PEMAC PROJECTS®

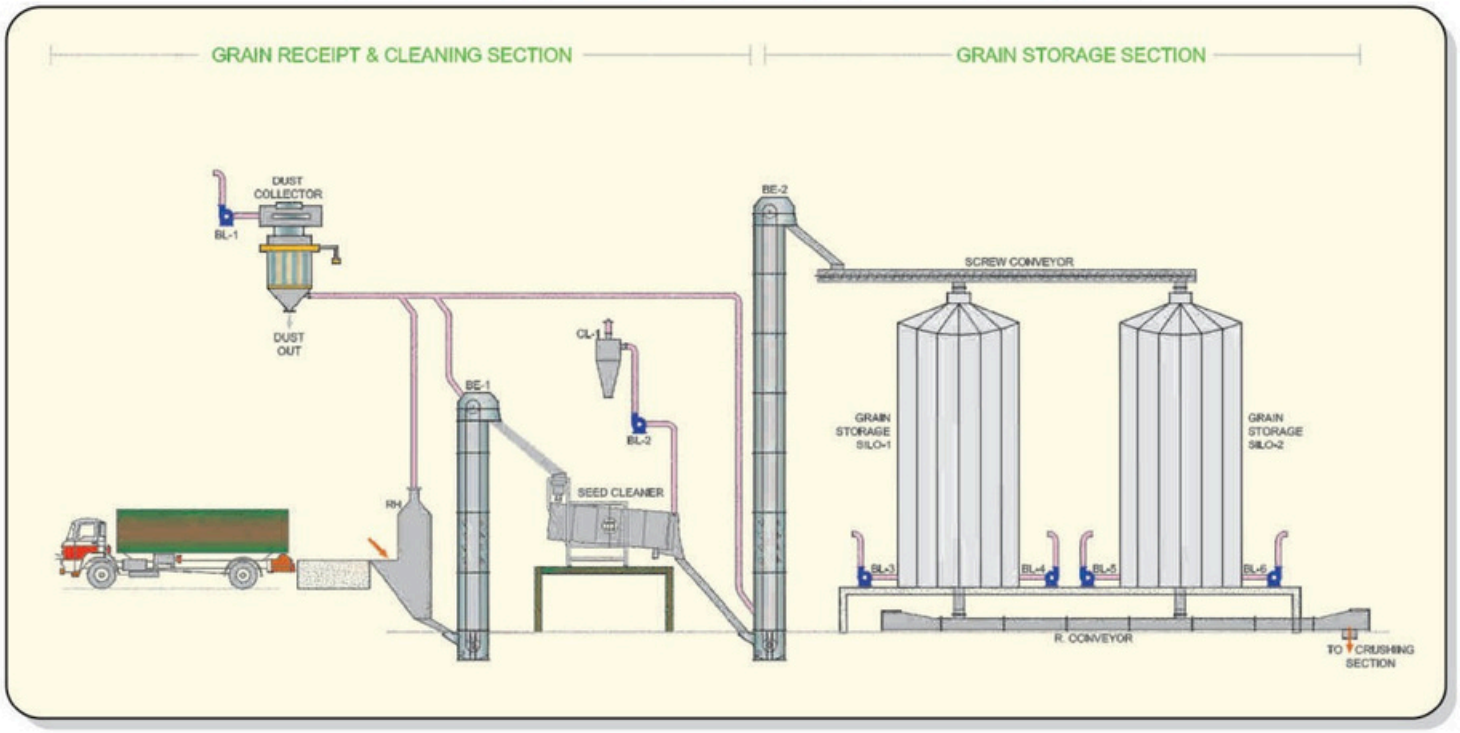
Engineering for The Vision Next,,,,,

- TURNKEY PROJECTS
- PROJECTS ENGINEERING
- ENGINEERING & CONSULTANCY
- EDIBLE OILS
- OLEO CHEMICALS
- HEAVY ENGINEERINGS

www.pemacprojects.com

an ISO 9001:2015 Certified Company

GRAIN RECEIPT, CLEANING & STORAGE SECTION



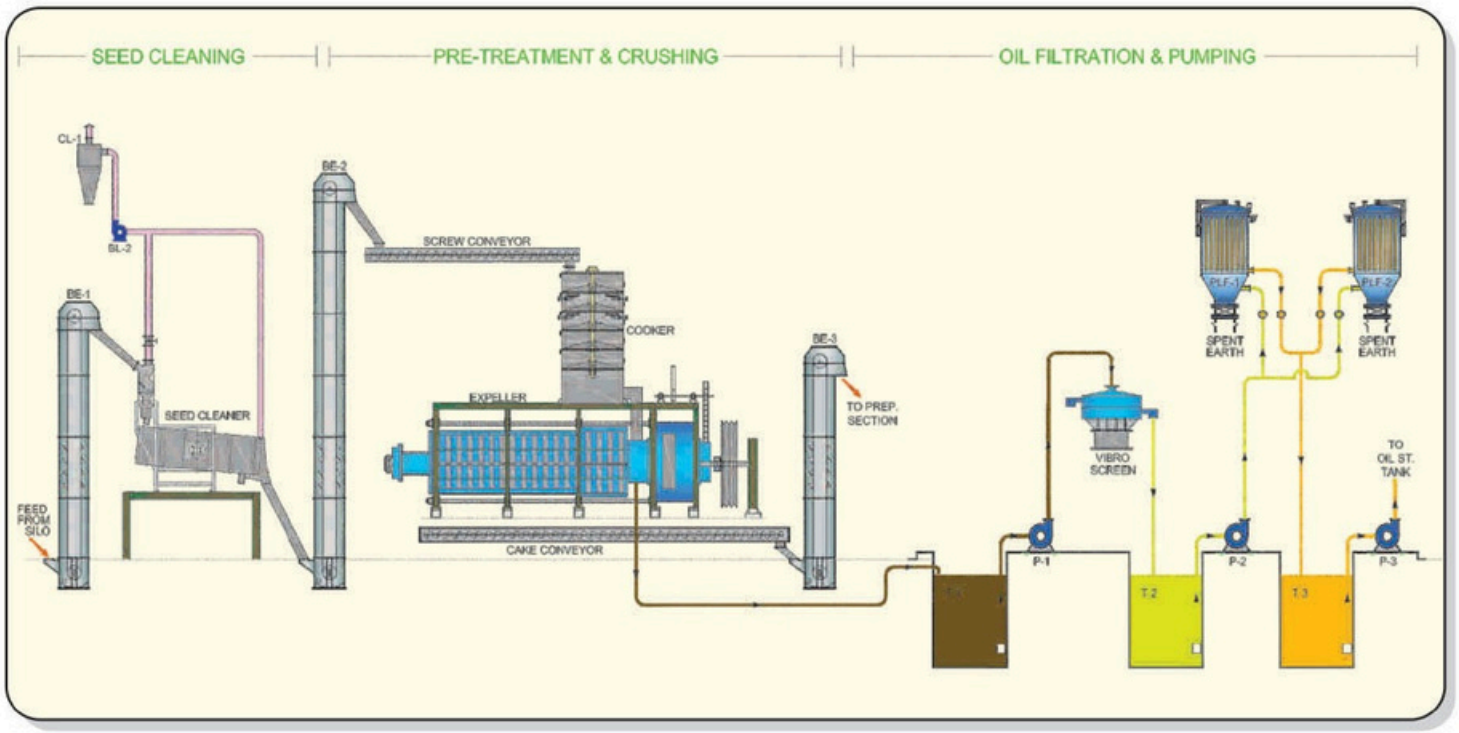
Welcome to **PEMAC's** turnkey project house with more than a decade experience. **PEMAC** is fully involved in Designing, manufacture and supply of various engineering projects.

PEMAC's grain receipt, cleaning & storage section consist of Precleaner , Silos & material handling equipments.

Special Features

Our Silos consist of self supporting roof. Body of shallow corrugated panels, galvanized outside stiffeners made from high tensile steel. Vertical ladder with safety cage according to safety standards. Roof ladder with safety handrail. Man hole on the roof for inspection & side access door on wall ring. Roof vents. Along with Sweep Auger, Level switches, Discharge Gate, Motorized Gate & Aeration Fans.

OIL MILL SECTION



PEMAC's Specially Designed Expellers installed for Processing, Mustard, Sunflower, groundnut, Cotton, and other various oil seeds.

Special Features:

- Two/Three chamber design pre-pressing & full pressing in single stage crushing for better oil Recovery & Profitable operation.
- Main shaft, worm and cage bars are made of special alloy steel with proper hardening for long life working span.
- Heavy duty double reduction gearbox assembly to withstand radial axial loads for crushing.
- Unique hollow drive sleeve arrangement to allow easier removal of main worm shaft without affecting the gear box assembly
- Provision for water cooling arrangement for better quality of oil & cake.

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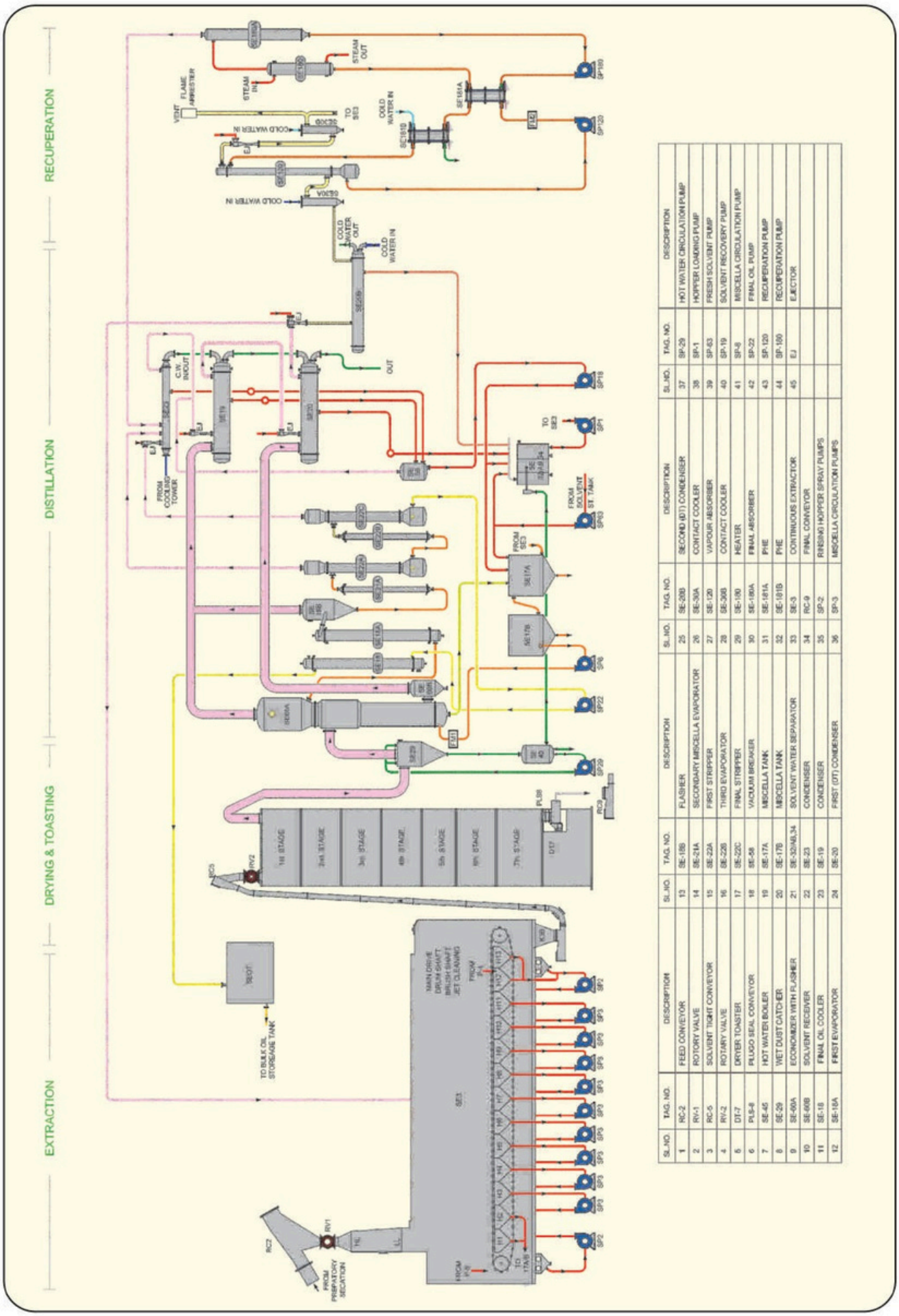
SOLVENT EXTRACTION PLANT



SL.NO.	TAG. NO.	DESCRIPTION
1	RC-2	FEED CONVEYOR
2	RV-1	ROTORY VALVE
3	RC-5	SOLVENT TIGHT CONVEYOR
4	RV-2	ROTARY VALVE
5	DT-7	DRYER TOASTER
6	PLS-8	PLUGG SEAL CONVEYOR
7	SE-45	HOT WATER BOILER
8	SE-29	WET DUST CATCHER
9	SE-60A	ECONOMIZER WITH FLASHER
10	SE-60B	SOLVENT RECEIVER
11	SE-18	FINAL OIL COOLER
12	SE-18A	FIRST EVAPORATOR
13	SE-18B	FLASHER
14	SE-21A	SECONDARY MISCELLA EVAPORATOR
15	SE-22A	FIRST STRIPPER
16	SE-22B	THIRD EVAPORATOR
17	SE-22C	FINAL STRIPPER
18	SE-58	VACUUM BREAKER
19	SE-17A	MISCELLA TANK
20	SE-17B	MISCELLA TANK
21	SE-32/48,34	SOLVENT WATER SEPARATOR
22	SE-23	CONDENSER
23	SE-19	CONDENSER
24	SE-20	FIRST (DT) CONDENSER
25	SE-20B	SECOND (DT) CONDENSER
26	SE-30A	CONTACT COOLER
27	SE-12B	VAPOUR ABSORBER
28	SE-30B	CONTACT COOLER
29	SE-18D	HEATER
30	SE-18BA	FINAL ABSORBER
31	SE-18A	PHE
32	SE-18B	PHE
33	SE-3	CONTINUOUS EXTRACTOR
34	RC-9	FINAL CONVEYOR
35	SP-2	RINSING HOPPER SPRAY PUMPS
36	SP-3	MISCELLA CIRCULATION PUMPS
37	SP-29	HOT WATER CIRCULATION PUMP
38	SP-1	HOPPER LOADING PUMP
39	SP-83	FRESH SOLVENT PUMP
40	SP-19	SOLVENT RECOVERY PUMP
41	SP-8	MISCELLA CIRCULATION PUMP
42	SP-22	FINAL OIL PUMP
43	SP-120	RECUPERATION PUMP
44	SP-100	RECUPERATION PUMP
45	EJ	EJECTOR

SOLVENT EXTRACTION PLANT

PEMAC's Solvent Extraction Process

Mechanical method is the combination of high pressure, high temperature & high moisture, which causes color fixation, oxidation, hydrolysis. Some seeds like rice bran & soya cannot be handled by the expellers. Continuous solvent extraction plant does not cause any alteration to the property of oil and recovers it with the characteristics as where present in the raw material and can handled all materials.

