

A PROJECT REPORT ON
ANALYSIS OF COTTON SEED OIL

Submitted in partial fulfillment of the requirements for the award of
Degree of BACHELOR OF SCIENCE

Submitted by

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CERTIFICATE

This is to certify that this is a Bonafide record of the project work entitled "ANALYSIS OF COTTON SEED OIL " submitted by **Y. SUMANYATHA** (Y193016042) in the academic year 2021-22 towards the partial fulfillment of the requirements for the award of Degree of **Bachelor of Science** in the department of **Chemistry**.



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HISTORY OF COTTON SEED

Cottonseed is a valuable by-product obtained from the cotton crop and is a source of edible oil. India is the 4th largest country in the production of the cotton seed. China occupies the 1st position followed by the U.S. in 2nd position and Russia in 3rd position.

Cotton is mainly produced in four species of *Gossypium*.

1. *Gossypium arboretum*
2. *Gossypium herbaceum*
3. *Gossypium hirsutum*
4. *Gossypium barbadense*.

India grows mainly the first three varieties. The first two are the desi varieties of cotton. The cotton ginning percent is high in desi cotton varieties.

The third and fourth varieties have longer and finer fibers. And the fourth one produces superior quality lint.

Cottonseed consists mainly of 2 parts.

1. Hull (fiber, lint)
2. kernel (oil or meal part)

The whole seed contains 18-20% of oil and kernel about 28-30% of oil.

The free fatty acid content, quality and quantity of oil depends on the harvesting conditions of the cotton crop.

Cotton seed contains minerals, vitamins B & E, lecithin and sterols. In India a small quantity of cotton seed oil is used in manufacturing of soaps and a larger quantity is used for edible purpose especially in producing vanaspathy.

Cotton seed meal contains high protein content and is also rich in essential amino acids. It also contains toxic pigments such as Gossypol, Gossypurpurin, Gossyfulvincarotenes. Due to such composition of toxic pigments, cotton seed oil is not recommended to use as an edible oil. But, it is easily digested with a digestibility coefficient of about 98%.

Cotton seed oil possesses better oxidation stability due to the presence of an antioxidant namely, Gossypol.

Several non-conventional products can be produced from this oil. Brominated cotton seed oils are used for the production of cotton clouds, flavored soft drinks. Emulsified cotton seed oil can be used for intravenous administration to patients who require a high calorie diet.

STORAGE OF COTTON SEED

The conditions which the raw seed is stored will effect the maximum quality of oil & meal produced. A cotton seed moisture level above the recommended (8-15%) level is the most damaging storage condition. High moisture content combined with high temperature & oxygen will cause microbiological degradation which, if it does not completely destroy the seed by spontaneous combustion, will so seriously effect the oil quality that it cannot be used for edible purposes.

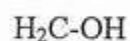
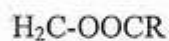
Storage of seed is based on three major factors. They are

- Nature of seed
- Moisture content
- Fermentation

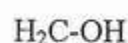
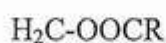
1. Nature of seed:- The cotton seed storage is not possible in vertical bins. The best method for storage of cotton seed is in Jute bags kept in wide well; ventilated rooms.

2. Moisture content:- The moisture content increases in cotton seed on storage is accompanied by increased rate of lipolysis. Cotton seed having less than 10% moisture does not deteriorate appreciably under ordinary conditions of storage where as cotton seed having 14% or more moisture is susceptible to deteriorate. Rate of lipolysis increases with the increasing length of storage time and also the rate of accumulation of F.F.A

3. Fermentation:- The fermentation process takes place in presence of lipase enzyme which is present in cotton seed. This is a cause for irreparable damage. The seed having high moisture level, high temperature, immaturity of seed, Then this enzyme gets developed.



(F.F.A)



(Tri Glyceride)

(Glycerol)

