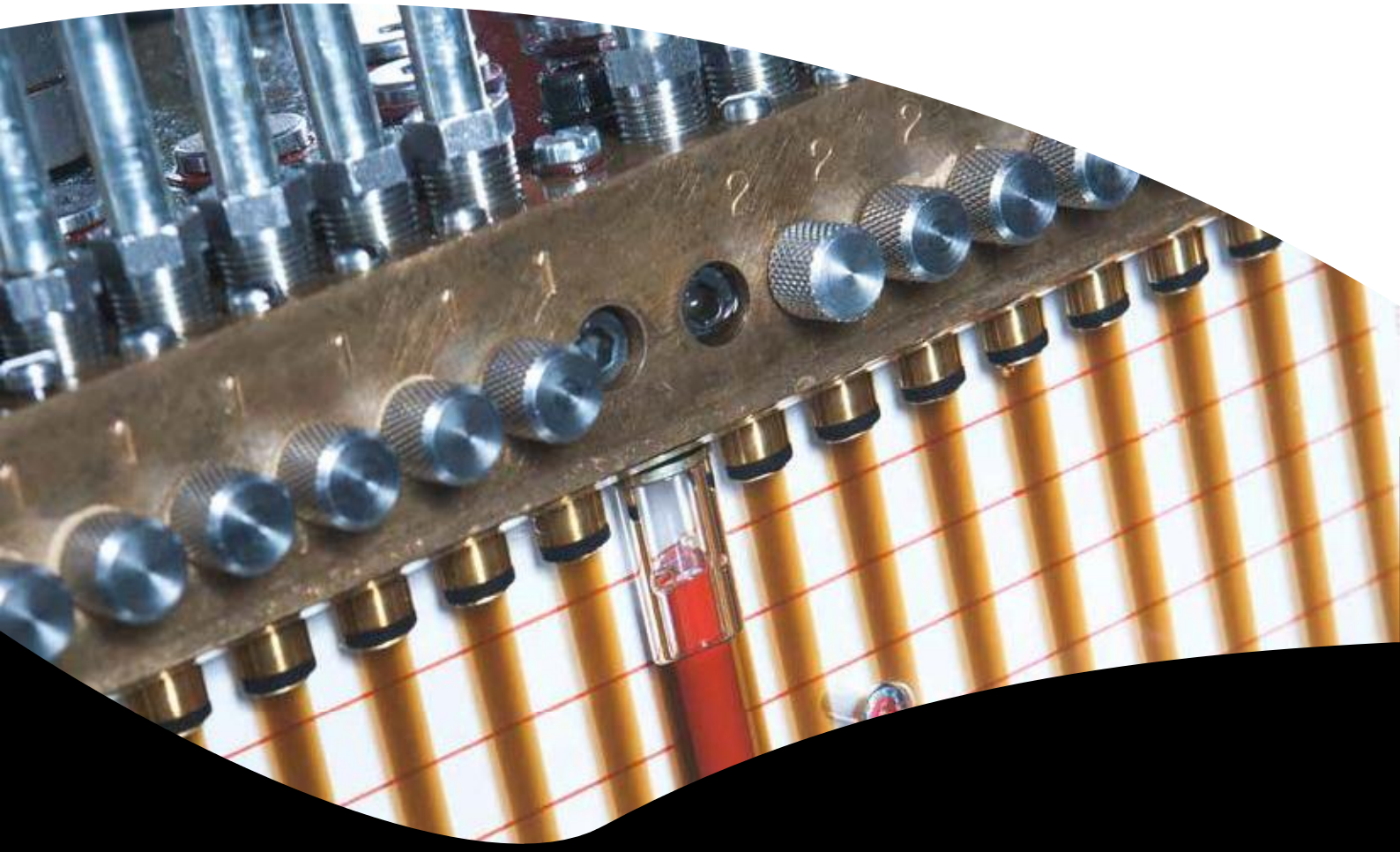
Hans Jensen Lubricators



HJ Regulations

Mechanical Reliability and Electronic Flexibility

- Automatic regulation of consumption
- Higher level of security due to automatic regulation
- Better cylinder condition due to well adjusted feed rate
- Significant savings potential in cylinder oil consumption
- Easy retrofit (in-situ)
- Also ideal for vessels running on partial load (slow or super slow steaming)

