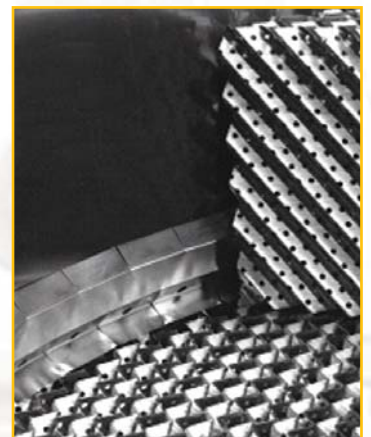




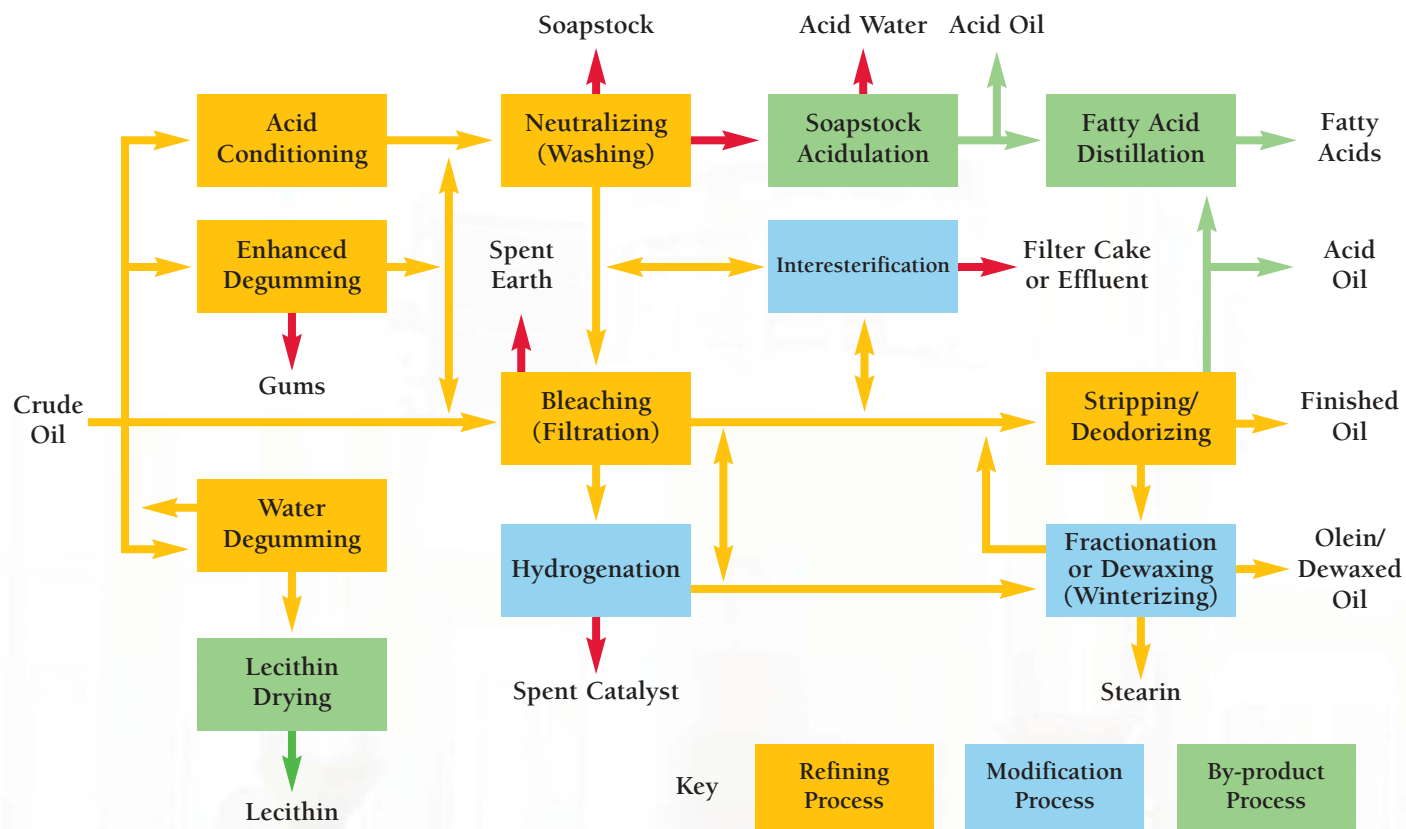
Oils & Fats Refining

Crown Iron Works Company
A CPM Company





CROWN'S ROAD MAP FOR OILS AND FATS REFINING



CHEMICAL REFINING

The Chemical Refining process is used for oils and fats with low FFA and contains three basic steps:

- Neutralizing
- Bleaching
- Deodorizing

Residual soap and gums removal in neutralizing is accomplished by either water washing or using a silica adsorbent in bleaching.

PHYSICAL REFINING

The Physical Refining process is used for oils and fats with high FFA and contains three basic steps:

- Acid Conditioning or Enhanced Degumming
- Bleaching
- Stripping and Deodorizing

The degumming process used depends on the oil or fat being refined.

CROWN DESIGN ADVANTAGES

Degumming/Neutralizing