Capacity-50 TPD To 2000 TPD

PEMAC Continuous Solvent Extraction Plant Consists of

- Seed preparatory section
- Solvent extraction section
- Distillation section
- Meal Desolventizing section
- Recuperation section
- Meal conditioning section

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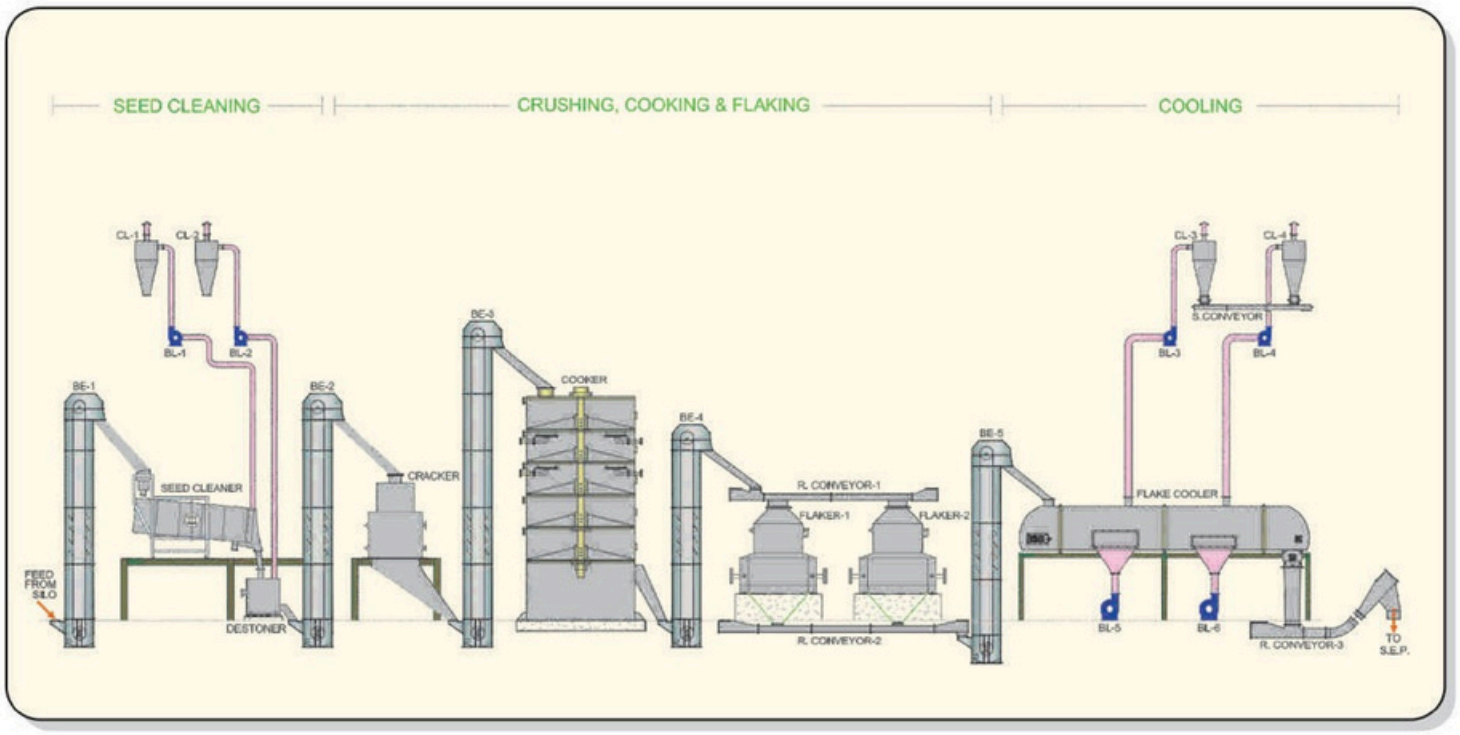
PREPARATORY SECTION



Preparation is the process of properly preparing seeds for extraction of oil either by solvent or mechanical method. While a particular seed may contain from 20% - 50% oil, the oil is tightly bound within the cell & mechanical action must be taken to either forcefully remove the oil or to make the oil accessible to subsequent, Solvent extraction. The unit operations typically involved are scaling, cleaning, cracking, conditioning (or cooking) & flaking / pelleting. Depending on process & oilseed in question, process drying and hulling may be employed, as may expander and collect dryer/coolers.

SOLVENT EXTRACTION PLANT

The main objective of the extraction process is to reduce oil contain in oilseed to the minimum possible level. The chain conveyor from preparatory transfers the prepared material to the rotary airlock feeder, which further drops it to the feeding hopper. Rotary airlock feeder ensures the effective vapor sealing & also regulates the feed. Hopper is provided with the special flameproof level switches for the indication of high and low level. So as to enable to generate audio signal in the situation of high level, for preparatory operator to take corrective actions.

PEMAC's Extractor is a M.S. or S.S. construction rectangular vessel, installed horizontally. Pretreated material from preparatory moves on the specially designed articulated band conveyor inside the extractor. Band conveyor speed is adjusted according to the process demand. Band conveyor insures the continuous travelling of the feed material from feed end to the final end with determined speed, pre-calculated bed height and under the continuous solvent spray. Bed height of the feed material on band conveyor is adjusted by adjustable damper. Band conveyor cleaning is accomplished by high pressure jet spray of fresh solvent on to the return of band conveyor at discharge end which ensures perfect cleaning of mesh and completely eliminates the possibilities of mesh choking & channeling.

PEMAC's specially designed spray breakers ensure the uniform distribution of solvent over the entire width of moving bed. Fresh solvent is admitted into the extractor near the discharge end of the material and the full miscella is recovered from the lineal stage, thus ensures the perfect counter current flow of the material and the solvent. The miscella circulates in a closed circuit in each of the successive section by overflowing from each hopper. So in each section there is equilibrium between the oil extracted from the seed in corresponding section and the difference in oil content of solvent overflowing the preceding hopper together with the solvent overflowing the following section.

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SOLVENT DISTILLATION PROCESS

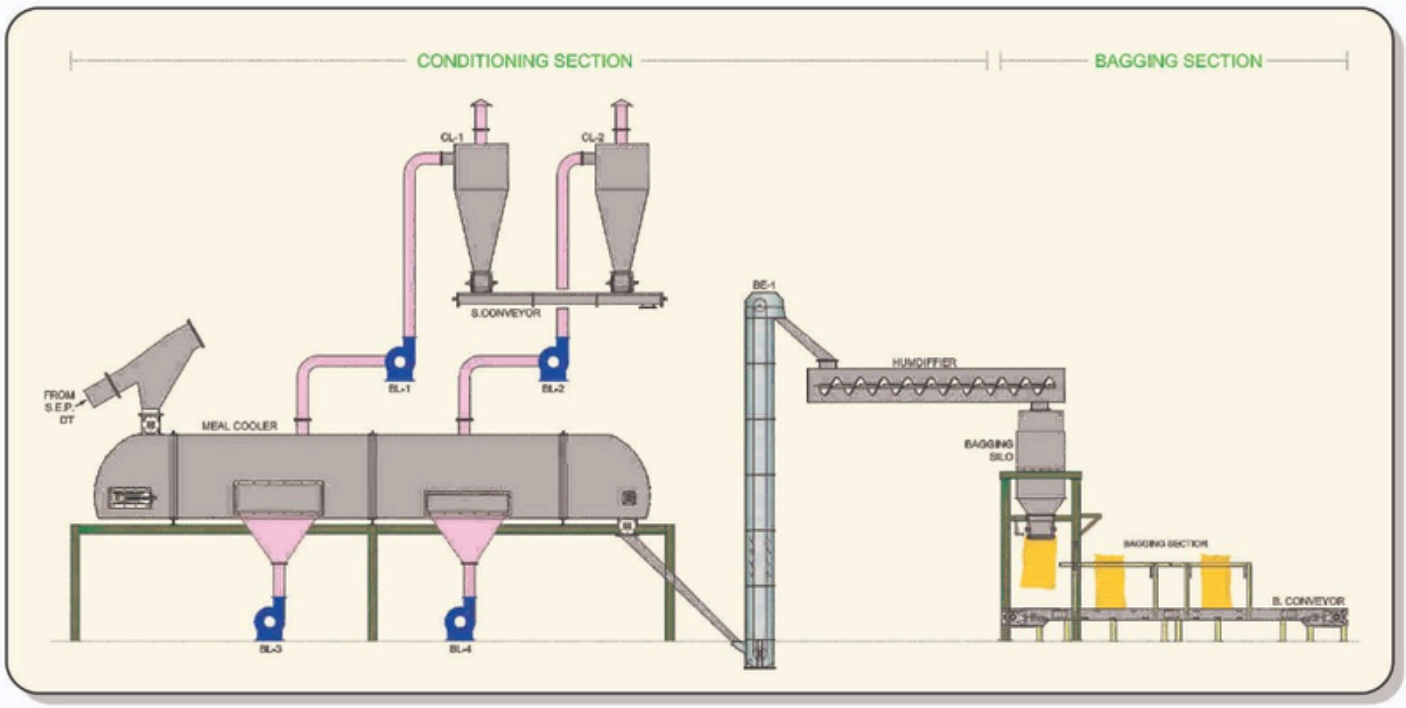
Special Features Of Pemac's Economizers

- Reduces the steam consumption
- Increases the capacity of distillation section
- Increases the capacity of condensing section.

The miscella from the tank is pumped through the vapour economizer, to the first evaporator. The economizer unit is specially designed in order to effectively utilize the heat of vapors emerging from the desolventizer toaster.

The concentrated miscella thus obtained from the economizer unit is rapidly heated in the first evaporator by means of low pressure steam and enters into the flasher, where solvent vapors are flashed off. The oil rich miscella thus obtained is charged into the second evaporator & stripper. The flashed of solvent vapors are condensed into the condensers & liquid solvent is re-circulated back to the process through solvent water separator. Distillation system operates under high vacuum & lower temperatures & short distillation period ensures good quality of oil. Furthermore the distillation system is coupled with a final drying of oil in final oil heater, which results in production of oil with exceptionally low volatiles in it.

CONDITIONING SECTION



PEMAC offer latest & most efficient Meal Conditioning Plants. The extracted meal from Extraction Plant travels to the Meal Conditioning Plant through outgoing conveyor. the meal emerging from Dryer & Toaster is hot about 100 deg. outgoing conveyor is ventilated conveyor to acquire maximum possible natural cooling. further it will cooled down, humidify & bagged in conditioning section.
meal cooler is horizontal equipment fully equipped with radiators, blowers, cyclones etc. it works on counter current cooling principle where atmospheric cooled air counters hot meal on cooler bed and exits through cyclone.

further this meal carries to Humidifier to add & thoroughly mixed moisture in it. before it bagged in automatic bagging machine.

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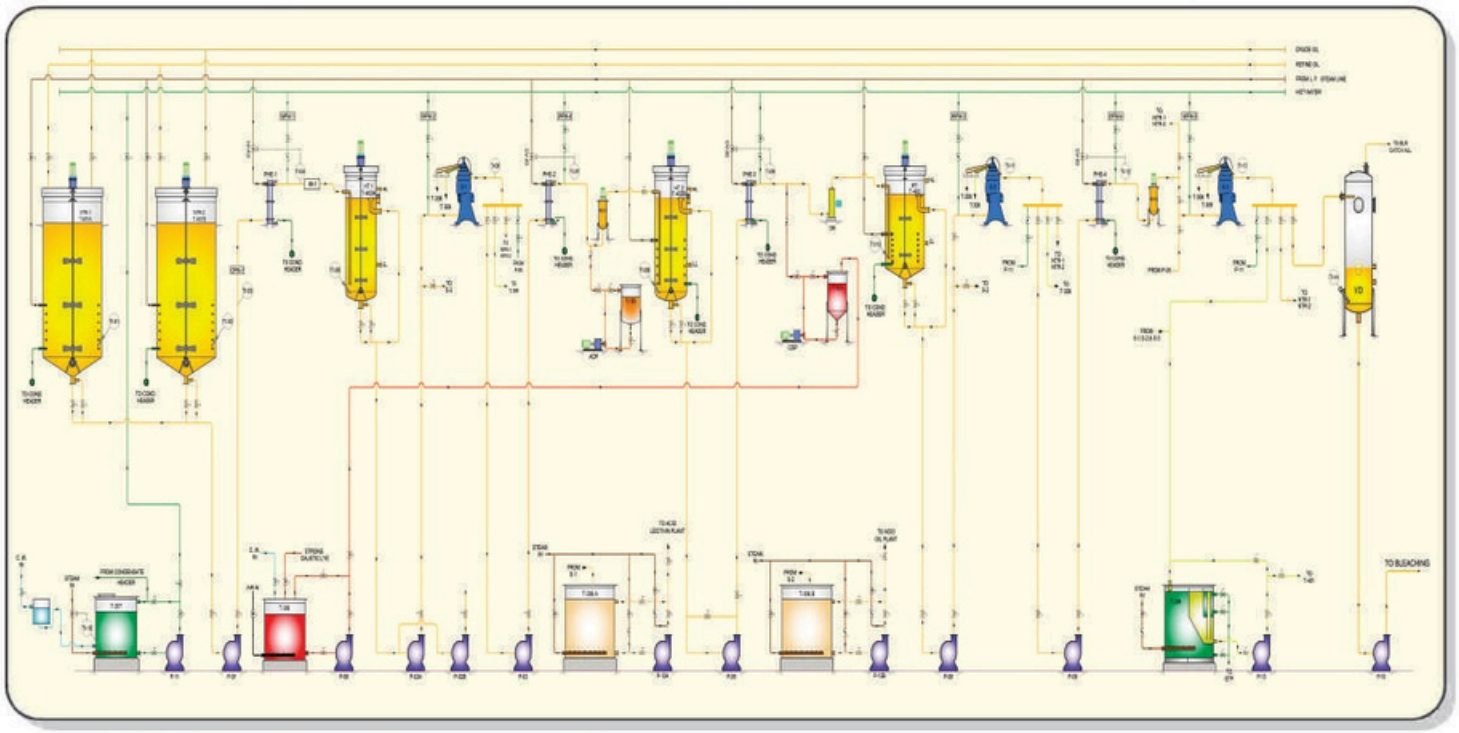
CONTINUOUS DEGUMMING / ALKALI REFINING SECTION



Basic process of refining is same in both batch & continuous refinery. Only difference is, instead of a measured batch, crude oil is processed continuously with constant stream of flow. In between required utilities & chemicals are added continuously in measured quantity.

