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DETAILED FEASIBILITY REPORT

(PROJECT FEASIBILITY REPORT)

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LIQUID GLUCOSE FROM MAIZE

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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CONTENTS

[EIRI/DFR/2359](J.C.3831)

INTRODUCTION

Liquid Glucose Plant

Liquid glucose is a solution of glucose suspended in liquid and sold in jars or tubs. Many companies manufacture glucose in powdered form to which water can be added to make liquid glucose, to make transportation of this product easier. Liquid glucose is available from a variety of sources, depending on how one intends to use it. Medical suppliers sometimes carry it, as do some grocery stores, especially stores with a large baking section. This monosaccharide is produced through the processing of starches such as corn and wheat. Glucose has a famously strong sugar flavor, and it plays an important role in the human body in addition to being very useful in the kitchen. Liquid glucose is an extremely pure form of glucose which has a concentrated flavor. The strength means that people must use it carefully, as it is easy to dispense too much for a particular application. Glucose is produced commercially via the enzymatic process of Starch. Starch is produced from various raw materials like maize, cassava/tapioca roots, potatoes, wheat, rice etc.

The technology or the manufacturing process of starch differs according to the raw material used. One of the highlighted aspects of starch processing / extraction is that starch is produced according to the requirement of the end users depending upon changing reaction condition (Temp, pH2 additives) and strict process control methods. Customized or specially developed starch is popularly known as Modified starch. This is superior quality starch applicable for varied industrial usages.

To facilitate these aspects of starch extraction or processing, we design & develop starch processing equipment & starch processing plants that meet varied requirements in starch & it's derivative manufacturing units. Our advance fabrication facilities, team of industry professionals & technical know how enable us to meet client’s specific requirement by developing custom design machinery. We also excel in establishing of complete plants for starch extraction & execute turnkey projects.

The main products include Starch & Glucose, Malt dextrin powder crystalline dextrose (food grade), crystalline dextrose (medicine grade), and high malt syrup.

Liquid Glucose, Corn Syrup or Glucose Syrup are synonyms and are usually manufactured by subjecting starch to high temperature in the presence of acid. However, Liquid Glucose of same Dextrose Equivalent can be manufactured by enzymatic conversion but the spectrum of saccharides will differ and so also the properties, in comparison to acid converted Liquid Glucose.

It is used widely used in-

- Making Candies
- Making Chocolates
- Making Chewing Gums
- Making Ice creams
- In Canned Fruits
- Fruit Juices and beverages
- Making breads and puddings
- Making cold drinks and beverages
- Making Jams, Jellies and other dairy products
- For flavouring and dressing tobacco for cigarettes
- Used in shoe polish prevents caking and also results in a quicker and better shine
- Used in Leather industry as it gives pliability and weight to the leather.

APPLICATIONS OF LIQUID GLUCOSE

Liquid Glucose Corn Syrup

Liquid Glucose is also known as Corn Syrum & Glucose Syrup, Mixture of Dextrose, Tetra & Penta higher saccharides..

Applications -

Industries - Candy, Confectionary, Ice Cream, Jams, Jelly, Chewing Gum, Canned Fruits, Syrup Making, Bakery

- **Jelly & Jam** - Liquid Glucose Prevents Cane Sugar Ingredient from Crystallising, ensured by Dextrins of the Glucose Syrup.
- Increasing Sweetness of the products by acting as weetner up to extent.
- Corn Syrup can replace the Cane Sugar up to 20-50%, depend upon the product to be made.
- **Confectionary** - Corn Syrup - Non Crystallising substance with less weetness, can successfully produce a homogenous and polatable confectionary product.
- **Hard candies** can be made completely from Liquid Glucose without adding cane sugar.
- **Ice Cream** - It gives homogenous smoother texture with definite advantage of preventing cane sugar crystallization.
- **Bakery Product** - In several product help to keep them in soft condition. Corn Syrup gives body, Bulk & Sweetness to the product.
- Addition of Corn Syrup up to 10% prevents caking & give better shine in certain application.
- Liquid Glucose is also used to make Chewing gum to impart flavour taste & thickness.

It cater to several industries with wide range of products, i.e. Bakery, Food, Beverages, Paper Industries, TexTile, Packing, Chocolate & Candy. Our wide range is as follow,

- **Liquid Glucose, Cocoa Powder**
- **Flavouring Essense -** Banana, Vanilla, Strawberry, Almond, Orange, Coffee
- **Liquid Food Color -** Red, Orange, Pink, Green, Chocolate Brown, Yellow, Blue, Safron Yellow
- **Food Color Powder -** Orange, Safron Yellow, Red, Green…
- **Instant Drink Powder -** Sugar Based & Sugar Free in any type of packing Size (Customized packing)
    - § Mango, Orange, Pinapple, Lemon, Cola, Strawberry, Mangorange, Black Current, Guava
    - **Syrups -** Rose Syrup, Lemon Juice, Lemon Squash, Orange Squash, Lime Juice Cordial
    - **Custard Powder, Baking Powder, Sodium Bi Carbonate**
    - **Maize Starch, Dextrose Mono Hydrate, Dextrose Anhydrous**

ECONOMIC SIZE UNIT AND PRODUCTION PATTERN

From our market analysis it is very clear that the wet milling of maize to give starch does not have demand at present. So only an economic unit can be thought of, if at all the client is interested in setting up the plant. Economic size unit varies from country to country and time to time. What may be an economic unit in an advanced entry may be too big for a developing country like India . The reasons for this are :

a) Cost of raw materials and labour

b) Cost of plant and machinery

d) Competition and market demand

As seen from process flow diagram, starch slurry obtained can be processed further in the following in the three different ways :

a) Flash dried to obtain maize starch.

b) Reacted with various chemicals to obtain modified starches.

c) Hydrolyzed to obtain liquid glucose or dextrose.

depending upon the specification of maize, the production capacity and specifications of starch will change.

