Ministry of Food Processing Industries
Government of India

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# Reading Manual for Popcorn

# Under PMFME Scheme


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# ABBREVIATIONS & ACRONYMS

| Sr: No. | Abbreviations &Acronyms | Full Forms |
|---|---|---|
| 1. | APEDA | Agricultural and Processed Food Products Export Development Authority |
| 2. | CAGR | Compound annual growth rate |
| 3. | FAO | Food and Agriculture Organization |
| 4. | FBO | Food Business Operator |
| 5. | FLRS | Food Licensing and Registration System |
| 6. | FPOs | Farmer Producer Organizations |
| 7. | FSSAI | Food Safety and Standards Authority of India |
| 8. | kcal | kilocalorie |
| 9. | MoFPI | Ministry of Food Processing Industries |
| 10. | PA | Polyamide |
| 11. | PET | Polyesters |
| 12. | PFA | Prevention of Food Adulteration |
| 13. | SHGs | Self Help Groups |
| 14. | WVTR | water vapor transmission rate |

# CHAPTER 1
# INTRODUCTION

## 1.1. Industrial Overview:

### Cereal Grains

Tiny, hard and edible dry seeds that grow on grass-like plants called cereals are cereal grains (or simply grains). In most nations, they are a staple food and have more food power worldwide than any other food category, by far. In human history, grains have played a major role, and grain agriculture is one of the key developments that fueled civilization's growth. They are consumed by people, and they are also used for feeding and fattening animals. It is then possible to transform grains into many different food items.

Cereals are an essential component of the human diet and are an important source of starch and other dietary carbohydrates (dietary fibre) that play an important role in human consumption of energy and nutrients.

A whole grain consists of 3 main parts:

- Bran: The hard, outer layer of the grain. It contains fibre, minerals and antioxidants.
- Germ: The nutrient-rich core that contains carbs, fats, proteins, vitamins, minerals, antioxidants and various phytonutrients. The germ is the embryo of the plant, the part that gives rise to a new plant.
- Endosperm: The biggest part of the grain contains mostly carbs (in the form of starch) and protein.
- A refined grain has had the bran and germ removed, leaving just the endosperm.

### *1.1.1. Types of Cereal Grains*

The cereals most commonly cultivated are wheat, rice, rye, Oats, millet, barley, corn (maize), and sorghum.

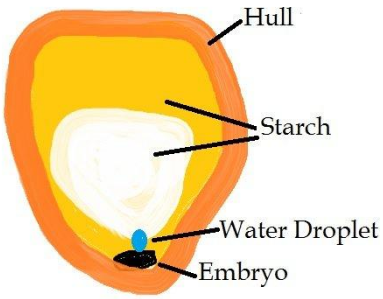
| Image | Name | Description |
|---|---|---|
|  | **Rice (*Oryza sativa*).** | Rice is an excellent source of calories because of its starch content. It comprises 75-80% of starch, 7% of protein, 0.4-0.8% of lipids and 12% of water. The protein of rice oats is of highly digestible nature and contains 4.1mg/100g of protein lysine higher than wheat. |
|  | **Barley**. | It is extremely nutritious and essential for malting. Usually used as an oat breakfast cereal, it is often used as animal feed. It is primarily grown on land that is unable to produce wheat. |
|  | **Sorghum** | Highly nutritious and used as a feed for livestock. |
|  | **Millet** | In China, Russia and Germany, millet porridge, mostly grown in Asia and Africa, is common. It may also be used as animal feed and bird feed for the manufacture of alcoholic beverages. |
|  | **Oats** | They are a staple cereal in Scotland and are exceptionally nutritious and used in more than half of the world as breakfast cereals. It is normal to reduce weight and lower blood sugar levels because of the high content of fibre. |

| | | |
|---|---|---|
|  | **Rye** | Cold climate cereal grain, used to produce beer, breads, whiskeys, vodka, and sometimes used as animal fodder. |
|  | **Maize** | Corn is a staple cereal used worldwide also as animal feed on continents such as South America and Africa. Cornflakes are a globally popular cereal, too. |
|  | **Wheat** | 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. |

