# Clean oil is a must

At Maersk Supply Service, most of the oil systems on the company's more than 30 state-of-the-art vessels are supplied with CJC® Oil Filters from C.C.JENSEN A/S

## SUCCESS STORIES:

- Diesel fuel filtration
- Engine lube oil filtration
- Energy efficiency & $CO_2$ reduction
- Condition Monitoring of oil & equipment wear

"The investment optimises performance, reduces the risk of errors and breakdowns, saves maintenance costs and reduces the $CO_2$ footprint"

# Clean oil is a must

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A zero-error culture is essential at Maersk Supply Service, as the company's vessels and crew operate worldwide, far away from any help.

For example, the technically advanced crane vessels must be able to hold objects weighing up to 300 tonnes absolutely still at the bottom of the sea, 1½ kilometres below the vessel. This requires efficient techno-logy and expert crews on the vessels.

"*Clean oil is crucial,*" states Jakob Eg Pedersen, Head of Technical Support at Maersk Supply Service.

**Jakob Eg Pedersen**

Head of Technical Organisation Vessel Management

Maersk Supply Service

"*Oil itself can last forever, but the microscopic fragments from wear of the equipment can put a vital part out of operation, and this can result in large sums in repairs and lost income. To avoid this risk, we have put CJC® Oil Filters on most oil systems within the fleet*" he says.

There are between 15 and 50 CJC® Oil Filters installed on each vessel, depending on its type.

**An important tool**

Initially, Maersk Supply Service began to test hydraulic oil together with the Danish Technological Institute in order to solve a problem with oxidation. It turned out, that an oil filter from Danish C.C.JENSEN was beneficial for this matter.

"*C.C.JENSEN was one of the first to continuously filter out water without changing filter inserts, which is absolutely crucial for achieving optimum operation. If you have no control over this process, you risk having to dock a vessel,*" notes Jakob Eg Pedersen.

The two companies have worked together on a very complicated development project in relation to an early warning system on all hydraulic equipment in the fleet.

It is an important tool, and as it makes it possible to be proactive and intervene before the problem accelerates.

**Optimising performance**

Maersk Supply Service invests in oil filters, analyses, and product development and Jakob Eg Pedersen is resolute when he says that it's worth it.

"*The investment optimises performance, reduces the risk of errors and breakdowns, and saves maintenance costs. It's much better to use the oil as a tool for condition monitoring, than to hoax with the gears and motors,*" he says.

"*Oil is a great indicator for the whole system's health. It is a good tool for identifying a problem and preventing or reducing dock time, and it is vital for the large, critical, hydraulic systems on our vessels. Clean oil is crucial for good ship management, and there are environmental benefits in reducing the amount of oil changes,*" states Jakob Eg Pedersen.

FACTS

## Maersk Supply Service

- Provides vessels and integrated solutions to offshore energy players, including oil and gas companies, offshore renewable companies and subsea contractors.
- Has a fleet of more than 30 vessels, including subsea support vessels, anchor handling tug supply vessels and platform supply vessels.
- Employs an international staff of approx. 1,100 seafarers and 250 people onshore.

