Ministry of Food Processing Industries
Government of India

सत्यमेव जयते

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WHEAT FLOUR

AATMANIRBHAR BHARAT

PM Formalisation of Micro Food Processing Enterprises Scheme (PM FME Scheme)

INTRODUCTION

Industrial Overview:

- Wheat flour is a powder food material, it is made from wheat for human consumption.
- Wheat is one of the oldest domesticated grains and a major cereal crop.
- In modern times, wheat is used to manufacture bakery items for meals, breakfast cereals, and oats.
- It can be grown on a wide variety of soils, but in temperate climates it thrives.

INTRODUCTION

Product Description:

- Among cereal grain flours, wheat flour is unusual in that its protein components.
- Wheat flour forms an elastic network capable of retaining gas and forming a strong spongy structure during baking, when mixed with water.
- The protein substances that contribute to these properties (gliadin and glutenin) are known collectively as gluten.
- Wheat flour is used to prepare bakery items like biscuits, cakes, bread, cookies etc.
- Wheat flour is to prepare roti, paratha, puri, samosa etc. in households & restaurants.

INTRODUCTION

Market Potential:

- In 2019, the global demand for wheat flour reached a consumption volume of 391 million tons, with steady growth during 2014-2019.
- Wheat flour is currently one of the most common food ingredients used in the world.
- Wheat flour provides health benefits, such as reducing levels of cholesterol, improving metabolism, managing obesity, and controlling blood sugar levels.
- Because of the presence of gluten, a protein that gives strength and elasticity to the dough as well as contributes to the texture of baked goods, wheat flour is used extensively.
- The global demand for wheat flour has been further strengthened by factors such as population growth, growing disposable incomes, increasing consumption of bakery goods and changing lifestyles.

- India's packaged wheat flour market is rising by almost 21% at a whooping CAGR .
- If the growth trend stays the same, by the end of the current fiscal year (2020-21) itself, the market could be likely to hit a new height of Rs 20,000 Cr.
- The numerous micro- and macroeconomic variables pave the way for the growth of the market.
- Wheat flour, which was still packed, remained an urban phenomenon, with the urban market occupying more than 90% of the overall market.
- With the market penetration of the leading players in the market expanding, the rural market would also see a steady increase in demand for packaged wheat flour in India.

INTRODUCTION

Raw Material Description:

- The main raw material is wheat grains.
- Wheat grains, or kernels, consist of about 85 percent of the starchy endosperm, or food-storage portion; about 13 percent of several outer layers that make up the bran; and about 2 percent of the oily germ, or embryo plant.
- The aim of the milling process in the manufacture of refined flour is to distinguish the endosperm from the other kernel parts. Both parts of the kernel are used in processing whole wheat flour.

- Starch's health effects largely depend on its digestibility, which determines its effect on levels of blood sugar.
- After a meal, high digestibility can cause an unhealthy spike in blood sugar and have harmful health effects, particularly for individuals with diabetes.
- Wheat produces small quantities of soluble fibres or fructans that can cause digestive symptoms in individuals with irritable bowel syndrome (IBS).
- A good source of various vitamins and minerals is whole wheat.

INTRODUCTION

Types of Raw Material:

- The main varieties of wheat grown in India are as follows VL-832,VL-804, HS-365, HS-240, HD2687,WH-147, WH-542, PBW-343, WH-896(d), PDW-233(d), UP-2338, PBW-502, Shresth (HD 2687), Aditya (HD 2781), HW-2044, HW-1085, NP-200(di), HW-741

