Improve quality of refined palm oil and biodiesel with Alfa Laval’s high speed separators

22 April 2021

- **Effectively mitigate 3-MCPD esters in your palm oil with our high speed separator technology**

- **Lower your operational cost in your plant with our high speed separator that provides maximum separation performance in your biodiesel processes**

Our speaker

Finn Rundstrom is the Global Technology Manager in Alfa Laval who oversees vegetable oil and biodiesel applications in Southeast Asia. He holds a MSc in Mechanical Engineering from KTH Royal Institute of Technology, Stockholm, Sweden and has been with Alfa Laval for 12 years with massive technical experience and knowledge in high speed separators under his belt.

Housekeeping rules

Please mute your microphones

Type questions into the chat function

Session will be recorded

Effectively mitigate 3-MCPD esters in your palm oil with our high speed separator technology

What are the concerns with 3-MCPD?

The concerns over 3-MCPD

- Difficult to remove after formation
- Could be carcinogenic to humans[1]
- Possible effect on kidney & male fertility[2]

[1] Classification by International Agency for Research on Cancer

[2] Institute of Food Science & Technology, UK (IFST)

How to mitigate 3-MCPD?

- Chlorines are present in the oil and during refining at high temperature, these chlorines form 3-MCPD
- By removal of chlorines, less 3-MCPD are formed after refining

Types of chlorines

- Inorganic chlorines are soluble in water
- Organic chlorines can be made soluble in water by caustic; i.e., by chemical neutralization

Choosing the right mitigation method

– Which method is the best for you?

Mitigation approaches

Plantations

- Reduce chlorine in fresh palm fruit bunches by changing fertilizers used
- Reduce DAG in palm oil by ensuring milling within 48 hours – improve quality of crude palm oil

Mills

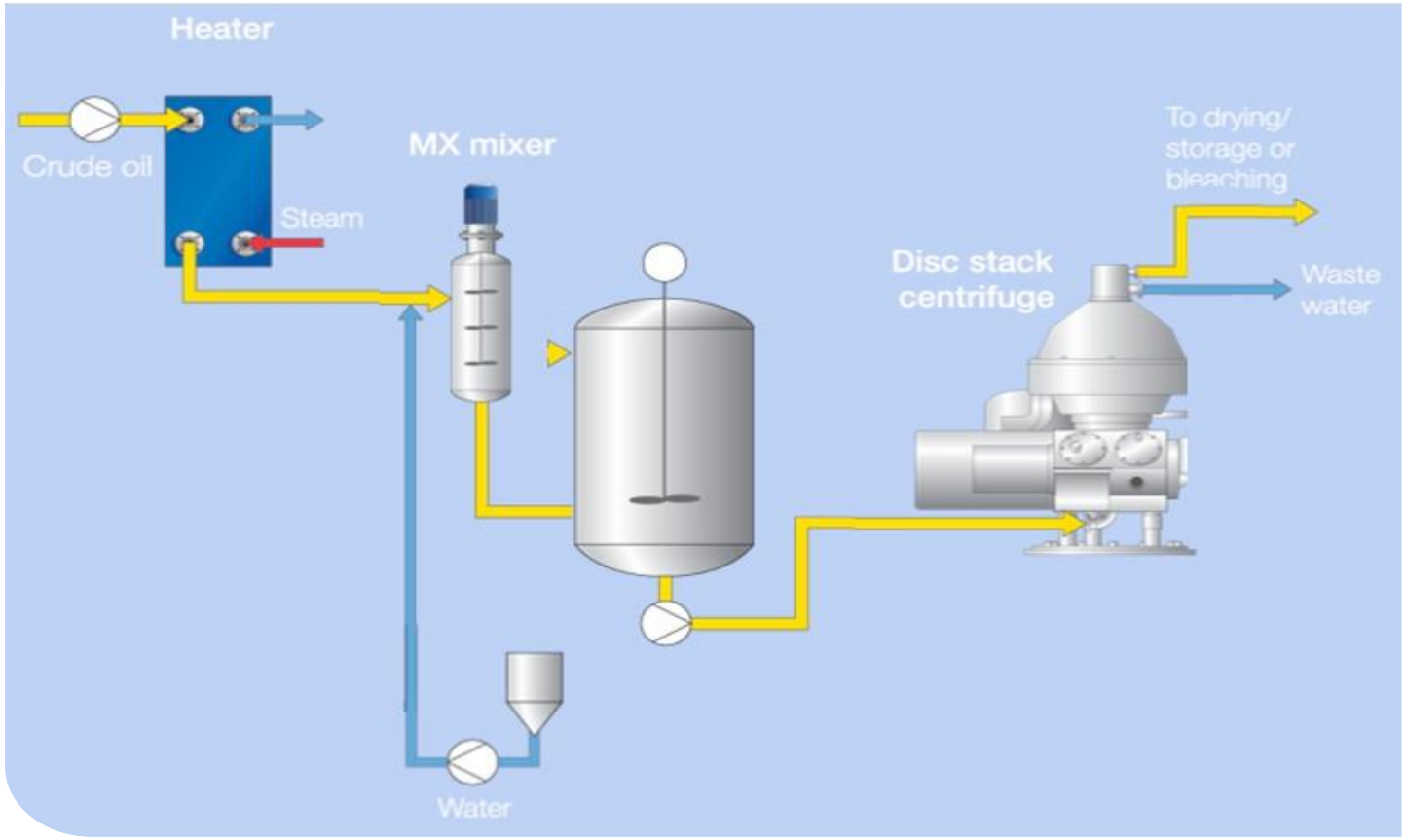
- Wash fresh palm fruit bunches to remove chlorine precursor
- Fresh palm fruit bunches sterilization with steam without chlorine
- Wash fresh crude palm oil with slightly alkaline water

