

Reading Manual for Dalia Processing Under PMFME Scheme



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CHAPTER 1

INTRODUCTION

1.1. Industrial Overview:

The word cereal is derived from the Latin word "cerealis" which means 'grain,' a type of fruit known as the caryopsis bot, consisting of endosperm, germ, and bran. The grains are annuals of the grass family (monocot family Poaceae, also known as Gramineae). Their cereals are mostly long and thin stalks such as rice, wheat, sorghum, millet, maize, rye etc. and are used as food for starchy grains. Not only these grains are classified as cereals, but they also mean food made from the stubborn cereal grains of flours, bread, Dalia, and pasta.



The amazing fact is the foods human beings eat most are grasses all around the world. The great truth is the foods that people consume most are worldwide grasses. Cereal grains were an early human farming experiment and still, due to where they live and what grows well there, people still enjoy them. The grain is cultivated more than any other form of crop and hence it provides more nutrition for food worldwide; food crops are therefore stapled. They are a rich source of vitamins, nutrients, carbohydrates, fats, proteins, and protein in their normal state (as in whole grain). The residual endosperm, though, is primarily carbohydrate and loses any other nutrients until refined by the elimination of bran and germ. Cereals are typically sold as human food in raw grain or as food additives or as animal feed.

A whole grain consists of 3 main parts:

- **Bran:** The outer, rough coating of the grain. It includes minerals, fiber, and antioxidants.
- **Germ:** a nutrient-rich core of carbohydrates, proteins, fats, minerals, vitamins, antioxidants, and various phytonutrients. The germ is the embryo of the plant, the portion which germinates and grows as a new plant.

- **Endosperm:** The endosperm contains carbohydrates (in the form of starch) and protein. it is the biggest part of the grains. When the bran and germ removed, leaving just the endosperm called refined grains.

1.1.1. Types of Cereal Grains

Image	Name	Description
	Rice (<i>Oryza sativa</i>).	<p>Rice is an ideal source of calories due to its starch quality. It contains 75-80 per cent starch, 7 per cent protein, 0.4-0.8 per cent lipids and 12 per cent water. Rice oat protein is of high digestible consistency and contains 4.1mg/100g lysine of protein more than wheat.</p>
	Wheat	<p>Wheat is produced in different parts of the world; India is the second-largest producer of wheat after China. Wheat the becoming an essential part of the everyday diet. Wheat is used for the cooking of cereals, flour, noodles, pasta, cakes, and porridge. Wheat is normally milled, but grains may also be puffed, flaked, or steamed.</p>
	Barley	<p>Barley is a quite healthy crop. it is widely used in stews, bread, soups, and health items, although it is mostly grown as animal feed and as a source of malt for alcoholic beverages, particularly beer.</p>

	<p>Sorghum</p>	<p>Very nutritious coarse grain seed Sorghum is commercially used for food, feed, and alcoholic beverage processing</p>
	<p>Millet</p>	<p>Mostly grown in Asia and Africa, Porridge millet is popular in China, Russia, and Germany. It can also be used to produce alcoholic drinks, such as animal feed and bird feed.</p>
	<p>Oats</p>	<p>Oats are the cereal and staple food in European countries and also used as breakfast cereals in more than half of the world. Due to the high fiber content, it is common to reduce weight and lower blood sugar levels.</p>
	<p>Rye</p>	<p>Rye is also known as a grain of cold climates used to make pizza, beer, whiskeys, and sometimes used as animal feed.</p>
	<p>Maize</p>	<p>Corn is a staple cereal in continents such as South America and Africa being consumed directly by humans and is used as animal feed worldwide.</p>

1.2. Product Description:

Broken wheat or cracked wheat or couscous is rendered grossly by milling whole raw wheat grains. wheat is processed to the required size after proper cleaning and husking. It is very nutritious as it does not undergo refining. Such cracked wheat has a large number of uses, especially as a dietary supplement. When the broken wheat is cooked, it has a hearty, delicious, grainy taste. It's a bit nutty and chewy.