Following the average analysis of maize in India :

Starch	:	**64%**
Protein	:	**8%**
Oil	:	**4%**
Fibres	:	**9%**
Others	:	**3%**
Water/Moisture	:	**12%**

It is proposed to run the plant for 300 days per annum, three shifts a day of 8 hours duration each.

PHASED PRODUCTION PROGRAMME

Phase - I : Wet milling plant for maize processing

Phase - II : Liquid glucose,

The first phase can be implemented immediately, of course, after giving a serous consideration regarding the marketing aspects and undertaking substantial market development work.

The second and third phases have to be implemented after undertaking another market analysis, and after the starch plant goes into stream and a regular cash flow is established.

1) Concentrated steep liquor :

It contains much of corns soluble protein carbohydrates and minerals. When dried and a added to gluten, it offers nutritive elements essential for a well balanced cattle feed. Steep water is used in the production of aureomycin, and other antibiotics. It is a good source for the manufacture of into sital a member of B- complex group of vitamins.

2) Germ oil and Gern cake: Crude maize oil contain free fatty acids, phosphates, waxes colour bodies and other impurities. It sold as such to the manufacturers of soap.

3) Gluten : The gluten obtain after dehydration and drying is sold as an adhesive or as cattle feed.

Uses of liquid Glucose :-

Usage of Starch
Food Industries : Glucose, Dextrose, Fructose, Sweetener.
Paper Industry : Sizing, Pulp Making & Surfacing.
Ceramic Industry : Binder.
Adhesive & Abrasive Industry : Important Ingredient.
Textile Industry : Pointing & Finishing

PROPERTIES

Commercial or liquid glucose (sp. Grairty 1.43) is a thick, syrupy, colourless to yellowish liquid obtained by the partial hydrolysis of Starch. It contains, water 14.20% dextrose maltose 31-55% ash, 0.5-0.8% and per obtain 0.02% . Liquid glucose is distinct form commercial Dextrose powder obtained by the complete hydrolysism of starch. Dextrose occurs in three crystalline form dextrose monohydrate anhydrous dextrose and anhydrous dextrose monohydrate is the most common form of crystallize out form aqueous solution at temperatures below 500 the anhydrous form separate at or above 500 dextrose in obtained in the anyhydrous form when the temperature of the solution exceeds 1150.

MARKET SURVEY

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.

CONCEPT OF TEXTURE

Starch has a multitude of food and industrial applications. Starch plays a leading role in determining the texture of many foods and texture is of vital concern to both the consumers and the manufacturers. Appearance, feel to the touch, softeners and finally mouth feel all contribute to the concept of texture.

USES OF MAIZE STARCH

Maize starch forms viscous, relatively short and opaque paste with cereal flavor. Its paste sets to stiff gels. It is widely used for thickening sauces, gravies, puddings and pie fillings. Maize starch finds numerous uses in the baking industry for the production of cakes, cookies, in ice-cream preparations etc.

In Paper industry a large quantity of starch is consumed as a surface-sizing agent, as a binder, as a paper coating agent etc. In textile industry, starch is used in sizing to strengthen the warpyarn, in finishing and changing the appearance of fabric after it is bleached, dyed or printed, in printing and increase the consistency of printing pastes. Also starch is used as a component in finishing agent to glaze and polish sizing thread.

STARCH DERIVATIVES

Starch when cooked forms high viscous gels and this property limits its applications. But by acid and other chemical treatments at varying temperatures the characteristics of the native starch is modified to suit various end users. Following products are made by the chemical / acid and heat treatments of starches.

White Dextrins

Yellow Dextrins

British Gums

These products are partly soluble in water and finds several applications in food industry as

Thickener in Sauces and Soups

Gel Former in Puddings

Suspension Stabilizer

Bodying agent in Baking

PRESENT MANUFACTURERS

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LIQUID GLUCOSE AND DEXTROSE - AN ASSESSMENT OF MARKET

Liquid Glucose and Dextrose are the products of same origin, former is in liquid form and the late in powder form.

Glucose is found almost in all types of fruits, vegetables, and corns. But till now maize potatoes and tapioca are found most promising source of starch and glucose. Starch is manufactures from these raw materials and liquid glucose is obtained as there from. However, in small scale sector glucose can also be produced directly from vegetables and fruit juices.

Dextrose is referred to as seetner and it is the most abundant source of sugar in nature. It occurs in substantial quantities in honey, fruits and berries.

Liquid Glucose and Dextrose Industry in India.

Liquid glucose and dextrose are starch based industries.

Before second world war, India used to import starch from Euroenan countries. But owing to difficulties in importing starch on one hand and its increasing use in cotton textiles, two units namely M/s. Anil starch products Limited and M/s. Maize products limited have came into operation at Ahmedabad in the years 1930 and 1941 respectively Production if liquid glucose and dextrose based on starch also started simultaneously.

Liquid Glucose and dextrose are being produced in the organized sector, Glucose is produced in solid as monohydrous and anhydrous and anhydrous form.

