



DELIVERING THROUGH TECHNOLOGY

Vegetable Oils
and Fats

Oleo Chemicals

Bio-Diesel

Filtration

Ethanol

HVO

CBG

Mectech is an **Engineering Process Company** engaged in manufacturing of plant & machinery on turnkey basis for vegetable oils and fats, biodiesel and oleo chemical industry.



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NO CHILD LABOUR
बच्चों का शोषण
निषिद्ध है।
अनुसूचित जाति/प्राय: शोषित वर्ग के
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अनुसूचित जाति/प्राय: शोषित वर्ग के

WHO WE ARE

Mectech Process Engineers Pvt. Ltd. is a closely held Indian company, which was founded in 1978 by Mr. Ishwar Sahai. A chemical engineer by qualification, is a person of indomitable courage and pioneering spirit. It entered in the oil & fats sector since its inception and in the last 50 years has established itself as one of the leading brand, not just in India, but globally.

Technology: Mectech offers a comprehensive range of services including the design, manufacturing, installation and commissioning of projects on turnkey basis in the field of Solvent Extraction Plant, Oil Processing Plant, projects aimed at value addition such as MCT and Lecithin powder production, Edible Oil Refinery Plant, Esterification, Hydrogenation, Margarine & Shortening both within India and internationally.

Further we excel in the field of Oleo chemical Plant covering processes like splitting, fatty acid distillation, Glycerin distillation and biodiesel plant.

In addition to these services, we also manufacture Mecklear gravity filters, vertical pressure leaf filters, horizontal pressure leaf filters and candle filters etc.

From its inception, Mectech has been committed to a strong research & development programme. It keeps its technology continuously updated with its own R&D efforts and also by remaining in touch with specialist component manufacturers/ technical collaboration for advanced technologies.

Engineering Facilities: Mectech have a full-fledged design department equipped with the latest software and AutoCAD facilities. Mectech's engineers are quite at home with international codes for design.

Manufacturing: One of Mectech's biggest strengths is that it manufactures components in-house. This gives it full control over quality, delivery and cost. It has two large and modern fully integrated manufacturing plants located in Haryana: one in Bahrapur and another in Bhatgaon.

Quality: Mectech uses components which are specifically designed for oil and fats industries and manufactures them in-house. It understands that "assuring" quality is better and cheaper than "controlling" quality.

Our commitment to delivering turnkey solutions and high quality equipment is at the core of Mectech's operation. Repeat orders from satisfied customers in India and abroad are proof of Mectech quality.

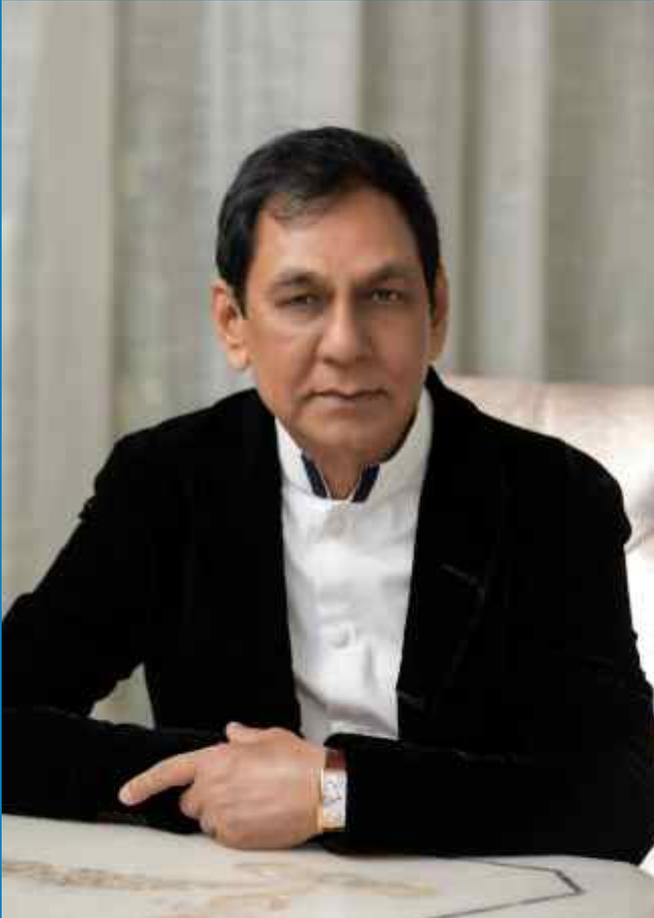
Project Management: Mectech believes in the concept of turnkey responsibility, which includes transportation to site, erection, commissioning and testing of complete plant.

To meet this requirement, Mectech has built up a large and experienced team of highly trained and motivated professionals capable of managing projects of any size and complexity and completing them smoothly on time. The project team is familiar with the special requirements of companies and export jobs.

After Sales Service: We have an experienced and well equipped after sales service set up which is fully capable of undertaking warranty claims (if any), and trouble shooting (if any).

Financial Stability: The Company's financial well-being is robust, enabling seamless order execution without encountering any issues.

Exports: Mectech has been exporting plants and have exported to more than 30 countries.



Chairman's Message:

Mectech Process Engineers was established with a clear vision: to become the leading provider of turnkey solutions in the vegetable oils and fats, oleo chemicals, and biodiesel industries, all while maintaining an unwavering commitment to quality.

We have added new technologies in our basket i.e. for manufacturing of medium chain triglycerides, fatty acid esters such as IP, 2EH, PET through multipurpose esterification units as well as products for the home and personal care markets such as betaine, CDE and amine oxide. Additionally, we have introduced technologies for producing emulsifiers such as glycol mono stearate, castor oil derivatives and dry lecithin powder.

Today, this vision resonates across our organization, embraced by over 400 dedicated professionals who consider it their own. It has empowered our team to serve an expanding clientele worldwide, not only delivering cutting-edge plant and machinery but also introducing innovative products to meet evolving demands.

I extend heartfelt gratitude to our customers across the globe for their continued support and trust.

Ishwar Sahai

“Adaptability
to change is the
key to future”

Over **650+** projects
supplied world over on
turnkey basis during
the last **50 years**

At a Glance

Mectech has secured patents in the following areas :

Filtration

Under patent no. 477636



Crystallizers

Under patent no. 519597



Mectech EXPERTISE

With a powerful team and cutting edge technology as its two pillars, the company is a bastion of reliability and deliverance.

Mectech has carved a niche for itself, in the following processes:

- Oil Milling
- Solvent Extraction
- Vegetable Oil Refining
- Dry fractionation of vegetable Oil (Palm Oil and Palm Kernel Oil)
- Continuous Dewaxing and Winterization of Vegetable Oil
- Hydrogenation of Oil & Fats (Semi Continuous & Fully Continuous)
- Inter-esterification
- Esterification and Transesterification
- Fat Splitting
- Sweet Water Treatment and Concentration
- Glycerin Refining
- Fatty Acid Distillation (Plain/Fractional)
- Lecithin Drying
- Cocoa Butter Substitute
- Flaking and Beading
- Tocopherol / Tocotrienol Extraction from Fatty acids
- Castor Oil Derivative Products
- Biodiesel
- Green field and Brown field project
- Filtration

Mectech ADVANTAGE

- Most Cost Effective Solution Provider
- Most capable and experienced technical team
- Two large & modern fully integrated manufacturing plants
- Technical Collaboration for Advanced Technologies

Mectech UNDERTAKES

- Planning
- Research & Development
- Engineering
- Manufacturing
- Installation
- Commissioning
- Standardization of Projects
- Training of Personnel
- Improvement & Modification Existing Plant



Most Cost Effective Solutions



650+ Projects executed in 30+ Countries



Inception to Completion



Two large & Modern Fully Integrated Manufacturing Plants



50 Years of Expertise



Best in Class



Most Capable & Experienced Technical Team



World Wide Technical Collaborations

Seed Preparation



Seed cooking & flaking

Milling of oil implies the breaking down of the oil seed into a form ideal for efficient extraction of oil. Various processes are combined to achieve this.



Seed Preparation

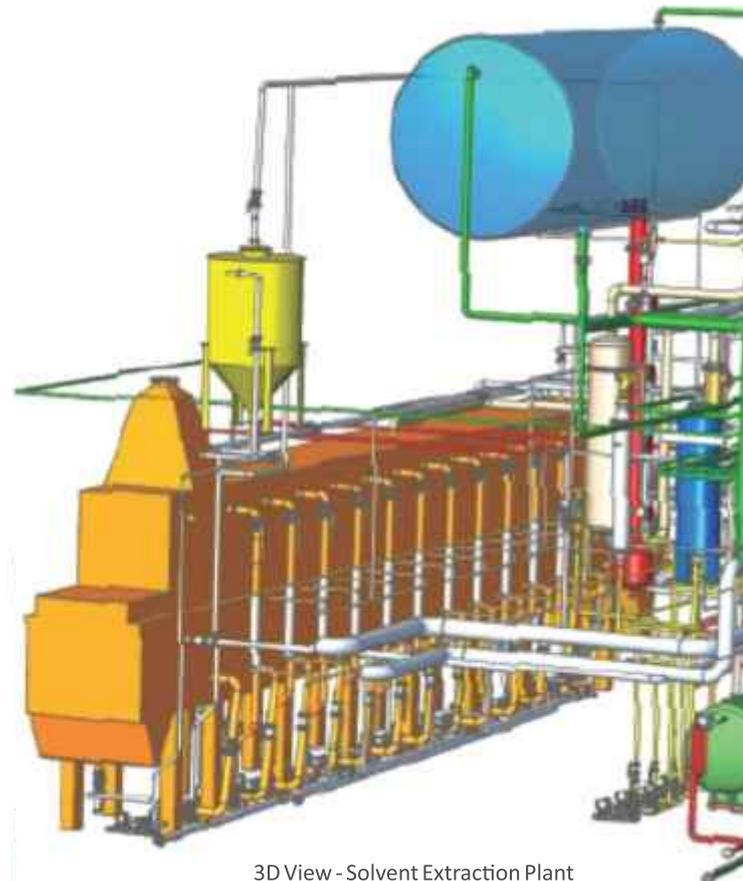
Mectech employs the following milling techniques for seed preparation:

Roller Mill: The seeds are crushed into tiny particles in these mills. The process involves preparation of oil seeds prior to direct solvent extraction.

Flaking Mill: Oil seeds need to be flaked to ensure profitable extraction. This process disintegrates the cellular structure of seeds. The equipment is fitted with smooth rolls, suitable for flaking oil seeds or cakes prior to solvent extraction.

Cookers-conditioner: This equipment is designed to condition the seed for better extraction by heating and adjusting moisture content to optimum level.

Expander- Extrudes the flakes to increase the bulk density of the material, thereby enhancing the percolation of hexane circulation within any raw material to improve the extract ability.



3D View - Solvent Extraction Plant

Solvent Extraction

‘Solvent losses as low as 1.5 Liters per ton of material processed’



MECTECH'S BELT-TYPE HORIZONTAL EXTRACTOR

This extractor comprises of a De-solventizing Toaster, a Distillation System and a Heat Recovery System.

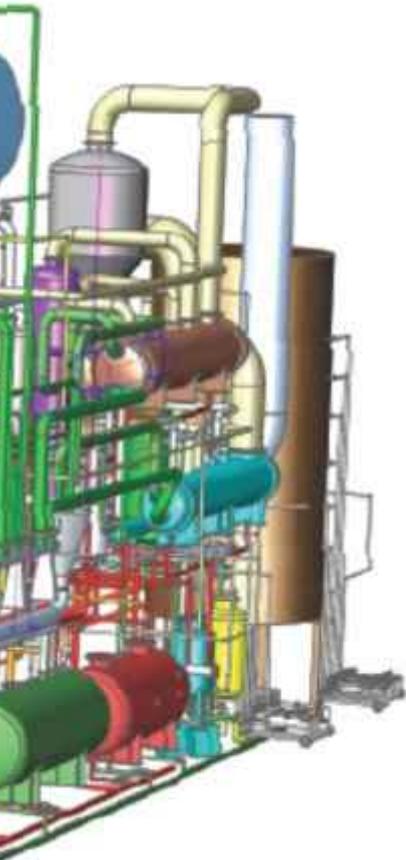
Solvent extraction is a multi level process used to extract oil from the seeds by use of a solvent. Post milling, the meal is transferred to the extractor, where it comes in contact with hexane (solvent). The solids and solvents are the outputs which are further processed and distilled for optimum extraction of oil and solvent removal.

MECTECH ADVANTAGE -

- Latest continuous belt type extractor with multi-spray system.
- Multi-Stage DTDC De-Solventizing toaster to achieve the best quality of DOC, suitable for export.
- Multi-Stage Distillation System and Solvent recovery system to minimize the solvent losses and to have the final oil with optimum flash point.

SALIENT FEATURES

The strides made by Mectech in solvent extraction technology have resulted in achieving very high efficiency. Adapting to the latest technology of extraction equipment, this process involves low hexane loss. Continuous Solvent extraction plants designed and supplied by Mectech are the most efficient and economical in processing cost.



Inside view of Solvent Extraction Plant

Capacity to build and supply plants from 100 to 5000 ton per day

Vegetable Oil Refining



Refining is the process to remove such undesired factors from the extracted oil, without losing out on the useful factors or affecting the composition.

Continuous Longmix, Degumming, Neutralizing & Washing

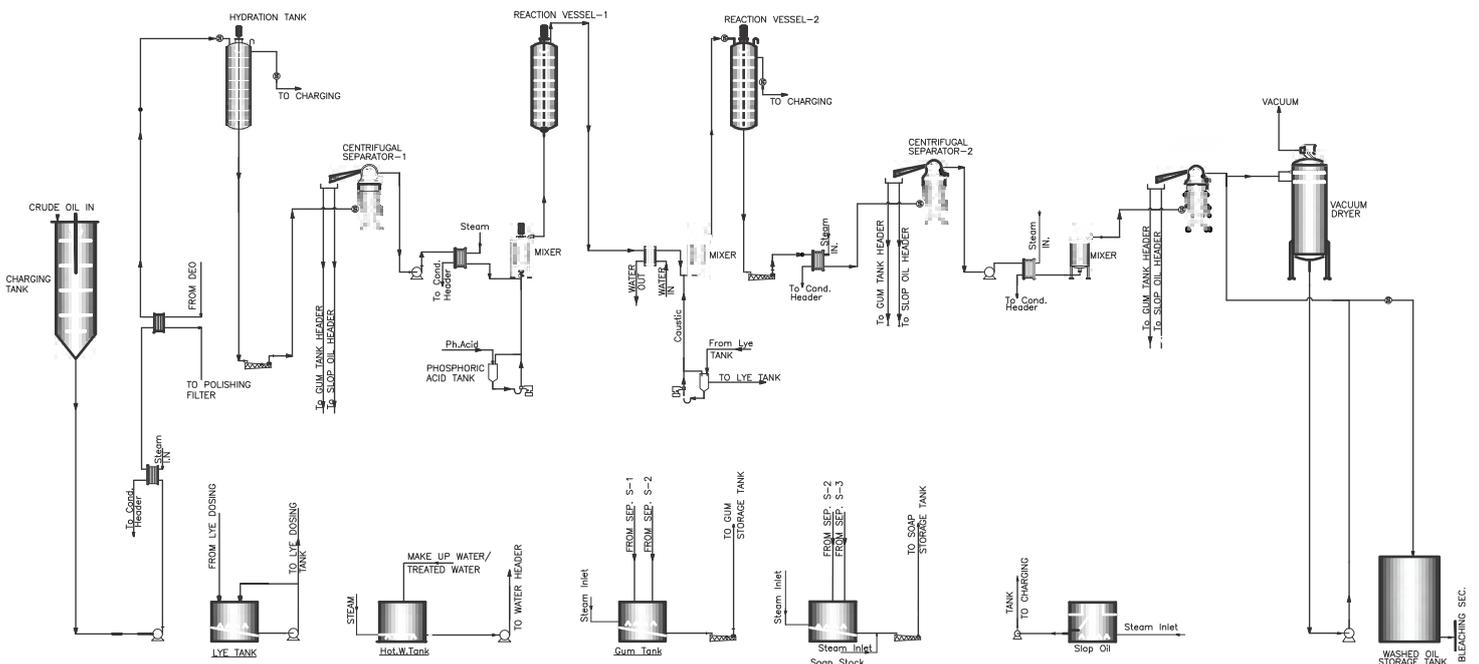


Salient features

For the successful Degumming, Neutralization and Washing of crude vegetable oil, the inherent phosphatides and free fatty acid need to be removed. Mectech achieves this through a highly evolved continuous process, in which Degumming is carried out by reaction with Phosphoric acid under controlled conditions. This reduces the Phosphorous content as well as the Hydratable & Non Hydratable gums. It is a Longmix process

Free Fatty Acids are reduced through reaction with caustic soda in a centrifugal separator under controlled conditions. As a result, fatty acids are removed as soap stock.

The Oil feed is finally washed in centrifugal separator under controlled conditions to achieve refined vegetable oil, free from gums and fatty acids.



Longmix Degumming / Neutralization / Washing section

Continuous Bleaching

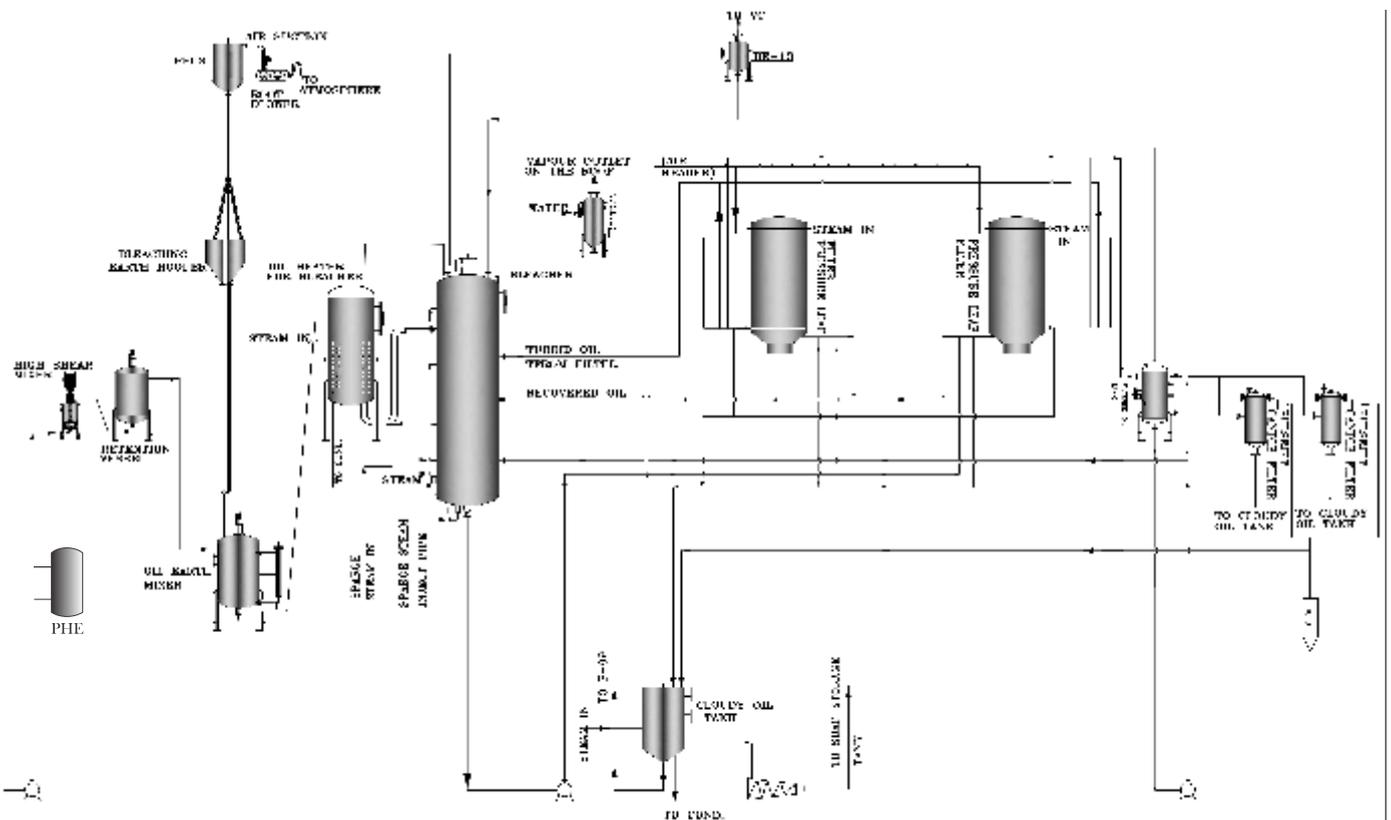
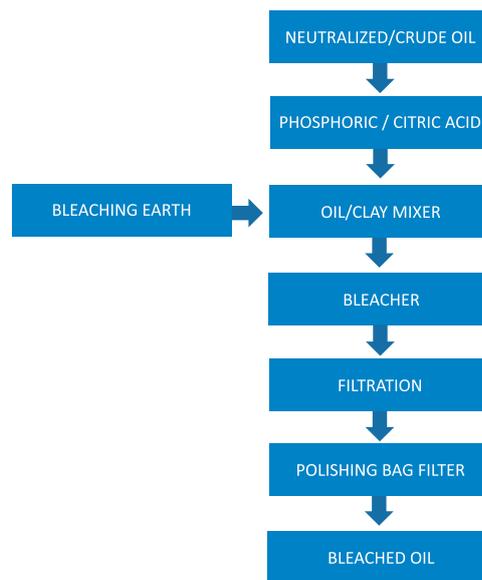


CONTINUOUS BLEACHING FLOW CHART

Mectech Advantage

Mectech's wet bleaching process keeps bleaching earth under suspension thereby avoiding dead areas. This results in lower consumption of bleaching earth.