Bulgur wheat is also manufactured by cracking the kernels of wheat. Bulgur, however, is made of kernels that are steamed and toasted before cracking, so that they develop a rich, nutty flavor. Bulgur also requires limited preparation, since it is already partially baked. Dalia is filled with a variety of health benefits. It's been a part of Indian cuisine for years. Made with broken wheat, Dalia is easy to digest and nutritious. It is rich in fiber and one of the best foods for weight loss. Dalia can be produced in a variety of ways and is one of the healthiest choices for breakfast/lunch and dinner. Broken wheat may be ground into coarse, medium, or fine kernels.

- **Large broken wheat**-Large broken wheat has a solid texture. It can be used as a cereal, or as a casserole salad, or as a stuffing. Toast them to improve the flavor and shorten the cooking time.
- **Medium-sized broken wheat**-Medium-sized wheat kernels are widely used for savory preparations such as upma or namkeen Dalia.
- **Fine-sized broken wheat**- The small, crushed kernels of wheat have a firm and fine texture. They are typically used to prepare kheer or sweet lappsi with milk.

1.3. Market Potential:

Dalia is a wheat-based product; the Global demand for wheat reached a consumption amount of 391 million tons in 2019, with steady growth in 2014-2019. Wheat Dalia is actually one of the most popular food ingredients in the world.

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. A very popular sweet dish "Laapsi" is prepared by dalia. dalia is known for its high fiber content, which not only helps to keep the digestive system balanced but also keeps hunger at bay for a longer time.

The breakfast cereals market is a rising market in India, pegged to USD 283 million in 2017, with a promise of double-digit growth over the next five years. In this sense, hot cereals and muesli have been the fastest-growing categories of items in the recent past. Among hot cereals, Dalia has achieved a high degree of acceptance and popularity, which can be attributed to consumer recognition of the health benefits of grain.

India, being a large market with the growing middle-income group and double-income households, holds great potential for breakfast which in turn must provide healthy, convenient, and tasteful options.

1.4. Raw Material Description:

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.

- ✓ Carbohydrate- 70%
- ✓ Protein- 9-15%
- ✓ Fat- 2-2.2%
- ✓ Fiber- 2-2.5
- ✓ Ash- 1.8 %
- ✓ Moisture - 9-13%ⁱ

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 fibers or fructans that can cause digestive symptoms in individuals with irritable bowel syndrome (IBS). Gluten, a large protein family, accounts for up to 80% of the total protein content. It's responsible for wheat dough's peculiar elasticity and stickiness, the properties that make it so useful in making bread. A good source of various vitamins and minerals is whole wheat. The quantity of minerals depends on the soil it is grown in, as with other cereal grains.

- ✓ Selenium: In your body, this trace factor has numerous critical functions. In some regions, including China, the selenium content of wheat depends on the soil and is very low.

- ✓ Manganese: Present in high quantities in whole grains, legumes, fruits and vegetables, due to its phytic acid content, manganese may be poorly absorbed from whole wheat
- ✓ Phosphorus: In the preservation and development of body tissues, this dietary mineral plays an important role.
- ✓ Copper: Copper, an important trace element, is often low in the Western diet. Deficiency may have detrimental effects on the health of the heart.
- ✓ Folate: Often known as folic acid or vitamin B9, folate is one of the B vitamins. During pregnancy, it is especially necessary.

1.5. 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.ⁱⁱ

Sl. No.	Varieties	Released	Characteristics
1.	HS 542 (Pusa Kiran)	2015	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.
2.	HW 1098 (Nilgiri Khapli)	2015	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)
3.	HDCSW 18	2015	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 Karnal bunt.
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4.	HD 3117	2015	It has genetic yield potential of 5.5 t/ha. Average yield of this variety under late sown (after 15 th Dec.) is 4.78 t/ha under tilled condition and 4.79 t/ha under conservation agriculture condition. It is free from brown and yellow rust under natural condition and highly tolerant to Karnal bunt. Grain protein content is 11.7 %.
5.	HD 4728 (Pusa Malvi)	2015	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. It has bold and lustrous grains and superior quality traits for end-use in semolina-based industry.
6.	HS 562	2015	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.
7.	HD 3226	2019	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.

