



सत्यमेव जयते

GOVERNMENT OF GUJARAT

Establishment of Maize Value Added Unit

Agro and Food Processing

Government of Gujarat



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Project Concept

The concept

The project envisages setting up of **Maize Value Added Manufacturing Unit** based on the raw material strength of Gujarat. The manufacturing unit can focus on production, processing, marketing, exports etc.

Consumption pattern of maize

▶ Maize is one of the staple foods in India. The annual maize production in India is around 21 million tonne with the highest maize cultivation in Karnataka, Andhra Pradesh and Rajasthan.

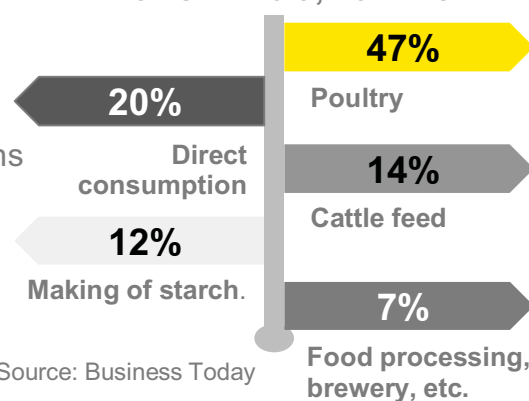
▶ India is one of the largest cultivators of maize in the world, and it is a crop suitable for all the growing seasons in nearly every agro-climatic zone within the country's borders. India has seen a dramatic increase in maize cultivation over the past few years, which explains its pre-eminence as a starch source among processors.

▶ Analysts anticipate this consumption rate to continue in the near future and maize consumption will rise to 25.2 million ton by 2016-17E.

▶ Traditionally, the grain is converted into flour in mills for making bread. Immature cobs are roasted and eaten all over the country. It is an important raw material for animal and poultry feed and corn flakes manufacturing units.

▶ But the quantity of maize utilised by these units is limited as the existing units are of small scale nature. They make only a few products having limited demand. Whereas, a large scale unit can process a large quantity of maize to different value added products.

Segment wise consumption of maize in India, 2012-13



Source: Business Today

Methods of maize processing

Maize is usually processed by two distinct processes:

Dry Milling:

Dry milling technology been standardised by Central Food Technological Research Institute (CFTRI), Mysore. The grits is the main product of dry milling process, which is used as porridge by boiling domestically. The processing units use grits for manufacture of products like ready-to-eat snacks (corn flakes), wall paper paste and manufacture of glucose by direct hydrolysis.

Value added products	Share (%)
Grits	40
Coarse meal	20
Germ	15
Fine Meal	10
Hominy feed	10
Flour	5

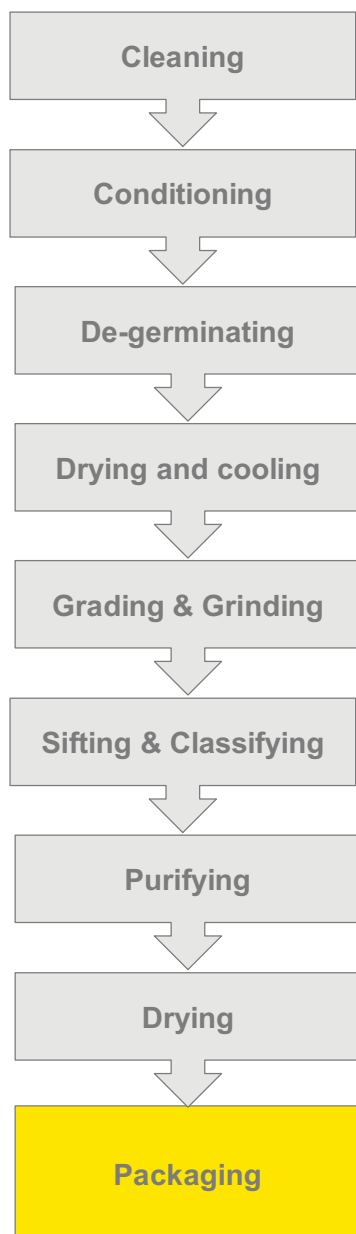
Wet Milling:

Maize is generally processed to manufacture corn starch by wet milling method around the world. The by-products of starch manufacturing, like corn oil, corn steep liquor, gluten etc. are the important value added products.

