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launches in Kenya P.4



WHAT'S NEW

Eppendorf AG and Kluber launches
lubes packaging kit P.12

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The African lubricants market continues to be an attractive one, despite the challenges that constrain business development in this market.

WearCheck acquires new equipment for its transformer division laboratories



Senior analytical chemist, Lynette Pillay, feeds samples into the new HPLC (high performance liquid chromatography) machine at WearCheck's transformer laboratory in Durban. SOURCE | WEARCHECK

WearCheck has acquired four new laboratory instruments for its transformer division laboratories in Johannesburg, Durban and Cape Town.

These machines are two high-speed gas chromatographs (GCs) in Johannesburg and Durban laboratories, a PCB (polychlorinated biphenyl) chromatograph in Cape Town lab, and an additional

HPLC (high-performance liquid chromatography) in Durban lab.

Neil Robinson said, "getting analytical test results and diagnoses to our customers as fast as possible is a priority for us, and our investment in these instruments has ensured that our transformer sample testing capacity is more than double now. Our transformer division also recently moved to a new,

larger laboratory in Westville, where we offer a wide range of specialist transformer monitoring techniques."

GCs perform dissolved gas analysis, while PCB determines the presence of PCB (polychlorinated biphenyl) in electrical equipment containing insulating oil, which must not exceed 50 ppm (parts per million or mg/kg) according to the latest version of SANS 290:2017. If the PCB level

exceeds this limit, the oil must be drained and disposed of in an approved manner. WearCheck further explains that HPLC separates mixtures of compounds in transformer oil to help predict the remaining useful life of the paper insulation of the transformer and the transformer itself.

"One of the greatest advantages of the new GCs is that they can be pre-loaded with samples before a weekend, and they will continue operating for 48 hours. Our older models require reloading every 24 hours. Our transformer customers in various business sectors such as mining, power generation, transport, manufacturing, industrial and marine maintenance are receiving their results at high speed, enabling them to make critical maintenance-related decisions in good time and risk reduction of unplanned transformer failure," said transformer division manager, Gert Nel.

WearCheck operates 16 laboratories around Africa and beyond, specialising in used oil and fluid analysis, reliability solutions services, transformer monitoring and advanced field services. ■

NIGERIA

Ardova PLC appointed Shell Lubricants distributor in Nigeria

Ardova Plc, which markets petroleum products, has been appointed by Shell Lubricants as their main distributor of lubricants in the Nigerian market.

Ardova's PLC CEO Olumide Adeosun while announcing this agreement

said: "We are delighted that our company will act as the main distributor for Shell lubricants branded products for the automotive and industrial sectors in Nigeria."

Ardova PLC's Chairman AbdulWasiu Sowami said: "The company's goal was to provide customers with



quality products and services, build partnerships that optimize synergies and create value for all parties involved. This deal ticks all those boxes and we are excited to add the Shell range of lubricants to the portfolio of products available to our customers."

"This is a reinforcement

of our commitment to continue to optimize our footprints in Nigeria while working with local companies for mutual benefits and to create opportunities for the people. Shell lubricants products will offer improved performance for automobiles across the country through Ardova's chain of stations and resellers," said Osagie Okunbor, Chairman of Shell companies in Nigeria. ■

OIL ANALYSIS

Oil analysis exposes fleet operational challenges: agricultural industry



By Shesby Chabaya

Operations HOD,
WearCheck Zimbabwe

Introduction

The challenge facing the agricultural industry is the need to meet high production targets for the agricultural season versus an unpredictable length (climate change impact) of the wet season. In some cases, this leads to the agricultural season starting off during wet weather, thus exposing the fleet to a considerable amount of operational risk. This operational risk is noticeable on the WearCheck oil analysis

reports through the following:

1. Repeat or high PQ levels (ferrous density or large wear metal particles) especially in unfiltered drivetrain components.
2. High concentration of wear particles observed through the Microscopic Particle Examination (MPE) and ICP (inductively coupled plasma) wear metal test results.

The correlation of the high wear levels with the high incident reports of equipment stuck in the fields as well as the high failure rate mainly on differentials and final drives are indicative of the operational risk affecting equipment.

The oil analysis programme runs throughout the productive season and action plans are implemented through an iterative process of regular oil sampling, development of trends, problem identification, investigation and troubleshooting, corrective action, feedback and review. Trends are analysed on a regular basis with a view to come up with sustainable solutions to any challenges affecting the fleet.

