CHHATTISGARH STATE INDUSTRIAL DEVELOPMENT CORPORATION LIMITED [CSIDC], FIRST FLOOR, UDYOG BHAWAN,

RING ROAD NO.: 1, TELIBANDHA, RAIPUR [C.G.]

PROJECT REPORT ON

MAIZE PROCESSING PLANT AT

DISTT.: BALRAMPUR [C.G.]

MARCH – 2021

CITCON

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PREPARED BY

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PROJECT AT A GLANCE

1.0	**GENERAL DATA**		
1.1	Name of the Project	:	Maize Processing Plant (**MPP**) for Manufacture of Various Derivatives upto **Ethanol** at Village: Kanchan Nagar, Tehsil: Ramanujganj, Distt.: **Balrampur [C.G.]**
1.2	Location	:	On "Ambikapur-Balrampur-Ramanujganj" Road. On National Highway: **343**)
1.3	Nearest City/Town (s)	:	Ramanujganj (07 Km.), Balrampur (25 Km.),
1.4	Nearest Railway Stations	:	Ambikapur
1.5	Nearest Highway	:	Ambikapur – Gadhwa National Highway (**NH – 343**)
1.6	**CLIMATE**		
1.6.1	Maximum Temperature	:	40^0 C Max.
1.6.2	Minimum Temperature	:	9^0 C Min.
1.6.3	Average Rainfall	:	1250 mm.
1.6.4	Wind Direction & Velocity	:	South to West 14 Km. per Hour (Ave.)
1.7	**SITE CHARACTERISTICS**		
1.7.1	Area	:	**Total Area** (Required): **50 Acre**
1.7.2	Housing	:	Rural & Semi Urban Housing Available at nearby Villages
1.7.3	Land Shaping	:	Nearly Plane with a little Variation of Contours (Agriculture Land)
1.7.4	Type of Soil	:	Mix Soil
2.0	**LAND BEARING CAPACITY**		
2.1	Possibility of Flooding	:	Very Low
2.2	Standing Water	:	Nil

3.0 TRANSPORTATION & COMMUNICATION

3.1	Nearest Air Port	:	Bilasa Bai Kewat Airport, Chakarbhata, Bilaspur [C.G.] at 339 Km. from Site Swami Vivekanand International Airport, Mana, Raipur [C.G.] at 497 Km. from Site
3.2	Major Air Connections	:	Bilaspur – Delhi, Bilaspur – Prayagraj, Raipur- Delhi, Raipur- Mumbai, Raipur- Bhubaneswar- Nagpur, Raipur- Chennai, Raipur-Indore, Raipur-Kolkata-Ranchi, Raipur-Vizag
3.3	By Road		
3.3.1	Proximity to National Highway/State Highway	:	Connected to **NH- 343**
3.3.2	Road Width	:	18 Mtr. Wide
3.4	**By Rail**		
3.4.1	Nearest Railhead	:	Ambikapur on Raipur-Ambikapur Rail Line
3.5	**Local Transport**		
3.5.1	Type	:	Buses, Trucks, LCVs, Taxis, Auto Rickshaws & Cycle Rickshaws
3.5.2	Frequency	:	Very Good
3.6	**Communication**		
3.6.1	Telephone Exchange	:	Ramanujganj [C.G.]
3.6.2	Post & Telegraph	:	Ramanujganj [C.G.]
3.6.3	Internet Facility	:	At Site

4.0 TECHNICAL INFRASTRUCTURE

4.1 POWER

4.1.1	Source	:	**CSPDCL** Sub-Station (33/11 KVA) at Ramanujganj, Distt.: Balrampur [C.G.]
4.1.2	Power Cuts	:	No Power Cut

4.2	**WATER**		
4.2.1	Source	:	Ground Water & Surface Water from Nearest Nalah through Intake Well. Construction of Stop Dam / Anicut*, if need be*.
4.2.2	Maximum Quantity of Water required	:	**1800 KLD** *i.e.* **1.80 MLD**
4.2.3	Water Quality	:	Soft
5.0	**WASTE - DISPOSAL**		
5.1	Centralized Effluent	:	Proposed within Plant Premise
5.2	Water Treatment	:	Treatment Facility Proposed
5.3	Degree of Pre-treatment	:	As per **MoEF** Standards
5.4	Waste Water Drainage System	:	Proposed
6.0	**SOCIAL INFRASTRUCTURE**		
6.1	**LABOUR**		
6.1.1	Un-Skilled Labour	:	Available at nearby Villages
6.1.2	Skilled Labour	:	Available at Ramanujganj
6.1.3	Approximate Wage Rate	:	Rs. 250/person/day (Minimum)
6.1.4	Training Facilities	:	ITI & Polytechnic at Ramanujganj and Polytechnic & Engineering Colleges at Ambikapur
7.0	**HOUSING**		
7.1	Availability for Workmen	:	At Ramanujganj & Kanchan Nagar
7.2	Availability for Officers	:	At Ramanujganj & Balrampur
7.3	Own Housing Complex	:	Proposed (Staff Quarters)
8.0	**EDUCATION**		
8.1	Primary School	:	At Ramanujganj
8.2	Higher Secondary School	:	At Ramanujganj
8.3	Colleges	:	At Ramanujganj & Balrampur
8.4	Technical Institution	:	At Ramanujganj, Balrampur & Ambikapur
8.5	Languages Used	:	Hindi & Chhattisgarhi
9.0	**MEDICAL**		
9.1	District Hospital	:	At Balrampur
9.2	Primary Health Centre	:	At Ramanujganj

10.0 POLICE STATION : At Ramanujganj

11.0 AVAILABILITY OF FUEL:

11.1 Petrol & Diesel : At Ramanujganj

12.0 BANKS

12.1 At Ramanujganj, Balrampur and Ambikapur

13. HOTELS : At Ramanujganj & Balrampur

14. Estimated Cost of Project :

(Amount Rs. in Cr.)

S. No	Particulars	Cost
1.	Cost of Land	10.00
2.	Site Development	5.00
3.	Building & Allied Civil Works	32.00
4.	Plant & Machinery and Allied Equipments	110.00
5.	Electrical Installations and Electrification	15.00
6.	Miscellaneous Fixed Asset	4.00
7.	Preliminary & Pre-Operative Expense	7.80
8.	Deposits with CSPDCL & Others	2.50
9.	Contingencies	1.66
10.	Margin money for Working Capital (on First Year Basis)	12.05
	Total	**200.00**

15. Means of Finance :

(Amount Rs. in Cr.)

S. No	Particulars	Amount
1.	**Equity**	
a.	Promoters' Contribution	**45.00**
b.	Unsecured Loan/Quasi Equity	**10.00**
c.	Subsidy	**5.00**
	Total Equity	***60.00***
2.	**Debt**	
a.	Term Loan from Bank(s)	***140.00***
	Total	**200.00**

16. Debt Equity Ratio **(DER) : 2.33: 1**

17. Installed Capacity : **400 Ton per Day (TPD)**
[Based on **Maize** Processing {**Compatible** for Additional Processing of **50 TPD Waste Grains** for Production of **Ethanol**}]

18. No. of Shifts & Working Days : Triple Shift, 330 Days/Annum

19. Capacity Utilization :

I Yr	II Yr	III Yr	IV Yr	V Yr	VI Yr	VII Yr	VIII Yr
60%	70%	80%	90%	90%	90%	90%	90%

20. Effective Output–Starch : 264 TPD
{Starch Content **66%** (At 100% Capacity Utilization)}

21. Bifurcation of Starch

- ✓ For **Ethanol** : **204 TPD**
- ✓ For **Starch** : **60 TPD**

22. Product Mix

- **Ethanol** : **150** Kilo Liter per Day **(KLPD)**
- Distillers Dried Grain with Solubles (**DDGS**) : 75 TPD
- Starch : 60 TPD
- Germs : 7 TPD
- Gluten : 6 TPD
- Fiber : 22 TPD

23. Sales Price (**Per KL** or **Per Ton**)

- Ethanol (Per KL) : Rs. 57,610.00
- DDGS : Rs. 16,500.00
- Starch : Rs. 25,000.00
- Germs : Rs. 46,000.00
- Gluten : Rs. 42,000.00
- Fiber : Rs. 15,000.00

24. Annual Sales Realization
(at 100% Capacity Utilization) : **Rs. 405.34 Cr.**

25. Cost of Raw Material

- ✓ Maize : Rs. 13,000.00 per Ton
- ✓ Waste Grains : Rs. 13,000.00 per Ton

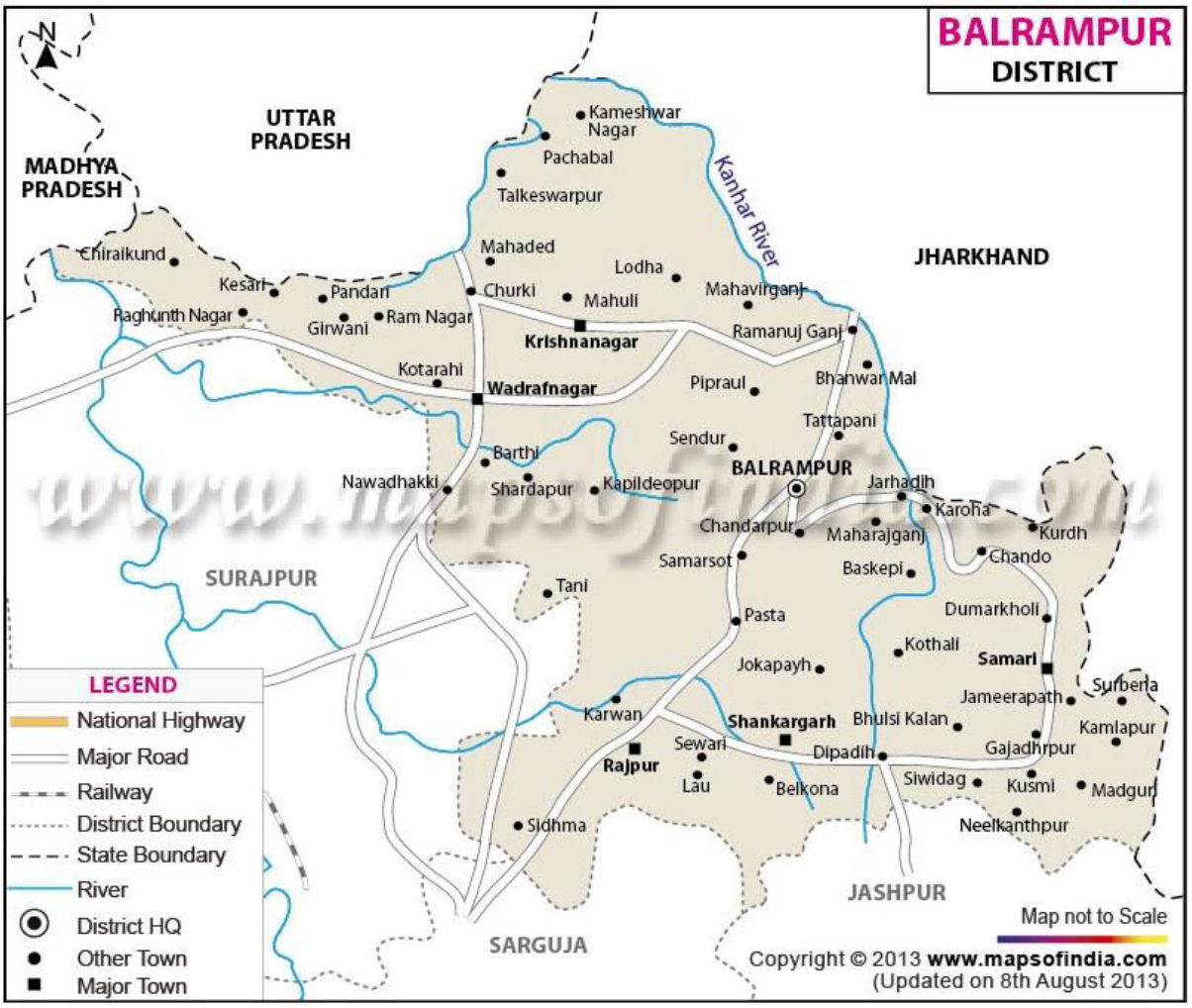
26. Annual Raw Material Cost :
{at 100% Capacity Utilization} : **Rs. 193.05 Cr.**

27. Annual Packing Cost :
{at 100% Capacity Utilization} : **Rs. 2.00 Cr.**

28.	**Maize Requirement**	:	
	{at 100% Capacity Utilization}	:	**1,32,000 Ton per Annum (TPA)**
29.	**Maize Production**	:	
	{*In State* (Year**: 2019**)}	:	**2,98,370 Ton**
30.	**Maize Production**	:	
	(*Estimated* Year**: 2020**)	:	**3,18,190 Ton**
31.	Man Power	:	977
	✓ Administrative Staff	:	152
	✓ Production Staff	:	825

	Total		**977**

32.	Power Requirement	:	**4150 KW**
33.	Water Requirement	:	
	➢ For Starch Production	:	**10 KL** per **Ton** of **Starch**
	➢ For Ethanol Production	:	**8 KL** per **1 KL** of **Ethanol**
34.	Debt Service Coverage Ratio	:	**2.10:1**
35.	Break Even Point **(BEP)** (During 3rd Year of Operation)	:	**39.58%**
36.	Internal Rate of Return **(IRR)**	:	**19.92%**
37.	Implementation Period	:	**20** Months (*w.e.f.* First Disbursement of Term Loan)


BALRAMPUR
DISTRICT
N
UTTAR PRADESH
MADHYA PRADESH
JHARKHAND
SURAJPUR
SARGUJA
JASHPUR
Kanhar River
Kameshwar Nagar
Pachabal
Talkeswarpur
Chiraikund
Kesari
Pandari
Mahaded
Churki
Lodha
Mahuli
Mahavirganj
Raghunth Nagar
Girwani
Ram Nagar
Krishnanagar
Ramanuj Ganj
Kotarahi
Wadrafnagar
Pipraul
Bhanwar Mal
Tattapani
Sendur
Barthi
BALRAMPUR
Nawadhakki
Shardapur
Kapildeopur
Jarhadih
Karoha
Chandarpur
Maharajganj
Kurdh
Samarsot
Chando
Baskepi
Tani
Pasta
Dumarkholi
Kothali
Samarl
Jokapayh
Jameerapath
Surbera
Karwan
Shankargarh
Bhulsi Kalan
Kamlapur
Sewari
Dipadih
Gajadhrpur
Rajpur
Lau
Belkona
Siwidag
Kusmi
Madgurl
Sidhma
Neelkanthpur
Map not to Scale
LEGEND
National Highway
Major Road
Railway
District Boundary
State Boundary
River
District HQ
Other Town
Major Town
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(Updated on 8th August 2013)

CHAPTER - I
INTRODUCTION

1.1 The State Scenario

1.1.1 Chhattisgarh State is full of Natural endowment throughout its length and breadth. It is widely known as a rich Land with Vast Potential, Rich Mineral, thick Forests, abundant Live Stock and massive Agricultural possibilities of development. The significant Industrial Growth during the last decade has given it a recognition of the "Most Happening State" of the Country. Though the concentration of Small, Medium and Large Scale Industries exists only in Raipur, Bilaspur, Raigarh, Champa-Janjgir, Korba and Durg Districts of the State but the other Districts, *too;* have their presence in the Industrial Map of the State. Some of the most important factors of the backwardness of a few Districts mainly constitute lack of Awareness, unbalanced Industrial Growth in the region, inadequate Infrastructure at Urban Level, underdeveloped Infrastructure at Rural Level and unorganized Urban-Rural Industry Network.

1.1.2 Built-up of adequate Infrastructure facilities is an essential perquisite to sustain and support all kinds of developmental efforts in the State. With a view to attain its prestigious Programme of rapid Industrialization, which would automatically generate opportunities for Employment & Self-employment in the State; the Infrastructural Development of Chhattisgarh has become the top Priority of the State Government.

1.1.3 If compared with the National Scenario *w.r.t.* all the indicators of the Infrastructural Development like Per Capita Power Consumption, Net Irrigated Area, Availability of Postal, Telecommunication and Banking Facilities *etc*., the *erstwhile* Chhattisgarh Region, as a part of erstwhile undivided Madhya Pradesh; had fared very poorly in the past. **The situation has dynamically changed now after the carving of the New State.**

1.1.4 The work of development of the Infrastructure for Industries is being organized by an Infrastructure Development Organization in Chhattisgarh State, which is known in the name and style of the Chhattisgarh State Industrial Development Corporation Limited [**CSIDC**], First Floor, Udyog Bhawan, Ring Road No.: 1, Telibandha, Raipur [C.G.], hereinafter referred as **CSIDC**. The Corporation has already developed number of Integrated Infrastructure Development Centers (IIDCs), Industrial Parks, Large Industrial Area, Sector Specific / Product Specific Industrial Areas, Mega Food Park, Food Park, Industrial Growth Centers and Industrial Estates in the State.

1.2 Government Initiatives

1.2.1 The initial strong wave for promotion of Medium and Large Scale High Capital Intensive Industries in the State has created loads of opportunities for all the allied Sectors. The Core Sector Industries *i.e.* Cement & Steel, have shown a remarkable upward trend in last decade and a half. The Technological Advancement in the field of Iron & Steel making, the possibilities of establishment of economically viable Sponge Iron Plants of Lower Capacities with the involvement of very low Capital Investment Cost, as compared to the similar Plants of last decade.