COTTON SEED

PRE

PROCESSING

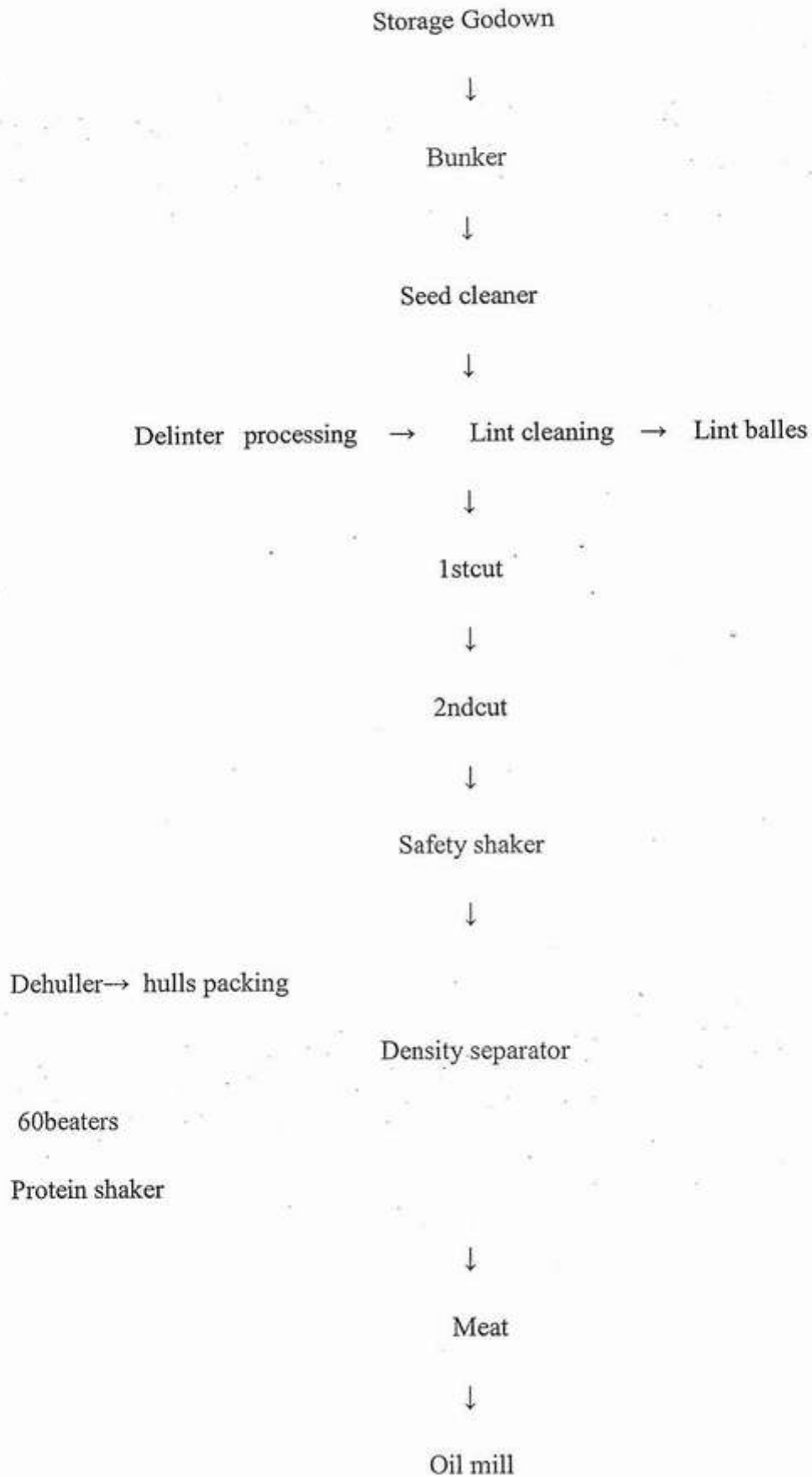
Cotton Seed Preprocessing

- It is very important step in processing of oil.
- Cotton seeds are collected from gining mills. So seeds contain different foreign materials like stones leaves and some iron particles.
- These cause damage to the machinery and also reduce the quality of the lint.
- So this step is necessary.
- The oil quality and quantity is depends upon this preprocessing step only.

Steps in Preprocessing

- Seed cleaning
 - Delinting
 - Dehulling
 - Density separators
 - Lint cleaning
-
- Cotton seed is raw material. It gives two biproducts and one semi products.
 - Lint and hulls are biproducts.
 - Meat is a semi product.

Flow chart of CSPP:



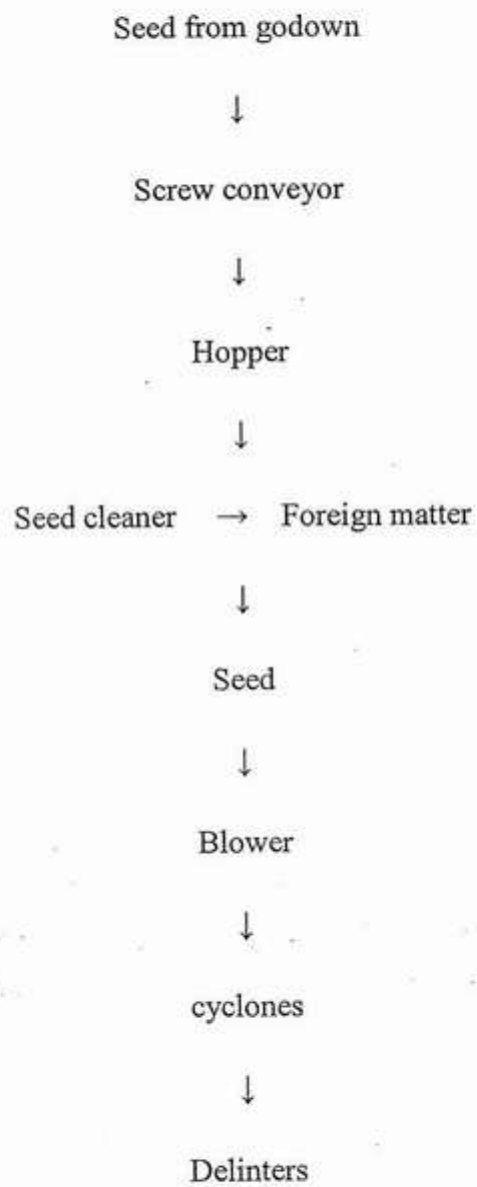
- *Seed cleaning :*

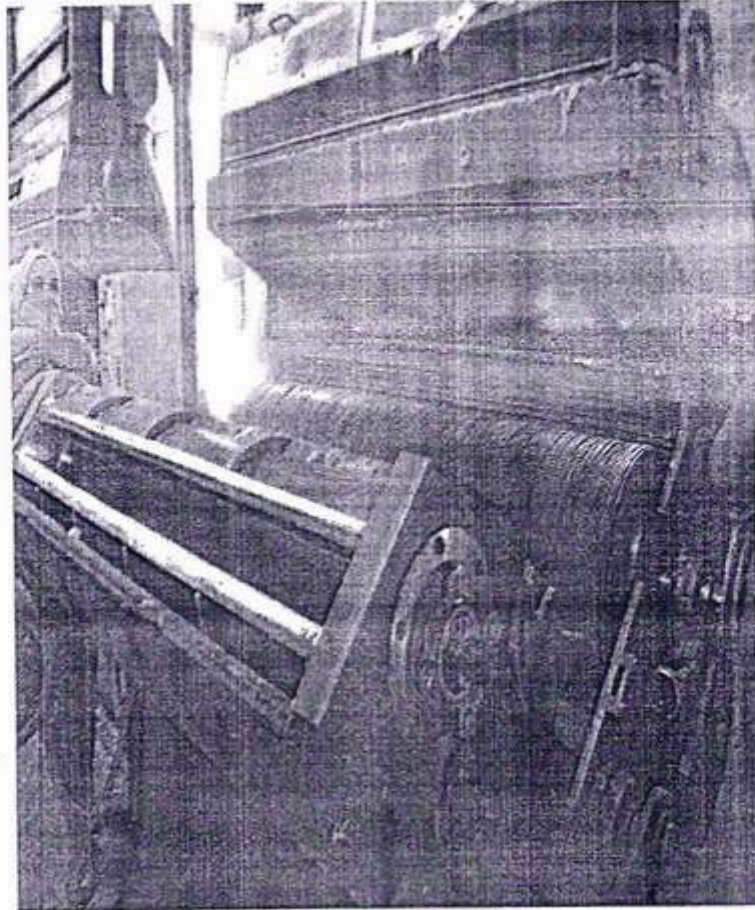
The cottonseed feeded into screw conveyer. Through this conveyor seed send to bunker. The bunker capacity is 80tonnes.