Refineries

- Wash the crude palm oil at the refinery and minimize residence time and temperature during deodorization to the extent possible

Alfa Laval high speed separator in crude palm oil washing

- Simple system
- Low losses
- High chlorine reduction
- Erosion protection of bowl
- Low moisture in oil 0.4-0.7%



High speed separator enables maximum chlorine reduction

- Target 1.5 ppm after washing
- Optimum when starting at 4-5 ppm
- Average chloride reduction from several sites in South East Asia by 70%
- Moisture in oil <1%
- Oil in wash water <0.5%

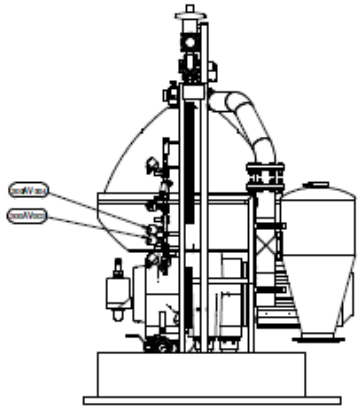
Full crude palm oil washing range for different plant capacity

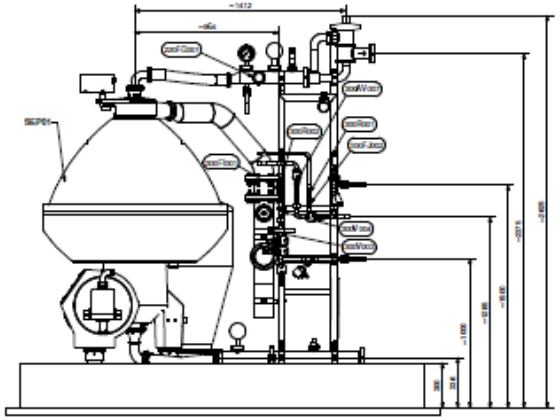
Machine	Capacity CPO Washing (TPD)
PX 55	150
PX 65	300
PX 70	400
PX 80	500
PX 100	1000
PX 115	1500
PX 115e	1500
VO 5	60
VO 10	100
VO 20	200
VO 30	300

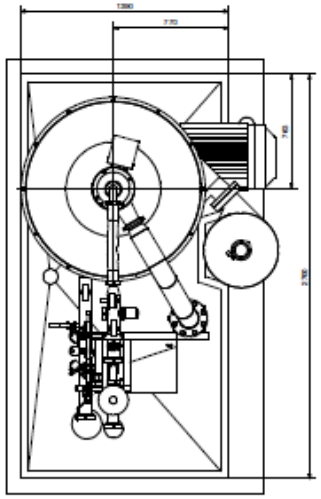
Modular PX system saves installation cost

