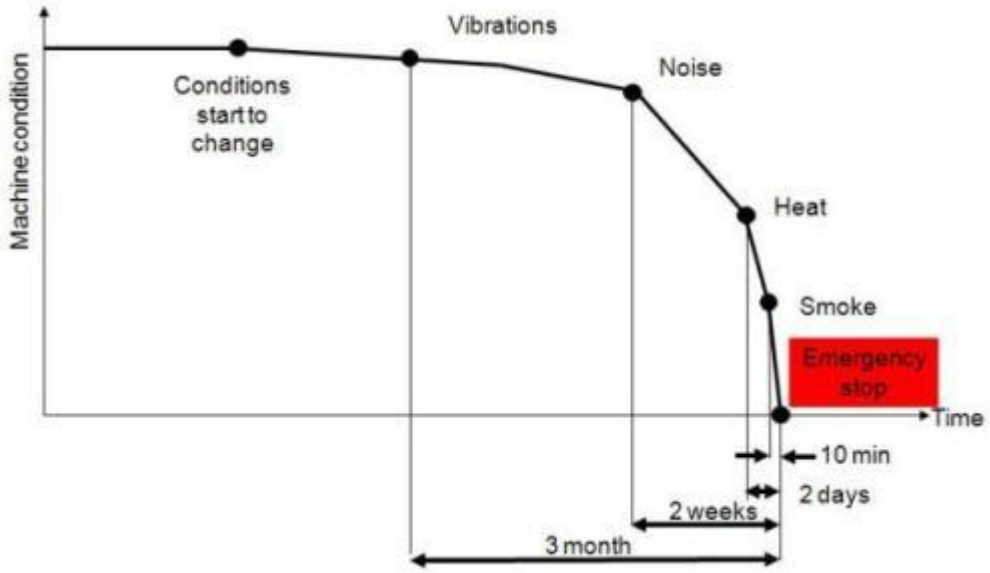
Experiment 1

Aim

Ferrography and condition monitoring by oil analysis (Quantitative).

Objective

Machine **condition monitoring is important** because it provides information about the health of a machine. You can use this information to detect warning signs early and help your organization stop unscheduled outages, optimize machine performance, and reduce repair time and maintenance costs.



Apparatus Used

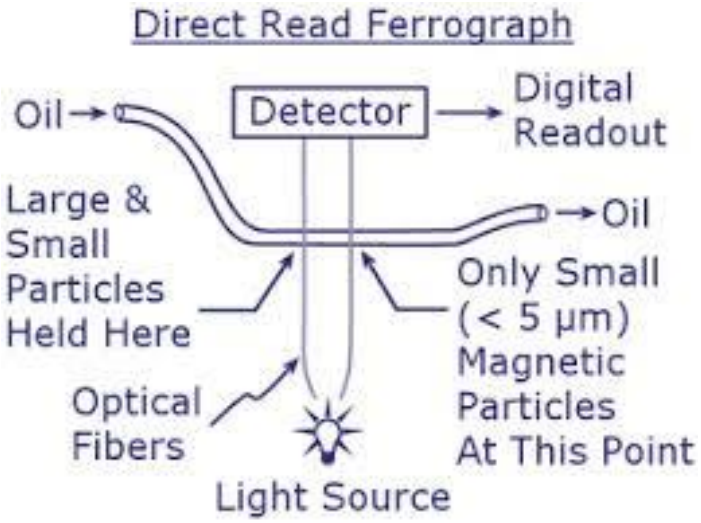
1. Furnace
2. Direct Reading Ferrography

Theory

Direct-reading ferrography is a more mathematical approach to ferrography. Essentially, the buildup on the glass slide is measured by shining a light across the slide. The blockage of the light by the buildup of particles is then used, over time, to calculate an average. An increase in blockage indicates higher amounts of machine wear. This method is less expensive, as expert analysis is not required, and can be automated. However, once an issue is identified, less information is available to diagnose the problem.

Limitations-

While ferrography is an effective tool for wear analysis, it does come with several limitations. Ferrography is a very expensive procedure because of the specialized and sophisticated instruments required. Ferrography stands out among oil analysis methods because of the magnetic element involved. This allows for a more detailed report that similar methods cannot produce. Additionally, for the qualitative approach that is analytical ferrography, experts are needed to make sense of the raw output. Furthermore, ferrography cannot solve problems, only bring attention to them. These issues then need to be dealt with on their own.



Procedure

1. The sample oils should be collected and stored in particular oil sample container so that they cannot react or damage their properties before conducting the experiments.
2. The sample oil is heated in a furnace at 55^0C in order to have homogeneous suspension of particles in the used oil.
3. 1 ml of oil along with 1 ml of carbon tetrachloride (CCl4) is shaked in a test tube with a view to reducing the viscosity of oil.
   Note: - Different types of oils have different proportions of mixture. 1:1 for turbine oil.
4. The mixture is than passed through the direct reading ferrography.

Precautions

1. Report all accidents, injuries, and breakage of glass or equipment to instructor immediately.
2. Keep pathways clear by placing extra items (books, bags, etc.) on the shelves or under the work tables.
3. Long hair (chin-length or longer) must be tied back to avoid catching fire.
4. Wear sensible clothing including footwear.
5. Machines should be handled with full & utmost care.

Results

Value of D_l

Value of D_s

Percentage of large particles (PLP= $\frac{D_L - D_S}{D_L + D_S} * 100$), severity index (SI =$D_L - D_S$), wear particle concentration (WPC = $D_L + D_S$) and wear severity index (WSI = ${D_L}^2 - {D_L}^2$).

where D_l and D_s or both hence changes the 'Severity Index (S.I.)'. This happens by so many factors, viz., duration of running, properties of oil, type of lubrication etc.

Conclusion

In this way, the results from ferrographic display are analyzed. Metal inclusion, constituent elements may be determined from the ferrograph itself. Distinctive elements are indicated on the ferrographic display by characteristic and distinguishing colours. Hence, it becomes possible to identify which of the two parts of a rubbing or mating pair, having a specific alloying element, has worn out more or has a tendency to increase the severity index.