UNIVERSITAS PGRI SEMARANG
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PROSES PEMURNIAN MINYAK

(Oil Refining Process)

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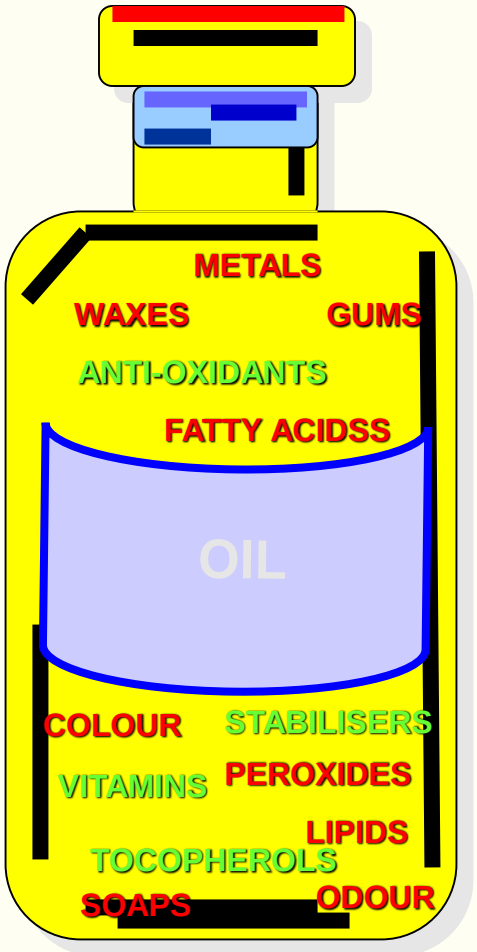
What is Refining ?

..We need to take a look at a Bottle of Crude Oil

WHAT'S IN THE OIL?

There are NUTRIENTS..



... And UNWANTED PRODUCTS!

Refining of crude oil

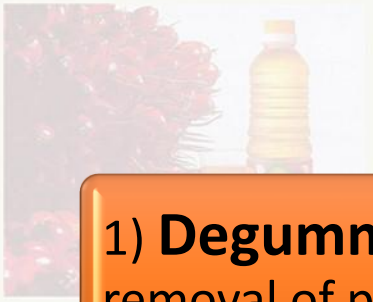
Crude oils as received from the extraction plant contain several non-triglyceride components which must be removed.

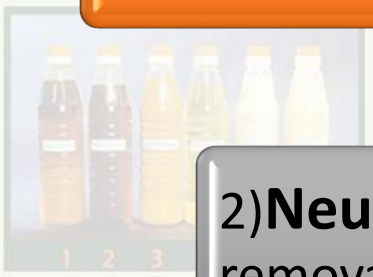
Refining consists of several processes which accomplish this aim.

- A refining process is carried out following extraction of crude edible oils by means of screw presses and/or solvent extraction.

- In refining, physical and chemical processes are combined to remove undesirable natural as well as environmental-related components from the crude oil.

- These components comprise for example phosphatides, free fatty acids, pigments (such as chlorophyll), odors and flavors (including aliphatic aldehyde and ketone), waxes as well as heavy metals, pesticides etc.





1) **Degumming** for removal of phosphatides

2)**Neutralization** for removal of free fatty acids

3)**Bleaching** for removal of color

4) **deodorization** to distill odors and flavors

OIL REFINING PROCESS

Objectives of Refining

1. Removal of undesired products from crude oils
   - free fatty acids (FFA)
   - phospholipids (gums)
   - oxidised products
   - metal ions
   - colour pigments
   - other impurities
2. Preservation of valuable vitamínes.
   (vitamin E or tocopherol–natural anti-oxidants)
3. Minimize oil losses
4. Protection of the oil against degradation

Refining Methods

Chemical Refining

- Degumming
- Neutralizing
- Bleaching
- Deodorization

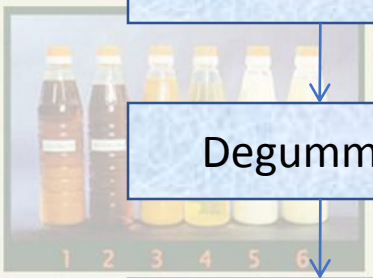
Physical Refining

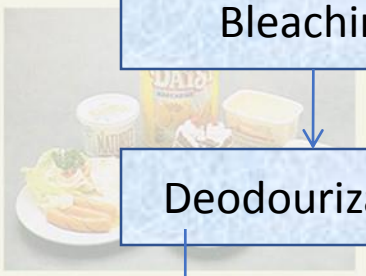
- Degumming
- Bleaching
- Steam distillation

Gums

Two main types :