Value added products	Share
Starch	60% - 62%
Husk	22% - 24%
Gluten	8% - 9%
Germ	6% - 7%

Process flow diagram for maize processing

Dry Milling process flow:



Wet Milling process flow:

Unloading and cleaning

Maize is unloaded from the trucks and is fed to the cleaning section by a feed conveyor. The cleaning section is housed in 3 floors, where the material is screened for debris such as sand, stones and any other foreign particles.

Steeping

Maize is washed with hot water and then steeped in water containing 0.2% sulfur-dioxide for 70 hrs at 52°C in a tank. The steep water produced in this process is then concentrated and fortified with vitamins, minerals to produce corn steep liquor.

Primary and secondary grinding

In this step, germ and husk are separated. The degermed maize is passed through a fibre washing section where the fibre (husk) is separated by pressure washing. Now the mixture consists of gluten and starch.

Gluten and starch separation

The gluten is separated from starch by centrifugal separation. The starch slurry is then passed through a 12 stage hydroclone washing system, wherein the starch is washed and concentrated simultaneously.

Maize processors directly market their products to the consumers like pharmaceutical industries, hotels, textiles, paper industries, etc. and through traders as well. Most of them have their marketing offices in metros and big cities for direct sale. They also sell through trading agencies as well. These traders restrict marketing of the products of one or a few companies and prefer to procure different maize products from a single supplier.

Market Potential – Starch

Market potential - Global

- ▶ Global sales of starches and derivatives was estimated to be US\$62.9 billion in 2015. The market is expected to reach US\$77.4 billion by 2018 growing at a compound annual growth rate (CAGR) of 7.1% during 2015-18. There has been a positive trend during the past two decade in the wet milling industry.

Source: BCC Research

- ▶ Maize is utilised mainly for ethanol production in the developed countries like US and EU, whereas in the rest of the world, it is either used as a staple human food or in manufacturing starch and its derivatives.
- ▶ China's starch consumption grew by 4 times in last decade.

Raw material	% of global starch production
Maize	83%
Potato	6%
Cassava	6%
Wheat	4%
Rice	1%

Source: NABARD Consultancy Services

Market potential - India

- ▶ India currently has installed starch capacity of 13,000 TPD (3 MTPA of starch production). The industry is witnessing increased investment leading to enhanced capacity and higher M&A.
- ▶ Ordinary Starch when cooked to increase its thickness power is termed as Modified Starch. Modified starch market is expected to grow at a CAGR of 3.2% during 2015-17 to reach US\$15.2 billion by 2017.

Trade Statistics – Maize Starch , 2012-16

(by value, in INR lakhs)

Year	Import	Export
2015-16	1,736.3	45,848.5
2014-15	1,599.0	48,377.5
2013-14	1,298.1	46,528.8
2012-13	855.0	33,667.3

Source: Department of Commerce

(by quantity, in thousand Kgs)

Year	Import	Export
2015-16	2,236.4	195,097.7
2014-15	1,694.6	200,789.6
2013-14	1,657.7	178,454.6
2012-13	1,205.5	142,214.4

- ▶ India's export of maize starch increased by over 35% during 2012-16, both in terms of value and volumes.

Growth drivers

- ▶ **Growth in industries using starch as raw material:** Industrial sectors which are demand driver for the starch industry are doing extremely well & expected to continue the uptrend in 2016.