1.2.2 The nearing saturation in the Core Sector has prompted the State Government to diversify. Thus, the Second Largest Resource of the State, *following Mineral Deposits*; the Agriculture & Non-Timber Forest Produce (**NTFP**); drew attention of the Policy Makers. With a view to do away with the ever Polluting & nearing Saturation Core Sector, the optimum utilization of the Agriculture & NTFP become the Top Priority of the State Government. Thus, Food Processing Industries, Agro-Based Industries and the NTFP Processing Industries have now been categorized under the "Top Priority Sector" in the Industry Policy 2019-2024, *in vogue*.

1.2.3 As far as the "Food Processing Industries" was concerned, the Sector, *in past*; had *predominantly* been confined to Paddy Processing for decades. The Rice Mill {a *misnomer* (should be "Paddy Mill)}, Oil Mill, Solvent Extraction Plant, Animal/Poultry Feed Manufacturing Plants *etc*. were established for obvious reasons of Huge Paddy Production in State. Needles to mention that Chhattisgarh is known as "Rice Bowl" since ages. However, the preference of Paddy Cultivation & *inturn* Processing lead to the neglect for other Agriculture Produce. Later on, the establishment of first "Sugar Mill" at Ramhepur, Distt.: Kabirdham [C.G.] tilted the focus of the Stakeholders towards other Agriculture Produce, *as well*.

1.2.4 The situation of **NTFP**, also known as (*aka*) Minor Forest Produce (**MFP**), {another *misnomer* (its the major Source of Livelihood for Forest Dwellers and Source of Manufacture of large number of Products belonging to Food, Medicine, Cosmetics, Aromatics, Healthcare, Dyes, Colours & Pigments, Textile, Packaging Sector *etc*.)}; had been even more disheartening.

1.2.5 In view of afore-mentioned indicators, a strong need of diversion of focus, *of one & all*; towards "Food Processing, Agro Processing & NTFP Processing" became the need of the hour. This has prominently been reflected in the Industry Policy, *in vogue*.

1.2.6 The favourable Policy and the series of Incentives for "Food Processing, Agro Processing & NTFP Processing Sector" have attracted Investors & Entrepreneurs. Besides the interest shown by the local investors, the investors from other States are also keen to take advantage of healthy Investment Climate, Low Labour Cost, better Power Supply condition and Availability of Technical Manpower in Chhattisgarh State, by setting up their Enterprise.

1.2.7 The State Government has now initiated the Process of Identification of Specific Resource/Product(s) falling under the category of "Food Processing, Agro Processing & NTFP Processing Sector" for development of such Industries. Maize happens to be one of Sources which has now become the most preferred Agriculture Produce for processing. The Cultivation of Maize in Large Area in few selected Districts and Scattered Coverage in other Districts, *as well*; has caused the Production of more than **3.00 Lakh Ton** of Maize during Agriculture Season: 2019. However, the Maize Processing Capacities within the State are *far below* when compared with the Maize Production. This imbalance deprive off the Cultivators from the deserving Value Addition.

1.2.8 The State Government, with an developmental & prudent objective of augmentation of "Maize Processing Facilities"; has identified Three Locations in the State, namely – (1) **Kondagaon**, (2) Vill.: Aundhi, Tehsil: Patan, Distt.: **Durg** and (3) **Balrampur;** for establishment of "Maize Processing Plant (**MPP**)" for the manufacture of various Derivatives upto **Ethanol**. The State Government envisages to propagate the Concept Plan by way of Investors' Meet, Identification of Prospective Entrepreneurs and Hand Holding Support to the Investors, who intend to establish the **MPP** at the identified Locations.

1.3 Proposed Project

1.3.1 For the sake of implementation of the conceived Concept Plan of propagation of Maize Processing the State Government considered it appropriate to obtain the Project Reports on **MPP** for Manufacture of various Derivatives upto **Ethanol**. Such Project Report (**PR**) would serve as a Lead Document for assessment of Availability of Raw Material, Evaluation of Market Potential, Estimation of Cost of Project and Assessment of Profitability. The **PR** might prove to be "Road Map" for the prospective Investor.

1.3.2 Accordingly, **CSIDC** has assigned the job of preparation of the Project Report (**PR**) for the afore-mentioned three **MPP** proposed at (1) Kondagaon, (2) Durg and (3) Balrampur to Chhattisgarh Industrial & Technical Consultancy Centre **[CITCON]**, Raipur [C.G.].

1.3.3 This **PR** has been prepared for the **MPP** proposed at Vill.: Kanchan Nagar, Tehsil: Ramanujganj, Distt.: Balrampur [C.G.]. Village Kanchan Nagar is located on "Ambikapur–Balrampur-Ramanujganj" Road, which is a National Highway (**NH: 343**). It is about 7 Km. from Tehsil Head Quarters-Ramanujganj, about 25 Km. from District Head Quarters-Balrampur [C.G.].

1.3.4 The selected location is ideal for the proposed **MPP** as it is on National Highway. It would be worthwhile to mention that the proposed **MPP** at Kanchan Nagar would be the first Mega Project in Ramanujganj Tehsil of Balrampur District.

1.4 Effect of Establishment of MPP on Development

1.4.1 The Proposed **MPP** at Village Kanchan Nagar would become a major tool for development of the Area. The Consumption of Maize {about 1.30 Lakh Ton per Annum (**TPA**)} shall pass on the benefits to the Grass Root Level. The **MPP** would *Pave the Path* towards "Crop Diversity" from Paddy to Maize.

1.4.2 Opportunities for number Auxiliary & Ancillary Industries/Enterprises would be created.

1.4.3 The proposed **MPP** shall be able to generate direct employment to around **1000** persons, besides indirect employment may be of 2500 persons or more in the local area within a time frame of 2 years.

1.4.4 The proposed **MPP** would become a Lucrative Source of Livelihood for more than 5000 Farmers of the Area, who are Maize Cultivators at present or would be Maize Cultivators of future.

1.5 The Project Report

1.5.1 **CITCON** has prepared this **PR** on the basis of the information and data made available to it by **CSIDC** and also by collecting/developing desired information. The collected Data has been analyzed and the inferences have been drawn and discussed in the ensuing Chapters/Annexure of this **PR.** The **Technical Feasibility** & the **Economic Viability** of the Project has also been evaluated. The **PR** encompasses the Techno-Economic Feasibility Report (**TEFR**), *as well*.

1.5.2 **DPR** has been prepared by Officials of CITCON to the best of their knowledge & abilities, however; **CITCON** does not hold the responsibility of any Loss at present or in future, of whatsoever nature, to any Individual(s)/Institution(s) on arriving at any decision based on this **DPR.**

1.5.3 **CITCON** expresses its gratitude towards **CSIDC** for entrusting the assignment of preparation of **PR**.

CHAPTER- II
TECHNICAL FEASIBILITY

2.1 The Maize Processing Line for Starch Production:

2.1.1 Maize Processing Line consists of Several Processes to produce **Starch** and **Ethanol**. The Product –**Ethanol** is a world wide accepted "Fuel Additive", whereas **Maize Starch** is used for its Gelling or Thickening properties in many Sectors of Agro-Food Applications (Soups, Delicatessen Meats, Sauces, Pastas, Creams). It is also used in Pastry, Cream, Desserts, Coating *etc*. It is sometimes preferred over Flour alone as because it forms a Translucent Mixture rather than an opaque one.

2.1.2 Starch is a group of Polysaccharides, composed of Glucopyranose units joined together by - Glycosidic linkages. It conforms to the Molecular Formula $-C_6H_{10}O_5n$, where "n" varies from a few hundred to over one million. Starch is found as the reserve Carbohydrate in various parts of Plants and is enzymatically broken down to Glucose to other Carbohydrates according to the metabolic needs of the Plants.

2.1.3 Starch occurs naturally in the Plants and its percentage varies with Plant-to-Plant and in different parts of the same Plant, *as well*. Corn (Maize), Sorghum Grain, Wheat, Rice, Potato, Tapioca, Arrow Root and Sago are among the natural Starches.

2.1.4 The Grains of Barley, Oat and the Millets are also employed in the Production of Starch. Maize {Corn} contains about 70% Starch, other components being Protein, Fibers and Fat. As the Starch content of Maize is so high, it is widely used in the production of Starch across the Globe.

2.1.5 Liquid **Glucose** is a solution of Glucose suspended in liquid and sold in Jars or Tubes. Many companies manufacture Glucose in Powdered Form for the ease of transportation. Liquid Glucose, also known as Corn Syrup; is used in preparation of Bakery Products, Canned Juices, Canned Fruits, Frozen Desserts, Confectionery Products, Soft Drinks, Wine, Jellies, Jams *etc*. Maize Starch forms viscous, relatively short and opaque paste with Cereal Flavor. Its paste sets to stiff gels.

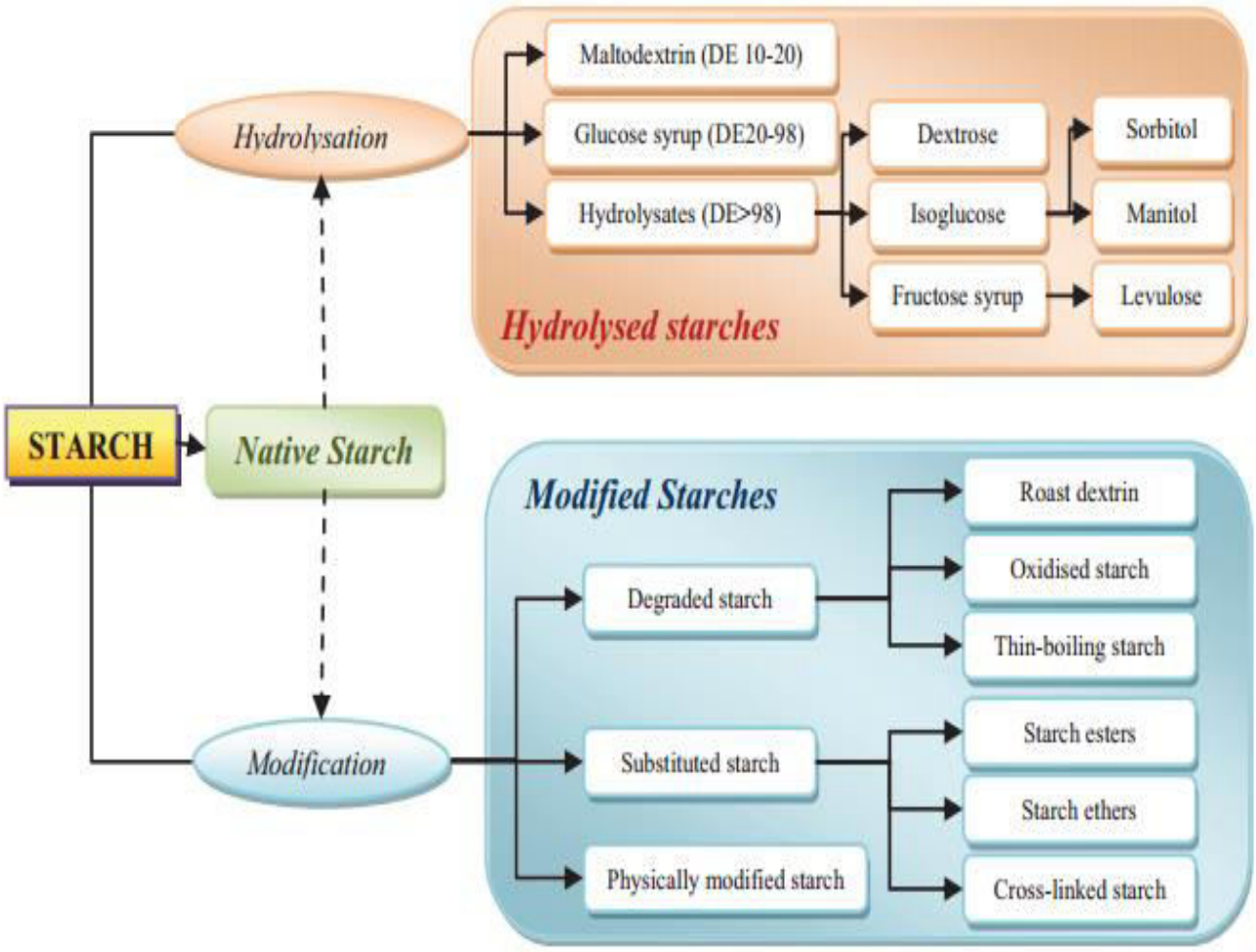
2.1.6 Starch has widespread applications and is used by people at large directly or indirectly in various forms. The main consumers of Starch are Industries, which use it in their Products and ultimately Starch reaches Indian population in various forms. Some of the prominent uses of Starch are illustrated in Table: 2.1 below:

TABLE: 2.1

S. No.	Particulars	Uses
1.	Paper Industry	As a Surface Sizing Agent, Binder, Paper Coating Agent
2.	Textile Industry	As a Sizing Agent to strengthen the Warp Yarn, in finishing and changing the appearance of Fabric after it is Bleached, Dyed or Printed, in Printing and increase the consistency of Printing Pastes
3.	Baking Industry	For the production of Cakes, Cookies, Ice-cream
4.	Health Care Industry	Used in Medical, Pharmaceutical, Cosmetics
5.	Chemical Industry	For Production of Corn Oil from Germs, Tobacco & Fermentation Industries.
6.	Food Industry	As Thickening Sauces, Gravies, Puddings and Pie filling, in Baby Foods, Chewing Gum, Chocolate Drink *etc*.
7.	Animal Feed Industry	As Feed Ingredient for Cattle/Poultry/Fish Feed


Cosmetics
Beverages
Sirups & Desserts
Confectionery
Bakery Products
Spray Concrete
Starch Products
Puddings
Ceramics & Constructions
Gravy & Creams
Paper & Glue
Medicines Pharmaceuticals
Weaving & Textiles
Colours, Printing
Instant Meals

Classification of Starch and Starch Derivatives



THE USES OF THE BY-PRODUCTS OF MPP

TABLE: 2.2

By- Products	Uses
Germs	As Corn Oil expelled from Germs being used in Food and other Chemical Industries
Gluten	As Rich Feed Ingredient for Cattle/Poultry/Fish Feed
Fibre	As Coarse Cattle/Poultry/Fish Feed

2.1.7 As has been mentioned in the preceding Sections of this **PR** the proposed **MPP** has been envisaged to manufacture Ethanol and Corn Starch from Maize. The By- Products of the Manufacturing Process are Distillers Dried Grains with Solubles (**DDGS**), Germs, Gluten and Fiber. The Starch obtained from the identified Process is known as Unmodified Starch and it is further processed with deferent Chemicals to manufacture Liquid Glucose and Malto Dextrin.

2.1.8 **Liquid Glucose** is an Aqueous Solution of Nutritive Saccharide obtained by Starch Hydrolysis, by using Corn (Maize) and Rice as Raw Material, which is purified and concentrated to obtain required Solids.

2.1.9 The Milling Process of Maize for manufacture of **Starch** is illustrated in the ensuing paragraphs.

2.1.9.1 Corn Receiving & Cleaning

The Corn is transported to the units in Trucks in Gunny Bags and offloaded in the receiving Areas or Silos. The Grain is fed to the Belt Conveyor, which takes the Maize Grains to Cleaning Section. The Grain contains various impurities like Cobs, Stone, Metal Parts, Dust, Other Foreign Matters *etc*. These unwanted (gangue) Materials are removed in Cleaning Section. The Grain is passed over Perforated Metal Sheets, Air Blowers, and Electromagnets to remove the impurities.

2.1.9.2 Steeping Vat

- Vat Tanks receives Feed from the Cleaning Section with Hot Water at 52^0 C.

- ❖ 70 Hrs. time is required for Fermentation Process.
- ❖ Steeping Mixture contains Sulphur Dioxide [SO_2]@0.2% concentration in Hot Water.
- ❖ The Steeping conditions the Grains for later steps by softening of the Maize Kernels and loosens the Bonds between Germs, Fiber & Starch.

2.1.9.3 Grinding

- ➢ The Grinders are made up of Stainless Steel. The Grinding Process is completed in 2 Stages. In the First Stage, the Steeped Maize Grains are ground coarsely to loosen the Husk and Germ.
- ➢ The Second Stage Grinding, known as Fine Grinding, helps in detaching the Germ from the Grain.

2.1.9.4 Germ Separation

Due to grinding process Germs separate from Maize. Germ Cyclones are used to separate the Germ from the Gluten and Starch. The Pasty Mix obtained after fine grinding is pumped to Water filled Setting Tanks, known as Germ Separators or Germ Cyclone. The light density overflow Germ is skimmed off. Then it is forwarded to Germ Press. Finally, it goes to Germ Dryer.

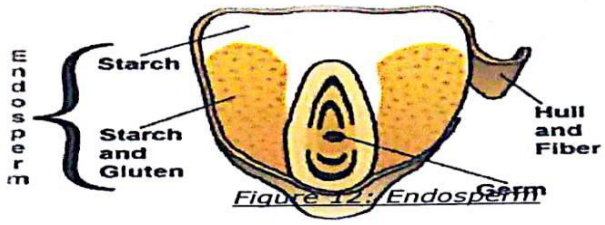


Figure 12.: Endosperm

2.1.9.5 Fiber Washing Section

The Slurry of Husk, Starch & Gluten is ground for better recovery of Slurry. The Fiber Washing is a Six Stage Process, which is carried on by DSM Box. The Husk is separated from the Soluble Starch and Gluten Slurry by a Counter Flow System. The Husk is sent to *either* Drying Section *or* used as Animal Feed in Wet Form. The Husk is mainly Carbohydrate, which also contains 8% Protein. The Under Flow contains Starch and Gluten.

