FEASIBILITY REPORT

(PROJECT FEASIBILITY REPORT)

O N

MAIZE AND ITS BYE PRODUCTS

INDENTIFICATION & EVALUATION DIVISION FOR HI-TECH PROJECTS

ENGINEERS INDIA RESEARCH INSTITUTE

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C A U T I O N

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MAIZE AND ITS BYE PRODUCTS

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INTRODUCTION

Starch Industry in India

Starch is an abundant carbohydrate distributed worldwide in plants. Starch has been a major ingredient in man's diet over the centuries. In addition it has become a major industrial raw material. Plant seeds, roots and tubers are all sources of industrial starch production. The commercial realities of the starch recovery process limit the industrial sources mainly to wheat, maize and tapioca. Indian starch industry mainly consumes maize as input raw material.

Also some industries are tapioca based.

Maize is doing wonderful things in our everyday life. Maize is present in one form or other in

The Food we eat
The Milk we drink
The Chocolates/Biscuits we take
The Clothes we wear
The Paper we read
The Medicines we take

Maize (Corn) contains about 70% starch, other components being protein, fibers and fat. The basis of the maize milling process is the separation of the maize kernel into its different parts. Maize starch is produced by the wet milling process, which involves grinding of softened maize and separation of corn oil seeds (germs), gluten (proteins), fibers (husk) and finally pure starch.

Byproducts from Maize

The byproducts from maize based industries find various applications:

i. **Maize(Corn) Steep Liquor** : It contains amino acids, proteins and are used by antibiotics drugs manufacturers. Also it is a large source of biogas, which is being used as fuel for driers, boilers etc.

ii. **Maize Gum** : Corn Oil is produced by expelling oil from the germs. Corn Oil finds applications in food and other chemical industries. Maize oil cake obtained after expelling oil is used as cattle and poultry feeds.

iii. **Maize Gluten** : Maize Gluten contains high protein content and it is used as cattle and poultry feeds.

iv. **Maize Husk** : It contains starch, protein and fat as minor components and mainly consumed as cattle feed.

1.0 Starches

Starch is a group of polysacchrides, composed of glucopyranose units joined together by-glucosidric linkages. It conforms to the molecular formula, (C6-H10O5)u, where n varies from a few hundred to over one million. Starch is found as the reserve cerbonhydrate in various parts of plants and is enzymatically broken down to glucose to other carbohydrates according to the metabollic needs of the plants.

Industrially, starch is broadly divided into two types viz, natural and modified. Natural starches, also designated as unmodified starches or simpluy starches, are obtained from grains such as and sorghum. from roots like potato, tapioca and arrow root, and from the pith of the stems of certain palms such a sago. They are further classified into cereal starches and root starches. The characteristics of the natural starches are changed by chemical or enzymatic action and the products of these reactions are termed modified starches. This group includes dextrins, acid-modified starches, oxidized starches, starch esters, starch ethers, dialdehyde starches, and cationic starches.

1.1 Natural Starches

Starch occurs naturally in the plants and its percentage varies with the plant and also in different parts of the same plant. Corn (maize) sorghum grain wheat, rice, potato, tapioca, arrowroot and sago are among the important sources of natural starches. The grains of barley, rye, oat, and the millets are also employed in the production of starches.

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1.2 Tapioca

The roots of tapioca plant (manihot utillissimax) froms one of the major sources of starch, ranking next to potato in the comimption by starch industry. Tapioa plant, also know as cassava and manioc, thrives in equatoraial regions between the Topic of Capricorn. There are as many as seventy five varieties of cassava plant of which two varieties viz., bitter and sweet are widely ultivated; the bitter is usually grown for the purposes if the manufacture of starch, as it contains a higher content of starch. The starch content of the plant varies between 12 and 33 per cent. The ratio of the percentage of any lase to amylopection has been found to be 16:84. More than hal of the total world arreage under tge cultivation of cassava is confined to the African countries such as Gambia, Ghana, Kenya, Mauritius, Nigeria, Zamibia, Nyssaland, Sierra Leone and Zanzibar and the rest come from the tropical regions of other continents.

1.3 Cereal Starches

The cereal starches ,such as maize wheat, rice and sorghum, are recovered by several processes, of which the wet-milling is by far the most important. Other processes commercially employed in the manufacture of unmodified starches are that alkali, Martin and batter in the order of decreasing importance. Of the material methods earlier used for the production of starch and which have now become obsolete, mention may be made of the Hakka, Alsation and Fescas processes. In all the above processes, Starch is recovered in five stages:

a) Softening or steeping of the grains, after thorough washing in water.

b) Tabling or centrifugation of the ground mass.

c) Dewatering and drying of the final products.

d) The recovery of important by products.

1.4 Raw Materials

The principal raw materials, used by the Indian Starch Industry are maize and tapioca.

1.4.1 Maize

Maize is grown in Uttar Pradesh, Bihar, Rajasthan, Punjab, Madhya Pradesh, Himachal Pradesh , Gujarat, Jammu and Kashmir, Andhra Pradesh, Mysore, and Haryana.

1.4.2 Sorghum Grains

Known as jowar in India, this material is widely cultivated in Mysore, Maharashtra, Madhya Pradesh, Andhra Pradesh, Rajasthan, Tamil Nadu, Gujarat, Uttar Pradesh, Orissa and Punjab

1.4.3 Bajra

Bajra is cultivated in Rajasthan, Gujarat, Uttar Pradesh, Haryana, Maharashtra, Tamil Nadu, Andhra Pradesh, Mysore, Punjab and Madhya pradesh .

1.4.4 Small millets

This group comprises French millets (Panicum milliaceum), little millets (Panicum miliare), Italian nillet (Setaria italica) and other millets from Echinochloa crus-galli, E.frumenaceum, and paspalum scrobiculatum. Small millets are cultivated in an area of 4,732,00 hectors, distributed in the states of Madhya Pradesh, Tamil Nadu, Uttar Pradesh, Andhra Pradesh, Gujarat, Bihar, Mysore, Maharashtra, and Rajasthan.

1.4.5 Wheat

It is one of the principal food grains of India. It is cultivated chiefly in Uttar Pradesh, Punjab, Gujrat, Maharashtra, Rajasthan, Bihar, Harayna, and Himachal Pradesh. respectively .

1.4.6 Chemicals

The important chemicals used by the starch industry are hydrochloric acid, sulphuric acid, soda ash , sulphur and activated carbon and all these are manufactured in the country

1.4.7 Tamarind Seed

Tamarind trees (Tamarindus indica) are found natur alized almost throughout the plains and sub- Himalayan tracts of India. The pulp of tamarind fruits, known as imli, is used as an acid flavoring agent. The seeds constitute 34 percent starch of the fruits and contain on an average 60 percent starch, Statistical information on the annual production of fruit pulp and seeds is not available.

MARKET SURVEY

Growth in processed food industry vis-a-vis starch industry

The processed food industry is mainly unorganized with 75% of the processing units belonging to the unorganized category, the organized category though small, is growing fast. The food production is expected to double in the next 10 years and the consumption of value-added food products is expected to grow at a much faster pace. The share and growth of value-added products is likely to be higher going forward as companies in the processing sector opt for higher margin products on ample supply of raw materials used for starch for food additives.

The Indian organized starch industry has an estimated size of around Rs 3,500 crore. The Indian starch Industry is predominantly based on corn, with negligible usage of wheat. Out of more than 1,000 downstream applications of starch, 40 have been commercialized in India. With companies globally focusing on innovations in their product portfolio through R&D, the demand for starch sweeteners and other derivatives has picked up in a number of industries in India as well as in the international markets. During the period 2011-12, the Indian starch industry grew at a CAGR of 21.8%; while starch demand grows at around 5% per annum.

Gujarat with a strong agricultural base, 3.6 million hectares of irrigated land and well developed agro research capabilities is well positioned to drive the growth of food processing industry. Gujarat offers a large number of incentives to set up food processing units. Hassle-free policies such as single window clearance, a strong agricultural marketing network with over 200 Agriculture Produce Marketing Committees (APMCs) and over 110 cold storages are some of the enablers that have facilitated the rapid growth of this industry. The state also provides financial incentives by offering interest subsidies to agro-industrial units and air & sea freight subsidies for agro exports.

Starches, modified starches and their application find great relevance in the rapidly developing and growing Indian food processing industry. The demand is likely to grow in coming years with already established mega food parks and upcoming projects in India. To tap opportunities in this industry, Anil Ltd has formed SPV for setting up Gujarat's first mega food park. In the first quarter of 2011-12, Ministry of Food Processing Industries (MoFPI), Government of India, allotted the project of establishing mega food park at Savli near Vadodara to this SPV.

Starch and Glucose are reserved cargohydrates of plants and are therefore widely distributed in their crude from. They can be found in almost all fruits, vegetables and crons. There is no definite information as to how they were initially obtained . But different countries are known to be using different agricultural sources for production of starch. While Japan and thr Europan countries produce starch from potatoes, Amerada from corn, countries like Thailand, and Brazil are understood to be producing starch mainly from tapioca. In the case of India, starch is being produced form Maze as well as tapioca. While the units producing starch from maize are concentrated in the large sector, the units producing starch from tapioca are by ad large concentrated in the small scale sector.

Commercially glucose is produced from starch only and these two products are generally made in the same unit side by side.

The objective of this article is to discuss the present status, imports, exports and also the future prospects for both starch as well as liquid glucose.

All-India Area, Production and Yield of Maize alongwith coverage under Irrigation

Area - Million Hectares
Production Million Tonnes
Yield - Kg /Hectare

Year	Area	Production	Yield	Area Under Irrigation(%)
1	2	3	4	5
2002-03	6.64	11.15	1601	19.5
2003-04	7.34	14.98	2041	19.1
2004-05	7.43	14.17	1907	20.5
2005-06	7.59	14.71	1930	21.1
2006-07	7.89	15.10	1912	21.5
2007-08	8.12	18.96	2335	23.5
2008-09	8.17	19.73	2414	25.2
2009-10	8.26	16.72	2024	NA
2010-11*	8.49	21.28	2507	NA
2011-12**	7.27	15.86	2181	NA

* Fourth Advance Estimates as released on 19.07.2011.

**First Advance Estimates released on 14.09.2011.

Note : The yield rates given above have been worked out on the basis of production & area figures taken in '000 units.