Mectech's unique design of bleacher requires no mechanical agitation and bleaching is carried out under optimum conditions of moisture content to achieve perfect results. This gives saving in power consumption for the system.



Continuous Bleaching Section

Continuous Deodorization

1. Continuous Deodorizer for High FFA Oils

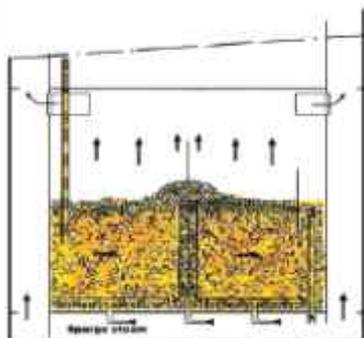
Vegetable oil is heated to the desired temperature in a multi-compartment Vacuum Heater with counter current flow of vegetable oil and heating medium i.e. High Pressure Steam or Thermic Fluid.

Pre-heating is gradual and methodical so that all of the oil comes in contact with this sparging system at the free surface exposed to vacuum.

Packed Column with packings of large surface area is provided on the top of Deodorizer. This ensures reduction of Free Fatty Acids to the desired level.

An additional top heating tray is provided below the Packed Column to compensate for the unavoidable loss of heat due to evaporation of Fatty Acids.

Perfect deodorization is accomplished by providing large free surfacing area contact between oil and stripping steam at an absolute pressure of 2 m bar. This results in furnishing oil surface layer of numerous bubbles having 5 - 10 mm diameter. These small bubbles burst and they discharge the water vapour saturated with distilled fatty acids and the odoriferous compounds. These ascending vapours are immediately and freely taken out into lateral ducts through the large section opening provided on top of each stripping tray. This ensures virtually no pressure drop from top to the bottom tray.

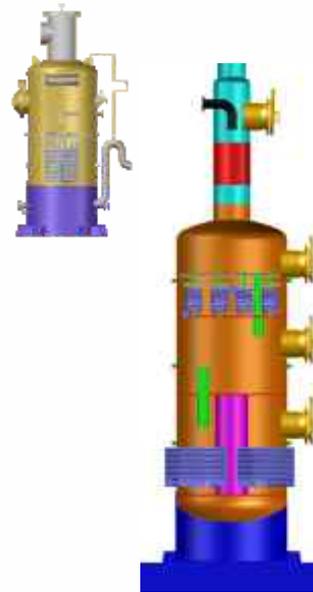


Inside view of Continuous Deodorizing Stripping Tray



Deodorization is a process of removing of-flavors, colors and other undesired constituents like free fatty acids from the pretreated and bleached oils.

Mectech supplies 2 kinds of Deodorizers:



Inside view of Continuous Deodorizer for high FFA oil

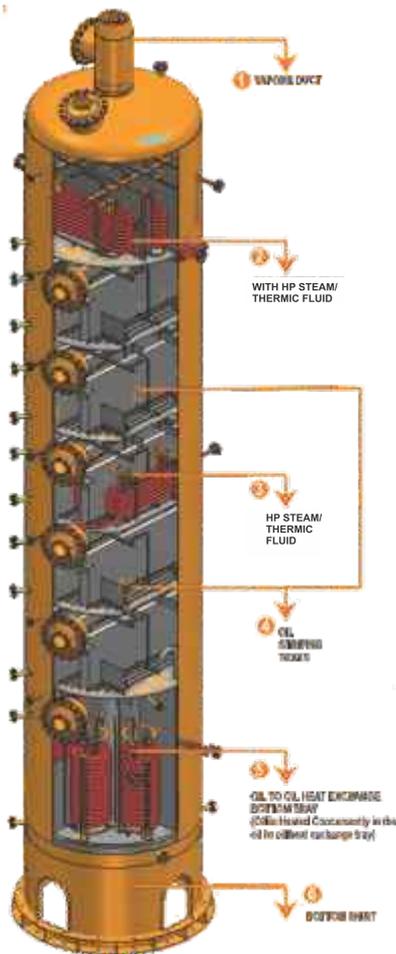


2. Continuous Deodorizer with Packed Column

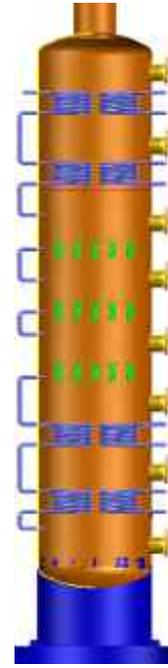
Deodorization is a vacuum stripping process in which a given amount of a stripping agent (usually steam) is passed for a given period of time through hot oil at a low pressure. Hence, it is mainly a physical process in which various volatile components are removed.

Salient features:

1. Most efficiently designed oil to oil heat exchanger fitted in last tray of Deodorizer ensures minimum heat energy requirement.
2. Elaborate and efficient design of fatty acid scrubbing recovery system ensures virtually no carry over fatty acid scrubbing condenser.
3. Most efficiently designed heating coils which prevents charring of oil during the process.



Continuous Deodorizer

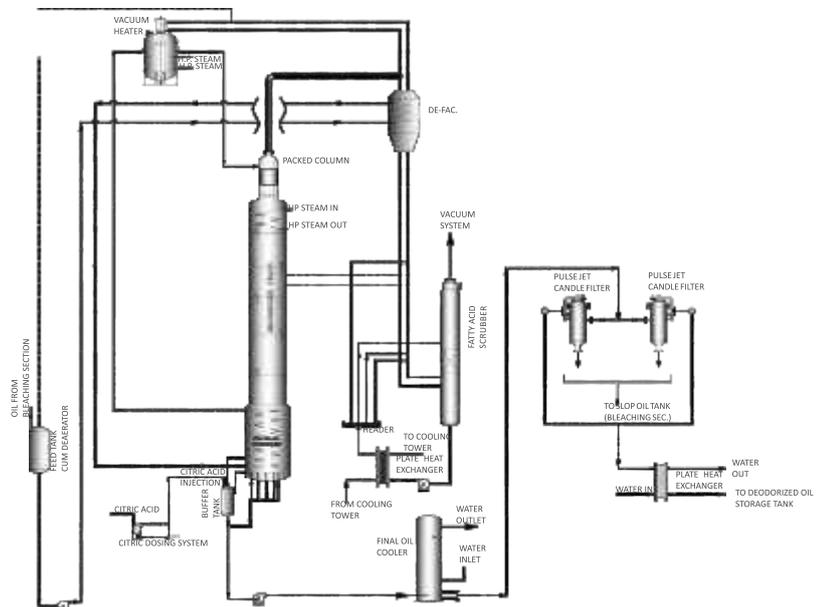


Inside view of Semi-Continuous Deodorizer for specialty fats

3. Semi Continuous Deodorizer for Specialty Fats

Heating of bleached oil is by heat recovered from hot oil of Deodorizer by thermo-siphon arrangement.

Changeover of feed oil at short intervals without any mixing of new feed oil with existing oil under deodorization.



PFD - Continuous Deodorizer for high FFA oil

Continuous Dewaxing and Winterization of Rice Bran Oil/Sunflower Oil

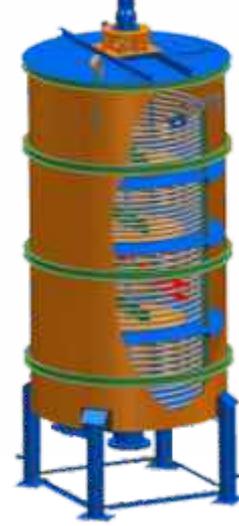
Dewaxing

Dewaxing of oil is a process of eliminating higher melting point constituents like waxes or triglycerides from oil by gradually cooling vegetable oils and separating saturated glycerides from the oil.

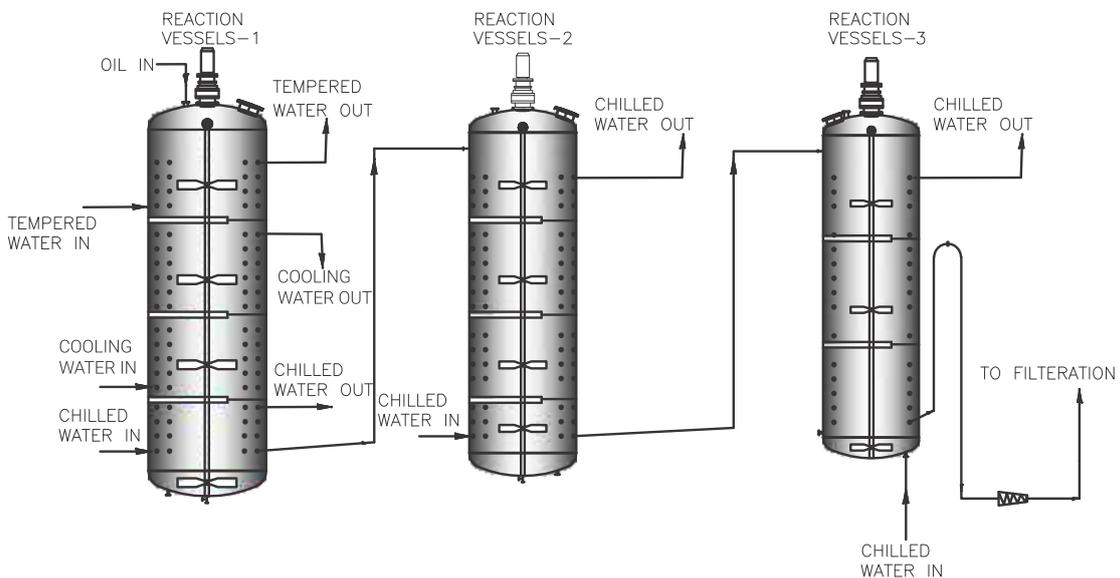
Normally Dewaxing process is carried out at a temperature of (10-14°C) to avoid the crystallization of saturated triglycerides & amalgamation of waxes & Saturated Triglycerides.

Winterization

Waxes & Saturated triglycerides which are fairly visible at low temperatures are removed in this process to keep the appearance oil clean. Degummed, Bleached & Dewaxed oil is cooled and filtered to achieve the requisite quality.



The crystallizers feature a substantial heat transfer area to the oil charge, which patented under patent number 519597



Continuous Dewaxing

Dry Fractionation of Palm Oil

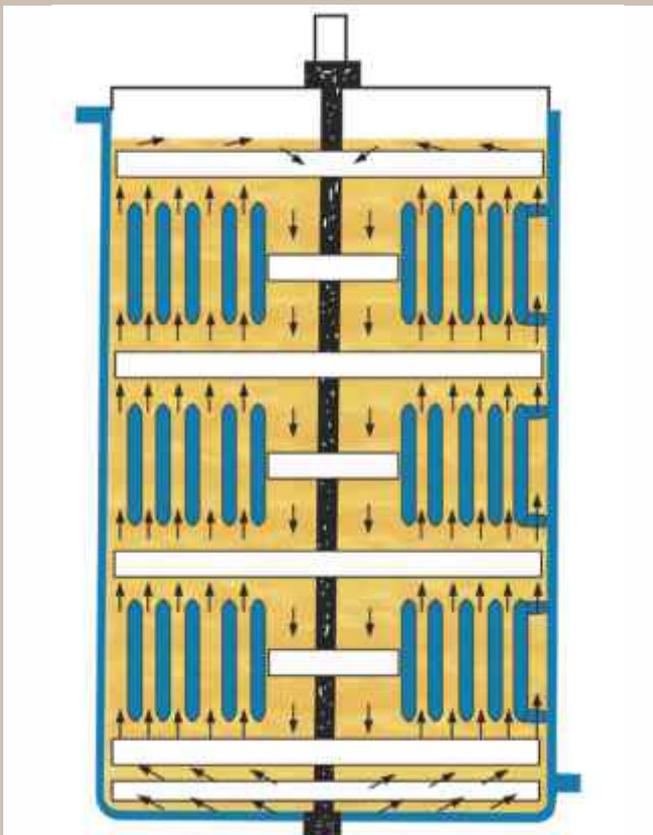
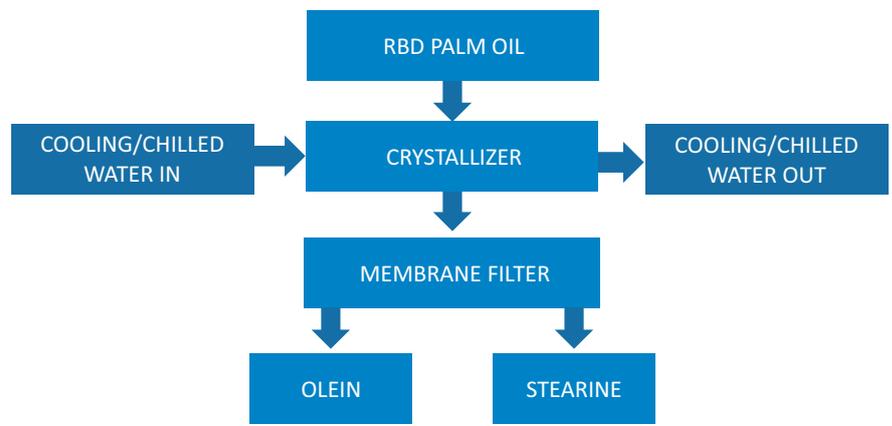


In edible oil processing, a fractionation process consists of a controlled cooling of the oil, thereby inducing a partial, or 'fractional', crystallization. The remaining liquid (olein) is then separated from the solid fraction (stearin) by means of filtration process .

Fractionation is the process where the crystallization of saturated triglyceride takes place in a mechanical equipment called the crystallizer. Crystallized oil is further passed through a filter where separation of solid and liquid phase takes place. Solid phase remains in the chamber. Liquid phase comes out through the taps and is collected in the storage tank.

Entire process takes place in several steps which including: Oil heating, oil charging, and crystallization, filtration, squeezing and cleaning of filter.

PROCESSING FLOW CHART Palm Oil Fractionation



ADVANTAGE

The crystallizers feature a substantial heat transfer area to the oil charge

Optimal position of the heat exchange surfaces with regard to the impellers, which compliment the oil circulation in the vessel.

All parts of the processed oil are driven too close to the heat exchange surfaces.

The cooling programme is applied with precision. At the end of each cooling step the temperature difference between cooling water and oil is close to 1°C.



Double Scrubbing



Double Scrubbing System to improve FFA of fatty acid distillate

This system is included in the Deodorization system to improve the FFA of Fatty Acid Distillate.

Advantage

This FFA increases to 93-94% with the addition of double scrubbing system.

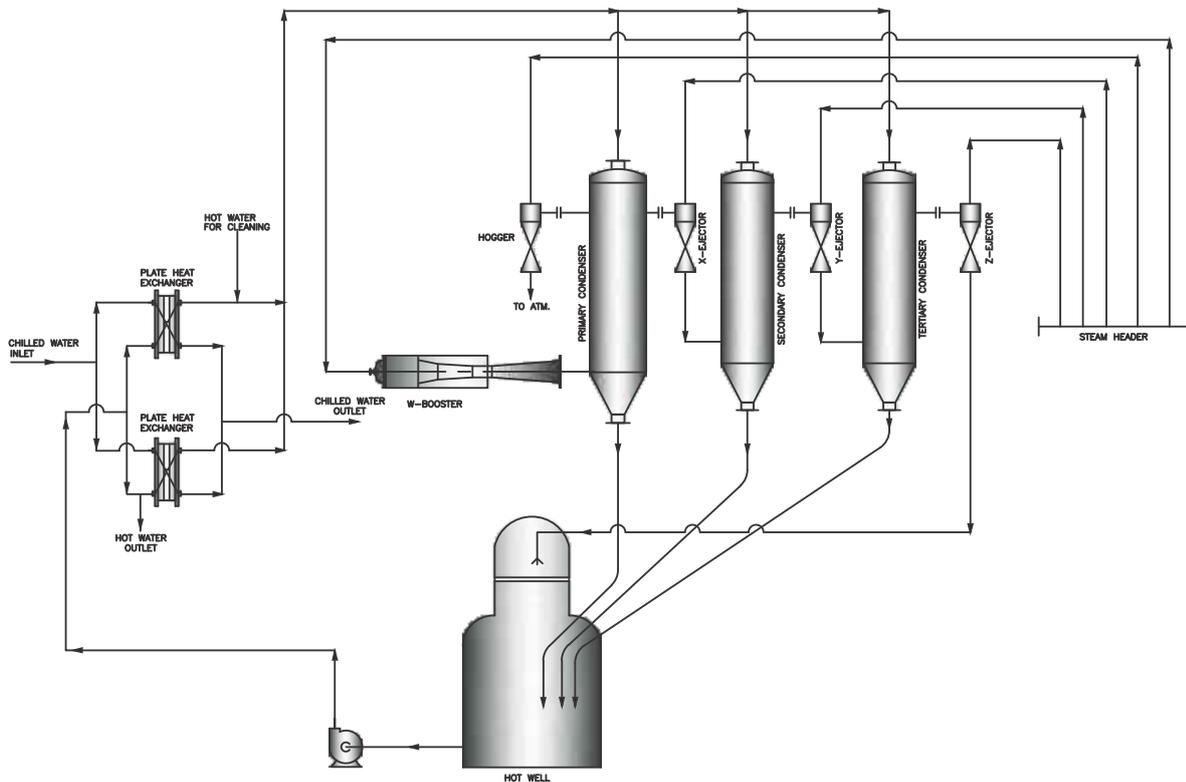
Close Loop Water Cooling for Deodoriser

The implementation of the closed loop cooling water system in the Deodorizer offers several benefits :

It effectively addressed the problem of odour pollution stemming from a contaminated water cooling tower. This method ensures that only a clean water cooling tower is utilized, eliminating the need of contaminated one.

It significantly reduces the production of effluent water, there by minimizing environmental impact.

By employing 7°C cooling water in barometric condensers of the vacuum system, the steam consumption is substantially reduced.



ACL System

Castor Oil Derivatives



Castor Oil is a colorless or pale yellowish oil extracted from the seeds of the castor (*Ricinus Communis*) plant. It is a fatty acid with 18 carbon atoms and a double bond between the ninth and tenth carbons.

It is also known as 12-hydroxyoctadec-9-enoic acid. Its derivatives are processed through subjecting the oil to specific reactions and processes, can yield a wide variety of chemical derivatives, which is used for diverse applications.

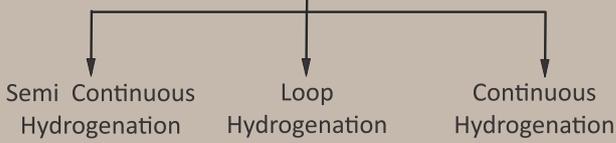
In the plants supplied and erected by Mectech, a range of castor oil derivatives are produced including :

- Ricinoleic Acid
- Hydrogenated Castrol oil (HCO)
- 12- Hydroxystearic Acid (12-HSA)
- Methyl Ricinolate
- DCO Fatty acid (DCOFA)
- Hydrogenated Methyl Ricinolate (HMR)
- Dehydrated Castor oil (DCO)
- Blown Castor oil

Castor oil and its derivatives finds extensive application in various Industries such as soap manufacturing, lubricants, hydraulic and brake fluids, paints, dyes, coatings, inks, cold resistant plastics, waxes and polishes, nylon, pharmaceuticals and perfumes



Hydrogenation



MECTECH ADVANTAGE

The simple procedure of hydrogenation in the presence of Nickel Catalyst is carried out with such perfection that Mectech has become a trend-setter.

Semi Continuous Hydrogenation

The unique design of agitation system enables hydrogenation cycle to be reduced to a minimum.

High degree of automation to control flow, temperature and pressure in autoclave ensures selective hydrogenation and excellent quality product.

