

Modern maintenance



Design for easy maintenance, remote monitoring and the ever-important drive to lubricate moving parts effectively – **IM** looks at some of the latest ideas

Maintenance is of course a vast subject so here we have taken just a few examples. In design we have chosen LeTourneau, but it could have been any of dozens of equipment manufacturers. Similarly with a look at Volvo's latest in remote monitoring, many manufacturers offer similar systems.

Design for easy access and serviceability is an important aspect of mining machines. LeTourneau Technologies' 50-Series wheel loaders are a good example, designed so that maintenance personnel have ground access to most of the main parts and assemblies of the loaders. This easy access makes service of components, such as traction-motor-driver modules, engine/generator assembly, and LINCSTM remote control modules, quick and simple. In addition, all filters and fill points are located for easy access.

These loaders feature over 10 access points to speed machine availability. These maintenance points include the middle pivot area, left ladder box, left and right sides of the engine via a walkway, the left side of the machine, ground, cab walkway/platform system, the hood via

access ladders on each side, rear gate, and the belly and axles via hinged axle covers.

LeTourneau offers four models in their 50-Series from the nimble L-950 Pit Bull™ loaders to the gigantic L-2350, the largest front-end wheel loader in the world. Payload capacities for these loaders range from 24 to 73 t with bucket capacities from 13.8 to 40.5 m³.

Following its successful introduction last year, Volvo CE has developed expanded functionality within its CareTrack remote telematics system – further increasing operators' ability to monitor and control equipment in the field. Now available in both Basic and Advanced formats, CareTrack provides a wide range of information about how and where machines are being used – delivered right to fleet managers' computers via the internet – even if they are based thousands of kilometres from the machines themselves.

Working with the machine's own diagnostic system, a small unit fitted to the machine transmits operating and location data wirelessly via the mobile telephone network – or via satellite communication if specified. This information is

With LeTourneau loaders, maintenance personnel have ground access to most of the main parts and assemblies.

then processed in a central database and users log on remotely using a unique password-protected website to 'see' their machine's current and historical operating data.

Besides providing GPS location, using the machine's own diagnostic system, CareTrack can also relay information on total operating hours, as well as its daily usage (e.g. work vs. idle time). It can chart a machine's service history and issue service reminders, as well as give information on when key wear parts were last changed; useful when scheduling maintenance plans over a fleet of machines.

Compressed maintenance

Mobile maintenance units powered by an onboard Atlas Copco portable air compressor and generator are being manufactured by an Indonesian company to service the wide variety of heavy-duty earthmoving and mining

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equipment used by its clients throughout Indonesia. PT Sanggar Sarana Baja - whose Transport Equipment Division is more usually known as SSB TransPORTER, manufactures all types of trailers, lube service bodies, fuel tankers, dump trucks and special custom built support vehicles for the mining sector.

SSB TransPORTER Manufacturing Manager John Schwarzenberg: "We began to make them because we had some direct enquiries, and now we have incorporated them into our product range. There are currently about 50 of these units working throughout the Indonesian archipelago, all the way from the western tip of Sumatra to Irian Jaya. We design and build them so that they can handle all maintenance needs on site, no matter where the client's vehicle fleet is operating."

These units are equipped to carry out all regular maintenance work from welding repairs to oil and water change, refuelling, and even body and wheel washing. So successful has the mobile maintenance concept proved, says Schwarzenberg, that the company is currently ordering about 20 Atlas Copco portable units each year for installation on the vehicles.

Typical mobile units are fitted with storage tanks for engine, transmission, gear and hydraulic oil, each operated by a diaphragm pump. There are also tanks for coolant and washing water, normally holding 1,500 litres, operated by a high-pressure water pump. A large fuel tank mounted to the rear of the chassis with capacities up to 7,000 litres of diesel.

Other typical onboard equipment includes a waste disposal unit, storage drums for grease and detergent, a toolbox and a fire extinguisher.

"The Atlas Copco compressor operates about 12 hours per day, sometimes more," says Schwarzenberg. Three types of Atlas Copco portable compressor are being used on the mobile units, depending on the specifications, the equipment carried, and the

air pressure required: the XAS 47, XAS 57 and XAS 67. These are often ordered with the 110/230V integrated generator to drive the onboard electrical equipment and work lights.