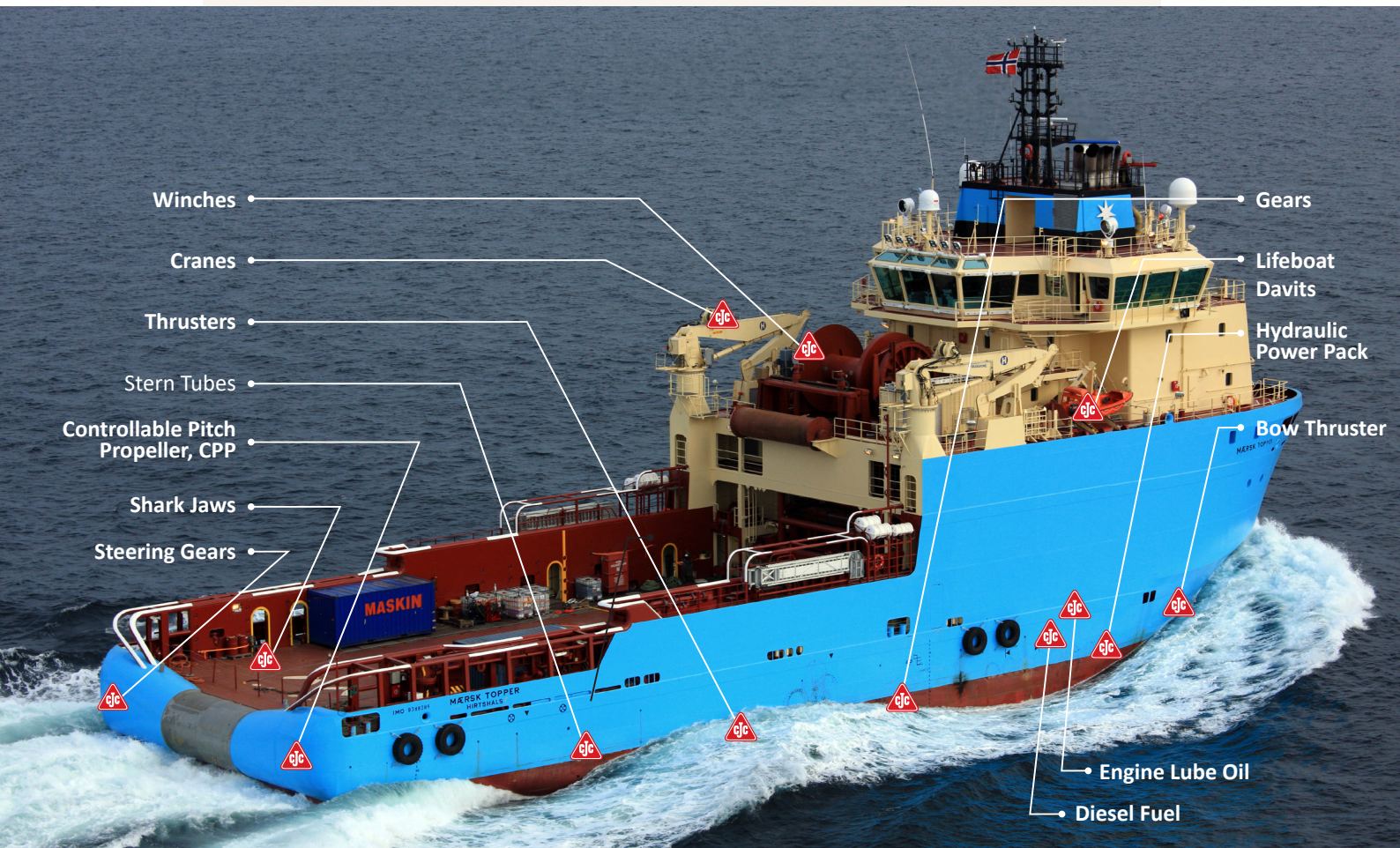
# CJC® Oil Filters keep your oil clean & dry

CJC® Offline Filtration Filters remove water, particles and oil degradation products from oil 24/7.

## Reduce:

- Crane breakdowns
- Seawater in thruster gear oil & stern tubes
- Excessive wear on reduction gears
- Condensation in hydraulics of lifeboat davits
- Malfunctioning shark jaws
- Bad working environment in purifier room
- Sludge production
- Energy consumption
- Emergency dockings

- all these problems can be reduced by installing CJC® Oil Filters !



# Diesel Fuel Filtration

- Savings on man hours, energy consumption and spare parts
- Service friendly solutions
- Improved working environment

*CJC® Marine Diesel Purifier PTU3 3x27/108 Multistay installed at Maersk Involver*

*CJC® Marine Diesel Purifier PTU3 2x27/108 Multistay installed at Maersk Mariner*

Maersk Supply Service is always looking at different areas to improve operations, where amongst other diesel oil cleanliness has been a focus area for the fleet.

