MINISTRY OF FOOD PROCESSING INDUSTRIES
GOVERNMENT OF INDIA

सत्यमेव जयते

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KNOWLEDGE • INNOVATION • OUTREACH

PM Formalization of

Micro Food Processing Enterprises (PMFME) Scheme

HANDBOOK

OF

SESAME SEEDS

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CHAPTER - 1

1. INTRODUCTION

Scientific Name	*Sesamum indicum*
Family	Pedaliaceae
Genus	Sesamum
Species	S. indicum

COMPISITION:

Sesame seeds contains the following:

I. Liganana
II. Sesamolin
III. Sesamin
IV. Pinoresinol and
V. Lariciresinol

1.1 About

- ✓ Sesame seed is a flowering plant, it is also called benne.
- ✓ Numerous wild relatives occur inIndia and Africa.
- ✓ It is widely naturalized in tropical regions around the world
- ✓ It is cultivated for its edible seeds, which in future grow in pods.

Sesame Seeds Expiration Date

Opened/Unopened	Pantry	Freezer
Sesame Seeds (Raw)	6 to 12 months	1 year

1.2 Origin

- ✓ Sesame seeds have originated in India from 1600 BC.
- ✓ They have been proved to be excellent for the human health.
- ✓ They are loaded with many useful nutrients and minerals which work for the body in many ways, preventing many health conditions and boosting the overall health.
- ✓ There are many different kinds of sesame seeds, which have too much benefits from variety to variety.
- ✓ India ranks amongst the major sesame seeds exporter around the world. This is why; we have brought to you a list of the four commonly used varieties of sesame seeds.
- ✓ This seed is the oldest oilseed crop which is known to humanity.

- ✓ This genus has many species, and mostly is wild. Most of the wild species of the genus *Sesamum* is native to the sub-Saharan Africa. *S. indicum,* originated in India.
- ✓ Archaeological reports suggest that the Sesame seeds was first domesticated in the Indian subcontinent (5500 years ago).
- ✓ Charred remains of sesame seeds recovered from archeological excavations dated to 3500-3050 BC.
- ✓ The fuller claims trading of sesame between the Mesopotamia and the Indian subcontinent are occurred by 2000 BC. It may be possible that the Indus Valley Civilization exported sesame oil to Mesopotamia, where it was known*ellu* in Akkadian.
- ✓ Some reports claim sesame was cultivated in Egypt also, during the ptolemaic period. In Egypt it is called as *sesemt*.
- ✓ They have included it in the list of medicinal drugs in the scrolls of the *Ebers Papyrus,*which was dated to be over 3600 years old.
- ✓ In Turkey their archeological reports about sesame seeds indicate that sesame was grown and pressed to extract the sesame oil in the empire of Urartu.

1.3 History

- ✓ The historic origin of sesame was known by its ability to grow in areas which do not support the growth of any other crops.
- ✓ It is also a robust crop which needed very little farming support, Areas - it grows in drought conditions, Temp - in high heat, with some amount of moisture in the soil after monsoons are gone or even when the rains fail or excessive rain.
- ✓ This was a crop that can be grown by subsistence farmers at the edge of deserts
- ✓ Sesame seed has also been called a survivor crop.

1.4 Botany

- This is an annual plant growing seed.
- ✓ 50 to 100 cm (1.6 to 3.3 ft) tall
- ✓ they have opposite leaves - 4 to 14 cm long in size with an entire margin
- ✓ They are broad lanceolate which is 5 cm broad in size, at base of the plant, and narrow to just 1 cm broad on the flowering stem of the sesame seed plant.
- ✓ The flowers are tubular which is 3 to 5 cm long in size with a four-lobed mouth, may the flowers vary in color with some white, blue, or purple.
- ✓ Sesame seeds occur in many colors which completely depending on the cultivator. The most traded variety of sesame is the off-white colored.
- ✓ The other common colors arefollowing: buff, tan, gold, brown, reddish, gray, and black. The color is the remains same for the hull and their fruit.