Future Demand :-

Liquid glucose and dextrose are the products having by and large some end. The biggest end user is pharmaceuticals . They are also being used in food industry particularly in biscuits and confectioneries, where they are of value for their physical , chemical and nutritive properties. They can also be used in wine industry and for making of chewing tobacco, tooth paste and printing for textiles etc.

As such 80 percent of the total production for liquid glucose and 60 percent of total production for dextrose is used by drugs and pharmaceutical industry, while remaining production is being used in biscuits, confectioneries, tooth pastes, etc . as the growth of liquid glucose and dextrose is linked with the growth of above mentioned end uses it would be appropriate to review the growth of the major end use areas before projecting the demand.

SPECIFICATION

REQUIREMENT FOR MAIZE, STARCHES,EDIBLE GRADE

	Maize Starch
Moisture, % , Max.	12.5
Total ash, on dry basis, % Max	0.30
Acid insoluble ash, on dry basis, % Max	0.05
Crude fibre, % Max	....
PH of an aqueous extrace	4.5–7.0
Starch, on dry basis, % Min.	98.0
Protein, % , Max.	0.5
Sulphur dioxide, % , Max.	....
Cold water soluble, % Max	....
Free acidity expressed as ml of 0.1 N of NaOH/100 g of sample, Max	40.0

* - IS: 1005 - 1969; IS: 1319; IS: 1006 - 1967

SPECIFICATIONS

SPECIFICATION FOR LIQUID GLUCOSE

1. This standard prescribes the requirements and the methods of sampling and test for liquid glucose.

2. For the purpose of this standard, liquid glucose or glucose syrup shall mean a refined and concentrated non- crystallizable aqueous solution of d-glucose, maltose, and other polymers of d-glucose, obtained by controlled hydrolysis of starch containing material.

3.Grades

The material shall be of the following five grades;

a) Low conversion (LC)

b) Regular conversion (RC)

c) Intermediate Conversion (IC)

d) High conversion (HC) and

e) Extra High Conversion (HC)

4. Requirements

The material shall be in the form of an odorless and various syrup with a characteristics sweet taste. It shall be clear, free from fermentation, moldy growth, sediment, dirt, or other suspended and extraneous matter, or added sweetening and flavoring agents.

Colour

When a 50% (m/v) solution of the material of regular conversion grade is tested in a levibond timtometer in a 2.54 cm. cell then colour of the material in terms of levibond units shall not be than:

a) 0.1 yellow and 0.1 red within a period of 90 days from the data of manufactur, and

b) 0.2 yellow and 0.1 red within a period of 180 days for the date of manu facture.

When determined according to the method, prescribed in the standard, the dextrose equivalent (De) value for different grades shall be as follows:

Low conversion - 28 to 37

Regular Conversion (RC) - 38 to 47

Intermediate Conversion (IC) - 48 to 57

Extra High Conversion (EHC) - 68 and above.

The material shall also comply with the requirements given in TABLE-1.

REQUIREMENTS FOR LIQUID GLUCOSE (ALL GRADES)

S.No.	Characteristics	Requirements
1.	Total Solids % by Mass, Min	80
2.	ASh, % by Mass, Max.	0.3
3.	PH	4.8 to 5.5
4.	Sulphur Dioxide ppm, Max	400
5.	Arsenic ppm, Max	1.0
6.	Copper ppm, Max	5

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 transported to steeping vat by elevators and conveyors through a weighing machine. Warm water 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 solid 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 grinds to fine slurry know as starch milk. The grinders may be either Buhror stone mills or preperably vertical mill make of stainless steel. The starch milk is processed in entrifuges 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 centriguges where the lighter gluten is separated form the heavier starch. In the first stage, the heavy starch layer is taped in such a way that least possible amount of starch goes in which the overflow of gluten, 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 backet 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 derivatives (Information form the Anil Starch products at Ahmedabad).

PROCESS DESCRIPTION

Wet milling or the classical process is the only process is the only process for the manufacture of starch which is universally in commercial use. Starch manufactured by this process can be used by textiles, paper and food industries. Starch manufactured by dry milling can only be used by food industry and hence dry milling process does not have much scope.

The wet milling process can be divided into seven major steps. There are:

1) Cleaning and Soaking (steeping) of maize
2) Steep liquor concentration
3) Crude germ oil recovery
4) Fibre separation
5) Gluten (protein portion) separation and concentration
6) Mixed food processing for cattle feed
7) Starch washing, dewatering and drying

CLEANING AND SOAKING

The maize received at site is weighed, cleaned by grain cleaners and stored in silos. When required, it is again cleaned. This operation is known as dry cleaning of maize, which removes dust, broken grain and foreign matters. This reject from the grain is mixed with cattle feed. After cleaning, the grains is once again weighed before steeping.

Sulphur is burnt separately in a rotary burner. Generated sulphur dioxide is cooled and absorbed in an absorption tower. The sulphuours acid formed is known as steep acid. It is pumped to steep acid tank where weighed again as already been added. The grain is soaked for 48 hour in warm steep acid, the temperature being maintained at 50-55~C. The steep inhibits fermentation and softens the kernel.

STEEP LIQUOR CONCENTRATION

During the steeping period, solubles are leached out of the maize grain, including those from the germ fraction. The steep liquor is drawn off from the steeping tanks. It is concentrated to about 50% solids in three stages. Vapours coming out of evaporators are condensed and the hot water from condenser is used for making steep acid again.