2.1.9.6 Thickener

The Slurry of Starch and Protein is passed through a Centrifugal Concentrator to get the Concentrated Slurry. This Machine is also called as Milk Stream Thickener.

2.1.9.7 Primary Starch Thickener

The Thickened Slurry is passed through a High Speed Centrifuge to separate the Heavier Starch from the Light Protein (Gluten).

2.1.9.8 Hydro Clone System

The Starch Slurry received from Primary Separation is passed through a Multi Stage Hydro Cyclone System. This is used to separate the Starch & Gluten from the Slurry. A nozzle system is used and no nozzle provide in a disc called battery. Slurry is forced through it and the resultant Over Flow is Gluten and Starch is found in Under Flow. Centrifugal Pumps are used for pushing Feed from one end and from just opposite direction Water is fed by Centrifugal Pump.

2.1.9.9 Gluten Thickener

The Protein Slurry is sent to the Dryer. Two types of Dryer mainly used:

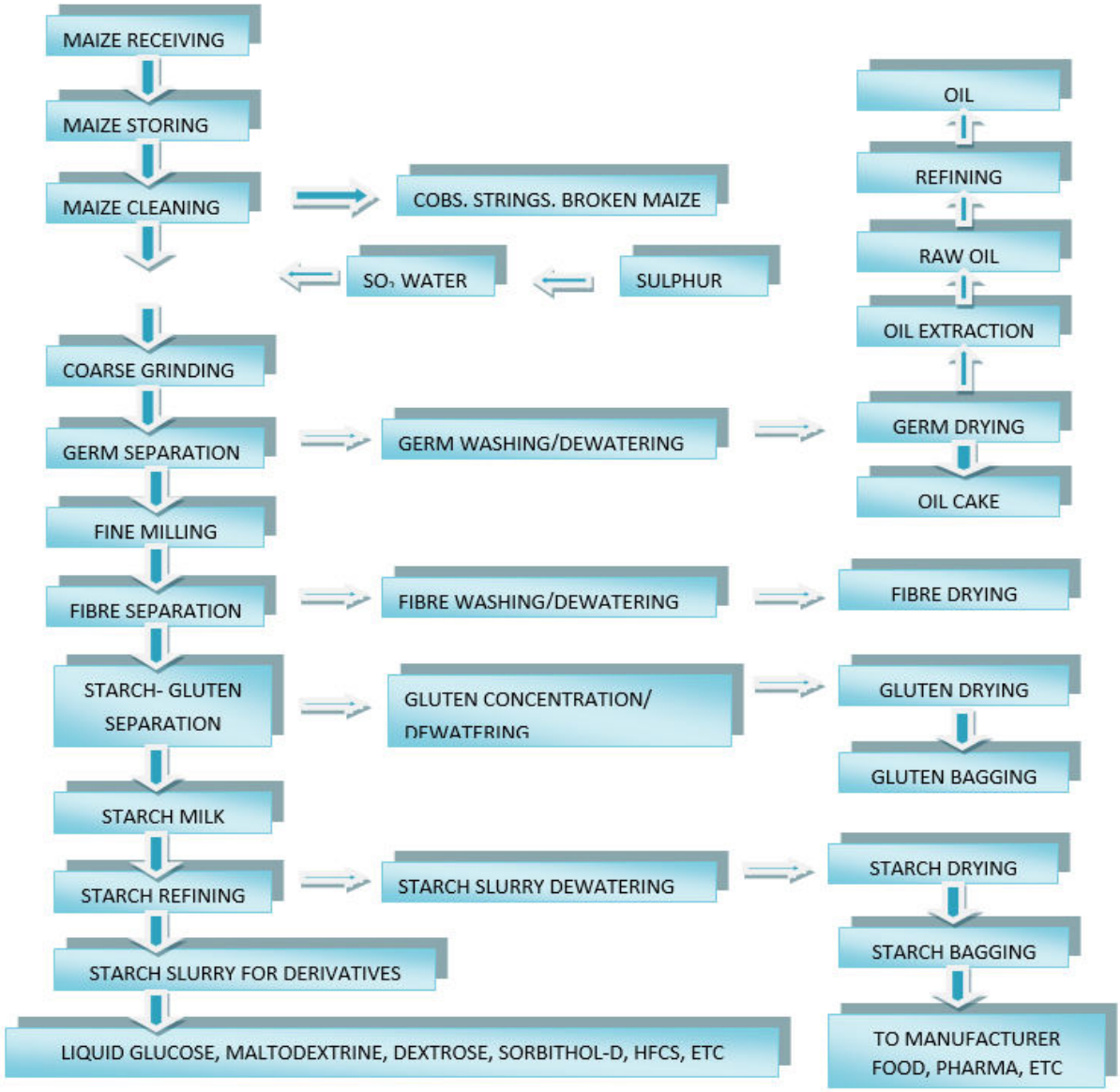
1. Spin Flash Dryer (Commonly Used)
2. Spray Dryer

2.1.9.10 The concentrated Starch Slurry is then dried by Hot Air Application (17^0 C) to 11%-12% Moisture Content Level. The main Product of Slurry is Starch and four major Co-products are for the Feed Industry namely the Steep Water, Fiber, Germ and Gluten. The average recovery of various products and Co-products of Maize during the Wet Milling are:

TABLE: 2.3

S. No.	Product	Recovery Percentage
1	Starch	62%-66 %
2	Gluten	8%-9 %
3	Germ	6%-7%
4	Husk	18%-24%

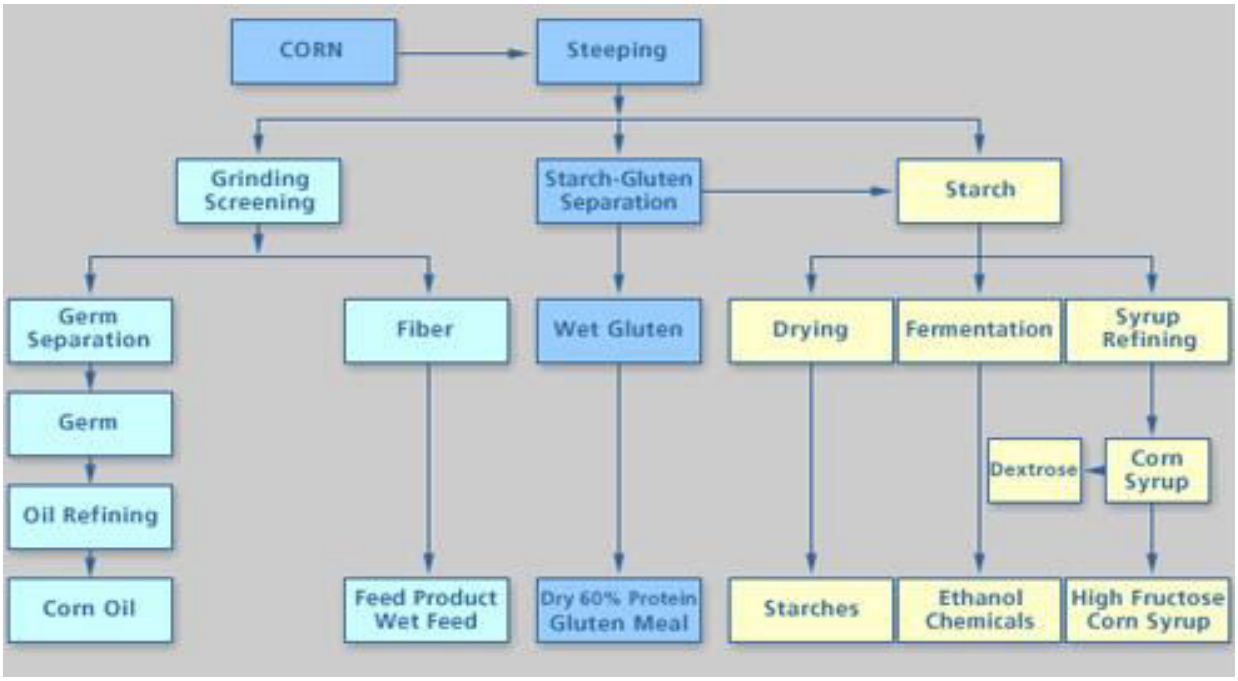
THE Process Flow Chart of Maize Processing



2.2 The Maize Processing Line for Ethanol Production:

2.2.1 The Process of manufacturing Ethanol from Maize {Corn} is a multistep Process. The first step is Milling of Maize. It can be done by Dry Milling or Wet Milling. The Illustrations below show the Process Steps for each Wet and Dry Milling. For Wet Milling, the Corn Kernels are broken down into Starch, Fiber, Corn Germ, and Protein by heating in the Sulfurous Acid Solution for 2 days. The Starch is separated, which can produce Ethanol, Corn Syrup, or Food-Grade Starch. The Wet Milling Process also produces By-Products *e.g.* Corn Oil, Gluten Meal and Gluten Feed. Dry Milling is a simpler Process than Wet Milling, but it is has limitations as far as the Products are concerned. The main products of Dry Milling Process are Ethanol, CO_2, and Dried Distiller Grain with Solubles (**DDGS**). The Four major Steps of Maize Processing are – (1) Grinding, (2) Cooking and Liquefaction, (3) Fermentation, and (4) Distillation. The Steps are discussed in the ensuing paragraphs.

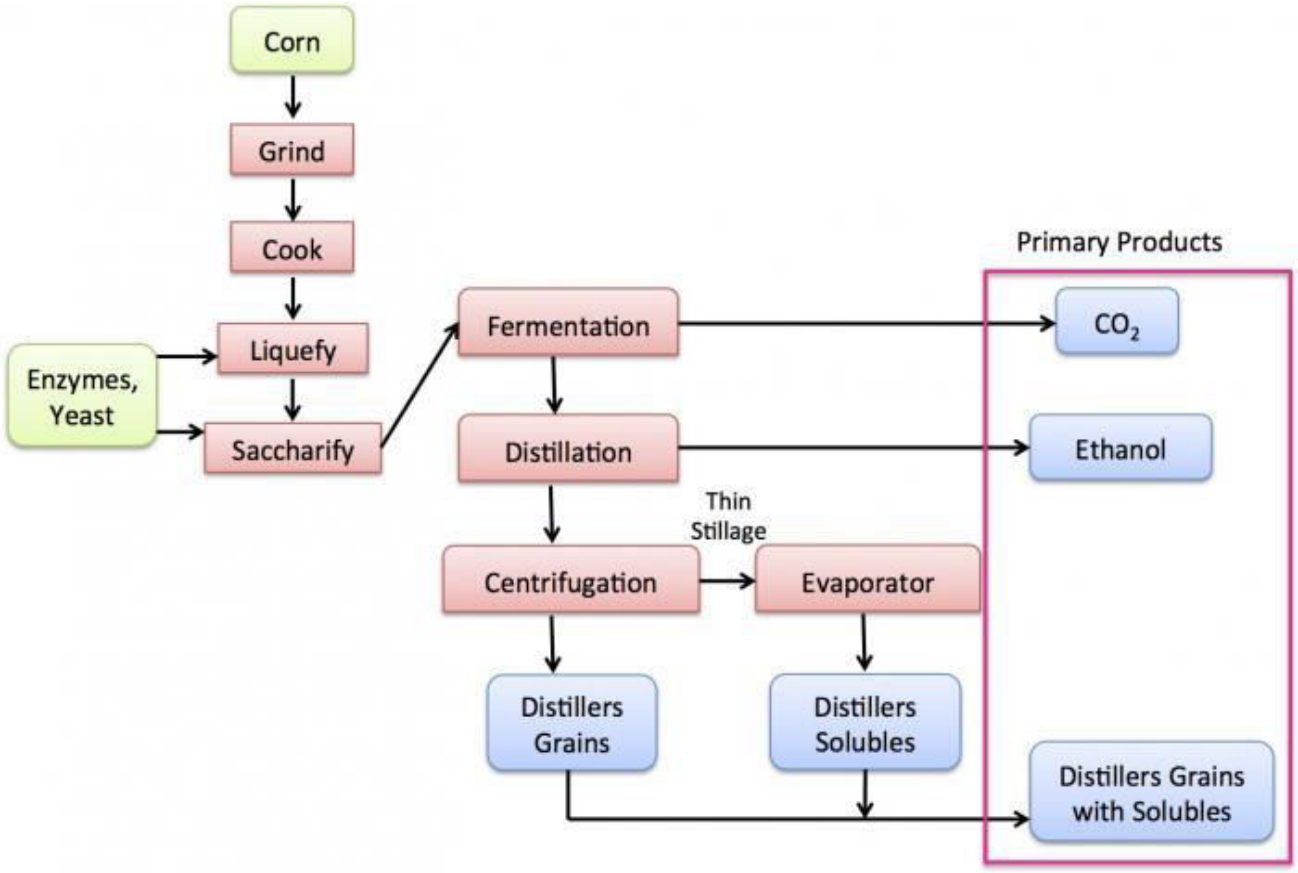
Process Flow Chart for Ethanol Production (Wet Milling)



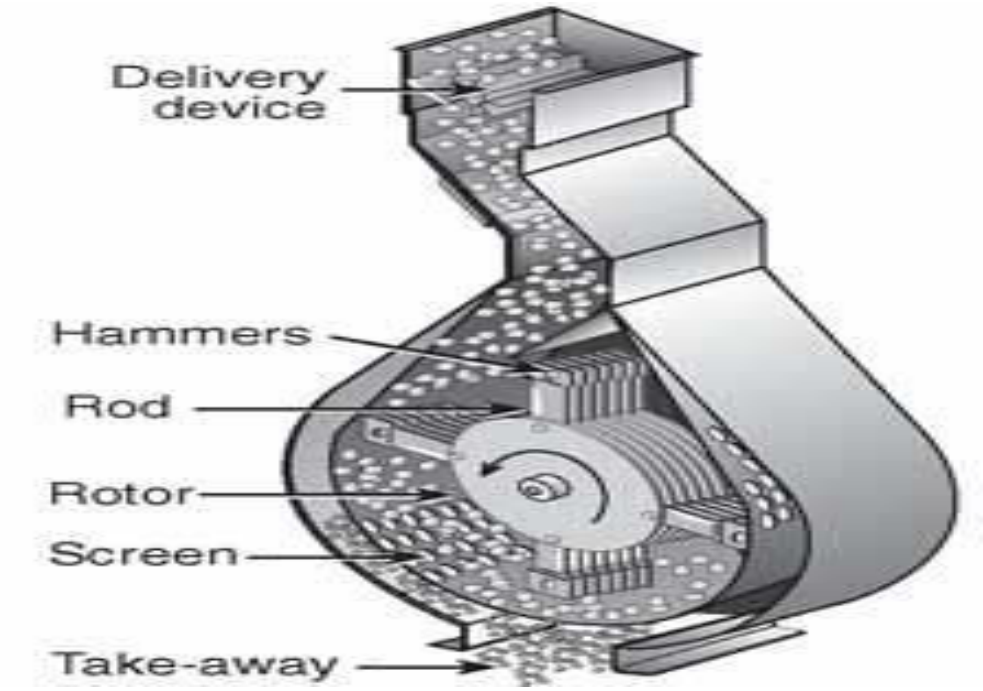
2.2.2 Grinding

A Hammer Mill or Roller Mill is used for Dry Grinding of corn. to do the grinding. The Hammers are attached to Rods that turn on a Rotor. As the Rotor turns, the Feed {corn in this case} is hammered against the wall. A Screen at the bottom allows particles that are small enough to leave the unit and keep in the larger particles to continue to be hammered until all the material is in the correct size range. The Grinding helps to break the tough outer Coatings of the Corn Kernel, which will increase the Surface Area of the Starch. Once the Corn is broken down, it is mixed and converted into **Slurry** with Heated Water.

Process Flow Chart for Ethanol Production (Dry Milling)



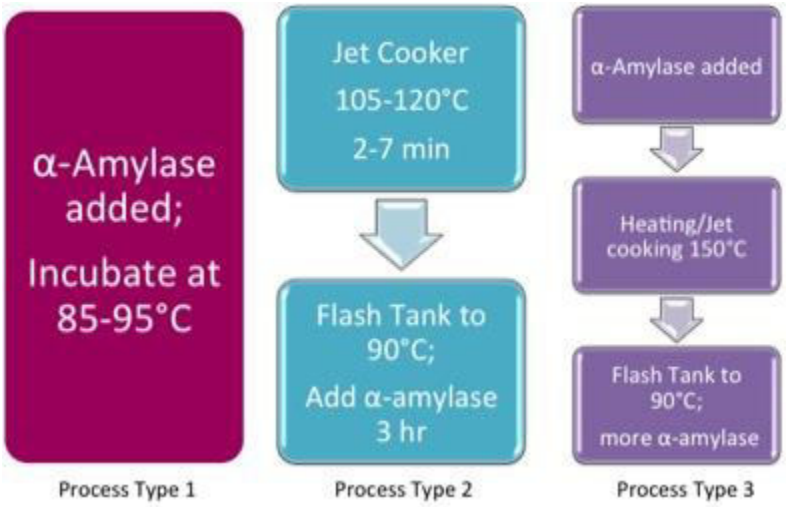
Cross Section of a Hammer Mill



2.2.3 Cooking and Liquefaction

2.2.3.1 Once the Corn Slurry (Mash) is ready, it goes through Cooking and Liquefaction. The cooking stage is also called **Gelatinization**. Water interacts with the Starch Granules in the Corn when the Temperature is >60° C and forms a Viscous Suspension. It will thicken with heat.

