

Fuel Treatment by IPCO Power

At the moment the shipping industry is facing several challenges. Most of them are related to fuel and emissions. The fuel quality is not improving. Based on emission legislation fuel blends are becoming common. Blended fuel can become very unstable. This can lead to major issues inside the fuel system.

Heavy Fuel Oil (HFO) is not homogenous and has an average droplet size of 70 micron and larger. It contains numerous much larger clusters of asphaltenes and complex long-chain hydro-carbons. It is a refinery waste stream product with a high BTU content used as fuel oil. Centrifuges and automated filters are used to clean the fuel. A percentage of the purchased fuel ends up in the slop tank.

HFO needs to be heated and pressurized before it can be used to operate engines or boilers. Exposing fuel to heat and pressure will unavoidably increase the size and mass of the fuel droplet, change the physical condition of the oil and negatively impact the combustion process.

Bad quality (blended) fuel tends to cause issues as tank residue and foaming fuel will upset centrifuges and filters.

Implementing IPCO Power Fluid Shearing Technology reduces fuel droplet size to 3 micron and smaller to enhance the cleaning process and reduce the waste stream going to the slop tank for disposal. Smaller fuel droplets enhance combustion, lower emissions, improve fuel economy, extend engine overhaul intervals and lower overall operating costs.

A cleaner combustion will have less emissions. This will contribute to a higher efficiency for scrubber operations. Also, the wash water of the scrubber will stay cleaner.



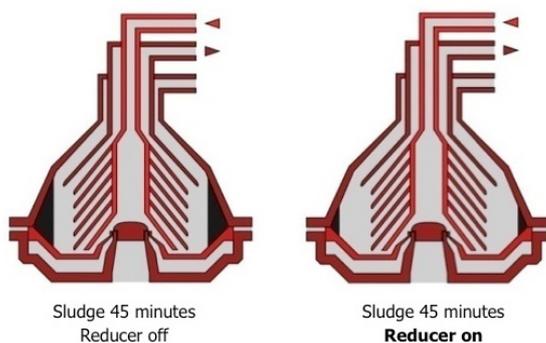
Sludge Reduction

IPCO Power's **FID Reducer** is installed directly before the centrifuge. As a result of the reduction in fuel droplet size, centrifuges and filters will be able to more effectively remove in-organic contaminants and stay clean much longer. Consequently, sludge generation will be reduced and centrifuge flushing intervals will be significantly extended.

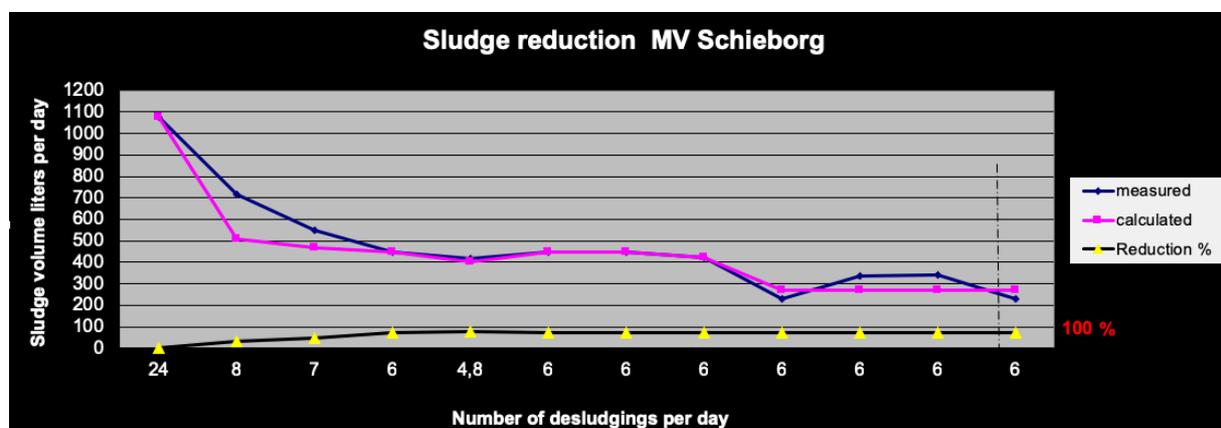
The efficiency depends on the size of the Asphaltenes. The larger the size of the asphaltenes, the more efficiency is reached.

Approximately 10% of the asphaltenes is transformed to usable fuel. Bunker slips normally show an average of 6,5 % asphaltenes for IF 380.

The sludge production will be reduced with 50 – 80%. Below an example of the build up of sludge inside the separator without and with the FID Reducer in operation.

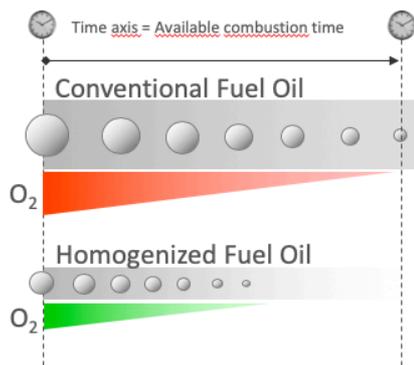


With less build up of sediments, the de-sludgings per days of the separator can be reduced significantly. Below an example from 24 de-sludgings per day towards 6 de-sludgings per day.



