MINISTRY OF FOOD PROCESSING INDUSTRIES
GOVERNMENT OF INDIA

सत्यमेव जयते

Reading Material for

Peanut Oil

Under PMFME Scheme

National Institute of Food Technology Entrepreneurship and Management
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Abbreviations & Acronyms

Sr:No.	Abbreviations &Acronyms	Full Forms
1.	PM FME	Prime Minister's Formalisation of Micro Food Processing Enterprises Scheme
2.	PVDC	Poly Vinylidene Chloride
3.	CAGR	Compound Annual Growth Rate
4.	PVC	Poly Vinyl Chloride
5.	PET	Polyethylene terephthalate
6.	EVOH	Ethylene-vinyl alcohol copolymer
7.	HACCP	Hazard Analysis and Critical Control Point
8.	GAP	Good Agricultural Practices
9.	GMP	Good Manufacturing Practice
10.	SOP	Standard operating procedure
11.	FSSAI	Food Safety and Standards Authority of India
12.	FoSCos	Food Safety Compliance System
13.	FBO	Food Business Operator
14.	FSMS	Food Safety management System

CHAPTER-1

INTRODUCTION

1.Introduction

Groundnut is an important Oilseed crop in the world with over 100 countries cultivating and playing a significant role in the world economy and is believed to have its origin in South America. The cultivation then spread to different parts of the world and eventually was introduced to southern India by Portuguese in 16th century.

Groundnut, an oilseed derived from the fruit of groundnut plant. It is commonly mistaken as a nut though it is not a nut exactly; it's a seed rather and is also known by the name of peanut. The Groundnut or Peanuts species belongs to the family of *Fabaceae* (commonly known as bean, legume or pea family). The groundnut is an annual herbaceous plant with feather type leaves yellow flowers and a legume shaped fruit with two to three seeds which develops inside the earth. The oil extracted from groundnut/peanuts is also known as Arachis Oil, which is a mild tastes vegetable oil with a light-yellow transparency, clear colour and lustre, mild pleasant fragrance accompanied by a good taste and relatively easy to digest. The oil from the groundnut seeds is proven to be an excellent source of vitamin E various fatty acids, good quality proteins (approx. 28%) and carbohydrates.

Groundnut oil is generally used in cooking, frying and manufacturing of margarine and shortening throughout the world. The kernel of groundnut contains approximately 45%-55% of oil. The oil cake/ leftover meal from the extraction makes a significant component of animal feeds for poultry and cattle. The aroma and taste of groundnut oil traces back to its parent legume family. The groundnut oil comprises of more than 80 % UFA (unsaturated fatty acids with around 42 % Oleic Acid, 38% Linoleic Acid and around 20% Palmitic acid, Steric acid, Arachidic acid along with some other unsaturated fatty acids in trace amounts. It is a rich source of all B vitamin except B12, minerals, phosphorus, calcium, iron. The biological value of groundnut protein is the highest among all vegetable proteins.

1.2 Market Potential and Varieties of Peanut

The favourable weather condition in the Indian subcontinent has helped India into an important contributor to the world production, bagging the 2nd rank in the world's annual groundnut production scenario. The peanut oil market size has an immense potential to grow by approximately USD 1.9 billion during 2020-2024 and the growth momentum will

probably accelerate progressing at a CAGR of 3% during the forecast period. The report on peanut oil market provides a wholistic approach and analysis in market size, forecast, trends, growth drivers and challenges as well as vendor analysis covering around 25 major global vendors. India has exported 6,64,442.93 MT of groundnuts to the world for the worth of Rs. 5,096.34 crores/ 711.38 USD Millions during the year 2019-20. Majorly peanuts are growing states in Gujarat, Andhra Pradesh, Tamil Nadu, Karnataka, Maharashtra, Rajasthan, Madhya Pradesh, Orissa, and Uttar Pradesh. In India groundnut are produced in both Rabi (25%) and kharif (75%) seasons.

Table 1. State wise area under Peanut in India

State	2018-2019		2019-2020	
	Area (Lakh Ha)	% of total Area	Area (Lakh Ha)	% of total Area
Gujrat	14.14	42.18	13.87	45.91
Rajasthan	5.81	17.33	5.25	17.38
Andhra Pradesh	3.83	11.43	2.43	8.04
Karnataka	2.6	7.76	1.93	6.39
Madhya Pradesh	2.09	6.24	1.92	6.36
Others	5.05	15.07	4.81	15.92
All India	33.52	100.00	30.21	100.00

Source: www.agricoop.com

Varieties of Peanut

Indian groundnuts are available in different varieties: Bold or Runner, Java or Spanish and Red Natal. The main Groundnut varieties produced in India are Kadiri-2, Kadiri-3, BG-1, BG-2, Kuber, GAUG-1, GAUG-10, PG-1, T-28, T-64, Chandra, Chitra, Kaushal, Parkash, Amber etc.

1.3 Health Benefits of Peanut Oil

CHAPTER – 2

PROCESSING AND MACHINERIES

2.1 Peanut Oil Manufacturing Process

Peanut oil manufacturing can be majorly categorised into two broad groups, first one is mechanical pressing and the second one is solvent extraction. Mechanical pressing method is able to extract up to 85% of oil and the remaining can be extracted by the process of solvent extraction. The goal of extraction of Oil is to produce pure oil free from contaminants and traces of the original plant material.

For the purpose of achieving oil free from any impurities groundnut /peanuts go through certain pre treatment process such as cleaning, shelling, grading, cooling, thermal conditioning.