2.2.3.2 The Liquefaction step is actually partial Hydrolysis that lowers the Viscosity. It is essential for breaking up of the longer Starch chains into smaller chains. One way to measure this is to look at Dextrose Equivalents (DE), or a measure of the amount of reducing Sugars present in a Sugar product, relative to Glucose, expressed as a percentage on a dry basis. Dextrose is also known as Glucose, and Dextrose equivalent is the number of bonds cleaved compared to the original number of bonds. In order to accomplish Liquefaction, the reaction must take place under certain conditions. The pH of the Slurry is to be maintained in the range of 5.9-6.2, and Ammonia & Sulfuric Acid are added to the tank to maintain the pH. About one-third of the required type of Enzyme, α-amylase, can be added to the Slurry before Jet Cooking (2-7 minutes at 105^0 C-120° C) to improve the flowability of the Slurry. The Jet Cooking serves as a Sterilization step to avoid Bacterial Contamination during the Fermentation step later on. Three types of processes can be utilized for liquefaction as illustrated below. Process 1 is where the α-amylase is added and the material is incubated at 85^0 C -95° C. Process 2 has the Slurry in the Jet Cooker at 105^0 C-120º C for 2-7 minutes, then flows to a Flash Tank at 90° C. α-Amylase is added three hours later. The third option, Process 3, adds the α-amylase, the heats in the Jet Cooker at 150° C, followed by flow to the Flash Tank at 90° C and adding more α-amylase



2.2.3.3 The α-amylase for Liquefaction acts on the internal α (1,4) Glycosidic Bonds to yield Dextrin and Maltose (Glucose Dimmers). A type of α-amylase exists in the saliva of humans; a different α-amylase is utilized by the pancreas. The α-amylase works a little faster than the β-amylase, and the β-amylase works on the second α (1,4) Glycosidic Bond so that Maltose is formed. β-amylase is part of the Ripening Process of Fruit increasing the Sweetness of Fruit as it Ripens.

2.2.4 Fermentation

2.2.4.1 The Final Chemical step in the process of manufacturing of Ethanol from Maize is Fermentation. The Chemical reaction of Fermentation is where 1 Mole of Glucose yields 2 Moles of Ethanol and 2 Moles of Carbon Dioxide.

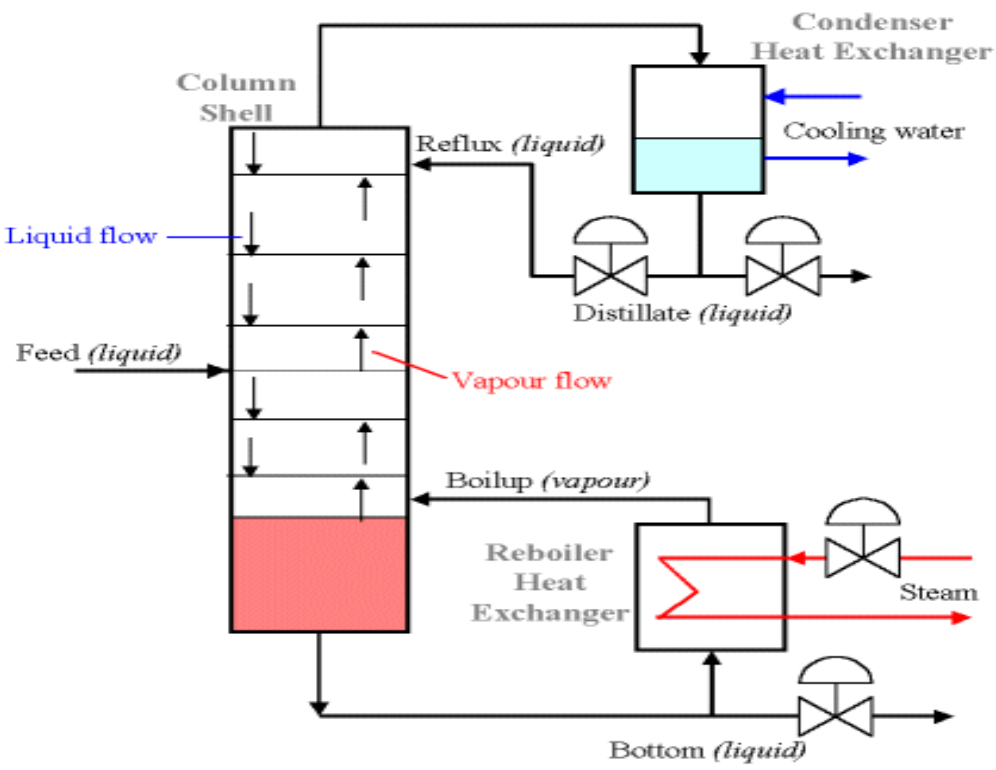
2.2.4.2 To cause fermentation to take place, yeast is added. A common yeast to use is *Saccharomyces Cerevisiae*, which is a Unicellular Fungus. The reaction takes place at 30^0 C-32° C for 2-3 days in a batch process. Supplemental Nitrogen is added as Ammonium Sulfate $\{(NH_4)_2SO_4\}$ or Urea. A protease can be used to convert Proteins to Amino Acids to add as an additional Yeast Nutrient. Virginiamycin and Penicillin are often used to prevent Bacterial Contamination. The Carbon Dioxide produced also lowers pH, which can reduce the contamination risk. Close to 90% to 95% of the Glucose is converted to Ethanol.

2.2.4.3 It is possible to do Saccharification and Fermentation in one step. It is called Simultaneous Saccharification and Fermentation (**SSF**), and both Glucoamylase and Yeast are added together. It is done at a lower temperature than Saccharification (32^0 C -35° C), which slows the Hydrolysis into Glucose. As Glucose is formed, it is fermented, which reduces Enzyme Product Inhibition. It lowers initial Glucose concentrations, lowers contamination risk, lowers energy requirements, and produces higher yields of Ethanol. Because SSF is done in one unit, it can improve Capital Costs and save residence time.

2.2.5 Distillation and Increase of Ethanol Concentration

The last phase of Ethanol Production is the processing of Ethanol to increase the Ethanol Concentration. Downstream from the Fermenters, the Ethanol concentration is 12% to 15% Ethanol in Water (which means it has e 85% to 88% water in the Solution!). **Distillation** is a process to separate components using heat and specially designed towers to keep the liquid flowing downward and the vapors being generated to flow upwards. Water boils at 100° C, while Ethanol boils at 78° C. However, because Water and Ethanol evaporate at a lower Temperature than their Boiling Points, and because they both have OH functional groups that are attracted to each other, Ethanol and Water Molecules are strongly bound to each other and form an Azeotrope together. That just means that complete separation of Ethanol from Water can not be achieved. The Ethanol fraction will contain about 5% Water and 95% Ethanol at the end of the Distillation Process.

Distillation Unit for Increasing Concentration of Ethanol

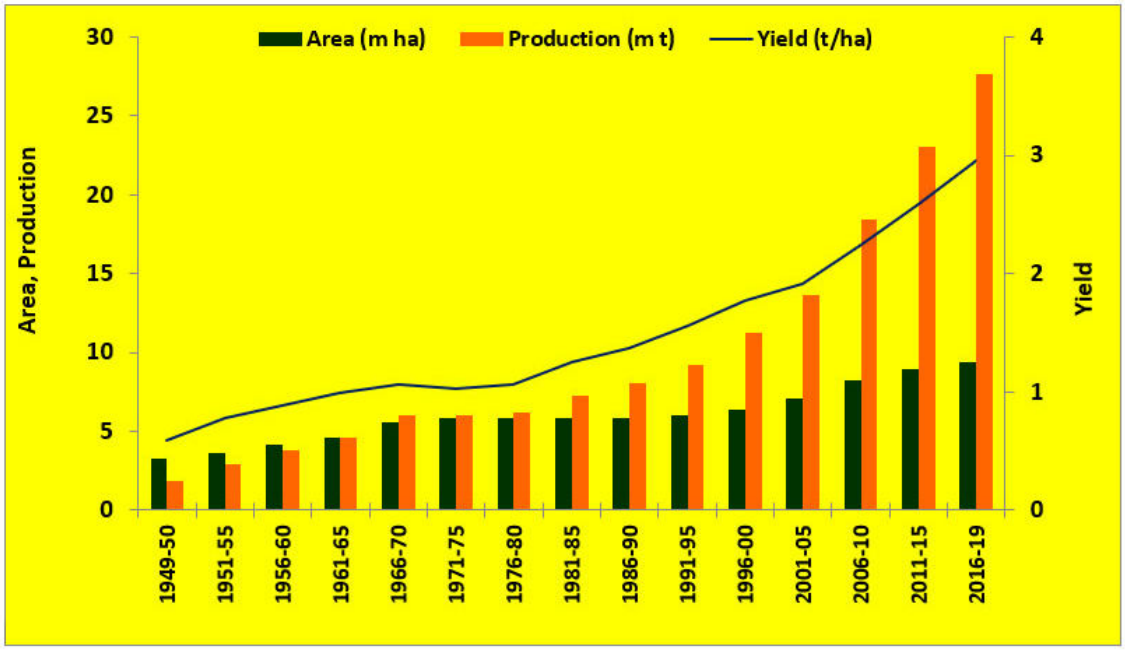


2.3 Market Potential for Starch

2.3.1 Global cereal demand in 2020 is estimated at 2.1 Billion MT and will, for the first time, show a major shift in favor of Maize with demand estimated at 852 million MT compared with 760 million MT for Wheat and 503 million MT for Rice. Thus, global demand for Maize in 2020 has increased by 45% (compared with 30% for Wheat and 32% for Rice). This reflects a substantial growth of 72% for Maize in Developing Countries, and 18% growth in Industrial Countries. This 72% increase in demand for Maize in developing countries compares with only 44% for Wheat and 33% for Rice.

TABLE: 2.4

	MAIZE			WHEAT			RICE*		
	1997 Demand	2020 Demand	Change (%)	1997 Demand	2020 Demand	Change (%)	1997 Demand	2020 Demand	Change (%)
Global	586	852	266 (45)	585	760	175 (30)	381	503	122 (32)
Industrial Countries	291	344	53 (18)	245	268	23 (9)	17	19	2 (9)
Developing Countries	295	508	213 (72)	341	492	152 (44)	364	484	120 (33)



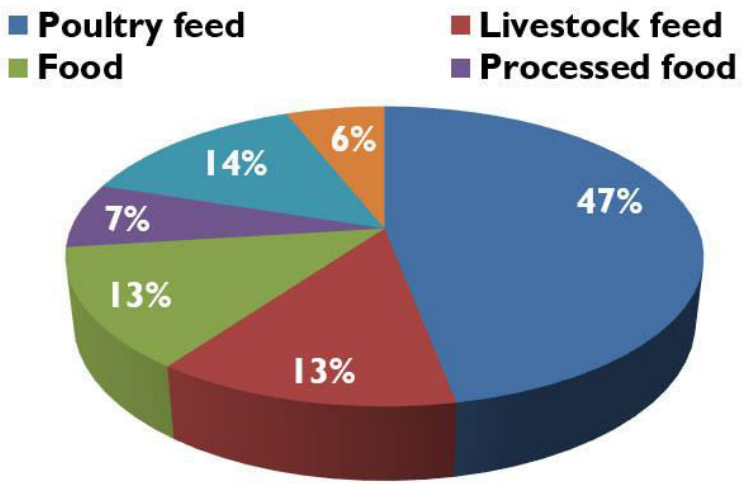
2.3.2 Among the Maize growing countries India rank 4th in Area and 7th in Production, representing around 4% of World Maize Area and 2% of total Production. During 2018-19 in India, the Maize Area has reached to 9.2 Million Ha (DACNET, 2020). During 1950-51 India used to produce **1.73 Million MT** Maize, which has increased to **27.8 Million MT** by 2018-19, recording close to 16 times increase in Production. The average productivity during the period has increased by 5.42 times from 547 Kg/Ha to 2965 Kg/Ha, while Area increased nearly by three times. Though the productivity in India is almost half of world the average per day productivity of Indian Maize is at par with many lead Maize producing Countries.

2.3.3 In India, Maize is grown in both the seasons - Kharif & Rabi. Kharif Maize represents around 83% of Maize Area in India, while Rabi Maize corresponds to 17% Maize Area. Over 70% of Kharif Maize Area is grown under Rain fed condition with prevalence of many Biotic and Abiotic Stresses. The Stress Prone Ecology contributes towards lower productivity of Kharif Maize (2706 Kg/Ha) as compared to Rabi Maize (4436 Kg/Ha), which is predominantly grown under assured Ecosystem.

2.3.4 In recent past Spring Maize Area is also growing quite fast in North Western Parts of the Country, in the States of Punjab, Haryana and Western Uttar Pradesh. Unfortunately, the Area and Production data of Spring Maize is not well documented. However, informal estimate suggest the Area to be around 150 Thousand Ha. Among Cereals Maize has highest growth rate in terms of Area and Productivity. Since 2010 Maize Productivity in India is increasing @ over 50 Kg/Ha/Year, which is the highest among all Crops.

2.3.5 Among Indian states Madhya Pradesh and Karnataka has highest Area under Maize (15% each) followed by Maharashtra (10%), Rajasthan (9%), Uttar Pradesh (8%) and others. After Karnataka and Madhya Pradesh, Bihar is the highest Maize Producer. Andhra Pradesh is having highest State Productivity. Some districts like Krishna, West Godavari *etc*. record as high as 12 Ton/Ha productivity.

2.3.6 Bulk of the Maize Production in India, approximately 47%, is used as Poultry Feed. Of the rest of the produce, 13% is used as Livestock Feed and Food Purpose each, 12% for Industrial Purposes, 14% in Starch Industry, 7% as Processed Food and 6% for Export and other Purposes.



2.4 Consumers of Starch

2.4.1 Since Maize processing Industry in India is blessed with the availability of a huge ready market base the end products manufactured by the proposed **MPP** enjoy an assured market in Chhattisgarh, adjoining States like Orissa, Maharashtra, Madhya Pradesh, Jharkhand, *etc*. and far off States, *as well*. Starch has widespread applications and is used by every Indian directly or indirectly. The target market of **MPP** would constitute the industries that can be classified into Food and Non-food Processing. Few of these industries could be as under:

2.4.2 Food Processing Industries

- Bakery & Pastry Products
- Soups & Sources
- Ice creams, Yoghurts, Lactic drinks, Puddings
- Processed Meat
- Sweets, chocolates, Candies, chewing gums
- Marmalades, jams
- Canned Fruits, Juices
- Soft drinks, beers
- Snack Foods
- Taste enhancers, Color enhancers
- Fat substitutes for dietary products
- Alternative protein sources
- Sweeteners

2.4.3 Non-Food Sectors

- Paper, Cardboard and Plywood- Carton, High quality papers, different Plywood
- Textile Industry Fillers, Stiffeners
- Leather Goods
- Chemical & Pharmaceutical Industries
- Glues, Paints & Cements
- Soaps, Detergents, Bleaches & Insecticides
- Explosives
- Oil drilling Materials

- ❖ Bio-degradable Plastics, Polyesters, etc
- ❖ Industrial Alcohols
- ❖ Combustibles, Ethanol, Oils
- ❖ Pharmaceuticals, Vitamin C & B-12, Antibiotics
- ❖ Water Treatment Agents
- ❖ Feed Industry Protein Substitutes and Carbohydrates

2.4.4 The Key Clientele of **MPP** includes the likes of Hindustan Unilever Ltd., Colgate Palmolive Ltd., Lotte India Ltd., Nutrine Confectionary Ltd., ITC Ltd., Kisan Foods Ltd., Nestle India Ltd., Heinz India Ltd., Griffon Labs Ltd., Britannia India Ltd., Godrej Agrovet Ltd., Kamani Oil Mills., Bombay Dyeing Ltd., Pepsico India Pvt. Ltd., MTR Foods Ltd., *etc*.