- Design provides flexibility for switching between the various degumming processes and neutralizing, and for processing multiple feedstocks
- Degumming/Neutralizing Reactor with adjustable retention time and agitation
- Silica adsorption and water wash designs for Enhanced Degumming and Neutralizing processes

Bleaching

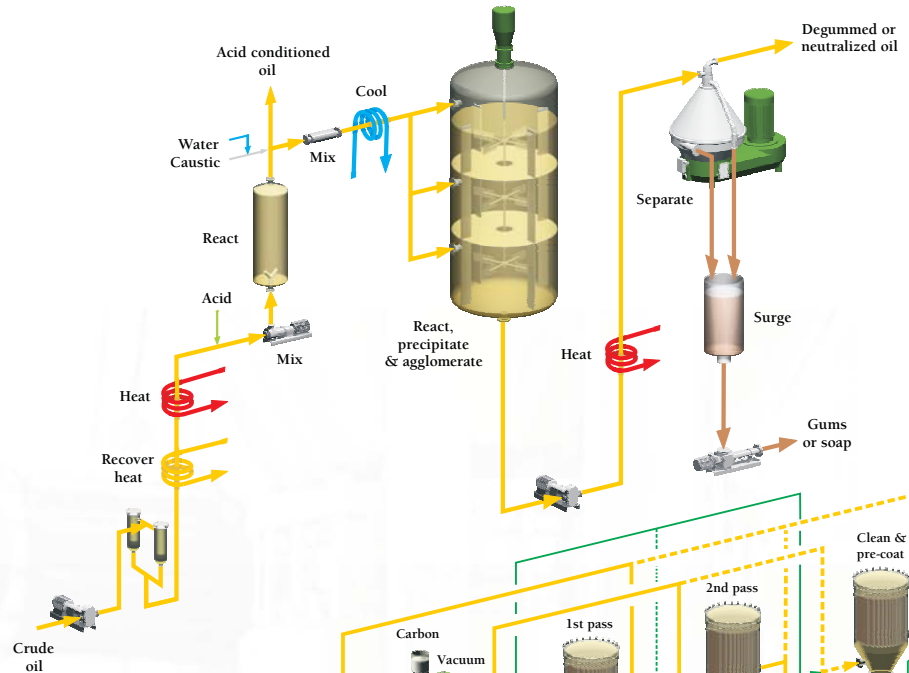
- Silica adsorption reduces water consumption, effluent treatment and bleaching earth consumption
- Pre-bleaching oil minimizes bleaching earth consumption

Deodorizing

- Innovative, industry proven continuous and semi-continuous deodorizer designs using low energy
- Continuous deodorizer design uses structured packing for minimum energy consumption and accommodates six stock changes per day
- Semi-continuous tray deodorizer designed for frequent stock changes and minimal installed cost