Pharmaceutical Industry

- ▶ Dusting media for various type of coating as well as binder & filler for capsules & tables
- ▶ An efficient dry – binder in dry granulation techniques

Textile Industry

- ▶ Provide stiffness & add weight to clothes
- ▶ Used in conjunction with thermoplastic or thermosetting resins to obtain a permanent finish

Paper Industry

- ▶ Used for sizing as well as to increase the paper strength
- ▶ An adhesive in pigmented coating for paper and paper board to enhance the printability and appearance of the paper

Food Industry

- ▶ Used for thickening sauces, gravies, puddings and pie fillings.
- ▶ Numerous applications in baking industry, provides strength to ice cream cones

- ▶ **Per capita consumption:** Per capita starch consumption in India is 1.5 Kg as compared to global average of 6.1 kg. The consumption in India is nearly one fourth in comparison to China, thereby indicating enormous scope of growth.
- ▶ **Changing consumer behaviour:** Rising health consciousness among consumers leading to a consumer preference for products using corn starch & derivatives due to their nutritional superiority.
- ▶ **New industrial applications:** Modified starch suited for various specific applications resulting in higher efficiency and better quality of end products. E.g. application of cationic starch in paper industry is resulting in lower fiber loss, better printability and use for starch in manufacturing ethanol.

Key considerations

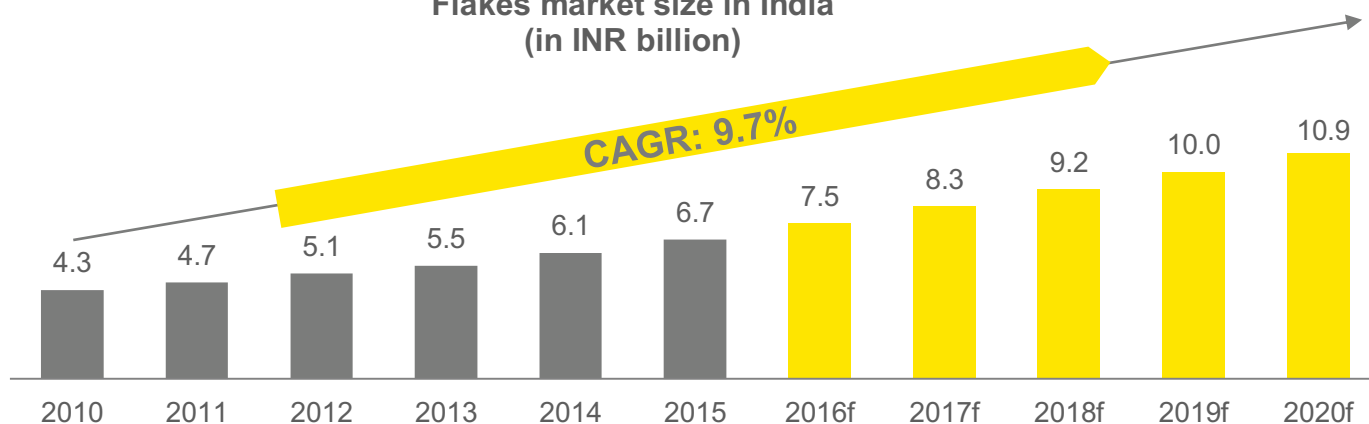
- ▶ Consistent quality of maize is not available round the year with high cost of cultivation is high as well as rising post harvest losses.
- ▶ Lack of adequate infrastructure and capacity to dry up corn to the level of 14% leading to wastage and loss to farmers.
- ▶ Government regulations limiting the permissible limit of usage of starch in products in India compared to the permissible limits in other American and European countries.

Market Potential – Corn Flakes

Market potential - India

- ▶ The flakes market size in India is estimated to be INR 6.7 billion in 2015 and is expected to grow by a CAGR of 10% to reach INR 10.9 billion by 2020. (Flaked cereals, the most widely known being corn flakes. The market size estimate also includes wheat flakes, bran flakes, etc.)
- ▶ Corn flakes is consumed as breakfast food in India and all over the world. In addition, raw corn flakes are also used by the liquor companies for manufacturing of beer. Fried corn flakes are served as snack foods.

