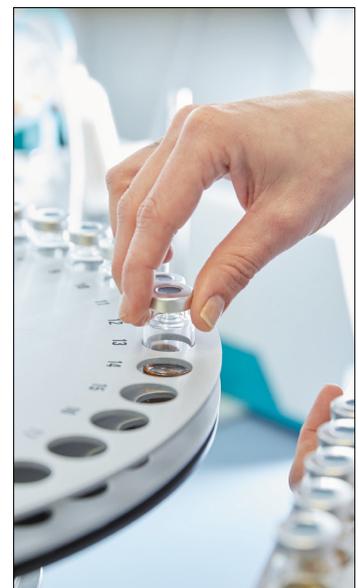
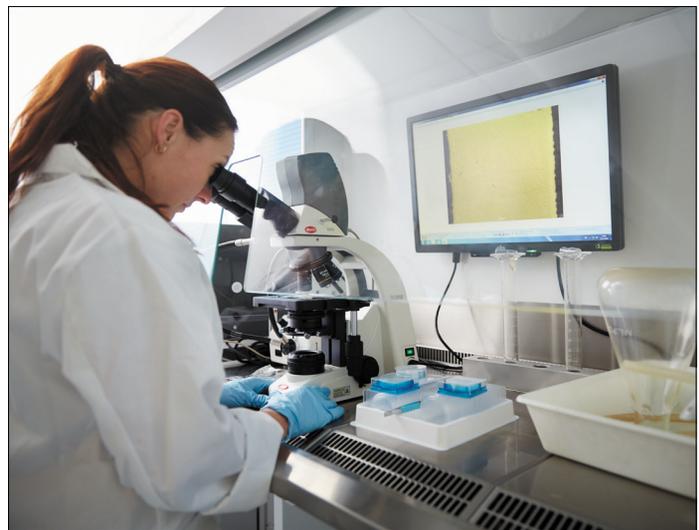


SERVICE BULLETIN #35

FRAMO MARINE CARGO PUMPING SYSTEM

Oil monitoring and inspection



Oil Monitoring and Inspection Program (OMP) includes:

Oil sampling – Oil analysis – Filter condition – Annual Inspection – Pre-Docking Inspection



The Oil Monitoring and Inspection Program

has proven to be a cost effective condition based maintenance system.

By monitoring the condition of the cargo pumping system, this will give an improved lifetime of the components in the system.

With the Oil Monitoring and Inspection Program (OMP), Framo offer assistance for cost control and optimal operation.

The **Oil Monitoring and Inspection Program** includes Oil Monitoring,

Annual Inspections and Pre-Docking Inspections. The program will be managed by one of the Framo service stations and dedicated personnel will follow up each ship.

We will:

- Supply Framo sample bottle kit annually, with instruction for sampling and labels for shipping.
- Provide recommended sampling and attendance schedule.
- Perform trend analysis of the different tests and send the Framo Oil Monitoring Report to ship and customer.
- Perform scheduled inspection and highlight recommended action / spare parts, if any.
- Available information related to oil analysis, performed inspections and consumption statistics, might be discussed during meetings with our customer.



Framo test laboratory

The program comprise the following:

The program includes a total of 4-four oil samples annually, in which there are 3-three Level 1 analysis and 1-one Level 2 analysis. A separate sampling valve is a standard installation by Framo.

Please study our recommended oil sampling procedure, 1400-0063-4, carefully prior oil sampling.

Oil Monitoring - Level 1:

- Particle counting and water content test, quarterly. The oil sample will be analysed at a Framo test laboratory and observed results reported according to ISO 4406-1999
 - Number and size of particles. Recommended limit is ISO -/16/12
 - Water content will be reported according to Karl Fisher ASTM

E-1064. Recommended limit is below 300 PPM.

Microscopic analysis will be carried out if higher amount of particles are observed during automatic counting. Tailor made comments and recommendations will be given in each Framo Oil Monitoring Report.