Basic stages of the process are as below

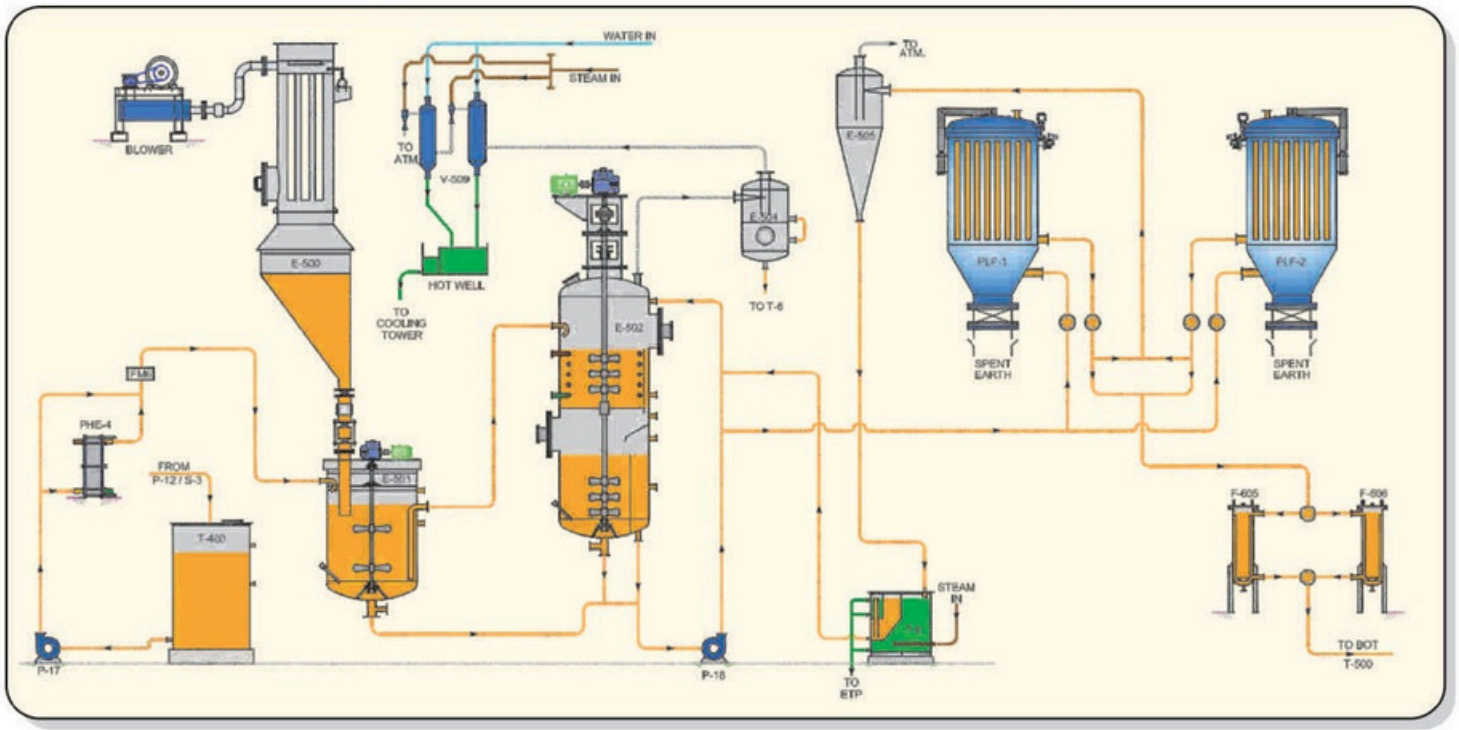
Neutralizing, Bleaching, Dewaxing & Deodorizing. Crude oil obtained from expellers / solvent extraction plant contains foreign impurities such as mucilage, gums and unfiltered proteinuous matter from the seed. It also contains free fatty acid which making it unfit for edible purpose.

Refining process consists of following sections.

1) Neutralizing 2) Bleaching
3) Dewaxing 4) Deodorizing

The first stage of refining is to separate these gums & foreign impurities with chemicals and hot water

CONTINUOUS BLEACHING SECTION



treatment called as degumming/neutralizing process. Thereafter the degummed oil is further processed in bleaching section under vacuum and treated with activated bleaching earth and carbon for reduction of color pigments. Next it will be deodorized under high vacuum. The edible oil obtained from **PEMAC's** Refinery is of good quality meeting all requirements of international standards.

De-gummed oil form NOT is pumped to the BLEACHER at the same time part of oil is carried to the SLURRY TANK oil is cooled before passing to slurry mixer. Pre-calculated amount of bleaching earth is added in the slurry mixer, this slurry is sucked by means of vacuum to the bleacher. After proper holding & mixing this oil is sent to the alternative operating set of PRESSURE LEAF FILTER by alternative operating set of polishing filters. Then it is cooled by shell and tube cooler before it reaches to the BOT.

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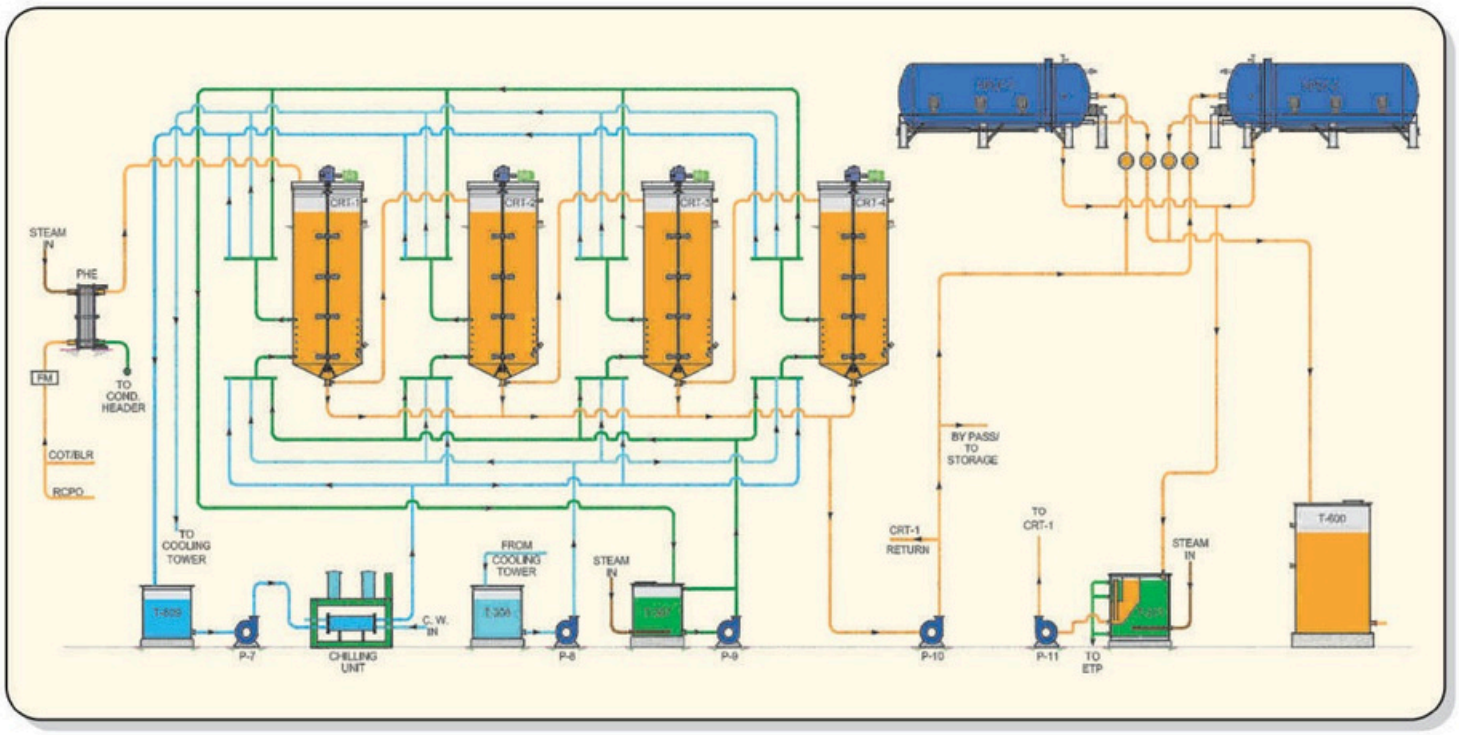
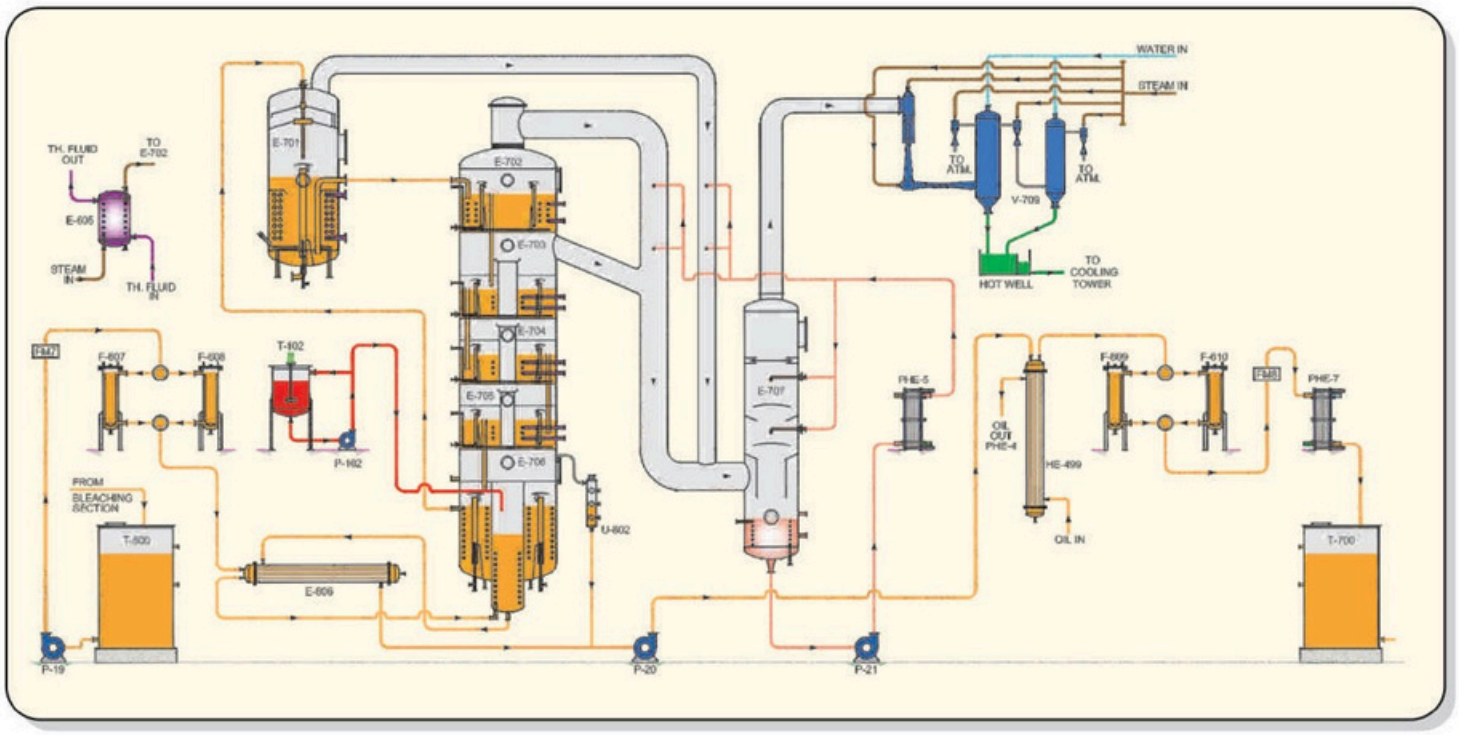
CONTINUOUS DE-WAXING / WINTERIZATION SECTION



De-waxing is the process to cool the oil at the temperature, at which wax converts in solid form (actually in slurry form) but oil remains in liquid form as it is. For this oil is cooled slowly and step by step, with cold water and then chilled water. The bleached oil from BOT is pumped continuously with stream of flow to the series of crystallizers, where oil is cooled slowly and steadily in counter current manner, so as to crystallized the wax for the purpose of easy filtration after this oil is carried to the maturater. Which is again in series to the crystallizers, here oil will maturate in terms of temperature it will be increased or decreased as per requirement to assure the crystal formation of wax. Finally this oil is filtered by the Horizontal PP / CI Filter presses / Horizontal pressure leaf filter.

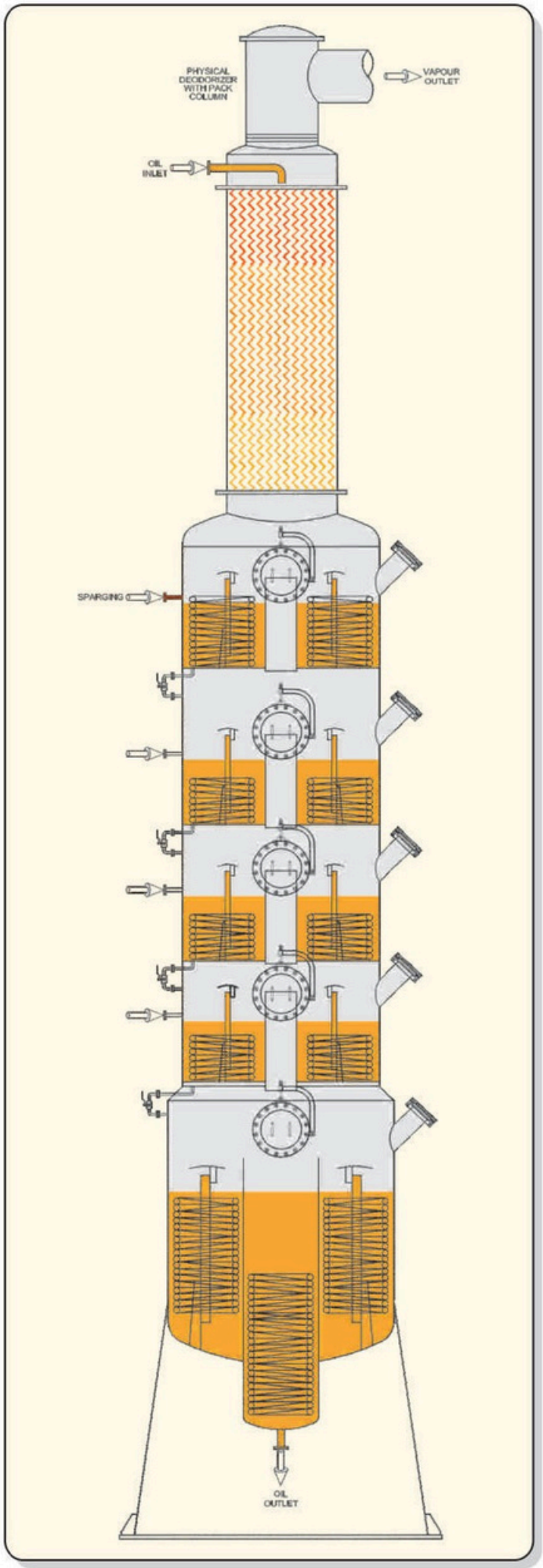
CONTINUOUS DEODORIZING SECTION



Deodorizing is nothing but the distillation process. In which fatty acid is distilled from oil. Under high temperature condition and in presence of high vacuum, with the help of sparging & agitation steam. Further this fatty acid in vapors form is condensed & recovered in liquid form by the vapors scrubbing system. De-waxed / bleached oil from intermediate storage tank is pumped by to primary heating plate heat exchanger. Which is used only in startup conditions. To heat the incoming cold de-waxed oil. Further it will be travel from oil to oil heat exchanger. Where de-waxed oil is getting heated by the outgoing hot refined oil.

Then this oil is going to the pre-heater via. Peripheral coils of the regenerative heat exchanger which is the bottom compartment of the multipurpose deodorizer. In regenerative heat exchanger de-waxed oil flows through the coils & refined oil flows through the open space of the exchanger. In counter current manner, continuous steam agitation at open steam side assures continuous and maximum heat exchange. After recovering maximum heat from the refined oil. Oil is further heated up to the required temperature, suitable for the deodorizing in final heater. This heater is equipped with agitation and sparging steam, continuous flow of superheated steam through this assures effective primary vaporization of fatty acid.