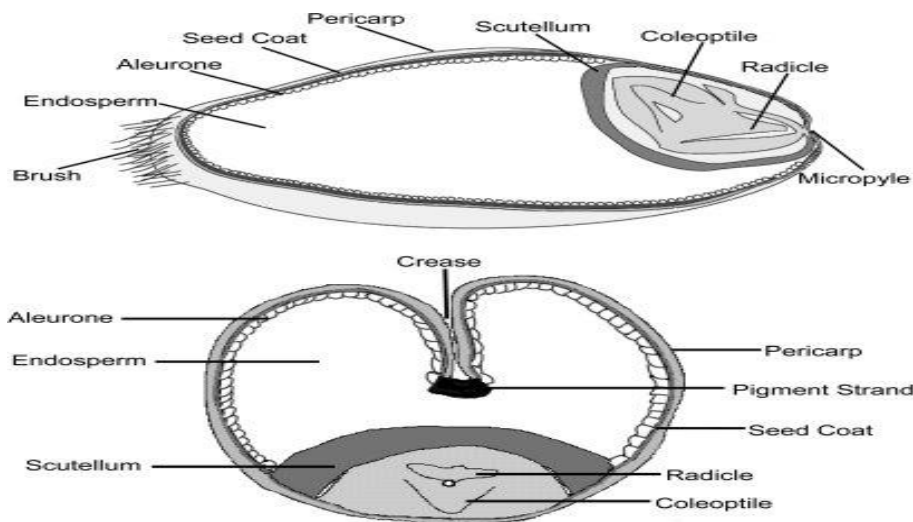
CHAPTER 2

PROCESS & MACHINERY REQUIREMENT

2.1. Raw Material Aspects:

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. As mentioned above, when he needs to determine if he can purchase the grain and what he wants to pay for it, the buyer of the grain takes into account the various assets.

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.



2.2. 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.

2.3. Technologies:

Saddle stones

It is the method of ground cereal grains into Dalia the processes similar to flour making. 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.



Saddle stones are the oldest known flour milling. 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. Before being used, the grain was also malted in order to make grinding faster. These work in a manner similar to modern millstones and consist of two circular stones, a static bed stone overlying a revolving runner stone. The grain joins the quern through a hole at the middle of the runner stone and migrates when it is ground to the edge, emerging as a coarsen ground floor from between the stones. These rotating querns are hand-powered and are thus constrained by their operator's strength in size and milling capability.

Grinding mill

In such mills, even larger circular-shaped stones used and a finer product than that produced by handheld instruments. To move the spinning motion of the runner stone, power sources have been used. Initially, cattle or slaves used to turn these big stones around. Over time, the source of power to transform the millstone became water or wind.



Electric motors are used in modern mills that use spinning millstones. Millstones do not touch when in operation. There is a distance between the rotating runner stone and the static bed stone that is defined by the grain scale. In the middle of the runner stone, the grain is fed from a chute into a cavity, referred to as the eye. The grain is spread over the millstone surface by a complex series of groves known as furrows, which help to ventilate and cool the millstones as well. The millstones' grinding surfaces are known as land and are separated into areas called harps. Once ground the flour passes along narrow groves called cracking and is expelled from the edge of the millstones..

Modern methods

As the population grew and the need for more and better new milling method was invented. Modern technology all touching components are non-corrosive materials. These machines are using Low-temperature grinding technology so that the original ingredient cannot be lost. Ideal for dry crushing today improved production capacities These Dalia








machines are widely used in the food industry and are known for their performance and economy.


2.4. Manufacturing Process:

Manufacturing Process

- **Grain delivery:** Grain is delivered to mills by covered trucks and hopper railcars. The distance the grain has travelled varies greatly. In some cases it has travelled hundreds of miles in a truck or train. In other instances it is being delivered from a local farm in the same county. Grain deliveries will frequently have gone through a number of aggregation steps prior to arriving at the mill (farmer, country elevator, terminal elevator etc.). The number of conveyances making deliveries of grain can vary depending on the time of year with more deliveries at harvest time.
- **Cleaning the Wheat:** The first milling steps involve equipment that separates grain from seeds and other grains, removes foreign materials that might have originated during the farmer's harvest such as metal, sticks, stones and straw; and scours the kernels of Wheat. Wheat is cleaned properly that is washed under running water and subsequently softened in water for 5 to 6 hrs. After germination it is dried in sunlight.
- **Grinding the Wheat:** The flow of material from the feeding hopper is regulated by means of side handle easily to suit the load. Rotor runs in anti-clockwise direction.
- The beater pass just beneath the ratchet teeth liner fitted inside the top half of the crushing chamber, leaving a suitable gap between the liner teeth and the tips of the rotating beater.
- This cuts the material caught between the liner teeth like a sword with a scissors action at a 450/650 RPM.
- After the required size reduction, the material will pass through the screen fitted inside the lower discharge end of the grinding chamber.
- The air generated in the crushing chamber forces the powder to pass through the screen fitted at the bottom discharge end of the crushing chamber, into a filter attached to the delivery trough below. (When crushing wet-pulpy materials, the balloon should not be use)
- **Packaging of Product:** The packaging is carried out in a much simple process then milling, the wheat is fed to holding tank of the packaging machine, which simply seals one end of continuous packaging first, then it simply fills the packet as per required weight & seals the other end, generating the required packet.