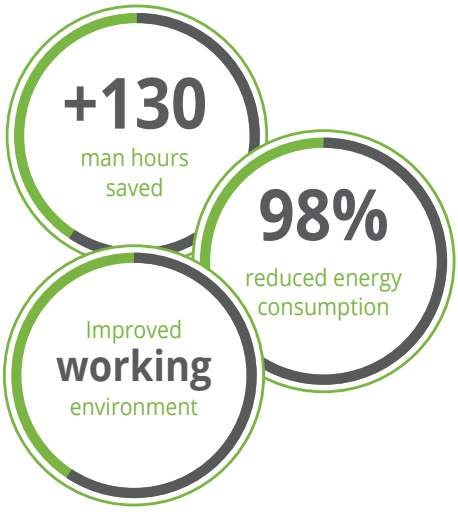
Here the focus was to improve the working environment of the crew, reducing the energy consumption of the purifying equipment with up to 98% and most importantly, to have a service friendly diesel oil purifying installation.

By replacing the conventional solutions for purifying diesel oil with a more service minded and lower energy demanding filter separator technology, Maersk Supply Service have been able to optimise its diesel oil purification program.

When designing the M-class and I-class vessels, Maersk Supply Service chose to equip each of the vessels with CJC® Marine Diesel Purifiers and since then also retrofitted CJC® Filters for the remaining of the fleet. It has been estimated for each vessel that +130 man hours have been saved annually for maintenance of the diesel oil purifying equipment as well as requiring less spare parts due to the simplicity of the CJC® Oil Filter.

## Installing the CJC® Marine Diesel Purifier, Maersk Supply Service have been able to:

- Save around **+130 man hours** annually for maintenance of the Diesel Oil Purifiers.
- Reduce the energy consumption with up to **98%** for Diesel Oil Treatment
- Improve the **working environment** for the crew.



# Engine Lube Oil Filtration

- $CO_2$ reductions
- Lowering of environmental footprint
- No sludge production
- Improved working environment

*CJC® Engine Lube Oil Filter, 2 x HDU 427/108 installed at Maersk Tracker*

*CJC® Filter Inserts LO4D*

Maersk Supply Service is actively taking part in solving the energy challenges of tomorrow. It is done by rethinking how to maintain engine lubrication oil clean and free from contaminants at a substantially lower energy demand. Previously, Maersk Supply Service used a high energy consuming Engine Oil Separator/Purifier for maintaining engine lube oil. In order for a separator to remove contamination from the oil, the oil temperature needs to be around 95°C, meaning that extra preheating is needed and more fuel is thereby consumed which creates more $CO_2$.

By replacing the separators and retrofitting with a CJC® Engine Lube Oil Filter, Maersk Supply Service has been able to lower the environmental footprint while maintaining the engine lube oil cleanliness, satisfying both the OEMs and the oil laboratories.

## Maersk Supply Service has at Maersk Tracker reduced its annual consumption for engine oil purification by:

- Total engine oil savings: 30 % ≈ 7 tonne(s)
- Fuel consumption savings: 98 % ≈ 65 tonne(s)
- $CO_2$ emission reduction: 98 % ≈ 202 tonne(s) *)
- Total sludge production: 65 % ≈ 32 tonne(s)

***) $CO_2$ reduction:**
Due to savings proven on several vessels, Maersk Supply Service has decided to replace all LO- and MDO Purifiers with CJC®, giving an estimated **annual $CO_2$ saving** across the fleet of up to **+6600 tonnes of $CO_2$.**

## CUSTOMER STATEMENT

### Decarbonizing Maersk Supply Service with CJC® Oil Filters

*The CJC® Oil Filters have proven to be an energy efficient, simple and yet effective oil filtration system for removing contamination from our engine oil and diesel oil.*