One of the second largest crop in the world, and the largest in the United States, is maize (corn). Popcorn was discovered by Native Americans and became a popular snack during the Depression and is one of the oldest snack foods. A grain is called the corn kernel itself (where popcorn comes from). Many grains, like popcorn, are considered a fruit to confuse things a little more. This is because they come from the plant's seed or flower section. The strategies of the Indians for popping corn ranged from tribe to tribe. By chance, they presumably learned how to pop popcorn because the hard kernel gives no hint of the possible care inside. When they popped and flew out of the flames, the earliest poppers of maize may have thrown it into the fire and eaten the kernels. The Incas, whose ruins contain specially formed clay pots with kernels of popped corn still inside them, are our only historical evidence of early yet more advanced popping methods.

### 1.2. Product Description:

The fruits of maize are maize kernels (called maize in many countries). Maize is a grain, and as a vegetable or source of starch, the kernels are used in cooking. The endosperm, germ, pericarp, and tip cap form the kernel. In 16 rows, one ear of corn contains about 800 kernels.

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The droplet of water converts to steam as heat is applied to the dried kernels, and pressure starts to build. The kernel bursts until the hull can no longer hold the weight of the steam. Within the kernel, the starch turns into the soft, crunchy white stuff we call popcorn.

Popcorns come in a large range of flavours. Popcorn is mainly developed in India with 'butterfly' corn kernels that form more elongated, irregular shapes after popping up. Another version called 'mushroom' maize contributes to bigger, rounded popcorn bits that are simpler to cover in a consistent coating of toppings such as caramel or melted chocolate.

***Popcorn Varieties-*** There are many varieties of corn:

- Sweet Corn-the maize on the cob that we eat
- Land Corn: the maize used to feed livestock
- Flint Corn-Also known as Indian maize, used as a decoration
- There are many kinds of popcorn, including rice popcorn, pearl popcorn, red, purple, rainbow, yellow, white, and blue. Popcorn is the only maize that pops. These are referred to as types of gourmet specialty popcorn. Some bigger popcorn businesses hire scientists who continually produce new strains and hybrids to enhance the "pop" of popcorn.

***Popcorn Flavours***

- Salt and butter
- Cheese flavour
- Combination of herbs and spices
- Glazed popcorn- caramel, peanut butter, chocolate, blueberry etc.

### 1.3. Market Potential:

With more than 60 percent of the overall market share, the popcorn market in India is dominated by the unorganized sector. Owing to the rise in the number of multiplexes and popularity of popcorn, however, the situation is expected to shift. The popcorn market in India is projected to rise between 2016 and 2022 at a compound annual rate of 36 percent. It is known as an industry with a high profit margin and limited processing.

These days, there has been a steep increase in the market for gourmet popcorn. During the forecast period (2018-2023), Caramel Market is poised to hit USD 2,940.9 Million by 2025 at an impressive 5.6 percent CAGR, reveals the latest report by Market Research Future (MRFR). The global Caramel Market geographical overview covers four regions: Asia Pacific, North America, Europe, and the rest of the world (RoW). Among these, Asia Pacific accounted for a large market share of 34.07 per cent in 2017. A comparatively higher CAGR of 5.9 percent over the forecast period is expected to show.

### 1.4. Raw Material Description:

About 14 percent water is the substance of popcorn kernels. This transforms into water vapor at the water's boiling point when the kernels are cooked. However, before the pressure builds up enough to break through, it is trapped by the kernel shield. The individual kernel volume (kernel size) was associated with the quality of the starch (r=0.84).

| | |
|---|---|
| Crude fat | 3.8–4.6% |
| Crude protein | 8.1–10.5% |
| Reducing sugars | 0.07–0.23% |
| Starch | 61.0–67.9% |
| Amylose | 27.0–28.5%[ii] |

Popped corn contains significant quantities of minerals, vitamins, and protein. Popped maize, among other health benefits, helps develop bones and muscle tissues and helps with digestion.

