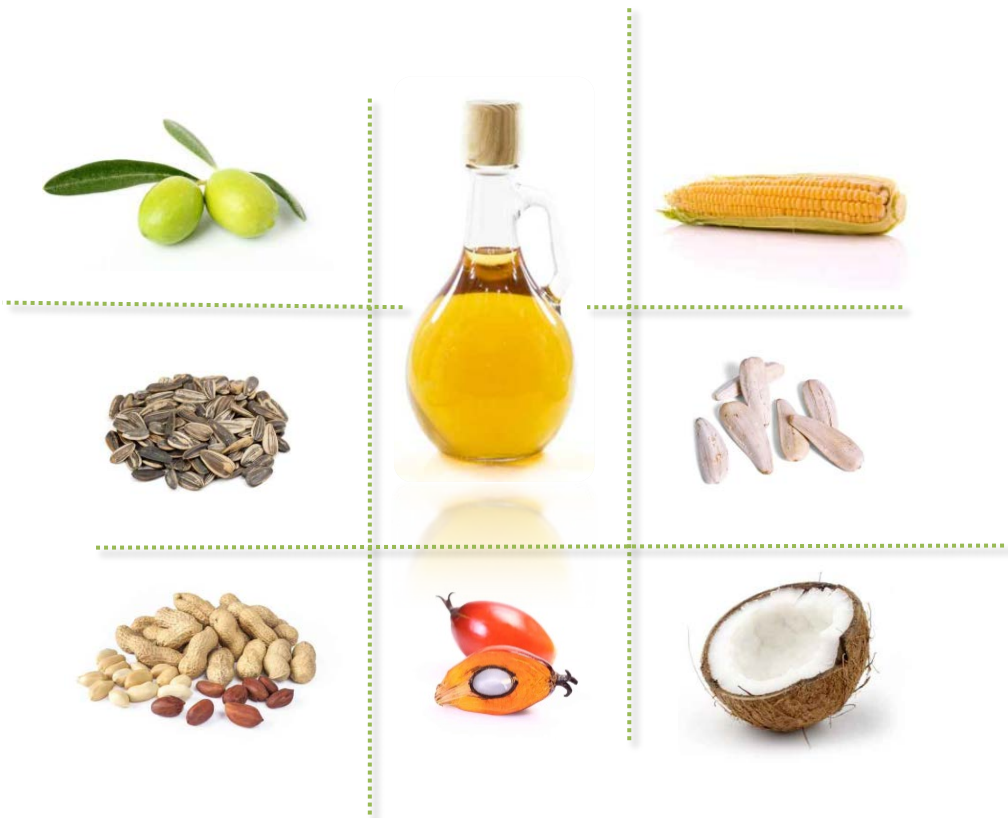


Edible Oil & Fat Refining

Processing Plant



General

Excellent experience gained over the last years on Edible oil refining and oleochemical plants further reinforces our commitment to offer innovative and eco sustainable solutions for both edible and inedible oil processing plants.

Our ability to design in this field is represented in the following pages which show our concepts of single unit or multi purpose unit.

Our specific solutions for specific projects are the activities that are carried out in close collaboration with the customer in order to identify the best applicable technology and optimize investment profitability. This is our best and innovative proposal to our partner. We are actively investing in upgrading and expanding our knowledge, while enhancing our design capabilities.