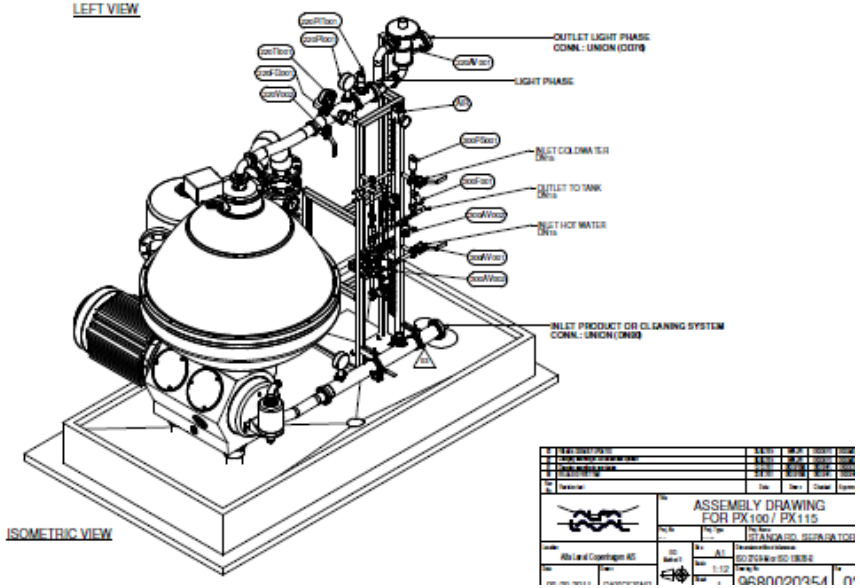
− Prefabricated module

- Separator
- Water rig
- Over head tank for Discharge
- Siemens or Allen-Bradley Controls