HJ Load Regulations

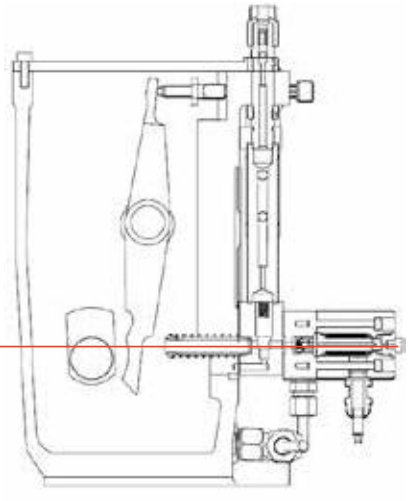
Purpose

For Traditonal Mechanical Cylinder Lubricators

Hans Jensen Lubricators A/S can offer various types of regulations for optimal and automatic adjustment of cylinder oil consumption for ME, leading to reduced consumptions in part load areas as well as optimized cylinder conditions. They are developed for use with traditional mechanical lubricators.

- HJ Mechtronic (electronic regulation)
- MEP regulation (mechanical regulation)
- BHP regulation (mechanical regulation)

HJ Mechtronic can be included on new deliveries or be retrofitted on existing HJ Lubricators. The traditional mechanical lubricator is simply fitted with a regulation module, enabling control of flow for each individual lube point.



Regulation module

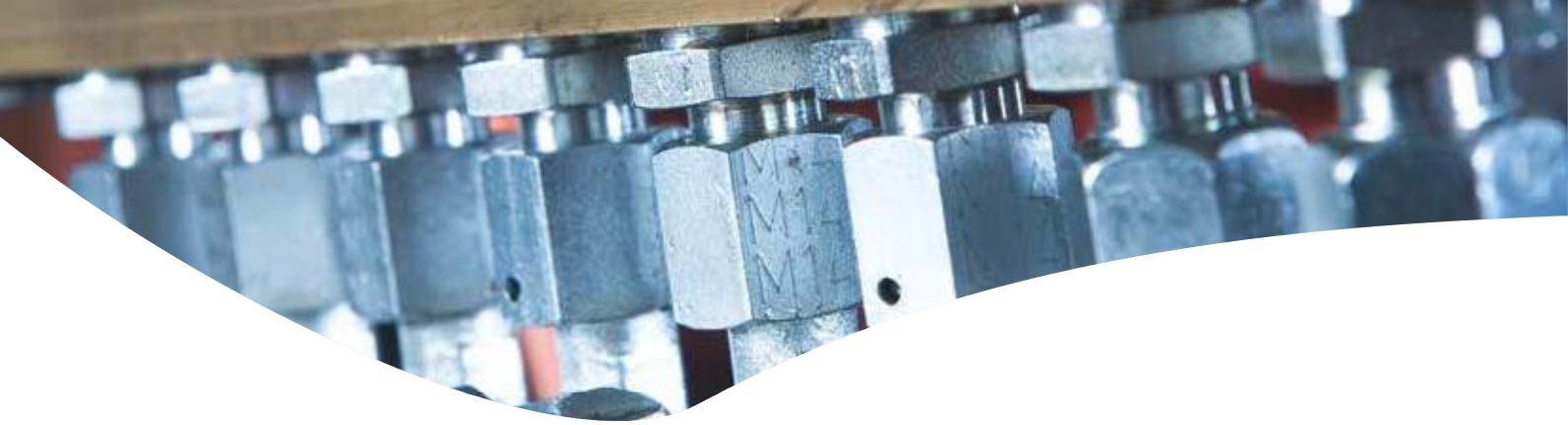
HJ Mechtronic

Description

Electronic flexibility combined with mechanical reliability

The function of HJ Mechtronic is fairly simple, and provides a large degree of operational reliability. The function is constructed so that possible errors on HJ Mechtronic will entail no risk of under lubrication of cylinders.

Information about the current reduction, and additional operational data, such as RPM, feed rate and load percentage, are easily accessible in the enclosed PC program for HJ Mechtronic. At the same time, the PC program is used to choose the regulation method on the individual system. There are two standard algorithms for regulation of cylinder oil, but a user defined regulation can also be chosen.



