**Lubricating Oil Analysis: A Predictive and Proactive Maintenance Tool**

**Prof. Rakesh Sehgal**

**Director National Institute of Technology Srinagar, Hazratbal, Srinagar (J&K) India**

**Abstract**

Lubricants are the life blood of oil wetted machinery. As an important element of predictive maintenance technologies, in-service oil analysis can provide trace information about machine wear condition, lubricant contamination as well as lubricant condition. Reliability engineers and maintenance professionals can make maintenance decisions based on the oil analysis results. The immediate benefits of in-service oil analysis include avoiding oil mix up, contamination control, condition based maintenance and failure analysis. One of the keys to keeping machinery operating at optimal performance involves monitoring and analyzing lubricant oils for characteristics such as contamination, chemical content and viscosity. A good amount of money is spent annually replacing machinery components that have worn out due to the inability of the lubricants to perform the required task. Knowing how to interpret changing lubricant properties can increase both the uptime and the life of critical equipment. The existence or amount of debris and particles from wearing parts, erosion and contamination provide insights about the issues affecting performance and reliability. Lubricant, fuel and other key fluid analyses provide critical early warning information indicative of machine failure. Analyzing and trending the data means one can schedule maintenance before a critical failure occurs. The result – higher equipment availability and productivity, lower maintenance costs, lower total cost of ownership (TCO), fewer outages, optimal equipment performance and a greener operation.

Solid contamination (sand and dirt) accelerates the generation of abrasive wear. Liquid contamination such as moisture in oil accelerates machine corrosion. Fuel or coolant dilution in engine oil will decrease the viscosity therefore generating more adhesive wear (rubbing wear). It is critical to keep the lubricating oil clean and dry all the time. This requires to set cleanliness limits and continuous monitoring of the contamination during the machine operation. Oil Condition Based Maintenance can monitor machine wear condition, oil contamination and oil degradation at the same time. Key parameters are continuously tested and trending of those parameters is monitored. If a change of rate is accelerated or if a parameter exceeds an alarm limit, reliability engineers are alerted and maintenance actions may be required to resolve the potential problems. Failure Analysis- A comprehensive oil analysis suite may include tests such as Ferrography, or SEM/EDX which are both time consuming and expensive. However, these tests provide detailed and definitive information about machinery wear, such as what the wear particles are made of, where they come from, and how severe they are. Such information provides reliability professionals with information on a past or imminent failure.

Because different types of mechanical components tend to have various oil related issues, different oil analysis techniques might be applied. For example, reciprocal engines tend to generate fine wear particles. Coolant leak, soot buildup and fuel dilution are common problems in lubricants. On the other hand, rotating machinery such as gear boxes tend to generate large wear particles. Acidity increase and moisture contamination are among common parameters monitoring lubricant condition to prevent corrosion. In almost all cases, monitoring and maintaining lubricant viscosity within specification is critical to ensure mechanical components are well lubricated.