The seed conveyed through seed cleaning machines through conveyors. In seed cleaners foreign matter(iron particles,leavesetc) are removed. Then seed send to cyclone through blowers. from cyclones seed send to delinters.

- Any foreign materials present along with the seed are removed in this step.
- If this process is not done properly, it effects the machines also the plant capacity and maintainance cost.
- Totalseed cleaners-5.

Flow chart for seed cleaning:





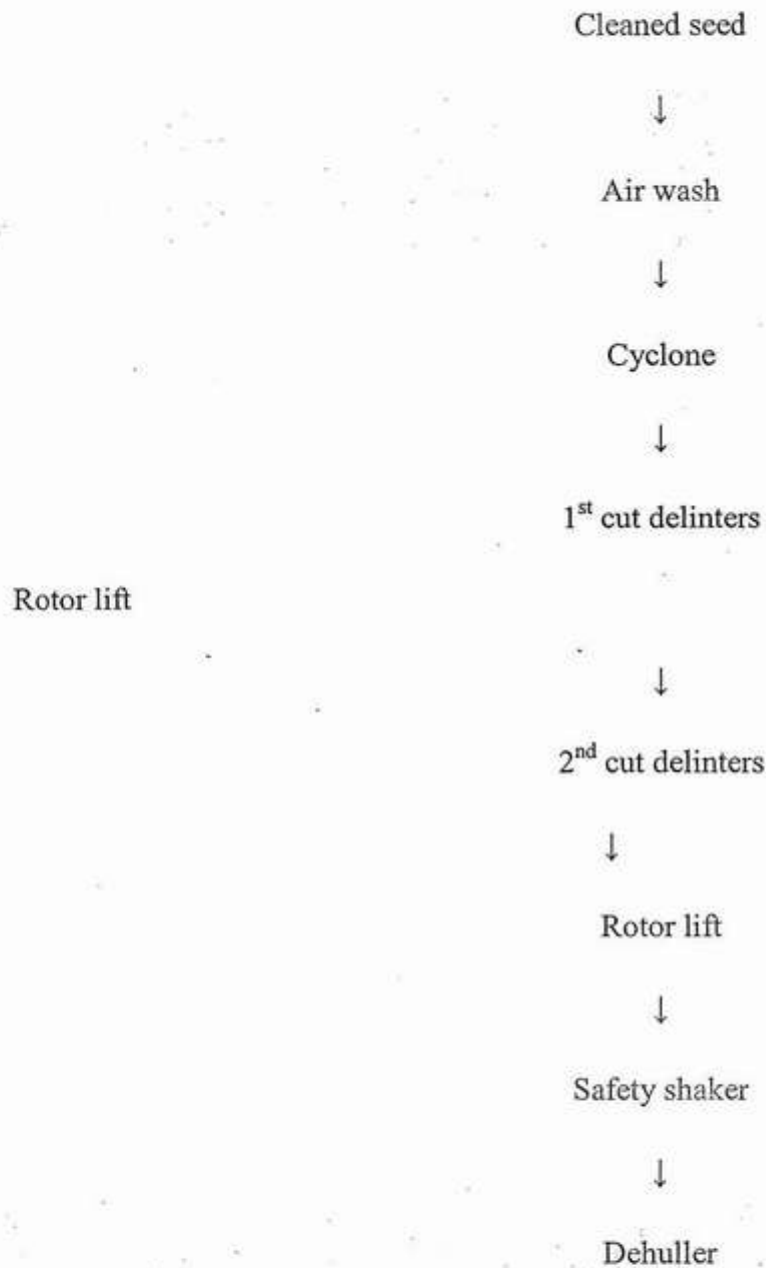
DELINTER

2.Delinting:

Delinting is done by delinters.

- Seed from the cleaners fall into the delinters.
- In this step the lint present on the cotton seed are removed.
- The lint is not removed in the 1st cut itself,so the lint is removed in two cuts.

• Flow chart for dehulling:

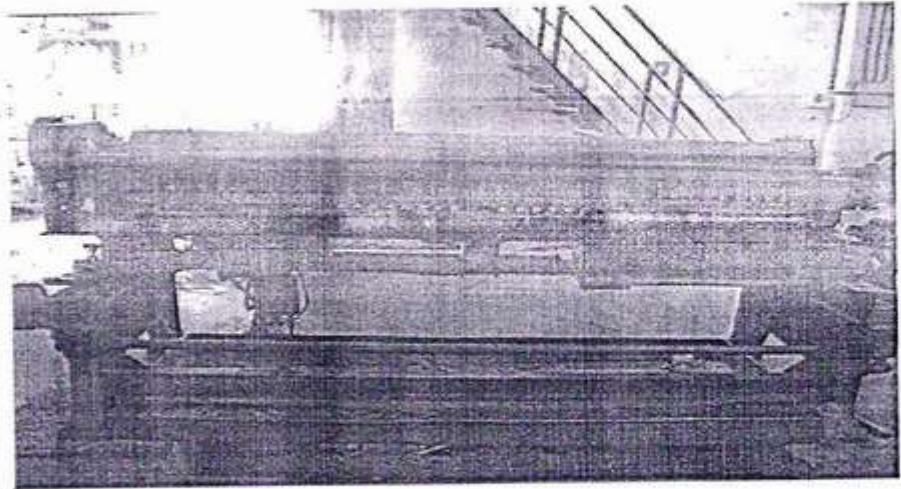


- In delinting process lint will removed from the seed.
- Delinting can be done in two steps.They are 1st cut&2nd cut. In delinting process total 6% lint will removed.
- The seed enters into 1st cut delinter.Here 2.5% hull is separeted.

- The cleaned seeds enters into feeder it consists of magnet so if any iron material is present in the seeds, they will be separated.
- Below the magnet there is a float arrangement which controls the feed level.
- The cylinder which has blades.
- Each cylinder has 200 blades&201 grades.
- Each blade contains 426 teeth.
- And in between the float and cylinder, the link removed from the seed by a bresh drum.
- The lint from the blades is continuously removed by the brush drum arrangement.
- This removed lint is sent to lint section with the help of air blowers and cyclones.
- The seed enters into 2nd cut delinters. here 3.5% hull is separated.
- The same process will repeated.
- Seed enters into safety shaker. Here any iron particles is there will be removed.
- 1st cut delinters-6
- 2nd cut delinters-9
- Gummers:

Gummer is used for sharpening of the saws teeth.