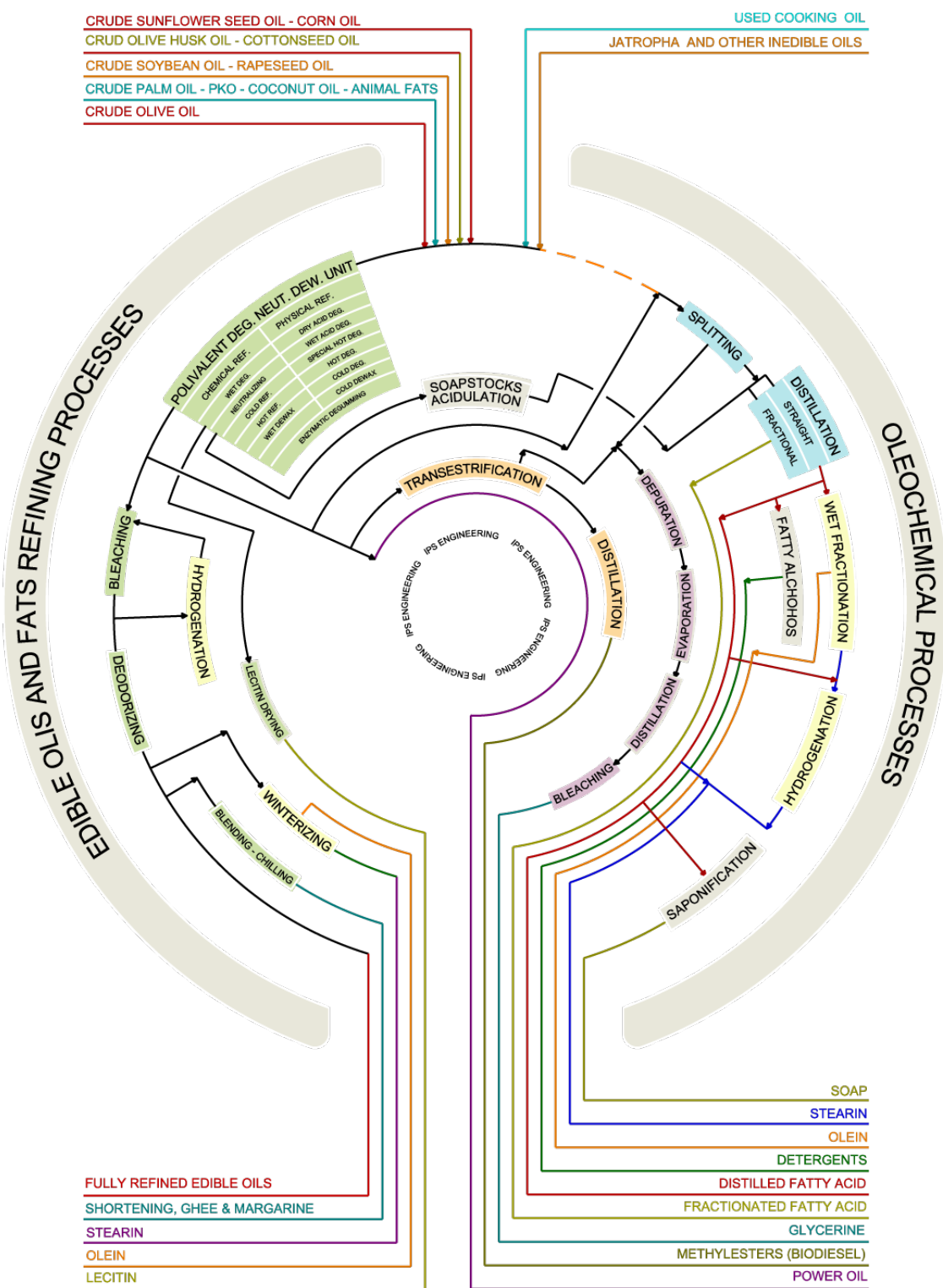
We can develop your idea.



We assist customers in the project development and realization process – from the preliminary research, feasibility study, conceptual design, technology selection, assignment of tasks specification to the detailed engineering design, procurement, construction, commissioning & start-up, maintenance & optimization and personnel training.

This unique focus allow us to develop services to trigger process improvement, providing a range of " Services to Compete". In this manner, with market conditions ever changing, we offering the engineering services at an extremely affordable price.

Oil & Fat Processing



Oil & Fat Refining

In refining , physical and chemical processes are combined to remove undesirable components such as phosphatides, free fatty acids, pigments, odors and flavors, waxes as well as heavy metals, pesticides etc. without significantly affecting the concentration of desirable constituents such as vitamins and polyunsaturated fatty acids, and without significant loss of the major glyceride components.