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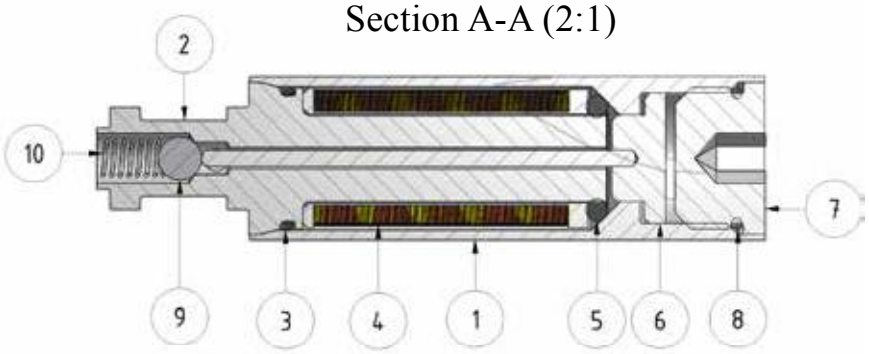


Principle

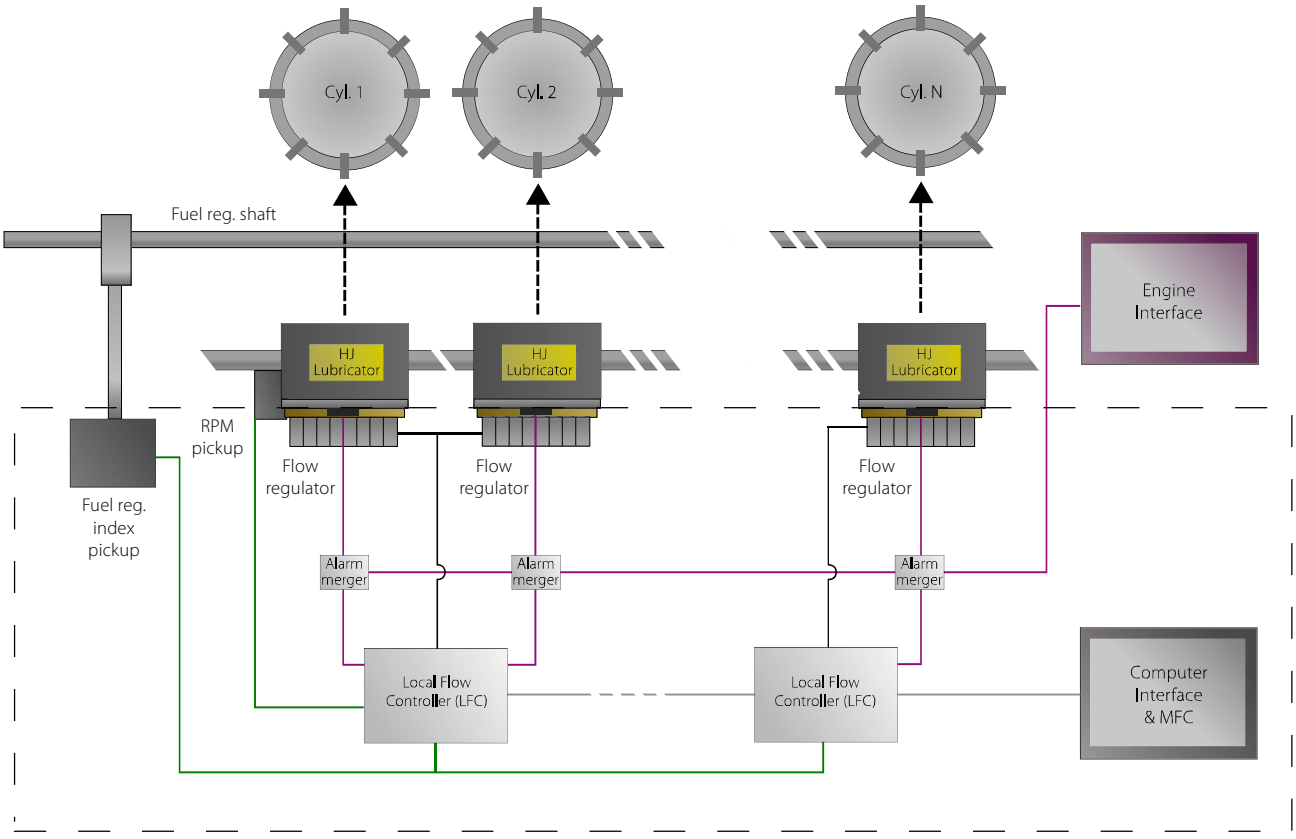
Reduction of lube oil to the cylinders is electronically controlled, based on measured values for RPM and Index, meaning that the calculation of the engine load is a snapshot value. Based on these inputs, reduction of cylinder oil can be controlled according to different regulation algorithms. When the calculation has been carried out, the control chooses which lubrication points need to be bypassed. Basically, the same lubrication point will not be reduced twice in a row. Reduction takes place when the solenoid is energized, hereby opening the bypasses, leading the oil from the lubrication point back to the lubricator. When de-energizing the solenoid, the bypass will close again. In the event of a failure in the voltage supply to HJ Mechtronic, under lubrication of the cylinders cannot occur, as an electric activation of the valve needs to take place.

