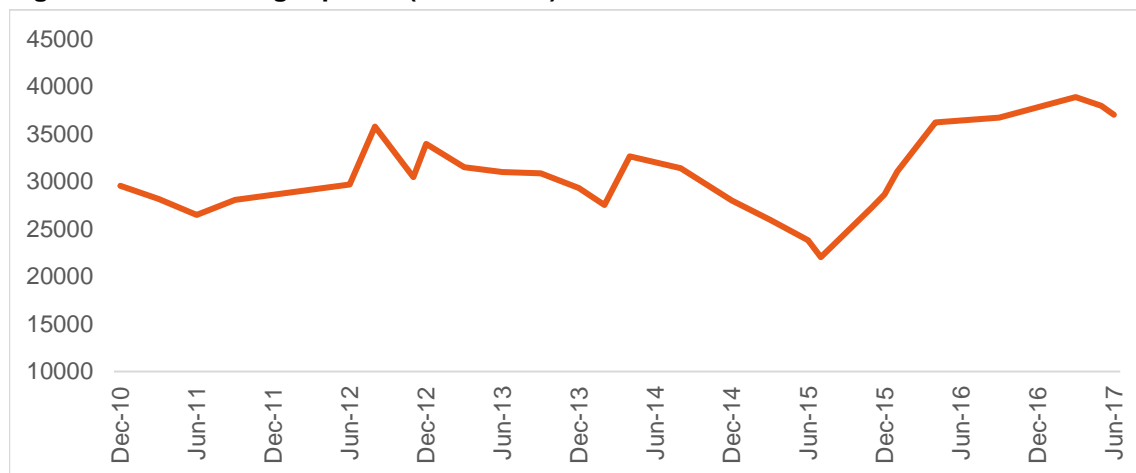


Source: ISMA, Import Export Data Bank

- Given the surplus production for past six years, little import were needed, except for SS 2013 and 2014.
- However, as discussed earlier; the current SS 2016-17 will witness deficit in supply side.

4.6 Pricing Scenario

The cost of cane procurement alone accounts to around 70% and given the different taxes regime in India, the same adds large sums towards ex-chequer. Figure below indicates the historical sugar price (in Rs/MT). Price is taken for S-30 Variety in Mumbai.

Figure 9: Trend in sugar prices (INR/Tonne)

Source: Crisil Research

- The average monthly all-India domestic sugar prices after reaching highs of Rs 37,548.3/ MT in wholesale during October 2012 began declining owing to surplus sugar production globally in the past five years and reached lows of Rs 26,399.4/ MT in wholesale in August 2015. However, since then, the prices began reviving as severe drought scenario and forecast for low production began looming.
- The average monthly all-India prices reached highs of Rs 32,259.0/ MT in wholesale by the end of fiscal 2015-16. Further, with research agencies forecasting a lower sugarcane production and higher consumption in 2016-17, the prices are constantly rising and have reached highs of Rs 38,000/ MT in wholesale as of June 2017 – highest level in last four years.
- Going forward, it is expected the prices to retain its momentum, as the domestic sugar production is expected to further decline by ~12% y-o-y in SS 2016-17 on account of lower cane acreage. In addition, the prospect of sugarcane as a future renewable energy crop for ethanol production, due to its increasing use as a fuel blend in the automobile sector in addition to the cogeneration of electricity, boosts its attractiveness and demand as a raw material.

4.7 Government Policies

Till as recent as early-2013, the Indian sugar industry was a completely regulated industry across the value chain. However, it was partially de-regulated in April 2013, the snapshot of the current regulatory regime is as under:

Table 47: Current Policy and Regulatory Scenario

	Parameter	Regulatory Status
Cane Side	Cane area reservation	Regulated
	Distance: minimum of 15km between two mills	Regulated
	Pricing: Dual cane pricing + Revenue sharing model	Regulated
Sugar Side	Monthly quota mechanism	De-regulated
	Obligation of levy sugar on mills	De-regulated
	Import/Export of sugar	Regulated

Source: MM Analysis, ISMA

- The sugar side is largely de-regulated with no restrictions on sale of sugar.
- Sugar imports and exports are largely controlled through tariff rates
- The complete regulation on the cane side by GoI is a major point of concern for involved stakeholders.
- The pricing policies with respect to cane prices have evolved over the years and government. has come up with various welcomed initiatives such as
 - Introduction of Fair and Remunerative Pricing or FRP (discussed below);
 - Revenue Sharing Model suggested by Rangarajan Committee in 2012 (linkage of cane prices with realisation of sugar and its first level by-products).

4.7.1 Fair and Remunerative Pricing Mechanism

The FRP is decided by the central government every year at the beginning of SS; which is the minimum price the sugar-mill must pay to the farmers for procuring sugarcane. Some state governments also announce State Advisory Prices (SAP). The mills must pay FRP or SAP, whichever is higher. Internationally, the FRP/SAP declared by the Indian government for sugarcane is very high compared to other major producers in the world. Brazil, the largest sugar producing nation in the world, has linked the sugarcane prices in line with global sugar prices.

The various factors that affect the fixation of FRP of sugarcane include:

- Sugar rates sold by Sugar Producers
 - Cost of Production of Sugarcane
 - Reasonable Margins for cane growers for bearing risks
 - Recovery Rate of Sugar from cane
 - Realization made by sale of By-products (Molasses, Press Mud)
 - Inter-Crop Price Parity
- Under the FRP system, the farmers are not required to wait for the end of the season or for any announcement of the profits by the sugar mills or the Government.
 - The new system also assures the margins because profit and risk to farmers, irrespective of the fact whether the sugar mills generate profit or not, is not dependent on the performance of any individual sugar mill.
 - To ensure that higher sugar recoveries are adequately rewarded, the FRP is linked to a basic recovery rate of sugar, with a premium payable to farmers for higher recoveries of sugar from sugarcane.
 - Accordingly, FRP for 2015-16 sugar season has been fixed at Rs. 230 per quintal. linked to a basic recovery of 9.5% subject to a premium of Rs.2.42 per quintal for every 0.1 percentage point increase above that level.

Citing differences in cost of production, productivity levels and because of pressure from farmers' groups, some states declare state sugarcane prices called State Advised Prices (SAP), usually higher than the SMP/FRP. Since early 1970s, State Advised Price (SAP) came into existence in States like UP, Tamil Nadu, Punjab, Haryana etc. The FRP and SAP prices of major states are given in the table below.

Table: Policy Impact on FRP and SAP of Major Sugar Producing States, Rs/Quintal

	FRP	UP	Karnataka	Tamil Nadu	Maharashtra
2010-11	139	205	180	190	200
2011-12	145	240	200	200	195
2012-13	170	280	220	225	230
2013-14	210	280	250	255	260
2014-15	220	280	220	240	220
2015-16	230	280	230	285	230

Source: ISMA, Industry Reports

- Dual sugarcane pricing is distorting sugarcane and sugar economy and leading to cane price arrears. For instance, UP declared SAP for rejected variety at just Rs.5/quintal price differential with common variety due to which farmers are not motivated to grow better varieties.
- It is recommended that SAP of rejected variety, if any, be kept at a Rs.20/quintal lower than that of the common variety to help improve recovery rate and overall efficiency
- Higher SAP than FRP has led to year on year rise in cane price arrears

The government is in pursuit to resolve the dilemma of FRP and SAP to arrive at a basic competitive pricing through recommendations of various committees. The major steps taken by government to address these issues are as under.

Figure 10: Government Initiatives for Sugar Industry

De-regulation of monthly release quota and levy sugar

- Following the recommendation of the Committee headed by Dr C Rangarajan, the GoI has partially deregulated the sugar industry in June 2013 by eliminating the monthly release mechanism of non-levy sugar. Moreover, the central government has removed the compulsory supply of 10% of mill's production as levy sugar at subsidised rate meant for the public distribution system. Both these moves have helped the mills in reduction in their working capital requirement and improvement in average sales realisation. However, the key recommendation by the Committee on determination of sugarcane pricing remains unimplemented.

Export Subsidy on Raw Sugar

- The Government announces export subsidy from time to time to make Indian raw sugar competitive in the international market and ease the liquidity crisis of sugar mills. (For instance Govt. announced subsidy of Rs. 4,000 per tonne up to 1.40 million tonnes of raw sugar export during current SS14-15).

Minimum Indicative Export Quotas (MIEQ)

- The Government fixed indicative export targets for each mill proportionate to their sugar production to evacuate 4 MT of sugar stocks. No export subsidy or incentive is offered and the industry is expected to export at prevailing international prices and absorb the losses so incurred. It is expected that with stock evacuation, domestic sugar prices would increase and reach levels more supportive of cane prices.

Ethanol Blended Programme (EBP)

- Ethanol is produced from the by-product of the sugar industry, viz, Molasses. The EBP programme, besides lowering pollution levels, ensures utilisation of molasses produced during manufacture of sugar and improves the revenue stream of the sugar mills. The Government of India (GoI) has mandated minimum ethanol blending of 5% with petrol from June 2013 and has set aggressive target of increasing the blending ratio up to 20% by 2020 to be in line with other major sugar producing countries.

Sugar Development Fund (SDF)

- The Government has set up SDF under SDF Act, 1982 for financing ISI. The sugar mills are required to pay for levy of cess, which currently is Rs.124 per quintal of sugar manufactured to the Consolidated Fund of India. The GoI uses the SDF primarily for advancing loans to facilitate the rehabilitation and modernisation of any sugar factory. Fund can also be used to build up and maintain buffer stocks of sugar.
- Introduction of schemes like Scheme for Extending Financial Assistance to Sugar Undertakings (SEFASU-2014) envisaging interest free loans by bank as additional working capital to sugar mills, for clearance of cane price arrears of previous sugar seasons and timely settlement of cane price of sugar season is a positive step reducing the onus from debt ridden companies.

Source: MM Analysis

A hybrid approach as per the CACP recommendations should be adopted wherein the Revenue Sharing Model of Rangarajan Committee is merged with FRP price movement and SDF for arriving at a viable solution for both farmers and sugar industry. This Single Sugarcane Pricing

Formula pan India for the sugar industry will pave the way ultimately benefiting involved stakeholders. A brief of same is as under

Box 1: One Pricing Sugarcane Formula and Hybrid Approach

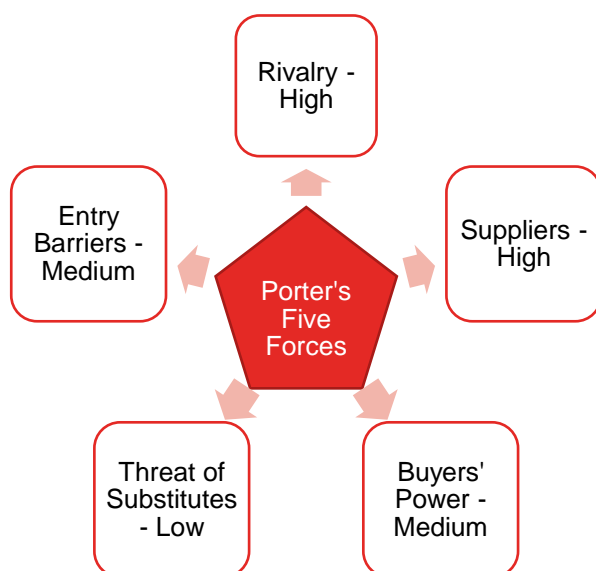
- CACP recommended that under the Revenue Sharing Formula (RSF), the Total Revenue Pot (TRP) generated from the cane-sugar value chain, which is the value of sugar and its first stage by-products, be shared between the farmers and the millers in the ratio of their relative costs in producing cane at farm level and converting that cane into sugar and its by-products at factory level. This act is also in line with recent sugar acts in Karnataka and Maharashtra.
- It is also recommended that if price determined by RSF is less than FRP, the difference is to be paid by the Cess levied under SDF initiative (Sugar Reserves – Central Government already passed the Sugar Cess (Amendment Bill) to allow enhancing of ceiling prices of cess from Rs 0.2/Kg to Rs 2/Kg)
- Proceeds thus will be used for making cane payments to farmers through the DBT route. This route is successfully implemented in Uttar Pradesh during SS 2014-15.
- The adoption of above one price formula will ensure stable returns and consistent cash flow to farmers; Reasonable returns to Mills and ability to invest in mill expansion/improve operations; Reduce Volatility in pricing benefiting end consumers

Source: ISMA, MM Analysis

MM notes the gravity of government intervention across sugar value chain and encourages the implementation of one price formula for benefitting Farmers, Industry, Consumers, and Government at large.

4.8 Industry Attractiveness

Figure 11: Porter's 5 forces



Source: MM Analysis

Rivalry – High

- Around 700+ sugar mills (Private and Co-operatives), most of them in operation typically concentrated in Maharashtra, UP and Karnataka
- Competition is Intense for companies are now manoeuvring into development of by-products (like Ethanol, Cogen) and generate revenue from its sales

Bargaining power of Suppliers – Medium to High

- Sugar Mills have around 80 % of sugarcane as raw material for sugar production and beet being the remaining
- Mills thus must procure cane from farmers which remain the only source
- Partial de-control in pricing (FRP/SAP) will only prove to protect farmers interest

Bargaining power of Buyers – Low to Medium

- Sugar industry id highly controlled by Government influencing distribution and pricing related aspects

Threat of Substitutes – Low

- Gur and Khandsari are the available alternatives for sugar catering generally to rural markets
- Increasing per capita consumption with rise in population and disposable income will create huge demand for sugar especially in urban areas

Barriers to Entry / Exit – Medium

- Integrated business model along with higher capex may restrict new entrants
- Government regulation of no two mill within 15 kms radius

4.9 Key Take-aways

- Sugarcane is a water-intensive crop; hence, abundant rainfall, strong and extensive irrigation and canal network, are key factors influencing production
- Globally sugar production has been growing at a CAGR of around 2.8% since 2012-13 and stood at around 170 million tonnes in SS 2016-17. Global consumption for the same period grew at a CAGR of 2.2%
- Over the next 2-5 years, consumption is set to continue outpacing production in many countries, thus creating huge new markets for imports. However, at the same time, it can be inferred that reduced global sugar stocks would impact the markets' ability to respond to adverse climatic conditions. This is likely to increase the price volatility in coming months and shall prevail for couple of sugar years.
- India is the world's largest sugar consumer and second largest sugar producer
- The country has 716 installed sugar factories (as on 31.01.2017), 530+ under operation, with crushing capacity to produce ~ 330 Lakh MT. It is highly fragmented market with Co-operatives (326 Mills), Private (347 Mills), Public (43 Mills)
- Six states – Maharashtra, UP, Karnataka, TN, AP, Telangana, & Gujarat – account for 90% of India's sugar production
- Surplus sugar production for past six consecutive sugar seasons (SS) breaking the cyclical nature of three years of surplus production followed by two deficit years. But the next SS starting from 1st October 2016 to 30th September 2017 is expected to be a deficit year because adverse climatic conditions in Maharashtra specifically.
- India is an off and on importer of sugar with imports mainly from Brazil, Germany, and USA.

- Cane FRP is usually fixed by GOI and it has grown at a CAGR of 10.59% while average sugar price at paltry 2.8%. It is currently (2017-18) being fixed at ₹255/Quintal.
- Wholesale price of sugar slumped to a low of ₹.26.40/kg in August 2015 and remained below ₹.30/kg for almost half of production period in the SS2015-16. However, the wholesale sugar prices are hovering around ₹.38/kg in June 2017, and is expected to retain its momentum, as the domestic sugar production would further decline in SS 2016-17 on account of lower cane acreage.
- Although there is a net surplus, but the production has declined over the past few year mainly due to extended dry weather in Maharashtra and Karnataka. With draught in western part, cane acreage is expected to decline further. In Uttar Pradesh, sugar production is expected to rise owing to improvement in cane yield on account of better variety, which will be offset by the decline in sugar recovery.
- Sugar Mills are under huge financial stress due to significant losses and increasing cane arrears. Total estimated debt of sugar industry was estimated to be Rs 50,000 Crore at the end of SS 2015-16; around a fifth of the same is expected to be cleared off in SS 2016-17.
- The sugar side is largely de-regulated with no restrictions on sale of sugar.
- Dual sugarcane pricing is distorting sugarcane and sugar economy and leading to cane price arrears.

5 Existing Market Scenario

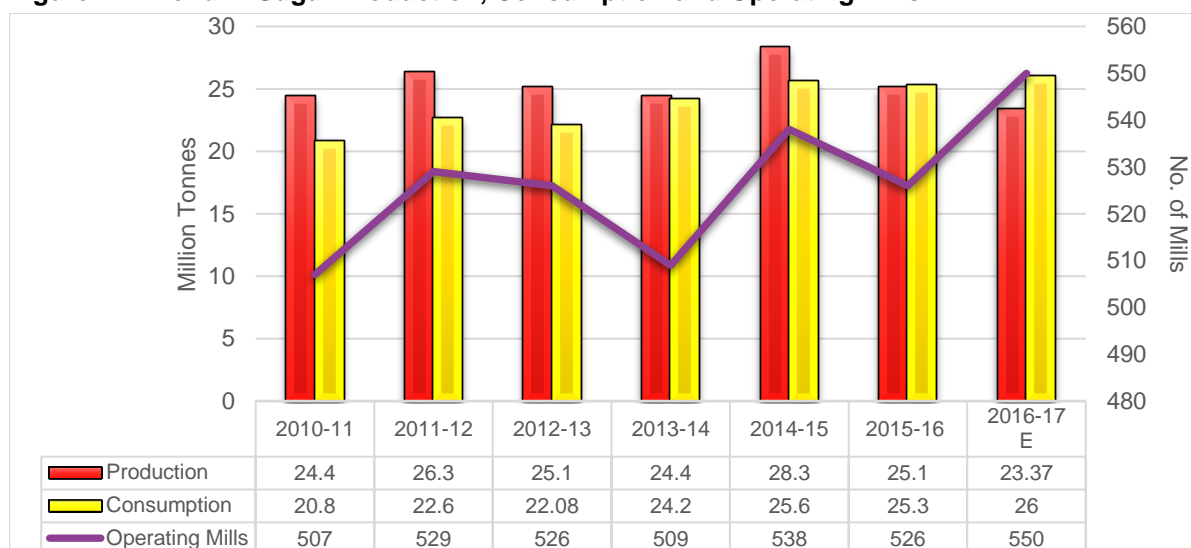
5.1 Sugar Production and Consumption

Sugar industry is one of the key agro-based industries in India. With an annual productive capacity of over 25 MMT, the Indian sugar industry stands out to be the second largest in the world after Brazil, accounting for around 15 per cent of the global sugar production. The country consumes approximately 25 MMT of sugar annually, with Maharashtra meeting over 60 per cent of the demand, while the rest of the output come from states like Tamil Nadu, Karnataka, Uttar Pradesh and Madhya Pradesh. The sufficient and well distributed monsoon rains, rapid population growth and substantial increases in sugar production capacity have made India the largest consumer and second largest producer of sugar in the world.

- Between 2010 and 2016, sugar production has been growing at a CAGR of around 2.8% while consumption is growing at a CAGR of 4.1 %.
- Indian sugar industry has previously displayed a 5-year sugar production cycle, with 3 years of surplus sugar, followed by 2 years of deficit. However, breaking this trend, the sugar industry has constantly seen surplus production for past 6 SS from 2010 to 2015.

The domestic sugar production and consumption is as stated in the figure below.

Figure 12: Trend in Sugar Production, Consumption and Operating Mills



Source: ISMA, DFPD

- As per ISMA estimates, India's SS 2016-17 sugar production is likely to decline by 7.3% mainly because a severe fall in production expected in Maharashtra, the top sugar producing state in the country. Based on the September 2016 satellite images, ISMA has estimated the total cane acreage at around 49 lakh hectares, which is about 5% less than 2015-16 SS on pan India basis.
- Accordingly, India is likely to start the 2016-17 marketing year on October 1 with 7 million tonnes in carry-forward stocks, down 21.3 per cent from a year ago
- Top five states mentioned above account for approximately 85% of total sugar production.

- The average recovery rate of mills across states has been around 9% to 12%.
- Maharashtra was the largest sugar producing state in SS 2015-16 followed by UP. Maharashtra and Karnataka together account for half of the sugar production in India

Below is a summary of the estimations of sugar production during 2016-17 sugar season.

Table 48: Region-wise Sugar Industry Performance Estimates (for SS 2016-17)

Region	Share in Total Production	Performance Indicators and Estimates
Maharashtra	34%	<ul style="list-style-type: none"> – The total cane acreage estimated to be 8.10 lac ha, down 23% as compared to last year – Sugar production during SS 2016-17 estimated at 62.7 lac tons, 25% less than actual sugar production of 84.11 lac tons in 2015-16 SS – The state has received 5% more than normal rainfall during the SW monsoon of 2016, increasing water availability for irrigation in sugarcane producing Districts.
Uttar Pradesh	28%	<ul style="list-style-type: none"> – Total cane acreage is expected to be same that of previous season i.e. at 23.10 lac ha – Though there were poor rainfall in the initial months of monsoon season, the latter part of SW monsoon would help in sugarcane yield, resulting in higher sugarcane production in SS 2016-17
Karnataka	16%	<ul style="list-style-type: none"> – Sugarcane acreage has dropped by 19% in SS 2016-17 to ~4.15 lac ha, compared to 5.10 lac ha. in 2015-16 SS – Sugar production in 2016-17 SS is estimated at 31.9 lac tons, as compared to 40.7 lac tons produced in 2015-16 SS. – Due to drought like situation during the cane plantation period, cane yield and production is expected to drop by 5% and 20%, resp.
Tamil Nadu	4%	<ul style="list-style-type: none"> – Around 2.65 lac ha are expected to be under sugarcane cultivation, marginally higher to 2015-16 – Sufficient rainfall is expected to help increase sugarcane yields and sugar recovery. – The State is expected to produce around 15.6 lakh tons of sugar in 2016-17, about 2 lac tons higher than 2015-16 SS.
Gujarat, Haryana, Punjab, AP, Telangana	18%	<ul style="list-style-type: none"> – Sugar production in these states in 2016-17 SS is expected to be either slightly higher than previous year or at the same level as that of last year.
Bihar, Uttarakhand, Madhya Pradesh, Chhattisgarh		<ul style="list-style-type: none"> – Sugar production in these states is expected to increase in 2016-17 SS, as compared to previous season. – During 2016-17 SS, Bihar is expected to produce 5.79 lac tons, Uttarakhand to produce 3.29 lac tons and Madhya Pradesh & Chhattisgarh would together produce 4.37 lac tons.

Source: ISMA, IISRA, MM Analysis

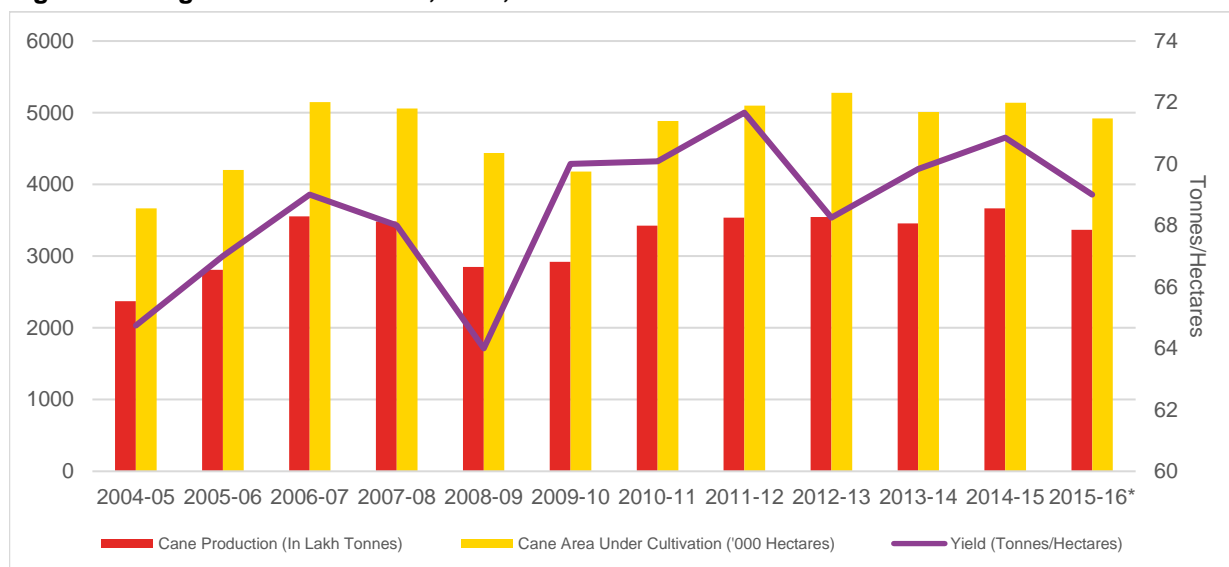
5.2 Raw Material Scenario

The key raw materials for sugar production are sugarcane and beet. However, in India, sugarcane has been the prime raw material for sugar production as analysed in above sections. It is the preferred raw material because of the following factors:

- Sugar content is the highest amongst all crops
- Durable crop
- backed by strong price support by the Government (GoI) in terms of favourable prices for cane through the Fair & Remunerative Price (FRP) / State Advisory Price (SAP) mechanism
- Government incentives helps the sugar industry stakeholders to generate competitive returns as compared with paddy and cotton.
- Sugarcane is grown on around 2.8% of Gross Cropped Area of India. India is estimated to have produced around 330 MT of cane in 2015-16.
- The sugarcane production has been growing at a CAGR of 1.5% and cultivable area at a CAGR of around 2.1% from 2010-11 to 2015-16.

Figure below depicts the sugarcane production and acreage over the years in India.

Figure 13: Sugarcane Production, Area, and Yield in India



Source: ISMA, DFPD; *As per estimates of ISMA released in Sep., 2016

- The drop in the cane acreage area has been due to poor rainfall and draught like conditions in Maharashtra and Karnataka.
- From the above figure, it is evident that over the years, the area under sugarcane cultivation has almost been steady and since 2004-05, the area has expanded by 16.44 per cent.
- The expansion in production of sugarcane is also on the same line and it has increased by 17.20 per cent since 2003. The main reason behind slow expansion in production is the lack of improvement in the productivity.
- In the last 15 years, the production has marginally improved by 0.65 per cent, which highlights the lack of focus on the High Yielding Varieties of sugarcane and research establishments for improving the production in a significant way. Despite the stagnation in sugarcane production,

the production has improved significantly by about 38.94 per cent owing to improved recovery percentage of sugar and decline in quantum of diversion of cane to Gur (25.04 per cent) and Khandsari (40.91 per cent).

The table below shows the sugarcane production and area under cultivation of states.

Table 49: Sugarcane Production and Area

	Cane Production ('000 T)		Area ('000 Hectare)		Yield (Tonnes/Hectare)	
	2014-15	2015-16*	2014-15	2015-16*	2014-15	2015-16*
Uttar Pradesh	133061	138816	2140	2169	62.1	64.0
Maharashtra	84699	73790	1030	987	82.2	74.7
Andhra Pradesh	9987	9312	139	122	71.8	76.3
Karnataka	43776	38475	480	450	91.2	85.5
Tamil Nadu	28092	25723	263	249	106.1	103.3
All India	366800	346723	5307	4960	71.5	69.8

Source: ISMA, * As per third advance estimates by ISMA

- Significant drop in cane production can be observed from the table because of severe drought and adverse climatic conditions pan India
- Uttar Pradesh is having largest sugarcane production facility because of large acreage area but it is Maharashtra, because of larger mill capacity, which have greater sugar production capacity
- Karnataka is amongst the top three producing states and have demonstrated higher yields year on year. The area under cultivation has reduced mainly due to the drought like situation in the state.

Production of sugar from beet has been low and this heavy dependence on sugarcane as raw material may adversely affect the industry. For instance, the current sugar season i.e. 2016-17 is predicted to be a deficit one unlike surplus since past 5 years mainly due to poor rainfall and consequent lesser cane production. In fact, based on the satellite images procured in June 2016, the total acreage under sugarcane in the country is estimated to be around 49 lakh hectares in 2016-17 SS, which is 5.5% lower to 2015-16 sugar season's cane area of around 53 lakh hectares

5.3 Pricing Scenario

The major factors affecting the Indian sugar price are enlisted in the following table.

Table 50: Factors impacting Indian Sugar Prices

Factor	View	Impact on Price
Lower area under sugar cane cultivation	Drop in the cane cultivation area due to draught in Maharashtra and Karnataka has compelled farmers to shift to other crops	↑
Arrears in payments	Arrear in payments to the farmers results in diversion of cane growing areas to other crops resulting in less cane availability for crushing next season and lower production. For 2014-15 season, estimated cumulative cane arrear build up across the country stood at over INR 20099 Crore.	↑
Dependence on Monsoon	Being an agricultural commodity, sugar cane is exposed to adverse weather conditions. Therefore, any significant change in production estimates due to poor monsoons can decrease inventory and increase sugar prices and vice versa.	↑

Factor	View	Impact on Price
Increase in sugar consumption	Global sugar consumption is projected to increase at CAGR of 4.6 per cent and reach nearly \$97.2 billion by 2017. Consumption in India, which is major sugar producing nation, is expected to grow in same trajectory.	↑
Government Policy	Risk of government intervention to control the prices to curb inflation and stabilize the sugar prices in the domestic market	↑

Source: MM Analysis

The sugar industry is highly regulated by the GoI in terms of sugar production, cane procurement areas for sugar mills, and most importantly, for determining sugarcane pricing. The pricing of sugarcane is governed by the statutory provisions of the Sugarcane (Control) Order, 1966 issued under the Essential Commodities Act (ECA), 1955. Statutory Minimum Price (SMP) was replaced with the Fair and Remunerative Price (FRP). FRP is announced at the recommendations of the Commission for Agricultural Costs and Prices (CACP).

As per the regulations, sugar mills should purchase cane at FRP from farmers and compulsorily crush for sugar production. In India, the government decides the sugarcane floor price, also known as the FRP, which must be paid mandatorily by sugar mills to farmers within 15 days of the commencement of crushing. Thus, mills do not have any control on cane pricing as well as on the quantity of sugar produced.

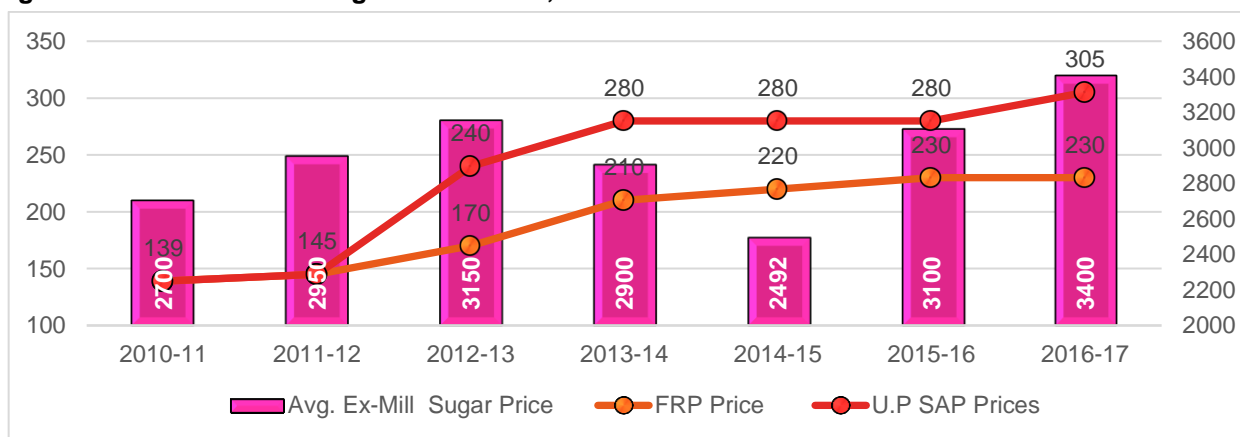
The main cost components of a typical sugar mill in India include:

- Cane Pricing- 70%;
- Wages – 10%;
- Admin Expenditure – 3%;
- Other – 17%.

Thus, the sugar price mainly depends upon the sugarcane pricing. The industry has seen a partial de-regulation too, but the same has not proved to be of much advantage as the gap between the cost of production and sugar prices are dismal and markedly effects the overall bottom-line of the companies.

The sugar prices are market driven and is governed by domestic and global demand-supply dynamics. A brief regarding the cane prices and the actual sugar prices is stated in Figure 14:

Figure 14: Cane FRP and Sugar Price Trend, in Rs/Quintal

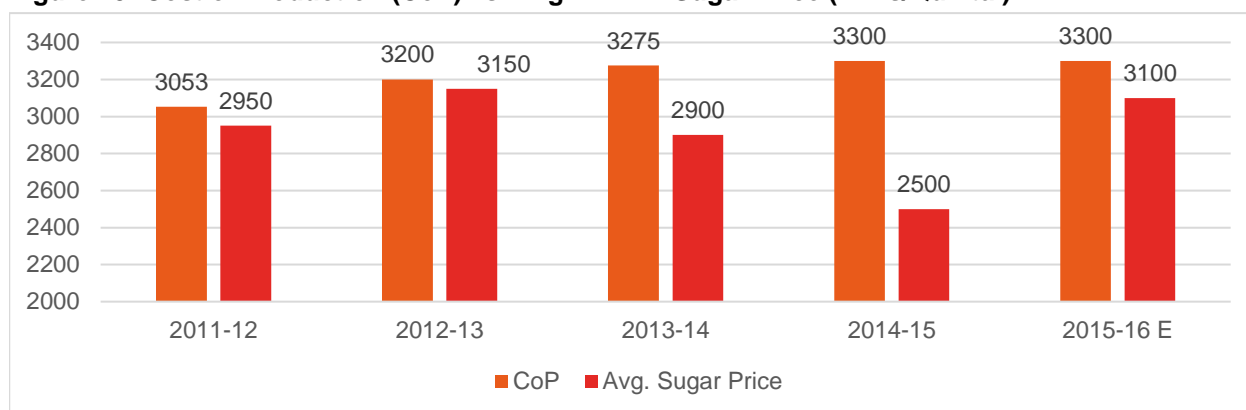


Source: ISMA, National Informatics Centre,

- Cane FRP is usually fixed by Govt and it has grown at a CAGR of 10.59% while average sugar price at paltry 2.8%. This shows how the FRP prices have grown while sugar prices have remained flat with negative bias.
- Meanwhile, as can be seen from the graph, SAP prices of sugarcane in UP have been constantly higher than FRP from 2012-13, and currently (2016-17) stand at INR 305/quintal compared to INR 230/quintal of FRP. This creates a further pressure on the sugar millers in respective states where SAP prices are higher than FRP prices.
- Declining trend of sugar prices and consistent increase in the FRP declared by the government have resulted in moderation in operating margins of sugar mills and delay in payment to farmers for sugarcane procured by the sugar manufacturers.
- As on March 31, 2015, the difference between payment to the farmers to be made as per FRP/SAP against sugarcane procured and actual payment made by the sugar manufacturers, referred to as cane arrears, was estimated at about Rs. 19,000 crores, but the same was significantly down to approx. 5000 crores next SS because of FRP fixation and other policy initiatives discussed in the previous Chapter

The cane pricing is majorly regulated by Govt. and since it forms a major component of production cost (around 70%) there exists gaps between the cost of production and sugar prices as evident in Figure 15 which exacerbates the overall business of sugar refinery.

Figure 15: Cost of Production (CoP) vs. Avg. Ex-Mill Sugar Price (in Rs/Quintal)

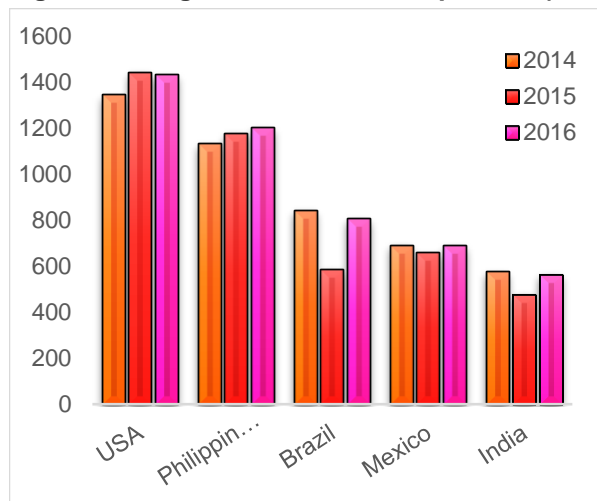


Source: ISMA

- The gap between CoP and sugar prices deeply mars the overall financials of the company and adds to the cane arrears as discussed above.
- The Indian sugar industry has been witnessing a challenging phase marked by extreme volatility resulting in lopsided margins for the sugar mill owners
- Sugar Prices started to decline from August 2014 because of surplus sugar stock both in domestic and global markets.
- Wholesale price of sugar slumped from Rs.33.76/kg in August 2014 to a low of Rs.26.40/kg in August 2015 and remained below Rs.30/kg for half of production period in the 2015-16.
- The sugar price started picking up from September 2015 and since then it has been on a continuous uptrend. In August 2016, sugar price prevailed at Rs.37.86/kg in wholesale market and crossed the price level of Rs.40/kg in the retail market.
- On the other hand, the cane prices in India are amongst highest world over and the sugar prices are very much low. This affects not only company's profitability but also reduces ex-

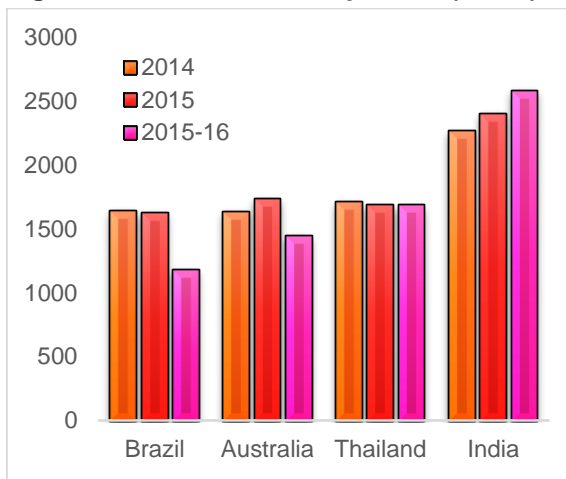
chequer amount. The Following Figures clearly show the difference in both cane and sugar pricing.

Figure 16: Sugar Retail Price Comparison (\$/Ton)



Source: ISMA

Figure 17: Cane Price Comparison (\$/Ton)



Source: ISMA

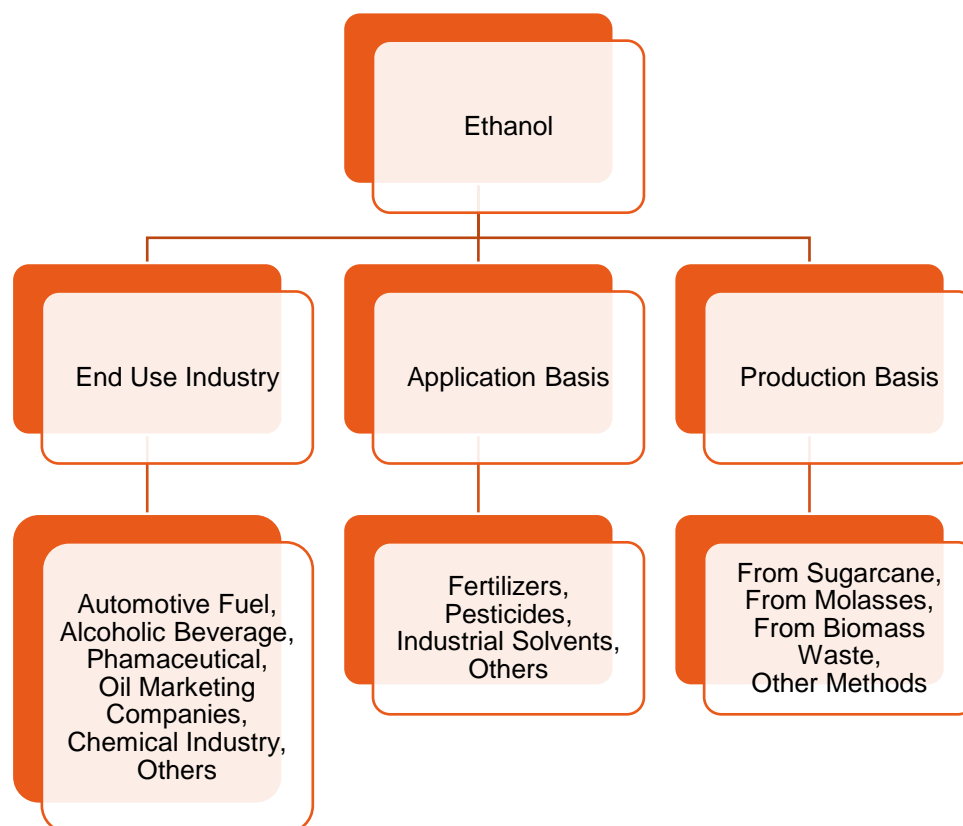
- India has the lowest retail price of sugar in comparison to other key sugar consuming countries
- India has highest cane price with lowest retail price of sugar

Partial de-regulation to arrive at cane pricing would not be the optimal scenario for the sugar industry and there is a need for developing an appropriate regulatory environment. This environment would need to enable the industry to leverage the transformation opportunities. Farmer interests would need to be protected and sector attractiveness would need to be enhanced. Protection for consumer interests would need to be aligned with the consumption pattern. There is thus a need to re-evaluate the partial de-regulation and implement the recommendations which would arrive at fair pricing formula. (The Govt. Policies and interventions are discussed in subsequent sections)

5.4 Ethanol Industry

The most common conventional biofuels that are largely used in transportation and other applications are Ethanol and Biodiesel. Ethyl alcohol or ethanol can either be produced by direct fermentation of cane juice or from molasses, which is a by-product of the sugar manufacturing process. Ethanol can be used for potable alcohol industry, chemical industry and as a bio-fuel in vehicles (direct/blended with gasoline). The figure below Provides Ethanol segmentation in India:

Figure 18: Ethanol Segmentation in India



Source: MM Analysis

India is the fourth largest producer of alcohol globally and the leading producer of alcohol in the South-East Asian region with about 65% share.

It can be observed from the figure above that use of Ethanol as automotive fuel has the potential to substitute gasoline and hence may also be a substitute for crude oil. The Central Government has been promoting the production and blending of Fuel Ethanol with petrol. India has implemented Ethanol Blended Programme (EBP) with a mix of 5% (E5) or 10 % (E10), thus encouraging the growth of sugar industry and improve overall financial health. The Government has prescribed a remunerative price for Ethanol and has also provided excise duty benefits to encourage the production of ethanol.

Sugarcane Molasses and Beet Molasses have primarily been the feedstock for ethanol industry in India, but not so in other countries. A brief look at the main feedstock is stated in Table 51.

Table 51: Feedstock of Major Countries

Country	Feedstock for Ethanol Production
Brazil	Sugarcane, Cane Molasses
USA	Corn Grain, Maize
China	Maize, Wheat, Cane and Beet Molasses, Cassava
EU	Beet Molasses, Wheat, Maize

Country	Feedstock for Ethanol Production
India	Sugarcane, Cane Molasses,

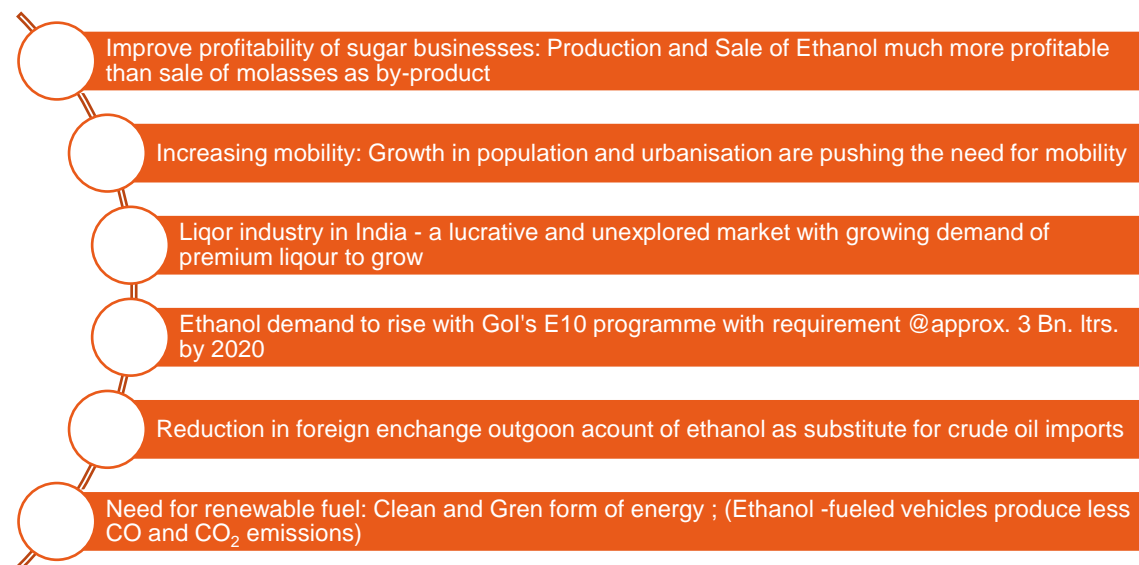
Source: MM Analysis

- India has around 330 distilleries which produce over 4 billion litres of rectified spirit (alcohol) per year. Of this total, about 162 distilleries have the capacity to distil over 2 billion litres of conventional ethanol.
- In India, Molasses (74 %) is the major feedstock for ethanol production followed by coarse grains unlike developed countries (4 %).
 - Installed capacity of around 6.25 Billion Litres of alcohol production
 - Of 6.25 Bn. Ltrs, 2 Bn. Ltrs. Capacity for Fuel Ethanol (Bio-Fuel)
 - An approx. 1.8 Bn. Ltrs. With Sugar Mills (130 of the 530 mills have ethanol producing facility), and
 - Remaining with standalone distilleries
- Use of ethanol as bio-fuel has started with the Government's ambitious plan of EBP. In fact, contracts worth 1.3 Bn. Ltrs. were finalized in 2016-17 which was equivalent to 5% EBP programme. And with E10 on radar, the demand will almost double creating many opportunities for the distilleries and sugar industry

MM notes the gravity of EBP programme and focusses on the burgeoning demand it will create that will impact sugar industries positively in form of improved financials. It thus analyses the ethanol industry in detail.

The important drivers for growth in this sector as MM envisages is stated in Figure 19

Figure 19: Ethanol Drivers



Source: MM Analysis, ISMA

In the current season, the sugar industry, for the first time, would be meeting the 5% blending target. To meet the 10% blending, distillation capacities need to be increased through increasing the existing capacities as well as setting up of new capacities. Extending the ethanol

blending program to cover production from 'B' heavy molasses would also help in meeting the targets.

The production and consumption pattern of fuel ethanol along with ethanol refineries and blend rate is stated in Table 52.

Table 52: Trend in Fuel Ethanol Usage (in.) and Refineries in India

Particulars	Units	2011	2012	2013	2014	2015	2016
Opening Stock	Mn. Ltrs	1241	847	824	618	422	286
Production	Mn. Ltrs	1681	2154	2057	2002	2292	2085
Import	Mn. Ltrs	39	34	33	107	217	450
Export	Mn. Ltrs	119	177	234	175	200	140
Consumption	Mn. Ltrs	1995	2035	2062	2130	2445	2360
Fuel Consumption	Mn. Ltrs	365	305	382	350	685	600
Ending Stocks	Mn. Ltrs	847	824	618	422	286	321
Ethanol Refineries	No.	115	115	115	115	160	162
Capacity	'000 Mn. Ltrs	15	20	20	20	20.5	20.5
Ethanol Blend rate	%	1.80	1.40	1.60	1.40	2.30	1.90

Source: Gain Reports, 2016

- Domestic ethanol production in last decade has remained stable, growing at a CAGR of around 4.4 % while consumption grew at 3.41%
- India is consuming more ethanol than it produces as evident. Ethanol consumption grew from 1.9 billion litres to 2.4 billion litres in 2016, and is expected to increase in 2017 to approximately 2.5 billion litres
- Despite having sufficient production capacity (nameplate capacity of around 2 Bn. Ltrs.), India is importing more ethanol primarily from Brazil, USA, and Spain, due to higher consumption pattern
- The blend rate has not been in line with E5 blending programme, but the same has started to pace up and initiative like E5, E10, use of indigenous ethanol only will relatively put a thrust on increased production and ultimately will benefit sugar industry.

5.4.1 Policy Initiatives in Ethanol Sector

The various policy initiatives undertaken by the Government to support ethanol production in the country are as under:

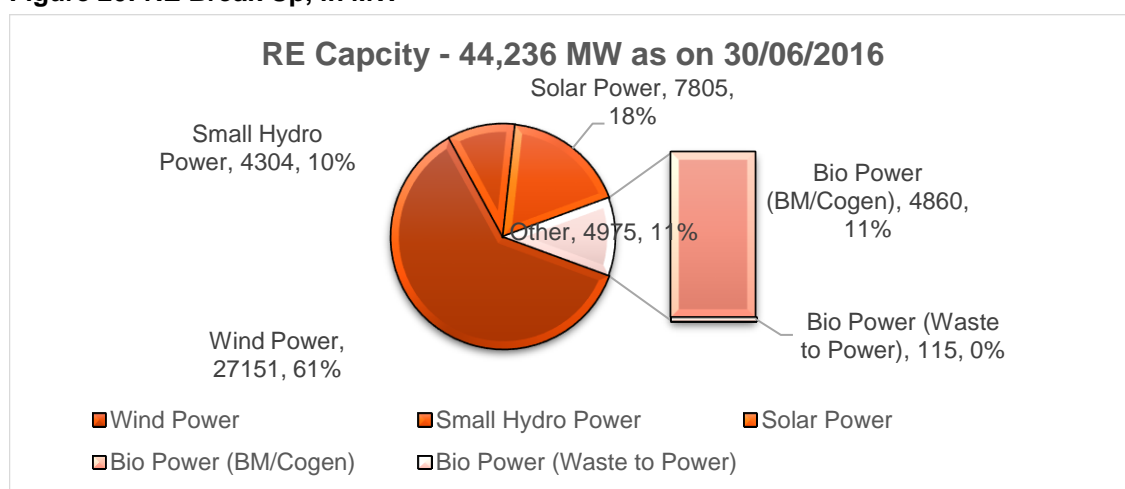
- Excise duty benefit of around Rs 5/litre has been provided on the sale of ethanol produced from molasses, to Oil Marketing Companies (OMCs).
- The GoI approved the National Policy on Biofuels on December 24, 2009. The policy encourages use of renewable energy resources as alternate fuel to supplement transport fuels and had proposed an indicative target to replace 20 percent of petroleum fuel consumption with biofuels (bioethanol and biodiesel) in years to come.
- In a bid to renew its focus and strongly implement the ethanol blending program (EBP), the GoI recommended 10% mandatory blending of ethanol with gasoline across all states
- The Government has fixed the price of ethanol. Petrol has been decontrolled with effect from June, 2010. The Government has fixed the delivered price of ethanol in the range of Rs 48.50 per litre to Rs 49.50 per litre. This will help the sugar mills to negate any downturn in the sugar prices and also facilitate the payment for the cane to the farmers.

- The GOI's target of five percent blending of ethanol in gasoline was partially successful in earlier years but as per reports, India is finally set to achieve the E5 target since its proposal in 2003 for OMC companies have contracted to buy over 1.3 Bn. Ltrs. which will save roughly RS 6,000 Crore in form of reduction in net oil import bill. However, India's ethanol blending level will still be much lower than that of 25-30% in Brazil, 15% in the US and a whopping 85% being planned by Thailand.

5.5 Co-Generation Scenario

In India, during 2015-16, of the total 306 GW power generation, 44 GW was through Renewable Energy (RE). Of this RE generation, 4975 MW was through biomass and bagasse based fuel and is expected to grow at a significant pace. Figure 20 details out the Renewable break up.

Figure 20: RE Break Up, in MW



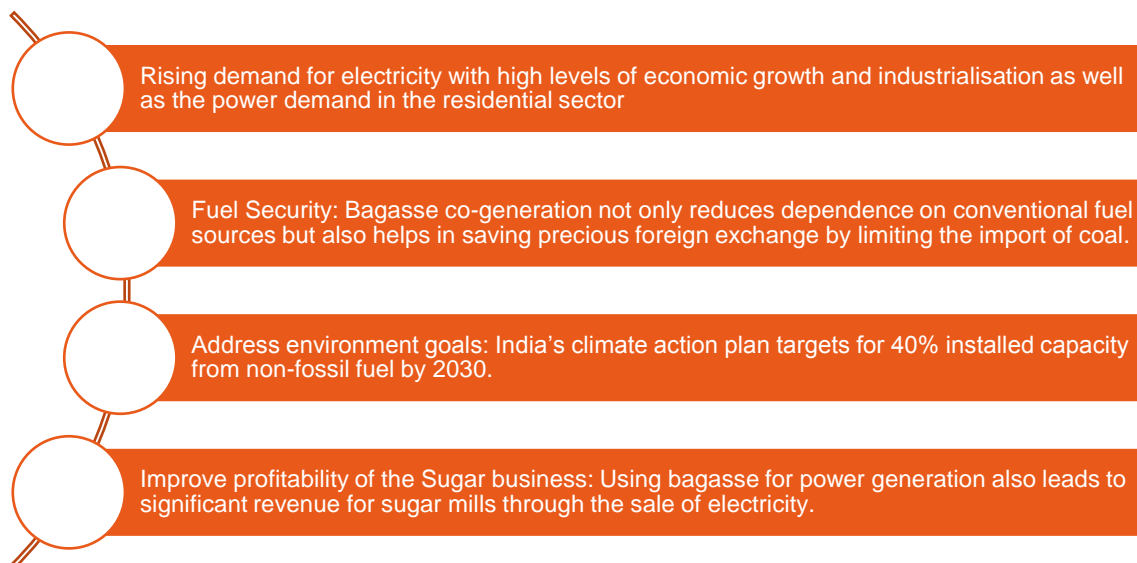
Source: MNRE, CEA

Bagasse, as discussed, can be effectively used as heating fuel thereby useful for steam generation. With the technological innovations, the high pressure steam generated in boilers can in turn be used to rotate the turbo generator blades to produce electric current. The process employed here to generate power is called cogeneration which essentially implies the production of two forms of energy, electricity, and heat. The power thus generated can be used for meeting the requirements of the sugar mill and the surplus can be fed into the grid.

Cogeneration or production of electricity in combination with another industrial process is not limited to sugar mills alone. There are several other industries such as paper and pulp, textile, fertilizer, petroleum, petrochemicals, and food processing which require electrical as well as thermal energy for their operations and therefore can use cogeneration as a process. The total fuel consumption is significantly reduced when "co-generation" or "combined heat and power" (CHP) is applied. For every 100 tons of Sugarcane crushed, a Sugar factory produces nearly 30 tons of wet Bagasse along with the overall efficiency of energy use in cogeneration mode up to 85 per cent and above in some cases.

The main demand drivers of the co-generation market are as under.

Figure 21: Co-Generation Drivers



Source: MM Analysis, ISMA

The Ministry of New and Renewable Energy is promoting cogeneration through various incentive based schemes. Biomass Cogeneration programme in India is currently divided into two components

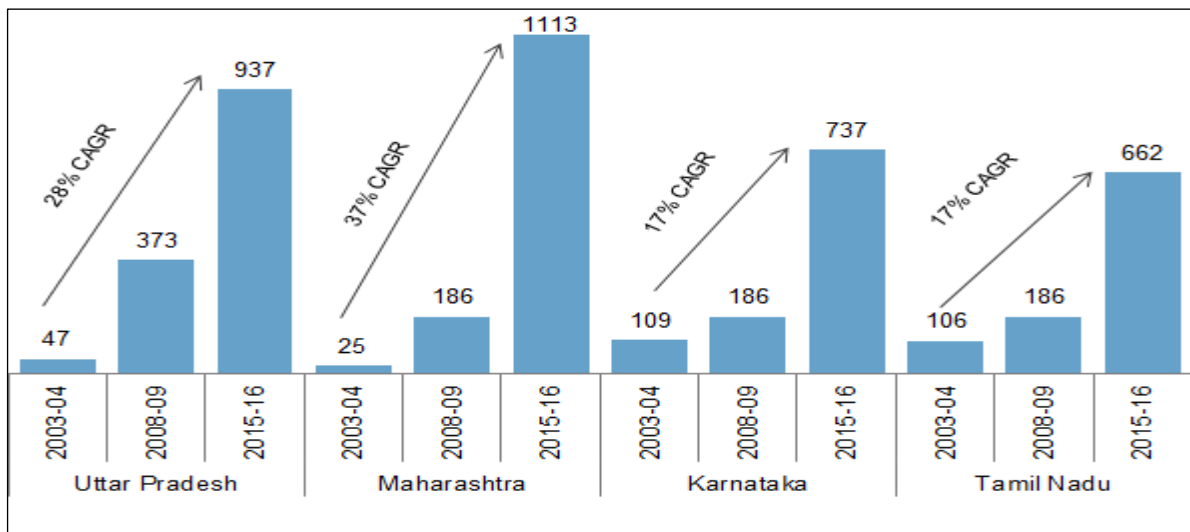
- Bagasse based
- Non-Bagasse based

While bagasse cogeneration is essentially sugar mills oriented non-bagasse biomass cogeneration is used in biomass industry.

Bagasse is mainly used for captive power generation in domestic sugar mills. Sugar factories use bagasse to meet their electricity and steam requirements. Bagasse is burnt in large furnaces, which releases large amounts of heat for boiling water and generating high-pressure steam. The steam is used to drive a turbine, which generates electricity. The residual low-pressure steam is used in the sugar making process. Bagasse is also partly used to manufacture paper, particle boards and as cattle feed.

The trend in Bagasse based Power generation capacities (in MW) in key sugar producing states is as depicted below:

Figure 22: State-wise Trend in Bagasse-based Power Generation (in MW)



Source: Ministry of New and Renewable Energy, CRISIL research

- Maharashtra, UP and Karnataka are amongst the biggest biomass and co-gen based power producers in India with almost 60% share.
- UP is the leading state in bagasse based power generation, with an installed co-generation capacity of 1100 MW. The potential of bagasse co-generation within UP is around 2000 MW, from over 130 sugar mills. The sugar mills work on a Power Purchase Agreement (PPA) model with the Uttar Pradesh Power Corporation Ltd. (UPPCL).
- The all India potential of bagasse based co-generation is estimated at 7000-7500 MW.

5.5.1 Policy Incentives for Co-Generation Production

The Government is providing various incentives and schemes to promote bagasse based co-generation. A subsidy is provided under Central Financial Assistance for private sector projects viz IPP Grid interactive bagasse co-generation in private / joint sector sugar mills, IPP based BOOT/BOLT model projects in cooperative / public sector sugar mills. A target of 1400 MW Bagasse Co-generation has been planned by the Government under 12th Plan, against a fund allocation of Rs 310 crore.

5.6 Key Take-aways

- Indian sugar industry has previously displayed a 5-year sugar production cycle, with 3 years of surplus sugar, followed by 2 years of deficit. However, breaking this trend, the sugar industry has constantly seen surplus production
- As per ISMA estimates, India's SS 2016-17 sugar production is likely to decline by 7.3% mainly because a severe fall in production expected in Maharashtra, the top sugar producing state in the country.
- India has the lowest retail price of sugar in comparison to other key sugar consuming countries and has highest cane price. MM notes the pricing regime to be unfair towards company's overall business and emphasizes on the implementation of committee recommendations.
- The sugar price mainly depends upon the sugarcane pricing. Declining trend of sugar prices and consistent increase in the FRP declared by the government have resulted in moderation

in operating margins of sugar mills and delay in payment to farmers for sugarcane procured by the sugar manufacturers.

- SAP prices of sugarcane in UP have been constantly higher than FRP from 2012-13, and currently (2016-17) stand at INR 305/quintal compared to INR 230/quintal of FRP. This creates a further pressure on the sugar millers in the states where SAP prices are higher than FRP prices.
- Globally ethanol production stood at around 115 Mn.Cu. Mtrs. in 2015 and is growing at a CAGR of 2.9% with ethanol as automotive fuel at 1%
- India has around 330 distilleries which can produce over 4 billion litres of rectified spirit (alcohol) per year. Of this total, about 162 distilleries have the capacity to distil over 2 billion litres of conventional ethanol. India produces conventional bioethanol mostly from sugar molasses and partly from grains.
- MM notes that a mandatory EBP is necessary that will prove to benefit not only sugar and oil market but also will be a positive step towards greener initiatives.
- A long-term clarity on pricing will attract more amount of contracted quantities
- Ethanol production from domestic molasses will add to top line of ailing sugar industry and improve their overall financials.
- With onset of E10 programme in coming years' huge opportunities in terms of investment and growth can be ascertained

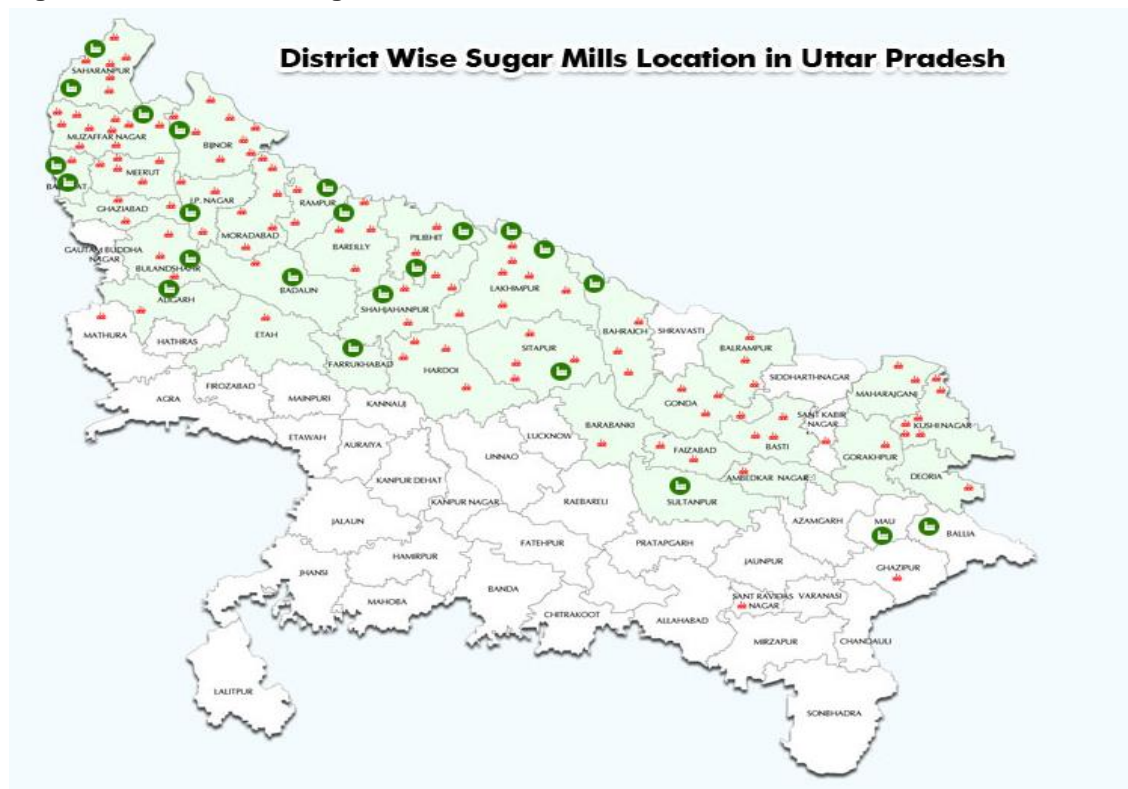
6 Uttar Pradesh Sugar Industry Scenario

Uttar Pradesh is one of the largest states of the country, accounting for around 7.3% of the country's total area and 17%% of the country's total population. The decadal population growth rate of the state is 20.09% (India's average: 17.7%) making it a major consumption market and demand centres. It is one of leading state in the country with regards to agriculture production, especially wheat production and sugarcane.

In fact, Uttar Pradesh and Maharashtra together contribute to more than 60% of India's sugar production.

The following map shows the location of sugar mills in Uttar Pradesh.

Figure 23: Location of Sugar Mills in Uttar Pradesh



Source: Uttar Pradesh Cane Development Department

- From the map above it can be inferred that all sugar mills are clustered around the sugarcane producing regions of Uttar Pradesh, which is primarily the North-Eastern belt of the State.
- In particular, it is the Western UP that has attracted the maximum mill establishment as this region has access to abundant and continues water resources through the perineal rivers that make the soil fertile for the water-intensive sugarcane production.
- The eastern UP, on the other hand, has fertile soil belt but is heavily dependent on the monsoons for yielding high sugarcane production. Thus, the concentration of sugar mills is scanty in this region.

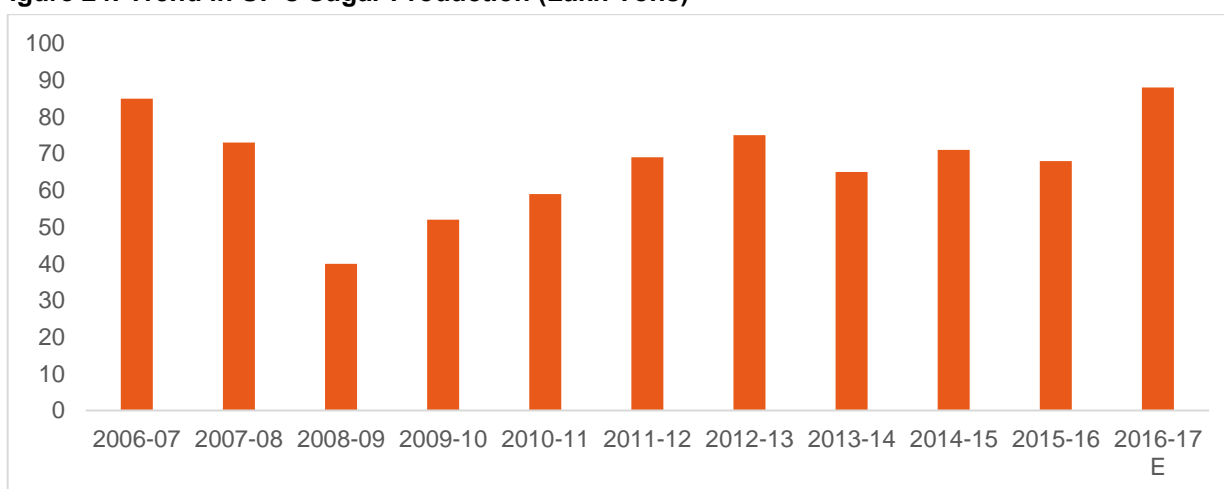
- Finally, the southern part of Uttar Pradesh is water deficient and thus unsuitable for cane production.

6.1 Sugar Production and Consumption

Although India is forecasted to continue experiencing a slide in its sugar production this year, Uttar Pradesh is set to reclaim its position as top producer, filling the vacuum created by Maharashtra and Karnataka's low performance due to a drought-like situation. Till February 2017, sugar production stands at 56.22 lakh tonne against last year's 47.63 lakh tonne during the same period.