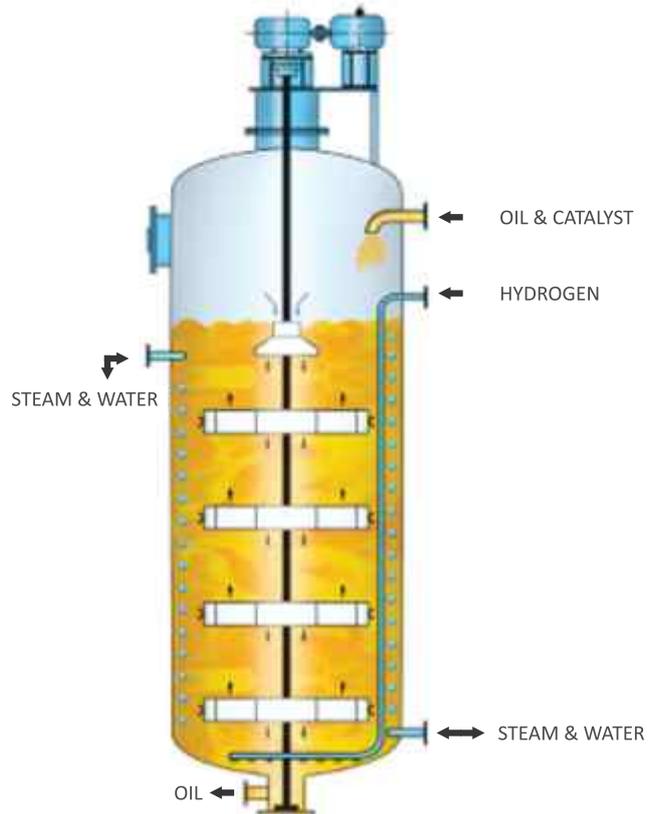
100% reproducibility of product ensured.

ABSTRACT

Zero steam consumption. (Steam is required only once for the first charge of oil while starting the plant operation). This is achieved with the most efficient design of oil to oil Heat Exchanger.

Practically maintenance free – due to low speed agitation system in Autoclave.

Low power and catalyst consumption.



Loop Reactor for Hydrogenation of Oils / Fats

Candle filter with auto wash arrangement are used for filtration of catalyst.

MECTECH ADVANTAGE

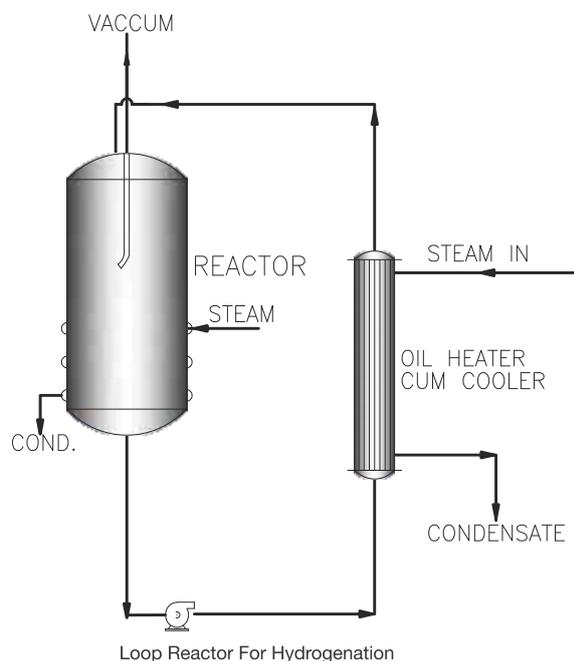
Low iodine value up to 0.5 is achieved.

Nickel catalyst consumption is minimised with high flow rate circulation in reactor.

Temperature control is achieved with high degree of automation.

Continuous Hydrogenation

Hydrogenation of Oil / Fats is one of the largest modification processes in oil & Fats Industry. It consists of the direct addition of Hydrogen atom at double bonds in the Fatty Acid chain.

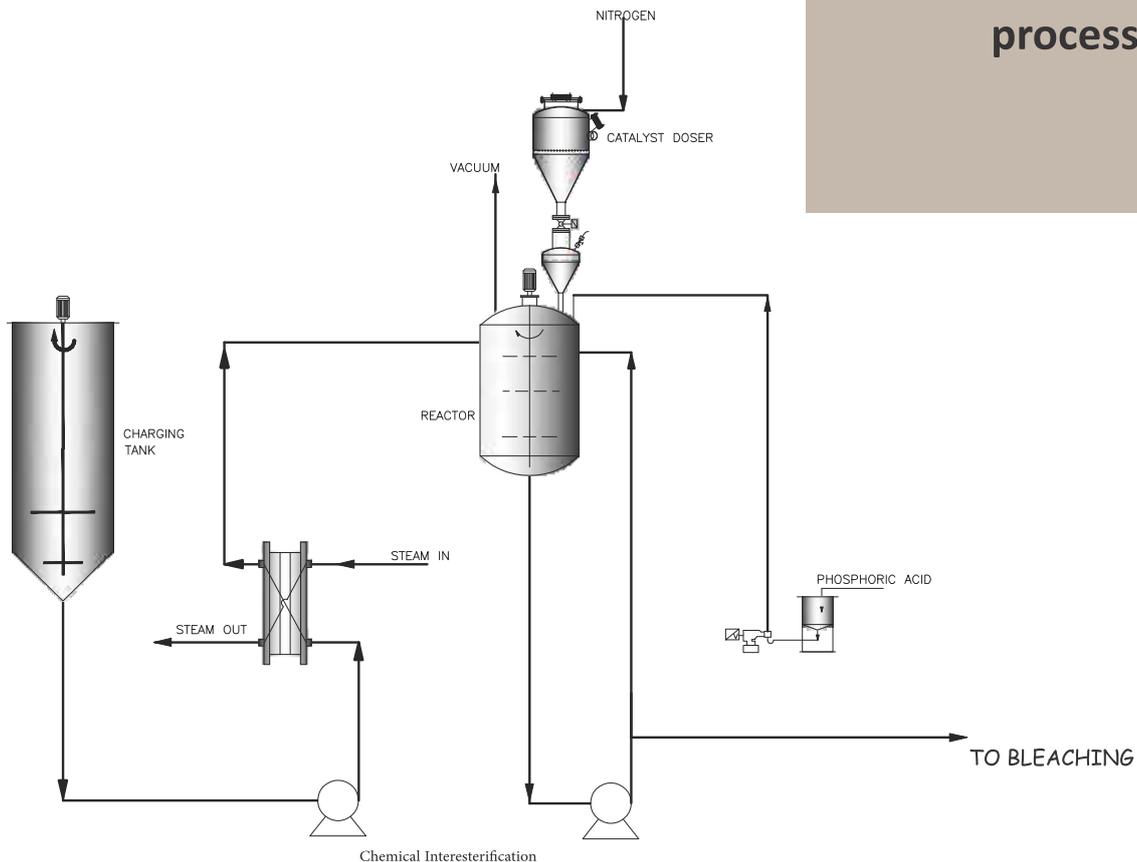


Interesterification



Interesterification is the process of re-arranging the fatty Esters within and between triglycerides resulting in most cases, a change in the physical properties of the oil / fats. Interesterification is the intra and inter – molecular exchange of fatty acids on the glycerol of backbone of triacylglycerols. In this process commonly used catalysts are sodium methylate and ethylate followed by sodium method, Na/K alloy and hydroxides of Na/K in combination with glycerol. The process reacts at low temperatures about 85-90°C used in very low rates of catalyst (0.1% if the starting material is well refined and dried.)

Mectech provides chemical as well as **enzymatic Interesterification processes**

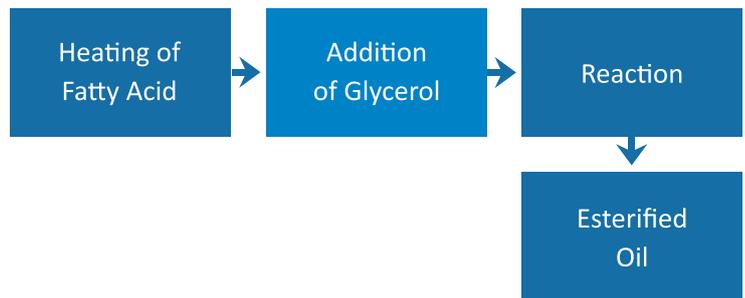


Glycerolysis



It is well known that Oil is the ester of Glycerol and fatty acids, which can be decomposed in to their original constituents (Fatty Acid and Glycerol) or synthesized in to Triglycerides by Fatty acids and glycerol.

GLYCEROLYSIS PROCESS



ABSTRACT

Glycerolysis reaction is reverse of Hydrolysis process. It is carried out by reacting fatty acids with glycerol. In addition to esters, water is also a product of Glycerolysis. The reaction is reversible and proceeds to completion only if water is removed from the medium. The equilibrium between the forward reaction (Glycerolysis) and the reverse reaction (Hydrolysis) is controlled by water content of the reaction mixture. In the presence of excess water, hydrolysis predominates, whereas under water eliminating conditions Glycerolysis is favored.

MECTECH ADVANTAGE

Mectech supplies PLC automated continuous Esterification plants to convert fatty acids into oil with 0.1% final FFA.



MCT from Coconut Oil, & PKO

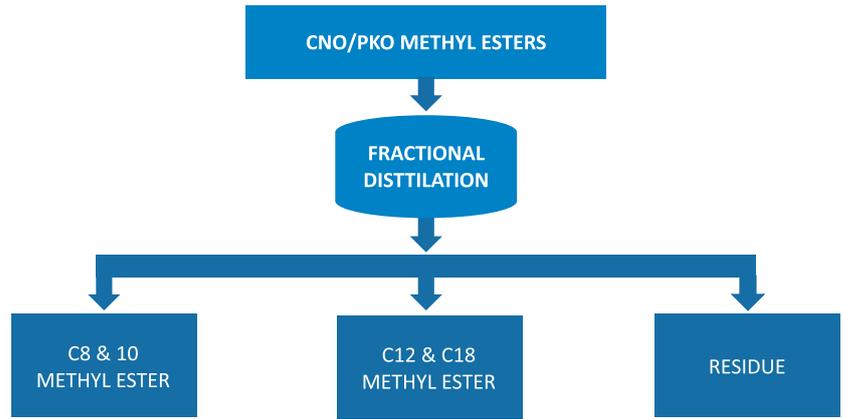


Medium Chain Triglycerides (MCT) are Triglycerides whose fatty acids have an aliphatic tail of 6-12 carbon atoms.

The fatty acids found in MCT's are called Medium Chain Fatty Acids (MCFA's). Like all Triglycerides MCT's are composed of a glycerol backbone and three fatty acids.

In case of MCT's, 2 or 3 of the fatty acid chains attached to glycerol are of medium length.

FRACTIONAL DISTILLATION



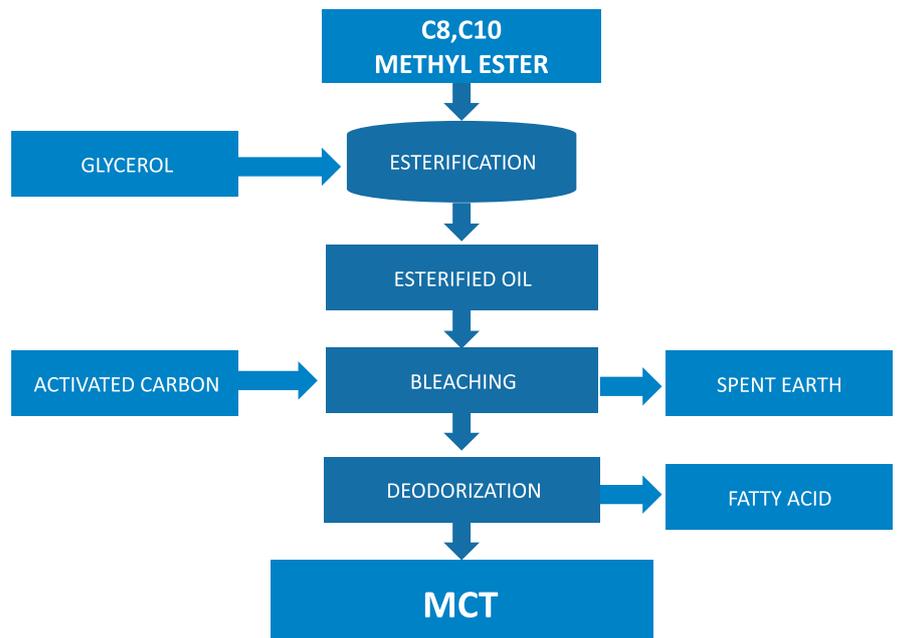
APPLICATION

Dietary Relevance

Medical Relevance

Technical Uses

PROCESSING STEPS FROM CNO/PKO METHYL ESTER TO MCT

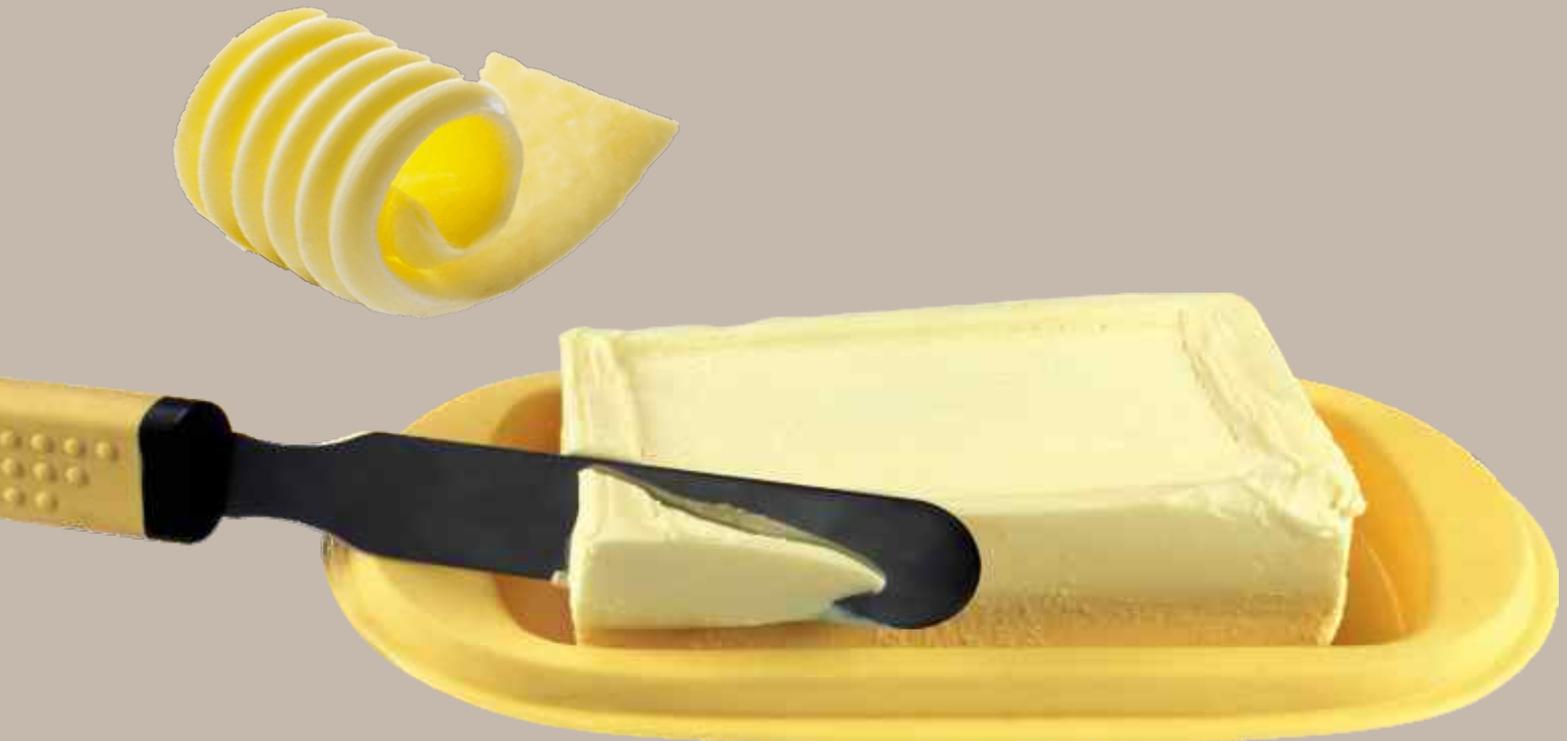
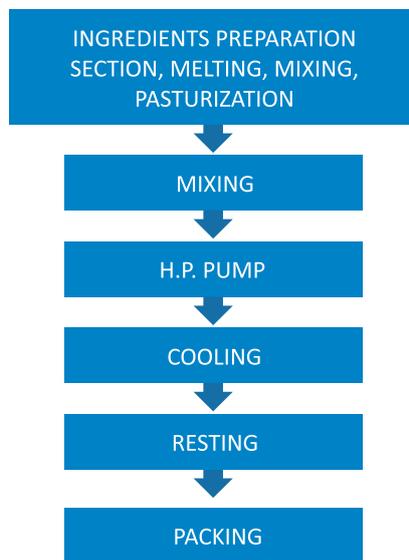


Bakery Shortening & Margarine



Shortening occurs when any type of solid fat is used to prevent the formation of a gluten matrix in baked goods, allowing for the creation of non-elastic pastries like cakes. Lard, hydrogenated (solidified) oils, and even butter can be used as shortening. Usually, shortening refers to hydrogenated oil.

MARGARINE PROCESS FLOW CHART



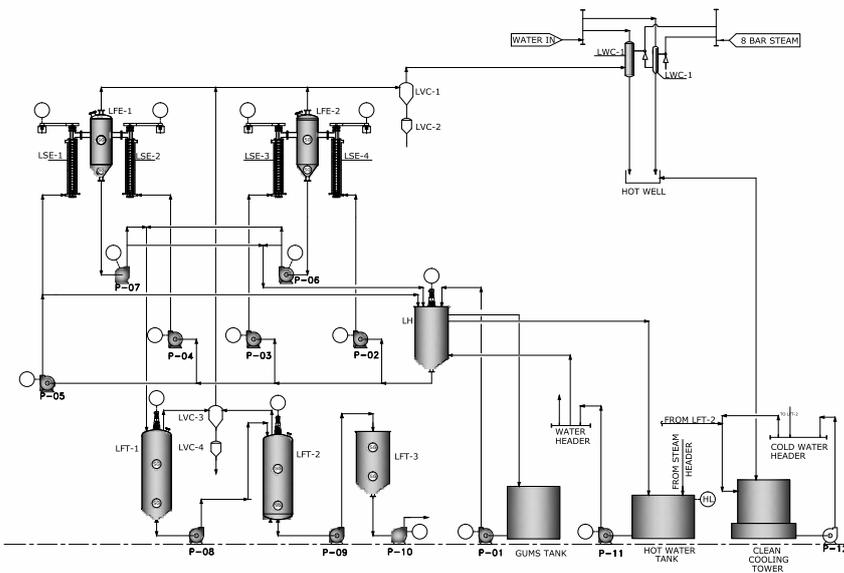
Lecithin



Recovery of wet Lecithin is done from hydratable gums of soyabean oils, rice bran oils and sunflower oil.

Lecithin is the predominant source material for food and pharmaceutical. Food lecithin is usually de-oiled to improve its functionality. The major phospholipids as listed below are the source of the Lecithin

- Phosphatidylcholine
- Phosphatidylethanolamine
- Phosphatidylinositol
- Phosphatidylserine
- Lysophosphatidylcholine
- Lysophosphatidylethanolamine
- Phytoglycolipids
- Phytosterines



The fractions enriched with phosphatidylcholine & phosphatidylinositol are effective emulsifiers in water and are commonly utilized in the chocolate industry.