It is abundant in antioxidants as well (polyphenols). "Instead of the soft, white portion, most of the nutrients are found in the "hull" or shell. Popcorn with too much butter, oil or salt, however, jeopardizes its health benefits. Popcorn is a rich and centred source of nutrients such as proteins, antioxidants, fibre, vitamin B complex, and others, making it popular for

breakfast and meals as a healthy alternative among households. Popcorn is also a good source of polyphenols, in addition to fibre, which are antioxidants that have been associated with increased blood circulation and digestive health, as well as a potentially lower risk of some cancers.

The basic raw material used are:

- Salt
- Butter
- Corn Kernels

### 1.5. Types of Raw Material:

Maize varieties of different maturity suitable for various states and seasons- List of hybrids (H) and composites(C) varieties of different maturity groups for different states for kharif season.

| **States** | **Extra early maturity** | **Early maturity** | **Medium maturity** | **Late maturity** |
|---|---|---|---|---|
| Delhi | H: Vivek 17 &21, PMH 2 | H: PAU 352, PEH 3, Parkash, X 3342 | H:HM4, HM 8 10, DK 701 | H: PMH 3, Buland, NK 61, Pro 311, Bio 9681, Seed Tech 2324 |
| Punjab | H: Vivek 17& 21, PEEH 5 | H: PAU 352, PEH 3, JH 3459, Parkash, PMH 2, X 3342 | H:HM4, HM 8& 10, DK 701 | H: PMH 3, PMH-1, Buland, Pro 311, Bio 9681, NK 61, Pro 311, Seed Tech 2324 |
| Haryana | H: Vivek 17 &21, PMH 2, PEEH 5 | H: HHM 1, PAU 352, Pusa Early Hybrid 3, JH 3459 Parkash, X 3342 | H:HM 2, HM 4,8 &10 DK 701 | H: PMH 3, Buland, HM 5, NK 61, Pro 311, Bio 9681, Seed Tech 2324 |
| Uttar Pradesh | H: Vivek 5, 15, 17, 21 & 27 PMH 2, | H: JH 3459, Parkash, PEH 2, X 3342 C: Pusa Composite 4, | H:HM 8& 10, Malviya hybrid makka 2, Bio 9637, DK 701 | H: PMH 3, Buland, Pro Agro 4212, Pro 311, Bio 9681, NK 61, Seed Tech 2324 |

| | | | | |
|---|---|---|---|---|
| Rajasthan | H: Pratap hybrid 1, Vivek 4 & 17, | H: PEHM 2, Parkash, Pro 368, X 3342 C: Pratap Makka 3, Aravali Makka 1, Jawahar Makka 8, Amar, Azad Kamal, Pant Sankul Makk 3, | H: HM 10, NK 21 C: Pratap Makka 5 | H: Trishulata, Pro 311, Bio 9681, Seed Tech 2324 |
| Madhya Pradesh | H: Vivek 4 & 17 | H: PEHM 2, Parkash, Pro 368, X 3342 C: Jawahar Makka 8, Jawahar composite 12, Amar, Azad Kamal, Pant Sankul Makka 3, Chandramani, Pratap Makka 3 | H: HM 10, NK 21 C: Pratap Makka 5 | H: Trishulata , Pro 311, Bio 9681, Seed Tech 2324 |
| Gujarat | H: Vivek 4 &17 | H: PEHM 2, Parkash, Pro 368, X 3342 C: Jawahar Makka 8, Pant Sankul Makka 3, Pratap Makka 3, G M 2,4 & 6 Aravali Makka 1, Narmada Moti | H: HM 10, NK 21 C: Pratap Makka 5 | H: Trishulata , Pro 311, Bio 9681, |
| Andhra Pradesh | H: Vivek 9, 15, 17& 27, PEEH 5 | H: PEHM 1, PEHM 2, DHM 1, BH- 2187, Parkash, JKMH 1701, X 3342 | H:HM 8& 10, DHM111, DHM117 | H: DHM113, Kargil 900 M, Seed Tech 2324, Pro 311, Bio 9681, Pioneer 30 v 92, Prabal, 30 V 92, |
| Tamil Nadu | H: Vivek 9, 15, 17, 21& 27, PEEH 5 | H: PEHM 2, Parkash, X 3342 JKMH 1701 | H:HM 8& 10, COHM 4 | H: COHM 5, Prabal, Pro 311, Bio 9681, Seed Tech 2324, 30 V 92, |

