Enhance sustainability and profitability in your palm oil mills with Alfa Laval’s oil recovery module and multiscrubber technologies

28 April 2022

- Segregating CPO stream in palm oil mill process for better food safety and profitability

- Improve sustainability in palm oil mills by reducing Particulate Matter (PM) in flue gas

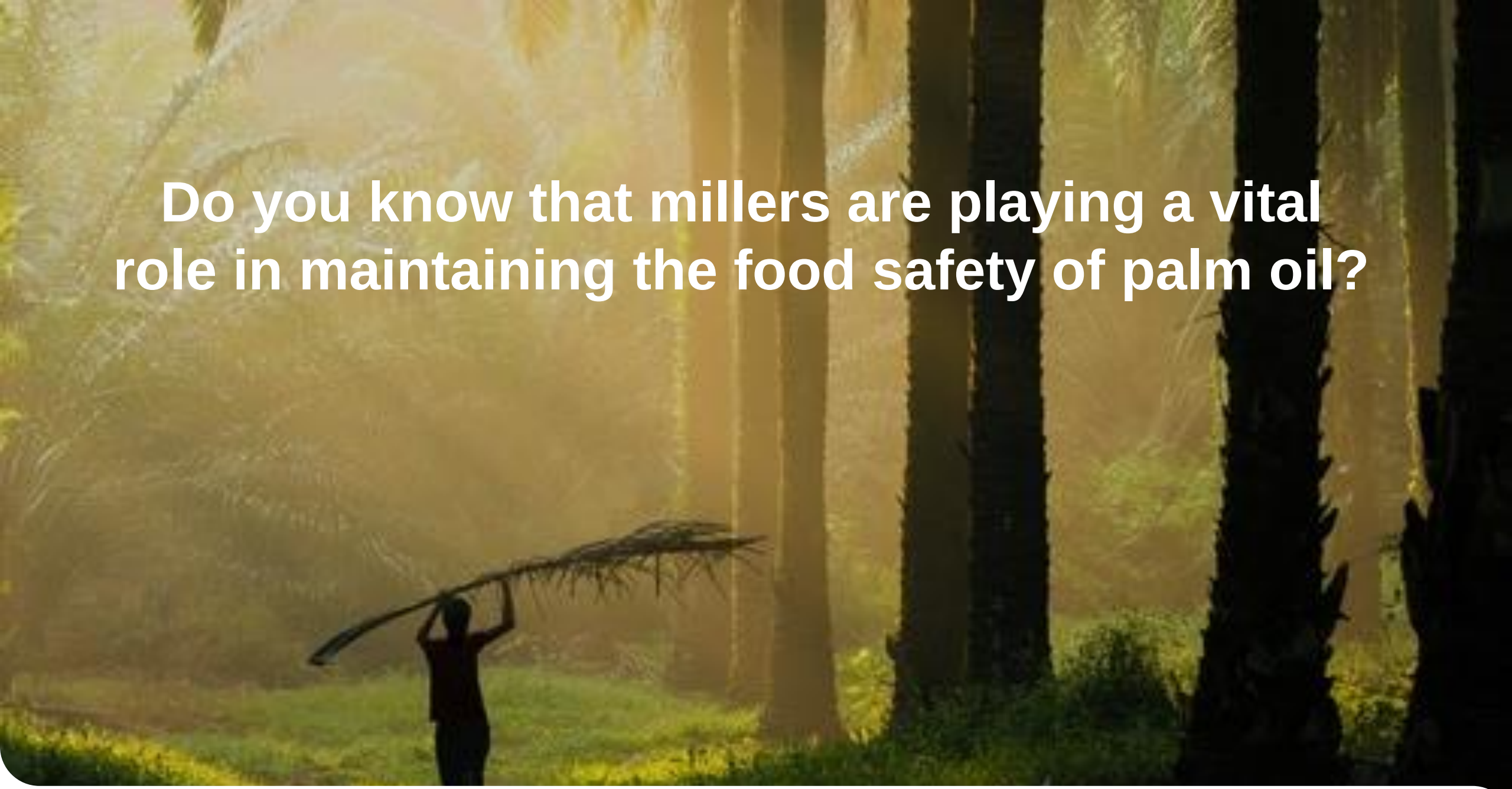
Our speakers

Ong Toon Wei is Alfa Laval's Regional Sales Manager - Food & Water (South East Asia). He graduated from University of Technology, Malaysia in Chemical Engineering and he also holds an MBA from University of Strathclyde. He has been with Alfa Laval for 13 years, and he is an expert in palm oil technologies and processes.

Ir. Sellam Hmadouch received his Master's Degree in Electrical Engineering from Delft University of Technology, Netherlands. He is responsible for industrial air emission control markets for gas systems and has been with Alfa Laval for 4 years. Having developed new air emission control solutions and with more than a decade of experience in the industry, he is actively developing solutions to further improve air quality for the palm oil mill industry.

Segregating CPO stream in palm oil mill process for better food safety and profitability

Ong Toon Wei
Regional Sales Manager



What multiple streams are we dealing with?