Source: Directorate of Economics and Statistics, Department of Agricu

Area, Production and Yield of Maize during 2009-10 and 2010-11 in major Producing States alongwith coverage under Irrigation

Area - Million Hectares
Production - Million Tonnes
Yield - Kg./ Hectare

State	2010-11					2009-10					Area Under Irrigation(%) 2010-11*
	Area	% to All - India	Production	% to All - India	Yield	Area	% to All - India	Production	% to All - India	Yield	
1	2	3	4	5	6	7	8	9	10	11	12
Karnataka	1.24	15.01	3.01	18.02	2430	1.07	13.08	3.03	15.35	2833	41.3
Andhra Pradesh	0.78	9.48	2.76	16.52	3527	0.85	10.42	4.15	21.04	4873	49.4
Maharashtra	0.79	9.61	1.03	10.30	2302	0.66	8.01	1.56	7.91	2382	14.7
Bihar	0.63	7.65	1.48	8.84	2341	0.64	7.84	1.71	8.69	2676	60.6
Rajasthan	1.10	13.28	1.15	6.85	1044	1.05	12.88	1.83	9.27	1736	1.9
Tamil Nadu	0.24	2.96	1.14	6.84	4686	0.29	3.61	1.26	6.37	4389	47.9
Madhya Pradesh	0.83	10.07	1.05	6.25	1268	0.81	10.29	1.11	5.60	1381	1.8
Uttar Pradesh	0.71	8.58	1.04	6.21	1460	0.80	9.76	1.20	6.07	1499	34.5
Himachal Pradesh	0.30	3.58	0.54	3.25	1839	0.30	3.64	0.68	3.43	2273	8.8
Gujarat	0.50	6.02	0.53	3.19	1072	0.50	6.10	0.74	3.75	1481	9.6
Jammu & Kashmir	0.31	3.76	0.49	2.91	1566	0.32	3.86	0.63	3.21	2006	7.3
Punjab	0.14	1.68	0.40	2.41	3117	0.15	1.86	0.51	2.60	3404	61.6
West Bengal	0.10	1.18	0.39	2.30	3943	0.09	1.11	0.34	1.74	3782	17.4
Jharkhand	0.16	1.98	0.19	1.14	1165	0.22	2.64	0.30	1.54	1407	2.4
Others	0.43	5.17	0.65	3.88	@	0.41	4.96	0.64	3.23	@	
All India	8.26	100.00	16.72	100.00	2024	8.17	100.00	19.73	100.00	2414	25.2

@ - Since area/ production is low in individual states, yield rate is not worked out.

Note: States have been arranged in descending order of percentage share of production during 2010-11.

* Provisional

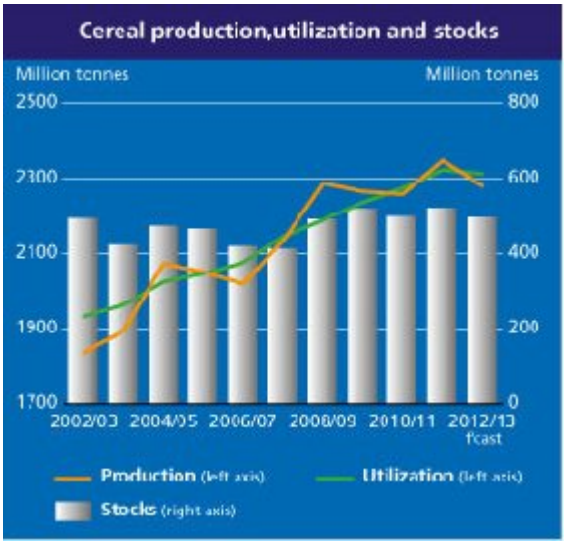
Source: Directorate of Economics and Statistics, Department of Agriculture and Cooperation.

UPPLY & DEMAND: MAIZE*

Million tons

	Opening stocks	Production	Imports	Total supply	Use: Food	Use: Industrial	Use: Feed	Use: Total a)	Exports	Closing stocks
TOTAL COARSE GRAINS										
2010/11	201.9	1,097.9	116.9	**1,299.8**	164.8	278.3	630.7	**1,127.2**	116.9	172.6
2011/12 *est.*	172.6	1,155.1	124.8	**1,327.8**	167.4	286.4	644.1	**1,156.9**	124.8	170.9
2012/13 *f'cast*	170.9	1,120.7	118.8	**1,291.6**	167.8	280.2	640.9	**1,143.5**	118.8	148.0
	(172.4)	*(1107.8)*		*(1280.1)*		*(277.6)*	*(627.6)*	*(1128.8)*		*(151.4)*
MAIZE										
Argentina (Mar/Feb)										
2010/11	1.7	22.7	0.0	**24.4**	0.3	1.4	4.5	**6.5**	16.0	1.9
2011/12 *est.*	1.9	23.8	0.0	**25.7**	0.3	1.4	4.7	**6.7**	15.7	3.3
2012/13 *f'cast*	3.3	21.0	0.0	**24.3**	0.3	1.5	5.0	**7.1**	16.5	0.8
2013/14 *f'cast*	0.8	27.5	0.0	**28.3**	0.3	1.8	5.5	**7.9**	19.5	0.9
		(26.0)		*(26.8)*					*(18.0)*	
Brazil (Mar/Feb)										
2010/11	7.7	56.0	0.4	**64.1**	3.8	0.6	40.1	**46.9**	11.5	5.6
2011/12 *est.*	5.6	57.4	0.8	**63.8**	3.8	0.8	42.0	**48.9**	8.4	6.6
2012/13 *f'cast*	6.6	73.0	0.5	**80.1**	3.9	1.3	43.2	**51.1**	21.0	8.0
2013/14 *f'cast*	8.0	71.0	0.4	**79.4**	4.0	1.7	45.0	**53.7**	18.0	7.7
	(10.0)		*(0.3)*	*(81.3)*						*(9.6)*
EU-27 (Oct/Sep)										
2010/11	7.8	55.8	7.5	**71.0**	4.2	11.0	46.7	**64.1**	1.0	6.0
2011/12 *est.*	6.0	66.0	6.3	**78.3**	4.2	12.0	50.0	**68.6**	3.0	6.7
2012/13 *f'cast*	6.7	54.2	10.5	**71.4**	4.2	13.5	46.7	**66.5**	0.8	4.1
		(53.6)	*(10.0)*	*(70.3)*		*(13.3)*	*(45.8)*	*(65.5)*		
South Africa (May/Apr)										
2010/11	3.7	13.4	0.0	**17.1**	4.3	0.1	5.1	**10.2**	2.1	4.8
2011/12 *est.*	4.8	10.9	0.3	**16.0**	4.3	0.1	5.4	**10.4**	2.4	3.2
2012/13 *f'cast*	3.2	12.0	0.0	**15.2**	4.3	0.1	5.4	**10.4**	1.8	3.0
2013/14 *f'cast*	3.0	13.0	0.0	**16.0**	4.3	0.1	5.5	**10.5**	2.5	3.0
	(2.7)			*(15.7)*						*(2.7)*
Ukraine (Oct/Sep)										
2010/11	0.7	11.9	0.0	**12.6**	0.4	0.3	5.2	**6.5**	5.0	1.1
2011/12 *est.*	1.1	22.8	0.0	**23.9**	0.4	0.3	6.0	**7.7**	15.1	1.1
2012/13 *f'cast*	1.1	20.9	0.0	**22.0**	0.5	0.3	6.2	**7.8**	13.2	1.0
		(20.0)		*(21.1)*			*(6.3)*	*(7.9)*	*(12.0)*	*(1.2)*
USA (Sep/Aug)							f)			
2010/11	43.4	316.2	0.7	**360.3**	5.0	157.8	121.7	**285.0**	46.6	28.6
2011/12 *est.*	28.6	313.9	0.7	**343.3**	5.2	157.7	115.5	**279.0**	39.2	25.1
2012/13 *f'cast*	25.1	273.8	2.5	**301.4**	5.1	143.3	113.0	**262.1**	24.1	15.3
		(272.4)		*(300.0)*			*(105.0)*	*(254.0)*	*(29.5)*	*(16.5)*
China (Oct/Sep)										
2010/11	50.3	177.2	1.0	**228.6**	6.8	45.0	115.0	**174.7**	0.1	53.8
2011/12 *est.*	53.8	192.8	5.3	**251.9**	7.0	50.0	126.4	**192.9**	0.2	58.8
2012/13 *f'cast*	58.8	208.0	2.0	**268.8**	7.2	56.0	136.5	**209.6**	0.2	59.0
		(198.0)		*(258.8)*		*(53.0)*	*(131.0)*	*(200.2)*		*(58.4)*
Japan (Oct/Sep)										
2010/11	0.8	0.0	15.7	**16.4**	1.1	3.3	11.0	**15.7**	0.0	0.7
2011/12 *est.*	0.7	0.0	14.8	**15.5**	1.1	3.4	10.2	**14.9**	0.0	0.6
2012/13 *f'cast*	0.6	0.0	14.9	**15.5**	1.1	3.4	10.1	**14.9**	0.0	0.6
WORLD TOTAL			g)						g)	
2010/11	145.4	829.6	93.3	**975.0**	95.7	242.0	474.9	**843.9**	93.3	131.1
2011/12 *est.*	131.1	876.9	96.8	**1008.0**	99.0	249.7	490.7	**875.4**	96.8	132.7
2012/13 *f'cast*	132.7	844.7	93.4	**977.3**	99.5	243.4	487.4	**864.6**	93.4	112.7
	(134.4)	*(830.1)*	*(93.8)*	*(964.5)*		*(240.4)*	*(475.6)*	*(849.0)*	*(93.8)*	*(115.5)*

Lower cereal production and stocks from last month while trade forecast raised



World cereal production in 2012 falls

FAO's latest forecast for world cereal production in 2012 has been revised downward marginally (2 million tonnes) since the November figure to 2 282 million tonnes (including rice in milled terms), 2.8 percent down from the previous year's record. This month's revision mostly reflects adjustments to maize output estimates in the Russian Federation and Ukraine, where figures became firmer towards the completion of the harvests, as well as reduced wheat production prospects in Australia and Brazil where the 2012 harvests are underway. Prospects for rice production in 2012 remained virtually unchanged. Based on latest figures, the overall decrease in world cereal output this year comprises a 5.7 percent reduction in wheat production and a 2.6 percent decline for coarse grains, which largely outweighed the marginal 0.9 percent growth expected in the global rice crop. Early indications for the winter wheat crops already planted in the northern hemisphere, to be harvested in 2013, are mixed, and somewhat less promising than one month ago. Although firm estimates are not yet available, latest information suggests that farmers generally responded to the incentive of high prices by increasing their winter wheat plantings. However, conditions remain adversely dry for emergence and crop establishment before dormancy in important producing regions of the United States and the Russian Federation, while in major producing parts of the EU, wet conditions have hampered fieldwork.

Total cereal utilization in 2012/13 down slightly from 2011/12

» World cereal utilization in 2012/13 marketing season is forecast at 2 314 million tonnes, nearly unchanged from the previous month and down slightly (0.4 percent) from the previous season. The anticipated reduction from 2011/12 would be on account of reduced feed use of wheat and industrial usage of maize. Total use of cereals for food consumption is forecast to rise by 1.3 percent in 2012/13, keeping pace with world population growth and therefore resulting in a stable per capita consumption of 152.6kg for the world as a whole. A slight increase foreseen in rice consumption (on per caput level) is expected to offset a small decline in wheat. As for the global utilization, in the case of wheat it is forecast to contract by 1.2 percent in 2012/13 to 686 million tonnes, reflecting a 5.8 percent cut in the use for wheat for animal feed from the previous season's all-time high to 138 million tonnes. Lower feed use of wheat in China (from a record in 2011/12) and the EU is expected to more than compensate for the significant (almost 4 million tonnes) increase in feed use of wheat in the United States, which could hit a new record because of elevated maize prices. Total utilization of coarse grains is also forecast down, by 0.8 percent, from the previous season, to 1 152.2 million tonnes. While feed use of coarse grains is likely to increase slightly (0.5 percent) to 638 million tonnes, its industrial application is seen to contract sharply, mainly reflecting a significant (10 percent) reduction in demand from the ethanol industry in the United States, the world's largest maize-based ethanol producer.

