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# HEAVY OIL HOMOGENIZER

By  
Alpha Omega

# Background

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- ❑ The increase of residual/heavy fuel price.
- ❑ Extra cost for disposal of fuel sludge
- ❑ Poor Combustion causes smoke, dirty exhaust system and high maintenance cost

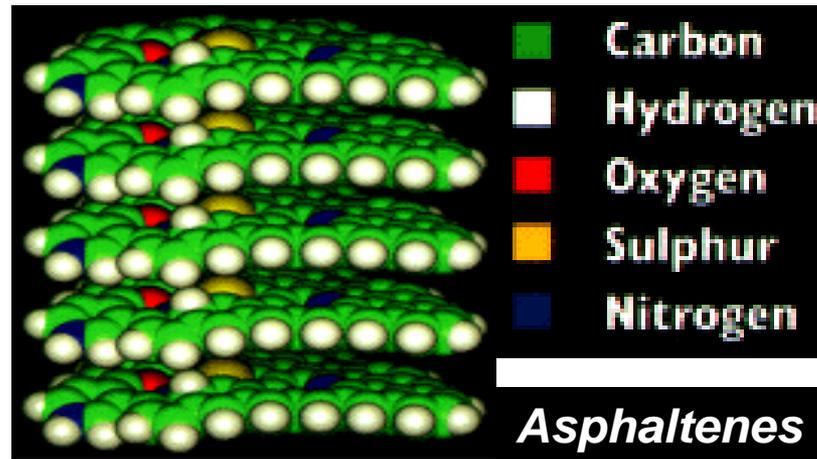
# Heavy Fuel

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- ❑ High Fuel Oil Price forces buyers to buy heavy fuel which has lower price but also lower quality.
- ❑ Heavy fuel is a lower quality distilled fuel which carries considerable amount of impurities and produce fuel sludge
- ❑ Fuel Sludge primarily consists of **asphaltenes** and creates problems such as high cost disposal and poor combustion

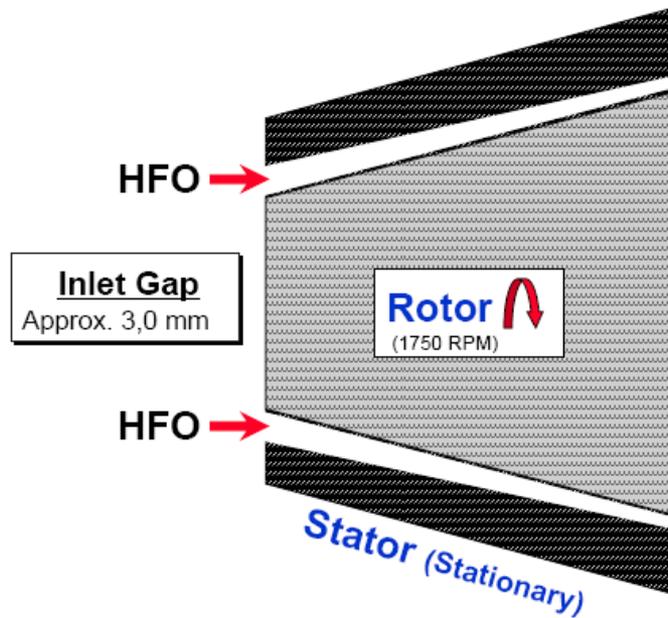
# What Is Asphaltenes?

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- ❑ Asphaltenes primarily contain hydrocarbons ( $C_{57}H_{32}$ )
- ❑ It can be as large as 120 microns and usually removed by centrifugal purifiers and filters
- ❑ However, asphaltenes actually still have a potential to be used as fuel if the size is much smaller
- ❑ The size reduction is done by homogenizer