2.1.1 Cleaning

During harvesting of peanuts certain impurities come together with the pod of peanuts, so when peanuts are brough in the production house it is further cleaned so that quality of final product can be ensured. The impurities fall under three categories: -

1. Inorganic Impurities: - Dust, Sand, Metal, Plastic Chips etc
2. Organic Impurities: - Stem, leaves, hemp, shell, twigs etc
3. Oil bearing Impurities: - Kernel infested with mould, worms, weevils and unsound kernels etc.

The above stated impurities affect the oil yielding capacity and also distort the quality of fat and residual cake. They may also hamper the equipment's and machinery causing breakage and even production accidents

The following methods can be used to remove impurities when combined with their respective equipment:

- Screening
- Winnowing
- Magnetic Separation
- Gravity Separation

The maximum permissible limit for the impurities in the cleaned raw peanuts is capped up to 0.1% only

Table 2. Raw Material Grade Specification

Categories	Grade Designation			(NAFED)
	Special	Good	General	Maximum limits of tolerance (%by weight per quintal)
Foreign Matter per cent by weight (max)	0.5	1	2	2
Immature, shrivelled and dead seeds, per cent by weight (max)	1	2	3	3
Damaged & Discoloured seeds per cent by weight (max)	Nil	1	2	2
Mixture of other varieties/ types per cent by weight (max)	5	10	15	10
Moisture content per cent by weight (max)	5	6	7	7

Source: Agmarknet

Table 3. Maximum Tolerance Limit of Special Characteristics

Special Characteristics	Maximum Limits of tolerance (%by weight per quintal)
Foreign Matter	2
Shrivelled and immature	3
Damaged and discoloured	2
Admixture of other varieties	10
Moisture Content	7

Source NAFED

2.1.2 Shelling (Decortication)

Prior to processing, the raw peanuts need to be deshelled or decorticated to improve the oil yield and reduce the fat loss this can be done either by manual shelling or mechanical shelling, manual shelling is generally done for peanuts meant for exporting but this is a labour-intensive method and renders the process inefficient.

Mechanical shelling acts as superior method, as it saves time and labour but may cause minor mechanical to damage to the peanuts. This process is highly suitable for oil production and hence its is preferred in industrial application.

2.1.3 Grading and Selection

Grading process is adopted to remove the impurity and unsound kernel from the lot and ensure that the kernel size is not damaged, uniform, free from weevil, mould o worm infestation. The introduction of colour sorting process adds to the efficiency of the process by effectively eliminating the aflatoxin contaminated peanuts (efficiency above 99%).

2.1.4 Drying

Peanuts are subjected to drying followed by air cooling in order to lower the water content of the kernels and enabling the red skin of the kernels, crisp and easy to peel. The drying process is temperature controlled and lies in the range of 40-80 C and the duration depends upon the water content of the peanuts. Below 5 % water content of the peanut kernels, peeling efficiency is relatively high.

2.2 Peanut Oil Pressing Process

The oil from the peanuts is extracted mainly by two pressing methods: -

- **High Temperature Pressing: -** Before extraction/ Pressing peanuts are subjected to hot air dryer repeatedly to bring down the water content in the range of 5-6% and then the temperature of oil extracted must be quickly brought down with cool air to a temperature below 40 ℃.

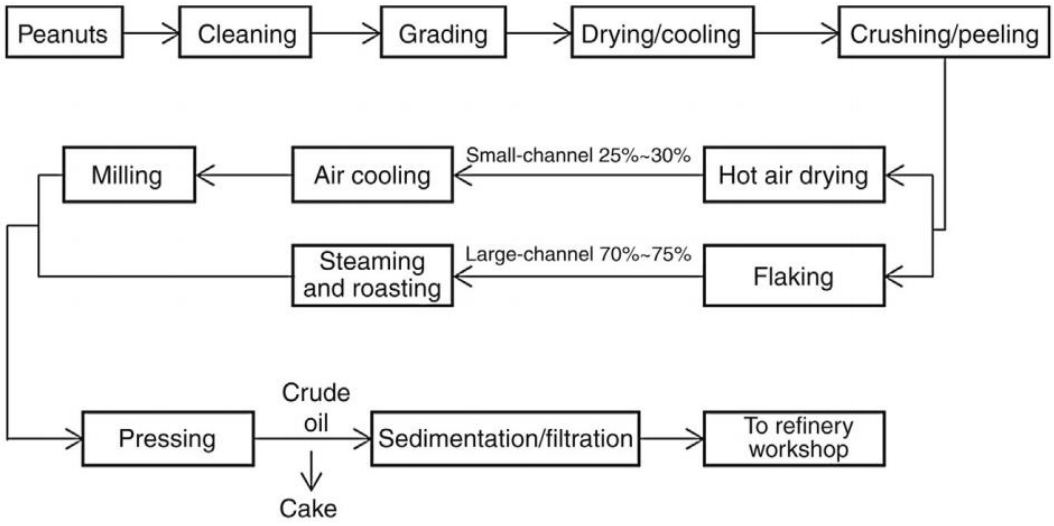
  After crushing the small-channel kernels are again subjected to 180-200℃ n a stir-fry furnace for hot-air frying in order to enhance the oil yield and fragrance. The large-channel kernels are pressed into flakes using flaking machine and destroying the cellular tissue of the peanuts in the process known as uncooked flakes.

  Pros: -

  - Strong fragrant flavour leading to mass acceptability by consumers

  Cons: - High temperature pressing method leads to

  - Poor organoleptic quality
  - Heavy loss of Vitamin E, sterol, wheat germ phenol, phospholipids and other nutritional factors
  - Poor stability or shelf life.



High-temperature peanut oil production flow chart.