Flakes market size in India
(in INR billion)



Source: Euromonitor

Trade Statistics – Corn Flakes, 2012-16

(by value, in INR lakhs)

Year	Import	Export
2015-16	59.2	2,651.5
2014-15	653.0	1,836.1
2013-14	84.9	1,696.0
2012-13	20.2	1,467.2

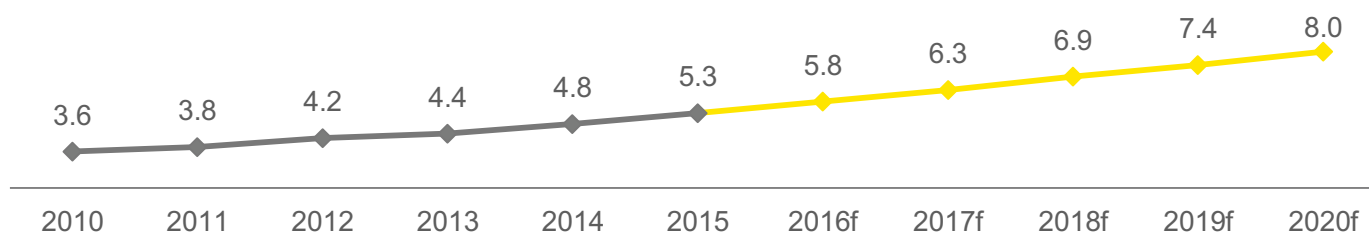
(by quantity, in thousand Kgs)

Year	Import	Export
2015-16	27.9	1,973.0
2014-15	522.1	1,314.7
2013-14	51.2	1,485.8
2012-13	16.8	1,217.6

Source: Department of Commerce

- ▶ India's export of corn flakes increased by 80% by value and over 60% by volumes during 2012-16.

Rising per capita consumption of flakes in India (INR per capita)



Source: Euromonitor

- ▶ India's per capita consumption of flakes is expected to double during 2012-2020.

Gujarat - Competitive Advantage



Availability of raw material

Gujarat is the eighth largest maize cultivator state in India. It produces 0.8 million tonnes of maize with 0.5 million hectares cultivation area. Nine states viz. Karnataka, Andhra Pradesh, Tamil Nadu, Rajasthan, Maharashtra, Bihar, Uttar Pradesh, Madhya Pradesh and Gujarat account for 85% of India's maize production and 80% of cultivation area.



Favourable consumer demographics

▶ Gujarat, with 42.6% of its population residing in the urban areas, is among the top three urbanized states in the country (as per Census 2011).



Ease of Doing Business

- ▶ Only state to comply 100% with Environmental procedures. Gujarat fares highly when it comes to setting up a business, allotment of land and obtaining a construction permit.
- ▶ 10 Cold Chain Projects have been approved by the Ministry in Gujarat which are being implemented under MoFPI assistance.



Availability of technical man power

Skill development industry in the state is well-developed with many technical institutions (786 ITI's and 52 Skill upgradation centres).



Boost from foreign investment

- ▶ The government is continuously improving infrastructure in Gujarat. As a result, the state has been witnessing significant development, encouraging manufacturers to invest in the state. Gujarat has attracted cumulative FDI worth US\$12 billion from April 2000 to March 2015.
- ▶ Gujarat contributes around 19.1% to India's total exports of goods in 2014-15.



Flourishing Economy

▶ Gujarat contributes 7.2% of the Nation GDP and shows leadership in many areas of manufacturing and infrastructure sectors. Gujarat's SDP (State Domestic Product) at current price registered a growth of 11% during the year 2014-15.



Strategic location and excellent infrastructure

▶ Located on the west coast of India, Gujarat is well connected to the major cities of the world by air and sea routes.