# Principle of Homogenizer

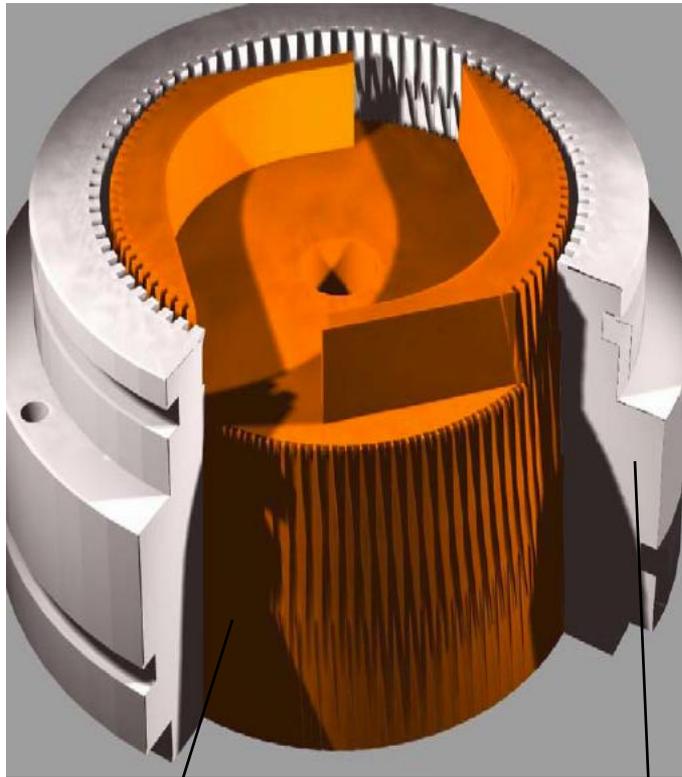


*Homogenizer*

- Homogenizer is a high speed mill with a rapid rotor rotates in the casing which serves as stator. The fuel forced trough a fine labyrinth between stator and rotor and cut asphaltenes into smaller size ( 3 – 5 micron ) which burn completely and do not overload the engine.

# Construction of Homogenizer

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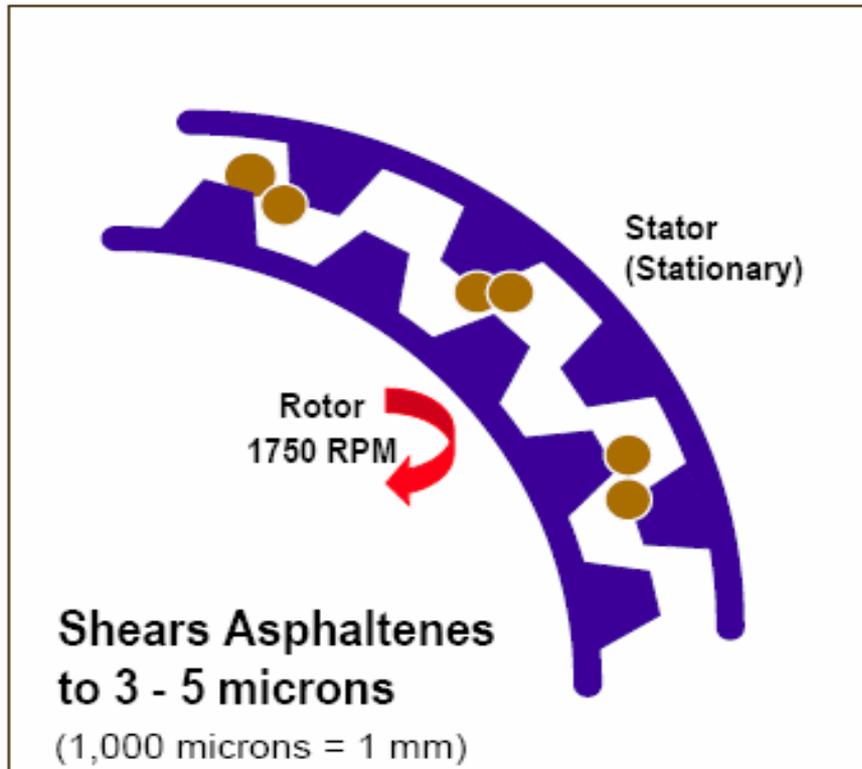


Rotor

Stator

- ❑ Conical shaped motor-stator is concentrically mounted with a motor-driven rotor
- ❑ Designed to accelerate the fuel as it passes through the unit

# How Homogenizer Works



- ❑ Fuel is exposed to hydrodynamic power: Shearing and frictional forces, acceleration power and high frequency ultrasonic waves
- ❑ Reduce the asphaltene size to 3 to 5 microns, allowing them to be blended with heavy fuel oil, reduce sludge formation