- ✓ Sesame fruit is in the form of a Capsule, which is normally pubescent, structurally rectangular in section.

- ✓ Aand it is typically grooved with a short triangular beak.

- ✓ The length of the fruit capsule varies at the following length pattern:
    - from 2 to 8 cm, its width varies between 0.5 and 2.0 cm,
    - and their number of loculi varies from 4 to 12.

- ✓ The fruit naturally splits opento release the seeds by splitting along its septa from top to bottom or by the means of two apical pores, depending on the varietal cultivator.

- ✓ The degree of dehiscence is important in breeding for mechanized harvesting, for the insertion height of the first capsule.

- ✓ Sesame seeds are small in size. Their sizes vary with the thousands of varieties known.

- ✓ The seeds are about 3 to 4 mm long by 2 mm wide and 1 mm thick. The seeds are ovate, slightly flattened, and thinner at the eye of the seed (known as hilum) at the opposite end. The mass of the 100 sesame seeds is 0.203 g. The sesame seed coat (known as testa) may be very smooth or ribbed.

1.5 Cultivation

- Sesame Seeds all differentvarieties have adapted to many soil types. The high-yielding crops thrive are well-drained, fertile soils of medium texture and with neutral pH. However, these have a very low tolerance for the soils with high salted and water-logged conditions.
- The commercial sesame seed crops require 90 to 120 frost-free days, warm conditions above 23 °C whichfavor growth and its higher yields. While sesame seed can grow in poor soils, but the excellent yields may come from properly and better fertilized farms.
- The initiation of flowering is so sensitive to the Photoperiod and Sesame variety. The photoperiod may also affect the sesame seed oil content in it; if we increase the photoperiod then the oil content also gets increased. The oil content of the sesame seed is inversely proportional to its protein content.
- Sesame seeds are drought-tolerant, in part due to its extensive root system. There is requirement of adequate moisture for germination and for the early growth. While the sesame crop survives the drought and the presence of excess water, the yields areget significantly lower in either condition. Moisture levels before planting and flowering impact the yields of sesame seed most.
- Most commercial cultivators of sesame seeds are intolerant of water-logging. If rainfall occurs late in the season prolongs then the growth gets effected and there isincreases in loss to dehiscence, when the seedpod shatters, scattering the seed. Wind may also cause or effects shattering at harvest.

CHAPTER - 2

2.1 TYPES OF SESAME SEED

- **Hulled Sesame Seeds**

  This is one of the most common and healthiest varieties of sesame seeds. Hulled sesame seeds are basically those kinds of sesame seeds from which the outer husk or hull has been removed. While this process of removing the husk is practiced by many sesame seeds manufacturers, the process, machinery and skill used to do so may vary greatly. The HL Agro is one of the best sesame seeds exporter and manufacturer of hulled sesame seeds, known for its high-quality hulling process.

- **Unhulled Sesame Seeds**

  As the name suggests, unhulled sesame seeds are those kinds of sesame seeds whose hull or outer skin hasn't been removed. These seeds go through a step lesser during the manufacturing process as compared to hulled and are known to have higher benefits too. The outer skin is considered to be nutritious and thus this variety is used for many purposes and in many recipes across the world.

- **White/Natural Sesame Seeds**

  Another variety of sesame seeds that you must know about is the white sesame seed variety. White/Natural sesame seeds are considered to be those sesame seeds which are in their purest form. You must have seen these seeds sprinkled on top of burgers, donuts and other kinds of desserts and snacks. They have a very rich flavor and texture and are among the most commonly used sesame seeds in the world. Within the variety of white sesame seeds, both hulled and unhulled varieties can be found.