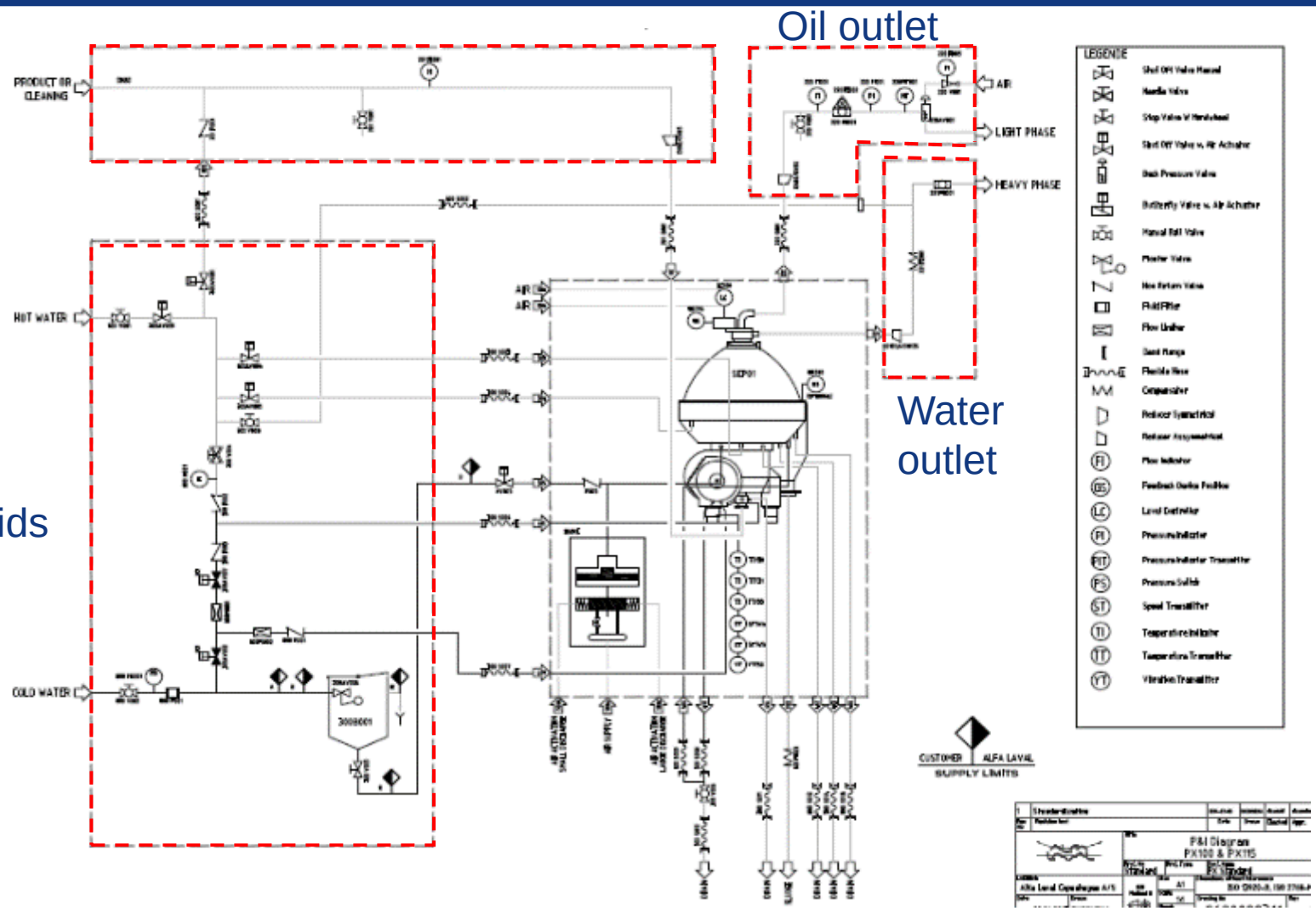




Optimal performance with full automated control

Inlet line

Service liquids



Proven crude palm oil washing track record

– Alfa Laval presence in the South-East Asian region

A total of 37 CPO washing systems sold since 2017

Mill 300 tons per day	Mill 600 tons per day	Refinery 100–1000 tons per day	Refinery 1000–3000 tons per day
• IOI palm oil mill • Unique palm oil mill • Boustead palm oil mill • IJM Edible Oils	• Sarawak Oil Palms • Kim Loong • Classic Segamat	• PGEO Group • Wilmar Group • Sime Darby Group • International Oil Group	• International Oil Group • Patum Vegetable Oil • Apical Group

Summary

Alfa Laval high speed separator reduce chlorines in crude palm oil by 70% in one washing stage

- One single machine up to 1500 tons per day
- Low moisture content – <1%
- Low losses <0.5% oil in wash water

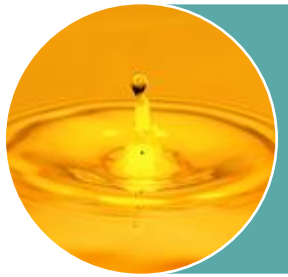
Comments & Questions

Lower your operational cost with maximum separation performance with Alfa Laval high speed separator in your biodiesel processes

Alfa Laval high speed separators in biodiesel processes

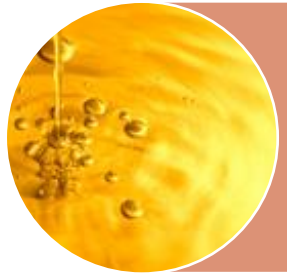
A. Transesterification

process in which fat or oil reacts with an alcohol to form esters and glycerol



B. Biodiesel Washing

process of removing soap and glycerine from biodiesel by using water

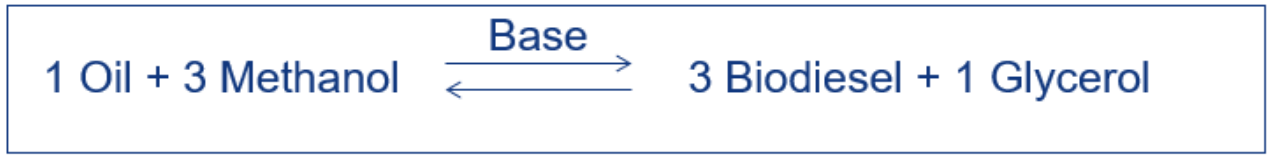


C. Sterol Glucoside (SG) removal

process of removing Sterol Glucoside (SG) from biodiesel to conform to the quality standard