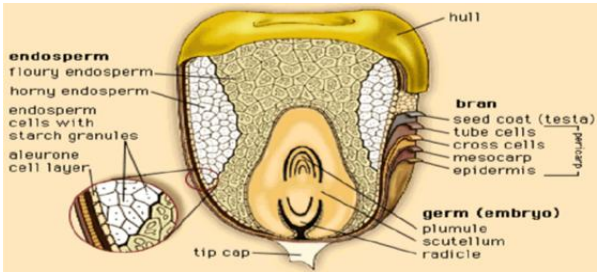
| | | | | |
|---|---|---|---|---|
| Maharashtra | H: Vivek 9, 15,17, 21& 27, PEEH 5 | H: PEHM 1& 2, Parkash, X 3342 , JKMH 1701 | H:HM 8& 10 | H: Prabal, Pro 311, Bio 9681, Seed Tech 2324, 30 V 92, |
| Karnataka | H: Vivek 9, 15, 21& 27, PEEH 5 | H: PEHM 2, Parkash, X 3342 JKMH 1701<br>C: NAC 6002 | H:HM 8& 10 | H: Nithya Shree, EH434042, DMH 1, DMH 2, Bio 9681, Prabal, Pro 311, Seed Tech 2324<br>C: NAC 6004, 30 V 92iii |

# CHAPTER 2
# PROCESS & MACHINERY REQUIREMENT

## 2.1. Raw Material Aspects:

Corn kernels are the fruit of maize. Maize is a grain and kernels are used as a vegetable or starch source in cooking. The endosperm, Germ, Pericarp, and tip cap are part of the kernel. A maize ear has about 800 kernels in 16 rows. Corn kernels can readily be found in bulk in all areas of maize production. They are used for various purposes, including food and biofuel. Corn is made of husk and silk, the husk is sometimes misunderstood.

There are about 800 kernels in 16 rows on one maize ear. There may be one hundred bushels of maize with up to 7,280,000 kernels. Costs are increased when dried clean corn kernels have been transported and packaged to non-producing areas.




## 2.2. Source of Raw Material

Maize (Zea mays L.) is one of the most versatile new crops, which can be adapted in various agro-climate circumstances. Globally, maize has the most genetic potential for cereal production and is known as the queen of cereals.

It is cultivated on almost 150 m hectares in some 160 countries that provide 36% (782 metric tonnes) of global grain production, with a broader variety of soil, climate, biodiversity, and management practices. The U.S. is the biggest producer of maize that accounts for almost 35% of the total world output. China, Brazil, Argentina, India, Ukraine, and Mexico are also big rising countries. In India, the area under maize was cultivated over 80.38 lakh hectares in the Kharif 2019-20 era compared to 78.54 lakh during Kharif 2018-19. Karnataka, Maharashtra, Rajasthan, Bihar, Uttar Pradesh, Telangana, Gujarat, and Tamil

Nadu are the main maize-cultivating states in India. The 4th Advance Estimates of 2018–19 food grain production showed that the production of maize was expected to be about 27.23 million tonnes, compared to the 2714 million tonnes produced last year. In Kharif, 2019-20 maize area was 3.81 lakh hectares, in Kharif 2018-19, compared with 4.62 lakh hectares.

These sources show that the raw material can be available throughout the whole country from the district mandi, local vendors, and farmers.[iv]

### 2.3. Technologies:

- **Stove-pot/microwave popcorn:**

This is the basic homemade popcorn making technique where the packaged popcorns are put in either pan over the stove or the microwave and cooked for the assigned time till all the kernels gets popped.