- **Black Sesame Seeds**

  Black sesame seeds are also considered to be the most nutritional variety of sesame. The ancient Chinese believed that the nutrients present in the Black sesame seeds could cure many kinds of body infections which are caused due to aging, worrying, anxiety and others kinds of tolls in life. These seeds are loaded with zinc and calcium due to which they provide prevention of many health conditions that are caused due to aging. These seeds are mixed in yughurts and many kinds of dishes across the world. Black sesame seeds are further divided into two types-hulled black sesame seeds and unhulled black sesame seeds.

Chapter – 3

3.1 SESAME SEED PROCESSING

- Sesame seeds in structure are flat, oval shaped and tiny seeds, which have a crunchy and nutty texture.
- These are used all over the world in food recipes and skin care products. These seeds are grown and manufactured in bulk quantities in India, Mexico, Africa and China etc.
- The seeds grow naturally in pods and are cultivated from edible seeds. They have a lot of varieties and **variants like natural white sesame seeds, hulled white sesame seeds, black sesame seeds, and brown sesame seeds**, all of these have some use and application over the globe.
- There are many well-known sesame seeds manufacturers & exporters of sesame seeds or sesame oil in India and most of them follows the same sesame seeds manufacturing process to produce it in bulk quantity.
- The following are thestep-by-step description for the process of sesame seeds manufacturingas follows:

Processing:

The sesame seeds manufacturer need big processing plants and the big machinery in-house to correctly process the sesame seeds. The Sesame Seed processing is broadly carried out in the three main steps which is**Cleaning, Dehulling and Sorting**. There are two kinds of sesame seeds- one is hulled and the other is unhulled. Therefore, the unhulled seed does not need to go through the Dehulling process.
The sesame seeds manufacturer adopt the following steps for manufacturing & processing the sesame seeds:

Step 1: Cleaning of the Sesame Seeds:

- It is the **Pre-cleaning process** which is to clean all the raw seeds and it is done by removing all the impurities and the dust particles.
- There are many devices within the cleaning machinery for carrying on this process of Cleaning the sesame seeds.

- Firstly, all the seeds are sieved and then it transferred to a spiral blending machine and then finally into the grader which is followed by the de-stoner.
- The machine has the three different discharging outlets for impurities, for sewage and for cleaned sesame seeds.

Step 2: Dehulling of Sesame Seeds:

- This process has two different kinds for it - one is dry dehulling and other is wet dehulling.
- The dry dehulling is not used in the commercial plants and in industries, whereas wet dehulling is used for a large output needs to be obtained.
- The wet dehulling in includes five processes which are:

  1. Soaking, 2. Dehulling 3. Separation 4. Cleaning and 5. Drying.

Step 3: Sorting of Sesame Seeds:

- This is the final step for the Sesame Seeds Manufacturing Process is Sorting in which it is again divided into further 3 steps: 1. Fine sorting 2. Magnetic sorting 3. Color sorting.

  1. **Fine sorting-** it is a kind of a sorting process in which all the seeds are fined and then sorted on the basis of seeds size.

  2. **Magnetic sorting-** it is a kind of a sorting process in which the fined seeds are made to go through the magnetic field or charge for the removal of all kinds of magnetic impurities.

  3. **Color sorting-** in this sorting, the single sorter machine separates impurities like foreign particles and stones.

CHAPTER – 4

4.1 PACKAGING TECHNOLOGY OF SESAME SEED:

- Packaging - it is the technology of enclosing and for protecting products for the distribution, storage, sale and use**.**
- Packaging also refers to the process of its design, the evaluation and theproduction of packages.
- It can be described as a coordinated system of preparing goods for transport, the warehousing, logistics, sales and its uses.
- Without the packaging the materials handling would be very messy, inefficient and much costly exercise and for modern consumers marketing would be virtually impossible.
- Packaging plays an very important role in food manufacturing process. It protects the food products from the physical, chemical and biological damages.
- Packaging Institute International defined that the packaging is a enclosure of products, items or packages wrapped in Pouch, Jute or cotton Bags, Boxes, Cup, Tray, Cans, Tube, Glass and Plastic Bottles or other container form to perform one or more of the following functions: Containment, Protection, Preservation, Communication, Utility and Performance.

