Selecting the Right Oil Maintenance System

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For virtually all types of industries smooth operation of their oil systems is crucial. A break-down in for example a hydraulic system is always inconvenient whereas a production machine stoppage may be catastrophic with lost production costs amounting to thousands of pounds for every idle hour.

Consequently, it is very relevant to check whether the vital oil systems are maintained in the best possible way. There are many factors to be considered before selecting oil maintenance equipment. The purpose of this article is to provide a general overview of the possibilities and to present a guide as to which information is relevant for making the right choice.

Consequential costs at break-downs

Before installing maintenance equipment on an oil system there is a number of financial consequences to be considered.
If contamination in the oil causes an unplanned stoppage or break-down, what are the costs in terms of lost production time, spare parts and working hours before the break-down has been repaired?
It is also very important to consider whether there are bottlenecks in the production process, where a stoppage implies extraordinary high consequential costs.

Oil cleanliness requirements

When assessing the oil cleanliness requirements it is important to consider if any oil systems or components are particularly sensitive, such as servo and proportional valve – and consequently to define the oil cleanliness requirements for the oil system as a whole as well as its components. An ISO code 16/14/12 is often appropriate for a servo valve, for example.

Equally important are procedures for adding or refilling fresh oil to the system. Typically, a fresh standard oil has a cleanliness of ISO 19/17/15, which can be harmful to many components. This type of problem can be solved by using a pre-filtration system for cleaning the oil prior to filling it into the system.

Last, but not least, be meticulous when checking that the oil tank is clean. A dirty tank can grossly contaminate a clean oil in a matter of minutes! An efficient, off-line installed oil filter will maintain a clean tank – otherwise, make sure to clean the tank manually at every oil change.

An effective filter should take out considerable amounts of harmful contaminants which are created within the oil system.

Which parts of the system are contaminated – and by what?

Contaminating particles can have various sources. They can ingress from the surroundings or they can be generated internally in the system. They may even be brought in from other parts of the production process (e.g. insufficiently cleaned components).

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Potential risks of water ingression must also be considered as well as any other contaminants which cause the oil to age/degrade fast.
The oil degradation may be caused by oxidation, thermal overload (excessive temperatures,"hot spots"), hydrolysis (water), diesel effect (air), spark formation etc, so you would need to identify the cause in order to minimise – or possibly eliminate – the problem.

It is recommended to take oil samples and analysis on a regular basis.

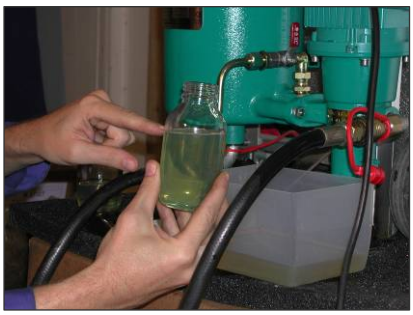
Oil analyses
It is very important to sample the oil at regular intervals and that the samples are drawn at representative locations of the system. In order to detect a pattern or trend in the oil analysis results it is important to keep a record of the results for comparison. Systematic oil sampling can also help in identifying the locations where installation of on-line monitoring equipment may prove a valuable tool to minimise the time between the arising of a problem and the corrective action.

The economic benefits
Generally the installation of oil maintenance equipment lead to reduced total operation costs, not least because the costs of servicing and maintenance will be reduced and service intervals extended. A cleaner oil leads to extended oil life and, consequently, reduced cost for oil replacements and disposal, just as the operational life of components such as bearings, pumps and valves will be prolonged.
All in all, the result of systematic oil care will reduce risk of break-downs and unplanned stoppages, which in turn lead to enhanced productivity and precision – and as additional bonus the in-line pressure filters of the system, will last longer.

What must be removed from the oil?
Oil maintenance equipment must be able to remove all relevant types of contamination from the oil system in question. The typical contaminants are

Hard contaminants – and all solid particles, even the sub-micron sized (1/1000 mm), are potentially harmful, as they cause abrasive wear of servo valves, bearings, gears etc.

Water, because water in oil causes for example micro-pitting and hydrogen embrittlement in pumps, gears and bearings and it is a catalyst to rust and oil degradation. How much water an oil can be allowed to contain depends on the oil type and the system, but as a basic rule the water content should be kept below 30% of the given oil's water saturation level.



Be aware that the sampling valve needs to be flushed prior to taking the sample. The results of the oil analysis should be saved for future trending.

Oil degradation products (oxidation residuals) are generated through the aging of oil and lead to a number of unwanted products such as acid and polymeric compounds which, in turn, reduces oil lifetime, precipitate as varnish/sludge and cause sticking valves, blocked coolers and increased wear due to the "sanding paper effect".