Falling wheat and coarse grain inventories against rising rice stocks

The latest forecast for world cereal stocks at the close of crop seasons ending in 2013 stands at around 495 million tonnes, down 5 percent (25 million tonnes) from their opening level. This forecast is slightly (0.6 percent) below the November figure, mainly because of revisions to wheat stock levels. At the current forecast level, the world cereal stock-to-use ratio is projected at 20.5 percent, down 2 percentage points from 2011/12 and only 1.7 percentage points above the 2007/08 low of 18.8 percent. World wheat inventories are expected to fall to 163 million, down 11 percent from their opening level and 2 percent (3 million tonnes) less than was reported in November. The revision since the previous month largely reflects lower anticipated inventories in China and India, more than offsetting a small increase in the United States. The sharp reduction from the previous season is mostly on account of reduced stocks in the CIS countries (because of disappointing harvests), China (driven by strong domestic use), the EU (following a decline in production) and the United States (reflecting a surge in domestic feed use). World inventories of coarse grains are forecast to exceed 161 million tonnes, 8 percent (15 million tonnes) less than their opening level and nearly unchanged from November. Most of the decline from the previous season reflects shrinking inventories in the United States, where total coarse grain inventories are projected down nearly 8.3 million tonnes while significantly lower (by 4.6 million tonnes) stocks are also forecast for the EU. By contrast, global rice inventories are expected to increase by 6.6 percent (10.5 million tonnes) to a record of nearly 170 million tonnes, unchanged from the previous month. This expansion reflects three consecutive years of record world production.

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Phone: 044-28228155/8204/28206420-22

V. RAJKUMAR, JT. M.D.
KAMALA SUGAR LTD
GOWTHAM CENTRE ANNEXE,
1054/14 & 15, 1ST FLOOR, AVAN
COIMBATORE-641018, TAMIL NADU
Phone:+91 422 572 132

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L N EXIM PVT LTD
108, TWIN ARCADE,
'C' ING, MILITARY ROAD,
MAROL, ANDHERI (E),
MUMBAI-400059, MAHARASHTRA
Phone: 912256924113/14/28503533/56205802/65205802
Email: lnexim@vsnl.net

MR RAJEEV NANDA
MAHALAXMI MAIZE PRODUCTS
C/69, 2ND FLOOR,
B G TOWER, SHAHIBAUG ROAD,
AHMEDABAD-380004, GUJARAT
Phone: 917925622134/25633854
Email: ravjeevnanda@hotmail.com

LIST OF MANUFACTURERS OF RAW MATERIAL-DEXTROSE

JAGDISH MACHINERIES PVT LTD
3, Sharada Industrial Estate,
Near Picker'S Factory,
Anil Starch Road ,Saraspur
Ahmedabad-380018, Gujarat
Phone: 079-2201455

S. V. Shanmuga Vadivelu, Director
RIDDHI-SIDDHI GLUCO-BIOLS LTD
701, Sakar - I, Off. Ashram Road
Ahmedabad-380006, Gujarat
Phone: +91 79 658 1000
Email: sdroy_rsgbl@rediffmail.com

SUKHJIT STARCH & CHEMICALS LTD
Sukhjit Road
Phagwara-144401, Punjab
Phone: +91 1824 261 516,
+91 1824 262 144, +91
Email: sukhjit@comeconnect.com
sukhjit@vsnl.com

UNIVERSAL PROCESS ENGINEERS
Plot A28/1/10, I.D.A, Nacharam
Hyderabad-500076, Andhra Pradesh
Phone: 040-7172573
Email: upe040@yahoo.com

UNIVERSAL STARCH CHEM ALLIED LTD
Mhatre Pen Bldg.,`B Wing , 2nd Floor,
Senapati Bapat, Marg Dadar (W)
Mumbai-400028, Maharashtra
Phone: 022-24300898
Email: usaltd@bom3.vsnl.net.in

MANUFACTURES OF STARCH AND ALLIED PRODUCTS

Maize Starch

Starch form maize is obtained by the wet milling process. The process involves cleaning of grains, steeping, milling, separation of jusk, germ and gluten, and drying the product. The grains received at the mills and magnitic separators to completely eliminate the extraneous mater present. The cleaned grain is stored in concrete silos.

The grain is stransported to steping vat by elevators and conveyors through a weighing machine. Warm mater containing a small amount of sulphur dioxide is circulated through the vats to loosen the husk and soften the gluten. During the steeping, a part of the soluble salts and proteins of the traisn get dissolved and when the lolid matter content of the water reaches percent at 6-10 ie it replaced by fresh steep water. Tweshed water is concentrated by evaporation and is used as cattle feed.

After steeping the softened grains are passed over vibrating screens to remove any adhering foreign matter and then ground in attrition mills consisting of two plates with producing teeth. The ground mass is passed in to wooden, V shaped, germs form the rest of the mass. The floating terms are skimmed over by sweep paddles, washed on screens dried and sent to the oil extraction Islant. The mixture of starch gluten, husks add fibre recovered at the bottom and sent to vibrating screens to eliminate excess water and soluble substances. IT is then thoroughly milled in fine grindes to fine sullry know as starch milk. The grinders may be either Buhror stone mills or preferably vertical mill make of stainless steel. The starch milk is processed in centrifuges to remove husk and fibre which are washed free of adhering starch in the counter current system and washing fed back to the main starch stream.

The resulting slurry is passed through high speed continuous centrifuges where the lighter glugen is separated form the heavier starch. In the first stae, the heavy starch layer is taped in such a way that least possible amount of starch goes in which the overflow of guluten, thus maintaining gluten purity. In the latter stages the processed is reversed to ensure the purity of the starch. The gluten form the first stage is concentrated and pressed into cake. The glutenous starch form the latter stages is fed back to the main stream at the husk sepration stage. The deglutenized starch milk is dewatered in a perforated bucket centrifugal machine to a moisture content of about 30-36 percent. It is flash-dried and packed or passed on to other division for the manufacture of starch derivaties (Information form the anil Starch products at Ahamedabad).

TAPIOCA STARCH

In raw tapioca tuber amount 20-30 percent of the weight account for starch while the remainder is make up of fibre, water other carbohydrates and proteins. The method of extracting tapioca starch is essentially similar to the maize starch. It is however comparatively simpler owing to relatively Small amount of secondary substances in tapioca. To obtain a good product, processing of tapioca tube after digging should be accomplished within the shortest possible period to avoid the enzymic activity.

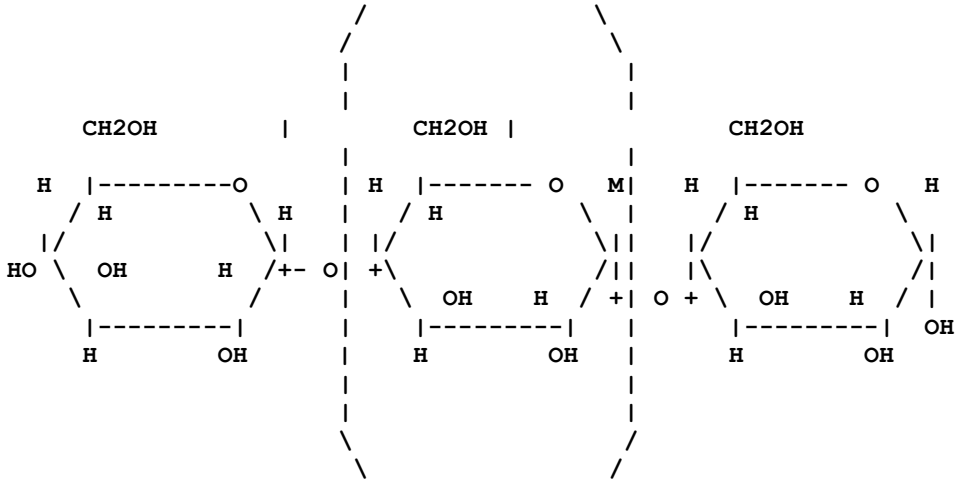
The method involves peeling resping strining recovery of starch granules and drying. In small units, the tubers are peeled by land and then washed in water. In large units whole roorsare processed in compartment washer consisting of perforated tank equipped with water jets and horizontal shaft with paddles to agitate then tubers.

Here the roots are thoroughly agitated and washed with water to all the direct and a good portion of the peel are removed. In small scale units rasping is done by pressing the tubers against harp protection of a wheel grater operated by hand treadly or machine. Large units use John resper, a machine consisting of a rotor fitted with several saw blades; the shape and number of teeth on each blades determines the efficiency of separation of starch granules. The percentage of starch set free by rasping determines to a large extent the commercial success in the manufacturing of starch.

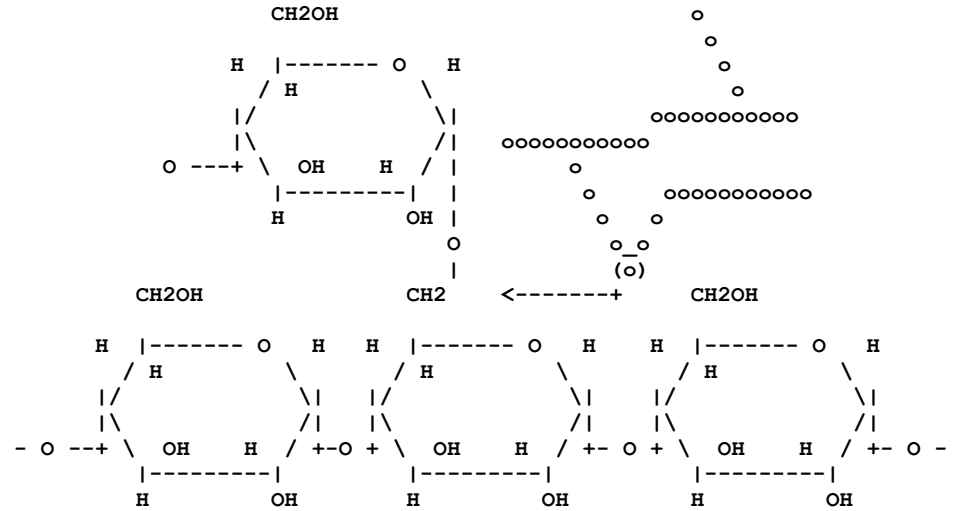
The rasped material is strained with water to liberate the tarsh granules form athe fibrous residues. In the small units this is done by squeezing in coarse bages or frames fitted with violuor mill (Cotton fabric). In large units the diluted pulpis passed through a battery of rotating and shaking screens of increasing fineses (80-200). The residue on the first screen is returned for a second rasping.

The starch milk obtained by straining is treated for the recovery of starch granules in various way. Pot settling is in vogues in cottage industries while setting on table in common in small scale units. In large units, this operation is carried out rapidly by mans of centrifugal separators and purifiers. The starch sullurry obtined by settling is then partly dewatered on centrifuges and vacuum filters. Final drying of starch is done in chamber kiln or flash driers working of steam or hot air, In small units it is sun-rivers working on steam or hot air. In the small units it is sun dried. If in lump form the dried starch is pulverized and bolted (dry screening) before packing (Information form the laximi starch factory Ltd, Kundara).