4.2 NEEDS OF PACKAGING

4.1.1 CONTAINMENT:

The Containment function of packaging - it makes an huge contribution to protecting the environment from the myriad of food products that are moved from one place to the another on numerous occasions each day in our modern society. Faulty packaging can result in major pollution of the environment which is harmful for the nature.

4.1.2 PROTECTION:

The Primary function of the package - it is to protect its contents from outside environmental influences such as water, water vapors, gases, odors, microorganisms, dust, shocks, vibrations and compressive forces.

4.1.3 CONVENIENCE:

Products are designed to increase the convenience which include ready to cook or ready to eat foods, which can be reheated in a very short time, preferably without removing the primary package. Thus, packaging helps in convenience of consumer. Convenient packages promote sales.

4.1.4 COMMUNICATION:

Packaging contains a lot of information such name of its manufacturer, product name, terms and uses, date of manufacturing, best before. Nutritional information thus helping the consumer to be more informed.

4.2 TYPES OF PACKAGING

4.2.1 PRIMARY PACKAGING:

- Primary package are those package which directly came into contact with food products.
- It provides first or initial layer of protection to the food products.
- Examples includes - Metal cans, Cotton bags, Paperboard cartons, Glass bottles and Plastic bottles or pouches.

4.2.2 SECONDARY PACKAGE:

- Secondary package are those package which surrounds or contains the primary package.
- It further used to group primary packages together.
- Act as carriers and many times it also used for the display of it.
- Ex. Corrugated case, Boxes.

4.2.3 TERTIARY PACKAGE:

- It contains number of secondary package together.
- Mainly used for bulk handling of food products.
- Example: stretch-wrapped pallet.

4.2.4 QUATERNARY PACKAGE:

- Quaternary package is mainly used for handling the tertiary packages.
- It is generally includes a metal container which can be transferred easily in or from ships and trains.

4.3 PACKAGING OF SESAME SEEDS

Packaging of their is also done to increase their shelf life. SESAME SEED can be packed in wide range

material which includes LDPE, PET, glass, aluminum etc.

4.3.1 LDPE:

- **Low - Density Polyethylene -** it is heat sealable, inert, odour free and shrinks when heated.
- It act as a barrier to the moisture and has high gas permeability, high sensitivity to oils and poor odours resistance. It is less expensive, therefore widely used. One of the great attributes of LDPE is its ability to be fusion welded to itself to give good, tough, liquid-tight seals.

4.3.2 PET:

- It can be made into film by the blowing or casting. It can be moulded, injection moulded, foamed, extrusion coated on paperboards and extruded as sheets for the thermoforming.

4.3.3 GLASS:

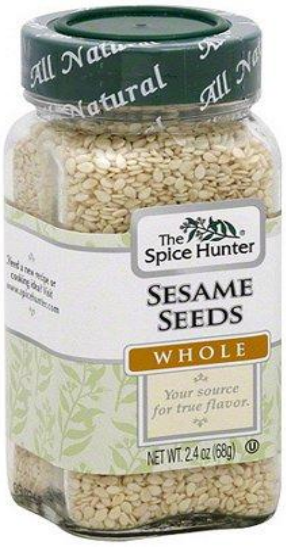
- Now a day glass container has been also used for packaging the sesame seed.
- It has following advantages:
- act as strong barrier to moisture, gases, odours and micro-organisms and do not react easily with food products
- suitable for the heat processing when hermetically sealed
- glass are easily re-useable and recyclable
- they are very much transparent to display the contents
- they are rigid in surface, to allow stacking without the container damage.