PEMAC's Deodorizer is multi-compartment vertical vessel, where each and every tray is specially designed which ensures uniform steam distribution in each tray. Specially designed trays provide sufficient mass transfer surface for effective removal of volatile matters. Flow control system at the outlet of the deodorizer, ensures the maintenance of required level at the bottom tray. The steam used for stripping the steam meets the deodorized oil. Stripped off the volatile matter and rises through the vacuum. Stripping the volatile matter from the oil. The counter-current flow of steam and oil in specially designed trays lowers steam consumption, than the conventional deodorizers. The deodorized oil leaving regenerative heat

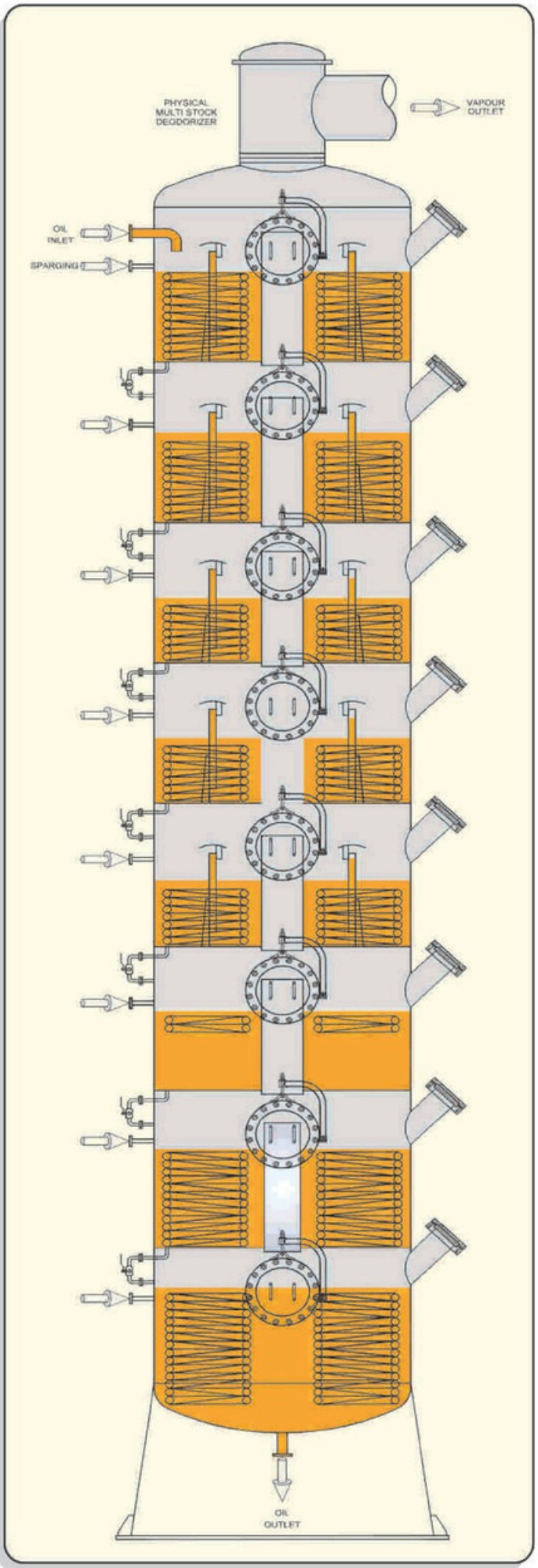


exchanger and finally cooled by water in heat exchanger finally this oil is passed through the alternatively operating set of polishing filters.

Vapors Scrubbing

The volatile matters consisting of free fatty acid and other odoriferous substances stripped from the deodorizer are led to the vapor scrubber located at the outside of the deodorizing column. In the scrubber volatile material rises through the structured packings rings and meets liquid fatty acid sprayed from the top. vapors are cooled, condensed and then collected to condenser.

PEMAC's component Fatty acid scrubber is specially designed for minimum carryover of fatty materials, to the vacuum system.



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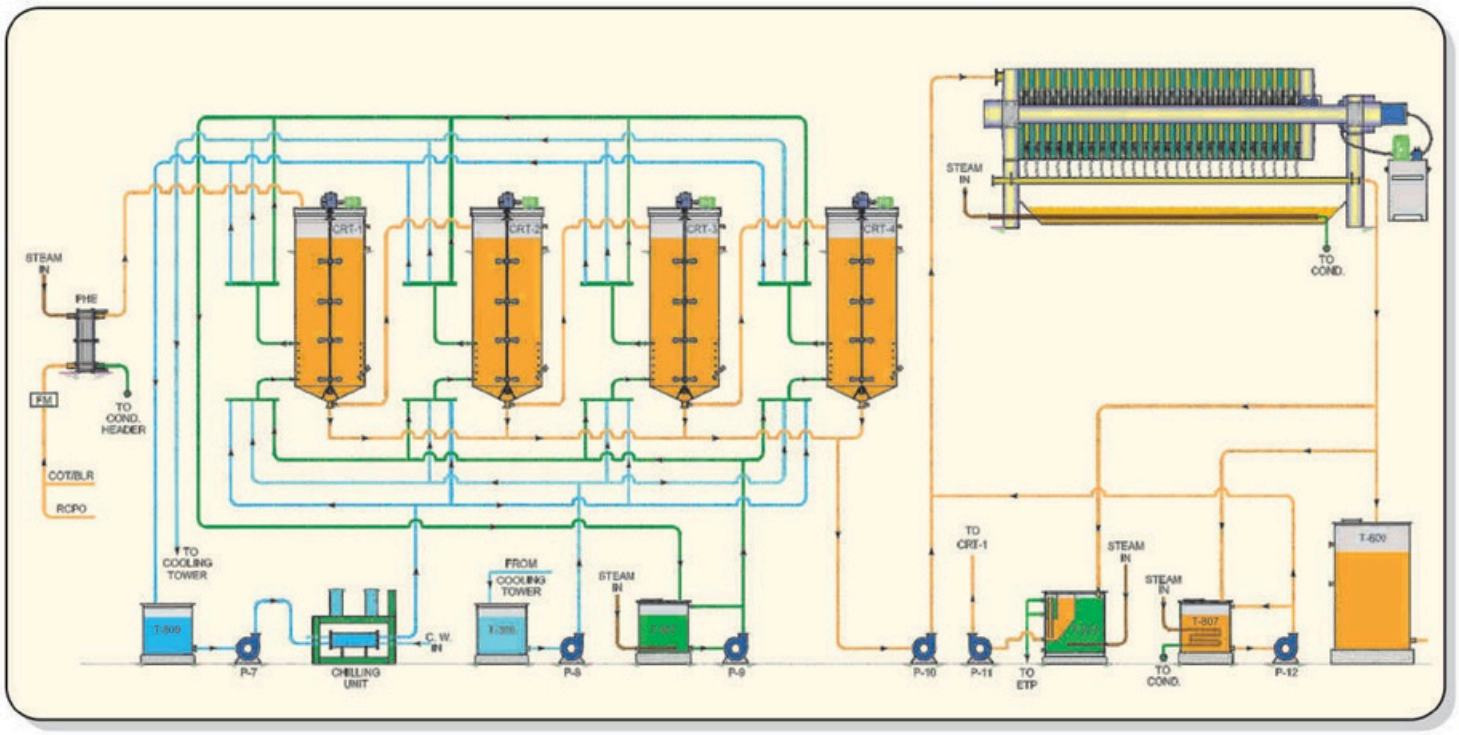
CONTINUOUS DRY FRACTIONATION



PEMAC offers a wide range of batch & continuous dry fractionation plants.

Most of the natural oils & fats have only a limited applications in there original forms as a consequence of their specific chemical composition. In order to widen there uses the oils goes through Varity of modifications, fractionation is one of them.

Fractionation is the fully reversible modification process.

It is basically a thermo chemical separation process in which a multi component mixture is physically separated in to two or more fractions with distinct physical & chemical properties that can be based on a difference in solidification, solubility or different compounds.

PEMAC's dry fractionation plant is a custom design to allow you to achieve selective crystallization of different triglycerides in edible oil. This is plant you can count on

producing stable & filterable crystals giving you a product fit to your standards and quality requirements.

PEMAC's Dry Fractionation System is designed to process crude, pre-treated or RBD palm oil. The process is divided in few steps as below.

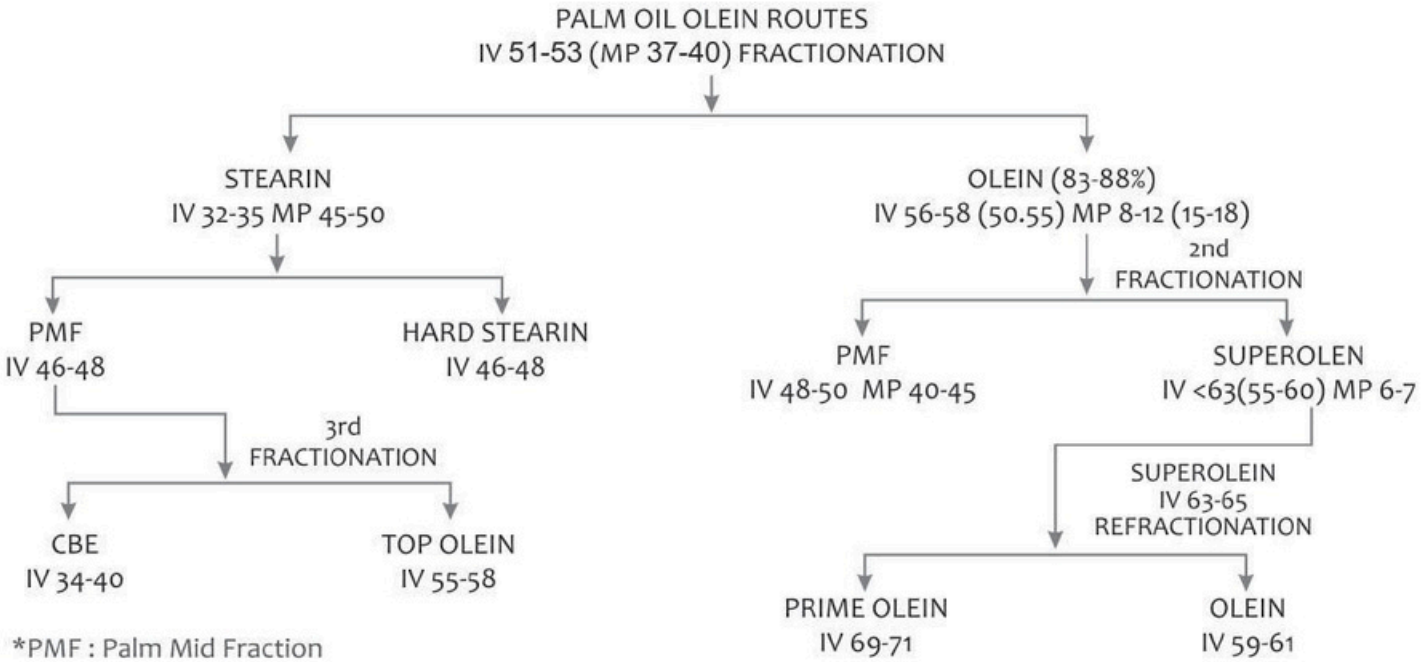
- Feed oil heating
- Crystal formation under controlled cooling
- Crystal growth
- Crystal maturation
- Filtration

PALM OIL

The latest development in fractionation of palm oil have made it possible to produce super olein with IV of 70 & more these prime or top olein products are obtained by re-fractionation of super olein.

General uses of Stearin - frying fats, margarine & shortenings.

General uses of Olein - cooking, salad, bleaching



*PMF : Palm Mid Fraction

*CBE : Coca Butter Equivalent

Comparison of Vacuum Drum Filter / Membrane Filter		
	DRUM	MEMBRENE
IV PALM OIL	52	52
IV OLEIN	57	57
IV STEARIN	40	34
SFC SLURRU	12%	12%
SFC CAKE	41%	55%
YIELD OLEIN	71%	78%

Effect of Squeeze VS Pressure		
FRACTIONATION DATA	MEMBERANE	FILLARATION
	6 BAR	20 BAR
IV PALM OIL	55.8	55.8
IV SUPEROLEIN	63.4	63.9
IV PMF	44.5	44.5
SFC SLURRY	32%	32%
SFC CAKE	56%	71%
YEILD OLEIN	44%	55%
OLEIN ENTERTENMENT	56%	45%

* SFC : Solid Fat Content

IV is a measurable degree of instauration. During crystallization more saturated & hence higher melting triglycerides concentrate in to solid phase, where as the olein fractions becomes enriched in more unsaturated triglycerides. The change in IV also measurable for separation efficiency as it can be used to quantity the separation.

$$\text{Yield stearin (\%)} = \frac{\text{IV OLEIN - IV INITIAL}}{\text{IV OLEIN - IV STEARIN}} \times 100$$

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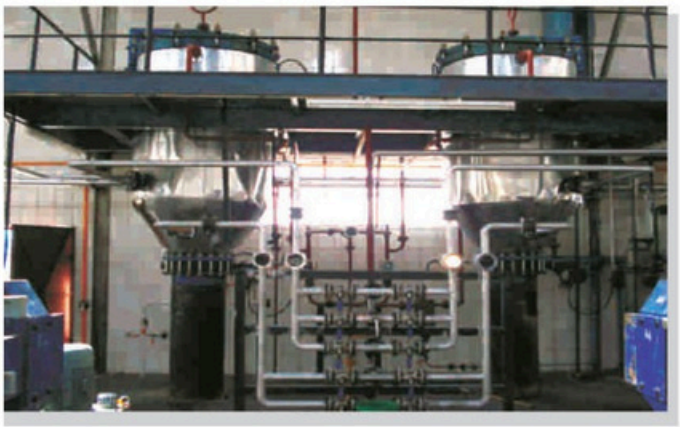
FILTRATION EQUIPMENTS



PEMAC's equipment manufacturing and emerging player in liquid –solid separation technologies marketing services with annual sales of more than 50 Pressure Leaf Filters Vertical & Horizontal. We are engaged with number of happy customers for services like spare leafs, leafs reconditioning and accessories for Pressure Leaf Filters.

Supported by streamline infrastructure we manufacture and supply arrange of superior quality pressure leaf filters.

Pressure leaf filters are pressure vessel with vertical mounted leafs accumulated on central outlet filter manifold. There are two types of filters classified according to shell design.

1. Vertical pressure leaf filters.
2. Horizontal pressure leaf filters.

Vertical Pressure Leaf Filters

Equipment is designed vertically with conical bottom & dish end top. Filter elements are easily mounted vertically from top, which is tighten with "I" bolt system, to ensure quick loosing / tightening. Electro-pneumatic operated butterfly valve is installed at bottom end for quick removal of filtered material.

Horizontal Pressure Leaf Filters

As compared to other continuous filtration process HPLFs offer simplicity of process, easy operation and maintenance, modest space requirement & low energy consumption.

The horizontal pressure leaf filters are classified as how filter is opened for cleaning.

1. Shell retraction: filter body/shell is retracted back while head and leaf bundle is stationery.
2. Leaf bundle retraction: in this type filter head and leaf bundle moves while Opening.

FILTRATION EQUIPMENTS

Equipment Description

The horizontal leaf filter (shell retraction) consist of a horizontal cylindrical vessel with special bonnet wedged lock closure & neoprene seal. The retractable filter shell is mounted on 4 external mounted wheel assemblies and retraction is accomplished by hydraulic cylinders complete with hydraulic power pack. The hydraulic cylinders are connected to power pack by high-pressure flexible rubber hoses/s.s.tubings.

All nozzle connections are mounted on fixed head of filter vessel & to open & close the filter vessel, during cake discharge no connections have to be disconnected.

To avoid opening under pressure, appropriate interlocking is provided, if process demands.

Horizontal pressure leaf filters (HPLF) are designed for high flow rates and batch operation. HPLF are used when the filter cake is sticky and difficult to remove.

Horizontal pressure leaf filters are specially designed for filtration of wax in edible oils.

Filter elements construction-5 ply riveted

SS 316/60 X 60 / 110 x 110 Mesh X Dutch Weave Filter Mesh : 2 layers

SS 304/ 8 X 8 Mesh /22 SWG Support Mesh : 2 layers

SS 304/ 4 X 4 Mesh/16 SWG Drainage Mesh : 1 layer

SS 304, 16 SWG THK Tubular channels, mouth, forks & Rivet.