The impact of wet weather operations

Wet weather operations have posed several challenges with the fleet drive trains. The high failure rate on drive trains during the wet season and period following the wet season poses a high risk and therefore



provides a compelling reason for a case study and a formulation of strategies to protect the axles/drive trains, minimise failures and improve equipment reliability.

This case study is an analysis of this phenomenon. A number of techniques such as the 5-Why analysis – are used to try and get to the bottom or root cause of the problem. Some of the questions asked in this analysis are:

1. How are wear patterns spread throughout the year?
2. Any seasonal trends?
3. Any changes in the lubricant in use?
4. Are there any changes in tonnage ferried by the fleet per load?
5. Any changes in intensity of operation?
6. Is this a fleet-wide problem or only affecting a few machines of the same make & model?
7. Are there any changes in operating conditions/road conditions/field conditions and so on?

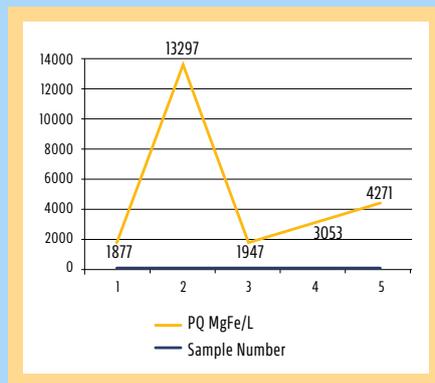
Where the answer is yes, the 5-Why analysis principle and other techniques are applied to test and critically analyse the aspect or factor, in order to establish the root source of the problem.

Analysis of MPE and wear on differentials and final drives: case study of ZT49 differential (August 2017)

For simplicity of analysis, the case of ZT49 differential is used to illustrate the findings

characterising the phenomenon, though the challenges are spread across the fleet.

The differential oil analysis results showed a repeat problem on the Microscopic Particle Examination (six times). Large wear metal particles rose from 1 877MgFe/L (sample 1) to 13 297 MgFe/L (Sample 2) towards the end of the rainy season, see graph below:



Feedback provided by the customer indicates that when the tractor was stuck in the field, the operator repeatedly tried to drive it out, resulting in differential damage before the tractor was eventually pulled out of the field. It was also reported that the tractor had experienced a broken propeller shaft. The differential was then scheduled for replacement.

Oil analysis results show that this trend is commonly experienced across the fleet during periods of wet weather operation as well as periods following the wet season. An analysis of feedback submitted indicated

the following common observations:

- High concentration of wear particles
- Chipped gears
- Broken planetary gear carriers
- Broken thrust washers and so on

These are observed upon draining oil or upon inspection, leading to regular differential and final drive overhaul. In some cases, tractors end up losing drive, and broken half shafts are often discovered as a result.

The incident chart below illustrates the distribution of differential failures during the 2017-2018 agricultural season:

As shown in the incident chart, 71% of differential failures occurred during the wet season while 29% occurred during the dry season. In all these failures, broken planetary gear carriers/spiders were discovered upon inspection. All failures were linked to wet weather challenges and/or post wet weather impact of abrasive wear.

The introduction of wear particles in the differentials and final drives resulted in accelerated wear or **abrasive wear**. The end result is a **spiral effect**: as more wear particles are generated, the wear rates increase (advanced wear) and in some cases resulting in failures which are costly, especially in terms of downtime and lost production.

It must be noted that the above are only symptoms, not the root cause of the problem at hand. To get to the root source of this phenomenon, we invoked the 5-Why analysis technique:

Toyota's **5-Why strategy** is a good trouble-shooting tool, which can be used in conjunction with the WearCheck oil analysis programme to discover the root cause of a phenomenon. This involves asking a series of "why?" questions until the root cause of the problem is discovered as illustrated below:



Problem - High differential failure rate

1. Why? High concentration of wear particles in the oil
2. Why? Abnormal wear of components
3. Why? Chipped gears/broken drive train components
4. Why? Tractors stuck in the fields / axle spinning
5. Why? Wet weather operating conditions, slippery roads and fields



»

Applied solutions:

A trend in operational challenges has been noticeable over the years. To counter the problem, several strategies have been applied to remove (avoid wet weather operations where possible) or minimise impact (where wet weather operations cannot be avoided.) These strategies are discussed below:

Assess the level of risk.

Pay attention to oil analysis severity status and PQ levels.

Pay attention to repeat problems.

Pay attention to ICP results as well in view of holistic analysis

This is a good guide to determining level of risk.

