Man and Machines: Monitoring

Although the lubricating oil in a machine act to reduce friction & wear, minimise corrosion and absorb shock, they are particularly crucial to capturing information on the health condition of the machinery. For instance, as the machinery operates and metal parts wear over time, worn metal parts are deposited in the lubricating oil. Similarly, a broken seal can lead to the ingress of fuel or water into the engine lubrication system. In some instances, by-products of combustion such as soot and other organic solids contaminate the lube oil during machinery operation. All of these sparks a chain reaction that degrades the lubricating oil, enriching unwanted compounds such as acid content which in turn begins corrosion while depleting the alkaline reserve in the oil.

The depletion or enrichment of certain symptomatic components like metals, acid, alkaline reserve, soot, water etc., in the lube oil is indicative of the health condition of the machinery. Since the lube oil is able to capture such information about the condition of the machinery, engineers typically take samples of lube oil from the machinery every quarter (or monthly in the best of cases) and send to laboratories for chemical composition analysis. This information drives maintenance intervention on the machinery. It is widely acknowledged by reliability engineers and maintenance teams that the problem with infrequent periodic (quarterly or monthly) monitoring is that often, rapid wear on moving parts can be missed. This results in higher costs for operations, from either, more regular testing or more regular preventative maintenance as there can be high rate of wear and equipment breakdowns.

The time delay and reactive maintenance brought about by sending samples to offsite laboratories for analysis is driving the need for automation and digitisation of the monitoring process. Consequently, there is an increasing interest in automated technologies that can permit real-time analysis of lube oil on a machinery. Technologies capable of providing laboratory type measurement of lube chemistry which is deliverable onsite (on the machinery) through automation have the potential to revolutionise the monitoring process. The potential for such a technology is far reaching. It enables machine condition analysis on a real-time basis and the trending of lube oil chemistry data. This then creates a platform to forward model machine behaviour through predictive analytics where operational information is pooled from the machinery and used to identify when a machinery will fail in the future.

Automating and digitising health condition monitoring isn't a new phenomenon. Human health condition monitoring is actively being automated and digitised with monitoring devices such as fit bits, heart rate monitors, blood sugar testing kits etc. The progress that has been made with automating and digitising the monitoring of human health condition, could be replicated for machines given some of the systemic similarities presented in parts 1 and 2 of this series.

RAB Microfluidics
Unit 9-10, Energy Development Centre
Aberdeen Science and Technology Park
Bridge of Don, Aberdeen
AB23 8GD