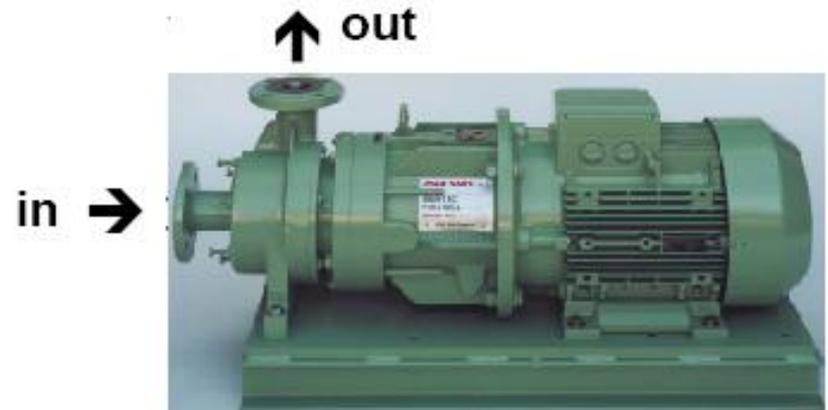
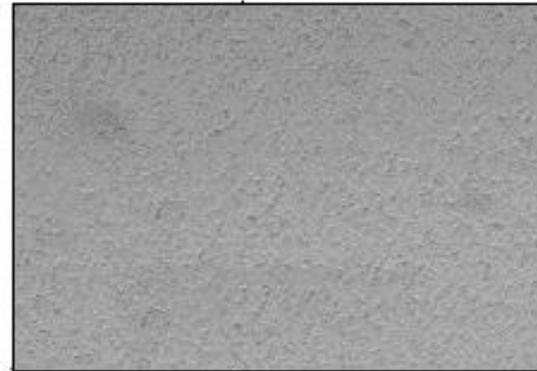
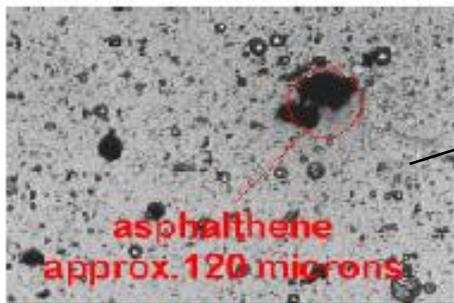
# The Advantages of Homogenizer

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- Allow the usage of heavy fuel effectively
- Reduce sludge formation ( up to 80% sludge reduction ) and waste disposal cost
- Improve combustion
- Reduce smoke and maintenance cost

# Homogenizer Performance

**IFO 180  
Fuel Oil**



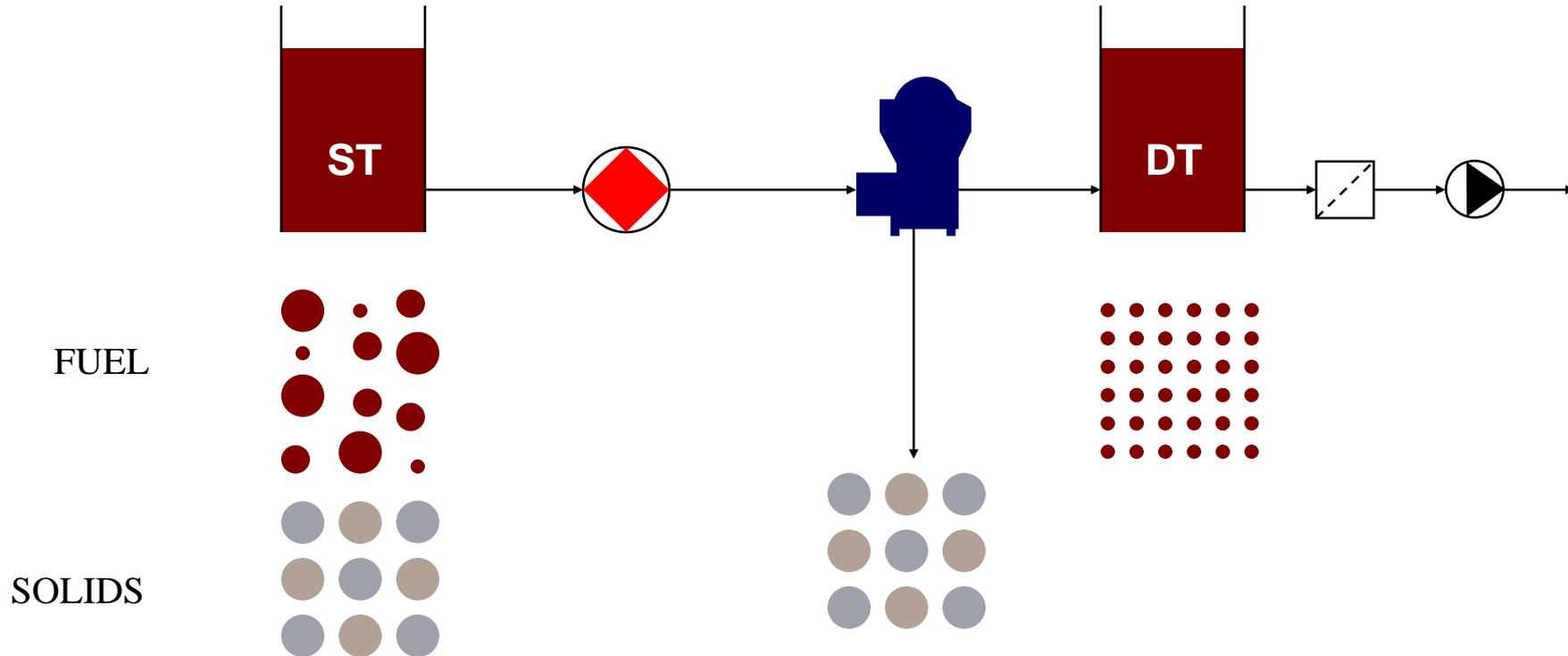
Photographed by: Aerospace Science and Technology Research  
Center National Cheng Kung University (Tainan, Taiwan)