Infrastructure availability

Logistics & connectivity

All the six regions are well-connected with each other in Gujarat as well as other cities in India



Rail

- ▶ The total length of railway lines in the state is 5,188 route km.
- ▶ Three projects, namely Viramgam-Surendranagar-Pipavav; Gandhidham-Palanpur and Mundra-Adipur were been taken up under Private Sector Participation (PSP) mode.



Road

- ▶ The state is well connected with district roads, state highways and national highways.
- ▶ National Highways: NH-8A and State highways ease the transportation.



Air

- ▶ The state has 12 domestic airports and 1 international airport, the highest in any state of India. Ahmedabad is connected with important national and international cities.



Port

- ▶ Gujarat is strategically positioned to service the vast Northern and Central Indian hinterland. The state has 40 minor and intermediate ports, geographically dispersed across the state.

Utilities



Water

- ▶ Gujarat has a state wide “water supply grid” spread across 1,20,769 km that aims to serve 75% of the Gujarat’s population.

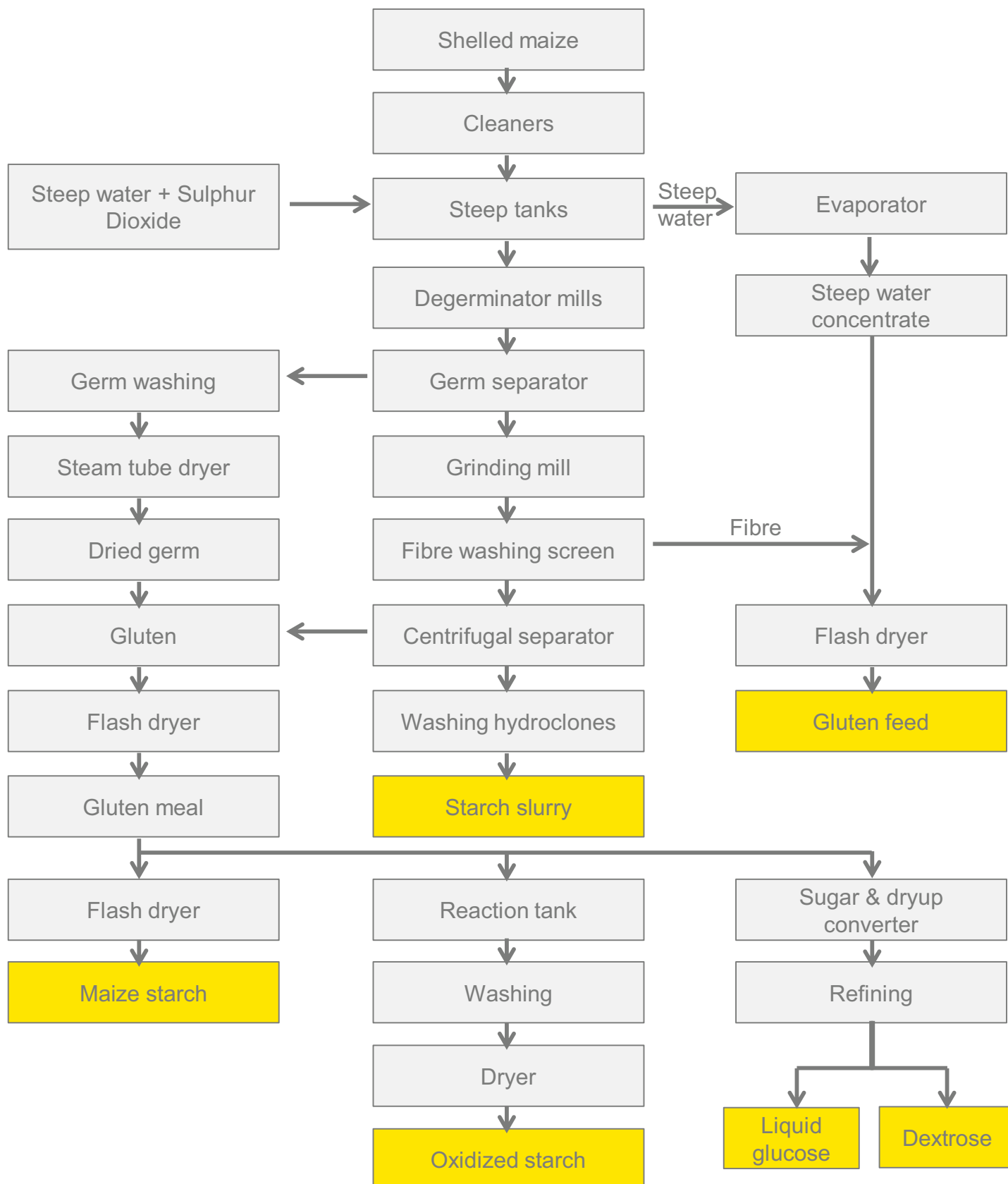


Power

- ▶ Gujarat boasts of 24 hours 3- phase uninterrupted power supply.
- ▶ The present generating capacity of 9,827 MW will be doubled to 20,725 MW in next five years to make Gujarat a power surplus state.

Project Information – Starch

Process flow diagram for starch manufacturing



Project Information – Starch



Project location

The preferred location for setting up starch manufacturing plant will be north and central Gujarat as these are maize cultivation areas and would ensure easy access to raw material. Most of the existing maize processing units are also in this area.

Estimated capacity of the plant

6000 metric tonnes (MT) per annum starch production from maize
(Assumption: 25 working days/month and 3 shifts per day of 8 hours each)

Utilities

Utilities	Est. quantity per month
Power	15000 Kwatt hours
Water	700 Kilo liters

Man power required

Grade	Est. number of people required
Manager	1
Secretary	1