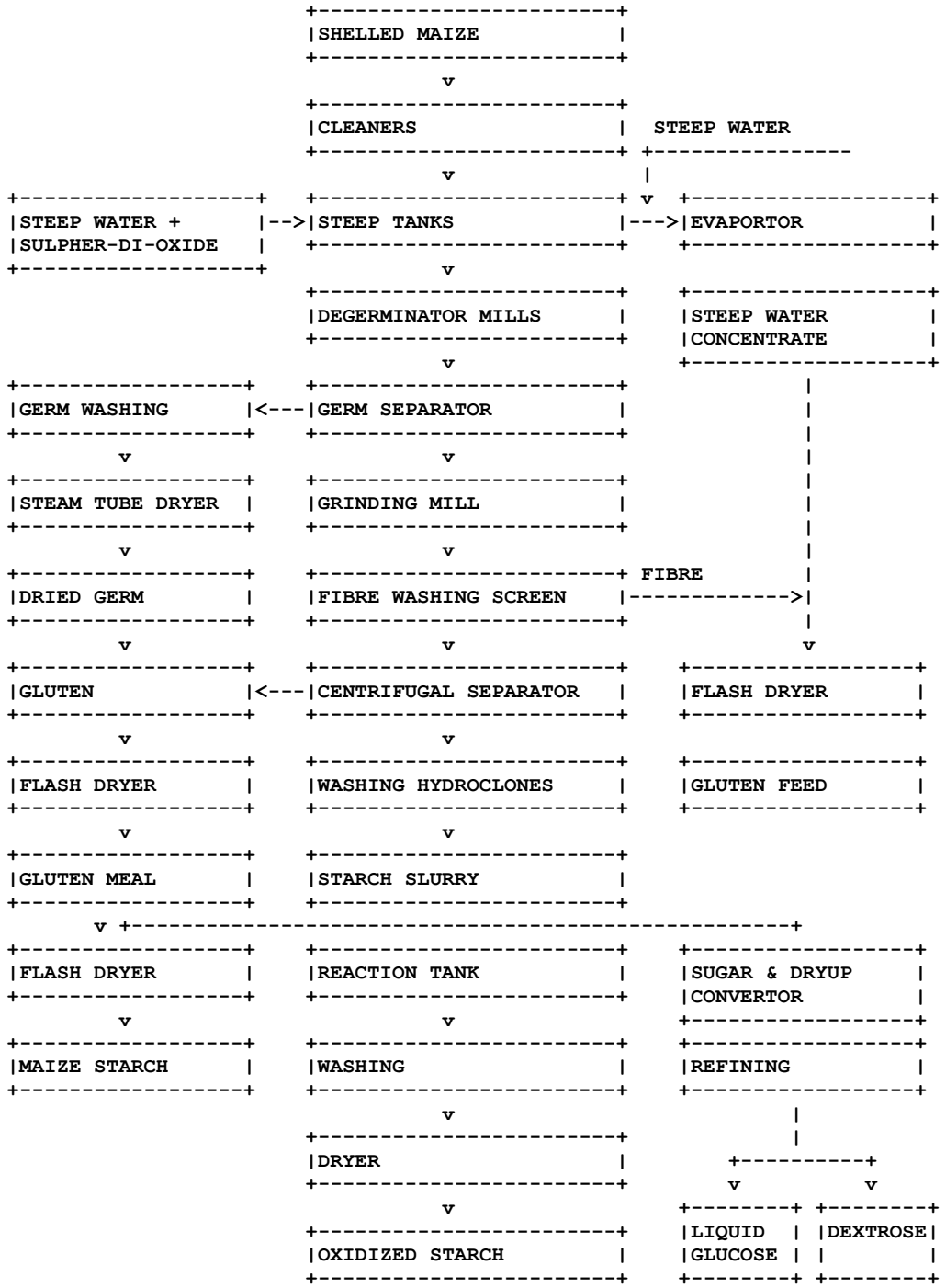
AMYLOSE MOLECULE OF STARCH
TABLE NO.2.1



AMYLOPECTIN MOLECULE



PROCESS FLOW DIAGRAM FOR THE MFG. OF STARCH



MANUFACTURING PROCESS FOR LIQUID GLUCOSE-G

The raw materials required for the manufacture of glucose are starch and mineral acid; Amylolytic enzymes may also be use for starch hydrolysis. The conversion of starch to glucose takes place through a series of steps in which carbohydrates of progressively decreasing complexity-soluble starch, dextrims like amylo dextrin, erythro dextrin and achro-dextrin, maltose and dextrose- are formed. The composition of the hydrolysate is determined largely by the concentration and temperature of the acid used for catalysing the hydrolysis. For the manufacture of glucose a starch suspensions in water containing 35-40% starch is mixed with sufficient hydrochloric acid to give a concentration of 0.012 to 0.02N acid in the final mixture and heated in an autoclave to a temperature of 140-160. The product is held at this temperature for 15-20 minutes. The reaction mixture is tested with iodine and if not starch is present, as indicated by the colour test the pressure is released and the liquit transferred to a meutralizing tank. The acid is neutralized with soda ash. Proteins fats, fatty acids, and colloidal material are coagulated by adjusting the PH to 4-3. The mixture is passed through a filter press, the filtrate is decolourised by activated carbon and the clear filtrate clear filtrate concentrated in a triple offect evaporator. Treatment with activated carbon is repeated and the liquid further concentrated in a vacuum pan. The concentrated syrup (40-45~ Be) is quickly cooled and tranferred to drums. The product obtainned contains 43% dextrosion dry basis. Glucose is prepared also by enzymic conversion of starch or by a combination of acid conversion, neutralisation and enzymic conversions (U.S. Patent 2,201,609 of 1940)

RAW MATERIALS

The principal raw materials required for the manufacture of glucose is starch. Excepting glucose and foods Ltd. who purchase their requirement of maize starch, other factories utilize upto 20% of their any productions of maize starch. Maize was being imported from U.S.A. for making starch but the price of maize was reported to be somewhat higher than that of imported starch. Efforts have been made to use indigenous tapioca starch as the raw material. In fact Kamla Sugar Mills Ltd. have attempted to utilize only tapioca starch for the manufacture of dextrose.

The manufacturing process employed in India is the same as that in use in other countries. Maize starch is suspended in water and cooked after adding hydrochloric acid, in a converter under a pressure of 30 lbs/inch. For 15 minutes the hydrolysis is interupted when a test sample of the hydrolysate fails to give a blue coluration with codine. The pressure is released and the charge run into a wooden vat, where it is neutralised with a solution of soda ash and the reaction adjusted to the Iso electric point to coagulate colloidal impurotoes. The liquor is filtered decolorized with activated carbon and filtered again. The filtraaaataea (20~ Be) is concentrated to 30-32 Be under vacuum , when all inorganic salts other than sodium chloride precipitate out. The syrup is treated with activated carbon, filtered, and concentrated to 45 Bc. It is their cooled packed in steel drums of or in galvanised tin containers of 56 lb capacity. Both ordinary and B.P. liquied glucose are manufactured in India. The former contains 43-44% reducing sugars (estimated at dextrox) the B.P. product contains 43-47% reducing sugars. The quality of indegenous liquid glucose is reported to be satisfactory through there appears to be scoot for improvement.

CONFECTIONERI GLUCOSE-D:

Confectionery glucose, otherwise known as syrup (when derived from maize) crystal syrup, commercial glucose is a highly viscons, slightly sweet and colourless substance. It is produced in a wide range of beame densities, 26~ - 45~ approximately, and an equally comprehensive range of dextrox equivalent, or D.E. of glucose syrup is a factor, calculated on a dry basis which proxide asguide as to the amount of dermantable sugars present liquid glucose is chefly derived from maize, and, to a lesson degree potato starches.

The process of manufacture is based on hydrolysis of a refirmed starches under several atomspheres of pressure in the pressure in the presence of a minute quantity of chemically pure hydrochloric acid. The hydrolysed syrup is neutralised and purified with the aid of animal or and activated carbon. This carbon treatment is amlogous to the methods used in the refining of cane or beet sugar.

The degree of hydrolysis of liquid glucose is closely controlled, and modified to produce a final syrup possessing the required dextrox equivalent the beaume density is of course dependant or the degree of evaporation in vacus.

Normal liquid glucose contains simply expressed dextrox maltox dextrin and water and has the following approximate analytical characteristics, at 43~ Be density.

1. Water	17.7
2. Dextrox and maltose expressed as dextrose d.b.	35.0
3. Ash	0.40
4. Polysaecharides	46.85
5. Sulphur Dioxide	0.03

Under the food and Drugs. Regulations, liquid glucose is permitted to contain a maximum of 450 parts per million sulphur dioxide as a preservative, actually in peroxide practice it contains approximately 350-400 p.p.m.

Liquid glucose may classified into four main groups based on the degree of conversion, and sub-divided by the method of convention into a further two groups, i.e. single conversion and dual conversion. The difference between the two methods is that an additional converting agent, an appropriate enzyone, is employed after the single acid conversion process has taken place, hence the term "dual".

LOW CONVERSION:

Syrups of a D.E. of less than 40 are considered 1000 conversion types.

REGULAR CONVERSION

The Next D.E. range, from 40-49, includes liquid glucose of the type normally used the syrups in this range contain 62-63% total sugars on a dry solids basin, and are usually offered at D.E. 42.

INTERMIDIATE CONVERSION

These syrups are in the 50-57 D.E. range and are produced by single and dual conversion. The total sugar solids are of the order of 70.3 - 78.3%

HIGH CONVERSION

These glucose syrups fall in the D.E. 58.64 and over range the total sugar solids are 84 - 87.8%. They contain the smallest proportion of polysaocharides, and have the highest fluidity, hence their humectant characteristics. The manufacture of liquid glucose, a highly complex substance, is subject to the most exating production and analytical control so that it will perform its proper function of granulation inhibition prolongatcori of shelf life, and several other essential effects in the sugar confectionary field.