# Homogenizer Application

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- Sludge Reduction
- Improve Combustion
- Reduce Nitric Monoxide (NO<sub>x</sub>)
- Blending Fuel Oil

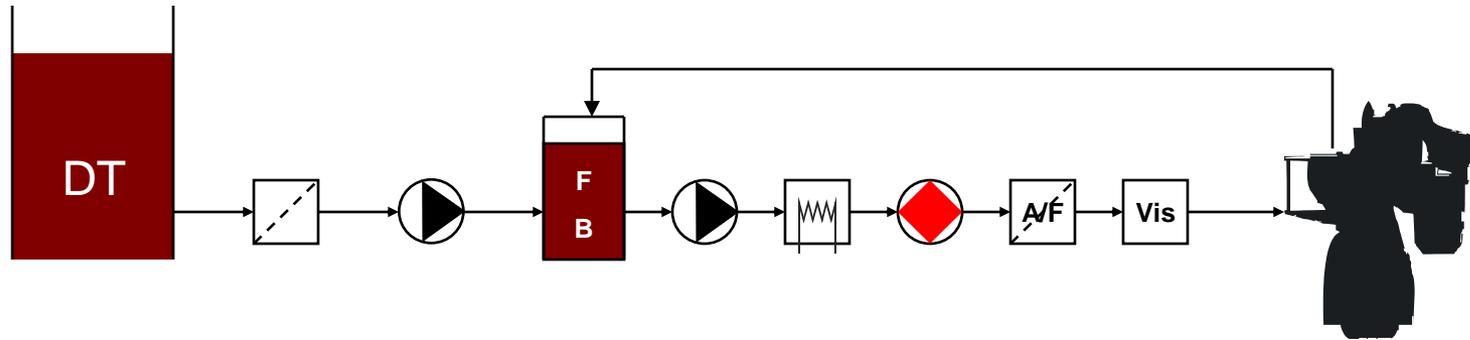
# Sludge Reduction



- ❑ Asphaltenes content in bunker oil usually vary between 2-3%. In conventional way, asphaltenes is separated and throw away as waste
- ❑ By using homogenizer, asphaltenes utilization is up to 80-85%. You can save more than 2% of total fuel oil used and your headache to remove the asphaltenes is solved.