- **The disadvantages of glass include**:

  - higher weight which increases the higher transport costs than other types of packaging
  - it is lower in resistance than other materials to fractures, scratches and thermal shock
  - it havemore variable dimensions than metal or any plastic containers
  - it is potentially serious hazards from glass splinters

4.3.4 LAMINATE :

- It can be formed, filled, Gas flushed and Sealed on a single machine from the stock.
- Gas flushing is achieved by saturating the powder with inert gas. The main advantages associated with laminates are lower material cost and lighter material weight. The disadvantages are that laminates do not have the mechanical strength and durability of rigid containers, and there can be difficulty in obtaining a satisfactory heat seal because of contamination of the heat seal area by powder during filling at high speed.



4.4 SOME OTHER PACKAGING METHODS

4.4.1 MODIFIED ATMOSPHERE PACKAGING UNIT:

- It can be defined as packaging of the food items where atmosphere inside the packet has been modified to increase the shelf life of food products. It involves active modification or passive modification.
- In active modification air is displaced with a controller, desired mixture of gases, and this process is called as Gas flushing (may be nitrogen gas, oxygen gas, carbon-dioxide gas).
- The passive modification isoccurs due to respiration and the metabolism of microorganisms associated with the food.

4.5 LABELING

Labeling performs the communication function of packaging, informing the consumer about nutritional content, net weight, product use and so on. Labeling acts as a silent salesman through distinctive branding, as well as facilitating identification at check-outs through the Universal Product Code (UPC).

There various types of labeling which are as follows:

4.5.1 GLUED-ON LABELS :

These are the simplest type and consist of sheet material (typically paper), which has been printed and cut to size. They are attached to the package withadhesive, which is applied either at the time of application, and at the time of manufacture, inwhich case the Adhesive is activated with moisture immediately prior to application.

4.5.2 SELF-ADHESIVE (PRESSURE-SENSITIVE) LABELS :

These can be made fromthe paper, plastics or aluminum foils laminated to paper or plastic, and it can be produced to adhere to awide range of materials.

4.5.3 IN-MOLD LABELS:

It offers better resistance to heat, moisture and chemical than thoselabels made from paper. There are also recycling advantages with film labels. IML materialsmust be able to withstand the container manufacturing process. The heat generated during blowmolding presents a challenge to most inks because pigments can change.

4.5.4 SLEEVE LABELS:

A wide range of containers can be sleeve labeled including glassbottles, plastic bottles and metal cans. Sleeve labels shrink into or stretch around contours,penetrate variable geometries and conform to irregular features.

4.5.5 HOLOGRAPHIC LABELS:

Holographic labels that incorporate a hologram have largeapplication in food packaging for both marketing and security reasons, specifically in the areasof anticounterfeiting (authentication) and brand protection. Surface relief and volume are themost common type of hologram. Surface relief holograms exhibit a characteristic rainbow-colored pattern or image. Volume, or reflection, holograms have a very different appearance tosurface relief holograms and are generally used for authentication.

4.6 Packaging Machines

5.1 FSSAI REGULATION

- **TIL Oil** (gingelly or sesame oil) means, oil expressed from clean and sounds seeds of Til (Sesamum indicum), black, brown, white, or mixed.

- It should be clear, free from the rancidity, suspended from or other foreign matters also, separated water, added colouring or any flavouring substances, or mineral oil

- **It should confirm to the following standard values : -**

• Butyro - Refractometer reading at 40 °C - 58.0 to 61.0
• Refractive index at 40°C -1.4646 - 1.4665
• Acid value - Not more than 6.0
• Iodine value 103-120
• Saponification value - 188-193
• Un- saponifiable matter -Not more than 1.5 per cent
• Bellier test - (Turbidity temperature for Acetic acid method) - Not more than 22 °C

- **Provided that the oil obtained from white sesame seeds grown in Tripura, Assam and West Bengal should confirm to the following standard values : -**

• Butyro - Refractometer reading at 40 °C - 60.5 to 65.4
• Refractive Index at 40°C -1.4662-1.4694
• Acid value - Not more than 6.0
• Iodine value - 115 to 120
• Saponification value - 185 to 190
• Un- saponifiable matter -Not more than 2.5 per cent
• Bellier test - (Turbidity temperature of Acetic acid method) - Not more than 22oC
• Test for the Argemone oil should be negative.

