

## Patented oil filter brings savings in energy and maintenance

***GreenOil offers a patented and innovative technology for both particle filtration and water separation from oil. Energy consumption and maintenance requirements are low. Among the customers is Maersk Line.***

Oil for lubrication and hydraulic processes needs to be cleaned for unwanted particles and in addition, there has to be a separation of water from the oil. However, the market for oil filtration equipment offers different solutions with different technology, design and maintenance levels. GreenOil - an innovative Danish company – has patented a technology that separates its solutions from other suppliers – both in design and filtration technology. A fact that has been recognized by the maritime industry...

Among several others, Maersk Line is a large GreenOil customer. Hundreds of filtration solutions from GreenOil have been installed and are in operation onboard Maersk Line container ships. Among these ships are the world's largest container vessels – The Triple-E-series. Some of these ships have 10 GreenOil filtration systems onboard.

>>We are very dependent on efficient particle filtering – primarily because of our hydraulic systems that include sensitive components and operate at very small tolerances. We try to get rid of particles that can wear down the hydraulics systems too soon. Otherwise, there is a risk of an operational shutdown. So, we try to have a very efficient oil filtration and water separation – to ensure operational reliability and durability<< says Frants Sommer Reuss, Fleet Group Manager at Maersk Line.



*M/V Maersk Mc Kinney Moller 1 of 20 Triple-E vessels, which are the world biggest container vessels using GreenOil filters. Onboard each vessel 10 GreenOil filters are installed for different applications.*

### Water inhibits particle filtration

Clean oil – that has gone through particle filtration and has been separated from water – is essential for critical systems and equipment like steering gears and cranes.

>>Of course, we have redundancy in all our critical systems, like steering gears, to ensure safe navigation, but even with redundant systems it is very important to have efficient oil filtration for operational reliability<< says Frants Sommer Reuss.

Water in the oil is another problem that can affect particle filtration.

>>In our experience, oil filters stop working properly if there is too much water in the oil. Some filter systems cannot operate with water. They swell up and the particle filtration stops. Because of this, water separation from the oil is very important to us. An additional problem is the fact, that with a 300-400 bar pressure in some processes, water adds to the risk of damaging components<< says Frants Sommer Reuss.

### Unique design prevents spillage

For Maersk Line, a common problem is that new oil is not always clean oil.



*GreenOil filter which are installed for stern tube application. Keeping the EAL bio-oils oil free of any water and particles.*

>>Often, we experience that new oil in barrels has not been sufficiently cleaned, which leaves metal slags and other unwanted particles in the oil. This reduces operational reliability and life expectancy. Consequently, we always pump new oil through our filtration systems to make sure it is clean. Also, to achieve the full warranty, our suppliers demand certain standards for oil quality and purity. These demands have to be met by our filtration systems, and GreenOil has not let us down yet<< says Frants Sommer Reuss.

He also points to the unique design of the GreenOil filters, which makes it possible to replace filters without direct personal contact with the oil.

>>GreenOil stands apart from competing solutions with a very easy and clean replacement of the particle filters. It is a cartridge design that allows replacement of the filter without any direct contact with the oil – as opposed to other solutions that leave an oil spillage<< says Frants Sommer Reuss.

### Cheaper than separators

He also emphasizes that GreenOil solutions are easy to install and put into operation.

>>Usually, the crew can install our solutions in a few hours, and after that, the filtration systems are fully automated. Of course, we very much look for solutions that can help us save man-hours – which is accomplished by smart design, automation, and operational reliability. GreenOil's filtration systems help us achieve this goal<< says Frants Sommer Reuss.

Compared to oil separators, GreenOil filters also offer a very energy efficient solution.

>>Oil filters use a lot less energy than separators and if the filters can handle the necessary volume of oil, filters are a very good alternative to separators in our experience. In the end, the goal is to avoid operational shutdowns caused by bad oil quality. At Maersk Line, we have been very focused on these

issues for years and we are always looking for solutions, which can improve the filtration and at the same time save energy and man-hours<< says Frants Sommer Reuss.

### **24 hour filtration**

The development of GreenOil filters began in 2003, and from 2008 GreenOil has been commercially pursuing sales while at the same time improving the filtration systems. Until now, thousands of GreenOil solutions have been sold to the maritime industry, primarily ship owners.