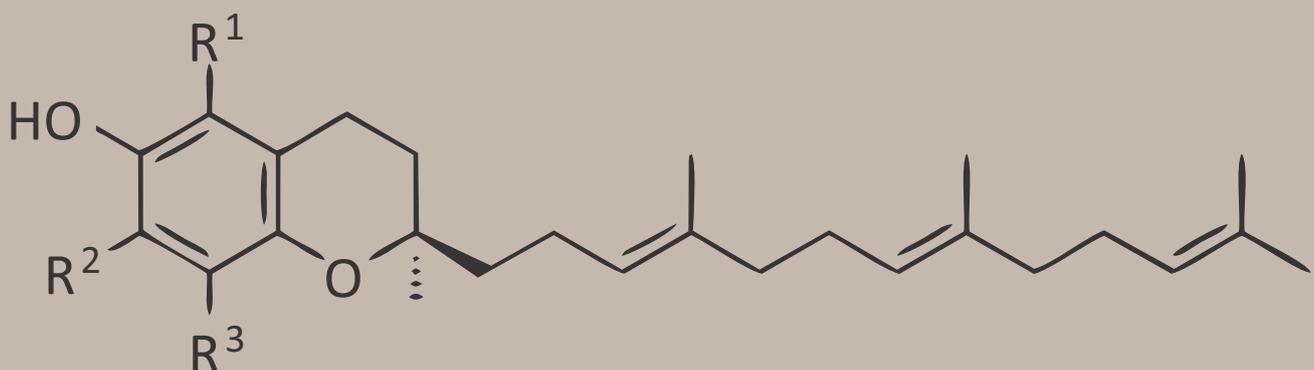
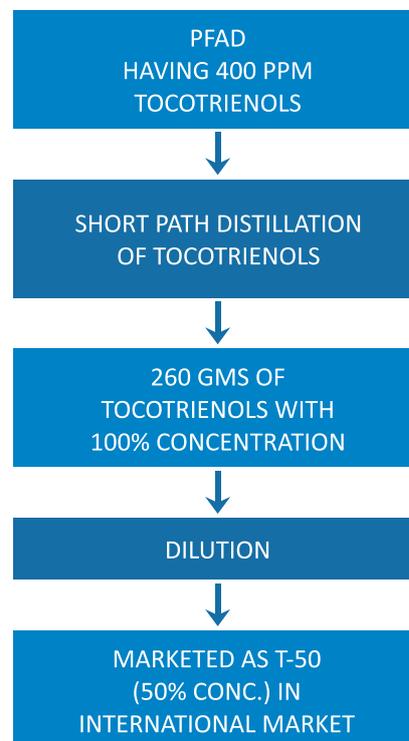
Tocotrienol



Tocotrienols encompass all the compounds that happen naturally occur at higher levels in numerous vegetable oils. These span across palm oil, rice bran oil, wheat germ, barley and certain other types of seeds, nuts and grains, as well as the oils derived from these.

The vitamin E family has two closely related groups encompassing them. These comprise four Tocotrienols categorized as alpha, beta, gamma, delta as well as four Tocopherols- similarly categorized as alpha, beta, gamma, delta. The critical and the significant chemical structural difference between the two is that Tocotrienols have unsaturated isoprenoid side chains with three carbon-carbon double bonds. Tocopherols, on the other hand, possess saturated side chains.

Processing Steps: Tocotrienols from PFAD



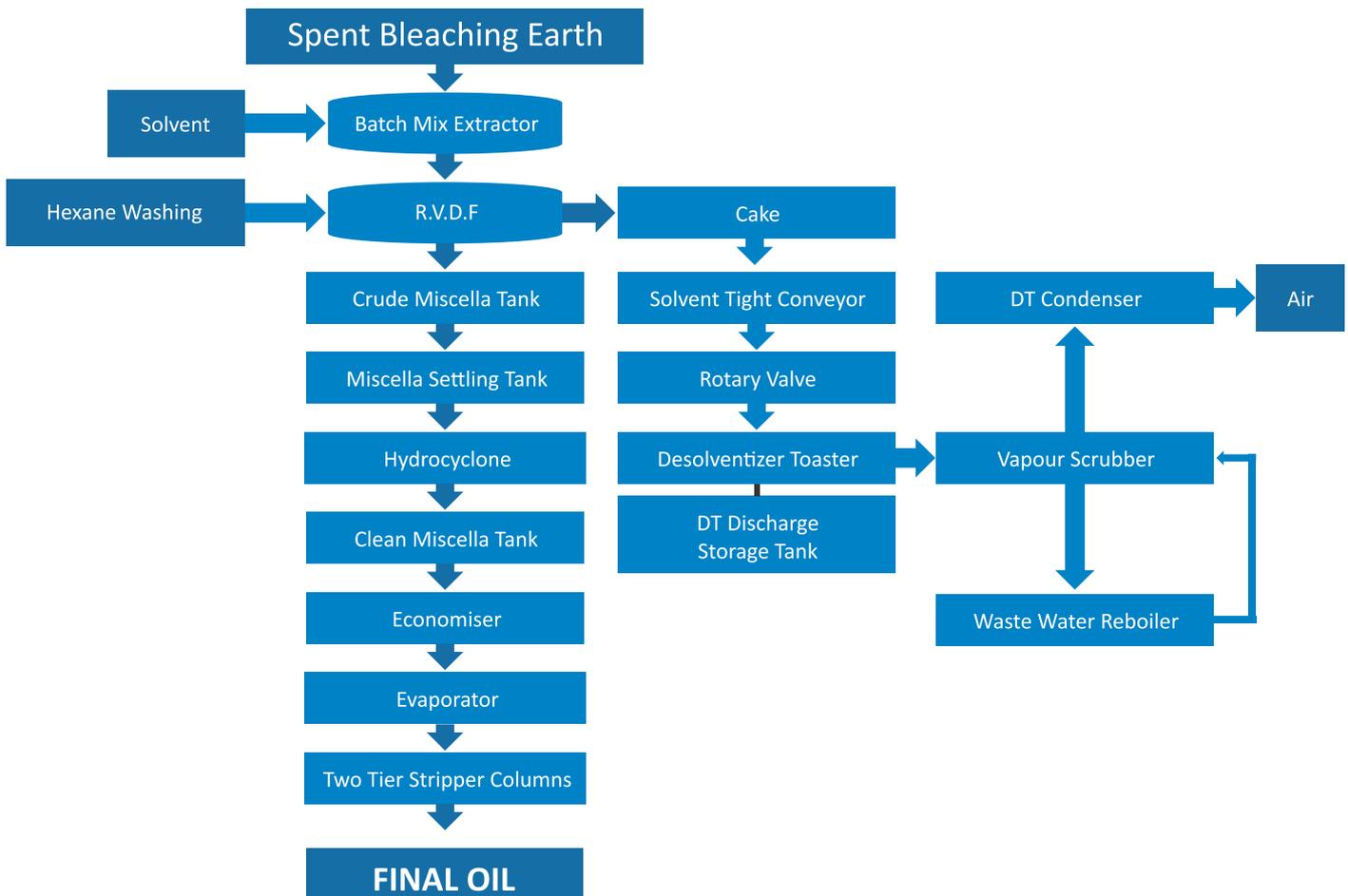
Spent Earth Oil Recovery



The process refers to recovery of oil from spent bleaching earth recovered from vegetable oil refining process. The process involves three sub-processes comprising of a) reacting the spent bleaching earth with a solvent selected from a group consisting of toluene, acetone, xylene, isopropyl alcohol or n-hexane at a temperature between 35°C. to 50°C.; b) separating the solids and liquid from slurry formed in the previous step; and c) extracting oil from the liquid fraction obtained in the previous step. The separation of the solids and the liquid from slurry can be achieved in two steps. The slurry mixture of solids and liquid is first separated into a solid fraction and a liquid fraction. The solid fraction so separated still contains a significant portion of oil. Therefore, the solid fraction is reacted with some solvent. The other slurry of solids and liquids is again separated into a solid fraction and a liquid fraction.

Typical Vegetable Oil Physical Refining process involves the Degumming of Crude Vegetable Oils such as Palm Oil to remove Gums and Phosphatides by Hydration with Phosphoric Acid, which is then settled out as Soap Stock. This reduces the Phosphatides in the Oil to approx. 20ppm. This oil is then bleached with Activated Earth in order to reduce the color in the Oil and, more importantly, to remove Peroxides, Residual Gums and Soaps which still exist, despite the prior separation process Industries such as the Crude Palm Oil Refining industry, large quantities of Spent Earth is generated and there exists a strong need to recover the Oil in the Spent Earth in an economical manner.

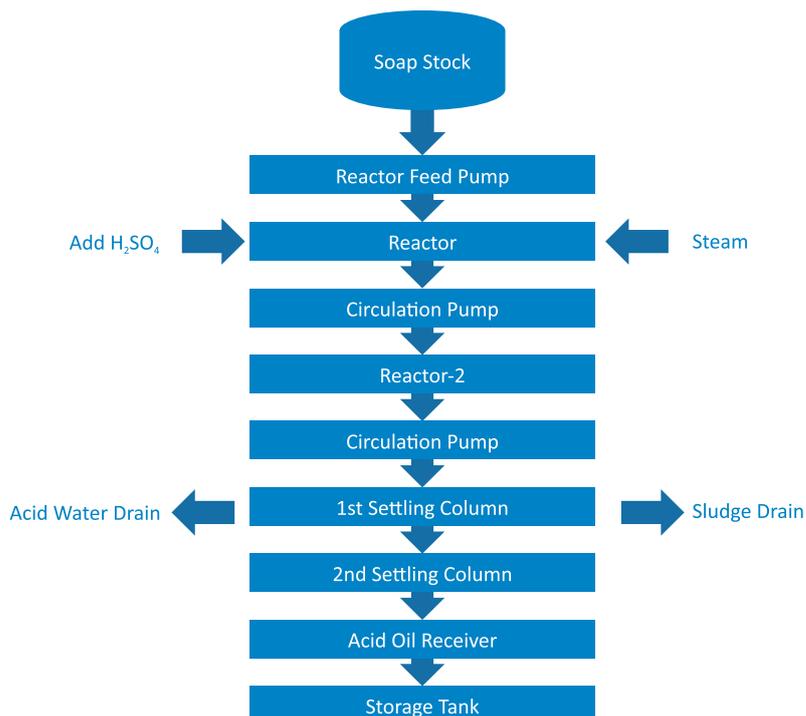
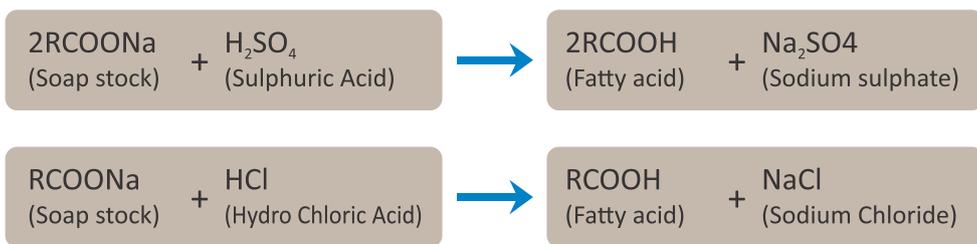
PROCESS FLOW CHART



Soap Stock Splitting



Acid oil is produced by splitting of vegetable oil soap stock with sulphuric acid or hydrochloric acid. Splitting process can be performed either in batch or in continuous process, but considering the production cost and quality of acid oil, continuous process is more economical than the batch process.



Continuous Saponification Plant



PROCESS DESCRIPTION

ABSTRACT

Mectech provides Continuous Saponification Plants ranging in capacity starting from 1 TPH. Soap Noodles are manufactured from the Fatty Acids of oil and fats derived from vegetable oil. Soap Noodles have a wide application in the manufacture of Toilet Soaps, Laundry Soaps and Bathing Bars.

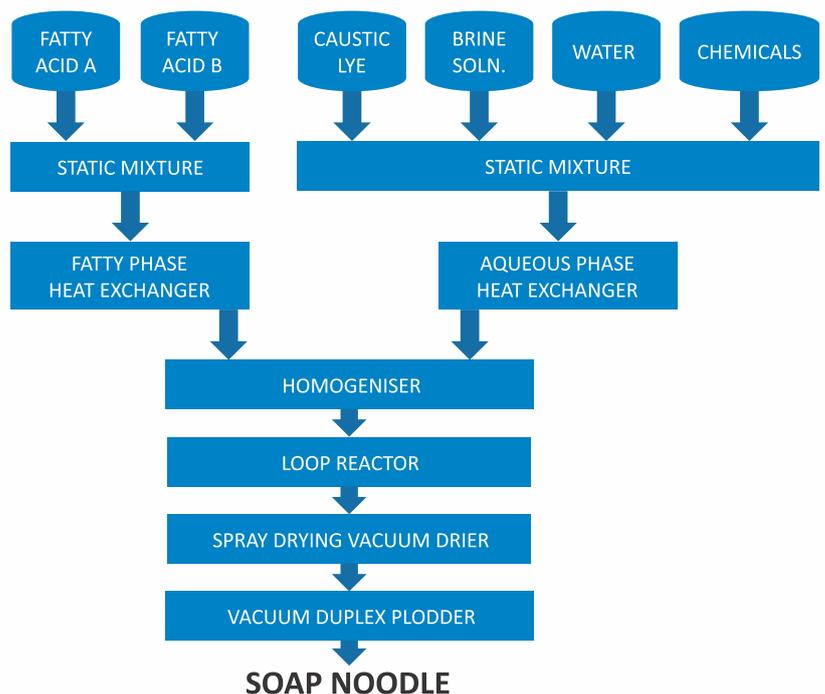
Measured and controlled streams of Fatty phase and aqueous phase, from their respective constant level dosing tanks, are pre-heated up to 95°C (max) before entering into the homogenizer. Fatty phase is a blend of fatty acids. The aqueous phase comprises of Caustic Lye - to saponify fatty acids, Brine Solution- to maintain the viscosity and other chemicals - to enhance the shelf life of the soap noodle as well as the final product. In the homogenizer, neat soap temperature is raised upto 135°C without using any external steam. This rise in temperature is brought about by the heat liberated from exothermic saponification reaction. The saponified mass then passes through a loop reactor for maturing and gives a constant flow of neat soap to Vacuum Spray Drier. The neat soap is sprayed into the vacuum spray drier to convert liquid neat soap into dry soap by removing moisture following which it goes into vacuum duplex plodder to produce soap noodles of desired TFM.

We use mass flow meters of very high accuracy (0.1%) and the signal is directly in Mass flow Units. Intensive mixing of the fluids in homogenizer provides a homogenous product at a faster rate. The continuous process allows easier achievement of a good and constant product quality because the operations are all instrument based and do not rely on operator inputs. This process produces clean neat soap. Continuous Saponification process requires lesser Steam, Water and Power which in turn minimizes Operating Cost and Payback Period.

MECTECH ADVANTAGE

- Plant is Fully Automatic.
- This is the only Continuous Saponification plant which gives precise control over free alkali content in Soap Noodle.
- No external heating of Neat Soap is required which in turn minimizes the utility consumption.

PROCESS FLOW CHART



Bio Diesel



Biodiesel refers to the addition of a methyl /ethyl group to the aliphatic chains in vegetable oils or animal fats rendering them equivalent to the properties of diesel. This is achieved by chemically reacting lipids (e.g., vegetable oil, Fatty acids, animal fat and used cooking oil) with an alcohol (Methyl/Ethyl) producing fatty acid esters.



Feed Stock

The feedstock for Bio Diesel can be categorised into two broad segments, viz:

- Low Grade Feed Stock**
Which includes used cooking oil, Acid Oil, Low grade fatty Acid, High FFA vegetable oil
- High Grade Feed Stock**
This includes Low FFA vegetable oil (CPO, Soya, Sunflower, etc.), Palm Stearin, High Grade Fatty Acid & Tallow

Blends

- Blends of biodiesel and conventional hydrocarbon - based diesel are products most commonly distributed for use in the retail diesel fuel marketplace. Much of the world uses a system known as the "B" factor to state the amount of biodiesel in any fuel mix
- 100% biodiesel is referred to as B100
- 20% biodiesel, 80% Petro diesel is labeled B20
- 5% biodiesel, 95% Petro diesel is labeled B5
- 2% biodiesel, 98% Petro diesel is labeled B2

Highlights

The plant is capable of manufacturing Bio-diesel conforming to EU (EN 14214) and BIS 15607:2005 standards.

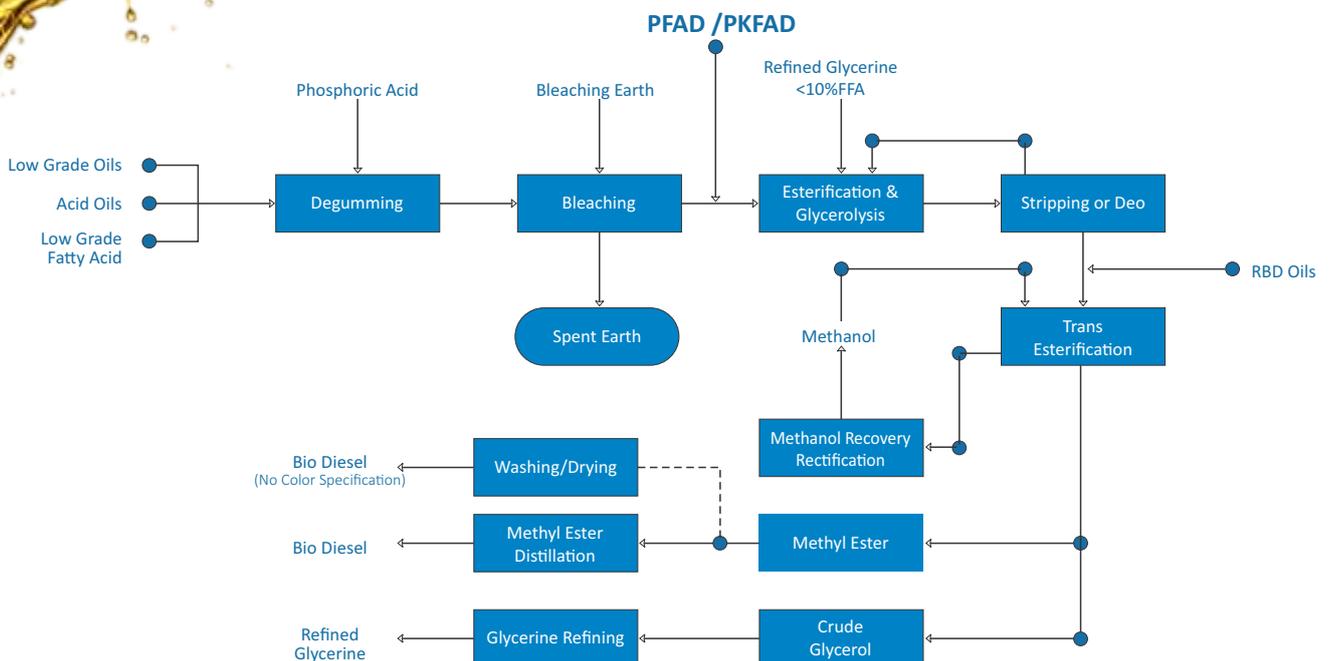
Extremely low Sulphur content; which helps checking Air Pollution.

Better industry benchmarks in ash & moisture content, total contaminations and carbon residue indicators.

Salient Features :

- Fully automated PLC-operated multi-feed stock system
- Various feed stock, including vegetable oil, used cooking oil, refinery by-products & animal fats can undergo processing
- Energy-efficient plant design
- High conversion rates
- Production of high quality bio-diesel meeting international standards
- Minimal soap formation
- Soap removal without methanol usage
- Reduced catalyst consumption
- Low methanol consumption
- Low waste water
- Low utility consumption
- Low emission levels
- Entire process conducted at temperatures ranging from 50-60 degree Celsius
- Pharmaceutical grade glycerin production
- Customizable plants available in both batch and continuous types

Process Flow Chart



PRE-TREATMENT OF WASTE OILS FOR HVO FEED

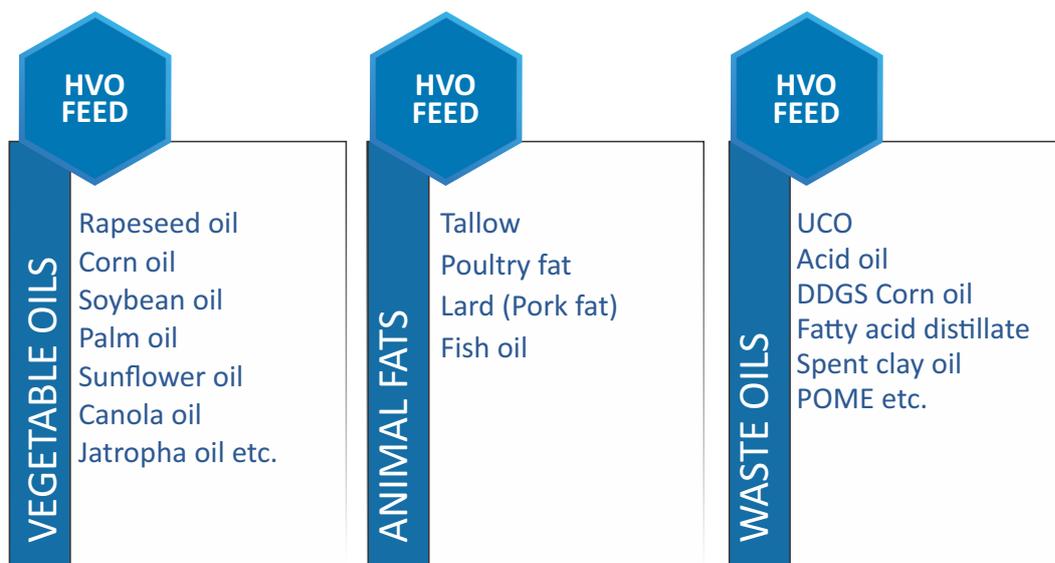
BRIEF DESCRIPTION ABOUT HVO

- Hydro treated Vegetable Oil (HVO) is a type of renewable diesel produced through the hydrocracking of vegetable oils and animal fats. This process involves breaking down large molecules into smaller ones using hydrogen, or adding hydrogen to molecules.
- HVO is known for its high cetane number, which means it ignites easily and burns cleanly. It is free from sulfur, oxygen, and aromatic hydrocarbons, making it a cleaner alternative to traditional fossil diesel.
- HVO can be used in existing diesel engines either on its own or blended with conventional diesel.