Quality	Crude CPO	Sterilizer condensate oil	EFB liquor oil	Fibre oil (hexane recovery)	POME sludge oil
FFA (%)	2 ~ 3% max	18 ~ 30	14 ~ 22	~31	40~80
DOBI	2.8 min	0.9 ~ 1.1	1.0 ~ 1.7	N.A.	very low
Chloride (ppm)	< 8 ppm	42 ~ 54	20 ~ 42	N.A.	N.A.
Phosphorus (ppm)	< 15 ppm	70 ~ 112	89 ~ 15	~144	N.A.
Mineral oil contamination	low	medium	high	high	very high
Hexane content (ppm)	nil	nil	nil	?	nil
OER contribution	± 20%	0.2 ~ 0.3%	0.2 ~ 0.5%	0.3 ~ 0.6%	0.3 ~ 0.6%
"	± 20%	1.0 ~ 2.0%			
Recommended application	Food grade	High grade technical oil			Low grade technical oil

SC + EFB Liquor as dilution in oil room affecting CPO quality

SC +EFB Liquor as dilution in oil room*:

- Both total chlorine (TC) and 3MCPD increase by ~30%.
- FFA% increased by 7%
- Peroxide Value increased by 25%
- DOBI decrease by 8%
- Phosphorus content increased by 42%

Conclusion: SC and EFB Liquor shall be processed separately to produce Technical Oil.

**Source: Processing Technology, Sime Darby Research Sdn. Bhd., Rahmat N et Al. (2019). Production of High-Quality Crude Palm Oil (CPO) and Low 3-MCPD Esters RBD Palm Oil. Palm Oil Engineering Bulletin No. 131, 24-28*

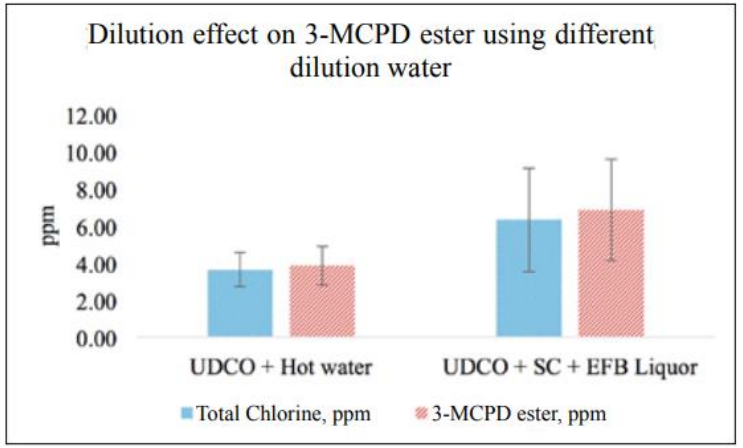


TABLE 2. CPO QUALITY IN UNCLEAN CPO AND CLEAN CPO

Source of CPO/ analysis	FFA, %	Peroxide value (2.0 max)	Carotene, ppm	Anisidine value (5.0 max)	Total oxidation by UV	DOBI (2.3 min)
Unclean CPO	4.08	2.10	607	4.11	2.421	2.37
Clean CPO	3.80	1.68	629	3.99	2.237	2.59

TABLE 3. METAL AND PHOSPHORUS CONTENT IN UNCLEAN CPO AND CLEAN CPO

Source of CPO/ analysis	Fe (ppm)	Phosphorus (ppm)	Cu (ppm)
Unclean CPO	5.0	12.5	0.03
Clean CPO	4.2	8.8	0.02

The concerns of palm oil millers

- Higher CAPEX and OPEX
- Lower Oil Extraction Rate (OER)
- Increased POME due to freshwater dilution
- Limitation of technical oil sales

Alfa Laval's solutions to the industry

Edible Oil Stream

Main CPO Stream from Press (Oil Room) → D3PRO Undiluted Oil Room → CPO Washing → Premium Edible CPO (Food Application)