2.5. Flow Chart:

Steps	Machine Name	Description	Machine Image.
Grain Delivery	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.	
Grain Storage	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.	
Cleaning	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.	
Grinding	Dalia Grinding machine	It basically a grinder class machine, which may employ any possible grinding arrangement to achieve, required grinding as per product to be grinded.	
Shorting and Separation	Gravity separator	This machine is used to separate grains according to a different specific weight. It is used in the different grain processing plants.	

Packaging & Storage	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.	
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2.6. Additional Machine & Equipment:

Machine	Description	Machine Image
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	
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.	

2.7. General Failures & Remedies:

S. No.	General Failures	Remedies
1.	Ball bearing failure of various machine	<ol style="list-style-type: none"> 1. Proper periodic lubrication of all bearings in various machines. 2. Regular replacement of all bearing to prevent critical failures.
2.	Power Drive Overload	<ol style="list-style-type: none"> 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.
3.	Mechanical Key Failure	<ol style="list-style-type: none"> 1. Ensure that mechanical keys are replaced as per there pre-defined operational life. 2. Prevent Overloading.
4.	Loss of Interface	<ol style="list-style-type: none"> 1. This problem is dominant in newly established automatic plant, one must learn to maintain rules in plant & ensure no employee goes near transmission lines, unless authorised. 2. Provide proper physical shielding for the connections.
5.	Hulling	<p>Grain has the whole hull intact.</p> <p>Extra cleaning required for wheat grains flour milling to sift out the impurities (dirt, chaff, etc.)</p>

2.8. Nutritional Information:**Composition of wheat products per 100g edible portion**

Wheat Product	Protein¹	Fat¹	Carbohydrate¹	Starch¹	Total Sugar	Vitamin E²	Thiamin²	Riboflavin²	Niacin²	Folate³
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

(¹units in g; ² units are mg; ³units are µg; *values are estimates; ^unfortified values not given; ² No data given for amount of nutrient present)ⁱⁱⁱ

2.6. Export Potential & Sales Aspect:

Dalia has been an inseparable part of Indian cuisine for ages and is thought to be the healthiest treat to begin your day with. Dalia is derived from wheat and is sometimes referred to in western countries as broken wheat porridge.

The size of the global wheat protein market surpassed USD 2 billion in 2017 and is projected to hit more than 4.2% CAGR by 2024. The demand for the global wheat protein industry will be driven by increased demand for plant-based nutritional diets along with an increasing vegan population in emerging economies.



The rising elderly population, rising levels of wages, and increased urbanization are likely to fuel the demand for goods. Because of restricted access to high-nutrition diets such as meat, seafood, fruit, and vegetables, the growing prevalence of deficiencies in low-income countries will further fuel industry development.

CHAPTER 3

PACKAGING

3.1. Shelf Life of Product:

Insect-pest infestation is a common problem that both traders and flour millers face. Maintaining the consistency of the grain and its product is a difficult task. With due treatment & managed conditioned climate, Dalia can be stored without any signs of damage for up to 1 year months. Wheat has a very good shelf life that can extend up to few months. The first thing to know is that it will remain good long past its "best by" or "better if used by" date that can be found on the original container. Dalia tends to last 8-10 months past its printed date.

Shelf life of Dalia depends on following

- Storage Conditions
- Storage –Temperature & Humidity
- Cross Contamination
- Unhygienic Conditions
- Cracks on the floors & walls
- Standing water near the stores
- Spillage & bird faeces in the stores/stairs & floors
- Presence of grains germs in the flour.