The following graph shows the trend in sugar production in Uttar Pradesh:

Figure 24: Trend in UP's Sugar Production (Lakh Tons)



Source: Uttar Pradesh Cane Development Department

Uttar Pradesh has revised its output upwards to 8.3 million tonnes from its initial estimates of 7.7 million tonne of sugar production for the 2016-17 marketing year (Oct-Sept) against 6.85 million tonne in the previous year. With these estimates, the State is expected to surpass Maharashtra as the country's largest sugar producer. The last time UP had surpassed Maharashtra in sugar output was in the 2006-07 season.

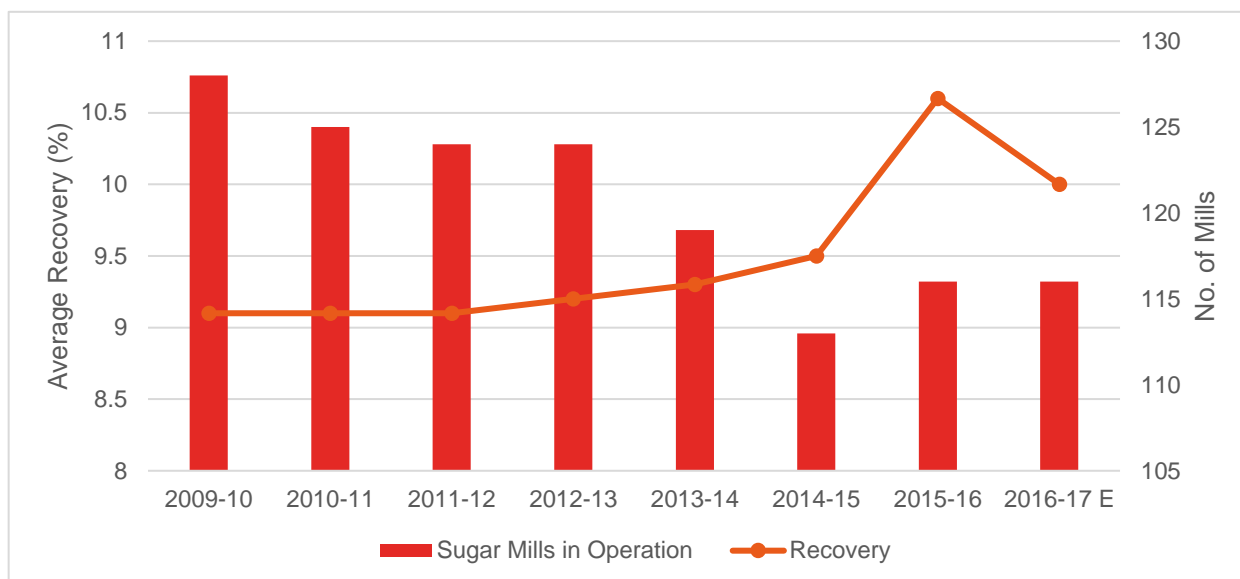
The main factors for this boost in sugar product include

- adequate rains that have bolstered the yield,
- high yielding cane varieties,
- Early crushing season with an expected average recovery rate of around 10.13%

In Uttar Pradesh, 116 sugar mills are in operation and they have crushed 278 lac tons of sugarcane and produced 27.40 lac tons till December 2016, with an average recovery of 9.86%. Last year (2015-16), 113 sugar mills were in operation and they crushed around 178 lac tons till December 2015 of cane to produce 17.97 lac tons of sugar at an average recovery of 10%.

The Following graph illustrates these trends in detail:

Figure 25: Trend in UP's Sugar Mills and Recovery Rate

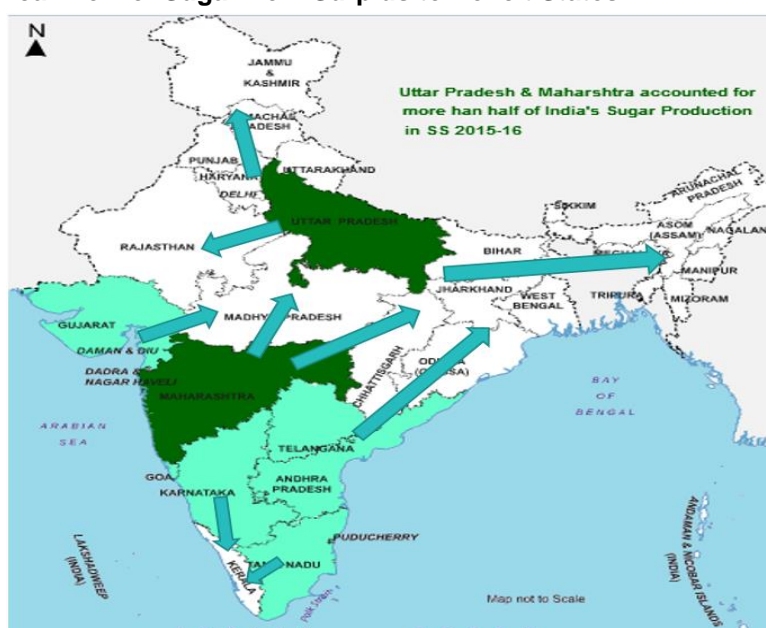


Source: Uttar Pradesh Cane Development Department

Out of around 68 lakh ton (2015-16) produced by UP sugar producers, roughly about 50% was sold within the UP market. This have been the general trend in the sugar consumption market in UP. The rest is sold outside UP, largely in Kolkata, north eastern market, Rajasthan and North Indian sugar deficit regions.

The following map shows the general sugar trade flows in the country:

Figure 26: Geographical Flow of Sugar from Surplus to Deficit States



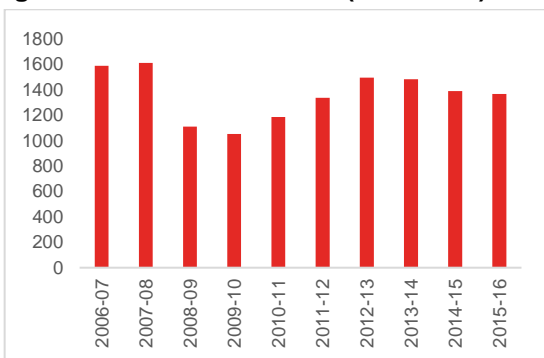
Source: MM Analysis

6.2 Sugarcane Scenario

Uttar Pradesh is the leading sugarcane producer of the country which is the prime raw material for production of sugar in India. UP constitute around 39% to the total sugarcane production of the country, followed by Maharashtra at 21% (2013-14).

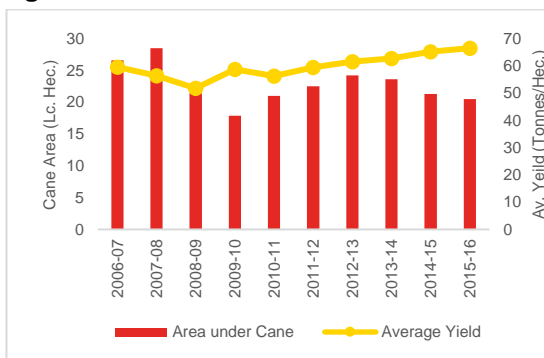
The following graphs show the trends in UP's cane production and average cane yield per hectare.

Figure 27: Cane Production (Lac. Tons)



Source: Uttar Pradesh Cane Development Department

Figure 28: Trend in Cane Area and Yield

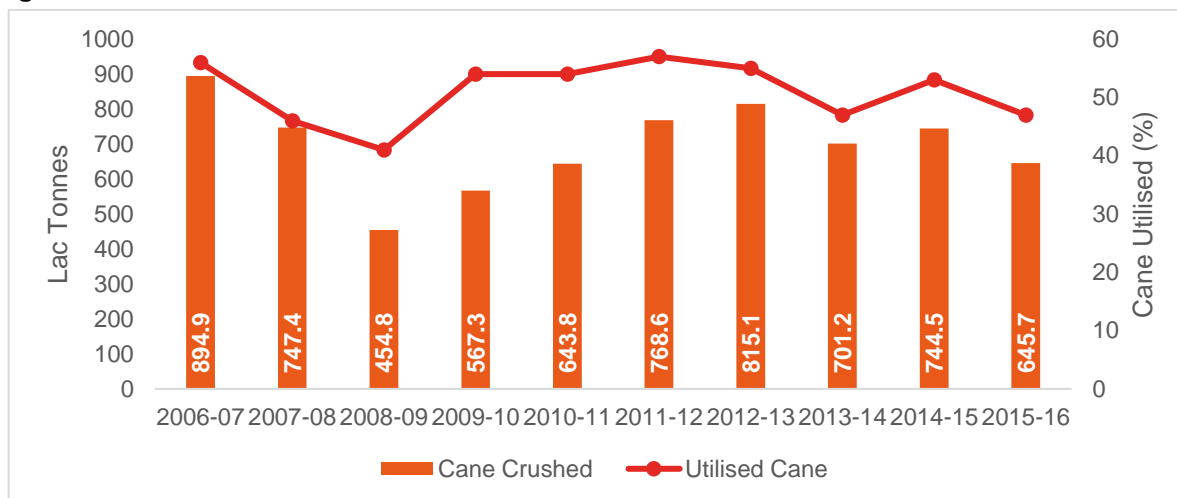


From the graphs above it can be observed that UP experienced a sharp cane production decline in 2009-10, the year when area under cane cultivation was also the lowest at 18 lakh hectares. One of the key reasons for this was uncertainty on cane pricing in addition to farmers' interest in crop swapping.

Another interesting trend that can be seen in these graphs is that although area under cane cultivation has been declining in Uttar Pradesh over the past 5 years, the average yield has been steadily increasing. This validates our above claims that Uttar Pradesh's recent sugar production boost is on account of cultivators using high yielding varieties of cane. This trend is likely to get further enhanced going forward.

The following figure illustrates the trend in cane crushed and utilisation rate in Uttar Pradesh:

Figure 29: Trend in Cane Crushed and Utilization Rate



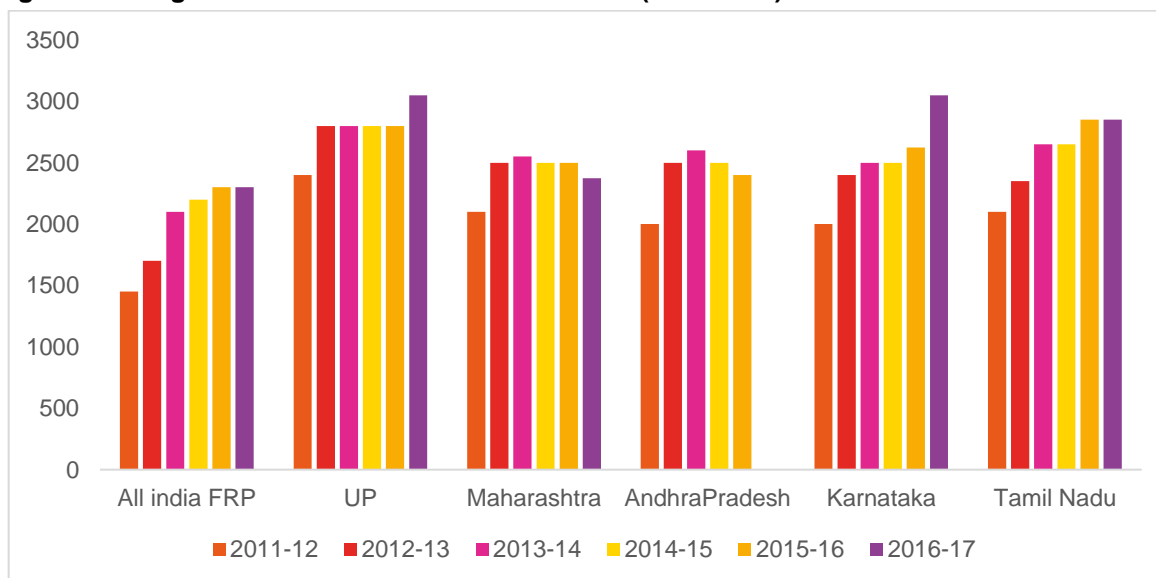
Source: Uttar Pradesh Cane Development Department

6.3 Pricing Scenario

As discussed in earlier sections, sugarcane prices in India are controlled at the central level as well as the state level. Year on year the central government fixes a Fair and Remunerative Price (FRP) to be paid to sugarcane farmers for procurement of sugarcane by sugar mills. Above this various states also fix up a State Advised Price (SAP).

In Uttar Pradesh, the SAP is the highest amongst the leading sugarcane producing states in India.

Figure 30: Ex-gate Cane Prices for Different States (INR/tonne)



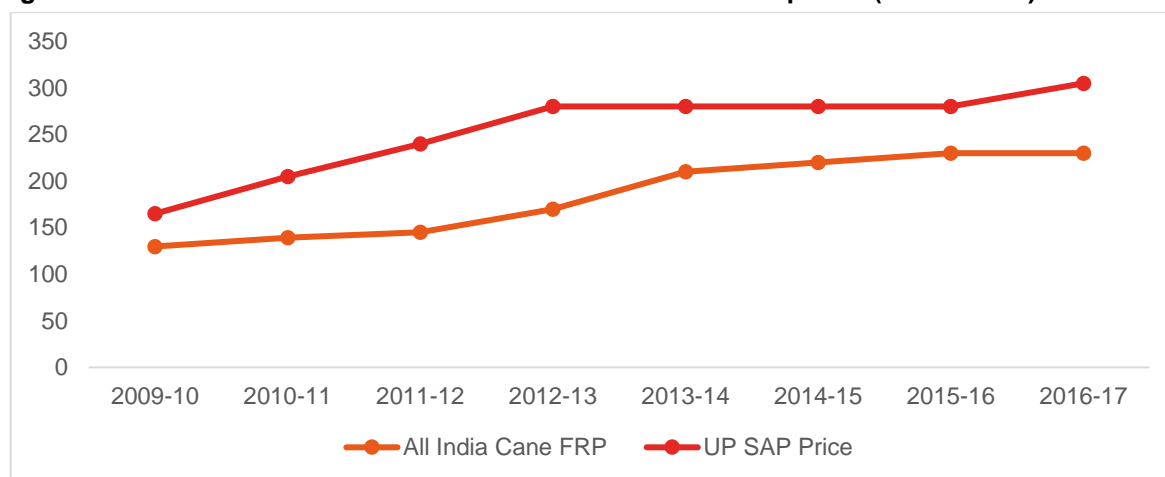
Source: Industry Reports and MM Analysis

- The rise in sugarcane prices is visibly higher for the states following SAP.

- Furthermore, the SAP has been substantially higher than the FRP fixed by the central government to support the farmers for the state of Uttar Pradesh.
- UP's SAP is highest among the cane price difference of other leading producers.
- This has an adverse impact on the bottom-lines of mill owners as it increases the cost of production substantially, but the sugar prices are market determined and are hence competitive on a country-wide basis.

The following graphs highlights the disparity in the all India FRP prices and those set by UP's State Governments during 2009 to 2017:

Figure 31: Difference between India's FRP and UP's SAP cane prices (INR/Quintal)



Source: Uttar Pradesh Cane Development Department

UP's SAP increased 1.36 times since 2010-11 to reach a difference of INR 75 per quintal between SAP and FRP which is highest among the cane price difference of other leading producers.

Meanwhile, for the last many years, UP had suffered due to low recovery as well as low sugar prices, leading to huge accumulation of cane arrears. However, this year, the cane payment in UP has seen an upward mobility with sugar mills having paid 76.63% of cane dues till early March 2017 (Rs. 11,110.01 crore out of the total Rs. 14,497.31 crore). Due to steady sugar prices, mills in UP have made better payments.

Improved domestic sugar prices prospects: For last 3-4 years, domestic sugar prices were continuing to be quite depressed and much below the production cost of sugar. However, from the year 2015-16, domestic sugar prices have started showing signs of improvement.

Major reasons for improvement in domestic sugar prices are as under:

Table 53: Factors for Expected Sugar Price Improvements

Factor	Description
Estimated deficit in country's demand-supply balance sheet	After 5 years of consecutive surplus production in country leading to high stocks, the country is expected to enter into a supply deficit phase when sugar production is estimated to be 25.0 million tonnes as against consumption of 26 million tonnes and estimated exports of 1.5 million tonnes
Estimated deficit in world balance sheet	In line with Indian sugar balance sheet, after 4 years of consecutive surplus in world sugar balance sheet, sugar year 2016-17 is estimated to be deficit year on global basis
Bigger deficit in year 2016-17	Due to poor acreage in states of Maharashtra and Karnataka due to drought conditions during 2015, year 2016-17 is estimated to witness further decline of production. Therefore,

Factor	Description
	on one hand production will come down, on the other hand, consumption is estimated to increase to the level of 26 million MT which means depletion of stocks by 3.0 to 4.0 million MT, unless imported
Improvement in recovery of sugar in state of UP	During the sugar year 2015-16, sugar recovery from cane in state of U.P. has also significantly improved from last year level of 9.54% to this year level of 10.6% due to Industry's efforts for cane development, increased availability of better variety of cane and ideal weather conditions

Source: BHSL and MM analysis

6.4 Challenges faced by UP Sugar Industry

Figure 32: Key Challenges faced by UP Sugar Industry



Source: MM Analysis

6.5 Government Initiatives and Other Cane Development Schemes

While the initiatives being undertaken by the Government of India have been detailed in the sections above, the following are some State-specific initiatives being undertaken by the industry players in Uttar Pradesh sugar industry:

Cane Development Program: Out of 28 co-operative sugar factories, 13 sugar factories are also working as cane societies. There are no separate cane societies in these 13 sugar factories. These mill societies are arranging all the Input required for cane cultivation. Mill societies are doing the business of fertilizers and insecticides. Under the NABARD scheme, cane growers get fertilizers, insecticides on the loan basis.

Availability of High Yielding Seed Variety: To increase the cane as well as sugar production per unit of land, factories are making available the seed of early and other improved varieties. Efforts are made to bring the cane area under early varieties upto 35-40% in every mill. Certain factories had the cane area more than 50% under unsuitable varieties like COS-91269 and B.O.-91. To bring down the area under late varieties, Varital replacement program was implemented.

Cane management: In order to make available clean and mature cane to the factories, a new scheme was launched recently. Every field supervisor was made in-charge of the circle consisting of 4-5 centers in the factory areas. Supervisor had to ensure daily cane purchase as per indent, regular lifting of cane, supply of clean and fresh cane at all the centers of his circle. Supervisors were also responsible for taking daily cane purchase report to the factory gate by the next morning.

Technology Adoption: Out of 23 sugar factories, 22 mills have got their own computer system. These mills generate purchies, calendars and bank advices from the computers. 22 sugar mills have computerised cane weighment at their mill gates. In all 10 sugar mills, all the electronic weigbridges at the mill gate are interlinked with each other and with main computer system. SIS-Sugarcane Information System V-2 is implemented in all sugar mills. Uttar Pradesh Cane Development Department claims that website of all 23 sugar mills is maintained and updated daily.

Initiative to adopt Rangarajan sugarcane pricing formula: In July 2017, the Centre formally approached the State Govt. of UP to consider implementing the Rangarajan formula for sugarcane pricing. According to the Rangarajan committee's revenue sharing formula, which has so far been implemented by only Maharashtra and Karnataka, sugar mills will initially pay the FRP to farmers during a season; thereafter, another price will be calculated every quarter, taking 70% of a mill's sugar price realisation and 5% of the realisation from by-products, (ex-mill), including bagasse, molasses and press-mud, as cane dues payable to farmers for supplies. If this price exceeds the FRP, the difference will be paid to farmers, else farmers will get only FRP. If this cane-linked price is adopted by Yogi Adityanath's govt., it is likely to offer much relief to the millers.

7 Future Market Projections

7.1 Key Growth Drivers

The growth drivers from the perspectives of producers, consumers or the nation may be different, but all are congruent to shared goal of improved future performance and higher sectoral growth. Key growth drivers for sugar industry can be broadly classified under the two heads:

1. Internal Drivers, which include factors such as:

- Plant Size and Location
- Technology Employed
- Plant Efficiency (Recovery rate etc.)
- Financial Management
- Value Addition from utilization of by-products

2. External Drivers, which include factors like:

- Cane Pricing and Sugar Pricing
- Growing Population and Rise in Income
- Growing Demand (Domestic / Intl.)
- R&D Innovation to increase Yield/hectare
- Prospects from Sugar Beet Production as alternative

Table below details out the key growth drivers for various stakeholders in the sugar Industry:

Table 54: Sugar Industry Growth Drivers for Various Stakeholders

Stakeholder	Key Drivers
Farmers or Cane Cultivators	<ul style="list-style-type: none"> • Cane price, productivity, and cost of cultivation impact the farmers economic profit. • The key controllable risks for farmers are those related to offtake of cane and non-payment of dues by the mills. • The farmer miller relationship can have a significant impact on both these risks.
Sugar Mills	<ul style="list-style-type: none"> • Major drivers for economic profits of mills are the sugar prices in domestic and international markets and by-product realizations. The inventory cost has a negative impact, and influences the extent of price risk. • The mill efficiency influences the milling costs, hence the overall economic profit. The risk of cane availability is significant for mills, and is influenced by the farmer-miller relationship.
Farmers and Mill Owners	<ul style="list-style-type: none"> • There are interdependencies between farmer and miller business drivers. A high cane price benefits farmers, but leads to lower profits for mills, for a given sugar price. Cane price and mill realization, if misaligned, can lead to arrears, that would negatively impact both the mills and farmers.

Stakeholder	Key Drivers
	<ul style="list-style-type: none"> Higher mill efficiency on the other hand leads to better recovery, with the benefits being shared by both farmers and millers.
Consumers	<ul style="list-style-type: none"> For consumers, the availability of a range of sugar-based products is a driver of product variety. Industrial consumers use sugar in various forms including liquid sugar. The availability and affordability of sugar is dependent on domestic production and prices, which are also driven by the stocks that are held by the mills.
The Government	<ul style="list-style-type: none"> For the government, food security is the key aspiration. Domestic production influences it as well as India's linkages with international trade. Energy security is driven by the extent of investments that mills have made in by-product capacities. Fiscal revenue for the government is directly related to the mill realizations. The social objectives of the government highlight a key conflict area. From a social perspective, the cane price should be high, so that it benefits the farmer. For the benefit of the consumers, the price of sugar should be low. In case both events occur together, as was seen earlier, they would lead to arrears leading to default of payments to farmers and reduced availability for consumers in the subsequent years.

Source: MM Analysis

Based on the table above, the critical ingredients that can be leveraged by the sugar industry to move towards the growth path can be summarized as in the figure below:

Figure 33: Critical Business Drivers for Sugar Industry



Source: MM Analysis

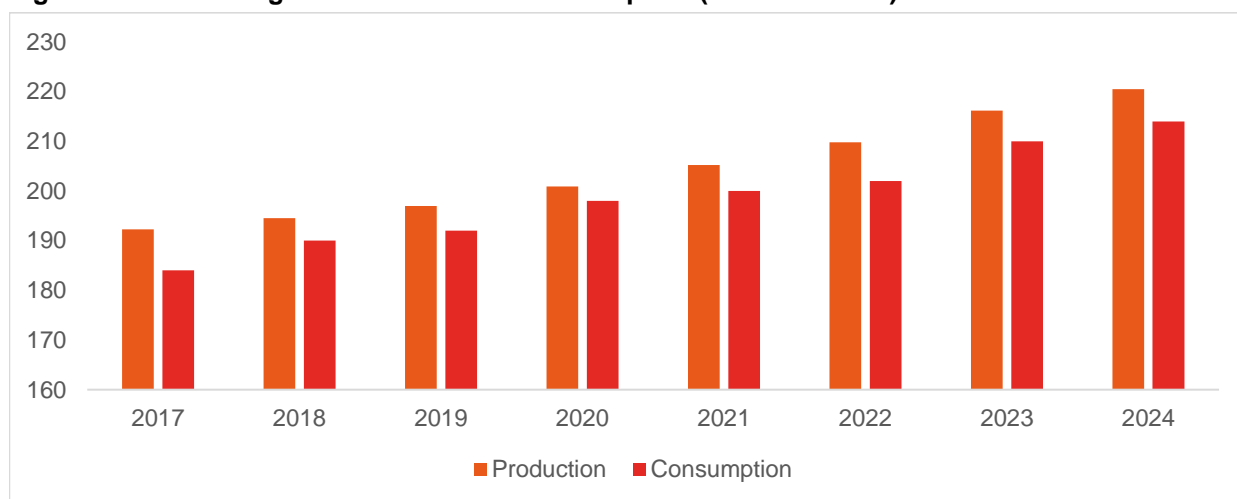
These business drivers must be leveraged in such a way that the sector can fulfil its aspirations, without diluting its social objectives. Each of these drivers also translates into an opportunity that could become the enabler for future growth.

7.2 Sugar Industry

7.2.1 Global Scenario

Over the next seven-year period, MM Consultants project the global growth in sugar production to grow at an average of 2.1% per annum with production reaching 220 MT by 2025. Global sugar consumption is likely to also grow at similar rate, but remain lower than the cumulative production levels, thus helping in maintaining sugar stocks. The following figure shows these trend:

Figure 34: Global Sugar Production and Consumption (million tonnes)

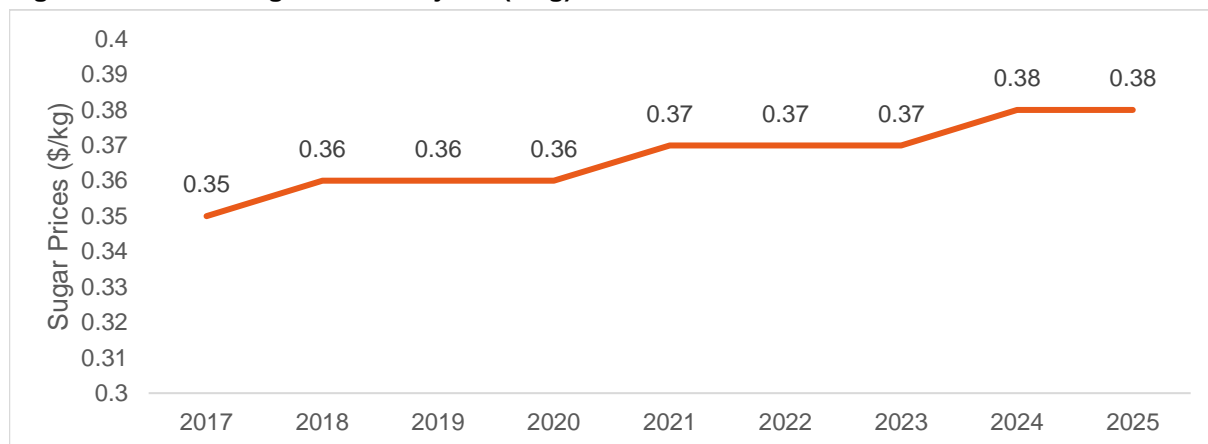


Source: Statista, MM Analysis

- Over the next 3-5 years, while the cumulative global sugar production will be more than the estimated consumption (as shown in the diagram above). Consumption in many countries is expected to outpace indigenous sugar production, thus intensifying their dependence on sugar imports. This is likely to increase the cross-national sugar trade flow and creation of new import markets.
- However, at the same time, it can be inferred that reduced global sugar stocks would impact the markets' ability to respond to adverse climatic conditions. This is likely to increase the price volatility in coming months and shall prevail for couple of sugar years.
- Most of the additional production will originate in countries producing sugarcane rather than sugar beet.
- The main driver of output growth is cane cultivation area expansion, notably in Brazil, even though yield improvements are foreseen for sugar crops and sugar processing in producing countries like India and Thailand.

The following figure shows the trend in global sugar prices till 2024:

Figure 35: Global Sugar Price Projects (\$/kg)



Source: The World Bank (July 2016)

- Since the global sugar production and consumption levels are projected to increase gradually and at a consistent rate, global sugar price levels are unlikely to fluctuate drastically and are projected to remain stable within the range between \$0.35/kg and \$0.38/kg during this period.

7.2.2 Domestic Scenario

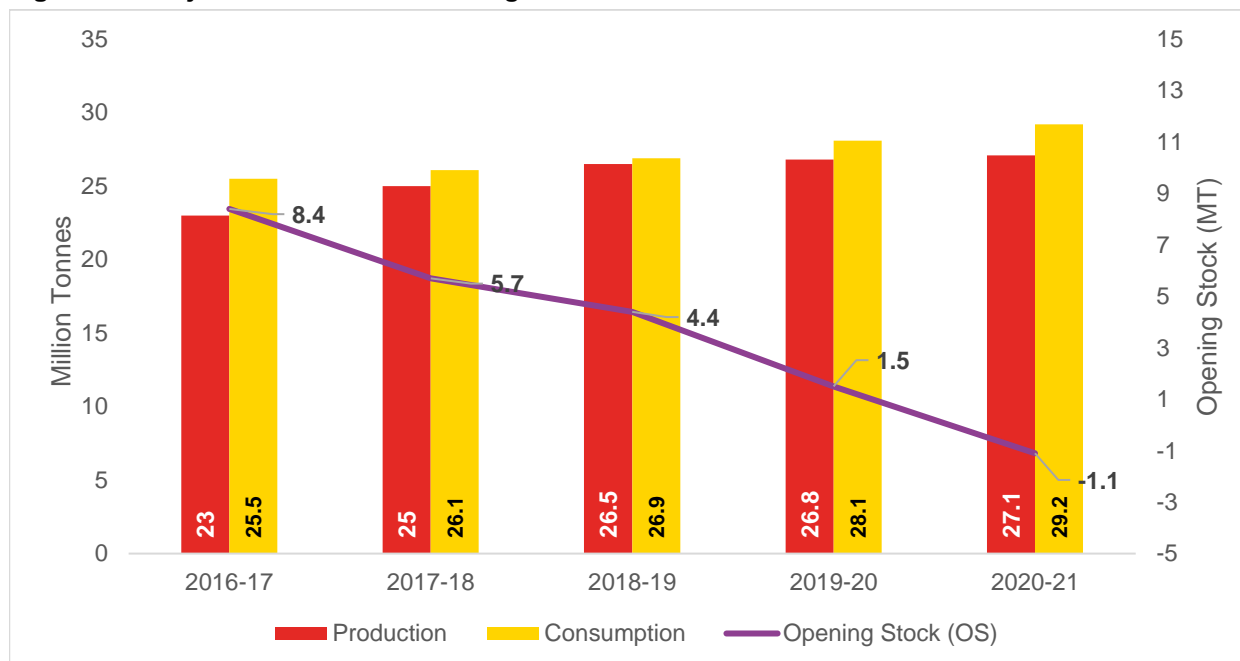
The sugar market remains one of the most volatile of all commodity markets. Two of the chief contributory factors for this volatility are policy-induced production swings and the cyclical nature of sugarcane production.

The sugar industry has witnessed surplus production for past six consecutive years. This is very much in contrary to the 5-year Indian Production Cycle, wherein the industry goes through:

- 3 years of surplus sugar followed by 2 years of deficit
- Large scale net export or import to countries
- Deficit sugar production acted as a self-correcting mechanism
- Controlled surplus sugar

The productivity depends on a slew of factors like Climatic conditions, technology employed etc. Accordingly, the future projections for India's sugar balance sheet are made as under:

Figure 36: Projected trend in India's Sugar Balance Sheet



Source: ISMA, MM Analysis; * Future ISMA Estimates and Reports, **Projected

- MM notes the consumption pattern is expected to improve for rise in income and per capita consumption. Though the production is expected to grow, the demand is set to outstrip the supply pattern in coming years
- Dwindling inventories are expected to deplete for shortfall in production which may boost prices.
- Projected shortages of stock will necessitate Imports as evident from above
- The highest ever production of sugar in India is 28.3 million tons (SS 14-15) and unless the yield per hectare of cane and sugar recoveries improve drastically, India would become a net importer of sugar leading to higher sugar prices
- The government's intervention is necessary to revive the sugar sector which has been reeling under the twin impacts of high sugarcane prices and low sales realisation on sugar leading to recurring losses being incurred by sugar mills and mounting cane arrears.
- The average recovery rate is also expected to increase from current 9% to an approx. a range between 12 to 14% due to innovative technologies and process methods employed in mills

MM notes that over the next 3 years, there would not be any shortage of sugar in the country as stocks in hand are adequate. But India might start to rely on imported sugar from 2021 when its sugar stocks would have reached a negative level.

India has continuously produced surplus sugar, though in SS2016-17 the trend will be upset for adverse climatic conditions in Maharashtra. In the box below, Consultants present the key highlights of the probable upshots of the ongoing sugar season (2016-17).

Box 2: Outlook for Sugar Season 2016-17

- Cane area across the country will be much better, due to:
 - Better monsoon and water availability in reservoirs
 - Possibility of higher and timely cane price payments because of strong competition amongst millers
 - Better yields and recovery
 - Due to more area under 15 and 18 month crops
 - Better care of crop including irrigation, by farmers
 - Opening Stock for SS 2016-17 being healthy at around 7 MT
 - In fact, despite arrears, farmers are still growing 'surplus' sugarcane
 - Now with better and timely payments, they will increase area further
 - Surplus cane crop thus seems to be evident in SS 2017-18
-
- MM notes the consumption pattern is expected to improve for rise in income and per capita consumption. Though the production is expected to grow, the demand is set to outstrip the supply pattern till 2019. The demand is driven primarily from two main sources:
 - Direct Household – 40%
 - Bulk Consumers – 60%
 - Since the bulk of sugar is consumed indirectly, any impact of the sugar price increase will not majorly to the overall household budget.
 - In terms of **consumptions**, Indian sugar consumption in MY 2016-17 is forecast to rise marginally to 27.2 MMT. Growing domestic demand from soft drink manufacturers, bakeries, hotels, restaurants, confectionary, and ice-cream manufacturers will support higher consumption. India's relatively stable economy, stable political situation, rising incomes, young population, and changing consumption patterns are key drivers for food consumption
 - In terms of **prices**, dwindling inventories are expected to deplete for shortfall in production which may boost prices. Moreover, with global inventories too experiencing a drawdown, global sugar prices are expected to rally further. The projected global production deficit should thus aid domestic price realizations.
 - The **government's intervention** is necessary to revive the sugar sector which has been reeling under the twin impacts of high sugarcane prices and low sales realisation on sugar leading to recurring losses being incurred by sugar mills and mounting cane arrears.
 - The **average recovery rate** is also expected to increase from current 9% to an approx. a range between 12 to 14% due to innovative technologies and process methods employed in mills
 - The potential for expanding sugar production in India exists and can be fully exploited if adjustments are introduced to ensure a market driven relationship between sugar and sugarcane prices. The same could provide sugar factories with some cash flow flexibility.
 - The highest ever production of sugar in India is 28.3 million tons (SS 14-15) and unless the yield per hectare of cane and sugar recoveries improve drastically, India would become a net importer of sugar leading to higher sugar prices
 - Retail sugar prices are currently hovering around Rs 38/kg and are expected to stay in the same range in the near future. The key reasons for this are:

- Indian sugar consumption in SS2016-17 is forecast to rise marginally to 27.2 MMT with the growing domestic demand from soft drink manufacturers, bakeries, hotels, restaurants, confectionary, and ice-cream manufacturers.
- A shortfall in sugar production for the sugar season 2016-17 are expected to result in dwindling domestic sugar inventories, which are expected to keep the sugar retail prices from falling down drastically.
- With global inventories too experiencing a drawdown, global sugar prices are expected to remain high. The projected global production deficit should thus aid domestic price realizations.
- At the same time, the government's intervention in the form of fixing the cane prices through the FRP mechanism is expected limit the sugar retail prices from surging too high. This is because, sugarcane prices constitute almost 80% of the sugar production cost. With the Central and UP State Government recently fixing the FRP and SAP, respectively, cane prices are unlikely to increase during the next few years; thus, ensuring that the cost of sugar production remains in the range specified above.
- The average recovery rate in UP is also expected to increase from current 9% to an approx. a range between 12 to 14% due to innovative technologies and process methods employed in mills.

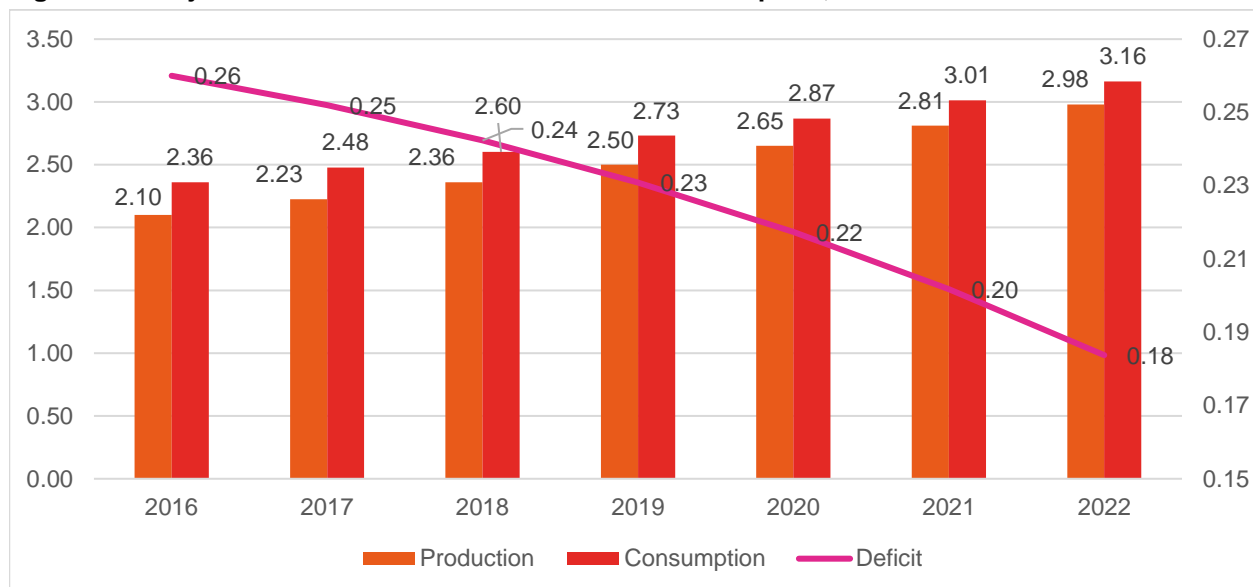
7.3 Ethanol Scenario

In India, factors such as rising per capita income, urbanisation, and infrastructure development has led to increased vehicle density, and consequently, increased demand for gasoline. The amount of ethanol that will be required for blending depends both on blending targets and gasoline demand.

As the GoI is setting an ambitious target of 20 percent ethanol and gasoline blends by 2020, it is important to anticipate ethanol demand so that necessary measures can be taken to ensure sufficient supply.

The overall production and consumption has been projected to grow at a CAGR of 6% and 5%, given the increasing ethanol demand mainly in form of automotive fuel, the overall ethanol demand supply is as under:

Figure 37: Projected Total Ethanol Production and Consumption, in Bn. Ltrs.



Source: MM Analysis

- Consumption is set to outpace the overall supply and is estimated to be around 3 Billion Litres by 2022.
- Though the deficit in supply will reduce but the above production will not be enough to meet the Blending programme (E10, E20) after catering the supplies to potable and industrial applications.
- Ramping up the production, establishment of more number of distilleries and importing huge amount of ethanol, mainly from USA and Brazil, should suffice the E5, E10 targets along with other applications
- Some other forms of biofuel like use of biodiesel demand will also increase to achieve such ambitious targets of EBP.
- The ENA prices are expected to hover around Rs. 42-44 /ltr because domestic ethanol production in last decade has remained stable, growing at a CAGR of around 4.4 % while consumption grew at 3.41%. the trend is expected to continue till 2020.
- While India is consuming more ethanol than it produces, it is importing ethanol primarily from ethanol abundant countries such as Brazil, USA, and Spain, at low prices, thereby mitigating the domestic demand-supply gap pressure on ethanol prices. Thus, the prices are not expected to increase drastically even though consumption exceeds domestic ethanol production.
- The blend rate has not been in line with E5 blending programme, but the same has started to pace up and initiative like E5, E10, use of indigenous ethanol only will relatively put a thrust on increased production and ensure that ethanol prices do not dip even if fuel prices fall in the near future

7.4 Key Take-aways

- MM notes the consumption pattern is expected to improve for rise in income and per capita consumption. Though the production is expected to grow, the demand is set to outstrip the supply pattern; thereby, impacting the closing sugar stocks for subsequent years.

- MM notes the gravity of EBP programme (E5 and E10 Blend Rate) and focusses on the burgeoning demand it will create that will impact sugar industries positively in form of improved financials.
- Crude prices can have a significant impact on ethanol usage and demand. Higher crude prices can make ethanol blending a popular option. However, a drop in crude prices can make ethanol less attractive as a substitute.
- India is a developing market for ethanol also in terms of vehicular compatibility for E5-E20.
- Ethanol prices can also have a significant impact on the entire agro-market dynamics in India. An increase in ethanol prices will lead to an increase in sugarcane demand, which will draw up sugarcane prices and the need for cultivation acreage. Since sugarcane is a water-intensive crop, a rise in sugarcane cultivation can lead to drop in water tables; thereby impacting water and land availability for other crops. Therefore, regulating sugar market is imperative and MM concludes that complete deregulation of sugar industry is not a viable option in the next 5-7 years.

8 Technical Analysis

8.1 Introduction

BHSL has an aggregate sugarcane crushing capacity of 136,000 TCD, alcohol distillation capacity of 800 KLD and co-generation capacity of 449 MW across 14 locations in the North Indian state of Uttar Pradesh. BHSL also produces molasses, bagasse and press mud which are by-products and sells the surplus quantity in market

The Business Operations of BHSL are broadly classified under following divisions:

- Sugar units
- Ethanol & Industrial Alcohol units
- Power Generation Facilities

The sugar plant at each location consists of its own cogeneration plant to meet power and process steam demand of the entire complex. The additional power after meeting the in-house load is exported to state grid in majority of the plants. The boilers of these cogeneration units utilize bagasse as fuel for steam and power generation.

This section covers the details of various facilities of sugar and cogeneration plants as collected during site visit in sugar plants of fourteen locations.

8.2 Overview of BHSL's Plants

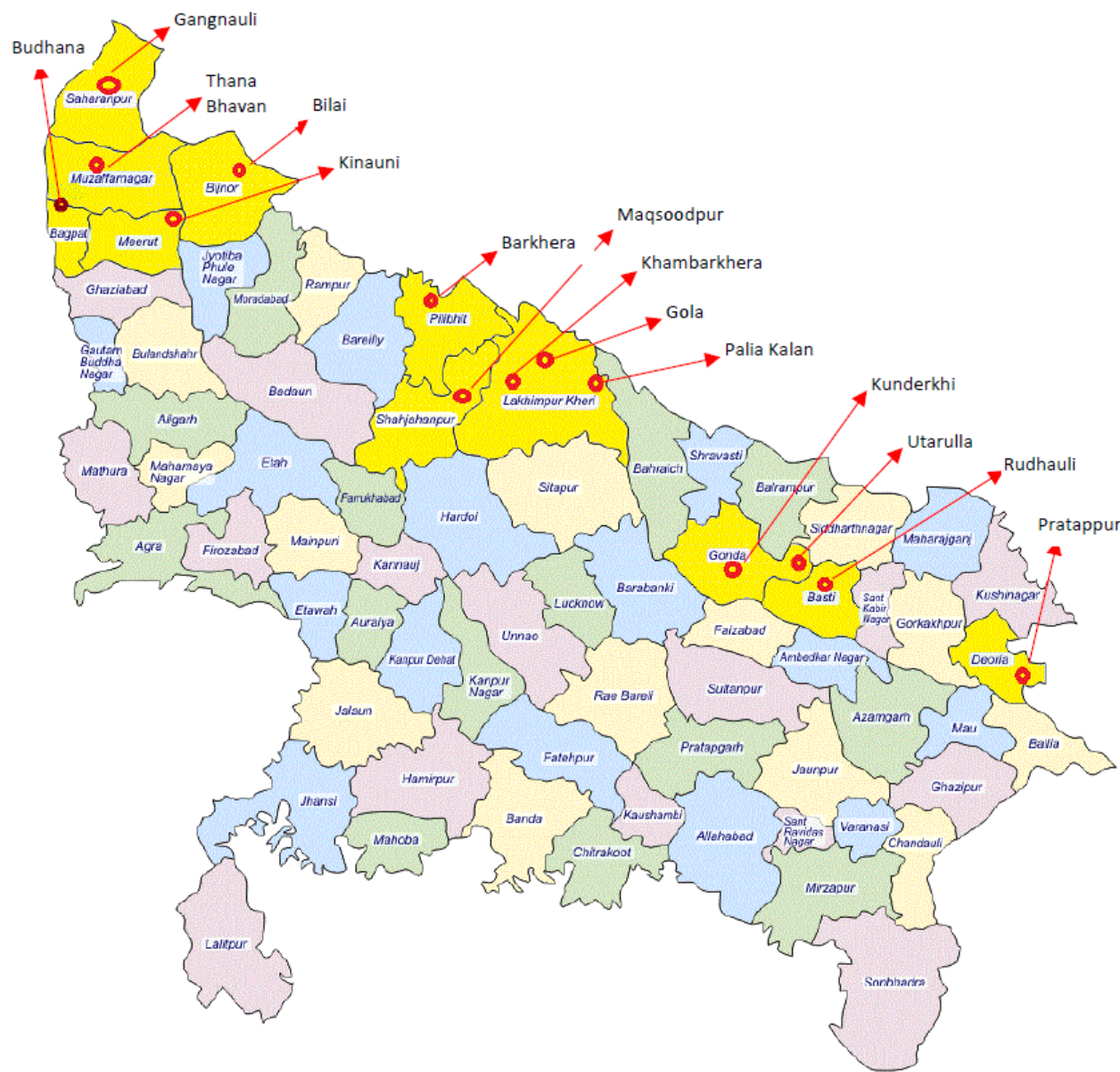
BHSL has 14 sugar plants, which are all located in Uttar Pradesh. These plants have an aggregate sugarcane crushing capacity of 136,000 TCD. The Plant wise location capacity for Sugar, Alcohol and Power are as under:

Table 55: Location-wise Plant Capacities of BHSL's Facilities

S. No.	Location	Installed Capacity		
		Sugar (TCD)	Alcohol (KLD)	Power generation (MW)
1	Golagokarannath	13,000	100	29
2	Palia Kalan	11,000	60	43
3	Kinauni	12,000	160	38
4	Thanabhawan	9,000	-	34
5	Budhana	9,000	-	33
6	Bilai	9,000	-	24
7	Gagnauli	9,000	160	25
8	Khambharkhera	10,000	160	35
9	Barkhera	7,000	-	34
10	Maqsoodpur	7,000	-	28
11	Pratappur	6,000	-	13
12	Rudauli	7,000	160	17
13	Kunderkhi	15,000	-	59
14	Utraula	12,000	-	37
	Total	1,36,000	800	449

Source: BHSL

Figure 38: Plant locations



Source: MM Analysis

8.3 Manufacturing Processes

A brief description of the process adopted in the plant are as delineated in the subsequent subsections.

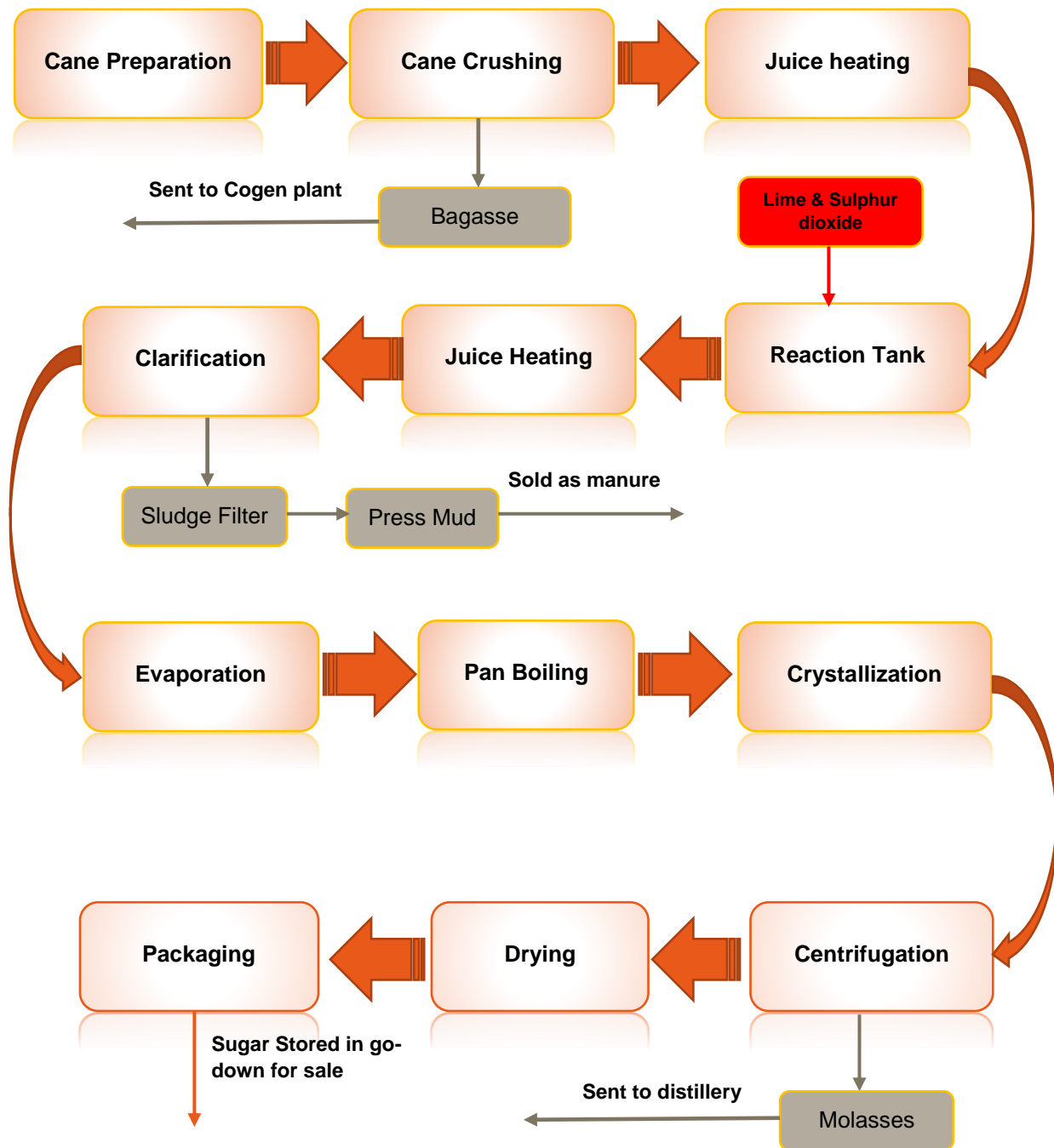
8.3.1 Sugar

Sugar manufacturing comprises of the following:

- Cane preparation
- Cane crushing
- Juice clarification
- Juice evaporation
- Crystallization
- Centrifugation
- Drying and packaging

The sugar manufacturing process is as presented in Figure 39.

Figure 39: Sugar Manufacturing Process



Source: MM Analysis

Each of the steps in the sugar manufacturing process are as briefed below:

- **Step 1: Sugarcane Preparation and Crushing:**

Sugarcane is brought to the storage yard via trucks and sugarcane trucks are weighed and stack for preparation. In the preparation section the sugarcane passes through leveller, Chopper and

fiberizer. The prepared cane is then crushed by passing through 4 set of mills. Hot water is added in the course of crushing as imbibition water for better extraction of juice from sugarcane. Bagasse generated is sent to cogeneration power plant for firing in the boiler as fuel.

- Step 2: Juice Clarification and Evaporation:

The juice from the crushing section is heated to 70 – 75 °C in juice heater. The juice then under goes a process of lime treatment and Sulphidation with the addition of lime and sulphur dioxide respectively. The juice is heated again to 105 °C in another set of juice heaters. The hot juice with 15% solids is decanted out from the clarifier and sent for evaporation in a set of multiple effect evaporators. In the evaporators the juice is concentrated into a syrup with 60% solids. Sludge from the clarifier is filtered to separate solid impurities as press mud.

- Step 3: Crystallization

The syrup from the evaporator is taken to pans for boiling where the syrup concentrates and attains super saturation stage. During this stage sugar crystal are formed in the syrup. The syrup mass with sugar crystals is called massecuite. The massecuite is dropped in crystallizer and cooled to complete the crystallization.

- Step 4: Centrifugation

Massecuite is taken into high speed centrifuge. Sugar crystals are separated from mother liquor in the centrifuge. Non-crystallisable matter from the syrup called molasses is drained out from the centrifuge. The molasses is weighed and sent to storage tank. The wet sugar from centrifuge is sent to driers.

- Step 5: Drying Grading and Bagging

Sugar is dried in the vibrating tray drier and graded by passing through standard sieves. The graded sugar is bagged (50 Kg and 100 Kg), stitched, numbered and stacked in finished sugar storage go-down.

Sugar is made in different sizes and accordingly classified into various grades I.E. large, medium and small.

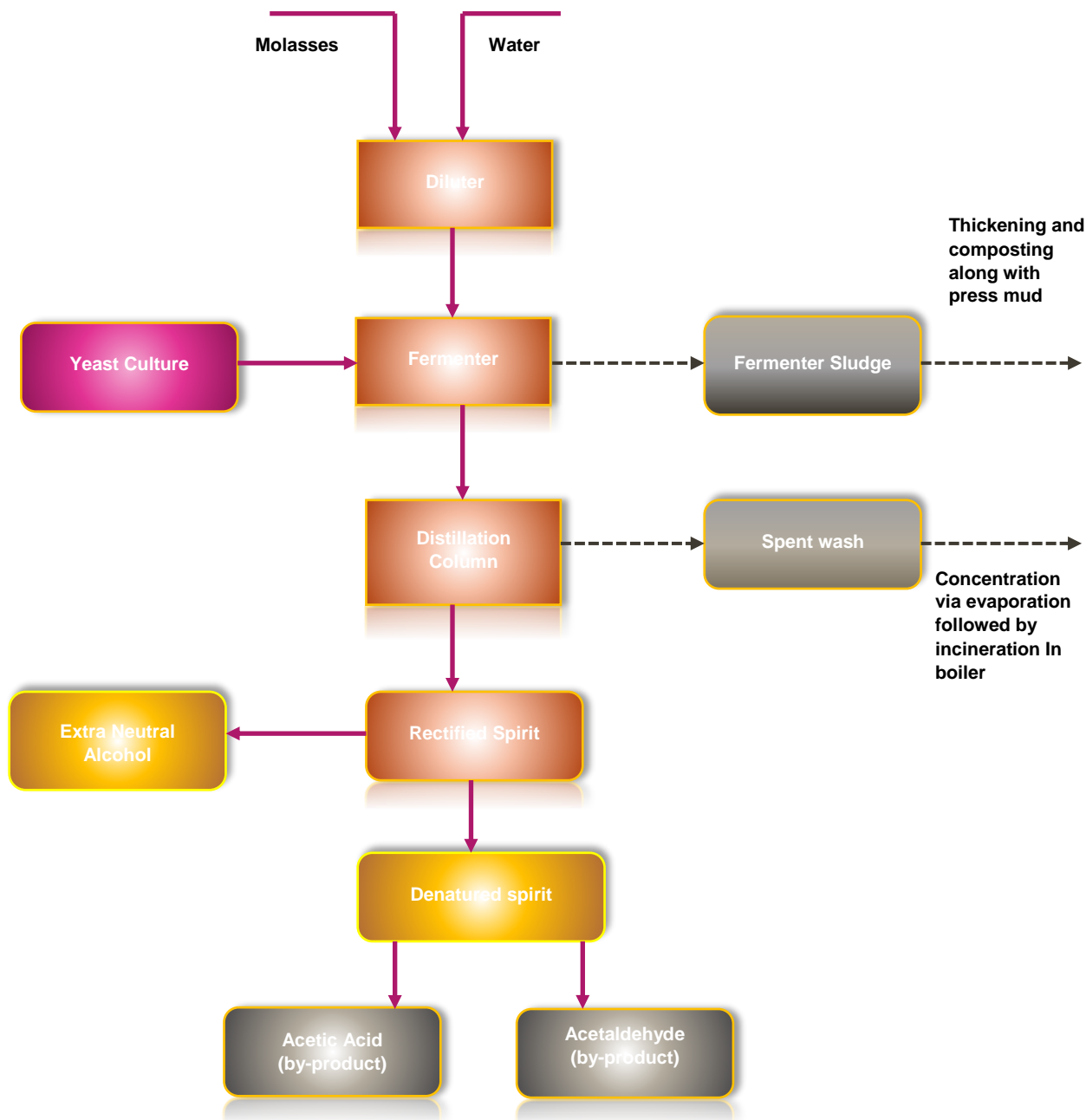
8.3.2 Ethanol and Industrial Alcohol

Distillery process comprises of the following:

- Feed preparation
- Yeast propagation and continuous fermentation
- Multi-pressure distillation

Distillation process is as presented in Figure 40.

Figure 40: Distillation Process



Source: MM Analysis

Large volume storage tanks of molasses provide continuous supply of molasses and store the fresh molasses from sugar processing section during the fermentation process. The molasses from the tanks are diluted with water to obtain the sugar concentration around 10-15%. The acidic nature of molasses supports the growth of yeast during breaks up of sucrose, for that purpose acids are added to maintain the pH between 4 and 5. Continuous diluter equipment takes up this task.

A yeast culture tank, which is provided with nutrition supply of ammonium and magnesium phosphate or sulphate, is used as nutrient to the yeast. The acidic condition favours the yeast to produce catalytic enzymes, invertase and zymase. Diluted and treated molasses and the yeast from storage are fed to the fermentation chamber. Modern fermentation tanks are made with stainless steel material provided with heating coils or jacket provision.

The temperature 20-30 °C is maintained in the tanks by the heating and cooling system. The process of fermentation takes place around 30-70 hours based on the temperature and sugar concentration to yeast count. Final temperature 35 °C is attained at the end of the process. During the fermentation process, microorganism yeast produces carbon dioxide as by-product.

After the process cycle, the product liquid mixture is fed to beer still to perform distillation. Solid and slurry mass is separated leaving the solution of alcohol and water. The concentration of alcohol in the liquid mixture would around 8-10%. A series of beer still work out to produce different quality of beer products. The slurry form of material obtained from bottom of beer still is called as slops. It is used for cattle feed and fertilizer after some waste treatment operations. However, the aldehydes are not allowed in consumable beer so aldehydes present in the solution are removed by aldehyde column.

The streams coming out at different section of the column are aldehydes from top, fuel oil and ethanol mixture from middle and bottom stream with water. The middle stream is fed to rectification column to produce a product called rectified spirit having 95% ethanol. Rectified spirit further made to absolute alcohol by anhydrous still using benzene as third component. Absolute alcohol with 100% ethanol concentration is a standard product used as intermediate for producing other chemical products and blending agent in power fuels.

BHSL has six distilleries having capacity to produce 800 KLD. Out of the six, five distilleries manufacture Ethanol whereas distillery at Kinauni manufactures Extra Neutral Alcohol (ENA).

Major clients of BHSL for ethanol/ industrial alcohol are Indian Oil Corporation Limited, Bharat Petroleum Corporation Limited, Hindusthan Petroleum Corporation Limited, Ester (India) Chemicals Limited and Gujarat Narmada Valley Fertilizers & Chemicals Limited.

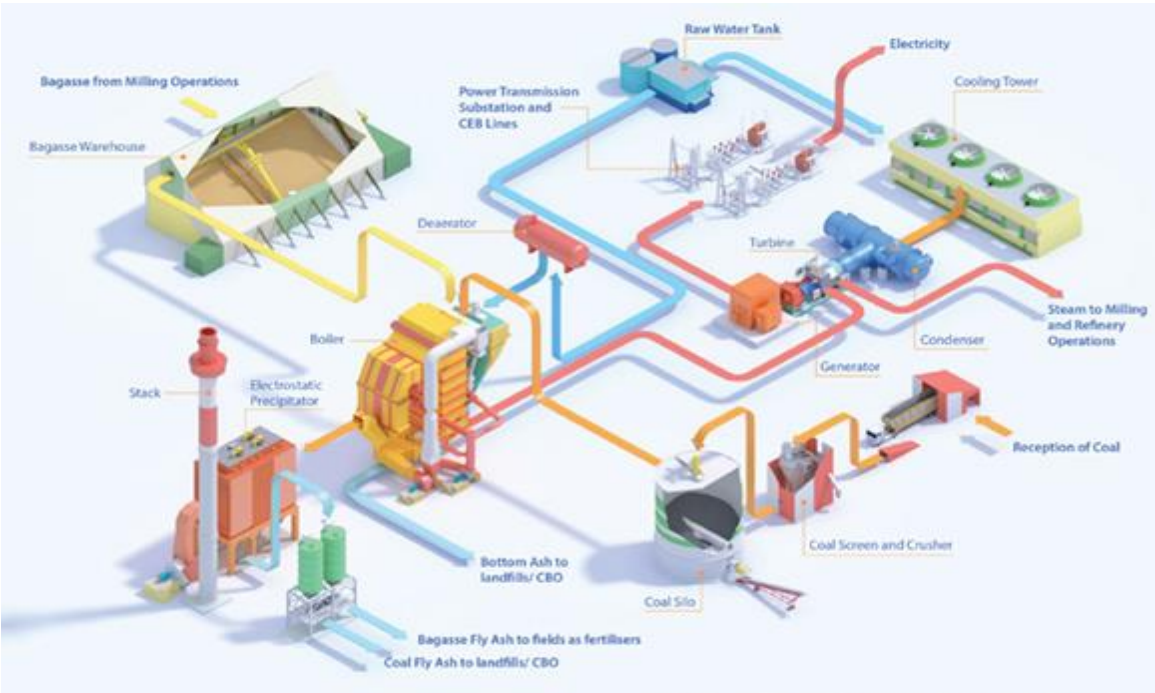
8.3.3 Power Plant

The total co-generation capacity of all units is 449 MW which includes co-gen turbines and turbines directly connected to sugar mills equipment. After meeting the energy needs of the Company, the surplus of power is supplied to the UP state grid via Energy Banking Arrangement.

Power is generated through bagasse which is a fibrous residue of cane stalk that is obtained after crushing and extraction of juice. It consists of water, fibre and relatively small quantities of soluble solids. The yield of bagasse varies from 29% - 32% based on the variety of sugarcane, maturity of cane, method of harvesting and the efficiency of the sugar mill.

The power produced from Co-generation plant is utilized by the Sugar & Distillery units of the Company. Further, after captive consumption by BHSL, the surplus power is sold to UPPCL under already executed long term PPAs with UPPCL at rate predefined by the notified UPERC orders. The raw material is internally sourced from the Sugar units of the Company & is used to produce steam & power. Subsequently the steam & power both are utilized in the Sugar & Distillery units of the Company.