Oil Monitoring - Level 2:

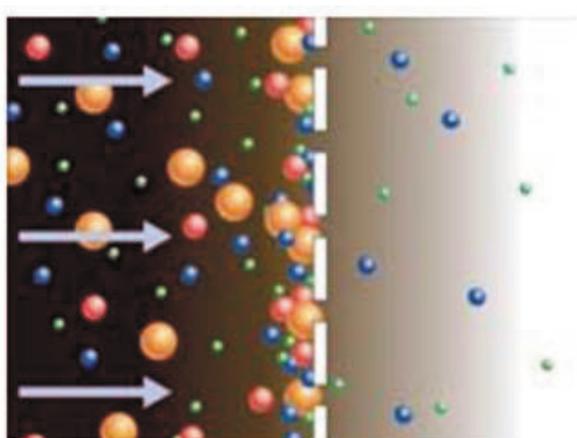
- 1-one full analysis will be done annually, and will in addition to particle counting and water content, comprise the following:
 - Viscosity test at 40°C
 - Total acid number, (TAN).
 - Phosphor, ppm. (P)
 - Zinc, ppm. (Zn)
 - Calcium, ppm. (Ca)

Filter condition:

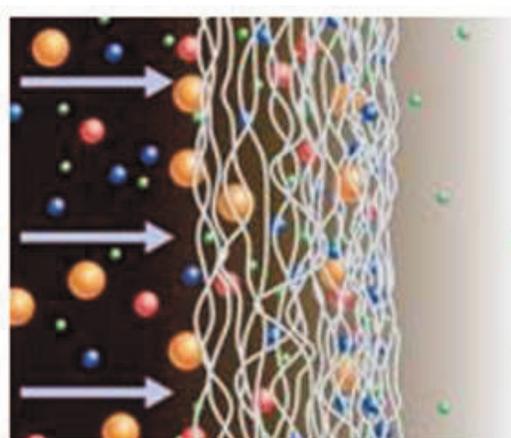
As we all know, the cleanliness of the oil, as well as the general oil condition, is very important for the lifetime of the Framo Cargo Pumping System. In this respect, please keep in mind that:

- Our systems are equipped with full flow filters, securing that all circulated oil is filtrated.
- Particle counting, combined with pressure drop measurements over the filter is the only safe indicator on when to change the filter element(s).
- Framo is using a depth filter, which means that these are not cleanable at all.

Please make sure that you use only genuine Framo filters.



Surface Filtration



Depth Filtration

The Framo main filter is a so called depth filter. Glass fiber and metal are the materials used. Depth filters cannot be cleaned and are regarded as disposable elements.

Annual Inspection:

Framo will provide skilled engineers to attend your ship worldwide in order to perform a visual inspection on board your vessel, together with representatives from the vessels crew.

The inspection will comprise the following:

- Visual inspection of hydraulic power unit.
- If possible, perform a visual inspection of manual wear indicators.
- Check for air in the system and de-aerate if necessary.
- Inspect the system for leakages, abnormal noise etc.
- Visual inspection and evaluation of hydraulic deck piping and valves, including quick coupling stations for the portable pump.
- Visual inspection of cargo pumps top plates, including FCV / STC valves.
- Evaluation of purging routines of the cargo pumps cofferdam.
- Visual inspection of Framo portable pump with accessories.
- Visual inspection of standard pumps and other Framo delivered equipment.

- Control of Framo toolbox incl. special tools and the pressure testing kit / manometer set.
- Inspection and evaluation of spare part inventory as well as stock location.
- Evaluation of planned maintenance records.
- Following the survey, a detailed inspection report including recommended action / spare parts, will be sent to the customer.

Pre-Docking Inspection:

Framo will provide skilled engineers to attend your ship worldwide in order to evaluate the condition of the entire Framo cargo pumping system, prior to docking. The Pre-Docking Inspection is preferably carried out prior to a discharge operation, if possible. The Pre-Docking Inspection can also be replaced with an On-board Training session. For that, a short voyage is recommended.

The inspection will comprise the following:

- If possible, test all cargo pumps against closed cargo valve in order to evaluate condition of the pumps and control valves (depending port authority and type of cargo).