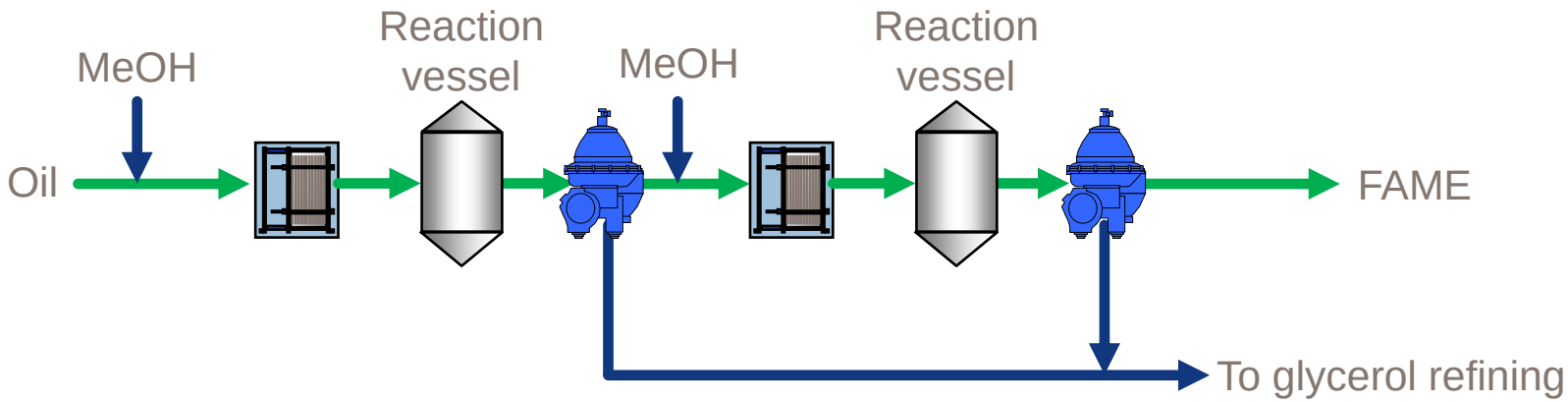
A. Transesterification in biodiesel processes

- Basic reaction -



- Oil as Triglyceride
- Biodiesel or FAME (Fatty Acid Methyl Ester) is a monoglyceride
- Base usually NaOH
- Base must be neutralized with acid before washing

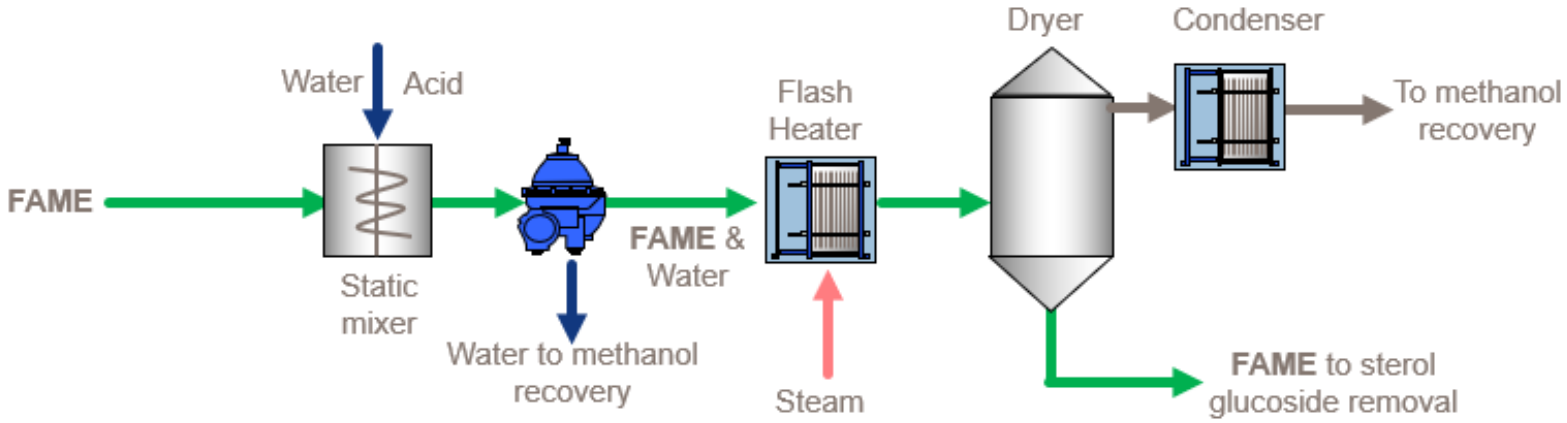
A. High speed separator in biodiesel transesterification



- Reaction in one or two stages
- Glycerol is removed between stages to push reaction towards FAME formation. Two stages will increase overall yield
- Minimize glycerol content in FAME and reduce load in washing