Figure 41: Power plant configuration

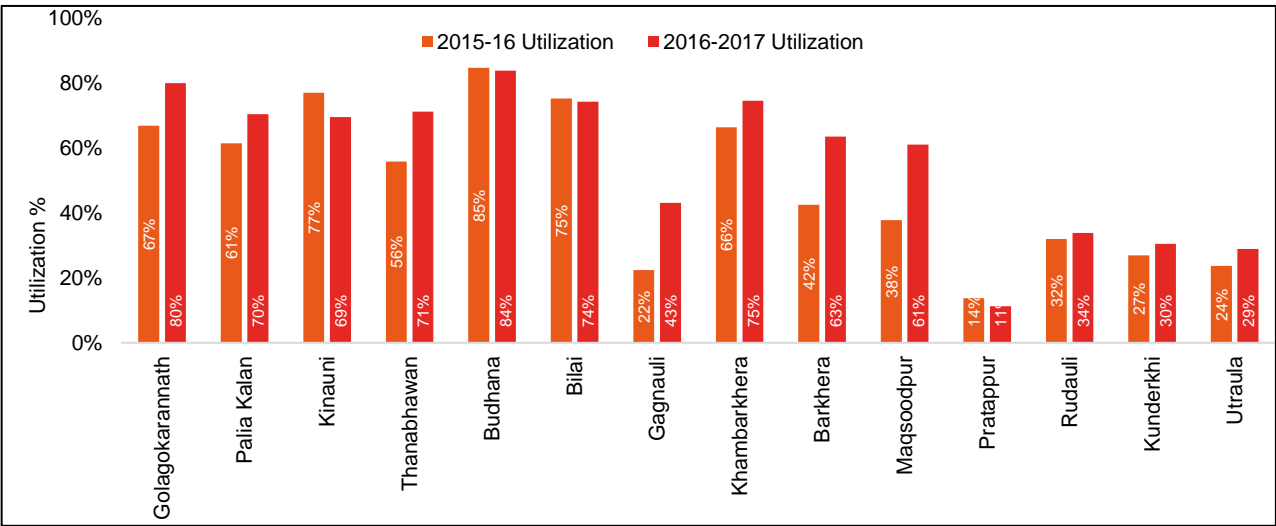


Source: MM Analysis

8.4 Plant wise capacity Utilisation

Given below are the capacity utilization of all 14 plants of Bajaj Hindusthan in terms of sugarcane crushed, Alcohol produced and power generated for 2016-17 season

Figure 42: Capacity Utilization for Sugar Production (TCD)

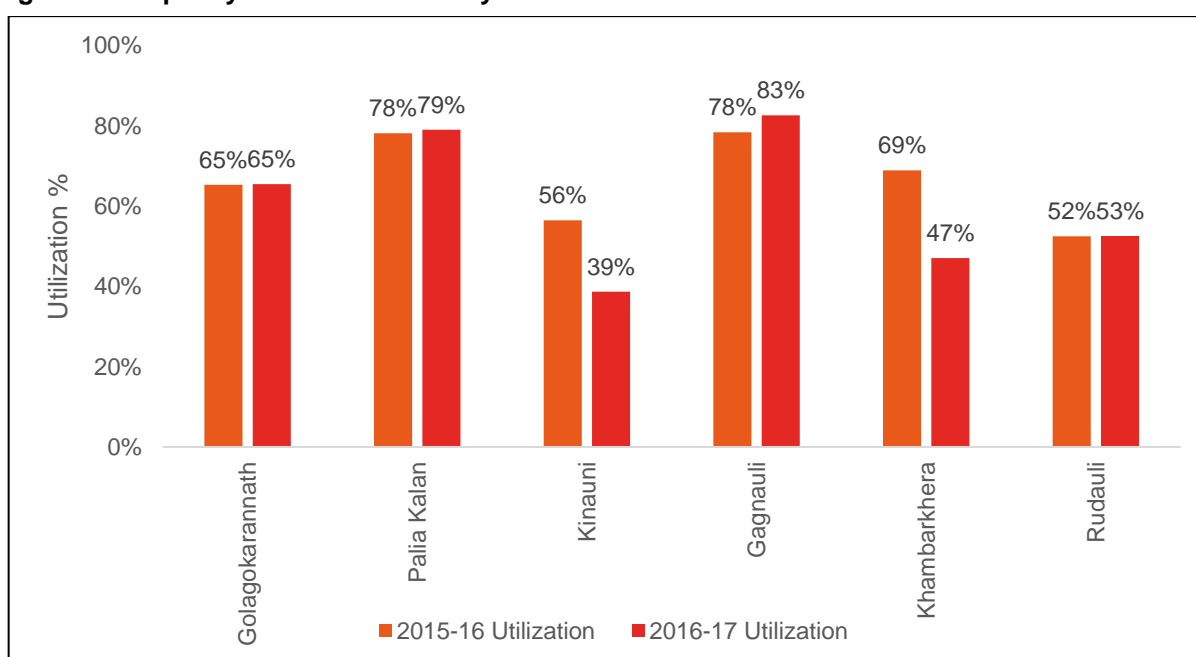


Source: BHSL/MM Analysis

MM observes that

- The capacities are calculated considering average crushing period of 160 days.
- Capacity Utilization of plants in Eastern UP namely Pratappur, Kunderkhi, Rudauli and Utraula have lower capacity utilization mainly due to less operating days in a season. The plant operations in this region suffered due to unavailability of cane on account of scanty rains during SS 2014-15 and 2015-16.
- Western and Central UP, being rich in availability of cane, the capacity utilization at Gola, Budhana, Bilai are relatively much higher than other plants
- Excluding Bilai and Pratappur the capacity utilization has slightly increased from 2015-16 to 2016-17

Figure 43: Capacity Utilization Distillery

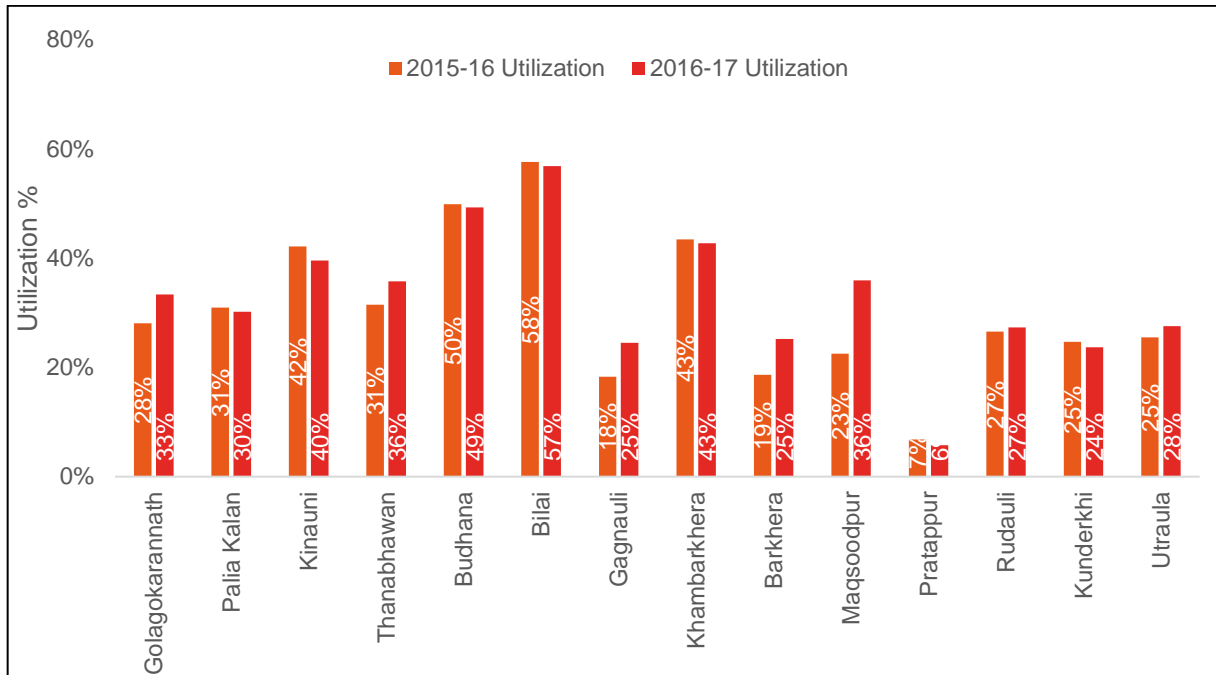


Source: BHSL/MM Analysis

MM Observes that

- Capacity utilization is calculated considering the distillery operations of 240 days.
- Capacity Utilization of the Gangnauli distillery and Palia distillery is higher than other plants due to continuous supply of molasses from sugar plants. This distillery being in Western region has an advantage of high cane availability.
- Whereas Distilleries in eastern region due to low cane availability have lower utilization.
- In general year on year the capacity utilization has remained constant except for Kinauni plant where it drastically decreased from 59% to 39%.
- The days of operation for distillery have been considered in accordance with industry practice and it may change based on the availability of the cane.

Figure 44: Capacity Utilization Power Generation



Source: BHSL/MM Analysis

MM observes that

- Capacity utilization is calculated considering the power plant operations of 240 days
- Capacity Utilization in case of power generation is higher in case of Budhana and Bilai plants.
- It should be noted that overall capacity utilization of all plants is on the lower side with maximum utilization being 58% at Budhana plant.
- The days of operation for Cogen power plant have been considered in accordance with industry practice and it may change based on the availability of the cane.

8.5 Plant wise Cost of Production

8.5.1 Plant wise cost of production of Sugar

The plant wise cost of production of sugar is given in the below table:

Figure 45: Cost of Production: Sugar

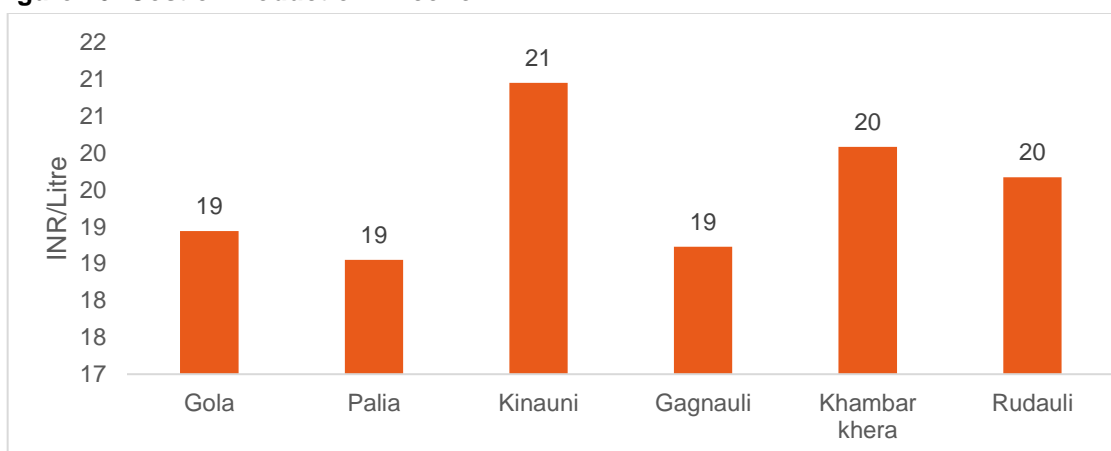


- The average cost of production for sugar for BHSL plants is Rs 34/kg.
- The cost of production for the Eastern UP sugar plants is high because of low utilisation factor which was primarily due to low cane availability.
- At the eastern UP plants the cost of production is higher to the extent that, it will be challenging to make profits via sales of sugar at a selling price of approx. Rs 36/kg

8.5.2 Plant wise cost of production of Alcohol

The plant wise cost of production of sugar is given in the below table:

Figure 46: Cost of Production: Alcohol



Source: MM Analysis

- The average cost of production for alcohol of BHSL plants is Rs19/Lt.
- The cost of production of alcohol is highest in the case of Gagnauli plant while it is the lowest in the case of Kinauni plant.
- At the current cost of production, the alcohol business seems to be profitable.

8.6 Inventory Management Policy

Raw material inventory: Sugarcane is the main raw material for BHSL. Since cane is a highly perishable item, the Company operates on an extremely lean inventory system for the same. As sugarcane must be crushed within 24 hours of being cut from the fields, to avoid recovery losses, once at the factory, sugarcane is immediately processed for manufacturing of sugar. Therefore, BHSL does not have any long inventory facilities for sugarcane stocking.

Stores and Consumables Inventory: BHSL follows the policy of maintaining minimum inventory to minimize the cash locked up in the same. The Company keeps a track of the inventory levels and categorizes its inventory under the following heads:

- **Fast moving items:** These are the stock items which are consumed at a faster rate in the mills. Thus, the Company frequently tracks and reviews the stocks for these items and replenishes them immediately.
- **Slow moving items:** These items are consumed at lower levels periodically and are reviewed every 2-3 years. If these items are found to be sitting in the inventory stocks for more than 4 years, then they are categorized either as “surplus inventory” that can be utilized at other plants or as “obsolete inventory”.
- **Insurance inventory:** These are typically long lead items which are critical for the mills but take considerable time to be delivered on site. Since these items are crucial for running the mills, adequate items under this category are maintained that are utilized for meeting contingencies.
- **Surplus inventory:** Items under this category are reviewed on bi-annual basis. These are recorded in BHSL’s SAP system, wherein it shows the items’ availability for their utilization by any other facilities of the Company; hence improving the overall efficiency of the group
- **Obsolete Inventory:** These are the obsolete items, which have been unutilized for more than 4 years or whose usability has reduced below acceptable levels. BHSL tries to liquidate these items through channels such as e-options, tenders, etc.
- **Finished Goods Inventory:** Since sugar production is carried out for about 160 days per year, adequate sugar inventory (Finished Goods) must be maintained to supply to the market for the remaining period. Hence, BHSL also maintains sugar inventory post the crushing season. BHSL plans a sales schedule for the whole year, month-wise scheduling the stock offload. However, depending upon the market forces, demand-supply dynamics and pricing scenario, the Company selectively offloads the sugar stocks into the market for optimum realization.

8.7 Cane Sourcing Policy

The Company operates 14 plants spread across Western and Eastern UP. As mentioned earlier, sugarcane must be crushed within 24 hours of being cut for optimum recovery. Hence, depending upon the available crushing capacity at each of the mills, BHSL maintains a procurement schedule with the farmers, under which the farmers must provide the Company with a predetermined quantity of sugarcane on pre-decided dates.

BHSL procures cane from farmers either:

- directly at the factory/mill if the farmers are located close to the mill, or

- at its collection centers if the farmers are located far away from the mill. The Company operates about 50-70 collection centres in the state. From the collection centers, BHSL arranges to transport the cane through trucks to its mills as speedily as possible.

It is to be noted that across Eastern UP, the cane farmers have faced rising cane arrears. Consequently, they have shifted from cane cultivation to other crops. However, BHSL is now incentivizing the farmers for cane cultivation by providing them with high yield varieties of cane and timely payments under its Cane Development Scheme. In addition, starting 2018, the Company also plans to procure cane from Bihar for its Eastern UP Plants.

8.8 Plant Wise consumption norms in Sugar production

The consumption norms for last two seasons in sugar production are given in following table. The values in the table are in terms of 'Kg per 100 Quintals of cane'.

Table 56: Consumption Norms

Particular	Maqsoodpur		Palia Kalan		Pratapur		Rudhauri		Thanabhawan		Utraula		Bilal		Barkhera		Budhana		Gangnauli		Gola		Kunderkhi		Kinauni		Khambhar Khera	
Season	16-17	15-16	16-17	15-16	16-17	15-16	16-17	15-16	16-17	15-16	16-17	15-16	16-17	15-16	16-17	15-16	16-17	15-16	16-17	15-16	16-17	15-16	16-17	15-16	16-17	15-16	16-17	15-16
Lime	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.2	0.2
Phosphoric Acid	0.1	0.1	0.3	0.3	0.1	0.1	0.0	0.0	0.1	0.1	0.1	0.0	0.1	0.1	0.2	0.2	0.1	0.1	0.1	0.1	0.4	0.4	0.0	0.1	0.8	0.9	0.2	0.2
Colour PPT	0.1	0.1	0.2	0.2	0.0	0.1	0.0	0.0	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.0	0.0	0.2	0.3	0.2	0.2
Lubricants	0.2	0.2	0.2	0.2	0.3	0.5	0.2	0.2	0.1	0.2	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.3	0.2	0.3	0.2	0.2	0.1	0.2	0.1	0.1
Grease	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
Gunny bags for sugar	0.1	0.2	0.1	2.4	0.0	0.0	0.0	0.0	0.7	0.3	0.3	0.5	0.2	3.9	0.3	0.0	0.3	1.6	0.1	2.2	0.0	3.8	0.0	0.7	0.2	0.8	0.4	1.0
HDPE/ PP Bags(50 kg)	21	23	18	15	17	20	18	21	19	19	18	20	21	14	20	20	20	17	19	16	23	15	19	20	19	19	22	20
Seed Slurry	0.1	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.0	
Bacteriocides Used in Mill House	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Washing soda	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0
Caustic soda	0.3	0.4	0.4	0.4	0.4	0.7	0.3	0.5	0.3	0.4	0.4	0.5	0.3	0.3	0.3	0.4	0.5	0.5	0.5	0.6	0.4	0.4	0.4	0.5	0.9	0.9	0.3	0.3
Common salt	0.3	0.0	0.2	0.4	0.0	0.0	0.0	0.0	0.1	0.2	0.1	0.2	0.0	0.1	0.4	0.6	0.2	0.3	0.1	0.1	0.0	0.0	0.1	0.2	5.6	5.8	0.3	0.4
Hydrochloric Acid	0.3	0.3	0.3	0.4	0.4	0.7	1.1	2.0	0.2	0.5	0.3	0.6	0.1	0.1	0.1	0.3	0.3	0.5	0.9	1.7	0.2	0.2	1.3	1.6	0.3	0.3	0.1	0.1

Source: MM Analysis

MM observes that

- The plant wise and year wise difference can be seen in the consumption norm because of the variation in input cane quality and minor change in manufacturing process adopted by each plant.
- Lime is the biggest cost centre among all the consumables listed in the table above and the consumption norm of Lime varies in the range of 0.1 to 0.2 kg per 100 quintals of cane crushed for all the BHSL plants under study which is lower than the industry standards of 0.25kg per 100 quintals of cane crushed.
- There are no irregular variations in the plant wise consumption norms. Hence, we conclude that all processes are running under normal conditions.

8.9 Consumption norms for Utilities

The consumption norms for utilities in season 2016-17 are given below

Table 57: Utilities Consumption

	Particulars	UOM	Golagoka rannath	Palia Kalan	Kinauni	Thanab hawan	Budh ana	Bilai	Gagn auli	Khambh arkhera	Barkh era	Maqso odpur	Prata ppur	Ruda uli	Kund erkhi	Utraula
1	Utilities: Sugar															
a	Power	KW/Ton	239.09	261.71	286.93	293.72	268.59	295.40	273.96	209.90	274.83	330.96	377.90	464.99	337.29	404.85
b	Steam	MT/Ton	2.67	5.78	4.83	4.83	4.49	4.50	5.28	4.61	3.54	4.98	11.00	3.74	5.02	4.92
2	Utilities: Distillery															
a	Power	KW/Litre	0.18	0.11	0.28	N/A	N/A	N/A	0.31	0.36	N/A	N/A	N/A	0.32	N/A	N/A
b	Steam	Mt/Litre	0.001	0.002	0.006	N/A	N/A	N/A	0.004	0.003	N/A	N/A	N/A	0.004	N/A	N/A

Source: MM Analysis

MM Observes that

- The industry standard for power consumption for sugar mills is 25 to 30 KW/tonnes of cane crushed. In general power consumption for BHSL plants is higher than industry standards. Due to the low utilization factor, the power consumption is higher than industry standards in eastern UP plants.
- The industry standard for steam consumption is .45 MT/Tonnes crushed. For most of the central and eastern UP plants of BHSL it is higher than industry standards.
- The power and steam requirement for Gangnauli distillery is higher compared to other plants as the distillery also includes a spent wash treatment facility which has a multi effect evaporator which requires significant power and steam.

8.10 Product Mix

There are different grades of sugar produced at BHSL Plants. The grades are namely large medium and Small denoted by L, M and S. Each plant has different percentage of production for these grades but overall M grade sugar are produced in maximum percentage in each plant while company is planning to stop production of S grade items due to low demand in the market. The details of the plant wise product mix is given in table below.

Table 58: Product Mix

Grade	Maqsoodpur	Palia Kalan	Pratapur	Rudhauli	Thanabhanawan	Utraula	Bilal	Barkhera	Budhana	Gangnauli	Gola	Kunderkhi	Kinauni	Khambar Khera
	2016-17	2016-17	2016-17	2016-17	2016-17	2016-17	2016-17	2016-17	2016-17	2016-17	2016-17	2016-17	2016-17	2016-17
	%ge	%ge	%ge	%ge	%ge	%ge	%ge	%ge	%ge	%ge	%ge	%ge	%ge	%ge
L-31	1.63	0.47	0.00	0.00	11.18	0.00	3.87	3.47	14.28	13.05	7.30	0.00	26.53	11.95
M-31	97.98	99.18	97.37	99.22	88.37	99.14	95.39	96.53	85.45	86.47	92.45	99.64	65.20	87.73
S-31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.92	0.00
SS-31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
L-30								0.00						
BISS								0.29						

Source: MM Analysis

MM observes that

- of M 31 grade sugar is produced maximum at every plant location while S grade sugar production is stopped by the company.
- Product Mix mainly comprise of S and M grade sugar with only Bilal plant producing BISS grade sugar

8.11 Mandatory Capex requirement

There is a mandatory capex requirement of 90cr to be utilised for compliance to CPCB norms. This mandatory capex is applicable for plants having distilleries. As per information collected during site visit, there should be zero effluent from distilleries as per the guidelines given by CPCB. A multiple effect evaporator is needed to be installed at each distillery to comply with these guidelines.

The plant wise capex requirement and status of implementation is given in the table below:

Table 59: Capex requirement to comply with CPCB

Plant	Evaporator Rs in crore	Status
Gola	16	Work orders are under process
Palia	14	Work orders are under process
Kinauni	24	Under Implementation
Gangnauli	18	Under Implementation
Khambharkhera	18	Under Implementation
Rudhauli		Already installed
Total	90	

Source: BHSL

The major equipment's to be installed to comply with CPCB norms are On line monitoring systems for:

- Bore well,
- Spent wash generation,
- Process condensate,
- MEE inlet
- Effluent Consumption point
- Camera feed system
- Alcohol production
- Data logger for data integration of flow meters to CPCB/UPPCB

8.12 Identification of non-core assets for divesture

As per discussion with BHSL there are no assets identified at plant level for divesture. However an Aircraft own by the company is identified as non-core asset for divesture and BHSL is in process of identifying the buyers for the same.

9 Site Assessment: Plant Wise Observations

Rudhauri Plant

9.1.1 Plant Details

Details of the Rudhauri manufacturing facility are given below.

Table60: Plant Details

Sr. No.	Particulars	Description
1	Location	Rudauri - Sugar Unit P.O.: Rudra Nagar, Rudauri - 272001
2	Land Area	159 Acres
3	Manufacturing facility	Cane Crushing, Distillery and Power generation (Captive)

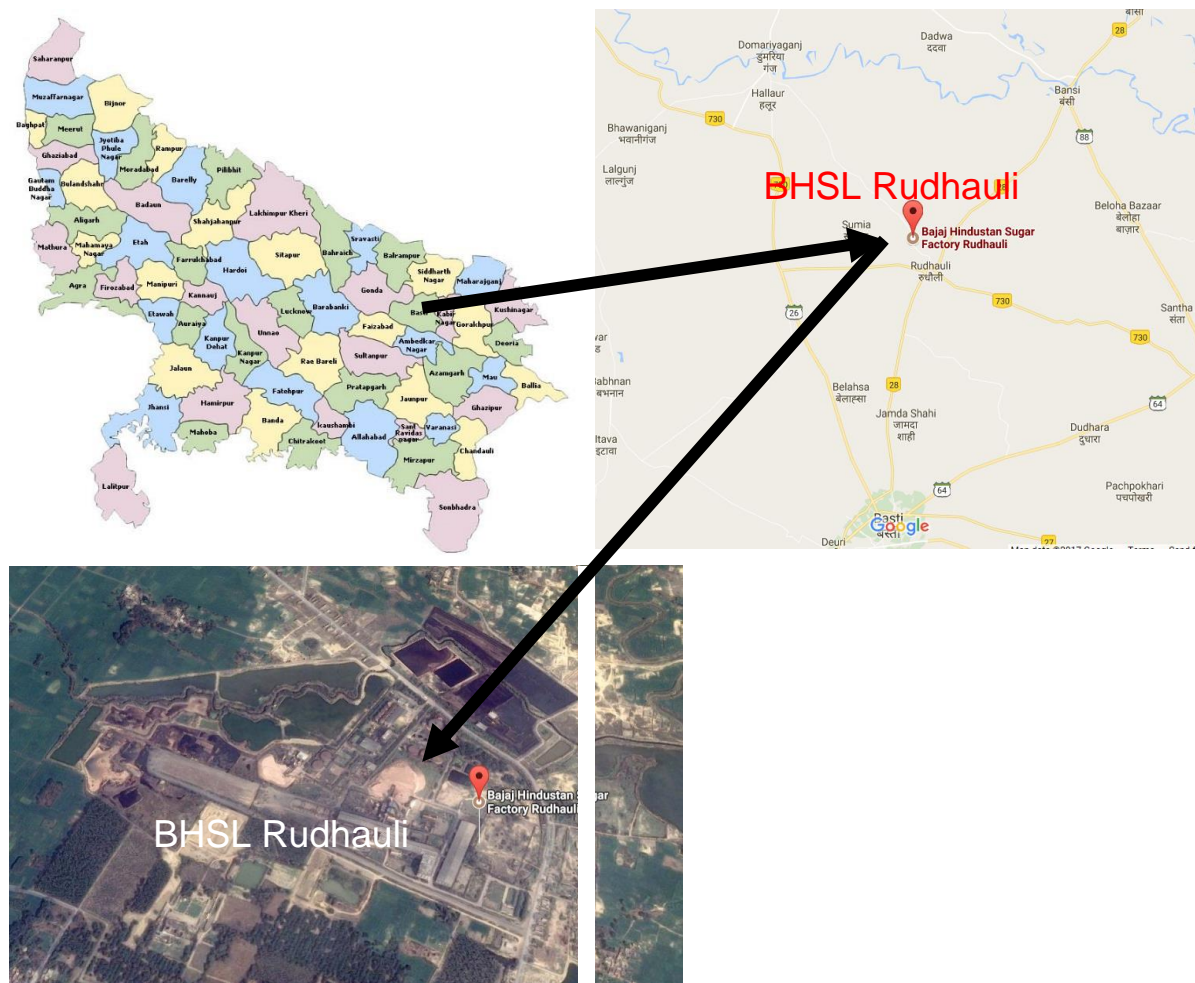
Source: MM Site Visit

9.1.2 Location Analysis

Plant is located at district Basti in Eastern UP. The eastern part of the UP is cane deficit area. It accounts for only 18% of area under sugarcane cultivation in UP. Hence MM opines that it is challenging to run plant to its full capacity at this region.

The location of the plant is depicted in the figure below:

Figure47: Site Map



Source: Google Maps

Accessibility and connectivity details of Rudhauri plant are given in following table.

Table 61: Site Accessibility

Connectivity	Description	Distance
Nearest City	Basti	30 Km
Nearest highway	NH730	31 Km
Nearest Station	Basti railway station.	2.1 Km
Nearest Airport	Chaudhary Charan singh International Airport Terminal, Amausi, Lucknow, Uttar Pradesh	246 Km

9.1.3 Plant Configuration

- The Rudhauri plant has facility of Sugar Production Distillery and Power cogeneration.
- The power plant runs on the bagasse generated in sugar crushing while Alcohol is manufactured from the molasses generated in sugar manufacturing.

- A part of the power generated is used for captive consumption while the residual power is exported to the grid
- The molasses from Kundarki, Pratappur and Utraula plant's is brought to the Rudhauli distillery to manufacture alcohol.
- The carbon dioxide generated during the fermentation of molasses is captured and is sold to chemical companies.
- Spent wash from the distillery is used to generate methane gas.
- Methane gas is in turn used as fuel for boilers installed in the distillery.

The Installed capacities for the all the facilities is given in following table.

Table 62: Installed Capacities

Particulars	U.O.M	Values
Cane Crushed	TCD	7000
Alcohol Generation	KLPD	160
Power Generation	MW-H	17

Source: MM Analysis

9.1.4 Site Infrastructure

9.1.4.1 Civil Infrastructure

The plant started its operations in 2007 having an installed capacity of 7000 TCD. There hasn't been any increase in capacity since then. The details of buildings and civil facilities are given below:

Table 63: Buildings and Infrastructure

Sr. No	Building Name	Area (Sq. Mtr.)	Type of structure	Year of Construction
1	Mill House	3376	RCC Fd./MS Structure/AC sheeting roof/Brick wall	2006-07
2	Evaporation House	576	RCC Fd./MS Structure/AC sheeting roof/Brick wall	2006-07
3	Pan House	2304	RCC Fd. /MS Structure/AC sheeting roof/Brick wall	2006-07
4	Sugar House	1872	RCC Fd./MS Structure/AC sheeting roof/Brick wall	2006-07
5	Clarification House	1440	RCC Fd./MS Structure	2006-07
6	Feed Water Tank	312	RCC Fd./MS Structure	2006-07
7	Power House	1125	RCC Fd./MS Structure/AC sheeting roof/Brick wall	2006-07
8	Return Baggage Carrier	240	RCC Fd./MS Structure	2006-07
9	Cooling Tower	730	RCC Structure	2006-07
10	Molasses Tank (3 nos)	3000	RCC Fd./MS Structure	2006-07
11	Pump for cooling Tower	18	RCC Fd	2006-07
12	E.T.P	3671	RCC Fd./RCC roof/Brick wall	2006-07
13	Store Godown	600	RCC Fd./MS Structure/AC sheeting roof/Brick wall	2006-07

Sr. No	Building Name	Area (Sq. Mtr.)	Type of structure	Year of Construction
14	Bagasse Yard	21750	RCC Floor	2006-07
15	Boiler Section	509	RCC Fd./MS Structure	2006-07
16	Lime & Sulphur Godown	360	AC sheeting roof/Brick wall	2006-07
17	Sugar storage	8000		

Source: BHSL

- There is unutilised area in the mill house and the power house which can be used for future expansion to install an additional roller and a turbine if the company plans to increase the cogeneration capacity.
- Considering the low capacity utilization and lesser cane availability, expansion won't be a feasible option.
- The area of cane yard is adequate to facilitate easy movement of the trucks and tractors coming into the plant to deliver the sugarcane.
- Adequate storage area for sugar and bagasse is available in the plant.
- The sugar storage area is sufficient to hold sugar for 58 days while bagasse yard can store the bagasse for a whole season.
- At the Rudhauri plant DC driven mills are used unlike in other old plants like Gola and Palia where steam driven mills are used.
- The area of the Mill house at the Rudhauri plant is 50% lesser than the plants where steam driven mills are used as auxiliary items such as steam pipelines aren't required if the mills are DC driven.
- The plant area and the current infrastructure is adequate to operate the plant at full capacity.
- The plant area also includes social infrastructure like quarters for employees, school etc.

9.1.4.2 Plant Machinery

The Rudhauri plant has one tandem(Line) of 7000 TCD. Tandem has 4 rollers which results in optimum extraction of juice from sugarcane.

The status of the available plant and machinery at Rudhauri unit is given in the table below:

Table 64: Plant Machinery

Machineries	Number of Units	Manufacturer	Specifications
Cane Handling			
Cane unloader	4 no.	Automech	Capable to handle 25 tips/hr, 5 tons SWL of each tip.
Truck Tippler	1 no.	Shree enterprises	Capacity - 60 T
Mills			
Mill Tandem			
Drives			
Mill 1,2,3,4,5			
Steam generation Plant			
Boilers	2 no.	WIL	Capacity - 90 T/Hr
	2 no.	Batliboi	Capacity - 49 M3/Sec
Electric Generators	1 no.	Cummins	1010 KVA
	1 no.	Cummins	500 KVA

Machineries	Number of Units	Manufacturer	Specifications
	1 no.	Cummins	320 KVA
	1 no.	Kirloskar	82.5 KVA
Power Turbines	1 no.	Triveni	10 MW
	1 no.	Triveni	3 MW
Clarification			
Juice Heaters			
Juice Sulphiters	2 no.		Capacity - 400 H.L.
Sulphur Gas Plant			
Lime Section			
Lime Classifier			
Clarifier	1 no.		Capacity- 7000 H.L.
Vacuum Filter			
Sugar Grader	2 no.	IC	Capacity- 30 T/Hr

Source: BHSL

MM Observes that

- Majority of the core equipment like Mills, Boilers and Turbines have been supplied by market leaders like WIL, Triveni and Uttam and Cummins.
- The plant has a separate boiler and power house for its distillery to meet the power requirements of the distillery.
- The boilers in the distillery are fuelled by methane gas generated from spent wash.
- The plant is having state of the art facility with DCF controls in place
- The mills are DC driven which leads to optimum utilisation of plant area.
- The boiling pans are operated in batch process while in most of the other modern plants they are operated in continuous process which leads to consistent quality of the sugar and reduces the cycle time.
- The crushers and the cutters must go for resheiling every 2-3 years which requires a capital expenditure of 7.5 lakhs per crusher.
- There are standby evaporators, clarifiers and preheaters which are used during scheduled maintenance to avoid any downtime
- The boilers installed at the plant can generate steam of 45kg/m² but most of the boilers installed in modern plants can generate steam up to 110kg/m².
- Boilers which can generate high pressure steam involve higher capital expenditure but are more efficient in terms of amount of steam required to generate 1 MGW of power.
- Steam after production of power is utilised to in preheaters and is then condensed which is then used in the boilers.
- The technology used in the distillery is from Praj Industries.
- MM Observation on overall plant facility
 - Plant is situated in Eastern UP which accounts for only 18% of the sugarcane production of Uttar Pradesh. it is challenging to run plant to its full capacity at this region.

9.1.4.3 Manpower

Details of the manpower at Rudhauli sugar plant is as per following table:

Table 65: Manpower Details- Sugar

Sr.no	Department	Nos
1	Unit Head	1
2	Finance & Accounts	6
3	HR & Admin	11
4	Cane Head	94
5	Lab Head	8
6	Engineering Dept.	120
7	Production Dept.	77
8	EHS	1
9	Legal	1
10	Indirect Taxation	1
11	EDP & I.T.	5
12	Store	6
13	Horticulture	1
14	Sugar Sales	10
	Total	342

Source: BHSL & MM Analysis

Details of manpower for Rudhauri Distillery is given in the table below:

Table 66: Manpower Details-Distillery

Sr.no	Department	Nos
1	Unit	1
2	HR & Admin & Gen. Office	5
3	ETP Head	7
4	Engineering	44
5	Production	28
6	Commercial	5
	Total	90

Source: BHSL & MM Analysis

MM Observes that,

- The Rudhauri plant is state of the art with automated controls hence the manpower requirement at this plant is lesser than some of the older plants like Gola.
- The total manpower deployed at the plant is 342 for the sugar plant and 90 at the distillery.
- The manpower per lakh quintal of cane crushed for the plant is 9.04 employees and 0.45 employees per lac litre for the distillery.
- The current manpower deployed at the plant is adequate to operate the plant at its full capacity

The Organogram of the Rudhauri Sugar plant is depicted below:

Figure 48: Organogram-Rudhauri Sugar Plant

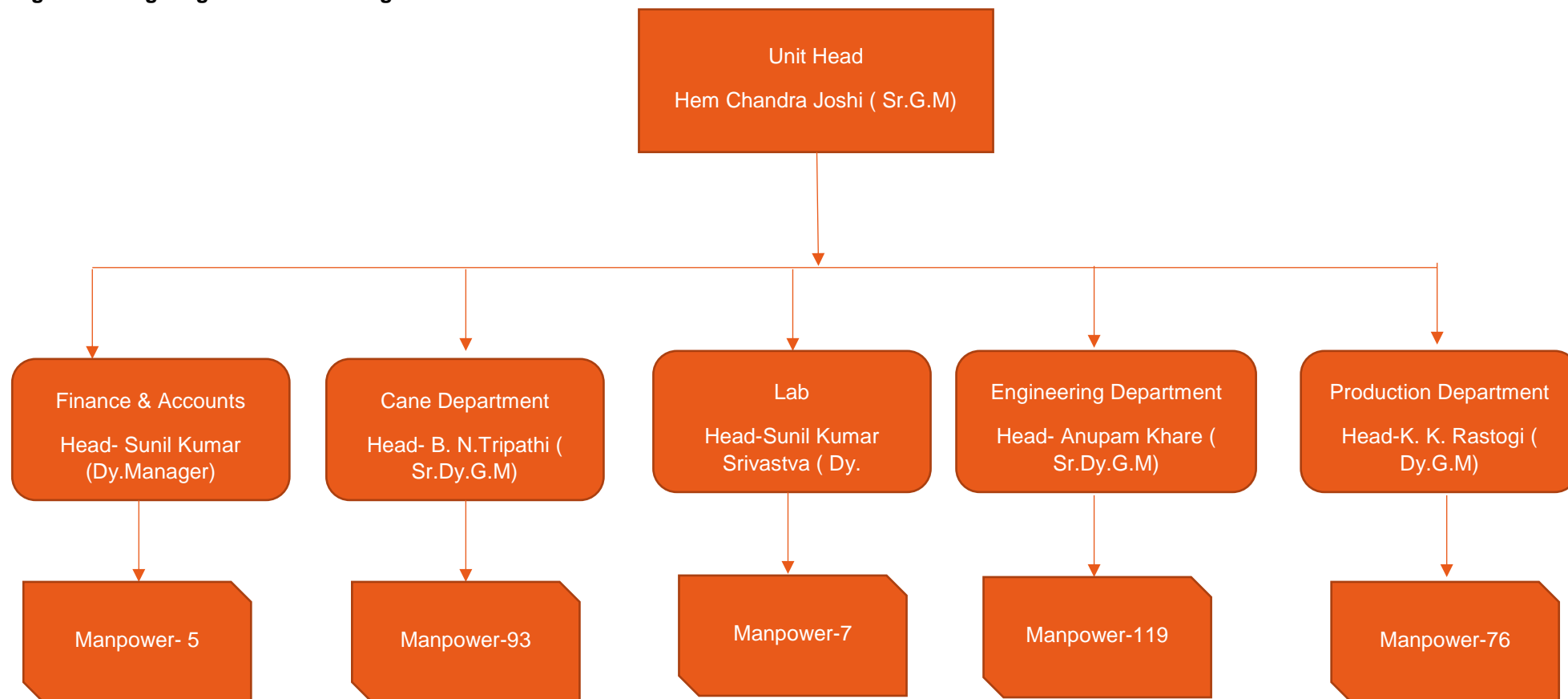
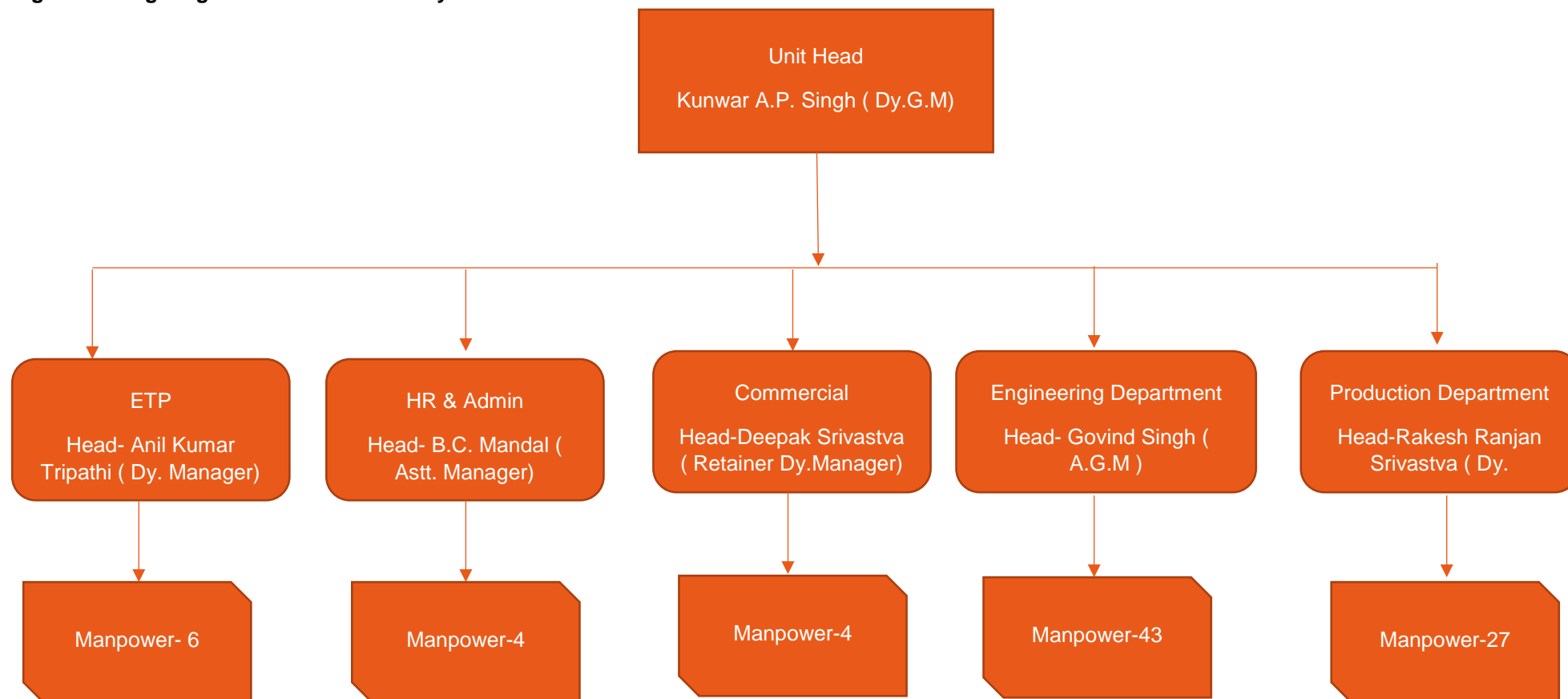


Figure 49: Organogram- Rudhauli Distillery



Source: BHSL

9.1.5 Production Details

The details of the last 5 years' cane crushed and recovery rates for Rudhauri plant can be seen in following table

Table 67: Production Sugar

	U.O.M	2011-12	2012-14	2014-15	2015-16	2016-17
Cane Crushed	Lakh Quintals	36.85	103.12	41.51	35.72	37.83
Sugar Produced	Lakh Quintals	3.52	9.40	3.78	3.72	3.48
Capacity Utilization	%	33%	32%	37%	32%	34%
Recovery Rate	%	10%	9%	9%	10%	9%

Source: MM Analysis

The generation of Alcohol for 2015-16 and 2016-17 is given in the table below:

Table 68: Production Distillery

	U.O.M	2015-16	2016-17
Installed Capacity	KLPA	38400	38400
Alcohol Produced	KL	20158	20182
Utilization	%	52%	53%

Source: MM Analysis

The power generation for the years 2015-16 and 2016-17 is given in the below table:

Table 69: Production Power plant

	U.O.M	2015-16	2016-17
Installed Capacity	MW	17	17
Units Produced	MW-H	22089	22729
Utilization	%	37%	35%

Source: MM Analysis

MM observes that,

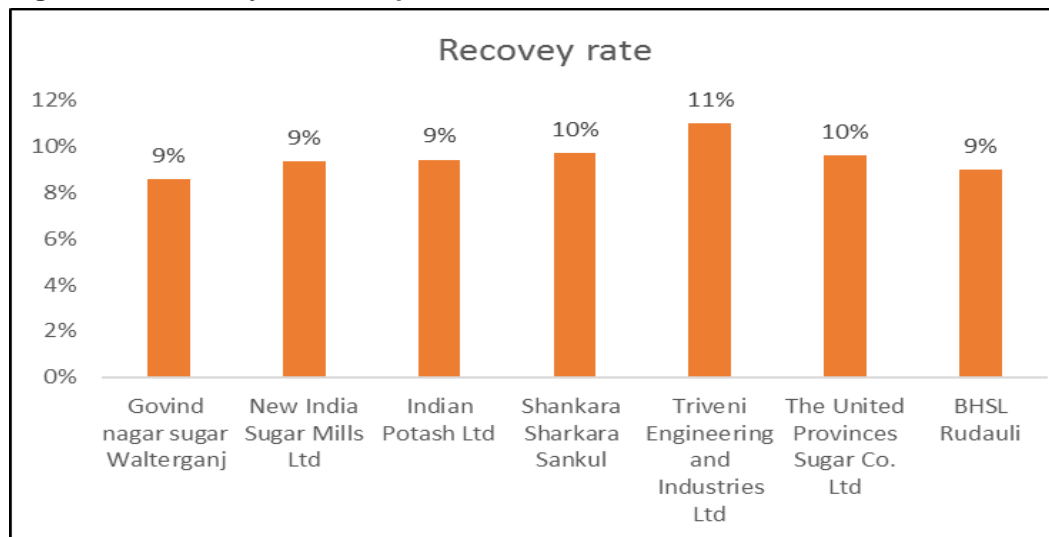
- There was a sharp decline in the sugar production in 2014-15 which was mainly due the low cane availability in eastern Uttar Pradesh.
- The capacity Utilization of the Rudhauri plant is in the range of 30 to 32% and the average utilization of peers in the same region is 50%
- The recovery of the plant is in the range of 9-10%
- The plant has undertaken many cane development activities to improve the cane production in the area which will in turn increase the plants operational performance.
- The utilization of distillery is constant at 52%
- The utilization of power plant and distillery is dependent on sugar cane availability as bagasse and molasses which are by-products of sugar production are used as inputs for power plant and distillery. Therefore, when the sugar cane availability is less distilleries and power plant would be operational for lower number of days.
- The Rudhauri plant does not export power, so the only requirement is that of internal usage.
- The contribution of Rudhauri plant in total sugar produced by the Bajaj group was only 3 % in 2016-17 season. This was mainly due to low cane availability in eastern UP.

9.1.6 Comparison with Peers

The Rudhauri plant operates at Eastern UP region. MM has analysed the data of other sugar mills operating in same area. Details of the same are furnished below

The data provided below is for year 2016-17.

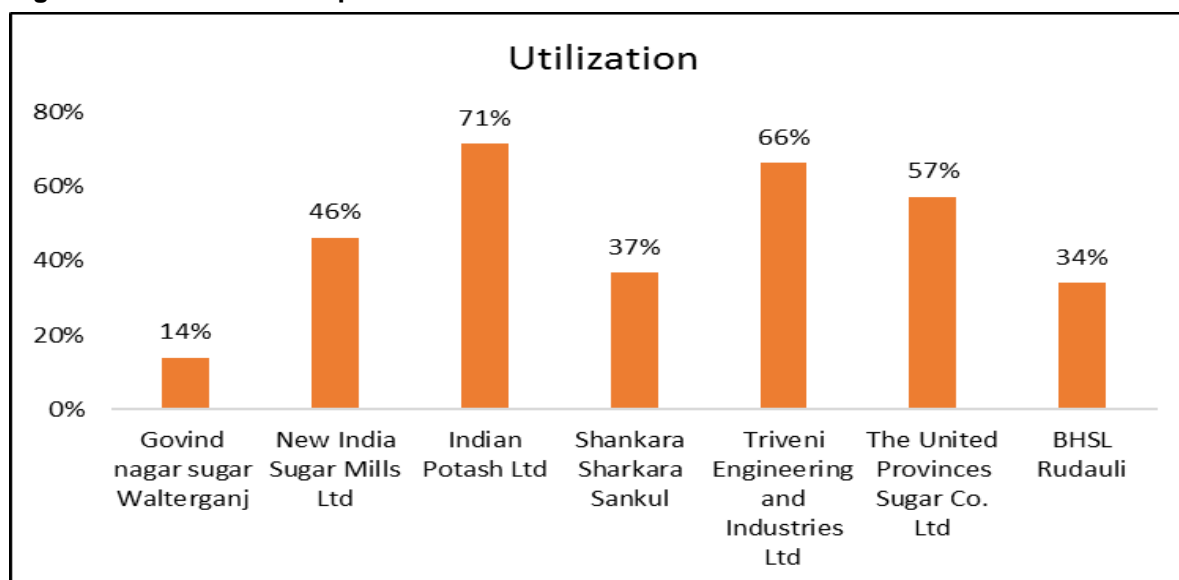
Figure 50: Recovery Rate Comparison



Source: MM Analysis

- The average recovery rate of the plants of peers operating in same region is 9.4%.
- The recovery rate of the Rudhauri plant is lesser than its peers in eastern UP because of low-yield cane in the region.

Figure 51: Utilization Comparison



Source: MM Analysis

- The average capacity utilisation of the peers operating in same region is 46.42%.
- The reason for such low utilisation factor in eastern UP is unavailability of cane which is affecting the production of sugar manufacturers.
- The capacity utilisation of the Rudhauri plant is less in comparison to its peers in eastern UP

9.1.7 Maintenance Philosophy

- An expert team from BHSL carries out scheduled maintenance in off season to save time in crushing season
- Repair & Maintenance budget received by the company during off season is the range of Rs 3 to Rs 4 per quintal with some increment every year.
- Apart from the Repair & Maintenance budget the plant can avail for additional budget from head office in case of major works.

9.1.8 Effluents from the plant

- Consultants have reviewed the inspection reports of the Rudhauri plant Ambient air carried out by Noida Testing Laboratories and all the effluent parameters are within the limits given by Central Pollution Control Board(CPCB).
- Similarly test results of the ground water are also in the limits given by CPCB.
- Also, there is proposed capex plan for distillery units for compliance with PCB orders

9.1.9 Status of the statutory approvals

Table 70: Status of Statutory Approvals

Clearances sought	Rudhauri
Environment Clearance MoEF	J-11011/486/2006-IA II(I)
Valid From (Date)	31.07.2007
Valid Till (Date)	to till plant operation
Water Usage	Water Consent order - 128/consent(water)order/112/2016/Basti
Valid From (Date)	01.01.2016
Valid Till (Date)	31.12.2017
NOC from state pollution board	F-07405/C-6/NOC/03/GKP/2006
Valid From (Date)	10.10.2006
Valid Till (Date)	to till plant operation
Consent to operate	Air consent order - 120/consent (air)order/112/bst/16 Water Consent order - 128/consent(water)order/112/2016/Basti
Valid From (Date)AIR/Water	01.01.2016
Valid Till (Date)	31.12.2017
CIB certification for boiler	
Valid From (Date)	27.10.2016
Valid Till (Date)	26.09.2017
Approval of fire protection scheme	03/FS/AGNI SURAKSHA/AUDHOGIK BHAWAN/2016-17
Valid From (Date)	01.01.2017
Valid Till (Date)	31.12.2017
Panchayat/Municipal corporation Approval	
Valid From (Date)	01.04.2017
Valid Till (Date)	31.03.2018

Source: MM Analysis

MM observes that

- Consent to operate and CIB certification of boiler would expire at the end of year 2017.
- Also, Fire NOC needs to be sought in January 2018.

9.2 Kunderki Plant

9.2.1 Plant Details

The details of Kunderki plant are given in the below mentioned table:

Table 71: Plant details

Sr. No.	Particulars	Description
1	Location	Kundarki - Sugar Unit Kastuwa-Kundarki Moti Ganj - 271301
2	Land Area	196 Acres
3	Manufacturing facility	Cane Crushing, and Power generation (Cogeneration)

Source: MM

9.2.2 Location Analysis

Plant is located at district Moti Ganj in Eastern UP. The eastern part of the UP is cane deficit area. It accounts for only 18% of area under sugarcane cultivation in UP. Hence MM believes that it is challenging to run plant to its full capacity at this region.

The location of the plant is depicted in the figure below:



Source: Google Maps

The connectivity details to Kundarki site are given below:

Table 72: Site Accessibility

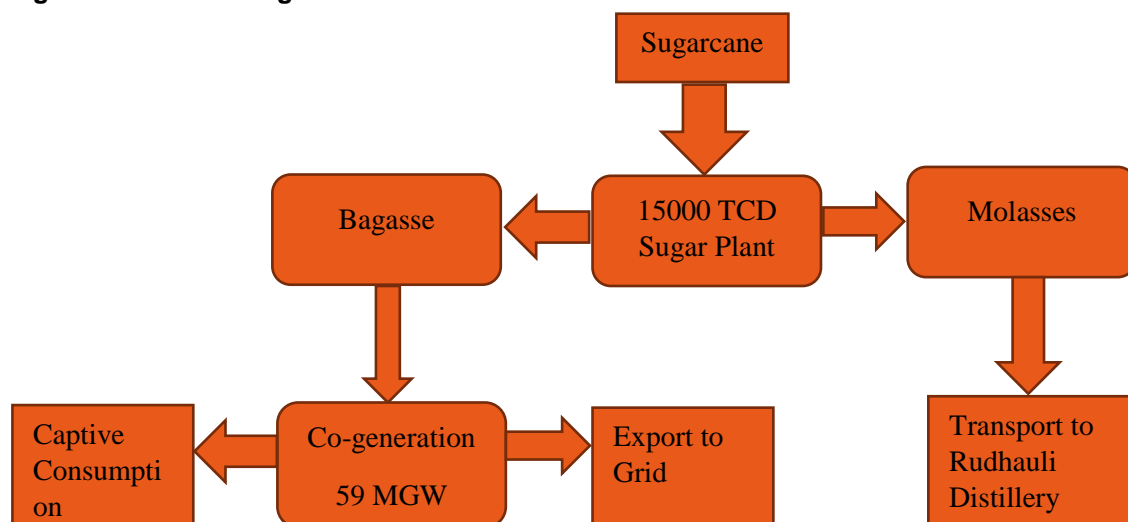
Connectivity	Description	Distance
Nearest Major City	Gonda	21 Km
Nearest highway	NH 30 (Bhairach-Gonda-Faizabad Marg)	5 Km
Nearest Station	Gonda Railway Station.	18 Km
	Lucknow Jn	188 Km
Nearest Airport	Chaudhary Charan singh International Airport Terminal, Amausi, Lucknow, Uttar Pradesh	200 Km

Source: Google Maps

9.2.3 Plant Configuration

The Kundarki plant has facility of Sugar Production and Co-generation. The power plant runs on the bagasse generated in sugar crushing. A part of the power generated is used for captive consumption while the residual power is exported to the grid. Molasses produced during sugar production is transported to the Rudhauri distillery to manufacture Alcohol. The plant configuration is described in the below figure:

Figure52: Plant Configuration



Source: MM

9.2.4 Site Infrastructure

The Kunderkhi plant was established in 2007 with an installed capacity of 15000TCD.

9.2.4.1 Civil Infrastructure

The details of civil infrastructure at the Kunderkhi plant and their respective areas are given in the table below:

Table 73: Buildings and Structures

Sr. No.	Building Name	Area (Sq Mtr)	Type of structure	Year of Construction
1	Mill House	4704	RCC Fd. /MS Structure/AC sheeting roof/Brick wall	2007
2	Evaporation House	2732	RCC Fd. /MS Structure/AC sheeting roof/Brick wall	2007
3	Pan House	5040	RCC Fd. /MS Structure/AC sheeting roof/Brick wall	2007
4	Sugar House	2240	RCC Fd. /MS Structure/colour coated sheet roof/Brick wall	2007
5	Clarification House	3832	RCC Fd. /MS Structure	2007
6	Feed Water Tank	243	RCC Fd./MS Structure	2007
7	Power House	2016	RCC Fd./MS Structure/AC sheeting roof/Brick wall	2007
8	Return Baggage Carrier	437	RCC Fd./MS Structure	2007
9	Cooling Tower	1460	RCC Structure	2007
10	Molasses Tank (4 nos)	2826	RCC Fd./MS Structure	2007

Sr. No.	Blinding Name	Area (Sq Mtr)	Type of structure	Year of Construction
11	Pump for cooling Tower	240	RCC Fd./MS Structure/AC sheeting roof	2007
12	E.T.P	4050	RCC Fd./RCC roof/Brick wall	2007
13	Store Godown	972	RCC Fd./MS Structure/AC sheeting roof/Brick wall	2007
14	Bagasse Yard	36000	RCC Floor	2007
15	Boiler Section	11453	RCC Fd./MS Structure	2007
16	Lime & Sulphur Godown	432	AC sheeting roof/Brick wall	2007
17	Sugar Godown	17032		

Source: BHSL

- There is 36 acres of unutilised space in the plant which is assigned for MDF plant which can be utilised for future expansions or can be monetised if required
- The area of cane yard is adequate to facilitate easy movement of trucks and tractors coming into the plant to deliver the sugarcane.
- Adequate storage area for sugar and bagasse is available in the plant.
- The sugar storage area is sufficient to hold sugar for 57 days.
- At the Kundarki plant DC driven mills are used unlike in other old plants like Gola and Palia where steam driven mills are used.
- The area of the Mill house at the Kundarki plant is 50% lesser than the plants where steam driven mills are used.
- The plant area also includes social infrastructure like quarters for employees, school etc.
- The plant area and the current infrastructure is adequate to operate the plant at full capacity.

9.2.4.2 Plant Machinery

The Kundarki plant has only one tandem(Line) of 15000 TCD. Tandem has 5 rollers which leads to optimum extraction of sugar juice from sugarcane.

The List of Machineries at the Kundarki plant is provided in the below mentioned table:

Table 74: Plant Machinery

Machinery	Number of Units	Manufacturer	Specifications
Cane unloader	No. 1	Globe Eng.	5 Tons SWL/ Tip along with gantry of 26.5 meter long
	No. 2	Uttam Industry	6 Tons SWL/ Tip along with gantry of 26.5 meter long
	No. 3	Uttam Industry	7 Tons SWL/ Tip along with gantry of 26.5 meter long
	No. 4	Uttam Industry	8 Tons SWL/ Tip along with gantry of 26.5 meter long
	No. 5	Uttam Industry	9 Tons SWL/ Tip along with gantry of 26.5 meter long
	No. 6	Uttam Industry	10 Tons SWL/ Tip along with gantry of 26.5 meter long
	No. 7	Globe Engg	11 Tons SWL/ Tip along with gantry of 26.5 meter long
Truck Tippler	No. 1	Shree Enterprises	Capacity - 60 ton

Machinery	Number of Units	Manufacturer	Specifications
	No. 2	Shree Enterprises	Capacity - 60 ton
Mills			
Mill Tandem		Uttam Industry	1300 mm dia, 2300 mm long
Drives		ABB	DC Motor of 1200 KW
Steam generation Plant			
Boilers	4	IJT	Capacity - 90 T/Hr
Clarification			
Juice Sulphiters	1	Kaybouv	Capacity-250 HL
Lime Section			
Lime Classifier	2	Shiv Pad Engg	Capacity- 4* 20 feet
Clarifier	3	Universal Heavy Engg	Capacity- 5900 HL

Source: BHSL

MM Observes that

- Majority of the core equipment like Mills, Boilers and Turbines have been supplied by market leaders like Thermax, Bukau Wolf, Triveni and Uttam.
- There has been no major capital refurbishment from the time the plant was established in 2007.
- The entire plant is automated and is centrally controlled.
- The mills are DC driven which leads to optimum utilisation of plant area.
- The crushers and the cutters must go for reselling every 2-3 years which requires a capital expenditure of 7.5 lakhs/crusher.
- The boiling pans are operated in continuous process which leads to consistent quality of sugar and less cycle time.
- There are standby evaporators, clarifiers and preheaters which are used during scheduled maintenance to avoid any downtime
- The boilers installed at the plant can generate steam of 45kg/m² but most of the boilers installed in modern plants can generate steam up to 110kg/m².
- Boilers which can generate high pressure steam involve higher capital expenditure but are more efficient in terms of amount of steam required to generate 1 MGW of power.
- Steam after production of power is utilised to in preheaters and is then condensed which is then used in the boilers.

9.2.4.3 Manpower

The total manpower deployed at the Kundarki plant is given the below table:

Table 75: Manpower- Details

Sr.no	Department	Nos
1	Unit Head	1
2	Finance & Accounts	6
3	HR & Admin	11
4	Cane	108
5	Lab	6
6	Engineering	143
7	Production	130

Sr.no	Department	Nos
8	Internal Audit	1
9	Legal	3
10	Indirect Taxation	1
11	I.T.	5
12	Store	6
13	Horticulture	1
14	Sales	12

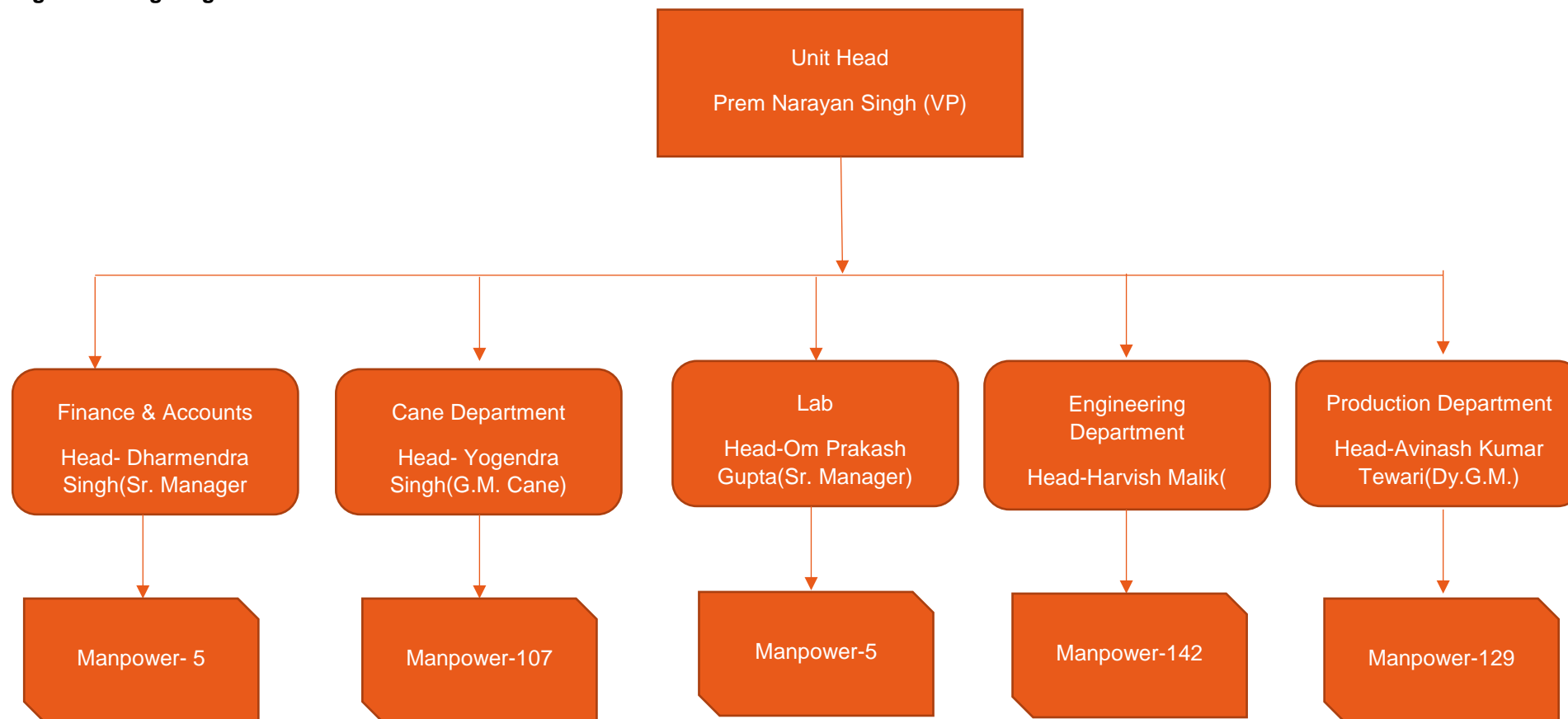
Source: BHSL & MM Analysis

MM Observes that

- The plant is automated therefore has very less manpower requirement compared to other plants which aren't automated.
- Out of 434, 250 are seasonal workers which are employed only in the crushing season between November-March.
- There are 16 trainees who are employed in the crushing season in the cane department to handle sugarcane procurement.
- The manpower per lakh quintal of cane crushed for the plant is 5.94 employees, which are adequate to handle the entire sugar manufacturing process.

The Organogram of the Kunderki Sugar plant is depicted below:

Figure 53: Organogram Kunderki



Source: BHSL

9.2.5 Production Details

The details of the last 5 years' cane crushed and recovery rates for Gola plant can be seen in following table

Table 76: Production details- Sugar

	U.O.M	2011-12	2012-14	2014-15	2015-16	2016-17
Cane Crushed	Lakh Quintals	116.82	239.95	94.98	64.54	73.02
Sugar Produced	Lakh Quintals	10.81	22.50	8.86	6.74	6.89
Capacity Utilization	%	49%	47%	40%	27%	30%
Recovery Rate	%	9%	9%	9%	10%	9%

Source: BHSL

The power generation for the years 2015-16 and 2016-17 is given in the below table:

Table 77: Power Generation

	U.O.M	2015-16	2016-17
Installed Capacity	MW	59	59
Units Produced	MW-H	71255	68371
Utilization	%	38%	41%

Source: BHSL

MM Observes that

- There was a sharp decline in the sugar production in 2014-15 which was mainly due the low cane availability in eastern Uttar Pradesh. The trend continued in 2015-16 as well due to poor monsoons, but started to recover in 2016-17 on account of better cane variety and adequate rainfall.
- The capacity utilisation of the Kundarki plant is in the range of 27% to 47% since last 4 years.
- The plant has undertaken many cane development activities to improve the cane production in the area which will in turn increase the plants operational performance.
- One of the primary reasons for low capacity utilisation of the plant is higher installed capacity than its peers operating in the same region.
- The recovery of the plant is 9% which has remained constant y-o-y.
- The utilization of power plant is dependent on sugar cane availability as bagasse is a by-product of sugar production are used is inputs for power plant. Therefore, when the sugar cane availability is less distilleries and power plant would be operational for lower number of days.
- It should be noted that, even though capacity utilization of power plant was low there was no situation of power outage at the plant. This means this level of utilization is sufficient to fulfil power requirement of the plant.
- Therefore, the generation of power also saw a decline in 2015-16
- There was a slight increase in the power generation in 2016-17 as the total cane crushed improved.
- The contribution of Kunderki plant in total sugar produced by the Bajaj group was only 6% during 2016-17 due to unavailability of cane in eastern UP.

9.2.6 Comparison with Peers

Table 78: Comparison with peers

Sr. no	Plant	Status	Capacity TCD	Recovery	Cane Crushed Lakh MT	TCA	Utilization
1	Govind nagar sugar Walterganj Uttar Pradesh	Running	6000	8.60%	1.34	960000	14%
2	New India Sugar Mills Ltd (Unit- The Oudh Sugar Mills Ltd.), Vill. Dhadha Bujurg, Uttar Pradesh	Working	8000	9.36%	5.92	1280000	46%
3	Indian Potash Ltd., Raja Bazar, Uttar Pradesh	Working	1600	9.44%	1.83	256000	71%
4	Shankara Sharkara Sankul (A Unit of The Kanoria Sugar General Manufacturing Co. Ltd.), Kushinagar, Uttar Pradesh	Working	6000	9.71%	3.53	960000	37%
5	Triveni Engineering and Industries Ltd., Kushinagar, Uttar Pradesh	Working	6500	11.21%	6.91	1040000	66%
6	The United Provinces Sugar Co. Ltd, Kushinagar, Uttar Pradesh	Working	6500	9.60%	5.95	1040000	57%

Source: MM Analysis

MM Observes that

- The capacity utilisation of the Kundarki plant is in the range of 27% to 49% while the capacity utilisation of its peers in eastern UP is more than 49%.
- The recovery of the plant is 9% which is less than its peers in eastern UP who have a recovery rate of about 9.36% to 11.21%.

9.2.7 Maintenance Philosophy

Major breakdowns for year 2016-17 are given below

Table 79: Major Breakdown in 2016-17

Date	Hrs Lost	Reason	Root Cause Analysis	Action Taken
19/12/2016	0.5	Return Juice Line Drain Valve broken	New Valve Replaced & Proper Checking to be done time to time	Replaced
27/12/2016	2.67	Cane jamming at 1st mill Donnelly chute	Foreign material comes and jammed the mouth of the roller opening	Material removed
14/01/17	0.75	IRC No 1 Attachment broken & new rake fitting	Chain Attachment broken at welding portion	Chain link & rake replaced
28/01/2017	1	Mill No 3 GRPF motor tripped off	Due to heavy fluctuation of 132 KVA Grid voltage field card got damaged	Field card Replaced
1/2/2017	0.5	MBC No 1 Tripped off	Cable got fire due to bagasse burning at outside of furnace	Damaged cable replaced

Source: BHSL

- An expert team from BHSL carries out scheduled maintenance in off season to save time in crushing season

- Repair & Maintenance budget received by the company during off season is Rs 3.34 per quintal which is adequate and varies in the range of Rs 3 to Rs 4 per quintal with some increment every year.
- Apart from the Repair & Maintenance budget the plant can avail for additional budget from head office in case of major works.
- During the season 2016-17 plant availed Rs 2.4 Crores as an additional budget from the head office
- The breakdowns during the Season 2015-16 and 2016-17 are very less due to proper scheduled maintenance carried out during off-season

9.2.8 Effluents from Plant

- Consultants have reviewed the inspection reports of the Kundarki plant for Ash dumping area, waste water, Ambient air, Ambient noise, and Stack boiler carried out by Noida Testing Laboratories and all the effluent parameters are within the limits given by Central Pollution Control Board(CPCB).
- Similarly test results of the ground water are also in the limits given by CPCB

9.2.9 Status of Statutory Clearances

Table 80: Status of Statutory Clearances

Sr.no	Clearances sought	Kunderkhi
1	Environment Clearance MoEF	
	Valid From (Date)	31.07.07
	Valid Till (Date)	Lifetime
2	Water Usage	
	Valid From (Date)	01.01.16
	Valid Till (Date)	31.12.17
3	NOC from state pollution board	
	Valid From (Date)	26.09.06
	Valid Till (Date)	One time
4	Consent to operate	
	Valid From (Date)AIR/Water	01.01.16
	Valid Till (Date)	31.12.17
5	CIB certification for boiler	
	Valid From (Date)	18.10.16
	Valid Till (Date)	24.09.17
6	Approval of fire protection scheme	
	Valid From (Date)	31.12.16
	Valid Till (Date)	31.12.17
7	Panchayat/Municipal corporation Approval	
	Valid From (Date)	01.10.16
	Valid Till (Date)	30.09.17

Source: BHSL/MM Analysis

MM observes that

- Consent to operate and NOC from pollution board would expire at the end of year 2017 while approval for water usage is under renewal process

- Fire NOC, CIPB certification for boiler and water usage NOC expires in Dec 2017.