Segregation

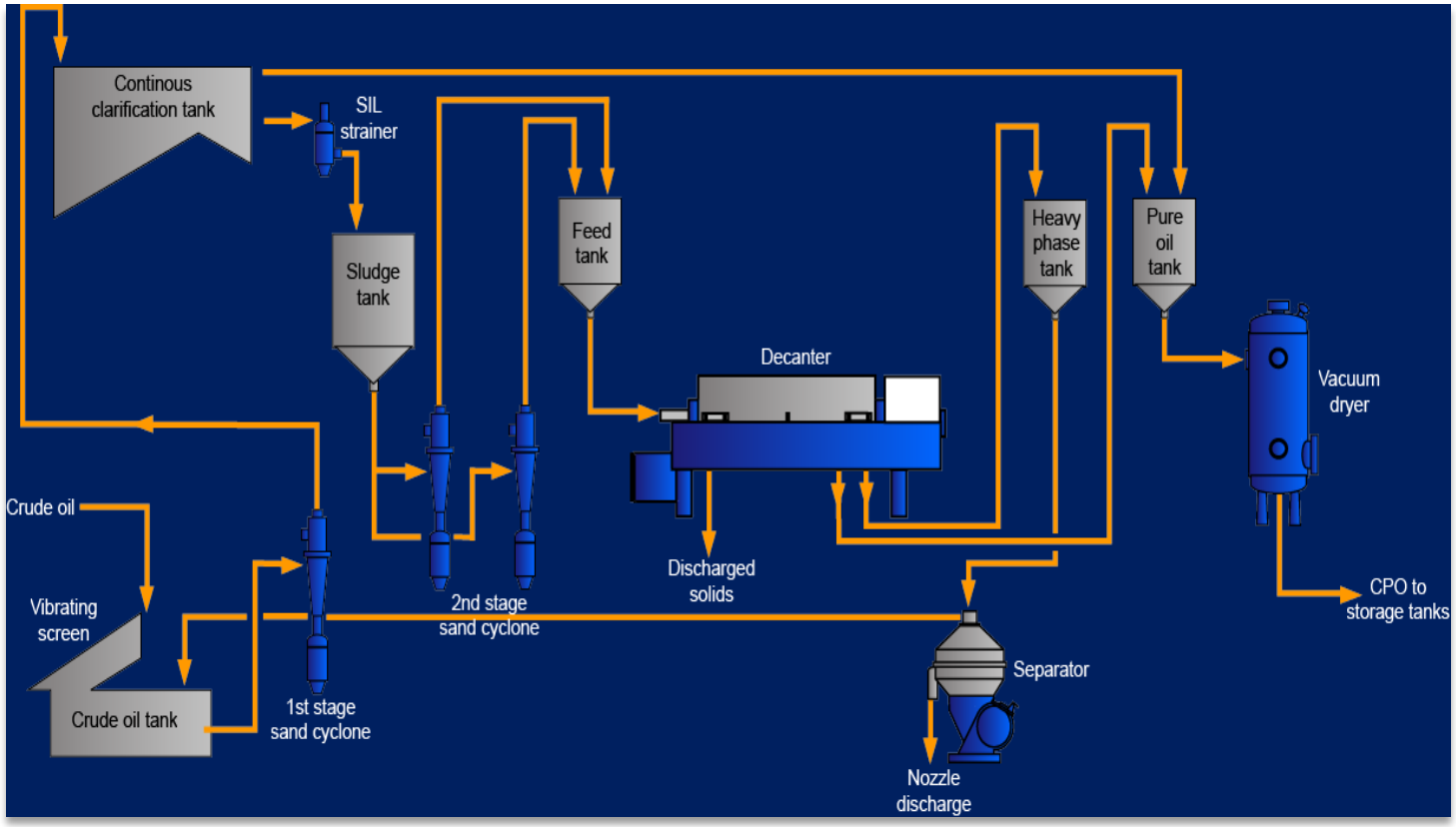
Technical Oil Stream

EFB Pressed Liquor
Sterilizer Condensate
POME
Fiber Oil
Sludge Oil

→ ALFORM Oil Recovery Station → Technical Oil (Non-Food Application including Biodiesel, HVO)

Edible oil stream: D3PRO undiluted oil room

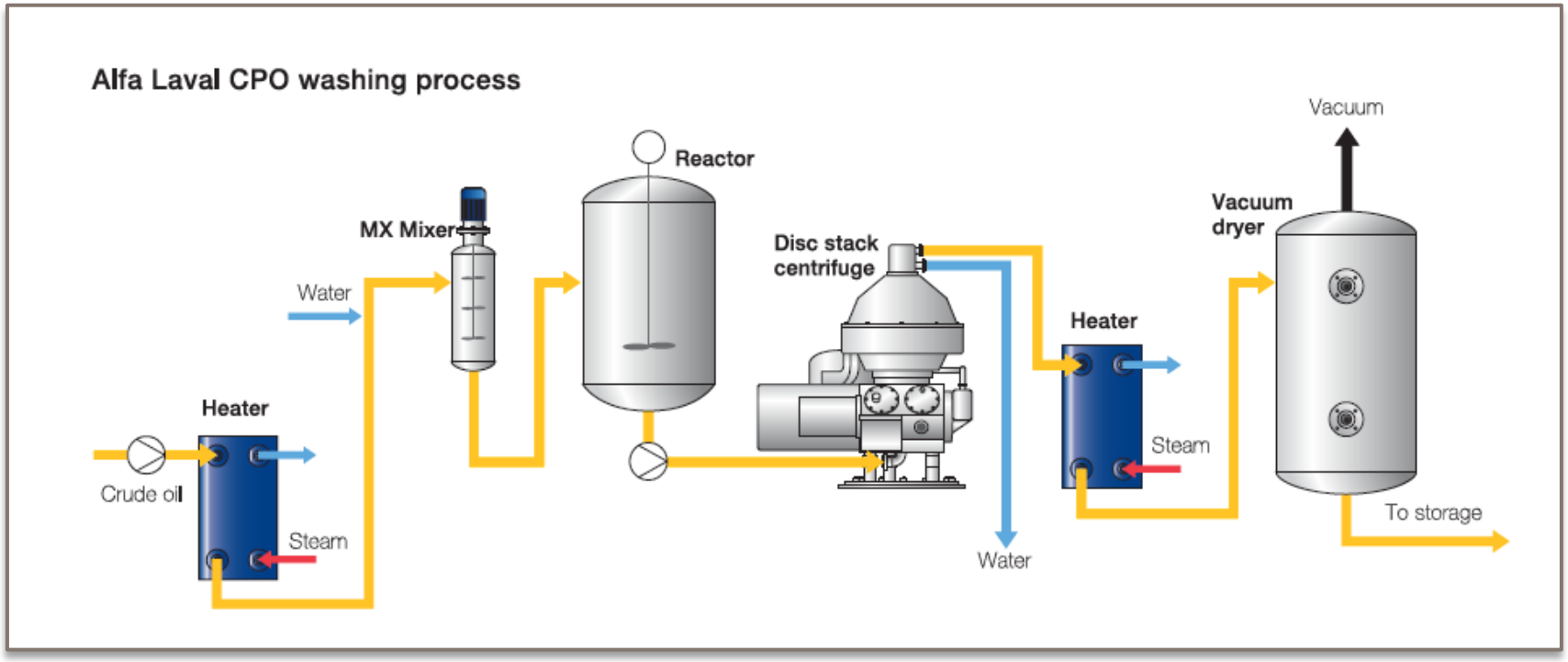
– Most environmentally friendly oil room solution