Accountants	2
Process Engineer	1
Production & maintenance superintendent	1
Sales & marketing officer	1
Skilled labor	5
Unskilled labor	5
Peons & office attendants	2
Typist	1
Driver	2
Total	22

Project Information – Starch

Raw material

Raw material	Est. quantity per month
Maize	875 MT
Sulphur	4.2 MT
Fuel oil	150 MT
Lubricating oil	75 Kg

Plant and machinery (required for production of 20 metric tonnes of starch per day)

List of equipment and machinery	Est. quantity	List of equipment and machinery	Est. quantity
Steep tanks	6	Merco strainer	1
Recirculating pumps	6	Gulten thickener	1
Heaters	6	Drum filter	1
Steep acid tank	1	Dorrclone starch	1
Dorr clone	4	Clarification system	1
DSM screens	4	Starch milk tank	1
Filtrate tank	1	Starch filter	1
Steep liquor evaporator	1	Emergency tank	1
Grind mill	2	Sulphur burner	1
Fine mills	1	Absorption tower	1
Expellen press	2	Dryers	3
Merco rotary	1	Separating cyclones	1
Merco B-30	1	Flash dryer (starch)	1

In addition to this list of equipment, storage, vessels, pumps, heat exchangers, agitators, conveyors, strainers, packing systems, etc. will also be required. About 40% of the equipment will need to be imported and rest can be purchased through Dorr Oliver, that has developed special equipment such as Dorr clones, DSM screens, etc.

Project Financials – Starch



Estimated project cost of setting-up a wet milling unit to manufacture starch for 6000 MT per annum capacity is INR ~95 million

Project cost*	
Project components & specifications	Cost (INR million)
Land (Area: 2.5 acres i.e. 10117.1 square meters) Rate: (INR3,000 per sq. mtr. as of May 2016) ¹	30.3
Development cost (plant area, office, godown, lab, service area etc.) ^{2,3}	20.4
Plant and machinery	9.2
Misc. Fixed Assets (Furniture and fixtures, office equipment, etc.)	3.4
Preliminary and pre-operative expenses (12%) (Company formation, interest during construction, etc.)	7.6
Contingency (10%)	7.1
Total	78.0
Margin money for working capital	17.2
Total Project cost	95.2

*Note: estimated project cost based on annual inflation adjusted figures of 2008.