4 stroke engines and Heavy Fuel Oil

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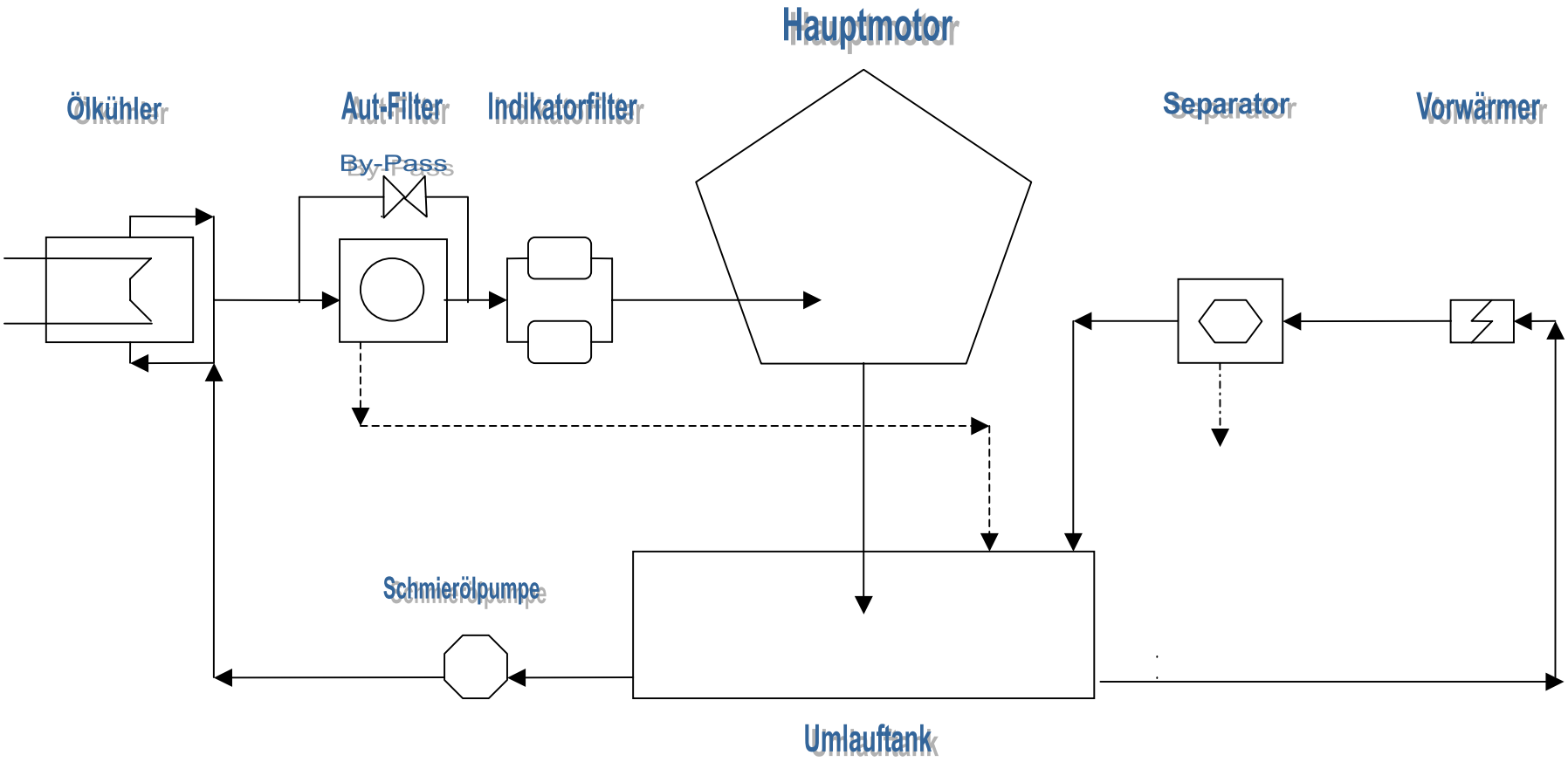
Lube-Oil

In addition to minimising friction and wear between moving parts of an engine, lube-oil has to fulfil a number of other tasks such as e.g.: Cooling, heat-transport, corrosion protection, neutralisation of residues of combustion, prevention of deposition of solid foreign matter, and so on. To be able to meet all this tasks the lube-oil is mixed with certain so called additives.
The fulfilment of all this tasks however will not leave the lube-oil without any traces. The lube-oil will age by thermal load and will be polluted by combustion residues, which in turn will have an effect on the quality of the lube-oil.