Surveillance of the system takes place by means of a series of sensors, which ensure optimal operation of the system. In addition to the current method of operation, there is a self-test with user defined intervals taking place, where all functions are controlled. If irregularities are detected, the system gives an error warning or an error alarm, and a potential free relay is activated, for easy connection to the vessel's surveillance system.

HJ Mechtronic is not dependent on the communication to the PC. This is only used for the upload of new parameters and for data collection.

HJ Mechtronic

System Overview



Based on the number of lubrication points per cylinder, the number of LFC (Local Flow Controller) boxes is projected. The remaining parts of the system are not dependent on the number of cylinders/lubrication points.

Alarms from HJ Mechtronic are connected to the existing alarms on the lubricators.

Standard
HJ Regulation Algorithms

Purpose

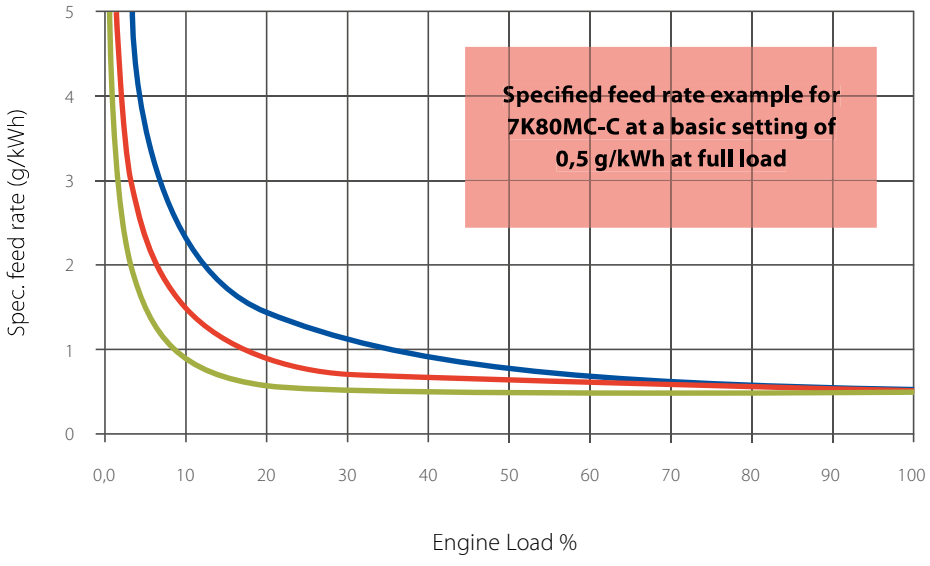
Based on index/load pickup on the fuel regulation shaft of the system, and based on choice of regulation type, an automated adjustment of lube oil can be controlled. The index/load pickup unit is calibrated based on data sheets from the individual engine's fuel index curves.

Typically, we use a load dependent regulation (BHP regulation). This regulation type secures that the specific feed rate is constant, i.e. at part load the system reduces the feed rate proportional to the load. In some cases, a more conservative regulation algorithm is chosen (MEP regulation), where the reduction is smaller. The savings in lube oil consumption takes place due to the feed rate being kept stable, as opposed to systems without regulation. These types of systems are also shown as RPM regulation.

RPM dependent

MEP proportional dosing

BHP proportional dosing



When using the HJ Mechtronic, there is full flexibility in regulation algorithm. The reductions will always be relative to the present stroke setting of the traditional lubricators.

A mechanical regulation is also available for the traditional lubricators. This solution is based on a special regulation cover for the mechanical lubricator, where a special cam profile performs the necessary reduction of feed rate.

Hans Jensen Lubricators A/S
Smedevænget 3
DK-9560 Hadsund

Tlf. +45 98 57 19 11
Fax +45 98 57 13 87
Mail hjl@hjlubri.dk

www hjlubricators.com

Hans Jensen Lubricators A/S
Danish Export Association
Shanghai Rep. Office
Rm1703, 1277 Beijing Xi Lu
Shanghai 200040
China
Phone +86-21 5965 6790