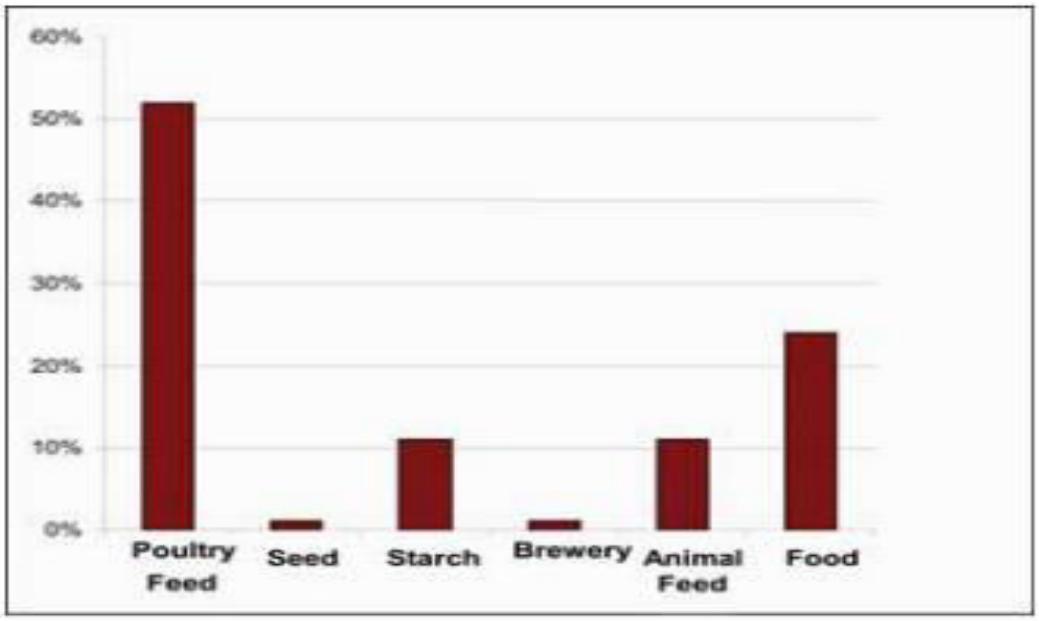
A Few Renowned Buyers for Starch

2.5 Market Potential for Ethanol

2.5.1 **Corn Ethanol** is Ethanol produced from Corn (Maize) Biomass and is the main source of Ethanol Fuel. Corn Ethanol is produced by Ethanol Fermentation and Distillation. With Technological Developments in the recent past, Ethanol has been effectively used as an additive with Petrol as a Fuel.

2.5.2 Energy is the vital need of mankind and it is the priceless gift offered by the nature. Apart from Food, we need lots of Energy in various forms in our *day-to-day* life. At present, most of our Energy requirements are fulfilled by Non-Renewable Sources. The most extensively used non-renewable energy sources are the Fossil Fuels. Due to the unsustainable use of World's Energy Stores we had been encountered with numerous issues in the past and are fast approaching towards a similar crisis. The Gasoline shortage of 1970's or the panic of Fuel-Price after Hurricane Katrina should be taken as wake-up calls so that we could remind ourselves from time-to-time regarding our ever depleting Energy Reserves. Its known fact that Energy can *neither* be created *nor* it can be destroyed, it can only be converted from one form to the other. As need is the mother of discovery, the foreseeing Energy crisis has induced interest in the Synthesis of Bio-Fuel. The global consumption of the Liquid Petroleum would increase tremendously in coming years. It is estimated that if the present trend continues, the Energy demand is projected to grow by more than 50% by 2025 (Ragauskas, 2006). Most importantly, Unlimited Demand for Limited Petroleum Resources can not be a satisfactory option for a long time. Therefore, the transition from the Non-Renewable Carbon Source to Renewable Bio-Resources, is the *need of the hour*. Maize to Ethanol concept would be a "Road Map" in this regard.

Maize Utilization Pattern in India



2.5.3 Global Scenario

Brazil is the second largest producer of Ethanol globally after U.S. While U.S. produces Ethanol from Corn, Brazil manufactures Ethanol from Sugarcane. Brazil has mandatory Blending Ratio of Ethanol in Gasoline ranging from 18% to 25%. The Blend Rate was as high as 25% before September' 2011 and was reduced to 20% due to drop in Sugarcane output hence affecting the Ethanol Production. Currently, Flex-Fuel Cars, which can use *either* Ethanol or Blended Gasoline, in Brazil; account for about 53% of the total Car Fleet and around 90% of the new Vehicles' sales. The proportion of the Flex-Fuel Cars are expected to cross 80% by 2020. Currently, the Brazilian Light Vehicle Fleet has been increasing by 6.7% Year-on-Year (*Y-o-Y)* since 2003 with currently 90% of the New Vehicles being Flex-Fuel Cars. Thus, there exists an increasing demand in Brazil for Ethanol which is encouraging for the Ethanol Producers.

2.5.4 Indian Scenario

India has 330 Distilleries, which produce over 4 Billion Liters of Rectified Spirit (Alcohol) a year. Of the total Distilleries, about 120 Distilleries have the capacity to distillate 1.8 Billion liters (an additional annual Ethanol production capacity of 365 million Liters was built up in the last three years) of conventional Ethanol per year which is far from the estimated requirement for 7% to 8% Ethanol Blending with Petrol.

2.5.5 Total Ethanol production has increased from 1,435 Million Liters in 2009-10 to 1,934 Million Liters in 2010-11 on account of higher Sugarcane & Maize production. The increasing trends continued in the succeeding decade, *as well*.

2.5.6 Government Policy

In 2006, GoI mandated 5% Ethanol Blending with Petrol (EBP) programme to reduce the Petrol Consumption. However, the programme could not take off despite the fact that the Cabinet Committee on Economic Affairs (**CCEA**) in November 2009 directed that a financial penalty be imposed on Oil Marketing Companies (**OMCs**) for their failure to reach targets.

2.5.7 In November 2012, the CCEA has made it mandatory for OMCs namely - Bharat Petroleum, Hindustan Petroleum and Indian Oil Corporation to blend 5% Ethanol with Petrol. This is likely to reduce the Fuel Import Bill and lower India's dependence on Fossil Fuel as the Ethanol Prices are lower than that of Petrol. OMCs have been blending Ethanol with Petrol for the past couple of years but the policy was partially implemented in absence of any clear directive. The Committee, headed by the Prime Minister, has also approved market-based pricing of the Bio-Fuel, opening the market for Ethanol producers. This shall result in an increased demand for Ethanol by OMCs.

2.5.8 The National Bio-Fuel Policy has plans for a 10% Ethanol Blending programme to reduce India's dependence on Fossil Fuel Imports.

2.6 Maize Cultivation in Chhattisgarh

2.6.1 Earlier Maize was mainly cultivated in Surguja and Bastar Division of Chhattisgarh but now it is emerging as main Cash Crop in entire Chhattisgarh State. The Area and Production have shown steady increasing trends. There had been an increase of 20% in Maize Crop Acreage in Chhattisgarh during the past 10 years. Framers are willing to buy the Hybrid Seed for cultivation from the market. Now they are taking Maize as green cob and also utilizing the green parts as Fodder. Maize threshers have been purchased by some Farmers in the region, which is an indicative of large Maize Production. With the advent of Industrial Utilization of the Maize in Chhattisgarh Farmers would be getting assured Buyers for their Produce. Below table illustrates the Production Data of Maize in Chhattisgarh.

Table: 2.5

Maize Production In Chhattisgarh				
District	Production in Thousand MT			Projected
	2017	2018	2019	2020
Jashpur	13.75	11.67	11.67	11.67
Sarguja	19.51	19.96	20.42	20.89
Surajpur	24.59	25.14	25.7	26.28
Balrampur	61.58	63.42	65.31	64.27
Raipur	1.07	1.86	3.23	5.62
Dhamtari	8.54	6.72	6.72	6.72
Durg	1.03	1.59	2.45	3.79
Balod	0.55	0.69	0.87	1.09
Bemetara	0.05	0.22	0.97	4.26
Rajnandgaon	14.91	13.56	13.56	13.56
Jagdalpur	33.52	36.13	38.94	41.98
Kondagaon	54.17	57.59	61.23	65.09
Narayanpur	3.51	2.83	2.83	2.83
Kanker	34.98	39.44	44.47	50.14
Total	**271.76**	**280.82**	**298.37**	**318.19**

2.6.2 The Cultivation and Production of Maize in the State had been analyzed during the process of Conceptualization of establishment of **MPP** in the State. The analysis revealed that the State could be classified in three Clusters, *w.r.t.* Maize Cultivation and Production. The Epicenters of these three Clusters are - (1) Kondagaon, (2) Durg and (3) Balrampur. Thus, three Districts have been identified for the proposed Locations for **MPP**. The below illustrations shows the Maize Clusters of the State.

2.6.3 The Maize Production in Balrampur Cluster is illustrated in the Table: 2.6 below:

Table: 2.6

Balrampur				
District	Production in Thousand MT			Projected
	2017	2018	2019	2020
Jashpur	13.75	11.67	11.67	11.67
Sarguja	19.51	19.96	20.42	20.89
Surajpur	24.59	25.14	25.7	26.28
Balrampur	61.58	63.42	65.31	64.27
Total	**119.43**	**120.19**	**123.1**	**126.11**

2.6.4 Although the total Maize Production in the identified Cluster *in and around* Durg [C.G.] is about 1.23 Lakh Ton but the overall Production in the State is nearing **3.00 Lakh Ton**. Moreover, it is an Universal Fact that the "Cultivation is Directly Proportionate to the Processing". It is proven fact that the Industrial Consumption of an Agro Produce immediately motivates the Farmers for "Crop Diversification" and opt for the Cultivation of the needed Agro Product.

2.6.5 Apart from the available Maize within the State the Prospective Investors/Entrepreneurs, who intend to establish the **MPP** at one or more of the three Locations; shall have to initiate the process of "Backward Integration" of their proposed Venture(s) by way of commencement of Farmers' Aware Drive for Maize Cultivation *in & around* their Plant Location(s). The assurance of Industrial Utilization of their produce and the receipts of Minimum Support Price (**MSP**) would certainly motivate the Farmers to opt for Crop Diversification and start the Maize Cultivation.

2.7 Capacity Utilization

2.7.1 As has been stated earlier, the Installed Capacity of the proposed **MPP** has been envisaged at **400 TPD** of Maize Processing with the compatibility for Additional Processing of **50 TPD** of Waste Grains for Ethanol Production. The Products and the Estimated Output are shown in Table: 2.7 below:

Table: 2.7

S. No.	Product/By-Product	Installed Capacity
1.	Ethanol	**150** Kilo Liter per Day (**KLPD**)
2.	Distillers Dried Grains with Solubles (**DDGS**)	**75** Ton per Day **(TPD)**
3.	Starch	**60 TPD**
4.	Germ	**7 TPD**
5.	Gluten	**6 TPD**
6.	Fibre	**22 TPD**

2.7.2 As regards to the build-up of Production and the Capacity Utilization is concerned, the proposed **MPP** is assumed to operate at 60%, 70%, 80% & 90% respectively during the First, Second, Third & Fourth and onwards.

2.7.3 In view of the Capacity of the Plant & Machinery chosen, **CITCON** finds the build-up of Production and the Capacity Balancing of the chosen Plant & Machinery are as per the standard norms and accordingly, the proposed **MPP** is Technically Feasible from these angles.

- To create Integrated Modern Infrastructure leading to an ideal Ecosystem to facilitate Diverse Food Processing Operations and encourage Entrepreneurship in Food Processing in the region.
- To create State-of-the-art enabling Infrastructure in the spirit of an Industrial Park Model.
- To create significant Direct Employment opportunities in the command zone of influence of the Project.

CHAPTER– III
ECONOMIC VIABILITY

3.1 Cost of Project

3.1.1 The Cost of Project **[CoP]** of proposed **400 TPD** Maize Processing Plant (**MPP**) for manufacture of various derivatives upto Ethanol; has been estimated at **Rs. 200.00 Cr.** divided into various heads of accounts. The Components of **CoP** are discussed in following paragraphs.

(Rs. in Cr.)

TABLE: 3.1

S. No	Particulars	Cost
1.	Cost of Land	10.00
2.	Site Development	5.00
3.	Building & Allied Civil Works	32.00
4.	Plant & Machinery and Allied Equipments	110.00
5.	Electrical Installations and Electrification	15.00
6.	Miscellaneous Fixed Asset	4.00
7.	Preliminary & Pre-Operative Expense	7.80
8.	Deposits with CSPDCL & Others	2.50
9.	Contingencies	1.66
10.	Margin money for Working Capital (on First Year Basis)	12.05
	Total	**200.00**

3.1.2 Land & Site Development

3.1.2.1 Requirement of Land for the proposed **MPP** has been estimated at 50 Acre. A piece of Government Land has been identified at Vill.: Kanchan Nagar, Tehsil: Ramanujganj, Distt.: Balrampur [C.G.]. The Prospective Investor/Entrepreneur may acquire the Identified Piece of Land and may expand his Area by additional Purchase of the Land available *in & around* the vicinity, *if need be*. The Prospective Investor/Entrepreneur may opt for any other Location in the District, *as well*; based on availability of Land or his own Land Bank.

3.1.2.2 The cost of Land has been considered at **Rs. 10.00 Cr.** assuming the Guidelines Rate @Rs. 2.00 Lakh per Acre. The identified piece of Land is well connected to the main road. The Site Development Work like Boundary Wall, Levelling, Internal Roads, Open Drainage for Storm Water, Closed Drainage for Effluents, Culverts, Fire Hydrants, Water Source, Water Supply System, Power Supply System, Land Scapping, Green Belt, Gates *etc*. would be required at the proposed Plant Site. The Estimated Cost of Site Development has been worked out at considered at **Rs. 5.00 Cr.**

3.1.3 Building and Civil Works

The total Estimated Cost of Building and Civil Works at **Rs. 32.00 Cr.,** which will have Civil Work of Core Processing Facilities as **Rs 12.00 Cr.** and Civil work for Basic enabling Infrastructure at **Rs 20.00 Cr**.

3.1.4 Cost of Plant and Machinery

The Cost of Plant & Machinery, including Accessories; has been estimated at **Rs. 110.00 Cr.** for the Maize Processing Plant for manufacture of various Derivatives up to **Ethanol**.

3.1.5 Electrical Installations & Electrification

An estimated cost of **Rs. 15.00 Cr.** has been considered for the Installation of Electrical Sub-Station, Electrical Equipments and Exterior and Internal Electrification.

3.1.6 Miscellaneous Fixed Assets:

The estimated cost of **Rs. 4.00 Cr.** has been considered for Office Equipment, Furniture, Ventilation, Air Conditioning, General Lighting Furniture & Fixtures, Fire Fighting Equipment, Vehicles *etc*.

3.1.7 Preliminary & Pre-operative Expenses

Cost on this head has been estimated at **Rs. 7.80 Cr**. It includes Interest Expenses on Term Loan during Construction Period and others. The Preliminary & Pre-Operative Expenses would be about @4.43% of the Cost of Fixed Assets

3.1.8 Deposits

A Sum of **Rs. 2.50 Cr**. has been earmarked towards the Estimated Deposits to **CSPDCL** and Government/Semi-Government Departments.

3.1.9 Contingency

Provision has been kept for the Contingencies, to meet out the Cost Escalation, of around **Rs. 1.66 Cr.** for Site Development, Building, Plant & Machinery and Misc. Fixed Assets which would be about @1% of the Cost of Fixed Assets.

3.1.10 Margin Money for Working Capital

The Margin money on Working Capital during 1st year of operation has been arrived at **Rs. 12.05 Cr**. The Working Capital requirement in the First Year of production will be around **Rs. 40.32 Cr**. The Working Capital Loan *aka* the Cash Credit Limit {**CC Limit**} would be **Rs. 28.27 Cr.**

3.2 Means of Finance

The proposed Means of Finance for the **MPP** is given below:

TABLE: 3.2

(Rs in Cr.)

S. No	Particulars	Amount
1.	**Equity**	
a.	Promoters' Contribution	**45.00**
b.	Unsecured Loan/Quasi Equity	**10.00**
c.	Subsidy	**5.00**
	Total Equity	***60.00***
2.	**Debt**	
a.	Term Loan from Bank(s)	***140.00***
	Total	**200.00**

3.2.1 Term Loan

The requirement of Term Loan has been assessed at **Rs. 140.00 Cr.** The Term Loan will be secured by the First Charge Mortgage on the total Fixed Assets worth **Rs. 185.46 Cr.**

3.2.2 Promoter's Contribution:

An amount of **Rs. 45.00 Cr.** would be contributed by the Promoters as Share Capital.

3.2.3 Unsecured Loan as *Quasi Equity*

Unsecured Loans of **Rs. 10.00 Cr.** would be induced by the Promoters and their Friends & Relatives to meet out the short fall in Equity.

3.2.4 Capital Investment Subsidy

A Sanction of Capital Investment Subsidy amounting to **Rs. 5.00 Cr.** may be considered by the State Government towards Incentive for establishment of a Mega Project in Top Priority Sector with the aim to utilize Local Agro Produce *i.e.* Maize.

3.3 Margin & Security:

3.1 The Estimated Term Loan at **Rs. 140.00 Cr.** would be secured by the First Charge Mortgage on the total Fixed Assets worth **Rs. 185.46 Cr.**, which gives a Margin of **132%**.

3.4 Depreciation

The calculation of Depreciation has been carried out on Straight Line Method at the rates prescribed under Companies Act for profitability estimates.

3.5 Economic Indicators:

3.5.1 Debt Equity Ratio:

The Debt Equity Ratio (**DER**) works out to be **2.33:1**, which is favourable with the Bankers' point of view.

3.5.2 Debt Service Coverage Ratio

The Economic Indicators *e.g.* Debt Service Coverage Ratio **(DSCR)**, Break Even Point **(BEP)** and Internal Rate of Return (**IRR**) have been calculated in **PR**. The Average **DSCR** at **2.10:1**, **BEP** at **39.58%** (during the **3rd** Year of Operation) & **IRR** at **19.92%** indicate the Commercial Viability of the Project.

3.6 Projected Balance Sheet

The Projected Balance Sheet as illustrated in **PR** is in accordance with the standard norms. The Projected Balance Sheet indicates that proposed **MPP** shall become self-financing in future and shall be able to absorb all the liabilities, during operation in ensuing years, including that of increase in Working Capital requirement due to increase in Capacity Utilization.

