WEAR CHECK
Condition Monitoring Specialists
MONITOR
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WEAR CHECK
CONDITION MONITORING
THROUGH OIL ANALYSIS

NEW TRANSFORMER MONITORING TECHNOLOGY GIVES SPEEDY RESULTS

WearCheck recently invested several million Rand in four brand new laboratory instruments for our flourishing transformer division laboratories in Johannesburg, Durban and Cape Town.

Managing director Neil Robinson says the company's investment in the equipment has relieved some of the current sample volume pressure and reduced turnaround times in line with customers' expectations, ensuring that transformer oil samples are processed and analysed even faster than before.

WearCheck's transformer division now has an additional two new high-speed gas chromatographs (GCs) in the Joburg and Durban laboratories, and an additional new PCB (polychlorinated biphenyl) chromatograph, as well as an additional new HPLC (high performance liquid chromatography) in both the Cape Town and Durban labs.

'Getting the analytical test results and diagnoses to our customers as fast as possible is a priority for us,' says Robinson, 'and our investment in the new instruments has ensured that our transformer sample testing capacity is more than doubled. Our transformer division also recently moved to a new, larger laboratory in Westville, where we offer a wide range of specialist transformer monitoring techniques.'

The new Perkin Elmer GCs – designed and manufactured in The Netherlands – each have a carousel that can hold 120 prepared samples and standards. Added to the 80-sample capacity of the existing GCs in the Durban laboratory, with more samples being processed at any one time, the sample turnaround time has been significantly reduced. The same instrument was bought for the Johannesburg lab, boosting their existing GCs.

'One of the great 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,' says transformer division manager, Gert Nel.

'The primary function of the GC is to perform dissolved gas analysis (DGA) – a highly effective preventive maintenance tool which has formed part of WearCheck's condition monitoring programmes for more than 10 years,' says Nel.

Nel explains further, 'The new PCB instrument determines the presence of PCB in electrical equipment containing insulating oil, which must be tested at least once and after every maintenance event to determine the PCB level. According to the latest version of SANS 290:2016, the current maximum allowed PCB level in oil is 50 ppm (parts per million or mg/kg). If the PCB level exceeds this limit, the oil must be drained and disposed of in an approved manner. As PCB molecules are highly toxic, this is an important test in transformer maintenance and management for both health and environmental purposes.

'The additional HPLC,' continues Nel, 'separates mixtures of compounds in transformer oil to identify and quantify the individual furanic compound concentrations of the oil. The results enable our diagnosticians to predict the remaining useful life of the paper insulation of the transformer with high accuracy, giving a very good indication of the remaining useful life of the transformer itself.'

Nel observes that new instruments have already reduced sample processing time. '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, which enables them to make critical maintenance-related decisions in good time and reduce the risk of unplanned transformer failure.'

WearCheck transformer laboratory technician, Zamaswazi Dlamini, operates the new high-speed gas chromatograph (GC) in Durban. The GC, one of two new ones, has more than doubled WearCheck's capacity for processing dissolved gas analysis DGA on transformer oil samples

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

REGIONAL ROUNDUP

NORTHERN CAPE

WearCheck Northern Cape is ready to welcome customers. Contact us on +27 66 474 8628

DURBAN

WearCheck's beautiful new head office and laboratory in Westville is a testing hub for transformer samples as well as the full oil analysis programme. Here is a quick peek inside the lab – watch this space in our next issue for more pics.

NAMIBIA

WearCheck Namibia offers fast turnaround time on samples – we are at 14 Lafrenz Industrial Park, Rensburger Street, Windhoek, or call Bryan on +264 81 253 4899

GUJARAT, INDIA

WearCheck now has an office in Gujarat, in North-western India.

Contact Mr Pathan Mustaq in Baroda, Gujarat on mustaq@wearcheck.co.in | Mobile : +91 81 44922253

We hear you...

Our sincere thanks to everyone who took the time to give us feedback in our annual customer survey - your answers play a major role in how we tailor our business services to suit our customers.

WearCheck sales developer Kay Meyrick is grateful for the positive responses. She shares some of the compliments from our valued customers:

'Excellent service/knowledge of product, also correct advice on preventative measure diagnosed.'
'Excellent communication with me.'
'Great relationship over the last 30 years.'
'A very good service being provided in Tarkwa-Ghana.'

Lucky winner! *Cathy Sale of Komatsu won the lucky draw prize for customers who completed WearCheck's customer survey 2020*

UPCOMING EXPOS

Due to ongoing uncertainty due to Covid, these events are tentatively planned:

CBM Conference: April 2021
African Utility Week: 11 – 13 May 2021
African Mining Indaba: 7 – 10 February 2022
Electra Mining Africa: 5 – 9 September 2022

Lube tip: Beware of Blue Engine Smoke

Black diesel engine exhaust smoke can be a concern, as can white smoke. However, blue smoke is the worst. It is rarely a transient condition but rather a serious engine defect. It occurs when the engine is burning too much oil due to poor piston ring control (collapsed or worn rings), worn intake valve guides or other causes of high oil ingress into the combustion chamber. Blue smoke usually means the engine is heading for serious trouble. Don't delay in getting the problem diagnosed and fixed to avoid excessive collateral damage.