- No added fresh water as dilution
- OER Improvement up to 0.1%
- Improved oil quality with short holding time (i.e., reduced oxidation)
- Lower total cost of ownership

Edible oil stream: CPO washing

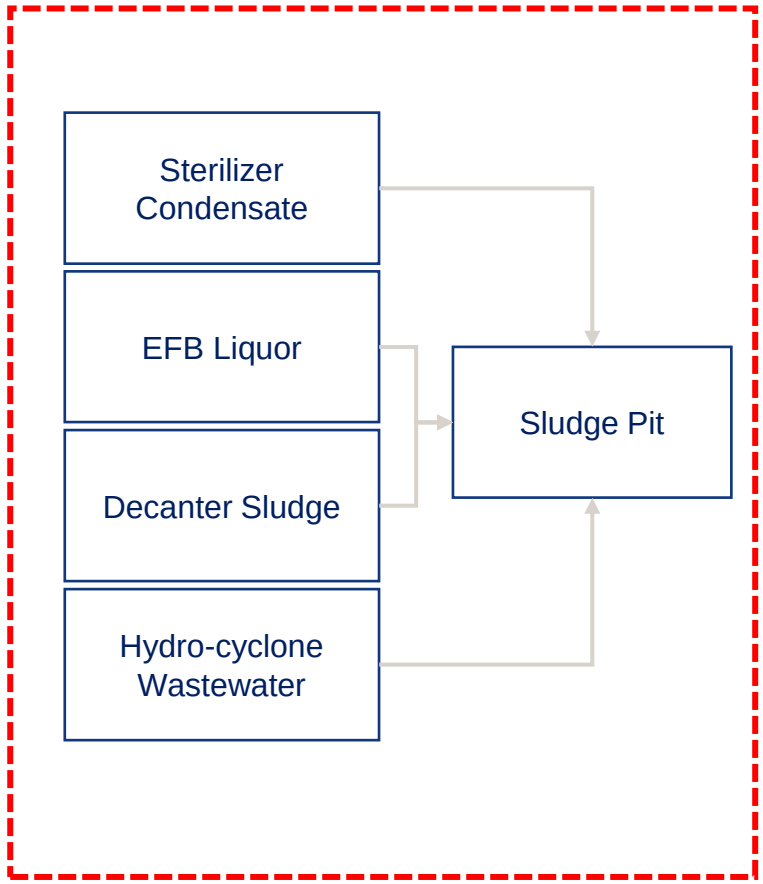
− Mitigation of 3-MCPDE with chlorides washing



Guarantee (on average basis) :

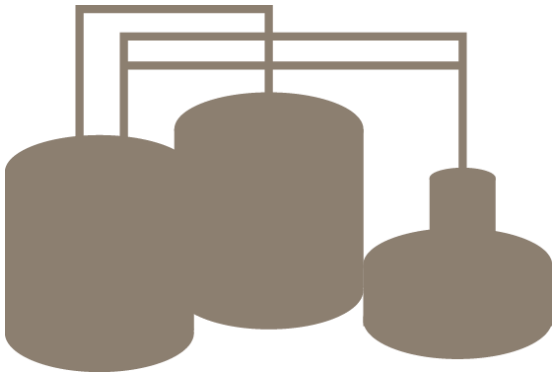
- If chlorine in CPO is <10ppm, the guaranteed chlorine level in washed CPO is <2 ppm
- If chlorine in CPO is >10ppm, the total chlorine reduction is more than 80%

Technical oil stream: Recovery with Alfa Laval Final Oil Recovery Module (ALFORM)



