HEAVY OIL HOMOGENIZER

By

Alpha Omega
Background

- 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

- 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?

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

- 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

Shears Asphaltene to 3 - 5 microns
(1,000 microns = 1 mm)
The Advantages of Homogenizer

- 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

Water droplet approx. 20 microns

Asphaltene approx. 120 microns

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

- Sludge Reduction
- Improve Combustion
- Reduce Nitric Monoxide (NOx)
- Blending Fuel Oil
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

With very homogenous and clean fuel to the engine, combustion is stable and therefore extends equipments life time.
Reduction of NOx of 10% in shipping is legally required. For this reason, water is added to fuel by emulsifying. For every 1% water added, 1% NOx will be reduced.
Effect of water in fuel to smoke and NOx

Smoke Reduction

NOx Reduction
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
Fuel-Water Emulsion Module

- 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
Homogenizer Manufacturers

- Ashland
- CPA Merkur
- S.I.T
- LEMAG Slashpol
- Microfuel
- Fuel Technology System
Our Capability

- 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