TURNKEY CONSULTANT FOR SETTINGUP MAIZE PROCESSING UNIT

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Tele/ Fax: 91 22 25277428
mail to : starchchem@vsnl.net

List of some starch processing industries

- Sukhjjit Starch & Chemicals Ltd., India.
- Bharat Starch & Chemicals Ltd., India- Thaper Group.
- Rajaram Brothers, India.
- K.G.Gluco Biols Ltd., India-Joint Venture Glaxo (India) & Karnataka State Industrial Development Corporation.
- Kashyap Sweetners Ltd., India.
- Anil Starch Products Ltd., India.
- Laxmi Starch Ltd., India.
- Sahyadri Starch & Auxichem Pvt.Ltd., India.
- Shri Devji Agro Industries Pvt.Ltd., India.
- Gayatri Starchem Industries Ltd., India.
- Wave Industries., India.
- Shri Sangam Glucose Ltd., Pune, India

COMPLETE PLANT AND MACHINERY SUPPLIERS FOR STARCH (MAIZE)

Sifter International
Corporate Office :
Plot No. 227, Sector - 24,
Faridabad- 121005, Haryana (INDIA)
Phone :+91-129-4060039 / 2234540
Telefax : +91-129-2230039
E-mail : sifter@ndb.vsnl.net.in

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Fax 91-40-27179701
Contact Person Mr. SYED ISMAIL (Managing Director)
Mobile +919849052100

SUPPLIERS OF RAW MATERIALS

HYDROCHLORIC ACID

Hind Enterprises
10/ 12, Narayan Niwas, Office No. 10,
3rd Floor, Opposite Edward Cinema,
Jamboolwadi, Kalbadevi Road,
Mumbai - 400002, Maharashtra, India
Phone: +(91)-(22)-22058743
Website: http://www.hindenterprises.net/

Lords Chloro Alkali Limited
A-263, IInd Floor, Defence Colony,,
New Delhi - 110 024, Delhi, India
Phone: +(91)-(11)-46865999
Website: http://www.lordschloro.com/

Water Care Technology
L-121/122, Ground Floor,
Phase 2,, New Delhi – 110001
Phone: +(91)-(11)-27512220
Preferred Number: 08373902939
Website: http://www.swimmingpoolexpertindia.com/

SULPHURIC ACID

Triveni Chemicals
No. 135, Pancharatna Char Rasta,
G. I. D. C., Vapi, Gujarat - 396 195, India
Phone: +(91)-(260)-6618618
Fax: +(91)-(260)-6618624
Mobile / Cell Phone: +(91)-9227788155
Website: http://www.trivenichemical.com/chemicals-by-alphabet-s.html

Surya Fine Chem
C/102 Sai Grece, Near Eagle Hotel
PCMC Link Road,Near Petrol Pump, Pune,
Maharashtra - 411 033, India
Phone: +(91)-(20)-65103846
Mobile / Cell Phone: +(91)-9890443743
Website: http://www.suryafinechem.com/laboratory-chemicals.html

SODA ASH

Triveni Chemicals
No. 135, Pancharatna Char Rasta,
G. I. D. C., Vapi, Gujarat - 396 195, India
Phone: +(91)-(260)-6618618
Fax: +(91)-(260)-6618624
Mobile / Cell Phone: +(91)-9227788155
Website: http://www.trivenichemical.com/chemicals-by-alphabet-s.html

B. K. Chemicals
B - 2, Shrushti Apartment, 1st Floor, Near Century Enka,
Colony No. 2, Pune - Nasik Highway, Bhosari,
Pune, Maharashtra - 411 039, India
Fax: +(91)-(20)-27111941
Mobile +(91)-9371020040 / 9881418345
Website: http://www.bkchemicals.in/industrial-chemicals-powder.html

Yash Chemicals
Shop No D -31, Gagan Avenue, Near Sai Service,
Kondhwa - BK, Pune, Maharashtra - 411 048, India
Phone: +(91)-(20)-26930858
Fax: +(91)-(20)-26930858
Mobile / Cell Phone: +(91)-9372286769 / 9822286769
Website: http://www.yashchemicals.net/

CAUSTIC SODA

B. K. Chemicals
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Fax: +(91)-(20)-27111941
Mobile / Cell Phone: +(91)-9371020040 / 9881418345
Website: http://www.bkchemicals.in/industrial-chemicals-powder.html

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Website: http://www.trivenichemical.com/chemicals-by-alphabet-c.html

ACTIVATED CARBON

Air Care Equipments
Dreams Aakruti, C-102, Plot No-1, Sr. No.-52,
Kalepadad, Near Dhere Concrete Company,
Hadapsar, Pune, Maharashtra - 411 028, India
Phone: +(91)-(20)-24345758
Fax: +(91)-(20)-24345758
Mobile / Cell Phone: +(91)-9823050371 / 9420174854
Website: http://www.aircarepune.com/

Hindustan Produce Company
No. 7, Clyde Row, Hastings, Kolkata,
West Bengal - 700 022, India
Phone: +(91)-(33)-22230828 / 22230110
Fax: +(91)-(33)-22230140
Mobile / Cell Phone: +(91)-9831484682
Website: http://www.hindustanproduceco.com/petroleum-coke-graphite-powder-flakes-activated-carbon.html

PLANT & MACHINERY SECTION WISE

A. List of machinery and equipment

1. Maize Steeping

1.01	8	Steeping tanks	
		For maize steeping.	
		Volume	Approx. 150 M3 each.
		Material	RCC - Customer scope
1.02	1	Tank	
		To provide suction head for the maize pump,	
		Volume	Approx. 0.5 M3
		Material	Stainless steel 316
1.03	8	Centrifugal Pumps	
		To circulate steeping water	
		Capacity	Approx. 40 M3 / each
		Delivery head	Approx 20 M
		Material	Stainless steel 316
1.04	8	Heat Exchangers	
		To heat the circulating steeping water	
		Heating	Approx. 2 M3 / each
		Material	Stainless steel 316
1.05	1	Centrifugal Pump	
		To pump and steeped maize and flushing water to	
		the maize dewatering screen.	
		Capacity	Approx. 70 M3 / hr
		Delivery head	Approx 20 M
		Material	Stainless steel 316
1.06	1	Arc Screen	

To dewater steeped maize.

Material Stainless steel 316

1.07 1 Tank

To collect the flushing water separated from the steep maize.

Volume	Approx. 2 M^3
Material	FRP

1.08 1 Centrifugal Pumps

To pump steep liquor to the desanding tank for maize transport.

Capacity	Approx. 120 M^3 / h
Delivery head	Approx 20 M
Material	Stainless steel 316

1.09 1 Fluming System.

For transport of steeped maize.

Capacity	Suitable for 500 TPD maize plant.
Material	SS 316

2.Sulphurdioxide Plant

2.01	1	<u>Sulphur Burner with all Accessories</u> For Sulphur combustion. Capacity Material	 Approx. 25 Kg/h, Carbon steel, cast iron.
2.02	1	<u>Compressor with Air Receiver</u> To provide combustion air to Sulphur burner. Capacity Material	 Approx. 500 Nm3/h, CI
2.03	1	<u>Absorption tower</u> For absorption of sulphur gas. Diameter Height Material Packing	 Approx. 0.6 M Approx. 6 M Stainless steel 316 Structured packing
2.04	1	<u>Centrifugal Pump</u> For SO_2 - water Capacity Delivery head Material	 Approx. 12 M^3/h Approx. 20 M Stainless steel 316
2.05	1	<u>Tank</u> For SO_2 - water Volume Material	 Approx. 60 M^3 FRP
2.06	1	<u>Centrifugal Pump</u> For SO_2 - water Capacity Delivery head Material	 Approx. 40 M^3/h Approx. 30 M Stainless steel 316
2.07	1	<u>Plate Heat Exchanger.</u> for SO_2 water. Material	 SS 316

3. Degermination and Germ Washing

3.01 1 Tank

For Dewatered steeped maize.

Volume	Approx. 7.5 M^3
Material	Stainless Steel 316

3.02 1 Rotary Valve

To meter steeped maize into the 1st grind mill..

Capacity	Approx. 12 T/h maize
Material	Stainless steel 316

3.03 1 1st Grind Mill

For coarse milling of steeped maize.

Capacity	500 MT/Day maize equivalent
Material	Stainless Steel 316

3.04 1 Tank

For Coarse milled maize slurry

Volume	Approx. 7 M^3
Material	FRP

3.05 1 Agitator

To mix coarse milled maize slurry.

Material	Stainless Steel 316

3.06 1 Centrifugal Pump

To pump coarse milled maize slurry to the first stage germ hydrocyclone unit.

Capacity	Approx. 65 M^3/h
Delivery head	Approx. 70 M
Material	Stainless steel 316

3.07	1	1st Stage germ hydrocyclone unit.	
		To separate maize germ by centrifugal flotation, 1st stage consists of 2 sets of hydrocyclones	
		Capacity	500 MT/Day maize equivalent.
		Material	Stainless steel 316
3.08	1	Arc Screen.	
		To dewater partially milled and degerminated maize slurry.	
		Material	Stainless steel 316
3.09	1	2nd Grind Mill	
		For milling of partly degerminated maize slurry.	
		Capacity	500 MT/Day maize equivalent.
		Material	Stainless steel 316
3.10	1	Tank	
		For fine milled maize slurry	
		Volume	Approx. 7 M^3
		Material	FRP
3.11	1	Agitator	
		Material	Stainless Steel 316
3.12	1	Centrifugal Pump	
		To pump fine milled maize slurry to the 2nd stage germ hydrocyclone unit.	
		Capacity	Approx. 65 M^3/h
		Delivery head	Approx. 70 M
		Material	Stainless steel 316
3.13	1	2nd Stage germ hydrocyclone unit.	
		To separate maize germ by centrifugal flotation, 2nd stage consists of 2 sets of hydrocyclones.	
		Capacity	500 MT/Day maize equivalent.
		Material	Stainless steel 316

		Germ washing arc	
3.14	3	screens	
		For counter current washing of maize germ,	
		Material	Stainless steel 316
3.15	1	Agitator	
		To mix content of overflow pit.	
		Material	Stainless Steel 316
3.16	1	Centrifugal Pump	
		To pump germ wash water from one screen to the next	
		Capacity	Approx. 20 M^3/h each
		Delivery head	Approx. 20 M
		Material	Stainless steel 316
3.17	1	Tank	
		As overflow pit to collect any overflows.	
		Volume	Approx. 15 M3 Customer's scope
		Material	Concrete with epoxy resin coated.
3.18	1	Tank	
		For Germ Milk.	
		Volume	Approx.4 M3
		Material	FRP
3.19	1	Centrifugal Pump	
		To pump contents of overflow pit to the 1st grind tank.	
		Capacity	Approx. 7 M^3/h
		Delivery head	Approx. 20 M
		Material	Stainless steel 316

4. Fibre Milling And Washing

4.01	1	Tank	
		For Degerminated maize slurry	
		Volume	Approx. 3 M^3
		Material	FRP
4.02	1	Agitator	
		For maize slurry tank	
		Material	Stainless Steel 316
4.03	1	Centrifugal Pump	
		For maize slurry	
		Capacity	Approx. 30 M^3/h
		Delivery head	Approx. 40 M
		Material	Stainless steel 316
4.04	1	Pressure fed arc screen	
		For fibre dewatering	
		Material	Stainless steel 316
4.05	1	Tank	
		For remilled maize.	
		Volume	Approx. 1.5 M^3
		Material	Stainless steel 316
4.06	1	Rotary Valve with speed control	
		Capacity	Approx. 12 MT/h
		Material	Stainless steel 316

4.07	1	Fibre mill To release starch/gluten particles from maize fibres.	
		Capacity	500 MT/Day maize equivalent
		Material	Stainless steel 316
4.08	1	Tank For Fibre washing	
		Volume	Approx. 3 M^3
		Material	FRP
4.09	1	Agitator	
		Material	Stainless Steel 316
4.10	1	Centrifugal Pump To pump the suspension to the fibre washing station.	
		Capacity	Approx. 20 M^3/h
		Delivery head	Approx. 20 M
		Material	Stainless steel 316
4.11	7	Fibre washing screens For counter current washing of maize fibre.	
		Capacity	500 MT/Day maize equivalent.
		Material	Stainless Steel 316
4.12	1	Multi-compartment cascade tank For counter current washing of maize fibre	
		Total volume	Approx. 7 M^3
		Material	Stainless Steel 316
4.13	7	Centrifugal Pumps To pump maize fibre slurry through the fibre washing system.	
		Capacity	Approx. 30 M^3/h
		Delivery head	Approx. 30 M
		Material	Stainless steel 316