COMMON FEED STOCKS FOR HVO

- Hydro treated Vegetable Oil (HVO) is a type of renewable diesel produced from various feedstock's. These feedstock's are primarily renewable and can include:
- **Vegetable Oils:** Commonly used oils such as rapeseed oil, sunflower oil, and soybean oil.
- **Animal Fats:** By-products from the meat industry, such as tallow, Chicken fat and Lard.
- **Used Cooking Oils (UCO):** Recycled oils collected from food processing and restaurants.
- **Waste Oils and Fats:** Including those from industrial processes and other waste streams.

FEED STOCKS FOR HVO



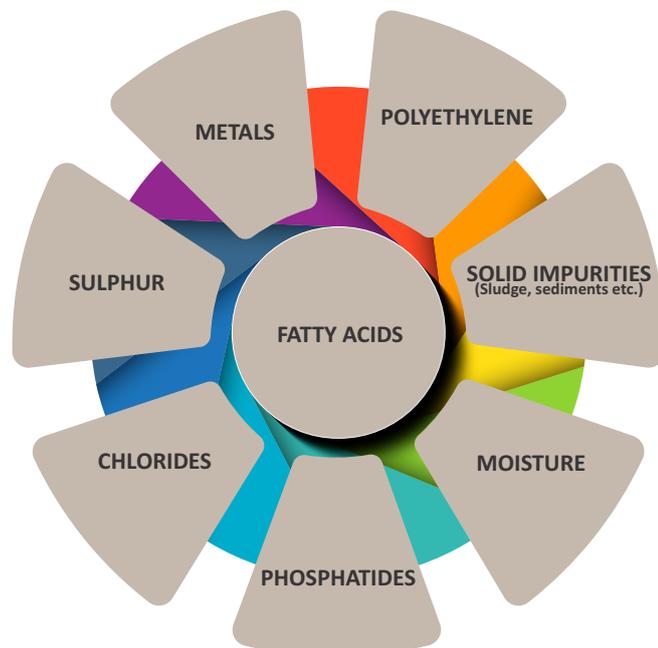
IMPURITIES AND CONTAMINANTS IN WASTE OILS

Here's a brief overview of the impurities and contaminants commonly found in various types of waste oils:

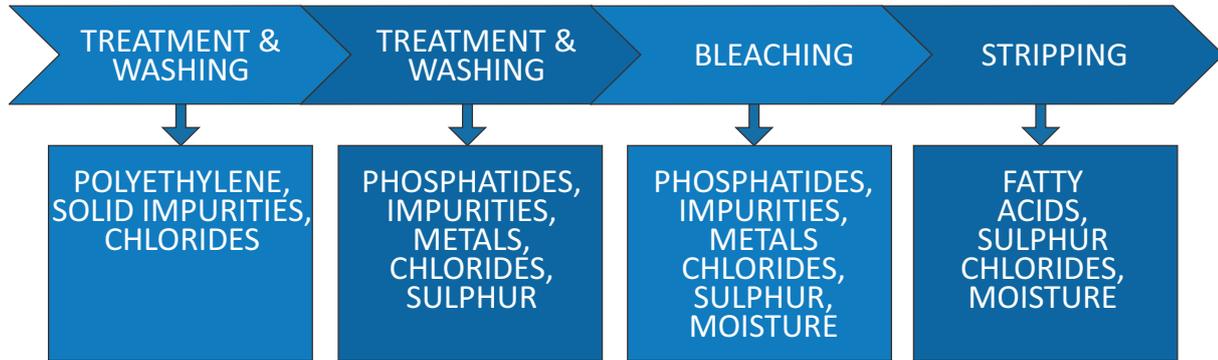
- **Acid Oil:**
 - **Impurities:** Free fatty acids, water, and residual chemicals from the refining process.
 - **Contaminants:** Dirt, metal particles, and other solid residues.
- **Palm Oil Mill Effluent (POME):**
 - **Impurities:** High levels of biochemical oxygen demand (BOD) and chemical oxygen demand (COD), suspended solids, and oils.
 - **Contaminants:** Carotenes, pectin, tannins, phenolic, and lignin.
- **Used Cooking Oil (UCO):**
 - **Impurities:** Free fatty acids, water, and degraded oil components.
 - **Contaminants:** Food particles, burnt residues, and sometimes cleaning agents.
- **Distillers Dried Grains with Soluble (DDGS) Corn Oil:**
 - **Impurities:** Residual proteins, fibers, and free fatty acids.
 - **Contaminants:** Dust, dirt, and processing chemicals.
- **Tallow:**
 - **Impurities:** Free fatty acids, water, and Unsaponifiable matter.
 - **Contaminants:** Dirt, metal shavings, and other solid residues.

These impurities and contaminants can affect the quality and usability of the waste oils, necessitating proper treatment and purification processes before reuse or disposal.

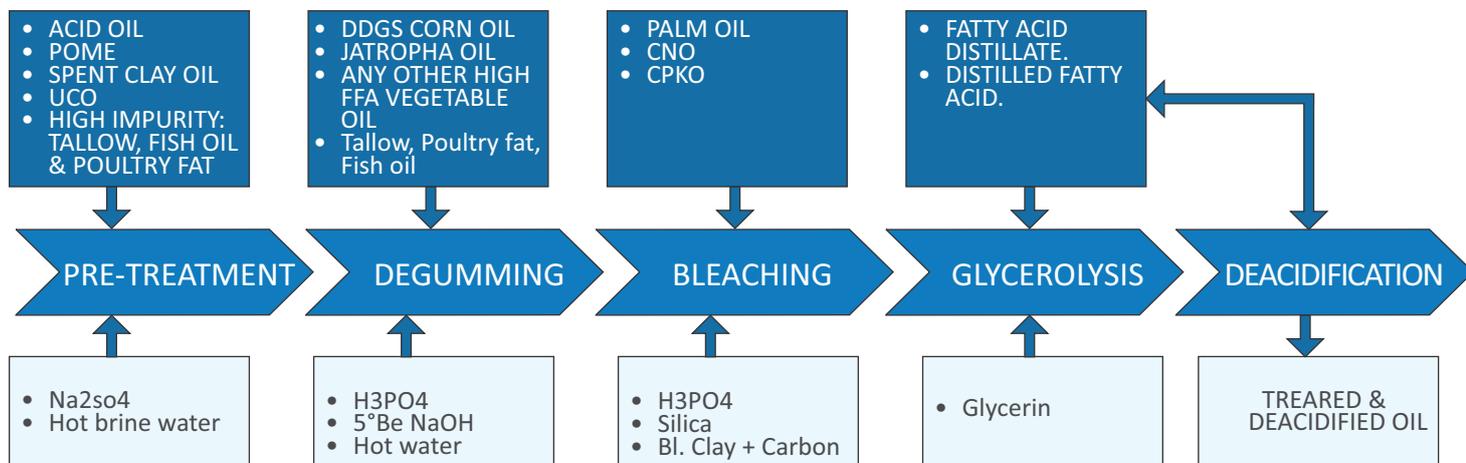
- **Animal Fats:** By-products from the meat industry, such as tallow, Chicken fat and Lard.
- **Used Cooking Oils (UCO):** Recycled oils collected from food processing and restaurants.
- **Waste Oils and Fats:** Including those from industrial processes and other waste streams.



DIAGRAMMATIC EXPRESSIONS OF PRETREATMENT PROCESS

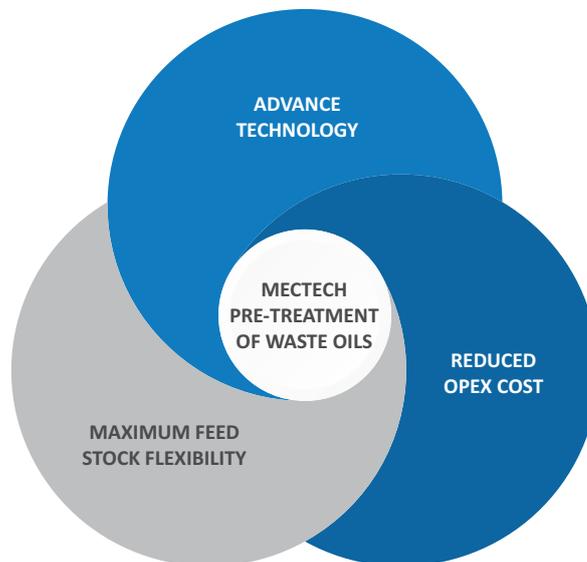


DIAGRAMMATIC EXPRESSIONS OF TREATMENT PROCESS WITH DIFFERENT FEED MATERIAL



MECTECH ADVANTAGES

- Advance technology can streamline and optimize treatment processes, leading to high efficiency in waste oil conversion and purification.
- In house engineering allows quick troubleshooting, maintenance to minimizing downtime and ensuring continuous operation.
- Flexible design, allowing maximum number of feed stocks.
- Advance technology often requires less energy and fewer chemical consumptions.
- Customized design for available feed stock and capacity.





Fat Splitting Plant

Splitting is the process through which the triglyceride hydrolysis is carried out, breaking up the molecules to obtain fatty acid and glycerine. The mechanism of this reaction goes through three steps – the triglyceride is successively transformed into diglyceride, monoglyceride and glycerine, liberating fatty acid in each step. Mectech has built several plants for thermal pressure splitting of fats and oils with water into fatty acid and glycerine. It is a simple economical process and does not pollute the environment. Mectech provides Fat Splitting Plant ranging in capacity from 30–1000 TPD.

Process Description

The continuous, counter-current, high pressure fat-splitting process is the most efficient of the current methods of fat hydrolysis. The high temperature and pressure used permit short reaction time. Full counter-current flow of water and oil produces a high degree of splitting without the need of a catalyst. The splitting tower is at the heart of the process.

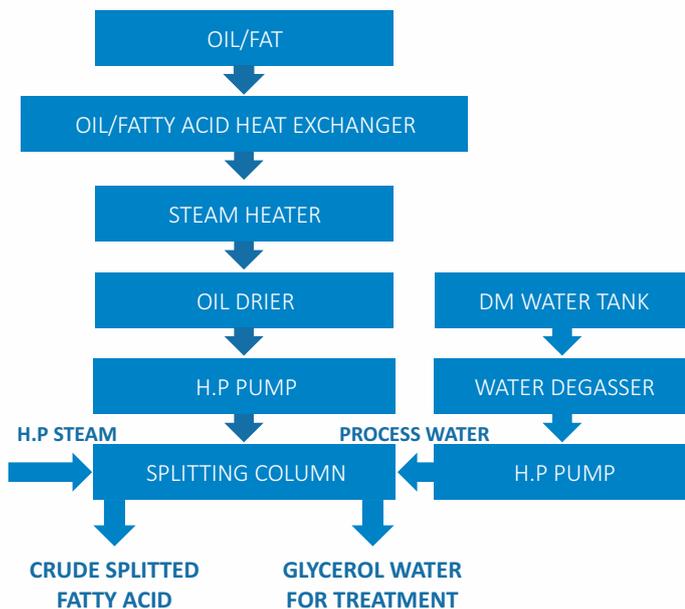
The Process water is introduced from the top and flows down through the continuous up-flowing oil phase. This is then dispersed with efficient distributors at the top and after regular intervals to ensure a MINIMUM SPLITTING DEGREE OF 99%.

High pressure steam (60 bar g) is injected into the splitting tower at 3 points.

- Bottom Steam: To bring input oil to temperature of splitting column, provide heat for reaction, and solubilisation netted against heat from outgoing sweet water.
- Middle Steam: Provide heat of reaction, maintain the optimum temperature for the splitting reaction.
- Top Steam: To bring water to temperature of the splitting column, netted against heat from outgoing Crude Fatty Acid and heat of water de-solubilisation.

Split fatty acids exits from the top of the splitting tower and sweet water from the bottom

FAT SPLITTING - FLOW CHART



MECTECH ADVANTAGE

- This is a Single Tower Design
- Our splitter working at the modern pressures of 50 - 55 bar G gives high degree of splitting 99%
- The splitter design has internal heat exchangers for heat recovery of outgoing streams.
- Distributors are placed strategically that redistribute the two phases that allow us to achieve this level of splitting efficiently.
- The splitter volume allows for 4 hours of residence time in order to fully complete the splitting.
- This section in our plant includes Pre-Concentrators to recover heat from the Flash Steam so that the sweet concentration from the process is in the range of 26–30% rather than the 10–11% that is obtained in older technology systems. Furthermore, heat is also recovered from the outgoing products.

Glycerine Recovery Glycerine Water Treatment & Evaporation



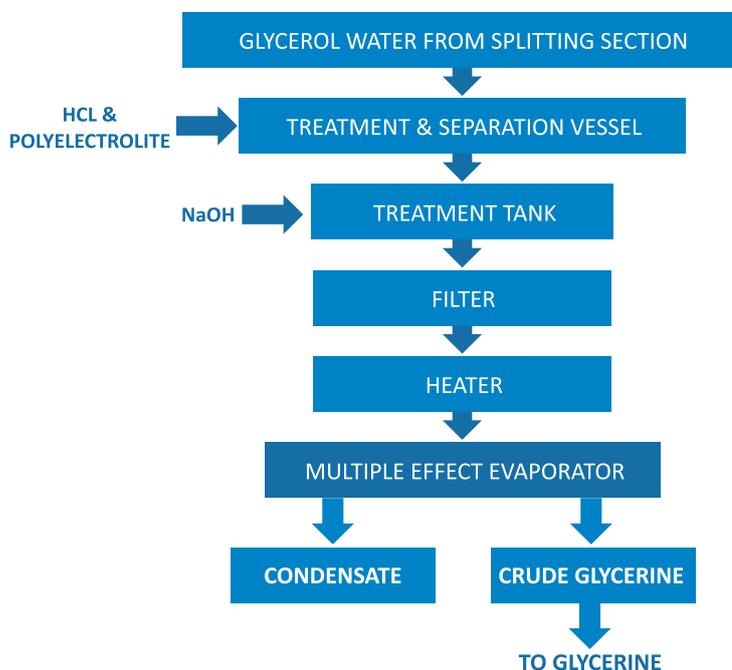
Glycerine is a ubiquitous substance that is widely found in nature and has a broad range of uses ranging from Cosmetics to Food Products. Mectech has long experience in the Oils & Fats and Oleo-Chemical industry sectors which has long been associated with the production of Glycerol as a by-product. Plants executed by Mectech produce Glycerol by the following means – the Transesterification of Methyl Esters, from Fats Splitting and by Saponification which is used to produce soap.

The Glycerine / Sweet Water purification and evaporation allows maximum recovery and pre-treatment before evaporation to produce Crude Glycerine. The pre-treated sweet water is concentrated in Triple Effect or Quadruple Effect Evaporation systems under vacuum. The use of multiple effects reduces the requirement of steam.

ADVANTAGE

- Energy saving devices attached to Splitter reduce the size of Glycerine Evaporation Plant thereby reducing the Overall Consumption of UTILITIES for the Sweet Water Pre- Treatment and Evaporation Section.
- MULTIPLE EFFECT EVAPORATION SYSTEM is designed for Glycerine Evaporation which makes efficient use of Steam required for Evaporation.
- The Condensate water from the System is collected and RECYCLED FOR SPLITTING.
- The extremely efficient HEATING CANDLES strip the last possible traces of Glycerine from the residue to maximum recovery.

GLYCERINE WATER PRETREATMENT AND EVAPORATION- FLOW CHART



Fatty Acid Plain/ Fractional Distillation



FATTY ACID PLAIN DISTILLATION

Fatty acids from splitting tower contains several impurities, such as odour bodies, unsaponifiable matter, aldehydes, water, together with high boiling components—unsplit glycerides, phosphatides, etc. These impurities are removed by adequate distillation in order to obtain a pure product with light colour and good stability. Distillation is one of the most effective purification techniques. It is an economical and successful method of producing high purity fatty acids.

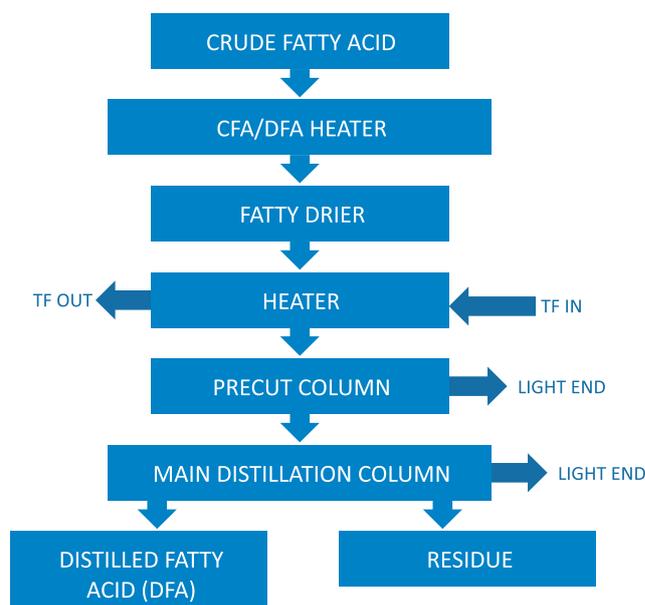
FATTY ACID FRACTIONAL DISTILLATION

Fractional distillation is used for separation of Fatty acid mixtures into composite cuts or even individual components.

This process is used to produce high purity fractions of fatty acids.

The fatty acids are fractionated in fractionation columns having structured packing which allow high separation efficiency and low pressure drop. Falling films are provided to gently evaporate the liquid phase and vapors are condensed in surface condenser. The operation depends on the feed composition or is based on the origin of raw material and the product fractions composition or purity. The number of fractional distillation column are selected and operated in series.