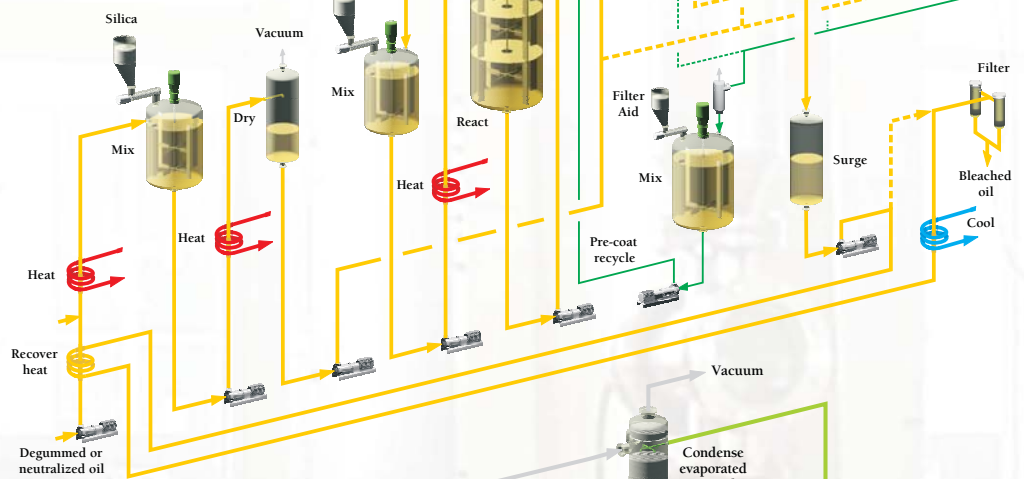
THE “MULTIPURE” DEGUMMING/ NEUTRALIZING SYSTEM

The key feature in the “MultiPure” Degumming/Neutralizing system is a reactor with variable retention time and agitation. The design can be used for acid conditioning, various types of degumming, and neutralizing. The system can be designed with either silica adsorption in bleaching or water washing, which requires a second centrifuge.



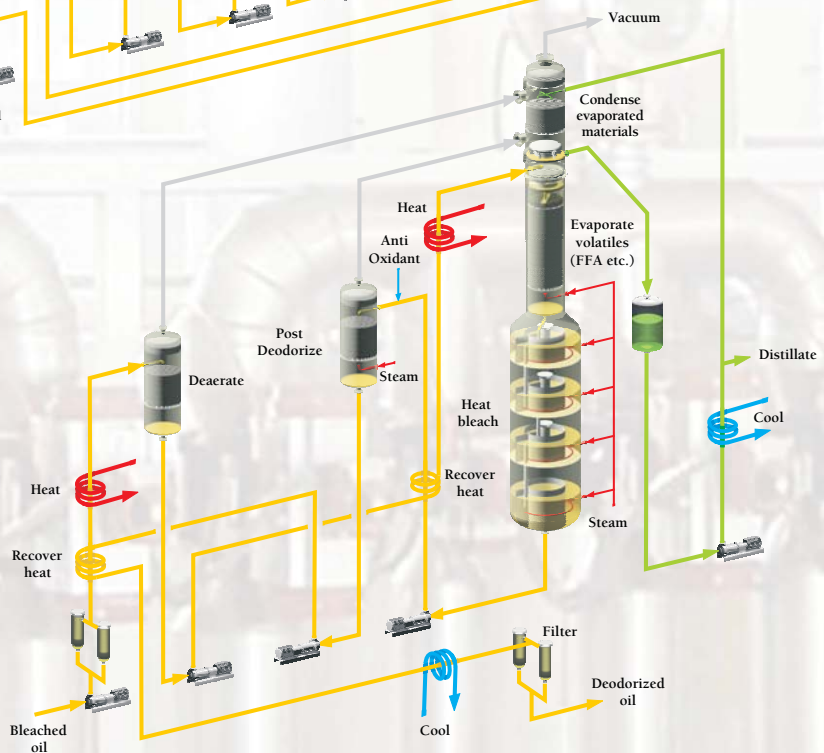
THE “DOUBLEPASS” BLEACHING SYSTEM

The key feature in the “DoublePass” Bleaching system is a third filter, which is used to pre-bleach the oil. Degummed or neutralized oil is pumped through a filter containing once used bleaching earth utilizing the remaining activity of the clay.