4.14	1	Tank	
		Buffer tank for washed fibre slurry.	
		Volume	Approx. 12 M^3
		Material	FRP
4.15	1	Agitator	
		Material	Stainless Steel 316
4.16	1	Pressure fed arc screen	
		To dewater the wash fibre slurry.	
		Capacity	500 MT/Day maize equivalent.
		Material	Stainless steel 316
4.17	1	Centrifugal Pump	
		To pump washed fibre slurry to the fibre dewatering screen.	
		Capacity	Approx. 30 M^3/h
		Delivery head	Approx. 20 M
		Material	Stainless steel 316

5. Starch Separations And Refining

5.01	1	Tank	
		To collect starch/gluten Slurry	
		Volume	Approx. 15 M^3
		Material	FRP
5.02	1	Agitator	
		To mix starch/gluten slurry, all parts coming into contact with the product to be made from stainless steel AISI 316, complete with gear motor and all accessories required.	
		Material	Stainless Steel 316
5.03	1	Centrifugal Pump	
		To pump starch/gluten slurry to the Primary separator.	
		Capacity	Approx. 30 M^3/h
		Delivery head	Approx. 60 M
		Material	Stainless steel 316
5.04		Heat Exchanger for Starch Milk suitable	
		for cooling starch milk from 36 to 30 deg. C	
		Type	Plate type.
		Material	Stainless steel 316
5.05	3	Degritting cyclones - two stage	
	1	Rotary Strainer	
		Material	Stainless steel 316/Ceramic.

5.06	1	Wash Water Tank	
		Capacity	Approx. 3 M^3
		Material	FRP
5.07	1	Centrifugal Pump	
		To supply wash water to the separator.	
		Capacity	Approx. 10 M^3/h
		Delivery head	Approx. 20 M
		Material	Stainless steel 316
5.08	1	Tank	
		For partly refined starch milk.	
		Volume	Approx. 7.5 M^3
		Material	FRP
5.09	1	Agitator	
		For partly refined starch milk.	
		Material	Stainless Steel 316
5.10	1	Centrifugal Pump	
		To pump starch slurry to the hydrocyclone unit.	
		Capacity	Approx. 15 M^3/h
		Delivery head	Approx. 30 M
		Material	Stainless steel 316
5.11	1	Rotary Strainer	
		To filter out particles that could block hydrocyclonettes.	
		Capacity	Approx. 15 M^3/h
		Material	Stainless steel 316
5.12	1	Tank	
		For wash water	
		Volume	Approx. 5 M^3
		Material	FRP

5.13	1	<u>Centrifugal Pump</u> For wash water.	
		Capacity	Approx. 10 M^3/h
		Delivery head	Approx. 60 MLC
		Material	Stainless steel 316
5.14	1	<u>Heat Exchanger</u> for heating wash water to 50 deg. C	
		Type	Plate heat exchanger.

		Capacity	Approx. 10 M^3
		Material	Stainless steel 316
5.15	1	Tank	
		For safety water	
		Volume	Approx. 15 M^3
		Material	FRP
5.16	1	Tank	
		To hold caustic solution for cleaning purpose with steam sparger.	
		Volume	Approx. 5 M^3
		Material	Stainless Steel 316
5.17	1	Centrifugal Pump	
		To supply caustic water to the refining station & separator.	
		Capacity	Approx. 40 M^3/h
		Delivery head	Approx. 30 M
		Material	Stainless steel 316

6. Gluten Concentration

6.01	2	Gluten Foam Boxes suitable for 500 TPD Equivalent corn.	
		Volume	1 M^3
		Material	Stainless steel 316
6.02	1	Tank	
		To hold gluten water.	
		Volume	Approx. 25 M^3
		Material	FRP
6.03	1	Agitator	
		For gluten water tank	
		Material	Stainless steel 316
6.04	1	Centrifugal Pump	
		To supply gluten water to the separator.	
		Capacity	Approx. 25 M^3/h
		Delivery head	Approx. 20 M
		Material	Stainless steel 316
6.05	1	Rotary Stainer	
		For gluten water.	
		Capacity	25 M3/H
		Material	Stainless steel 316
6.07	2	Tank for Gluten Concentrates	
		To hold gluten water.	
		Capacity	Approx. 7.5 M^3
		Material	FRP
6.08	2	Agitators	
		For Gluten concentrate tank.	
		Material	Stainless steel 316
6.09	1	Centrifugal Pump	
		To recycle gluten concentrate.	
		Capacity	Approx. 10 M^3/h
		Delivery head	Approx. 15 M
		Material	Stainless steel 316

6.10	1	Centrifugal Pump To pump gluten concentrate to the rotary vacuum drum filter.	
		Capacity	Approx. 7.5 M^3/h
		Delivery head	Approx. 20 M
		Material	Stainless steel 316
6.11	2	Process Water tanks	
		Capacity	Approx. 15 M^3/h
		Material	FRP
6.12	2	Process water pumps	
		Capacity	Approx. 20 M^3/h
		Delivery head	Approx. 30 M
		Material	Stainless steel 316
6.13	1	Filter presses For gluten dewatering suitable for 500 TPD Maize equivalent with all accessories.	
6.14		Screw Conveyor For conveying gluten cake to dryer.	
		Capacity	500 MT/Day maize equivalent.
		Material	Stainless steel 304
6.15	1	Sealing water recirculation System for vacuum pump of Rotary filter.	
		Material	Stainless steel 316/MS
6.16	1	Tank for steam condensate.	
		Volume	3 M^3
		Material	Stainless steel 316
6.17	1	Centrifugal Pump For steam condensate	
		Capacity	Approx. 5 M^3/h
		Delivery head	Approx. 20 MLC
		Material	Stainless steel 316

7. Germ dewatering and drying

7.01 1 Screw press

To dewater maize germ.
Capacity Approx. 500 T/24 h maize equivalent
All product contact parts to be SS 316 dewatering screw inside conical screen, driven by an electric motor via a gear box, all mounted on a M S frame, complete with all accessories required.

7.02 1 Germ Dryer

To dry dewatered maize germ
Capacity Approx.. 250 Kg/h Water evaporation.
Carbon steel tube bundle, with SS 316 lifter blades driven by an electric motor via a gear box, carbon steel housing with wet product contact parts in SS 316, steam heater for purge air, rotary steam and condensate joints, complete with all accessories required, including a vapour extraction fan with ductwork made of SS 304 and electric motor,
a rotary valve with geared motor for product discharge.

8. Steeping Water Concentration

8.01 1 Tank

To collect light steep liquor from the steeping tanks.
Volume Approx. 40 M^3
Material Stainless steel 316
Complete with inlet and outlet connections and all accessories required

8.02 1 Centrifugal Pump
To pump the light steep liquor to the evaporator..

Volume	Approx. 7.5 M^3 / h
Delivery Head	Approx. 20 M.

8.03 1 Duplex Strainer.
To remove the extraneous particles from the light steep liquor.

Capacity.	Approx. 10 M^3 / h

All product contact parts to be of SS 316, complete with mesh screens, 3-way change-over valves, inlet and outlet connections, and all accessories required.

8.04	1	Multiple effect evaporator with thermal vapour recompression To concentrate light steep water Capacity. Approx. 4750 Kg/ h water evaporation. Complete package unit to include: feed balance tank, 500 Lit. capacity. Centrifugal pumps for product and condensate. Heat Exchangers for preheating the product. Surface condenser for vapour. Falling film evaporators with product vapour separator. Thermal vapour compressor. Watering- ring type vacuum pump. Valves and instruments for automatic plant control., Interconnecting pipe work and ducts, and all accessories required, all product contact parts are made of SS 316.
8.05	1	Tank To collect Conc. Steep liquor from the evaporator Volume Approx. 3 M^3 Material SS 316 Jacket for steam heating SS 316
8.06	1	Agitator. To mix concentrated steep liquor, all product contact parts to be of SS 316, complete with geared motor and all accessories required .
8.07	1	Displacement pump To pump concentrated steep liquor to animal feed dryer. Capacity. Approx. 2 M^3 / h Delivery head Approx. 60 M Parts coming in contact with the product to be of stainless steel and EPDM

Section: 9.00

9.01	1	Gluten Flash Dryer. For drying gluten cake after filter presses. System complete with direct fired hot air generator with burner assembly, LDO tank, feed conveyor, swing fan, recycle conveyor, flash duct, cyclones, exhaust fan and rotary valve below cyclones. All product contact parts to be in SS 316.

10.00 :Animal Feed Dewatering And Drying

10.01	1	Screw Press To dewater maize fibre.	
		Capacity	Approx. 500 T/Day Maize grind equivalent.
		Material	Stainless steel 316
10.02	1	Feed conditioner For intensive mixing of recycled dried feed, concentrated mixed liquor with thick phase slops and dewatered maize fibre.	
		Capacity	Approx. 3 T/h

		Material	Stainless steel	316

10.03 1 Dryer for Animal feed

Type flash dryer.

Capacity Approx. 900 Kg/h water evaporation.

Material Stainless steel 316. (all product contact parts)

Complete with:

- Feed screw conveyor
- Direct fired hot air generator with Burner assembly.
- Exhaust fan and feed disintegrater
- Cyclone separator,
- Recycle conveyor
- Rotary air lock.

11.Starch Dewatering and Drying

11.01	1	Tank for Feeding Centrifuge For starch milk Volume Approx 2 M^3 Material Stainless Steel 316
11.02	2	Peeler Centrifuge For dewatering starch milk Capacity Approx. 60 T/24 h Parts coming into contact with the product are made from stainless steel SS 304 complete with perforated basket, housing, disc brake, peeling knife, discharge screw conveyor with gear motor-belt drive and hydraulic coupling for main motor, protection device, hydraulic system with oil pump, 2 special valves for filling the centrifuge with starch milk, electric control panel for automatic operation, special tools and all required accessories.
11.03	1	Screw Conveyor. For conveying dewatered starch cake to starch dryer Capacity Approx. 4.0 MT/ h Material Stainless steel 304.
11.04	1	Starch Dryer Designed as pneumatic flash dryer. Capacity Approx. 96 T/24 h commercial starch. Material Stainless steel AISI 316 in welded construction, complete with steam Air heater dryer ventilator, special rotating feeding device, drying duct, battery of cyclone, reception bunker , rotary valve, all required electrical gear motors, inlet and outlet chutes and fittings and all required accessories.

11.05 1 Starch Sifter
of tumbling type with two decks for separating starch grits.

Capacity	Approx. 4000 Kg/ h commercial starch.
Material	Stainless steel AISI 316

11.06 1 Buffer Tank with ventilator

For sifted starch.

Volume	Approx. 1 M3
Material	Stainless Steel 316

11.07 1 Tank

For dissolving starch grits.