FATTY ACID DISTILLATION FLOW CHART



ADVANTAGE

- The Pre-Cut Column allows the system to handle the worst possible feed-stocks available in the market today like PFAD, Acid Oils etc., and still produce a high grade Distilled Fatty Acid for Soap Noodles
- Optimizes the recovery of heat and produces 3 bar steam for use Reduces the thermal stress on the product by the use of Falling Film Evaporators
- Mectech system has a structured packed column for efficient distillation and separation of odours, colours and fractions
- The use of the internal heavy end sections results in the best product colour

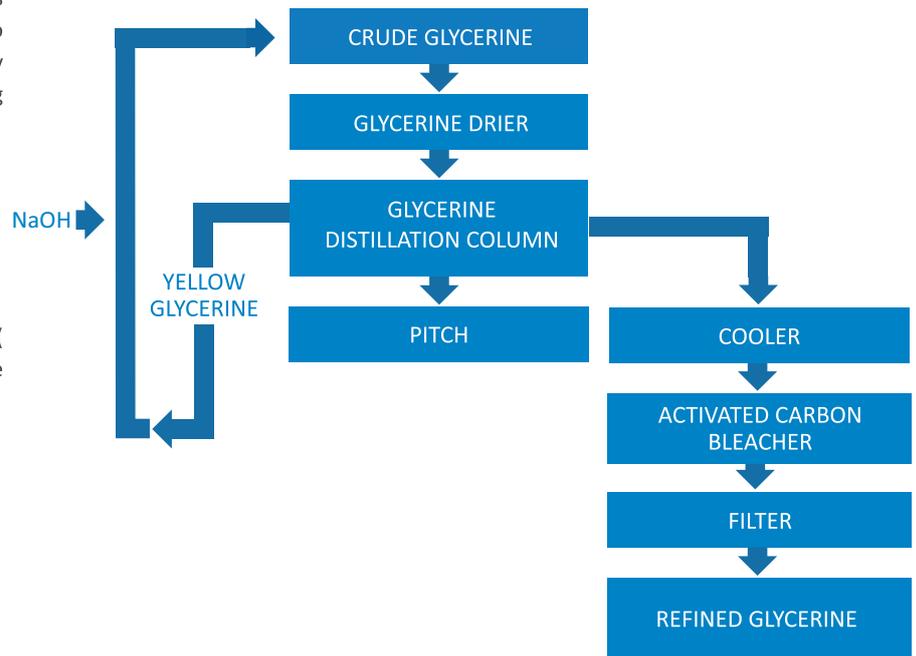
Glycerine Refining



The Crude Glycerine obtained from the process of Oils / Fats splitting (Sweet Water Crude) OR Saponification (Spent Lye Crude) OR Trans esterification (Biodiesel Crude) can be converted to Refined Glycerine of different grades (Chemically Pure, Industrial or Pharma) by using the following processes in sequence

- Drying cum Deaeration
- Distillation & Deodorization
- Bleaching
- Salt Decanter or Agitated / Wipe Film Evaporator (Optional – To improve yield & reduce waste generation)

GLYCERINE REFINING - FLOW CHART



ADVANTAGE

- Low Energy consumptions
- Maximum Yield
- Packed column design

Pilot Plants



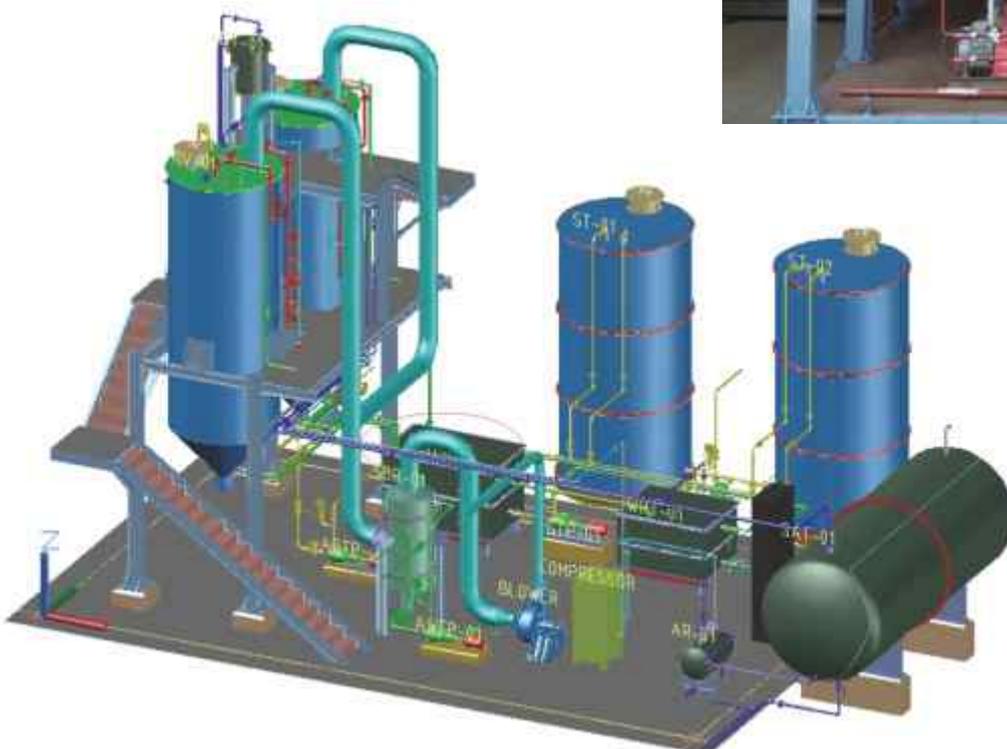
Mectech' recognizes the fact that R & D is an integral part of any manufacturing company who wish to launch a new product in the market. For the said purpose, Pilot Plants are required for ascertaining the desired product parameters , taste, composition , look & feel etc., before going for mass production.

Mectech Process Engineers, can provide pilot plants from the capacity of 1 Ton/ Day to any capacity as desired . The Pilot Plants offered by Mectech are 100% customized and can be made skid mounted or can be set up in the R & D Shed of the customer.

Mectech can provide Pilot plant for the following:

- Vegetable oil Refinery
- Fractionation
- Hydrogenation

Apart from the same if any other pilot plant is desired with respect to Vegetable oil Refining & Oleo Chemicals, Mectech' will consider the same & shall extend all cooperation.





Multiple trains

The reduced staffing that automation makes possible, coupled with the enormous expansion in data work-up and mining capabilities offered by today's computers will promote the increased use of multiple trains. This will increase the complexity of pilot plants as well as their support and maintenance requirements — but the added

productivity and effectiveness will outweigh the higher costs. Such setups may consist of multiple trains on the same unit or multiple copies of a single unit, depending upon the organization's requirements. They will provide not only traditional data but also more-in-depth analytical and operational results for use in evaluation and design.

Unit size

The days of the size of pilot plants shrinking every generation are probably realistically approaching an end. However, the use of very small high-throughput "pilot plants" (which actually are more akin to very complex experimental equipment) will increase. These high-throughput units will handle much of the screening currently performed more slowly and expensively in standard small pilot plants. Highly automated pilot plants then will run the promising leads at a more realistic and scalable range, to evaluate synergistic effects and operations at transient conditions as well as process conditions more realistic of a plant environment. The combination, when properly applied, will produce a greater number of high quality leads faster, and provide a means to screen these for the next generation of process or product improvements. Modeling will continue to augment and validate pilot-plant operations and, in the always symbiotic relationship, pilot plants will continue to augment and validate modeling.



MecKlear Gravity Filter



Filtration

Under patent no. 477636



The **MecKlear** Gravity Filter showcases Mechtech's most recent advancement in filtration technology patented under patent no. 477636. In this, the filtration process occurs at low pressures thereby restricting the passage of fine wax particles in the filtered oil. The clarified winterized oil after filtration through the MecKlear Gravity Filter is better as compared to the results obtained from Horizontal pressure leaf filter / plate and frame type filter. The MecKlear Gravity filter ensures removal of wax and stearin in a more scientific way while preventing oil spillage and no manpower.

Dewaxing &
Winterisation



Mecklear Gravity Filter suitable for Dewaxing and Winterization



Technical Specifications

Mecklear Gravity Filter can be supplied with a filtration area varying from 100 M² to 400 M²

Utilities:	
Air	0.5 bar pressure
Steam	3 bar pressure
Water	Temperature will vary as per process requirement.
Range of temperature	2°C to 22°C
working pressure & temperature:	Shall vary as per process and technical specifications of oil.

Salient features of Mecklear Gravity Filter

No Hiflow required for filtration, saving in cost of Hiflow and oil loss with it.

No manual operations ensures savings on manpower costs

All operations can be automated via PLC according to customer's need

Enhanced Operational Convenience

Removing wax/stearin after filtration is quicker with requiring the filter to be opened.

Prevents spillage due to closed system

The filter is cooled to desired operating condition for next cycle efficiently in a short amount of time

Saves on maintenance costs as absence of moving part precludes maintenance

Filter element replacement required after 1½ to 2 years of operation

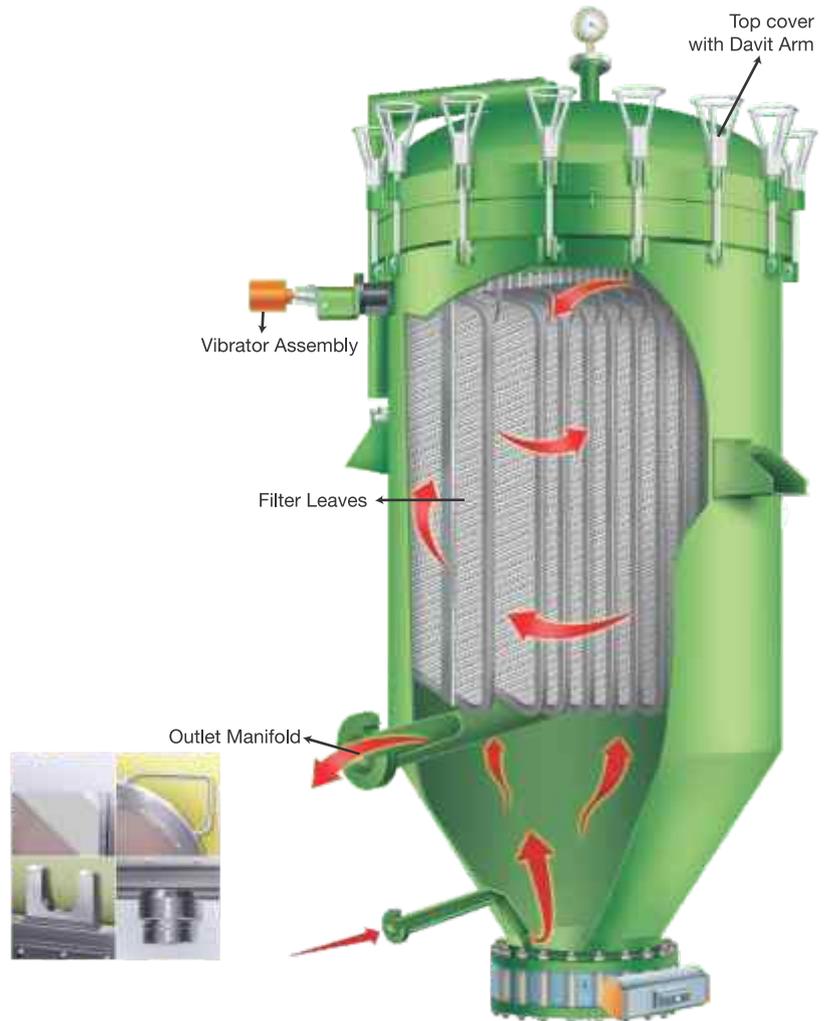
Mecklear Vertical Pressure Leaf Filter

FEATURES

- Hermetically sealed
- Less space and more filtration rate.
- Designed for PLC automation
- Automated discharge of filtered cake
- Filtration areas up to 125 M2 in single housing
- Minimum pressure drops across the leaves

APPLICATIONS

- Edible Oils
- Pharmaceuticals
- Chemicals
- Bio Fuels
- Beverages
- Foods
- Pesticides
- Sulphur
- Brine solutions



MECTECH ADVANTAGE

- Less time consumption to start filtration
- Low maintenance cost
- CNC Machined Mouth and fitting parts
- Single O-ring Sealing arrangement
- High Temperature resistant O- rings and Sealing arrangement
- Automatic dislodging of filtered cake by pneumatic vibrator or oscillating sluice header
- Long Life of filtration Leaves

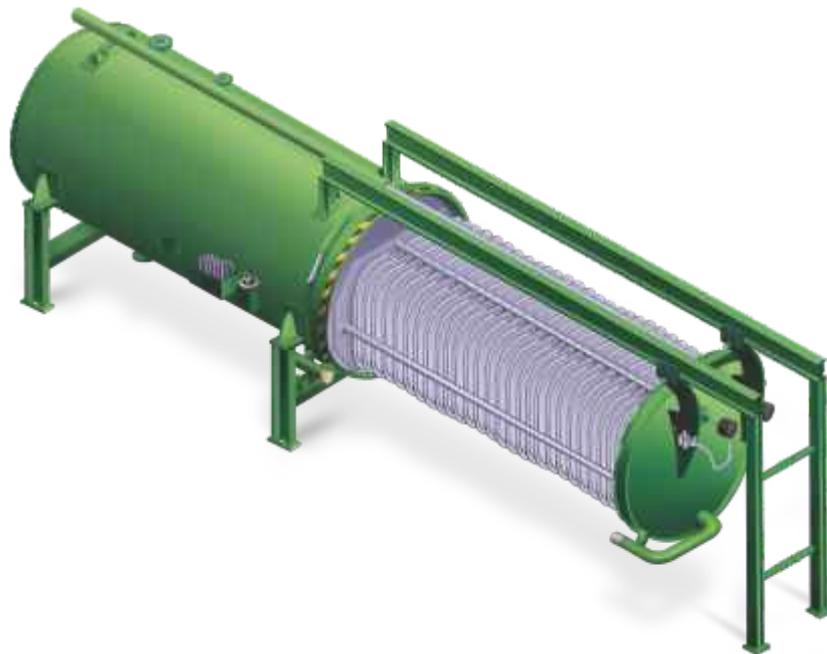
MecKlear Horizontal Pressure Leaf Filter

FEATURES

- Movable bundle or movable shell
- Movement of bundle or shell by hydraulic power pack
- Designed for PLC automation
- Suitable for dry or wet cake discharge
- Filtration areas up to 200 m²

APPLICATIONS

- Edible Oils
- Pharmaceuticals
- Chemicals
- Petrochemicals
- Molten Sulphur



MECTECH ADVANTAGE

- Big filtration surface
- Easy to clean filter plates
- Heating jacket to prevent solidification
- The pressure leaf filter possesses no rotating parts, thus keeping maintenance to a minimum
- Less time consumption to start filtration
- Low maintenance cost
- CNC Machined Mouth and fitting parts
- Single O-ring Sealing arrangement

Mecklear Shining Filter

FEATURES

- Plates in horizontal construction
- MOC of housing & plates in Stainless Steel construction
- No hassle opening and closing system
- Paper filters used in special application for shining products
- Commonly used in Edible Oils and Pharmaceuticals
- Capacity upto 50 tons/hr

APPLICATIONS

- Precious metal catalyst like Nickel and Palladium Carbon
- Pharmaceuticals
- Chemicals
- Oils and Foods
- Miscella
- Bio Fuels
- Beverages
- Foods
- Pesticides
- Sulphur



MECTECH ADVANTAGE

- Completely sealed machine
- Operates under inert conditions
- Zero movement of parts
- If required, fully PLC automation can be provided
- Large filter areas with low floor area
- By using right quality of replaceable filter cloth, particle free filtrate quality can be assured
- Cake discharge to suit the process requirement
- Heel filtration available

Mecklear Candle Filter

FEATURES

- Filter elements in Stainless Steel construction
- Candle in Metal or Polypyrene construction
- Suit process requirement
- Body in Stainless Steel or Carbon Steel

APPLICATIONS

- Precious metal catalyst like Nickel and Palladium
Carbon
- Pharmaceuticals
- Chemicals
- Oils and Foods
- Miscella
- Bio Fuels
- Beverages
- Foods
- Pesticides
- Sulphur



MECTECH ADVANTAGE

- Completely sealed machine
- Operates under inert conditions
- Zero movement of parts
- Auto cleaning with back wash under pressure
- Available up to 200 M2 filtration area
- If required, fully PLC automation can be provided
- Large filter areas with low floor area
- By using right quality of replaceable filter cloth particle, free filtrate quality can be assured
- Cake discharge to suit the process requirement
- Heel filtration available

Mecklear Pulse Jet Candle Filter

FEATURES

- No frequent change of bags
- Filter cloth used is long lasting
- MOC Stainless Steel
- Designed for PLC automation
- Auto backwash for removal of solids

APPLICATIONS

- Edible Oil
- Biodiesel
- Food process
- Chemical Industry
- Catalyst Filtration
- Activated carbon filtration
- Polyols
- Pesticides



Mecklear Self Cleaning Disk Filter

FEATURES

- Compact continuous automatic operation
- Permanent long-lasting filter media
- Total control of input, circulation of filter
- Liquid and outlet allow smart operation
- No labor required
- Very suitable for filtering high volume of low impurity suspended solids of the size 10 microns and larger

APPLICATIONS

- Chemical Industries
- Edible oil Industries
- Pharma Industries
- Resin
- Ink
- Beverage Industry
- Miscella filtration



MECTECH ADVANTAGE

- No frequent change of bags
- Filter cloth used is long lasting
- MOC Stainless Steel
- Designed for PLC automation
- Auto backwash for removal of solids

MECTECH ADVANTAGE

- Low percentage of impurity removal from high volume duty
- To reduce load on centrifuges

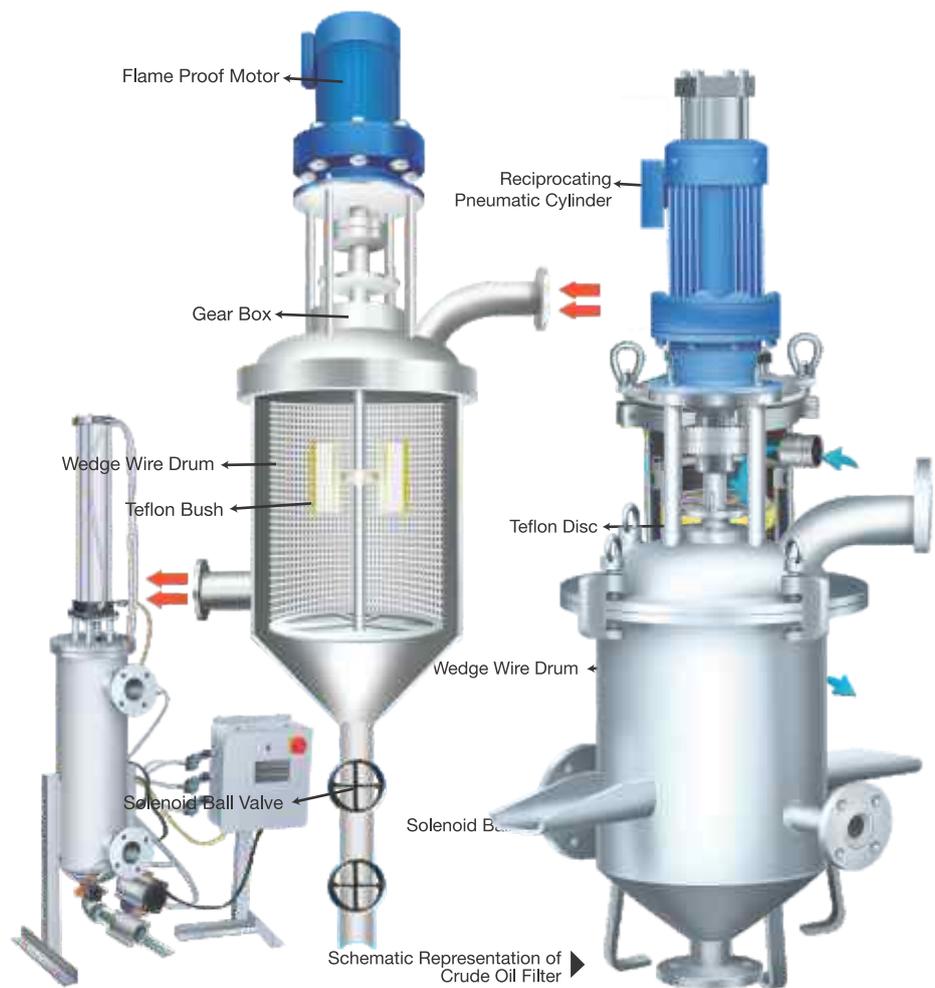
MecKlear Automatic Brush Filter Strainer

FEATURES

- CS or Stainless-Steel Vessel
- Geared motor flame proof
- Wedge wire filter element in S.S.
- Rotating brushes in Teflon

APPLICATIONS

- Solvent Extraction and Related Fields



MECTECH ADVANTAGE

- Continuous operation with PLC/Timer panel and hence no manual attention is required
- Closed operation and hence no loss of Hexane
- Sediments are periodically de-sludged from bottom of vessel through bottom valve with actuator which is controlled by a timer and sent back to extractor

BIO-ETHANOL

Mectech provides end-to-end technology solutions for production of Bio Ethanol and ENA from starchy as well sugar-based feedstocks. Mectech provides turnkey solutions for the distillery sector and specializes in Fermentation, Distillation, Evaporation, Dehydration and Zero Liquid Discharge systems.

We provide grain-based distilleries, sugarcane juice and molasses-based distilleries as well as multi-feed distillery solutions that can handle all feedstocks and help clients to optimize profit margins depending on market dynamics of different feedstocks.



Feed Stock

The feedstock for distillery can be categorized into two broad segments, viz.

Starchy feedstocks:

Which include corn, rice, barley, millets, and wheat

Sugar-based feedstocks:

Which include sweet sorghum, beet, sugarcane, and molasses.

Bio Ethanol and ENA are extracted from these feedstocks using 1G technology.

Bio Ethanol & Extra Neutral Alcohol End uses of Alcohol

Fuel Blending: Bio Ethanol produced using different feedstocks is used in blending with Petrol.

Potable Alcohol: Extra Neutral Alcohol (ENA) produced in distilleries is used in preparation of potable alcohol.