- Presence of methanol
- Explosion risk
- Purged system needed

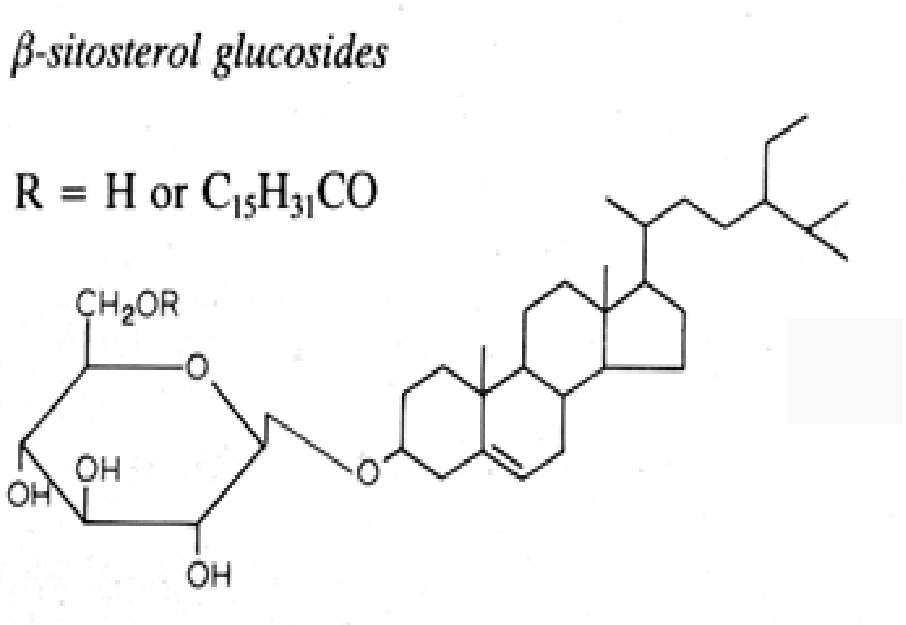
B. High speed separator in biodiesel washing



- Methanol elimination : Consider flash evaporator - enables a non-inerted system to save capital cost.
- Neutralizing agent : Citric acid preferred. Avoid HCl to prevent corrosion and reduce maintenance cost.
- Bowl Material : Super Duplex bowl material to improve lifespan.
- Wash Water : About 10% water. Consider 2 stage washing to reduce water consumption (ca 7% is needed).
- Biodiesel after washing : Maintain good quality (200-500ppm free water). Water in solution can be higher.

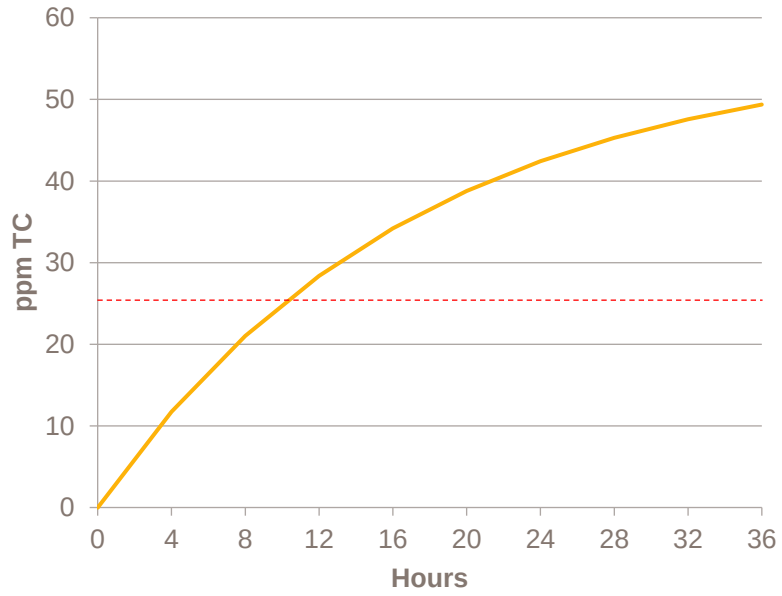
C. Sterol Glucoside (SG) removal in biodiesel process

- Soluble in vegetable oil
- Converted in the process to a form which is insoluble in FAME
- SG crystals are formed in storage tanks
- Appears as a haze in FAME
- <24 ppm in final FAME according to the ASTM and EN standards