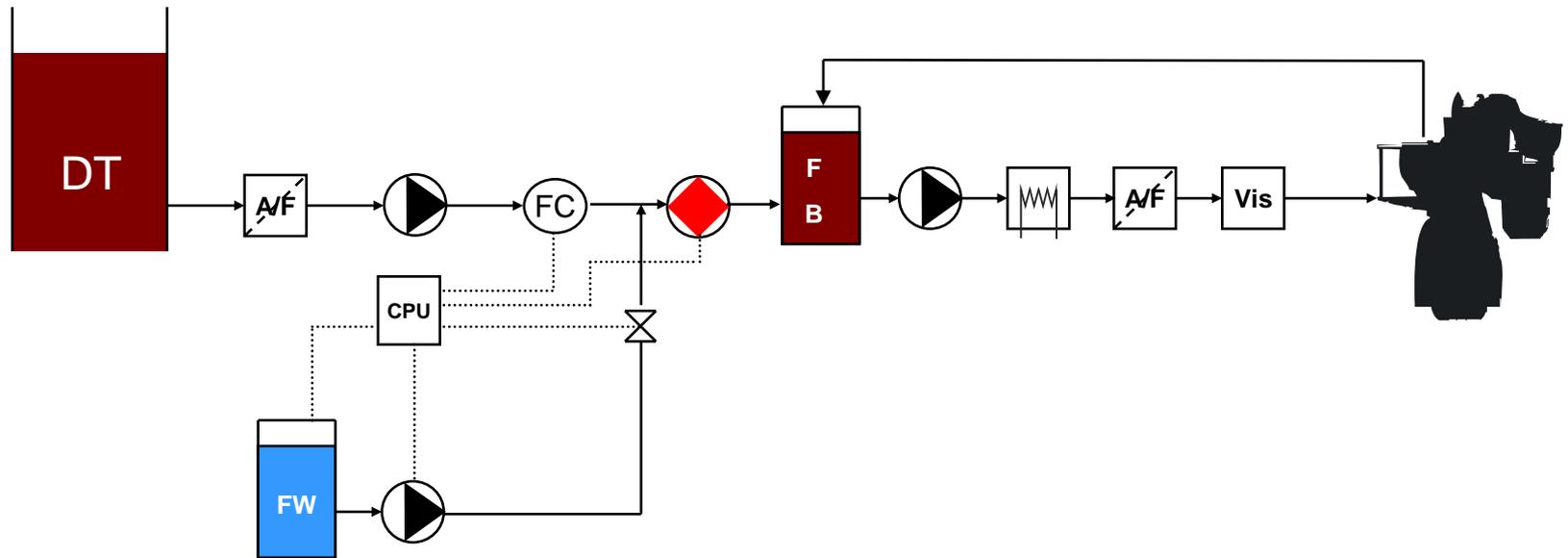
# Improving combustion

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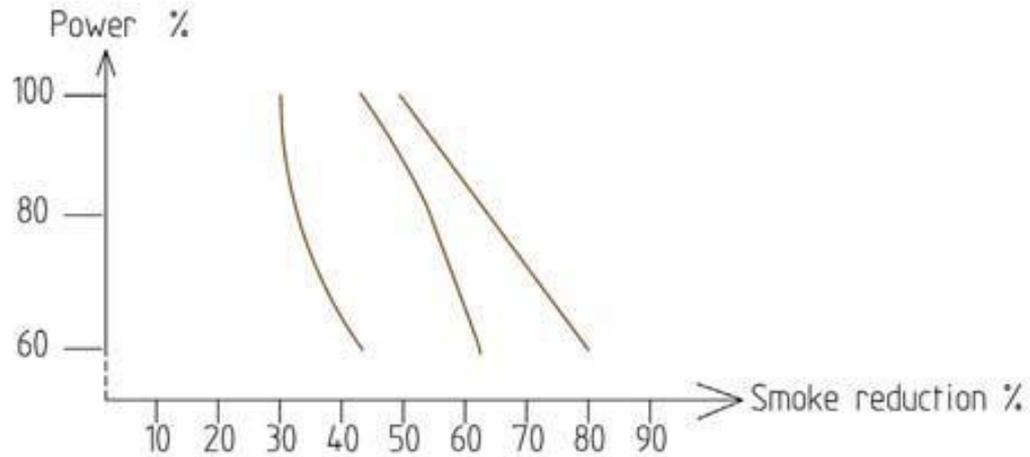
With very homogenous and clean fuel to the engine, combustion is stable and therefore extends equipments life time.