THE “MAXEFFICIENCY” DEODORIZING SYSTEM

The two key features in the “MaxEfficiency” Deodorizing system are the double shell packed column and post deodorizing. This design minimizes energy consumption and ensures high quality oil.



ADDITIONAL PROCESSES

WINTERIZING PROCESSES

Winterizing is a generic term that describes various processes which cool oil to remove high melting constituents from the oil.

Dewaxing

Oils such as sunflower, corn, canola, rapeseed and ricebran contain “waxes”; long chain alcohols, sugars or starches; that create a haze when the oil is stored for an extended period or refrigerated. These waxes are typically removed during the refining process if the finished (RBD) oil will be packaged as a salad oil. In the Dewaxing process, filter aid is added to the oil which is quickly cooled to a desired temperature. The oil is agitated at that temperature for up to 12 hours to ensure full crystal formation. The waxes are separated from oil using a pressure leaf filter. Dewaxing is typically a continuous process though some specialty oils or small capacity plants dewax in batches.

Winterizing

Some oils such as cottonseed, fish and partially hydrogenated soybean are winterized using processes similar to Dewaxing. The Winterizing processes cool the oil at slow rates and do not use filter aid to promote the crystallization.

OIL MODIFICATION PROCESSES

Oils are modified to change their melting characteristics.

Dry Fractionation

Oils with high saturation like palm oil sometimes require the higher melting fractions be separated from the lower

melting fractions. Dry Fractionation is a reversible batch process where higher melting fractions (stearin) form crystals and are separated from the lower melting liquid fractions (olein). In the Dry Fractionation process, the oil is cooled to a desired temperature using a multistep program over a varying range of time. The temperature is decreased at a controlled rate under slow agitation to ensure proper crystal formation of the targeted triglycerides. The crystals are removed by specially designed filters.

Hydrogenation

Oils such as soybean, canola and rapeseed are routinely modified to alter their melting characteristics and improve their oxidative stability. Hydrogenation, which reduces the amount of unsaturation, has been the primary modification method until recent health concerns regarding the consumption of transisomers were raised. Hydrogenation is typically a batch process where oil is metered into an agitated pressure vessel and nickel catalyst is added. Hydrogen is then injected into the slurry. When the reaction is finished, the hydrogenated oil is cooled and the catalyst is removed by filtration.

Chemical Interesterification

An increasingly common oil modification process is interesterification, a process that rearranges the fatty acids of a triglyceride to change its melting characteristics. Chemical Interesterification is a batch process in which an alkali catalyst is blended with oil in an agitated pressure vessel until the reaction is at equilibrium. Acid is added to stop the reaction and the resulting soaps are removed by silica adsorption and filtration,

the Bleaching process, or washing and drying.

BYPRODUCT PROCESSES

Oil Filtration and Lecithin Drying

Lecithin for human consumption can be produced from the “gums” removed in the Water Degumming process. Food grade lecithin is produced by filtering the oil prior to water degumming to ensure a solids free feed to the lecithin dryer. In the Lecithin Drying process, moisture is evaporated from the wet gums under carefully controlled conditions to avoid darkening the lecithin. The lecithin is then cooled as it is discharged from the dryer and sent to storage. Lecithin is sometimes bleached using hydrogen peroxide.