>>Our technology is offline solutions that operate independently of the primary process, which is typically a hydraulic system, or a lubrication process. There is a continuous 24 hour per day filtration and separation process. The oil is pumped from the bottom of the oil tank where the particles usually gather and the oil is then pumped through an oil filter and the water separator before being returned to the top of the tank. This way, there is always clean oil available for the necessary processes and operation of equipment<< explains Hans Lund, CEO at GreenOil – with a background as a marine engineer.

### **Patented technology**

The water separation technology has been patented and only GreenOil offers this method for separating water from oil.

>>We realized that there was a market for more energy efficient separation solutions. Instead of absorbing the water or heating the oil itself, the oil is pumped through a heated chamber whereby the water evaporates and is led directly to the atmosphere. This way, our solution benefits from the fact that heating air is much more energy efficient than heating oil – without compromising the separation efficiency<< says Hans Lund.

Changing the particle filter itself is also a unique GreenOil solution – a cartridge that can easily be replaced without oil spillage.

>>Our solution takes into consideration the working condition of the crew. With the cartridge solution, replacing the filter is easy, fast and clean - as the crew does not have to get in direct contact with the oil, and there is usually no need for cleaning afterwards<< says Hans Lund.

Particles and water are two separate issues that can impair operational reliability and the life span of the equipment.

>>Particles and metal fragments are the cause of equipment wear when the particles are pumped through the systems. The result is unnecessary wear, which can be avoided with an efficient filtration. Water can cause corrosion, freezing damage and cavitation which are responsible for abrasions in the oil systems<< says Hans Lund.

### Both retrofit and new-builds

The GreenOil solutions have a size and design that make them operable for both retrofit and new-builds. >>Our market targets both new-builds and retrofit solutions. The largest size is 0,5 meters and have a weight of 30 kg which makes it possible to retrofit our solutions even on smaller vessels<< says Hans Lund.

Ships are heavily equipped with systems that require oil for either lubrication or for hydraulic systems: Engines, gears, cranes, anchors, hatches, thrusters, propellers, ramps and other systems with large cylinders where oil is used.

>>We are very happy to have Maersk Line as a customer because they use our solutions, as they are intended – as a preventive measure to avoid production stops. We also have customers that use our filters to cope with failures when an incident has occurred but the optimal solution is, of course, to have a continuous process of filtering the oil – to avoid operational problems<< says Hans Lund.



*GreenOil filter used for Steering Gear, Cranes and Lubrication Oil applications onboard Maersk Triple-E-series.*

### New markets in sight

For GreenOil, energy consumption and maintenance are very important factors in design decisions. >>We are aware that energy consumption and maintenance are two very important parameters for our customers, and as a consequence our solutions are designed specifically to meet the customer needs and expectations in our choice of design, materials and the filtration and separations technologies<< says Hans Lund.

The future strategy for GreenOil is to expand beyond the maritime market into offshore oil, gas and wind turbines – e.g. the oil used in gearboxes.

>>We see several future market opportunities. In addition to our maritime customers, there are possibilities in the manufacturing industry, power plants and heavy construction machinery which depend on both lubrication and hydraulics<< he adds.

Recently, GreenOil has developed solutions for cleaning diesel and gas oil for diesel engines.

>>The technology is based on coalescence, a filtration principle that can remove water from oil. Engine fuel is a new area for us but our goal is to offer energy saving solutions with a size and design that make them operable for both retrofit and new-builds<< says Hans Lund.

### GreenOil Standard ApS

GreenOil develops and delivers filter solutions for lubrication oil and oil in hydraulic systems

- The filter solutions clean the oil for particles and separates water from the oil
- GreenOil offers a patented and energy-saving technology that separates water from oil by evaporation
- GreenOil filtration solutions comply with NAS 4 and ISO 12/10/7
- Water separation is at a 40-ppm level, particle cleaning is down to a size of 2 microns
- A GreenOil solution has the capacity of cleaning up to 12.000 liters of oil in a 24 hour-period. For diesel fuel, the capacity is 30 cubic meters in a 24 hour-period.