3.7 Sensitivity Analysis

3.7.1 The Sensitivity Analysis has been carried out in the **PR**; in order to test the Economic Viability of the Project under adverse Financial Conditions. The results of such tests have been shown in Table as under:

TABLE: 3.3

Financial Indicator	Basic Data	Reduction of Selling Price by		Increase in Cost of Raw Material by 3%	
		3%	5%	3%	5%
DSCR (Average)	**2.10:1**	1.75:1	1.51:1	1.91:1	1.78:1
BEP	**39.58%**	43.47%	46.55%	41.63%	43.12%
IRR	**19.92%**	15.50%	12.33%	17.58%	15.95%
PAT (4th Yr.), Rs. in Cr.	**32.27**	30.00	25.16	30.83	30.04

3.7.2 The perusal of the above Sensitivity Analysis reveal that even after considering the changes in factors, the **DSCR** stands greater than 1.50:1.

3.7.3 The Sensitivity Analysis shows that the proposed **MPP** would be capable to honour its Commitments and Loan Obligations with Profits. The proposed **MPP** indicates Financial Soundness under adverse situations, *as well.*

CHAPTER– IV
OTHER RELEVANT ASPECTS

4.1 Project Implementation:

4.1.1 The Implementation Period based on the Time Frame required for each activity of implementation would be about 20 Months from the date of Disbursement of First Instalment of Term Loan.

4.2 SWOT

4.2.1 Strengths

- ✓ Project falls under the Top Priority Sector in the State.
- ✓ The proposed **MPP** would be the first of its kind in the District.
- ✓ Maize is grown abundantly in India. In addition, Government is taking initiative to further push the Production of Maize in the Country.
- ✓ The Cultivation & Production of Maize in the State, *too*; is quite heartening.
- ✓ The State Government is propagation Crop Diversification.
- ✓ The Maize Cultivation would certainly be increasing after the Establishment of the **MPP**.
- ✓ The Prospective Investor/Entrepreneur would initiate "Backward Integration".
- ✓ The Indian Starch Industry is getting continuous orders based on its quality from various Sectors across the World.

4.2.2 Weakness

- × The Agro based industries are predominantly Monsoon dependent in the Country.
- × Maize Cultivation is a Water intensive affair and hence can be a cause of concern during the dry months of the year.

4.2.3 Opportunity

- Expansion Plan in Stages for the next several years.
- The possibility of "Forward Integration" by way of Establishment of Plant for the Manufacture of "Modified Starch", "Liquid Glucose" & "Malto Dextrin" and to reach upto the most valued derivative – the "Sorbitol".
- The use of **Ethanol** as "Fuel Additive" is increasing day-by-day.
- Huge Export Opportunity – Indian per Capita consumption of Starch is much lower when compared to other parts of the World. Indian Exports of Starch & its Derivatives have been rising tremendously whereas the Starch Import forms a miniscule part of the Foreign Trade. As per estimates, Exports shall continue to grow and reach INR 9500 Million by 2025.

4.2.4 Threats

The entry of new players in the Industry coupled with the Expansion Plans of the Existing Players could result in mismatch between Demand and Supply in the Sector.

CHAPTER-V

STATUTORY CLEARANCES

S. No.	Statutory Document/Authority	Authority
1	Company Formation	Registrar of Companies
2	Industrial Entrepreneurs Memorandum (IEM Part-I)	Ministry of Commerce & Industry, New Delhi
3	Acquisition of Land	District Administration/CSIDC
4	Diversion of Land	District Administration
5	Approval of Layout Plan	Department of Town & Country Planning
6	Arrangement of Power	Chhattisgarh State Power Distribution Company Limited [CSPDCL]
7	Environment Protection	Chhattisgarh Environment Conservation Board, [CECB]
9	MoU with Government of Chhattisgarh	CSIDC/SIPB

CHAPTER– VI
CONCLUSION AND RECOMMENDATION

6.1 A Maize Processing Plant (**MPP**) has been proposed at Vill: Kanchan Nagar, Tehsil: Ramanujganj, Distt: Balrampur [C.G.] to be established by Prospective Investor/Entrepreneur for the manufacture of various Derivatives upto Ethanol .

6.2 **CITCON** has estimated the Components of **CoP** on the basis of available Secondary Data.

6.3 The proposed **MPP** shall provide direct or indirect employment to approximately **1000** families of the State, *in general*; and of the District, *in particular*; which has Socio-Economic advantages for the State.

6.4 Crop Diversification is one of the major agenda of State and Central Government. The Project will promote the Crop Diversification.

6.5 Based on the this Project Report it may be concluded that the proposed "**MPP**" is **Technically Feasible** and **Economically Viable** and hence deserves support from *all concerned*.

(Er. P. K. NIMONKAR)
STATE HEAD

PROJECT REPORT - MAIZE PROCESSING PLAT AT AUNDHI, PATAN, DISTT.: DURG [C.G.] FOR MANUFACTURING OF VARIOUS DERIVATIVES UPTO ETHANOL												
					ANNEXURE- T.1							
ASSUMPTIONS												
1	No. of Working Days					330						
2	No. of Shift(s)					3						
3	Installed Capacity {Ton per Day (**TPD**)}		Based on **Maize** Processing {Compatible for Additional Processing of **50 TPD** of **Waste Grain** for Ethanol Production}			400						
4	Hr./Shift					8						
5	**Capacity Utilisation(%)**											
a.	1st Year					60%						
b.	2nd Year					70%						
c.	3rd Year					80%						
d.	4th Year & Onwards					90%						
6	Effective Output (%)					100%						
7	**Starch Content & Bifurcation**	**Yield**										
a.	Starch Content	**66%**	{Ton per Day (**TPD**)}			264						
b.	Bifurcation of **Starch** Content for Production of **Starch** & **Derivatives** (out of Available Content)		{Ton per Day (**TPD**)}			60						
c.	Bifurcation of **Starch** Content for Production of **Ethanol**		{Ton per Day (**TPD**)}			204						
d.	**Additional** Raw Material avialble for Production of Ethanol - **Waste Grains**		{Ton per Day (**TPD**)}			50						
8	Product Mix											
a.	Ethanol	59.06%	{Kilo Litre per Day (**KLPD**)}		(Starch + Waste Grians)	150.00						
b.	Distillers Dried Grains with Solubles (**DDGS**)	29.53%	{Ton per Day (**TPD**)}			75.00						
c.	Starch	100.00%	{Ton per Day (**TPD**)}			60.00						
d.	Germ	1.75%	{Ton per Day (**TPD**)}			7.00	11.67%					
e.	Gluten	1.50%	{Ton per Day (**TPD**)}			6.00	10.00%					
f.	Fiber	5.50%	{Ton per Day (**TPD**)}			22.00	36.67%					
9	**Average Sale Price**		Net of Taxes									
a.	Ethanol		Rs. Per Kilo Ltr. (**KL**)			57610.00						
b.	Distillers Dried Grains with Solubles (DDGS)		Rs. per Ton			16500.00						
c.	Starch		Rs. per Ton			25000.00						
d.	Germ		Rs. per Ton			46000.00						
e.	Gluten		Rs. per Ton			42000.00						

f.	Fiber		Rs. per Ton			15000.00						
10	**Requirement & Cost of Raw Material And Consumables**		**Quantity (as % of Product)**		**Quantity (TPD)**	**Rate (Rs. per Ton)**						
a.	Maize		100%		400	13000.00						
b.	Waste Grains		100%		50	13000.00						
11	**Packaging Cost**		Rs. in Cr. Per Annnum			2.00						
12	Annual Cost of Utilities (100%)		Rs. in Cr.			16.64						
13	Annual Wage Bill		Rs. in Cr.			36.99						
14	Annual Salary Bill		Rs. in Cr.			14.70						
15	Rate of Annual increase in Wages & Salaries					3.50%						
16	Annual Repairs, Maintenance and Insurance					2.50%						
17	Annual increase in above					10%						
18	Admn. Exps. as % of Administrative Salaries					10%	2.10					
19	Rate of Annual increase in Admn. Exps.			(Till Third Year)		2.50%	39.58%					
20	Selling Expenses {Fixed Cost (Salary+Travelling Exps. *etc.*)}					4.00%						
21	Selling Expenses {Variable Cost (Commission+Promotion Exps. etc.)}					7.50%						
					Contd. Annexure -T. 1							
22	Moritorium period for Repayment of Term Loan (in Months)					6						
23	Moritorium period for Repayment of Term Loan (in Quarters)					2						
24	Period for Repayment of Long Term Loan including Moritorium (in Years)					8.00						
25	Period for Repayment of Long Term Loan {excluding Moritorium-(in Quarters)}					30						
26	Period for Repayment of Long Term Loan {excluding Moritorium-(in Months)}					90						
27	**Rate of Depreciation(WDV)**											
a.	Site Development, Building & Civil Works					10%						
b.	Plant & Machineries					25%						
c.	Misc. Fixed Asset					5%						
28	**Rate of Depreciation(SLM)**											
a.	Site Development, Building & Civil Works					3.39%						
b.	Plant & Machineries					8.33%						
c.	Misc. Fixed Asset					1.64%						
29	**Estimated Cost of Project**					**(Rs. in Cr.)**						
a.	Cost of Land					10.00						
b.	Site Development					5.00						
c.	Building & Allied Civil Works					32.00						
d.	Plant & Machineries and Allied Equipments					110.00						
e.	Electrical Installations and Electrification					15.00						
f.	Miscellaneous Fixed Asset					4.00						
g.	Preliminary & Pre-operative Expenses			4.4%		7.80						
h.	Deposits					2.50						
i.	Contingencies			1.00%		1.66						

j.	Margin Money for Working Capital (On **I** Year Basis)					12.05						
30	**TOTAL**					**200.00**						
31	Promoters' Contribution											
32	Unsecured Loan					5%						
33	Subsidy			0%	20%	25%						
34	Term Loan on Eligible Items			0%	70%	75%						
35	Debt Equity Ratio					**2.33**						
36	% Deduction in Taxable income					20%						
37	Rate of Income Tax					30%						
38	**ASSUMPTIONS FOR WORKING CAPITAL**											
39	Stock of Raw Material (Days)					25						
40	Bank Finance (%)					75%						
41	Stock of Packing Material (Days)					25						
42	Bank Finance (%)					75%						
43	Work in Process (Days)					1						
44	Bank Finance %					0%						
45	Stock of Finished Goods (Days)					25						
46	Bank Finance %					75%						
47	Receivable (Days)					25		40.32	28.27	12.05		
48	Bank Finance %					75%		47.88	35.44	12.44		
49	Interest on Long Term Loan & Working Capital		Qrtly.	0%	Yrl.	10.50%		54.28	40.19	14.09		
50	Interest on Unsecured Loan				Yrl.	0.00%						
51	Total Term Loan Period in Years					8.00						
52	Sundry Creditors (Days)											
a.	Raw Material & Conumables					0.00						
b.	Packing Material					0.00						
53	Power Requirement & Tarriff											
a.	Equipment Load (in **H.P**.)					5500						
b.	Lighting Load (in **K.W.)**					47.00						
c.	Tarriff **Rs./Kwh**					7.00						
54	Average **DSCR**					**2.10**						
55	**BEP (%)**					**39.58%**						
56	**IRR (%)**					**19.92%**						
57	**PAT (Rs. in Cr.) During Fourth Year**					**32.27**						
					ANNEXURE - T.2							
		ANNUAL SALES REALISATION										
		(AT 100% CAPACITY UTILISATION)										
	a. Installed Capacity- Based on Maize Processing (TPD)				**:**	**400**						
	b. No. of Shift(s)/Day				**:**	**3**						
	c. No. of Hours/Shift				**:**	**8**						
	d. No. of Days/Annum				**:**	**330**						
	e. Installed Capacity {Ton per Day (TPD)}				**:**	**400**						

	f. Installed Capacity {Ton per Annum (TPA)}			**:**	**132000**	
	f. Effective Output			**:**	**100%**	

S. No.	**Particulars**	**Unit**	**Qty. (KLPD/TPD)**	**Qty. (KLPA/TPA)**	**Rate (Rs./KL or Rs./Ton)**	**Amount (Rs. in Cr.)**
1	Ethanol	KL	150.00	49499.90	57610.00	285.17
2	Distillers Dried Grains with Solubles (DDGS)	Ton	75.00	24749.53	16500.00	40.84
3	Starch	Ton	60.00	19800.00	25000.00	49.50
4	Germ	Ton	7.00	2310.00	46000.00	10.63
5	Gluten	Ton	6.00	1980.00	42000.00	8.32
6	Fiber	Ton	22.00	7260.00	15000.00	10.89
	Total		**320.00**	**105599.43**		**405.34**

ANNEXURE - T.3

ANNUAL COST OF RAW MATERIAL & CONSUMABLES

S. No.	**Particulars**	**Unit**	**Qty. (Per Day)**	**Qty. (Per Annum)**	**Rate (Rs./Unit)**	**Amount (Rs. in CR.)**
A.	**Raw Materials**					
1	Maize	Ton	400.00	132000	13000	171.60
2	Waste Grains	Ton	50.00	16500	13000	21.45
	Total		**400.00**	148500		**193.05**
B.	**Packing & Consumables**					
1	Packaging Cost	Lot				2.00
	Total					**2.00**
	Grand Total					**195.05**

ANNEXURE T-4

ESTIMATES OF COST OF PLANT & MACHINERY

S. No.	**Description**	**Capacity**	**Nos.**	**Rate (Rs. in Cr.)**	**Total (Rs. in Cr.)**

1	Maize Processing Plant (**MPP**), for Manufacturing of various Derivatives upto Ethanol, Complete in all Respect inclusive of Plant & Machinery, Allied Equipments, Structurals *etc.* and Freight & Transportaion, Taxes & Duties *etc.;* duly Installed at Plant Site and Commissioned as per Scope of Work.	**400 TPD** (Based on Maize Processing)	1	110.00		110.00						
	Grand Total					**110.00**						
==========												
					ANNEXURE- T.5							
ESTIMATES OF ELECTRICAL INSTALLATION & ELECTRIFICATION												
S. No.	**Description**	**Capacity**	**Nos.**	**Rate (Rs. in Cr.)**	**Total (Rs. in Cr.)**							
1	Electrical Installations & Electrification Work for Maize Processing Plant (**MPP**), Complete in all Respect inclusive of Equipments, Structurals, Sub-Station and External and Internal Transmission Systems *etc.* and Freight & Transportaion, Taxes & Duties *etc.;* duly clubbed with Plant & Machinery at Plant Site and Commissioned as per Scope of Work.	Suitable for 400 TPD MPP	1	15.00		15.00						
	Grand Total					**15.00**						
==========												
					ANNEXURE- T.6							
ESTIMATES OF MISCELLANEOUS FIXED ASSETS												
S. No.	**Description**	**Capacity**	**Nos.**	**Rate (Rs. in Cr.)**	**Total (Rs. in Cr.)**							

1	Miscellaneous Fixed Assets inclusive of Office Equipments, Furnitures and Fixutes, Fire Fighting Equipments & Fire Extinguishers, Electical Appliances, Computers & Peripherals, Laboratory Equipments & Furnitures, E-Vehicles for Internal Transportation & Material Handling, Staff Vehicles,	Suitable for 400 TPD MPP	1	4.00		4.00						
	Grand Total					**4.00**						
					ANNEXURE- T.7							
		ANNUAL SALARY & WAGE BILL										
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S. No.	**Category**		**Nos.**	**Salary/Wage (Rs./Month)**	**Amount (Rs. in Cr.)**							
-----	----------	----------	----------	----------	----------	----------						
A.	**ADMINISTRATIVE STAFF**											
1	Director (Technical)		1	250000		0.30						
2	Director (Administration & Finance)		1	250000		0.30						
3	General Manager (Technical)		1	200000		0.24						
4	General Manager (Administration)		1	200000		0.24						
5	General Manager (Finance)		1	200000		0.24						
6	General Manager (Marketing)		1	200000		0.24						
7	Deputy General Managers		12	150000		2.16						
8	Chief Financial Officer		1	150000		0.18						
9	Accounts Officer		2	100000		0.24						
10	Administrative Officer		2	100000		0.24						
11	Assistant General Manangers		12	100000		1.44						
12	Manangers		12	100000		1.44						
13	Deputy Manangers		12	75000		1.08						
14	Assistant Manangers		12	50000		0.72						
15	Office Assistants		12	25000		0.36						
16	Supporting Staff & Peon		24	15000		0.43						
17	Security Guards		45	12000		0.65						
			----------			----------						
			152			**10.50**		10.55				
		Add Towards Social Benefits			40%	4.20						

			Sub-Total "A"			**14.70**						
B.	**PRODUCTION STAFF**											

1	General Manager (Production)		3	200000.00		0.72						
2	Deputy General Manager (Production)		18	150000.00		3.24						
3	Chief Boiler Operators		3	150000.00		0.54						
4	Chief Chemists		3	150000.00		0.54						
5	Shift Supervoisers		18	100000.00		2.16						
6	Plant Operators		45	75000.00		4.05						
7	Boiler Attendents		15	60000.00		1.08						
8	Laboratory Attendents		15	60000.00		1.08						
9	Plant Assistants		45	25000.00		1.35						
10	Skilled Worker		90	20000.00		2.16						
11	Semi-Skilled Worker		180	18000.00		3.89						
12	Un-Skilled Worker		390	12000.00		5.62						
			---			---						
			825			**26.42**		26.44				
		Add Towards Social Benefits			40%	10.57						

		Sub-Total "B"				**36.99**						

		Grand Total (A+B)	**977**			**51.70**						

===	==========	=========	=========	==========	=========	=========						
					ANNEXURE - T.8							
		ESTIMATES OF UTILITIES & SERVICES										
-----	----------	----------	----------	----------	----------	----------						
S. No.	**Description**				**Requirement & Amount**							
----	----------	----------	----------	----------	----------	----------						
A.	**POWER**											
1	Equipment Load		5500	H.P.	4103.00	K.W.						
2	Lighting Load			47.00	K.W.							
3	Load Factor			0.90								
4	Power Factor			0.80								
5	Total Connected Load			4150.00	K.W.							
6	Power Tarriff (Rs.)			7.00	**per KWH**							
7	Annual Running Load of Equipment				**23396947**	**KWH**						
8	Annual Power Bill (Rs.)				**16.38**	**Cr.**						
9	Annual Running Load for Lighting				**370548**	**KWH**						
10	Annual Power Bill (Rs.)			Rs.	**0.26**	**Cr.**						
11	Total Power Bill (Rs.)			Rs.	**16.64**	**Cr.**						

B.	**Water**											
12	No Water Charges to be paid. Own Source proposed.											
	Total Cost of Utilities			Rs.	**16.64**	**Cr.**						
					ANNEXURE - T.9							
	ESTIMATES OF LAND, SITE DEVELOPMENT AND BUILDINGS											
S. No.	**Description**	**Unit**	**Area (Sq. Mt.)**	**Rate per Unit (Rs.)**		**Amount (Rs. in Cr.)**						
A.	**Land**											
1	Free Hold Land	**Acre**	50.00	2000000.00		10.00		31.16	3.116			
				Total		**10.00**						
B.	**Site Development**											
1	Inclusive of Boundary Wall around the Periphery of the Premises, Internal Roads, Culverts, Storm Water Drainage (Both Sides of the Roads), Closed Drains for Effluent (Both Sides of the Roads), Water Supply System, Green Belt Development & Gates					5.00						
				Total		**5.00**						
C.	**Buildings & Allied Civil Works**											
1	Building and Allied Civil Works for the 400 TPD Maize Processing Plant (**MPP**) for Manufacture of Various Derivatives upto Ethanol					32.00						
				Total		**32.00**						

ANNEXURE- F.1

ESTIMATES OF COST OF PROJECT

(Rs. in Cr.)