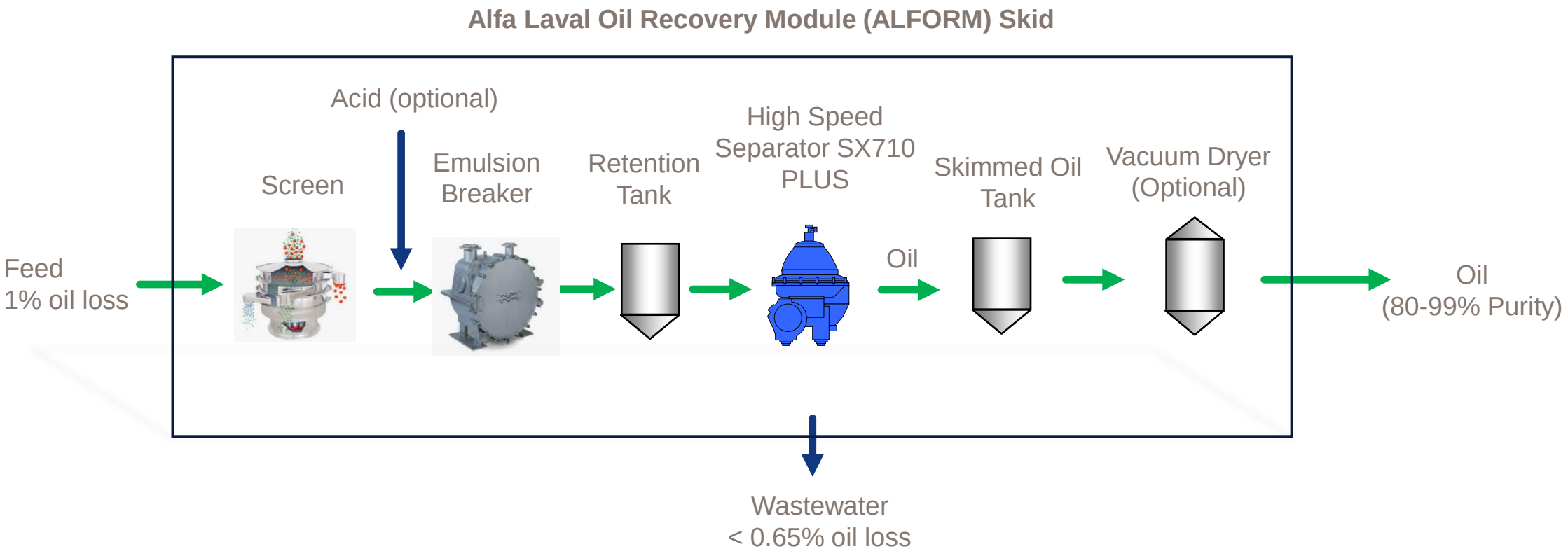
Alfa Laval Technical Oil Recovery Module (ALFORM)

Technical palm oil storage



Technical oil stream: ALFORM as technical oil recovery module

Enable oil loss reduction of 0.35%- 0.48%, OER % improvement up to 0.3%



Key benefits of Alfa Laval Oil Recovery Module (ALFORM)

- Simple and efficient recovery (additional 0.3% OER)
- Containerized module – plug and play, ready for outdoor installation
- Smaller footprint
- Act as final oil gatekeeper
- Guaranteed result

Addressing palm oil millers' concerns

- Higher CAPEX and OPEX
- Lower Oil Extraction Rate (OER)
- Increased POME due to freshwater dilution
- Limitation of technical oil sales

- Higher OER % yield payback up to < 2 years
- High OER% is expected up to 0.4% (with D3PRO + ALFORM).
- No freshwater dilution -> no added POME
- Technical oil has vast application in biodiesel and HVO

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Protecting future business of palm oil and company reputation

Compliance with Food Safety Regulation and best practices

Summary

- Segregation of oil stream is a MUST in Palm Oil Mill
- Edible and Technical Oil can be processed separately with Alfa Laval D3PRO Undiluted System and ALFORM Oil Recovery Module
- Palm oil millers can sleep in peace enjoying better profitability

Reducing particulate matter (PM) emissions in palm oil mills with Alfa Laval MultiScrubber PM

Ir. Sellam Hmadouch
Product Expert – Exhaust Gas Cleaning

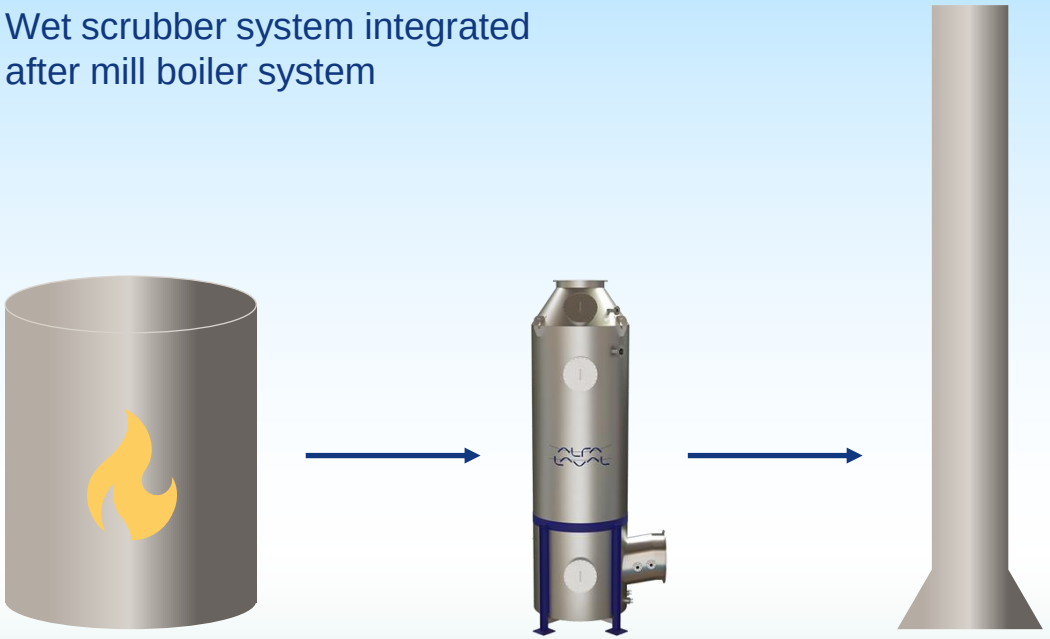
Industry challenges in the palm oil industry