1. Hydratable Phosphatides-easy to remove
2. Non-Hydratable Phosphatides (NHP) -hard to remove from oil
   - some NHP removed with hydratables in water degumming
   - requires the use of a acid to convert to hydratable for complete removal





Crude Oil

Physical Refining

Degumming

Bleaching

Deodourization

Fatty acid distillates

Refined Bleached deodourized oil

Gums

Soap Stock

Chemical Refining

Degumming

Alkali neutralization

Bleaching

Deodourization

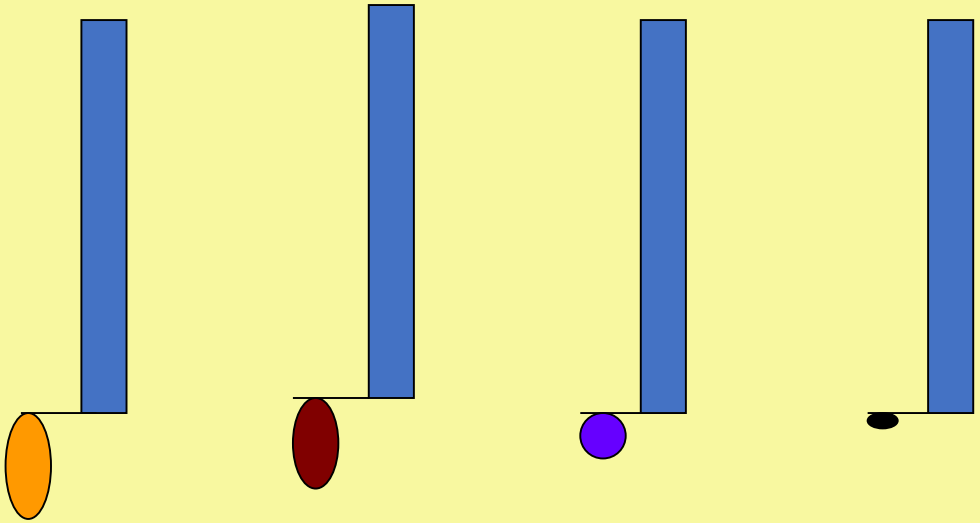
Neutralised , Bleached , Deodourized oil

Degumming

The aim of degumming operation;

- The emulsifying action of phospholipids increases oil losses during alkali refining.
- Gums lead brown discoloration of oil after heating during deodorization.
- Salts may be formed with cooper, magnesium,calcium and iron, accelerating oxidative degredation of oil.
- Certain phospholipids, such as lecithin, find widespread industrial application.

Model of phospholipids



Phosphatidic cholin **P.inositol** **P.ethanolamin** **P.acid**

The groups on the phosphor differ in size and sturcture. The larger the group the more hydratable is the phospholipids

Different degumming processes are carried out to remove phosphatides. For efficient and economic application of this procedure appropriate machines and equipments are used.

1. Water degumming
2. Acid degumming
3. Enzymatic degumming
4. Membrane degumming

Water degumming

- A large part of the phosphatides (gums) can be hydrated quickly and easily. If the pressed or extracted oil contains a considerable quantity of gums the oil is subjected to the water degumming process immediately following extraction.
- In this process, water is added to the oil. After a certain reaction period the hydrated phosphatides can be separated either by decantation (settling) or continuously by means of centrifuges.
- In this process step a large part of hydratable and even a small proportion of the non-hydratable phophatides are removed. The extracted gums can be processed into lecithin for food, feed or for technical purposes.

Water Degumming Process Steps

- Heat oil to 60 -70 °C
- Water addition and mixing
- Hydration mixing 30 minutes
- Centrifugal separation of hydrated gums
- Vacuum drying of degummed oil
- Gums -dried for edible lecithin or recombined in meal

Acid degumming

Dry acid degumming: Dry acid degumming is particularly suitable for processing oils with low gum contents such as palm oil, coconut oil, palm kernel oil or animal fats. Intensive mixing is implemented following addition of acid to the pre-heated crude oil. The conditioned gums are absorbed into the bleaching earth and are separated by filtration.

The benefits of the dry acid degumming process are:

1. Efficiency as a result of :
   - low energy consumption,
   - low operation and maintenance costs (sturdy and reliable control system),
2. long service life (the components are acid proof),
3. low investment costs,
4. environmental-friendly as no wastewater or soap stock occur.

Wet acid degumming :Initially oils with higher gum contents (e.g. corn oil) are similarly processed as in dry acid degumming. However, to achieve gum hydration water is added following acid apportioning. The gums are removed by a separator prior to bleaching.

- centrifuges enable easy separation of gums in oil types with higher non-hydratable gums contents (e.g. rape oil and soybean oil),
- the consumption of bleaching earth is reduced because the oil has already been extensively degummed.