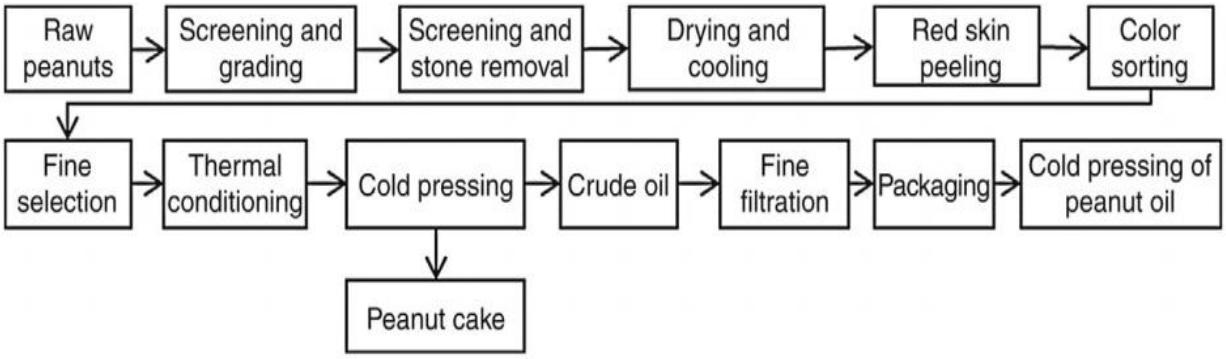
- **Cold Temperature Pressing:** -Less than 10% of peanut oil is produced using cold press techniques, in which the conducted temperature lies in the range of 60-70 ℃. Before pressing method, removal of the red skin is done which is beneficial to reserve nutrients and comprehensive utilisation of peanut protein in peanut oil.

  Pros: -

  - Higher original nutritional quality of peanuts
  - Peanut protein powder with low variability are produced and hence the peanut utilisation rate and economic benefits are improved
  - More promising market potential

  Cons: -

  - Premature oil exudation making material difficult to be fed into the press
  - The residual cake does not take shape



Flow chart of cold pressing of peanut oil.

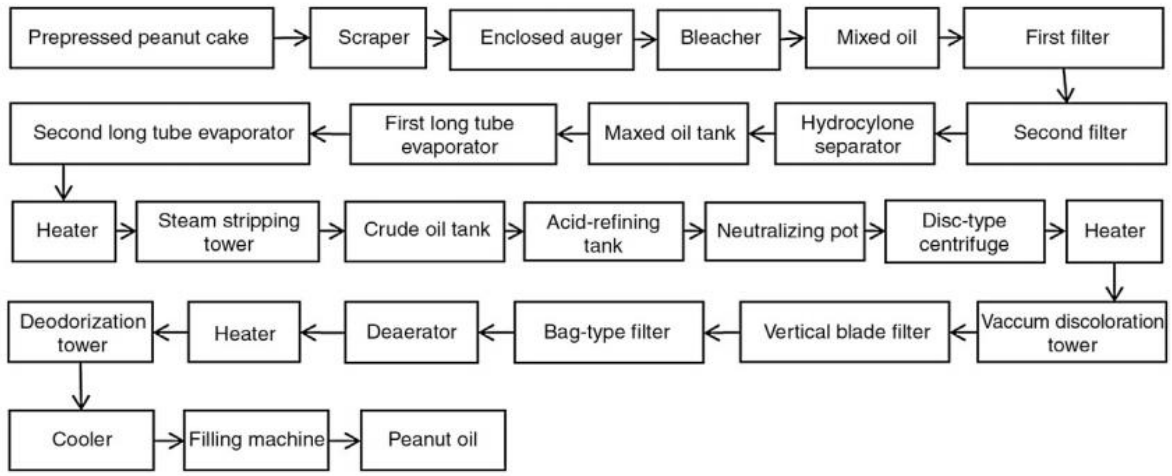
2.3 Peanut Oil Extraction Method

It is also known as leaching method, that employs organic solvent to dissolve fats, spray and immerse the oil-bearing materials in order to eventually separate the fat from material. In comparison to pressing method, leaching method has advantages such as: -

- high oil yield
- low residual oil ratio of peanut meal
- low production cost
- larger production scale

The disadvantages include: -

- High Capital investment
- Leaching agents/organic solvents are highly flammable and explosive toxic substances threatening the production safety



Flow chart of equipment for peanut oil production with leaching method.

2.4 Oil Refining Procedure

The leached crude peanut oil is brought to the refinery workshop for the following process: -

