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NEWSLETTER

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March 2013

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Oil Analysis for Metalworking and Cutting Fluids

Metalworking Fluids are used in machining, cutting and grinding operations. Their main functions consist of reducing heat (cooling) and friction (lubrication), removing particles and preventing corrosion:

- **Cooling** : Friction between cutting or grinding tool and the surface of the workpiece generates heat. At high cutting speeds, it is very important to keep the surface at a stable temperature and avoid very hot or alternate hot and cold temperatures. It is precisely the function of the liquid's coolant to remove heat rapidly in order to speed-up the cutting process, avoid workpiece distortion and prevent cutting tool abrasion.

- **Lubrication** : At low speed cutting, lubrication allows maximising the life of the cutting tip and reduces work-hardening of the surface being processed. Preventing friction also allows preventing some of the heat generated.

- **Flushing chips** away from the workpiece, which eases the cutting process and prevents tip welding interference with subsequent cutting.

- **Prevent corrosion** of both the metal workpiece and the cutting edge of the cutting equipment.

Oil-Based Fluids vs Water-Based Fluids

Without going into details, metalworking fluids may have several formulations, whether oil-based or water-based :

- In short, oil-based fluids are used for better lubrication performance, whereas
- Water-based fluids allow a more effective cooling performance.

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Whether oil or water-based, metalworking fluids play a primary role in metal cutting and machining. Their main benefits can be summarized as follows :

- Longer Tool Life
- Reduced Thermal Deformation of Workpiece
- Better Surface Finish
- Ease of Chip and Swarf handling

Due to their very specific uses, metal cutting fluids are exposed to contamination and subject to degradation. As chemically degraded fluids lose their protective properties and usefulness, it is therefore necessary to test them on a regular basis.

Oil Analysis for Oil-Based Metalworking Fluids

The recommended oil analysis package for oil-based metalworking fluids consists of five (5) individual tests:

- **ICP Spectroscopy**, for the detection of wear metal particles in the oil.
- **Viscosity at 40°Celsius**, which indicates the ability of the oil to lubricate the interface between the workpiece and the cutting tool.
- The **Karl Fischer** water titration test allows detecting water contamination in the oil.
- The **Copper Corrosion** test will assess the degree of corrosiveness of the oil.
- The **Density** test discloses the fluid's composition. It is used to detect the contamination particles and determine the oil cleanliness level.

Water-Based Fluids

For water-based fluids, we recommend a set of six (6) tests:

- **Spectroscopy,** for the detection of wear metal particles in the fluid, as above.
- **pH**: reveals the level of acidity or alkalinity of the fluid. An acidic pH will cause corrosion of ferrous components, while a basic pH will cause corrosion of copper and aluminum components.
- The **Karl Fischer** water titration test reports the water content in the fluid.
- The **Conductivity** test examines the ability of the coolant to resist carrying an electrical current between two dissimilar metals. The level of conductivity is determined by the concentration of glycol and additives in the coolant. Corrosion can occur as a consequence of high conductivity.
- The **Percent Glycol** test determines the percentage of glycol in the fluid in order to measure its heat transfer capacity
- The **Hardness** test measures the amount of minerals dissolved in the fluid : Calcium Carbonate ($CaCO_3$), Magnesium Carbonate ($MgCO_3$) and Calcium Sulfate ($CaSO_4$).

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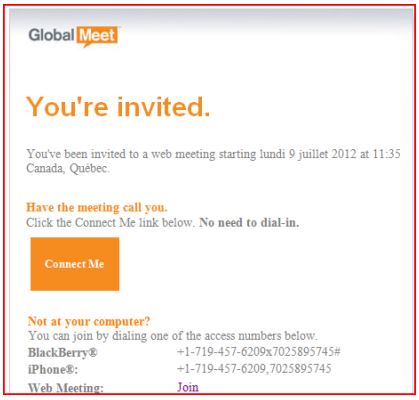
In conclusion, submitting metalworking fluids to oil analysis can make a big difference between poorly or properly machined parts and components in critical metal processing industries.

Rejecting and reprocessing parts and repairing or replacing cutting tools are high cost factors and one must remember that these costs can be minimised through a regular oil analysis program.

For additional information, please contact your technical sales rep.

Friday March 15 WEBINAR : Oil Analysis Fundamentals



By **Jeremie Verdene**

Date : Friday March 15, 2013

Time :

- **Ontario, Manitoba : 12:00 PM, Toronto time**
- **Saskatchewan, Alberta : 10:00 AM, Calgary time**

Duration : 30 minutes

Reserve now with Jeremie : jeremie@tribologik.com

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