Report severity: Normal - Low risk, **Borderline**- Moderate risk. **Urgent & Critical** - High risk.

Low Risk

Strategy - Minimise impact and monitor.

See minimise impact section below.

High Risk

Further troubleshooting required.

See diligent approach section below

Minimise impact

Drain oil and refill with new oil.

It may be necessary to open the component and clean all parts.

This reduces risk of further abrasive wear.

However it does not address root cause.

Plan further action to address root cause.

If parts are worn overhaul component.

Diligent approach

High risk cases call for a more thorough approach in investigation and troubleshooting.

In cases of high risk procedure below suffices.

Check for discolouration of oil.

Inspect the drain plug for presence of excessive particles.

Check end-play.

If excessive particles are discovered, open unit for further investigation.

Cases with high copper levels, open component and inspect straight away.

Excessive endplay is indicative of advanced wear.

It may be necessary to overhaul unit at this stage.

Maintenance planning & management

There has been a continuous assessment of component change patterns over the years, this has provided a guide to determining optimum stock requirements for Differentials and other commonly affected parts.

This has facilitated a smooth and swift component change process in response to failures thus minimising downtime and enhancing cost savings. The failed component can be overhauled while the equipment is back in operation.

Critical trends and fault repeats are noted as the productive season nears the end and are used as a guide to budgeting for off-crop maintenance.



A stock of differentials as part of the maintenance planning and downtime minimisation strategy.

Operator training

The people side cannot be ignored. An operator training programme was implemented to improve vigilance and foster behaviour change amongst the operators. This should be an ongoing project as new operators are employed from time to time.

Continuous improvement of procedures:

Operator procedures are continuously reviewed in response to current challenges. Operators to call for assistance once stuck in the fields and avoid spinning the axles in slippery conditions.

Minimise impact:

1. Drain oil to curb the risk of further abrasive wear.
2. Take further action to address the root cause of the problem.

This strategy resulted in savings amounting to ZMK363 984 (US\$37 100) in cost avoidance (component replacement cost) of potential differential and final drive failures. Savings in reality are more, considering the cost of averted potential downtime which would result in huge loss of tonnage of cane deliveries.

Draining oil is often done to minimise the impact of abrasive wear, thus giving a lifeline to components. It must be noted that this does not solve the root cause of the problem – further action required.

Draining oil must be carefully considered and balanced with the need to minimise oil usage and save the environment. There

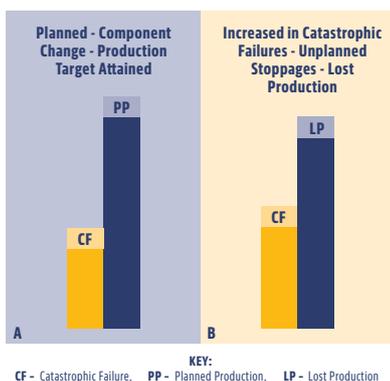


should be a balance between the need to change oil versus the need to reduce oil usage. From a cost perspective, it is argued that draining two litres of oil change is better than the potential cost inflicted by abrasive wear.

It is important to actually consider the real cost of oil change, including the cost of labour, administrative costs, supervision, oil disposal, warehouse overheads, inventory overheads, safety risks, environmental risks and so on.

Planned change versus catastrophic failure

The oil analysis programme is used to closely monitor equipment health and make timely and informed decisions. Planned component changes for example have resulted in huge cost savings mainly accruing from minimised catastrophic failures which are normally associated with losses as a result of unplanned downtime and lost production. This is illustrated in the graph below:



It must also be noted that these strategies have largely been successful in reducing



the impact of wet weather operations. Fleet availability has been kept above an average of 95%, thus the measures have kept the wheels turning.

Conclusion

The rule of conversion: With WearCheck, every oil sample is an opportunity to learn and better apply engineering principles to solve any identified challenges with an

endeavour to maintain and stay up to date with modern engineering best practices, striving to do better than the previous financial year or season – a continuous improvement approach. The WearCheck oil analysis programme is a dynamic tool. With recurring problems, strategies are put into place to get to the root cause of the problem and prevent it recurring or control it in cases where the challenge cannot be fully eliminated. Where necessary, maintenance procedures are modified accordingly, in line with the new trends discovered.

At WearCheck, we establish partnerships that constantly explore and seek ways of improving current systems, processes and efficiencies or breaking new ground through oil analysis and condition monitoring programmes. ■

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