9.3 Gola Plant

9.3.1 Plant Details

Details of the Gola manufacturing facility are given below.

Table 81: Plant Details

Sr. No.	Particulars	Description
1	Location	Lakhimpur Kheri District, Golagokarannath-Sugar unit, Vill: Golagokarannath
2	Land Area	184 Acres
3	Manufacturing facility	Cane Crushing, Distillery, and Power generation (Captive)

Source: MM Site Visit

9.3.2 Location Analysis

The location of the plant is strategic considering the availability of sugarcane. Plant is situated in Central UP which accounts for almost 30% of the sugarcane production of Uttar Pradesh.

The location of the plant is depicted in the figure below:

Figure54: Site Map



Source: Google Maps

Accessibility and connectivity details of Gola plant are given in following table.

Table 82: Site Accessibility

Connectivity	Description	Distance
Nearest Major City	Lucknow	161 Km
Nearest highway	NH730	1 Km
Nearest Station	Gola Gokarannath railway station.	2.1 Km

Connectivity	Description	Distance
	Charbagh Railway station bus stop, Lucknow, Uttar Pradesh	162 Km
Nearest Airport	Chaudhary Charan singh International Airport Terminal, Amausi, Lucknow, Uttar Pradesh	176 Km

9.3.3 Plant Configuration

The Gola plant has facility of Sugar Production Distillery and Power generation. The power plant runs on the bagasse generated in sugar crushing while Alcohol is manufactured from the molasses generated in sugar manufacturing. The Installed capacities for the all the facilities is given in following table.

Table 83: Installed Capacities

Particulars	U.O.M	Values
Cane Crushed	TCD	13000
Alcohol Generation	KLPD	100
Power Generation	MW-H	29

Source: MM Analysis

9.3.4 Site Infrastructure

Established in 1932 with an installed capacity of 400 TCD which was increased in a phased manner to 13000 TCD. The status of the available plant and machinery at Gola unit is given below

9.3.4.1 Civil Infrastructure

The List of structures at the Gola plant and their respective areas are given in the table below:

Table 84: Civil Infrastructure

Structure	Area (in sq. mtr)
Sugar Godown	38851
Boiling House	2273
Mill House	2595
Drier and Bagging House	949
Raw Juice tank and Clarifier	458
Cane Carrier Shed	2993
Gunny Bag Godown	550

Source: BHSL &MM

- The area of cane yard is adequate to facilitate easy movement of the trucks and tractors coming into the plant to deliver the sugarcane.
- Adequate storage area for sugar and bagasse is available in the plant.
- The sugar storage area is sufficient to hold sugar for 151 days.
- The plant doesn't have any unutilised space therefore there is no opportunity for any future expansion
- The plant area also includes social infrastructure like quarters for employees, school etc.
- The plant area and the current infrastructure is adequate to operate the plant at full capacity
- MM Observation on overall plant facility

- Plant is situated in Central UP which accounts for only 30% of the sugarcane production of Uttar Pradesh. it is challenging to run plant to its full capacity at this region.

9.3.4.2 Plant Machinery

The Gola plant has two tandems(Lines) one of 8000 TCD and the other of 5000 TCD. Each tandem has 5 mills which are steam driven which results in optimum extraction of juice from sugarcane.

The status of the available plant and machinery at Gola unit is given in the table below:

Table85: Plant Machinery

Machineries	Number of Units	Manufacturer	Specifications
Cane Handling			
Cane unloader	4		Capacity- 5 MT each
Truck Tippler	2		Capacity- 40 MT
Steam generation Plant			
Boilers	1	Thermax	steam generating Capacity- 100 Ton/Hr.
	1	WIL	steam generating Capacity- 80 Ton/Hr.
	1	Lipi	steam generating Capacity- 70 Ton/Hr.
	1	Buckau Wolf	steam generating Capacity- 50 Ton/Hr.
Electric Generators	2	Kirloskar Cummins	Capacity- 630 KVA
	2	Kirloskar Cummins	Capacity- 330 KVA
		Kirloskar Cummins	Capacity- 1000 KVA
Power Turbines	1	Triveni	Capacity- 3000 KVA
	1	Triveni	Capacity- 2500 KVA
	1	Boveri	Capacity- 1.2 MW
	3	Triveni	3000 KW
	1	DLF	3000 KW
Sulphur Gas Plant	1	Utility	Capacity- 100 kg/hr. sulphur burning
	3	Utility	Capacity- 200 kg/hr. sulphur burning
	1	Utility	Capacity- 300 kg/hr. sulphur burning
Sugar Grader	4.		each having 6 decks & 25 Tons/Hr. sugar grading capacity

Source: BHSL

MM Observes that

- Majority of the core equipment like Mills, Boilers and Turbines have been supplied by market leaders like Thermax, Bukau Wolf, Triveni and Uttam.
- The mills are powered by steam driven turbines which is an outdated technology as in modern plants the rollers are DC driven which leads to better space utilisation, energy saving, smooth control, and operations.

- The steam which the company can save from using DC driven turbines can be used for cogeneration.
- The boiling pans are operated in batch process while in most of the other modern plants they are operated in continuous process which leads to consistent quality of the sugar and reduces the cycle time.
- The crushers and the cutters must go for reselling every 2-3 years which requires a capital expenditure of 7.5 lakhs/crusher.
- There are standby evaporators, clarifiers and preheaters which are used during scheduled maintenance to avoid any downtime
- Steam after production of power is utilised to in preheaters and is then condensed which is then used in the boilers.
- The technology used in the distillery is from Praj Industries.
- MM Observation on overall plant facility
 - Plant is situated in central UP which accounts for almost 30% of the sugarcane production of Uttar Pradesh. Hence plant will not face any problem with respect to sugarcane availability considering the normal monsoon.
 - Total power requirement of the plant is approx.473 Lakh KW which is fulfilled by captive power plant.

9.3.4.3 Manpower Details

Details of Manpower at Gola sugar plant is given below:

Table 86: Manpower Details- Gola Sugar plant

Sr. No.	Department	Nos
1	Store	11
2	Sugar Sales	25
3	Medical	3
4	Security	9
5	Legal	2
6	Internal Audit	2
7	Indirect Taxation	2
8	Horticulture	6
9	Finance & Accounts	12
10	EHS Head	1
11	EDP & IT	6
12	Director Office	4
13	Corp. Secretarial	1
14	General Office/Unit	1
15	HR & Administration	62
16	Cane	183
17	Lab	14
18	Engineering	284
19	Production	156
	Total	784

Source: BHSL

Details of manpower at Gola Distillery is given below:

Table 87: Manpower Details-Gola Distillery

Sr. No.	Department	Nos
10	ETP	15
14	General Office/Unit Head	1
15	HR & Administration Head	2
18	Engineering	12
19	Production	21
	Total	51

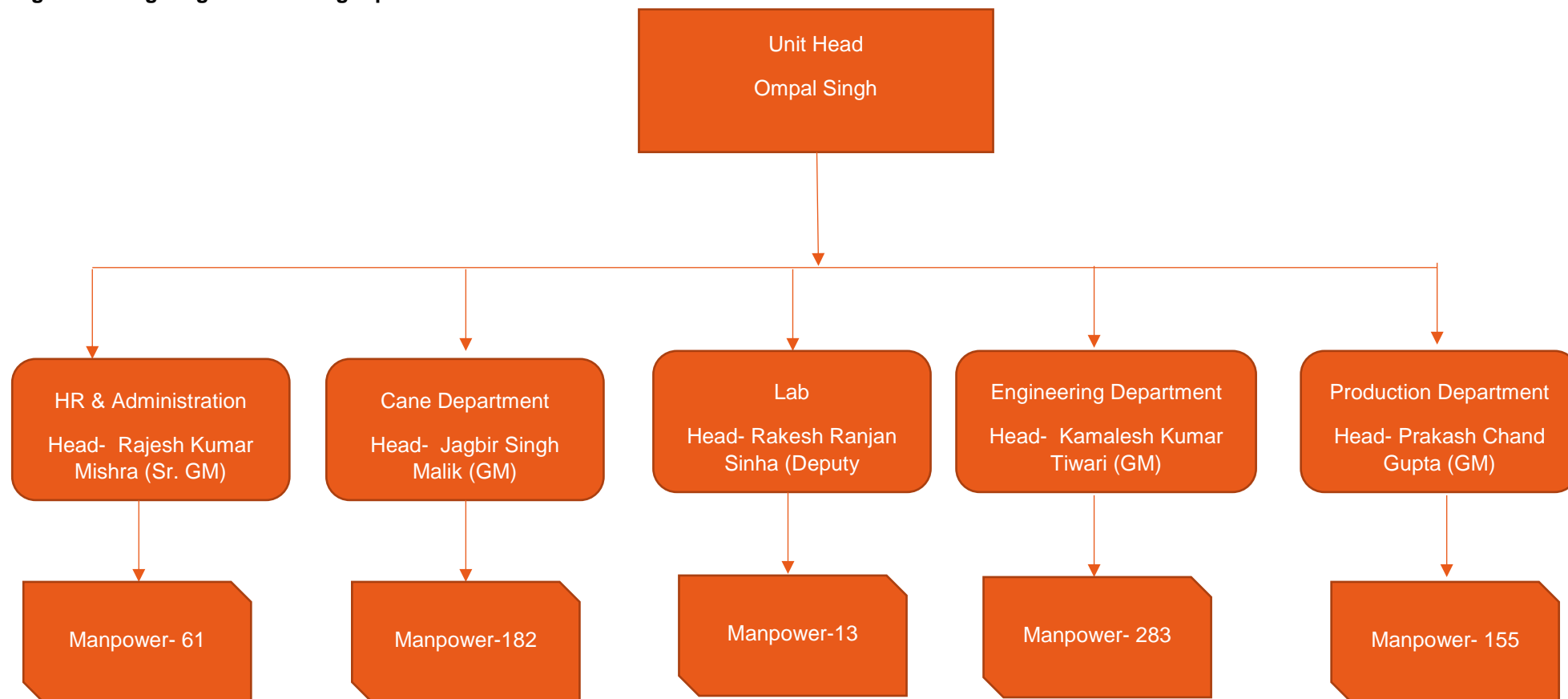
Source: BHSL

MM Observes that,

- The Gola plant is not automated hence the manpower deployed at the plant is higher than the its peers which are modern and where the entire process is controlled by programmable logical controls.
- There are 296 employees in the engineering department which are adequate to handle the entire sugar manufacturing and distilling processes.
- The manpower per lakh quintal of cane crushed for the plant is 4.72 employees and 0.32 employees per lac litre for the distillery
- The manpower deployed at the plant is in line with other plants having similar installed capacities.

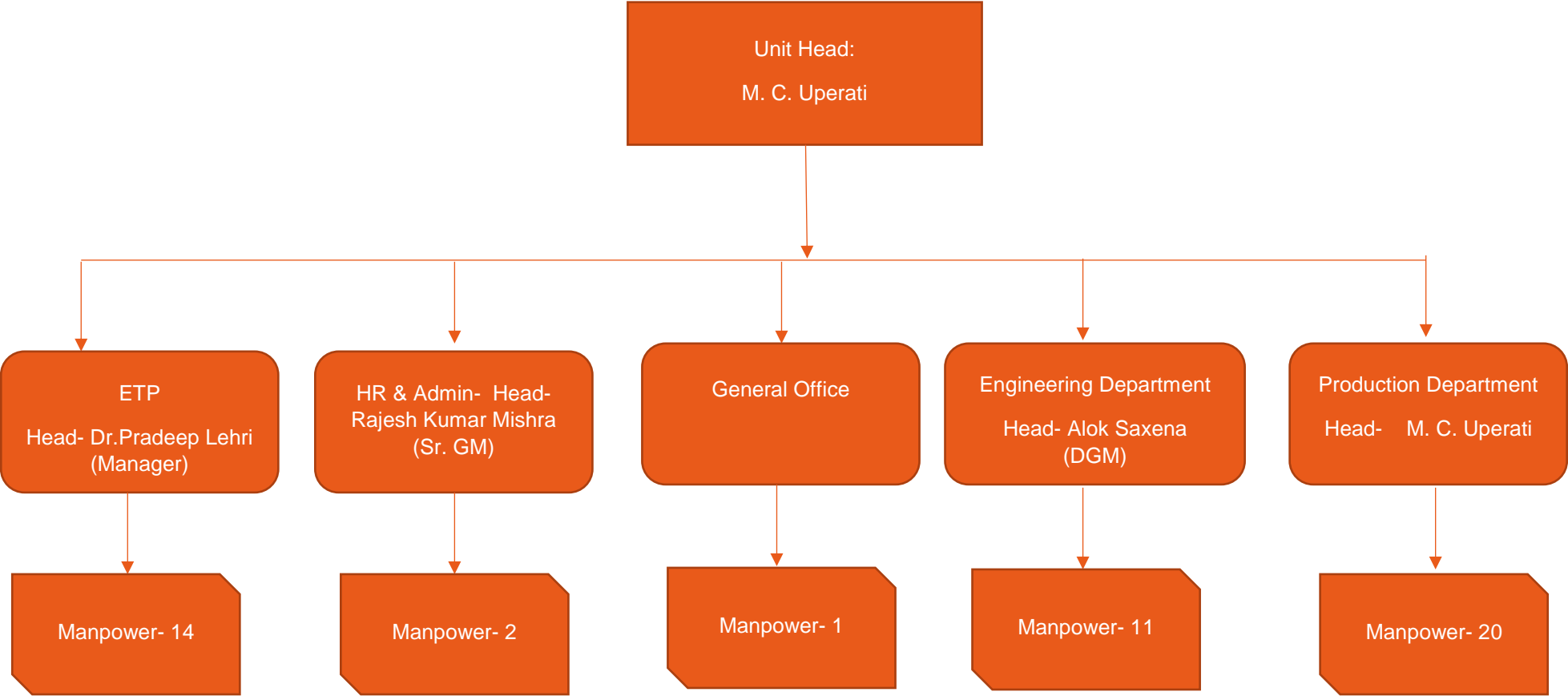
The Organogram of the Gola Sugar plant is depicted below:

Figure 55: Organogram-Gola Sugar plant



The Organogram of the Gola distillery is depicted below:

Figure 56: Organogram- Gola Distillery



Source: BHSL

9.3.4.4 Adequacy of Plant infrastructure and Manpower

The adequacy of area and manpower is given in the below table:

Table 88: Adequacy of Area and Manpower

Parameter	Value	Cane crushed Lakh qntl. (2016-17)	Value/Lakh qntl.of cane crushed
Plant Area	184 acres	181	1
Manpower	844	181	5

Source: MM Analysis

- The total plant area is 184 acres and the area per lakh quintal of cane crushed for the plant is 1acres which was found to be as per industry standards.
- It also includes social infrastructure such as Staff and worker's quarters school etc.
- The total manpower deployed at the plant is 844 and the manpower per lakh quintal of cane crushed for the plant is 5 employees which was found to be as per industry standards.

MM Observes that,

- The plant area and the current infrastructure is adequate to operate the plant at optimal capacity
- The Gola plant is not automated hence the manpower deployed at the plant is higher than the its peers which are modern and automated.

9.3.5 Production Details

The details of the last 5 years' cane crushed and recovery rates for Gola plant can be seen in following table

Table 89: Production Sugar

	U.O.M	2011-12	2012-14	2014-15	2015-16	2016-17
Cane Crushed	Lakh Quintals	170.53	289.61	136.93	139.01	166.17
Sugar Produced	Lakh Quintals	16.53	27.69	13.43	15.52	18.60
Capacity Utilization	%	82%	80%	66%	67%	80%
Recovery Rate	%	10%	10%	10%	11%	11%

Source: MM Analysis

The generation of Alcohol for 2015-16 and 2016-17 is given in the table below:

Table 90: Production Distillery

	U.O.M	2015-16	2016-17
Installed Capacity	KLPA	24000	24000
Alcohol Produced	KL	15666	15718
Utilization	%	65%	65%

Source: MM Analysis

The power generation for the years 2015-16 and 2016-17 is given in the below table:

Table 91: Production Power plant

	U.O.M	2015-16	2016-17
Installed Capacity	MW	29	29
Units Produced	MW-H	39866	47319
Utilization	%	42%	49%

Source: MM Analysis

MM observes that,

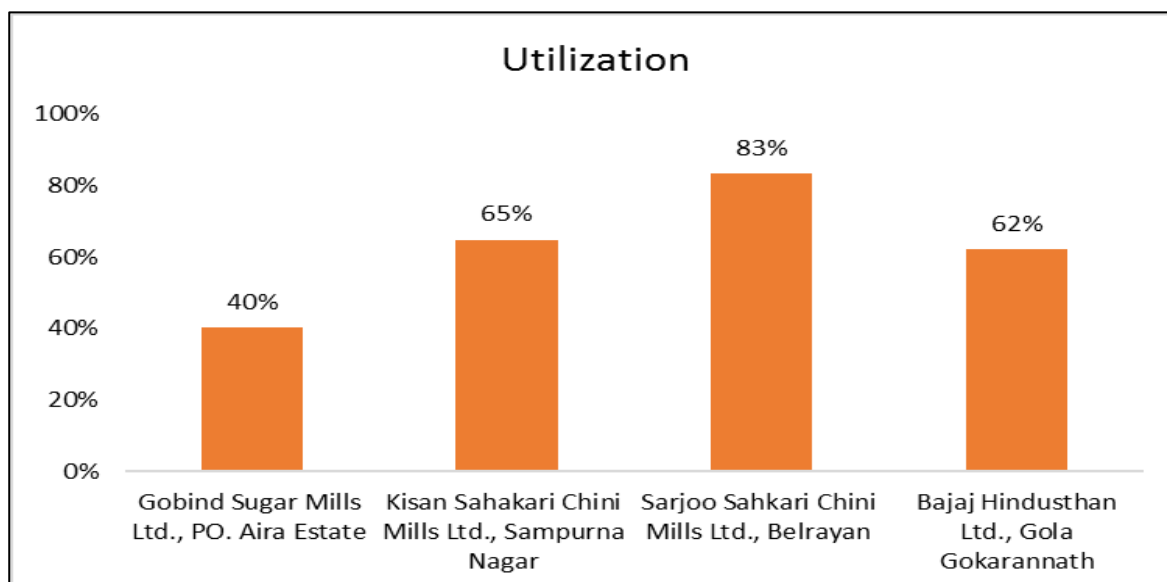
- Overall Capacity Utilization of the Gola is in the range of 67 to 82% since last 5 years and the average utilization of peers in same region is 63%
- Utilization dipped in year 2014-15 and 2015-16 due to low cane availability.
- The utilization of distillery is constant at 65%
- The utilization of power plant and distillery is dependent on sugar cane availability as bagasse and molasses which are by-products of sugar production are used as inputs for power plant and distillery. Therefore, when the sugar cane availability is less distilleries and power plant would be operational for lower number of days.
- Recovery rate of Gola plant is better than its peers operating in the same region.
- It should be noted that, even though capacity utilization of power plant was low there was no situation of power outage at the plant. This means this level of utilization is sufficient to fulfil power requirement of the plant.
- Depending upon the availability of cane we can say that when capacity utilization for sugar production is 80% distillery runs at 65%.
- The contribution of Gola plant in total sugar produced by the Bajaj group is the highest. Which is 16 % in 2016-17 season. The reason behind the same would be the higher availability of cane in nearby region.

9.3.6 Comparison with Peers

The Gola plant operates at central UP region. MM has analysed the data of other sugar mills operating in same area.

The comparison of plants in terms of utilisation in the same region is given below:

Figure 57: Utilization Comparison

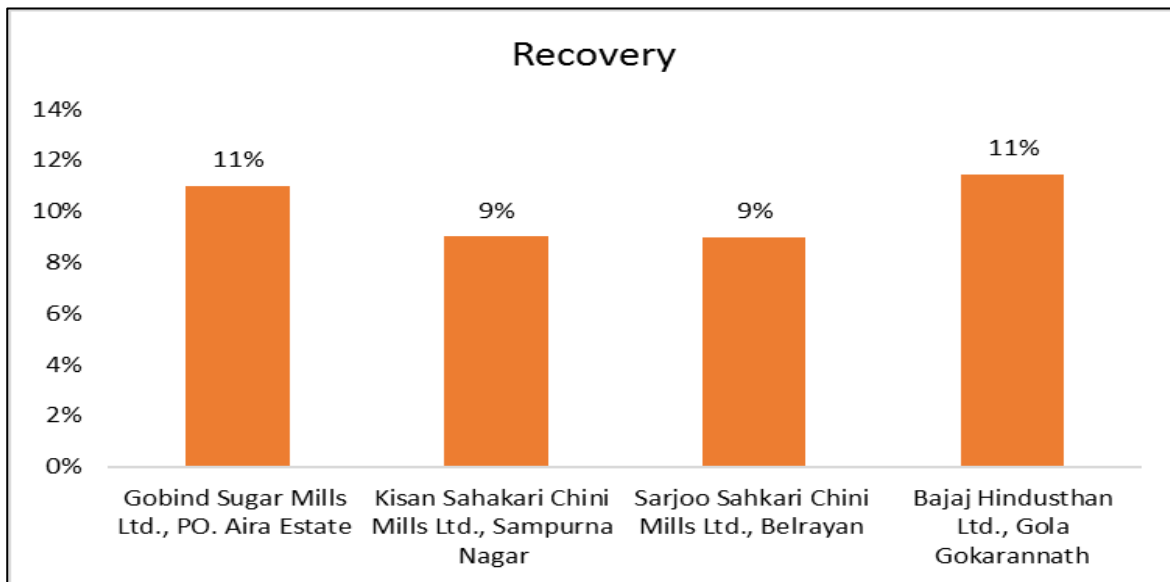


Source: MM Analysis

- The average capacity utilisation of peers operating in same region is 62.5%.
- The capacity utilisation of the Gola plant is at par with its peers in central UP.

The comparison of plants in terms of recovery in the same region is given below:

Figure 58: Recovery Comparison



Source: MM Analysis

- The average recovery rate of the plants in central UP peers operating in same region is 10%.
- The recovery rate of the Gola plant is more in comparison with its peers in central UP

9.3.7 Maintenance Philosophy

Following table denotes breakdown details for Gola plant for 2015-16 and 2016-17 season.

Table 92: List of breakdowns with root cause

Date	Breakdown	Action Taken	Rootcause
Season 2015-16			
3/12/2015	Breakdown at TBW boiler	Leaky Tube attended	Aging Factor
18/02/2016	WIL boiler out-let 02 nos.joint leakage	Repaired	Automation Malfunctioning
Season 2016-17			
1/1/2017	Lipi Boiler MBC side link	Replaced	Due to old & repaired chain
5/2/2017	MBC Chain derailed		Aging Factor
6/2/2017	MBC Chain derailed		Aging Factor
7/3/2017	TBW Boiler attended	Leaky Tube attended	Aging Factor
6/4/2017	MBC Chain derailed		Aging Factor

Source: BHSL

- An expert team from BHSL carries out scheduled maintenance in off season to save time in crushing season
- Repair & Maintenance budget received by the company during off season is Rs 3.34 per quintal which is adequate and varies in the range of Rs 3 to Rs 4 per quintal of cane crushed with some increment every year.

- MM believes the repair & maintenance cost is higher than its peers operating in same area which incur Rs 1.5 to 2.5 per quintal of cane crushed towards Repairs and Maintenance.
- Apart from the Repair & Maintenance budget the plant can avail for additional budget from head office in case of major works.
- During the season 2016-17 plant availed Rs 4 Crores as an additional budget from the head office. MM Observes that,
- The breakdowns during the Season 2015-16 and 2016-17 are very less due to proper scheduled maintenance carried out during off-season

9.3.8 Effluents from Plant

Details of the effluents from distillery are given below:

Table 93: ETP Outlet

Sr.no	Parameter	Results	Units	Limits as per CPCB norms
1	pH	7.65		5.0-9.0
2	Colour	Colourless		
3	Odour	Odourless		
4	Total Dissolved Solids	488	mg/l	
5	Total Suspended Solid	27	mg/l	100
6	Chemical Oxygen Demand	135	mg/l	250
7	Biological Oxygen Demand	21	mg/l	30
8	Oil & Grease	<1	mg/l	10

Source: Noida Testing Laboratories

- Consultants have reviewed the inspection reports of the Gola plant ETP outlet carried out by Noida Testing Laboratories and all the effluent parameters are within the limits given by Central Pollution Control Board(CPCB).
- Similarly test results of the stack emission are also in the limits given by CPCB.
- The effluents from the distillery are used to generate biogas in the effluent treatment plant
- Also, there is proposed capex plan for distillery units for compliance with PCB orders. Details of the same are given below.

The table below shows the mandatory capex towards effluent treatment by CPCB:

Table 94: Capex requirement

No	Machinery
1	On line monitoring system of Bore well
2	Spent wash generation
3	Process condensate
4	MEE inlet
5	Effluent consumption point
6	Camera feed system
7	Integration of flow meter
8	Total Cost Rs 15.8 Lakhs

Source: Client Data

9.3.9 Status of the statutory approvals

Table 95: statutory Approvals

Clearances sought	Gola
Environment Clearance MoEF	Not Produced to MM
Valid From (Date)	N/A
Valid Till (Date)	N/A
Water Usage	Renewal under process
Valid From (Date)	N/A
Valid Till (Date)	N/A
NOC from state pollution board	Air / Water
Valid From (Date)	01.01.2016
Valid Till (Date)	31.12.2017
Consent to operate	Air / Water
Valid From (Date)AIR/Water	01.01.2016
Valid Till (Date)	31.12.2017
CIB certification for boiler	
Valid From (Date)	30.09.16
Valid Till (Date)	28.08.17
Approval of fire protection scheme	Fire N.O.C.
Valid From (Date)	01.01.2017
Valid Till (Date)	31.12.2017
Panchayat/Municipal corporation Approval	
Valid From (Date)	01.04.2017
Valid Till (Date)	31.03.2018

Source: MM Analysis

MM observes that

- Environmental Clearance has not been provided by the company hence there is need to seek the clarification on this issue
- Consent to operate and NOC from pollution board would expire at the end of year 2017 while approval for water usage is under renewal process
- CIB certification of boiler will be due for renewal in August 17.

9.4 Palia Plant

9.4.1 Plant Details

Details of the Palia manufacturing facility are given below.

Table 96: Plant Details

Sr. No.	Particulars	Description
1	Location	Palia Kalan - Sugar Unit P.O.: Palia Kalan - 262902
2	Land Area	173 Acres
3	Manufacturing facility	Cane Crushing, Distillery, and Power generation (Captive)

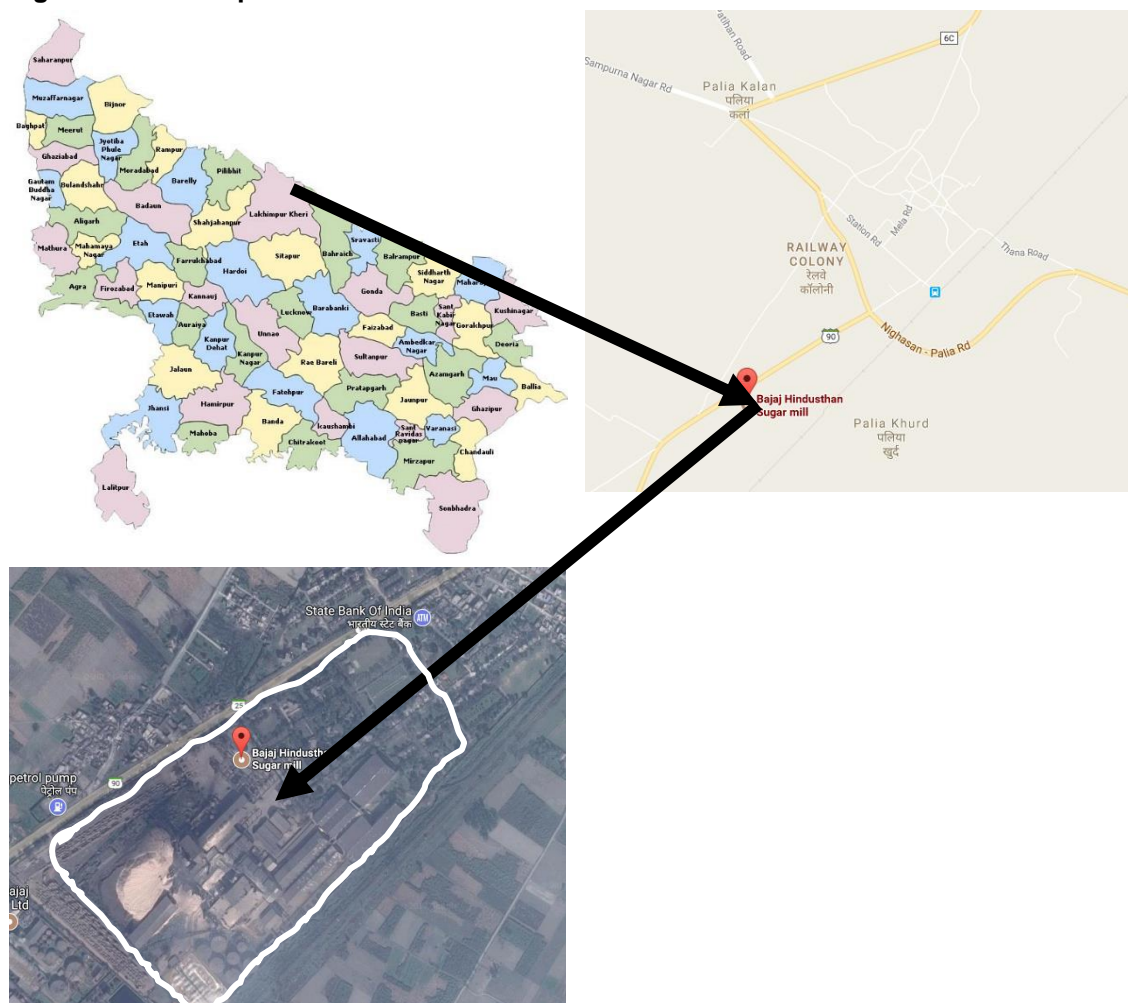
Source: MM Site Visit

9.4.2 Location Analysis

The location of the plant is strategic considering the availability of sugarcane. Plant is situated in Central UP which accounts for almost 30% of the sugarcane production of Uttar Pradesh.

The location of the plant is depicted in the figure below:

Figure 59: Site Map



The plant is situated near Palia Kalan village in Kheri district, Uttar Pradesh. Accessibility and connectivity details of Palia plant are given in following table.

Table 97: Site Accessibility

Connectivity	Description	Distance
Nearest City	Palia Kalan	1 Km
Nearest highway	NH730	1 Km
Nearest Station	Palia Kalan railway station.	1.3 Km
Nearest Airport	Chaudhary Charan singh International Airport Terminal, Amausi, Lucknow, Uttar Pradesh	259 Km

9.4.3 Plant Configuration

The Palia plant has facility of Sugar Production Distillery and Power generation. The power plant runs on the bagasse generated in sugar crushing while Alcohol is manufactured from the molasses generated in sugar manufacturing. The Installed capacities for the all the facilities is given in following table.

Table 98: Installed Capacities

Particulars	U.O.M	Values
Cane Crushed	TCD	11000
Alcohol Generation	KLPD	60
Power Generation	MW-H	43

Source: MM Analysis

9.4.4 Site Infrastructure

The Palia plant was established in 1971 with an installed capacity of 1400 TCD which was increased in a phased manner to 11000 TCD with the latest expansion from 7500 TCD to 11000 TCD in 2003-04

9.4.4.1 Civil Infrastructure

The List of structures at the Palia plant and their respective areas are given in the table below:

Table 99: Buildings and Structure

Sr. No.	Building Name	Area	Type of structure	Year of Construction
1	Mill House	4164	MS Structure / Tin Shed	1993-94
2	Evaporation House	1152	MS Structure / Tin Shed	1993-94
3	Pan House	3478	MS Structure / Tin Shed	1993-94
4	Sugar House / Drier House	1729	MS Structure / Tin Shed	1993-94
5	Clarification House	1728	MS Structure / Tin Shed	1993-94
6	Feed Water Tank	300	Open to Sky	1993-94
7	Power House	1475	MS Structure / Tin Shed	1993-94
8	Return Baggage Carrier	330	Open to Sky	1993-94
9	Cooling Tower	1088	Open to Sky	2005-06
10	Molasses Tank (% nos)	3488.94	Open to Sky	2006-07
11	Pump for cooling Tower	267	Open to Sky	2005-06
12	E.T.P	15760	Open to Sky	1988-89
13	Store Shed/ Godown	974	Tin Shed	1990-91
14	Bagasse Yard	18227	Open to Sky	
15	Sugar Godown	18817.83	Tin Shed	
16	Boiler Section			
a	Boiler No.1 & 11	1380	MS Structure / Tin Shed	
b	Boiler No. 8	1117.60	MS Structure / Tin Shed	1993-94
c	Boiler No.9	1117.60	Open to Sky	1994-95
d	Boiler No.10	830.70	Open to Sky	1996-97
17	Lime & Sulphur Godown	421.4	RCC & Tin Shed	1995-96

Source: BHSL

- The area of cane yard is adequate to facilitate easy movement of the trucks and tractors coming into the plant to deliver the sugarcane.
- Adequate storage area for sugar and bagasse is available in the plant.
- The sugar storage area is sufficient to hold sugar for 86 days.
- The plant doesn't have any unutilised space therefore there is no opportunity for any future expansion
- The plant area also includes social infrastructure like quarters for employees, school etc.
- The plant area and the current infrastructure is adequate to operate the plant at full capacity.
- MM Observation on overall plant facility
 - Plant is situated in Central UP which accounts for only 30% of the sugarcane production of Uttar Pradesh. it is challenging to run plant to its full capacity at this region.

9.4.4.2 Plant Machinery

The Palia plant has only one tandem(Line) of 11000 TCD. Tandem has 5 rollers which leads to optimum extraction of sugar juice from sugarcane.

The status of the available plant and machinery at Palia unit is given in the table below:

Table 100: Plant Machinery

Machineries	Number of Units	Specifications
Juice Sulphiters	1 no with 5.8 dia	Capacity - 700 HL
	1 no with 5.4 dia	Capacity - 583 HL
Sulphur Gas Plant	2 no.	sulphur furnace of Palia design of 200 kg/hr sulphur burning capacity each for juice
	1 no.	Kapil makes sulphur furnace of 150 kg/hr sulphur burning capacity each for syrup
	1 no.	local design sulphur furnace of capacity 150 kg/hr for syrup.
	1 no.	Film type Furnace of capacity 300 kg/hr
	1 no.	Local design S.furnace of capacity 7m2 T.A.

Source: BHSL

MM Observes that

- Majority of the core equipment like Mills, Boilers and Turbines have been supplied by market leaders like Thermax, Bukau Wolf, Triveni and Uttam.
- The mills are powered by steam driven turbines which is an outdated technology as in modern plants the rollers are DC driven which leads to better space utilisation, energy saving, smooth control, and operations.
- Steam which the company can save from using DC driven turbines can be used for cogeneration.
- Boilers and other plant machinery are from reputed manufacturers which are among the best in their field.
- The boiling pans are operated in batch process while in most of the other modern plants they are operated in continuous process which leads to consistent quality of the sugar and reduces the cycle time.
- The crushers and the cutters must go for reselling every 2-3 years which requires a capital expenditure of 7.5 lakhs/crusher.
- There are standby evaporators, clarifiers and preheaters which are used during scheduled maintenance to avoid any downtime
- Steam after production of power is utilised to in preheaters and is then condensed which is then used in the boilers.

- The technology used in the distillery is from Praj Industries.
- MM Observation on overall plant facility
 - Plant is situated in Central UP which accounts for almost 30% of the sugarcane production of Uttar Pradesh. Hence plant will not face any problem with respect to RM availability considering the normal monsoon.
 - Total power requirement of the plant is approx.445 Lakh KW which is fulfilled by captive power plant while additional power generated is exported to state grid.
 - In year 2016-17 191 Lakh KW power was exported to the state grid.

9.4.4.3 Manpower Details

Manpower Details of the Palia Sugar plant is given in the table below:

Table 101: Manpower Details-Palia Sugar plant

Sr. No.	Department	Nos
1	Corp. Affairs/Communication	1
2	Medical	1
3	General Office	2
4	EHS Head	5
5	Security	2
6	CIT Head	1
7	Legal Head	1
8	Horticulture	1
9	Internal Audit Head	1
10	Store	9
11	Sales	36
12	F&A Head	9
13	EDP & IT	7
14	HR & Admn	14
15	Cane	111
16	Lab	8
17	Engineering	236
18	Production	141
	Total	586

Source: BHSL

Manpower Details of the Palia Distillery is given in the table below:

Table 102: Manpower Details- Palia Distillery

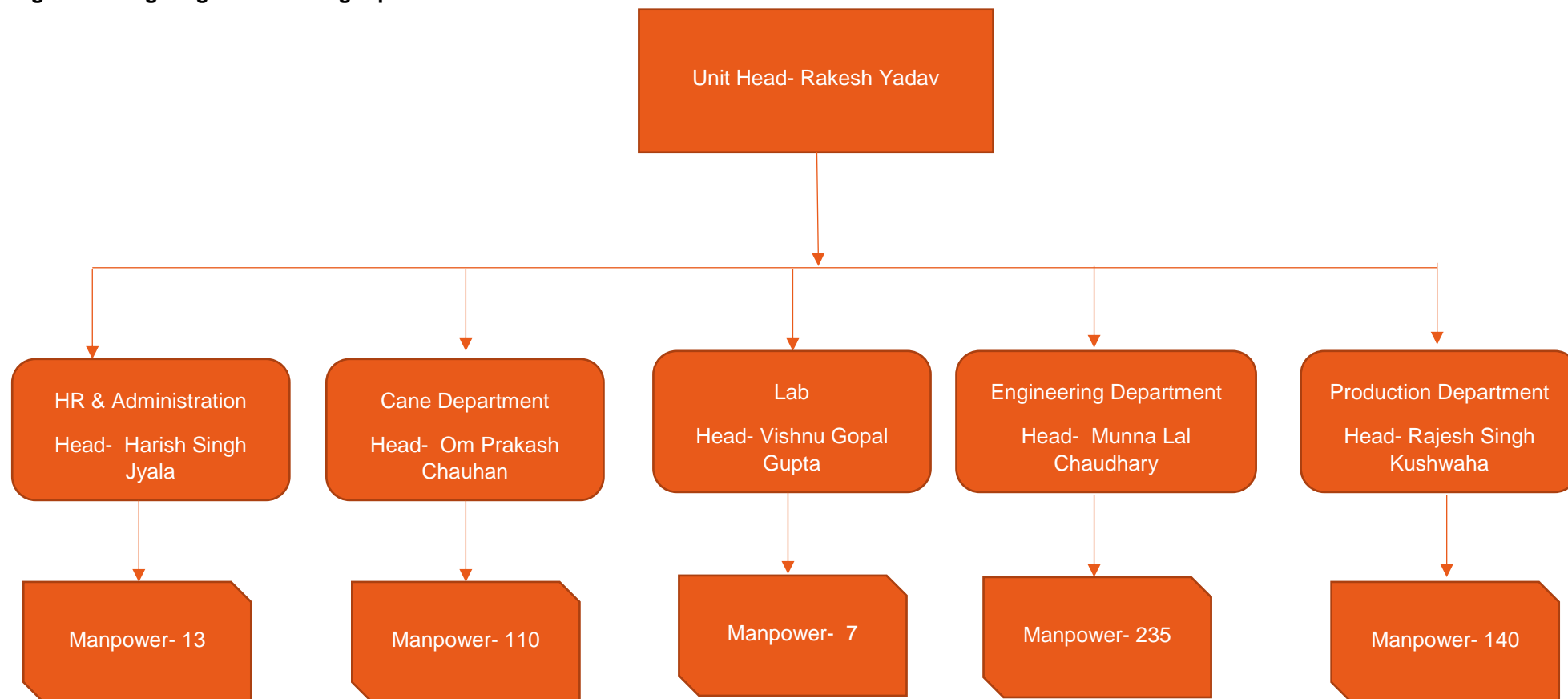
Sr. No.	Department	Nos
1	Commercial	4
2	ETP Head	8
3	General Office/Unit	1
4	HR & Administration	1
5	Engineering	11
6	Production	22
	Total	47

Source: BHSL

- The Palia plant is state of the art with automated controls hence the manpower requirement at this plant is lesser than some of the older plants like Gola.
- The total manpower deployed at the plant is 586, with 236 in the engineering department which is adequate to operate the plant at its full capacity.
- The manpower per lakh quintal of cane crushed for the plant is 4.74 employees and 0.41 employees per lac litre for the distillery.

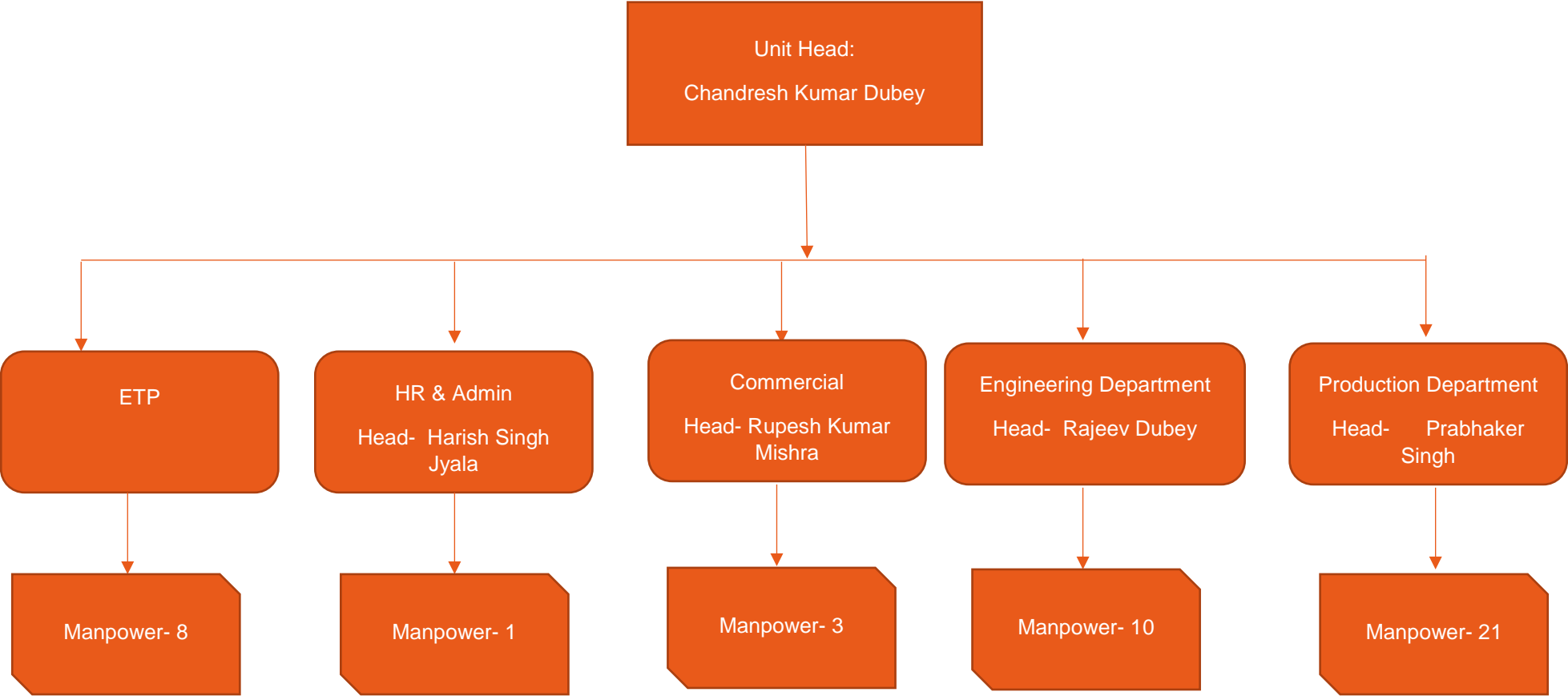
The Organogram of the Palia Sugar plant is depicted below:

Figure 60: Organogram-Palia Sugar plant



The Organogram of the Palia Distillery is depicted below:

Figure 61: Organogram- Palia Distillery



Source: BHSL

9.4.4.4 Adequacy of Plant infrastructure and Manpower

The adequacy of area and manpower is given in the below table:

Table 103: Adequacy of Area and Manpower

Parameter	Value	Cane crushing Lakh Qntl. (2016-17)	Ratio
Plant Area	173 acres	123	1.4
Manpower	586	123	5

Source: MM Analysis

- The total plant area is 173 acres and the area per TCD for the plant is 1.4acres/Lakh Quintals cane crushed.
- The total manpower deployed at the plant is 586 and the manpower per Lakh quintals of sugar produced for the plant is 5 employee/Lakh Qntls of cane crushed
- The plant area and the current infrastructure is adequate to operate the plant at optimal capacity
- The Palia plant is not automated hence the manpower deployed at the plant is higher than the its peers which are modern and where the entire process is controlled by programmable logical controls.

9.4.5 Production Details

The details of the last 5 years' cane crushed and recovery rates for Palia plant can be seen in following table

Table 104: Production Sugar

	U.O.M	2011-12	2012-14	2014-15	2015-16	2016-17
Cane Crushed	Lakh Quintals	143.84	226.25	115.27	108.07	123.75
Sugar Produced	Lakh Quintals	13.05	20.06	10.32	10.61	11.87
Capacity Utilization	%	82%	80%	65%	61%	70%
Recovery Rate	%	9%	9%	9%	10%	10%

Source: MM Analysis

The generation of Alcohol for 2015-16 and 2016-17 is given in the table below:

Table 105: Production Distillery

	U.O.M	2015-16	2016-17
Installed Capacity	KLPA	14400	14400
Alcohol Produced	KL	11250	11378
Utilization	%	78%	79%

Source: MM Analysis

The power generation for the years 2015-16 and 2016-17 is given in the below table:

Table106: Production Power plant

	U.O.M	2015-16	2016-17
Installed Capacity	MW	43	43
Units Produced	MW-H	65178	63579

	U.O.M	2015-16	2016-17
Utilization	%	46%	45%

Source: MM Analysis

MM observes that,

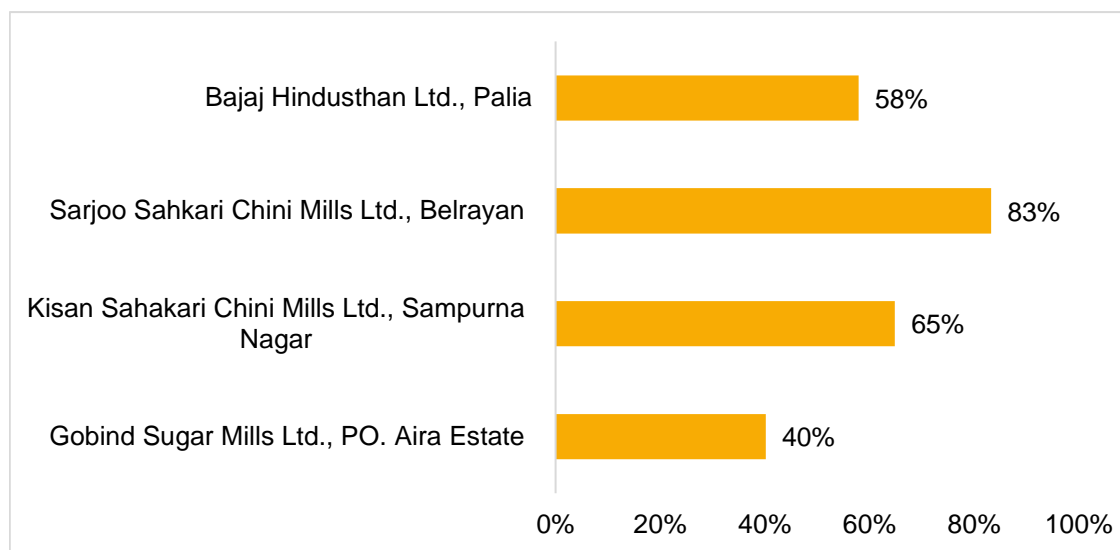
- Overall Capacity Utilization is in the range of 61 to 82% since last 5 years and the average utilization of peers in same region is 63%
- Utilization dipped in year 2014-15 and 2015-16 due to low cane availability.
- The utilization of distillery is constant at 78-79% since last 2 years
- The utilization of power plant and distillery is dependent on sugar cane availability as bagasse and molasses which are by-products of sugar production are used as inputs for power plant and distillery. Therefore, when the sugar cane availability is less distilleries and power plant would be operational for lower number of days.
- Recovery rate of Palia plant is in line with its peers operating in same district but lesser than Bajaj's another plant at Gola.
- It should be noted that, even though capacity utilization of power plant was low there was no situation of power outage at the plant and excess power was exported to the state grid. This means this level of utilization is sufficient to fulfil power requirement of the plant.
- Although further increase in utilization would mean better sales realization via power exported to the grid.
- The contribution of Palia plant in total sugar produced by the Bajaj group is 10 % in 2016-17 season which is among the highest ones.

9.4.6 Comparison with Peers

The Palia plant operates at central UP region. MM has analysed the data of other sugar mills operating in same area.

The comparison of plants in terms of utilisation in the same region is given below:

Figure62: Utilization Comparison

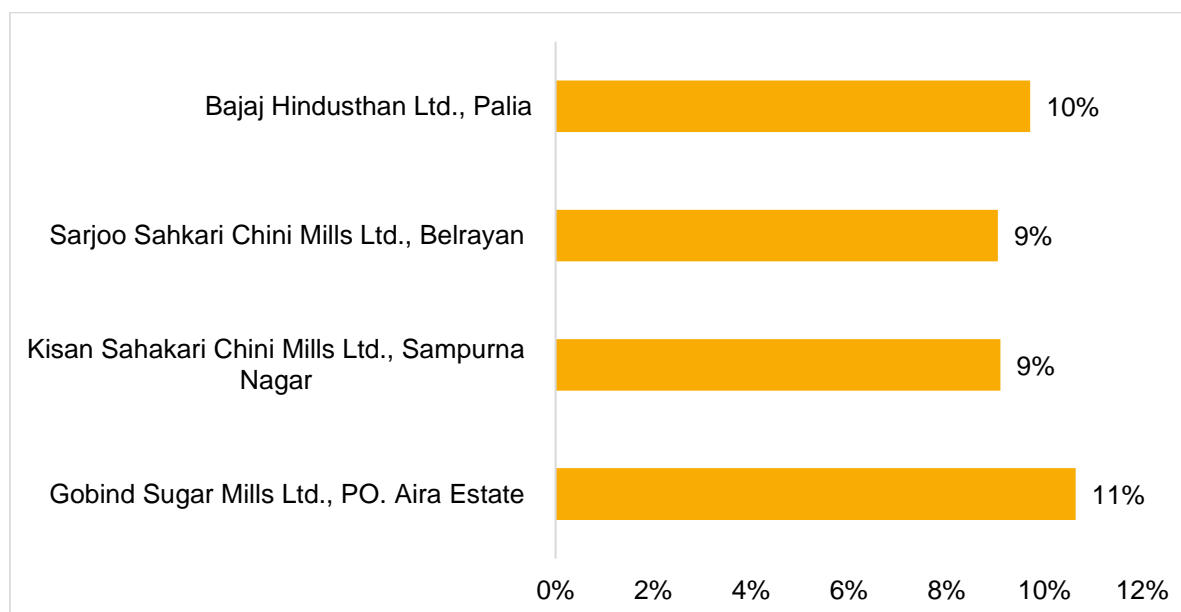


Source: MM Analysis

- The average capacity utilisation of peers operating in same region is 61.5%.
- The capacity utilisation of the Palia plant is lower compared to its peers in central UP.

The comparison of plants in terms of recovery in the same region is given below:

Figure63: Recovery Comparison



Source: MM Analysis

- The average recovery rate of peers operating in same region is 9.75%.

- The recovery rate of the Palia plant is more in comparison with its peers in central UP

9.4.7 Maintenance Philosophy

- Repair & Maintenance budget received by the company during off season is in the range of Rs 3 to Rs 4 per quintal of cane crushed with some increment every year.
- MM believes the repair & maintenance cost is higher than its peers operating in same area which incur Rs 1.5 to 2.5 per quintal of cane crushed towards Repairs and Maintenance.
- Apart from the Repair & Maintenance budget the plant can avail for additional budget from head office in case of major works.
- During the season 2016-17 plant availed Rs 2.4 Crores as an additional budget from the head office.

9.4.8 Effluent from Plant

- Consultants have reviewed the inspection reports of the Palia plant ETP outlet carried out by Noida Testing Laboratories and all the effluent parameters are within the limits given by Central Pollution Control Board(CPCB).
- Similarly test results of the stack emission are also in the limits given by CPCB.
- The effluents from the distillery is used to generate biogas in the effluent treatment plant
- Also, there is proposed capex plan for distillery units for compliance with PCB orders. Details of the same are given below.

9.4.9 Status of the statutory approvals

Table 107: Status of Statutory approvals

Sr. No	Clearances sought	Palia Kalan
1	Environment Clearance MoEF	One time
	Valid From (Date)	02.04.2004
	Valid Till (Date)	N/A
2	Water Usage	Under Process
	Valid From (Date)	09.03.2004
	Valid Till (Date)	Renewal under process
3	NOC from state pollution board	Air / Water
	Valid From (Date)	01.01.2016
	Valid Till (Date)	31.12.2017
4	Consent to operate	Air / Water
	Valid From (Date)AIR/Water	01.01.2016
	Valid Till (Date)	31.12.2017
5	CIB certification for boiler	
	Valid From (Date)	30.09.2016
	Valid Till (Date)	28.08.2017
6	Approval of fire protection scheme	Fire Noc
	Valid From (Date)	30.12.2016
	Valid Till (Date)	31.12.2017
7	Panchayat/Municipal corporation Approval	For Period of Payment
	Valid From (Date)	01.04.2016
	Valid Till (Date)	31.03.2017

Source: BHSL

- Consent to operate and NOC from pollution board would expire at the end of year 2017 while approval for water usage is under renewal process
- CIB certification of boiler will be due for renewal in August 17.

9.5 Utraula Plant

9.5.1 Plant Details

Details of the Utraula manufacturing facility are given below.

Table 108: Plant Details

Sr. No.	Particulars	Description
1	Location	Balrampur District Utraula - Sugar Unit Itai Maida, Utraula Sri Duttganj - 271607
2	Land Area	161.70 Acres
3	Manufacturing facility	Cane Crushing, and Power generation (Cogeneration)

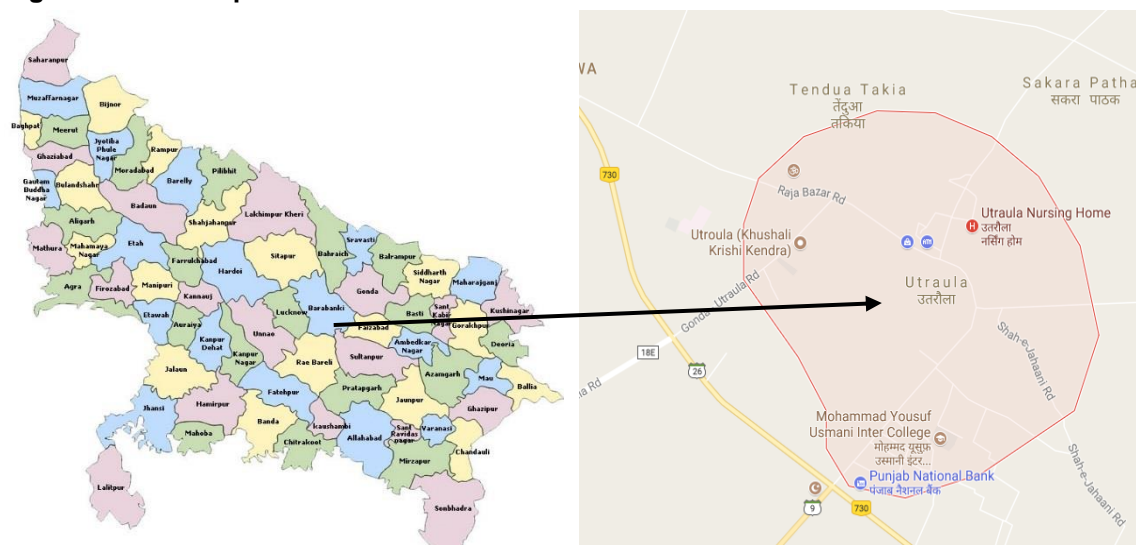
Source: MM Site Visit

9.5.2 Location Analysis

Plant is located at district Balrampur in Eastern UP. The eastern part of the UP is cane deficit area. It accounts for only 18% of area under sugarcane cultivation in UP. Hence MM believes that it will be difficult for the plant to run at its full capacity in near future.

The location of the plant is depicted in the figure below:

Figure 64: Site Map



Source: Google Maps

Accessibility and connectivity details of Utraula plant are given in following table.

Table 109: Site Accessibility

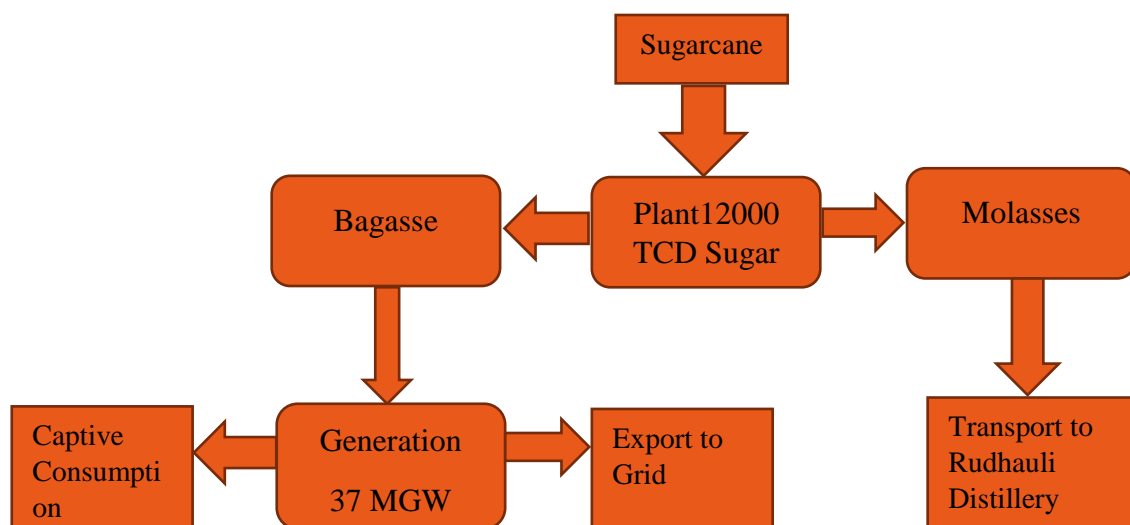
Connectivity	Description	Distance
Nearest Major City	Balrampur	33km
Nearest highway	NH 730	11km
Nearest Station	Balrampur Railway Station.	21km
	Lucknow Jn	174km
Nearest Airport	Chaudhary Charan singh International Airport Terminal, Amausi, Lucknow, Uttar Pradesh	185km

Source: Google Maps

9.5.3 Plant Configuration

The Utraula plant has facility of Sugar Production and Co-generation. The power plant runs on the bagasse generated in sugar crushing. A part of the power generated is used for captive consumption while the residual power is exported to the grid. Molasses produced during sugar production is transported to the Rudhauri distillery to manufacture Alcohol. The plant configuration is described in the below figure:

Figure 65: Plant Configuration



Source: MM Analysis

9.5.4 Site Infrastructure

The Utraula plant was established in 2007 with an installed capacity of 12000TCD.

9.5.4.1 Civil Infrastructure

The List of structures at the Utraula plant and their respective areas are given in the table below:

Table 110: Civil Infrastructure

Sr.no	Structure	Area (Sqm)
1	Mill House	4830
2	Evaporation House	2145
3	Pan House	4075
4	Sugar House	1732
5	Clarification House	2709
6	Feed Water Tank	1560
7	Power House	1480.5
8	Return Baggage Carrier	377.5
9	Cooling Tower	1449
10	Molasses Tank (% nos)	3532.5
11	Pump for cooling Tower	230
12	E.T.P	4225
13	Store Godown	972
14	Bagasse Yard	42500
15	Boiler Section	5100
16	Lime & Sulphur Godown	432
17	Press Mud Yard	405
18	D.M Plant	315
19	Sugar Godown	11880
20	Sub Station	24892
21	Cane Yard Area	21002.85
22	Raw Material Storage	42928
23	Lab & Technical Office	210
	Total	178982.4

Source: BHSL

- There is 11 acres of unutilised space at the southwest corner of the plant.
- This unutilised space can be used for future expansions or can be monetised if required.
- The area of cane yard is adequate to facilitate easy movement of the trucks and tractors coming into the plant to deliver the sugarcane.
- Adequate storage area for sugar and bagasse is available in the plant.
- The sugar storage area is sufficient to hold sugar for 50 days.
- There are 6 Mills in the Utraula plant unlike other plants which have 5 mills due to which the area of the mill house is greater than other plants.
- The plant area also includes social infrastructure like quarters for employees, school etc.
- The plant area and the current infrastructure is adequate to operate the plant at full capacity.

9.5.4.2 Plant Machinery

The Utraula plant has only one tandem (Line) of 12000 TCD. Tandem has 6 rollers which leads to optimum extraction of sugar juice from sugarcane.

The List of Machineries at the Utraula plant is provided in the below mentioned table:

Table 111: Plant Machinery

Machineries	Number of Units	Manufacturer	Specifications
Cane Handling			
Cane unloader			
Truck Tippler	1 no.	Shree Enterprises	Capacity- 60 T
Steam generation Plant			
Boilers		IJT	Capacity- 90*3 TPH
Electric Generators	2 no.	Cummins	Capacity- 320 kva
	2 no.	Cummins	Capacity- 500 kva
	2 no.	Cummins	Capacity- 1500 kva

Source: BHSL

MM Observes that

- Majority of the core equipment like Mills, Boilers and Turbines have been supplied by market leaders like IJT, Cummins, Triveni and Shree Enterprises
- There has been no major capital refurbishment from the time the plant was established in 2007.
- The entire plant is automated and is centrally controlled.
- The mills are DC driven which leads to optimum utilisation of plant area.
- The crushers and the cutters must go for reshelling every 2-3 years which requires a capital expenditure of 7.5 lakhs/crusher.
- The boiling pans are operated in batch process while in most of the other modern plants they are operated in continuous process which leads to consistent quality of the sugar and reduces the cycle time.
- There are standby evaporators, clarifiers and preheaters which are used during scheduled maintenance to avoid any downtime
- The boilers installed at the plant can generate steam of 45kg/m² but most of the boilers installed in modern plants can generate steam up to 110kg/m².
- Boilers which can generate high pressure steam involve higher capital expenditure but are more efficient in terms of amount of steam required to generate 1 MGW of power.
- Steam after production of power is utilised to in preheaters and is then condensed which is then used in the boilers.
- Plant is situated in Eastern UP which accounts for only 18% of the sugarcane production of Uttar Pradesh therefore it is challenging to run the plant at its full capacity in this region.

9.5.4.3 Manpower

The total manpower deployed at the Utraula plant is given the below table:

Table 112: Manpower

Sr.no	Department	Unit Total
1	Cane	99
2	Corp Communication	0
3	EDP & IT	5
4	EHS	1
5	Engineering	144
6	F&A	6
7	General Office	2

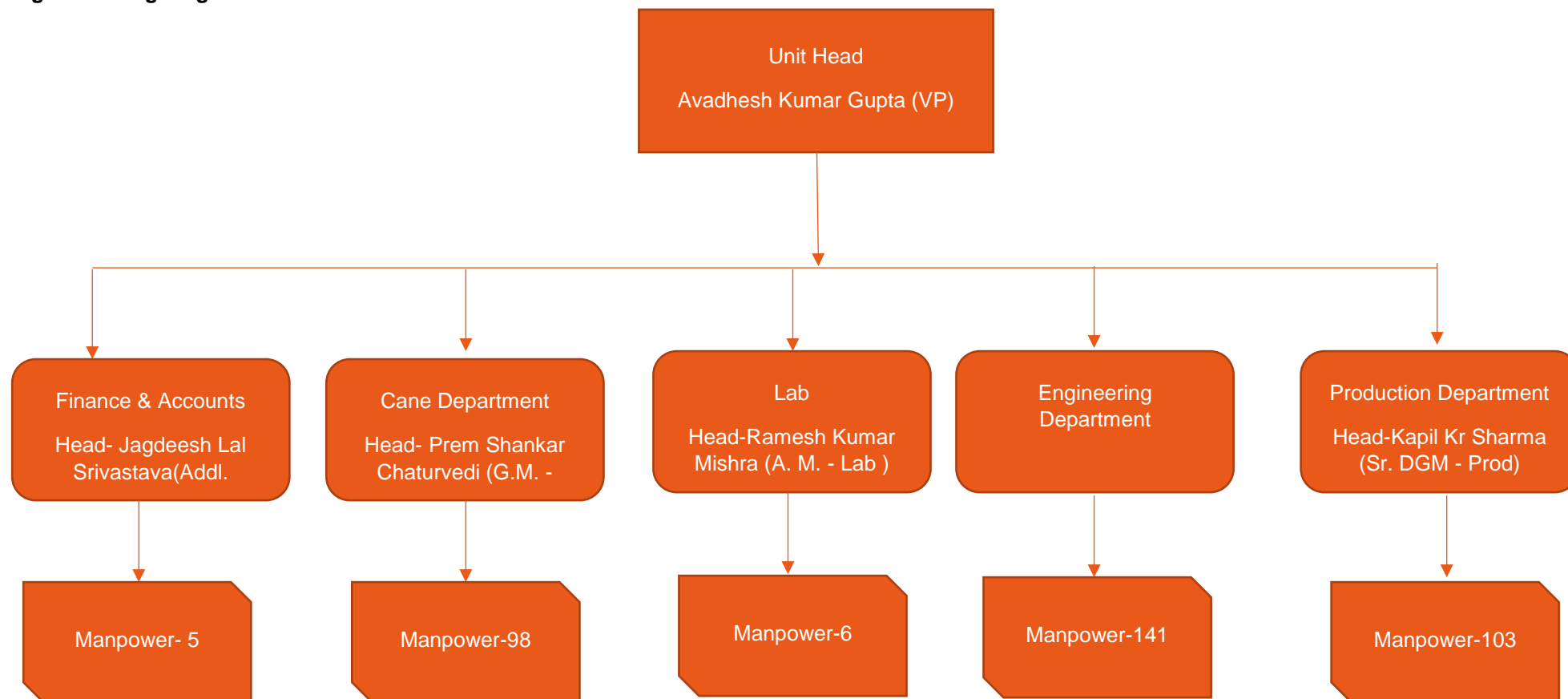
Sr.no	Department	Unit Total
8	Horticulture	1
9	HR/Prsl & Time Office	5
10	Indirect Taxation	1
11	Internal Audit	0
12	Laboratory	7
13	Legal	1
14	Medical	2
15	Production	106
16	Security	2
17	Stores	6
18	Sugar Sales	10
	Total	398

Source: BHSL

MM Observes that

- The plant is automated therefore has less manpower requirement compared to other plants which aren't automated.
- Out of 398, 247 are seasonal workers which are employed only in the crushing season between November-March.
- There are 106 employees in the production department which are adequate to handle the entire sugar manufacturing process.
- The manpower per lakh quintal of cane crushed for the plant is 7.16 employees
- The manpower deployed at the plant is in line with other plants having similar installed capacities.