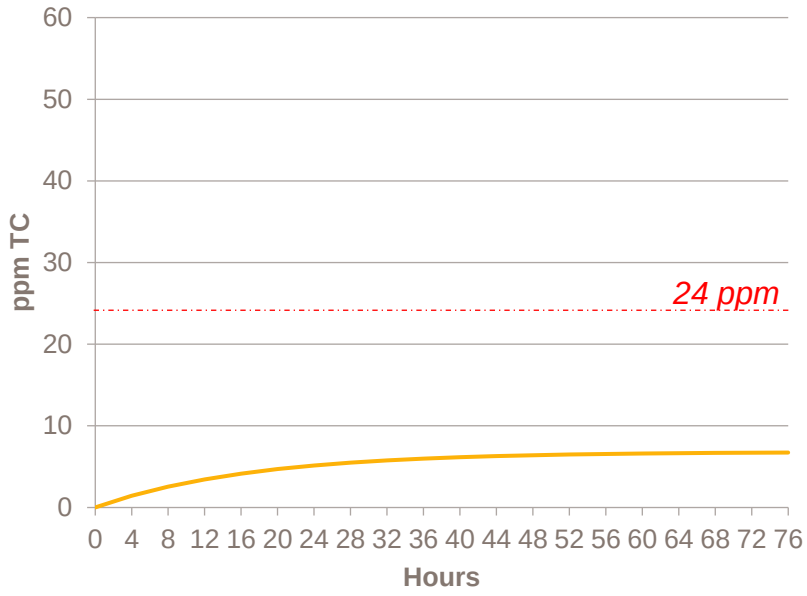


C. Optimal SG removal by HSS after three days

− Sterol Glucoside (SG) removal in biodiesel processes



- Same sample analyzed 36 hours later
- Total TC ca. 50ppm → precipitation continues



- Same sample analyzed 76 hours later
- Total TC <7ppm → precipitation rate slow enough to stay well below 24ppm

Separator range developed for biodiesel processing

BD 65P/C
50 - 300 tons/day

BD 80P/C
300 - 500 tons/day

BD 120P/C
500 - 1400 tons/day

Self discharging BD series

BDB 610
20 - 120 tons/day

BDB 104
0 - 20 tons/day

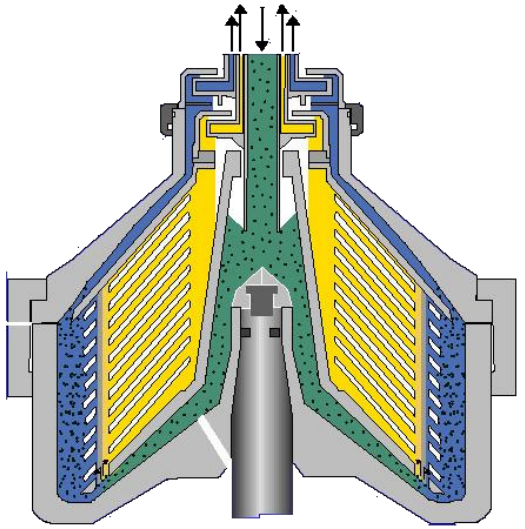
Solid bowl BDB series

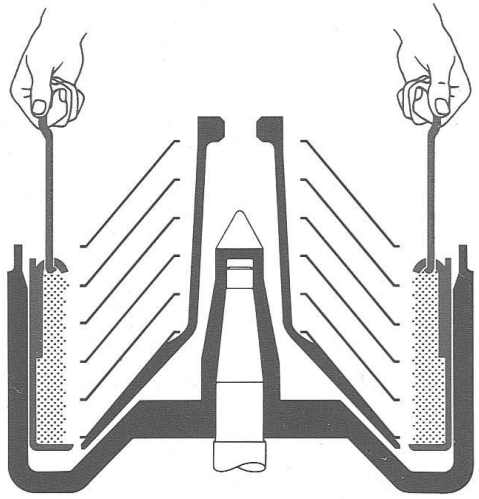
Lower operation cost with self discharging biodiesel separator

- Low power consumption
- Gentle product acceleration in hermetic inlet
- Hermetic inlet eliminates risk of emulsion
- Gentle inlet gives higher separation performance
- Low inlet pressure means small feed pump can be used
- Pressurized outlets both for light phase and heavy phase outlets, up to 8 bar pumping pressure.

Solid bowl series for smaller plant operations

- Low cost and simple
- Used when the solid content is max. 0,01% v/v
- Small flow rates
- Batch wise production – small scale production
- Separator is stopped and solids are removed manually for cleaning,





References from around the world

− High speed separators in biodiesel industries across the globe

Worldwide references of 114 units of BD series including -

- **South East Asia** –18 units
- **Europe** –35 units
- **South America** –22 units

Summary

- Low power consumption with hermetic inlet
- Better separation performance with hermetic inlet
- Excellent corrosion resistance with super duplex bowl material as option

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