- **Machine made popcorn:**

A popcorn machine (likewise called a popcorn popper or popcorn machine) is a gadget used to pop popcorn. Since antiquated occasions, popcorn has been a well-known nibble food, created through the touchy extension of bits of warmed corn.

- **Traditional Method:**

This is the oldest method used to pop popcorn in India. In this process the corn kernels are heated in a pot with sand, this allows corn kernels to get popped without using oil or butter and later is seasoned with salt. This is the healthiest form for consumption with zero added calories.

### 2.4. Manufacturing Process:

- **Transportation-** The raw material procured from the local vendor and transported to the factory for further processing.

- **Cleaning of kernels-** A cleaner and de-stoner sort out grains and any dirt or particles by passing it through a series of screens to separate. A gravity separator is then used to separate good kernels from bad; the kernels that have matured properly are lighter in weight, so the bad kernels drop through the bottom of the separator and are recycled for use as seed. The kernels near the two ends of the cob also tend to be either too small or too large to pop properly, and the gravity separator removes them as well.

- **Popping:** There are two methods. The dry method consists of putting the un-popped grain in a basket or wire cage, agitating it over a heat source like the campfire or coal stove, allowing the corn to pop, and seasoning it with butter and salt. The general method in caramel popcorn used is the wet-pop method; corn is placed in a container with a solid bottom. Oil is added (either before the corn or poured on top), and the oil helps to distribute the heat and cause more even and complete popping.

- **Seasoning:** The unit consists of a salt coating machine which is used to coat the popped corns for flavouring. Here in this project we are explaining how to make popcorn with salt and butter flavour.

- **Packaging of Product:** Finally, popcorns are packed by a packing 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 | Uses | Picture |
|---|---|---|---|
| **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. |  |
| **Primary Cleaning** | Vibro separator | Vibro separator is used to clean dust contained in the maize, dirt, and other foreign particle etc. |  |

| | | | |
|---|---|---|---|
| **Final cleaning** | The gravity separator | this machine is used for separating grains that are of the same size but with a different specific weight |  |
| **Popping** | Popcorn Making Machine | This machine is used for making popcorns. |  |
| **Seasoning** | Popcorn Seasoning Machine | The dried popcorn is put into this machine for seasoning coating. |  |
| **Filling** | Popcorn filling and packaging Machine | This machine is used to package the coated popcorns in the boxes or plastics packages. |  |

## 2.6. Additional Machine & Equipment:

| **Machine and Equipment** | **Uses** | **Pictures** |
|---|---|---|
| **Material handling Equipments** | These set of tools are specifically used for decorating cakes and other bakery items with appropriate design with cream, chocolate etc. |  |
| **Conveyor** | Generally used to move objects from one location to another. |  |

### 2.7. General Failures & Remedies:

| S. No. | General Failures | Remedies |
|---|---|---|
| **1.** | Ball bearing failure of various machine | 1. Proper periodic lubrication of all bearings in various machines.<br>2. Regular replacement of all bearing to prevent critical failures. |
| **2.** | Power Drive Overload | 1. Ensure proper weighing & metering specially in case of semi-automatic plant.<br>2. Install warning sensor in buffer region of loading capacity to ensure efficient operation. |
| **3.** | Mechanical Key Failure | 1. Ensure that mechanical keys are replaced as per there pre-defined operational life.<br>2. Prevent Overloading. |
| **4.** | Loss of Interface | 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.<br>2. Provide proper physical shielding for the connections. |

### 2.8. Nutritional Information:

Popcorn can be a healthy snack depending on its preparation. Popcorn provides a lot of fiber, vitamins, and minerals that the body needs if the air is breathed, not sweetened, or unsalted. That said, added butter, sugar, and salt can make popcorn an unhealthful snack.

## Nutritional contents of 100 g of Popcorn

This is the nutrient content of a 100-gram (3.5-oz) serving of air-popped popcorn:

- **Vitamin B1 (Thiamin):** 7% of the RDI.
- **Vitamin B3 (Niacin):** 12% of the RDI.