CRUDE GEM OIL RECOVERY

The grain, after steeping is dewatered in a DSM dewatering screen. The softened corn kernels are degerminated between two studded steel plates, one rotating and one stationary, which tear the kernels apart and extricate the corn germs without crushing them. The germs are made into a slurry and are floated away from the rest of the kernel, because of their high oil content. They are then dewatered by DSM dewatering screen and go for expelling and oil recovery.

Primary grinding or determination is a difficult separation since maize has to be partially macerated to remove the pericarp (outer fibrous layers), free the germ from endosperm by breaking up the endosperm partially and at the same time not damage the germs.

FIBRE SEPARATION

Grain slurry is again dewatered in a DSM dewatering screen. The determinated maize at this stage contains fibre, starch and protein. Fine grinding is done in a secondary grinding mill. The starch and gluten (protein) are reduced to a fine particle size while fibres is not reduced to the same degree and hence can be separated.

GLUTEN SEPARATION AND CONCENTRATION

Gluten is separated from starch particles by hydrocyclones, where the heavier starch granules settle out at the bottom while the lighter gluten particles are carried off in the overflow.

MIXED FEED PROCESSING

Washed and filtered fibres, from step 4, corn rejects from step 1, concentrated steep liquor from step 2 and gluten from the previous step are mixed in the required proportions to the desired protein content, suitable for making cattle feed. The mixed feed is dried in flash drier to and milled to the required size.

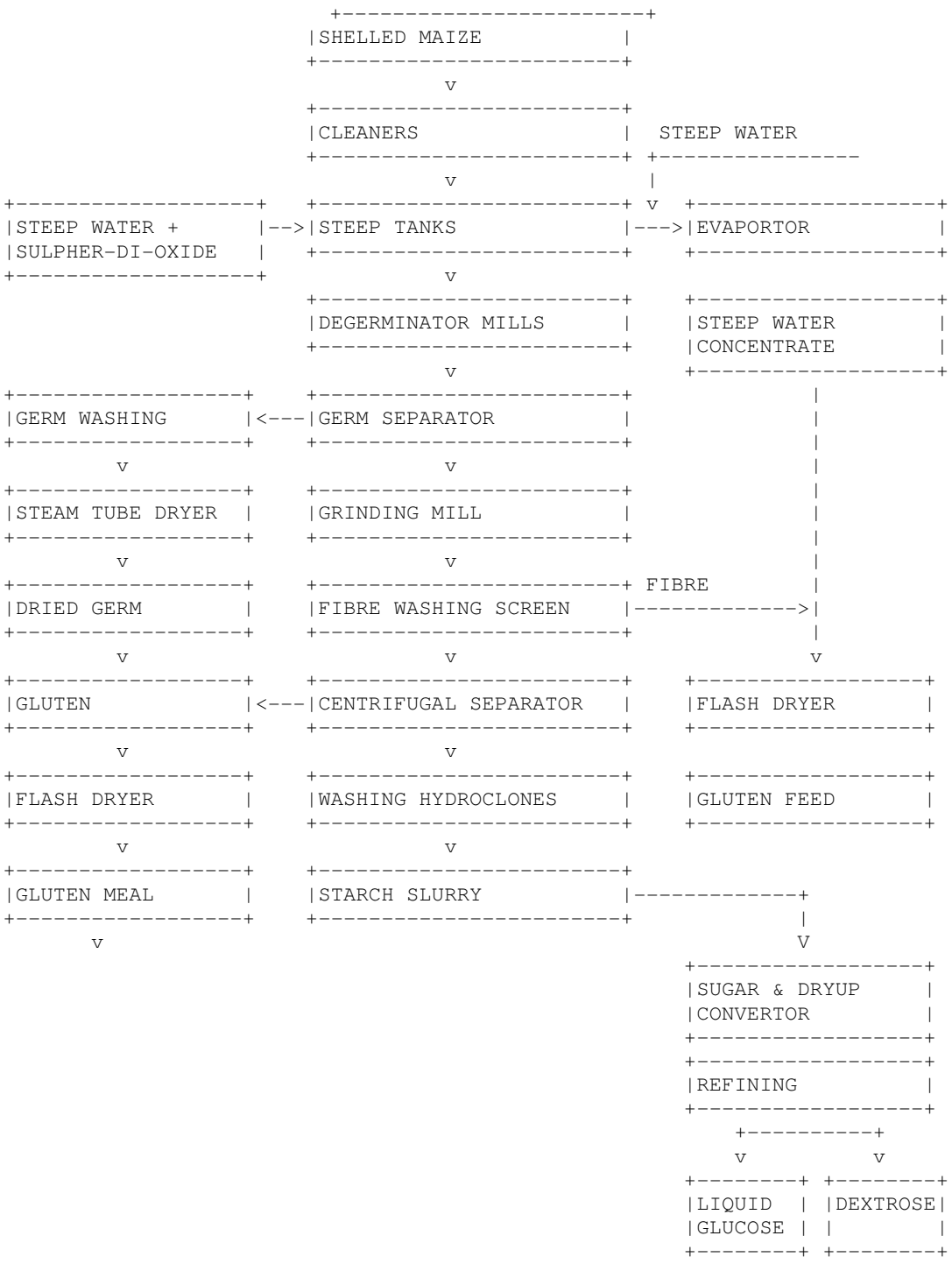
STARCH WASHING DEWATERING AND DRYING

Starch slurry free of gluten is washed with fresh water in a series of hydrochlones.

It is then pumped to a dewatering centrifuge where water is removed and recycled to prime starch tank. Drying of starch is done in a flash driner.