Every day teeth will be sharpend once. The operation in both the delinters are same.



Safety shaker:

This machine is used for removing of iron particles present in the seed. It contains a magnet. With this magnet the iron particles can removed.

Total safety shakers-2.

Dehulling:

- Removal of hulls from the seed is the aim of dehuller.
- Usually cotton seed contains 40% hulls.
- Hulls contain 0.5% of oil and 3 - 4% of protein.
- So dehulling is an important processing step to obtain a good quality of oil and cake.

Cotton seed hullers are of 2 types.

- Bar type
- Disc type

The company BRAHMAS is using bar type.

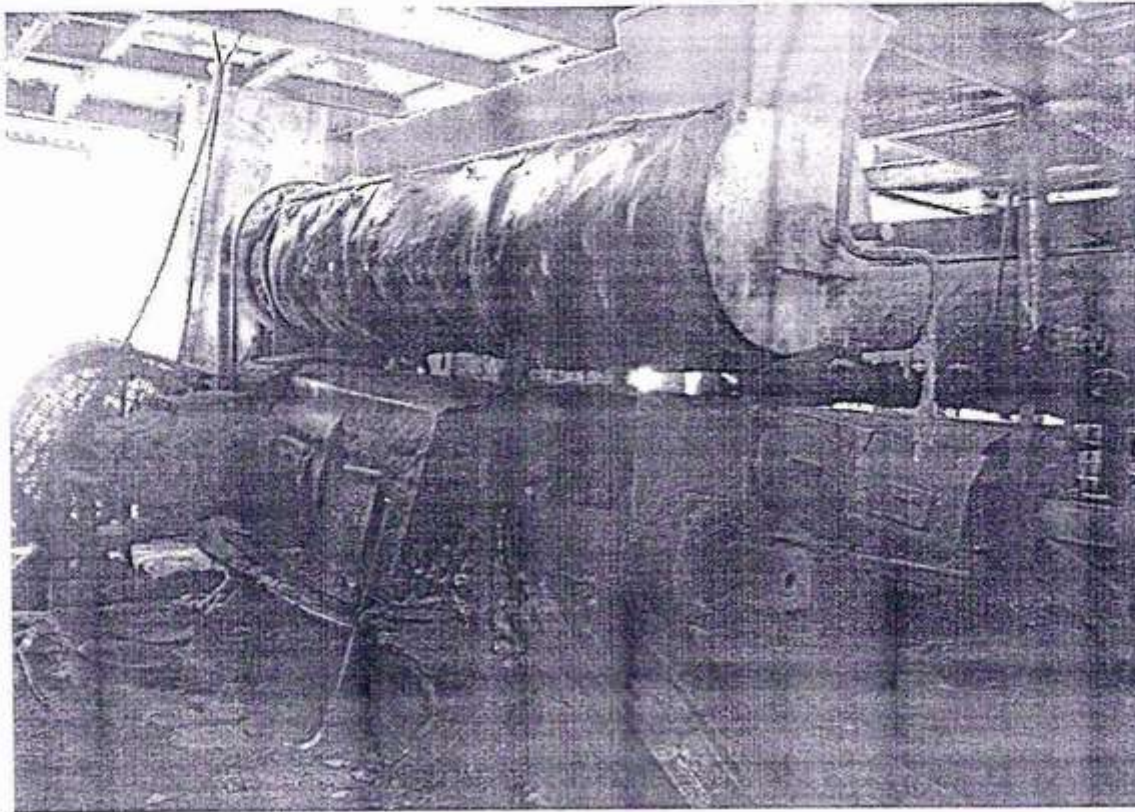
- The seed enters into dehullers from safety shakers through conveyors. In this process 25% hulls are removed.
- The seed comes to feeder. The dehuller consists of two rollers. one is fixed and another one is moved. The gap between two rollers is 1mm.
- The roller contain 24 knives. The seed falling between two rollers then maximum amount of hull is removed.
- Then seed comes to beaters. In beaters the seed can beated maximum. Then hulls will cutted.
- The seed comes to shaker here hulls&meataresepareted. Then hulls&uncuttseed are send to DSP.
- The hulls, uncutted seeds and meat are separated on a DSP.
- The meat is sent into oil mill and hulls and uncutted seed are passed to hullers for recrushing.
- Total dehullers-3

Density separator:

The hulls and uncutted seeds are conveyed to the feeder of the seed separator by means of rotor lift and screw conveyor.

- The hulls&uncuttedseed comes to DSP.Herehulls&uncuttedseedcansepareted in DSP.
- Meat and uncutted seeds are separator by mesh.
- Then hulls are sent to packing .
- Then meat is sent into oil mill.
- The uncutted seeds are again sent into dehuller.
- Total DSPs-3

OIL MILL



OIL EXPELLER

OIL MILL

The word expelling means extraction of oil from meal. The machine which is used in expelling of oil is called expeller.

The 1st successful expeller was made by V.D Anderson in 1900 .in germany

The company BRAHMAS used "screw pressing" Expellers .It is also called as mechanical pressing Expeller. The company BRAHMAS used 12 Expellers for Extraction of oil out of 12 expellers 4 expellers sizes are 13*11 and remaining are 12 *9 .The capacity of 13*11 expellers are 2Tlh and capacity 12*9 expellers.

Principle of expeller construction:

The Mechanical expeller has 5 essential elements

- Main worm shaft and worms
- Choke mechanism
- Drainage barrel
- Motor transmission and trust bearings .
- Cooling mechanism

Prior to extraction process by screw press the meat coming from CSPP is cooked by open steam (In summer) and jacket steam (in winter) ,to maintain the moisture percentage in feed or mixture.

The purpose of cooking the cotton seed meat before pressure extraction are :

- To coagulate the protein
- To reduce the viscosity of the oil
- For easy separation of oil from ruptured cells
- To control moisture level
- To inactivate the enzymes
- To detoxify the free gossypol by heating

The process of cooking is done kettle tank .It is nothing but horizontal cooker .This type of cooker consists of a feeder at the top to convey the prepared seed material from CSPP in to the top horizontal cooker.