Schmierölsystem eines 4 Takt Motors

Lube-Oil System of a 4-stroke Engine

Lube-oil maintenance

Modern engines with high output and high operation temperatures are very demanding in respect of lube-oil quality - at the same time the lube-oil consumption of these engines was reduced even further. With the reduction of replenishment of fresh lube-oil the maintenance of lube-oil becomes more important, as it has a direct input on the wear in the engine and thereby on costs.

Generally lube-oils which have been approved by the engine manufacturer should be used only. Especially with 4-stroke engines running on heavy fuel the ability of the lube-oil, to neutralise acid residues is of high importance. The TBN number, stated by the engine manufacturer, must be strictly observed.

To safeguard the quality of the lube-oil it has to be analysed in accordance with the respective maintenance plan regularly.

The continues use of centrifugal separators when the engines are operating and as well in port, plus adding fresh oil, will safeguard the requested quality of the lube-oil for several thousand operating hours.

Lube-oil systems are fitted with an Automatic and a so called Indicator Filter, both are located in the Lube-oil main stream. These filters serve as a protection device for the main engine but can not replace the cleaning of the lube-oil from dirt, water and other foreign particles by the separator. Any impurity dissolved in the oil will flow through the filter unhindered like water.
Certainly the separator will have to be adjusted in accordance with the operating instructions. Lowering the separating temperature from 95° by 5° will cause of loss of effectiveness of 20%.

Ineffective or lack of cleaning of the lube-oil by separators will cause abnormal wear and damage to construction parts of a main engine even if the filters in use are intact.

Often occurring problems

Filter	Causes
• Filter filling (candle) defect	improper filter cleaning, cleaning tools of manufacturer not available
• "repaired" filter fillings (candles)	no spares available
• Automatic filter, cleaning cycles too low	Filter cleaning on “manual”, instead on “differential pressure”
• Automatic filter, cleaning cycles too high	Separator does not work effectively
• Automatic filter defect or is operating in by-pass mode	lack of spare parts, lack of filter filling in rinsing oil discharge

Separators	Causes
• Wrong separation discs	lack of knowledge, missing manual or manual in wrong language
• Separating temperature too low, flow rate too high	lack of knowledge, missing manual or manual in wrong language*

Lube oil	Causes
• High contamination, water content too high	insufficient cleaning, wrong setting at separator, Too low separation time
• TBN value too low / has dropped	Sulphur content in fuel

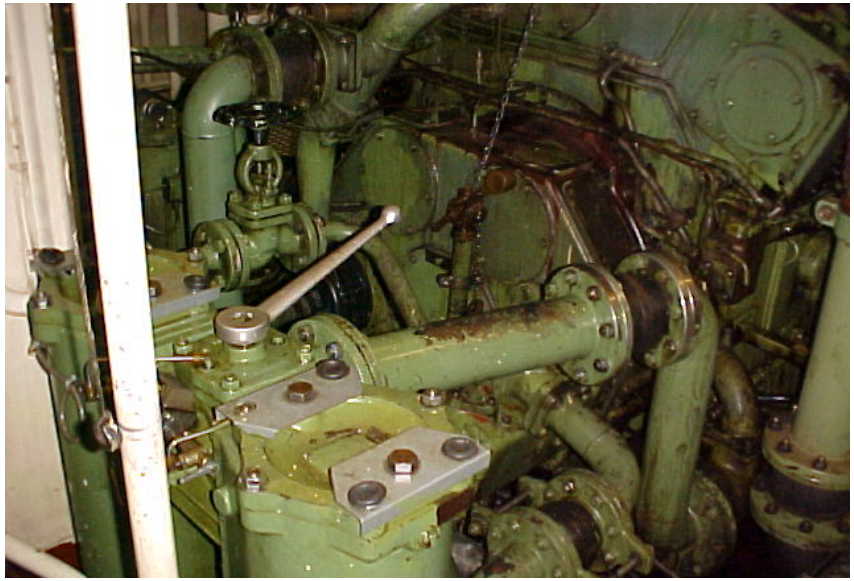
Bearing	Causes
• Operating hours not yet reached	Dirt embedding in bearing metal Water in lube oil Fuel in the lube oil TBN value too low