Starch slurry can directly be sent to glucose, dextrose or modified starch manufacture, if required

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 used for starch hydrolysis. The conversion of starch to glucose takesplace through a series of steps in which carbohydrates of progressively decreasing complexity-soluble starch, dextrin 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 liquid transferred to a neutralizing 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 decolorized by activated carbon and the clear filtrate clear filtrate concentrated in a triple effect 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 transferred to drums. The product obtained contains 43% dextrose on dry basis. Glucose is prepared also by enzymic conversion of starch or by a combination of acid conversion, neutralization and enzymic conversions.

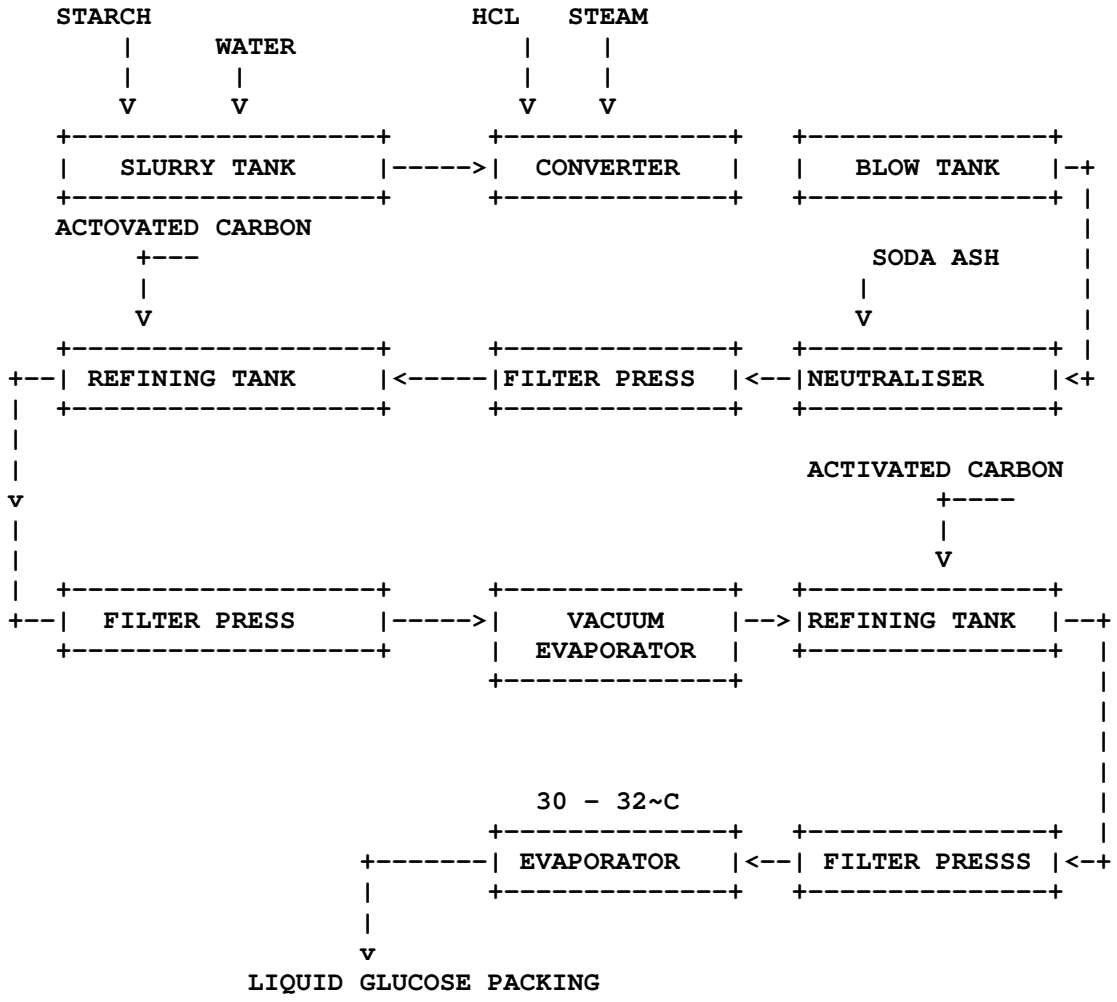
RAW MATERIALS

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 interrupted 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 neutralized 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 galvanized tin containers of 56 lb capacity. Both ordinary and B.P. liquid 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 indigenous liquid glucose is reported to be satisfactory through there appears to be scope for improvement.

MANUFACTURING DIAGRAM

MANUFACTURS OF LIQUID GLUCOSE



COMPLETE PLANT SUPPLIERS

MKS Industrial Solutions
Srishty Tower
Near State Bank of Patiala,
GT Road,Samalkha - 132101,
Dist. Panipat, Haryana (India)
Tel. +91 180-2570011
Fax. +91 180-2574111
Mob: +91 9991000145
+91 9991000137
Email : info@mks.co.in, sales@mks.co.in
mks.111@rediffmail.com

FOOD & BIOTECH ENGINEERS (INDIA) PVT. LTD.
Chaprola Road, Prithla,
Tehsil & Distt., Palwal - 121102, Haryana, India
Phone :91-1275-262157/58/249400/249401
Fax :91-1275-262259
Mr. Sanjeev Kumar (General Manager)
Mobile :+919312069945, +919310099004
info@foodbiotech.co.in
Send Inquiry