A cooker must be large enough to hold the material for the accepted optimum period of 20 min in vapor tight atmosphere at a temp of 192-200 F

The horizontal kettle tank consist of three compartments in vertical manner has a horizontal shaft. Which mix the meat so that uniform cooking takes place in the kettle tank

Horizontal cooker consists of a shaft rotating due to which the meat passes from one end to another end and falls into expeller for pressing operation

Process :

In expeller, a shaft is surrounded by worms on which a chamber box is situated. In between 2worms 1 collar is present to provide distance between worms.

The meat is enters into feeder. Then meat comes to ketletank. In this tank the jacketed steam is giving for cooking the meat. The meat will cooked for 20min. Then meat drawn on the hopper. From the hopper meat enters into shaft. It contains 12worms and 8collars. It contains two reverse worms. Then meat comes to shaft and worms. Here the meat is expelled and the oil comesoutthrough cage bar. Then oil send to oiltank through conveyors.

The expeller cone maintains the thickness of the cake. Then cake send to cake coolers through conveyors. Cake cooler contain blowers to cool the cake. After cooling cake send to solent extraction plant.

The cruedoilo is came from expeller goes to food separator. In this food separator the mud is removed in the oil. After separation oil send to boosters. In this tanks filteraid is added due to the mud&sediments are present in the oil are removed by adding filteraid. The filteraid absorbs the mud. then oil send to PLF(pressure leaf filters). In the PLF mud&sediments are removed from the oil. After filtration oil send to storage tank.

Crude oil purification:-

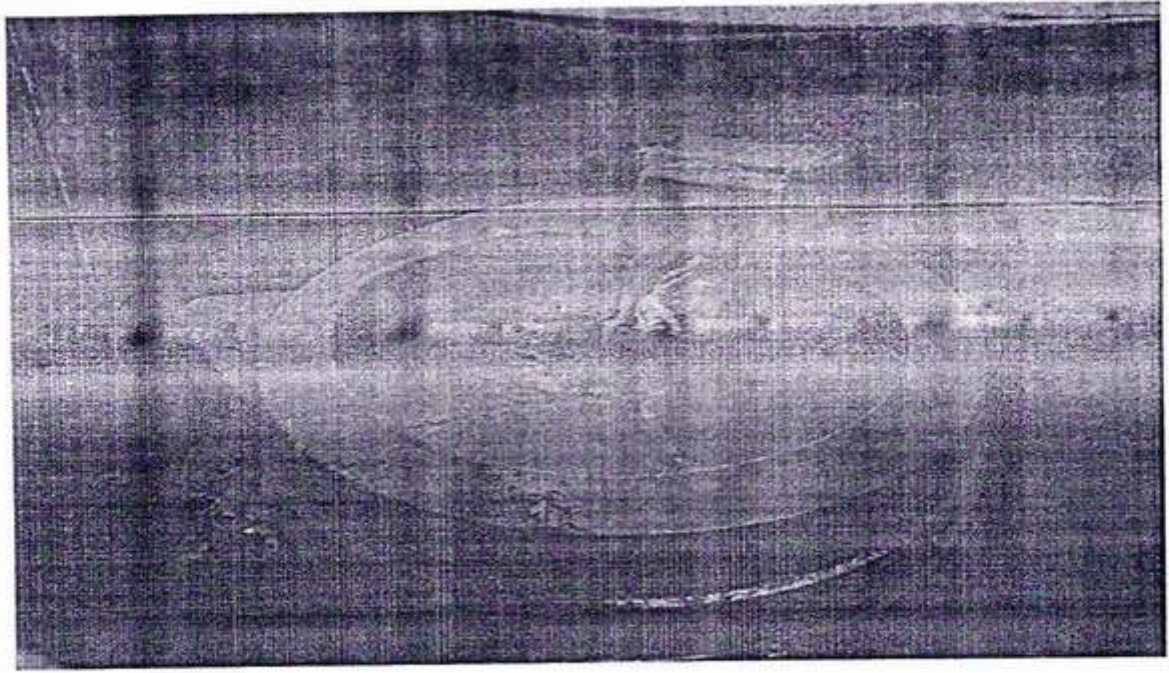
Expelled oil contains impurities such as meat particles, fines etc. which may detoriate the oil during storage. So, the oil is subjected to purification by the following two conjugates steps.

- Separation of oil from soil particles by means of a mesh and settling in a tank.
- The oil from 1st step is filtered in a plate and frame filter press for 2 times.

Cloth filter press :-

It si one of the easiest type of the filter press . In this press , the cloth and frames are arranged alternatively and its maintainance cost is also low and economical when compared to other processes. The filter cloth is set tightly between the plate and frames by screw adjustment. At the bottom of the frame, there is hole for collecting filtered oil and tap arrangement for oil outlet.

8-10% of oil is recovered in this process. Andhence, the cake contains 9-10% of remaining oil. This cake is cooled (50-60⁰C by passing cool air and then conveyed to the solvent extraction plant as feed to extract the remaining oil present in it.



SOLVENT EXTRACTION PLANT

Solvent Extraction Plant

Solvent :

Able to dissolve or from a solution with something.

The Extraction process mainly depends on the solvent used.

Different types of solvents are used in extraction process. They are

- Hexane
- Benzene
- Carbon disulphide
- Tri Chloro Ethylene
- Ethanol
- Isopropanol
- Acetone
- Super critical gases
- Light Petrileum hydrocarbons

Solvent Extraction :

Extraction of oil from oil bearing material by using solvent (Hexane).

The company COPOL used food grade hexane as a solvent.

Properties of Hexane :

Mainly used food grade Hexane. It is byproductsofpetrole extraction.

- Hexane is a non corrosive.
- It has low boiling temperature 67-69 °C.
- Highly immersable.
- It should selective to extract.
- At reasonable cost.
- It should not react with oil.
- High solubility power.
- It should not be toxic in nature.

The mechanical expression of oil bearing material does not yield 100% oil. The expelled cake contains 8-10% of oil. Which can be recovered efficiently through solvent extraction:

It has certain disadvantages which are as below.

- Machinery required for SEP is much complicated and also expensive.
- Fire hazards are very high when compared to other methods of extraction.
- Superior technical control is necessary.
- The deoiledcake obtained from this process contain less than 1% oil.

- Hence, even if disadvantages are also present, this process is called as an “Efficient Process”..

Principle of Solvent Extraction :-

Complete extraction can be achieved only by the use of a large volume of solvent relative to the oil extracted, and this solvent must eventually be recovered from the oil. Even in the most efficient extraction plants, changes for steam and water for solvent recovery constitute a substantial part of the operating cost.