- **Vitamin B6 (Pyridoxine):** 8% of the RDI.
- **Iron:** 18% of the RDI.
- **Magnesium:** 36% of the RDI.
- **Phosphorus:** 36% of the RDI.
- **Potassium:** 9% of the RDI.
- **Zinc:** 21% of the RDI.[v]

**2.9. Export Potential & Sales Aspect:**

Popcorn is now one of the most popular snacks, not an added accompaniment for your favourite show when watching movies, sports. Therefore, one can find this humble snack everywhere from Indian kiraanawaalas, fantastic mall stores to different online platforms. And there's no more sweet or salty, popcorn comes in various aromas. The advent of a variety of popcorn companies is a testament to the rising popularity of popcorn. This snack also found space in the renowned list of Oprah's favourites last year.

Garrett's, which changed the picture of popcorn from a snack built for binge-looking movies to a great donation you can give your loved ones, are much to be credited with the growth of the popcorn industry in India. Their packing itself claims that they are festive with holiday specials and Christmas tins. The same packaging concept has also flooded the Indian market, where colourful and peculiar tins prevail.

The global popcorn market is expected to hit 15 billion dollars by the year 2023, with a CAGR of 7.6% from 2017 to the year 2023, with the ready-to-eat market leading the segment, according to a study by Allied Market Research. Although existing FMCG companies have either launched or are attempting to launch a Popcorn product, start-ups have also established Popcorn brands ready-to-eat. The potential of this industry would be futile to weaken.

# CHAPTER 3
# PACKAGING

## 3.1. Shelf Life of Product:

Popcorn's shelf life depends on what kind you have and whether it's popped or un-popped. Popped popcorn: Popped popcorn would be fine for about two to four weeks if left unopened. The shelf life drops to one to two weeks once you open the box.

In most instances, popcorn doesn't go off or spoil it. But it also doesn't last forever. Popped kernels go stale, dry out un-popped ones, and the fat goes rancid in microwaveable popcorn. Unopened ready-to-eat popcorn lasts for 2 to 3 months, and after opening or making popcorn yourself for between a week or two.

- **Proper Storage**

Popcorn kernels maintained in the proper, airtight storage can last for long, but try to pop and eat kernels within six months to a year of having them. They will lose their ability to pop as reliably over time, and they might have a slightly less fluffy texture than they did when you got them the first time. That's because popcorn kernels lose the moisture inside that makes them pop as time continues. In order to keep your popcorn long-lasting, an airtight container is necessary because it helps kernels maintain their moisture.

- **Appropriate Storage**

To preserve the optimal taste popcorn, there are two essential keys. Store them in air tight containers and keep them in a cool dark place. They would be safe from moisture and decay by holding containers that will protect them from oxidation and spoilage. It'll protect their color from fading by keeping them hidden from the over sun. The shelf life of popcorn depends on the packaging and how it is handled, the best before the date. Popcorn is 100% whole grain, low in fat and high in fibre, which makes it a great snack.

The explanation why popcorn pops is that the moisture trapped inside the kernel expands when the corn is cooked. It expands until the strain can no longer be resisted by the hull and thus pops open.

### 3.2. Popcorn Packaging:

The packaging material to be used must be carefully chosen, taking into account both practical and marketing specifications, in order to ensure the consistency of the product during handling, transport, storage, and delivery. In general, the packaging specifications for popcorn are listed below:

- To protect the product from spillage and spoilage.
- To provide protection against atmospheric factors such as light, heat, humidity, and oxygen.
- The selected packaging materials should have high water vapour and oxygen barriers.
- The packaging material should have a high barrier property to prevent aroma/flavour losses and in gross of external odour.
- The packaging content should, in addition to the above practical specifications, have good machinability, printability and be readily available and disposable.
- In its original air tight container with a tight seal in a cool dark place like the pantry, away from the stove or other appliances that can generate heat, the best way to store popcorn is.
- Using the fridge or freezer to store popcorn is not recommended because it will dry out faster and shorten its shelf life.