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TYPES OF RAW MATERIAL

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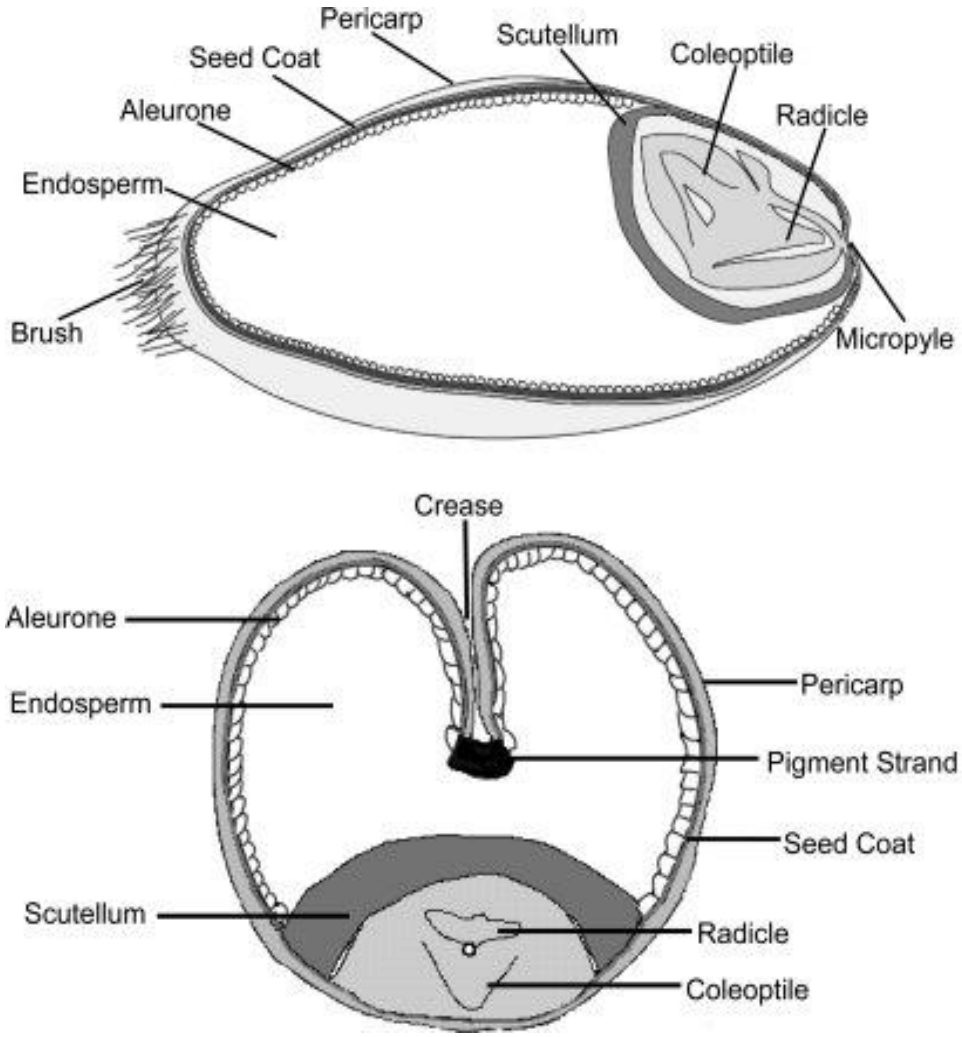
Varieties	Characteristics
HS 542 (PusaKiran)	A semi-dwarf variety with grain yield potential of 6.03 t/ha under rain fed situations. HS 542 has good chapatti and bread making qualities. The variety is resistant to stripe and leaf rust.
HW 1098 (Nilgiri Khapli)	A high yielding, semi-dwarf (85 cm) dicoccum wheat variety with yield potential of 4.78 t/ha and high degree of resistance to stem, leaf and yellow rust. HW 1098 produced bold grain (40.3g), with better grain quality (>13% protein and 3.7 ppm β carotene).
HDCSW 18	This is the first variety of the country bred specifically for CA. It has genetic yield potential of more than 7t/ha. It out yielded the checks like HD 2967, PBW 550 and DBW 17 under CA by 11.13 to 20.74 % in NCR. It is resistant to high temperature at seedling stage. It escape high temperature at maturity due to early seeding. It is highly resistant to brown rust and has lower incidence of Kernel bunt.
HD 3117	It has genetic yield potential of 5.5 t/ha. Average yield of this variety under late sown (after15th Dec.) is 4.78 t/ha under tilled condition and 4.79 t/ha under conservation agriculture condition.
HD 4728 (PusaMalvi)	A semi-dwarf (90 cm), 120 days maturing durum wheat variety with genetic yield potential of 6.8 t/ha. The variety has high degree of resistance to leaf and stem rust diseases.
HS 562	It has genetic yield potential of 6.2 t/ha under irrigated condition. It has shown good levels of field resistance to leaf and stripe rusts and possesses good chapatti and bread making qualities.
HD 3226	The Wheat Variety HD 3226 is released for commercial cultivation in North Western Plain Zone comprising of Punjab, Haryana, Delhi, Rajasthan (Except Kota and Udaipur Divisions), Western Uttar Pradesh (Except Jhansi Division), Jammu and Kathua district of J&K, Una district and Paonta Valley of H.P and Uttarakhand (Tarai region) under Irrigated, timely Sown Conditions.

PROCESS & MACHINERY REQUIREMENT

Raw Material Aspects:

- To produce flour, wheat grains can be milled as a first step in processing.
- Three main groups can further divide the standard of wheat: (I) botanical (species and cultivars); (ii) physical and (iii) chemical characteristics.
- Wheat quality physical properties include grain mass, hardness, grain size and form, and color.
- Moisture content, protein (gluten) content, amylase content, and fiber content are chemical characteristics of wheat.