- Yield of palm oil and biofuel
- Sustainability
  - Waste and effluent
  - Emissions
- Maintaining profitability
- Malaysian Department of Environment

  - Environmental Quality:
    Clear Air Regulation (CAR) 2014
  - PM emissions limit 150 mg/Nm^3
  - POM compliance deadline

Reducing particulate matter from POM emissions

Wet scrubber system integrated after mill boiler system



Main PM emissions reduction technologies available to POMs

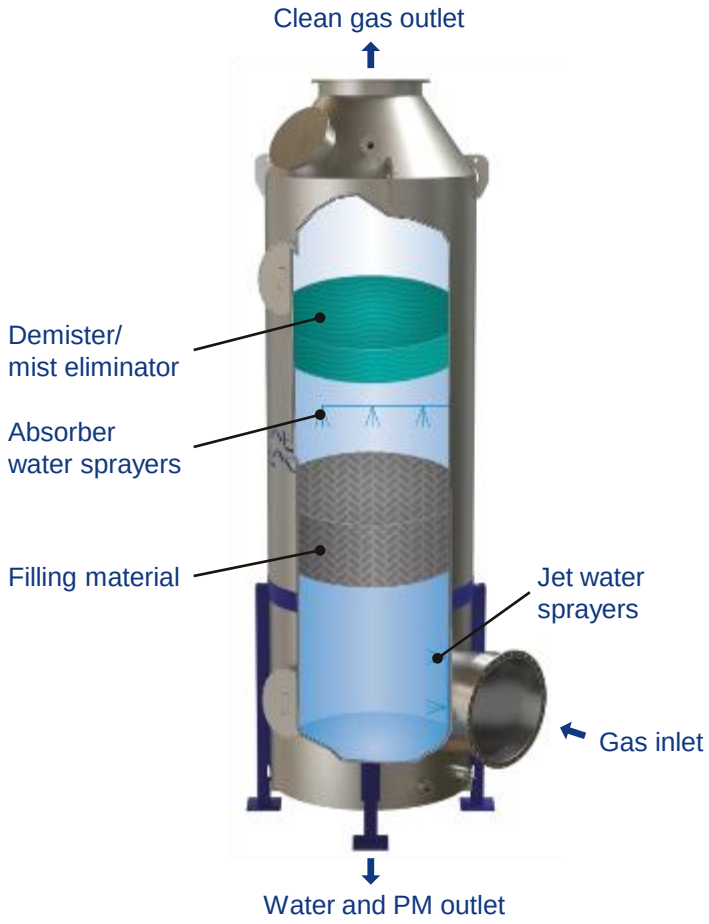
1. Wet scrubber systems
2. Electrostatic precipitators (ESP)
3. Bag filters
4. Vortex tube separators

1. Wet scrubber systems

− Reducing particulate matter from POM emissions

Flue gas sprayed with water to capture PM, which is separated from the water enabling water reuse

- Up to 99% removal of PM
- Requires high grade material
- Very simple and stable system
- Particle removal efficiency unaffected by fluctuating gas load
- Relatively low capital cost
- Relatively low pressure drop



2. Electrostatic precipitators (ESP)

− Reducing particulate matter from POM emissions

Particles are separated from flue gas stream by very high voltage and collect on plates, which are periodically cleaned

- Sensitive to fluctuation of PM concentration
- Relatively large footprint
- High capital cost
- Requires educated staff specializing in high voltage systems to operate and maintain

3. Bag filters

− Reducing particulate matter from POM emissions

Particles are captured in filter fabric, which is automatically cleaned at regular intervals

- Simple technology
- High PM reduction efficiency
- Flue gas often needs pre-treatment
- Limited gas temperatures
- Relatively high pressure drop

4. Vortex tube separator

− Reducing particulate matter from POM emissions

Centrifugal force swirls the gas instream in the tubes, pushing PM to the outside