SUPPLIERS OF RAW MATERIALS

HYDROCHLORIC ACID

M. Madhavan, Director
A R WILFLEY INDIA PVT LTD
301, Timmy Arcade,
Makwana Road, Marol Naka,
Andheri(E), Mumbai-400059,
Maharashtra
Phone: +91 22 285 25533
Email: pumps@wilfley.com wilfleyind@vsnl.com

Mehmood Syed, Owner
AQUATIC WORLD
Rahat Basar Manzil,
1st Floor, 1-D,
Fort Road, Mahim
Mumbai-400016, Maharashtra
Phone: +91 22 244 57749
Email: aquaticworld@rediffmail.com

Harish Uberoi, MD
APL CANPACK PVT LTD
GNT Road, Kotapolur Village,
Sullurpet, Nellore-524123
Tamil Nadu
Phone: +91 8623 242 652, +91 8623 224 2653,
Email: canpack@vsnl.com

C. H. Krishnamurthi Rao, Chairman
CHEMFAB ALKALIES LTD
Gnanananda Place, Kalapet
Pondicherry-605014, Pondicherry
Phone: +91 413 655111, 655114

M. S. Shah, Director
CHEMIEORGANIC CHEMICALS (I) PVT LTD
Hemu Plaza, Station Road,
Vile Parle (W), Mumbai-400056
Maharashtra
Phone: +91 22 261 13911,26114891
Email: chemie@bom5.vsnl.net.in

SULPHURIC ACID

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A R WILFLEY INDIA PVT LTD
301, Timmy Arcade,
Makwana Road, Marol Naka,
Andheri (E), Mumbai-400059,
Maharashtra
Phone: +91 22 285 25533
Email: pumps@wilfley.com wilfleyind@vsnl.com

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ACIDS & CHEMICALS LTD (SHREE)
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Delhi-110033
Phone: +91 11 7218906/7121946
Email: sacl@ndf.vsnl.net.in

Dahyabhai J Patel, CMD
ADARSH CHEMICALS & FERTILISERS LTD
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Ravinder Krishan, Director
AGRO CHEM PUNJAB LTD
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Chandigarh-160101,
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ALEMBIC LTD
Alembic Road,
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SULPHUR

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ALLIED ELECTROMECH COPRN
404,Vyapar Bghavan,
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BHAVI INTERNATIONAL LTD
209, Mewad, 2nd Floor,
L.B.S. Marg, Patanwala Indl.
Complex, Ghatkopar (West)
Mumbai-400086, Maharashtra
Phone: +91 22 250 00429,25006035
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Mr. Madhava Rao
COROMANDEL FERTILISERS LTD
Coromandel House,
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Andhra Pradesh
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Email: madhavarao-k@murugappa.co.in

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DVS CHEMICAL & ENGG INDS
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SODA ASH

Mg. Director
AMBALA SILICATE UDYOG
141 Vikas Vihar, Vikas Vihar
Ambala-134003, Haryana
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1st Floor, 4753/23,
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CURE CHEM INDIA
D-3/3582, Vasant Kunj
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Phone: +91 11 268 98689
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Shashi Chand Jain, CMD
DCW LTD
Dhrangadhra
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Phone: +91 265 2781914, 2871918
Email: dcwbby.dcwltd@gems.vsnl.net.in

CAUSTIC SODA

B. L. Shah, Director
BIHAR CAUSTIC & CHEMICALS LTD
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Garhwa Road, P O Rehla
Palamau-822124, Bihar
Phone: +91 6562 872 11
Email: chemidy.grasimng@gems.vsnl.net.in

Mg. Director
BLEACH MARKETING PVT LTD
120, Bleach Chem Compound,
Near Chandola Lake Narol
Ahmedabad-380028, Gujarat
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CENTURY RAYON
Industry House, 159,
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CENTURY TEXTILES & INDUSTRIES LTD
Century Bhavan,
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Rajgopal Dhoot, Chairman
DHOOT INDUSTRIAL FINANCE LTD
504, Raheja Centre,
214, Nariman Point
Mumbai-400021, Maharashtra
Phone: +91 22 228 45050,22835152
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ACTIVATED CARBON

Mg. Director
ABSOSIL PRODUCTS
197/7718, Kannamwar,
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Mumbai-400083, Maharashtra
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ACTIVE CARBON INDIA PVT LTD
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BLUE STONE SUPPLY AGENCY
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Phone: +91 33 222 01459

SUPPLIERS OF PLANT & MACHINERY

BOILERS

D. N. Reddy, MD
A P MOTRONIX PVT LTD
3-18-3, Pragathi Nagar,
Ramanthapur, Hyderabad-500013,
Andhra Pradesh
Phone: 040-27038560/27031929
Email: apmotronix@satyam.net.in

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Mr. M. G. Patel
ACCU TECH ENGINEERING CO
34, P. D. Estate,
Near Revabhai Estate,
C.T.M. Amraiwadi,
Ahmedabad-380026, Gujarat
Phone: 079-5856596
Email: accutech@wilnetonline.net

Mr. Kailash Magolra
ALBATRON FINE CHEM LTD
40, Dlf Industrial Area,
Alishan Building, Kirti Nagar,
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Email: albatross@vsnl.com

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ALFA ENTECH (GUJ) PVT LTD
504, Suyojan Hotel President Lane,
Off C G Road, Navrangpura,
Ahmedabad-380009, Gujarat
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STORAGE TANK & PRESSURE VESSELS

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ABSOSIL PRODUCTS
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Email: acil@hd1.vsnl.net.in

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thomas@adsorbentcarbons.com

Mg. Director
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Phone: +91 33 222 01459