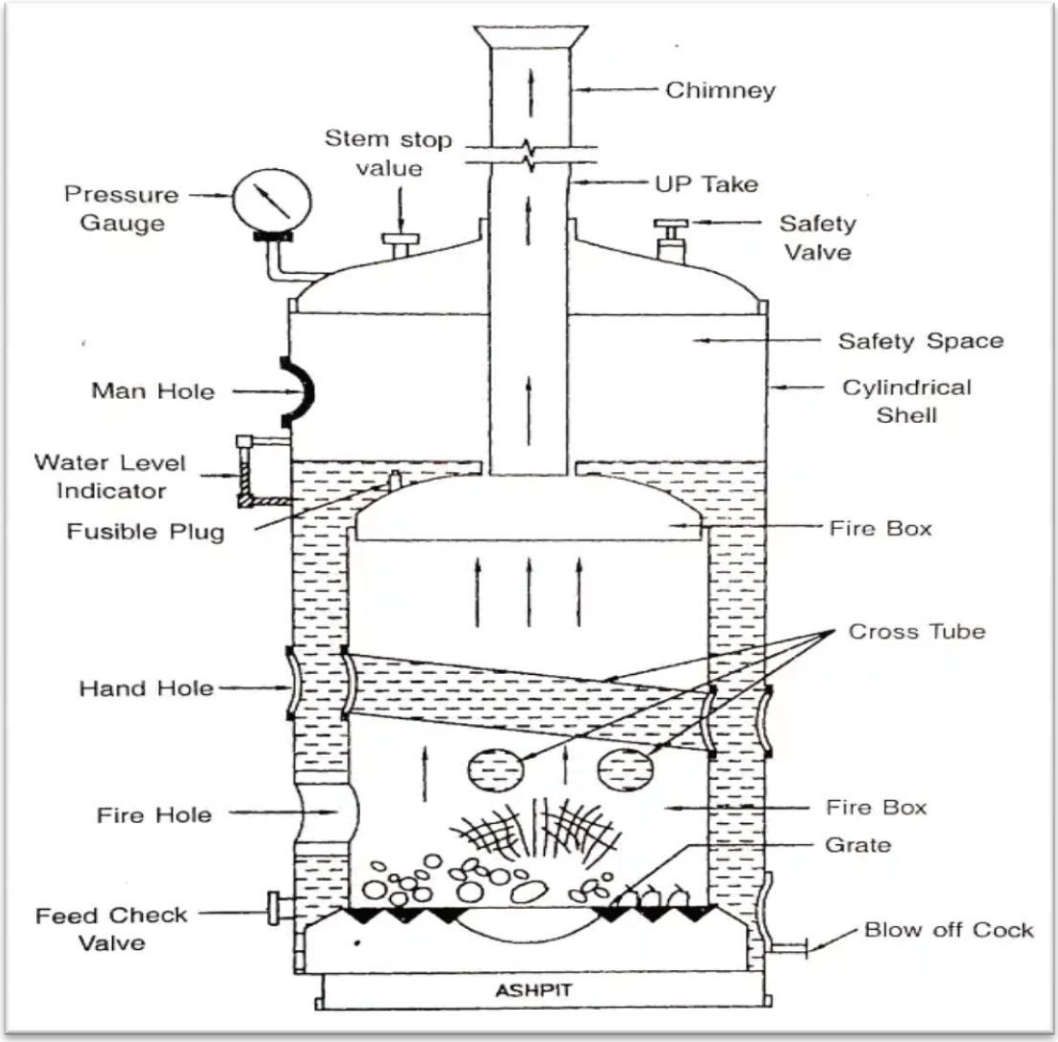
- **Degumming: -** Mainly done to remove the colloidal impurities from the oil and the process include
  a) Hydration degumming
  b) Acid Degumming
- **De-acidification:-** This process is adopted to remove the free fatty acid from the oil. The main deacidification method include includes: -
  a) Distillation
  b) Alkali Refining
- **Bleaching:** This process is done mainly to remove the unwanted pigments from oil to ensure the stability of oil and physical appearance. The common bleaching method adopted in industry is *Absorption* bleaching method.
- **Deodorisation:** This process is crucial and is done using vacuum steam deodorisation method rendering good effects. Following benefits are achieved by this process:
  a) Elimination of unpleasant odour from the oil
  b) Improving the smoke point of the oil
  c) Increasing the shelf life/stability of oil
  d) Improving the colour and overall quality of oil

2.5 Machinery Used in Peanut Oil Manufacturing Process

1. **Vibratory Pre-cleaner machine: -**The machine is used to discard foreign impurities like husk, stone, plastic from the peanuts. The machine works on the principle of gyratory vibrations and separates the peanuts on the basis of their particle size.

2. **Decorticator Machine: -** This machine serves the purpose of bi furcating the groundnut pods by using shear force of action into kernels and outer shell.

2. **Cross Tube Boiler: -**The feed water is supplied to the cross drum through inlet, this water then lowers down by the downcomer pipe and enters into the inclined water tube placed in hot chamber. The steam is generated and is fed into the steam chamber**.**

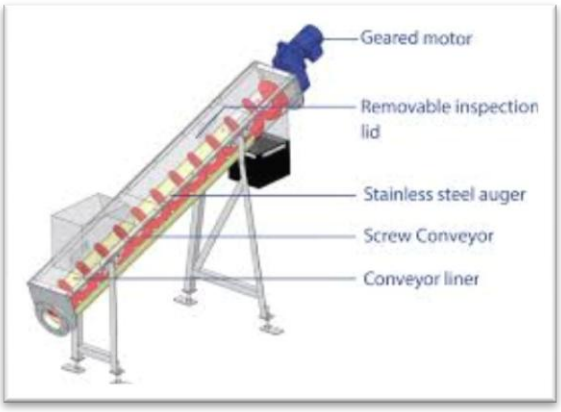


3. **Oil Expeller:** -It is used in crushing the peanut kernels to extract oil. The expelling unit comprises of a screw expellant shaft. Rotary screw movement is made by the shaft to crush the kernels. Subsequent heating of groundnut seeds is achieved by the generated heat that heats the surrounding of the seeds passage.

4. **Oil Filter Press:-** To separate the residual cake from oil, an industrial filter is put to application. A bunch of filter elements are stacked in such a way that it can be easily opened and the filtered solids can be removed. It facilitates the cleaning process and replacement of filter elements.

5. **Bottle filling Machine: -** The machine fills the bottles with oil at controlled pressure and in required quantity.

6. **Screw Conveyor: -** It is used for conveying the raw material to different machines in processing section. By-products or oil cakes are also conveyed to collection units.



7. **Collection tanks/ Silos: -** It is used for storage of various products right from the raw material to the intermediary products and the by-products or finished goods during the whole process.