- However, it may contain food additives permitted in the above regulations and Appendix A Further, if the oil is obtained by the method of solvent extraction and the oil imported into India whether obtained by solvent extraction or otherwise, it shall be supplied for human consumption only after refining and shall conform to the standards laid down under regulation 2.2.1 (16). The oil so refined shall not contain Hexane more than 5.0 ppm.

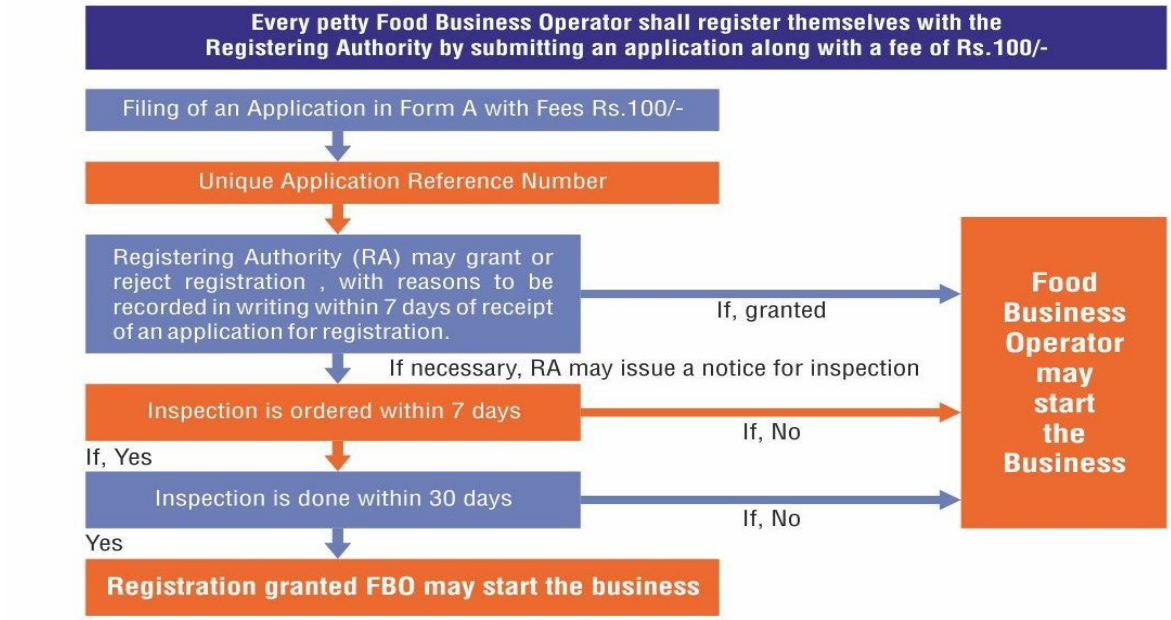
➢ **Refined Vegetable Oil** –

- It means any vegetable oil which is obtained by the expression or the solvent extraction of vegetable oil bearing materials, de-acidified with alkali and/or physical refining and/or by miscella refining using permitted foodgrade solvents followed by bleaching with absorbent earth and/or carbon and deodourised with steam. No other chemical agent shall be used. The name of the vegetable oil from which the refined oil has been manufactured shall be clearly specified on the label of the container. In addition to the under-mentioned standards to which refined vegetable oils shall conform to the standards prescribed in these regulations for the specified edible oils shall also apply except for acid value which shall be not more than 0.5. Moisture shall not exceed 0.10 per cent by weight.