In order to improve the shelf life of the grains Products, the following additional precautions should be taken by millers -:

- ✓ Use clean & fumigated grains for grinding.
- ✓ Use scouring machines in the cleaning line.
- ✓ Set cleaning machines with optimum efficiency to separate out all the impurities from the Wheat grains
- ✓ Clean the dead pockets of the cleaning line frequently, to get rid of non-moving grains at the elevator bottom & outlets, grains conveyor troughs, and tempered grain conveyors.
- ✓ Fumigate empty Grains bag.
- ✓ Before grinding, use scourers to remove dirt in tempered grains
- ✓ Regularly clean the Grinding equipment etc.

- ✓ Fumigate packing materials before every use.
- ✓ Frequently fumigate bins & conveyors.
- ✓ Always keep the parking area & the Dalia storage area clean.
- ✓ Type of packaging materials used.

3.2. Dalia Packaging:

Packaging refers to the act of designing and producing the container or wrapper of a product. It is one of the most important parts of marketing.

There are many factors that need to consider while selecting a suitable type of pack for the product:

- The product contents.
- The application of the product.
- Content stability.
- Protection from any environmental factors
- Acceptability of the pack to the customer.
- Regulatory, legal, and quality issues.

Characteristics of packaging material:

The material selected must have the following characteristics:

- ✓ Must meet tamper-resistance requirements
- ✓ Must not reactive with the product
- ✓ They must protect the preparation from environmental conditions
- ✓ Must be non-toxic
- ✓ Must not impart odour/taste to the product
- ✓ Must be FDA approved.

Dalia is packed directly in gunny bags, gunny poly-line bags for bulk sale, and for retail sale in laminated pouches or poly-bags.

- **Hanging Bags-** Hanging bags in grocery stores and other shopping outlets are commonly used. They are a type of plastic bag that is also sealed with a back-middle seam on both ends as well. Hanging bags have a pre-cut hole that makes it easier for them to hang from hooks so that they can be seen in an attractive way.

- **Pillow bags** - A pillow bag is another typical type of package. The bags are named for their shape, which is like a cushion. They are found lying flat on grocery store shelves in the grocery store and were known to carry the items.
- **Gusseted Poly Bags-** Gusseted bags are often called flat-bottom bags because they feature a tucked in pleat that's been pressed flat. It allows the bag to expand for greater carrying capacity and to keep the shape of a box if necessary. These types of poly bags can be heat sealed, tied, stapled, or taped shut. They're the perfect poly bag for anyone looking to get more flour in a single bag.
- **Flexible Pouches-** Flexible pouches are a perfect way to carry most packaged items. They can be made with zipper-seal closures, which tend to keep the inside contents fresh for use. Flexible pouches offer amazing printing capabilities, so you can add your attractive product branding to the pouch itself. Many pouches stand up on their own, which helps you improve your shelf appearance.

3.3. Packaging:

- **Primary packaging:** Primary packaging is packaging which is in close association with the product itself and is often referred to as a consumer unit. The main purpose of the primary packaging is to contain, protect and/or conserve the final product, in particular against contamination.
- **Secondary packaging:** Secondary packaging is the outer packaging of the main packaging, which connects packages and further covers or marks the prescription component.
- **Tertiary packaging:** Tertiary packaging is used for the handling, transportation, and delivery of bulk products.

3.4. Material of Packaging:

In addition to cellulose and Aluminium foil, a very large amount of polymeric materials is used for packaging products. Paper boards and metal containers are also used for such purposes. While a range of packaging materials are available, the ultimate option of the packaging depends on the appropriate shelf life, the efficiency of the packaging machine, and the cost that is purely based on the market segment targeted by the manufacturer. The most common choice of packaging medium is plastic (usually flexible) as it offers the requisite safety and preservation, resistance to grease, physical strength, machinability, and printability.

Plastics that are lighter in weight are also the most preferred material for the packaging of flour. There are changing trends in the packaging of Flour. Plastic films and their laminates are increasingly used due to better properties and aluminium laminates due to price and better flex crack properties. Plastic packaging products that can be used are described below.

Polypropylene- Polypropylene films have better clarity than polyethylene and enjoy superior machinability due to stiffness. Lack of good sealability has been a problem; however, PVDC and vinyl coating have been used to overcome this problem. Some varieties of PP have been specially developed for twist-wrap applications as they have the ability to lock in position after twisting.