Refining usually involves the following stages:

- 1) Degumming or Acid conditioning to remove phosphatides;
- 2) Neutralizing or deacidification to remove free fatty acid by treatment with lye (called alkali neutralization or **Chemical Refining**) or by distillation (called **Physical Refining**);
- 3) Bleaching to remove pigments by adsorptive treatments;
- 4) Deodorizing and stripping in vacuum condition to remove odors.

In practice, the numerous combinations of these processes and other processes such as Dewaxing, winterizing, hydrogenation , etc. are applied, depending on certain properties of the oils and requirements of product.



Gum, Wax
Odors
Pigments
Acidity



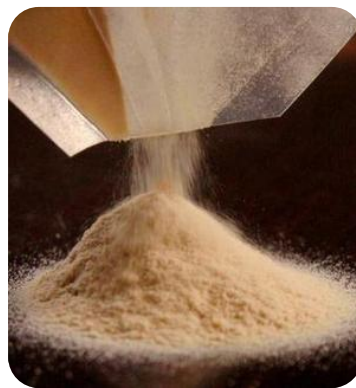
Degumming & Neutralizing

Degumming

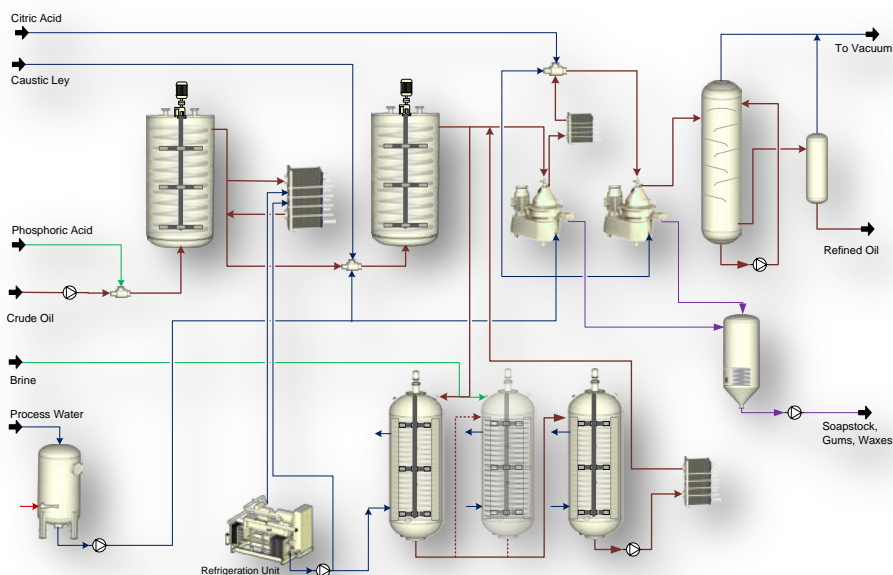
The purpose of the degumming is to remove phosphorus and other complex colloidal compounds, that are present in the crude oil in the form of hydratable phosphatides and non hydratable phosphatides (NHP).

Generally the Degumming refers to several processes that are applied based on the type of the oil and the phosphatide content. The degumming techniques comprise the following processes:

- **Water degumming:** treatment of crude oil with hot water to remove hydratable phospholipids. Water degumming is utilized commonly with palm and coconut oils and is not associated with significant oil loss, saponification, or environmental pollution.
- **Dry acid degumming:** treatment of crude oil with phosphoric acid, citric acid, oxalic acid or maleic anhydride. In this treatment, the acid is dispersed in oil followed by raising the pH with a base, and separating the NHP, FFA, and some trapped triglycerides.
- **Wet acid degumming:** dry acid degumming with very small amount of water to increase degree of hydration.
- **Special degumming:** acid degumming with partial neutralization
- **Enzymatic degumming:** modification of phospholipids with enzymes to obtain the water-soluble compounds



Palm lecithin powder



Multi-purpose unit for Degumming, Dewaxing and Neutralizing

Degumming & Neutralizing

Neutralizing

The purpose of neutralization is to remove the Free Fatty Acids (FFA) that are responsible for the oil acidity. There are two different processes for this operation, the **Alkali Neutralization** and **Distillative Neutralization**.