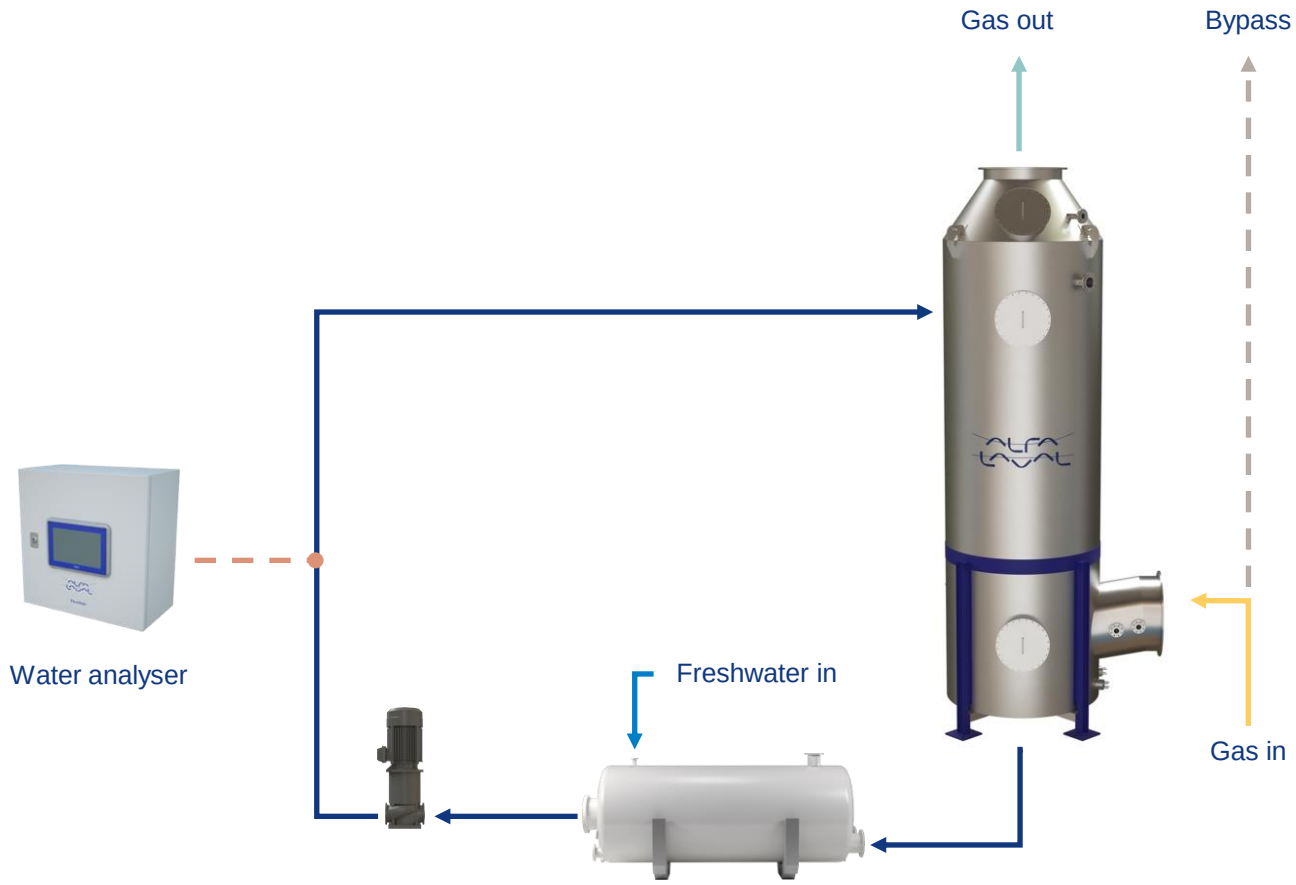
- Ideal for high temperatures, high dust loads
- Minimal velocity required for proper operation
- Training required for staff to operate and maintain
- Less efficient in removing PM than wet scrubbers or ESPs

Alfa Laval Multiscrubber PM

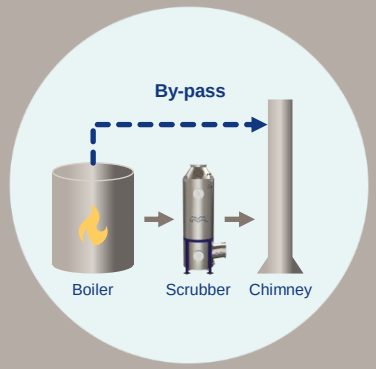
- A complete solution for POM emissions compliance
- Based on proven, reliable technologies
- Simple to install, operate and maintain
- Good for new and existing plants
- Helps palm oil mills achieve sustainable operations

Proven solution with Alfa Laval MultiScrubber PM

- Reductions in PM emissions well below 150 mg/Nm^3
- Full CAR 2014 compliance
- Closed loop system
- Minimal effluent
- Low-cost investment
- Safe and simple to install, operate and maintain with only basic training
- Optional deplume application



Some options of Alfa Laval MultiScrubber PM



Bypass mode

Ensures more uptime

Decanter

De-waters sludge on site

DeSOx

Reduces emissions SOx content

DePlume

Reduces or removes visible plume

Benefits of Alfa Laval MultiScrubber PM

CAR 2014 compliance

PM reduction well below 150 mg/Nm^3

Minimal effluent

Closed system, less wastewater

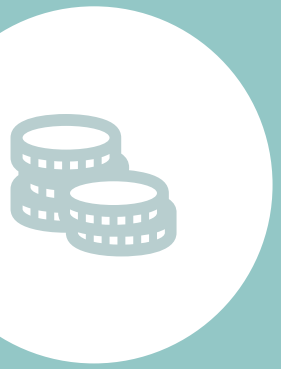
Less space

Up to four times more compact than other technologies

Simplicity

Easy to install, operate and maintain

Benefits of Alfa Laval MultiScrubber PM (cont.)