Poly Vinyl Chloride (PVC)- PVC is a stiff and clear film having a low gas transmission rate. PVC can be used as small wraps, bags, and pouches. PVC when co-polymerized with polyvinylidene chloride is known as Saran. Since it is a costly material, it is only used as a coating to obtain barrier properties and heat sealability. PVC film is also used for twist wraps, as it has twist retention properties and is excellent on high-speed machines.

Polyesters (PET) and Polyamide (PA) - Polyethylene terephthalate film has high tensile strength, gloss, and stiffness as well as puncture resistance. It has moderate WVTR but is a good barrier to volatiles and gases. To provide heat seal property, PET is normally laminated to other substrates. Nylons or polyamides are similar to PET but have high WVTR.

CHAPTER 4

FOOD SAFETY & FSSAI STANDARDS

4.1. Introduction to FSSAI:

The Food Safety and Standards Authority of India (FSSAI) has been established under Food Safety and Standards, 2006 which consolidates various acts & orders that have hitherto handled food-related issues in various Departments. The FSSAI is responsible for setting standards for food so that there is one body to deal with and no confusion in the minds of consumers, traders, manufacturers, and investors. The Act aims to establish a single reference point for all matters relating to food safety and standards, by moving from multi-level, multi-departmental control to a single line of command.

Highlights of the Food Safety and Standard Act, 2006-

Various central Acts like Prevention of Food Adulteration Act, 1954 , Fruit Products Order , 1955, Meat Food Products Order , 1973, Vegetable Oil Products (Control) Order, 1947, Edible Oils Packaging (Regulation) Order 1988, Solvent Extracted Oil, De- Oiled Meal and Edible Flour (Control) Order, 1967, Milk and Milk Products Order, 1992 etc will be repealed after commencement of FSS Act, 2006.

The Act also aims to establish a single reference point for all matters relating to food safety and standards, by moving from multi- level, multi- departmental control to a single line of command. To this effect, the Act establishes an independent statutory Authority – the Food Safety and Standards Authority of India with head office at Delhi. Food Safety and Standards Authority of India (FSSAI) and the State Food Safety Authorities shall enforce various provisions of the Act.

Establishment of the Authority-

Ministry of Health & Family Welfare, Government of India is the Administrative Ministry for the implementation of FSSAI. The Chairperson and Chief Executive Officer of Food Safety and Standards Authority of India (FSSAI) have already been appointed by Government of India. The Chairperson is in the rank of Secretary to Government of India.

4.2. FSSAI Registration & Licensing Process:

According to Section 31(1) of Food Safety and Standards (FSS) Act, 2006, Every Food Business Operator (FBO) in the country is required to be licensed under the Food Safety & Standards Authority of India (FSSAI).

As per FSS (Licensing & Registration) Regulations, 2011, Licenses and Registrations are granted to FBOs in a 3 tier system

- Registration - for petty FBOs with annual turnover less than Rs 12 lakhs
- State license - for medium-scale food manufacturers, processor and transporters
- Central License - for large-scale food manufacturers, processor and transporters

FSSAI registration is done online on the FSSAI website through Food Safety Compliance System (FoSCoS)

- FoSCoS has replaced the Food Licensing and Registration System (FLRS).
- Petty food business operators are required to obtain FSSAI Registration Certificate
- “Petty Food Manufacturer” means any food manufacturer, who manufactures or sells any article of food himself or a petty retailer, hawker, itinerant vendor or temporary stall holder (or) distributes foods including in any religious or social gathering except a caterer;

or

- Other food businesses including small scale or cottage or such other industries relating to food business or tiny food businesses with an annual turnover not exceeding Rs. 12lakhs and/or whose production capacity of food (other than milk and milk products and meat and meat products) does not exceed 100 kg/ltr per day

Any person or entity that does not classify as a petty food business operator is required to obtain an FSSAI license for operating a food business in India.

FSSAI License - two types - State FSSAI License and central FSSAI License

Based on the size and nature of the business, the licensing authority would change.

- Large food manufacturer/processors/transporters and importers of food products require central FSSAI license
- Medium-sized food manufacturers, processor and transporters requires state FSSAI license.
- License period: 1 to 5 years as requested by the FBO.
- A higher fee for obtaining FSSAI license for more years.