Genuine spare-parts

- Purge cofferdam on all cargo pumps (depending on type of cargo).
- If possible, test each hydraulic power pack.
- If possible, test the hydraulic control system, alarm and shutdown functions.
- Visual inspection and evaluation of hydraulic deck piping and valves, including coupling stations for the portable pump.
- Inspection and test of portable pump, if possible.
- If possible, test-run the ballast pumps and tank cleaning pumps.
- Inspection of spare part inventory and Framo toolbox incl. special tools and the pressure testing kit / manometer set.

- Following the survey, a detailed inspection report with repair recommendations, followed by our quotation for recommended spare parts, will be sent to the customer. This will help the ship's superintendent in preparing the docking activities on the Framo system and at the same time keep the maintenance cost down.
- In the year when Pre-Docking Inspection is carried out, it is not deemed necessary to also carry out an Annual Inspection.
- Pre-Docking Inspection can also be combined with On Board Training.

You will get:

- Secured optimal performance of your Framo cargo pumping system.
- Reduced maintenance costs.
- Increased lifetime of the hydraulic components.
- Better possibility to plan the maintenance and to have an indication of required spare parts.
- Documentation of the system condition.

In order to secure smooth cooperation from both parties, your vessel (s) will have to:

- Collect 3-three oil samples per year and send same to

a Framo service station for further analysis. Shipping costs will be at customer`s account. Our target is to collect 1-one oil sample during the Annual / Pre-Docking Inspections.

- Contact us prior to attendance in ports where we are located, if your vessel is due for inspections. We will act accordingly, as long as we have available capacity. We are also able to attend vessels in other ports. More info below.

Port attendance:

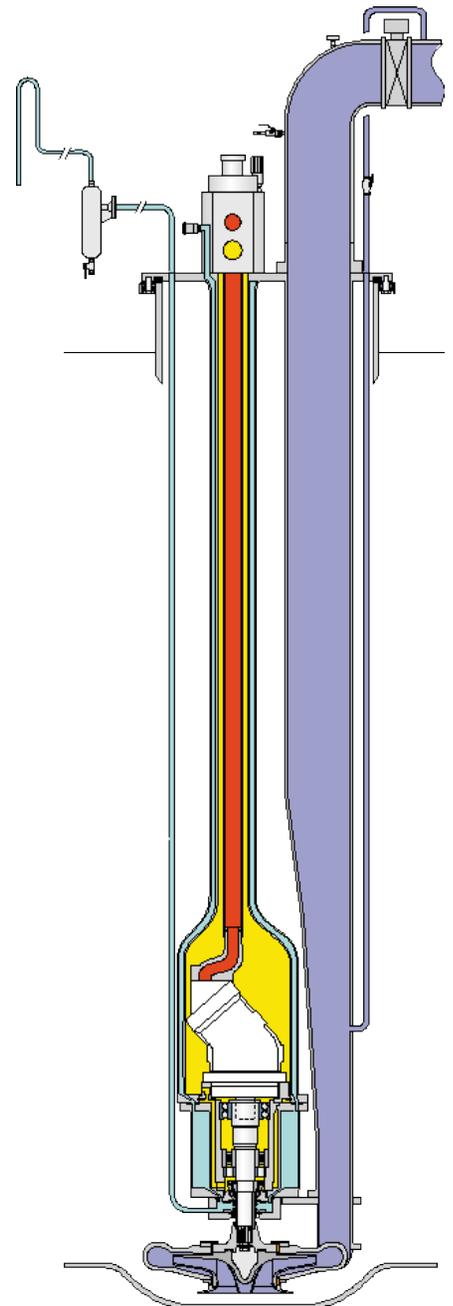
Please note that the costs of inspection included in the Oil Monitoring and Inspection Program are based on the inspection being carried out in ports where Framo have an office (Rotterdam, Houston, Singapore, Bergen, Shanghai, Busan, Tokyo, Rio de Janeiro - City Harbor and Dubai area).

For attendance outside Framo ports:

Tickets, hotel, subsistence allowance, travelling expenses and driving pre-paid by us will be charged at cost face value.

For traveling and waiting time we will charge the actual hours, limited to a maximum amount pr. calendar day.

For any further information regarding our services, please do not hesitate to contact any of the Framo service stations.







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