



Healthier palm oil

Solutions for reducing 3-MCPDE esters and glycidyl esters in palm oil processes





Balancing food safety, economy and performance

Regulatory guidelines for palm oil processing are evolving to address health risks associated with the formation of 3-monochloro-1,2-propanediol, its esters (3-MCPDE), and glycidyl esters (GE). As a result, Alfa Laval is working with palm oil producers to safeguard public health as well as palm oil plant productivity worldwide.

Innovative processing solutions

Based on proven technologies, Alfa Laval's innovative solutions help palm oil producers mitigate process contaminants while ensuring sound operating economy as well as final quality of palm oil.

Prepared for future regulations

The European Food Safety Authority Panel on Contaminants in the Food Chain has set the tolerable daily intake of free and bound 3-MCPDE as 2.0 µg/kg of body weight. Although no regulation limiting 3-MCPDE in refined palm oils exists, Malaysia is spearheading a campaign to re-

duce 3-MCPDE formation during the physical refining process. Meanwhile, the European Commission has drafted a regulation to limit GE in all kinds of refined oil. Alfa Laval is working to help palm oil producers meet future 3-MCPDE and GE regulations while optimizing process economy. Significant reductions in 3-MCPDE and GE can be achieved in these areas:

- Crude palm oil washing – Installing the Alfa Laval Crude Palm Oil process before the physical refining process helps remove chlorines that promote 3-MCPDE formation.

- Neutralization – The Alfa Laval Combi Mix process produces refined oils with 3-MCPDE and GE content of less than 0.5 ppm.

- Dual-temperature-dual-strip technology – The Alfa Laval dual-temperature-dual-strip process offers the option of cooling after pre-stripping the free fatty acids. This minimizes GE formation by reducing the temperature required to retain the oil. Post-stripping after oil retention helps strip any traces of GE.

Secure low total cost of ownership

Alfa Laval solutions reduce 3-MCPDE and GE from refined palm and maximize yield for palm oil producers. These energy-efficient, low-maintenance solutions deliver top performance, operational reliability and premium quality. This translates into low total cost of ownership and true peace of mind.

Professional, competent partners

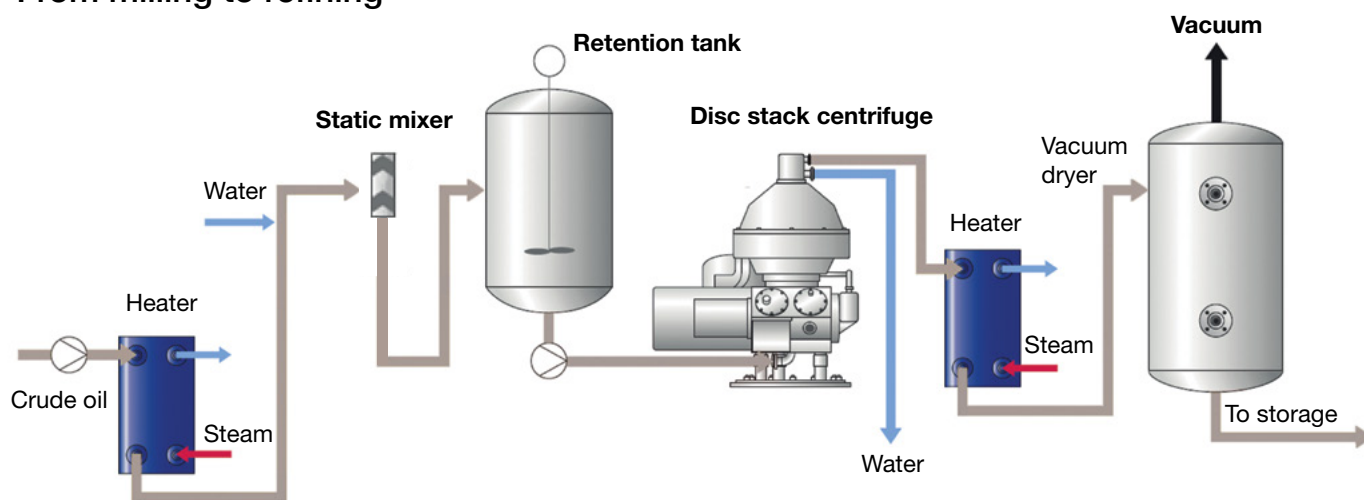
With more than 50 years of industry experience, Alfa Laval has a deep understanding of palm oil processes and vast expertise in addressing the challenges that palm oil producers face. Rest assured, we put Alfa Laval R&D resources, materials technology and specialist know-how to work for you – from processing fresh fruit to producing quality refined palm oil.





Mitigation starts at the source

From milling to refining



Alfa Laval CPO washing process

Mitigation of 3-MCPDE via removal of chlorine in CPO

Alfa Laval has successfully installed and commissioned CPO washing plants that effectively reduce chlorines. The washing process can achieve more than 80% chlorine removal from CPO. The Alfa Laval CPO washing process does not react with oil, but only removes chlorine in the moisture content as well as less soluble chlorine salts.

