

<b>Sector</b>	Agro and Food Processing
<b>Sub - sector</b>	Food Processing
<b>Project No.</b>	AF-10
<b>Project Title</b>	Potato processing for powder and flakes

## Project Description

The proposed project envisions setting up of Potato powder and flakes manufacturing unit. Gujarat is one of the leading potato producing states in western India. Potatoes produced in Gujarat are suitable for value added processing like manufacturing of potato powder and flakes.

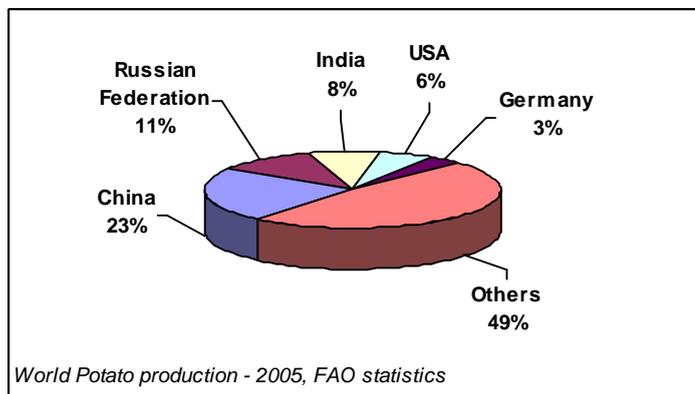
## Product Application

Potato powder/flakes have wide application in the processed and snack food industries, it can be used in any recipe which requires mashed potatoes. Potato powder is used as a thickener or base for preparation of ready to eat vegetable gravies and soups. It is also used as an ingredient for potato chips, texturised potato products, snack pellets etc.

## Market & Growth Drivers

Global potato production for the year 2005 was around 322 million MT of which China dominates the world by contributing around 23%, followed by Russian federation, India, USA and Germany.

Netherlands dominates the world in export as well as import of potatoes, exporting around 1700000 MT, valued US \$ 498 million and importing around 1650000 MT, valued at US \$ 208 million in the year 2004-2005. France, Germany and Egypt and USA are the other leading exporters of potatoes, while the



countries importing substantial quantum are Germany, USA, Algeria and Brazil.

## Trade Statistics

Sr. No.	Particulars	Years					TOTAL
		2002-03	2003-04	2004-05	2005-06	2006-07*	
1	Export (Q)	43.89	17.02	122.48	141.91	76.01	436.1
	(V)	15	2.58	20.57	72.46	20.85	141.87

Sr. No.	Particulars	Years					TOTAL
		2002-03	2003-04	2004-05	2005-06	2006-07*	
2	Import (Q)	414.01	560.15	830.24	369.4	40.27	2450.13
	(V)	203.28	311.51	492.06	211.1	22.97	1362.27

Source: Department of Commerce, India. (Q) Quantity in MT, (V) Value in INR Lacs. 2006-07\* indicates data from April to June

India's export of potato flakes for the current fiscal year 2006-2007 (Apr-Jun) till date is estimated to be 76.01 MT, valued at Rs. 2.08 million. The leading importer of Indian potato flakes is USA, followed by Malaysia and Kenya.

The average annual value of imports of potato products in India remained at US \$ 1.19 million up to year 2003. In the year 2004, India imported US \$ 3.48 million from USA, Netherlands, New Zealand, Italy and Canada. In all five countries supplied potato products to India.

### Growth Drivers

- Increasing consumption of ready to cook and ready to eat food products. Increasing consumption of fast food such as French fries and other potato based snacks items in all classes of people is boosting the market for potato flakes and powder.
- Changing societal trends, increasing nuclear families, aging population and people looking for more convenient snacking and pleasure food with less indulgence.
- Indian snack food industry is one of the largest snack markets in the world and is presently estimated at Rs.1530 crores and is expected to grow at 10%. Potato powder and flakes contribute around 20 to 25% of this market.

### Why Gujarat?

- Gujarat produced 978182 MT of potatoes from 43268 hectare cultivated in the year 2005.
- Rapidly growing food processing industry in Gujarat offers opportunity for newer products from potato powder and flakes.
- Gujarat offers availability of technical / skilled manpower for Food processing industry.
- Easy availability of industrial land with basic facilities (power, water, fuel and drainage etc;) in potato producing areas.

### Technology/Process

The manufacturing process for potato flakes/powder includes following processes:

#### - Washing / Sorting & Grading of Potatoes

The primary procedure consists of washing and grading the raw material as per requirement. Potatoes with high solid contents are considered the best for potato flakes for, when rehydrated, it should give the same texture as a freshly mashed potato.

- **Peeling / second washing**

There are three methods that can be used for peeling - steam, abrasion, and lye. Generally, for commercial processing the Peeling Grade 4 defined as "a grade that has either multiple peel fragments or defects and does not appear well peeled and may also have a thin layer of outer cortical cells remaining. The potatoes falling in this cadre are not acceptable for the production of French fries without considerable trimming, while they are absolutely acceptable for dehydrated mashed potato manufacturing." on the Willard Peeling Score Chart is used.

