

Why monitoring is so important

The importance of equipment and machine maintenance cannot be stressed enough. With machine working-hours equating to revenue, there is little 'fat to burn' when it comes to ensuring minimal downtime. CEN looks at some of the options available to make sure that machinery and equipment are working at optimum output, while minimising the financial ramifications of down-time.

There are three types of equipment maintenance viz. scheduled, breakdown and predictive maintenance.

Scheduled maintenance is determined by hours on the clock or kilometres on the odometer, dependent on what piece of plant or vehicle is being maintained.

This level of maintenance requires planning, the allocation of a significant amount of time and a high degree of co-ordination between different departments; and is typically initiated through a work order.

Breakdown maintenance requires repairs or replacements performed only after a machine has failed to return to its functional state, following a malfunction or shut-down. This is often the most expensive maintenance and was the principle used during the recession; running fleets into the ground through extending their sell-by-date by postponing the time between services, rather than replacing machines.

And there is **predictive maintenance**, which requires paying attention to the likes of lubrication, cleaning, adjusting and replacing minor parts so that they do not create a problem in the smooth running of the machine. Predictive maintenance ensures that steps are taken to keep every piece of equipment and/or machinery in the best possible condition and not waiting until it is in dire need of maintenance.

Christo van der Walt, Engineering Dynamics, says "Through using predictive maintenance you can ensure that your expensive equipment does not reach a state of disrepair where problems become catastrophic."

WearCheck training John Evans and Deepak Deepnarain.



Some systems

In environments where machinery is used, any combination of moving parts creates stresses and strains on equipment. Christo says that of the techniques of predictive maintenance that his company offers, two are that of vibration analysis and infra-red thermography. The latter works through a system similar to that of an infra-red camera, but instead of picking up heat discrepancies - as for example the cameras used in Customs to measure human body temperature - this machine picks up temperature differences caused by friction between moving parts on rotating machines.

"All machines have a level of heat, but we look for areas of abnormally elevated temperature," says Christo and adds, "We supplement the findings with vibration analysis, which can determine what is causing the fault in the machine; usually some type of misalignment." He adds that his company then offers a solution to the problem, correcting any misalignment.

He continues, "Some of the larger companies, such as Sasol, Eskom and Mittal, have an in-house section that focuses on condition monitoring, maintenance services or something similar, that falls under the services division of the company. They would use the technologies we supply, and implement them in-house; but smaller companies cannot afford to have a specialist on-site, and for them we will undertake the service to come out to conduct the analysis on a monthly basis and provide a report."

He emphasises, that while there are a multitude of types of machinery, Engineering Dynamics focuses specifically on rotating machinery. "This does not exclude everything that is static," he adds hastily.

By way of example he cites the massive metal hose attached to a suction machine deployed in Richards Bay harbour, that sucks out the contents from the ships' holds. "There is a tremendous amount of friction created within that huge tube, as the product rubs against the inside surface of the tube. We have to measure the thickness of the tube as, over time, the attrition of the material being siphoned causes wear on that piece of machinery."

As part of his company's contract he is tasked with spot-monitoring the thickness of the metal tube, "Which," Christo adds, "is obviously not a moving part, but falls within our service offering nonetheless."

Needless to say, the financial ramifications of not conducting predictive maintenance can be extensive. However, Christo says that he does not promote predictive maintenance on its own and comments, "If you look at the various maintenance strategies, you will often find that, dependent on the types of



equipment and machinery in question, there will be a mix of the three options.”

He continues, “What we have found traditionally in South Africa, over the past two decades, is that many plant companies are running on breakdown maintenance mode for the majority of their equipment, then scheduled maintenance coming in second, with predictive maintenance coming last. However,” he adds, “this is also influenced by the maturity of the maintenance organisation in question.”

Christo notes that as technology improves and new machines are built, they often come ready-instrumented with built-in sensors for monitoring.

He observes, “Those bigger, better established companies would rely more on predictive maintenance than breakdown maintenance.” He continues, “The smaller companies on the other hand, would rely more on breakdown maintenance, what with the current skills shortage and the cost of implementing predictive maintenance systems.” He adds, “They often, simply, don't have the people to maintain their equipment in prime condition; it would make better sense to make use of the services of companies such as ourselves.”