# Reduce Nitric Monoxide (NO<sub>x</sub>) by Emulsification

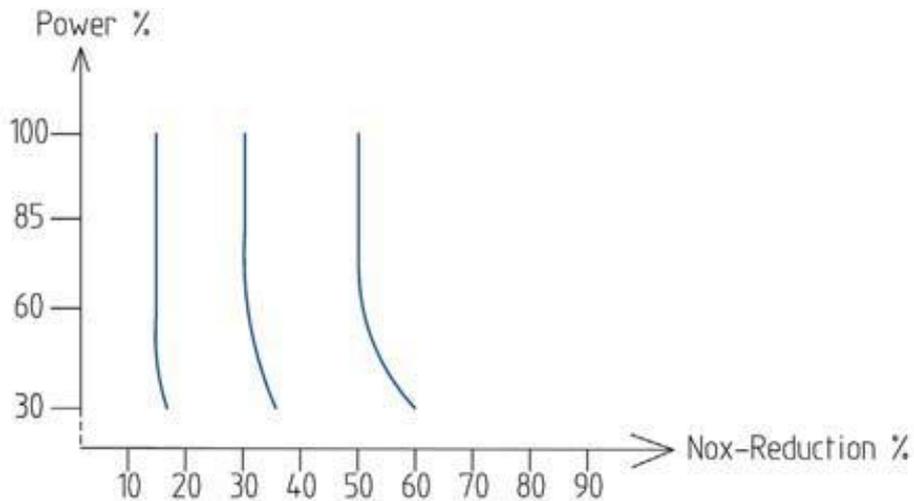


- Reduction of NO<sub>x</sub> of 10% in shipping is legally required. For this reason, water is added to fuel by emulsifying. For every 1% water added, 1% NO<sub>x</sub> will be reduced.