- **Cooking**

Cooking is done to separate the potato cells to the desired degree of aggregation with minimum cell rupture. There are three types of steam cookers used commercially: the conventional design, direct steam injection in a screw conveyor, and steam injection with counter rotating screws.

- **Pulping and Drum drying of Pulp to produce flakes**

A single drum dryer equipped with four to six applicator roles is the best way to accomplish the drying process. The clearance between the top roller and the drum surface determines the rate of flow of the mash to the rolls beneath; this is adjusted by the operator as required. The operator progressively transfers mash from the upper to the lower rollers, ensuring that each roll is provided with a continuous reservoir of mash to obtain maximum density of the dried sheet of potatoes, and finally discards the mash from the bottom of the roll when it has accumulated the optimum level of defects. A reciprocating doctor knife removes the dried sheet; in some cases when a thick dry sheet is being made, it peels away from the drum just ahead of the knife, leaving the drum surface quite clean. The sheet then drops into a collecting screw conveyor, which transfers the roughly broken sheet to a collecting point at one end of the dryer." The potato flakes are dried to commercial specifications of 6 - 7.5% moisture and bacteriological standards of coli form, 10/gram, E. coli, negative, standard plate count, 10,000/gram, and negative for Staphylococcus aureus and Salmonella.

**Slicing, Precooking, Cooling & Grinding of flakes into Potato powder**

Potatoes should be sliced to about 5/8 of an inch thick to obtain a more uniform heat treatment during the precooking and cooling steps. The purpose of precooking is to get the starch to gelatinize within the potato cell, but not allow the softening of the intracellular bonds to take place. To accomplish this, water is heated to 71°C to 74°C. The process of a continuous screw through a processing unit heated usually does this by the direct injection of steam.. The gelatinization of the starch within the cells must be complete for the retro gradation to take place during cooling, allowing for the bonds that formed to retain their linkages through the cooking and drying steps which follow, reducing the stickiness of the reconstituted finished flake. Cold water is used to reduce the stickiness of the potato for convenience in later handling. The free starch is also washed from the surface of the precooked potato slices to avoid sticking and scorching during the dehydration process. In commercial processing, a screw conveyor, either U-shaped or with "wrap around" sides, is used. The potato slices advance through a counter - current flow of cold water. The quality of water used depends on three factors: the water temperature, the flow rate of the

potato slices, and the degree of retro gradation desired (expressed by the Blue Value Index method). High solids potatoes are generally cooled to a maximum internal pulp temperature of 21°C and low solids potatoes to an internal temperature of 10°C.

### **Packaging in moisture proof multi layer plastic pouches**

The moisture content being low flavor deterioration is the outcome of oxidation. This can be significantly reduced or retarded by the partial exclusion of air or the use of antioxidants. Therefore, the packaging used should afford a moisture barrier and be opaque because light will greatly accelerate rancidity. Potato flakes are nitrogen packaged in tin cans with 3.5% oxygen and will remain substantially unchanged in flavor for more than a year at 73°F, about room temperature.

Yield ration of raw potatoes to flakes is approx. 6.7:1 and re-hydration ratio of potato flakes to potato mash is 1:5. Potato Flakes and powder making technology is indigenously available but few critical equipments need to be imported to have Semi-automatic processing in line with the capacity suggested in this project and meet, product quality with international standards.

## **Raw Material**

The principle raw material required for making Potato powder and flakes is potato, salt, spices, preservatives, edible oil and hard coke. Since, Gujarat is one of the leading states producing potatoes availability of raw material in sufficient quantity will not pose a bottle-neck for the unit.

Potato production and area per hectare are summarized in the following table in giving an overview of raw material availability in the state.

**Area and Production of Potatoes in Gujarat**

<b>Sr. No</b>	<b>Year</b>	<b>Area (Hectares)</b>	<b>Production (MT)</b>
1	2001-02	40,163	978358
2	2002-03	35,794	780001
3	2003-04	31,211	704099
4	2004-05	43,268	978182
5	2005-06	40,992	1088530

*Source: Department of Agriculture Statistics, Gandhinagar, Government of Gujarat*

Kheda, Banaskantha, Mehsana, Sabarkantha and Anand are major potato producing districts in Gujarat. It can be observed that there is difference in area and productivity every year, the reason being fluctuations in rain fall.

## Suggested Plant Capacity & Project Cost

The proposed project will have a plant capacity of 2500 TPA, which will produce 1625 MTPA of finished product considering 65% utilization for the first year.

Capital cost is estimated to be INR 25 million (US \$ 0.56 million).