Preparatory Section :

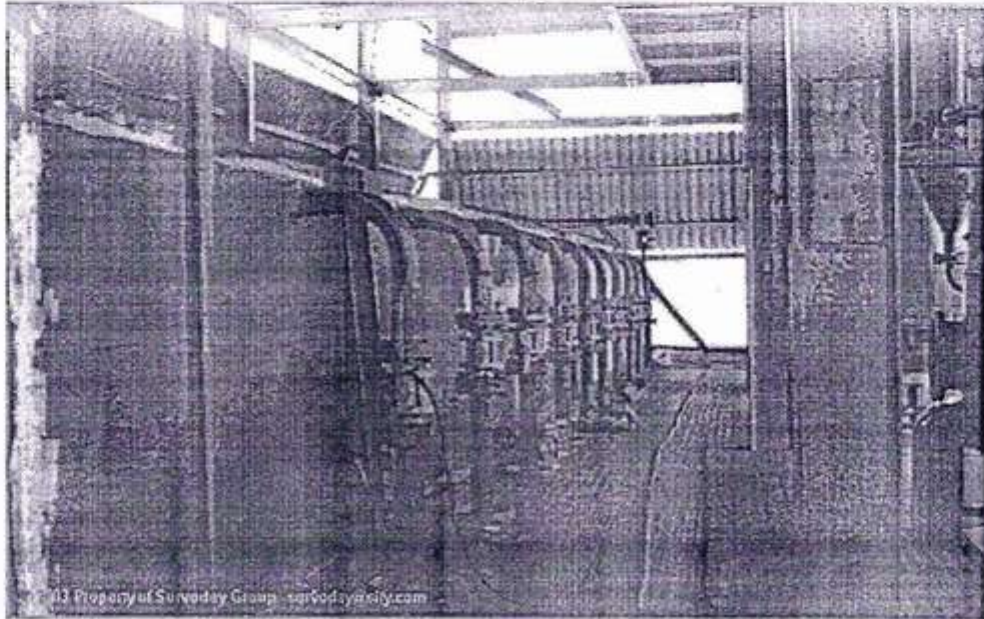
The feed for the solvent plant prepared at oil mill plant itself.

- The expelled cake is cooled by using air coolers to decrease its temperature. As it contains 8-10% of oil, their thickness is also an important fact, which should be about 3-5 mm. If the fines percentage is high in the cake, they are fed back to oil expellers. And the remaining expelled cake are conveyed to SEP by means of a bulk flow conveyor solvent extraction mainly involves in 4 steps.

They are

- Extraction
 - Desolventising and toasting
 - Distillation
 - Recuperation
- Extraction :
 - The extraction process takes place in an equipment is called “Extractor”.
 - It is most important one in the solvent plant.
 - The feed from the preparatory section is fed into the extractor on bed by means of bulk flow conveyor through rotary valve.
 - The rotary valve is having 4 blades and is placed between the chute and the hoffer regulates the feed and prevent air entering into the system.
 - By adjusting the damper plate, we adjust the height of the material.

- The mesh is arranged in extractor for moving of the bed.
- The height of the cake moving on the bed ranges from 90-120 cm depending upon the oil content in the expelled cake.
- The extractor bed length is 20 meters and width is 1.8 meters and the extraction time is maximum 4hrs.
- Extraction process is done only in 11 hoppers. But it contains 15 hoppers.



- The hexane is sprayed on the moving extractor bed.
- The concentration of miscella is increasing from 1st -15th hopper.
- The miscella is sprayed on the extractor bed with a temperature of 50-55°C.
- The miscella overflow from hopper to hopper until reaches the miscella concentration upto 20%.
- The miscella is collected in 12th hopper and sent into fine separator, where any fine particles in miscella are settle down to its bottom.
- And miscella enters into the miscella tank.
- In miscella tank 1/4th is filled with water, for the collection of dust, if any is drained off.
- The DOC from extractor send to DT.

Technical Data :

Material of the mesh used	---	stainless steel
Extractor capacity	---	350 per day
Bed height	---	2 meters

• Distillation :

The miscella extracted from extraction section contains 15% of oil and 85% of hexane.

- The oil and hexane have largely different boiling points and so, the oil can usually be separated by distillation process.
- The distillation process mainly occurs in
 - Economizer
 - 1st heater
 - 2nd heater
 - Stripper
- The miscella from miscella tank is pumped through flow meter into Economizer.
- The flow rate depends on the oil content in the cake.
- The miscella enters into the tubes at the bottom of the economizer.
- The heat required for the evaporation is provided by heat exchanger through hot hexane vapours coming D.T in the shell side economizer.
- This evaporation is carried out under vacuum.
- The temperature of the miscella coming from the economizer is about 70-75 °C.
- Hexane vapours enters the vertical condenser.

- In this condenser, the vapours are cooled by cold water supplied through water circulation system.
- The hot water leaving from the system and cooled and at stored at pond.
- The vapours which gets condensed in the condenser and small amount in economizer comes by gravity into the solvent water separator.
- After the water and solvent is separated by different in their densities.
- Solvent is collected in the hexane receiver of solvent water separator is pumped to the extractor and water enters into safety boiler.
- Any traces of hexane are evaporated and again sent to condenser for recondensing.
- Miscella is enters into economizer & it is situated at the top.
- After this miscella enters into 1st flasher. It maintains vacuum is 400mmhg. Here hexane vapours are evaporated.
- After miscella enters into 1st heater. It maintains temperature is 85° C.
- In heater heat is provided for evaporation by steam in the shell and surrounding the tube, with raise the temperature under vacuum.
- Next miscella enters into 2nd flasher. It maintains vacuum is 450mmhg. Here hexane vapours are evaporated.
- After miscella enters into 2nd heater. It maintains temperature is 95° C.
- In heater heat is provided for evaporation by steam in the shell and surrounding the tube, with raise the temperature under vacuum.
- Then miscella comes to 3rd flasher. It maintains vacuum is 500mmhg. Here hexane vapours are evaporated.
- Here remaining almost all hexane vapours are evaporated and enters into condenser and condensed.
- Next it is enters into stripper.
- Here stripper contain high vacuum i.e. 600 mm of Hg.
- In stripper hexane is removed from the crude oil.
- In stripper we will apply open steam at bottom.
- Here contact between steam & miscella increases.
- Here oil and hexane is separated.