HEAT EXCHANGER

V. VENUVINOD, PARTNER
A M POWER EQUIPMENT
ASHOK CHAMBERS, 4-6, S D ROAD
SECUNDERABAD-500004, ANDHRA PRADESH
Phone: +91 40 27892919, 27893818
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MR. DAVINDER SAPRU (SALES MGR)
AADI HEAT EXCHANGER PVT LTD
D-83, HOSIERY COMPLEX, PHASE-2
NOIDA-201301, UTTAR PRADESH
Phone: 0120-2460072 - 73, 2460074, 98110 49293
Email : aadihe@hotmail.com

MOHAMMED MEERAN, PROPRIETOR
AASIA RADIATORS
PT NO. 27, 28, C - 12 BLOCK,
P.S.C. BOSE ROAD, JAWAHAR AUTO NAGAR
VIJAYAWADA-520007, ANDHRA PRADESH
Phone: +91 866 254 3881, +91 866 254 4006, +91 866 25
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CENTRIFUGES

Mr. Kamesh Bahai Patel
A D ENGINEERS
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Behined Lion's School, GIDC,
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ANUP ENGG LTD
Anil Starchs Premises,
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Mr. Chandrakant
CHEMIEX ENGG ENTERPRISES
Plot No 277-278.
Opp.Shed No L-1,
G.I.D.C. Ind. Estate.
Odhav Ahmedabad-382415, Gujarat
Phone: 079-2871180

REACTION KETTLE

Mr. Martin
ASSOCIATED TECHNOCRATS
R-423, TTC Rable, Navi Mumbai
Mumbai-400701, Maharashtra
Phone: 022-27691617/27696378
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Mg. Director
TR SHARMA ENGINEERING WORKS
A-156, Hari Nagar Clock Tower
New Delhi-110064
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Email: paintmachinery@yahoo.com

TRAY DRYER

Mg. Director
AERO THERM SYSTEMS PVT LTD
Plot No. 1517,
Phase-III, GIDC, Vatva
Ahmedabad-382445, Gujarat
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Email: vadherad1@sancharnet.in

Joitaram S. Patel, Manager
AIRTECH ENGINEERS
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Near Revabhai Estaet CTM
Ahmedabad-380026, Gujarat
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Mg. Director
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Mr. Sanjay Khan
BHARAT ENGINEERING INDUSTRIES
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DISINTEGRATORS

Mg. Director
GUJARAT MICROWAX LTD
6th Floor, Motilal Centre,
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Mr Pravin Aggarwal
PRECIOUS FAB-CAST PVT LTD
4809, Near Water Tank,
Phase-IV, GIDC, Near Water Tank
Vatva, Ahmedabad-382445, Gujarat
Phone: 079-25842237, 25845315
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Mr. H. Nischal Ananthapurushottham
SURABEE MACHINES & CO
9/11 A, 4th Main 6th Cross,
Balesetappa Compound,
Industrial Town, Rajajinagar
Bangalore-560044, Karnataka
Phone: 080-3406165/3113529/3358551
Email: impactmill@hotmail.com

PULVERISER/GRINDER

Mg. Director
ABLE MANUFACTURERS
14-164, 1st Phase, Ida
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Andhra Pradesh
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Mr. Vinubhai Panchal
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Email: dollplast@wilnetonline.net

PLANT ECONOMICS

Rated Plant capacity	**=**	**1667.00 KGS/day**
	=	**500100.00 KGS/annum**

LIQUID GLUCOSE (HONEY)FROM MAIZE

Basis

No. of working days	=	25 days/month
	=	300 days/annum
No. of shifts	=	2 per day
One shift	=	8 hours

Currency - Rs.

RUPEES

LAND & BUILDING

1.	Land required 1500 sq. mts. @ Rs. 2500/- per sq. mt.	Rs.	37,50,000.00
2.	Covered area 700 sq. mts. @ Rs. 6000/- sq. mt.	Rs.	42,00,000.00
3.	Miscellaneous, gate, tubewell and others.	Rs.	5,00,000.00
	TOTAL	Rs.	84,50,000.00

PLANT & MACHINERY

1.	Washing tank with paddles 1 No.	1 No.	Rs.	3,00,000.00
2.	Wet Milling Machine 1 No.	1 No.	Rs.	2,00,000.00
3.	Centrifugal Separator. 1 No.	1 No.	Rs.	1,80,000.00
4.	Slurry tank complete with agitator and motor 1 No.	1 No.	Rs.	1,20,000.00
5.	Converter (Autoclave) made of manganese Bronze vessel, pressure 30 psi 1 No.	1 No.	Rs.	2,50,000.00
6.	Filter press 2 Nos.	2 No.	Rs.	2,80,000.00
7.	Refinining with complete accessories. 2 Nos.	2 No.	Rs.	2,90,000.00
8.	Neutralisation tank with agitator. 1 No.	1 No.	Rs.	1,80,000.00
9.	Vacuum pan evaporator with vacuum pum 2 Nos.	2 No.	Rs.	6,50,000.00
10.	Boiler 100 Kg steam capacity 1 No.	1 No.	Rs.	3,00,000.00
11.	Weighing machine, pumps, tanks etc.		Rs.	1,50,000.00
12.	Miscellaneous		Rs.	1,50,000.00
		TOTAL	Rs.	30,50,000.00

OTHER FIXED ASSETS

1.	Office equipment, furniture plus other equipment & accessories	Rs.	3,00,000.00
2.	Installation costs for water, electricity, fuel etc.	Rs.	2,50,000.00
3.	Technical know-how	Rs.	1,50,000.00
4.	Computer with Printer	Rs.	1,00,000.00
	TOTAL	Rs.	8,00,000.00