The usual method of **alkali neutralization** is treatment with weak lye. The method comprises the conversion of FFA in soaps and dilution the resulting soaps in a water phase. These soaps are removed by separators. In the separation stage other undesirable substances such as gums, oxidized component, metal ions, pigments and insoluble impurities are also removed.



Soya acid oil

In distillative neutralization (**physical refining**) the free fatty acids are continuously removed from the crude oil with water vapor in vacuo. Prior to this phase, stripping, gums, phosphatides, and trace metals must be almost completely removed since these compounds impair the oil quality during distillation.

The financial efficiency of distillative neutralization improves by increasing content of free fatty acids.

Capability & Performance

The Multi Purpose unit can treat different types of oils. Its configuration depends on the characteristics of feedstock and the required specifications for refined oil and its performance is in accordance to Wesson loss criteria:

$$TL = (FFA + \text{phosphatides} + \text{moisture} + \text{impurities} + 0.3) \% \text{ weight}$$

$$AL = k \cdot TL$$

Where

TL= theoretical loss

AL= actual loss

$k = 1.4 \div 1.80$ for alkali refining and $1.1 \div 1.20$ for physical refining

The typical product parameters that can be obtained are:

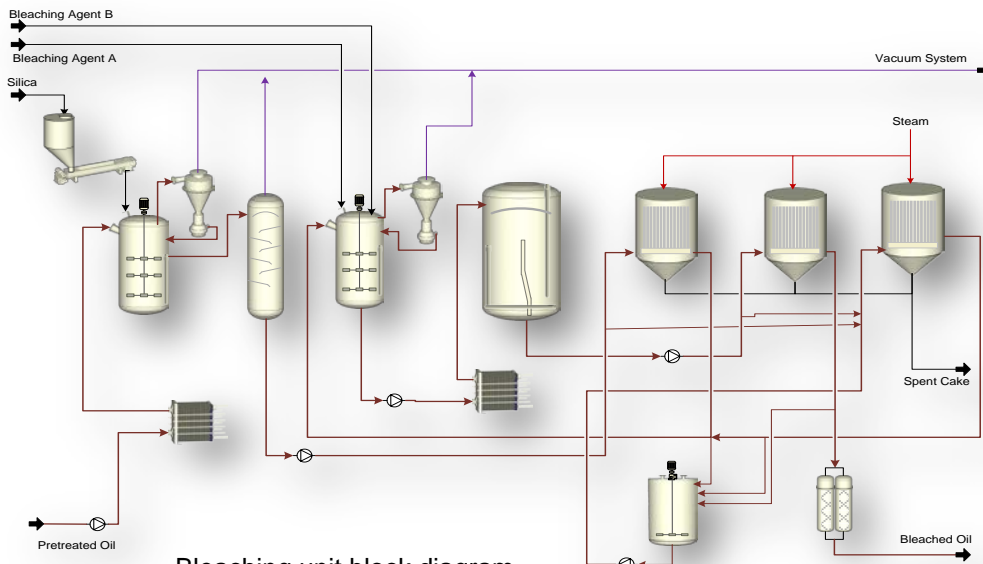
- ✓ Free fatty acid content of refined below 0.1 %;
- ✓ Residual soap after second washing stage below 50 ppm.
- ✓ Moisture after drying below 0.10%

Bleaching



Refined coconut oil

The purpose of the degumming is removal of color and oxidizing bodies, residual gums, soap and trace metals by mixing oil with special adsorbents (silica, bleaching earth and activated carbon). The adsorbents containing the mentioned impurities are then removed by filtration.