Washing CPO in the producing countries, not the receiving countries is crucial. This ensures more effective chlorine reduction as well as more effective preservation of oil quality. It has also been established that chlorine removal is most effective early in the process before the formation of organic chlorines takes place.

The Alfa Laval CPO washing process

Here, chlorine-free water is added into the CPO. The oil-water mixture

is retained in the mixing tank for about 15 minutes. Water is separated by a disc stack centrifuge. The washed oil is then sent directly to a bleaching plant or dried and cooled for storage using a heat economizer with feed oil. The washed oil then has improved phosphate content and reduced secondary oxidation products compared to the crude oil.

The Alfa Laval CPO washing process can be equipped for acid washing to further reduce bleaching earth consumption in the bleaching stage.

Alfa Laval CPO washing: Best in mill or refinery?

The Alfa Laval CPO washing plants can be set up in the mills or in refineries. However, an integrated refinery where both mill and refinery are located at the same site produces the best oil quality and mitigation of 3-MCPDE and GE.

Alfa Laval high speed separators

Robust and easy to maintain, Alfa Laval VO and PX self-cleaning high speed separators are designed for neutralization and oil washing. The Alfa Laval PX range with its semi-hermetic design is equipped with the unique Alfa Laval Centrizeom™ adjustable paring disc. This makes it easy to handle a wide range of gums and soapstocks, as well as quickly adjust process conditions via remote control. It also reduces energy consumption dramatically.



PX range



Alfa Laval Neutralization

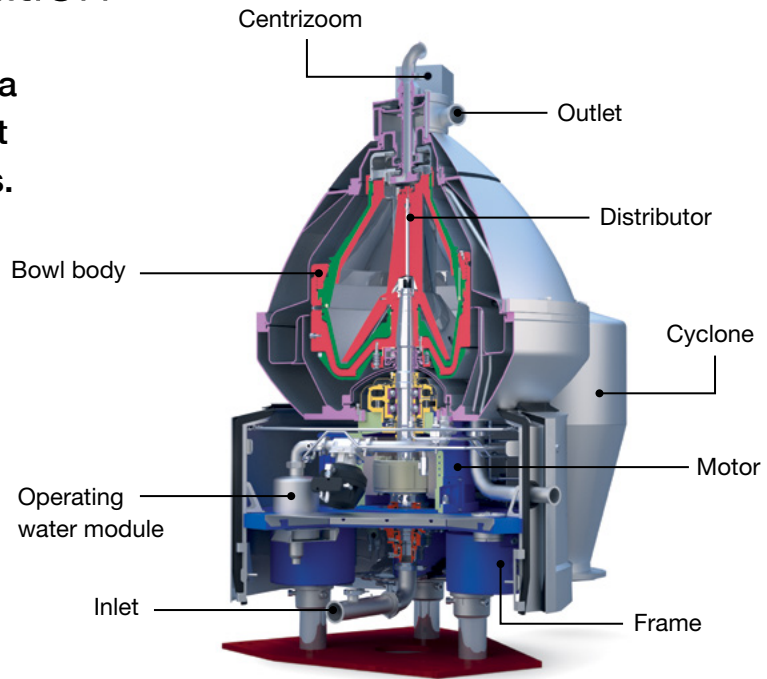
Neutralization using caustic soda is widely recognized as the most effective way to purify crude oils.

Another advantage of neutralization is that the soapstock formed by this process also encapsulates other impurities such as sugar, pigments and trace metals.

Neutralization is generally carried out using a continuous disc stack centrifuge. Once neutralization has been completed, the oil is washed. The wash water is then removed using disc stack centrifuges, and the oil is dried in a vacuum dryer.

Alfa Laval palm oil neutralization only requires short contact time. This is because palm oil has very low gums but high content of free fatty acids.

Due to our vast palm oil process experience, Alfa Laval has been able to optimize acid dosing as well