CHAPTER – 3

NUTRITIONAL PROFILES

3.1 Nutritive Value of Groundnut/Peanuts

Table 4– Chemical composition of Raw Peanuts/100g

Sr. No.	Parameters	Content
1	Moisture	6.5 g
2	Energy	567Kcal
3	Protein	25.8 g
4	Fat	45.24 g
5	Carbohydrate	16.13 g
6	Crude fibre	8.5 g
7	Sugar	3.97 g
8	Calcium	93.0 mg
9	Phosphorus	376.0mg
10	Iron	4.58 mg
11	Sodium	18mg
12	Potassium	705mg
13	Zinc	3.27 mg
14	Copper	11.44 mg
15	Manganese	1.934 mg
16	Selenium	7.2 mcg

3.2 Fatty Acid Profile of Peanut Oil.

Peanut oil contains 79% of unsaturated fat and 16% saturated fats of which the composition of each fatty acid is listed below

Table 5: Fatty Acid Profile of Peanut Oil

Category	Formula	Components	*W* (%)
Saturated Fatty Acid	C14:0	Myristic Acid	0.63
	C16:0	Palmitic Acid	19.46
	C17:0	Heptadecanoic Acid	0.07
	C18:0	Stearic Acid	2.10
	C20:0	Arachidic Acid	0.18
	C22:0	Behenic Acid	0.13
	C24:0	Tetracosanoic Acid	0.09
Mono Unsaturated Fatty Acid	C16:1	Palmitoleic Acid	0.58
	C17:1	Heptadecenoic Acid	0.08
	C18:1	Octadecenoic Acid	16.41
	C20:1	Eicosaenoic Acid	0.29

Poly-Unsaturated Fatty Acids	C18:2	Linoleic Acid	59.91
	C18:3	Linolenic Acid	0.07

3.3 Physico-Chemical Properties of Peanut

Table 6: Physico Chemical Properties of Peanut Oil

Properties	Characteristics
Physical State at Room temperature	Liquid
Colour	Yellow
Melting Point (℃)	3.00
Relative Density (25℃)	0.913
Saponification Value (mg KOH/kg of Oil)	187.80
Iodine Value	118.20
Peroxide Value (meq O_2/kg Oil	2.09

3.4 Nutritive Value of Cold Pressed Groundnut/Peanut Oil

Nutritive value of groundnut oil per 100gm manufactured by the process of cold pressing technique.

Table 7: Nutritive Value (percentage value are based on 2000kcal diet)

Parameters	Amount	% Daily Value
Calories	899 kcal	45%
Total fat	100gm	154%
Saturated Fat	22gm	109%
Mono Unsaturated Fat	44gm	
Poly Unsaturated Fat	34 gm	
Trans Fat	0 gm	
Total Carbohydrate	0 gm	0%
Sodium	9 mg	
Dietary Fibre	0 gm	0%
Sugar	0 gm	0%
Protien	0 gm	0%
Iron		5%
Vitamin E		34%

3.5 Difference Between Hot Pressed and Cold Pressed Oil

As discussed above in manufacturing process we came across two types of processing techniques for peanut oil production ie: Cold Pressed Oil and Hot-Pressed oil. On basis of certain parameters, we will compare both technology of Oil production.

Table 8: Difference between Hot Pressed and Cold Pressed Oil

Parameters	Hot Pressed Oil	Cold Pressed Oil
Production Method	Seeds are heated up before pressing. And colour of raw oil is relatively dark due to high temperature treatment and is edible only after refining	Oil is extracted at room temperature of around 27℃ and the acid value of Oil is also low so no need of refining the oil afterwards. Oil is obtained after precipitation and filtration.
Yield and Cooking Changes	Yield of Hot-Pressed Oil is higher (35%-38%) than that of cold pressed oil, but there are chances of foam formation while cooking.	Cold pressed oil yield less oil (34%-36%) content of total oil from seed. And do not from foam or silt during cooking process
Nutritional Value	Some of natural nutrients are lost during processing due to high temperature. On the other side it smells better than cold pressed oil.	Cold pressed oil ensures that its natural physiological and chemical properties are preserved and have a original taste.
Advantages	Oil Yield is Improved. Easy to Preserve as less residue in oil. As it is roasted special fragrances is developed.	Nutrients are preserved. Natural Flavour and odour are retained.

CHAPTER – 4

PACKAGING AND LABELLING

4.1 Packaging Requirements

Packaging materials shall provide protection for all food products to prevent contamination, damage and shall accommodate required labelling as laid down under the Food Safety Standard Act 2006 & the Regulations there under.

For primary packaging (i.e. packaging in which the food or ingredient or additive comes in direct contact with the packaging material), only Food grade packaging materials are to be used. For packaging materials like aluminium, plastic and tin, the standards to be followed are

as mentioned under the FSS Regulations and rules framed there under.

Packaging materials or gases where used, shall be non-toxic and shall not pose a threat to the safety and suitability of food under the specified conditions of storage and use. The selection of packaging materials should take care of functional as well as market requirements.

For retail packaging variety of packaging materials are available based on design, strength & price.

Table 9: Type of Packing Material and Standards

S. No	Type of Packing Material and Standards	Tare Weight/ 1 Kg Pack	Quantity Packed
01	High Density Polyethylene (HDPE) **(IS-10840:1994)**	40 g	200 g -15 Kg
02	Pet Bottle **(IS-12887:1989)**	22-28 g	200g- 2Kg
03	Tin Can **(IS-10339:1988 & IS-10325:1989)**	63 g	1 kg-15 kg
04	Flexible Plastic Pouches **(IS-12724:1989)**	9-13 g	200g-1 Kg
05	Poly Vinyl Chloride (PVC) Bottles **(IS-12883:1989)**	22-28 g	200g- 2Kg

4.2 General Requirements for Labelling

Every pre-packaged food shall carry a label containing information as required here under Food Safety and Standards (Packaging and labelling) Regulations.