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How do I select the optimum oil maintenance for my oil system?

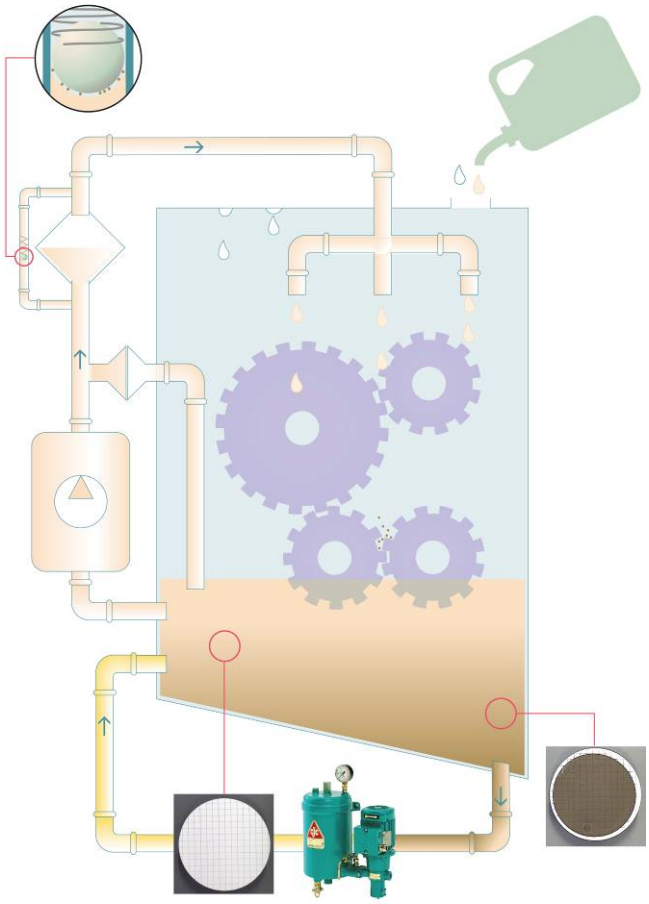
If the optimum oil cleanliness can be achieved by using a coffee filter – then use that! However, it is usually recommendable to define a set of actual and relevant criteria of comparison when selecting an oil care equipment supplier.

Before making your choice, you should start by asking the following questions:

Is the required oil cleanliness achieved?
That is, are the oil system contaminants removed (hard contaminants, water and oil degradation products, for example)?
Which size range of particles is removed, and does this comply with the requirements of the oil system's components?

Be aware that the relevance of a beta value (ß-value) is limited in connection with filters installed off-line, because an off-line filter is designed to maintain a long term high cleanliness and not to act as "safety filter". Furthermore, the entire oil volume of the main system usually passes through an off-line filter 6 to 12 times a day.

Can the supplier guarantee that the required oil cleanliness level is achieved – ISO class 16/13/11 for example? Deciding factors are, among others, the oil care system's design, type and flow rate (in relation to the system oil volume). And can the equipment keep the inside of tanks, coolers etc. absolutely clean so that time consuming cleaning can be avoided?



Oil maintenance systems can be installed both in-line, by-pass or as off-line.

What are the operational costs?
What is the cost of removing 1 kg of contaminants from the oil with the equipment in question? It is the cost per kilogram of removed particles, water and oil degradation products, which is the comparable factor between oil care systems. Hence the irrelevance of discussing price per filter insert and dirt holding capacity as were they independent factors.

Also consider the consumption of air or water and whether oil is wasted during operation – and with present prices on electrical power the consumption of electrical motors and preheaters etc. must also be calculated.

What are the servicing costs?
The service/maintenance costs of oil care equipment are often overlooked. You should consider the servicing frequency of the equipment and what the cleaning and replacement of parts will amount to.

The servicing frequency of the equipment is determined by the design, the dirt holding capacity and the degree of contamination in the oil system itself.

What are the accumulated long term operational costs?
A calculation of the total, long term operational costs of the oil maintenance equipment should include:

- Purchase price
- Installation costs
- Operational costs
- Servicing costs
- The expected operational life
- Disposal costs

The difference between new and used oil can be significant.

How efficient is the equipment under real life conditions?
To have the best possible basis of evaluation you should always ask the supplier for case studies and references to similar oil systems and applications.

Future savings!
At the end of the day it all comes down to optimising the operational economy and you are well advised to consult the supplier or independent consultants, who can assist with calculating the payback time of the equipment in question. That enables you to calculate the return on investment and to identify the actual benefits of installing an oil care system.

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