All three units have a normal effective working pressure of 7 bar, 102 psig. The XAS 47 delivers 2.6 m³/min of free air, the XAS 57 delivers 3 m³/min, and the XAS 67 delivers 3.7 m³/min. All the units are equipped with Deutz diesel engines, the XAS 47 and XAS 57 featuring the two-cylinder F2M2011 power pack and the XAS 67 with a three-cylinder F3M2011.

Atlas Copco's Series 7 range of compressors feature a single, high performance two storage air intake filter as standard. This prevents dust and dirt particles entering the engine and the compressor. A source indicator on the filter indicates when it needs maintenance or replacement. They also feature a stepless and fully automatic regulator which varies the engine speed to match air demand. This reduces power and fuel consumption and ensures continuous airflow at a stable pressure.

"The big advantage with Atlas Copco compressors is their reliability, their ability to deliver under the most critical of conditions," says Schwarzenberg. "Our customer's vehicles are working in remote mines, in the jungles, on mountainsides, along country highways, and in just about every grueling situation you could

put a truck into. Usually of course they are also working to maximum productivity. Consequently, maintenance of these vehicles is critical, and in turn the reliability of the maintenance unit is critical. We are having great success with them."

Efficient lubrication

Since 1910, Lincoln has set innovative standards for lubrication systems for mining equipment. As the company points out, "proper lubrication increases uptime and makes maintenance routines simple. The increased cost of lubricants and maintenance duties, coupled with a higher machine and equipment value, drives the need for automatic centralized lubrication systems. Similar to today's need for multi-grade, finely-filtered lubricants for engine bearings, pins and friction points require a modern approach to lubrication. No equipment owner would contemplate running the engine without oil, yet many bearings and pins are operated without sufficient lubrication."

Lincoln says its lubrication systems are a reliable means of regular lubrication. "While the machine is in motion, the lubricant is automatically delivered in time-controlled and metered quantities to all connected points in the system. Lubrication 'in motion' ensures that the lubricant is optimally and evenly distributed within the bearing, thus reducing friction and



Lincoln's Centro-Matic SL-V XL metering devices and, right, fitted to a hydraulic excavator.

premature wear. This is the ultimate form of lubrication applied in a systematic manner."

The installation of a centralized lubrication system can drastically reduce repair and maintenance costs. In addition lubricant consumption is cut and the life span of wear components is increased. This automatically reduces downtime and operation costs.

One of Lincoln's new products developed for mining is the SL-V Injector

Series for centralized grease lubrication. For the Centro-Matic single-line centralized lubrication system, Lincoln has developed a new innovative two-chamber system injector with differential piston, representing significant progress for single-line centralized grease lubrication systems.

After dispensing metered lubricant quantities, single-line metering devices must be relieved from pressure before another operating cycle can follow. Depending on the type of lubricant and tubing system, at falling ambient temperatures



"We selected Atlas Copco portable compressors right from the start," Schwarzenberg said. Used in mobile maintenance units for mining equipment in Indonesia.

of lubricant and lubrication lines, thus expanding the field of application for single-line centralized grease lubrication systems. Now, even applications traditionally demanding for two-line centralized lubrication systems may be accommodated.

The SL-V injector series is robust and designed for a maximum operating pressure of 413 bar. A defective injector sealing becomes visible immediately thanks to the injector's bypass indicator. So even without comprehensive

this may be critical for automated centralized grease lubrication systems. The two-chamber design and differential piston allow the SL-V injector to vent many times faster and to reset at a residual pressure of 69 bar. This feature offers significant advantages compared to conventional single-line metering devices. The injectors can use thicker lubricating greases. Smaller line diameters can be used, which saves money on material and plumbing costs. The SL-V series offers greater flexibility in selection

function tests, maintenance personnel can easily detect injectors to be serviced.

The SL-V injector has an adjustable maximum output of 1.31 cm³; its newly available big brother, the SL-V XL meters up to a maximum of 5 cm³. Spectrum adjustment sleeves are available in various colours allowing precise fixing of different dispensing volumes. A water-tight clear plastic cap protects the adjusting screw and indicator stem of the visual function indicator against contamination.

MINIPAL 4 NEW BENCHTOP EDXRF SYSTEM

Effective monitoring of wear metals by XRF



The MiniPal 2 provided expert analysis of wear metals in lubricating oils and greases.