The particulars of declaration required under these Regulations to be specified on the label shall be in English or Hindi in Devnagri script: Provided that nothing herein contained shall prevent the use of any other language in addition to the language required under this regulation. Label in pre-packaged foods shall be applied in such a manner that they will not become separated from the container. Contents on the label shall be clear, prominent, indelible and readily legible by the consumer under normal conditions of purchase and use;

1. The Name of Food: The name of the food shall include trade name or description of food contained in the package.

2. List of Ingredients: Except for single ingredient foods, a list of ingredients shall be declared on the label. The name of Ingredients used in the product shall be listed in descending order of their composition by weight or volume, as the case may be, at the time of its manufacture.

3. Nutritional information: Nutritional Information or nutritional facts per 100 gm or 100ml or per serving of the product shall be given on the label containing the following:

(i) energy value in kcal;
(ii) the amounts of protein, carbohydrate (specify quantity of sugar) and fat in gram (g)
(iii) the amount of any other nutrient for which a nutrition or health claim is made:

4. Declaration regarding Veg or Non-veg :

Every package of "Vegetarian" & "Non-Vegetarian" food shall bear a declaration to this effect made by a symbol and colour code.

5. Declaration regarding Food Additives:

For food additives falling in the respective classes and appearing in lists of food additives permitted for use in foods generally, the following class titles shall be used together with the specific names or recognized international numerical identifications:
Acidity Regulator, Acids, Anticaking Agent, Antifoaming Agent, Antioxidant, Bulking Agent, Colour, Colour Retention Agent, Emulsifier, Emulsifying Salt, Firming Agent, Flour Treatment Agent, Flavour Enhancer, Foaming Agent, Gelling Agent, Glazing Agent, Humectant, Preservative, Propellant, Raising Agent, Stabilizer, Sweetener, Thickener:

6**. Name and complete address of the manufacturer:**

The name and complete address of the manufacturer and the manufacturing unit if these are located at different places and in case the manufacturer is not the packer or bottler, the name and complete address of the packing or bottling unit as the case may be shall be declared on every package of food;

7. Net quantity:

Net quantity by weight or volume or number, as the case may be, shall be declared on every package of food.

8. Lot/Code/Batch Identification:

A batch number or code number or lot number which is a mark of identification by which the food can be traced in the manufacture and identified in the distribution, shall be given on the label. Provided that in case of packages containing bread and milk including sterilised milk, particulars under this clause shall not be required to be given on the label.

9. Date of manufacture or packing:

The date, month and year in which the commodity is manufactured, packed or pre-packed, shall be given on the label: Provided that the month and the year of manufacture, packing or pre-packing shall be given if the "Best Before Date" of the products is more than three months: Provided further that in case any package contains commodity which has a short shelf life of less than three months, the date, month and year in which the commodity is manufactured or prepared or prepacked shall be mentioned on the label.

10. Best Before and Use By Date:

The month and year in capital letters up to which the product is best for consumption.

11. Instructions for use:

Instructions for use, including reconstitution, where applicable, shall be included on the label, if necessary, to ensure correct utilization of the food.

CHAPTER – 5

REGULATORY REQUIREMENTS

5.1 Introduction to Regulatory Requirements

Every Manufacturer, Processer, Repackaging unit, Relabelling Units & Other related Food Business Operators has to obtained Food Safety License or Registration form Food Safety Standard Authority of India (FSSAI) to carry out the business. Carrying a food business without obtaining a Food licence/Registration, it is illegal and unauthorized and violates the provision of the Food Safety & Standards Act, 2006. Based on the needs FSSAI has categorized the related food business operators into following categories.