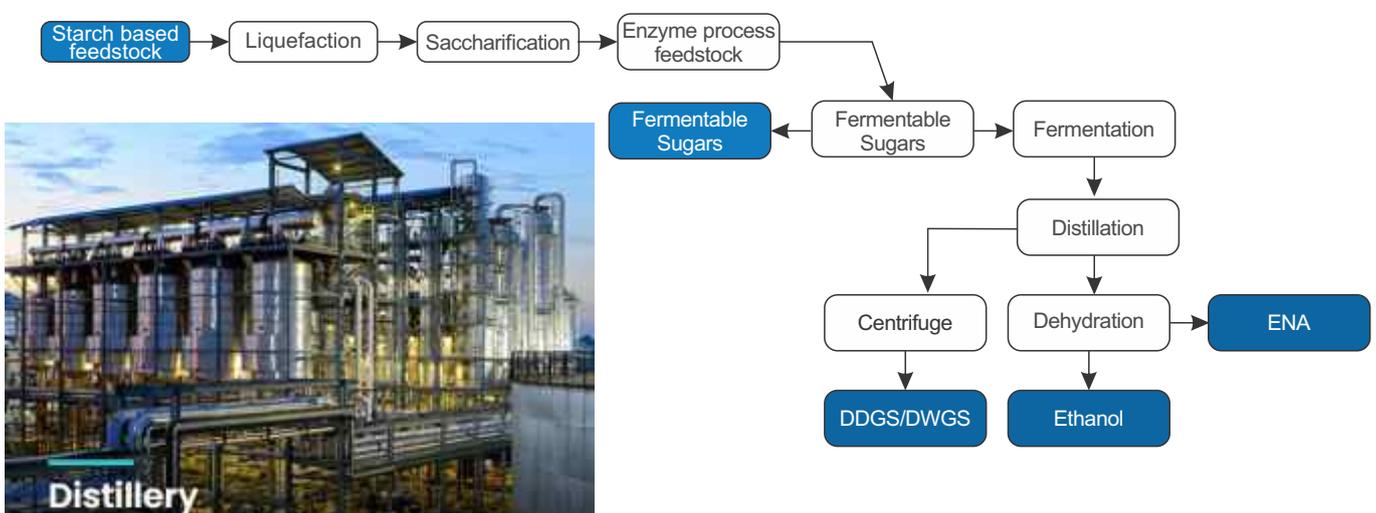
Other industries: Tailored grades of alcohol can be produced in distillation to cater to industries like pharma, chemicals, and paints.

Mectech offers refined and highly efficient technology solutions to cater to all the above industries.

Salient Features of Mectech's distilleries :

- Highly energy-efficient systems.
- Customized schemes offering most competitive steam consumption in terms of kg/lit of alcohol. Our ethanol schemes can run under 2.8 kg/lit of AA in case of rice and 3.2 kg/lit of AA in case of maize operations. These scenarios are with Jet cooker and without using MVR.
- Highly integrated systems with MVR offering best steam efficiencies in the market making your plant highly profitable.
- Additional revenue generation during corn operations through specially designed corn oil extraction system. This scheme is integrated with distillery operations and helps improve quality of DDGS as well thereby fetching higher rates for your DDGS.
- Multi-effect and highly integrated evaporation systems that are tailored to handle the load of the distillery industry.
- Zero liquid discharge systems tailored as per the water quality available at customer site. Innovative approaches to handling RO rejects and ETP rejects to ensure 100% compliance to Pollution Control Board norms and ensuring optimization of resources.
- Water efficient systems with consumption of entire distillery complex(including Cogen and domestic use) kept under 4 lit/ lit of ethanol.
- Power efficient systems designed keeping steam and power balance of the complex.

PROCESS FLOW CHART



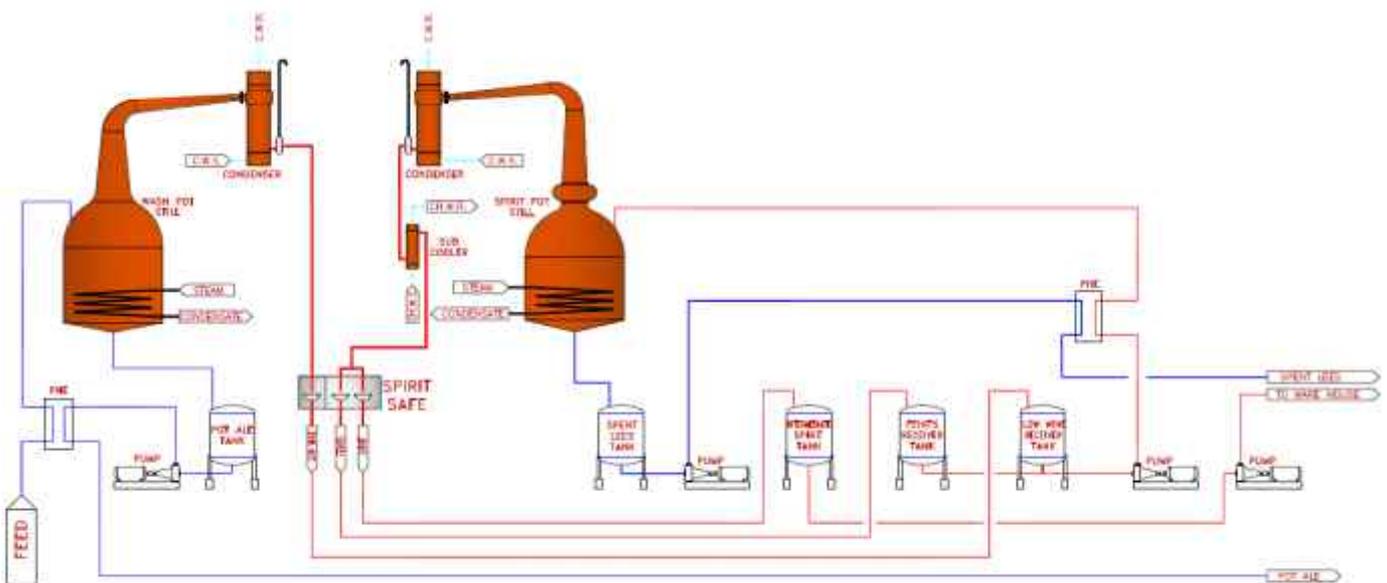
Malt Spirit



Offerings :

- Mectech offers complete turnkey solutions for Malt spirit industry covering:
- Malt unloading and storage
- Malt milling
- Brewhouse & Spent Grain Separation with its Silo
- Fermentation
- Pot still Distillation plant with heat recovery system
- Alcohol storage
- Water treatment plant
- Effluent treatment plant with ATFD
- Complete distillery instrumentation system
- Complete distillery electrical system
- Chilling plant & Cooling tower with its circulation circuit
- Interconnecting pipelines and its fittings
- Lab setup for the distillery
- Steel structural building for Milling, Brewhouse, Fermentation, and Distillation

Among select few suppliers offering a highly integrated and turnkey solution to the industry.



Corn oil extraction

Process flow and description

- Thick syrup, collected from concentrating thin slope in evaporation section, will be fed to static mixer where de-emulsifier will be mixed in required proportion.
- The syrup will be heated by using low pressure steam and then fed to tri-canter.
- This mixture will feed to the tri-canter, where the crude oil separation from thick syrup will be done.
- Two more streams will be separated from tri-canter -sludge and thick syrup after removal of oil. Both these streams will be recycled back to the wet cake for the further drying in DDGS dryer.
- The crude oil separated from tri-canter will be further cooled down to normal temperature and stored in crude oil live storage tank & transferred to crude oil storage tank for issue purpose.
- DDGS quality improves as fat % gets reduced, protein % (weight/weight) improves thereby leading to a higher rate per kg.



- Corn oil recovery around 12 kg/ton of corn depending on grain composition
- Purity guarantee > 97 %
- Area requirement: broadly 20 mt x 20 mt
- Helps improve DDGS quality due to lesser fats and increased proteins % (weight/weight)
- Helps improve profit margins for the distillery
- End uses: For production of biodiesel, Animal feed
Not fit for human consumption

The system has a payback of 8-10 months!

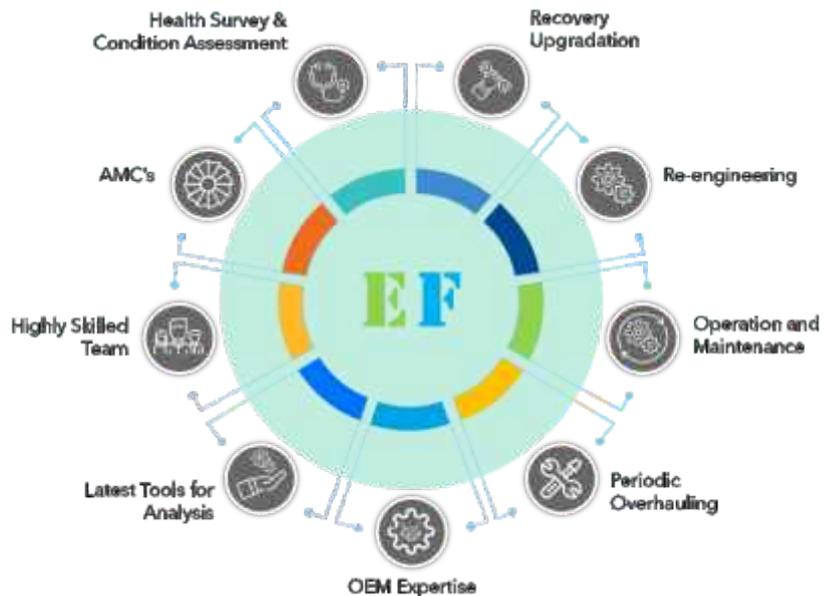
Get ahead of competition, get more value out of your corn, and make your distillery unit more profitable!

Compressed biogas plant



360°
CUSTOMISED
SERVICE PORTFOLIO

CONNECT
COLLABORATE
ARE



CBG PLANT



Main Components

Feed Receipt	Feed Preparation	Anaerobic Digestion	Biogas to Bio-Methane
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A typical Biogas/Bio-CNG production plant

Step 1: Feedstock Pre-treatment

Mechanical or Chemical Pre-treatment based on feedstock and associated impurities

Step 2: Anaerobic Digestion

Unique design technology for mixing (Turbo Liquid Gas Mix System)
Medium to higher organic load effluents.

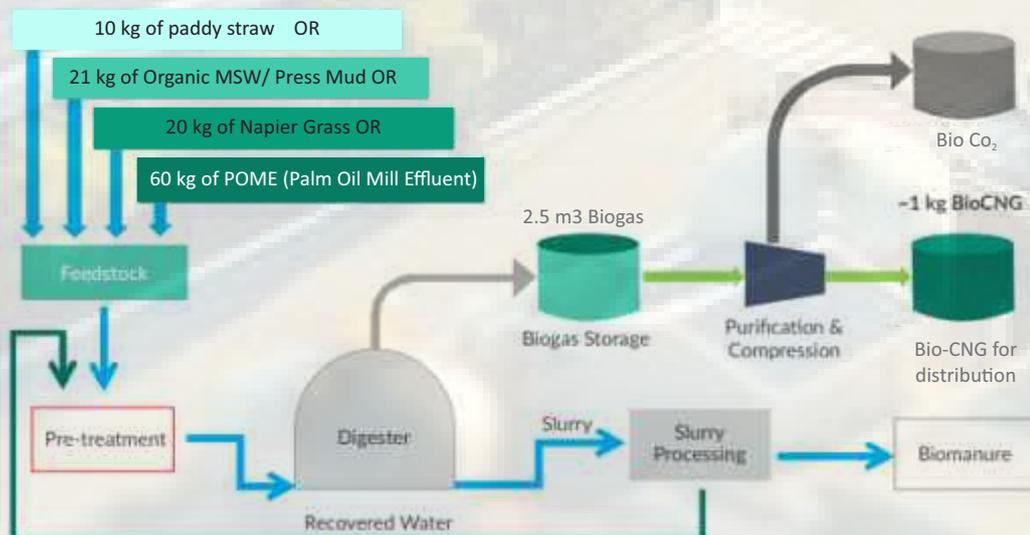
Operates on either Mesophilic or Thermophilic process

Step 3: Upgradation & Purification

CO₂ removal either by Dry or Wet scrubbing based on H₂S content in Biogas
H₂S removal either by Pressure Swing Adsorption (PSA), Membrane or Amine Solution based

Step 4: Distribution

Purified Biogas is compressed up to 250 bar pressure and stored in cascade cylinders for transferring to fuel station



BIO-CNG POTENTIAL PER TON OF WASTE AND ITS APPLICATION

Bio-CNG potential per ton of waste:

Sources of waste	Raw Biogas m3/ Ton of waste	Bio-CNG Kgs/ Ton of waste	Solid Fertilizer Kgs/ Ton of waste
POME (Palm Oil Mill effluent)	40	15	29
Cow Dung	45	16	134
Poultry Litter	85	33	237
Napier Grass	120	44	155
Organic MSW	120	48	126
Paddy Straw	300	109	520
Spentwash	40	16	29
Press Mud	120	46	190

ADVANTAGES OF ADOPTING BIO-CNG

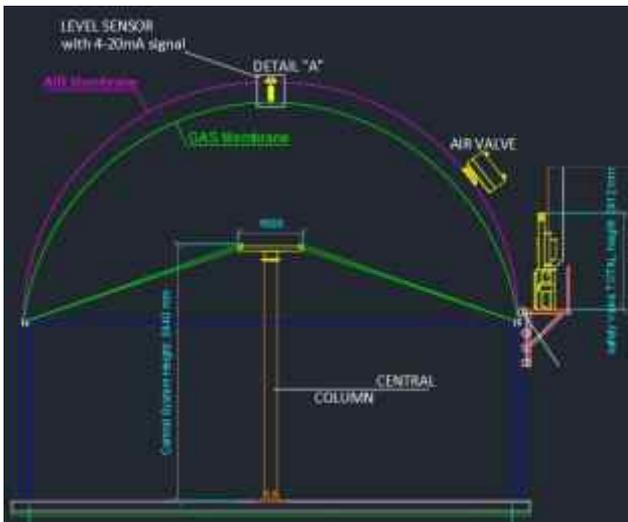
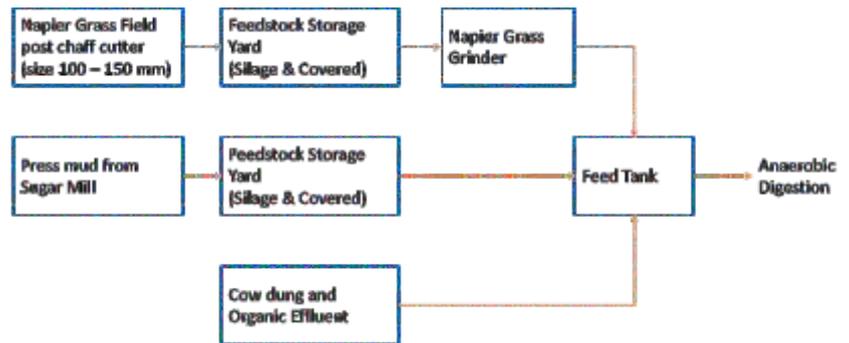
production helps mitigate greenhouse gas emissions by capturing methane from organic waste that would otherwise be released into the atmosphere. It also contributes to a circular economy by recycling and re-purposing waste materials.

APPLICATIONS OF BIO-CNG

1. Transportation Sector: Bio-CNG is used as a clean and renewable fuel for vehicles, particularly in compressed natural gas (CNG) vehicles.
2. Industrial and Commercial Use: It can be utilized in co-generation systems to produce both electricity and heat, offering a sustainable energy solution for industries.
3. Domestic and Small-Scale Applications: In households, Bio-CNG can be used for cooking and heating purposes, providing a clean alternative to traditional fuels.
4. Rural Energy Access: Small-scale Bio-CNG plants contribute to decentralized energy solutions and promote energy access in rural areas.

FEED RECEPTION AND PRETREATMENT AREA

- The reception area has been designed so that there is sufficient space for vehicle traffic.
- Truck scales / weighbridge have been arranged so that vehicles are weighed at the entrance and exit of the plant in order to monitor and control the flows of substrates entering and leaving the plant.
- Regarding the storage yard, PCC platform with suitable soling is made and constructed for sufficient storage at site for uninterrupted operation of CBG plant.
- As for the pretreatment of the rice straw below mentioned process sequence is followed:
 - Feed receipt
 - Shredder / Grinder (size reduction)
 - Feed tank for slurry preparation



ANAEROBIC DIGESTION AREA

- Once the mixture is pretreated and diluted to 11% to 12% Ts, it is considered ready to be ready for digestion. It is known that the limiting stage of the process is hydrolysis. In other words, the digesters will have a hard time breaking down the mixture into elemental compounds. Hence, instead of designing a single-stage system, a multi-stage system has been chosen in which the first stage of anaerobic digestion i.e., hydrolysis, will be optimized.
- That is, a reactor system is going to be designed to accelerate the decomposition of the mixture. In this way, the overall process can be optimized.
- Hydraulic residence time (HRT) is the average time that matter is inside the digester or undergoes Anaerobic Digestion. It is an average because the anaerobic digestion process is continuous, that is, the matter is continuously entering and leaving the digester, every day it is fed and discharged.
- The reactor technology considered is CSTR reactors or full mix reactors.
- The proposed AD plant will operate in 3 stages, the operational parameters and characteristics of the reactors are summarized in the table below.
- At the top, each digester has a double membrane gasometer that temporarily stores the gas prior to entering the gas line.

Following items are provided in the Digester Tanks

- Inspection windows on the sides of the tanks to visually check the interior.
- Manhole that allows access to the interior of the tanks for maintenance and / or cleaning requirements.
- Temperature, level, pressure, pH sensors and gas analyzer to measure its composition.
- The digesters are connected to each other by balancing, forming a gas network at equal pressure. The piping system is designed in such a way that any element can be isolated from the rest, allowing the plant to be partially operated if necessary.

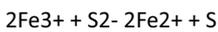
H2S SCRUBBING SYSTEM -EISET PROCESS (IISC TECHNOLOGY)

PROCESS PRINCIPLE:

EISET process is based on the red-ox reaction of chelated polyvalent metal ion. In this particular process iron in chelated form in an aqueous medium is used for scrubbing H₂S from biogas stream. Iron which exists as both Fe³⁺ and Fe²⁺ form, works as a catalyst to scrub the gas of H₂S. The sulfur component in the hydrogen sulfide is precipitated as elemental sulfur.

A. PROCESS CHEMISTRY:

H₂S when dissolved in aqueous medium is ionized to H⁺ and S²⁻. The sulfur ions can be oxidized by polyvalent metal ions such as those of iron, which can exist in both ferric (Fe³⁺) and ferrous (Fe²⁺) state. When the sulfur ion comes in contact with ferric ion complex, it gets oxidized to elemental sulfur and is precipitated.



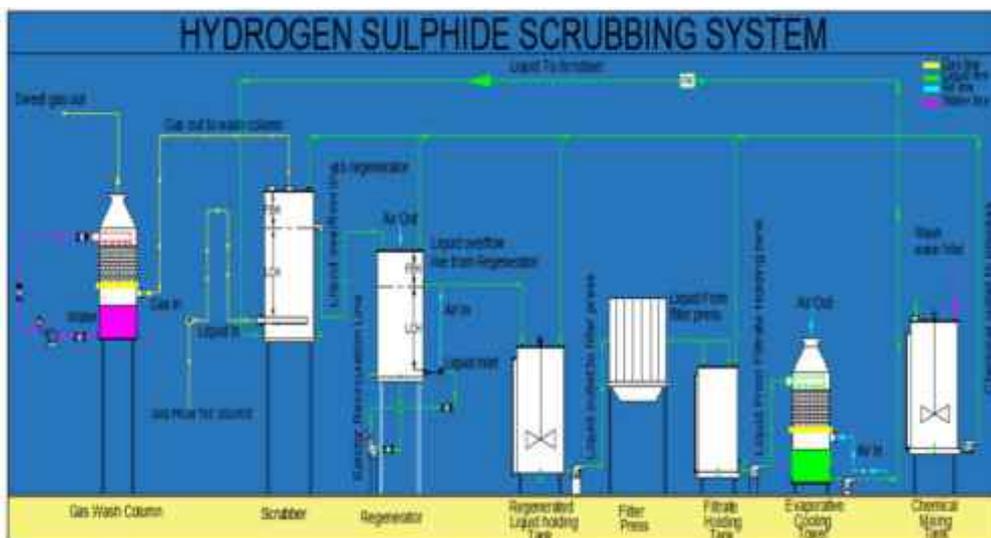
The ferrous ions are later oxidized to ferric ions by reaction with oxygen in the atmospheric air.