Figure 66: Organogram- Utraula



Source: BHSL

9.5.5 Production Details

The details of the last 5 years' cane crushed and recovery rates for Utraula plant can be seen in following table

Table 113: Production details- Sugar

	U.O.M	2011-12	2012-14	2014-15	2015-16	2016-17
Cane Crushed	Lakh Quintals	57.40	144.73	62.71	45.49	55.55
Sugar Produced	Lakh Quintals	5.58	13.48	5.87	4.80	5.24
Capacity Utilization	%	30%	32%	33%	24%	29%
Recovery Rate	%	10%	9%	9%	11%	9%

Source: BHSL

The power generation for the years 2015-16 and 2016-17 is given in the below table:

Table 114: Power Generation

	U.O.M	2015-16	2016-17
Installed Capacity	MW	37	37
Units Produced	MW-H	46164	49853
Utilization	%	38%	41%

Source: BHSL

MM Observes that

- There was a sharp decline in the sugar production in 2014-15 which was mainly due the low cane availability in eastern Uttar Pradesh.
- The capacity utilisation of the Utraula plant is in the range of 24% to 33% since last 5 years.
- The plant has undertaken many cane development activities to improve the cane production in the area which will in turn increase the plants operational performance.
- One of the primary reasons for low capacity utilisation of the plant is high installed capacity of 12000TCD set up by the company in a cane deficit area in 2007.
- The recovery of the plant is 9% which has remained constant y-o-y.
- The generation of power depends on sugar production as bagasse which is a by-product produced when sugarcane is crushed which is in turn used as a fuel in boilers.
- Therefore, the generation of power also saw a decline in 2015-16
- There was a slight increase in the power generation in 2016-17 as the total cane crushed improved.
- The contribution of Utraula plant in total sugar produced by the Bajaj group is only 4% during 2016-17 due to unavailability of cane in eastern UP.

9.5.6 Comparison with Peers

The comparison of plants in terms of utilisation and recovery in the same region is given below:

Table 115: Comparison with peers

Sr. no	Plant	Status	Capacity TCD	Recovery	Cane Crushed Lakh MT	TCA	Utilization
1	Govind nagar sugar Walterganj Uttar Pradesh	Running	6000	8.60%	1.34	960000	14%
2	New India Sugar Mills Ltd (Unit- The Oudh Sugar Mills Ltd.), Vill. Dhadha Bujurg, Uttar Pradesh	Working	8000	9.36%	5.92	1280000	46%
3	Indian Potash Ltd., Raja Bazar, Uttar Pradesh	Working	1600	9.44%	1.83	256000	71%
4	Shankara Sharkara Sankul (A Unit of The Kanoria Sugar General Manufacturing Co. Ltd.), Kushinagar, Uttar Pradesh	Working	6000	9.71%	3.53	960000	37%
5	Triveni Engineering and Industries Ltd., Kushinagar, Uttar Pradesh	Working	6500	11.21%	6.91	1040000	66%
6	The United Provinces Sugar Co. Ltd, Kushinagar, Uttar Pradesh	Working	6500	9.60%	5.95	1040000	57%

Source: MM Analysis

- The capacity utilisation of the Utraula plant is in the range of 24% to 33% while the average capacity utilisation of its peers in eastern UP is more than 49%.
- The recovery of the plant is 9% which is less than its peers in eastern UP who have a recovery rate of about 9.36% to 11.21%.

9.5.7 Maintenance Philosophy

Major breakdowns for year 2015-16 and 2016-17 are given below:

Table 116: Breakdowns

Date	Total Hrs lost	Reason
Season 2015-16		
02/02/2016	4.5	Shredder Belt V.F.D conveyor flash off and tripped and VFD replaced
10/02/2016	4	Schedule stoppage taken to replace Hammer Tips & Leveller knives replaced
13/02/2016	5	
Season 2016-17		
14/01/2017	5	No cane due to Makar Sakranti festival
28/01/2017	7	No cane availabilty due to heavy rainfall
18/02/2017	5.5	No cane availability due to poor cane arrival
19/02/2017	10	No cane availability

Source: BHSL

- An expert team from BHSL carries out scheduled maintenance in off season to save time in crushing season
- Repair & Maintenance budget received by the company during off season varies in the range of Rs 3 to Rs 4 per quintal with some increment every year. Which is higher than the industry standard of Rs 1.5 to 2 per quintal of sugar.
- Apart from the Repair & Maintenance budget the plant can avail for additional budget from head office in case of major works.
- The company has an annual service agreement with Triveni for the turbines wherein service engineers from Triveni carries out schedule maintenance of the turbines every tear during the off season.
- The maintenance of all the other machines is carried out in-house by BHSL experts.
- The loss in man hours during the Season 2015-16 and 2016-17 have been primarily due to unavailability of cane.

9.5.8 Effluent from Plant

- Consultants have reviewed the inspection reports of the Utraula plant for Ash dumping area, waste water, Ambient air, Ambient noise, and Stack boiler carried out by Newcon Consultants and Laboratories.
- All the effluent parameters like Particulate matter, sulphur dioxide, nitrogen dioxide and carbon monoxide levels are within the limits given by Central Pollution Control Board (CPCB).

9.5.9 Status of the statutory approvals

Table 117: Status of statutory approvals

Clearances sought	Utraula
Environment Clearance MoEF	Not available with MM
Valid From (Date)	NA
Valid Till (Date)	NA
Water Usage	NA
Valid From (Date)	NA
Valid Till (Date)	NA
NOC from state pollution board	Air & Water Consent
Valid From (Date)	01.01.2016
Valid Till (Date)	31.12.2017
Consent to operate	
Valid From (Date)AIR/Water	01.01.2016
Valid Till (Date)	31.12.2017
CIB certification for boiler	
Valid From (Date)	18.10.2016
Valid Till (Date)	16.09.2017
Approval of fire protection scheme	
Valid From (Date)	11.11.2016
Valid Till (Date)	10.11.2017
Panchayat/Municipal corporation Approval	
Valid From (Date)	01.10.2016
Valid Till (Date)	30.09.2017

Source: MM Analysis

MM observes that

- EC from MoEF has not been produced by the client to MM hence MM is unable to comment on the same
- Consent to operate and NOC from pollution board would expire at the end of year 2017 while approval for water usage is under renewal process
- Fire NC, CIPB certification for boiler and water usage NOC expires in Dec 2017.
- Environment clearance by MoEF and NOC for water usage has not been made available to MM

9.6 Pratappur Plant

9.6.1 Plant Details

Details of the Pratappur manufacturing facility are given below.

Table 118: Plant Details

Sr. No.	Particulars	Description
1	Location	Deoria District Pratappur - Sugar Unit Pratappur – 274703
2	Land Area	66 Acres
3	Manufacturing facility	Cane Crushing, and Power generation

Source: MM Site Visit

9.6.2 Location Analysis

Plant is located at district Deoria in Eastern UP. The eastern part of the UP is cane deficit area. It accounts for only 18% of area under sugarcane cultivation in UP. Hence MM believes that it will be difficult for the plant to run at its full capacity in near future.

The location of the plant is depicted in the figure below:

Figure 67: Site Map



Source: Google Maps

Accessibility and connectivity details of Pratappur plant are given in following table.

Table 119: Site Accessibility

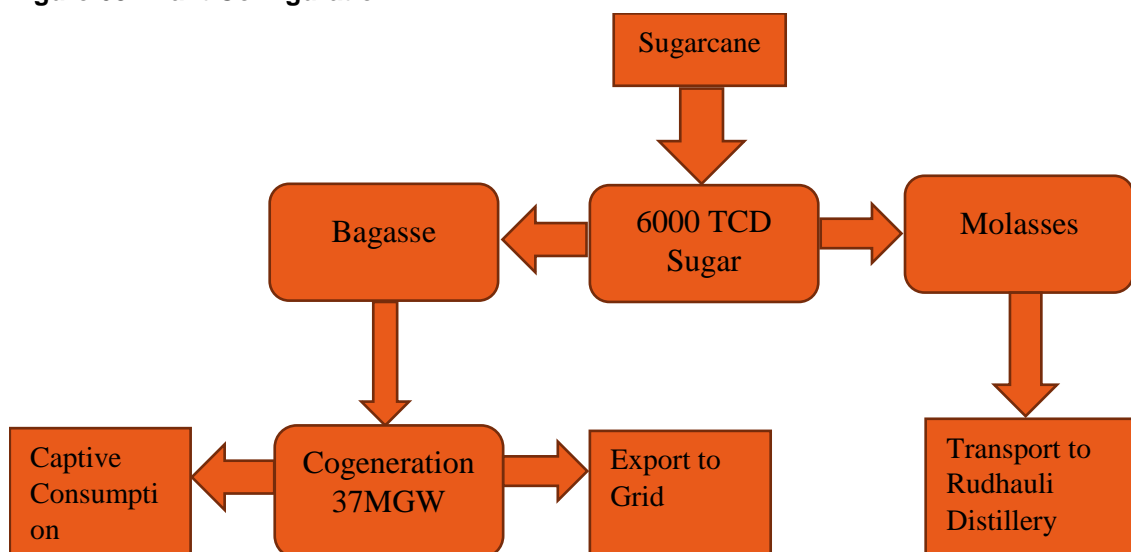
Connectivity	Description	Distance
Nearest Major City	Patna	159km
Nearest highway	NH 43	8 km
Nearest Station	Deoria Railway Station.	32km
	Patna Jn	158km
Nearest Airport	JPNi Airport, Patna	160km

Source: Google Maps

9.6.3 Plant Configuration

The Pratappur plant has facility of Sugar Production and power generation. The power plant runs on the bagasse generated in sugar crushing. All the power that is generated is used for captive consumption and is not exported to the grid. Molasses produced during sugar production is transported to the Rudhauri distillery to manufacture Alcohol. The plant configuration is described in the below figure:

Figure 68: Plant Configuration



Source: MM Analysis

9.6.4 Site Infrastructure

The Pratappur plant was established in 1903 and was acquired by Bajaj Hindusthan Sugar from Kanoria Group in 2005. BHSL undertook a major expansion activity in 2006-2007 wherein the plant capacity was increased from 3200TCD to 6000TCD and many machines and equipment's were upgraded or replaced.

9.6.4.1 Civil Infrastructure

The List of structures at the Pratappur plant and their respective areas are given in the table below:

Table 120: Buildings and structures

Sr. no	Bulinding Name	Area (Mtr2)	Type of structure	Year of Construction
1	Mill House	1415	M.S.Structure with Tin Shed	1997/2000/2006
2	Evaporation House	642	M.S. Structure	1903/2000/2006
3	Pan House	16144	M.S. Structure	1986 / 2006
4	Sugar House & Godown	9703	Brick/ RCC Structure with Tin Shed	1986 / 2006
5	Clarification House	1160	M.S. Structure with Tin Shed	1999/2000/2006
6	Feed Water Tank	290	M.S. Structure	1986/1993/2006
7	Power House	770	Brick/ RCC Structure with Tin Shed	1986/2006
8	Return Baggage Carrier	76	M.S. Structure	1993
9	Cooling Tower	607	Wood / RCC Structure	2006
10	Molasses Tank (% nos) 3 Nos.	10500	Open	2000/2006
11	Pump for cooling Tower	12.5	Open	2006
12	E.T.P	2365	Open	1990
13	Store Godown	1317	Brick Structure with Tin Shed	1986
14	Bagasse Yard	7700	Open	1986 /2006
15	Boiler Section	1445	M.S. Structure with Tin Shed	1986/1993/2006
16	Lime & Sulphur Godown	106	Brick Structre with Tin Shed	2006

Source: BHSL

- The plant area and the current infrastructure is adequate to operate the plant at optimal capacity
- The plant doesn't have any unutilised space therefore there is no opportunity for any future expansion
- The area of cane yard is adequate to facilitate easy movement of the trucks and tractors coming into the plant to deliver the sugarcane.
- Adequate storage area for sugar and bagasse is available in the plant.
- The sugar storage area is sufficient to hold sugar for 81 days
- The plant area also includes social infrastructure like quarters for employees, school etc.
- The plant area and the current infrastructure is adequate to operate the plant at full capacity

9.6.4.2 Plant Machinery

The Pratappur plant has only one tandem (Line) of 6000 TCD. Tandem has 5 rollers which leads to optimum extraction of sugar juice from sugarcane.

The List of Machineries at the Pratappur plant is provided in the below mentioned table:

Table 121: Plant Machinery

Machineries	Number of Units	Manufacturer	Specifications
Cane unloader	1 no.	Uttam	Capacity- 5 Ton SWL/Tip
		Jagat	Capacity- 5 Ton SWL/Tip
	4 nos.		Capacity- 5 Ton SWL/Tip

Machineries	Number of Units	Manufacturer	Specifications
Chopper			355 KW/ 590 rpm at secondary cane carrier
Fiberizer			Having 108 hammers each of 22.50 kg weight at 800 rpm
Steam generation Plant			
Boilers	2 nos.	LIPI	Capacity - 30T/Hr & 32 Ton/hr
	1 no.	Sitson	Capacity - 75 T/Hr
Clarification			
Sulphur Gas Plant	2 nos.	Redient	Capacity- 200 kg/hr
Sugar Grader	1 no.	IC	Capacity- 35 T/Hr

Source: BHSL

MM Observes that

- Majority of the core equipment like Mills, Boilers and Turbines have been supplied by market leaders like Uttam, Lipi, Sitson, Triveni and Shree Enterprises
- There has been no major capital refurbishment from the time the plant capacity was increased to 6000TCD in 2007.
- The mills are powered by steam driven turbines which is an outdated technology as in modern plants the rollers are DC driven which leads to better space utilisation, energy saving, smooth control, and operations.
- The steam which the company can save from using DC driven turbines can be used for cogeneration.
- The crushers and the cutters must go for reselling every 2-3 years which requires a capital expenditure of 7.5 lakhs/crusher.
- The boiling pans are operated in batch process while in most of the other modern plants they are operated in continuous process which leads to consistent quality of the sugar and reduces the cycle time.
- There are standby evaporators, clarifiers and preheaters which are used during scheduled maintenance to avoid any downtime
- Steam after production of power is utilised in preheaters and is then condensed which is used in the boilers as feed water.
- Plant is situated in Eastern UP which accounts for only 17% of the sugarcane production of Uttar Pradesh therefore it is challenging to run the plant at its full capacity in this region.

9.6.4.3 Manpower

The total manpower deployed at the Pratappur plant is given in the below table:

Table 122: Manpower

Sr.no	Department	Nos			Total
		HOD	Dy HOD	Officers/Workers	
1	Gen Admin	1		7	8
2	Cane	1	1	35	37
3	EDP IT	1	1	1	3
4	EHS	0	0	1	1
5	Engineering	1	1	106	108
6	Fin Acct	1	1	3	5

Sr.no	Department	Nos			Total
		HOD	Dy HOD	Officers/Workers	
7	HR & Admin	1	1	7	9
8	Internal Audit	1	0	0	1
9	Production and Lab	1	1	63	65
10	Legal	1	0	0	1
11	Store	1	1	3	5
12	Sugar Sale	1	0	6	7
	Total	11	7	232	250

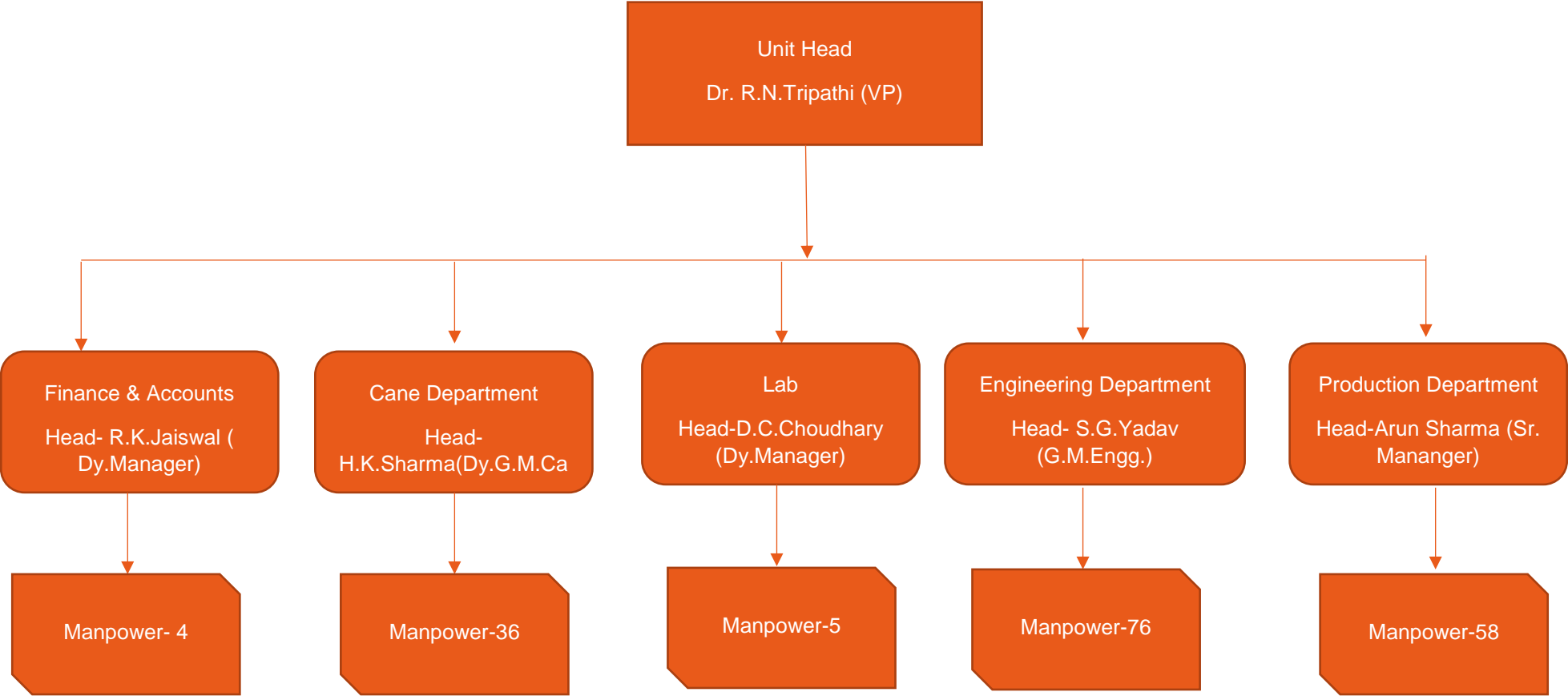
Source: BHSL

MM Observes that

- The Pratappur plant is not automated hence the manpower deployed at the plant is higher than the its peers which are modern and where the entire process is controlled by programmable logical controls.
- There are 108 employees in the engineering department which are adequate to handle the entire sugar manufacturing process.
- The manpower per lakh quintal of cane crushed for the plant is 23.11 employees, which is the highest amongst all the plants of BHSL

The Organogram of the Pratappur Sugar plant is depicted below:

Figure 69: Organogram- Pratappur



Source: BHSL

9.6.5 Production Details

The details of the last 5 years' cane crushed and recovery rates for Pratappur plant can be seen in following table

Table 123: Production details- Sugar

	U.O.M	2011-12	2012-14	2014-15	2015-16	2016-17
Cane Crushed	Lakh Quintals	29.46	76.75	28.83	13.20	10.82
Sugar Produced	Lakh Quintals	2.83	7.37	2.71	1.34	0.97
Capacity Utilization	%	31%	30%	30%	14%	11%
Recovery Rate	%	10%	10%	9%	10%	9%

Source: BHSL

The power generation for the years 2015-16 and 2016-17 is given in the below table:

Table 124: Power Generation

	U.O.M	2015-16	2016-17
Installed Capacity	MW	13	13
Units Produced	MW-H	4342	3652
Utilization	%	10%	9%

Source: BHSL

MM Observes that

- There was a sharp decline in the sugar production in 2014-15 which was mainly due the low cane availability in eastern Uttar Pradesh.
- The capacity utilisation of the Prattapur plant is in the range of 11% to 31% since last 5 years.
- The plant has undertaken many cane development activities to improve the cane production in the area which will in turn increase the plants operational performance.
- One of the primary reasons for low capacity utilisation of the plant is the low cane availability in eastern UP.
- The recovery of the plant is in the range of 9%-10% which has remained constant y-o-y.
- The generation of power depends on sugar production as bagasse which is a by-product produced when sugarcane is crushed which is in turn used as a fuel in boilers.
- Therefore, the generation of power also saw a decline in 2016-17.
- The contribution of Pratappur plant in total sugar produced by the Bajaj group is only 1% during 2016-17 due to unavailability of cane in eastern UP.

9.6.6 Comparison with Peers

The comparison of plants in terms of utilisation and recovery in the same region is given below:

Table 125: Comparison with peers

Sr. no	Plant	Status	Capacity TCD	Recovery	Cane Crushed Lakh MT	TCA	Utilization
1	Govind nagar sugar Walterganj Uttar Pradesh	Running	6000	8.60%	1.34	960000	14%

Sr. no	Plant	Status	Capacity TCD	Recovery	Cane Crushed Lakh MT	TCA	Utilization
2	New India Sugar Mills Ltd (Unit- The Oudh Sugar Mills Ltd.), Vill. Dhadha Bujurg, Uttar Pradesh	Working	8000	9.36%	5.92	1280000	46%
3	Indian Potash Ltd., Raja Bazar, Uttar Pradesh	Working	1600	9.44%	1.83	256000	71%
4	Shankara Sharkara Sankul (A Unit of The Kanoria Sugar General Manufacturing Co. Ltd.), Kushinagar, Uttar Pradesh	Working	6000	9.71%	3.53	960000	37%
5	Triveni Engineering and Industries Ltd., Kushinagar, Uttar Pradesh	Working	6500	11.21%	6.91	1040000	66%
6	The United Provinces Sugar Co. Ltd, Kushinagar, Uttar Pradesh	Working	6500	9.60%	5.95	1040000	57%

Source: MM Analysis

- The capacity utilisation of the Pratappur plant is in the range of 11% to 31% while the average capacity utilisation of its peers in eastern UP is more than 49%.
- The recovery of the plant is in the range of 9%-10% which is lesser than its peers in eastern UP who have a recovery rate of about 9.36% to 11.21%.

9.6.7 Maintenance Philosophy

Major breakdowns for year 2015-16 and 2016-17 are given below:

Table 126: Breakdowns

Duration	Reason	Root Cause
Season 2015-16		
19:50	To attend leaky tube of Sitson boiler	Boiler tube failure due to less thickness
11:50	To attend leaky tube of Sitson boiler	
00:50	Main cane carrier derailed	Runner broken due to weak & welding cracked at joints
10:25	Main cane carrier derailed	
Season 2016-17		
02/01/2017	Sitson Boiler tube burst	Boiler tube failure due to less thickness
03/01/2017	Sitson Boiler tube burst	

Source: BHSL

- It can be observed from the above table that there was a tube burst in the boiler in years 2015-16 as well 2016-17 which was due to less thickness of the tubes.
- Therefore, consultants believe that the tubes of the boiler must be replaced to avoid such frequent breakdowns in the future.
- An expert team from BHSL carries out scheduled maintenance in off season to save time in crushing season
- Repair & Maintenance budget received by the company during off season varies in the range of Rs 3 to Rs 4 per quintal with some increment every year.

- Apart from the Repair & Maintenance budget the plant can avail for additional budget from head office in case of major works.
- The company has an annual service agreement with Triveni for the turbines wherein service engineers from Triveni carries out schedule maintenance of the turbines every year during the off season.
- The maintenance of all the other machines is carried out in-house by BHSL experts.

9.6.8 Effluent from the plant

- Consultants have reviewed the inspection reports of the Pratappur plant for Ash dumping area, waste water, Ambient air, Ambient noise, and Stack boiler carried out by Noida Testing Laboratories.
- All the effluent parameters like Particulate matter, sulphur dioxide, nitrogen dioxide and carbon monoxide levels tested by Noida Testing Laboratories are within the limits prescribed by Central Pollution Control Board (CPCB).

9.6.9 Status of the statutory approvals

Table 127: Status of statutory approvals

Clearances sought		Pratappur
1	Environment Clearance MoEF	
	Valid From (Date)	NA
	Valid Till (Date)	
2	Water Usage	
	Valid From (Date)	NA
	Valid Till (Date)	
3	NOC from state pollution board	
	Valid From (Date)	NA
	Valid Till (Date)	
4	Consent to operate	
	Valid From (Date)AIR/Water	01.01.2017
	Valid Till (Date)	31.12.2017
5	CIB certification for boiler	
	Valid From (Date)	11.11.2016
	Valid Till (Date)	10.10.2017
6	Approval of fire protection scheme	
	Valid From (Date)	Applied For
	Valid Till (Date)	
7	Panchayat/Municipal corporation Approval	
	Valid From (Date)	2016
	Valid Till (Date)	2017

Source: BHSL

MM observes that

- EC from MoEF has not been furnished by client to MM hence MM cannot comment on the same.
- Consent to operate and NOC from pollution board would expire at the end of year 2017 while approval for water usage is under renewal process
- Fire NC, CIPB certification for boiler and water usage NOC expires in Dec 2017.
- The approval for fire protection has been applied for by the plant and is under process.

9.7 Bilai Plant

9.7.1 Plant Details

Table 128: Plant Details

Sr. No.	Particulars	Description
1	Location	Bijnore District, Bilai - Sugar Unit, Vill: Bilai
2	Land Area	91 Acres
3	Manufacturing facility	Cane Crushing and Power generation (Cogeneration)

Source: MM Site Visit

9.7.2 Location Analysis

The location of the plant is strategic considering the availability of sugarcane. Plant is situated in West Uttar Pradesh in Bijnore district which accounts for almost 53% of the sugarcane production of Uttar Pradesh.

The location of the plant is depicted in the figure below:

Figure 70: Site Location – Top view



Source: Google maps

Table 129: Site Accessibility

Connectivity	Description	Distance
Nearest Major City	Meerut	91.2 KM
	Bijnor	16.5 KM
Nearest highway	NH734	22.5 KM
Nearest Station	Dhampur railway station	22 KM
	Bijnor railway Station	18.1 KM
	Bus Station, Nai Basti, Bijnor	16.5 KM
Nearest Airport	Pandit Deen Dayal Upadhyay Airport, Agra	311 KM

Source: Google Maps

9.7.3 Plant Configuration

The Bilai plant has facility of Sugar Production and Co-generation. The power plant runs on the bagasse generated in sugar crushing. A part of the power generated is used for captive consumption while the residual power is exported to the grid. Molasses produced during sugar production is supplied to the BHSL - Thanabhawani and Kinauni distillery to manufacture Alcohol. The bottom ash is collected and distributed to farmers to increase the productivity of the cane. The plant configuration is described in the below figure:

Table 130: Installed Capacities

Particulars	U.O.M	Values
Cane Crushed	TCD	9000
Power Generation	MW-H	24

Source: MM Analysis

9.7.4 Site Infrastructure

The plant was established in 2005-06 with an installed capacity of 9000 TCD with 24 MW Cogeneration Power Plant with DCS Control System

9.7.4.1 Civil Infrastructure

The List of structures at the Bilai plant and their respective areas are given in the table below:

Table 131: Buildings and structures

S.no	Building Name	Area (M2)	Type of structure	Year of Construction
1	Mill House	2268	Steel / Covered	2005
2	Evaporation House	784	Steel / Open	2005
3	Pan House	2415	Steel / Covered	2005
4	Sugar House	525	steel & covered	2005
5	Clarification House	3016	Steel / open	2005
6	Feed Water Tank	186.2	RCC / OPEN	2005
7	Power House	1458	Steel, Covered	2005
8	Return Baggage Carrier	314.6	Steel, Covered	2005
9	Cooling Tower	1025	RCC / OPEN	2005
10	Molasses Tank (03 nos)	7938	OPEN	2005

S.no	Building Name	Area (M2)	Type of structure	Year of Construction
11	Pump for cooling Tower	203	OPEN	2005
12	E.T.P	2511	OPEN	2005
13	Store Godown	615	RCC, COVERED	2005
14	Bagasse Yard	9576	OPEN	2005
15	Boiler Section	3380	OPEN	2005
16	Lime & Sulphur Godown	165	RCC, COVERED	2005
17	Sugar Godown	8000		
18	Cane Yard	30750		

Source: BHSL

- The area of cane yard is adequate to facilitate easy movement of the trucks and tractors coming into the plant to deliver the sugarcane.
- Adequate storage area for sugar and bagasse is available in the plant.
- The sugar storage area is sufficient to hold sugar for 86 days.
- At the Bilai plant DC driven mills are used unlike in other old plants like Gola and Palia where steam driven mills are used.
- The area of the Mill house at the Bilaipant is 50% lesser than the plants where steam driven mills are used.
- The plant area also includes social infrastructure like quarters for employees, school etc.
- The plant area and the current infrastructure is adequate to operate the plant at full capacity.

9.7.4.2 Plant Machinery

The Bilai plant has one tandem line with a crushing capacity of 9000 TCD. Tandem line has 5 mills which are DC driven

The List of Machineries at the Utraula plant is provided in the below mentioned table:

Table 132: Plant Machinery

Machineries	Number of Units	Manufacturer	Specifications
Cane Handling			
Cane unloader		SS Engineers	capable to handle 20 Tips/ Hr., 5 Tons SWL capacity
		Globe Engineering Co	capable to handle 20 Tips/Hr., 5 Tons SWL capacity
Truck Tippler		SS Engineers	Capacity 60 ton
Steam generation Plant			
Boilers	2	SS Engineers	90 TPH Capacity
Electric Generators		Oiesel engg.	1000 KVA, 250 KVA, 1000 KVA
Power Turbines	1	Bellise	10 MW, Multistage turbine , pressure of inlet 45 Kg./Cm ² and back pressure of 1.5 Kg./Cm ² non condensatable type w1th alternator of BHEL.
	1	Triveni	10 MW, Multistage turbine , pressure of inlet 45 KG/ SQcm and back pressure of 1.5 Kg/ Sqcm. Non condensabl e type with alternator of BHEL
	1	Bellise	3 MW, Multistage turbine , pressure of inlet 45 KG/ SQcm and back pressuLe of 1.5 Kg/ Sqcm. Non

Machineries	Number of Units	Manufacturer	Specifications
			condensable type with alternator of BHEL
Clarification			
Sulphur Gas Plant	4	Kishan	Capacity- 200 Kg./Hr. each 2 Nos. Vishwa make 2 Nos. Digital Utility make.
Sugar Grader	2	I.C.	6 deck Mogensen sizer Having Capacity- 30 Ton/Hr . each

Source: BHSL

MM observers that

- Majority of the core equipment like Mills, Boilers and Turbines have been supplied by market leaders like Thermax, Bukau Wolf, Triveni and Uttam.
- There has been no major capital refurbishment from the time the plant was established in 2005-06.
- The entire plant is automated and is centrally controlled.
- The mills are DC driven which leads to optimum utilisation of plant area.
- The crushers and the cutters must go for reshelling every 2-3 years which requires a capital expenditure of 7.5 lakhs/crusher.
- The boiling pans are operated in continuous process which leads to consistent quality of sugar and less cycle time.
- There are standby evaporators, clarifiers and preheaters which are used during scheduled maintenance to avoid any downtime
- The boilers installed at the plant can generate steam of 45kg/m2 but most of the boilers installed in modern plants can generate steam up to 110kg/m2.
- Boilers which can generate high pressure steam involve higher capital expenditure but are more efficient in terms of amount of steam required to generate 1 MGW of power.
- Steam after production of power is utilised to in preheaters and is then condensed which is then used in the boilers.
- The juice heaters must be replaced every 15 years so the heater must be replaced in 2020.

9.7.4.3 Manpower

Details of the manpower at Bilai plant is as per the following table:

Table 133: Manpower details

Sr.no	Department	Nos
1	Cane	198
2	Lab	11
3	Engineering	158
4	Production	104
5	Finance & Accounts.	6
6	Sugar Sales	10
7	CIT	1
8	Store	7
9	HR & Admn, Medical	14
10	EHS	1
11	Horticulture	1
12	EDP & IT	4

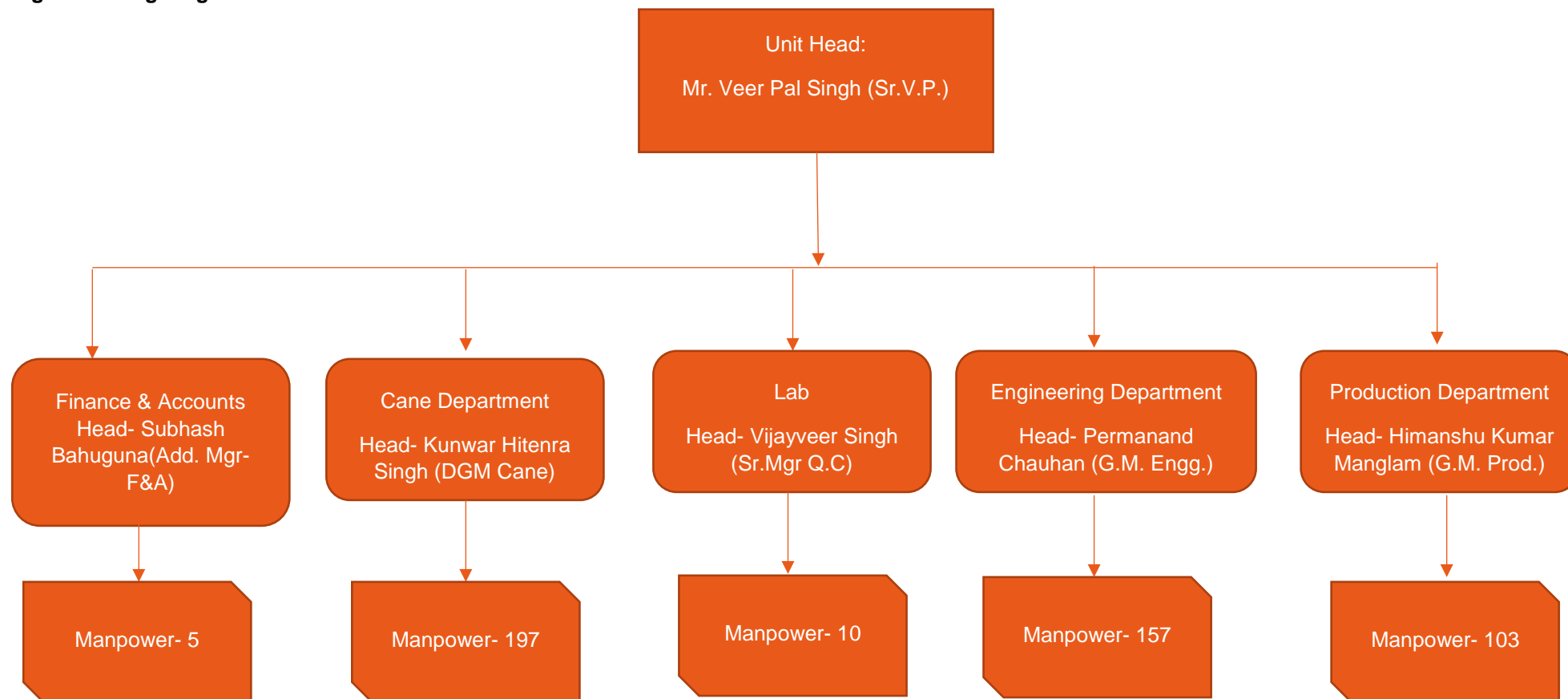
Sr.no	Department	Nos
13	Legal	1
	Total	516

Source: BHSL & MM Analysis

- The Budhana plant is state of the art with automated controls hence the manpower requirement at this plant is lesser than some of the older plants like Gola.
- The manpower per lakh quintal of cane crushed for the plant is 4.83 employees
- The current manpower deployed at the plant is adequate to operate the plant at its full capacity.

The Organogram of the Bilai Sugar plant is depicted below:

Figure 71: Organogram-Bilai



Source: BHSL

9.7.5 Production Details

Production details of last 5 years is illustrated in the below table

Table 134: Production- Sugar

	U.O.M	2011-12	2012-14	2014-15	2015-16	2016-17
Cane Crushed	Lakh Quintals	83.47	181.37	97.63	108.26	106.89
Sugar Produced	Lakh Quintals	8.03	17.81	9.81	11.69	11.70
Capacity Utilization	%	58%	64%	68%	75%	74%
Recovery Rate	%	10%	10%	10%	11%	11%

Source: MM Analysis

The power generation for the years 2015-16 and 2016-17 is given in the below table:

Table 135: Production-Power

	U.O.M	2015-16	2016-17
Installed Capacity	MW	24	24
Units Produced	MW-h	67657	66768
Utilization	%	86%	85%

Source: MM Analysis

MM observes that,

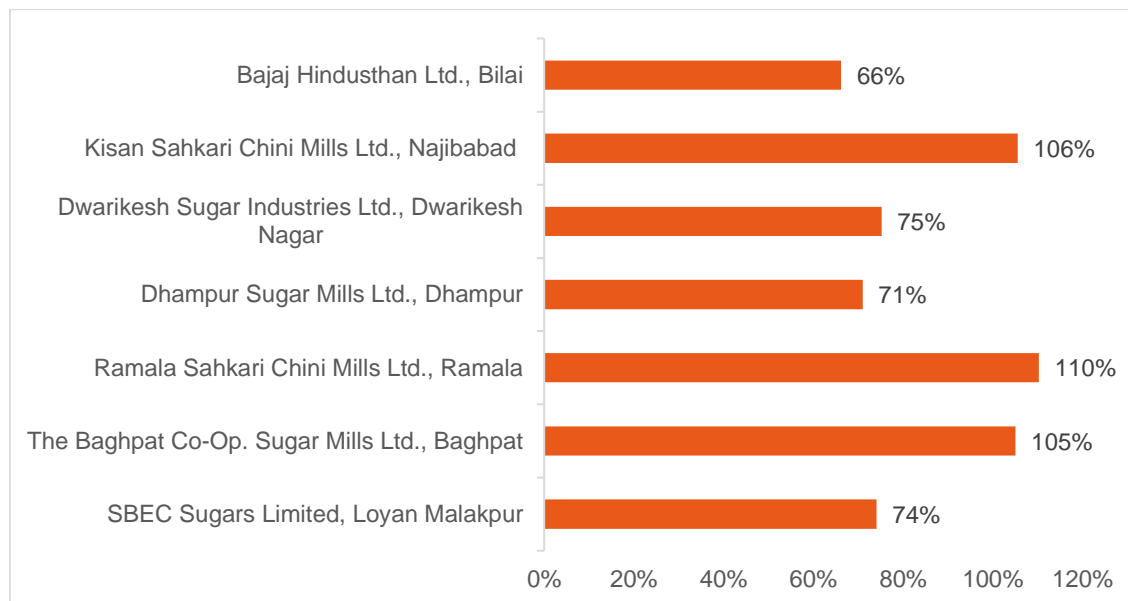
- There was a sharp decline in the sugar production in 2014-15.
- The capacity Utilization of the Bilai plant is in the range of 58% to 71%.
- The recovery of the plant is in the range of 10-11%.
- The utilisation and recovery of the Bilai plant is much higher than the plants in eastern UP as the cane availability in western UP is higher.
- The utilization of power plant is dependent on sugar cane availability as bagasse which is a by-products of sugar production is used as input for power plant. Therefore, when the sugar cane availability is more power plant would be operational for higher number of days.
- The contribution of Bilai plant in total sugar produced by the Bajaj group was 10.32% in 2016-17 season.

9.7.6 Comparison with Peers

The comparison of Bilai plant with its competitors operating in Western UP in terms of utilization and recovery (in %) is illustrated in the figures below. The data used to generate the graphs are of production season 2015-16

The comparison of plants in terms of utilisation in the same region is given below:

Figure 72: Comparison of utilisation factor



Source: MM Analysis

- The average capacity utilisation of the peers operating in same region western UP is 86 %.
- The capacity utilisation of the Bilai plant is lower compared to its peers in western UP.

The comparison of plants in terms of recovery in the same region is given below:

Figure 73: Comparison of Recovery Rates



Source: MM Analysis

- The average recovery rate of peers operating in same region in Western UP is 10.42%.

- The recovery rate of the Bilai plant is in line with its peers in western UP

9.7.7 Maintenance Philosophy

- An expert team from BHSL carries out scheduled maintenance in off season to save time in crushing season
- Repair & Maintenance budget received by the company during off season varies in the range of Rs 3 to Rs 4 per quintal with some increment every year.
- Apart from the Repair & Maintenance budget the plant can avail for additional budget from head office in case of major works.
- The company has an annual service agreement with Triveni for the turbines wherein service engineers from Triveni carries out schedule maintenance of the turbines every tear during the off season.
- The maintenance of all the other machines is carried out in-house by BHSL experts.

9.7.8 Effluents from the plant

- Consultants have reviewed the inspection reports of the Bilai plant for Ash dumping area, waste water, Ambient air, Ambient noise, and Stack boiler carried out by Noida Testing Laboratories and all the effluent parameters are within the limits given by Central Pollution Control Board(CPCB).
- Similarly test results of the ground water are also in the limits given by CPCB

9.7.9 Status of Statutory approvals

Table 136: Status of Statutory approvals

Sr. No	Clearances sought	Bilai
1	Environment Clearance MoEF	
	Valid From (Date)	N/A
	Valid Till (Date)	N/A
2	Water Usage	
	Valid From (Date)	Applied & Under Process
	Valid Till (Date)	Applied & Under Process
3	NOC from state pollution board	
	Valid From (Date)	15.07.2004
	Valid Till (Date)	-
4	Consent to operate	
	Valid From (Date)AIR/Water	01.01.2016
	Valid Till (Date)	31.12.2017
5	CIB certification for boiler	
	Valid From (Date)	23.09.2016
	Valid Till (Date)	10.09.2017
6	Approval of fire protection scheme	
	Valid From (Date)	30.01.17
	Valid Till (Date)	31.12.17
7	Panchayat/Municipal corporation Approval	
	Valid From (Date)	01.10.2016
	Valid Till (Date)	30.09.2017

Source: BHSL

9.8 Gangnauli Plant

9.8.1 Plant Details

Table 137: Plant Details

Sr. No.	Particulars	Description
1	Location	Saharanpur District, Gangnauli - Sugar Unit, Vill.: Gangnauli
2	Land Area	184
3	Manufacturing facility	Cane Crushing, Distillery, and Power generation (Cogeneration)

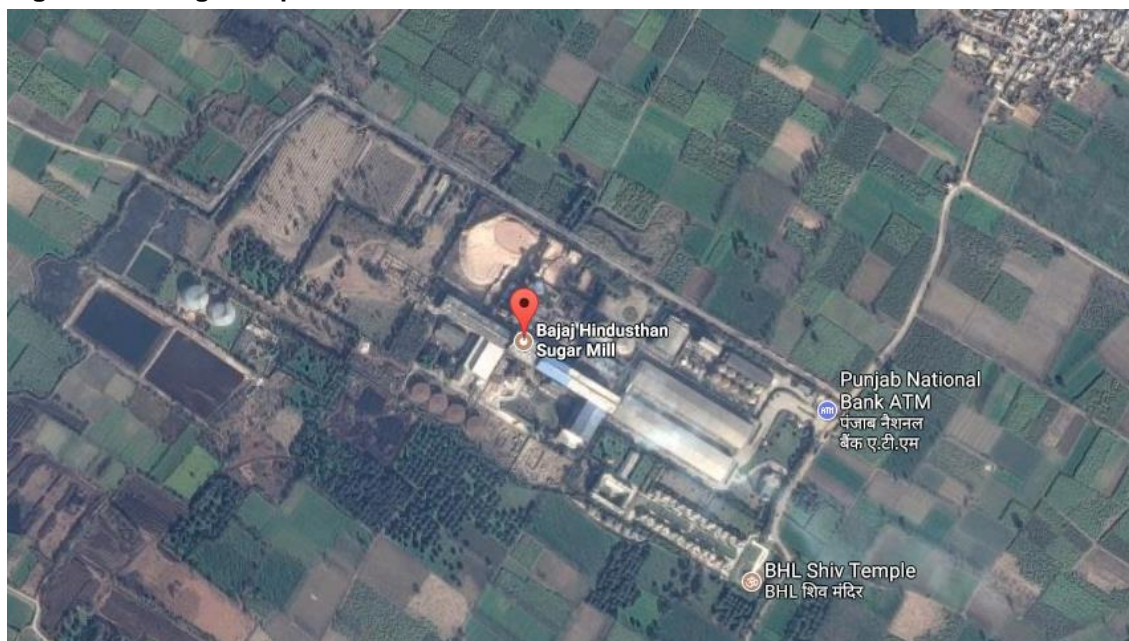
Source: MM Site Visit

9.8.2 Location Analysis

The location of the plant is strategic considering the availability of sugarcane. Plant is situated in West Uttar Pradesh in Saharanpur district which accounts for almost 53% of the sugarcane production of Uttar Pradesh.

The location of the plant is depicted in the figure below:

Figure 74: Gangnauli plant location



Source: Google Maps

The connectivity details to Gangnauli site is given in the below table:

Table 138: Site Accessibility

Connectivity	Description	Distance
Nearest Major City	Saharanpur	22.1 KM
Nearest highway	NH344	21 KM
	SH57	15.4 KM
Nearest Station	Saharanpur Jn. railway station.	20.6 KM
	Muzaffarnagar railway station	53.2 KM

Connectivity	Description	Distance
	Saharanpur bus station	47.4 KM
Nearest Airport	IGI Airport, New Delhi	200 KM

Source: Google Maps

9.8.3 Plant Configuration

The Gangnauli plant has facility of Sugar Production, Distillery, and Power generation. The power plant runs on the bagasse generated in sugar crushing while Alcohol is manufactured from the molasses generated in sugar manufacturing. The carbon dioxide generated during the fermentation of molasses is captured and is sold to chemical companies. Spent wash from the distillery is used to generate methane gas. Methane gas is in turn used as fuel for boilers installed in the distillery.

The Installed capacities for the all the facilities is given in following table.

Table 139: Plant Configuration

Particulars	U.O.M	Values
Cane Crushed	TCD	9000
Alcohol Generation	KLPD	160
Power Generation	MW-H	25

Source: BHSL

9.8.4 Site Infrastructure

The Gangnauli plant was established in 2006-07 with an installed capacity of 9000 TCD with 24 MW Cogeneration Power Plant and 160KLD Distillery.

9.8.4.1 Civil Infrastructure

The List of structures at the Gangnauli plant and their respective areas are given in the table below:

Table 140: Building and Structure

Sr.no	Building Name	Area	Type of structure	Year of Construction
1	Mill House	4873.7	Shed / open	2006
2	Evaporation House	1666	Shed	2006
3	Pan House	3753	shed	2006
4	Sugar House	1792	shed	2006
5	Clarification House	1764	open	2006
6	Feed Water Tank	include in boiler	open	2006
7	Power House	2740	shed	2006
8	Return Baggage Carrier	Include in bag.yard	open	2006
9	Cooling Tower	1690	open	2006
10	Molasses Tank (% nos)	5040	open	2006
11	Pump for cooling Tower	60	open	2006
12	E.T.P	5625	RCC / Open	2006
13	Store Godown	16000	RCC/shed/open	2006
14	Bagasse Yard	17425	open	2006
15	Boiler Section	6800	open	2006

Sr.no	Building Name	Area	Type of structure	Year of Construction
16	Lime & Sulphur Godown	200	shed	2006

Source: BHSL

- The area of cane yard is adequate to facilitate easy movement of the trucks and tractors coming into the plant to deliver the sugarcane.
- Adequate storage area for sugar and bagasse is available in the plant.
- The plant area also includes social infrastructure like quarters for employees, school etc.
- The plant area and the current infrastructure is adequate to operate the plant at full capacity
- The bagging area is totally covered which is a standard requirement for FSSAI certification.

9.8.4.2 Plant Machinery

Gangnauli plant has one tandem mill with a capacity of 9000 TCD, 160 KLPD and 25 MW of cogeneration

The List of Machineries at the Gangnauli plant is provided in the below mentioned table:

Table 141: Plant & Machinery

Sr.no	Description	specifications	QTY
1	Cane Unloader Specifications	Rachitech, 5 Tonns SWL	4 Nos.
2	Tippler Specifications	Carter Hydraulic, 60 Tons	1 Nos.
3	Head on Cutter	ISGEC	1 Nos.
4	Cane Chopper Specifications	ISGEC	1 Nos.
5	Cane Leveller Specifications	ISGEC	1 Nos.
6	Cane Fibrizer Specifications	UTTAM	1 Nos.
7	Mill Specifications	ISGEC	5 Nos.
8	EOT Crane Specifications	RACTHITECH	
9	Boiler Specifications		
	Make	WIL PUNE	2 Nos.
	Capacity	90 T/Hr.	
	Heating Surface	4010 M ²	
	Working Pressure	45 kg/cm ²	
	Steam Temperature	435 Deg.C	
	Make	S.S Pune	01 Nos.
	Capacity	30 T/Hr.	
	Heating Surface	1337 M ²	
	Working Pressure	45 kg/cm ²	
	Steam Temperature	410 Deg.C	
10	Generator Specifications	CATERPILLAR, 1000 KVA \ 500 KVA \ 320 KVA	3 Nos.
11	Turbine Specifications		
A)	Make	BELLIS (SBP-560)	1 Nos.
	Type	Back Pressure	
	Stage	Mutistage	

Sr.no	Description	specifications	QTY
	Capacity	10 M.W.	
	Inlet Pressure	45 Kg/Cm2	
	Back Pressure	1.5 Kg/Cm2	
B)	Make	BELLIS (HS-14)	2 Nos.
	Type	Back Pressure	
	Stage	Mutistage	
	Capacity	3 M.W.	
	Inlet Pressure	45 Kg/Cm2	
	Back Pressure	1.5 Kg/Cm2	
C)	Make	BELLIS (SBP-450)	1 Nos.
	Type	Back Pressure	
	Stage	Mutistage	
	Capacity	4000 KW	
	Inlet Pressure	45 Kg/Cm2	
	Back Pressure	1.5 Kg/Cm2	
D)	Make	BELLIS (SS-26)	5 Nos.
	Type	Back Pressure	
	Stage	Mutistage	
	Capacity	1100 HP	
	Inlet Pressure	45 Kg/Cm2	
	Back Pressure	1.5 Kg/Cm2	
E)	Make	BELLIS	1 Nos.
	Type	Back Pressure	
	Stage	Singlestage	
	Capacity	860 HP	
	Inlet Pressure	45 Kg/Cm2	
	Back Pressure	1.5 Kg/Cm2	
12	Juice Sulphitor Specifications	KAY BOUVET	3 Nos.
13	Clarifier Specifications	THE KING SUGAR & GENRAL ENGG. COMPLANY	2 Nos.
14	Evaporator	SPRAY ENGG.	3 Nos.

Source: BHSL

- A multi effect evaporator is being installed at the plant to improve the process efficiency.
- Majority of the core equipment like Mills, Boilers and Turbines have been supplied by market leaders like Thermax, Bukau Wolf, Triveni and Uttam.
- Cane feeding process is automated through DCF control.
- The mills are powered by steam driven turbines which is an outdated technology as in modern plants the rollers are DC driven which leads to better space utilisation, energy saving, smooth control, and operations.
- The steam which the company can save from using DC driven turbines can be used for cogeneration.

- The boiling pans are operated in batch process while in most of the other modern plants they are operated in continuous process which leads to consistent quality of the sugar and reduces the cycle time.
- The crushers and the cutters must go for reselling every 2-3 years which requires a capital expenditure of 7.5 lakhs/crusher.
- There are standby evaporators, clarifiers and preheaters which are used during scheduled maintenance to avoid any downtime
- Steam after production of power is utilised to in preheaters and is then condensed which is then used in the boilers.
- The plant has a separate boiler and power house for its distillery to meet the power requirements of the distillery.
- The boilers in the distillery are fuelled by methane gas generated from spent wash.
- The technology used in the distillery is from Praj Industries.
- MM Observation on overall plant facility
 - Plant is situated in western UP which accounts for almost 53% of the sugarcane production of Uttar Pradesh. Hence plant will not face any problem with respect to sugarcane availability considering normal monsoon.

9.8.4.3 Manpower

Details of the manpower at Gangnauli plant is as per the following table:

Table 142: Manpower details- Sugar

Sr.no	Department	
1	Cane Head	162
2	Lab Head	9
3	Engineering	139
4	Production	77
5	Finance & Accounts.	6
6	Sugar Sales	9
7	CIT	1
8	Store	7
9	HR & Admn, Medical	12
10	EHS	0
11	Horticulture	2
12	EDP & IT	4
13	Legal	1
	Total	429

Source: BHSL & MM Analysis

Details of Gangnauli Distillery is given in the table below:

Table 143: Manpower Details- Gangnauli Distillery

Sr.no	Department	Nos
1	Engineering Head	21
2	Production Head	27
3	Comm. Head	6
4	ETP Head	3

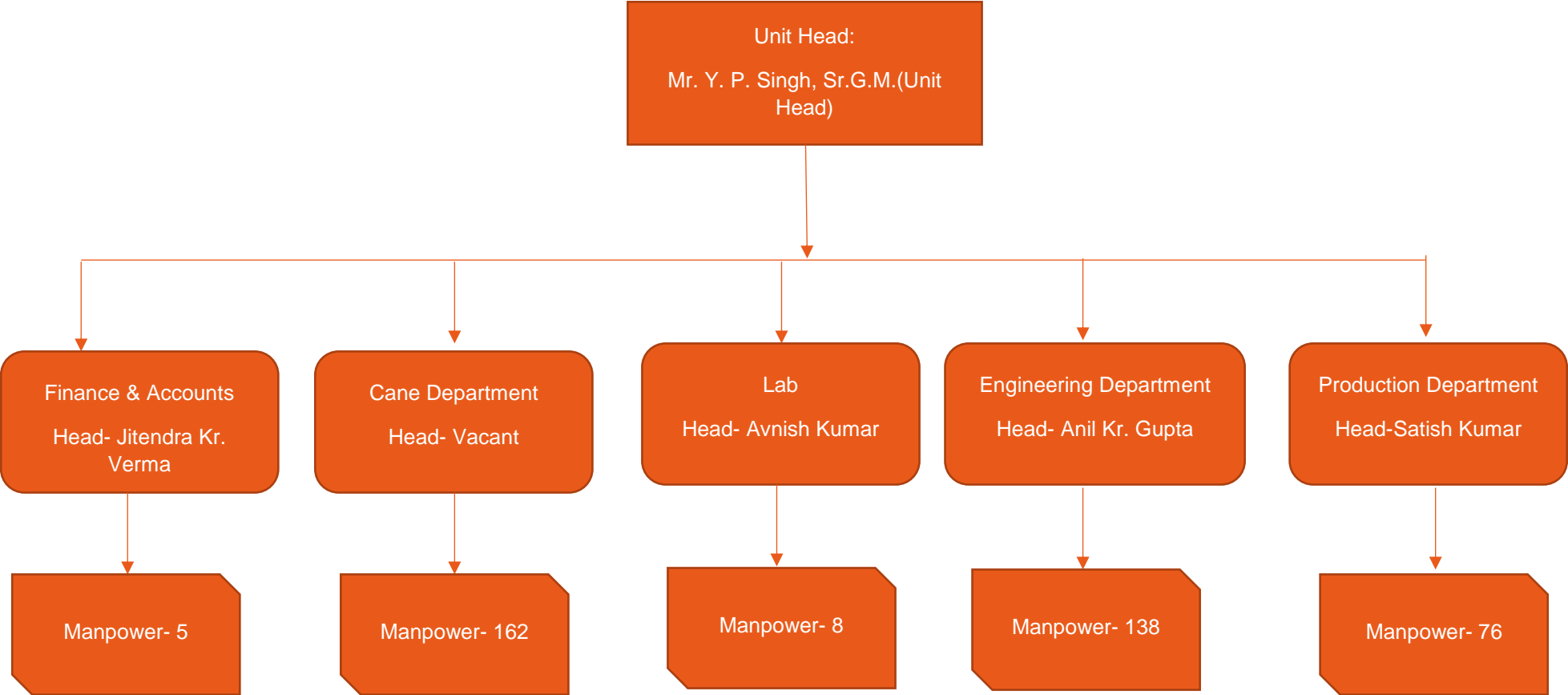
Sr.no	Department	Nos
5	HR & Admn, Medical	3
	Total	60

Source: BHSL& MM Analysis

- The Gangnauli plant is state of the art with automated controls hence the manpower requirement at this plant is lesser than some of the older plants like Gola.
- The manpower per lakh quintal of cane crushed for the plant is 6.92 employees.
- The plant's manpower requirement for the distillery is 0.19 employees per lac litre, which is the lowest amongst of distilling facilities of BHSL.
- The manpower deployed at the plant is in line with other plants having similar installed capacities.

The Organogram of the Gangnauli Sugar plant is depicted below:

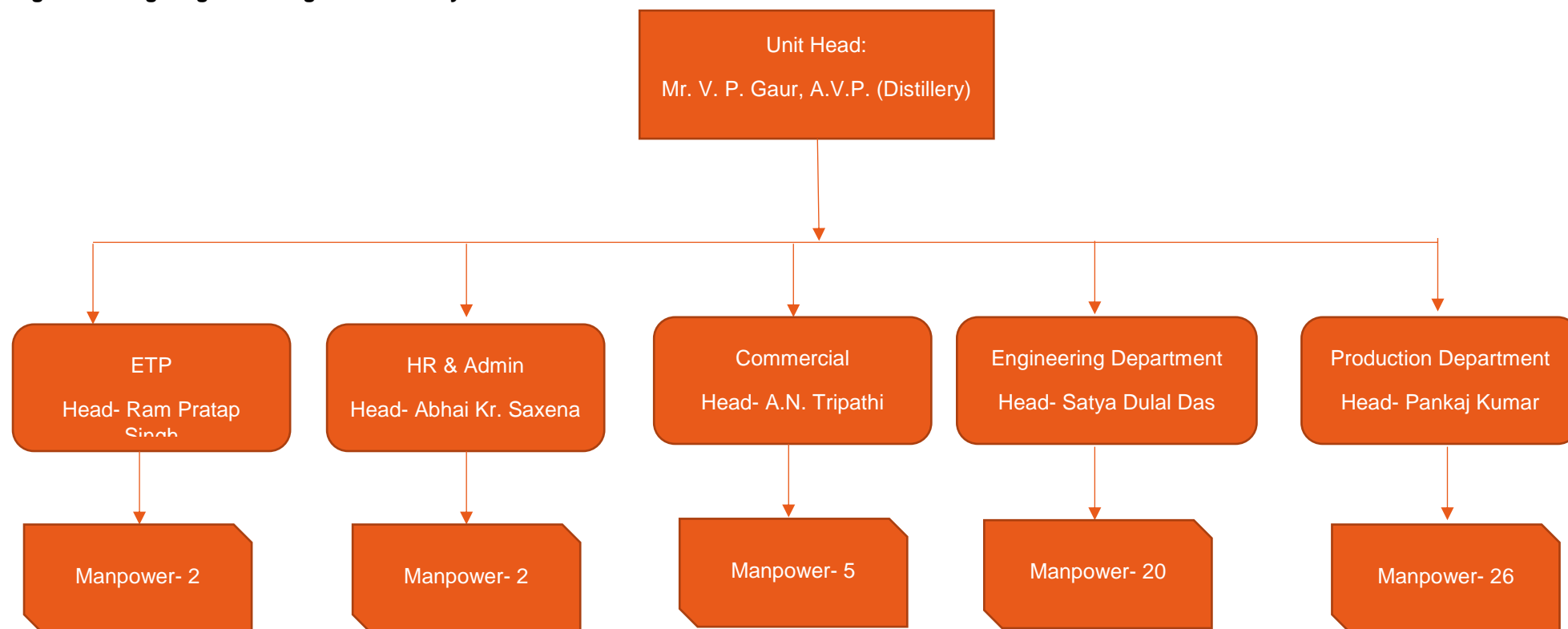
Figure 75: Organogram- Gangnauli Sugar plant



Source: BHSL

The Organogram of the Gangnauli distillery is depicted below:

Figure 76: Organogram- Gangnauli Distillery



Source: BHSL

9.8.5 Production Details

The details of the last 5 years' cane crushed and recovery rates for Gagnauli plant can be seen in following table

Table 144: Production-Sugar

	U.O.M	2011-12	2012-14	2014-15	2015-16	2016-17
Cane Crushed	Lakh Quintals	42.21	105.20	46.03	32.29	62.04
Sugar Produced	Lakh Quintals	3.59	9.12	4.08	3.22	5.94
Capacity Utilization	%	29%	30%	32%	22%	43%
Recovery Rate	%	8%	9%	9%	10%	10%

Source: BHSL & MM Analysis

The generation of Alcohol generation for 2015-16 and 2016-17 is given in the below table:

Table 145: Production-Distillery

	U.O.M	2015-16	2016-17
Installed Capacity	KLPA	38400	38400
Alcohol Produced	KL	30111	31729
Utilization	%	78%	83%

Source: BHSL & MM Analysis

The power generation of Gangnauli plant is mentioned in the below table:

Table 146: Production-Power

	U.O.M	2015-16	2016-17
Installed Capacity	MW	25	25
Units Produced	MW-h	22410	29994
Utilization	%	27%	37%

Source: BHSL & MM Analysis

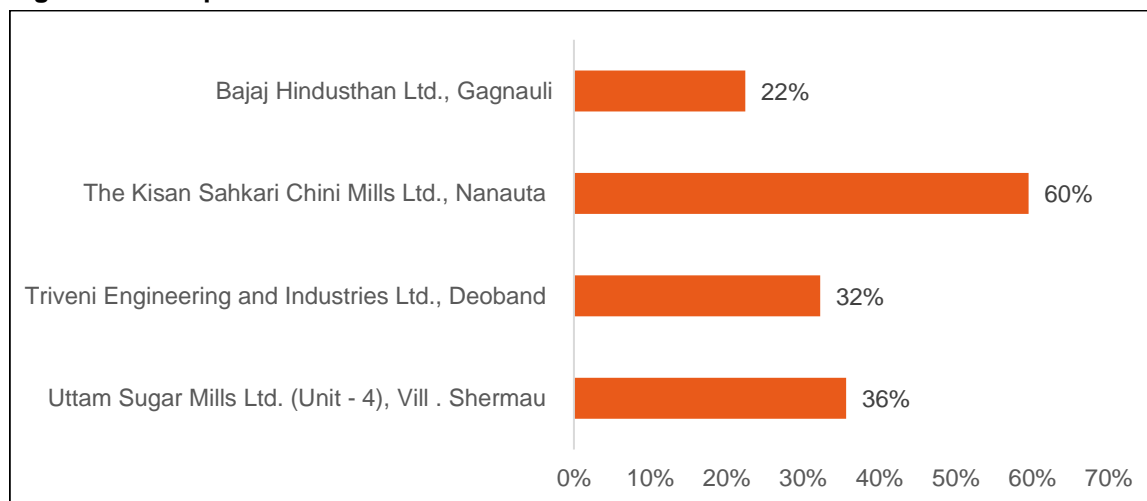
- There was a sharp decline in the sugar production in 2015-16 but the sugar production saw some improvement in 2016-17.
- The capacity Utilization of the Gangnauli plant is in the range of 22% to 43% since last 5 years.
- The recovery of the plant is in the range of 8-10%.
- The reason low recovery and utilisation factor is the availability of poor cane quality in the region.
- The utilisation factor of most of its peers was also on the lower side in 2015-16.
- The utilization of power plant is dependent on sugar cane availability as bagasse which is a by-products of sugar production is used as input for power plant. Therefore, when the sugar cane availability is less power plant would be operational for lower number of days.
- The contribution of Gangnauli plant in total sugar produced by the Bajaj group was 5% in 2016-17 season.

9.8.6 Comparison with Peers

The comparison of Gangnauli plant with its competitors operating in Western UP in terms of utilization and recovery (in %) is illustrated in below mentioned table . The data used to generate the graphs are of production season 2015-16

The comparison of plants in terms of utilisation in the same region is given below:

Figure 77: Comparison of utilisation factor

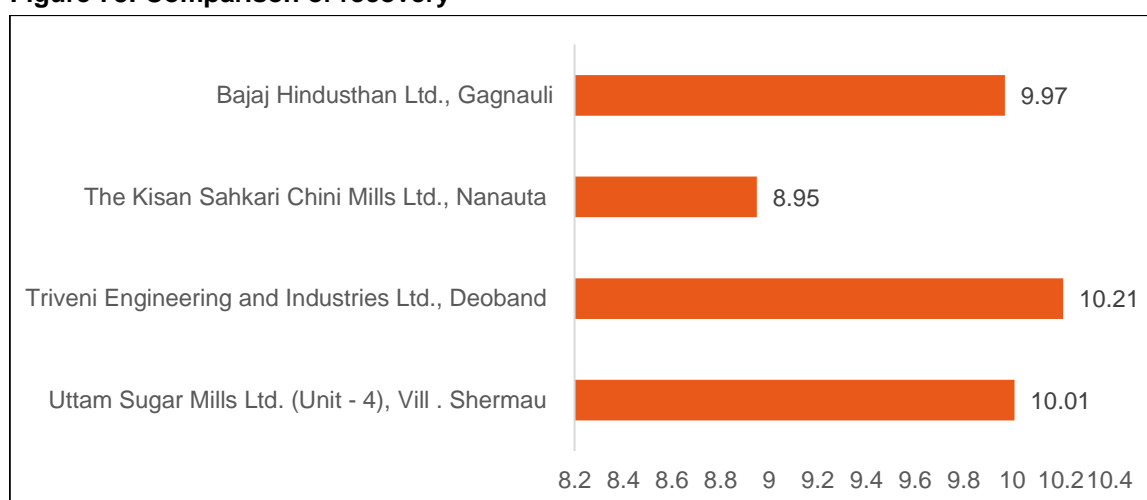


Source: MM Analysis

- The average capacity utilisation of peers operating in same region western UP is 37.5%.
- The reason for low capacity utilisation for Gangnauli plant was poor quality of cane.
- The capacity utilisation of the Gangnauli plant is lower compared to its peers in western UP.

The comparison of plants in terms of recovery in the same region is given below:

Figure 78: Comparison of recovery



Source: MM Analysis

- The average recovery rate of peers operating in same region western UP is 9.78%.

- The recovery rate of the Gangnauli plant is in line with its peers in western UP.