Oil sampling

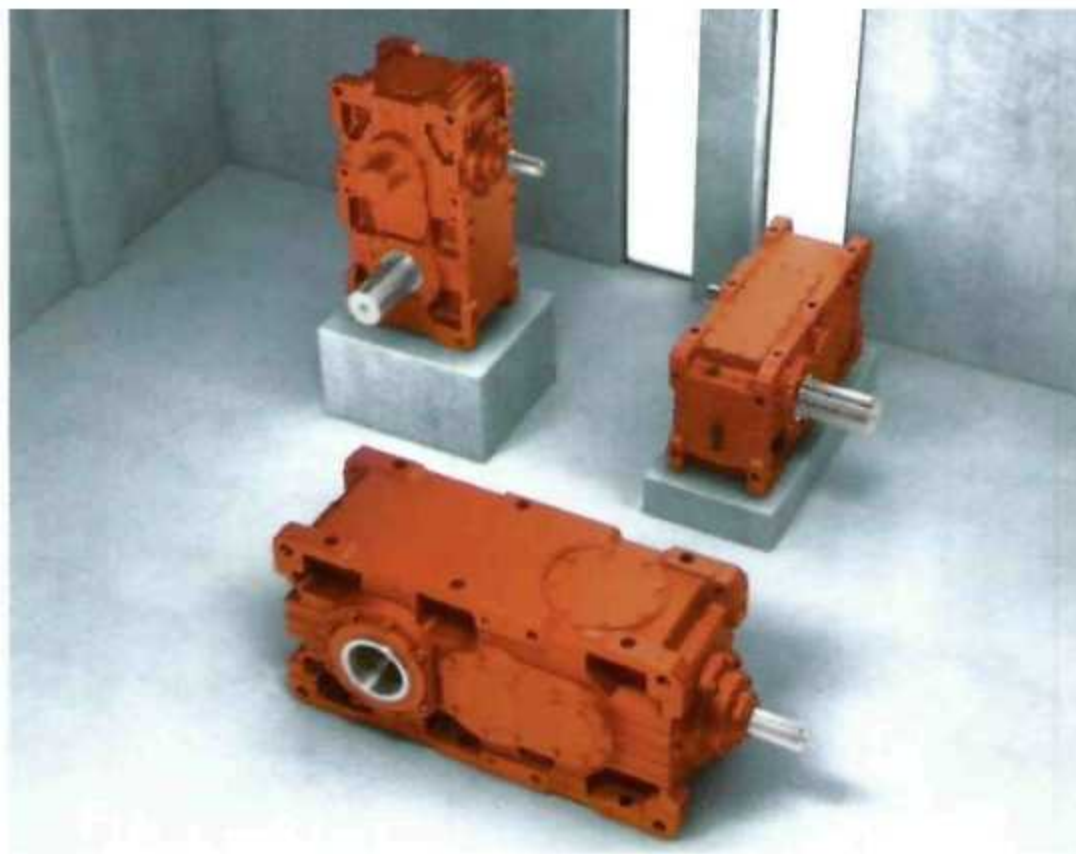
Christo stresses that one of the most important aspects of good maintenance is frequently having the machine's oil analysed. He says, “Oil condition monitoring is vital in the upkeep of your machines. In the case of truck fleets, owners are very conscious of the wear within the engines and obviously would like to extend the life of the vehicle.”



Vibration sensors which form part of vibration monitoring systems used by Engineering Dynamics.

He emphasises that the cost to analyse samples, specifically for large fleet owners, can become exorbitant, where presently, each sample analysed costs in the region of R130 per sample. He continues, “We offer a portable monitoring system, which has a huge impact on the bottom line of fleet owners, given the cost per unit for analysis. Multiply that by scores of units – depending on the size of a fleet – and you get an idea as to the savings of having an on-site monitoring service.”

He adds, “Oil analysis obviates automatically changing the oil every 10 000km. How it works is a sample of the oil is taken from either/and the gearbox and the engine, and is sent to a specialised laboratory. It is analysed and from the results it is then determined what exactly needs attention and whether the oil in fact needs to be changed.”