Miscella Filter – Vertical filter with agitator & flame proof motor to remove fines from miscella

PEMAC offers various other filtration equipment as

1. Mild Steel / PP Filter Presses
   Compete range is available from 24" to 60" and 24 plates to 120 plates with modern hydraulic power pack system.
2. Micro Polishing Filters
   a. Range of filters for micro filtration up to 3 microns
   b. Single/multi bag options available to enhance selectivity.
3. Strainers
   Complete range & sizes for "Bucket" & "Y" type strainers.

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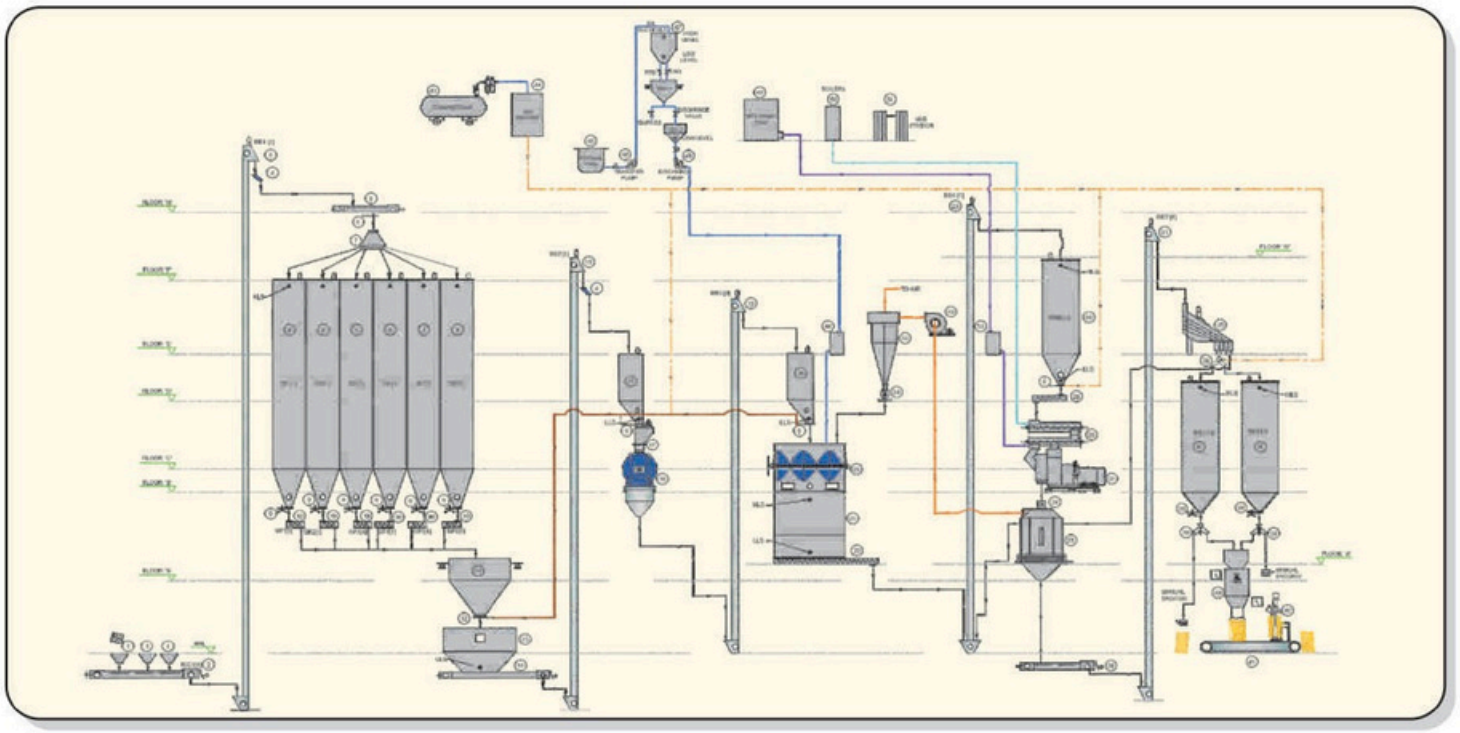
CATTLE, POULTRY FEED PLANT



PEMAC's Fully automatic & dust free cattle & poultry feed plants are highly specialized in global market.

Raw Material Intake

All the solid ingredients packed in bags for feed production would be received in plant by road. Their materials will be store in store godown. According to requirement these material will be dumped manually in dumping hopper and conveyed to the pre-cleaner through the mechanical conveyor system.

Pre-cleaning

Pre-cleaning is a process of removing unwanted material from our ingredients. As we received the material, there will be possibility of having unwanted material such as iron pieces, jutes threads, oversize pieces which can jam our silos\system. So for cleaning we use a pre-cleaning machine. Then these pre-cleaned materials are transferred to silos through mechanical conveyors and elevators.

-: Design Data & Design basis of Feed Formula for pelletized feed for Milk Cattle :-

Sr. No.	Feed formulation (General)	% Basis of Dry matter		
		Ordinary	By-Pass	Limit
1	Crude protein	20	22	Minimum
2	Crude fibre	12	12	Maximum
3	Ether extract (fat)	2.5	3	Minimum
4	Acid insoluble ash (sand, silica)	4	4	Maximum
5	Common Salt	2	2	Maximum
6	Vitamin A	500 iu/kg	500 iu/kg	Minimum
7	Calcium	0.5	0.5	Minimum
8	Phosphorus	0.5	0.5	Minimum
	Other requirements for feed			
1	Grains	10	20	Minimum
2	Moisture	10	10	Maximum
3	Molasses	10	10	Maximum
4	Premix of salt, urea & mineral mixture with a carrier	10	10	Maximum

Batching

Batching is process of combining each and every material in a proportioning ratio called feed formula it is very important process of every feed plant. A better and accurate ration of material will give is a better quality and a fully nutrients feed. This batching process may be a computerized controlled or may have manual control room to cut the cost of the plant.

Grinding

Grinding is a process of breaking solid ingredients to a required size. Finer the material higher will be the surface area exposure to heat and moisture to accomplish the gelatinization in conditioning. A fine grinding material can transfer his maximum energy to the animal as compare to a course grinded material. It is a very energy consuming process.

Mixing

As the name implies mixing is a process of combining\blending of micro ingredients. A proper mixing can be defined with a unit called co-efficient of variation. Of variation higher will be the quality of mixing. Our well designed mixer machine has such a great quality. Beyond this is a mixer machine should have a provision to mix liquid to it as we need oil or molasses addition to the feed.

Conditioning

Conditioning is a checking process. We decide whether our material is ready to pellet or not. When the material will be ready only then it will be allowed to transfer to the

pellet mill. Conditioning is a process of adding heat & moisture in the mixed feed to achieve gelatinization and making the product more pliable for pelleting. Heating is done to roast the mixed feed which will increase its digestibility quality. And moisture is increase to easy pelleting of feed. A good conditioning should have a desired retention time.

Pelleting

Pelleting is a main step of any pelleting plant. It is a process of converting any powder to solid shape called pallet. In this process the powder material is extruded through a well designed die with the help of rollers to convert it in to pellets. The quality & production of pellet mill depends on so many parameters.

1. Feed formula
2. Die configuration

-: Typical feed formula : (Tentative figures and can change with seasons/costing etc.) :-

	Type - 1	By-Pass Feed		
Sr. No.	**Ingredient**	**Percentage**	**Ingredient**	**Percentage**
1	De-oiled Rice Bran (DORB)	49	De-oiled Rice Bran (DORB)	26.6
2	DOCSC	10	DOCSC	37
3	Maize / Broken Rice	10.1	Grain (Maize)	9.5
4	Broken Rice / Maize	5	Molasses	13 (Max.)
5	Molasses	13 (Max.)	Mineral Mixture	0.5
6	Rice Polish	8.4	Calcite	1.5
7	Mineral Mixture	0.5	Common Salt	1.5
8	Calcite	1.5	Urea	1
9	Common Salt	1.5	Rice Polish	9.4
10	Urea	1		

Typical raw materials - Maize, Groundnut De-oiled Cake, De-oiled Rice Bran, Broken Rice, Rice Polish, De-oiled Cotton Seed Cake, Molasses, Mineral Mixture, Common Salt, Urea etc.

3. Quality of grinding
4. Quality of conditioning

No doubt every material can be converted into pellets weather it may be a wood.

Cooling is a process of removing heat. As we know during conditioning we add heat and moisture and also through pelleting process heat generates by extrusion process. But the pellet should have a standard moisture and heat to attain its life of storage and make it safe from fungus. So we have to remove extra heat and moisture from the pellet. All this is done with the help of a well designed counter flow cooler. Here we use atmosphere air to cool the pellet.

Crumbling

Crumbling is a process in which pellets after cooling is broken in to small pieces to make it suitable for small chicks or hens. When there is no need of crumbling, we by-pass the feed directly to the screen with the help of by-pass mechanism. A well when there is no need of crumbling, we by-pass the feed directly to the screen with the help of by-pass mechanism. A well designed Crumbler should have capability to break the pellets without making much finer.

Screening

Product coming out of Crumbler is or their in pellets form (if we use by-pass) or in crumbs form. This is required to

STANDARD SPECIFICATION FEED

-: Cattle Feed :-

Characteristics	Cattle (Type 1)	Cattle (Type 2)	Calf (Starter)	Calf (Grower)
Moisture Max %	11	11	10	10
Crude Protein Min %	22	20	23-26	22-25
Ether Extract Min %	3	2.5	4	4
Crude Fiber Max %	7	12	7	10
AIA Max %	3	4	2.5	3.5
Salt Max % (as NaCl)	2	2		
Calcium Min % (as Ca)	0.5	0.5		
Available Phosphorus	0.5	0.5		
Vitamin A (iu/kg)	5000	5000		

screen to remove fines and oversize particle. Double deck screeners are used to remove both fine and oversize particles. Fines are directed to pellet mill for re-pellitizing while oversize particles are directed to Crumbler for reprocessing. A well desired screener should have capability to remove fine and over size to desired percentages, and it should not be clog frequently.

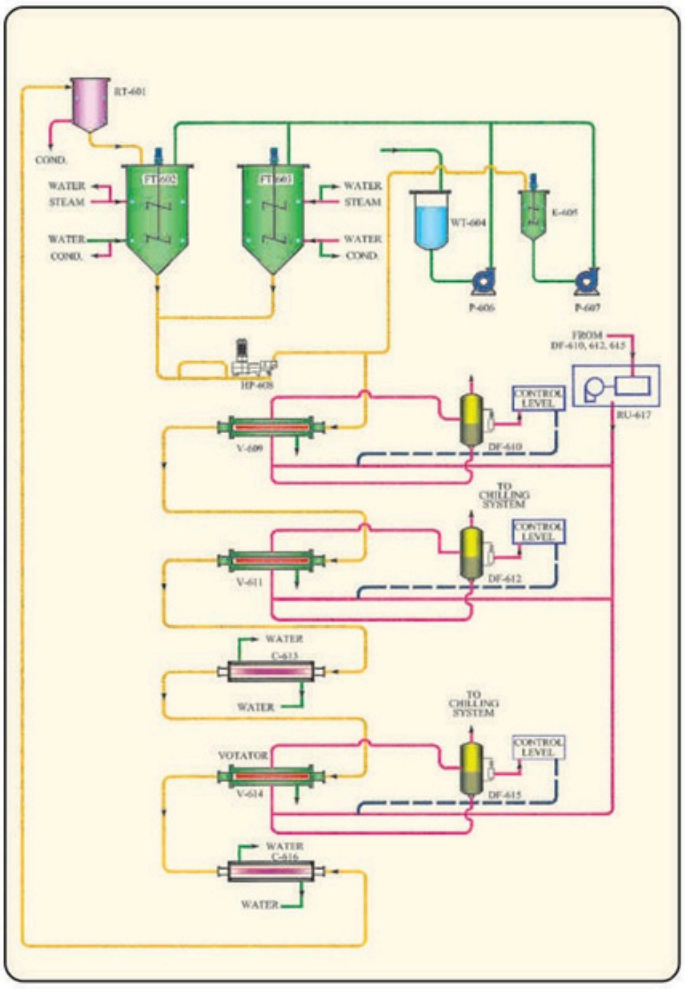
Bagging

The end of process in every plant is bagging also called packing. After screening the finished products are filled in to bags. In small and medium plants, bagging can be carried out manually but for higher production it is batter to go for electronic bagging machine.

-: Poultry Feed :-

Characteristics	Broiler Starter	Broiler Finisher Feed	Chick Feed	Growing Chicken Feed	Laying Chicken Feed	Breeder Laying Feed
Moisture Max %	11	11	11	11	11	11
Crude Protein Min %	23	20	20	16	18	18
Crude Fiber Max %	6	6	7	8	8	8
AIA Max %	3	3	4	4	4	4
Salt Max % (as NaCl)	0.6	0.6	0.6	0.6	0.6	0.6
Calcium Min % (as Ca)	1.2	1.2	1	1	3	3
Available Phosphorus Min %	0.5	0.5	0.5	0.5	0.5	0.5
Vitamin A (iu/kg)	6000	6000	6000	6000	6000	6000
ME Min % (Kcal/Kg)	2800	2900	2600	2500	2600	2600

BAKERY SHORTENING, MARGRAINE & LECITHIN PLANTS



PEMAC is a leading manufactures & exporter of process equipments & Turnkey Projects for processing bakery shortening. The plant will be capable of producing upto 1,000 kgs/hour when cooling from an inlet temperature of 45 C TO 23/25 C suitable for semi-liquid filling into cans. The capacity is dependent upon product formulations and inlet temperature of the product to be processed.

The Plant Consist Of The Following

1. Essessprocessor-Heat transfer cylinder assembly.
2. Crystal distribution cum stabilizer.
3. Triplex plunger reciprocating pump.
4. Nitrogen gas purging system.
5. Interconnecting product pipeline.
6. Control panel.

Esssessprocessor

Two numbers of interconnected esessprocessor consisting of a single horizontal heat transfer cylinder assembly mounted on an open frame. The cylinder is jacketed and lagged for use with glycol solution. The removable heat transfer cylinder will be internally hard chrome plated. The esessprocessor shaft is concentrically mounted within the cylinder and has four diametrically opposed rows of floating type scraper blades and is driven by suitable motor hose proof to IP55 standard via belts and pulleys suitably guarded.

All the product contact parts are made of stainless steel AISI 304 materials. The scraping blades, seal parts and 'o' rings will be compatible with the product, the frame and the external product non-contact parts are in carbon steel and finished painted with metallic paint.

Essessprocessor chilling jacket is suitability insulted for eliminating heat loss and cladded with stainless steel sheets for maintaining utmost hygiene.

Crystal Distribution Cum Stabilizer

Horizontally mounted and sequentially connected to the two number of essessprocessors mentioned above. The cylinder has two rows of fixed pins at 180 with a concentric shaft carrying pins in a helical arrangement which intermesh with fixed pins while rotating, driven through a gear box and a suitable motor hose proof to Ip55.

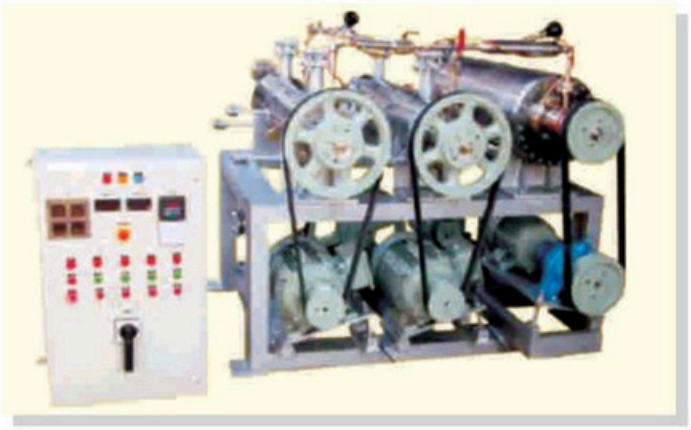
All product contact parts are made of stainless steel AISI 304 materials. Two numbers of heaters are provided for heating of the product in case of product solidification inside the product cylinder during power failure or production stoppage.