S. No.	ASSET	Promoters' Contribution	Unsecured Loan	Subsidy	Term Loan	Total
1	Cost of Land	2.00	0.50	0.00	7.50	10.00
2	Site Development	1.00	0.25	0.00	3.75	5.00
3	Building & Allied Civil Works	6.40	1.60	0.00	24.00	32.00
4	Plant & Machineries and Allied Equipments	15.49	6.10	5.00	83.41	110.00
5	Electrical Installations and Electrification	3.00	0.75	0.00	11.25	15.00
6	Miscellaneous Fixed Asset	0.80	0.20	0.00	3.00	4.00
7	Preliminary & Pre-operative	1.56	0.39	0.00	5.85	7.80
8	Deposits	2.38	0.13	0.00	0.00	2.50
9	Contingencies	0.33	0.08	0.00	1.25	1.66
10	Margin Money for Working Capital (On I Year Basis)	12.05	0.00	0.00	0.00	12.05
	Total	**45.00**	**10.00**	**5.00**	**140.00**	**200.00**
	Cost of Fixed Assets					**185.46**

ASSUMED MEANS OF FINANCE

A.	Equity	Rs. in Cr.		% of Cost of Project
1	Promoter's Contribution	45.00		**22.50%**
2	Unsecured Loan	10.00		**5.00%**
3	Subsidy	5.00		**2.50%**
	Sub - Total	**60.00**		**30.00%**
B.	**Equity**			
1	Long Term Loan from Bank(s)	140.00		**70.00%**
	Total	**140.00**		**70.00%**
	Grand Total	**200.00**		
C.	**Debt Equity Ratio**	**2.33**	**:1**	

D.	Working Capital											
	Total Working Capital Requirement-During **First Year**	**40.32**										
	Working Capital Loan from Bank(s) [Cash - Credit Limit {**CC Limit**}] -During **First Year**	**28.27**										
	Margin Money for Working Capital-During **First Year**	**12.05**										

ANNEXURE- F.2

ESTIMATES OF WORKING CAPITAL

(Rs. in Cr.)

S. No.	Particulars	Period in Days	Bank Fnc. %	First Year	Second Year	Third Year
1	Raw Material	25.00	75%	8.78	10.24	11.70
2	Packaging Material	25.00	75%	0.09	0.11	0.12
3	Finished Goods	25.00	75%	13.87	15.64	17.43
4	WIP	1.00	0%	0.55	0.63	0.70
5	Receivable	25.00	75%	17.03	21.26	24.33
	Total			**40.32**	**47.88**	**54.28**

ANNEXURE- F.2 Contd.

(Rs. in Cr.)

ESTIMATES OF BANK FINANCE & MARGIN MONEY

RAW MATERIAL	**FINISHED GOODS**	**WORK IN PROCESS**

YR.	BNKFNC	MM	BNKFNC	MM	BKKFNC	MM
I	6.58	2.19	10.40	3.47	0.00	0.55
II	7.68	2.56	11.73	3.91	0.00	0.63
III	8.78	2.93	13.07	4.36	0.00	0.70

RECEIVABLE — **Packaging Material**

YR.	BNKFNC	MM		BKKFNC	MM
I	12.77	4.26		0.07	0.02
II	15.95	5.32		0.08	0.03
III	18.25	6.08		0.09	0.03

	Requirement	TOTAL BNKFNC	MM
	40.32	**28.27**	**12.05**
	47.88	**35.44**	**12.44**
	54.28	**40.19**	**14.09**

ANNEXURE- F.3

COST OF PRODUCTION AND PROFITIBILITY ESTIMATES

(Rs. in Cr.)

S. No.	Particulars	Operating Years							
		I Year	II Year	III Year	IV Year	V Year	VI Year	VII Year	VIII Year
1	No.of Days/Year	330	330	330	330	330	330	330	330

2	No.of Shift(s)/Day	3	3	3	3	3	3	3	3			
3	No.of Hrs./Shift	8	8	8	8	8	8	8	8			
4	Installed Capacity **(TPD)**	400	400	400	400	400	400	400	400			
5	Capacity Utilization **(%)**	60%	70%	80%	90%	90%	90%	90%	90%			
6	**Production (KLPD/TPD)**											
a.	Ethanol	90.00	105.00	120.00	135.00	135.00	135.00	135.00	135.00			
b.	Distillers Dried Grains with Solubles (DDGS)	45.00	52.50	60.00	67.50	67.50	67.50	67.50	67.50			
c.	Starch	36.00	42.00	48.00	54.00	54.00	54.00	54.00	54.00			
d.	Germ	4.20	4.90	5.60	6.30	6.30	6.30	6.30	6.30			
e.	Gluten	3.60	4.20	4.80	5.40	5.40	5.40	5.40	5.40			
f.	Fiber	13.20	15.40	17.60	19.80	19.80	19.80	19.80	19.80			
7	**Production** {Kilo Litre per Annum **(KLPA)**/Ton per Annum **(TPA)**}											
a.	**Ethanol**	29700	34650	39600	44550	44550	44550	44550	44550			
8	Add Opening Stock	0	2250	2625	3000	3375	3375	3375	3375			
9	Less Closing Stock	2250	2625	3000	3375	3375	3375	3375	3375			
10	Net Quantity of Ethanol	**27450**	**34275**	**39225**	**44175**	**44550**	**44550**	**44550**	**44550**			
b.	**Distillers Dried Grains with Solubles (DDGS)**	14850	17325	19800	22275	22275	22275	22275	22275			
11	Add Opening Stock	0	1125	1312	1500	1687	1687	1687	1687			
12	Less Closing Stock	1125	1312	1500	1687	1687	1687	1687	1687			
13	Net Quantity of DDGS	**13725**	**17137**	**19612**	**22087**	**22275**	**22275**	**22275**	**22275**			
							CONTD. ..ANNEXURE- F.3					
c.	**Starch**	11880	13860	15840	17820	17820	17820	17820	17820			
14	Add Opening Stock	0	900	1050	1200	1350	1350	1350	1350			
15	Less Closing Stock	900	1050	1200	1350	1350	1350	1350	1350			
16	Net Quantity of Starch	**10980**	**13710**	**15690**	**17670**	**17820**	**17820**	**17820**	**17820**			
d.	**Germ**	1386	1617	1848	2079	2079	2079	2079	2079			
17	Add Opening Stock	0	105	123	140	158	158	158	158			
18	Less Closing Stock	105	123	140	158	158	158	158	158			
19	Net Quantity of Germ	**1281**	**1600**	**1831**	**2062**	**2079**	**2079**	**2079**	**2079**			
e.	**Gluten**	1188	1386	1584	1782	1782	1782	1782	1782			
20	Add Opening Stock	0	90	105	120	135	135	135	135			
21	Less Closing Stock	90	105	120	135	135	135	135	135			
22	Net Quantity of Gluten	**1098**	**1371**	**1569**	**1767**	**1782**	**1782**	**1782**	**1782**			
f.	**Fiber**	4356	5082	5808	6534	6534	6534	6534	6534			
23	Add Opening Stock	0	330	385	440	495	495	495	495			

24	Less Closing Stock	330	385	440	495	495	495	495	495			
25	Net Quantity of Fiber	**4026**	**5027**	**5753**	**6479**	**6534**	**6534**	**6534**	**6534**			
26	**Net Sales (TPA)**											
a.	Ethanol	27,450	34,275	39,225	44,175	44,550	44,550	44,550	44,550			
b.	Distillers Dried Grains with Solubles (DDGS)	13,725	17,137	19,612	22,087	22,275	22,275	22,275	22,275			
c.	Starch	10,980	13,710	15,690	17,670	17,820	17,820	17,820	17,820			
d.	Germ	1,281	1,600	1,831	2,062	2,079	2,079	2,079	2,079			
e.	Gluten	1,098	1,371	1,569	1,767	1,782	1,782	1,782	1,782			
f.	Fiber	4,026	5,027	5,753	6,479	6,534	6,534	6,534	6,534			
27	**Rate (Rs. per KL or per Ton)**											
a.	Ethanol	57610	57610	57610	57610	57610	57610	57610	57610			
b.	Distillers Dried Grains with Solubles (DDGS)	16500	16500	16500	16500	16500	16500	16500	16500			
c.	Starch	25000	25000	25000	25000	25000	25000	25000	25000			
d.	Germ	46000	46000	46000	46000	46000	46000	46000	46000			
e.	Gluten	42000	42000	42000	42000	42000	42000	42000	42000			
f.	Fiber	15000	15000	15000	15000	15000	15000	15000	15000			
							CONTD. ..ANNEXURE- F.3					
28	**Net Sales Value**	**(Rs. in Cr.)**										
a.	Ethanol	158.14	197.46	225.97	254.49	256.65	256.65	256.65	256.65			
b.	Distillers Dried Grains with	22.65	28.28	32.36	36.44	36.75	36.75	36.75	36.75			
c.	Starch	27.45	34.28	39.23	44.18	44.55	44.55	44.55	44.55			
d.	Germ	5.89	7.36	8.42	9.48	9.56	9.56	9.56	9.56			
e.	Gluten	4.61	5.76	6.59	7.42	7.48	7.48	7.48	7.48			
f.	Fiber	6.04	7.54	8.63	9.72	9.80	9.80	9.80	9.80			
	Total "A"	**224.78**	**280.67**	**321.20**	**361.73**	**364.80**	**364.80**	**364.80**	**364.80**			
29	**Cost of Production**											
30	Raw Material	115.83	135.14	154.44	173.75	173.75	173.75	173.75	173.75			
31	Packing & Consumables	1.20	1.40	1.60	1.80	1.80	1.80	1.80	1.80			
32	Power+Fuel+Water	9.98	11.65	13.31	14.97	14.97	14.97	14.97	14.97			
33	Wages Including Benefits	36.99	38.29	39.63	41.02	42.45	43.94	45.47	47.07			
34	Salaries Including Benefits	14.70	15.21	15.75	16.30	16.87	17.46	18.07	18.70			
35	Repairs, Maint. & Insurance	4.39	4.83	5.31	5.84	6.42	7.06	7.77	8.55			
	Total "B"	**183.09**	**206.51**	**230.03**	**253.67**	**256.26**	**258.98**	**261.83**	**264.84**			
36	**Add** Opening Stock of RM	0.00	8.78	10.24	11.70	13.16	13.16	13.16	13.16			

37	**Less** Closing Stock of RM	8.78	10.24	11.70	13.16	13.16	13.16	13.16	13.16			
38	**Add** Opening Stock of Packing Material	0.00	0.09	0.11	0.12	0.14	0.14	0.14	0.14			
39	**Less** Closing Stock of Packing Material	0.09	0.11	0.12	0.14	0.14	0.14	0.14	0.14			
40	**Add** Opening Stock of WIP	0.00	0.55	0.63	0.70	0.77	0.78	0.78	0.79			
41	**Less** Closing Stock of WIP	0.55	0.63	0.70	0.77	0.78	0.78	0.79	0.80			
42	**Add** Opening Stock of FG	0.00	13.87	15.64	17.43	17.43	17.43	17.43	17.43			
43	**Less** Closing Stock of FG	13.87	15.64	17.43	17.43	17.43	17.43	17.43	17.43			
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44	Net Cost of Production **"C"**	**159.80**	**203.19**	**226.70**	**252.12**	**256.25**	**258.97**	**261.83**	**264.83**			
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45	Gross Profit **"D"= (A-C)**	**64.98**	**77.48**	**94.50**	**109.61**	**108.55**	**105.83**	**102.98**	**99.98**			
							CONTD. ..ANNEXURE- F.3					
46	Depreciation **"E"**	12.40	12.40	12.40	12.40	12.40	12.40	12.40	12.40			
47	**Financial Expenses**											
48	Interest on Term Loan	14.41	12.66	10.70	8.74	6.78	4.82	2.86	0.90			
49	Interest on WC	2.97	3.72	4.22	4.22	4.22	4.22	4.22	4.22			
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	Total "F"	**17.38**	**16.38**	**14.92**	**12.96**	**11.00**	**9.04**	**7.08**	**5.12**			
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50	Admn. Expenses **"G"**	1.47	1.52	1.57	1.63	1.69	1.75	1.81	1.87			
51	Selling Expenses (Fixed Cost) **"H"**	8.99	11.23	12.85	14.47	14.59	14.59	14.59	14.59			
52	Selling Expenses (Variable Cost) **"I"**	16.86	21.05	24.09	27.13	27.36	27.36	27.36	27.36			
53	**Total "J"=(E+F+G+H+I)**	**57.10**	**62.58**	**65.83**	**68.59**	**67.04**	**65.14**	**63.24**	**61.34**			
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54	Net Profit before Income Tax **"K"**=(**D-J**)	**7.87**	**14.90**	**28.67**	**41.02**	**41.51**	**40.70**	**39.74**	**38.64**			
55	Taxation **"L"**	0.00	0.00	0.25	8.75	9.77	10.27	10.57	10.71			
56	Net Profit after Income Tax **"M"**=(**K-L**)	7.87	14.90	28.41	32.27	31.74	30.43	29.17	27.93			
57	Net Surplus	7.87	14.90	28.41	32.27	31.74	30.43	29.17	27.93			
58	**Cumulative Surplus**	**7.87**	**22.77**	**51.19**	**83.46**	**115.20**	**145.63**	**174.80**	**202.73**			
59	Gross Profit as % of Sales	**28.91%**	**27.61%**	**29.42%**	**30.30%**	**29.76%**	**29.01%**	**28.23%**	**27.41%**			
60	Profit After Tax	7.87	14.90	28.41	32.27	31.74	30.43	29.17	27.93			
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ANNEXURE- F.4

CALCULATION OF DEPRECIATION

(Rs. in Cr.)

S. No.	Particulars	Cost	Rate %	Operating Years								
				I Year	II Year	III Year	IV Year	V Year	VI Year	VII Year	VIII Year	
A.	**Written Down Value**											
1	Site Development	5.28	10.00%	0.53	0.48	0.43	0.39	0.35	0.31	0.28	0.25	
2	Building & Allied Civil Works	33.82	10.00%	3.38	3.04	2.74	2.47	2.22	2.00	1.80	1.62	
3	Plant & Machinery	116.27	25.00%	29.07	21.80	16.35	12.26	9.20	6.90	5.17	3.88	
4	Electrical Installations &	15.85	25.00%	3.96	2.97	2.23	1.67	1.25	0.94	0.71	0.53	
5	Miscellaneous Fixed Assets	4.23	5.00%	0.21	0.20	0.19	0.18	0.17	0.16	0.16	0.15	
	Total	**175.46**		**37.15**	**28.49**	**21.94**	**16.97**	**13.19**	**10.31**	**8.11**	**6.43**	
A.	**Straight Line Value**											
1	Site Development	5.28	3.39%	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	
2	Building & Allied Civil Works	33.82	3.39%	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	
3	Plant & Machinery	116.27	8.33%	9.69	9.69	9.69	9.69	9.69	9.69	9.69	9.69	
4	Electrical Installations & Electrification	15.85	8.33%	1.32	1.32	1.32	1.32	1.32	1.32	1.32	1.32	
5	Miscellaneous Fixed Assets	4.23	1.64%	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	
	Total	**175.46**		**12.40**	**12.40**	**12.40**	**12.40**	**12.40**	**12.40**	**12.40**	**12.40**	

	Asset		Value	Pre-operative	Contingencies	Total Cost
1	Site Development		5.00	0.23	0.05	5.28
2	Building & Allied Civil Works		32.00	1.50	0.32	33.82
3	Plant & Machinery		110.00	5.17	1.10	116.27
4	Electrical Installations & Electrification		15.00	0.70	0.15	15.85
5	Miscellaneous Fixed Assets		4.00	0.19	0.04	4.23
	Total		**166.00**	**7.80**	**1.66**	**175.46**

ANNEXURE- F.5

COMPUTATION OF TAX LIABILITY

(Rs. in Cr.)