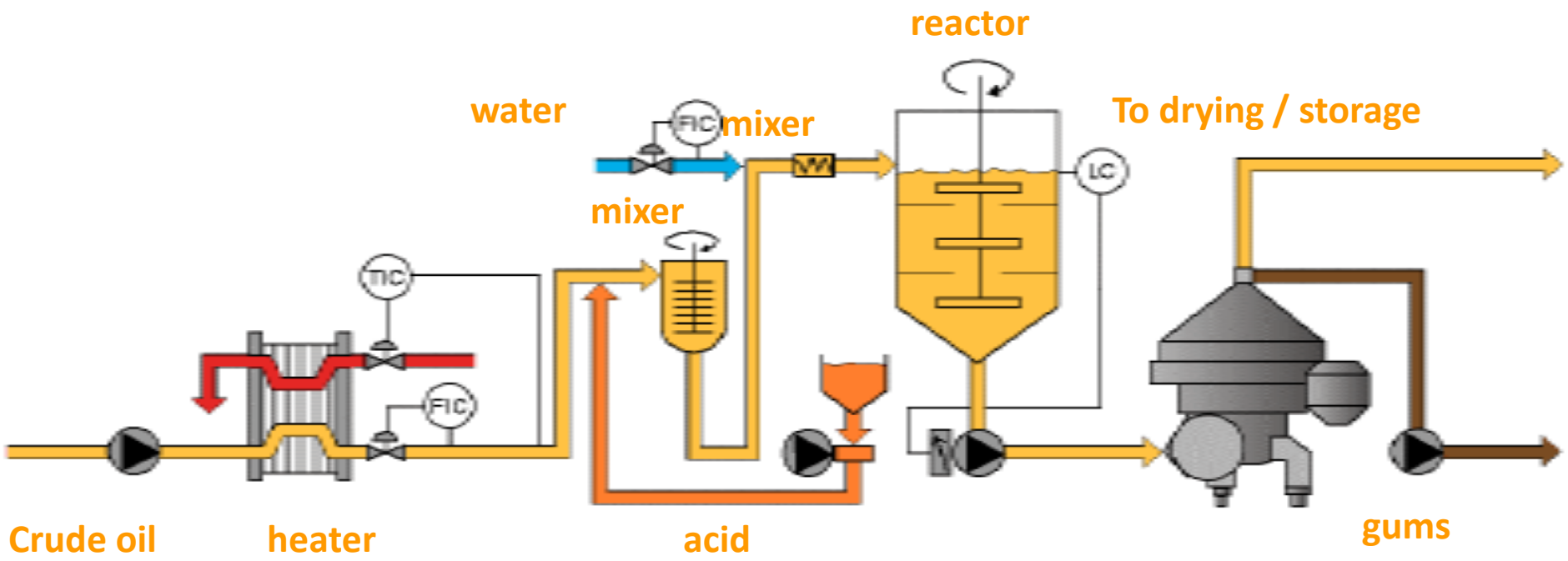
Dry or wet acid degumming are not always sufficient to reduce gums to the value required in the oil prior to the combined deodorization and distillation process.
Thus, a special degumming process is developed.

Acid Degumming Process Steps

- Heat oil to 60 -70 °C
- Acid addition and mixing
- Hydration mixing 30 minutes
- Centrifugal separation of hydrated gums
- Vacuum drying of degummedoil
- Gums -recombined in meal

Acid Degumming

Phosphorous in degummed oil -20 to 50 ppmmax.
Moisture in dried and degummed oil -< 0.1%



Enzymatic degumming

Enzymatic degumming was first introduced by the German Lurgi Company as the »Enzy Max process« .The EnzyMax process can be divided into four different steps:

(*i*) the adjustment of the optimal conditions for the enzyme reaction, *i.e*. optimal pH with a citrate buffer and the optimal temperature;

(*ii*) the addition of the enzyme solution;

(*iii*) the enzyme reaction;

(*iv*) the separation of lysophosphatide from the oil at about

75 °C.

<u>Enzymes for enzymatic degumming;</u>

- Lecitase® 10L (pancreatic phospholipase A2)
- Lecitase® Novo (microbial lipase)
- Lecitase® Ultra (microbial lipase)