The cylinder is suitably insulated for eliminating heat loss and cladded with stainless sheets for maintaining utmost hygiene.

Triplex Plunger Reciprocating Pump

Triplex model single acting reciprocating plunger pump is used for feeding the product to the system. The capacity

BAKERY SHORTENING, MARGRAINE & LECITHIN PLANTS



of the pump is 1,690 liters/hour driven by a suitable motor hose proof to IP 55. All product contact parts are of stainless steel AISI/316 materials and the product handling compartment is suitability jacketed for hot water/steam circulation for melting the product.

Nitrogen Purging System

This consist of pressure regulating value for regulating the line pressure with two numbers gauges for reading the line pressure as well as cylinder pressure. This system has flow meter with flow regulating value for adjusting the required amount of gas to be mixed with the products.

Interconnecting Product Pipeline

The interconnecting product pipeline is jacketed for heating in case of product being solidified inside the pipeline. Further each section of the product pipeline is interconnected suitably for continuous heating of the entire length of the product pipeline.

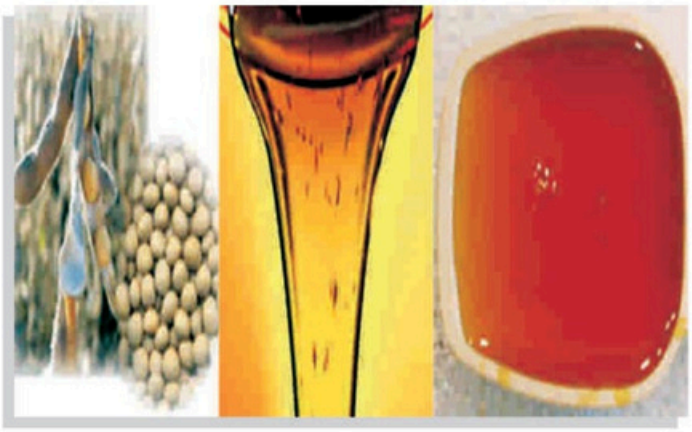
Control Panel

This control panel not only enables smooth and trouble free handling of the product but also ensures safe operation of the plant. The unique design features of the control panel prevents mishandling of the plant thereby avoiding costly damages.

The unit does not start unless temperature of the product at certain specified locations is below the specified limit. At the same time the unit does not stop even the temperature are the specific locations goes below the specified temperature during the operation of the unit. This safety factor avoids damage to the equipments of the plant when the product inside the equipments as well as pipeline is solid in case the plant is stopped due to power failure or product change over.

The bakery shortening plant enumerated above is not the only capacity limit but also we can manufacture higher production capacity plants as may be required by the clients.

We can also procure other fabricated equipments like fat blenders of various capacities in both stainless steel and carbon steel as per the specific requirements.



PEMAC's high efficiency lecithin plants are design to manufacture dry lecithin from wet gums obtained from the soybean oil. In this process moisture from the wet gums is evaporated & the resultant product is cooled in order to receive dry lecithin. It's a natural ingredient, filled with a range of stabilizers, emulsifiers and release agents.

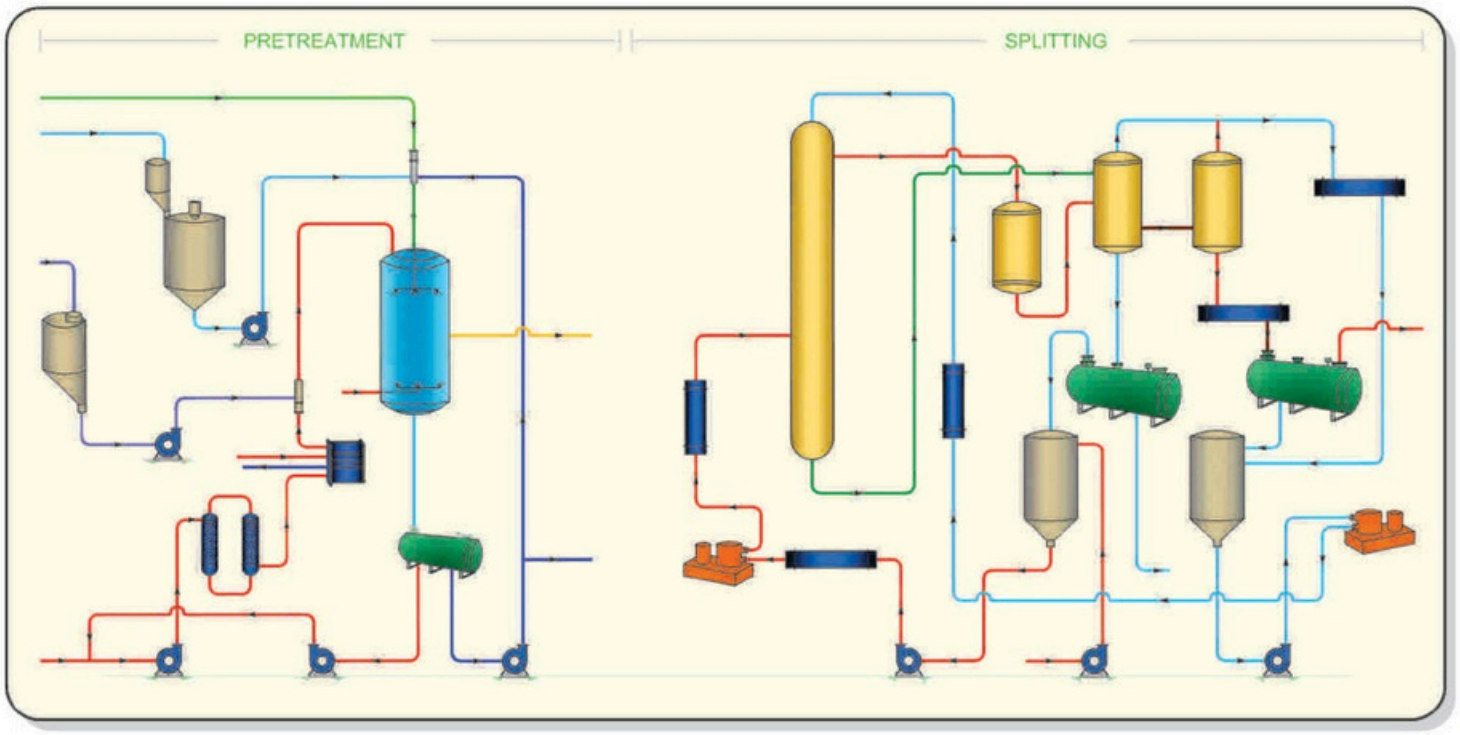
They have a number of uses in the pharmaceutical or cosmetic industry applications. Its hydrophobic / hydrophilic character makes it an ideal food emulsifier.

We are experts in manufacturing high performance Lecithin Plants for dehydration of wet gums from soybean. Our plants feature unique design which makes the drying process of the feed gentle without any burn. The soybeans are conveyed in the plant, where screening and cracking to appropriate dimensions are conducted. Beans, in the plant pass through solid fractions developing a bow wave ahead of each blade. Our Lecithin Plant can be easily clean and requires minimum maintenance.

Features

High Flow rate
Continuous operation
Low energy consumption
Technology based solvent extraction process
Low power consumption
Low oil residue in extracted meal.

OLEO CHEMICALS



PEMAC is leading turnkey project supplier in distillation process. Fatty acids are widely distributed in nature as components of lipids, both of vegetable and animal origin like liquid (oil) or solid form (fat) and they have long been employed in a very wide range of industrial applications as free fatty acids.

Pretreatment
Before being subjected to splitting, crude commercial fats are sometimes purified by removing troublesome impurities, such as minerals, gums, soaps, and proteins.

Splitting
The splitting or hydrolysis is carried out in a continuous countercurrent, at medium or high pressure, without Catalyst, in multi column or a single tower depending on the production capacity. The high temperature and pressure used permit short reaction time. Full Countercurrent flow of oil and water produces a high degree of splitting. The splitting tower is the heart of the process.

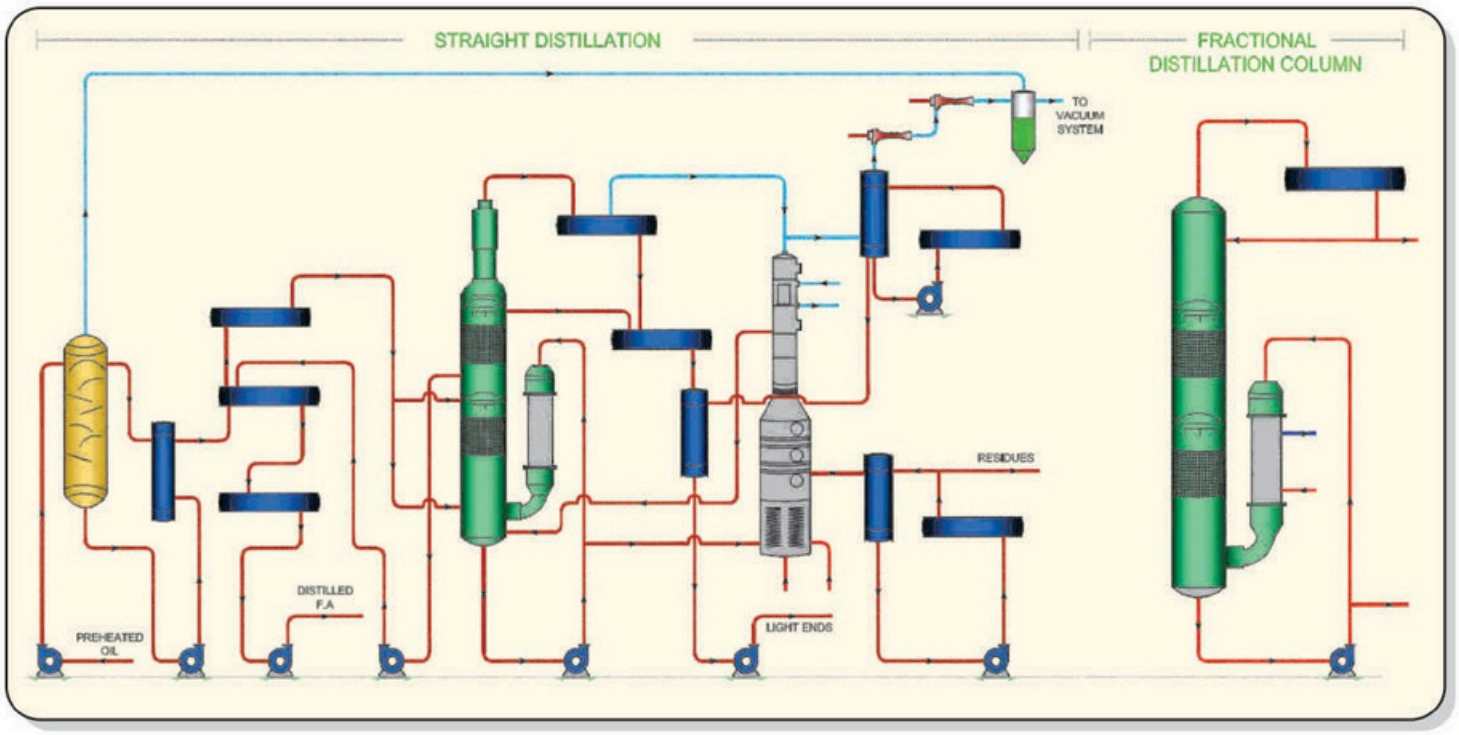
Straight Distillation
Fatty acids from splitting unit contain a series of low-boiling substances, such as Odor bodies, unsaponifiable matters, aldehydes, water, together with high-boiling components, e.g. unsplit glycerides, phosphatides, soaps, pitch and so on. These impurities are removed by adequate distillation in order to obtain a pure product with light color and good stability. Straight distillation is one of the most effective purification techniques. It is an economical and successful method of producing high-purity fatty acids. The distillation unit, in continuous operation, is composed of the de-aerator, Main column, residue stripper, falling film evaporators or Special heating candles, surface Condensers and vacuum system.

Fractional Distillation Column
To remove low quantity of C6 ÷ C10 Fraction from Coconut oil fatty acid as Well as obtain only C16 ÷ C18 cut from Tallow fatty acid, by a partial Fractionation, it's just needed to add to distillation unit a simple arrangement comprising a cut column and a cut surface condenser.

Hydrogenation
The hydrogenation process can be performed before or after splitting. Hydrogenation is the reaction between hydrogen and the ethylenic double bond of an unsaturated fat in the presence of a catalyst. The saturated (hydrogenated) fat obtained is characterized by better stability properties and higher melting point. The typical hydrogenation process is carried out at a temperature between 160 – 250°C and hydrogen pressure of 10 – 25 bar with the presence of a finely divided nickel catalyst supported.

Glycerin Process
Animal or vegetable grade glycerin is produced through cleavage of the triglycerides of animal and vegetable fats by splitting, trans esterification, or saponification. Glyceric aqueous solutions are purified, concentrated, and distilled

Pretreatment Of The Glyceric Solutions
Spent soap lye and glycerol solutions, coming from splitting or trans esterification of low grade or recycled fats, are treated with coagulating salts such as aluminum



sulfate or ferric chloride, acids, and lime to remove impurities containing low levels of salts and soaps, which after purification can reach concentrations higher than 99.5 percent.

Evaporation

Spent soap lye and sweet waters are processed under reduced pressure and high temperature in multistage evaporators where glycerin achieves concentrations of up to 80 percent.

Distillation

Glyceric solutions from transesterification and from evaporation containing up to 80 percent glycerol are distilled in Falling film columns where heavy and light boiling impurities are separated and pure glycerin (more than 99.5 percent) is obtained.

Biodiesel Production

Biodiesel is defined as mono-alkyl esters of long-chain fatty acids.

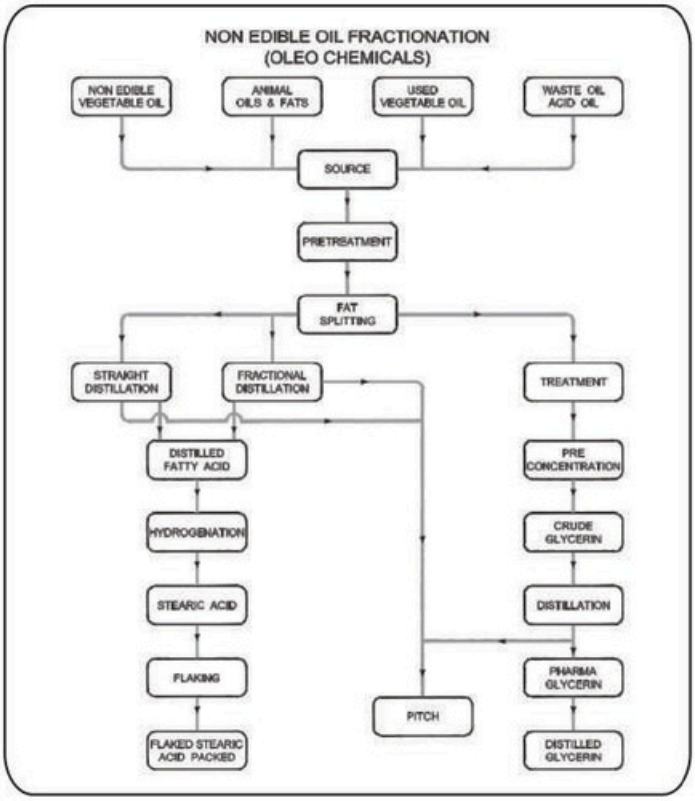
Biodiesel is mainly obtained by direct reaction (trans esterification) of oils and fats of vegetable and animal origin with methanol oleo chemical products, including fatty alcohols (surfactants industry).

