Predictive maintenance utilizing oil analysis

By Steffen D. Nyman, Education Coordinator, C.C.JENSEN July 2010

Why waste money on oil analysis and filtration?

This may be a provocative question, but please read on and you will get my explanation.

Firstly it is a well known fact that proper lubrication and maintenance ensuring the optimum running condition for a machine may cost money up front for the best oil, filtration and breathers, but this investment will come back hundredfold in increased uptime. An unscheduled breakdown is much more expensive than proper maintenance, oil analysis and oil change.

So why do we change oil after all?

Oil change can be done at fixed intervals due to experience and old habits, manufacturer's regulations/requirements or demands/clauses from insurance companies.

However more and more companies are turning to condition-based oil changes looking on what the oil analysis are telling. The aim is predictive maintenance, so the conclusion of a good oil analysis report should include:

- Is the oil suitable for further use – properties still intact?
- The condition of the machine – the wear situation
- Level of contaminant ingression – are seals, breathers and filters OK?
- Is oil degradation/aging speeding up – could severe varnish problems occur soon?

Before relying on data from oil analysis reports it is important that the sample is taking in the correct way to give a representative picture of the oil. The best samples are taken from live zones with the machine in stable operation condition. Always flush the sample valve/port first and use clean sample bottles designed for oil analysis.

An oil analysis can include many parameters, depending on the oil application, but typical:

- Viscosity (at 40°C and 100°C)
- Acidity (TAN/TBN)
- Solid contaminants (particle count and Element Analysis)
- Additive level (Element Analysis)
- Water content in ppm (Karl Fisher Titration)
- Oxidation stability / varnish potential (colorimetric analysis, RULER, Ultra Centrifuge)
- Flashpoint
- Foaming tendency

Most important is seeing the trend, because oil, wear rates and ingression will be different from machine to machine. Comparing data with new oil as baseline is also crucial.

Particle count will show both ingression of particles and those being generated internally in the machine by means of wear. Typical given in ISO or NAS classes a particle count is effectively showing the condition of the machine and how breathers, seals and filters are doing their job.

Particle count is a good tool for predictive maintenance, since it shows how well the machine is being maintained.

Element Analysis (spectrometry) is used for seeing trends of wear in machines and metal additives levels in the oil. The oil additive level will indicate possible depletion or if a wrong oil type has been added. If read correctly it can be a good tool for predictive maintenance.

Oxidation stability and varnish potential tests will tell the condition of the oil in terms of degradation and aging, which is a widespread problem in most industries. The degradation products are the precursors of varnish deposits on components causing machine problems. The problems are most notable in close tolerances and sensitive control systems or hot running lube systems.

Different tests exist for detecting oxidation stability or varnish potential of the oil e.g. colorimetric analysis/Millipore patch test, RULER, Ultra Centrifuge etc.

Just changing the oil will not get rid of the oxidation and varnish deposits on internal system surfaces. Here you will need a good offline cellulose depth filter or an electrostatic solution. Offline depth filters cannot be compared with your typical inline pressure filter chart, since their purposes are different. A good offline depth filter is designed to remove both particle, water and oil degradation products (varnish) from the oil system in the cheapest possible way.

Since offline filters are not interfered by the operating oil system, these filters can work under optimum conditions with constant flow and pressure and without disturbing fluctuations, which are so lethal for effective filtration. Numerous Return On Investment calculations show that a well designed offline depth filter will outperform even the best of inline pressure filters and will ensure excellent lubrication and low machine operation cost many years to come.

So the brief answer to the provocative title is:

You should spend money on oil analysis and good filtration solutions because it is part of predictive maintenance which will save money in oil change, maintenance, unscheduled downtime and lost production.

To learn more contact your local supplier of CJC offline filters today. See www.cjc.dk.

Photos are attached.

Best regards

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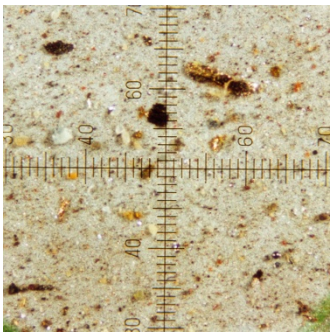
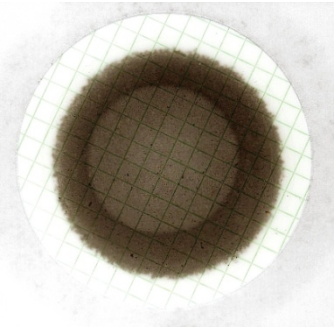
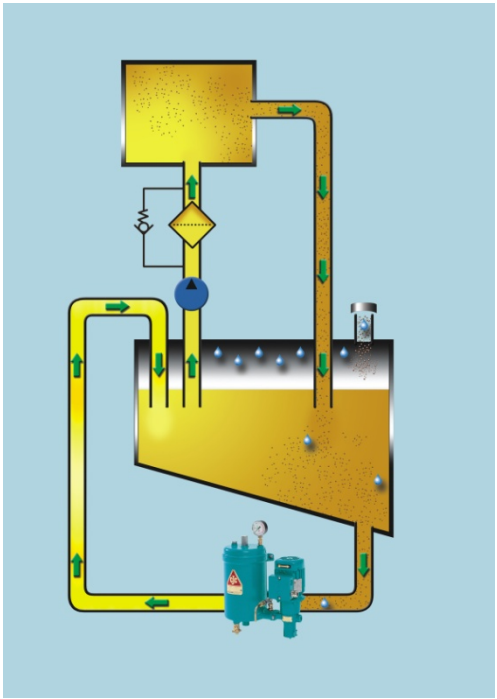
Clean oil – Bright Ideas

Drained oil tank with varnish and particles





Millipore patch test showing highly contaminated oil. Particle count ISO 22/20/17



The principle of offline filtration