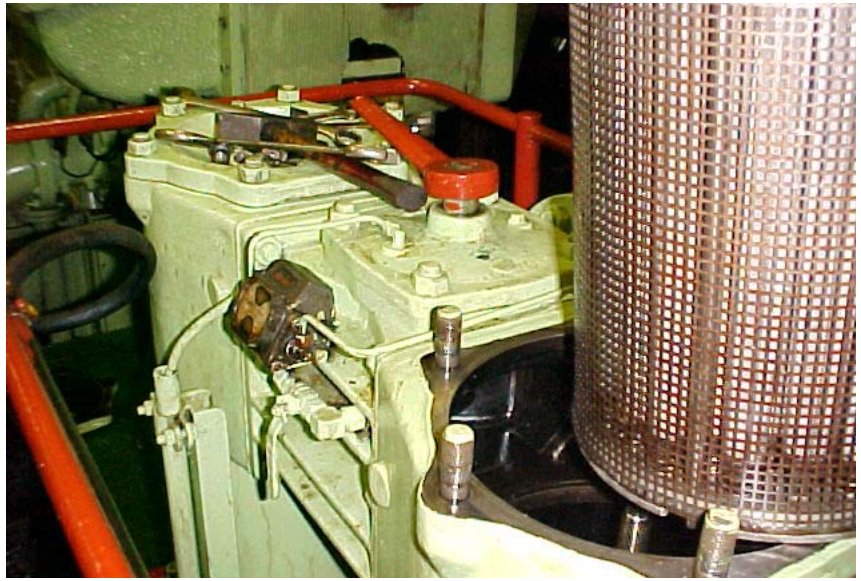
Caution

For lube oil filtration the functionality of the whole filtration chain is indispensable. The Automatic Filter is the **Main Filter** with the finest filter mesh and must be by-passed in **utmost emergencies** only.

*The total lube oil volume should be recycled abt. 5 times per day. Separators to be charged with max.20% of the nominal load. Separating to continue even after closing down of the main engine.