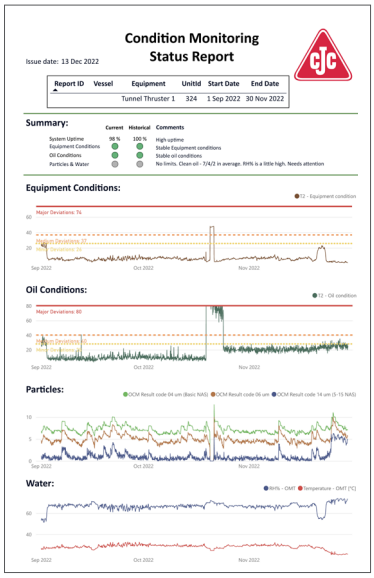
*Due to the much lower energy demand of the CJC® Oil Filters, we have decided to replace all LO & MDO separators in the MSS fleet with CJC® Oil Filters, which helps us towards reaching our 2030 goal for $CO_2$ reduction.*

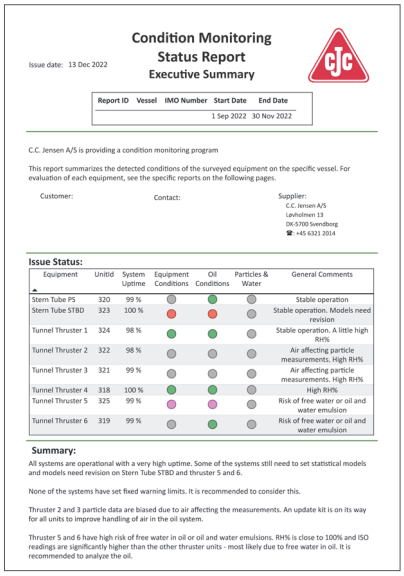
**Anders Olsen**
Fleet Technical Vessel Manager
Maersk Supply Service

# Condition Monitoring

- Early detection
- Reduced total cost of ownership
- Extended time between docking

*CJC® Condition Monitor Unit, CMU installed at Maersk Connector*




*T²render Quarterly Class Reports*

## Early detection of abnormal wear

By continuously monitoring the equipment online, any abnormal wear is detected and an alarm indicating a change in the equipment status will be triggered. If a change does occur, Maersk Supply Service is able to take the necessary actions early, in order to minimize and rectify the issue. The aim is to reduce cost of failure by early detection.

## Extended docking intervals

Maersk Supply Service have implemented a condition-based maintenance strategy for several of its vessels. Together with other monitoring systems, the CJC® T2render Pro condition-based monitoring system, allows Maersk Supply Service to extend the dry-dock intervals by 2,5 years from 5 to 7,5 years until 3rd special survey. By doing so, this gives Maersk an increased flexibility in its operation, benefitting both Maersk Supply Service, but also its clients.

## Online condition monitoring for thrusters and stern tubes

Maersk Supply Service have installed CJC® Condition Monitoring Units with CJC® T²render Pro licenses for its M-Class Anchor Handling Tug Supply Vessels, the I-class Subsea Support Vessels and the Cable-laying Vessel on the following applications; Bow/stern/azimuth thrusters and stern tubes. The total number of CJC® Condition Monitoring Units with the T²render Pro Subscription is 80 on 11 different vessels.

# Condition Monitoring - with CJC®

- Online monitoring of oil and system conditions
- Early equipment failure warnings
- Predictive maintenance
- Intelligent interpretation of data