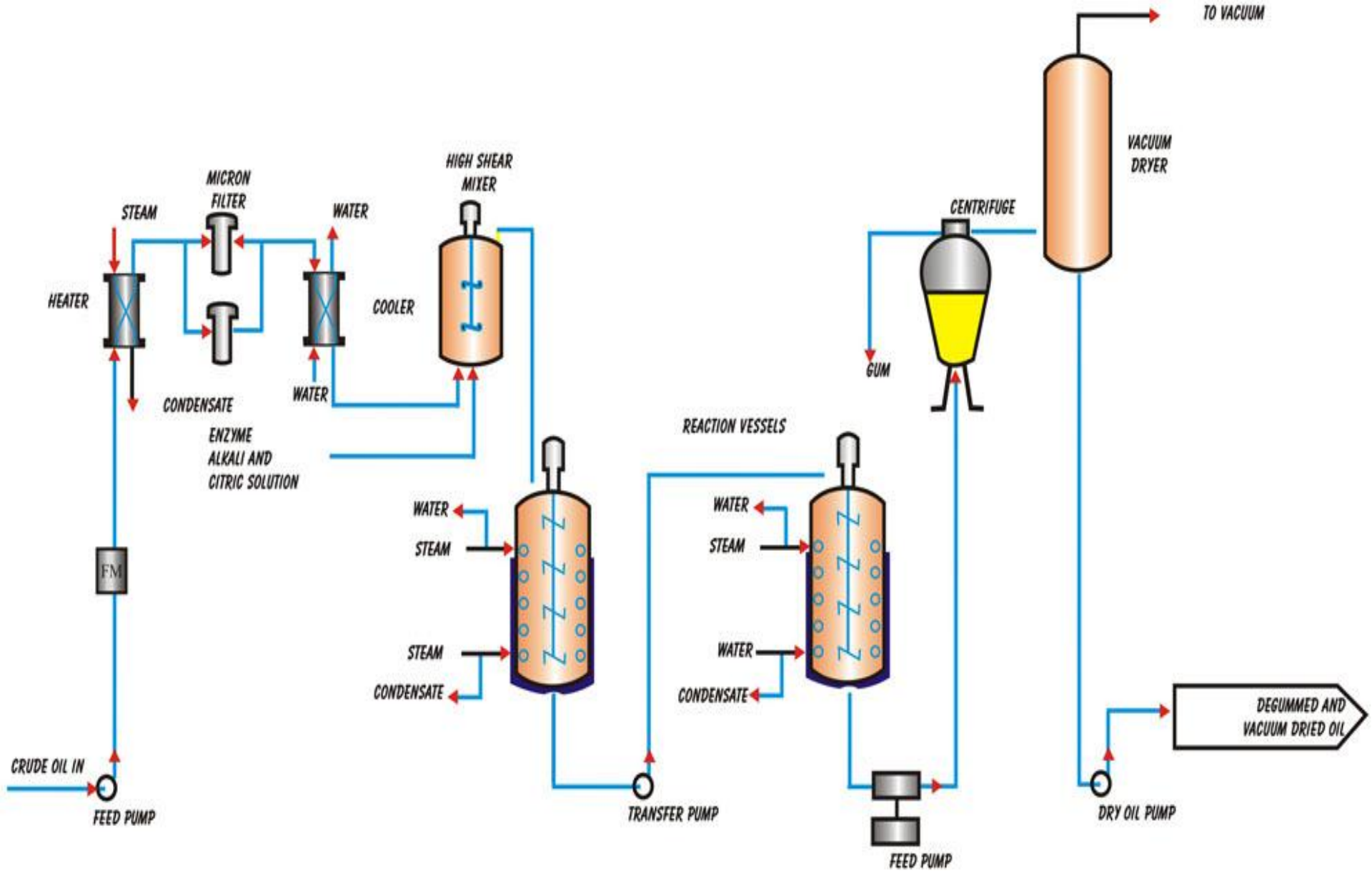
The enzyme solution (Aqueous solution of citric acid, caustic soda and enzymes) is dispersed into filtered oil at mild temperature,

a high speed rotating mixer used for effective mixing of enzyme and oil.

The conversion of non-hydratable phospholipids (NHPs) into hydratable phospholipase (HPs) is attained by the effect of enzyme, the enzyme treated oil is sent to mechanical separation

and the degummed oil received is dried under vacuum and suitable for further process.

Enzymatic degumming



NEUTRALISATION

Objective: Removal of free fatty acids

Two different refining principles:

1. Chemical Refining:Removal by a chemical reaction with alkali (caustic soda)
2. Physical Refining:Removal by distillation at higher temperature and low vacuum

Batch Neutralization:

Refining of vegetable oils is essential to ensure removal of gums, waxes, phosphatides and free fatty acid (F. F.A.) from the oil; to impart uniform colour by removal of colouring pigments and to get rid of unpleasant smell from the oil by removal of odiferous matter.

Refining is carried out either on batch operation or as continuous operation. With certain oils even physical refining can be carried out instead of chemical.

For processing less than thirty tones of oil per 24 hours, and when oil has F.F .A. content of 1 % or less normally batch process is recommended. Batch process involves low capital investment, simplicity of operation and low maintenance, making refining economically a viable proposition even at capacity as low as 10 tonnes per 24 hours.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DAISY
NATURE