FIXED CAPITAL

1.	LAND & BUILDING	Rs.	84,50,000.00
2.	PLANT & MACHINERY	Rs.	30,50,000.00
3.	OTHER FIXED ASSETS	Rs.	8,00,000.00
	TOTAL	Rs.	1,23,00,000.00

WORKING CAPITAL REQUIREMENT/MONTH

RAW MATERIALS

1.	Maize 35 Tons @ Rs. 10000/- per Ton	Rs.	3,50,000.00
2.	Activated Carbon 1700 Kgs. @ Rs. 40/- per Kg.	Rs.	68,000.00
3.	Soda Ash & Hydrochloric Acid and chemicals	Rs.	30,000.00
4.	Packing Materials	Rs.	50,000.00
	TOTAL	Rs.	4,98,000.00

SALARY & WAGES / MONTH

1.	Manager cum Technologist	1 No.	Rs.	25,000.00
2.	Superviser	1 No.	Rs.	15,000.00
3.	Chemist	1 No.	Rs.	14,000.00
4.	Skilled worker	6 No.	Rs.	48,000.00
5.	Unskilled Worker	15 No.	Rs.	93,000.00
6.	Clerk/Typist	1 No.	Rs.	6,000.00
7.	Security/Peon	2 No.	Rs.	11,600.00
		TOTAL	Rs.	2,12,600.00
	Plus perks @ 33% p.a.		Rs.	70,158.00
		TOTAL	Rs.	2,82,758.00

UTILITIES AND OVERHEADS

1.	Power Consumption of 16000 Kwatt hrs @ Rs. 5.00 per Kwatt hr.	Rs.	80,000.00
2.	Stationery, Postage, Telephone etc.	Rs.	25,000.00
3.	Conveyance & Transportation etc.	Rs.	50,000.00
4.	Publicity & Sales Promotion	Rs.	60,000.00
5.	Telegraphic Expenses	Rs.	10,000.00
6.	Miscellaneous	Rs.	40,000.00
7.	Coal 10 Ton @ Rs. 5000/- per Ton	Rs.	50,000.00
	TOTAL	Rs.	3,15,000.00

Total load is 44 Kwatts

TOTAL WORKING CAPITAL/MONTH

1.	RAW MATERIAL	Rs.	4,98,000.00
2.	SALARY & WAGES	Rs.	2,82,758.00
3.	UTILITIES & OVERHEADS	Rs.	3,15,000.00
	TOTAL	Rs.	10,95,758.00
1.	**WORKING CAPITAL FOR 3 MONTHS**	**Rs.**	**32,87,274.00**
2.	MARGIN MONEY FOR W/C LOAN	Rs.	8,21,818.50

COST OF PROJECT

TOTAL FIXED CAPITAL		Rs.	1,23,00,000.00
MARGIN MONEY		Rs.	8,21,818.50
	TOTAL	Rs.	1,31,21,818.50

TOTAL CAPITAL INVESTMENT

TOTAL FIXED CAPITAL	Rs. 1,23,00,000.00
TOTAL WORKING CAPITAL FOR 3 MONTHS	Rs. 32,87,274.00
TOTAL	Rs. 1,55,87,274.00

COST OF PRODUCTION/ANNUM

1.	Working Capital for 1 year	Rs. 1,31,49,096.00
2.	Interest @ 13.50% on T.C.I	Rs. 21,04,281.99
3.	Depreciation @ 10.00% on buildings	Rs. 4,70,000.00
4.	Depreciation @ 20.00% on Plant and Machinery	Rs. 6,10,000.00
5.	Depreciation @ 30.00% on office equipment & furnitures	Rs. 90,000.00
	TOTAL	Rs. 1,64,23,377.99

TURN OVER/ANNUM

1.	By selling Liquid glucose 500 Tons, @ Rs. 40,000/- per Ton	Rs. 2,00,00,000.00
	TOTAL	Rs. 2,00,00,000.00

PROFIT = RECEIPTS - COST OF PRODUCTION

= 2,00,00,000.00 - 1,64,23,377.99

= 35,76,622.01

PROFIT SALES RATIO = Profit / Sales x 100

$$= \frac{35,76,622.01}{2,00,00,000.00} \times 100$$

= **17.88 %**

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

$$= \frac{35,76,622.01}{1,55,87,274.00} \times 100$$

= **22.95 %**

BREAK EVEN POINT (B.E.P)

Fixed Costs of the plant are as under -

1.	Interests	Rs.	21,04,281.99
2.	Depreciation	Rs.	11,70,000.00
3.	40.00% of salaries	Rs.	13,57,238.40
4.	40.00% of overheads	Rs.	15,12,000.00
	TOTAL	Rs.	61,43,520.39

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

$$= \frac{61,43,520.39}{61,43,520.39 + 35,76,622.01} \times 100$$

= 63.20 %

LAND MAN RATIO = Total land / Manpower

1500 : 27 :: 56 : 1

RESOURCES FOR FINANCE

1. Term loans from Financial institutions (65.00 % of fixed capital) at @13.50% p.a rate of interest	Rs.	79,95,000.00
2. Bank loans for 3 months (65.00 % of working capital) at @ 13.50% p.a rate of interest	Rs.	21,36,728.10
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.	54,55,545.90
TOTAL	**Rs.**	**1,55,87,274.00**

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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