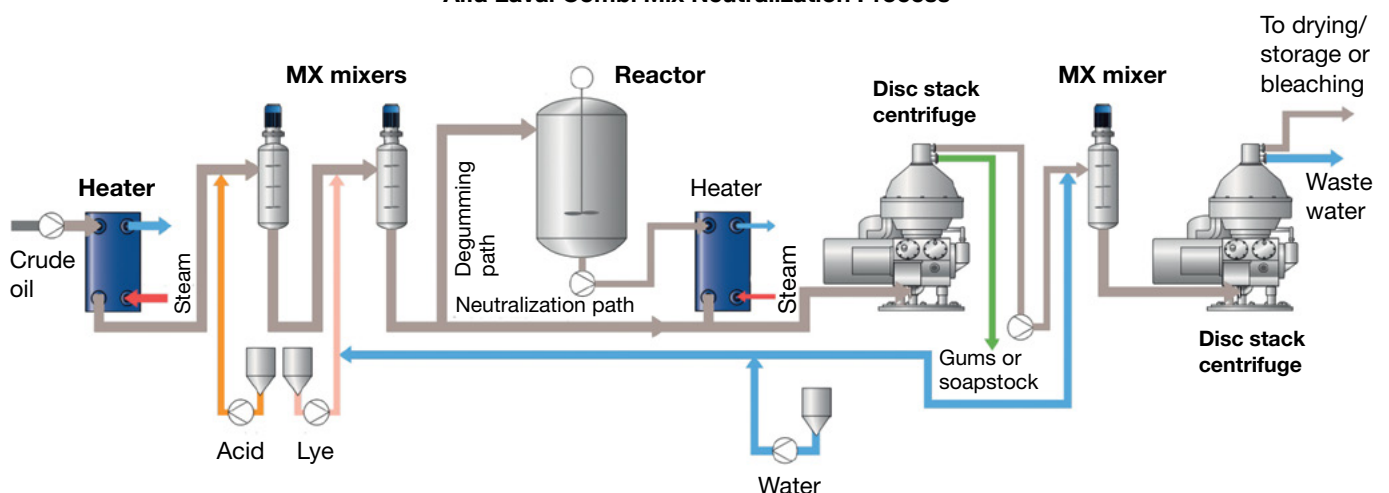


Alfa Laval PX115e Direct Drive Disc Stack Separator

as accurate dosing of caustic soda with optimum caustic strength. This enables Alfa Laval to facilitate palm oil neutralization with minimum yield loss while enabling the production of premium oil with good economy.

To achieve premium palm oil quality with very low 3-MCPDE and GE, the Alfa Laval neutralization process is the go-to solution. And the recipe to success lies within Alfa Laval separation technology.

Alfa Laval Combi Mix Neutralization Process





Safeguarding food safety

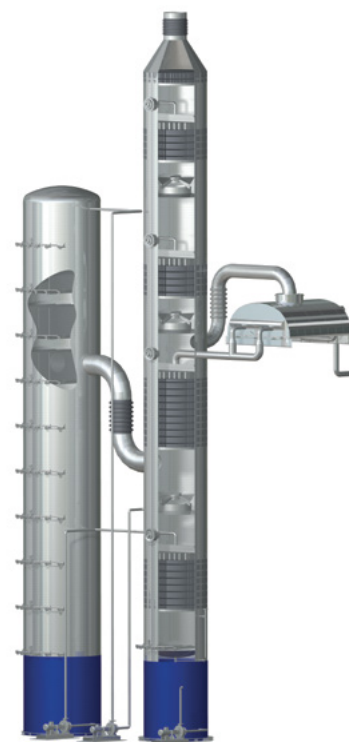
Mitigation of GE with Alfa Laval Deodorization

GE is a contaminant that results from the diacylglycerides (DAG) reacting at high temperatures. Most palm oil is physically refined for good process economy. Bleached palm oil is heated to very high temperatures (260°C – 265°C) to strip fatty acids, then retained for an hour for heat bleaching and deodorization. However, because palm oil has a higher percentage of DAG compared to other oils, palm oil deodorization steps can

easily form undesired GE at high temperatures.

To maintain palm oil process economy, Alfa Laval has introduced post-stripping. Bleached oil is heated to 260°C to strip free fatty acids and then deodorized. After deodorization the oil is cooled to <230°C before post-stripping.

To further improve GE removal, Alfa Laval's deodorizer column operates under very low vacuum with pre- and post-stripping.



Comparison of CPO: Standard Physical Refining, Improved Physical Refining and Chemical Refining

	CPO	Standard Physical Refining	Improved Physical Refining	Chemical Refining
FFA (%)	5	0.05	0.04	0.03
Colour (5-1/4") based on DOBI 2.3 (R)		2.5	2.0	1.5-2.0
GE (ppm)		8-10	<1	<0.5
3-MCPDE (ppm)		4-6	<1	<0.5

Alfa Laval in brief

Alfa Laval is a leading global provider of specialized products and engineered solutions.

Our equipment, systems and services are dedicated to helping customers to optimize the performance of their processes. Time and time again.

We help our customers to heat, cool, separate and transport products such as oil, water, chemicals, beverages, foodstuffs, starch and pharmaceuticals.

Our worldwide organization works closely with customers in almost 100 countries to help them stay ahead.

How to contact Alfa Laval

Up-to-date Alfa Laval contact details for all countries are always available on our website at **www.alfalaval.com**.

Close to you

With the Alfa Laval 360° Service Portfolio, support and service are always close at hand. Our global reach and local presence ensure maximum uptime, performance and operational efficiency of your Alfa Laval equipment throughout its life cycle.