➢ **FSSAI REGISTRATION:**

- As per the section 31(1) & 31(2) of FSS Act, 2006 the every Food Business Operator in the country is required to be licensed/registered under the Food Safety &Standards Authority of India.
- The Licensing and Registration procedure and requirements are regulated by Food Safety & Standards Regulations, 2011. (Licensing and Registration of food Business)

- Registration is meant for the petty food manufacturers which includes Petty retailer, Hawker, Itinerant vendor or any other temporary stall holder or small or cottage scale industry which is having annual turnover up to 12 lacs. All food businesses having income more than this limit are required to take a license.



➢ **FSSAI LICENSE:**

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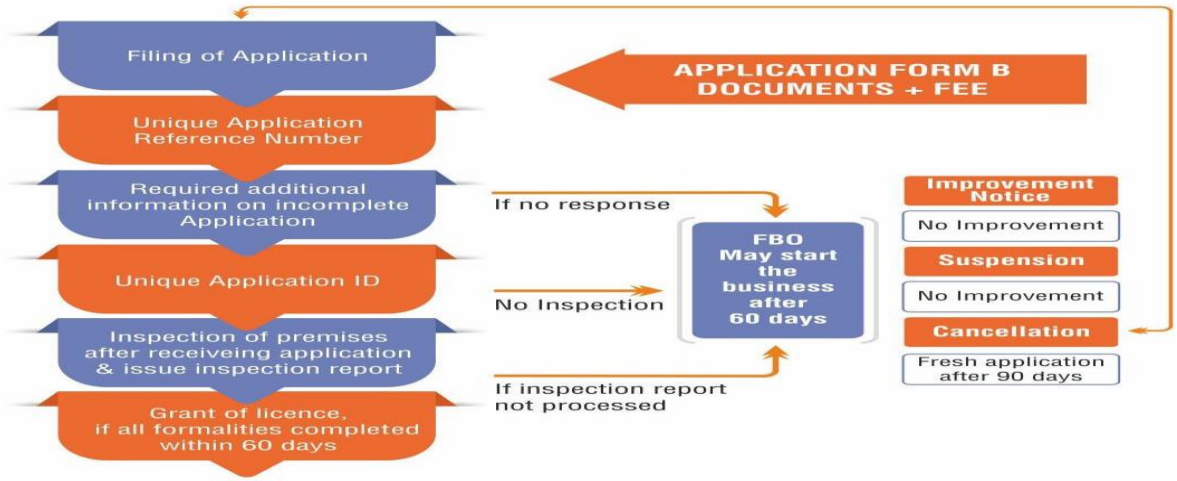

➢ FSSAI LICENSE AND REGISTRATION PROCESS:

- Every Petty Food Business Operator should register themselves with the Registering Authority by submitting an application form for registration in Form A under Schedule 2 of all these Regulations along with a fees as provided in Schedule 3.
- The Petty food manufacturer must follow the basic hygiene and safety rules or requirements provided in Part I of Schedule 4 for these Regulations and provide a self attested declaration of adherence to these requirements with the application in the format provided in Annexure-1 under Schedule 2.
- The Registering Authority shouldconsider the applications and may either grant registration or reject it with reasons to be recorded in writing or issue notice for inspection, within 7 days of receipt of an application for registration.
- In the event of an inspection being ordered, the registration should be granted by the Registering Authority after being satisfied with the safety, hygiene and sanitary conditions of the premises as contained in Part II of Schedule 4 within a period of 30 day
- The Registering Authority should issue a Registration Certificate and a Photo Identity card, which shall be displayed at a prominent place at all times within the premises or vehicle or cart or any other place where the person can carries on sale/manufacture of food in case of Petty Food Business.
- The Registering Authority or any Officer or Agency may be authorized for this purpose should carry out food safety inspection for the registered establishments at least once in a year.

➢ MODIFICATION OF LICENSE

- The Food business operator are required to operate any change in the business to Food Safety Authority of India (FSSAI) within a reasonable time.
- If there are any changes related to kind of business, scale of production, products category or formulation etc. should follow the regulation
- Once the FSSAI License or Registration (FORM C) has been granted, any change required in the same requires filing application for the modification of FSSAI License or Regulation.