- If a FBO has obtained the license for one or two years, renewal may be done, no later than 30 days prior to the expiry date of the license.

4.3. Food Safety & FSSAI Standards & Regulations:

“2.4.6 Food grains 2.4.6.2. Wheat: 1. Atta or resultant atta means the coarse product obtained by milling or grinding clean wheat free from rodent hair and excreta It shall conform to the following standards:—

Sl. No.	Characteristics	Requirement
1.	Moisture,	Not more than 14 per cent by weight (obtained by heating the pulverised grains at 130°C 133°C for two hours).
2.	Foreign matter (Extraneous matter)	Not more than 1 per cent. By weight of which not more than 0.25 per cent. By weight shall be mineral
3.	Other edible grains	Not more than 6 per cent by weight.
4.	Damaged grains	Not more than 6.0 per cent by weight including kernel bunt affected grains and got affected grains. The limit of kernel bunt affected grains and ergot affected grains shall not exceed 3.0 per cent and 0.05 percent by weight, respectively.
5.	Weevilled grains	Not more than 10 per cent by count.
6.	Uric acid	Not more than 100 mg. per kg.
7	Deoxynivalenol	Not more than 1000 micrograms per kilogram
It shall also conform to the following standards namely:—		
	Provided that the total of foreign matter, other edible grains and damaged grains shall not exceed 12 per cent by weight.	

Food Safety

Part I - General Hygienic and Sanitary practices to be followed by Petty Food Business Operators applying for Registration

SANITARY AND HYGIENIC REQUIREMENTS FOR FOOD MANUFACTURER/PROCESSOR/HANDLER

The place where food is manufactured, processed or handled shall comply with the following requirements:

1. The premises shall be located in a sanitary place and free from filthy surroundings and shall maintain overall hygienic environment. All new units shall set up away from environmentally polluted areas.
2. The premises to conduct food business for manufacturing should have adequate space for manufacturing and storage to maintain overall hygienic environment.
3. The premises shall be clean, adequately lighted and ventilated and sufficient free space for movement.
4. Floors, Ceilings and walls must be maintained in a sound condition. They should be smooth and easy to clean with no flaking paint or plaster.
5. The floor and skirted walls shall be washed as per requirement with an effective disinfectant the premises shall be kept free from all insects. No spraying shall be done during the conduct of business, but instead fly swats/ flaps should be used to kill spray flies getting into the premises. Windows, doors and other openings shall be fitted with net or screen, as appropriate to make the premise insect free The water used in the manufacturing shall be potable and if required chemical and bacteriological examination of the water shall be done at regular intervals at any recognized laboratory.
6. Continuous supply of potable water shall be ensured in the premises. In case of intermittent water supply, adequate storage arrangement for water used in food or washing shall be made.
7. Equipment and machinery when employed shall be of such design which will permit easy cleaning. Arrangements for cleaning of containers, tables, working parts of machinery, etc. shall be provided.

8. No vessel, container or other equipment, the use of which is likely to cause metallic contamination injurious to health shall be employed in the preparation, packing or storage of food. (Copper or brass vessels shall have proper lining).
9. All equipments shall be kept clean, washed, dried and stacked at the close of business to ensure freedom from growth of mould/ fungi and infestation.
10. All equipments shall be placed well away from the walls to allow proper inspection.
11. There should be efficient drainage system and there shall be adequate provisions for disposal of refuse.
12. The workers working in processing and preparation shall use clean aprons, hand gloves, and head wears.
13. Persons suffering from infectious diseases shall not be permitted to work. Any cuts or wounds shall remain covered at all time and the person should not be allowed to come in direct contact with food.
14. All food handlers shall keep their finger nails trimmed, clean and wash their hands with soap, or detergent and water before commencing work and every time after using toilet. Scratching of body parts, hair shall be avoided during food handling processes.
15. All food handlers should avoid wearing, false nails or other items or loose jewellery that might fall into food and also avoid touching their face or hair.
16. Eating, chewing, smoking, spitting and nose blowing shall be prohibited within the premises especially while handling food.
17. All articles that are stored or are intended for sale shall be fit for consumption and have proper cover to avoid contamination.
18. The vehicles used to transport foods must be maintained in good repair and kept clean.
19. Foods while in transport in packaged form or in containers shall maintain the required temperature.
20. Insecticides / disinfectants shall be kept and stored separately and away from food manufacturing / storing/ handling areas.