Methyl Esters Synthesis By Trans esterification

The trans esterification of fats and oils with methanol is typically carried out with basic catalysts (e.g., sodium hydroxide, potassium hydroxide, and sodium methyl ate at 60 – 70°C and normal pressure, although higher temperature and pressure are also used. The equilibrium of the reaction is pushed to the ester production by an excess of methanol and by the settling of the glyceric phase in the bottom of the reactor. Once the reaction is complete, the mixture is allowed to settle or is separated by centrifugation.

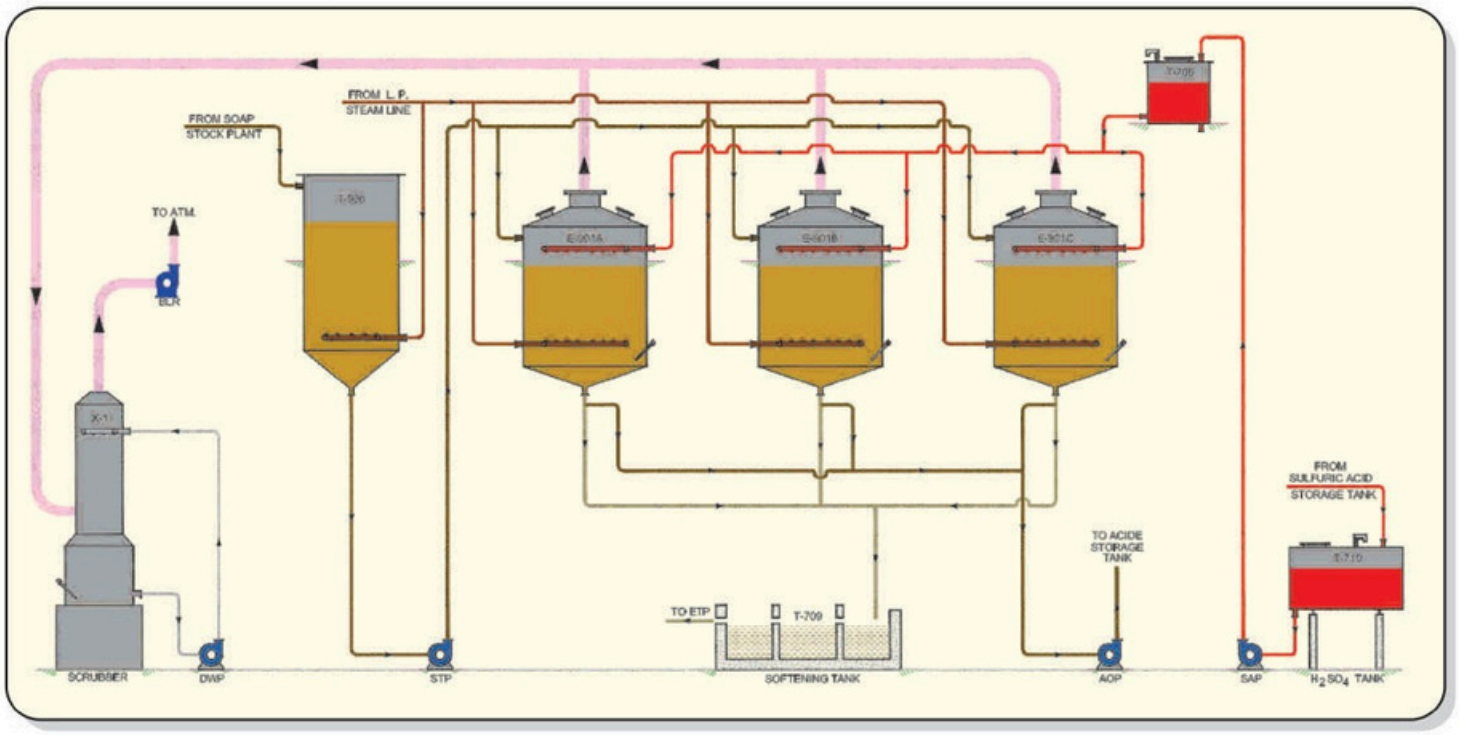
Methyl Esters Synthesis By Esterification

Fatty acids can be converted into FAMEs by esterification with methanol in the presence of an acid catalyst. Process water is purified from the excess methanol used in the reaction before discharge. Continuous counter current plants produce methyl esters streams at yields of 99 percent and above.



PEMAC PROJECTS

SOAP STOCK SPLITTING/ACID OIL PLANT



PEMAC offers new generation, completely environment friendly Soap Stock Splitting/Acid Oil Plants.

This Latest designed Plants are completely closed & does not pass any acid fumes to the atmosphere. The final output will be acid oil with good color which is the direct raw materials for the soap plants.

Process Description

Soap stock from process house is accumulated in a homo-gentian tank, which is equipped with the open steam heating arrangement. In this soap stock is heated with the open steam, so as to evaporate moisture as per as possible in term of minimizing acid consumption for splitting.

This soap stock is pumped through the horizontal screw pump to the acid Reactors for splitting, Reactors are PP FRP constructed fully closed vessel, equipped with copper Stem heating cum agitation coils, light & sight Glasses, inspection manhole etc. splitting takes place in semi-continuous manner. Reactor are used in cycle for splitting operation. After getting appropriate charge in selected reactor, the soap stock is getting boiled in term of drying with steam heating cum agitation coils. After removing maximum moisture pre-calculated amount of acid (H2SO4) will be added slowly splitting is done under continues observation so as to maintain appropriate acid value of final product also avoiding excess acid fumes.

After completion of splitting operation, settling process starts for 3-4 hour. After that water is getting drained to the fat trap tank and clear acid oil is pumped to the

PILOT PROJECTS

storage tank with PP pump. Fat trap tank is PP FRP constructed rectangular tank specially designed with multi-compartment & syphoning system to collect all the droplets of acid oil.

PILOT PROJECTS

On basic of practical experience, **PEMAC** successfully designs & executes all capacities of pilot plants for Solvent Extraction & Vegetable/cooking Oil Plants.

Capacities

Pilot Projects - 50 Kgs – 500 Kgs

Small Capacities Commercial Projects – 500 Kgs – 10 TPD

Silent Features For **PEMAC** Pilot Projects & Small Capacities Commercial Projects

Simple Operation

Easy Maintenance

Less Civil Work

Convenient Shifting

Minimum Capital Investment

Less Manpower

Less Power Consumption

Compact Design

Market Standard Product Quality

Basic Needs Of Small Capacities Commercial Plants In Rural Areas

Best Quality Natural Product Will Be Available For Consumers

Right Price For The Raw Material

Nullifies The Chances Of Mixing In Raw As Well As Final Product

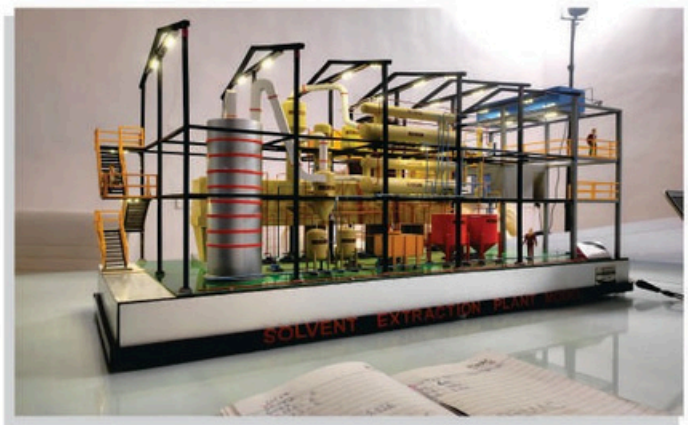
Employment Growth

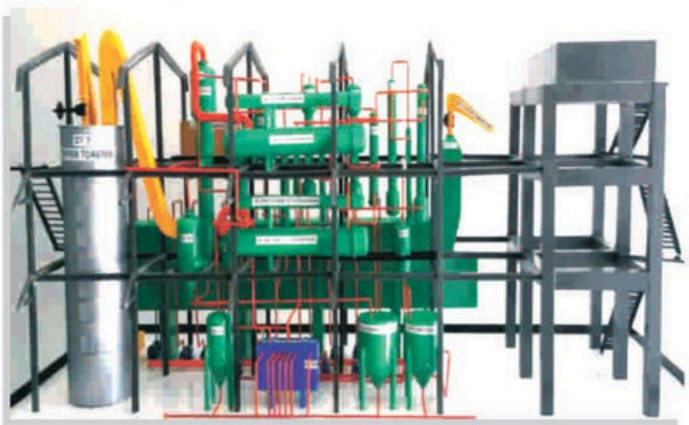
Saves Transport

Best Utilization Of Byproducts,

Best Profit Margin For Processors

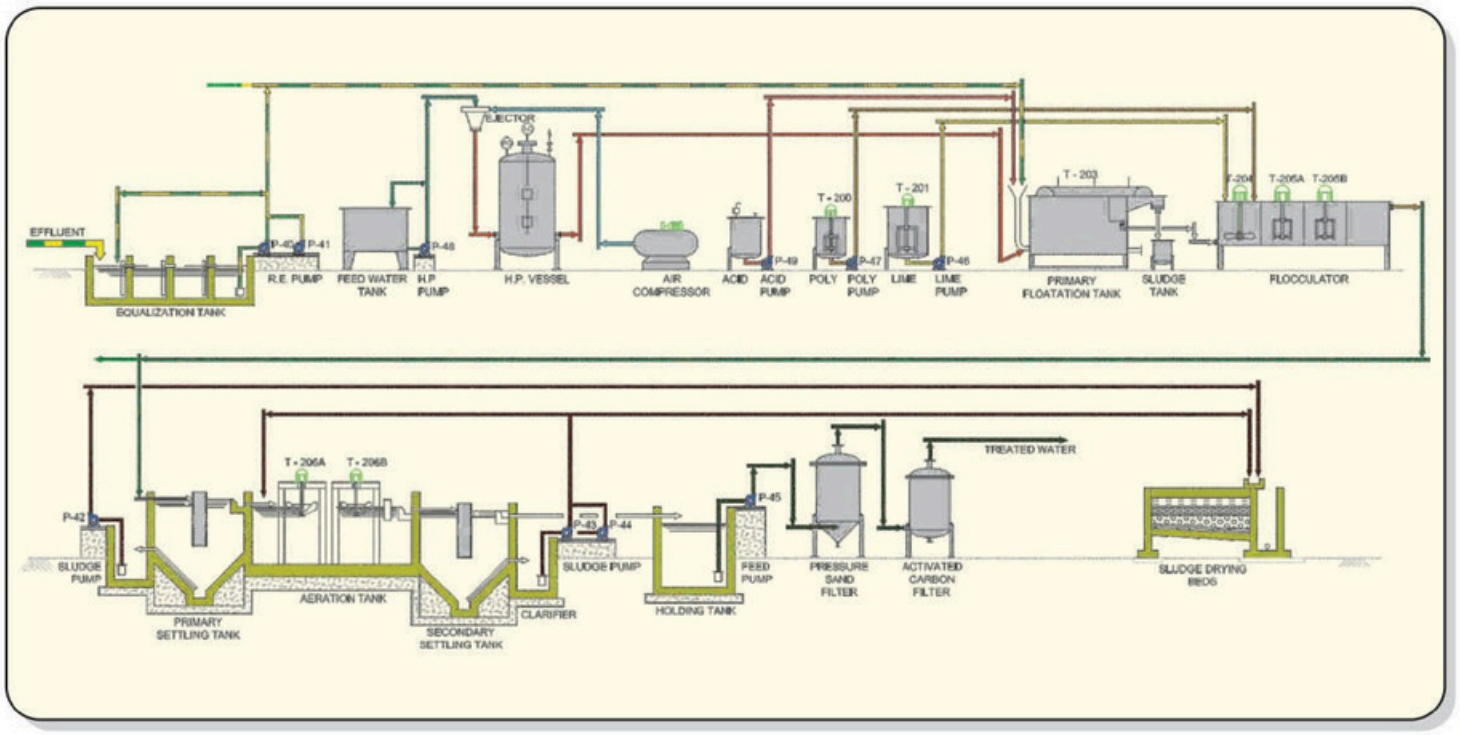
Best Purchasing Cost For Consumers, As It Avoids Unnecessary Packing Expenses





PEMAC PROJECTS

EFFLUENT WATER TREATMENT PLANT



PEMAC offers a wide range of new generation effluent treatment plants which are having various industrial applications.

The proposed effluent scheme is based on dissolved air floatation technique followed by the conventional activated sludge process and pressure sand filtration and activated carbon filtration to achieve the final parameters.

I. Equalization
II. Acidification
III. Floatation
IV. Fat recovery
V. Chemical conditioning
VI. Flocculation
VII. Removal of chemical sludge
VIII. Biological oxidation by activated sludge process
IX. Bio-clarification/sludge recycle
X. Up flow pressure sand filtration
XI. Activated carbon filtration XII. Refuse options

Parameters after final treatment

Ph	7-8
Cod	<200 P P M
Bod	<30 P P M
Tss	<50 P P M
Fog	<5 P P M
Temp.	AMBIENT
Color	SPARKLING WHITE
Bio assays	90% survival in 96 hours on fish

The segregated effluent streams from the process plant will join the equalization tank, with adequate retention time. The effluents will be received in the equalization tank to check and stabilize the variations in the PH the other impurities. By this step differences in the temp. Rate of flow of various streams balances out and acquire homogeneity so as to facilitate optimum treatment conditions. The homogeneous effluent from the equalization tank will be pumped at the required rate into the primary floatation tank

EFFLUENT WATER TREATMENT PLANT

and predetermined quantity of acid will be dosed to spilt the free floating as well as the emulsified oils and fats and other colloidal impurities. At this PH (3-4) most of the soluble and insoluble fats and oils are separ5ated and could be separated quickly by injecting the dispersion water made by the dissolved air floatation technique. Air is dissolved in water under pressure and is injected in the floatation tank, wherein because of the difference I pressure, air comes out in water as of millions of minute air bubbles. This minute air bubbles get attached to the suspended and colloidal impurities and float them to the surface of the floatation tank. These floated oils and greases could be removed with the help of mechanical scraper provided and could be used for making acid oil. Or crude soap hence a valuable by-product.

After the removal of fats and oils acidified effluent will be coagulated and neutralized with help of common coagulants like hydrated lime solution in specially designed flash mixer cum flocculator. In order to affect complete coagulation it advisable to make use of polyelectrolyte this will combine the flocks as well as the rate of separation of chemical flocks to achieve the max. Clarity. The purpose of chemical coagulation is to destabilize the floating, emulsified and suspended contaminant particles. With the force of repulsion suppressed, mixing gently results in particles contact and forces of attraction causes the particles to stick to each other, producing progressive agglomeration coagulant, used to enhance the process of flocculation.