### Estimated Project cost & Means of finance

Sr. No.	Cost of project	INR in Million
1	Land and Land development	2.10
2	Building & Civil works	5.00
3	Plant & Machinery	9.00
4	Misc. Fixed Assets	2.00
5	Preliminary & Pre-operative	2.00
6	Provision for contingencies	1.40
	<b>Total Fixed Assets</b>	<b>21.50</b>
7	Margin Money for working capital	3.50
	<b>Total</b>	<b>25.00</b>
	<b>Means of Finance</b>	
8	Promoters contribution	8.50
9	Term loan	16.50
	<b>Total</b>	<b>25.00</b>

As indicated above the proposed project will require approx. 3000 Sq. mt of land and proposed built up area for proposed unit will be approx. 1000 sq. mt. The unit will have installed capacity of 2500 TPA, considering 125 working days in a year the unit will have installed capacity of 20 TPD. Total estimated fixed cost of the project in INR 21.50 million and INR 3.50 million will be as working capital margin, which will make estimated block capital cost of INR 25 million. The proposed unit will cater to domestic and international demand so the Debt equity ratio of 2:1 is suggested. Thus, the estimated term loan amount would be of INR 16.50 million and Equity will be INR 8.50 million.

## Plant and Machinery Required

The proposed project would require the following basic as well as necessary plant and machinery:

### List of Main Plant and Machinery

Sr. No	Particulars	Quantity	Supplier/Technology Provider
1	Potato Washer	2	Global Agri Tech Engineer, Vadodara Shriram Temp Exchangers, Vadodara

Sr. No	Particulars	Quantity	Supplier/Technology Provider
2	Potato Peeling Machine	4	Honey Comb Products, Ahmedabad Economode Food Equipment (India) Private Ltd.. Mumbai
3	Slicing Machine	4	Ambica Boiler & Fabricators, Ahmedabad Hind Pulverizer works, Ahmedabad
4	Dryer	2	Shivaom Machine Tools, Noida SSP (PVT) Limited, Haryana
5	Pulveriser	2	Kaps Engineer, Vadodara Shriram Temp Exchangers, Vadodara
6	Sealing Machine	1	Ajinomoto India Pvt Ltd, Chennai
7	Steam Boiler	1	Sadanand Approtech Pvt. Ltd, Mumbai
8	Electronic Weighing Scale	1	Avery India Ltd, Kolkata

## Utilities

The unit would necessitate utilities like water, electric power and fuel. 25000 litres water, 125 HP power and 5 MTPD coal/FO as fuel, would be a mandatory requirement on per day basis for the proposed unit.

## Estimated Man power required

Estimated total manpower requirement for the proposed unit is 20 persons, that will include 3 people at managerial grade, 8 people staff in the manufacturing section, 2 persons in quality control and 7 other staff members for other departments including purchase and marketing assistants.

## Suggested Location

The suggested locations for proposed potato processing unit of powder and flakes are Banaskantha, Mehsana, Kheda, Sabarkantha, and Anand districts.

## Project Time Line

The proposed project will have cumulative implementation period of 10-12 months of which 5 to 6 months would be for obtaining the obligatory clearances from various authorities.

## Financial Indicators

Based on the profitability projections worked out for the proposed project, key financial indicators are as summarized below:

### Key Financial Indicators

Sr. No	Financial Ratios	1 <sup>st</sup> Year	2 <sup>nd</sup> Year	3 <sup>rd</sup> Year
A	Break-Even Point in % capacity	42.28	39.26	36.35
B	Debt-service Coverage Ratio	1.51	2.12	3.42
C	<b>Average DSCR</b>	<b>2.35</b>		
D	Return on Investment (ROI)	8.95	12.19	17.79
E	<b>IRR</b>	<b>22%</b>		

As observed from the table of Project cost and Means of finance, the suggested Debt Equity ratio for the proposed project is 2:1. The IRR (Internal Rate of Return) for the proposed project is approx. 22% for a projected period of 10 years.

### Clearances required

The proposed unit will have to register itself with Secretariat of Industrial Approvals (SIA), Ministry of Industries and Government of India, by filing Industrial Entrepreneur's Memorandum (IEM), as it will have plant and machinery investment of more than INR 10 million.

The unit will also cater to global needs and therefore it will necessitate registering with Food and Drugs Administration (FDA) of that country and strictly following the quality standards accepted by them, apart from registration with Indian and state food administration.

The most critical aspect of this product will be its shelf life for export consumers and hence there will be need for import of stabilizers and preservative meeting FDA regulations in consuming countries and Codex standards followed by them.

The unit will get EOU registration from RBI, DGFT and with APEDA as registered manufacturer exporter to avail export incentives. Domestic food processing unit needs no license, but as the unit is opting to export it will require obtaining quality control license and permission from MOFPI.

It is obligatory to meet provisions under the PFA act for all ingredients and quality aspects for marketing product in Indian market.

### Agencies to be contacted

Industrial Extension Bureau  
Mott MacDonald India  
Gujarat Agro Industries Corporation Ltd.