9.8.7 Maintenance Philosophy

- An expert team from BHSL carries out scheduled maintenance in off season to save time in crushing season
- Repair & Maintenance budget received by the company during off season varies in the range of Rs 3 to Rs 4 per quintal with some increment every year.
- Maintenance during production season is done after every 30 days for 6-7 hours which is done to increase the performance and efficiency of the equipments.
- Apart from the Repair & Maintenance budget the plant can avail for additional budget from head office in case of major works.
- The company has an annual service agreement with Triveni for the turbines wherein service engineers from Triveni carries out schedule maintenance of the turbines every tear during the off season.
- The maintenance of all the other machines is carried out in-house by BHSL experts.

9.8.8 Effluents from Plant

- Consultants have reviewed the inspection reports of the Gangnauli plant for Ash dumping area, waste water, Ambient air, Ambient noise, and Stack boiler and all the effluent parameters are within the limits given by Central Pollution Control Board(CPCB).
- Similarly test results of the ground water are also in the limits given by CPCB

9.8.9 Status of Statutory approval

Table 147: Status of Statutory approval

Sr.no	Clearances sought	Gangnauli Plant
1	Environment Clearance MoEF	Not Available
	Valid From (Date)	
	Valid Till (Date)	
2	Water Usage	Applied & Under process
	Valid From (Date)	
	Valid Till (Date)	
3	NOC from state pollution board	
	Valid From (Date)	31.08.2005
	Valid Till (Date)	One Time
4	Consent to operate	
	Valid From (Date)AIR/Water	1.1.2016
	Valid Till (Date)	31.12.17
5	CIB certification for boiler	
	Valid From (Date)	29.9.16
	Valid Till (Date)	18.08.17
6	Approval of fire protection scheme	Fire inspection carried out Document provided
	Valid From (Date)	Fire inspection carried out on 10.03.2016
	Valid Till (Date)	
7	Panchayat/Municipal corporation Approval	Available for distillery not separately provide for sugar plant

Sr.no	Clearances sought	Gangnauli Plant
	Valid From (Date)	
	Valid Till (Date)	

Source: MM Analysis

- Environment Clearance EC has not been furnished by BHSL to MM. hence MM cannot comment on the same
- The plant has Food Safety System(FSSAI) certification which valid from 20th April 2015 to 19th April 2018.
- CIB certification for boiler, consent to operate from pollution control board are due for renewal by the end 2017.

9.9 Thana Bhawan Plant

9.9.1 Plant details

Details of the Thanabhawan plant are given in following table.

Table 148: Plant details

Sr. No.	Particulars	Description
1	Location	Muzaffarnagar District, Thana Bhawan - Sugar Unit, Vill.: Thana Bhawan
2	Land Area	80 Acres
3	Manufacturing facility	Cane Crushing, Power generation (Cogeneration)

Source: MM Analysis,

9.9.2 Location Analysis

Thanabhawan plant is in western UP near Muzaffarnagar. The location of the plant is strategic considering the availability of sugarcane. Plant is situated in West Uttar Pradesh which accounts for almost 53% of the sugarcane production of Uttar Pradesh.

The location of the plant is depicted in the figure below:

Figure 79: Site Location- Top view



Source: Google Maps

The connectivity details to Thanabhawan site is given in the below table:

Table 149: Site Accessibility

Connectivity	Description	Distance
Nearest Major City	Thana Bhawan	3 KM
	Muzaffarnagar	36.4KM
Nearest highway	NH 709A	18KM
	SH 57	.35 KM
Nearest Station	Thana Bhawan railway station	5 KM
	Muzaffarnagar railway station	37.4 KM
	Bus Station, Muzaffarnagar	16 KM
Nearest Airport	IGI Airport, New Delhi	145 KM

Source: MM Analysis

9.9.3 Plant Configuration

The Thanabhawan plant has facility of Sugar Production and Co-generation. The power plant runs on the bagasse generated in sugar crushing. A part of the power generated is used for captive consumption while the residual power is exported to the grid. Molasses produced during sugar production is supplied to the BHSL - Gangnauli distillery to manufacture Alcohol. The bottom ash is collected and distributed to farmers to increase the productivity of the cane. The plant configuration is described in the below figure

Table 150: Installed Capacities

Particulars	U.O.M	Values
Cane Crushed	TCD	9000
Power Generation	MW	34

Source: MM Analysis

9.9.4 Site Infrastructure

The Thanabhawan plant was established in 2005-06 with an installed capacity of 9000 TCD with 34 MW Cogeneration Power Plant

9.9.4.1 Civil Infrastructure

The List of structures at the Thanabhawan plant and their respective areas are given in the table below:

Table 151: Civil Infrastructure

Sr.no	Structure	Area (sq. mtr.)
1	Mill House	918
2	Power House	1440
3	Boiler House	5574
4	Clarification House	3312
5	Pan & Sugar House	2940
6	Lime & Sugar Godown	216
7	DG House	268.2
8	Administration Block	300
9	Sugar Godown*2Nos	16000
10	Bagasse Yard	14246.68

Source: BHSL & MM

- The area of cane yard is adequate to facilitate easy movement of the trucks and tractors coming into the plant to deliver the sugarcane.
- Adequate storage area for sugar and bagasse is available in the plant.
- The sugar storage area is sufficient to hold sugar for 90 days.
- At the Thanabhawan plant DC driven mills are used unlike in other old plants like Gola and Palia where steam driven mills are used.
- The area of the Mill house at the Thanabhawan plant is 50% lesser than the plants where steam driven mills are used.
- The plant area also includes social infrastructure like quarters for employees, school etc.
- The plant area and the current infrastructure is adequate to operate the plant at full capacity

9.9.4.2 Plant Machinery

Thanabhawan plant has one mill tandem with a capacity of 9000TCD and 34MW of cogeneration power The List of Machineries at the Thanabhawan plant is provided in the below mentioned table:

Table 152: Plant Machinery

Machineries	Number of Units	Manufacturer	Specifications
Cane Handling			
Cane unloader	4 Nos.	Uttam	Capacity- 25 Tips/hr, 5 Tons SWL for each tip.
	1 No.	Global Engg.	Capacity- 5 Ton
Truck Tippler	1 No.	SKS	Capacity- 60 T
Steam generation Plant			
Boilers	2 Nos.	SSE	Capacity- 90T/hr
Electric Generators	1 No.		1000 KVA
	1 No.		500 KVA
	1 No.		250 KVA
Power Turbines	1 No.	Kessels	Capacity- 10 MW
	1 No.	Triveni	Capacity- 10 MW
	1 No.	Belliss	Capacity- 10 MW
	1 No.	Belliss	3 MW T.G.
Lime Section			
Lime Classifier	1 No.		Driven by 5 HP * 1440 RPM & gear box
Clarifier		The King Sugar Co., Saharanpur	40 feet dia 4*4*4
		Universal Heavy Engg. Co., Saharanpur	Addition 5th compartment 40 feet dia 4*4*4
Vacuum Filter	3 Nos.	Universal Heavy Engg. Co.	driven by 5 HP * 960 RPM drum speed & 1.0 to 3.0 RPM
Sugar Grader	2 Nos.	I.C.	Capacity- 35T/hr

Source: BHSL

- Majority of the core equipment like Mills, Boilers and Turbines have been supplied by market leaders like Thermax, Bukau Wolf, Triveni and Uttam.
- There has been no major capital refurbishment from the time the plant was established in 2005-06.
- The entire plant is automated and is centrally controlled.
- The mills are DC driven which leads to optimum utilisation of plant area.
- The crushers and the cutters must go for reselling every 2-3 years which requires a capital expenditure of 7.5 lakhs/crusher.
- The boiling pans are operated in continuous process which leads to consistent quality of sugar and less cycle time.
- There are standby evaporators, clarifiers and preheaters which are used during scheduled maintenance to avoid any downtime
- The boilers installed at the plant can generate steam of 45kg/m² but most of the boilers installed in modern plants can generate steam up to 110kg/m².
- Boilers which can generate high pressure steam involve higher capital expenditure but are more efficient in terms of amount of steam required to generate 1 MGW of power.
- Steam after production of power is utilised to in preheaters and is then condensed which is then used in the boilers.
- The juice heaters must be replaced every 15 years so the heater must be replaced in 2020.

9.9.4.3 Manpower

Details of the manpower at Thanabhawan plant is as per following table:

Table 153: Manpower Details

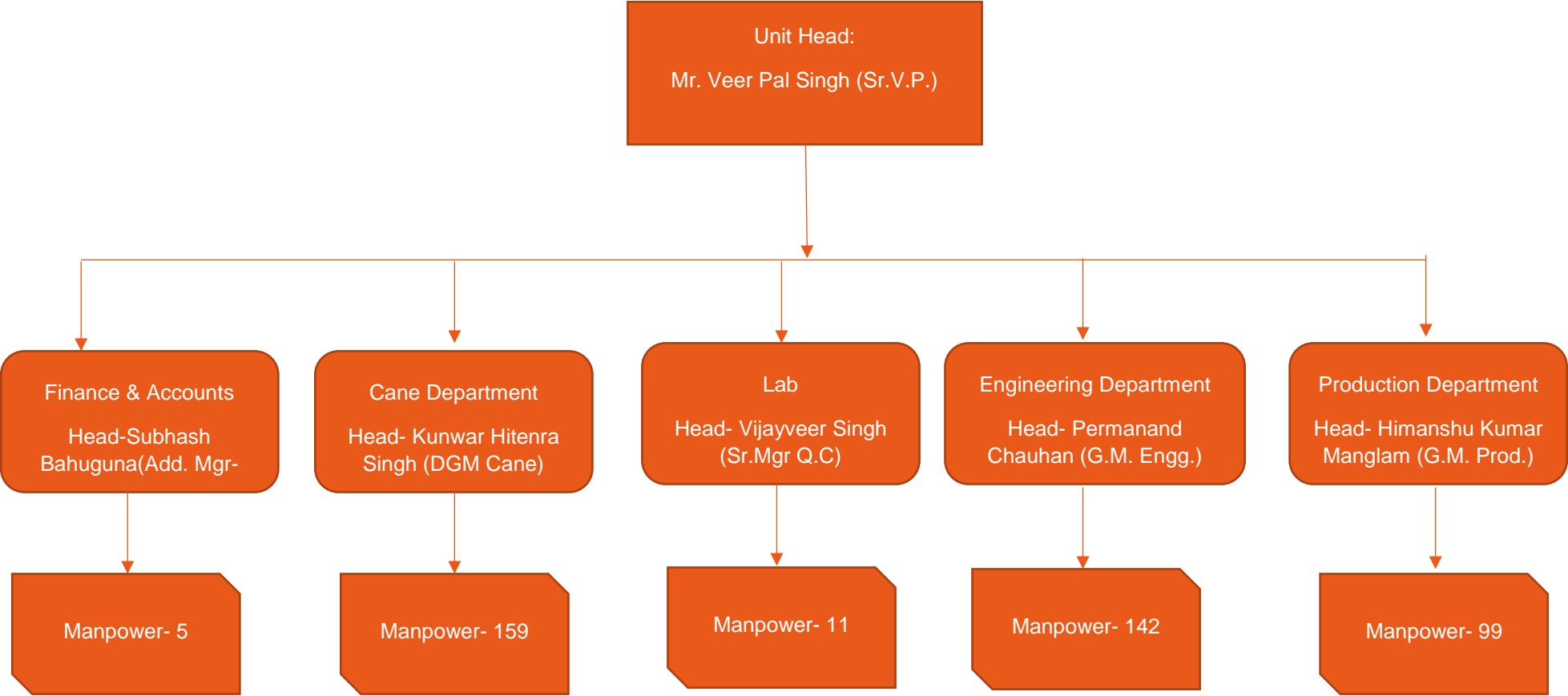
Sr.no	Department	Nos
1	Cane Department	160
2	Lab Department	12
3	Engineering	143
4	Production	100
5	Finance & Accounts.	6
6	Sugar Sales	14
7	CIT	1
8	Store	6
9	HR & Admn, Medical	13
10	EHS	0
11	Horticulture	1
12	Internal Audit	3
12	EDP & IT	3
13	Legal	1
	Total	463

Source: BHSL & MM Analysis

- The Thanabhawan plant is state of the art with automated controls hence the manpower requirement at this plant is lesser than some of the older plants like Gola.
- The manpower per lakh quintal of cane crushed for the plant is 4.52 employees
- The current manpower deployed at the plant is adequate to operate the plant at its full capacity.

The Organogram of the Thanabhawan Sugar plant is depicted below:

Figure 80: Organogram- Thanabhawan



Source: BHSL

9.9.5 Production Details

The details of the last 5 years' cane crushed and recovery rates for Thana Bhawan plant can be seen in following table

Table 154: Production details (Sugar)

	U.O.M	2011-12	2012-14	2014-15	2015-16	2016-17
Cane Crushed	Lakh Quintals	72.08	171.75	92.12	80.35	102.40
Sugar Produced	Lakh Quintals	6.00	14.83	8.29	7.89	10.21
Capacity Utilization	%	50%	55%	64%	56%	71%
Recovery Rate	%	8%	9%	9%	10%	10%

Source: BHSL

The power generation of Thanabhawan plant is mentioned in the below table:

Table 155: Production Details – Power Plant

	U.O.M	2015-16	2016-17
Installed Capacity	MW	34	34
Units Produced	MW-H	52416.52	59508.68
Utilization	%	47%	54%

Source: BHSL

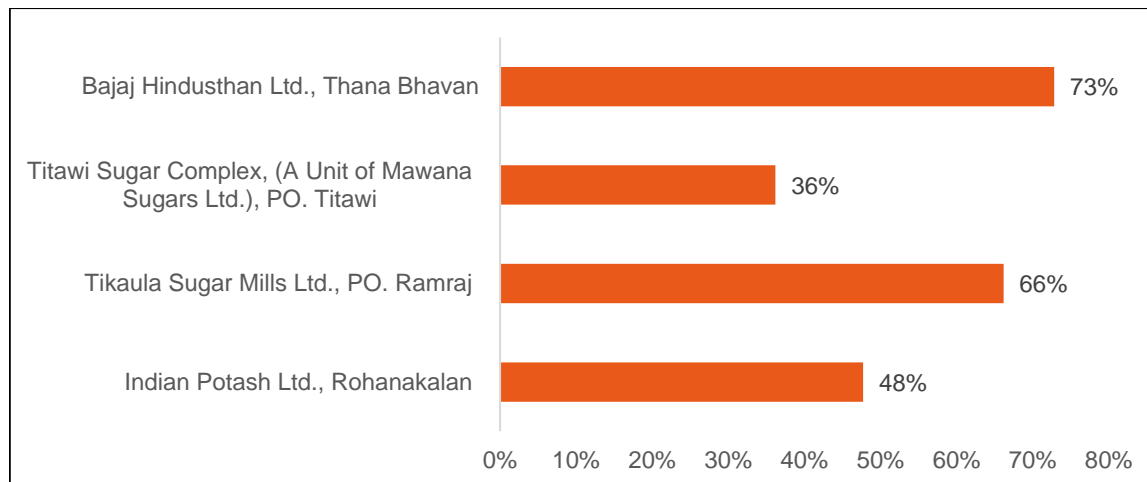
- There was a sharp decline in the sugar production in 2015-16 but the sugar production saw some improvement in 2016-17.
- The improvement in 2016-17 was due to use of more early variety of sugarcane which has a higher yield.
- The capacity Utilization of the Thanabhawan plant is in the range of 50% to 71% since last 5 years.
- The recovery of the plant is in the range of 8-10%.
- The utilization of power plant is dependent on sugar cane availability as bagasse which is a by-products of sugar production is used as input for power plant. Therefore, when the sugar cane availability is less power plant would be operational for lower number of days.
- The contribution of Thanabhawan plant in total sugar produced by the Bajaj group was 9% in 2016-17 season.

9.9.6 Comparison with peers

The comparison of Thanabhawan plant with its competitors operating in Western UP in terms of utilization and recovery (in %) is illustrated in below mentioned table . The data used to generate the graphs are of production season 2015-16

The comparison of plants in terms of utilisation in the same region is given below:

Figure 81: Comparison of Utilisation (in %)

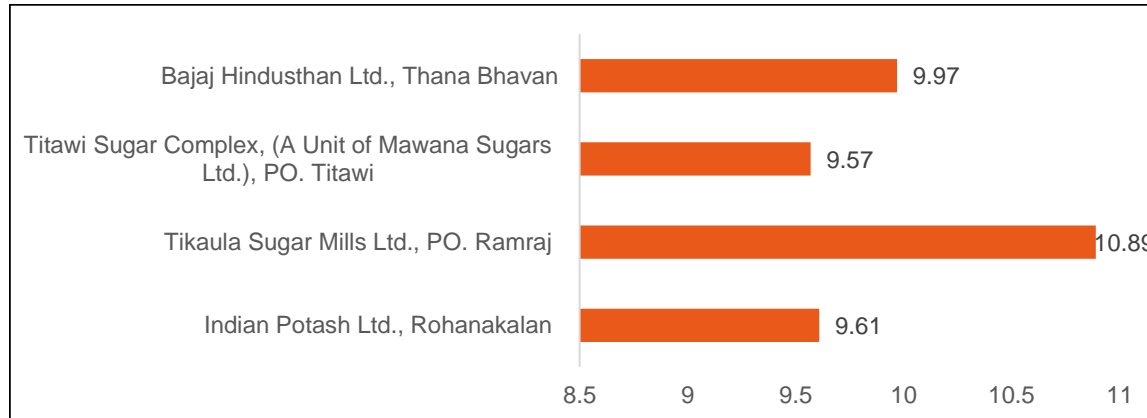


Source: MM Analysis

- The average capacity utilisation of peers operating in same region of western UP is 55.7%.
- The capacity utilisation of the Thanabhawan plant is higher compared to its peers in western UP.

The comparison of plants in terms of recovery in the same region is given below:

Figure 82: Comparison of recovery (in %)



Source: MM analysis

- The average recovery rate of the plants operating in the same region is 10%.
- The recovery rate of the Thanabhawan plant is in line with its peers in western UP.

9.9.7 Maintenance Philosophy

- An expert team from BHSL carries out scheduled maintenance in off season to save time in crushing season
- Repair & Maintenance budget received by the company during off season varies in the range of Rs 3 to Rs 4 per quintal with some increment every year.
- Maintenance during production season is after every 25 days for 8 hours which is scheduled to increase performance and efficiency

- Apart from the Repair & Maintenance budget the plant can avail for additional budget from head office in case of major works.
- The company has an annual service agreement with Triveni for the turbines wherein service engineers from Triveni carries out schedule maintenance of the turbines every year during the off season.
- The maintenance of all the other machines is carried out in-house by BHSL experts.

9.9.8 Effluents from the plant

- Consultants have reviewed the inspection reports of the Gangnauli plant for Ash dumping area, waste water, Ambient air, Ambient noise, and Stack boiler carried and all the effluent parameters are within the limits given by Central Pollution Control Board(CPCB).
- Similarly test results of the ground water are also in the limits given by CPCB

9.9.9 Status of Statutory Approval

Table 156: Status of Statutory Approvals

Sr. No	Clearances sought	Thanabhawan
1	Environment Clearance MoEF	
	Valid From (Date)	N.A
	Valid Till (Date)	N.A
2	Water Usage	
	Valid From (Date)	01.01.2016
	Valid Till (Date)	31.12.2017
3	NOC from state pollution board	
	Valid From (Date)	
	Valid Till (Date)	Not Available to MM
4	Consent to operate	
	Valid From (Date)AIR/Water	First Crushing season 20.07.2005
	Valid Till (Date)	one time
5	CIB certification for boiler	
	Valid From (Date)	24.9.2016
	Valid Till (Date)	27.8.2017
6	Approval of fire protection scheme	
	Valid From (Date)	01.12.2016
	Valid Till (Date)	30.11.2017
7	Panchayat/Municipal corporation Approval	
	Valid From (Date)	01.10.16
	Valid Till (Date)	30.09.2017

Source: BHSL/MM Analysis

- CIB certification for boiler, consent to operate from pollution control board are due for renewal by the end 2017
- Environment clearance by MoEF has not been provided by BHSL to MM.

9.10 Maqsoodpur Plant

9.10.1 Plant Details

Details of the Maqsoodpur manufacturing facility are given below.

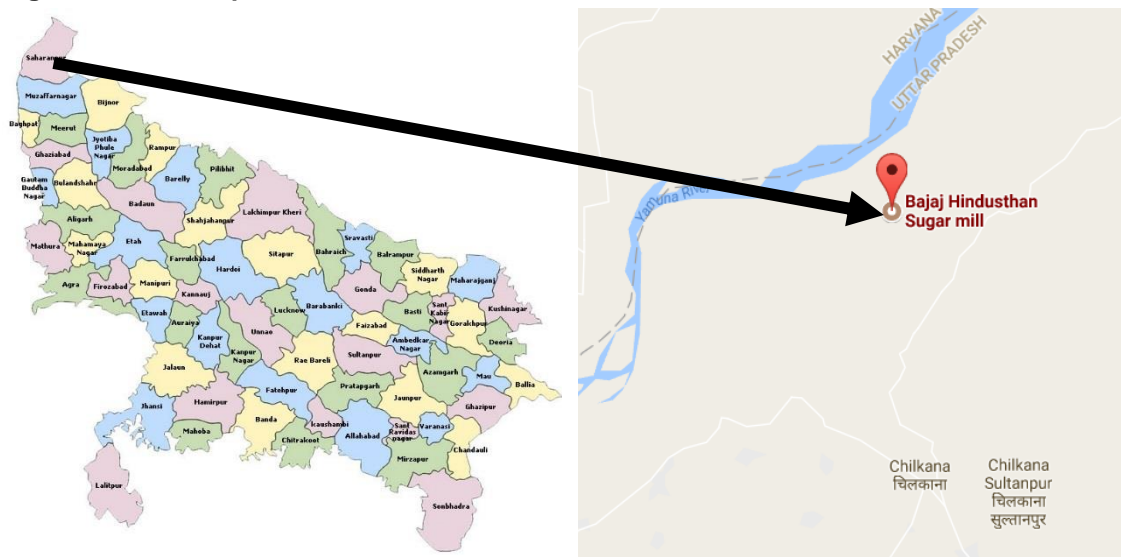
Table157: Plant Details

Sr. No.	Particulars	Description
1	Location	Maqsudpur - Sugar Unit Maqsudpur, Tehsil: Pawayan
2	Land Area	124 Acres
3	Manufacturing facility	Cane Crushing and Power generation (Captive)

Source: MM Site Visit

9.10.2 Location Analysis

The location of the plant is strategic considering the availability of sugarcane. Plant is situated in Western UP which accounts for almost 53% of the sugarcane production of Uttar Pradesh. The location of the plant is depicted in the figure below:

Figure 83: Site Map

Source: Google Maps

Accessibility and connectivity details of Maqsoodpur plant are given in following table.

Table 158: Site Accessibility

Connectivity	Description	Distance
Nearest Major City	New Delhi	227 Km
Nearest highway	NH 44 to Delhi	128 Km
Nearest Station	Maqsoodpur railway station.	2.1 Km
Nearest Airport	Indira Gandhi Airport New Delhi	250 Km

Source: MM Analysis

9.10.3 Plant Configuration

The Maqsoodpur plant has facility of Sugar Production and Power generation. The power plant runs on the bagasse generated in sugar crushing while Alcohol is manufactured from the molasses generated in sugar manufacturing. The Installed capacities for the all the facilities is given in following table.

Table 159: Installed Capacities

Particulars	U.O.M	Values
Cane Crushed	TCD	7000
Power Generation	MW-H	28

Source: MM Analysis

9.10.4 Site Infrastructure

Plant was established in 2007 with an installed capacity of 7000 TCD with no increment in the capacities till date. The details of major buildings and structures is given below

9.10.4.1 Civil Infrastructure

The List of structures at the Maqsoodpur plant and their respective areas are given in the table below:

Table 160: Buildings and Structures

Sr.	Building Name	Area (M ²)	Year of Construction
1	Mill House Building	3676.39	2006
1.1	Mill House Cane carrier	4309.00	2006
2	Evaporation House	913.24	2006
3	Pan House	4490.70	2006
4	Sugar House	1661.97	2006
5	Clarification House	1460.49	2006
6	Feed Water Tank	371.00	2006
7	Power House	1635.00	2006
8	Return Baggage Carrier	930.00	2006
9	Cooling Tower (Power)	672.00	2006
9.1	Cooling Tower (Sugar)	1148.00	2006
9.2	Cooling Tower FRP	100.00	2006
10	Molasses Tank (3 nos)	4515.00	2006
11	Pump for cooling Tower (Power)	45.00	2006
11.1	Pump for cooling Tower (Sugar)	104.00	2006
11.2	Pump for cooling Tower FRP	42.50	2006
12	E.T.P	7347.00	2006
13	Store	437.25	2006
13.1	Store Yard	1139.25	2006
14	Bagasse Yard	23065.00	2006
15	Boiler Section	3820.00	2006
16	Lime & Sulphur Godown	555.92	2006

Source: BHSL

- The area of cane yard is adequate to facilitate easy movement of the trucks and tractors coming into the plant to deliver the sugarcane.
- Adequate storage area for sugar and bagasse is available in the plant.
- The plant area also includes social infrastructure like quarters for employees, school etc.
- The plant area and the current infrastructure is adequate to operate the plant at full capacity.

9.10.4.2 Plant Machinery

The Maqsoodpur plant has one tandems(Line) line of 7000 TCD capacity.

The List of Machineries at the Utraula plant is provided in the below mentioned table:

Table 161: Plant Machinery

Machineries	Number of Units	Manufacturer	Specifications
Cane Handling			
Cane unloader	4 nos.		Capacity- 5 Ton/Tip
Truck Tippler	1 no.		Capacity- 60 MT
Steam generation Plant			
Boilers	2 no.	WIL, Walchandnaqer, Pune	Capacity- 90 TPH
Electric Generators	5 nos.	Caterpillar	Capacity- 1010 KVA
		Jackson	Capacity- 500 KVA
		Jackson	Capacity- 320 KVA
		Jackson	Capacity- 75 KVA
		Jackson	Capacity- 20 KVA
Power Turbines	3 nos.	Triveni	A) 10 MW Turbine- Capacity 10 MW
		Triveni	B) 3 MW Turbine- Capacity 3 MW
		Triveni	C) 15 MW Turbine- Capacity 15 MW
Clarification			
Juice Sulphiters	2 nos.		Capacity- 425 HL
Sulphur Gas Plant	2 nos. (Film type)	Digital Utility	1 no. for juice sulphitor (cap. 200 kg/hr)
		Digital Utility	1 no. for syrup sulphitor (cap. 150 kg/hr)
	2 nos. (Continuous type)		1 no. for juice sulphitor (cap. 200 kg/hr)
			1 no. for syrup sulphitor (cap. 150 kg/hr)
Lime Section			
Clarifier	1 no.	Jord Engg Ltd.	Capacity- 7100 HL
Vacuum Filter	2 nos.	Sintech	1 no. Annual water cooling type ,SMV 600 (cap. 50 M3 /Min or 3000 M3/Hr)
		PPI	1 no. Annual water cooling type,PL1250 (cap. 50 M3 /Min or 3000 M3/Hr)

Source: BHSL

MM Observes that

- Majority of the core equipment like Mills, Boilers and Turbines have been supplied by market leaders like Thermax, Triveni, Jackson, Caterpillar.
- Boilers and other plant machinery are from reputed manufacturers which are among the best in their field.
- MM Observation on overall plant facility
 - Plant is situated in Western UP which accounts for almost 53% of the sugarcane production of Uttar Pradesh. Hence plant will not face any problem with respect to RM availability considering the normal monsoon.
 - Total power requirement of the plant is approx.288Lakh KW which is fulfilled by captive power plant and excess power of 205 Lakh KW is exported to state grid

9.10.4.3 Manpower Details

Manpower Details of Maqsoodpur sugar plant is given below:

Table 162: Manpower Details

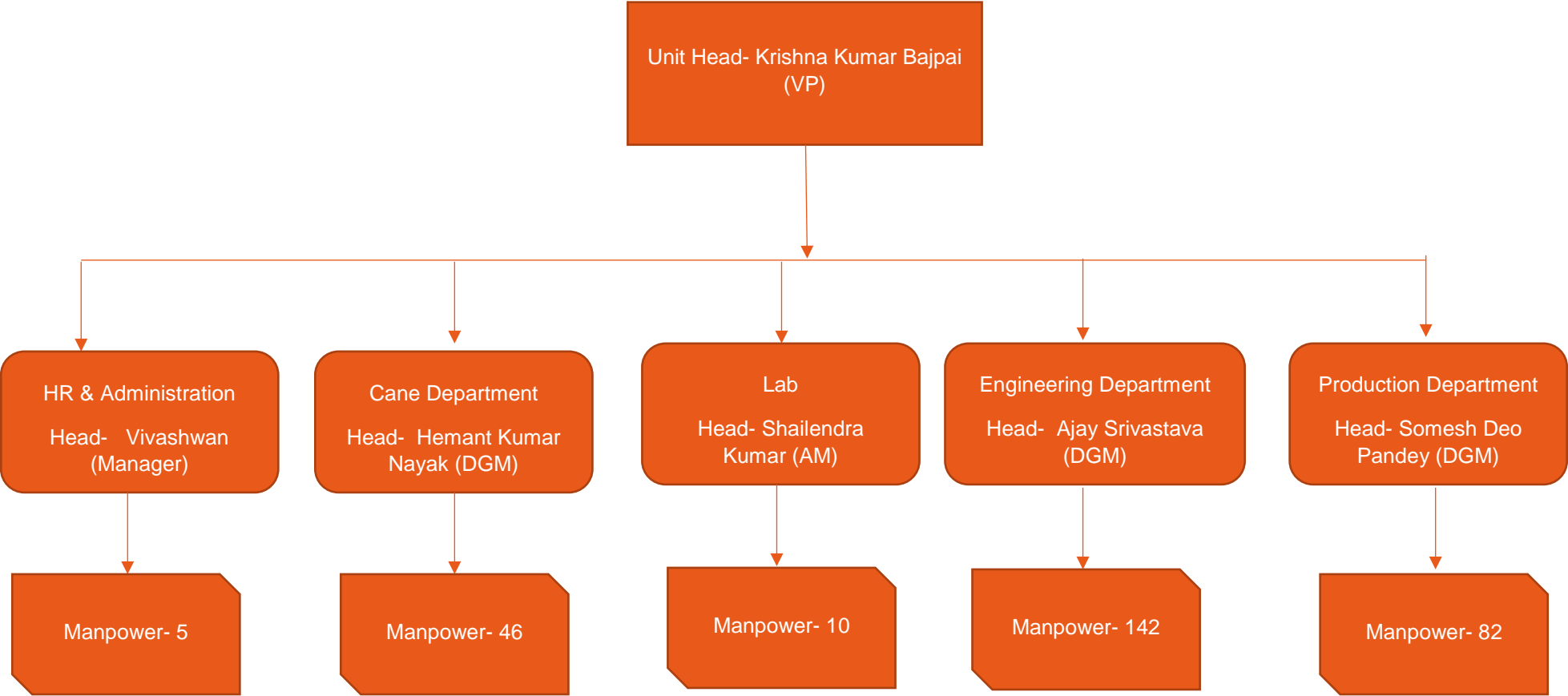
Sr. No.	Department	Nos
1	Store Department	6
2	Sugar Sales	9
4	Security	2
5	Legal	1
7	Indirect Taxation	1
8	Horticulture	1
9	Finance & Accounts	6
11	EDP & IT	4
14	General Office/Unit	1
15	HR & Administration	5
16	Cane Department	46
17	Lab Head	10
18	Engineering Department	142
19	Production Department	82
	Total	316

Source: BHSL

- The Maqsoodpur plant is automated therefore has less manpower requirement compared to other plants which aren't automated.
- There are 142 employees in the engineering department which are adequate to handle the entire sugar manufacturing process.
- The manpower per lakh quintal of cane crushed for the plant is 4.63 employees
- The manpower deployed at the plant is in line with other plants having similar installed capacities.

The Organogram of the Maqsoodpur Sugar plant is depicted below:

Figure 84: Organogram- Maqsoodpur Sugar Plant



Source: BHSL

9.10.4.4 Adequacy of Plant infrastructure and Manpower

Table 163: Manpower and Area adequacy

Parameter	Value	Cane crushing Lakh Qntls. (2016-17)	Ratio
Plant Area	124 acres	68	1.8
Manpower	320	68	5

Source: MM Analysis

- Manpower and Area was found to be adequate in comparison with the industry.
- The plant area and the current infrastructure is adequate to operate the plant at full capacity

9.10.5 Production Details

The details of the last 5 years' cane crushed and recovery rates for Maqsoodpur plant can be seen in following table

Table 164: Production Sugar

	U.O.M	2011-12	2012-14	2014-15	2015-16	2016-17
Cane Crushed	Lakh Quintals	83.34	141.01	54.19	42.24	68.26
Sugar Produced	Lakh Quintals	7.65	12.58	5.45	4.84	7.36
Capacity Utilization	%	74%	62%	48%	38%	61%
Recovery Rate	%	9%	9%	10%	11%	11%

Source: MM Analysis

Maximum utilization was achieved in year 2011-12 since then there is a decreasing trend in utilization. Recovery rate has increased from year 2011-12 and in year 2015-16 it was better than its peers operating in same region.

Table 165: Production Power plant

	U.O.M	2015-16	2016-17
Installed Capacity	MW-h	28	28
Units Produced	MW-H	30870	49245
Utilization	%	34%	53%

Source: MM Analysis

MM observes that,

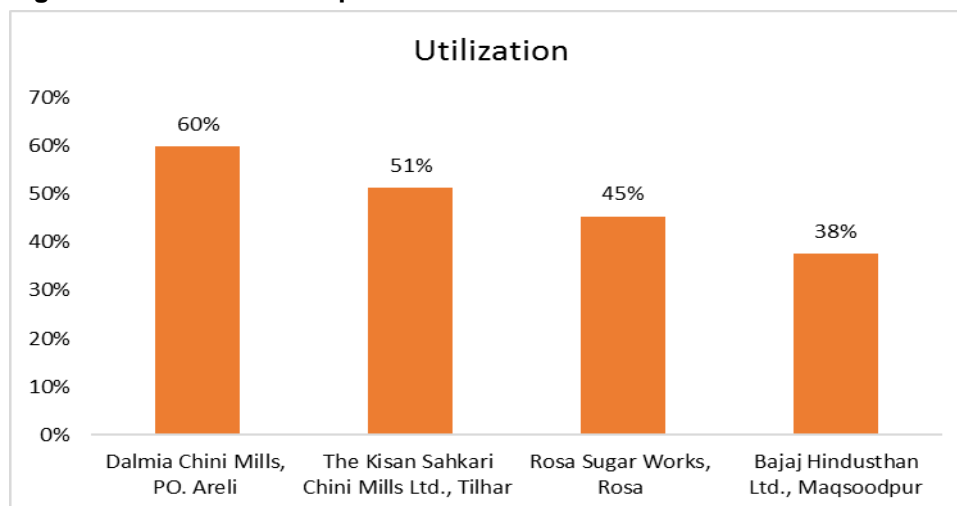
- Recovery rate of Maqsoodpur plant is better than its peers operating in same region.
- It should be noted that, even though capacity utilization of power plant was low there was no situation of power outage at the plant, and excess power produced was exported to the grid. This means this level of utilization is sufficient to fulfil power requirement of the plant.
- Increase in utilization would mean better sales realization via power exported to the grid.
- The contribution of Maqsoodpur plant in total sugar produced by the Bajaj group is 6 % in 2016-17 season.

9.10.6 Comparison with Peers

The Maqsoodpur plant operates at Western UP region. MM has analysed the data of other sugar mills operating in same area.

The comparison of plants in terms of utilisation in the same region is given below:

Figure 85: Utilization Comparison

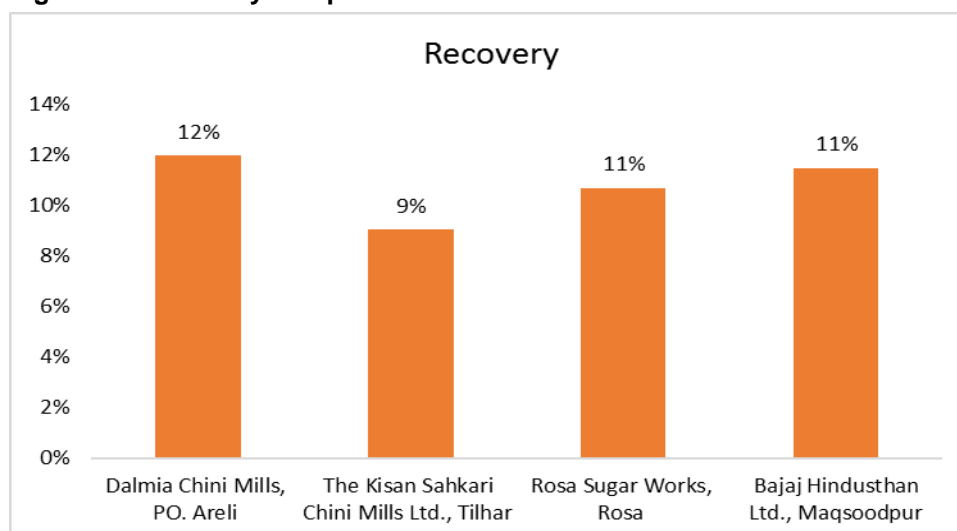


Source: MM Analysis

- The average capacity utilisation of peers operating in same region in central is 48.5%.
- The capacity utilisation of the Maqsoodpur plant is lower compared to its peers in western UP.

The comparison of plants in terms of recovery in the same region is given below:

Figure 86: Recovery comparison



Source: MM Analysis

- The average recovery of peers operating in same region in western UP is 10.75%.

- The recovery rate of the Maqsoodpur plant is in line with its peers in western UP

9.10.7 Maintenance Philosophy

As a standard process maintenance is carried out during off season every year and worn out/broken or expired machinery and parts are replaced. Details of such major works is given in following table.

Table 166: Major maintenance work sugar section FY 2016-17

Sr.N	Equipment	Year of Installation	Safe life	UOM	Qty	Approx. Value(in lacs including taxes)
1	Mill pinion with pinion shaft, bearing blocks & sleeves	2007	8-9 Years	Lot	1	22
2	Input shaft of Mill gear box	2007	7-8 Years	EA	1	14
3	750 KW DC Motor Commutator	2007	7-8 Years	EA	1	12
5	Plough Assy. For WIL make V-1750 machine and complete feed value with actuator	2007	7-8 Years	Lot	1	5
Sub Total Sugar						53

Source: BHSL

Table 167: Major maintenance work Cogen section FY 2016-17

Sr.N	Equipment	Year of Installation	Safe life	UOM	Qty	Approx. Value(in lacs including taxes)
1	Overhauling of 15 MW TG Set Alternator	2007	5-6 Years	Lot	1	3.5
2	Economizer & Air Pre-Heater coils	2007	5-6 Years	NO/M TR	50/34 0&100 /330	6.5
4	G.P. Sheets including fixing charges		6-7 Years	Sq. Mtr	1700	6
Sub Total COGEN						16

Source: BHSL

- Repair & Maintenance budget received by the company during off season is Rs 3.34 per quintal which is adequate and varies in the range of Rs 3 to Rs 4 per quintal with some increment every year.
- MM feels that it is bit higher in comparison with peers operating in same area having maintenance cost of Rs 1.5 to 2.5 per quintal.
- Apart from the Repair & Maintenance budget the plant can avail for additional budget from head office in case of major works.

9.10.8 Effluents from the plant

- Testing reports pertaining to Ambient Air, Ground water, waste water, stack emission have been reviewed by MM.
- All the effluent parameters are within the limits given by Central Pollution Control Board (CPCB).

9.10.9 Status of the statutory approvals

Table168: statutory Approvals

Sr No	Clearances sought	Maqsoodpur
1	Environment Clearance MoEF	
	Valid From (Date)	19.09.2016
	Valid Till (Date)	One time
2	Water Usage	
	Valid From (Date)	22.03.2007
	Valid Till (Date)	One time
3	NOC from state pollution board	
	Valid From (Date)	01.01.2016
	Valid Till (Date)	31.12.2017
4	Consent to operate	
	Valid From (Date)AIR/Water	01.01.2016
	Valid Till (Date)	31.12.2017
5	CIB certification for boiler	
	Valid From (Date)	01.10.2016
	Valid Till (Date)	26.08.2017
6	Approval of fire protection scheme	
	Valid From (Date)	22.01.2017
	Valid Till (Date)	21.01.2018
7	Panchayat/Municipal corporation Approval	
	Valid From (Date)	01.04.2017
	Valid Till (Date)	31.03.2018

Source: MM Analysis

MM observes that

- Consent to operate and NOC from pollution board would expire at the end of year 2017, while CIB certificate for boiler would expire in August 2017.
- The renewal process for clearances mentioned above needs to be expedited.

9.11 Budhana Plant

9.11.1 Plant Details

Details of the Budhana plant are given in following table.

Table 169: Plant Details

Sr. No.	Particulars	Description
1	Location	Muzaffarnagar District, Budhana - Sugar Unit Vill. Bhaiana
2	Land Area	86 Acres
3	Manufacturing facility	Cane Crushing and Power generation (Captive)

Source: MM Analysis

9.11.2 Location Analysis

Budhana plant is in western UP in Muzaffarnagar district. The location of the plant is strategic considering the availability of sugarcane. Plant is situated in West Uttar Pradesh which accounts for almost 53% of the sugarcane production of Uttar Pradesh.

The location of the plant is depicted in the figure below:

Figure 87: Site location – Top view



Source: MM Analysis

The connectivity details to Budhana site is given in the below table:

Table 170: Site Accessibility

Connectivity	Description	Distance
Nearest Major City	Meerut	47.5 KM
	Muzaffarnagar	31.4KM
Nearest highway	NH 709A	6.1KM
	NH 34	47.8 KM
Nearest Station	Meerut railway station	51.1 KM
	Muzaffarnagar railway station	35.6 KM
	Bus Station, Budhana	2.2 KM
Nearest Airport	IGI Airport, New Delhi	122 KM

Source: MM Analysis

9.11.3 Plant Configuration

The Budhana plant has facility of Sugar Production and Co-generation. The power plant runs on the bagasse generated in sugar crushing. A part of the power generated is used for captive consumption while the residual power is exported to the grid. Molasses produced during sugar production is supplied to the BHSL - Gangnauli distillery to manufacture Alcohol. The plant configuration is described in the below figure:

Table 171: Installed Capacities

Particulars	U.O.M	Values
Cane Crushed	TCD	9000
Power Generation	MW	33

Source: MM Analysis

9.11.4 Site Infrastructure

Budhana plant was established in 2005-06 with an installed capacity of 9000 TCD with 33 MW Cogeneration Power Plant

9.11.4.1 Civil Infrastructure

The List of structures at the Budhana plant and their respective areas are given in the table below:

Table 172: Buildings and Structures

Sr.no	building Name	Area (M2)	Type of structure	Year of Construction
1	Mill House	5994	Shed/Open	2005
2	Evaporation House	641.58	Open	2005
3	Pan House	2725.17	Shed/Open	2005
4	Sugar House	672	Shed	2005
5	Clarification House	1465.69	Open	2005
6	Feed Water Tank	280	Open	2005
7	Power House	1779.3	Shed	2005
8	Return Baggage Carrier	220.29	Open	2005
9	Cooling Tower	731.7	Open	2005
10	Molasses Tank (4 nos)	3418.22	Open	2005
11	Pump for cooling Tower	198	Shed	2005
12	E.T.P	6829	RCC/Open	2005
13	Store Godown	1992.23	RCC/Shed/Open	2005
14	Bagasse Yard	23400	Open	2005
15	Boiler Section	11764.3	Open	2005
16	Lime & Sulphur Godown	288	Shed	2005
17	Sugar Godown	8000		

Source: BHSL

- The area of cane yard is adequate to facilitate easy movement of the trucks and tractors coming into the plant to deliver the sugarcane.
- Adequate storage area for sugar and bagasse is available in the plant.
- The sugar storage area is sufficient to hold sugar for 45days.

- At the Budhana plant DC driven mills are used unlike in other old plants like Gola and Palia where steam driven mills are used.
- The area of the Mill house at the Budhana plant is 50% lesser than the plants where steam driven mills are used.
- The plant area also includes social infrastructure like quarters for employees, school etc.
- The plant area and the current infrastructure is adequate to operate the plant at full capacity

9.11.4.2 Plant Machineries

Budhana plant has only one tandem(Line) of 9000 TCD. Tandem has 5 rollers which leads to optimum extraction of sugar

The List of Machineries at the Budhana plant is provided in the below mentioned table:

Table 173: Plant Machinery

Machineries	Number of Units	Manufacturer	Specifications
Cane Handling			
Cane unloader	4 Nos.	SSE	Capacity- 25 Tips/hr, 5 Tons of SWL each tip
	1 No.	Uttam	Capacity- 25 Tips/hr, 5 Tons of SWL each tip
Truck Tippler	1 No.	SKS	Capacity- 60T
Steam generation Plant			
Boilers	2 Nos.	SSE	Capacity- 90 T/Hr.
	1 No.	WIL	Capacity- 90 T/Hr.
Electric Generators	2 Nos.	TDPS	Capacity- 10 MW generator
	2 Nos.	Kessel	Capacity- 11KVA
	1 No.	Triveni	Capacity- 12 MW
Power Turbines	1 No.	Triveni	Capacity- 12 MW
	1 No.	Triveni	Capacity- 10 MW
	1 No.	Kessel	Capacity- 10 MW
Clarification			
Juice Sulphiters	2 Nos.	Shanti	holding capacity- 530 HL
Sulphur Gas Plant	2 Nos.	Digital Utility	Capacity- 200 Kgs/hr.
	2 Nos.	Vishwa	Capacity- 200 Kgs/hr.
	1 No.	Kishan	Capacity- 250 Kg/hr.
Lime Section			
Clarifier	1 No.	Universal, Saharanpur	Holding Capacity- 890M3
Sugar Grader	2 Nos.	International combustion	Capacity- 35 tons/hr.

Source: BHSL/MM Analysis

- Majority of the core equipment like Mills, Boilers and Turbines have been supplied by market leaders like Thermax, Bukau Wolf, Triveni and Uttam.
- There has been no major capital refurbishment from the time the plant was established in 2005-06.
- The entire plant is automated and is centrally controlled.
- The mills are DC driven which leads to optimum utilisation of plant area.
- The crushers and the cutters must go for reshelling every 2-3 years which requires a capital expenditure of 7.5 lakhs/crusher.

- The boiling pans are operated in batch process while in most of the other modern plants they are operated in continuous process which leads to consistent quality of the sugar and reduces the cycle time
- There are standby evaporators, clarifiers and preheaters which are used during scheduled maintenance to avoid any downtime
- The boilers installed at the plant can generate steam of 45kg/m² but most of the boilers installed in modern plants can generate steam up to 110kg/m².
- Boilers which can generate high pressure steam involve higher capital expenditure but are more efficient in terms of amount of steam required to generate 1 MGW of power.
- Steam after production of power is utilised to in preheaters and is then condensed which is then used in the boilers.
- The juice heaters must be replaced every 15 years so the heater must be replaced in 2020.

9.11.4.3 Manpower Details

Details of the manpower at Budhana plant is as per the following table:

Table 174: Manpower Details

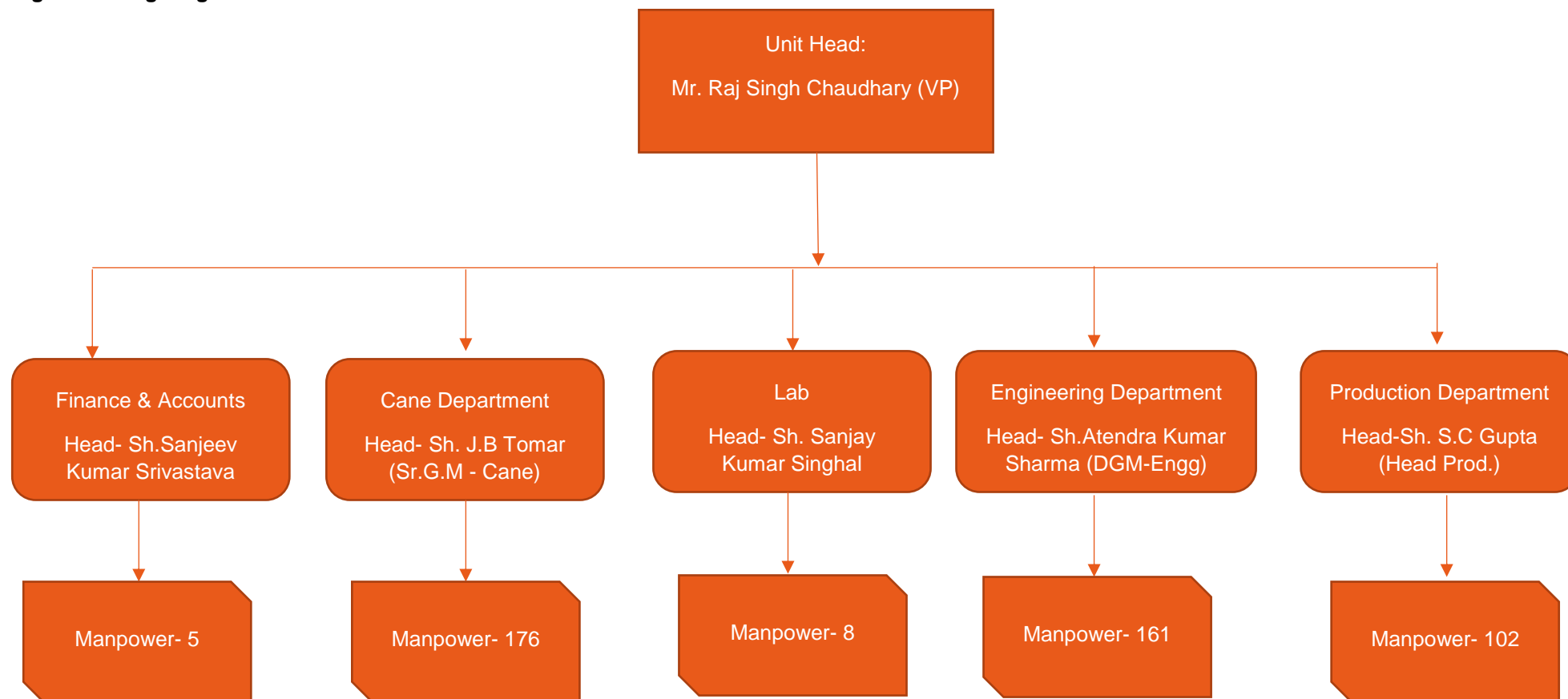
Sr.no	Department	Nos
1	Cane	177
2	Lab	9
3	Engineering	162
4	Production	103
5	Finance & Accounts.	6
6	Sugar Sales	11
7	CIT	1
8	Store	6
9	HR & Admn, Medical	14
10	EHS	1
11	Horticulture	1
12	EDP & IT	4
13	Legal	1
	Total	496

Source: BHSL & MM Analysis

- The Budhana plant is state of the art with automated controls hence the manpower requirement at this plant is lesser than some of the older plants like Gola.
- The manpower per lakh quintal of cane crushed for the plant is 4.11 employees
- The current manpower deployed at the plant is adequate to operate the plant at its full capacity.

The Organogram of the Budhana Sugar plant is depicted below:

Figure 88: Organogram- Budhana



Source: BHSL

9.11.5 Production Details

The details of the last 5 years' cane crushed and recovery rates for Budhana plant can be seen in following table:

Table 175: Production details (Sugar)

	U.O.M	2011-12	2012-14	2014-15	2015-16	2016-17
Cane Crushed	Lakh Quintals	95.89	191.13	124.49	121.84	120.58
Sugar Produced	Lakh Quintals	8.46	17.32	11.62	12.08	12.08
Capacity Utilization	%	67%	72%	86%	85%	84%
Recovery Rate	%	9%	9%	9%	10%	10%

Source: MM Analysis

The power generation of Budhana plant is mentioned in the below table:

Table 176: Production Details - Power

	U.O.M	2015-16	2016-17
Installed Capacity	MW	33	33
Units Produced	MW-H	80576.72	79612.98
Utilization	%	75%	74%

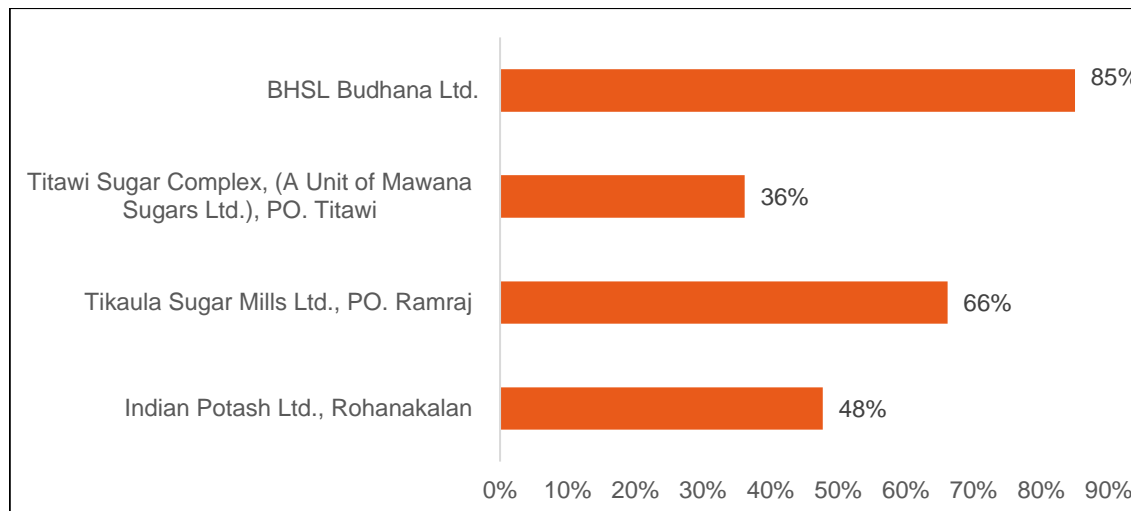
Source: MM Analysis

- The capacity Utilization of the Budhana plant is in the range of 67% to 86% since last 5 years.
- The recovery of the plant is in the range of 9-10%.
- The Budhana plant has the best utilisation factor compared to all the other BHSL plants
- The utilization of power plant is dependent on sugar cane availability as bagasse which is a by-products of sugar production is used as input for power plant. Therefore, when the sugar cane availability is more power plant would be operational for higher number of days.
- The contribution of Budhana plant in total sugar produced by the Bajaj group was 10% in 2016-17 season.

9.11.6 Comparison with peers

The comparison of plants in terms of utilisation in the same region is given below:

Figure 89: Comparison of Utilisation

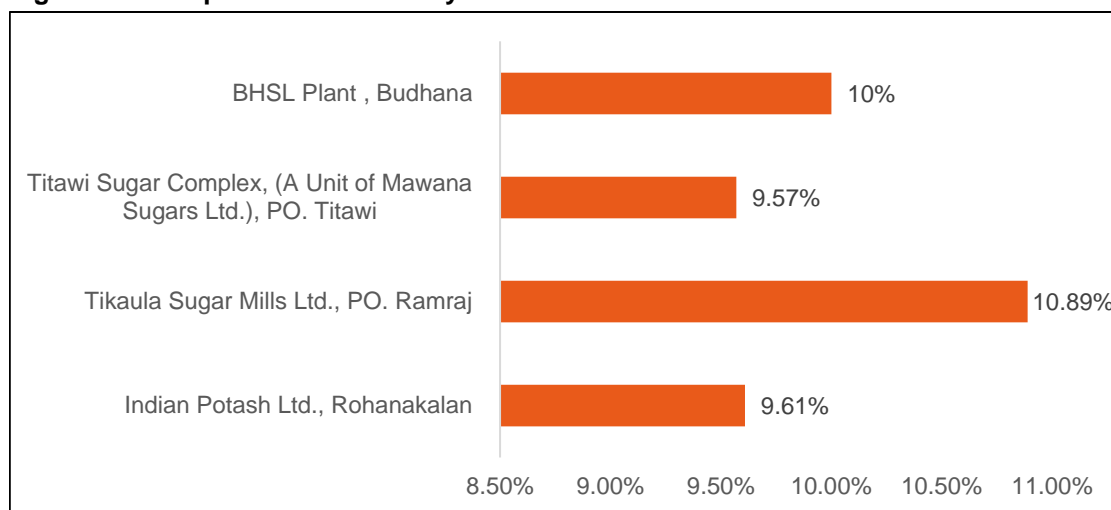


Source: MM Analysis

- The average capacity utilisation of the plants in eastern UP is 58.7 %.
- The capacity utilisation of the Budhana plant is higher compared to its peers in western UP.

The comparison of plants in terms of recovery in the same region is given below:

Figure 90: Comparison of Recovery



Source: MM Analysis

- The average recovery rate of the plants in western UP is 10%.
- The recovery rate of the Budhana plant is in line with its peers in western UP.

9.11.7 Maintenance philosophy

- An expert team from BHSL carries out scheduled maintenance in off season to save time in crushing season
- Repair & Maintenance budget received by the company during off season varies in the range of Rs 3 to Rs 4 per quintal with some increment every year.

- Maintenance during production season is after every 25 days for 8 hours which is scheduled to increase performance and efficiency
- Apart from the Repair & Maintenance budget the plant can avail for additional budget from head office in case of major works.
- The company has an annual service agreement with Triveni for the turbines wherein service engineers from Triveni carries out schedule maintenance of the turbines every year during the off season.
- The maintenance of all the other machines is carried out in-house by BHSL experts.

9.11.8 Effluents from Plant

- Consultants have reviewed the inspection reports of the Gangnauli plant for Ash dumping area, waste water, Ambient air, Ambient noise, and Stack boiler and all the effluent parameters are within the limits given by Central Pollution Control Board(CPCB).
- Similarly test results of the ground water are also in the limits given by CPCB

9.11.9 Status of Statutory Approval

Following table gives the status for statutory approvals.

Table 177: Summary of Statutory Approvals

Sr. No	Clearances sought	Budhana
1	Environment Clearance MoEF	
	Valid From (Date)	N.A
	Valid Till (Date)	N.A
2	Water Usage	
	Valid From (Date)	Applied &
	Valid Till (Date)	under process
3	NOC from state pollution board	
	Valid From (Date)	24.07.2004
	Valid Till (Date)	one time
4	Consent to operate	
	Valid From (Date)AIR/Water	01.01.2016
	Valid Till (Date)	31.12.217
5	CIB certification for boiler	
	Valid From (Date)	28.09.16
	Valid Till (Date)	21.08.17
6	Approval of fire protection scheme	
	Valid From (Date)	08.10.16
	Valid Till (Date)	07.10.17
7	Panchayat/Municipal corporation Approval	
	Valid From (Date)	01.10.16
	Valid Till (Date)	30.09.17

Source: MM Analysis

- Environmental clearance has not been made available to MM by BHSL
- The renewal is in process for consent for water usage.
- CIB certification for boiler and Consent to operate would expire in 2017.

9.12 Khambharkhera Plant

9.12.1 Plant Details

Details of the Khambharkhera manufacturing facility are given below.

Table178: Plant Details

Sr. No.	Particulars	Description
1	Location	Khambhar Khera - Sugar Unit Sarda Nagar Road, Khambhar Khera
2	Land Area	203 Acres
3	Manufacturing facility	Cane Crushing, Distillery, and Power generation (Captive)

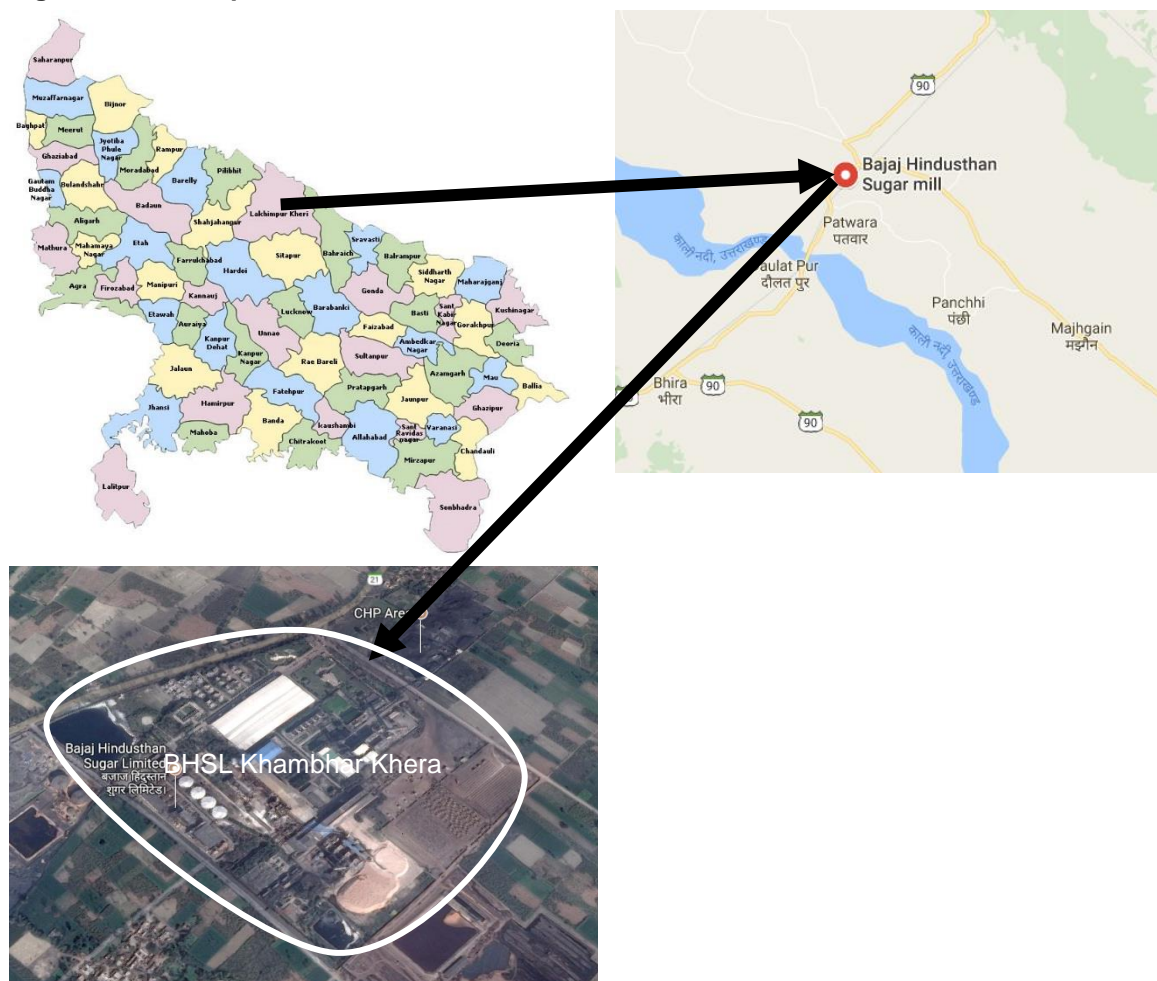
Source: MM Site Visit

9.12.2 Location Analysis

The location of the plant is strategic considering the availability of sugarcane. Plant is situated in Western UP which accounts for almost 53% of the sugarcane production of Uttar Pradesh.

The location of the plant is depicted in the figure below:

Figure91: Site Map



The plant is situated near Khambharkhera village in Kheri district, Uttar Pradesh. Accessibility and connectivity details of Khambharkhera plant are given in following table.

Table179: Site Accessibility

Connectivity	Description	Distance
Nearest City	Lakhimpur	10 Km
Nearest highway	SH 21	0 Km
Nearest Station	Lakhimpur railway station.	10.3 Km
Nearest Airport	Chaudhary Charan singh International Airport Terminal, Amausi, Lucknow, Uttar Pradesh	230 Km

9.12.3 Plant Configuration

The Khambharkhera plant has facility of Sugar Production Distillery and Power generation. The power plant runs on the bagasse generated in sugar crushing while Alcohol is manufactured from the molasses generated in sugar manufacturing. The Installed capacities for the all the facilities is given in following table.

Table180: Installed Capacities

Particulars	U.O.M	Values
Cane Crushed	TCD	10000
Alcohol Generation	KLPD	160
Power Generation	MW-H	35

Source: MM Analysis

9.12.4 Site Infrastructure

The Khambharkhera plant started its operations in Year 2006 07 and is operational since then. Plant is in good condition and no major refurbishment would require.

9.12.4.1 Civil Infrastructure

The List of structures at the Maqsoodpur plant and their respective areas are given in the table below:

Table 181: Building and Structure

Sr.no	Building Name	Area in M2	Type of structure	Year of Construction
1	Mill House	3216.00	Structure	2006
2	Evaporation House	1618.40	Structure	2006
3	Pan House	4134.40	Structure	2006
4	Sugar House	1792.00	Structure	2006
5	Clarification House	2688.85	Structure	2006
6	Feed Water Tank	526.50	Structure	2006
7	Power House	3281.20	RCC / Open Area	2006
8	Return Baggage Carrier			2006
9	Cooling Tower	4998.07	RCC / Open Area	2006
10	Molasses Tank (% nos)	5431.68	Structure	2006
11	Pump for cooling Tower	520.53	Open	2006
12	E.T.P	2984.91	Open	2006

Sr.no	Building Name	Area in M2	Type of structure	Year of Construction
13	Store Godown	600.00	RCC / Structure	2006
14	Bagasse Yard	30382.32	Open	2006
15	Boiler Section	7386.09	RCC / Structure	2006
16	Lime & Sulphur Godown	367.90	Structure / Tin Shet	2006

Source: BHSL

- The area of cane yard is adequate to facilitate easy movement of the trucks and tractors coming into the plant to deliver the sugarcane.
- The plant doesn't have any unutilised space therefore there is no opportunity for any future expansion
- The plant area also includes social infrastructure like quarters for employees, school etc.
- The plant area and the current infrastructure is adequate to operate the plant at optimal capacity

9.12.4.2 Plant Machinery

The Khambharkhera plant has only one tandem(Line) of 10000 TCD. Tandem has 5 rollers which leads to optimum extraction of sugar juice from sugarcane.

The status of the available plant and machinery at Khambharkhera unit is given in the table below:

Table 182: Plant Machinery

Machineries	Number of Units	Manufacturer	Specifications
Cane Handling			
Cane unloader	5 Nos.	Uttam	Capacity- 5 Tons/Tip
Truck Tippler	2 Nos.	SKS Engineers	Capacity(each)- 60 Tons/Tip
Fibrizer	1 No.	Triveni	4000 Kw*1 No.* 7500 rpm
Steam generation Plant			
Diesel Generators	1 No.	Cummins	Capacity- 1010 KVA
	1 No.	Cummins	Capacity- 500 KVA
Power Turbines	1 No.	Belliss India	Rating- 3 MW
	1 No.	Belliss India	Rating- 10 MW
	1 No.	Triveni	Rating- 12 MW
Lime Section			
Clarifier	2 Nos.	Universal Heavy Engg. Co., Saharanpur	36 feet Dia. 20 ft. Ht. 4*4*4
Vacuum Filter	4 Nos.	Universal Heavy Engg. Co., Saharanpur	driven by 5 H.P. * 960 RPM VFD
Sugar Grader	4 Nos.	I.C.	Capacity- 35T/hr.

