IF YOU DON'T MEASURE IT YOU WON'T BE ABLE TO COMBAT IT

For all mining and industrial operations the issue of reducing downtime and operational cost is more important than ever before. Most mechanical equipment uses oil for various purposes as well as fuel is a major ingredient in all operations. It is therefore necessary for the responsible engineers to evaluate what they can do to reduce the consumption of system oils as well as what they can do to prolong the effective lifespan of the high cost investments made into production equipment.

One of the first things to do is evaluating the level of contamination by sampling and analyzing the various system oils. Based on the analysis results calculations can be made to proof what savings can be achieved by introducing off-line filtration using depth filtration inserts based on cellulose.

Contamination factors to evaluate:

PARTICLES

Today's machinery must be fast, accurate and economical and operate longer without down-time.

Oil is increasingly stressed as machinery tolerances become finer, often below 3 microns. Since particles of this size can cause immediate breakdown, reducing their number to as few as possible is a priority.

Oil filtration using depth filtration is the most effective and economical way to remove smaller particles effectively. Research has shown that up to 6 times longer equipment lifetime - or even more – this can be achieved through effective off-line oil filtration.

WATER

Water in oil is an almost invisible contaminant with dramatic effects on system efficiency. Water can be seen in some oil samples since it collates at the bottom of the sample glass or reduces the oil's translucency. Small volumes of water can only be detected by analysis, which is why we started recommending sampling from your equipment.

Water seriously reduces oil's ability to lubricate, which leads to higher operating temperatures, resulting in oil degradation products such as generation of oxidation by-products, resin and varnish. Together with particles, oil degradation products are responsible for micro-pitting on component surfaces.

Another well-known effect of water in oil is corrosion – we have all seen this when opening for instance gearboxes and transmissions. If water in oil is not removed effectively, equipment lifetime is quickly reduced.

In some applications e.g. marine, steel and paper industries, ingress of water is a major problem. In order to avoid excessive amount of free water settling out in bearings and gears, special oils with the ability to hold water suspended, have been developed e.g. oil for paper machines as well as turbine plants.
Water can be dissolved in oil in two ways:

- Suspended and tied up until the oil’s saturation point (typically between 200 – 600 ppm water, depending on oil type)
- Emulsions – colloidal suspended water in levels above the saturation point

For optimal protection of machine components the water content should not exceed 30% of the saturation point. Emulsions of water/oil occur mainly due to shear forces in machinery e.g. in pumps, gears and valves.

The problems caused by emulsified water are similar to those of free water i.e. corrosion, cavitation, micro-pitting and oil degradation. Degraded oil only separates water poorly, because the oxidation products (acid, aldehydes, ketones) are polar and encapsulate water droplets, hindering merging of drops and separation by gravitation.

CJC™ Filter Separators and CJC™ Desorbers remove water. Desorbers are used for oil types, which create emulsions – often seen on marine applications, while Filter Separators are used for oil types, which will let water separate out, by gravity discharged from the filter separator either manually or using water level sensors for automatic discharge. These are typically diesel and hydraulic applications.

**OIL DEGRADATION**

**Avoid Problems when Your Oil Ages**

Oil degradation - such as oxidation products, resin, sludge and varnish - is a well-known problem in many industries. When oil is in use, it will degrade over time, depending on the type of oil, the temperature, operational conditions and the environment and therefore the mining industry often see issues with oil degradation.

Oil degradation can have negative effects on lubrication and hydraulic system, and may result in corrosion, sticking valves, lacquering and varnish on metal surfaces. These problems may result in serious consequences for the performance of the machinery, and may reduce the reliability of the machines and conclusively increase operational cost as well as reducing the effective lifespan of the high value equipment.

Documented results clearly demonstrate that removing oil degradation products eliminates downtime dramatically, increases the reliability of the processes and lifetime of expensive components and machinery.

**OXYGEN / AIR**

Oxygen and air typically enter an oil system due to defect suction lines, insufficient de-aeration after assembly or inadequate tank design. In transformers, gas is a consequence of degraded cellulose in paper insulation.
The negative effects of oxygen and air in oil systems are either cavitation that leads to system breakdown, or increased oil compressibility, which reduces operating precision. Both are critical in today's industrial processes, where equipment reliability and lifetime are in constant focus. In transformers, degraded paper insulation can lead to transformer fires.

ACID

Acids are formed in the presence of moisture, heat and oxygen. Acids are also formed as a result of ageing oil. The Total Acid Number (TAN measured) indicates oil's total acid content of oil, but not the strength of the acids.

Reducing the acidity of oil, for instance transformer oil or gas engine oil, reduces the ageing of the oil and the wear on equipment. In doing so, equipment reliability and lifetime are increased.

CJC™ depth filtration prevents acid formation in oil by keeping contaminants and moisture levels low.

Apart from oil sampling which are analyzed in laboratories it is an option to use the CJC Oil Contamination Monitor – this gives the opportunity to have continuous and remote monitoring of select oil systems – it gives you real-time particle count into the ISO:4406:1999 standard. Not only is the CJC OCM extremely accurate but you will get the earliest possible red flag when there is wear related contamination in your oil system thus avoiding costly breakdowns.

It communicates with SCADA/PLC and RS485 MODBUS RTU

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