Table 6: Categories of FSSAI Certificates

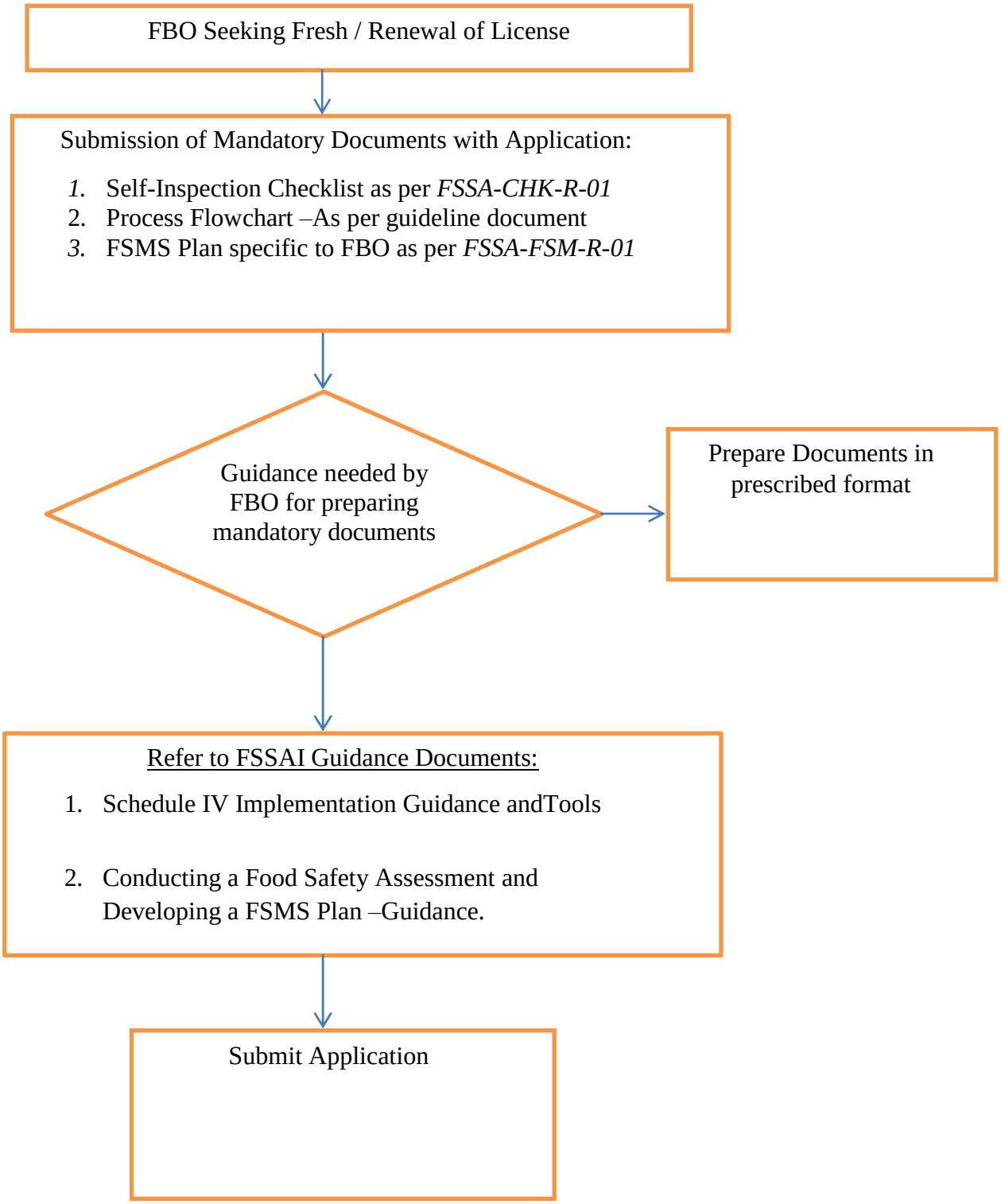
S. No	Category	Capacity	Annual Fee
1	Registration**(Petty Food Business Operators)**	Turnover not exceeding Rs. 12 lakhs and whose production capacity of food does not exceed 100 kg/ltr per day.	Rs 100/-
2	State License	All grains, Cereals & Pulses milling units without any ceiling on quantity and/or other Food Businesses more than 100Kg/Litre upto 2 MT/day. Turnover up to 30 crores/annum.	Rs 2000 to 5000/-
3	Central License	More than 2 MT/day. No grains, cereals and pulses milling units& other requirements also apply.	Rs 7500/-

Manufacturing or processing means each step-in conversion of raw material derived from agricultural produce into products for intermediate or final consumption. Repacking means packing of food product into different sizes with labelling after doing minimal processing as required like sorting, grading, sieving etc. from wholesale packages. The food product is not manipulated & the composition or formulation is not affected or changed.

The Food Business Operators may apply online for obtaining FSSAI License or Registration Certificate at FOSCOS Website https://foscos.fssai.gov.in with relevant documents based on business capacity. Detailed information has been provided in the website for more details.

The Food Business operators may apply for the other regulatory license like trade license, pollution license, factory license & Fire license etc based on the jurisdiction needs.

5.2 Flow Chart of Obtaining License by FSSAI



CHAPTER-6

GMP/GHP/HACCP REQUIREMENTS

To provide assurance of food safety, Food businesses must implement an effective Food Safety Management System (FSMS) based on Hazard Analysis and Critical Control Point (HACCP) and suitable pre- requisite programmes by actively controlling hazards throughout the food chain starting from food production till final consumption.

As per the condition under FSS (Licensing & Registration of Food Businesses) Regulations 2011, every food business operator (FBO) applying for licensing/registration must have a documented FSMS plan and comply with schedule 4 of this regulation. Schedule 4 introduces the concept of FSMS based on implementation of Good Manufacturing Practices (GMP) and Good Hygiene Practices (GHP) by food businesses.

6.1 Good Manufacturing Practices/Good Hygiene Practices

General Requirement of Hygiene and Sanitary Practices to be Followed by Edible Fats & Oils Food Business Operators Applying for License

The establishment in which food is being handled, processed, manufactured, packed, stored, and distributed by the food business operator and the persons handling them should conform to the sanitary and hygienic requirement, food safety measures and other standards as specified below. It shall also be deemed to be the responsibility of the food business operator to ensure adherence to necessary requirements. In addition to the requirements specified below, the food business operator shall identify steps in the activities of food business, which are critical to ensure food safety, and ensure that safety procedures are identified, implemented, maintained and reviewed periodically.

1. Location and Layout of Food Establishment

a) The factory is ideally located away from industries which are emitting harmful gases, obnoxious odor, chemical etc.
b) The nature of ceiling roof is of permanent nature (Iron sheet/Asbestos sheet/ R.C.C).
c) The floor of building is cemented, tiled or laid in stone/ pukka floor.
d) The production walls are smooth, made with impervious material upto a height of not less than five feet and the junction between the walls and floors are curved.

e) The premises of the factory is adequately lighted and ventilated, properly white washed or painted.
f) Provision for disposal of refuse and effluents is available
g) The food production/ food service area provided with adequate drainage facility.
h) Doors are provided with automatic door closer.
i) Doors, Windows and other openings are fitted with net or screen top revent insects etc.
j) Antiseptic/ disinfectant foot bath is provided at the entrance.
k) Sufficient number of latrine and urinals for worker are provided and located outside the processing hall
l) All the machinery is installed in such a manner which may allow continuous flow of production and do not occupy more than50% of the total production area.

2. Equipment & Containers

a) Appropriate facilities for the cleaning and disinfecting of equipment and instruments and preferably cleaning in place (CIP) system are adopted; wherever necessary.
b) The equipments are made of stainless steel /galvanised iron/ noncorrosive materials.
c) Temperature and pressure/vacuum of processing vessels are maintained as per requirements

3. Processing Plant

a) Only approved processes are being employed in the factory.
b) De-odourization is done at a temperature more than 180 deg. C
c) For hydrogenation/ interesterification units, post neutralization is being done.