B. PROCESS DESCRIPTION:

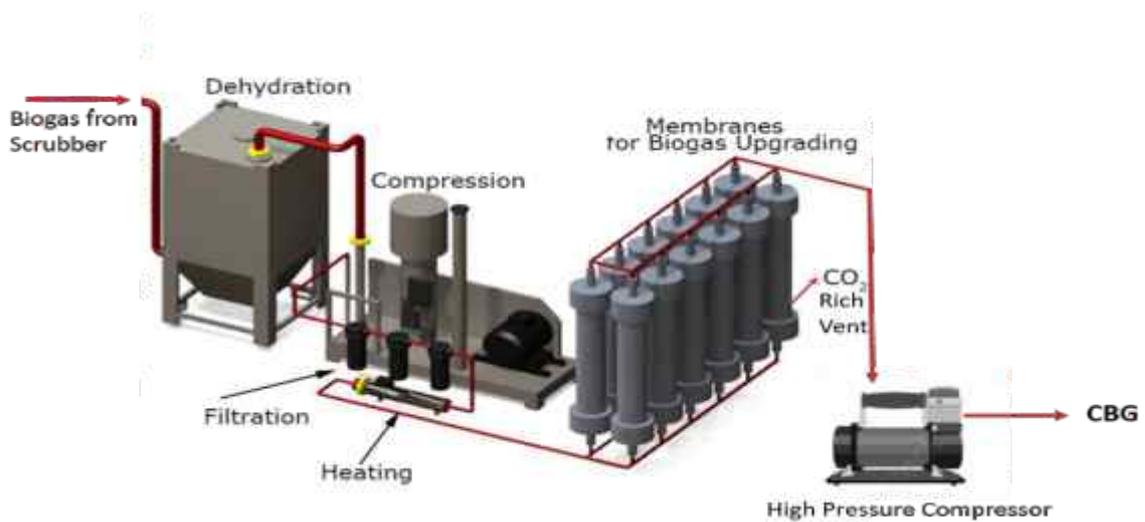
The process uses the sparger based gas liquid contact for removal of hydrogen sulphide from the gas. The liquid and raw gas are injected into the scrubber vessel from the bottom. The gas coming out of the scrubber, which is free of hydrogen sulfide, is then scrubbed with water for cleaning any minute quantities of chemical carried over. The clean gas thus obtained is fit for the end application. The scrubbed solution containing sulfur is then taken to the re-generator and regenerated with air using an ejector based air liquid contact process. The regenerated solution containing sulfur is passed through filter press for sulfur removal. The clear filtrate is then re-cycled back to the scrubber.

C. FLOW CHART

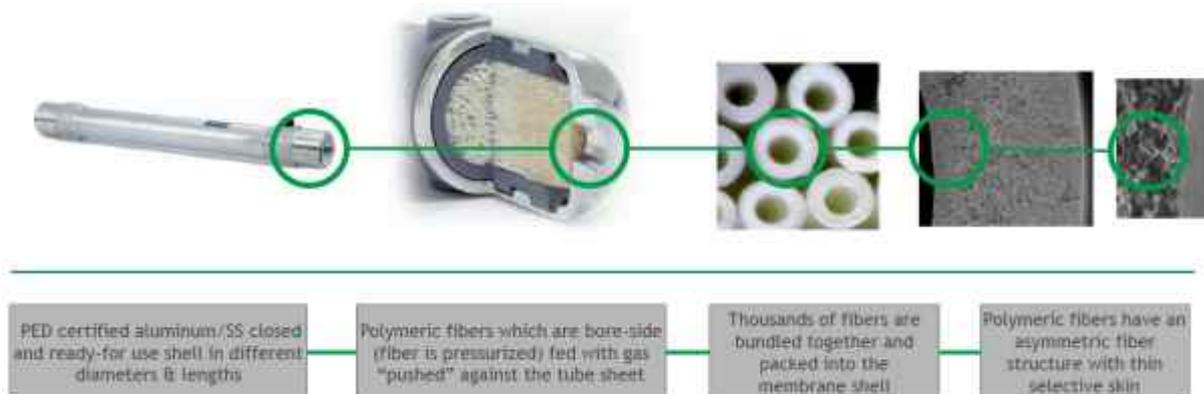


BIOGAS UPGRADATION SYSTEM

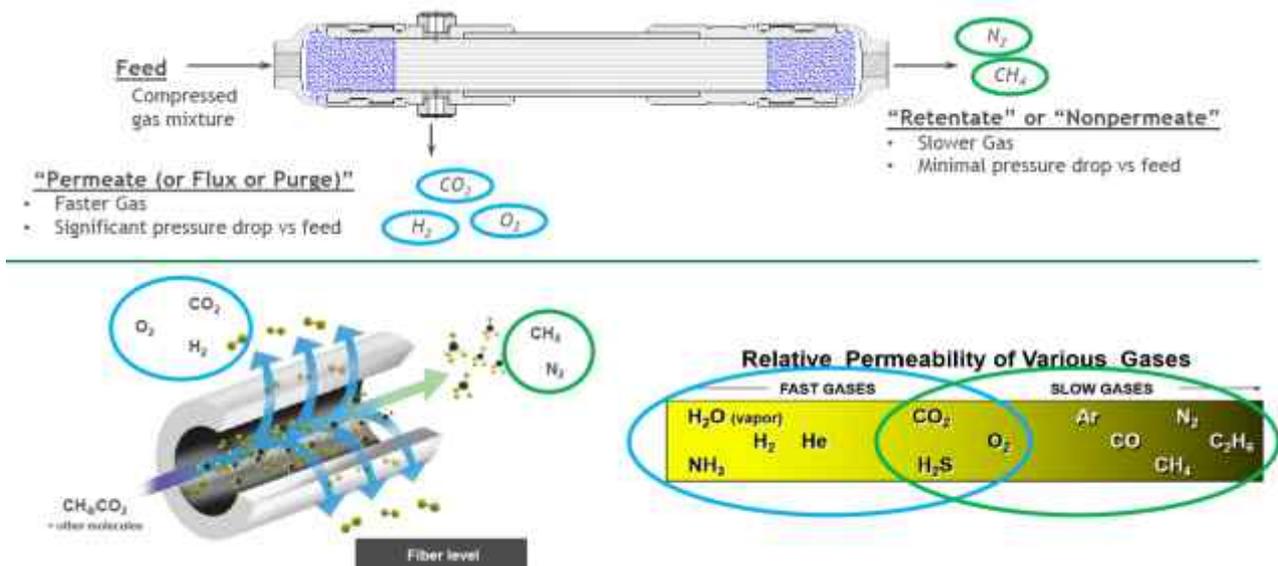
A membrane-based biogas upgrading system is a technology used to purify and upgrade raw biogas generated from anaerobic digestion processes, such as those in landfills, wastewater treatment plants, and agricultural waste facilities. Biogas primarily consists of methane (CH₄) and carbon dioxide (CO₂), along with trace amounts of other gases like hydrogen sulfide (H₂S) and water vapor. The goal of biogas upgrading is to increase the methane content while removing impurities, resulting in a higher-quality gas known as biomethane. Biomethane can then be used as a clean and renewable energy source for various applications, including heating, electricity generation, and even as a vehicle fuel.



Membrane-based systems use semipermeable membranes to selectively separate gases based on their permeation rates. These membranes allow methane to pass through more easily than CO₂ and other impurities. Membrane separation can be used to produce biomethane with varying purity levels and is suitable for a range of scales.



Gas separation membranes work on the principle of selective permeation through a membrane surface. The driving force for permeation of the gas through the membrane is the difference between the partial pressures of the gas on the retentate side (the interior of the hollow fiber) and the permeate side (the exterior of the hollow fibre). The membranes have the highest selectivity and provide a superior technology for processing of crude biogas.



In a separation of Biogas between carbon dioxide and methane, permeation of carbon dioxide through the membrane is much faster while methane is retained within. The prefiltered and de-sulphurised biogas is compressed to 12 - 16 bar pressure for the separation process. The throughput passes through the cooling process, resulting free condensate is separated from the raw gas, oil filters and coalescing filters for clean gas.

- The Biogas stream passes through a **2-stage** constructed membrane-gas processing plant and with CH₄ separated upto **96%** as per requirements of vehicular fuel (as per SATAT Scheme / BIS Norms and Grid injection norms).

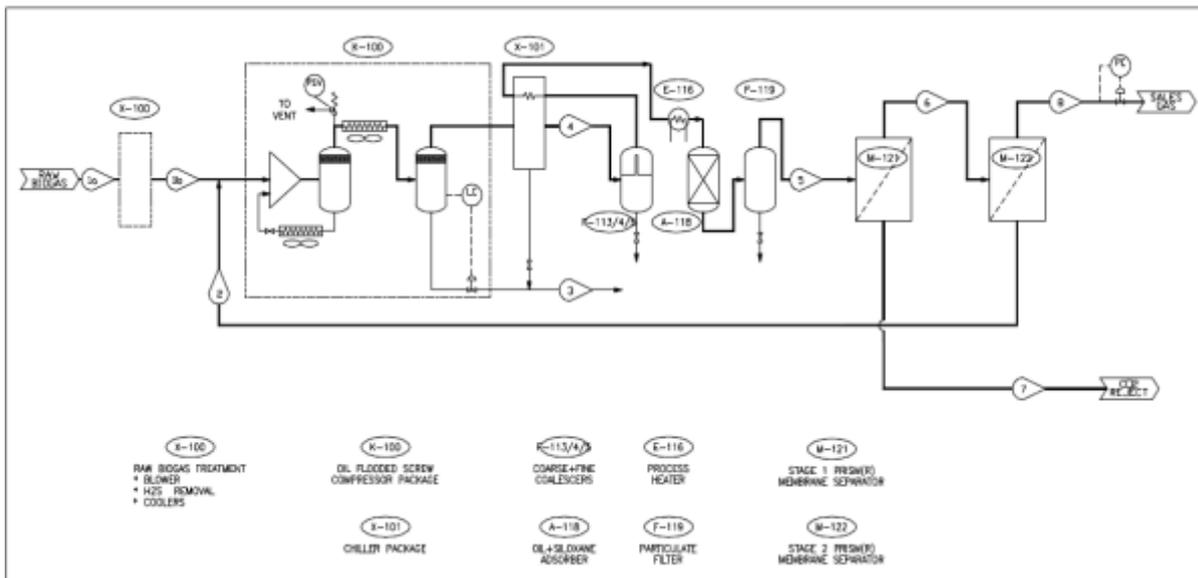
Benefits of Membrane Systems

- Low methane slip (loss)
- High methane yield of up to 99% can be obtained with additional stages / modules, which means maximum added value for the operator
- Highest energy efficiency for upgrading (<0.2 kWel/Nm³ raw biogas, <0.4 kWel/Nm³ biomethane)
- No additional ancillary materials or consumables such as water or sorbents (amines, glycols) are required, so no emissions into the environment
- Easily regulated for changes in flow rate or composition
- Following the upgrading process with membranes, the biomethane is already dry and satisfies the dew-point requirement for feeding into the grid
- Starting and stopping of the plant is possible at short intervals, ensuring high flexibility; therefore ideally suited for operation of a biomethane filling station at the site
- The simple, easy-to-handle set-up takes up less space in the upgrading plant.
- The continuous separation process results in very high energy efficiency.

Components of upgradation unit

Particulars	Details
Container(s) Frames	/ The container(s) / Frame shall be fitted with - 2 stage Membranes along with heat exchanger and filtration system.
Biogas Compressor	Biogas compressor with all safety features along with efficient oil filtration system. Working Pressure: 12 to 16 bar
Gas conditioning unit:	Biogas Dryer Shell tube heat exchanger for heating the biogas along with refrigerating water chilling equipment
Filtration system	Coalescing filter for elimination of water vapours, Oil absorber and Activated carbon filter for the elimination of oil vapour and particulate filter for the micron dust removal from the raw biogas
Hollow fibre Gas Separation Membrane:	Two stage membrane module / system for processing is provided. Membranes will have operational life of 8-10 years.

Refer Attached Process flow diagram for the scope offered
(2 Stage membrane system)



Upgradation technology comparison

Technology description		
<p>Wash water scrubbing</p> <p>Wash water scrubbing Raw biogas is fed into a column of water where the CO₂ and methane dissolve into the water. This saturated water is then fed into a flash tank where the pressure is reduced, the methane strips off, and the CO₂ departs with the water.</p> <p>Polyethylene glycol absorption Similar to water scrubbing with polyethylene glycol as the liquid contactor.</p> <p>Carbon molecular sieves Biogas is fed into reaction chambers which are filled with a carbon sieve under pressure. The CO₂ and H₂S molecules are adsorbed into the carbon sieve. The methane flows to an adjacent chamber with reduced pressure. A vacuum strip the first column of the unwanted molecules, and the pressure swing cycle repeats.</p> <p>Membrane separation</p> <p>Biogas is compressed and fed into modules which contain thousands of porous, hollow fibre membranes. Fast gases permeate the membrane walls while slow gases exit the hollow tube.</p>	<p>Advantages</p> <p>Good technology where wash water is abundant. Also, more efficient in cold climates as colder water increases CO₂ solubility. Able to process large volumes of gas.</p> <p>Higher selectivity than water reduces pumping requirements. Removes CO₂, H₂S, and halogenated hydrocarbons. Good for landfill gas. Closed loop system.</p> <p>Successful at removing several different compounds present in raw biogas. Can produce 96% pure methane. No solvents to dispose. Carbon sieves' usable lifetime up to 3 years.</p> <p>Passive technology requires minimal supervision. Systems scalable by adding or reducing the number of modules online. Multiple stage systems can produce 99% pure methane. Efficient at removing water vapor. Low capital investment. Membranes' usable lifetime 8 to 12 years.</p>	<p>Disadvantages</p> <p>Requires 150 litres of water per normal meter cube per hour (Nm³) of raw biogas. Recirculated systems experience biofouling and require removal of H₂S and CO₂. Introduces oxygen and moisture into gas stream. Electrical demand for pumping and cooling.</p> <p>Requires regeneration of polyethylene glycol with inert gas. Saturated solvent requires hazardous material disposal.</p> <p>Some methane losses to environment during adsorb cycle. Requires significant energy for compressors. Many mechanical components require maintenance.</p> <p>Single stage 88% to 93% purity. Energy required to heat gas plus compression.</p>

Plant automation and remote monitoring

The entire biogas generation plant, with all its actuators, and monitoring instrumentation is controlled by a plant automation system with PLC & DCS (Programming Logical Controller & Distributed Control System). The biogas generation plant is operating under standardized conditions & by modularized designed components with integrated consumers/actuators (as mixers, pumps, pneumatic valves, etc.), monitoring sensors & auto-switches (as temperature sensors, pressure sensors, level control, PTC-thermistor switches, PIS-sensors, flow meter, CAP-sensors, etc.) as per requirement. An integrated visualization screen allows the fast access to all required data Plant will also be equipped with Cloud based Remote Monitoring system.



Disadvantages

Requires 150 litres of water per normal meter cube per hour (Nm³) of raw biogas. Recirculated systems experience biofouling and require removal of H₂S and CO₂. Introduces oxygen and moisture into gas stream. Electrical demand for pumping and cooling. Requires regeneration of polyethylene glycol with inert gas. Saturated solvent requires hazardous material disposal. Some methane losses to environment during adsorb cycle. Requires significant energy for compressors. Many mechanical components require maintenance. Single stage 88% to 93% purity. Energy required to heat gas plus compression.

ONLINE GAS MONITORING

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METHANE COMPRESSION

Refined biogas gets supplied to the Methane Compression stage. The compressor will be installed for compressing the purified biogas from 16 bar to 250 bar pressures and filling into cascades of cylinders. This Methane Compressor is of multistage reciprocating type, designed for upgraded Biogas application.

Compressed Biogas (Bio-CNG / CBG)	
Biogas pressure	250 bar
Methane (CH ₄)	Approx. 96% - 97%
Carbon Dioxide (CO ₂)	Approx. 2.5 to 3 %
Nitrogen (N ₂)	Nil
Hydrogen Sulphide (H ₂ S)	<10 ppm
Water vapor	Nil
Oxygen (O ₂)	Nil
Hydrogen (H ₂)	Nil
Methanol/Glycerol (CH ₃ OH, C ₃ H ₈ O ₃)	Absent



Methane Compressor Details			
Number of stages	3		
Gas handled	Biogas		
Capacity (at suction conditions)	320	585	Nm ³ /h
Suction Pressure	16	17	kg/Cm ² g
Suction Temperature	40		°C
Discharge Pressure	251		kg/Cm ² g
Compressor Speed	615 – 1130		Rpm
Piston Stroke	100	Mm	
Max. Ambient Temperature	45		°C
Compressor Shaft Power Input	41	81	kW
Recommended Motor Power	90		kW
Tolerance on Specific Power Input	+/- 5%		
Tolerance on Capacity	+/- 5%		

CBG FILLING STATION

For transfer of compressed Bio-CNG into the Cascade bundle of CNG-Cylinders, a Bio-CNG Cascade Filling station is required. Customized for the site conditions, high-pressure stainless-steel pipes are connecting the Compressor station with precise manufactured tube face-flange fittings to three individual Cascade filling points, which are designed for filling the CNG Cascades. A calibrated high pressure CNG Flow Meter is monitoring the gas flow. Individual safety valves, filling whips and quickaction hose couplings with top-hat sealing are supporting a safe filling process, up to 255 bar pressure, according to PESO approval.



CBG CASCADES

The upgraded and compressed Bio-CNG storage cylinders (in cascades) are placed on specially designed trucks and brought to a fueling station or at the customer site, where it can be distributed into vehicles or used for their application in furnaces. The cascades are made up of high strength stainless steel which can handle pressure up to 255 bar. The cascade of capacities 500 kg, 400 kg and 100 kg are used for transportation at the customer end. Each cascade comprises of 40 cylinders. Each cylinder has a volume of 75 liter each, with a capacity of 13 kg / 10 kg at 250 bar. At customer site, PRS system will be installed which again reduces pressure to 1 bar.

MANURE PROCESSING

Windrow composting is the production of compost by piling organic matter or biodegradable waste, such as animal manure and crop residues, in long rows (windrows). This method is suited to producing large volumes of compost. These rows are generally turned to improve porosity and oxygen content, mix in or remove moisture, and redistribute cooler and hotter portions of the pile. Composting process control parameters include the initial ratios of carbon and nitrogen rich materials, the amount of bulking agent added to assure air porosity, the pile size, moisture content, and turning frequency.

Original forming of the windrow will be done out of the already digested material and with the help of any available farmyard/agro origin chopped biomass, e.g. Casurina leaves, other agri waste. The size of the windrow will depend on the turning equipment. A commonly used size in India is 1.25 m in height, after preparing the stack, and 2.5 - 3.0 m in width. The temperature of the windrows must be measured and logged constantly to determine the optimum time to turn them for quicker compost production. Turning of the windrows will be done with the help of a tractor pulled PTO-pitch propelled Aero Tiller, which will be pulled slowly along the windrows, straddling and turning the same, whenever required.

Spreading the digested slurry on the created windrows will be done with a tanker trolley, equipped with a pitch driven slurry pump. Same trolley could also be used for farmland application, whenever disposable. The frequency of turning depends on the rate of decomposition, the moisture content and porosity of the materials, the desired composting time, and the weather conditions per season. Because the decomposition rate is greatest at the start of the process, the frequency of turning decreases as the windrow ages. Besides the target of getting a ripe and ready compost, the process will also serve the evaporation of water in digestate. Again, depending on particular weather conditions, the active composting stage may last four to eight weeks. During the rainy season, when the application of slurry on the windrows is not possible and also to keep a good stock for those days when the farmers demand for liquid Fertiliser increases, digestate Buffer Storage Lagoon will serve to store the daily digestate output.



Manufacturing facilities

We have two large and modern fully integrated ISO 9001 certified manufacturing plants located at Behrampur (2.5 acres) and Bhatgaon (5 acres) in Haryana.

The products manufactured by Mectech cover a wide range and our manufacturing procedures are completely in accordance with best international design and specification (ASME and EN Standards).

Meticulous care is taken during manufacturing of all components to remain within close tolerances.

Our manufacturing facilities have the following certifications:

- ASME "U" Stamping
- National Board R Stamping
- PED Approval
- ISO 9001: 2015
- OHSAS 18001: 2007
- CCOE
- PED





Exports

Mectech lays a lot of stress on exports of its products and services. The aim is not only to earn foreign exchange for the country but also to tap additional markets and remain abreast of the latest process technologies and quality standards.

Mectech's prices tend to be very competitive on C&F basis, particularly in neighboring countries. Proximity to these countries also means shorter delivery and shipping cycles.

Mectech has installation in more than 30 countries including :

- | | |
|--|---|
|  Argentina |  Nepal |
|  Bangladesh |  Netherlands |
|  Belarus |  Pakistan |
|  Bhutan |  Philippines |
|  Chile |  Romania |
|  Egypt |  Rwanda |
|  Congo |  Senegal |
|  Germany |  Sri Lanka |
|  India |  Syria |
|  Indonesia |  Tanzania |
|  Iran |  Thailand |
|  Iraq |  Turkey |
|  Kenya |  UAE |
|  Malawi |  Uzbekistan |
|  Malaysia |  Vietnam |



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