Volume	Approx. 2 M^3
Material	FRP

11.08 1 Agitator

for dissolving starch grits.

Material	Stainless steel 316

11.09 1 Centrifugal Pump

For conveying	dissolved starch milk.
Capacity	Approx. 3.2 M^3/h
Delivery head	Approx. 15 M
Material	Stainless steel 316

12. Sorbitoal and maltodextrin manufacturing section

12.01 2 Tank for Feeding Centrifuge For starch milk

Volume Approx 1.5 M^3
Material Stainless Steel 316

12.02 3 Screw Conveyor.

For conveying dewatered starch cake to starch dryer

Capacity Approx. 3.0 MT/ h
Material Stainless steel 304.

12.03 1 Drying unit

Designed as pneumatic flash dryer.
Capacity Approx. 80 T/24 h commercial starch.
Material Stainless steel AISI 316

12.04 1 Starch Sifter

of tumbling type with two decks for separating starch grits.
Capacity Approx. 2000 Kg/ h commercial starch.
Material Stainless steel AISI 316

12.05 1 Tank

For dissolving starch grits.

Volume Approx. 2 M^3
Material FRP

13. DMH section

13.01	1	Tank	
		To collect starch/gluten Slurry	
		Volume	Approx. 15 M^3
		Material	FRP
13.02	1	Agitator	
		To mix starch/gluten slurry, all parts coming into contact with the product to be made from stainless steel AISI 316, complete with gear motor and all accessories required.	
		Material	Stainless Steel 316
13.03	1	Centrifugal Pump	
		To pump starch/gluten slurry to the Primary separator.	
		Capacity	Approx. 30 M^3/h
		Delivery head	Approx. 60 M
		Material	Stainless steel 316
13.04	1	Heat Exchanger for Starch Milk suitable	
		for cooling starch milk from 36 to 30 deg. C	
		Type	Plate type.
		Material	Stainless steel 316
13.05	2	Degritting cyclones - two stage	
	1	Rotary Strainer	
		Material	Stainless steel 316/Ceramic.

13.06	1	Drying unit	
		Designed as pneumatic flash dryer.	
		Capacity	Approx. 85 T/24 h commercial starch.
		Material	Stainless steel AISI 316
13.07	1	Tank	
		For wash water	
		Volume	Approx. 5 M^3
		Material	FRP

A = Approximate. Cost of the maize processing machinery and equipments

Total Cost Rs.80,00,00,000.00

B. HANDLING/HOLDING & STORAGE EQUIPMENTS

1. M.S Storage Silo Cap: 50 tons	15 No.	Rs.	1,25,00,000.00
2. Vibro-screen (Automatic) with 25 HP motor and accessories Cap: 30-50 tons/hour	2 No.	Rs.	1,80,00,000.00
3. Automatic weighing, filling, & bags sealing machine	1 No.	Rs.	1,50,00,000.00
4. Pipes, pumps, motors Airlock, structures & others		Rs.	90,00,000.00
5. Electrical fittings, switchgear, MCB, cables, & others		Rs.	50,00,000.00

B = Approximate. Cost of the HANDLING/HOLDING & STORAGE EQUIPMENTS

Total Cost Rs. 5,95,00,000.00

Lab testing equipment

Sr.No.	Chemical Testing/ Particulars	Quantity
1	Refractometer	1
2	TDS meter	1
3	PH meter	1
4	Water Distillation Unit	1
5	Laboratory Oven with Air Circulation	1
6	Scientific Balance	1
7	Heating menthal	1
8	Muffle Furnace	1
9	Electric Heating Plate	1
10	Thermometer	1
11	Bursting Strength Tester	1
12	Water Bath	1
	(Microbiological Testing)	
1	Rotary Shakers	1
2	Airflow Oven Drier	1
3	Laminar Airflow cabinet	1

4	Centrifuge Machine	1
5	Microscope	1
6	Autoclave	1
7	Refrigerator	1
8	Spirit Lamp	1
9	Incubator	1
10	Colony counter	1
11	Balance (chemical)	1 Lot
Sr.No.	List of lab Glass Ware	Quantity
1	Round Bottom Flask	
2	Beakers	
3	Volumetric Flask	
4	Conical Flask	
5	Pippete Stand	
6	Measuring Cylinder	
7	Burette	
8	Pippete	
9	Glass Funnel	
10	Clamps & Stand	
11	Pipetter(suction for pipette)	
12	Silica beads	
13	Sampling Probe	
14	Burette Stand With Clamp	
15	Tripod Stand	
16	Funnel	
17	Petri Plate	
18	Silica Crucible	
19	Glass beads	
20	Protein Estimation unit	
27	Fat Extraction Unit	
31	Spirit Lamp	
32	Reagent Bottles	
33	Glass Rod	
34	Ashless Filter Paper	
35	Normal Filter Paper	
36	Bottle Brush	
37	S.S. Scissor	
38	Rubber Corks	
39	Cappillary Tubes	

40	Cork Borer	
41	Rubber Pipes	
42	Triple Stand	

C = Approximate. Cost of the lab equipments Total Cost Rs. 75,00,000.00

Total cost of machinery and equipments

Grand Total A+B+C = Rs. 80,00,00,000.00+ Rs. 5,95,00,000.00+ Rs.75,00,000.00

= Rs. 86,70,00,000.00

TOTAL Rs. 86,70,00,000.00

PLANT ECONOMICS

Rated Plant capacity = MAIZE PROCESSING PLANT

1. Starch 60,000 MT
2. Liquid Glucose 8,000 MT
3. Dextrose Monohydrate 2,500 MT
4. Maize Germ 200 MT
5. Sorbitol 4,000 MT
6. Dextrin 3,000 MT
7. Gluten 2,500 MT
8. Animal feed, 8,000 MT

Basis

No. of working days = 25 days/month
= 300 days/annum

No. of shifts = 3 per day

One shift = 8 hours

Currency - Rs.

LAND & BUILDING

1.	Land 30 Acre @ Rs. 40,00,000/-per acre	Rs.	12,00,00,000.00
2.	Site Development charges	Rs.	40,00,000.00
3.	Civil Construction & Building:Maize receiving godown 5000 sq.mtr @ Rs. 7500/-	Rs.	3,75,00,000.00
4.	Maize/Corn storage Silos 1000 Sq.mtr @ Rs. 7500/-per sq.mtrs.	Rs.	75,00,000.00
5.	Maize Steeping section 2500 sq.mtr @ Rs. 7500/-per sq.mtrs.	Rs.	1,87,50,000.00
6.	Wet Milling Section 2000 sq.mtrs. @ Rs. 7500/-sq.mtrs.	Rs.	1,50,00,000.00
7.	Germ Drier and Oil seperation area 1000 sq.mtrs.@ Rs. 7500/-per sq.mtr	Rs.	75,00,000.00
8.	Cattle feed drier area 2000 sq.mtr @ Rs. 7500/-sq.mtrs	Rs.	1,50,00,000.00
9.	Starch drier & Packing area 1000 sq.mtrs. @ Rs. 7500/-per sq.mtrs.	Rs.	75,00,000.00
10.	Dextrin/Sorbitol processing area 1000 sq.mtrs.@ Rs. 7500/-per sq.mtr	Rs.	75,00,000.00
11.	Raw Material Storage area 1000 sq.mtrs. @ Rs. 7500/-	Rs.	75,00,000.00
12.	Packaging material storage 800 sq.mtrs. @ Rs. 7500/-per sq.mtrs.	Rs.	60,00,000.00
13.	Cattle feed storage 2000 sq.mtrs. @ Rs. 7500/-per sq.mtrs.	Rs.	1,50,00,000.00
14.	Glucose Dextrose Plants 1500 sq.mtr @ Rs.7500/-per sq.mtrs.	Rs.	1,12,50,000.00
15.	Provision for future expansion 3000 sq.mtrs.@ Rs. 500/-per sq.mtrs	Rs.	15,00,000.00

16.	Boiler House 200 sq.mtrs. @ Rs. 6500/-per sq.mtrs.	Rs.	13,00,000.00
17.	Water treatment & services area 100 sq.mtrs. @ Rs. 6500/-	Rs.	6,50,000.00
18.	Work shop 300 sq.mtrs.@ Rs. 6500/- per sq.mtrs.	Rs.	19,50,000.00
19.	Sulpher dioxide plant area 1000 sq.mtrs. @ Rs. 6500/-per sq.mtrs.	Rs.	65,00,000.00
20.	Electrical substation 500 sq.mtrs @ Rs. 6500/-per sq.mtrs.	Rs.	32,50,000.00
21.	First aid Post 300 sq.mtrs. @ Rs. 6500/- per sq.mtrs.	Rs.	19,50,000.00
22.	Security Office 200 sq.mtrs. @ Rs. 6500/-per sq.mtrs.	Rs.	13,00,000.00
23.	Time Office 100 sq.mtr @ Rs. 6500/- per sq.mtrs.	Rs.	6,50,000.00
24.	Truck Scale Weight bridge 500 sq.mt @ Rs. 6500/-per sq.mtrs.	Rs.	32,50,000.00
25.	Canteen 400 sq.mtrs. @ Rs. 6500/- per sq.mtrs.	Rs.	26,00,000.00
26.	Administrative office 500 sq.mtrs. @ Rs. 10000/-per sq.mtrs.	Rs.	50,00,000.00
27.	Laboratory cum R & D center 500 sq.mtrs. @ Rs. 8000/-per sq.mtrs.	Rs.	40,00,000.00
	TOTAL	Rs.	31,39,00,000.00

PLANT & MACHINERY

(1.)	Approximate. Cost of the Maize Processing Machinery and Equipment		Rs.	80,00,00,000.00
(2.)	Handling/Holding & Storage Equipments:-			
1.	M.S. Storage Silo Cap: 50 Tons.	15 No.	Rs.	1,25,00,000.00
2.	Vibro-Screen (Automatic) with 25 HP Motor and Accessories Cap: 30-50 Tons/hour	2 No.	Rs.	1,80,00,000.00
3.	Automatic Weighing, Filling & Bags Sealing Machine	1 No.	Rs.	1,50,00,000.00
4.	Pipes, Pumps, Motors Airlock, Structures & others		Rs.	90,00,000.00
5.	Electrical Fittings, Switchgear, MCB, Cables & others		Rs.	50,00,000.00
(3.)	Approximate. Cost of the Lab Equipments Total Cost		Rs.	75,00,000.00
		TOTAL	Rs.	86,70,00,000.00

OTHER FIXED ASSETS

1.	Water Electricity connection	Rs.	12,50,000.00
2.	Site fabrication work	Rs.	15,00,000.00
3.	Erection & Commissioning	Rs.	25,00,000.00
4.	Preliminary & Preoperative expenses	Rs.	20,00,000.00
5.	Office Furniture and equipment	Rs.	20,00,000.00
6.	DG Generator with accessories	Rs.	1,20,00,000.00
	TOTAL	Rs.	2,12,50,000.00

FIXED CAPITAL

1. LAND & BUILDING	Rs.	31,39,00,000.00
2. PLANT & MACHINERY	Rs.	86,70,00,000.00
3. OTHER FIXED ASSETS	Rs.	2,12,50,000.00
TOTAL	Rs.	1,20,21,50,000.00