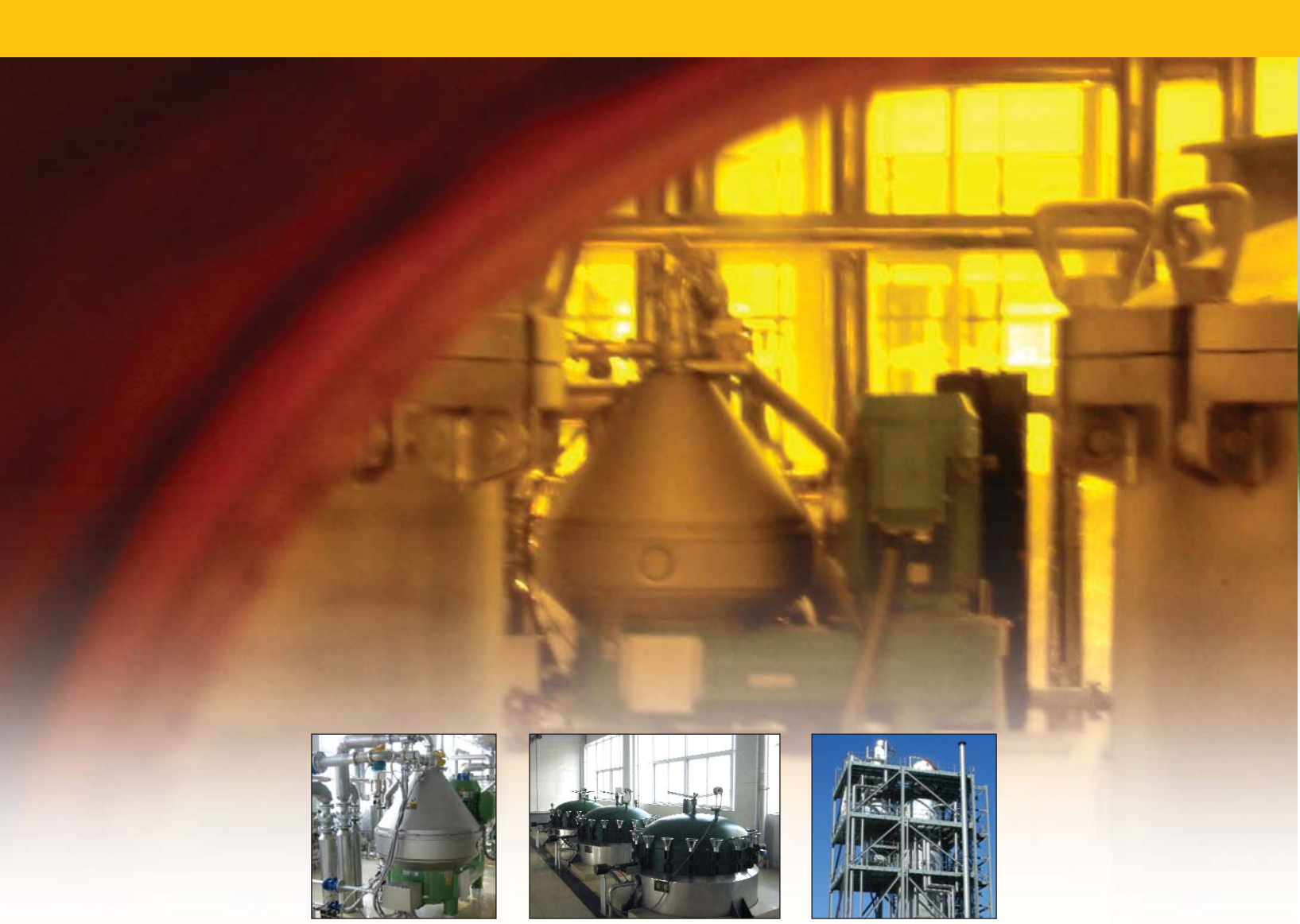
Soapstock Acidulation

When soapstock cannot be combined with meal or otherwise disposed of economically, the soapstock may be acidulated to recover the fatty acids. In the Acidulation process, soapstock is heated and reacted with sulfuric acid, which creates acid oil (crude fatty acids) and acid water. Caustic may be added to fully saponify the soapstock before heating. The acid oil may require further processing depending on its disposition. The acid water is neutralized before being transferred to effluent treatment.

Fatty Acid Distillation

Acid oil or deodorizer distillate are distilled to purify the fatty acids for resale.





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