- The separated oil is sent into storage tank for cooling.
- After cooling it is sent into bulk oil storage tank.
- The S.E.P mainly depends on the vacuum system.
- For this purpose we are using and steam jet ejectors.

1st heater temperature - 75 °C

Technocal data

2nd heater temperature - 85°C

Stripper oil - 95 °C

Economizer vacuum -350 mm Hg

1st flasher vacuum - 400 mm Hg

2nd flasher vacuum - 450 mm Hg

3rd flasher vaccum - 500 mm Hg

Evaparatorvaccum - 400 mm Hg

Stripper vacuum - 600mm Hg

• Recuperation :

In this process uncondensed vapours are taken into absorption system then vapours are required as solent vapours.

- The absorption system contains water chilling condenser, absorber, evaporator, cooler, heat exchanger.
- 1st uncondensed vapours are taken in water chilling sprayer, if any vapours are condensed they are sent to solvent-water separator.
- These uncondensed vapours are sent to mineral oil absorber.
- In absorber, the mineral oil is sprayed on the top &the vapours are coming out from the bottom.

- The vapours are mixed with the mineral oil and are separated in the evaporator through a heat exchanger.
- Any traces of uncondensed vapours are vented to atmosphere at the top of the absorber through ejector.
- In the evaporator high temperature is maintained by the open & jacket steam.
- Steam coils are placed in the absorber.
- The oil is sprayed at its top and hexane flashes off and carried out to the condenser.
- The mineral oil is cooled and recycled back to the absorber.
- The absorber requires cold oil and requires hot oils.

REFINING

OIL

Glycerol esters of fatty acid is called oil .Different types of oils are available .They are coconut oil ,palm oil ,vegetable oil, cotton seed oil etc. These are edible oils.

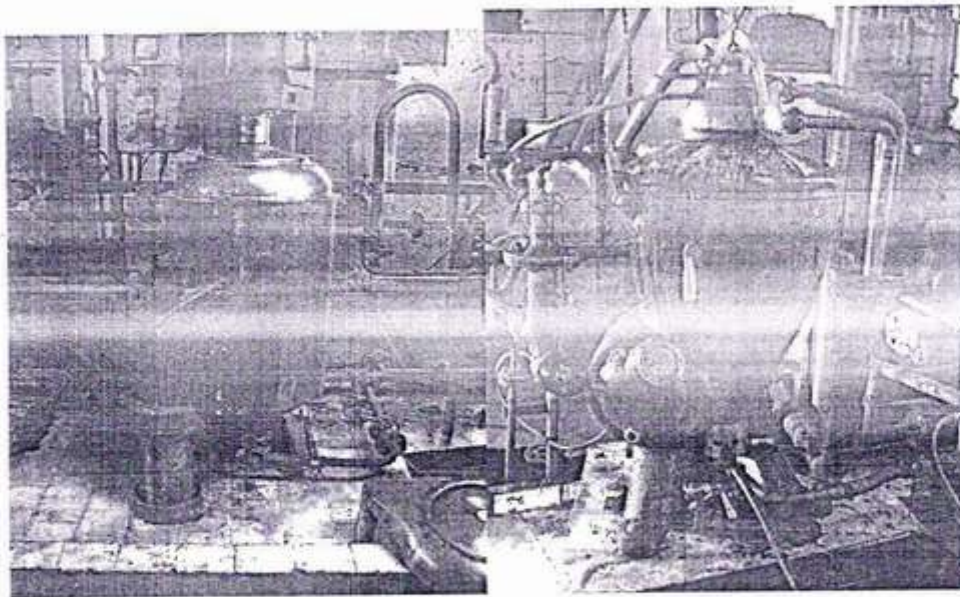
The first extracted oil from raw material is called crude oil which is having impurities.

”

Cotton seed oil refining consist of

- 1.Neutralization
- 2.Bleaching or decolourization
- 3.Deodorization.

NEUTRALIZATION



SHARPLES

CENTRIFUGE

ALPHA LEVELCENTRIFUGE

NEUTRALIZATION

Neutralization may be carried out in different methods, they are

1. Alkali refining
2. Miscella refining
3. Physical refining
4. physio chemical refining

The term neutralization means ,which involves the use of alkalis to react with pre fact acids in the oil . The removal of FFA from the crude oil represent the most delicate and difficult stage in refining .It is well known that fats and oils consists not only of glycerides but also contain more or less , high percent of FFA .

The alkali refining effects an almost complete removal of free fatty acids , which are converted into oil insolvable soaps. Other acidic substances like phosphoric acid combine with the alkali and there is some removal of impurities in the form of soap stoke

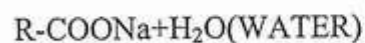
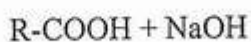
The formation of free fatty acids in the oil is usually due to the fermentative processed special enzymes, under given conditions of temperature split the glycerides in to glycerol and fatty acids

Since, an indispensable condition for enzymes to develop their action is the presents of water . An increase in the acidity of the oil must be absolutely avoid .Free fatty acids may be removed either by chemical or physical means .

Fats and oils neutralization usually consists in saponifying the free fatty acids present with aqueous solutions of sodium hydroxide and in separation via physical means.

In chemical method, the alkali most commonly employed for refining oil is caustic soda. Which is much more effective in its decolourizing action than weaker alkalies. .

More over all substances that become insoluble on hydration are removed



Since, it is reversible its direction is determined by the condition of temperature and pressure. In fact the reaction is conducted, atmospheric pressure and at means temperature. Its direction is totally from left to right

In case of cotton seeds neutralization and de gumming will be processed in single step. because of the cotton seeds consists very low amounts of gummy or mucilaginous substances.

There is a disadvantage of caustic soda:-

Caustic soda has the disadvantage, however of saponifying a small proportion of neutral oil in addition to reaction with free fatty acids.

The determination of the total loss and of the losses in the different refining stages allows a complete control of the refining process.

The losses can be calculated in the following way.