Now, PANalytical's new MiniPal 4 breakthrough detector technology delivers even lower levels of detection and better analysis of Cu, Fe, Ag, Pb, Cr, Al, Zn, Mo, W, Ni, Mn and other elements. This makes MiniPal 4 the ideal tool for oil analysis, maintaining the integrity of machine parts and maximizing uptime. Machinery runs smoothly with MiniPal 4 elemental analysis.

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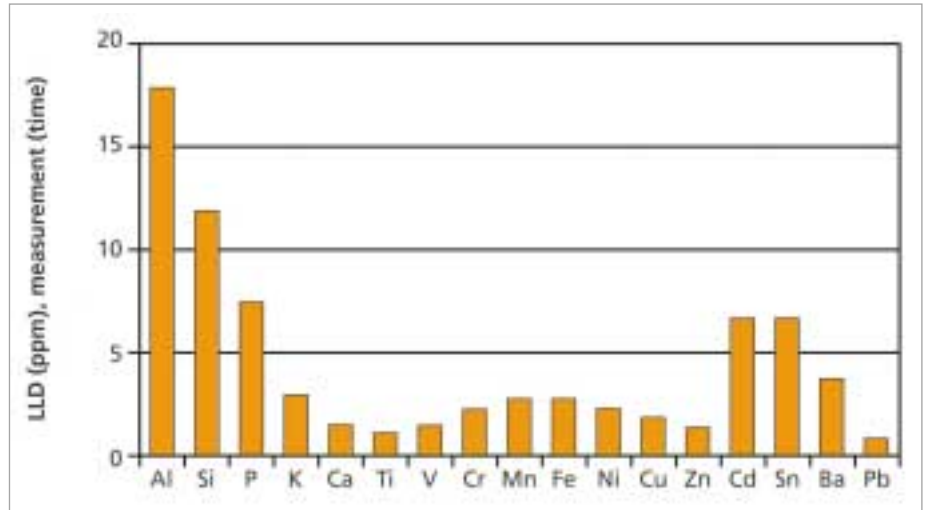
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XRF oil analysis

Dr Gary Pritchard, Australian Country Manager & Marketing Manager XRF Australasia and Asia/Pacific region for PANalytical notes the increasing emphasis on preventative and predictive maintenance programs and says "one way to monitor equipment for signs of wear and damage is through the analysis of lubricating oil. Identification of worn metal components in these oils allows problems to be diagnosed and corrected before failure occurs. The analysis of wear metals in lubricating oils can provide a fingerprint of a worn component, enabling its rapid identification. Some metals, such as Na and Si, are often an indication of contamination. Also, common oil additives, which include Zn and Ca, can be analyzed for depletion."

XRF (X-ray fluorescence) provides accurate, precise detection of wear metals in lubricating oils, to very low detection limits. XRF is also non-destructive, involves simple sample preparation and provides very stable data. There are two main types of XRF, either of which can be used for this analysis of lube oils: wavelength dispersive (WDXRF), and energy dispersive (EDXRF) spectrometry. WDXRF systems provide optimal measurement conditions, excellent light element performance, very high sensitivity and the lowest detection limits. The optical path of EDXRF systems is simpler than WDXRF



spectrometers, making them a lower cost but highly versatile alternative.

PANalytical's MiniPal 4 EDXRF spectrometer has excellent accuracy and precision for wear metals analysis in lubricating oils, with typical detection limits lower than 3 ppm (Figure 1).

For WDXRF spectroscopy, PANalytical's Axios-Petro is ideal for wear metals analysis. Furthermore, it can be used in combination with PANalytical's unique Oil-Trace package. Oil-Trace enables characterization of the unknown hydrocarbon and oxygen content (the so-called 'dark matrix') of oils.

Figure 1

The accuracy of Axios-Petro with Oil-Trace for the analysis of additives and wear metals in oils is excellent, as are precision, repeatability and reproducibility, and detection limits are very low. Comparison of the root mean square (RMS) error with the Counting Statistical Error (CSE) shows the excellent precision of the method and the outstanding stability of the instrument. The similar magnitude of the RMS and CSE values shows that errors originating from the instrument are negligible. *IM*

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