Bleaching unit block diagram

Capability & Performance

Since bleaching conditions depend on the properties of the bleaching clay as well as the type of crude oil, bleaching parameters should be optimized with different types of clay for each vegetable oil.

Concerning yield, the oil retention, depends on type of oil, bleaching agent and can be up to 50 wt % on bleaching earths and nearly 100 wt % on activated carbon. the spent cake can be deoiled in solvent extraction unit to reduce the above values below 5%.

Deodorizing

Deodorization is the last major processing step in the refining sequences, in which odors and flavors are removed from the bleached oil or fat. It is essentially a steam distillation process in which volatile compounds are separated from the nonvolatile glycerides.



Refined sunflower oil

The deodorizer/ stripper can be specifically designed for different applications and feedstock in order to improve the overall efficiency of the process of deodorization.

Deodorization can be carried out in batch, continuous or semi continuous units. However, Semicontinuous and continuous deodorization units are replacing batch deodorizers for their higher levels of efficiency in the saving of steam resulting from stripping and heat recovery.

The continuous deodorizer allows for low utility consumption, reduced labor costs, and high heat recovery, but it is not flexible when frequent quality changeovers are required.

In semicontinuous unit different quality of oil can be processed per batches under automatic control system. Compared to continuous system it is less efficient.

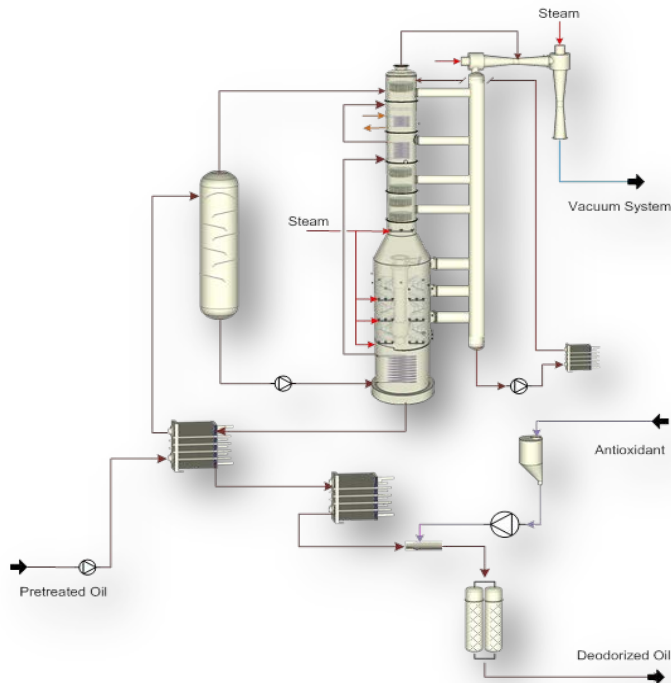
Considering the structure and dimensions, deodorizers are generally composed of a high column divided in compartments and fitted with a number of trays with bubble caps, structured packing and special steam distribution devices to promote intimate contact between the oil and steam, the heating system and recovery devices .



Structured packing column

Deodorizing

In order to optimize the performance of the system and achieve high heat recovery rate, the related equipment such as heater, economizer, cooler and so on can be arranged inside or outside the vessel.



Deodorizing unit block diagram

Capability & Performance

We can supply continuous or semicontinuous deodorizers in a wide range of capacities, from 15 to 800 t/d to obtain a high quality deodorized oil in complying with the required international standard.

The distillate removed during deodorization is about 0.2 % of the oil and contains very little amount of neutral oil. It is composed of free fatty acids (FFA), sterols, tocopherols, sterol esters, hydrocarbons and breakdown products of fatty acids, aldehydes and ketones.

Consumption of stripping steam ranges from 1 to 2 wt % and steam for vacuum production ranges from 10 to 15 % (based on the oil).

Thermal energy required for oil heating ranges from 30.000 to 50.000 kcal /t considering heat recovery rate about 75%.

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