# Effect of water in fuel to smoke and NO<sub>x</sub>

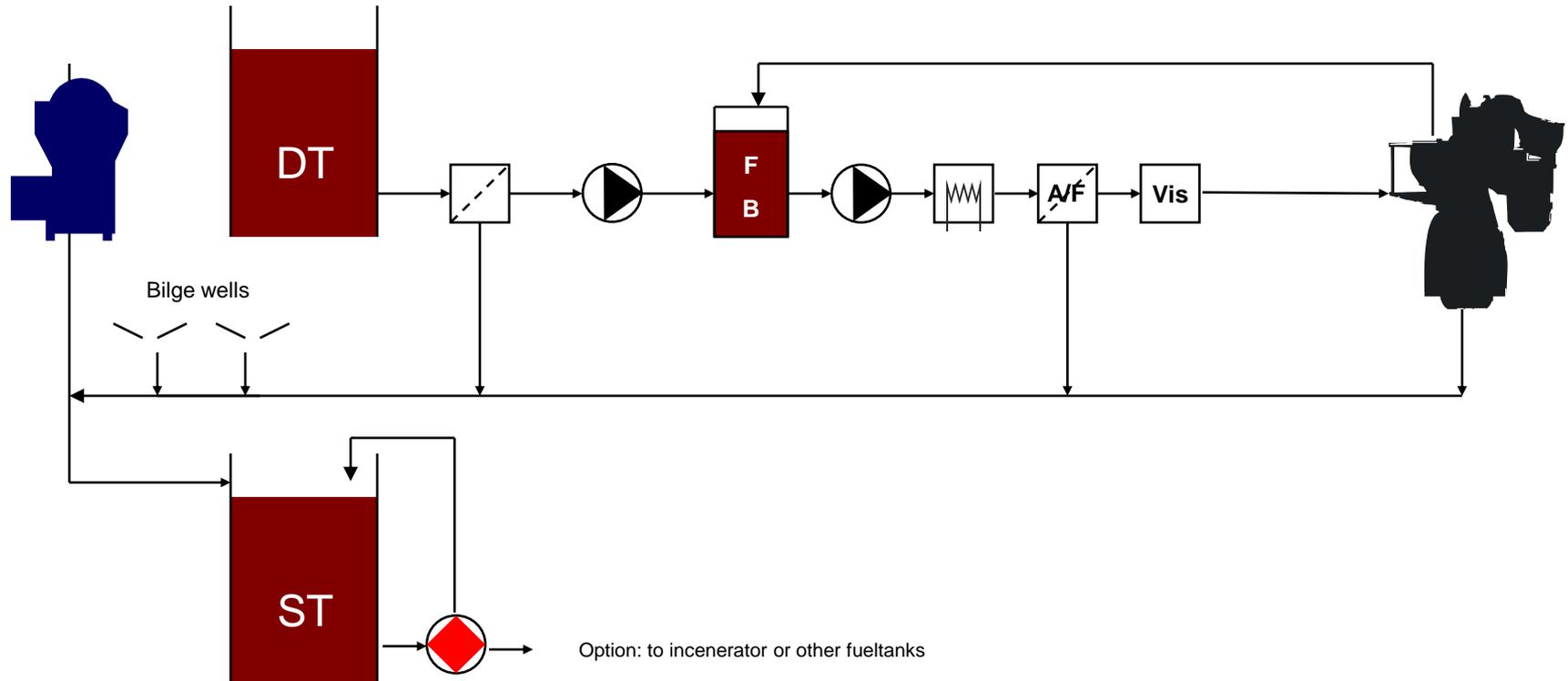


***Smoke Reduction***



***NOx Reduction***

# Blending of Fuel-Oil



**Oil Sludge and other oily residues can be completely recycled. With addition of small amount of MDO , the homogenizer will process the waste into valuable oil. Via a settling Tank, the mixture can be used as fuel for the engine itself. This means more savings on fuel and disposal cost disappear completely**

# Improve Combustion/Sludge Reduction Module

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# Fuel-Water Emulsion Module

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- Fuel-Water Emulsion module is used for mixing fuel oil with water into emulsion before fuel oil injected to diesel engine
- Water flashes due to high temperature and breaks fuel into smaller droplets
- Creates more surface area of fuel, which improves vaporization and fuel/oxygen mixing
- Cooler combustion temperatures result in a reduction of NOx emissions

# Oil Blending Module

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# Homogenizer Manufacturers

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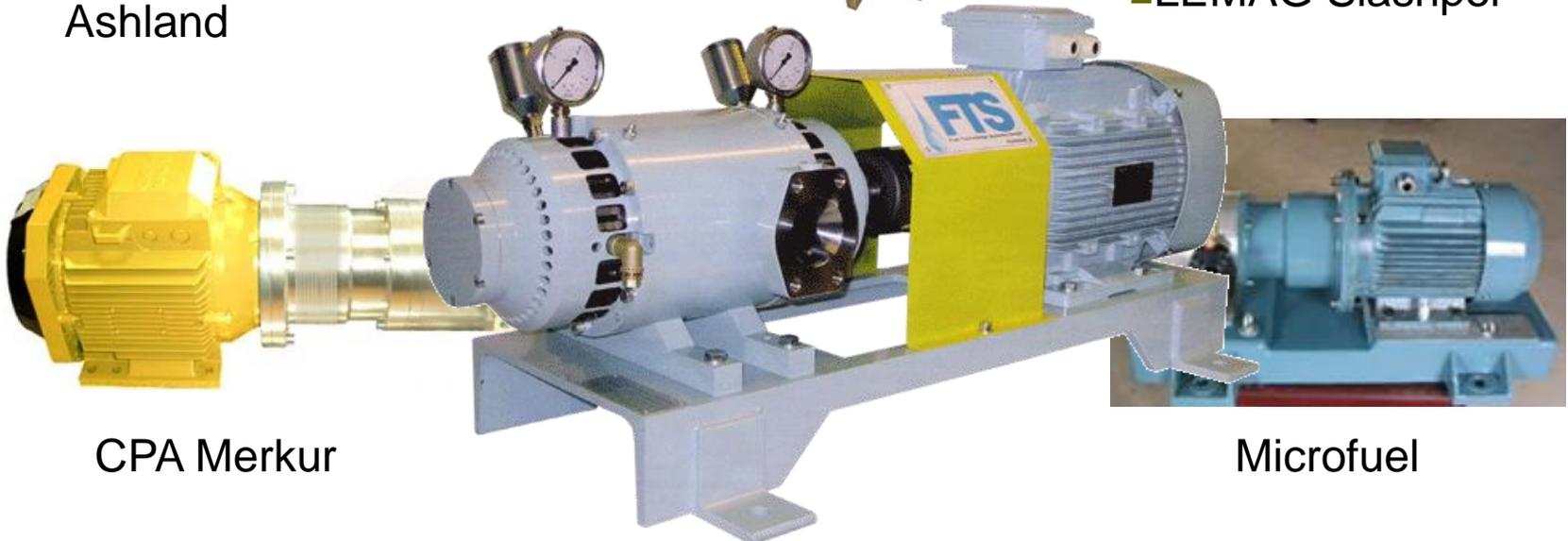
Ashland



S.I.T



LEMAG Slashpol



CPA Merkur

Fuel Technology System

Microfuel

# Our Capability

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- ❑ Alpha Omega can provide you a complete Fuel Treatment System, from Diesel Waste Heat Recovery as Heat Source to Homogenizer and Heat Exchangers for Oil Heating.
- ❑ Our aim is to serve you and provide you the best and the most economical System for your Fleet or Power Plant