4.1. Labelling Standards(Regulation 2.5 of FSS)

Labelling requirements for packaged food products as laid down in the Part 2.4 of the Prevention of Food Adulteration (PFA) Rules, 1955, and the Standards of Weights and Measures (Packaged Commodities) Rules of 1977, require that the labels contain the following information:

1. Name, trade name or description
2. Name of ingredients used in the product in descending order of their composition by weight or volume
3. Name and complete address of manufacturer/packer, importer, country of origin of the imported food (if the food article is manufactured outside India, but packed in India)
4. Nutritional Information
5. Information Relating to Food Additives, Colors and Flavors
6. Instructions for Use
7. Veg or Non-Veg Symbol
8. Net weight, number or volume of contents
9. Distinctive batch, lot or code number
10. Month and year of manufacture and packaging
11. Month and year by which the product is best consumed
12. Maximum retail price

Provided that — (i) the nutritional information may not be necessary, in case of foods such as raw agricultural commodities, like, wheat, rice, cereals, flour, spice mixes, herbs, condiments, table salt, sugar, jaggery, or non –nutritive products, like, soluble tea, coffee, soluble coffee, coffee-chicory mixture, packaged drinking water, packaged mineral water, alcoholic beverages or flour and vegetables, processed and pre-packaged assorted vegetables, flours, vegetables and products that comprise of single ingredient, pickles, papad, or foods served for immediate consumption such as served in hospitals, hotels or by food services vendors or halwais, or food shipped in bulk which is not for sale in that form to consumers.

Wherever applicable, the product label also must contains the following

The purpose of irradiation and license number in case of irradiated food. Extraneous addition of coloring material.

Non-vegetarian food – any food which contains whole or part of any animal including birds, fresh water or marine animals, eggs or product of any animal origin as an ingredient, not

including milk or milk products – must have a symbol of a brown color-filled circle inside a brown square outline prominently displayed on the package, contrasting against the background on the display label in close proximity to the name or brand name of the food.

Vegetarian food must have a similar symbol of green color-filled circle inside a square with a green outline prominently displayed.

All declarations may be: Printed in English or Hindi on a label securely affixed to the package, or Made on an additional wrapper containing the imported package, or Printed on the package itself, or May be made on a card or tape affixed firmly to the package and bearing the required information prior to customs clearance.

Exporters should review the Chapter 2 of the “FSS (Packaging and Labelling) Regulation 2011” and the Compendium of Food Safety and Standards (Packaging and Labelling) Regulation before designing labels for products to be exported to India. FSSAI revised the labelling Regulation and a draft notification to that effect was published on April 11, 2018, inviting comments from WTO member countries and the comments received are under review and the publication date remains unknown.

According to the FSS Packaging and Labelling Regulation 2011, “pre-packaged” or “pre packed food” including multi-piece packages, should carry mandatory information on the label.

CHAPTER 5

OPPORTUNITIES FOR MICRO/UNORGANIZED ENTERPRISES

5.1. PM-FME Scheme:

Ministry of Food Processing Industries (MoFPI), in partnership with the States, has launched an all India centrally sponsored "PM Formalisation of Micro Food Processing Enterprises Scheme (PM FME Scheme)" for providing financial, technical and business support for up-gradation of existing micro food processing enterprises. The objectives of the scheme are :

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

References

ⁱ <http://www.iaom-mea.com/wp-content/uploads/2016/07/Tech-03-Grain-Corp-IAOM-Jordan-2011.pdf>

ⁱⁱ [http://apeda.gov.in/apedawebsite/SubHead_Products/Wheat.htm#:~:text=Varieties%3A,di\)%2C%20HW%2D741.](http://apeda.gov.in/apedawebsite/SubHead_Products/Wheat.htm#:~:text=Varieties%3A,di)%2C%20HW%2D741.)

ⁱⁱⁱ Source: astonjournals.com/manuscripts/Vol2011/LSMR-22_Vol2011.pdf

^{iv} <https://mofpi.nic.in/pmfme/docs/SchemeBrochureI.pdf>