- Grain grading and grain specification systems ensure that the groups engaged in the manufacturing, storing and processing of grain are able to manage, exchange, and process grain that meets the requirements or properties necessary.
- Grain grading depends on four primary properties, including (i) hectolitre mass, (ii) moisture content, (iii) foreign matter, and (iv) damaged grains.



PROCESS & MACHINERY REQUIREMENT

Source of Raw Material:

- Uttar Pradesh is the largest producer of wheat in an area with 9.75 million hectares (32%), followed by Madhya Pradesh (18.75%), Punjab (11.48%), Rajasthan (9.74%), Haryana (8.36%), and Bihar (6.82%).
- As wheat is a major grown crop the availability of wheat grain is easy in the northern states of India.
- Various mandis are available in every district for wheat. Raw material can be procured from these mandis, local vendors, or direct from the farm.

PROCESS & MACHINERY REQUIREMENT

Technologies:

- **Hand operated flour mill:**

Milling is the method of ground cereal grains into flour. Traditionally, this would have been done by grinding the grain between two stones, a lower, stationary stone called the quern stone, and an upper, mobile stone called the hand stone

TECHNOLOGIES

- **Saddle Stone:** Saddle stones are the oldest known flour milling machines. A saddle stone is a piece of hard stone that is cradle-shaped and carries the grain. The sandstone will have been either a cylindrical piece of stone (worn in both hands and traced like a rolling pin over the grain) or a disc held in one hand with a vertical handle on its back (rather like an upside-down mushroom). These hand stones were used to crush the grain and fairly coarse flour was made.

TECHNOLOGIES

➢**Mills and mill stones:**

As the agricultural Production of cereals was the need for more efficient methods of flour production. In such mills, even larger circular-shaped stones would be used and a finer flour would be produced than that produced by handheld instruments. Electric motors are used in modern flour mills as power source.

TECHNOLOGIES

➢**Roller mills:**

As the population multiplied and the need for more and better flour and bread increased, a modern method of milling was devised. By moving the grain through a series of paired counter-rotating rollers with fluted surfaces, these mills work. To separate the bran from the starchy endosperm, the resulting crushed grain is sieved between each pair of rollers.

PROCESS & MACHINERY REQUIREMENT

Manufacturing Process:

- **Grain delivery:**

The grain is supplied by covered trucks and hopper railcars to factories. After arriving at the mill, grain stocks will often have gone through a variety of accumulation processes (farmer, country elevator, terminal elevator, etc.).

- **Grain standard:** Before wheat grains are unloaded in a factory, the assessment is required with samples. The grain is tested for moisture, test weight, unsound seeds, and foreign material.
- **Cleaning the grains:** It can take as many as eight steps.

- **Magnetic separator** – The grain first passes by a magnet that removes ferrous metal particles.
- **Separator** – Vibrating or rotating drum separators remove bits of wood, straw etc.
- **Aspirator** – Air currents act as a vacuum to remove dust and lighter impurities.
- **De-stoner** – Using gravity, the machine separates the heavy material from the light to remove stones that may be the same size as the desired grain.
- **Disc separator** –It rejects anything longer, shorter, more round, more angular or in any way a different shape.
- **Scourer**– The scourers eliminates the outer husks, the soil in the kernel crease, and other minor impurities.
- **Impact Entoleter**– The centrifugal force cuts down some unsound kernels or insect eggs and the aspiration rejects

- **Grinding**: The modern milling process is a gradual reduction of the wheat grains through the grinding and sifting process. This science of analysis, blending, grinding, sifting, and blending results in consistent end product.

- **Sifters-** Through pneumatic tubes, the broken particles of wheat are elevated and then dropped into huge, vibrating, box-like sifters where they are shaken to separate the larger from the smaller particles by either a series of bolting cloths or screens.

- **Blending:** From the fibre, the flour is separated and the process is repeated again.

- **Testing of the final product**: Lab checks are carried out after milling to ensure that the flour follows the specification and standards.

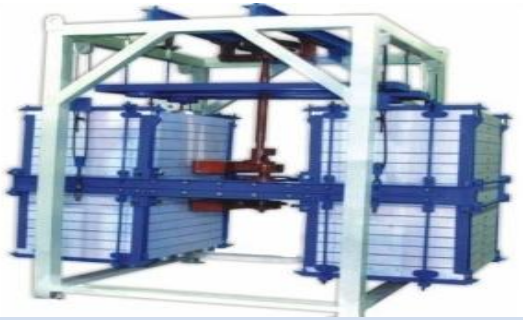
- **Packing:** The packaging is carried out as per required weight. Then sealing is done.

PROCESS & MACHINERY REQUIREMENT

Flow Chart:

Machine Name	Description	Machine Image.
Unloading Bins	These are large bins designed for unloading of grains & similar product; they are equipped with large rod mess to prevent big impurities from entering system.	
Silos	These Equipments are class of storage Equipments which are specifically designed for dry grain raw material of small granule composition. Usually used to store grains but can also be used to store cement & aggregate.	