## T²render Solution is available in two variations:

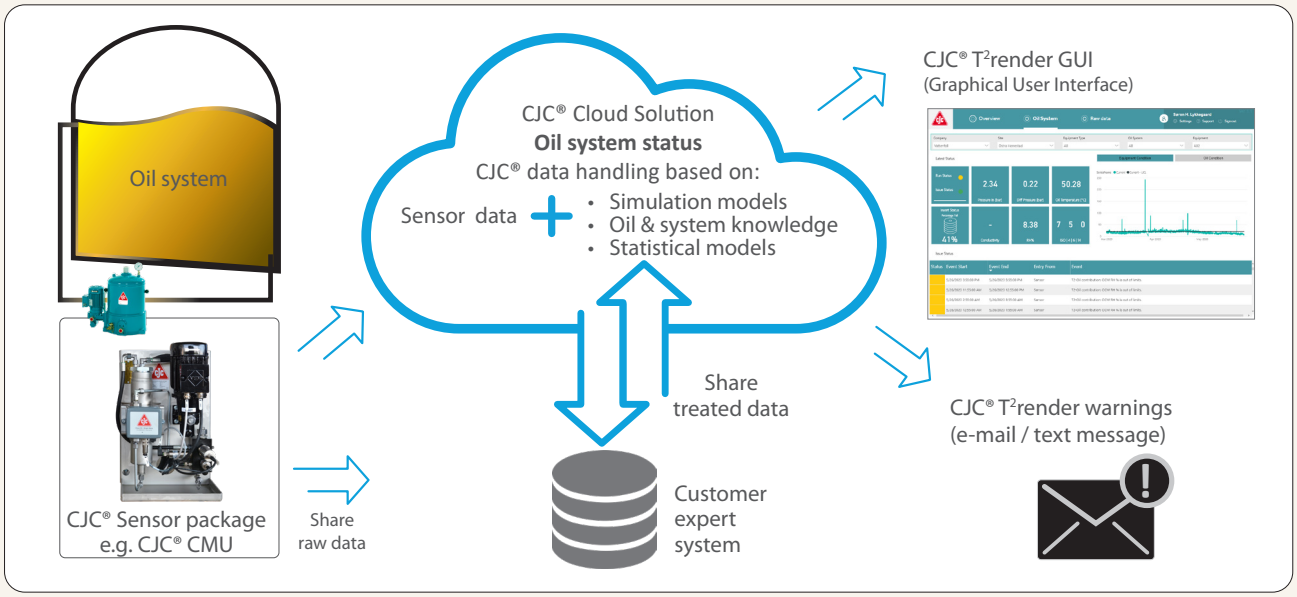
### CJC® T²render Basic:

The CJC® T²render Basic Solution provides online monitoring of oil and system conditions. Will generate warning messages to the equipment owner when the sensor values exceed pre-defined limits e.g. ISO 4406 codes.

### CJC® T²render Pro:

In addition to the Basic solution, the CJC® T2render Pro Solution is using machine learning and mathematical T²-models for individual system adaption. This online monitoring software will predict failures and can be used for optimising maintenance and repairs. Warning messages will be generated and sent to the equipment owner, when oil or equipment operating conditions deviate from normal operation patterns.

| CJC® T²render Solution Suite | | | |
|---|---|---|---|
| Features | CJC® Sensor package | CJC® T2render Basic | CJC® T2render Pro |
| Local Monitoring of ISO 4406, RH% & oil temp with Display on Sensor (OCM15) (MODBUS RTU data interface) | ✓ | | |
| Sensor/CMU and local data transfer | ✓ | ✓ | ✓ |
| Sensor/CMU w. 30 days offline data logging & CJC® Cloud data storage | | ✓ | ✓ |
| Web Portal with overview dashboard, monitoring of validated sensor data & logbook of historical & current events | | ✓ | ✓ |
| Share raw & treated sensor data via API | | ✓ | ✓ |
| Offline oil filtration performance analysis | | ✓ | ✓ |
| Warning status & messages based on individual sensor limits | | ✓ | ✓ |
| Automatic analysis of many sensor signals converted into one oil condition and one equipment condition value | | | ✓ |
| Detection of abnormal equipment and oil conditions for predictive maintenance | | | ✓ |
| Automatic and valid warnings uniquely adapted to each oil system with appointed direct cause | | | ✓ |



C.C.JENSEN

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