TRIBOLOGIK®
NEWSLETTER

Your Equipment's Best Friend! www.tribologik.com

October 2011

In this issue:

Glycol in Oil: Even Worse than Water Contamination

This is the third article of a series of four on the most harmful lubricant contaminants. ***Water : Oil's Public Enemy Number One,*** *the first of these articles, was published in the June 2011 issue of the Tribologik® Newsletter. The second one, on* ***Fuel Dilution****, has been published in September. They are both available on the Tribologik® website: http://www.tribologik.com/predictive.php?section=PAST_ISSUES*

Coolants, like lubricants, are essential fluids in ordeer to maintain engines and all heat generating mechanical systems in good working order.

Glycol is the main ingredient of coolants for diesel, gasoline or gas engines. **Antifreeze liquids** usually consist of **50/50** glycol with water mixtures.

Ethylene glycol is the most frequently used ingredient in coolants and antifreeze for ground motorized equipment such as cars, trucks, buses, locomotives, tractors, construction equipment, etc.

By itself however, ethylene glycol is more **corrosive** than water, and more aggressive. Its harmful properties must then be neutralized by cocktails of **corrosion inhibitors**, pH buffers (to prevent acidification) as well as various phosphates, borates, molybdates, silicates, nitrates, potassium, etc.

Unlike personal vehicles, diesel engines are usually operated under both harsh conditions and on a continuous basis. These engines and their transmissions require top quality cooling systems and coolants in order to maximise their performances and reliability while minimizing maintenance costs.

Both lubricating and cooling systems are complementary and essential to the smooth running of engines and transmissions, but they must work separately and remain **tightly impermeable to each other**. No matter their quality, antifreeze liquids become the worst enemies of your lubricants as soon as they come into direct contact with each other..

Effects of Glycol on the Lubricant

It is well known that glycol contamination causes much more harm than contamination due to water. The main harmful effects of glycol on lubricating oils can be summarized as follows:

- **Viscosity increase** or, in other words, **oil thickening,** causing a lower oil debit. Too thick oil will not circulate easily and its engine lubricating and cooling effectiveness will be reduced.

- **Emulsion and gel, dispersion**: coolant contamination affects soot dispersion, causing the latter to coagulate, resulting in sludge and deposits formation and filter plugging.

- **Acid formation**: the acidity of ethylene glycol lowers the base number (TBN) of the lubricant. Oxidized oil is ineffective against corrosion causing corrosion of parts and systems that it is meant to protect.

- **Precipitation of additives**: glycol reacting with oil additives causes their depletion, increasing friction, accelerating oxidation of the lubricant and damaging the engine's roller bearing system.

- **Filter degradation**: depleted additives block filters.

Changing Oil: a Lure

Glycol contamination promotes wear, corrosion, slugging, and lubricant breakdown. It is most commonly associated with cooling system leaks. Glycol makes its way into diesel engines **through defective seals and gaskets,** cracked cylinder heads and/or corrosion or cavitation (violent implosions oil vapour bubbles causing varying degrees of damage to engine parts).

Glycol contamination is an indication of a **severe problem** and **cannot be overcome by a simple oil change**. In fact, changing the oil can only create an illusion and **aggravate the situation**. The first thing to do is find the source of glycol and neutralize it; in other words stop the engine and repair or change the broken part, failing which repair cost will become very high if not prohibitive.

Early detection and prevention are the only ways to avoid these costs and protect equipment. In this context, a lubricant analysis program performed on a regular basis becomes an **extremely profitable** and preventive investment.

Detection and Quantifying Methods

Glycol tests indicate the presence of ethylene glycol in the lubricant. If the test performed indicates that coolant additives or water contamination is present in the oil sample, separate chemical tests are used to confirm ethylene glycol contamination:

1. **Fourier Transform Infrared Analysis Method (FTIR)**

Infrared analysis allows identifying the fingerprint of oil. By detecting the presence of chemicals due to oxidation, including nitrates, sulphate, and **ethylene glycol**, FTIR analysis provides an early warning of lubricant degradation and glycol contamination.

2. **Spectroscopy**

Spectroscopic analysis detects up to 23 elements in the tested sample, including the presence of **boron (borates), sodium (nitrate), potassium and silicium (silicates)**. These elements are being used as ingredients in coolant additives. Their presence in oil is an indication of a glycol-based antifreeze liquid contamination.

3. **Colorimetric Method - ASTM D-2982**

ASTM D-2982 is a colorimetric method: a HCL solution is added to the oil in order to oxidize the glycol. The reaction (product) is confirmed by a positive colour change from colourless to pink/to purple. **The darker the colour, the higher is the quantity of glycol in the oil.**

4. **Gas Chromatography (GC):**

GC is the **most precise** glycol detection method. It is also more expensive and time consuming than the other three. The most widely used GC procedure is ASTM 4291. The gas chromatography method can determine the concentration of glycol in the used transmission fluid **quantitatively**. Values acquired can be trended to alert a potential problem such as increased machine wear, corrosion, slug and lubrication breakdown.

For additional information on the tests and test combinations recommended for your equipment, please contact your technical representative.

SAFRAN Turbomeca renews PMC/Tribologik®'s Testing Certification on its Helicopter Engine Oil

We are proud to announce that SAFRAN Turbomeca, a global leading **helicopter engine** manufacturer, has renewed PMC/Tribologik®'s oil analysis **certification** on Turbomeca engines.

These engines are in service on helicopters manufactured by **Eurocopter, Sikorsky, Agusta, Agusta Westland and NH Industries**, as well as on helicopters built China, India and Russia, and many types of military aircraft.

This renewal constitutes a sign of confidence in the competence of our lab and personnel for oil analysis in the fields of aerospace and air transport.

Besides Turbomeca, PMC/Tribologik®'s oil analysis services are also certified by Pratt & Whitney Canada.

---

info@tribologik.com