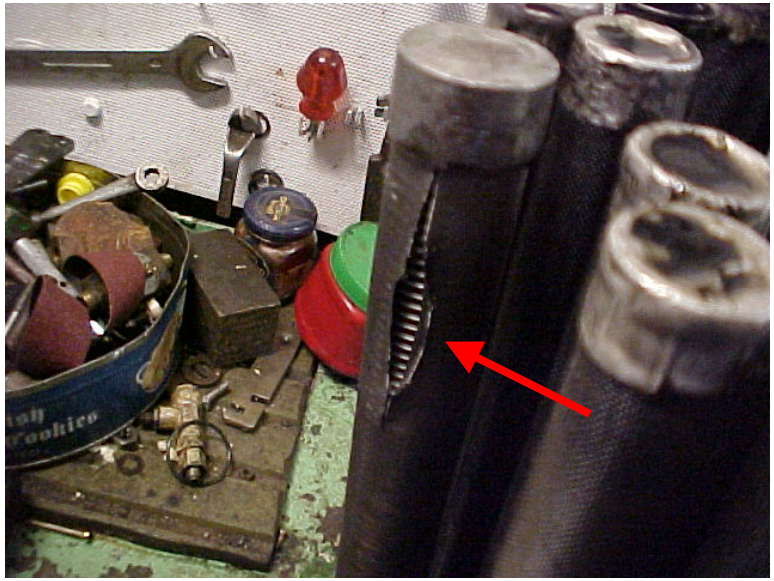
Picture Gallary

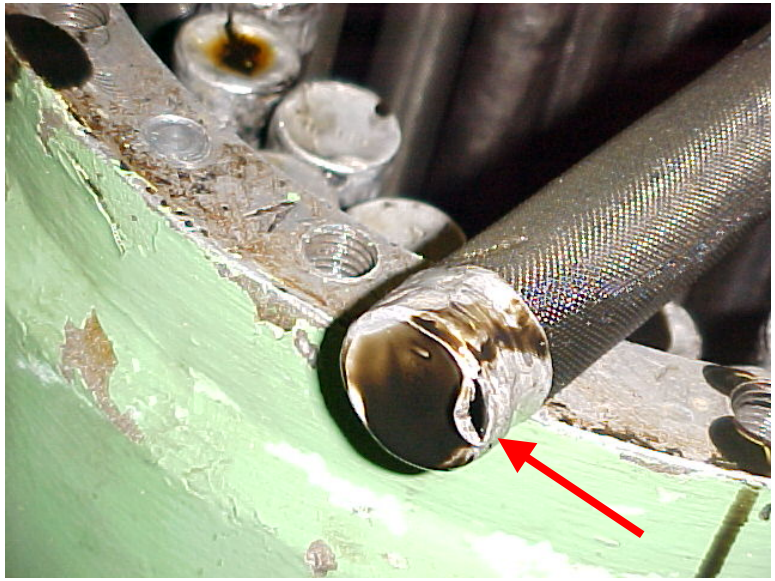


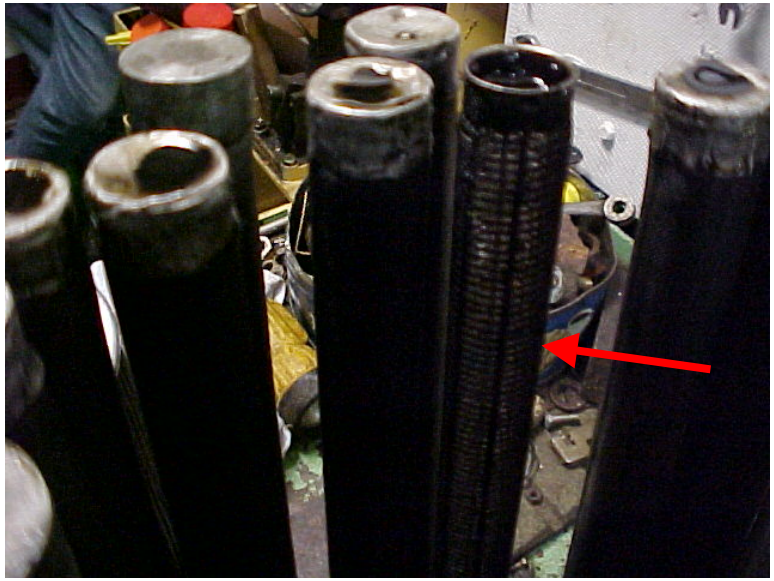


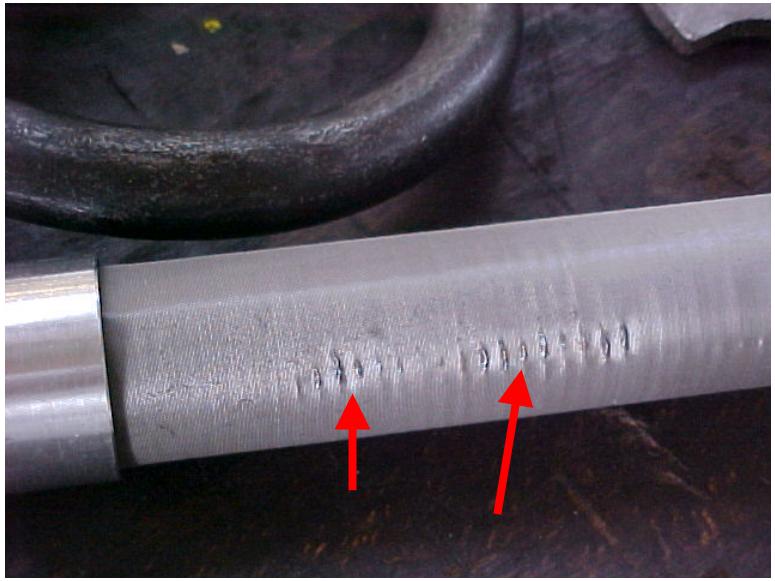
Indicatorfilter

Automatic-filter





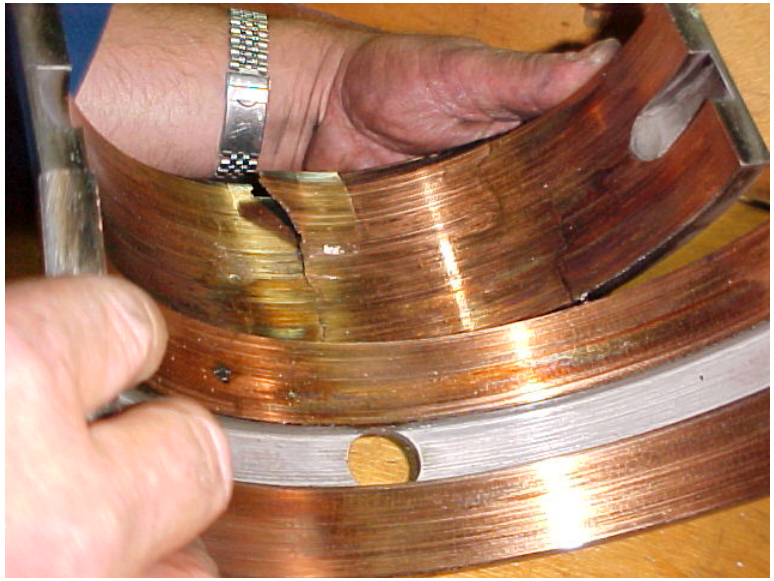




Filter fillings (candles)damaged by faulty mainteneance and which should not have been fitted again.