SEW Eurodrive South Africa offers vibration and oil analysis systems as optional extras on their industrial gear units.

Not only truck fleets, but yellow equipment fleet operators too, both large and small, make use of this portable on-site oil analysis system in an endeavour to save on maintenance costs.

Training

While oil analysis is a valuable diagnostic tool in a predictive maintenance programme, improving cost-efficiency and reducing lubrication costs, the benefits to be gained from it can be diminished if not accompanied by the appropriate technical training.

So says John Evans, Diagnostic Manager for WearCheck, a company that has been providing condition monitoring solutions for a variety of industry sectors for more than three decades.

“Training staff is a sound investment. Employees who understand a system or procedure will do it smarter, and a workforce which is performing intelligently has a direct impact on efficiency,” he says.

WearCheck runs a number of oil analysis training courses throughout South Africa, in all the major centres as well as beyond South Africa’s borders in Botswana, Namibia, Tanzania and Zambia.

The courses range from entry level to advanced, involving a two-day workshop on understanding oil and its analysis, and is supplemented by two full-day courses, one covering report interpretation and the other focusing on the management of an oil analysis programme.

They may also be presented on companies’ premises, along with two practical on-site courses focusing on correct sampling procedures and a full day course for workshop technicians.

John continues, “Our training helps employees to think proactively – to address root causes and implement solutions before minor problems turn into major ones – saving on maintenance costs and increasing equipment availability.”

WearCheck analyses 550 000 samples from across southern Africa every year. They capture information from the machinery under analysis and add it to their database. John explains, “This allows us to increase our knowledge base. We pass this knowledge on to our customers in the training courses and we illustrate the theory with meaningful, practical case studies – all related to local conditions.”



Cable grouping as used in vibration monitoring.

Monitoring software

Remote monitoring forms a vital part of predictive maintenance. Many truck and equipment manufacturers have this type of system built into their vehicle and/or pieces of machinery. Items such as due scheduled servicing, tyre air pressure, brake wear, overheating and oil levels, along with operator handling can be monitored from an off-site facility.

Information is relayed in real-time and can thus be attended to immediately, preventing incurring major costs by unexpected breakdowns or malfunctioning equipment thus reducing the costly risk of downtime.

Online monitoring is best suited to environments that have safety at their core, entailing automated data collection with minimal or limited machine access. Issues such as contamination, imbalance and misalignment are identified more easily with this system. In addition automated tools – such as basic alarms and analysis tools – are built into the software, which obviates the need for expert vibration analyses on some applications.

Reducing maintenance costs

SEW Eurodrive offers condition monitoring systems on their industrial gear units to assist customers in a systematic approach to keep all drive technology components in excellent condition. The approach includes measurement, interpretation and visualisation of defined parameters that are then forwarded to maintenance staff. The accuracy of these evaluations is based on technical expertise and precise sensor technology.

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The DUV (Diagnostic Unit Vibration) unit offers the perfect sensor for simple and reliable monitoring of roller bearings and gearings. The diagnostic unit measures the structure-borne noise and uses this value to calculate the frequency spectrum. The unit then uses this frequency spectrum to monitor the condition of the roller bearings. The sensor and evaluation electronics are fully integrated in the diagnostic unit.

The DUO (Diagnostic Unit Oil Aging) unit assists in determining the remaining life of the gear unit’s oil and will indicate the right time for an oil change. A thermal sensor installed in the gear unit measures the oil temperature and forwards this information to an evaluation unit that will calculate the time remaining until the next oil change. This feature is particularly important when the temperature of the gear unit oil is not constant during operation.

According to Raymond Obermeyer, Operations General Manager for SEW Eurodrive, there has been a gradual increase in companies who are fitting condition monitoring as standard on their geared units. “We have sold many of our new X Series range of industrial gears with the condition monitoring as optional extras and feedback from customers is that it works well in the field. Customers report a significant reduction in downtime and more efficient planning,” he says.

No matter which system you choose, ultimately all these methods ensure continuity of production and personnel safety, along with the all important financial benefit in the long run, viz reduced outlay on unexpected breakdowns. ♦