Machine Name	Description	Machine Image.
Vibrating Pre-Cleaner	It's composed of a vibrating sieve, powered by an exciter which is in turn is powered by an appropriate motor; which is used to remove most of the dirt & large impurities from given grain.	
Heavy duty Pulveriser Mill	It basically a grinder class machine, which may employ any possible grinding arrangement to achieve, required grinding as per product to be grinded.	

Machine Name	Description	
Flour Sifter Machine	It's basically an industrial version of the sieve used to sieve out, large fibers, particles etc, to achieve required particle size in flour.	
Flour testing kit	This is the type of kit that measure moisture of flour before packaging of final product.	
Packet Filling & Packaging Machine	It's a simple packaging machine, designed to fill the given food grade plastic material's continuous pouch with required product after sealing one end & after filling sealing the other end also to generate packet of product.	

PROCESS & MACHINERY REQUIREMENT

Additional Machine & Equipment:

Machine and Equipment	Uses	Pictures
De-stoner	It's a machine which is used to remove stones from the given grain, widely used in various grain mills in cleaning section.	
Disc Separator	It's a separator class machine, generally used to remove foreign grains from required grain efficiently	

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ADDITIONAL MACHINE & EQUIPMENT

Machine and Equipment	Uses
Magnetic Separator	It's a type of separator which is used to magnetic impurities from given product using powerful electromagnets, used in wide range of industries for separation.
Aspirator	It's a more fine-tuned separator designed to remove finer impurities like remaining dirt, similar sized impurities, leaves etc.
Food Grade Conveyor	These are conveyors with food grade belt to maintain food safety standards set by monitoring authorities.

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PROCESS & MACHINERY REQUIREMENT

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General Failures & Remedies:

General Failures	Remedies
Ball bearing failure of various machine	1. Proper periodic lubrication of all bearings in various machines. 2. Regular replacement of all bearing to prevent critical failures.
Power Drive Overload	1. Ensure proper weighing & metering specially in case of semi-automatic plant. 2. Install warning sensor in buffer region of loading capacity to ensure efficient operation.
Mechanical Key Failure	1. Ensure that mechanical keys are replaced as per there pre-defined operational life. 2. Prevent Overloading.
Loss of Interface	1. Provide proper physical shielding for the connections.
Hulling	1. Extra cleaning required for wheat grains flour milling to sift out the impurities (dirt, chaff, etc.)

PROCESS & MACHINERY REQUIREMENT

Nutritional Information:

Wheat Product	Protein[1]	Fat[1]	Carbo-hydrate[1]	Starch[1]	Total Sugar	Vitamin E2	Thiamin[2]	Riboflavin 2	Niacin[2]	Folate[3]
Wheat germ	26.7	9.2	44.7*	28.7*	16.0*1	22.0	2.01	0.72	45	?
Wheat bran	14.1	5.5	26.8	2.0	3.8	2.6	0.89	0.36	29.6	260
Wheat flour	12.6	2.0	68.5	66.8	1.7	0.6	0.30	0.07	1.7	51
Whole meal flour	12.7	2.2	63.9	61.8	2.1	1.4	^	0.09	^	57
White flour (plain)	9.4	1.3	77.7	76.2	1.5	0.3	0.10	0.03	0.7	22
White flour (self-raising)	8.9	1.2	75.6	74.3	1.3	0.3*	0.10	0.03	0.7	19
White flour (bread-making)	11.5	1.4	75.3	73.9	1.4	0.3*	0.10	0.03	0.7	31

PROCESS & MACHINERY REQUIREMENT

Export Potential & Sales Aspect:

- India's wheat production has historically been dominated by India's northern region. In India, the northern states of Punjab and Haryana Plains have been prolific producers of wheat.
- The production of distinctly superior varieties of Durum Wheat has paid off in recent years of meticulous study by India's finest scientific talent.
- Durum wheat is grown in Clay soil and is widely sought for its physical characteristics. Its high strength of gluten and uniform golden color makes it ideal for baking bread and cooking pasta.
- India is the second-largest producer of wheat in the entire world today.
- Several surveys and research have shown that wheat and wheat flour are playing an increasingly important role in controlling the food economy in India.

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PM-FME SCHEME

- Support for capital investment for up-gradation and formalization with registration for GST, FSSAI hygiene standards and Udyog Aadhar;
- Capacity building through skill training, imparting technical knowledge on food safety, standards & hygiene and quality improvement;
- Hand holding support for preparation of DPR, availing bank loan and up-gradation;
- Support to Farmer Producer Organizations (FPOs), Self Help Groups (SHGs), producers cooperatives for capital investment, common infrastructure and support branding and marketing.

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