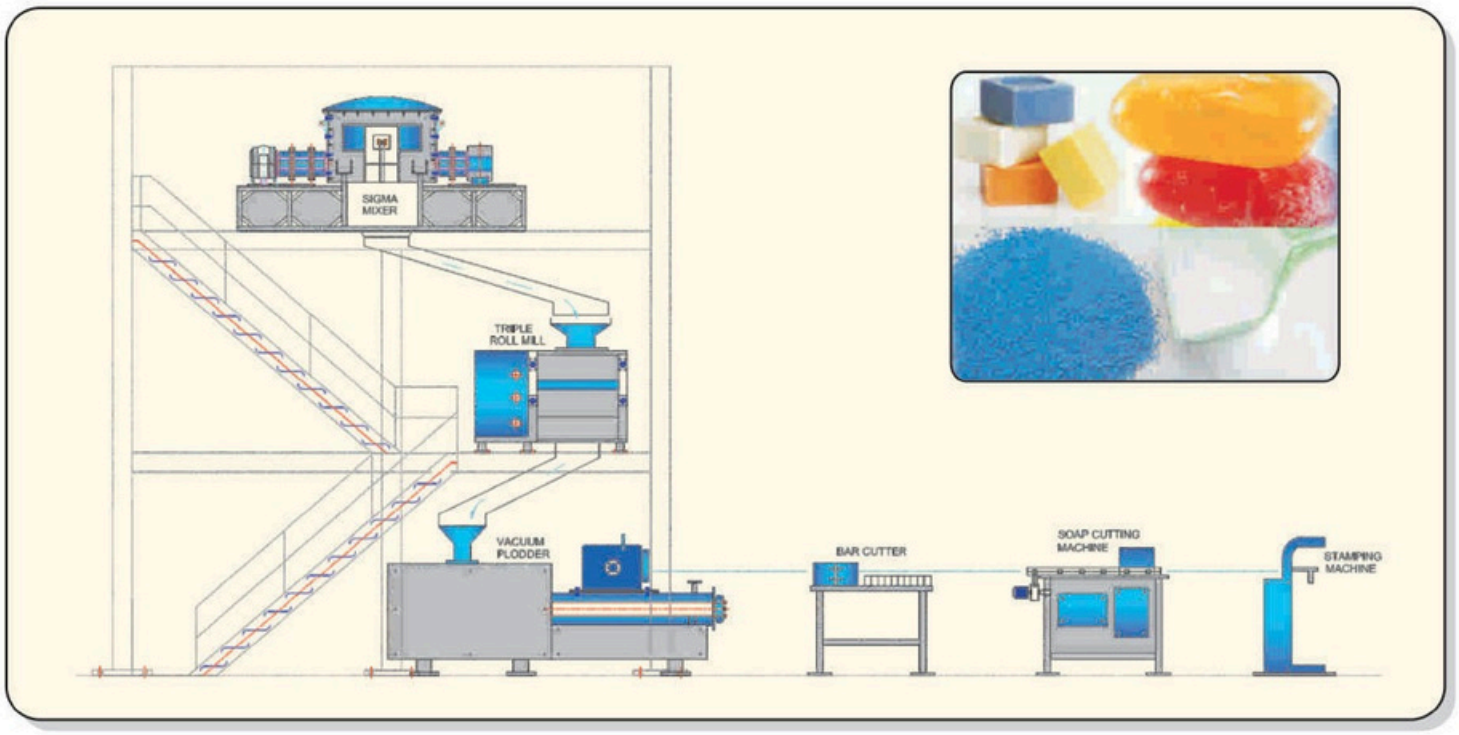
The coagulated effluents from the flocculator will be piped down in the primary settling tank. The chemical sludge settles at the bottom of the tank by gravity. The chemical sludge produced is removed periodically and is de-watered with the help sludge drying beds and treated water is taken further treatment. Also provision shall be made to recycle the effluent into the equalization tank and reprocessed till it produces the required characteristics before disposal. About 70-80% reduction In BOD, COD, suspended solids and fats and oils are envisaged by these steps. Since primary treatment alone is not sufficient to meet the required standards a secondary system is incorporated. Since the biological load is high single stage activated sludge process is incorporated. The primary treated water is treated further by the activate sludge process to bring down the parameters with in the prescribed limits.

The primary treated effluent is aerated in the aeration tank by surface aerators by providing enough micro organisms and nutrients. The general biological reaction that takes place is a predator prey reaction. The wast5e water supplies the organic matter (biological food) and aeration furnishes the dissolved oxygen. The primary reaction is the metabolism of the organic matter and uptake of the dissolved oxygen by bacteria releasing the co2 and producing substantial increase in the bacterial population. The secondary reaction results from the oxygen used by the protozoa consuming bacteria releasing carbon dioxide and protozoa cells. About 85-90% reduction is envisaged by this process.

The effluents after the aeration enter in the secondary settling tank and the biological sludge is allowed to settle down. The sludge is drawn off and re circulated back to the aeration tank to maintain the biological population in the aeration tank whereas excess sludge is wasted though the sludge drying beds. Treated water flows in to a holding tank and is filtered in an up flow pressure sand filter to trap further suspended solids and other impurities and the filtered water is passed through an activated carbon filter to absorb the traces of the organic impurities to prevent the smell and colors. The final treated water shall be sparkling white in colour with no smell and could be taken back for indirect cooling and general washing, agricultural and gardening process.

PEMAC PROJECTS

LAUNDRY,TOILET SOAP PLANT & DETERGENT POWDER PLANT



Laundry Soap Plants

PEMAC offers a wide range of Laundry soap making plant, with the latest technologies & machineries on turnkey basis. **PEMAC's** quality machineries, skilled & experience project management ensures best product quality, best productivity & efficiency from the day one of installation.

Capacities-100 kg/hr to 2000 kg/hr

General process of Laundry Soap making is derived in following steps,

- Saponification
- Drying
- Bar Cutting
- Cake Cutting
- Stamping

Basically the process classified into two section. In the first section reaction of variety of oils & fats take place with alkali. Crude soap with moisture obtained from this section if further processed for finishing.

Toilet Soap Plants

PEMAC quality machineries, skilled & experience project management ensure best product quality, best productivity & efficiency from the day one of installation.

Capacities – 100 kg/hr to 2000 kg/hr

General process of Toilet Soap Making is derived in following steps,

- Saponification
- Drying
- Mixing
- Plodding
- Roller Mill
- Vacuum Plodder
- Bar Cutting
- Cake Cutting
- Stamping

Basically the process classified into two section. In the first section reaction of oils & fats takes place with alkali. Crude soap with moisture obtained from this section is now taken in second section which consists of finishing of soap by mixing in mixer, milling on triple roller mill, extruding under pressure to form bars and finally stamping of soap to desired shape and size.

Process Description

General raw materials for soaps are oils & fatty acid. Oils are mixture of triglycerides and when this reacts with alkali the residua; will be sodium salts of fatty acid and glycerin. Generally blend of hard & soft oils are used for soap making. There are various Saponification process like

1. Cold Process- where reaction takes place in room temperature, but this process is not suitable for all the oils

LAUNDRY,TOILET SOAP PLANT & DETERGENT POWDER PLANT

2. Semi boiled process- in this glycerin is retained in the soap stock, which simplifies the process.
3. Full Boiled Saponification Process

In Full Boiled Saponification process brine is added for graining out the soap mixture. This mixture is then settled for the formation of different layers. Top layer will be soap and bottom is spent lye & glycerin. Bottom layer is drained out and soap is further boiled and washed with hot water, Alkali is getting added for syphoning unsap fatty matter.

Most favorite raw material for soap making is fatty acid. Which further simplifies the process because of less heat alkali time & power consumption.

Drying Section

Soap stock obtained from saponification process contain very high moisture, which has to be removed for further processing. For small capacity plants drying happens in open yard or oven after chipping the soap into pieces.

Sigma Mixer

PEMAC's specially designed Sigma Mixer gives fast & homogeneous mixing and cutting of soap noodles. Sigma mixer is used for mixing soap noodles or chips with perfume, color and other additives. Double shaft sigma mixer has specially designed Z shaped blades which are rotating at different speed & direction, which ensure maximum efficiency and homogenization. Mixed materials after mixing are removed from bottom discharge mechanism or by tilting the mixer. The is mounted on heavy duty bearing. The mixing machine is lined with thick sheet of stainless steel. Supporting structure is made from mild steel angles, channel and flats. The mixture is driven by gearbox.

Soap Plodder / Extruder

Mixed soap from sigma mixer enters to the soap plodder/Extruder through the feed hopper. Plodder is nothing but a mechanical Binder, which mechanism is designed in such a way that it binds a mixed soap by pressing action.

Roller Mill

Roller mill is one of the important machine in the soap making process which makes the soap more homogenous, free from grainy appearance and transparent.

It has three horizontal rolls so commonly called as three roller mill. All rolls are rotating with different speed & efficiency. Adjustable roller arrangement allows the gap adjustment between the roll for required film thickness of the soap. Mixed soap is fed to the slower pair of the roll and carrier to the next pair, Thus milling happens twice in single machine.

Adjustable scraper continuously removes the film sticking to the roll. Collecting cute is provided at the bottom for collecting spilled materials, which is then recalculated.

Rolls are specially hardened and chrome plated so as to remove the generated because of rubbing action.

Duplex Plodder

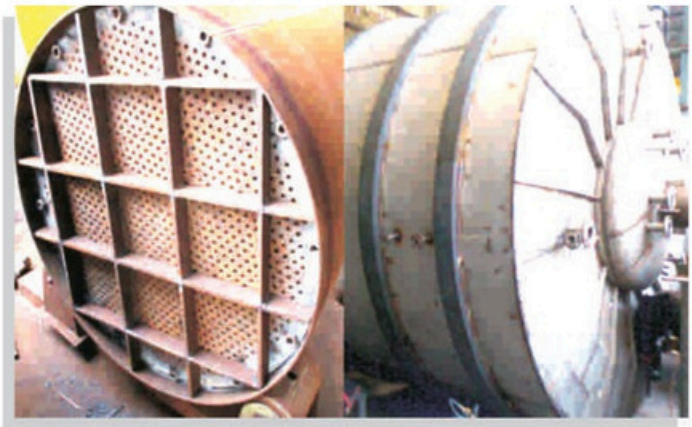
Duplex plodder is part of finishing line which extrudes the soap suitable for stamping. The extruder screw of top noodle plodder takes the milled soap ribbons from hopper and process the soap as it tries to pass through noodle plate. There is rotating knife which cute the noodle as they come out of noodle plate.

The noodles fall in the vacuum chamber. The screw of the bottom screw binds the soap noodles under vacuum as the soap mass comes out under pressure from the mouth of the cone through the die.

PEMAC PROJECTS

PROJECTS ENGINEERING MANAGEMENT AND CONSULTANCY

STRUCTURE & PIPING

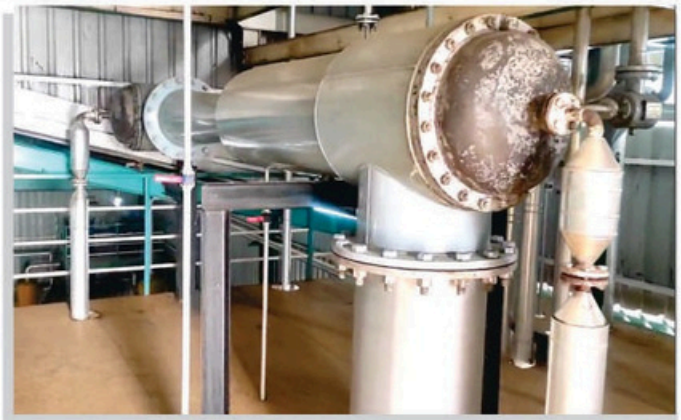


HEAVY FABRICATION

SHELL & TUBE HEAT EXCHANGER

PLATE HEAT EXCHANGER

POLISH FILTER



STEAM JET VACUUM SYSTEMS

SCREW CONVEYOR

BUCKET ELEVATOR

PEMAC PROJECTS

PROJECTS ENGINEERING MANAGEMENT AND CONSULTANCY

STORAGE TANKS

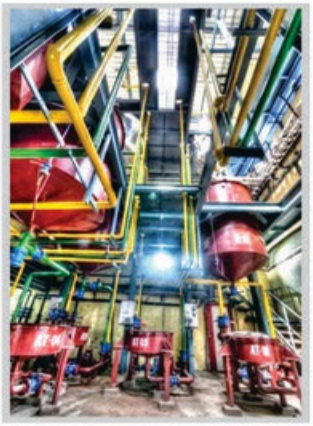
BOILERS & HEATERS

BELLOWS & COVERS

COOLING TOWERS

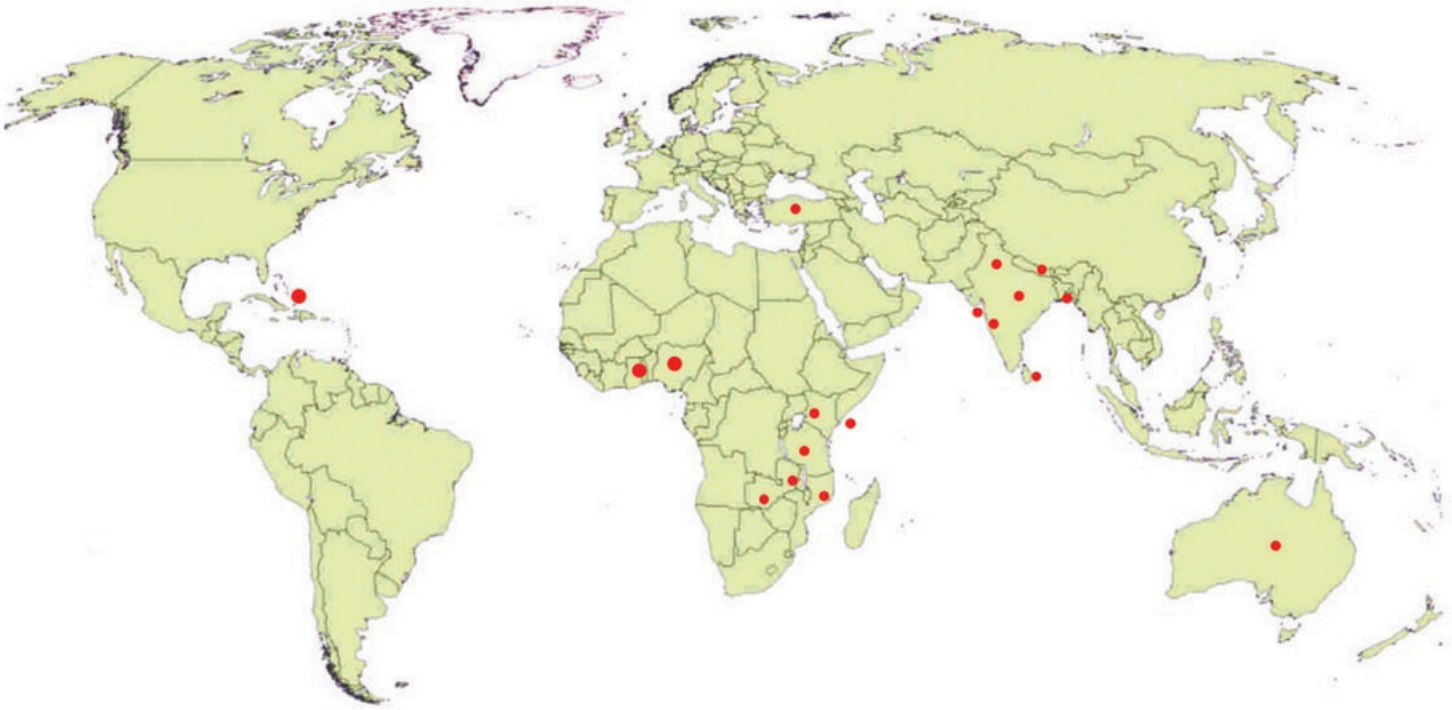
REDLER CONVEYOR

BELT CONVEYOR



LUBRICANT OIL BLENDING & REFINERY

VALVES



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