Source: BHSL

MM Observes that

- Majority of the core equipment like Mills, Boilers and Turbines have been supplied by market leaders like Thermax, Bukau Wolf, Triveni and Uttam.

- The mills are powered by steam driven turbines which is an outdated technology as in modern plants the rollers are DC driven which leads to better space utilisation, energy saving, smooth control, and operations.
- The crushers and the cutters must go for reselling every 2-3 years which requires a capital expenditure of 7.5 lakhs/crusher.
- There are standby evaporators, clarifiers and preheaters which are used during scheduled maintenance to avoid any downtime
- Steam after production of power is utilised to in preheaters and is then condensed which is then used in the boilers.
- MM Observation on overall plant facility:
 - Plant is situated in Western UP which accounts for almost 53% of the sugarcane production of Uttar Pradesh. Hence plant will not face any problem with respect to RM availability considering the normal monsoon.
 - Total power requirement of the plant is approx.383Lakh KW which is fulfilled by captive power plant while additional power generated is exported to state grid.
 - In year 2016-17 349 Lakh KW power was exported to the state grid.

9.12.4.3 Manpower Details

Manpower Details of Khambharkhera sugar plant are given in the table below :

Table 183: Manpower Details- Khambharkhera Sugar plant

Sr. No.	Department	Nos
1	Store	9
4	Security	1
5	Legal Head	2
8	Horticulture	1
9	Finance & Accounts	6
11	EDP & IT Head	5
14	General Office/Unit	2
15	HR & Administration	4
16	Cane	111
17	Lab	8
18	Engineering	178
19	Production	119
20	CIT	1
21	Sales	11
	Total	458

Source: BHSL

Manpower Details of Khambharkhera distillery are given in the below table:

Table 184: Manpower details- Khambharkhera distillery

Sr. No.	Department	Nos
1	Security	1
2	Commercial	4
3	ETP	4
4	General Office/Unit	1

Sr. No.	Department	Nos
5	HR & Administration	1
6	Engineering	19
7	Production	27
	Total	57

Source: BHSL

- The Khambharkhera plant is automated therefore has less manpower requirement compared to other plants which aren't automated.
- Out of 515 manpower deployed, 146 employees are in the production department which are adequate to handle the entire sugar manufacturing and distilling process.
- The manpower per lakh quintal of cane crushed for the plant is 3.84 employees, which is the lowest amongst all of BHSL's sugar manufacturing facilities
- The distilling facility at the plant deploys 0.32 employees per lac litre
- The manpower deployed at the plant is in line with other plants having similar installed capacities.

9.12.4.4 Adequacy of Plant infrastructure and Manpower

Table185: Adequacy of Area and Manpower

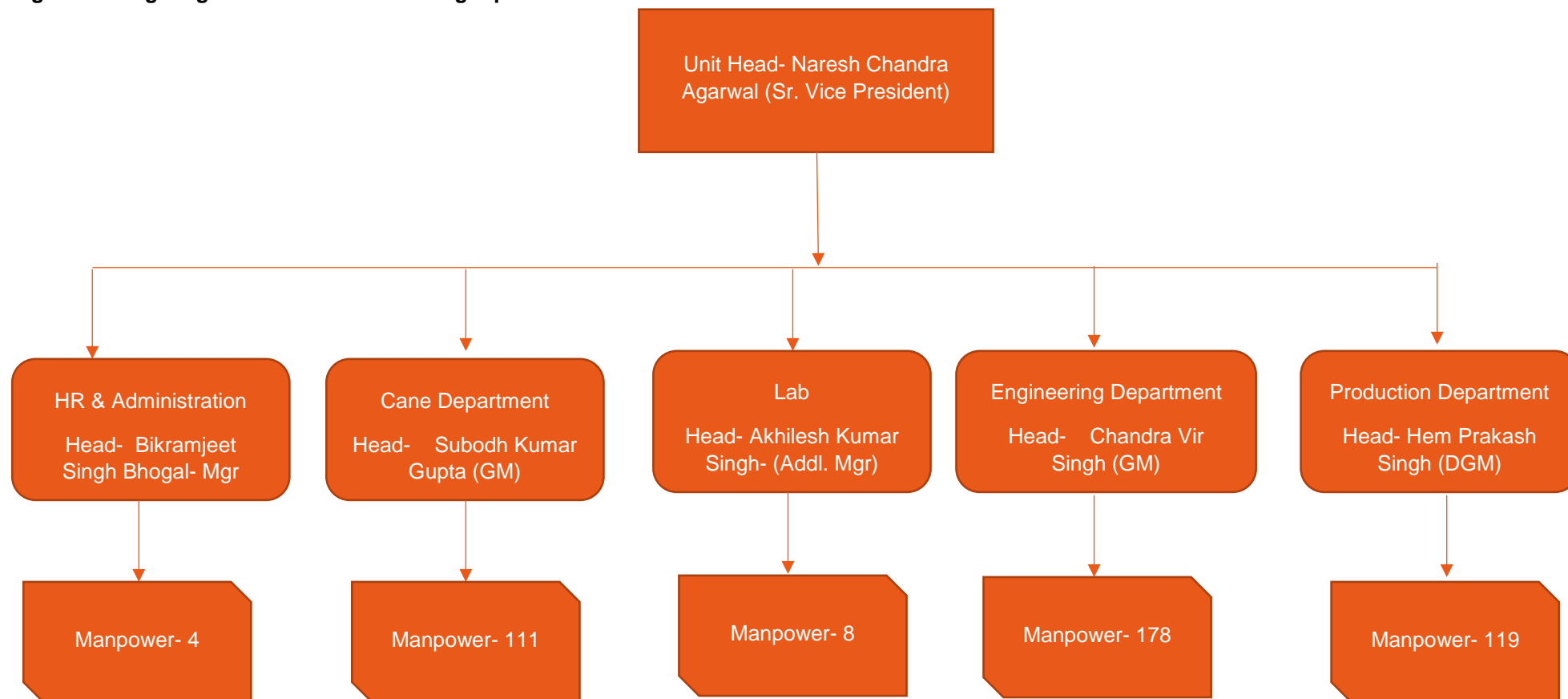
Parameter	Value	Cane crushing Lakh Qntls. (2016-17)	Values/ Lakh Qntls crushed
Plant Area	203 acres	119	1.4
Manpower	515	119	4.3

Source: MM Analysis

- The total plant area is 203 acres and the area per Lakh quintals of sugar produced for the plant is 1.4acres/Lakh Quintals cane crushed.
- The total manpower deployed at the plant is 515 and the manpower per Lakh quintals of sugar produced for the plant is 4.3 employees/ Lakh quintals of sugar produced
- The plant area and the current infrastructure is adequate to operate the plant at optimal capacity

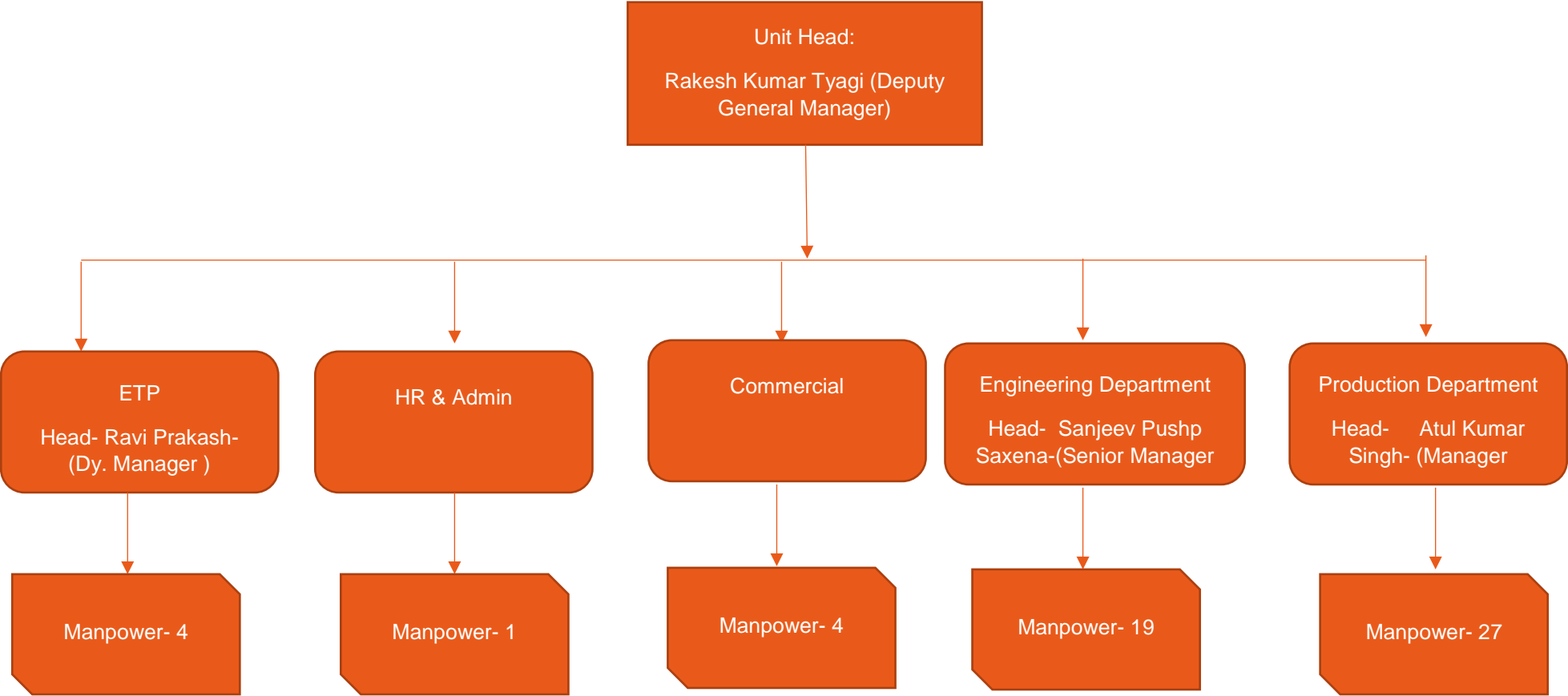
The Organogram of the Khambharkhera Sugar plant is depicted below:

Figure 92: Organogram- Khambharkhera sugar plant



The Organogram of the Khambarkhera distillery is depicted below:

Figure 93: Organogram-Khambhekhera distillery



Source: BHSL

9.12.5 Production Details

The details of the last 5 years' cane crushed and recovery rates for Khambharkhera plant can be seen in following table

Table 186: Production Sugar

	U.O.M	2011-12	2012-14	2014-15	2015-16	2016-17
Cane Crushed	Lakh Quintals	122.86	199.83	104.11	106.03	119.20
Sugar Produced	Lakh Quintals	11.62	19.03	10.06	11.85	13.20
Capacity Utilization	%	77%	75%	65%	66%	75%
Recovery Rate	%	9%	10%	10%	11%	11%

Source: MM Analysis

Table 187: Production Distillery

	U.O.M	2015-16	2016-17
Installed Capacity	KLPA	38400	38400
Alcohol Produced	KL	26457	18067
Utilization	%	68%	47%

Source: MM Analysis

Table 188: Production Power plant

	U.O.M	2015-16	2016-17
Installed Capacity	MW	35	35
Units Produced	MW-H	74453	73187
Utilization	%	65%	64%

Source: MM Analysis

MM observes that,

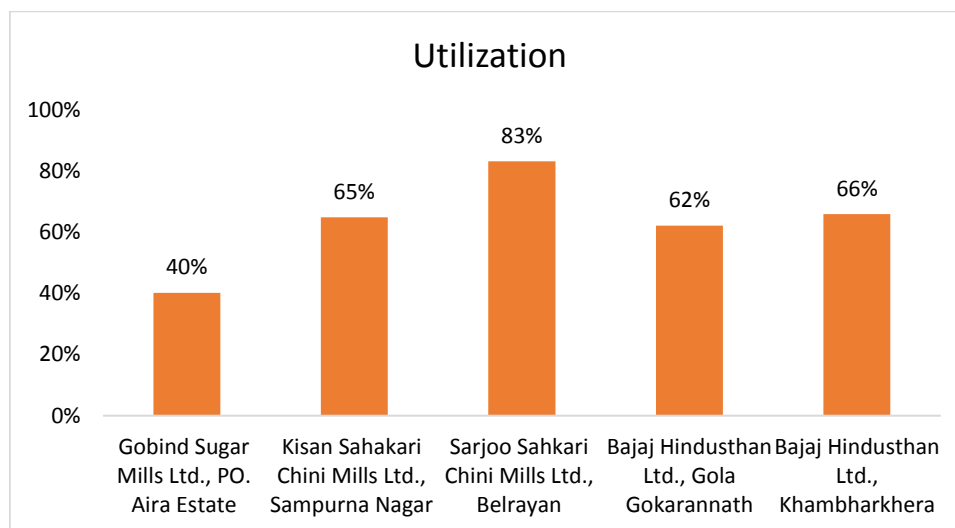
- Overall Capacity Utilization is in the range of 65 to 75% since last 5 years and the average utilization of peers in same region is 63%
- Utilization dipped in year 2014-15 and 2015-16 due to low cane availability.
- The utilization of distillery is constant at 65%
- Recovery rate of Khambharkhera plant is higher than its peers operating in same district but lesser than Bajaj's another plant at Gola.
- It should be noted that, even though capacity utilization of power plant was low there was no situation of power outage at the plant and excess power was exported to the state grid. This means this level of utilization is sufficient to fulfil power requirement of the plant.
- Although further increase in utilization would mean better sales realization via power exported to the grid.
- The contribution of Khambharkhera plant in total sugar produced by the Bajaj group is 11 % in 2016-17 season

9.12.6 Comparison with Peers

The Khambharkhera plant operates at central UP region. MM has analysed the data of other sugar mills operating in same area.

The comparison of plants in terms of utilisation in the same region is given below:

Figure 94: Utilization Comparison

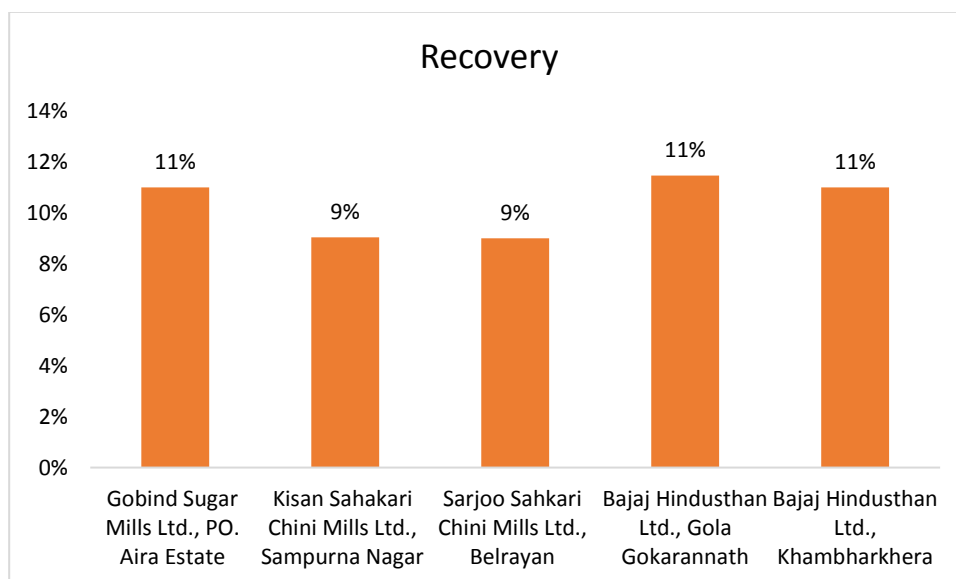


Source: MM Analysis

- Capacity utilization of Khambharkhera plant is better than average utilization of its peers which is 63%
- It Should be noted that Khambharkhera plant is doing better in terms of utilization than BHSL's Gola unit which operates in same region

The comparison of plants in terms of recovery in the same region is given below:

Figure 95: Recovery Comparison



Source: MM Analysis

- The average recovery rate of peers is 10% and BHSL Khambharkhera plant is doing better than in terms of recovery.

9.12.7 Maintenance Philosophy

- Repair & Maintenance budget received by the company during off season is in the range of Rs 3 to Rs 4 per quintal of cane crushed with some increment every year.
- MM believes the repair & maintenance cost is higher than its peers operating in same area which incur Rs 1.5 to 2.5 per quintal of cane crushed towards Repairs and Maintenance.
- Apart from the Repair & Maintenance budget the plant can avail for additional budget from head office in case of major works.

9.12.8 Effluents from The Plant

- Consultants have reviewed the inspection reports of the Khambharkhera plant ETP outlet carried out by Noida Testing Laboratories and all the effluent parameters are within the limits given by Central Pollution Control Board(CPCB).
- Similarly test results of the stack emission are also in the limits given by CPCB.
- The effluents from the distillery is used to generate biogas in the effluent treatment plant
- Also, there is proposed capex plan for distillery units for compliance with PCB orders. Details of the same are given below.

9.12.9 Status of the statutory approvals

Table 189: Status of Statutory approvals

	Clearances sought	Khambharkhera
1	Environment Clearance MoEF	
	Valid From (Date)	07.12.2006
	Valid Till (Date)	One time
2	Water Usage	Under process
	Valid From (Date)	04.02.2010
	Valid Till (Date)	One time
3	NOC from state pollution board	
	Valid From (Date)	02.09.2005
	Valid Till (Date)	One time
4	Consent to operate	
	Valid From (Date)AIR/Water	01.01.2016
	Valid Till (Date)	31.12.2017
5	CIB certification for boiler	
	Valid From (Date)	29.09.2016
	Valid Till (Date)	25.08.2017
6	Approval of fire protection scheme	
	Valid From (Date)	30.12.2016
	Valid Till (Date)	31.12.2017
7	Panchayat/Municipal corporation Approval	
	Valid From (Date)	01.04.2017
	Valid Till (Date)	31.03.2018

Source: BHSL

- Consent to operate and NOC from pollution board would expire at the end of year 2017 while approval for water usage is under renewal process
- CIB certification for boiler would expire in Aug 2017 and renewal for all these statutory approvals needs to be expedited.

9.13 Barkhera Plant

9.13.1 Plant Details

Details of the Barkhera manufacturing facility are given below.

Table 190: Plant Details

Sr. No.	Particulars	Description
1	Location	Barkhera - Sugar unit P.O.: Kalan - 262201
2	Land Area	134 Acres
3	Manufacturing facility	Sugar mill and Power generation (Cogen plant)

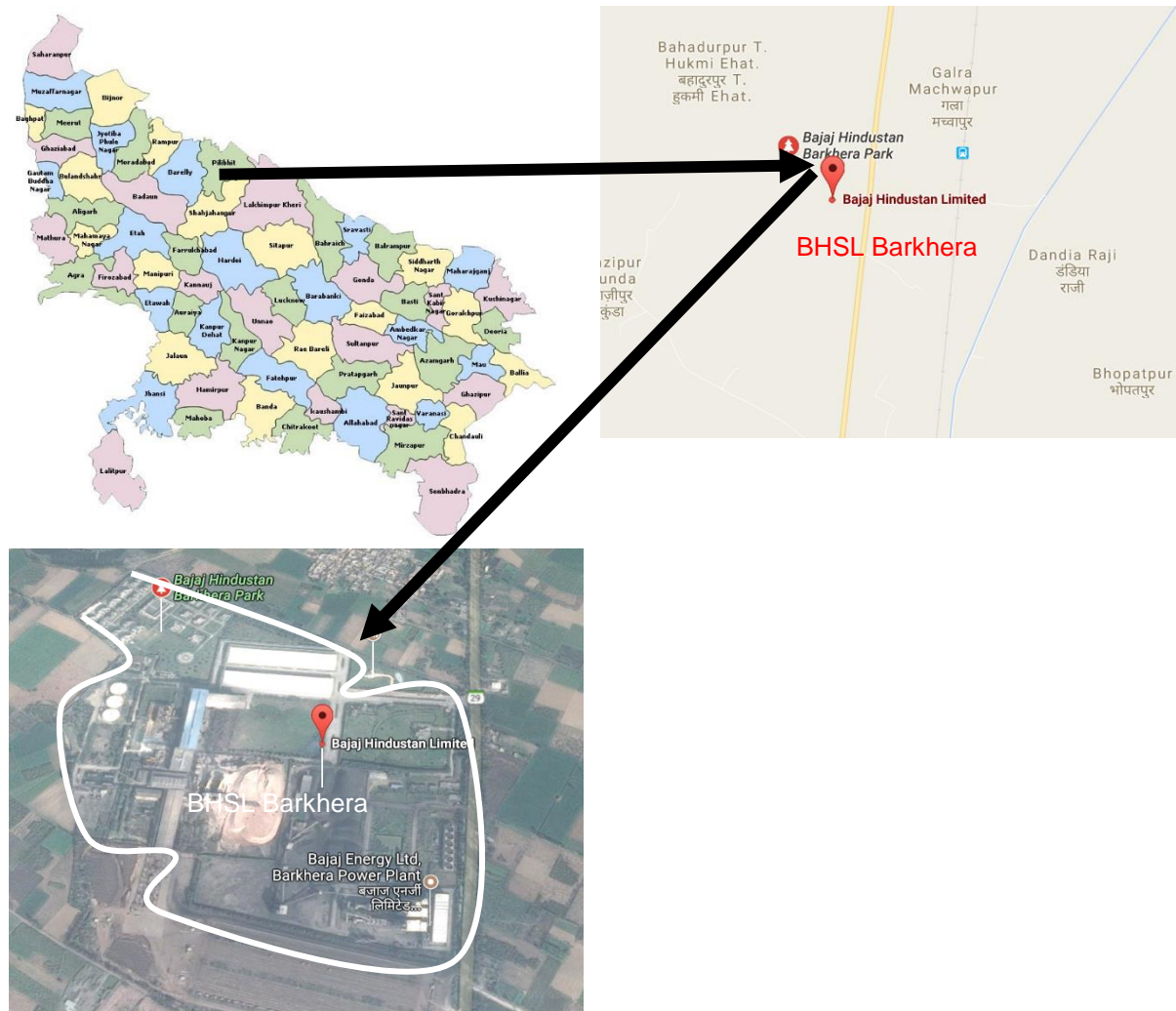
Source: MM Site Visit

9.13.2 Location Analysis

The location of the plant is strategic considering the availability of sugarcane. Plant is situated in Western UP which accounts for almost 53% of the sugarcane production of Uttar Pradesh.

The location of the plant is depicted in the figure below:

Figure 96: Site Map



The plant is situated near Barkhera village in Pilbhit district, Uttar Pradesh. Accessibility and connectivity details of Barkhera plant are given in following table.

Table 191: Site Accessibility

Connectivity	Description	Distance
Nearest City	Barkhera	2.2 Km
Nearest highway	SH 29	0 Km
Nearest Station	Barkhera railway station.	3 Km
Nearest Airport	Chaudhary Charan singh International Airport Terminal, Amausi, Lucknow, Uttar Pradesh	230 Km

9.13.3 Plant Configuration

The Barkhera plant has facility of Sugar Production and Power generation. The power plant runs on the bagasse generated in sugar crushing while Alcohol is manufactured from the molasses generated in sugar manufacturing. The Installed capacities for the all the facilities is given in following table.

Table 192: Installed Capacities

Particulars	U.O.M	Values
Cane Crushed	TCD	7000
Power Generation	MW-H	34

Source: MM Analysis

9.13.4 Site Infrastructure

The Barkhera plant started its operations in Year 2006-07 with one tandem line of 7000 TCD. Plant is in good condition and no major refurbishment would require.

9.13.4.1 Civil Infrastructure

The List of structures at the Barkhera plant and their respective areas are given in the table below:

Table 193: Buildings and structure

Sr.no	Building Name	Area in M2	Type of structure	Year of Construction
1	Mill House	6084	Open & M.S. Structure	2006
2	Evaporation House	1666	M.S. Structure	2006
3	Pan House	3753	M.S. Structure	2006
4	Sugar House	1792	M.S. Structure	2006
5	Clarification House	1680	RCC, Open	2006
6	Feed Water Tank	420	RCC, Open & M.S. Structure	2006
7	Power House	2672.8	RCC, & M.S. Structure	2006
8	Return Baggage Carrier	155.4	RCC, & M.S. Structure	2006
9	Cooling Tower	873.19	RCC, & M.S. Structure	2006
10	Molasses Tank (% nos)	4416	RCC, & M.S. Structure	2006
11	Pump for cooling Tower	133	RCC, Open	2006
12	E.T.P	2530	RCC, Open	2006
13	Store Godown	615	RCC, & M.S. Structure	2006
14	Sugar Godown	16000	RCC, & M.S. Structure	2006
15	Bagasse Yard	21744.6	RCC, Open	2006
16	Boiler Section	7060	M.S. Structure, RCC, Open	2006
17	Lime & Sulphur Godown	300	M.S. Structure, RCC,	2006

Source: BHSL

9.13.4.2 Plant Machinery

The Barkhera plant has only one tandem(Line) of 10000 TCD. Tandem has 5 rollers which leads to optimum extraction of sugar juice from sugarcane.

The status of the available plant and machinery at Barkhera unit is given in the table below:

Table 194: Plant Machinery

Machineries	Number of Units	Manufacturer	Specifications
Cane Handling			
Cane unloader	4	Uttam Industrial Eng., Ghaziabad	5 Tons SWL capacity,
Truck Tippler	1	S.K. S	incapacity - 60 Ton
Mills			
Mill Tandem	5	Uttam Ind. Ghaziabad.	mill size 1100 •2100 mm, Crown penion - Teeth 16 Nos. 00- 1200 mm , F.W- 600 mm , PCD -1120 mm Pitch 219.9 mm .
Drives	5	Bellis	Bellis make turbine of 45 kg/ern sq pressure and 1.5 kg/ cmsq back pressure, Of Model, SS-26 x , BHP-1000, RIG WIL GN-40 S.F-2 ,Ratio 4000 to 800 rpm. I Planetary gear box . WIL ,Rallo 1000 I 5.26 , power 1100 BHP S.F -2
Mill 1,2,3,4,5			
Steam generation Plant			
Boilers	2	I.J. T	90 TPH Capacity
Electric Generators	1	1010 KVA	
	1	320 KVA	
	01	500 KVA	
Power Turbines	1	Bellis	3 MW
	1	Trevine	10 MW
	1	Trevine	12 MW
Clarification			
Juice Heaters	3		V. L. Juice Heater, H.S. 400M2 each
	3		Raw Juice Heater, H.S. 400M2 each
	6		S Juice Heater, H.S. 400M2 each
	3		Cear Juice Heater, H.S. 300 M2 each
Juice Sulphiters	3		Capacity- 270 H.L. each
Sulphur Gas Plant	3	Digital Utility	Capacity - 200 Kg /hr each
	1	Vishwa	Capacity - 200 Kg /hr each
Lime Section			
Lime Classifier	1	Crystal Engineers Pune	
Clarifier	5	Universal Heavy Eng. Co. Saharanpur	Capacity-880M3
Vacuum Filter	3	Universal Heavy Engg Co. Saharanpur	Drum speed - 10 to 30 RPM
Sugar Grader	3	I.C.	Capacity- 35 Ton/Hr each

Source: BHSL

MM Observes that

- Majority of the core equipment like Mills, Boilers and Turbines have been supplied by market leaders like Thermax, Bukau Wolf, Triveni and Uttam.
- The mills are powered by steam driven turbines which is an outdated technology as in modern plants the rollers are DC driven which leads to better space utilisation, energy saving, smooth control, and operations.

- The crushers and the cutters must go for reselling every 2-3 years which requires a capital expenditure of 7.5 lakhs/crusher.
- There are standby evaporators, clarifiers and preheaters which are used during scheduled maintenance to avoid any downtime
- Steam after production of power is utilised to in preheaters and is then condensed which is then used in the boilers.
- MM Observation on overall plant facility
 - Plant is situated in Western UP which accounts for almost 53% of the sugarcane production of Uttar Pradesh. Hence plant will not face any problem with respect to RM availability considering the normal monsoon.
 - Total power requirement of the plant is approx.222 Lakh KW which is fulfilled by captive power plant while additional power generated is exported to state grid.
 - In year 2016-17 197 Lakh KW power was exported to the state grid.

9.13.4.3 Manpower Details

Manpower details of Barkhera plant are given in the below table:

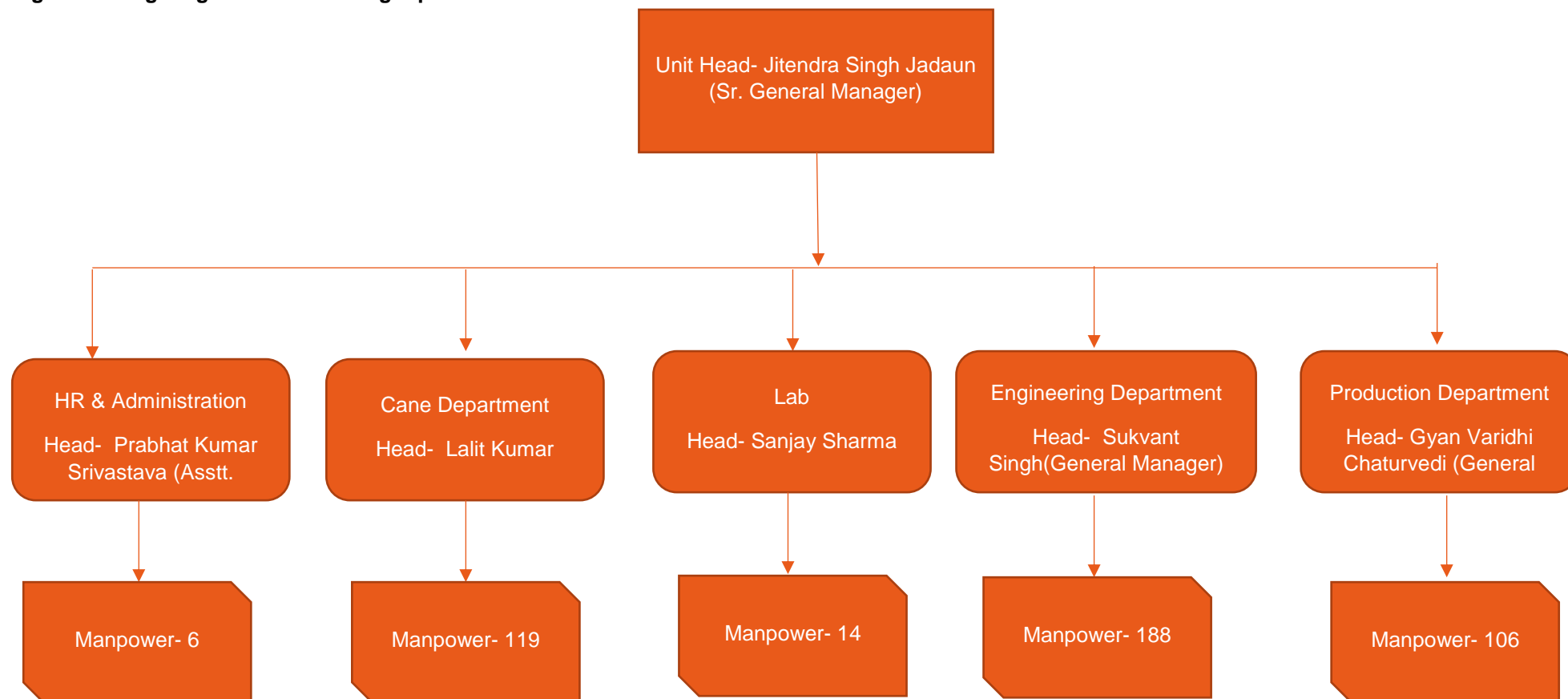
Table 195: Manpower Details- Barkhera Sugar plant

Sr. No.	Department	Nos
1	HR & Admin	6
2	Security	2
3	Medical	1
4	General Office	1
5	CIT	1
6	Legal	1
7	Horticulture	1
8	Store Head	6
9	Sales Head	11
10	EDP & IT	3
11	Cane	118
12	Lab	14
13	Engineering	188
14	Production	106
15	Account	5
	Total	465

Source: BHSL

- The Barkhera plant is state-of-art automated facility. Hence, the manpower required and deployed at the plant is less compared to other plants which aren't automated.
- The manpower per lakh quintal of cane crushed for the plant is 6.54 employees
- The manpower deployed at the plant is in line with other plants having similar installed capacities.

Figure 97: Organogram-Barkhera sugar plant



Source: BHSL

9.13.4.4 Adequacy of Plant infrastructure and Manpower

Table 196: Adequacy of Area and Manpower

Parameter	Value	Cane crushing Lakh Qntls. (2016-17)	Value/Lakh Qntls.
Plant Area	203 acres	119	1.4
Manpower	512	119	4.3

Source: MM Analysis

- The total plant area is 203 acres and the area per Lakh quintals of sugar produced for the plant is 1.4acres/Lakh Quintals cane crushed.
- The total manpower deployed at the plant is 512 and the manpower per Lakh quintals of sugar produced for the plant is 4.3 employees/ Lakh quintals of sugar produced
- MM Observes that,
- The plant area and the current infrastructure is adequate to operate the plant at its full capacity

9.13.5 Production Details

The details of the last 5 years' cane crushed and recovery rates for Barkhera plant can be seen in following table

Table 197: Production Sugar

	U.O.M	2011-12	2012-14	2014-15	2015-16	2016-17
Cane Crushed	Lakh Quintals	95.22	157.30	66.95	47.54	71.12
Sugar Produced	Lakh Quintals	8.53	13.79	6.23	4.77	7.25
Capacity Utilization	%	85%	65%	60%	42%	63%
Recovery Rate	%	9%	9%	9%	10%	10%

Source: MM Analysis

Table 198: Production Power plant

	U.O.M	2015-16	2016-17
Installed Capacity	MW	34	34
Units Produced	MW-H	31028	41960
Utilization	%	30%	37%

Source: MM Analysis

MM observes that,

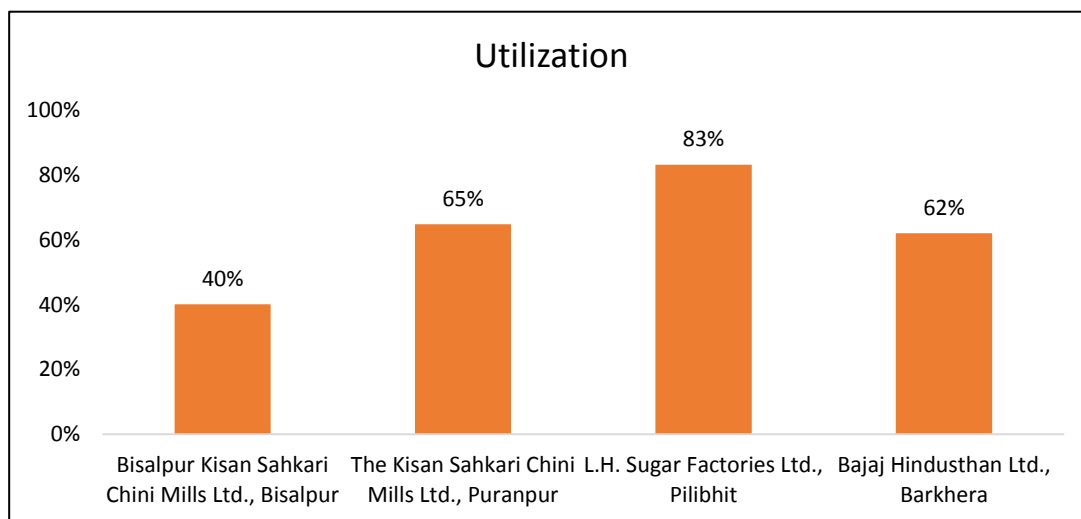
- Overall Capacity Utilization is in the range of 65 to 85% since last 5 years and there is a decreasing trend in the utilization.
- Recovery rate of Barkhera plant is higher than its peers operating in same.
- It should be noted that, even though capacity utilization of power plant was low there was no situation of power outage at the plant and excess power was exported to the state grid. This means this level of utilization is sufficient to fulfil power requirement of the plant.
- Although further increase in utilization would mean better sales realization via power exported to the grid.
- The contribution of Barkhera plant in total sugar produced by the Bajaj group is 6 % in 2016-17 season.

9.13.6 Comparison with Peers

The Barkhera plant operates at Western UP region. MM has analysed the data of other sugar mills operating in same area.

The comparison of plants in terms of utilisation in the same region is given below:

Figure98: Utilization Comparison

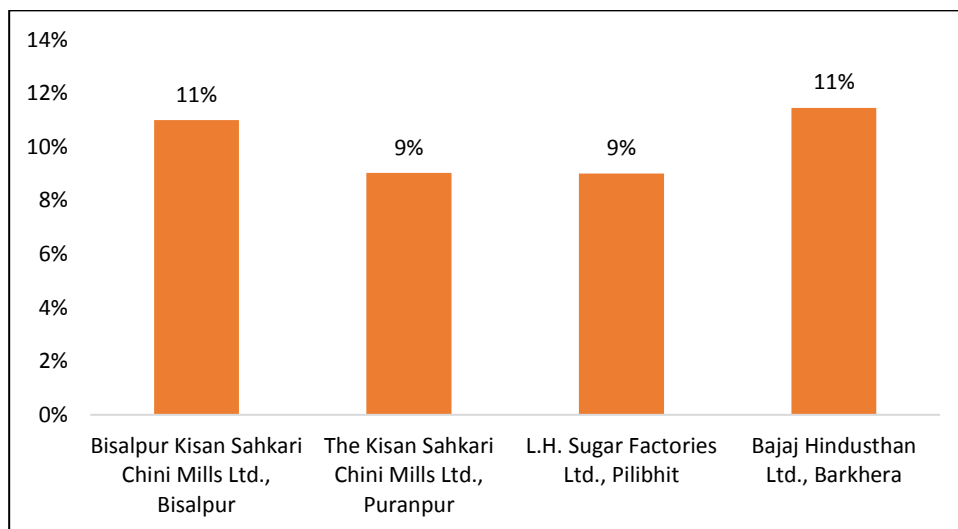


Source: MM Analysis

- LH Sugar Factories Ltd has the highest utilization in the region.
- Average utilization of other plants in same region is 62% hence we can say that utilization for Barkhera plant is in line with peers.

Comparison in terms of recovery is given below.

Figure 99: Recovery Comparison



Source: MM Analysis

- The average recovery rate of peers is 10% and BHSL Barkhera plant is doing better than its peers.

9.13.7 Maintenance Philosophy

- Repair & Maintenance budget received by the company during off season is in the range of Rs 3 to Rs 4 per quintal of cane crushed with some increment every year.
- MM believes the repair & maintenance cost is higher than its peers operating in same area which incur Rs 1.5 to 2.5 per quintal of cane crushed towards Repairs and Maintenance.
- Apart from the Repair & Maintenance budget the plant can avail for additional budget from head office in case of major works.

9.13.8 Effluents from the plant

- Consultants have reviewed the inspection reports of the Barkhera plant ETP outlet carried out by Noida Testing Laboratories and all the effluent parameters are within the limits given by Central Pollution Control Board(CPCB).
- Similarly test results of the stack emission are also in the limits given by CPCB.
- The effluents from the distillery is used to generate biogas in the effluent treatment plant

9.13.9 Status of the statutory approvals

Table 199: Status of Statutory approvals

	Clearances sought	Barkhera
1	Environment Clearance MoEF	Not available with MM
	Valid From (Date)	
	Valid Till (Date)	
2	Water Usage	Applied for
	Valid From (Date)	
	Valid Till (Date)	
3	NOC from state pollution board	
	Valid From (Date)	13.10.05
	Valid Till (Date)	One time
4	Consent to operate	Not Available to MM
	Valid From (Date)AIR/Water	1.01.16
	Valid Till (Date)	31.12.17
5	CIB certification for boiler	
	Valid From (Date)	Copies of challans available for boiler inspection
	Valid Till (Date)	
6	Approval of fire protection scheme	Fire NOC
	Valid From (Date)	2016-17
	Valid Till (Date)	31.12.17
7	Panchayat/Municipal corporation Approval	Only Challan Copy Available

Source: MM Analysis

- Environmental clearance by MoEF has not been made available to MM
- In case of Panchayat approval only challans of the payments done for seeking of their approval are provided. The document of the approval has not been furnished.

9.14 Kinauni Plant

9.14.1 Plant Details

Details of the Kinauni manufacturing facility are given below.

Table 200: Plant Details

Sr. No.	Particulars	Description
1	Location	Meerut District, Kinauni - Sugar Unit, Kaithwari Link Road, Vill.: Kinauni
2	Land Area	197 Acres
3	Manufacturing facility	Cane Crushing, Distillery and Power generation (Cogeneration)

Source: MM Site Visit

9.14.2 Location Analysis

The location of the plant is strategic considering the availability of sugarcane. Plant is situated in Western UP which accounts for almost 53% of the sugarcane production of Uttar Pradesh.

The location of the plant is depicted in the figure below:

Figure 100: Site Location: Top view



Source :Goggle Maps

The plant is situated near Kinauni village in Meerut district, Uttar Pradesh. Accessibility and connectivity details of Kinauni plant are given in following table

Table 201: Site Accessibility

Connectivity	Description	Distance
Nearest Major City	Meerut	28 KM
	NH 334B	11.8 KM
Nearest highway	NH 709A	21.5 KM
Nearest Station	Meerut railway station.	25.5 KM
Nearest Airport	IGI Airport, New Delhi	94.3 KM

Source: MM Analysis

9.14.3 Plant Configuration

The Kinauni plant has facility of Sugar Production and Power generation. The power plant runs on the bagasse generated in sugar crushing while Alcohol is manufactured from the molasses generated in sugar manufacturing. The Installed capacities for the all the facilities is given in following table

Table 202: Installed Capacity

Particulars	U.O.M	Values
Cane Crushed	TCD	12000
Alcohol Generation	KLPD	160
Power Generation	MW	38

Source: MM Analysis

9.14.4 Site Infrastructure

Plant was established in 2004-05 with an installed capacity of 7000 TCD.it was expanded to 8000 TCD in 2005-06 with an addition on 21kg Boiler and 160KLD Distillery unit and latest expansion in 2006-07, which made the capacity of plant to 12000 TCD.

9.14.4.1 Civil Structure

Area statement for major structures at the plant is given below:

Table 203: Buildings & Structure

Sr.no	Building Name	Area (M2)	Type of structure	Year of Construction
1	Mill House	6000	Shed/Open	2004-2006
2	Evaporation House	1222	Shed/Open	2004-2006
3	Pan House	4325	Shed	2004-2006
4	Sugar House	880	Shed	2004
5	Clarification House	1800	Shed/Open	2004-2006
6	Feed Water Tank	400	Open	2004-2006
7	Power House	1550	RCC	2004
8	Return Baggage Carrier	170	Open	2004
9	Cooling Tower	200	Open	2004-2006
10	Molasses Tank (6 nos)	8000	Open	2004-2006
11	Pump for cooling Tower	75	Open	2004-2006

Sr.no	Building Name	Area (M2)	Type of structure	Year of Construction
12	E.T.P	3500	Open	2004
13	Store Godown	3200	Shed/Open	2004
14	Bagasse Yard	20070	Open	2004
15	Boiler Section	6860	Shed/Open	2004-2006
16	Lime & Sulphur Godown	70	RCC	2004
17	Sugar Godown	8000		

Source: BHSL

- The area of cane yard is adequate to facilitate easy movement of the trucks and tractors coming into the plant to deliver the sugarcane.
- Adequate storage area for sugar and bagasse is available in the plant.
- The sugar storage area is sufficient to hold sugar for 50 days.
- At the Bilai plant DC driven mills are used unlike in other old plants like Gola and Palia where steam driven mills are used.
- The area of the Mill house at the Kinauni plant is 50% lesser than the plants where steam driven mills are used.
- The plant area also includes social infrastructure like quarters for employees, school etc.
- The plant area and the current infrastructure is adequate to operate the plant at full capacity.

9.14.4.2 Plant Machinery

The details of major plant and machinery is given below.

Table 204: Plant Machinery

Machineries	Number of Units	Manufacturer	Specifications
Cane Handling			
Cane unloader		UTTAM INDL.ENG.GZB	
Truck Tippler	2		Capacity -60 tons
Mills			
Mill Tandem	5	Uttam	
Steam generation Plant			
Boilers	1 no.	IJT	Capacity- 80 T/Hr
	1 no.	IJT	Capacity- 40 TPH/ Hr
	1 no.	Tex	Capacity- 40 T
	1 no.	Wil	Capacity- 90 TPH
Electric Generators	2 no.		1000 KVA and 1 No. 200 KVA.
Power Turbines	3 no.	Belliss	Capacity- 3MW
Lime Section			
Lime Classifier	1 no.		driven by 5HP, 1440RPM
Vacuum Filter	5 no.	PPI	PL-1250
Sugar Grader	4 no.	UIE	Capacity- 25 T/Hr

Source: MM Analysis

- The Kinauni plant has one mill tandem with a capacity of 12000 TCD, 160 KLPD in distillery and 38 MW of cogeneration power plant

- All the weighing bridges are automated and the truck trippers are supported by RCC column
- Along with ETP, Kinauni plant has one bio composite yard, one dry CO₂ production plant and one multiple effect evaporator which is in construction phase

9.14.4.3 Manpower

Details of manpower employed at Kinauni sugar plant is given below:

Table 205: Manpower Details-Sugar plant

Sr.no	Department	
1	Cane Head	337
2	Lab Head	11
3	Engineering	216
4	Production	162
5	Finance & Accounts.	8
6	Sugar Sales	11
7	CIT	1
8	Store	7
9	HR & Admn, Medical	13
10	EHS	1
11	Horticulture	1
12	Internal Audit	1
12	EDP & IT	4
13	Legal	1
	Total	774

Source: BHSL & MM Analysis

Details of manpower at the Kinauni Distillery is given in the below table:

Table 206: Manpower Details- Kinauni Distillery

Sr.no	Department	Nos
1	Engineering	44
2	Production	26
3	Comm.	4
4	ETP	12
5	HR & Admn, Medical	3
	Total	89

Source: BHSL & MM Analysis

9.14.4.4 Adequacy of Plant Infrastructure

The adequacy of area and manpower based on industry standards on per quintal cane crushing basis is given below

Table 207: Adequacy of Area and Manpower

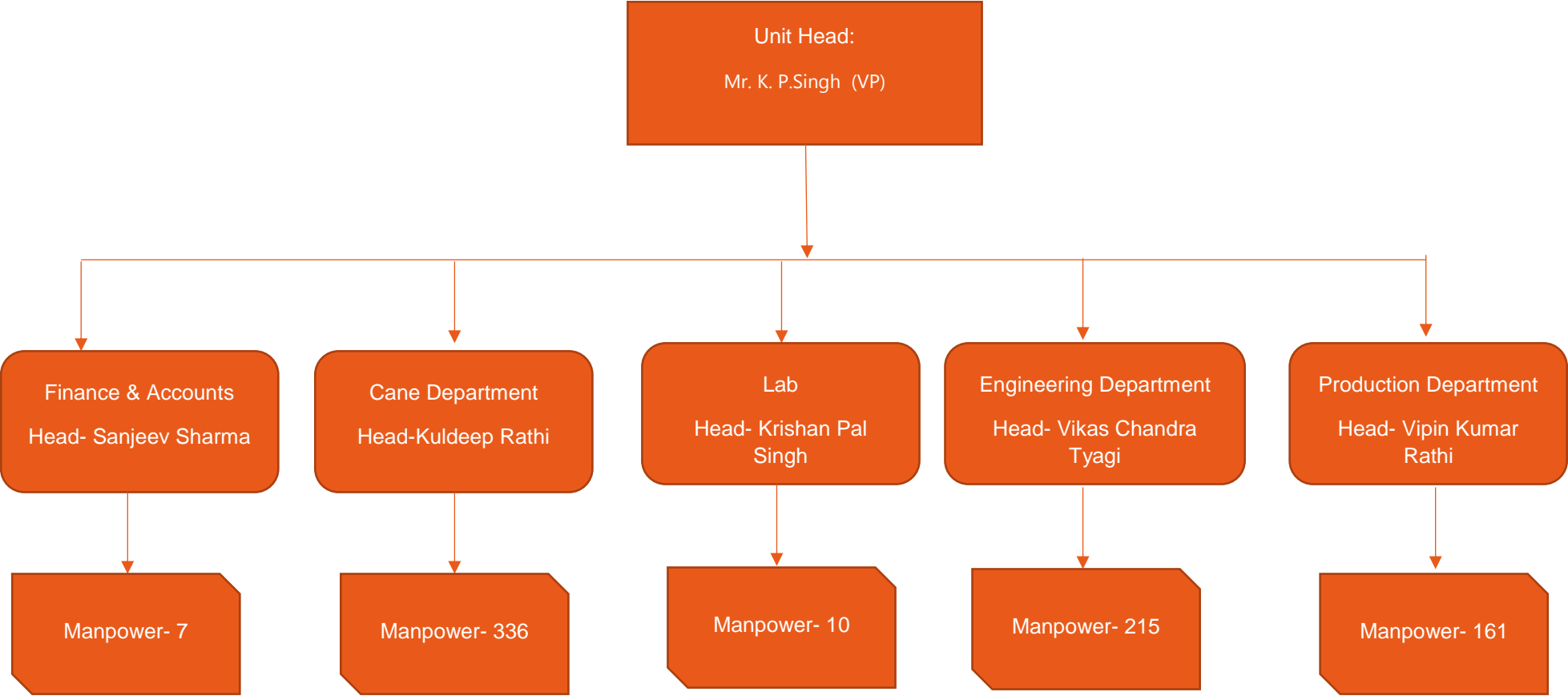
Parameter	Value	TCD (2016-17) (in Lakh quintals)	Ratio
Plant Area	197	146.85	0.74
Manpower	446	146.85	3.0

Source: MM Analysis

- The total plant area is 197 acres and the area per Lakh quintals of sugar produced for the plant is 0.74acres/Lakh Quintals cane crushed.
- The total manpower deployed at the plant is 446 and the manpower per Lakh quintals of sugar produced for the plant is 3 employees/ Lakh quintals of sugar produced
- MM Observes that,
- The plant area is adequate, perhaps less than industry standard which is generally 1 to 1.5acres/Lakh Quintals cane crushed, while manpower employed is also well within the range of industry standards.

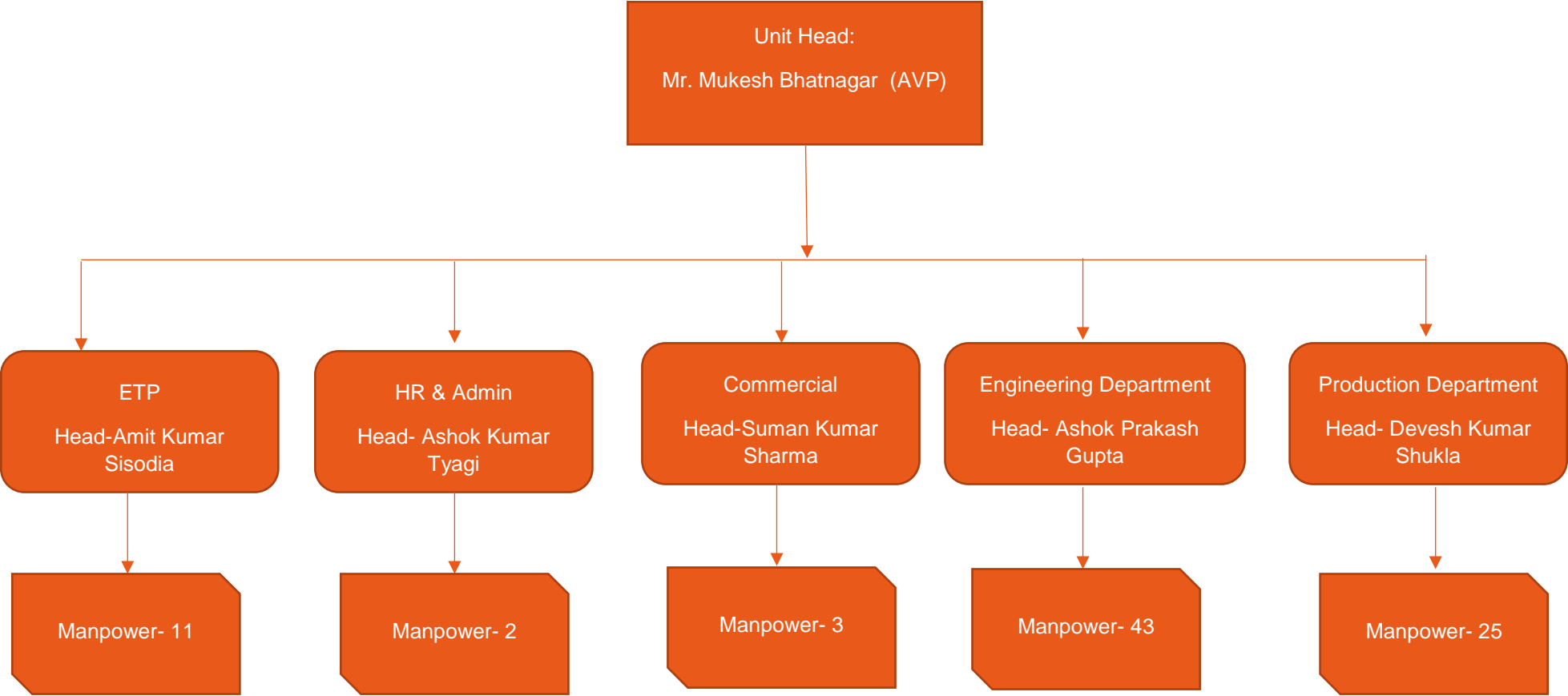
The Organogram of the Kinauni Sugar plant is depicted below:

Figure 101: Organogram- Kinauni Sugar Plant



The Organogram of the Kinauni Distillery is depicted below:

Figure 102: Organogram-Kinauni Distillery



Source: BHSL

9.14.5 Production details

The details of the last 5 years' cane crushed and recovery rates for Kinauni plant can be seen in following table:

Table 208: Production Details- Sugar

	U.O.M	2011-12	2012-14	2014-15	2015-16	2016-17
Cane Crushed	Lakh Quintals	125.62	255.76	144.99	147.66	133.29
Sugar Produced	Lakh Quintals	10.37	22.34	13.28	14.52	12.47
Capacity Utilization	%	65%	67%	76%	77%	69%
Recovery Rate	%	8%	9%	9%	10%	9%

Source: MM Analysis

The generation of Alcohol for 2015-16 and 2016-17 is given in the table below:

Table 209: Production details – Distillery

	U.O.M	2015-16	2016-17
Installed Capacity	KLPA	38400	38400
Alcohol Produced	KL	21666	14857
Utilization	%	56%	38%

Source: MM Analysis

The power generation for the years 2015-16 and 2016-17 is given in the below table:

Table 210: Production Details – Power (Cogeneration)

	U.O.M	2015-16	2016-17
Installed Capacity	MW	38	38
Units Produced	MW-H	78376	73647
Utilization	%	63%	59%

Source: MM Analysis

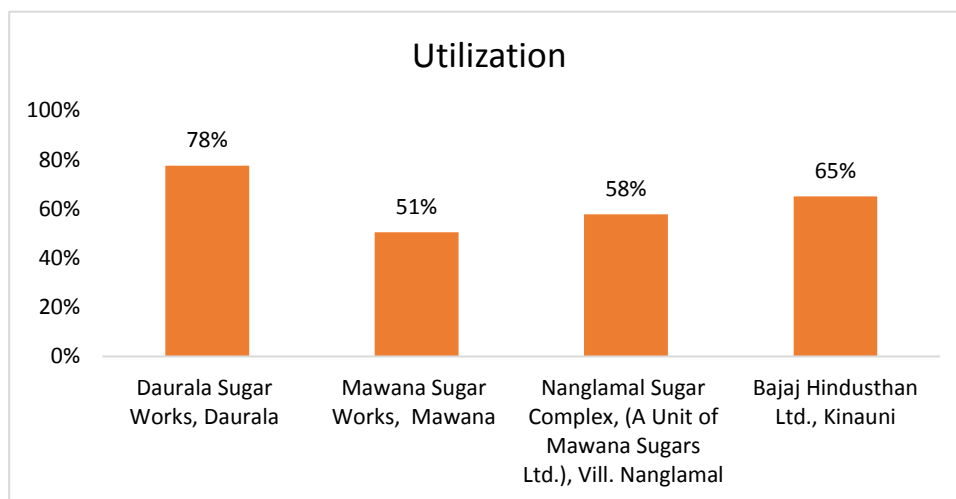
- Overall Capacity Utilization is in the range of 65 to 76% since last 5 years and there is an increasing trend in the utilization except for season 2016-17.
- Recovery rate of Kinauni plant is in line with its peers operating in same region.
- It should be noted that, even though capacity utilization of power plant was low there was no situation of power outage at the plant and excess power was exported to the state grid. This means this level of utilization is sufficient to fulfil power requirement of the plant.
- Although further increase in utilization would mean better sales realization via power exported to the grid.
- The contribution of Barkhera plant in total sugar produced by the Bajaj group is 6 % in 2016-17 seasons
- Kinauni plant contributes around 11% of total sugar produced by all the Bajaj Hindusthan sugar mills combined, which is one the highest within the group.

9.14.6 Comparison with peers

The Kinauni plant operates at Western UP region. MM has analysed the data of other sugar mills operating in same area.

The comparison of plants in terms of utilisation in the same region is given below:

Figure 103: Comparison of Utilisation (in %)

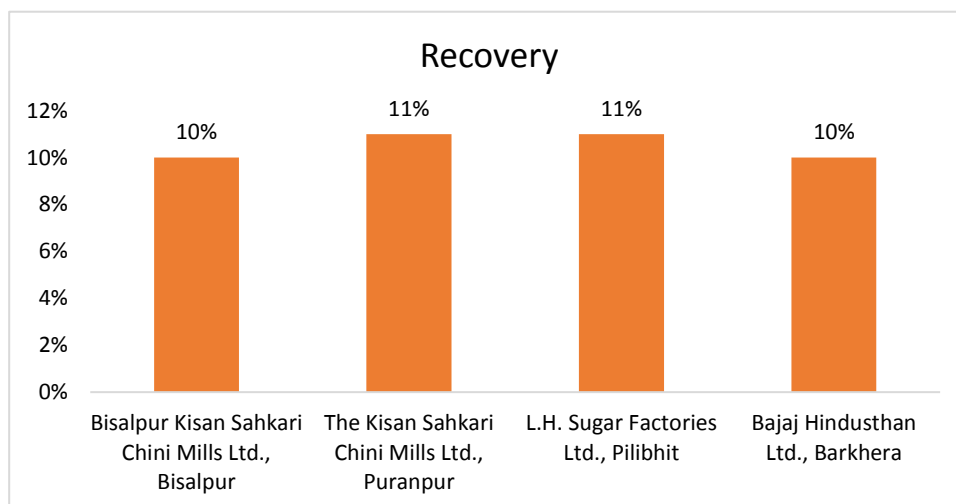


Source: MM Analysis

- The average capacity utilisation of the plants in western UP is 63 %.
- The capacity utilisation of the Kinauni plant is in line with its peers in western UP.

The comparison of plants in terms of recovery in the same region is given below:

Figure 104: Comparison of recovery (in %)



Source: MM Analysis

- The average recovery rate of the plants in Western UP is 10.5%.
- The recovery rate of the Kinauni plant is lowered as compared with its peers in western UP

9.14.7 Maintenance philosophy

- Repair & Maintenance budget received by the company during off season is in the range of Rs 3 to Rs 4 per quintal of cane crushed with some increment every year.
- MM believes the repair & maintenance cost is higher than its peers operating in same area which incur Rs 1.5 to 2.5 per quintal of cane crushed towards Repairs and Maintenance.
- Apart from the Repair & Maintenance budget the plant can avail for additional budget from head office in case of major works

9.14.8 Effluents from the Plant

- Consultants have reviewed the inspection reports of the Barkhera plant ETP outlet and all the effluent parameters are within the limits given by Central Pollution Control Board(CPCB).
- Similarly test results of the stack emission are also in the limits given by CPCB.
- The effluents from the distillery is used to generate biogas in the effluent treatment plant

9.14.9 Status of Statutory Approval

Status of the statutory approvals is given below:

Table 211: Statutory Approvals

Sr. No	Clearances sought	Kinauni
1	Environment Clearance MoEF	Not furnished to MM
	Valid From (Date)	
	Valid Till (Date)	
2	Water Usage	
	Valid From (Date)	01/01/2016
	Valid Till (Date)	31/12/2017
3	NOC from state pollution board	
	Valid From (Date)	Applied on 10.3.06
	Valid Till (Date)	One time
4	Consent to operate	
	Valid From (Date)AIR/Water	22/04/2016
	Valid Till (Date)	31/12/2017
5	CIB certification for boiler	
	Valid From (Date)	7.10.16
	Valid Till (Date)	16/08/2017
6	Approval of fire protection scheme	
	Valid From (Date)	14/02/2017
	Valid Till (Date)	13/02/2018
7	Panchayat/Municipal corporation Approval	
	Valid From (Date)	10.06.16
	Valid Till (Date)	31/03/2018
8	FSSE 22000 certification	

Source: BHSL/MM Analysis

- It should be noted that Environmental clearances document has not been furnished by Client to MM
- CIB certification for Boiler and Consent to operate by pollution control board would expire in 2017 and renewal process for the same needs to be expedited.

9.15 Suggestions for Improvement

- Boiler with higher pressure and higher temperature should have been selected for better performance for higher export of power to grid.
- Replacing existing set of boilers and turbines (with 45 bar(g) pressure and 430°C) and with new ones having higher pressure (more than 100 bar(g) and 540°C) would yield additional revenue from power selling. However, this would require a significant capital investment and a detailed study needs to be done for this proposal to work out the cost benefits.
- The proposal would be worth considering on increased quantum sugarcane procurement.
- Use of continuous boiling pan may improve the recovery.
- Use of DC drive for chopper, fiberizer, mill in place of steam driven turbine would yield monetary savings.

9.16 Site Summary

The key highlights for each plant for season 2016-17 are summarized in following table:

Table 212: Site Summary

Sr.no	Particular	U.O.M	Golagokarannath	Palia Kalan	Kinauni	Thana Bhawan	Budhana	Bilai	Gagnauli
1	Location in UP		Central	Central	Western	Western	Western	Western	Western
2	Crushing	Lakh Qntls	181.08	123.75	146.85	110.99	129.77	107.8	62.22
3	Recovery	% cane	11%	10%	10%	10%	10%	11%	10%
4	Crushing Days	Nos	162	138	164	163	169	155	149
5	Sugar Produced Year 2016-17	Lakh Qntls	20.61	11.9	13.96	11.3	13.07	11.81	6.04
	Selling price sugar	Rs/Qntls	3,555	3,574	3,584	3,548	3,542	3,557	3,552
6	Manpower Details	Nos	835	608	863	463	496	516	489
7	Power Generation	Lakh KW	473	636	736	595	796	668	300
8	Power to grid	Lakh KW	0	191	221	226	355	285	28
9	PPA	Rs/Kw-h	NA	4.79	4.79	4.79	4.79	4.79	4.79
10	O and M cost	Rs/Qntls	3.5 to 4	3.5 to 4	3.5 to 4	3.5 to 4	3.5 to 4	3.5 to 4	3.5 to 4
11	Plant area	Acres	184	173	197	80	86	91	184

Source: MM Analysis

Table 213: Site Summary

Sr.no	Particular	U.O.M	Khambharkhera	Barkhera	Maqsoodpur	Pratappur	Rudauli	Kunderkhi	Utraula
1	Location in UP		Central	Central	Central	Eastern	Eastern	Eastern	Eastern
2	Crushing	Lakh Qntls	119.2	71.12	68.26	10.82	37.83	73.02	55.55
3	Recovery	% cane	11%	10%	11%	9%	9%	9%	9%
4	Crushing Days	Nos	145	124	134	42	79	83	86
5	Sugar Produced Year 2016-17	Lakh Qntls	13.32	7.23	7.34	0.98	3.49	6.89	5.2
	Selling price sugar	Rs/Qntls	3,502	3,600	3,575	3,538	3,576	3,543	3,529
6	Manpower Details	Nos	515	466	316	434	432	434	398
7	Power Generation	Lakh KW	732	420	492	37	227	684	499
8	Power to grid	Lakh KW	349	197	205	0	0	374	242
9	PPA	Rs/Kw-h	4.79	4.79	5.35	N.A	4.79	5.45	5.62
10	O and M cost	Rs/Qntls	3.5 to 4	3.5 to 4	3.5 to 4	3.5 to 4	3.5 to 4	3.5 to 4	3.5 to 4
11	Plant area	Acres	203	134	124	66	159	196	163

Source: MM Analysis

9.17 Conclusion

- The sugar factory and its machines are in order in the sense some of the old plants (Palia & Pratappur) were upgraded in 2007-08. Thus, they are new plants with adequate machineries of right capacities. The new plants have DCS (data control system) with all the controls for operation of the plant.
- The staff of all the factories is qualified, experienced, and technically sound.
- The major problem is underutilization of plant capacities. In the sense, the plant capacities are being operated for less number of days and with less plant load.
- The major difficulty appears to be unavailability of adequate quantum of sugarcane in eastern region.
- The plant capacities are excessive and since all are having single tandem, in case of shortage of sugarcane, the plant capacity cannot be utilized.
- Since plant capacity is not adequately utilized, the specific energy (power & bagasse) consumptions are higher.

10 Business Dynamics

10.1 Business Cycles

Typically, sugarcane and sugar production in India have tended to follow a cyclical pattern, wherein production increases for 2 years, then declines for the next 2 years, and recovers thereafter. The graph below shows the cyclical display by Indian and Uttar Pradesh sugar markets over the past 12 years:

Figure 105: Sugar Production Cycles (Million Tonnes)



Source: ISMA, MM Analysis

- It is interesting to note that in general Indian sugar market has followed a 2-year increase and 2-year decline in production trend; except for the 2009-2012 3-year period when there was continuous rise in production.
- The graph above highlights how Indian and UP sugar production cycles are completely in sync, indicating the fact that UP is a major determinant of the country-wide sugar cycles.
- However, UP's improved cane harvest and weather conditions are responsible for the sudden increase in its sugar production levels during 2016-17 as seen in the graph above.
- Currently, India is in the slump cycle with the fall in production during 2015-16 and 2016-17 mainly on account of droughts in Maharashtra and Karnataka.
- While the drought situation in the above-mentioned states is likely to continue impacting the next season also; however, improved cane varieties and cane crop harvest in Uttar Pradesh is projected to surge up Indian sugar production levels over the next two years.