If only one candle is damaged, this is equal to the loss of the whole filter, exchange of all candles is indispensable.

Connecting Rod Bearing



Main Bearing

Piston

Typical Bearing Damage

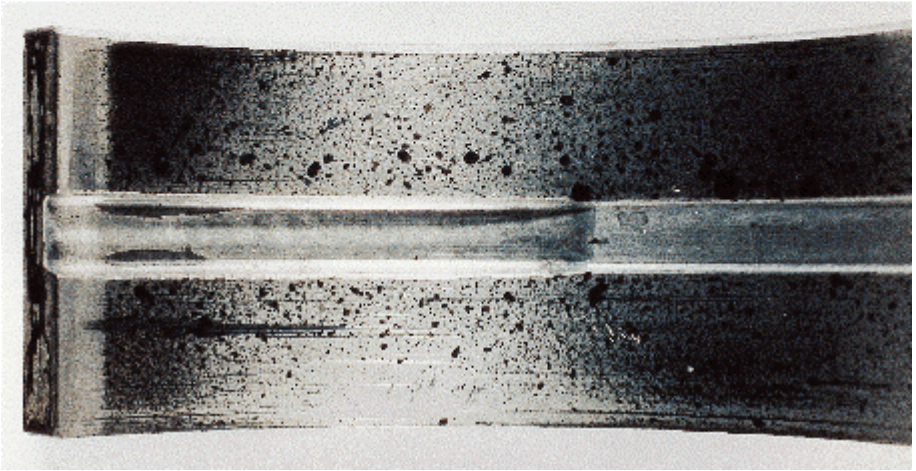
Grooves caused by foreign particles and embedding of foreign particles

Bild 1

Source: Miba

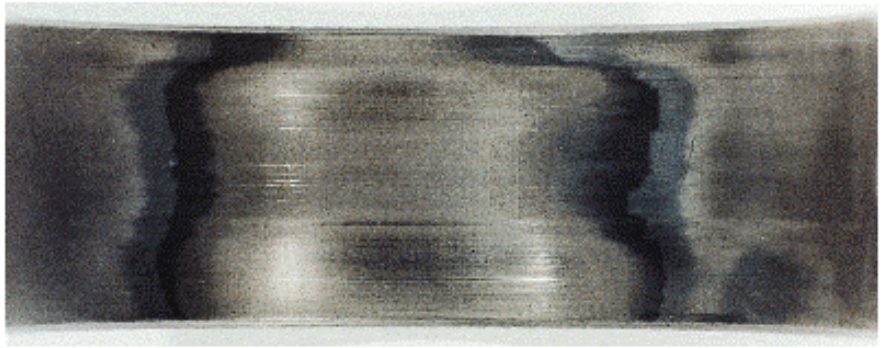
Grooves in circumferential direction

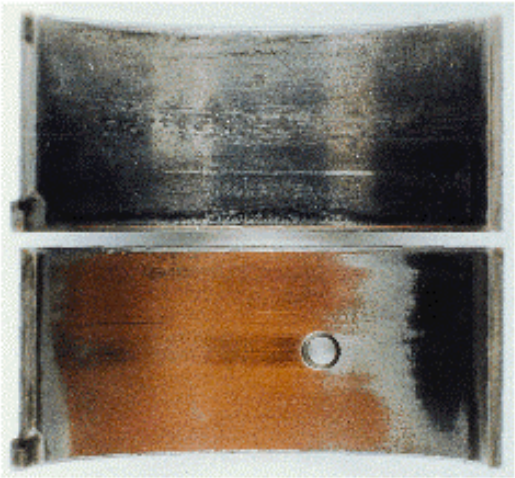
Bild 2



Scarred surface caused by embeddings

Corrosion





Source: Miba

Rough (eroded, fretted), porous or velvety contact surface (often darkly discoloured) or loss of material on contact surface with transition zones of different colours. There are cases where the contact surface is totally eroded. In extreme cases the lead bronze has been attacked.