S. No.	Particulars	Operating Years								
		I Year	II Year	III Year	IV Year	V Year	VI Year	VII Year	VIII Year	
1	Operating Profit (Before Tax)	7.87	14.90	28.67	41.02	41.51	40.70	39.74	38.64	
2	Add Depreciation (St. Line	12.40	12.40	12.40	12.40	12.40	12.40	12.40	12.40	
3	Less Depreciation (W.D.V. Method)	37.15	28.49	21.94	16.97	13.19	10.31	8.11	6.43	
4	Adjusted Profit	-16.88	-1.19	19.13	36.46	40.73	42.79	44.03	44.61	
5	Profit after Adjusting Losses	-16.88	-18.07	1.06	36.46	40.73	42.79	44.03	44.61	
6	Gross Taxable Income	0.00	0.00	1.06	36.46	40.73	42.79	44.03	44.61	
7	Less Deduction Under Section	0.00	0.00	0.21	7.29	8.15	8.56	8.81	8.92	
8	Net Taxable Income	0.00	0.00	0.85	29.17	32.58	34.23	35.22	35.69	
9	**Income Tax**	**0.00**	**0.00**	**0.25**	**8.75**	**9.77**	**10.27**	**10.57**	**10.71**	

ANNEXURE - F.6

PROJECTED CASH FLOW STATEMENT

(Rs. in Cr.)

S.	Particulars	Const.			Operating Years					

No.		Period	I Year	II Year	III Year	IV Year	V Year	VI Year	VII Year	VIII Year		
A.	**SOURCE OF FUNDS**											
1	Promoters' Contribution	45.00										
2	Unsecured Loan	10.00										
3	Subsidy	5.00										
4	Long Term Loan	140.00										
5	Increase in **WC** Loan		28.27	7.16	4.75	0.00	0.00	0.00	0.00	0.00		
6	Profit Before Tax + Financial Expenses	0.00	25.26	31.28	43.58	53.98	52.51	49.73	46.82	43.75		
7	Depreciation	0.00	12.40	12.40	12.40	12.40	12.40	12.40	12.40	12.40		
	Total	**200.00**	**65.93**	**50.85**	**60.73**	**66.38**	**64.91**	**62.14**	**59.22**	**56.16**		
B.	**DISPOSITION OF FUNDS**											
1	Capital Expenses	185.46										
2	Deposits	2.50										
3	Increase in **WC**		40.32	7.56	6.40	0.00	0.00	0.00	0.00	0.00		
4	Decrease in Long Term Loan		9.33	18.67	18.67	18.67	18.67	18.67	18.67	18.67		140.00
5	Financial Expenses (Inclusive of Interest on LTL & WC)		17.38	16.38	14.92	12.96	11.00	9.04	7.08	5.12		
6	Income Tax		0.00	0.00	0.25	8.75	9.77	10.27	10.57	10.71		
	Total	**187.96**	**67.04**	**42.60**	**40.24**	**40.37**	**39.44**	**37.97**	**36.31**	**34.49**		
C.	Net Surplus/Deficit **(A-B)**	12.05	-1.11	8.24	20.49	26.01	25.47	24.16	22.91	21.66		
D.	**Cumulative Surplus**	**12.05**	**10.94**	**19.18**	**39.68**	**65.68**	**91.16**	**115.32**	**138.22**	**159.89**		

ANNEXURE - F.7

PROJECTED BALANCE SHEET

(Rs. in Cr.)

S. No.	Particulars	Const. Period	Operating Years								
			I Year	II Year	III Year	IV Year	V Year	VI Year	VII Year	VIII Year	
A.	**LIABILITIES**										
1	Promoters' Contribution	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	
2	Unsecured Loan	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	
3	Subsidy	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	
4	Long Term Loan	140.00	130.67	112.00	93.34	74.67	56.00	37.33	18.67	0.00	
5	Reserves & Surplus	0.00	7.87	22.77	51.19	83.46	115.20	145.63	174.80	202.73	
6	Working Capital Loan		28.27	35.44	40.19	40.19	40.19	40.19	40.19	40.19	
	Total	**200.00**	**226.82**	**230.22**	**244.71**	**258.31**	**271.39**	**283.15**	**293.65**	**302.92**	
B.	**ASSETS**										
1	Gross Fixed Assets	185.46	185.46	185.46	185.46	185.46	185.46	185.46	185.46	185.46	
2	Less Depreciation		12.40	24.80	37.20	49.60	62.00	74.40	86.81	99.21	
3	Net Fixed Assets	185.46	173.06	160.66	148.25	135.85	123.45	111.05	98.65	86.25	
4	Deposits	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	
5	Current Assets (WC)		40.32	47.88	54.28	54.28	54.28	54.28	54.28	54.28	
6	Cash and Bank Balance	12.05	10.94	19.18	39.68	65.68	91.16	115.32	138.22	159.89	
	Total	**200.00**	**226.82**	**230.22**	**244.71**	**258.31**	**271.39**	**283.15**	**293.65**	**302.92**	
	Difference	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

ANNEXURE - F.8

COMPUTATION OF DEBT SERVICE COVERAGE RATIO

(Rs. in Cr.)

S. No.	Particulars	Operating Years										
		I Year	II Year	III Year	IV Year	V Year	VI Year	VII Year	VIII Year			
A.	**FUNDS AVAILABLE FOR DEBT SERVICE**											
1	Net Profit	7.87	14.90	28.67	41.02	41.51	40.70	39.74	38.64			
2	Depreciation	12.40	12.40	12.40	12.40	12.40	12.40	12.40	12.40			
3	Interest on Long Term Loan	14.41	12.66	10.70	8.74	6.78	4.82	2.86	0.90			
4	Interest on Unsecured Loan	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
	Total	**34.69**	**39.96**	**51.77**	**62.16**	**60.69**	**57.92**	**55.00**	**51.94**			
B.	**DEBT TO BE SERVED**											
1	Repayment of Term Loan	9.33	18.67	18.67	18.67	18.67	18.67	18.67	18.67			
2	Interest on Long Term Loan	14.41	12.66	10.70	8.74	6.78	4.82	2.86	0.90			
3	Interest on Unsecured Loan	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
	Total	**23.75**	**31.33**	**29.37**	**27.41**	**25.45**	**23.49**	**21.53**	**19.57**			
C.	**RATIO (A/B)**	1.46	1.28	1.76	2.27	2.39	2.47	2.56	2.65			
D.	**AVERAGE RATIO**		**2.10**	**:1**								

ANNEXURE - F.9

BREAK - EVEN ANALYSIS

(Based on 3rd Year of Operation)

A.	**VARIABLE COST**	
		(Rs. in Lakh)
1	Raw Material	154.44
2	Packing & Consumables	1.60
3	Power+Fuel+Water	13.31

4	Wages including Benefits				39.63							
5	Interest on WC Limit				4.22							
6	Selling Expenses {Variable Cost (Commission+Promotion Exps. etc.)}				12.85							

				Total- A	**226.05**							

B.	**FIXED COST**											
1	Salaries including Benefits				15.75							
2	Depreciation				12.40							
3	Repairs, Maintenance and Insurance				5.31							
4	Administatrive Expenses				1.57							
5	Selling Expenses {Fixed Cost (Salary+Travelling Exps. etc.)}			50%	12.04							

				Total- B	**47.08**							

C.	Sales Realisation			**"C"**	321.20							
D.	Contribution (C-A)			**"D"**	95.15							
E.	**Break - Even Point (B/D)**				**49.47%**							
F.	**BEP** in Terms of Installed Capacity				**39.58%**							
	==========	=========	========	==========	========	=========						

ANNEXURE- F.10

COMPUTATION OF INTEREST & REPAYMENT SCHEDULE OF TERM LOAN

(Rs. in Cr.)

Year	Month	Loan	Monthly Repayment	Balance Loan	Monthly Interest (@ 10.50% Per Annum)
First	1	140.00	0.00	140.00	1.23
	2	140.00	0.00	140.00	1.23
	3	140.00	0.00	140.00	1.23
	4	140.00	0.00	140.00	1.23
	5	140.00	0.00	140.00	1.23
	6	140.00	0.00	140.00	1.23
	7	140.00	1.56	138.45	1.21
	8	138.45	1.56	136.89	1.20
	9	136.89	1.56	135.34	1.18
	10	135.34	1.56	133.78	1.17
	11	133.78	1.56	132.22	1.16
	12	132.22	1.56	130.67	1.14
		Total	**9.33**	-	**14.41**
Second	1	130.67	1.56	129.11	1.13
	2	129.11	1.56	127.56	1.12
	3	127.56	1.56	126.00	1.10
	4	126.00	1.56	124.45	1.09
	5	124.45	1.56	122.89	1.08
	6	122.89	1.56	121.34	1.06
	7	121.34	1.56	119.78	1.05
	8	119.78	1.56	118.22	1.03
	9	118.22	1.56	116.67	1.02
	10	116.67	1.56	115.11	1.01
	11	115.11	1.56	113.56	0.99
	12	113.56	1.56	112.00	0.98
		Total	**18.67**	**-**	**12.66**

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	Third 1	112.00	1.56	110.45	0.97							
	2	110.45	1.56	108.89	0.95							
	3	108.89	1.56	107.34	0.94							
	4	107.34	1.56	105.78	0.93							
	5	105.78	1.56	104.22	0.91							
	6	104.22	1.56	102.67	0.90							
	7	102.67	1.56	101.11	0.88							
	8	101.11	1.56	99.56	0.87							
	9	99.56	1.56	98.00	0.86							
	10	98.00	1.56	96.45	0.84							
	11	96.45	1.56	94.89	0.83							
	12	94.89	1.56	93.34	0.82							
		---	---	---	---							
		Total	**18.67**	**-**	**10.70**							
		---	---	---	---							
	Forth 1	93.34	1.56	91.78	0.80							
	2	91.78	1.56	90.22	0.79							
	3	90.22	1.56	88.67	0.78							
	4	88.67	1.56	87.11	0.76							
	5	87.11	1.56	85.56	0.75							
	6	85.56	1.56	84.00	0.74							
	7	84.00	1.56	82.45	0.72							
	8	82.45	1.56	80.89	0.71							
	9	80.89	1.56	79.33	0.69							
	10	79.33	1.56	77.78	0.68							
	11	77.78	1.56	76.22	0.67							
	12	76.22	1.56	74.67	0.65							
		---	---	---	---							
		Total	**18.67**	**-**	**8.74**							
		---	---	---	---							
				CONTD. ...ANNEXURE- F.10								
	Fifth 1	74.67	1.56	73.11	0.64							
	2	73.11	1.56	71.56	0.63							
	3	71.56	1.56	70.00	0.61							
	4	70.00	1.56	68.45	0.60							
	5	68.45	1.56	66.89	0.59							
	6	66.89	1.56	65.33	0.57							
	7	65.33	1.56	63.78	0.56							

	8	63.78	1.56	62.22	0.54							
	9	62.22	1.56	60.67	0.53							
	10	60.67	1.56	59.11	0.52							
	11	59.11	1.56	57.56	0.50							
	12	57.56	1.56	56.00	0.49							
		---	---	---	---							
		Total	**18.67**	**-**	**6.78**							
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	Sixth 1	56.00	1.56	54.45	0.48							
	2	54.45	1.56	52.89	0.46							
	3	52.89	1.56	51.33	0.45							
	4	51.33	1.56	49.78	0.44							
	5	49.78	1.56	48.22	0.42							
	6	48.22	1.56	46.67	0.41							
	7	46.67	1.56	45.11	0.39							
	8	45.11	1.56	43.56	0.38							
	9	43.56	1.56	42.00	0.37							
	10	42.00	1.56	40.45	0.35							
	11	40.45	1.56	38.89	0.34							
	12	38.89	1.56	37.33	0.33							
		---	---	---	---							
		Total	**18.67**	**-**	**4.82**							
		---	---	---	---							
	Seventh 1	37.33	1.56	35.78	0.31							
	2	35.78	1.56	34.22	0.30							
	3	34.22	1.56	32.67	0.29							
	4	32.67	1.56	31.11	0.27							
	5	31.11	1.56	29.56	0.26							
	6	29.56	1.56	28.00	0.25							
	7	28.00	1.56	26.44	0.23							
	8	26.44	1.56	24.89	0.22							
	9	24.89	1.56	23.33	0.20							
	10	23.33	1.56	21.78	0.19							
	11	21.78	1.56	20.22	0.18							
	12	20.22	1.56	18.67	0.16							
		---	---	---	---							
		Total	**18.67**	**-**	**2.86**							
		---	---	---	---							
	Eight 1	18.67	1.56	17.11	0.15							
	2	17.11	1.56	15.56	0.14							
	3	15.56	1.56	14.00	0.12							
	4	14.00	1.56	12.44	0.11							
	5	12.44	1.56	10.89	0.10							
	6	10.89	1.56	9.33	0.08							
	7	9.33	1.56	7.78	0.07							
	8	7.78	1.56	6.22	0.05							
	9	6.22	1.56	4.67	0.04							
	10	4.67	1.56	3.11	0.03							
	11	3.11	1.56	1.56	0.01							
	12	1.56	1.56	0.00	0.00							
		---	---	---	---							
		Total	**18.67**	**-**	**0.90**							

ANNEXURE -F.11

RATIO ANALYSIS

(Based on 4th Year of Operation)

(Rs. in Cr.)

1	Fixed Assets-Sales Ratio (Sales/Fixed Asset)	1.95	: 1
2	Gross Profit-Turnover Ratio (Gross Profit/Turn Over)	0.30	: 1
3	Cash Flow Ratio (Cash From Operations/Turn Over)	0.15	: 1
	{Cash From Operations = Net Profit+Depreciation}		
4	Cash-Asset Ratio (Cash From Operations/Fixed Assets)	0.29	: 1
5	Debt-Equity Ratio (Debt/Equity)	**2.33**	: 1
6	Break-Even Point {Semi-Variable Cost/(Sales-Variable Cost)}	**39.58%**	
7	Internal Rate of Return **(IRR)**	**19.92%**	

ANNEXURE-F-12

INTERNAL RATE OF RETURN

(Rs in Cr.)

	Project Implementation Period	I	II	III	IV	V	VI	VII	VIII	IX	X
Cash Outflow											
Project Cost (A)	185.46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Increase in Margin Money (B)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total (A) + (B)	**185.46**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Cash Inflow											
Profit After Tax (A)	0.00	7.87	14.90	28.41	32.27	31.74	30.43	29.17	27.93	27.93	27.93
Depreciation (B)	0.00	12.40	12.40	12.40	12.40	12.40	12.40	12.40	12.40	12.40	12.40
Interest on Term Loan	0.00	14.41	12.66	10.70	8.74	6.78	4.82	2.86	0.90	0.00	0.00
Less: Tax shield on interest	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net Interest (C)	0.00	14.41	12.66	10.70	8.74	6.78	4.82	2.86	0.90	0.00	0.00
Release of Margin Money (D)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Release of Fixed Assets (E)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	**0.00**	**34.69**	**39.96**	**51.51**	**53.41**	**50.92**	**47.65**	**44.43**	**41.23**	**40.33**	**40.33**
Net Cash Inflow	-185.46	34.69	39.96	51.51	53.41	50.92	47.65	44.43	41.23	40.33	40.33
Discounting Rate	12%										
NPV	-165.59	34.69	39.96	51.51	53.41	50.92	47.65	44.43	41.23	40.33	40.3
IRR	**19.92%**										

ANNEXURE –T. 10

SCHEDULE OF IMPLEMENTATION

S. No.	Activity	Time Schedule in Months *w.e.f.* Disbursement of First Installment of Term Loan										
		0-2	03-04	05-06	07-08	09-10	11-12	13-14	15-16	17-17	18-18	19-19	20-20
01.	Transfer of Land												
02.	Appointment of Project Management Consultant												
03.	Deployment of Administrative Staff												
04.	Clearances, Permissions and Approvals												
05.	Site Development & Construction of Boundary Wall												
06.	Construction of Roads, Culverts, Surface Drains, Closed Drains, Service Ducts, Road Side Electrification, Parking and Development of Green Belt												
07.	Construction of Buildings, Water Supply System, Parking Bay and Rain Water Harvesting System												
08.	Selection & Ordering of Plant & Machineries												
09.	Delivery of Plant & Machinery												
10.	Erection & Commissioning												
11.	Electrification Work and Power Supply System												
12.	Construction of Effluent Treatment Plant (ETP) AND Solid Waste Handling Area												
13.	Test & Trial Run												
14.	Commercial Production												