10.2 Sensitivity Analysis

Any business's revenue stream is impacted by both the internal company dynamics and external factors of the market and economy it is operating in. In case of a sugar mill, the main external factors that the company's bottom-lines are sensitive to include cane availability, procurement price of raw material (cane), selling price of raw sugar, and cyclicity in sugar production.

BHSL will be influenced by similar factors. The following table analyses the ranges in deviations and sensitivity based on the past eight years' cane and sugar price and production in Uttar Pradesh:

Table 214: UP Sugar Mills' Sensitivity to Various Factors

	UP Cane Production (MT)	UP SAP (INR/Quintal)	UP Sugar Production (MT)	Sugar Price (INR/Quintal)
2009-10	110.78	165	5.17	2,955
2010-11	105.13	205	5.76	2,830
2011-12	118.40	240	6.96	3,216
2012-13	133.57	280	7.5	3,005
2013-14	149.40	280	6.61	2,951
2014-15	148.09	280	7.1	2,657
2015-16	138.90	280	6.8	3,746
2016-17 (E)	136.41	305	8.8	3,705
Std. Deviation	17.86	46	0.81	350
Average	129.18	247	6.56	3051
Sensitivity	14%	19%	12%	11%

Source: MM Analysis

The table highlights that the price of raw material, in this case the state-determined SAP sugarcane prices have the maximum influence on UP Sugar Mills, followed by cane availability and selling price of raw sugar.

10.3 BHSL's Peer Evaluation

The following table presents an overview of BHSL's peer performance on various operational parameters in the Western and Central UP regions:

Table 215: BHSL's Peer Comparison in Western and Central UP (data for 2015-16)

	District	Plant	Crushing Capacity (TCD)	Cane Crushed (Lakh MT)	Utilization (%)	Sugar Recovery (%)	Molasses Produced (M.T.)
Western UP	Bagpat	SBEC Sugars Limited, Loyan Malakpur	8000	9.48	74%	9.56	44628
		The Baghpat Co-Op. Sugar Mills Ltd., Baghpat	2500	4.2	105%	9.07	21549
		Ramala Sahkari Chini Mills Ltd., Ramala	2750	4.85	110%	8.65	24000
	Bijnor	Dhampur Sugar Mills Ltd., Dhampur	14000	15.9	71%	11.37	74775
		Dwarikesh Sugar Industries Ltd., Dwarikesh Nagar	6500	7.82	75%	12.12	31651
		Kisan Sahkari Chini Mills Ltd., Najibabad	2500	4.22	106%	11.44	18588
		Bajaj Hindusthan Ltd., Bilai	9000	9.53	66%	10.76	47350

	District	Plant	Crushing Capacity (TCD)	Cane Crushed (Lakh MT)	Utilization (%)	Sugar Recovery (%)	Molasses Produced (M.T.)
Central UP	Muzaffarnagar	Indian Potash Ltd., Rohanakalan	2200	1.68	48%	9.61	8207
		Tikaula Sugar Mills Ltd., PO. Ramraj	8000	8.47	66%	10.89	38330
		Titawi Sugar Complex, (A Unit of Mawana Sugars Ltd.), PO. Titawi	10500	6.08	36%	9.57	28545
	Meerut	Bajaj Hindusthan, Thana-Bhavan	9000	10.49	73%	9.97	50872
		Daurala Sugar Works, Daurala	12500	15.51	78%	10.6	71991
		Mawana Sugar Works, Mawana	12500	10.1	51%	11.01	45855
	Saharanpur	Nanglamal Sugar Complex,	6000	5.55	58%	11.47	21974
		Bajaj Hindusthan Ltd., Kinauni	12000	12.5	65%	9.82	56760
		Uttam Sugar Mills Ltd., Shermau	7000	3.99	36%	10.01	18185
	Shahjahanpur	Triveni Engineering and Industries Ltd., Deoband	14000	7.22	32%	10.21	35172
		The Kisan Sahkari Chini Mills Ltd., Nanauta	5000	4.76	60%	8.95	22545
		Bajaj Hindusthan Ltd., Gagnauli	9000	3.23	22%	9.97	15756
	Lakhimpur Kheri	Dalmia Chini Mills, PO. Areli	7500	7.18	60%	11.94	32884
		The Kisan Sahkari Chini Mills Ltd., Tilhar	2500	2.05	51%	9.03	9951
		Rosa Sugar Works, Rosa	4200	3.05	45%	10.68	13954
	Pilibhit	Bajaj Hindusthan Ltd., Maqsoodpur	7000	4.22	38%	11.46	18057
		Gobind Sugar Mills Ltd., PO. Aira Estate	10000	6.43	40%	10.64	33400
		Kisan Sahakari Chini Mills Ltd., Sampurna Nagar	5000	5.19	65%	9.1	25016
	Barkhera	Sarjoo Sahkari Chini Mills Ltd., Belrayan	5000	6.66	83%	9.05	32031
		Bajaj Hindusthan Ltd., Gola Gokarannath	13000	12.93	62%	11.11	59661
		Bajaj Hindusthan Ltd. (Sugar Division), Palia-Kalan	11000	10.2	58%	9.71	48084
	Barkhera	Bisalpur Kisan Sahkari Chini Mills Ltd., Bisalpur	2750	2.35	53%	8.91	11600
		The Kisan Sahkari Chini Mills Ltd., Puranpur	2500	1.84	46%	9.03	8617
		L.H. Sugar Factories Ltd., Pilibhit	11500	10.94	59%	10.63	50700
		Bajaj Hindusthan Ltd., Barkhera	7500	4.75	40%	10.03	21847

Source: MM Analysis

- In addition to the above-listed district-wise competitors, one of the other main competitors of BHSL is Balrampur Chini. The following table illustrates the operational performance of Balrampur Chini during 2015-16:

Table 216: Performance Levels of Balrampur Chini (2015-16)

Location	Plant	Capacity (TCD)	Cane Crushed (Lakh MT)	Sugar Produced (Lakh tonnes)	Recovery (%)	Utilization (%)
Central UP	Nausar Gularia	8000	9.79	1.14	11.6%	76%
	Rauzagaon	8000	5.62	0.61	10.9%	44%
	Kumbhi	8000	10.01	1.17	11.7%	78%
East UP	Maizapur	3000	2.79	0.3	10.8%	58%

Location	Plant	Capacity (TCD)	Cane Crushed (Lakh MT)	Sugar Produced (Lakh tonnes)	Recovery (%)	Utilization (%)
	Babhnan	10000	8.77	0.97	11.1%	55%
	Balrampur	12000	12.02	1.3	10.8%	63%
	Tulsipur	7000	7.11	0.76	10.7%	63%
	Akbarpur	7500	7.14	0.78	10.9%	60%

Source: MM

As analysed in Section 7.4, as well as highlighted in the table above, while BHSL's central and western UP plants are performing optimally in terms of capacity utilization. It is the Eastern UP plants that have become the points of concern for pulling down the overall performance of BSHL. The following table analyses the performance parameters of BHSL's peers operating in eastern Uttar Pradesh:

Table 217: Peer evaluation in Eastern UP

Plant	Location	Status	Cap. (TCD)	Recovery	Cane Crushed (Lakh MT)	TCA	Utilization
Govind nagar sugar	Walterganj	Running	6000	8.60%	1.34	960000	14%
New India Sugar Mills Ltd	Dhadha Bujurg	Working	8000	9.36%	5.92	1280000	46%
Indian Potash Ltd.,	Raja Bazar	Working	1600	9.44%	1.83	256000	71%
Shankara Sharkara Sankul	Kushinagar	Working	6000	9.71%	3.53	960000	37%
Triveni Engineering Industries Ltd.	Kushinagar	Working	6500	11.21	6.91	1040000	66%
The United Provinces Sugar Co. Ltd,	Kushinagar	Working	6500	9.60%	5.95	1040000	57%
BHSL	Pratappur	Working	6000	9%	1.08	960000	11%
BHSL	Rudauli	Working	7000	9%	3.78	1120000	34%
BHSL	Kunderkhi	Working	15000	9%	7.30	2400000	30%
BHSL	Utraula	Working	12000	9%	5.56	1920000	29%
Basti Sugar Mills Co.	Basti	Closed	5000			800000	
Cawnpore Sugar Works	Gauri Bazar	Closed					
U. P. State Sugar Corpn.	Basti	Closed					
U.P. State Sugar and Cane Dev. Corpn. Ltd.	Baitalpur	Closed					

Source: MM analysis

Following are few observations that can be noted in the table above:

- BHSL has the largest plants in terms of installed capacity. BHSL's plants have an average installed capacity of 10000TCD per plant, which is much higher than its peers' 6000 TCD capacity.
- In terms of capacity utilization, BHSL's plants (Eastern UP Plants) (at 11-30%) are amongst the worst performing operational plants in the region, when compared to its peers like Indian Potash's or Triveni's plants operating at around 70% capacity utilization levels.
- In terms of recovery rates, BHSL's performance is in line with most of its peers
- Except for Pratappur plant, BHSL's all other plants are crushing satisfactory levels of cane when compared to its peers in the region.

MM Consultants observe that since BHSL has much larger plants in terms of installed capacities, but comparable recovery rates to its peers in Eastern UP, BHSL's utilization rates are low because of challenges in cane procurement in the region. Thus, has the Company installed plants of lesser capacity could the Company operate at better utilization levels.

- In addition, the table below compares BHSL's key financial indicators with those of its top 5 competitors:

Table 218: Competitive Landscape (FY 2015-16)

Description	BHSL	KM Sugar Mills	DCM Shriram Industries	Dwarikesh Sugar Ltd	Dhampur Sugar Mills Ltd.	Balrampur
Profitability Ratios						
PBIT Margin (%)	2.22	7.59	6.08	10.83	8.51	12.83
PBT Margin (%)	-2.63	2.82	3.18	4.95	1.71	3.81
Net Profit Margin (%)	-2.56	3.31	2.73	4.90	1.46	3.60
Return on Net worth/Equity (%)	-4.84	40.76	13.89	45.35	7.75	8.07
Return on Capital Employed (%)	0.93	13.89	8.39	10.50	2.47	5.07
Return on Assets (%)	-0.96	4.33	3.13	3.89	1.00	2.65
Total Debt/Equity (X)	1.75	2.41	1.46	6.88	3.58	1.22
Asset Turnover Ratio (%)	33.56	130.72	114.65	79.33	68.40	73.64
Liquidity Ratios						
Current Ratio (X)	1.55	1.07	1.03	0.98	0.84	1.22
Quick Ratio (X)	0.93	0.24	0.26	0.13	0.18	0.18
Inventory Turnover Ratio (X)	0.57	2.27	2.38	1.48	1.73	1.48

Source: BHSL, MM

10.4 BHSL's Cane Development Scheme

BHSL's sugar recovery during the season 2013-14 BHSL's was extremely low at 9.14%. After analysing all the parameters contributing to lower recovery percentage, the Company launched cane development activities from March 2014 by introducing early high sugar and high yield varieties such as Co 0238.

- In crushing season 2015-16, BHSL multiplied the early varieties by introducing more varieties namely CoJ 85, Co 98014, Co 0118 & Co 0239 which are also equivalent to Co 0127 in yield and recovery. Additionally, two more general varieties were also procured from outside areas due to scarcity and achieved 30.40% plant cane (overall 21% of the total cane area).
- Similarly, in the planting year 2016-17 for crushing season 2017-18, BHSL is further focused to increase the participation of our early desired varieties.
- In the current year, BHSL plans to promote other desired varieties namely Co0239, Colk 94184, CoJ 85, Co 98014, Co0118, & CoJ88. It is estimated that overall coverage of early variety / desired varieties with high sugar recovery will reach to 70%.
- The following table shows the improvement in recovery rate witnessed by BHSL after launching its Cane Development Scheme:

Table 219: BHSL's Recovery Rate during Cane Development Scheme

Crushing Season	Recovery Rate
2014-15	9.38%

Crushing Season	Recovery Rate
2015-16	10.32%
2016-17	10.23%

Source: BHSL

- Average recovery of 2016-17 was marginally less due to a) climatic conditions b) Less cane supplies in east zone unit hence east zone unit had not much cane left during peak recovery period. Overall there is increasing trend of sugar recovery.

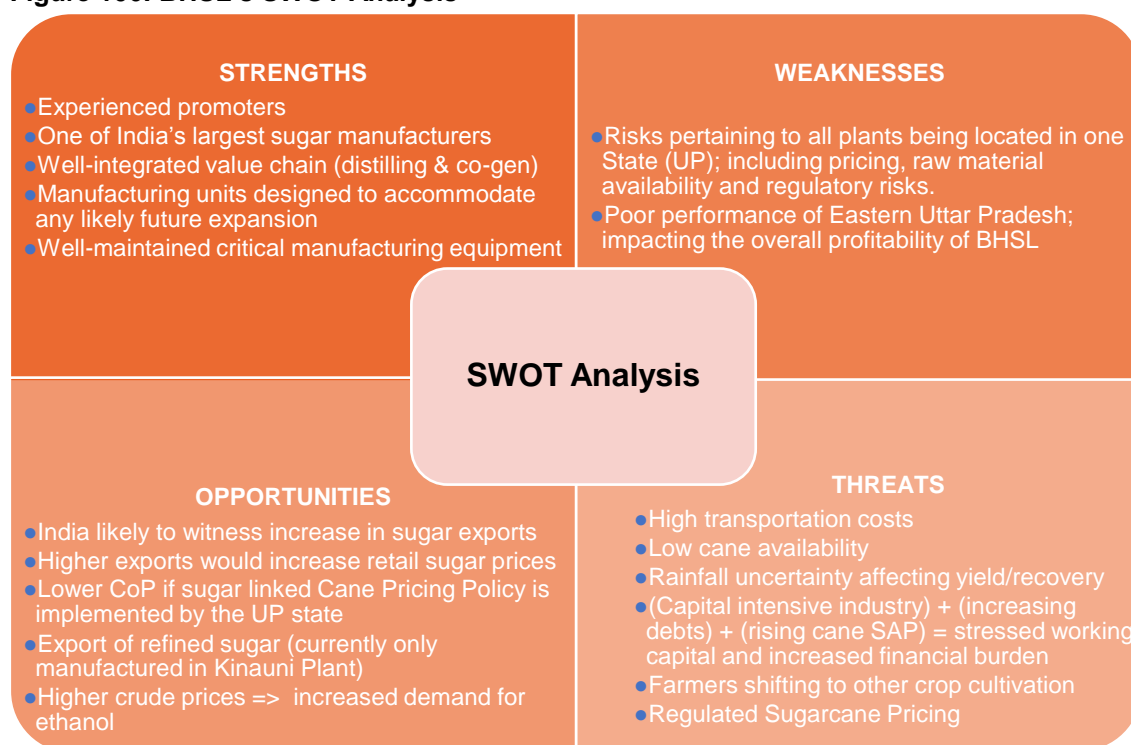
To achieve the planting of above varieties, BHSL has undertaken the following activities:

- Transportation of seed from outside areas.
- Premium on cane seeds and its transportation for inside areas.
- 10% subsidy on insecticides like Coragen & Furadan for controlling the attacks of top borers as these varieties are prone to frequent attacks of borers in comparison to other varieties.
- Regular visits and guidance of BHSL's field staff to growers for timely cultural practices.
- Increase awareness and practice of ratoon management to increase yield of ratoon crops.
- Distribution of seeds on FOC basis to growers who do not have desired early varieties' seed.
- Engage extra field staff for increasing growers' awareness regarding cane development through village meetings, distribution of pamphlets, conducting kisan goshties etc at the time of planting and throughout cane growth duration.

10.5 BHSL's SWOT Analysis

The following figure provides a synopsis of BHSL's SWOT analysis:

Figure 106: BHSL's SWOT Analysis



Source: MM Analysis

Strengths

- The promoters have significant experience in the sugar industry of more than five decades.
- BHSL is one of the largest manufacturer of Sugar (136,000 TCD), Distillery (800 KLPD), Power divisions of (449 MW) not only in the state of Uttar Pradesh, but also across India.
- The sugar manufacturing plants are well integrated with facility to generate power from bagasse and manufacture alcohol. This improves the overall value chain.
- The manufacturing units of the Company are well designed to accommodate the overall infrastructure as well as accommodate any likely future expansion.
- The condition of all critical equipment in manufacturing units is up to the mark as not only are they procured from renowned and established suppliers, but also are well-maintained.

Weaknesses

- All the manufacturing units of the Company are in the same State (Uttar Pradesh) where presently sugarcane prices are relatively higher than domestic average and are not linked to the market prices of sugar. This impacts the overall profitability of BHSL especially in a drought scenario wherein the sugar prices in domestic market fall.
- Sugarcane availability for and the capacity utilization of units located in Eastern Uttar Pradesh at Gangnauli, Pratapur and Utraula remains a concern. This pulls down the overall performance indicators of the Company.

Opportunities

- Indian sugar industry may see an upward movement in the export market considering the global surplus of sugar coming to an end. In addition to this, the sugar prices in domestic market are also likely to surge in the coming years due to drought situations in Maharashtra and Karnataka; thereby, benefiting Uttar Pradesh sugar producers.
- Implementation of Sugarcane Pricing Policy in the State of UP will establish relationship between the prices of sugar and sugarcane will enable the sugar mills in the state to manufacture sugar at low cost.
- The Company can start exporting refined sugar which is in demand in the international market, but is currently only manufactured in Kinauni Plant.
- A rise in the global crude prices could accompany a demand increase for ethanol. BHSL's facilities having distilleries manufacturing Ethanol could potentially benefit from such a scenario.

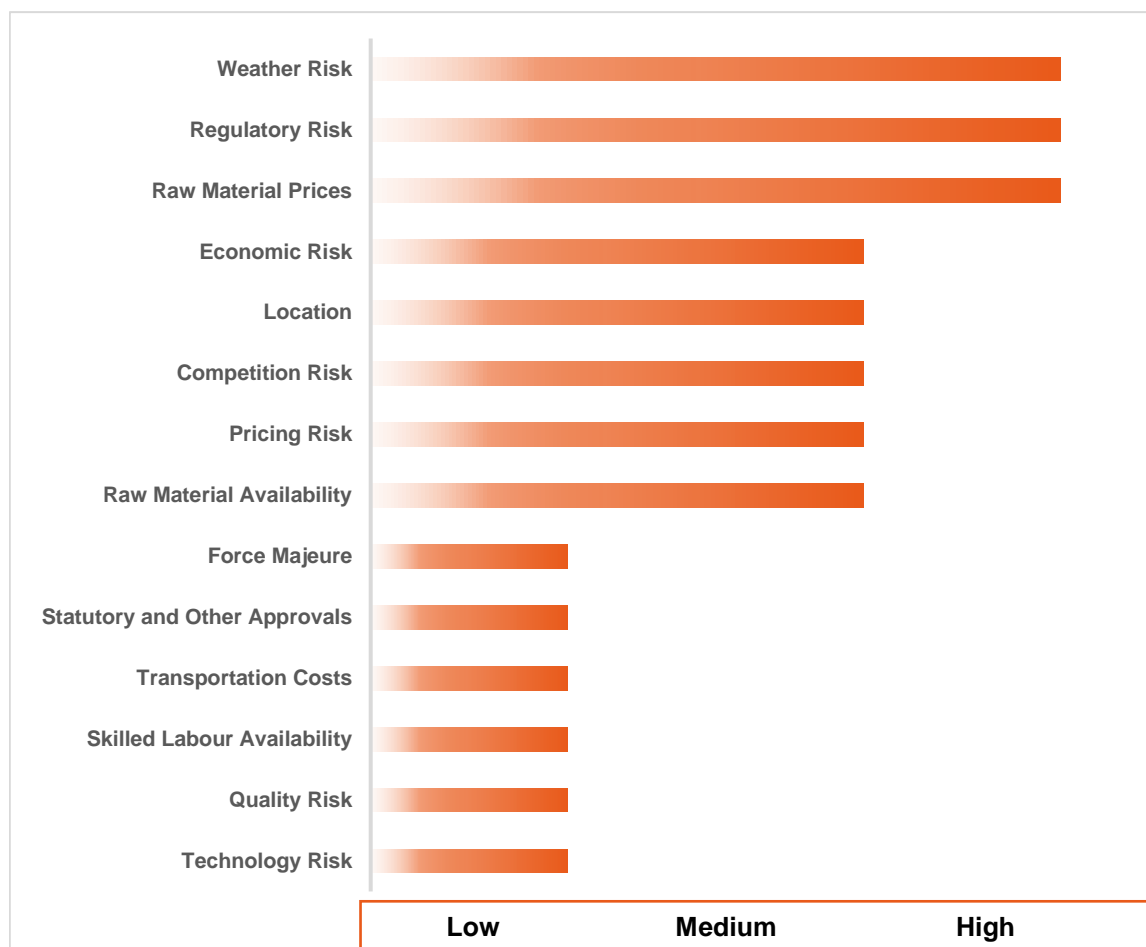
Threats

- Transportation cost is a significant factor in determining the availability of cane at a mill. Low cane availability due to higher transportation cost or competition possesses threat to the profitability of the mill.
- Uncertainty in rainfall can significantly affect the yield / recovery of sugar.
- Sugar Industry is highly capital intensive and players operating in the Indian market are presently burdened by significantly high amount of debts. Irregularity over cane purchase price significantly affects the working capital requirement and further increases the financial burden of companies.
- Farmers prefer to opt for more lucrative cash crops as profits from sugarcane cultivation are highly irregular and dependent on various external parameters like rainfall, government policy.
- Sugarcane pricing policy will continue to remain under the influence of Political environment

11 Risk Assessment and Mitigation

This section assesses the key risks faced by BHSL and the mitigation measures that are currently being undertaken or planned for by the Company. The following figure provides a brief overview of the nature of risks and their intensity faced by BHSL:

Figure 107: Assessment of Operating and Market Risks faced by BHSL



Source: MM Analysis

The table below elucidates these critical risk factors eminent to BHSL in detail:

Table 220: BHSL's Risk Assessment and Mitigation Measures

S. No.	Risk	Risk Description	Risk Mitigation	Risk Assessment
OPERATING RISKS				
1	Raw Material Availability	Sugarcane availability and assured adequate quantity allocated to BHSL for crushing are the main determinants of sugar business.	Increased efforts to monitor the sugarcane production in its 2,98,175 hectares of allocated area in Uttar Pradesh.	Medium
		Due to low realization (INR / Hectare) with sugarcane crop, farmers are likely to switch to several other food and cash crops like cotton, oil seeds, rice, etc.	For Gangnauli unit, BHSL plans to initiate measures like free transportation to mills, community welfare programs, etc.	
		Gangnauli plant is facing a similar crisis wherein, local farmers have shifted from sugarcane to 'Populus' wood plant.		
2	Raw Material Prices	Unviable sugarcane prices under the FRP and SAP regimes may impact the profitability of the mills.	The government has partially decontrolled the industry and going forward if the State government accepts C. Rangarajan Committee's proposed linking of sugarcane prices to sugar sales, this risk would be significantly mitigated.	High
		One of the key concern areas is the ability of BHSL to make timely cane price payment to farmers		
3	Technology Risk	To recover higher percentage of sugar from sugarcane, it is critical to have well equipped plant & machineries	BHSL is constantly adopting modern technologies for juice and syrup/melt clarification e.g. film type sulphur burner, SCS (Syrup Clarification System), FCS (Filtrate Clarification System) and MCS (Melt Clarification System).	Low
4	Quality Risk	Quality of sugar impacts pricing and thereby sales realization. Sugar being a food entity, quality is of prime importance and requires maintenance of uniform quality irrespective of the variations in the quality of input raw material.	BHSL claims to control the quality of its sugar by maintaining Company wide defined process parameters strictly, maintaining good sanitation at mills and in the boiling house, using tested and good quality chemicals for processes, avoiding direct steam application to intermediate sugar products.	Low
5	Skilled Labour Availability Risk	The inability to attract and retain a workforce with the required technical skills and capabilities remains a challenge for players in this Industry.	BHSL retains the technically skilled workforce at higher level by including them on Company payroll, whereas other skilled and unskilled labour is employed as per requirement on contractual basis.	Low

S. No.	Risk	Risk Description	Risk Mitigation	Risk Assessment
6	Transportation Costs	Transportation cost is a significant factor in determining the availability of cane at a mill. Low cane availability to higher transportation cost or competition possesses threat to the profitability of the mill.	BHSL has sugar units located at close vicinity to the cane fields so that it can be transported in trucks or through rail to the mill reliably at low costs. Also, the State Govt. had introduced Sugar Promotion Policy which provides benefits like freight subsidy on sugar transportation, freight subsidy on cane transport.	Low
7	Statutory and Other Approvals	BHSL has requisite statutory and other approvals already in place.		Low
8	Force Majeure	BHSL would have adequate insurance cover for insurable Force Majeure risks.		Low
MARKET RISKS				
9	Regulatory Risk	Sugar industry is a highly-regulated industry with the cane prices being controlled by the Central and State governments.	The Government of India, through Dr. C. Rangarajan Committee recommendations proposes to rationalize the pricing of sugarcane and links it with revenues of sugar and by-products in a phased manner. Such a revenue sharing formula for sugarcane pricing is expected to benefit all the stakeholders i.e. farmers, mills, consumers.	High
		Since this is a systemic risk, it cannot be alleviated unless the industry is completely decontrolled and the sugar cane price has linkage with the sugar price.		
10	Pricing Risk	As sugar sales have been decontrolled, they are dependent on the market forces and dynamics, and at times these are also influenced by international prices.	BHSL is focusing to increase its market share and has initiated several cost reduction measures at various levels.	Medium
		Excessive stocks in the country also lower the sugar price and distressed sale by financially stressed sugar mills also contribute to decline in sugar prices affecting the profitability.		
11	Competition Risk	With the highest SAP across India, cost of production of sugar outside UP is low. However, the average selling prices of sugar remain constant across states with minor variation. Thus, irrespective of its cost, BHSL has to sell sugar at prevailing market prices wherein its cost of raw material is high.	BHSL along with its peers in Uttar Pradesh has jointly approached the State Government to establish a linkage between sugarcane price and market price of sugar to safeguard the profitability of the Sugar manufacturers in UP	Medium

S. No.	Risk	Risk Description	Risk Mitigation	Risk Assessment
12	Weather Risk	Uncertainty in rainfall can significantly affect the yield / recovery of sugar. For better sugarcane yield, high and low rainfall is required during sugar sowing and harvesting season respectively. Rainfall uncertainty would result in poor sugarcane yield which would adversely impact the sales realization.	BHSL is in the process of implementing measures such as selection & evaluation of draught tolerant cane varieties, conduct water footprint exercise to better understand and manage available water resource, use of weather forecasting tools and an early warning system for flooding.	High
13	Location	All the manufacturing units of the Company are in same state (Uttar Pradesh), thus being subjected to the same raw material, pricing, and regulatory risks. This impacts the overall profitability of BHSL especially in scenario wherein the sugar prices in domestic market fall.	The Company has also been intensively focusing on cane development initiatives and has witnessed encouraging results during the past two seasons. Securing high yield and recovery rates can mitigate this risk	Medium
14	Economic Risk	Due to global slowdown and other macro factors such as inflation and interest rate, there could be an adverse impact on business and profitability.	BHSL can leverage its financial market experience to source funds at competitive rates in adverse market conditions.	Medium

Source: BHSL and MM analysis

11.1 Short and Medium term plans of BHSL

Short term and medium term plans of the company as stated by management of BHSL have been made in this section

- Cane Development

The Company is continuously focusing on cane development areas to increase the operational efficiency. The results of past cane development are very encouraging as the recovery has improved from around 9% to 10.30 %. The same is adding directly to the bottom line of the company and therefore Company is mainly focusing on cane development. The improvement in EBITDA levels in recent years is majorly on account of improvement in sugar recovery after factoring impact of sugar realisation increase. Therefore, the Management is focusing mainly on cane developmental activities to increase the yield of cane and improvement in sugar recovery.

- Allocation of More cane area

To improve the capacity utilisation, Company is continuously discussing with the cane commissioner's office for the allocation of larger area particularly in eastern UP units. The company is also focusing on increasing the cane area under cultivation to produce more cane in its allocated area which will result in increase in capacity utilisation which in turn will result in improved operational efficiency.

- Utilisation of Maximum Molasses for production of more Alcohol/Ethanol

Since the distillery is contributing significant revenue to the bottom line of the Company due to better margins, the company will focus on maximum utilisation of molasses into production of the alcohol and Ethanol.

- Realisation of SPP claim

The Company is continuously following up for settlement of its claim of Sugar Promotion Policy.

In a recent judgement Hon'ble Supreme Court has awarded the decision in favour of the Company and the Company expects inflow of around Rs.325 Crores by virtue of the same. The second Supreme Court judgement on the same case is expected within next 6-12 months. Based on the directions of the apex courts and having complied with the conditions of the policy, company expects that the claim of Capital Subsidy due to it will be settled with in a period of 1-2 year, if not earlier. Subject to the state honouring its commitment, the cumulative amount receivable under the said claim is about Rs. 1,200 Crore.

As and when such claim received, the same shall be used towards prepayment of debt.

- Post S4A

As per the business plan of the Company submitted with Mott MacDonald, the Company is expecting sufficient cash flows to run its business efficiently and service its debts. After implementation of S4A, the interest burden of company will get reduced significantly resulting in saving of EBITDA for debt repayments. The repayment of sustainable debt over a period will reduce the debt burden resulting in more improved cash flows for the Company

12 Business Plan Assessment

12.1 Introduction

The Consultants have reviewed the proposed Business Plan of the Company with due consideration of the following aspects:

- Existing business portfolio
- Technical assessment of manufacturing units
- Secondary Market research
- Historical financial statements, MIS statements, information / documents provided by BHSL's management
- Interactions with the management team of BHSL
- Experience of the Consultants in handling similar nature of Assignments.

12.2 BHSL's Unit-wise Operations

BHSL operates in the four key business segments at present:

- Sugar Division
- Distillery Division
- Power Division
- Bagasse Board division
 - The operations at all plants of bagasse board division were suspended due to non-availability of adequate quantity of sugarcane bagasse at affordable prices and inadequate demand of finished products in the market.

Besides smooth functioning of plants, timely and regular procurement of sugarcane is the most important activity of the Company.

12.3 Base Case Operating Performance

12.3.1 Capacity and Capacity Utilization

BHSL is one of the leading sugar and ethanol manufacturing company in India with its;

- fourteen sugar plants having an aggregate sugarcane crushing capacity of 1,36,000 TCD,
- six distilleries having aggregate capacity to produce Industrial Alcohol of 800 kilolitres per day and
- fourteen co-generation plants having a total power generation capacity of 449 MW.

No enhancement in capacity of sugar mill, co-gen power plant or distillery has been considered in the projected period.

12.3.1.1 Sugar Division

Details of plant wise installed capacity during the year, unit-wise crushing capacity, and percentage recovery of sugar from sugarcane are described in Table 221.

Table 221: Capacity and Capacity Utilization (Sugar)

Particulars	Capacity (Qtl. / day)	Capacity Utilization (full season – 160 days) (%)	Sugar Recovery Rate	Production per Year (Lac Qtl. / year)
Gola	130000	80%	11.39%	18.93
Palia	110000	70%	9.60%	11.88
Kinauni	120000	69%	9.51%	12.68
Thanabhawan	90000	71%	10.18%	10.42
Budhana	90000	84%	10.07%	12.14
Bilai	90000	74%	10.97%	11.73
Gagnauli	90000	43%	9.70%	6.02
Khambarkhera	100000	75%	11.18%	13.33
Barkhera	70000	63%	10.20%	7.25
Maqsoodpur	70000	61%	10.79%	7.37
Pratappur	60000	11%	8.92%	0.96
Rudauli	70000	34%	9.20%	3.48
Kunderkhi	150000	30%	9.43%	6.89
Utraula	120000	29%	9.43%	5.24
Total	1360000			128.31

Source: MM Analysis

- The company has an installed cane crushing capacity of 2176 lac quintal/year.
- Manufacturing of sugar is a seasonal phenomenon with a short crushing season varying normally from 4 to 7 months in a year.
- The company is producing 128.31 lac quintal/year, at an average capacity utilization rate of 57%.
- The average Sugar Recovery Rate of BHSL is 10.26%.

12.3.1.2 Alcohol and Power

Details of recovery rate for various products are described in Table 222.

Table 222: Recovery Rate

Particulars	Value
Molasses	
Recovery Rate	5.00%
Sold Outside	10.00%
Bagasse	
Recovery Rate	29.87%
Used for Steam Production	52.00%
Internal Use	4.00%
Press Mud & Others	
Recovery Rate	4.00%
Alcohol	
Recovery Rate	23.50%

Source: MM Analysis

Table 223: Production Capacity (Alcohol and Power)

Particulars	Production Capacity	
	Alcohol (KLD)	Power (MW/Hour)
Gola	100	29
Palia	60	43
Kinauni	160	38
Thanabhawan	-	34
Budhana	-	33
Bilai	-	24
Gagnauli	160	25
Khambarkhera	160	35
Barkhera	-	34
Maqsoodpur	-	28
Pratappur	-	13
Rudauli	160	17
Kunderkhi	-	59
Utraula	-	37
Total	800	449

Source: MM Analysis

- Recovery rate of Molasses, Bagasse, and Press-mud is 5%, 29.87% and 4%, respectively, of sugar cane crushed.
- Alcohol has a recovery rate of 23.50% of Molasses produced.
- Various plants are collectively able to produce 800 KI/day of Alcohol and 449 MW/hour as represented in Table 223.

12.3.2 Production Data

Estimated Production corresponding to the installed capacity for the proposed business plan will be as mentioned in Table 224

Table 224: Production Level

Particulars	Sugar (Lac Qtl. / year)	Molasses (Lac Qtl. / year)	Bagasse (Lac Qtl. / year)	Press Mud (Lac Qtl. / year)	Alcohol (Lac L / year)
Gola	18.93	8.31	49.64	6.65	172.65
Palia	11.88	6.19	36.96	4.95	156.09
Kinauni	12.68	6.66	39.81	5.33	403.89
Thanabhawan	10.42	5.12	30.59	4.10	-
Budhana	12.14	6.03	36.02	4.82	-
Bilai	11.73	5.34	31.93	4.28	-
Gagnauli	6.02	3.10	18.53	2.48	192.70
Khambarkhera	13.33	5.96	35.61	4.77	269.93
Barkhera	7.25	3.56	21.24	2.84	-
Maqsoodpur	7.37	3.41	20.39	2.73	-

Particulars	Sugar (Lac Qtl. / year)	Molasses (Lac Qtl. / year)	Bagasse (Lac Qtl. / year)	Press Mud (Lac Qtl. / year)	Alcohol (Lac L / year)
Pratappur	0.96	0.54	3.23	0.43	-
Rudauli	3.48	1.89	11.30	1.51	191.81
Kunderkhi	6.89	3.65	21.81	2.92	-
Utraula	5.24	2.78	16.59	2.22	-
Total	128.31	62.55	373.65	50.04	1387.07

Source: MM Analysis

- MM estimates a production of 128.31 lac quintal/year of sugar.
- Alcohol production is estimated to be 1387 lac litres/year.
- Production levels of Molasses, Bagasse and Press mud are estimated to 62.55, 373.65 and 50.04 lac Quintal/ year respectively.

12.3.2.1 Internal Consumption

Table 225 shows the how much of Molasses and Bagasse is used in production of Alcohol and Steam respectively.

Table 225: Internal Use of Molasses and Bagasse (in Lac quintal / year)

Particulars	Molasses (Used for Alcohol Production)		Bagasse (Used for Steam Generation)	
	2017-18	2018-24	2017-18	2018-19
Gola	7.40	7.48	44.93	44.96
Palia	6.74	5.57	33.73	33.49
Kinauni	6.23	6.00	38.69	38.43
Thanabhawan	5.32	4.61	26.63	26.63
Budhana	5.68	5.43	31.35	31.35
Bilai	5.33	4.81	27.79	27.79
Gagnauli	3.68	2.79	18.06	17.99
Khambarkhera	4.91	5.36	33.69	33.73
Barkhera	3.36	3.20	18.49	18.49
Maqsoodpur	3.37	3.07	17.75	17.75
Pratappur	0.44	0.49	2.81	2.81
Rudauli	1.59	1.70	11.75	11.71
Kunderkhi	3.22	3.29	18.99	18.99
Utraula	2.93	2.50	14.44	14.44
Total	60.19	56.29	339.11	338.55

Source: MM Analysis

12.3.3 Projected Revenue Stream

The products generated by the process flow shall be sold at the prevalent market rates. The selling prices and revenue generated is expected to be as given in Table 226, Table 227 and Table 228.

12.3.3.1 Selling Price

Table 226 lists the selling price for different products sold by BHSL.

Table 226: Sales Price

Particulars	Unit	Value
Sugar	INR/Qtl.	3670.00
Molasses	INR/Qtl.	210.00
Bagasse	INR/Qtl.	235.00
Press Mud & Others	INR/Qtl.	31.00
Alcohol	INR/L	42.00
Power	INR/MW	4747.00

Source: MM Analysis

12.3.3.2 Sales Volume

Based on the production capacities and utilization levels as mentioned in sections above, the projected sales volume are given in Table 227.

Table 227: Saleable Quantity (in Lac Quintal/ Year)

Particulars	31-Mar-18	31-Mar-19	31-Mar-20	31-Mar-21	31-Mar-22	31-Mar-23	31-Mar-24
Free Sugar							
Production	128.31	128.31	128.31	128.31	128.31	128.31	128.31
Add: Opening Stock	76.27	75.70	70.57	64.15	60.30	56.46	53.89
Less: Closing Stock	75.70	70.57	64.15	60.30	56.46	53.89	51.32
Saleable Qty	128.88	133.44	134.72	132.16	132.16	130.87	130.87
Molasses							
Production	62.55	62.55	62.55	62.55	62.55	62.55	62.55
Add: Opening Stock	32.05	28.15	28.15	28.15	28.15	28.15	28.15
Less: Closing Stock	28.15	28.15	28.15	28.15	28.15	28.15	28.15
Used in Alcohol	60.19	56.29	56.29	56.29	56.29	56.29	56.29
Saleable Qty	6.25	6.25	6.25	6.25	6.25	6.25	6.25
Bagasse							
Production	373.65	373.65	373.65	373.65	373.65	373.65	373.65
Add: Opening Stock	18.23	18.23	18.23	18.23	18.23	18.23	18.23
Less: Closing Stock	18.23	18.23	18.23	18.23	18.23	18.23	18.23
Used for Steam	339.11	338.55	338.46	338.46	338.46	338.46	338.46
Internal	14.95	14.95	14.95	14.95	14.95	14.95	14.95
Saleable Qty	19.59	20.15	20.24	20.24	20.24	20.24	20.24
Press Mud	50.04	50.04	50.04	50.04	50.04	50.04	50.04
Alcohol⁷							
Production	1387.07	1331.42	1322.84	1322.84	1322.84	1322.84	1322.84
Add: Opening Stock	342.89	346.77	332.86	330.71	330.71	330.71	330.71
Less: Closing Stock	346.77	332.86	330.71	330.71	330.71	330.71	330.71
Saleable Qty	1383.18	1345.33	1324.98	1322.84	1322.84	1322.84	1322.84

Source: MM Analysis

12.3.3.3 Revenue Stream

Based on future market scenario, Consultants understand that all produced items will be absorbed in the market. Revenue projections are mentioned in Table 228

⁷ in Lac Litre/Year

Table 228: Revenue (in INR Cr.)

Particulars	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24
Free Sugar	4729.90	4897.25	4944.34	4850.17	4850.17	4803.08	4803.08
Molasses	13.13	13.13	13.13	13.13	13.13	13.13	13.13
Bagasse	46.05	47.35	47.55	47.55	47.55	47.55	47.55
Press Mud & Others	15.51	15.51	15.51	15.51	15.51	15.51	15.51
Alcohol	580.94	565.04	556.49	555.59	555.59	555.59	555.59
Power	126.87	126.87	126.87	126.87	126.87	126.87	126.87
Other Revenue	30.00	30.00	30.00	30.00	30.00	30.00	30.00
Total	5542.39	5695.16	5733.90	5638.82	5638.82	5591.73	5591.73

Source: MM Analysis

- Revenue from operations is generated from the sale of sugar, alcohol, power, by-products.
- Sale of Sugar is a major source of revenue for the Company and contributes about 85% of turnover.
- While most of the power generated by BHSL continued to be used for captive consumption to run its plants, the surplus power was being sold to the Uttar Pradesh state grid.
- Industrial alcohol will be sold in the local market directly to end users, mainly alcohol-based chemical plants. Ethanol would be sold to oil companies, who use it for blending with gasoline.
- The Company also earns revenue from sale of by-products such as molasses, bagasse, press mud and others.

12.3.4 Projected Cost Stream

12.3.4.1 Variable Costs

The variable costs are categorized under the following segments:

- Raw material cost
- Consumables and Utilities
- Other Manufacturing Expenses

Raw Material Cost

The Company procures sugarcane from farmers situated in nearby region of respective sugar unit. Sugarcane is the main raw material in the production of sugar and accounts for around 70% of turnover. Thus, financial performance of the Company is highly co-related to cane prices.

Cane Cost estimate is based on the industry level consumption norms for the major raw materials used. The Consultants have considered the recent prices for the input materials. Cane Cost as mentioned in Table 229 have been determined based on prevailing market rates.

Table 229: Cane Cost

Particulars	Unit	Value
Cane Cost SAP	INR/Quintal	305.0
Cane P Tax	INR/Quintal	2.0
Society Commission	INR/Quintal	4.5
Other Cost	INR/Quintal	1.6
Transportation Cost	INR/Quintal	7.4

Particulars	Unit	Value
Total	INR/Quintal	320.5

Source: MM Analysis

Utilities and Consumables

Stores and consumables and power and fuel cost have been considered on basis of industry standards as mentioned in Table 230

Table 230: Utilities and Consumables

Particulars	Unit	Value
Sugar		
Stores Consumed	INR/Quintal	2.90
Power & Fuel - Sugar	INR/Quintal	1.21
Distillery		
Stores consumed	INR/Lac Litre	0.43
Power & fuel - To Distillery	INR/Lac litre	0.11

Source: MM Analysis

Other Manufacturing Expenses

Other manufacturing expenses would be towards:

- Repairs and Maintenance will be made for upkeep of the followings;
 - Factory premises buildings and structures
 - Replacement of worn out and broken parts
 - Cost of lubricants and similar cost
 - Power sub-station and electrical installations
 - Water and air systems
- Material Handling Systems
- Packing Cost
- Selling and Distribution Expenses

Table 231: Cost Assumptions

Particulars	Unit	Value
Sugar		
Packing (% of sugar produced)	INR/Quintal	36.25
Repairs & Maintenance	INR/ Lac Quintal	4.49
Distillery		
Selling & Distribution	INR/Lac litre	1.37
Transportation Cost	INR/Lac litre	37.50

Source: MM Analysis

Table 232: Selling Commission and Distribution Cost Assumption (Sugar)

Particulars	Selling Commission (INR/Bag Sold)	Selling & Distribution (INR/Bag Sold)
Gola	3.33	30.36
Palia	3.49	22.24
Kinauni	11.96	40.32
Thanabhawan	10.10	30.94

Particulars	Selling Commission (INR/Bag Sold)	Selling & Distribution (INR/Bag Sold)
Budhana	10.97	28.74
Bilai	10.83	23.28
Gagnauli	10.64	27.77
Khambarkhera	3.55	23.12
Barkhera	3.55	19.17
Maqsoodpur	3.56	10.29
Pratappur	3.31	3.67
Rudauli	3.44	6.61
Kunderkhi	3.74	16.99
Utraula	3.52	8.54

Source: MM Analysis

Table 233: Repairs & Maintenance Cost Assumption (Distillery)

Particulars	Repairs & Maintenance (INR/Lac Litre)
Gola	0.26
Palia	0.30
Kinauni	0.30
Thanabhawan	-
Budhana	-
Bilai	-
Gagnauli	0.30
Khambarkhera	0.30
Barkhera	-
Maqsoodpur	-
Pratappur	-
Rudauli	0.30
Kunderkhi	-
Utraula	-

Source: MM Analysis

12.3.4.2 Fixed Costs

Manpower Cost

The Consultants estimate that around 7000 associated manpower will be employed during the year. Sufficient skilled, semi-skilled and un-skilled labour force is available in the region, where the plant will be located. Manpower cost has been estimated based on the historical trend.

General and Administrative Expenses

Administrative and general expenses will comprise of –

- Administrative and office expenses
- Rent, rates and taxes
- Printing and Stationery
- Insurance and Communication
- Travel cost for administration staff

- Miscellaneous expenses

Administrative expenses have been considered based on present and historical expenditure

Repairs and Maintenance Cost

Repairs and Maintenance will be made for upkeep of the followings;

- Factory premises buildings and structures
- Replacement of worn out and broken parts
- Cost of lubricants and similar cost
- Power sub-station and electrical installations
- Water and air systems

Repairs and Maintenance Cost is estimated to be INR 4.49 per quintal of sugar cane crushed and INR 0.26 per litre of alcohol produced.

12.3.5 Projected Operating Statement – Base Case

Based on the revenues and operating cost streams as elaborated in the above sections, the resulting projected operating profit statement is indicated in Table 234.

Table 234: Projected Operating Statement (in INR Cr.)

Particulars	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24
Revenue							
Free Sugar	4729.90	4897.25	4944.34	4850.17	4850.17	4803.08	4803.08
Molasses	13.13	13.13	13.13	13.13	13.13	13.13	13.13
Bagasse	46.05	47.35	47.55	47.55	47.55	47.55	47.55
Press Mud & Others	15.51	15.51	15.51	15.51	15.51	15.51	15.51
Alcohol	580.94	565.04	556.49	555.59	555.59	555.59	555.59
Power	126.87	126.87	126.87	126.87	126.87	126.87	126.87
Other Revenue	30.00	30.00	30.00	30.00	30.00	30.00	30.00
Total	5542.39	5695.16	5733.90	5638.82	5638.82	5591.73	5591.73
Variable Expenditure							
Raw material consumed	4009.16	4009.16	4009.16	4009.16	4009.16	4009.16	4009.16
Transportation Cost	22.57	21.11	21.11	21.11	21.11	21.11	21.11
Change in Stock	47.67	173.14	208.31	124.86	124.88	83.21	83.23
Power & Fuel Cost	16.55	16.49	16.49	16.49	16.49	16.49	16.49
Stores Consumed	42.24	42.00	41.96	41.96	41.96	41.96	41.96
Packing Cost	46.52	46.52	46.52	46.52	46.52	46.52	46.52
Insurance	4.55	4.55	4.55	4.55	4.55	4.55	4.55
Rent rate & Taxes	4.80	4.80	4.80	4.80	4.80	4.80	4.80
Selling commission	8.55	8.78	8.86	8.70	8.70	8.61	8.61
Sellin & Distribution	50.89	51.39	51.43	50.76	50.76	50.45	50.45
Total Variable	4253.51	4377.95	4413.19	4328.91	4328.93	4286.86	4286.88
Fixed Expenditure							
Repair & Maintenance cost	60.66	60.49	60.47	60.47	60.47	60.47	60.47
Manpower Cost (Salaries & Wages)	233.49	233.49	233.49	233.49	233.49	233.49	233.49
Other Expenses (Gen. & Admin.)	49.44	49.44	49.44	49.44	49.44	49.44	49.44
Total Operating Expenses	4597.10	4721.37	4756.59	4672.31	4672.33	4630.26	4630.27
EBITDA	945.29	973.79	977.32	966.52	966.49	961.47	961.46

Particulars	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24
EBITDA Margin	17.06%	17.10%	17.04%	17.14%	17.14%	17.19%	17.19%

Source: MM Analysis

12.3.6 MM observation on Current Exposure

Post Restructuring the Company could not perform as projected in the approved Restructuring scheme. Apprehending inadequate liquidity availability for compliance of Restructuring loan repayment schedule the Company approached the lenders to consider Scheme for Sustainable Structuring of Stressed Assets (S4A). The Company proposes to realign its debt exposure under the "Scheme for Sustainable Structuring of Stressed Assets. Vide DBR No. BP.BC.103/21.04.132/2015-16 dated 13 June 2016, RBI issued the guidelines and prudential norms of S4A. The lenders agreed to review the proposal of the Company and appointed MM for the Techno-Economic Viability Study.

12.3.6.1 Debt Obligation

Total Debt obligation of the Company based on the financial statement as on 31st March 2017 is as mentioned in Table 235.

Table 235: Debt Obligation as on 31st March 2017

(Rs. Crore)		
Facility	Interest (%)	Outstanding as at March 31, 2017
Term loans (Secured)		
From Banks	11.75%	6,646.57
From others - Sugar Development Fund (SDF)	4.00%-8.25%	34.37
Total – Secured		6,680.94
Term loans (Unsecured)		
Loan from promoters		82.68
Department of Commercial Tax of Uttar Pradesh		0.83
Total – Unsecured		83.51
Grand Total		6,764.45
Working Capital		242.74
Total Debt Obligation		7,007.19

Source: BHSL

Total Debt obligation as on 23rd June 2017 as informed by the Company is as mentioned in Table 236

Table 236: Debt Obligation as on 23rd June 2017

Facility	Existing Debt	Disbursement in next 6 Months	Total Debt
Term loans	6,121		6,121
Working capital loan	218	1092	1310
Instalment for Q4 FY2017	281		281
SEFASU Loan	218		218
Interest for 2 months and 22 days	168		168
Total Fund Debt exposure	7,006	1,092	8,099

Source: BHSL

12.3.6.2 Capital Expenditure and Finance Charges

The Consultants understand that for the purpose of determining the cash flows available for debt servicing, the operating cash flows generated shall be reduced by the expected capital expenditure and the financial charges.

Committed Capital Expenditure

At the level of operations as envisaged in the business plan, the Company needs to invest in technology and equipment. The committed capital expenditure is estimated at Rs.15 crore during the period every year and the same shall be deducted while arriving at the cash flows available for debt servicing as detailed in Table 237. There is a mandatory capex requirement of about 90 crore to be utilised for compliance to CPCB norms as detailed in section 8.11. Besides regular capex of Rs.15 crore, the Company will incur onetime capex cost of about Rs.65 crore in FY 2017-18.

Table 237: Committed Capital Expenditure

	31-Mar-18	31-Mar-19	31-Mar-20	31-Mar-21	31-Mar-22	31-Mar-23	31-Mar-24
Capital Expenditure	80	15	15	15	15	15	15

Source: BHSL & MM

Finance Charges

The Banks levies charges for bank guarantees and other operational charges during the normal course of conducting business. The Consultant understand that bank charges at about 0.1% of the turnover based on historical averages shall be considered while arriving at the cash flows available for debt servicing.

12.3.6.3 Cash Flow from Operations (Base Case)

Quarterly free cash flows from operations are estimated to assess the debt servicing capability under S4A scheme derived by the financial consultant appointed by the Company. Free cash flows for Q3 and Q4 of FY 2016-17 have been incorporated based on the published financial statements. Free cash flow for Q1FY18 and Q2FY18 are arrived based on the data provided by the Company and MM projections. Information of Working capital changes for the four quarters have been as per fund utilization estimated by the Company.

Table 238: Cash Flow from Operations

Particulars	Actual Q3 FY 2017	Actual Q4 FY 2017	Projected Q1 FY 2018	Projected Q2 FY 2018	Total
Revenue from operations	691	1,567	1,578	1,589	5,425
Expenses					
Cost of Raw Material	1,653	2,331	197	4	4,186
Changes in Inventory	(1,282)	(1,431)	1,136	1,376	(201)
Employee Cost	58	76	50	50	234
Other Expenses	84	116	26	30	256

Particulars	Actual Q3 FY 2017	Actual Q4 FY 2017	Projected Q1 FY 2018	Projected Q2 FY 2018	Total
Total	513	1,092	1,410	1,460	4,475
Operating Profit	178	475	168	129	950
Adjustment for Working Capital	53	(92)	23	96	80
Decrease / (Increase) in Trade and other receivables	1	52	25	35	
Decrease / (Increase) in Inventories	(1,365)	(1,511)	1,208	1,463	
(Decrease) / Increase Trade and other payables	1,416	1,366	(1,211)	(1,402)	
Cash available from Operating Activity	231	382	191	225	1,029
Less: Bank charges	1	2	2	2	5
Gross Cash Available	230	381	190	223	1,024
CAPEX	4	4	4	4	15
Free Cash Flow	226	377	186	220	1009

Source: BHSL & MM

12.3.6.4 Splitting of Current Exposure

As per the financial consultant of BHSL after splitting of the current exposure, the sustainable and unsustainable debt would be as given in Table 239

Table 239: Breakup of Part A/ Part B

Facility Name	Total Debt	Sustainable Part A	Unsustainable Part B
Term loans	6,121	2999	3121
Working capital loan ⁸	1310	1310	-
Instalment for Q4 FY2017	281	-	281
SEFASU Loan	218	218	-
Interest for 2 months and 22 days	168	-	168
Interest for 6 months on Unsustainable Debt	200	-	200
Total	8299	4527	3771
%	100%	54.55%	45.45%

Source: BHSL

12.4 Sensitivity Analysis

This section examines the major risks associated with the Project. Based on the perceived major risks associated with the Project, the risk scenarios have been considered as under –

- Case-I: Increase in sugar cane price by 1.5%
- Case-II: Decrease in selling price of sugar by 1.4%
- Case-III: Decrease in production by 3.1%.
- Case IV: Decrease in sugar recovery rate by 0.14%
- Case V: Decrease in sugar recovery rate by 0.09% and sugar sales price to 3650

Table 240 lists various sensitivity cases, and the effect of each on the EBITDA, EBITDA Margin and Cash DSCR.

⁸ Sanctioned and undisbursed working capital limit

Table 240: Sensitivity Cases

Particulars	Base Case	Case I	Case II	Case III	Case IV	Case V
Average Revenue ⁹	5,633.22	5,633.22	5,565.47	5,478.11	5,572.63	5,568.11
Average Operating Expenses ¹⁰	4,668.60	4,725.31	4,668.60	4,544.60	4,667.49	4,667.89
Average EBITDA ¹¹	964.62	907.92	896.86	933.51	905.14	900.22
Average EBITDA Margin ¹²	17.12%	16.12%	16.12%	17.04%	16.24%	16.17%
Cash DSCR ¹³	1.24	1.18	1.16	1.18	1.17	1.16
Min Cash DSCR ¹⁴	1.10	1.01	1.00	1.00	1.01	1.00

Source: MM Analysis, BHSL

- The project is most sensitive to variation in selling price.
- MM observes that, based on the cash DSCR calculated by SBI Capital (refer Footnote 13), the Company would be able to maintain an average cash DSCR of above 1, even in the sensitivity scenarios considered above in Table 240

Minimum DSCR for different levels of unsustainable debt estimated by the Company is as illustrated below.

Table 241: Sensitivity Analysis – Unsustainable Debt

Sensitivity	Change	3400 Cr	3450 Cr ¹⁵	3500 Cr ¹⁶	3571.11 Cr ¹⁷
Base Case		1.05	1.06	1.07	1.10
Decrease in Sugar recovery rate	-0.14%	0.96	0.97	0.99	1.01
Decrease in Sugar Sales Price by	51.38	0.96	0.97	0.98	1.00
Decrease in capacity utilisation	-3.10%	0.96	0.97	0.98	1.00
Increase in Cane cost	3.2	0.96	0.98	0.99	1.01

Source: BHSL

12.5 Conclusion

- The Company proposes to realign its debt exposure under the “Scheme for Sustainable Structuring of Stressed Assets. Vide DBR No. BP.BC.103/21.04.132/2015-16 dated 13 June 2016, RBI issued the guidelines and prudential norms of S4A.
- The realignment of its debt obligations in line with its projected cash flows is expected to help the Company to tide over present liquidity constraints and ramp up the operations.
- The Company has recorded a sales turnover of about INR 2,258 Crore in Q3 and Q4 of FY 17, while the projected revenue in the Q1 and Q2 of FY 18 would be about INR 3,167 Crore, on account of improvement in the market, projecting free cash flow of around INR 406 Crore. The free cashflows estimated during these four quarters is estimated to be about INR 1,009 Crore.

⁹ FY 2017-18 to FY 2023-24

¹⁰ FY 2017-18 to FY 2023-24

¹¹ FY 2017-18 to FY 2023-24

¹² FY 2017-18 to FY 2023-24

¹³ DSCR has been calculated by the SBI Capital and only recorded by MM.

¹⁴ DSCR has been calculated by the SBI Capital and only recorded by MM.

¹⁵ excluding Interest on 6M Unsustainable Debt

¹⁶ excluding Interest on 6M Unsustainable Debt

¹⁷ excluding Interest on 6M Unsustainable Debt

- The total fund debt exposure as on 23rd June 2017 as informed by the BHSL is Rs.8099 crore (including expected disbursement of Working Capital). As per the proposed S4A plan by BHSL, 54.55% of debt exposure has been estimated as Sustainable debt (Part A) which should continue as per the existing repayment schedule and balance 45.45% to be converted into Unsustainable Debt (Part B).
- Based on our Techno Economic Viability Study in the “Base Case Scenario”, the Consultants understand that the Cash flows generated from operations after the committed capital expenditure and finance charges, are expected to be adequate for servicing the Sustainable debt (Part A - 54.55%), subject to the operational performance of the Company as per the assumptions/ descriptions mentioned herein this Report.

Appendices¹⁸

A.	Financial Statement	275
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¹⁸ Post EBITDA financials have been provided by the Company. The Consultants have only recorded the same.

A. Financial Statement

A.1 P&L Sheet

Table 242: P&L

(Rs. In Cr.)

Particulars	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24
Revenue							
Free Sugar	4729.9	4897.25	4944.34	4850.17	4850.17	4803.08	4803.08
Molasses	13.13	13.13	13.13	13.13	13.13	13.13	13.13
Bagasse	46.05	47.35	47.55	47.55	47.55	47.55	47.55
Press Mud & Others	15.51	15.51	15.51	15.51	15.51	15.51	15.51
Alcohol	580.94	565.04	556.49	555.59	555.59	555.59	555.59
Power	126.87	126.87	126.87	126.87	126.87	126.87	126.87
Other Revenue	30	30	30	30	30	30	30
Total	5542.39	5695.16	5733.9	5638.82	5638.82	5591.73	5591.73
Variable Expenditure							
Raw material consumed	4009.16	4009.16	4009.16	4009.16	4009.16	4009.16	4009.16
Transportation Cost	22.57	21.11	21.11	21.11	21.11	21.11	21.11
Change in Stock	47.67	173.14	208.31	124.86	124.88	83.21	83.23
Power & Fuel Cost	16.55	16.49	16.49	16.49	16.49	16.49	16.49
Stores Consumed	42.24	42	41.96	41.96	41.96	41.96	41.96
Packing Cost	46.52	46.52	46.52	46.52	46.52	46.52	46.52
Insurance	4.55	4.55	4.55	4.55	4.55	4.55	4.55
Rent rate & Taxes	4.8	4.8	4.8	4.8	4.8	4.8	4.8
Selling commission	8.55	8.78	8.86	8.7	8.7	8.61	8.61
Selling & Distribution	50.89	51.39	51.43	50.76	50.76	50.45	50.45

Particulars	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24
Total Variable	4253.51	4377.95	4413.19	4328.91	4328.93	4286.86	4286.88
Fixed Expenditure							
Repair & Maintenance cost	60.66	60.49	60.47	60.47	60.47	60.47	60.47
Manpower Cost (Salaries & Wages)	233.49	233.49	233.49	233.49	233.49	233.49	233.49
Other Expenses (Gen. & Admin.)	49.44	49.44	49.44	49.44	49.44	49.44	49.44
Total Operating Expenses	4597.1	4721.37	4756.59	4672.31	4672.33	4630.26	4630.27
EBITDA	945.29	973.79	977.32	966.52	966.49	961.47	961.46
Non Operating Income	175.63	175.63	66.56	12.94	12.94	12.94	12.94
Interest Income	145.62	145.62	56.55	2.93	2.93	2.93	2.93
REC Sale	20.00	20.00					
Other Income	10.01	10.01	10.01	10.01	10.01	10.01	10.01
Depreciation	211.94	209.84	210.33	210.82	211.31	211.79	212.28
EBIT	908.98	939.57	833.55	768.63	768.13	762.62	762.12
Net Interest	703.96	363.74	305.61	292.25	246.26	203.43	160.82
Term Loan & SEFASU Interest	264.74	274.45	214.99	163.14	115.48	70.77	26.07
Interest on Unsustainable Debt for 6 months	200.70						
Interest for Apr-June 22, 2017 (2 months 22 days)	174.84						
WC Interest	53.51	53.51	53.51	53.51	53.51	53.51	53.51
Interest subsidy on SEFASU Loan	-	-	-	-	-	-	-
Interest on Instruments (OCDs)	-	-	-	-	-	-	-
Interest on OCDs	0.25	24.66	24.66	61.66	61.66	61.66	61.66
Premium on redemption of OCDs	-	-	-	-	-	-	-
Interest on Promoters loan	9.92	11.11	12.45	13.94	15.61	17.48	19.58
PBT	205.03	575.83	527.93	476.39	521.86	559.19	601.30
Tax	70.96	199.28	182.71	164.87	180.61	193.52	208.10
Current tax	-	-	47.41	101.67	111.37	119.34	128.33
Deferred tax	70.96	199.28	135.29	63.20	69.23	74.18	79.77
PAT for the year	134.07	376.55	345.23	311.52	341.26	365.67	393.20

Source: BHSL

A.2 Cash Flow

Table 243: Cash Flow

(Rs. In Cr.)

Particulars	31-Mar-18	31-Mar-19	31-Mar-20	31-Mar-21	31-Mar-22	31-Mar-23	31-Mar-24
PBT before exceptional Items	205	576	528	476	522	559	601
Depreciation & Amortization	212	210	210	211	211	212	212
Less: Current Taxes paid	-	-	(47)	(102)	(111)	(119)	(128)
Cash Accruals	417	786	691	586	622	652	685
Unsustainable debt into paid up capital	88						
Unsustainable debt to Share Premium	1,217						
Issuance of Debentures	2,466						
Interest accrued but not paid	369						
Interest accrue on Promoter loans	10	11	12	14	16	17	20
Sale of Investments (as per JLF CAP)	-	-	-	770	-	-	-
Recovery from loans & advances (as per JLF CAP)	-	-	1,053	489	314	-	-
Increase in Bank borrowings	1,068	-	-	-	-	-	-
Realisation from Sale of Non-core assets (Aircraft)	32						
Total Inflow	5,667	797	1,757	1,858	951	669	705
Capital Expenditure	80	15	15	15	15	15	15
Increase/(decrease) in Current Assets	(300)	(172)	(208)	(126)	(125)	(84)	(83)
Interest accrue on L&A to group cos.	146	146	57	3	3	3	3
Decrease/(increase) in Current Liabilities & Prov	1,320	122	243	144	144	88	99
Repayment of TL	169	169	169	169	169	169	169
Repayment of WCTL 1	204	204	204	204	204	204	204
Repayment of WCTL 2	17	17	17	17	17	17	17
Repayment of TL3 (Fresh)	9	9	9	9	9	9	9
Repayment of FITL	35	58	58	51	-	-	-
Repayment of SEFASU	118	118	9	-	-	-	-
Repayment of SDF	17	9	7	2	-	-	-

Unsustainable debt - Equity (Incl. premium)	1,305						
Unsustainable debt - OCDs	2,466						
Total Outflow	5,586	696	581	488	436	422	434
Surplus/Deficit	81	101	1,176	1,370	515	247	271
Opening Cash Balance	40	121	222	1,398	2,768	3,283	3,530
Closing Cash Balance	121	222	1,398	2,768	3,283	3,530	3,802

Source: BHSL

A.3 Balance Sheet

Table 244: Balance Sheet

(Rs. In Cr.)

Particulars	31-Mar-18	31-Mar-19	31-Mar-20	31-Mar-21	31-Mar-22	31-Mar-23	31-Mar-24
ShareHolder's Fund	5,383	5,760	6,105	6,416	6,758	7,123	7,516
Equity Share Capital	199	199	199	199	199	199	199
Reserve & Surplus	5,184	5,561	5,906	6,218	6,559	6,925	7,318
- Security Premium	5,402	5,402	5,402	5,402	5,402	5,402	5,402
- Capital Redemption Reserve	0.05	0.05	0.05	0.05	0.05	0.05	0.05
- General Reserve	156	156	156	156	156	156	156
- Reserve for Molasses Tank Storage	3	3	3	3	3	3	3
-Gain / (loss) on Investment through FVOCI	(25)	(25)	(25)	(25)	(25)	(25)	(25)
-Actuarial gain / (loss)on employee benefit plans	(11)	(11)	(11)	(11)	(11)	(11)	(11)
-Equity component of compound financial instrument	136	136	136	136	136	136	136
- P&L	(476)	(100)	245	557	898	1,264	1,657
Loan Funds	2,802	2,229	1,767	1,329	945	563	183
Secured Loans	2,710	2,125	1,651	1,198	799	399	0.00
Unsecured Loans from Promoters	93	104	116	130	146	163	183
Debentures	2,466	2,466	2,466	2,466	2,466	2,466	2,466
DTL/(DTA)	724	923	1,059	1,122	1,191	1,265	1,345
Current Liabilities	1,830	1,708	1,465	1,322	1,178	1,090	991
Provisions	49	49	49	49	49	49	49

Particulars	31-Mar-18	31-Mar-19	31-Mar-20	31-Mar-21	31-Mar-22	31-Mar-23	31-Mar-24
Working Capital Borrowings	1,310	1,310	1,310	1,310	1,310	1,310	1,310
TOTAL LIABILITIES	14,565	14,446	14,222	14,014	13,897	13,867	13,861
ASSETS							
Gross Block	10,522	10,537	10,552	10,567	10,582	10,597	10,612
Less: Accumulated Depreciation	2,958	3,168	3,378	3,589	3,800	4,012	4,224
Net Block	7,564	7,369	7,174	6,978	6,782	6,585	6,388
CWIP	36	36	36	36	36	36	36
Total	7,600	7,405	7,210	7,014	6,818	6,621	6,424
Investments	1,108	1,108	1,108	338	338	338	338
Other Non-Current Financial Assets	5	5	5	5	5	5	5
Other Non-Current Assets	22	22	22	22	22	22	22
Total Current Assets (excl. Cash & Bank Balance)	5,667	5,641	4,437	3,825	3,389	3,308	3,228
Inventory	2,794	2,620	2,412	2,287	2,162	2,079	1,996
Receivables	81	83	83	82	82	81	81
Loans & Advances	1,856	1,856	802	314	-	-	-
Other Current Assets	770	770	770	770	770	770	770
Current Tax Assets (net)	22	22	22	22	22	22	22
Interest accrued for L&A	146	291	348	351	354	357	360
Cash and Cash Equivalents	121	222	1,398	2,768	3,283	3,530	3,802
Bank Balance (Earmarked for special purpose)	42	42	42	42	42	42	42
TOTAL ASSETS	14,565	14,446	14,222	14,014	13,897	13,867	13,861

Source: BHSL