4. Packaging and Storage

a) Appropriate arrangement for storage of Packing materials is available, and the place is clean, free from pest/rodent infestation
b) Containers used for packing are made of food-grade or prime quality materials
c) Tin containers are rust free.
d) Cold Storage facility, wherever necessary/ is provided
e) Packing sections are covered and protected from insects and flies
f) Packing sections are tiled, clean and tidy.

g) Batch numbering devises are running to satisfaction.
h) Label declarations on the packs are as per norms.

5. Personal Hygiene

a) Aprons, head cover, disposable gloves & footwear are provided.
b) Adequate facilities for toilets, hand wash and footbath, with provision for detergent/bactericidal soap, hand drying facility and nail cutter are provided.

6. Water Supply

a) Adequate supply of potable water
b) Appropriate facilities for safe & clean storage of water
c) Ice and steam wherever in use during processing is made from potable water.
d) Identifying marks are applied to the pipelines for easy identification of potable and non-potable water.

7. Pest Control System

a) Adequate control measures are in place to prevent insect and rodents from the processing area.

8. Food Testing Facility

a) A well-equipped laboratory for testing of vegetable oils/fats is available
b) All the necessary chemicals and supporting facilities are available.
c) The laboratory employs qualified chemists.
d) Quality parameters of raw oils and finished products are being tested as per standards.
e) Records on quality control are maintained satisfactorily

9. Audit, Documentation and Records

A periodic audit of the whole system according to the SOP shall be done to find out any fault / gap in the GMP / GHP system. Appropriate records of food processing / preparation, production / cooking, storage, distribution, service, food quality, laboratory

test results, cleaning and sanitation, pest control and product recall shall be kept and retained for a period of one year or the shelf-life of the product, whichever is more.

10. Sanitation and Maintenance of Establishment Premises

A cleaning and sanitation programme shall be drawn up and observed and the record thereof shall be properly maintained, which shall indicate specific areas to be cleaned, cleaning frequency and cleaning procedure to be followed, including equipment and materials to be used for cleaning. Equipments used in manufacturing will be cleaned and sterilized at set frequencies. Food establishment, including equipment and building shall be kept in good repair to prevent pest access and to eliminate potential breeding sites. Holes, drains and other places where pests are likely to gain access shall be kept in sealed condition or fitted with mesh / grills / claddings or any other suitable means as required and animals, birds and pets shall not be allowed to enter into the food establishment areas/ premises.

11. Product Information and Consumer Awareness

All packaged food products shall carry a label and requisite information as per provisions of Food Safety and Standards Act, 2006 and Regulations made there under so as to ensure that adequate and accessible information is available to each person in the food chain to enable them to handle, store, process, prepare and display the food products safely and correctly and that the lot or batch can be easily traced and recalled if necessary.

12. Training

The Food Business shall ensure that all food handlers are aware of their role and responsibility in protecting food from contamination or deterioration. Food handlers shall have the necessary knowledge and skills which are relevant to food hygiene and food safety aspects along with personal hygiene requirements, food processing / manufacturing, packing, storing and serving so as to ensure the food safety and food quality. Periodic assessments& training programmes shall be routinely reviewed and updated wherever necessary

6.2 Hazard Analysis and Critical Control (HACCP)

Implementing Hazard Analysis and Critical Control Point (HACCP) is crucial for any food business as it helps to identify weaknesses in the preparation and production of food. It also identifies critical limits in compliance with food law and helps to take preventive and corrective measures.

HACCP is therefore, that management tool that provides a structured, systematic approach to the identification of hazards and methods of control that is not achievable by traditional testing and inspection approaches (quality control). During implementation of HACCP, it is imperative to set controls at each point of the production line at which safety problems (physical, chemical and microbiological) are likely to occur.

A HACCP plan is required to be in place before initiating the HACCP system. A HACCP plan consists of 5 initial steps and 7 major HACCP principles. The requirements for Sanitation Standard Operating Procedures (SSOPs) along with Good Manufacturing Practices (GMPs) & Good Hygiene Practices should be considered as Pre-Requisite for HACCP.

Documentation shall include (as a minimum) the following:

- HACCP team composition;
- Product description;
- Intended use;
- Flow chart;
- Hazard analysis;
- CCP determination;
- Critical limit determination;
- Validation process; and
- HACCP plan

The HACCP plan shall include the following information for each identified CCP:

- Food safety hazard(s) to be controlled at the CCP;
- Control measure(s);
- Critical limit(s);
- Monitoring procedure(s);
- Corrections and corrective action(s) to be taken if critical limits are exceeded;
- Responsibilities and authorities for monitoring, corrective action and verification;
- Record(s) of monitoring.

References and Suggested Readings

- Liu MengQi, Shengli Nu, Lu Chumei, et al, A study on the catalytic performance of carbide slag in trans esterification and the calculation of kinetic parameters.
- Q. Wang, H Lui, H. Hu, et al, Peanut Oil Processing Technology
- FSSAI Act 2006
- Food Safety and Standards Regulation 2011
- Groundnut Outlook 2019, Agriculture Marketing Intelligence Centre, PJTSAU
- FSMS Manual of FSS Act 2006.
- Groundnut-Post Harvest Operation, by P.C. Nautiyal (Ph.D.) National Research Centre for Groundnut.
- Detailed Project Report on Groundnut Decorticator Unit by Rajsthan Agriculture Competitiveness Project.
- Groundnut Oil Detailed Project Report.