FFA = free fatty acids in the crude oil in percent

FFAR = free fatty acids in the refined oil in percent

FFASS = free fatty acids in split soap stock in percent

X = loss in percent

Provided that no saponification of neutral fat take place, then amount of fatty acid in the crude oil is equal to the amounts of fatty acid in the soap stock and the refined oil. thus for 100 parts of oil, the following equations

$$FFA + 100 = FFAR(100-X) + FFASS*(X)$$

$$\text{OR} \quad X = 100(FFA - FFAR) / (FFAS - FFAR)$$

NEUTRALIZATION

Hence our Company Brahmas carries the neutralization process as both the Batch and as well as continuous process.

The expelled oil requires the both Batch process and S.E.P oil requires the continuous process.

Batch Process for expelled oil:

- First the expelled crude oil is taken into a large & open cylindrical vessel with having conical bottom.
- This vessel is equipped with an agitator for the proper mixing of the mixture .
- Then the expelled oil is allowed to this vessel
- Before the entering of the crude oil into the vessel, the oil temperature is 35°C
- The vessel is also equipped with the steam coils around the vessel.
- After the entering the crude oil, the steam is passes through this circulated coil for increasesing the temperature of the crude oil and giving the proper agitation with the help of agitator and motor.
- After the the crude oil gets the temperature of 55°C , the calculated amount of caustic is added to this vessel. With the agitation of 15 to 20 min.
- Then this oil temperature is raises to 60°C , with the help of steam .
- After the oil getting the temperature of 60°C , the hot water is sprayed in to this oil for the separation of the oil & soap.
- After the adding of hot water to this oil the agitation will be stop and the mixture is settled with the duration time of 3 Hrs.
- After the settling of the mixture the oil layer is in upper portion of the vessel and the soap layer is in bottom portion of the vessel.
- Then the soap layer is removed and oil is passes to the alpha centrifuge with the help of pump. Liquid soap sent to soap plant.

- Then oil is passes to the Alfa laval centrifuge, where the hot water is used to wash the oil. And washed water and oil is separated depending upon their densities.
- Then washed water goes to acid oil plant. The washed oil send to NOT.

continuous Process for S.E oil:

- the S.E oil is taken into a large & open cylindrical vessel with having conical bottom.
- This vessel is equipped with an agitator for the proper mixing of the mixture .
- Then the S.E oil is allowed to this vessel .
- The vessel is also equipped with the steam coils around the vessel.
- After the entering the S.E oil, the steam is passes through this circulated coil for increasesing the temperature of the crude oil and giving the proper agitation with the help of agitator and motor.
- After the crude oil gets the temperature of 55°C , the oil passed to heater , here the cruedoiltempareture raises to 75°C .
- Then this oil is enter to the knife mixer where the caustic is added to the mixer at the bottom from the dosing pump.
- In the knife mixer the caustic and oil is mixed and transfer to the penvalt centrifuge.
- In this centrifuge the oil enters at the bottom and water is added at the top of the centrifuge, where the soap present in the oil is separated.
- Then the oil is passes to the small reactor tank and soap send to soap plant.
- Then this mixed oil is passes to the Alfa laval centrifuge, where the hot water is used to wash the oil. And washed water and oil is separated depending upon their densities.
- The washed water send to acid oil plant .
- Then washedoil send to dryer. It maintains tempareture is 105°C and vaccume is 750mmhg. If their is any water particles are present in the oil are removed by drying.
- After drying this neutral oil is pumped to the N.O.T.

TECHNICAL DATA

Batch for expelled oil:

Capacity of C.O.T - 13 ¹/₂ tones

Temperature – 50 to 60 °C

Strength of caustic – 18 or 20 Be

Agitation – 15 to 20 min

Settling time -3 Hrs

Continous for S.E oil:

Strength of caustic – 22 Be

Temperature – 70 to 80 °C

Type of mixer – knife & disc

Type of centrifuge – penvalt& Alfa laval

F.F,A – 0.08

Color – 13 to 30 units in ¹/₄ inch cell

Soap in P.P.M – below 100

M.I.V – below 1%

Bleaching

Bleaching

Introduction:-

Purpose of the bleaching process is the complete (or) partial removal of colour bodies (pigments) as well as oxidation products, trace metals, trace soaps and other impurities from the oil. The pigments can be destroyed by heat or chemical attack by oxidizing agents adsorbed on to natural or activated clay or carbon.

Heat (or) chemical attack or not used for decolouring edible oils because of risk of structural changes in the unsaturated fatty acids groups and (or) the production of coloured degradation products.

Remains the adsorption on to natural or activated clay or carbon. Activated clay is commonly used for bleaching cotton seed oils and vegetable oils, because of the higher costs of bleaching with activated carbon. The clay also removes residues of soap, gums and traces of metals. Natural clays are employed to remove soaps or to decolourise easily bleached oils such as coconut, palm kernel and some hardened oils.

The colouring bodies and pigments like chlorophylls, carotenoids, gossypol and related compounds are adsorbed on the adsorbent and are removed from the oils through filtration.

Here the adsorbent used may be activated earth with mixing of carbon or synthetic silicates and activated carbon. Activated carbon combined with bleaching earth in the ratio of 10 – 20 parts of earth to one of the carbon can be more effective.

Bleaching can be done by batch or continuous process. In the batch process the oil is heated in a agitated tank under vacuum and the clay is added at temperature of 95 – 110 °C. The slurry is agitated for 15 to 20 minutes. Usually cool to 75 – 80 °C and filtered.

Cotton seeds contains red and yellow coloured pigments in large quantities than other pigments. Bleaching earth adsorbs – Yellow pigments

Carbon adsorbs - red colour pigments

Colour pigments having bulkiest groups in their structure. So, they perform oxidation in the presence of moisture. It leads to decreasing of oil storage capacity.

So, Bleaching is necessary for improving the storage capacity of the oil. In this process not only to reduce colour pigments and also removal of FFA from the oil.

The bleached oil outlet temperature is 105 °C.

Disposal of spent Earth:-

The earth removed from the P.L.F is called spent earth.

The disposal of spent earth is yet another problem.

Land filling is most obvious choice.

The other suggested applications are in the manufacture of cement as a source of selenious oxide or mixing with sandy soils in the sweet maize corn cultivation.

OBSERVATION:

Cotton seed oil contains

Saturated Fatty acids- 25.9

Unsaturated fatty acids- 19.4

α , ω Linoleic acids- 51

CONCLUSION :

Here by we conclude that the cottonseed oil processing and refining includes many steps, which is done under supervision of experts with the help of highly sophisticated machines.