Economical

Up to two times more economical than other technologies

One-stop shop

Broad product portfolio

Local when you need us

SE Asia presence and service network

Global when it counts

Global expertise, financially stable

Reference case: 45 t/h biomass boiler

− Alfa Laval MultiScrubber PM

PM at outlet

< 150 mg/Nm³

Water consumption

1-7 m³/h

Power consumption

40 kWh

Cr

Material

High-grade stainless steel

Scrubber production of Alfa Laval MultiScrubber PM

- Manufactured at our own dedicated scrubber production facility
- Quality production
  - Onsite laboratory ensures steel & weld quality for corrosion-resistant scrubber
  - Inhouse welding school
- Short lead times due to well-established supply chain

Scrubber production facility in Alfa Laval

Dedicated scrubber production facility

In-house welding school

Alfa Laval quality control

Global knowledge centre in Netherlands and R&D in Denmark

Alfa Laval Test & Training Centre

- R&D
- Full-sized scrubber available
- Demos and trials upon request

Global scrubber development centre in the Netherlands

Alfa Laval Test & Training Centre in Aalborg, Denmark

Why Alfa Laval?

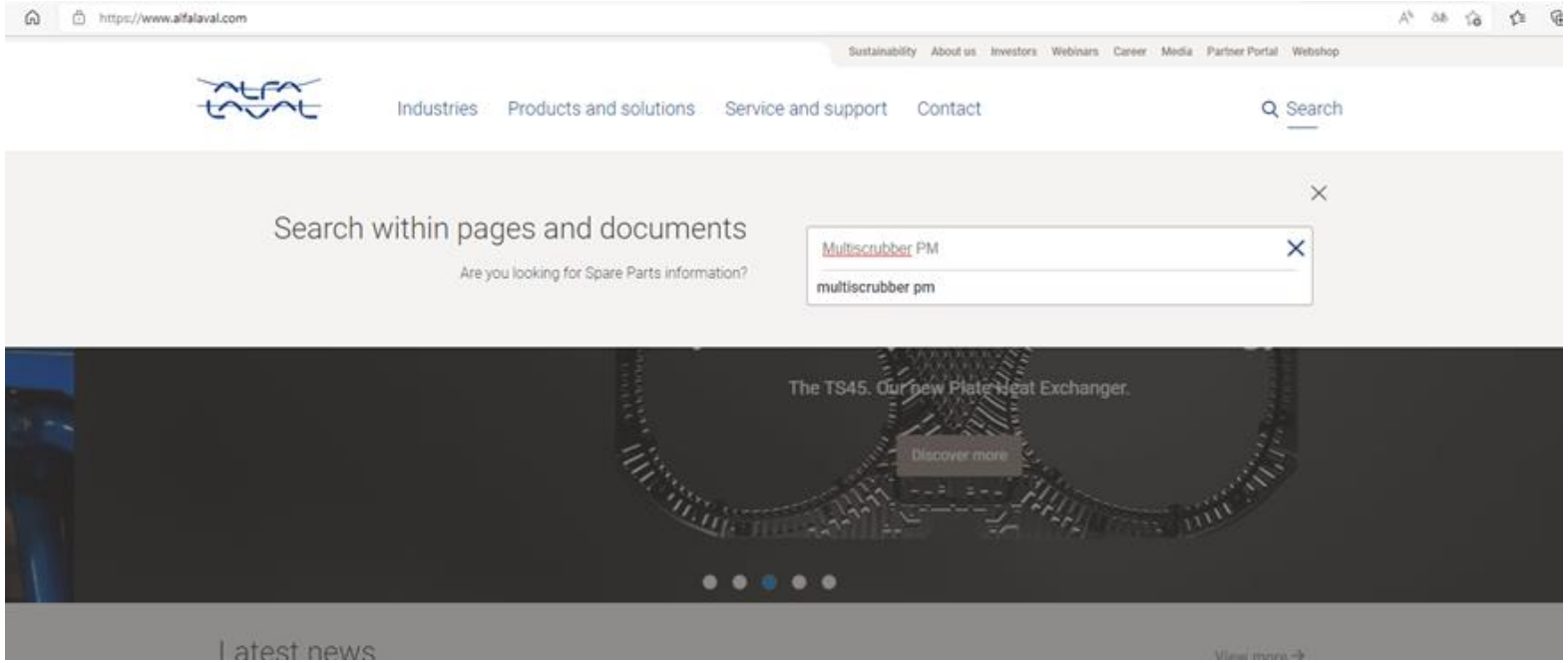
- World leader in separation, heat transfer and fluid handling
- Trustworthy, financially stable partner
- Global expertise, local presence
- Reducing PM emissions to well below 150 mg/Nm^3
- > 600 scrubber installations worldwide
- Commitment to sustainability

Summary of the key benefits of Alfa Laval Multiscrubber PM

- Proven and reliable
- Economical
- Easy to operate and maintain
- Cleaner air – good for people, good for your business, good for our planet

MultiScrubber’s video and brochures on our website!

- You can find Multiscrubber’s video and brochures on our website at www.alfalaval.com
- Search for at the search bar ‘*MultiScrubber PM*’



https://www.alfalaval.com/products/process-solutions/scrubber-solutions/exhaust-gas-cleaning/multiscrubber-pm/

- Segregating CPO stream is a must in palm oil mill process to improve food safety and profitability

- Improve sustainability in palm oil mills by reducing Particulate Matter (PM) in flue gas