Combustion Improvement

IPCO Power's **FID Improver** homogenize heavy fuel oil after passing through heaters and pumps in the high-pressure side of fuel system, supplying fine filters and injectors with fuel droplets of 3 micron or smaller. The improved atomization and more intensive contact of fuel with oxygen will significantly enhance combustion, reducing fuel consumption and lower emissions.



A smaller fuel droplet needs less combustion time

- Particulate emission reduced
- Soot emission reduced
- Fuel efficiency improved

Oxygen-Volume Comparison



A smaller fuel droplet needs less combustion oxygen

- Supply of excess air can be reduced
- Entrance of nitrogen will be reduced
- Combustion related NOx emission reduced

A better combustion is a cleaner combustion (less PM and soot emissions). Ships with scrubber systems will have cleaner wash water.



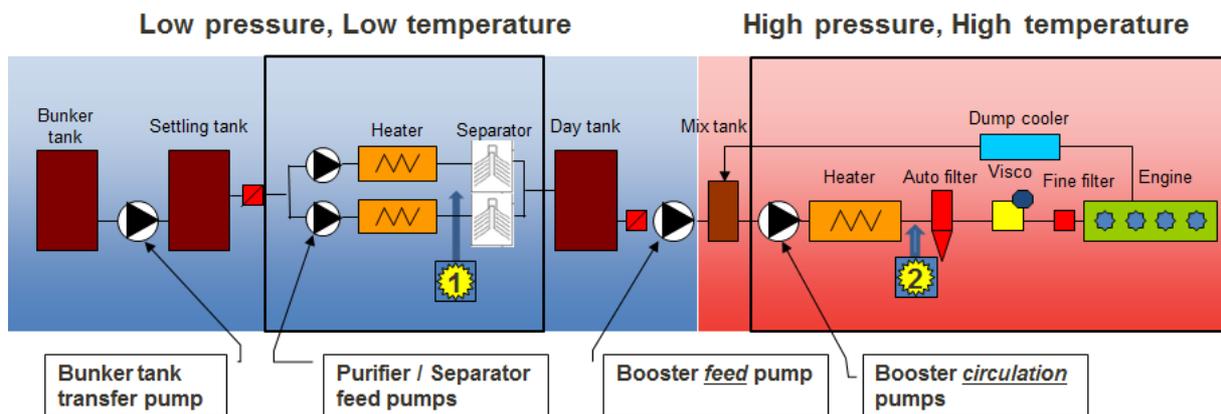
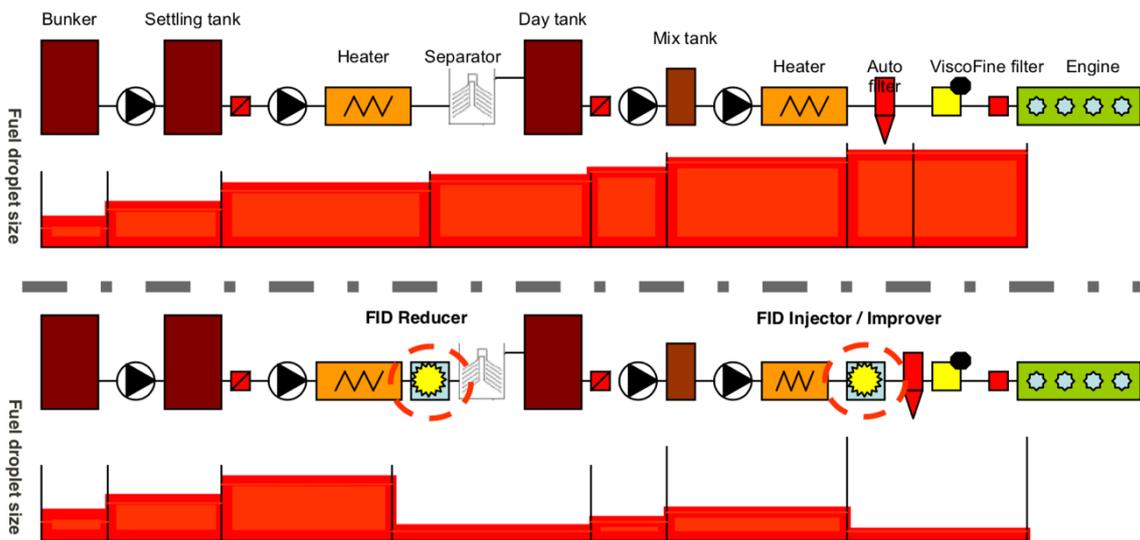
4400 running hours

2 stroke engines will have a 2,4% and 4 stroke engines a 1,2% fuel saving

Applications

To effectively improve the fuel quality, lower centrifuge maintenance, sludge production & disposal, enhance combustion, reduce undesirable emissions & soot, while lowering fuel consumption in engine and turbine installations, we recommend installing a combination of an FID Reducer and an FID Improver.

The FID Reducer will reduce the droplet size in the fuel system just before the separator and will assure that all useful fuel will pass the separator. Because of the heaters and pumps further in the system the fuel passes through piping towards the engine will normally re-agglomerates. To reverse this effect immediately before the engine an FID Improver is recommend. The FID Improver will reduce the droplet size again to a 3 micron for an improved combustion.



1 = FID Reducer

2 = FID Improver

The two-step fuel quality optimization process is environmentally supportive and will lower overall operating cost.

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