WORKING CAPITAL REQUIREMENT/MONTH

RAW MATERIALS

1.	Maize 12,500 MT @ Rs. 16,000/-per MT	Rs.	20,00,00,000.00
2.	Sulphur 9.5 MT @ Rs. 45000/-per MT	Rs.	4,27,500.00
3.	Sulphuric acid 50 MT @ Rs. 8000/-per MT	Rs.	4,00,000.00
4.	Caustic soda 50 MT @ Rs. 28000/-per MT	Rs.	14,00,000.00
5.	Activated Carbon 5 MT @ Rs. 35000/-per MT	Rs.	1,75,000.00
6.	Soda Ash 25 MT @ Rs. 12500/-Per MT	Rs.	3,12,500.00
7.	Bone Black 8 MT @ Rs. 35000/-per MT	Rs.	2,80,000.00
8.	Lubricating Oils 1.8 MT	Rs.	1,17,000.00
9.	Fuel Oil 10000 Ltr. @ Rs. 60/-Ltr	Rs.	6,00,000.00
	TOTAL	Rs.	20,37,12,000.00

SALARY & WAGES / MONTH

1.	Managing Director	1 No.	Rs.	80,000.00
2.	Secretary	1 No.	Rs.	25,000.00
3.	Works Manager	1 No.	Rs.	50,000.00
4.	Accounts & Admn. Officer	1 No.	Rs.	25,000.00
5.	Chief Chemical Engineer	1 No.	Rs.	40,000.00
6.	Production & Maintenance superntendent	1 No.	Rs.	25,000.00
7.	Purchase Officer	1 No.	Rs.	30,000.00
8.	Sales Officers	4 No.	Rs.	60,000.00
9.	Asst.Admn.Officer	1 No.	Rs.	20,000.00
10.	Junior Chemical Engineers	3 No.	Rs.	60,000.00
11.	Chemists	3 No.	Rs.	75,000.00
12.	Mechanical Engineer	1 No.	Rs.	25,000.00
13.	Electrical Engineer	1 No.	Rs.	18,000.00
14.	Watch & Ward Officer	1 No.	Rs.	8,000.00
15.	Manager quality control	2 No.	Rs.	60,000.00
16.	Laboratory Assistant	2 No.	Rs.	24,000.00
17.	Supervisors	4 No.	Rs.	60,000.00
18.	Store Keepers	2 No.	Rs.	20,000.00
19.	Sales Assistants	2 No.	Rs.	24,000.00
20.	Stenographers	10 No.	Rs.	1,00,000.00
21.	Clerk-cum-typists	2 No.	Rs.	17,000.00
22.	Operators	25 No.	Rs.	2,12,500.00

23.	Skilled workers	24 No.	Rs.	2,88,000.00
24.	Unskilled workers	30 No.	Rs.	2,25,000.00
25.	Boiler Atendants	3 No.	Rs.	30,000.00
26.	Pump House Men	3 No.	Rs.	30,000.00
27.	Compressor Room Men	3 No.	Rs.	30,000.00
28.	Packers	4 No.	Rs.	34,000.00
29.	Driers	5 No.	Rs.	45,000.00
30.	Watchmen	4 No.	Rs.	32,000.00
31.	Peons	4 No.	Rs.	30,000.00
32.	Sweepers	4 No.	Rs.	30,000.00
33.	Helpers	10 No.	Rs.	80,000.00
		TOTAL	Rs.	19,12,500.00
	Plus perks @ 33% p.a.		Rs.	6,31,125.00
		TOTAL	Rs.	25,43,625.00

UTILITIES AND OVERHEADS

1.	Power Consumption of 408000 Kwatt hrs @ Rs. 7.00 per Kwatt hr.	Rs.	28,56,000.00
2.	Water Consumption of 65000 KLs @ Rs. 4.00 per KL	Rs.	2,60,000.00
3.	Fuel Oil 15 MT @ Rs. 60/-per Ltr	Rs.	9,00,000.00
4.	Transportation	Rs.	15,00,000.00
5.	Packaging material @ Rs. 22,50,000 P.M.	Rs.	22,50,000.00
6.	Sales Promotion and Advertising	Rs.	15,00,000.00
7.	Administrative Expenses	Rs.	5,00,000.00
	TOTAL	Rs.	97,66,000.00

Total load is 748 Kwatts

TOTAL WORKING CAPITAL/MONTH

1. RAW MATERIAL	Rs.	20,37,12,000.00
2. SALARY & WAGES	Rs.	25,43,625.00
3. UTILITIES & OVERHEADS	Rs.	97,66,000.00
TOTAL	Rs.	21,60,21,625.00
1. WORKING CAPITAL FOR 3 MONTHS	Rs.	64,80,64,875.00
2. MARGIN MONEY FOR W/C LOAN	Rs.	16,20,16,218.75

COST OF PROJECT

TOTAL FIXED CAPITAL	Rs.	1,20,21,50,000.00
MARGIN MONEY	Rs.	16,20,16,218.75
TOTAL	Rs.	1,36,41,66,218.75

TOTAL CAPITAL INVESTMENT

TOTAL FIXED CAPITAL	Rs.1,20,21,50,000.00
TOTAL WORKING CAPITAL FOR 3 MONTHS	Rs.64,80,64,875.00
TOTAL	Rs.1,85,02,14,875.00

COST OF PRODUCTION/ANNUM

1.	Working Capital for 1 year	Rs.2,59,22,59,500.00
2.	Interest @ 13.50% on T.C.I	Rs.24,97,79,008.13
3.	Depreciation @ 10.00% on buildings	Rs. 1,93,90,000.00
4.	Depreciation @ 20.00% on Plant and Machinery	Rs.17,34,00,000.00
	TOTAL	Rs.3,03,48,28,508.13

TURN OVER/ANNUM

1.	Starch 60,000 MT @ Rs.28,000/- per MT.	Rs.1,68,00,00,000.00
2.	Liquid Glucose 8,000 MT @ Rs. 60,000/-MT	Rs.48,00,00,000.00
3.	Dextrose Monohydrate 2,500 MT @ Rs. 1,50,000/-MT	Rs.37,50,00,000.00
4.	Maize Germ 200 MT @ Rs. 58,300/-Per MT	Rs. 1,16,60,000.00
5.	Sorbitol 4,000 MT @ Rs. 1,80,000/-Per MT	Rs.72,00,00,000.00
6.	Dextrin 3,000 MT @ Rs. 1,80,000/-per MT	Rs.54,00,00,000.00
7.	Gluten 2,500 MT @ Rs. 90,000/-per MT	Rs.22,50,00,000.00
8.	Animal feed, 8,000 MT @ Rs. 22,000/-per MT	Rs.17,60,00,000.00
	TOTAL	Rs.4,20,76,60,000.00

PROFIT = RECEIPTS - COST OF PRODUCTION

= 4,20,76,60,000.00 - 3,03,48,28,508.13

= 1,17,28,31,491.88

PROFIT SALES RATIO = Profit / Sales x 100

$$= \frac{1,17,28,31,491.88}{4,20,76,60,000.00} \times 100$$

= 27.87 %

RATE OF RETURN = Operating profit / T.C.I x 100

$$= \frac{1,17,28,31,491.88}{1,85,02,14,875.00} \times 100$$

= 63.39 %

BREAK EVEN POINT (B.E.P)

Fixed Costs of the plant are as under -

1.	Interests	Rs.24,97,79,008.13
2.	Depreciation	Rs.19,27,90,000.00
3.	40.00% of salaries	Rs. 1,22,09,400.00
4.	40.00% of overheads	Rs. 4,68,76,800.00
	TOTAL	Rs.50,16,55,208.13

$$B.E.P. = \frac{\text{FIXED COSTS}}{\text{FIXED COSTS + PROFIT}} \times 100$$

$$= \frac{50,16,55,208.13}{50,16,55,208.13 + 1,17,28,31,491.88} \times 100$$

$$= 29.96\ \%$$

LAND MAN RATIO = Total land / Manpower

30 : 164 :: 0 : 1

RESOURCES FOR FINANCE

1. Term loans from Financial institutions
   (65.00 % of fixed capital)
   at @13.50% p.a rate of interest Rs. 78,13,97,500.00

2. Bank loans for 3 months
   (65.00 % of working capital)
   at @ 13.50% p.a rate of interest Rs. 42,12,42,168.75

3. Self raised capital from even
   funds & loans from close ones to
   meet the margin money needs at a
   @ 13.50% p.a rate of interest Rs. 64,75,75,206.25

TOTAL Rs. 1,85,02,14,875.00

We hope **Detailed Feasibility Report** in your possession at the time, must have conveyed you the elementary idea on process data, market and economics. We feel you must have now taken a decision to finalize your project plan for ultimate implementation in a successful manner. Before you go ahead, we suggest you to take our ***MARKET SURVEY CUM DETAILED TECHNO ECONOMIC FEASIBILITY REPORT.***

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Brief contents of MARKET SURVEY CUM DETAILED TECHNO ECONOMIC FEASIBILITY REPORT are as under :

- Introduction
- Properties
- BIS (Bureau of Indian Standard) Specifications & Requirements
- Uses & Applications
- Present Indian Market Position
- Expected Future Demand
- Export & Import Statistics Data
- Names and Addresses of Existing Units (Present Manufactures)
- List of Plant & Machineries
- Miscellaneous Items and Accessories
- Instruments, Laboratory Equipments and Accessories
- Electrification, Electric Load and Water
- Maintenance, Suppliers/Manufacturers of Plant and Machineries
- Process of Manufacture with formulae if applicable
- Flow Sheet Diagram
- List of Raw Materials
- Availability of Raw Materials
- Requirement of Staff & Labour
- Personnel Management
- Skilled & Unskilled Labour
- Requirement of Land Area
- Built up Area
- Plant Layout.

along with financial details as under:

Summary of Capital Cost of Project
Land & Side Development Exp.
Buildings
Plant & Machineries
Misc. Fixed Assets
Technical Know how Fees & Exp.
Preliminary Expenses
Pre-operative Expenses
Provision for Contingencies

below mentioned financial statements (Annexure) will be for 5 to 10 Years
Annexure :: Cost of Project and Means of Finance
Annexure :: Output, Profitability and Cash Flow Chart
Annexure :: Assessment of Working Capital requirements

Annexure :: Sources of Finance
Annexure :: Balance Sheets
Annexure :: Break-Even Analysis and profitability analysis.
Annexure :: Quantitative Details-Output/Sales/Stocks
Annexure :: Sales Realisation
Annexure :: Raw Material Cost
Annexure :: Other Raw Material Cost
Annexure :: Packing Material Cost
Annexure :: Consumables, Store etc.,
Annexure :: Employees Expenses
Annexure :: Fuel Expenses
Annexure :: Power/Electricity Expenses
Annexure :: Repairs & Maintenance Exp.
Annexure :: Other Mfg. Expenses
Annexure :: Administration Expenses
Annexure :: Selling Expenses
Annexure :: Depreciation Charges - Profitability
Annexure :: Depreciation Charges
Annexure :: Interest and Repayment - Term Loans
Annexure :: Tax on Profit
Annexure :: Assumptions for Profitability workings
Annexure :: Assessment of Working Capital

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