### 3.3. Type of Packaging:

- **Twist Tie Bag-** Although this is certainly the cheapest kind of packaging for popcorn, it is also the worst. This is the most common type for packaging the popcorn.
- **Popcorn Tin-** The popcorn tin is certainly a step up from the plastic bags, but some big shortcomings in this form of packaging still remain. While after they devour the popcorn, retailers might be great for individuals to store items in, retailers frown highly on this form of packaging. Because of the size of the containers, it is costly and difficult to ship to the retailer.
- **Form Fill Seal Bags-** These bags are made of roll stock and then sealed together by an FFS (form fill seal) machine with your usual chip bag being the end product. These bags appear to be a favourite among the crowd since they are recognizable to individuals. Once again, though, these bags have some problems.
- **Stand up pouches-** Stand up pouches are the best type of popcorn packaging, in my humble opinion. Stand up pouches are now, most importantly, the perfect way to

cover and preserve your popcorn. Multiple layers of laminated barrier film are made from these bags. You can shield your popcorn from moisture, vapor, odour and even UV rays with this barrier film.

- **Paper carton boxes-** Paper bag is used because the paper allows the air to flow, keeping the popcorn available for quick consumption. It must be consumed within 2-3 hours.

### 3.4. Material of Packaging:

Due to their simple availability, excellent printability, light weight, machinability, and cost-effectiveness printed flexible pouches have recently become quite popular. The laminate/film may also be customized to serve a particular purpose, depending on the practical and marketing criteria. The printed flexible pouches are generally laminates of various compositions. Some of the commonly used laminates are:

- ✓ Polyester/metallised polyester/LDPE
- ✓ BOPP/LDPE
- ✓ BOPP/metallised polyester/LDPE
- ✓ Polyester/Al foil/LDPE

Polyester and BOPP-based laminates are usually more common in the packaging of popcorn due to its potential and characteristics of both of these two films. In general, the polyester used for lamination is 10 to 12μm thick. The film is good clarity with outstanding transparency, excellence, and printability thereby improving the sales appeal. The film has very low moisture and gas permeability and thus guarantees a long shelf life of the contents of aroma, flavor, and flavor retention.

It may be Heat sealable or non-heat sealable. The film has high yields, is stable under climate change, and has an outstanding moisture barrier. The film is glossy, crystal clear, and smooth and has high mechanical strength and non-contamination properties for food contact applications. The sealant coating of LD – HD or LDPE may be replaced by LLDPE. Co-extruded films can also be used. Flexible materials based on PVDC, EVOH and EVAL still need to be tested, since they are now on the market and have high barrier properties.

# CHAPTER-4
# FOOD SAFETY REGULATIONS AND STANDARDS OF POPCORN

## 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:

**Food standards**

**"2.4.6 Food Grains: 2.4.6.** 3. **Maize:"** Maize shall be the dried mature grains of Zea mays Linn. It shall be sweet, hard, clean and wholesome. It shall also conform to the following standards, namely:—

| | |
|---|---|
| (i) Moisture- | Not more than 16.0 per cent by weight (obtained by heating the pulverised grains at 130oC- 133oC for two hours). |
| (ii) Foreign matter — | Not more than 1 per cent. by weight of which not more than 0.25 per cent. by weight shall be mineral matter and not more than 0.10 per cent. By weight shall be impurities of animal origin. |
| (iii) Other edible grains - | Not more than 3 per cent by weight. |
| (iv) Damaged grains- | Not more than 5 per cent by weight. |
| (v) Weevilled grains- | Not more than 10 per cent by count. |
| (vi) Uric acid- | Not more than 100 mg. per kg. |
| Provided that the total of foreign matter, other edible grains and damaged grains shall not exceed 9 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 equipment’s 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 equipment’s 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.

**4.4. 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 colouring 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 Labeling) Regulation 2011" and the Compendium of Food Safety and Standards (Packaging and Labeling) 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.

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