Reducing 3-MCPD and GE in palm oil processing

Proven technology for integration into oil mills and refineries
Produce palm oil that convinces the food industry and protects consumers

The mitigation of 3-MCPD is essential for acceptance of palm oil. GEA offers process solutions for minimization in the oil mill but also in the refining process.

New challenges for palm oil producers

Palm oil is the most widely used vegetable oil in the world. The global market is growing, the applications are diverse. At the same time, the oil is under intense debate. Fatty acid esters 3-MCPD (3-monochloropropane-1,2-diol) can be found in all types of cooking oils and foods containing fat but palm oil exhibits relatively high levels of these fatty contaminants. As the substances are suspected of being carcinogenic, certain maximum daily values should not be exceeded in consumption. For the palm oil producers, this means reducing the contents of these contaminants as far as possible.

As the market and technology leader in the area of centrifugal separation technology, GEA has supported palm oil extraction for many decades. For example, at the start of the 2000s, we developed and launched a completely new extraction process: our ecod process. The central advantages of this extraction method are improved oil quality and minimization of fresh water use. Thus, the wastewater volumes, which are collected in ponds and emit methane, are reduced as well.

When it comes to the formation of 3-MCPD esters the following precursors seem to play a role: chloride, mono and di-glyceride as well as process-dependent factors such as high temperatures, processing time (from harvest to CPO to RBD) and pH value. One source of chloride is the water added to the process. This makes our water-free ecod process the optimal process for the extraction of low 3-MCPD palm oil.

Di-glycerides, which form primarily in the continuous settling tank due to the very high temperatures and long holding time, are held responsible for the formation of GEs. It is precisely this process stage that is omitted in the ecod process, resulting in significantly lower values of di-glycerides and ffa.

However, to bring the contaminant values down to the lowest value technically possible, additional processing stages are required. GEA offers solutions both for the oil mill operator – to minimize the contaminants even on recovering the crude palm oil – and for the refiner, integrated into the respective refining process. Our decades of experience in the recovery and refining of vegetable oils can be found in both variants.

Your advantages

- Marketable solutions
- Production of high-quality palm oil with low 3-MCPD content
- Alternatives for oil mills and refineries
CPO washing for oil mills

Excellent washing effect to reduce chlorides

As inorganic chlorides are water soluble, they can be reduced by washing them out. This happens by means of intensive mixing of CPO and chloride-free water. Here, the chloride ions pass into the washing water, the water is then separated from the oil by high-performance separators.

This process technology has been tried and tested many times, and stands out for its first-class results. It is easy to install and to adapt to different production capacities. Additionally, an oil cooler can be installed. The rapid cooling improves the quality of the oil.

Benefits at a glance
- Maximum removal of chlorides
- Earliest possible separation of chlorides from the oil produces better oil quality
- Reduced formation of 3-MCPD in refining
- Robust, tried and tested process technology
- Easy installation – plug & play solution for all common capacities
- Optional: oil cooler – first-rate oil quality due to reduced thermal stress
- Removal of other contaminants, such as phospholipids, etc.
Mitigate 3-MCPD in refineries

Reduction of 3-MCPD through combined CPO washing and degumming

In case the CPO has not been washed already in the mill, GEA has also solutions to reduce the chlorides and phospholipids in the refinery. With a simple acid degumming you cannot only mitigate the formation of 3-MCPD, you will ultimately also reduce bleaching earth consumption considerably.

The crude oil is initially heated to the optimum process temperature in a heat exchanger. A metering unit is used for adding a small quantity of phosphoric or citric acid, which is mixed intensively with the oil in a centrifugal mixer. After a brief reaction time, hot water is added and mixed.

The heavy phase which contains phosphatides, proteins, pigments and other impurities is then separated. The oil which is treated in this way is generally sent directly to the bleaching stage and deacidified by means of distillation.

Benefits at a glance
- Reliable reduction of 3-MCPD in refineries
- Robust, tried and tested process technology
- Significant reduction of bleaching earth consumption
- Better end product quality
- Less fouling of downstream equipment
Mitigate 3-MCPD and GE in refineries

Reduction of 3-MCPD and GE through chemical refining

For customers who demand highest oil quality with minimum 3-MCPD and also GE impurities, we recommend chemical refining. Only a chemically neutralized oil allows lower temperature during deodorization which results in lower GE values in your end product. On top, minimization of the chlorides with the aid of sodium hydroxide produces the best results in the reduction of 3-MCPD and thus less contamination with 3-MCPD.

The lower the ffa content in the CPO from the oil mill, the lower the oil losses in chemical refining. In this respect too, our ecod process again proves to be the best recovery process, this time from an economic point of view.

Benefits at a glance
- Reliable reduction of 3-MCPD and GE in refineries
- Robust, tried and tested process technology
- Separators can be used flexibly depending on customer objective
- Chemical neutralization for premium-quality palm oil

To recover the fatty acids from the by-product soapstock, simplified soap splitting can be used. GEA also has this process stage in its portfolio.
CPO washing separators for mills

Features
- Flat belt drive, no gear
  ➔ High energy efficiency and less maintenance
- Double centripetal pump
- Hydraulic ejection: wear- and tearless ejection system
  ➔ Always precise ejections and minimum product losses
- Stainless steel catcher
  ➔ Food grade
- Special CPO washing disc stack
  ➔ No blockages
- High hydraulic capacity
  ➔ Top oil quality

Additional feature for VSE 115/165
- Manual fine tuner: adjustable to different process conditions without interrupting production
  ➔ Reduced oil losses

Separators to mitigate 3-MCPD and GE in refineries

Features
- GEA directdrive
  ➔ Highest energy efficiency compared to gear and flatbelt drive
  ➔ Maximum uptime due to fast maintenance and less parts
  ➔ Reduced noise level
- GEA finetuner: automatic adjustment of separation zone
  ➔ Lowest oil losses
  ➔ No interruption of production
- Double centripetal pump
- Adjustable, hydraulic ejection: wear- and tearless ejection system
  ➔ Always precise ejections and minimum product losses
- Hydrohermetic feed
  ➔ Gentle product treatment for highest yields
  ➔ No mechanical seal, no downtime due to wear and tear of the mechanical seal
- Stainless steel catcher
  ➔ Food grade
- Special CPO washing disc stack
  ➔ No blockages
  ➔ High hydraulic capacity
  ➔ Top oil quality

VSE 80
Capacity up to 300 t/d
(60 t/h FFB mill)

VSE 115/165
Capacity up to 400 t/d (90 t/h FFB mill)
/ 600 t/d (120 t/h FFB mill)

Separator VSE 450
Capacity up to 2,000 t/d

VSI 250/350
Capacity up to 1,000/1,500 t/d
We live our values.
Excellence • Passion • Integrity • Responsibility • GEA-versity

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