PRODUCT PICK: NON-DESTRUCTIVE TESTING (NDT)

by Adri Ludick, NDT manager: WearCheck

WearCheck's advanced field services (AFS) division offers a wide range of specialist monitoring techniques which include rope testing, technical compliance and non-destructive testing (NDT). Here, we take a closer look at some of the different NDT tests.

The NDT approach features a variety of testing techniques through which the properties and condition of a component or system are evaluated without causing any permanent damage to it. NDT is typically used in critical component assessments, machine condition assessments and inspection of ancillary equipment such as main vent fans, compressors, mills, pumps and conveyors.

WearCheck's NDT team delivers quality assurance and quality control of new as well as refurbished components.

Our main array of NDT tests includes eddy-current-, magnetic-particle-, liquid penetrant-, radiographic-, ultrasonic-testing and visual inspection.

The main advantage of NDT methods is that they do not permanently alter the test object undergoing inspection, making NDT a valuable tool that can save both money and time in a condition monitoring programme.

1. EDDY-CURRENT TESTING

This detects surface defects, such as early-stage cracks, on metallic machine components, and is used across a wide range of industries, from aerospace to beer brewing.

During the testing process, a high frequency electric current (an eddy current) is induced into the material, then the response of that eddy current field is measured. The information is processed to yield a profile of the component.

Defect-free material has a very specific "fingerprint", therefore, when the test results are compared to this, the presence of defects can be assessed.

When it comes to cracks, the earlier they can be detected, the less potential damage they can cause to the component. Eddy-current testing can detect crack initiation at extremely early stages.

An advanced option is the phased array eddy current testing, which creates a 3D picture of the component, giving a more visual insight into anomalies.

2. MAGNETIC-PARTICLE TESTING

This is a similar application to eddy-current testing, in that both techniques detect surface cracks on magnetic materials. This is used across a wide range of industries.

The process in this test is to magnetise the component and then saturate it with a very fine magnetised ink or a fine powder.

Any anomaly in the surface being tested causes a concentration of the magnetic field around it, therefore drawing the magnetic ink to the crack and making the defect visually detectable. (Eddy-current testing requires the interpretation of a signal on an oscilloscope screen.)

An advantage of magnetic particle testing is that it can be used to test very large surface areas, very quickly.

3. LIQUID PENETRANT TESTING

This is typically performed on non-magnetic materials (e.g. copper, aluminium), and is essentially a non-magnetic version of magnetic particle testing.

It involves a five-step process. Firstly, the surface is cleaned of all foreign material. Next, it is saturated with a non-harmful penetrating ink. The surface does not have to be horizontal. Thirdly, the penetrant is wiped off the surface of the material. Fourth, a developing chemical is applied over the ink. The developer draws the penetrant from any cracks to form a visible indication. In the fifth step, the component surface is visually examined during and after the development process and results are recorded.

This method is used to test such items as vehicle components and ventilation fan blades.

4. RADIOGRAPHIC TESTING

This is similar to X-rays done on humans and uses different types of X-ray sources which penetrate the material and display onto an X-ray plate behind the component. It is a widely-used technique which detects sub-surface defects which cannot be detected visually.

For thinner materials, such as a metal plate, a weak X-ray source is used, while thicker components (e.g. ventilation fan) require a stronger X-ray. The X-ray sources are contained in a "bomb", which is aimed at the target.

Radiographic testing is often used on welds to test the integrity of the bond between the weld metal and the parent metal. Using an electronic form plate instead of a photographic form is a new trend in this technique.

5. ULTRASONIC TESTING

Just how a "fish finder" on a fishing boat reveals the depth and size of the fish, this uses similar methodology, allowing us to see sub-surface defects in both metal and non-metal components.

During the process, an ultrasonic flaw detector instrument fires ultrasonic pulses into the material, and simultaneously detects the reflection. By measuring the time difference between the pulse and the reflection and knowing the speed of sound in the test material, you can pinpoint the location of the defect.

It is widely used across all industries to detect anomalies.

An advanced option is phased array ultrasonic testing, where, instead of one pulse, 64 pulses are fired into the component. By fine-tuning the pulse-strength, we can "steer" the beam in different directions. The advanced option enables us to get a 3D picture of the component, instead of merely a pulse on a screen.

6. VISUAL INSPECTION

Our highly-experienced, well-trained technicians conduct a multitude of visual inspections on a range of components daily. Their eyes are conditioned to recognise early-stage defects which are visible, and to identify potential "hotspots" which require further testing.

WearCheck's senior machinery inspector, Jaco Venter, conducts ultrasonic testing on a winder's brake components during a non-destructive testing (NDT) routine

OUT & ABOUT

WearCheck training consultant Jan Backer (third from left) recently conducted an oil analysis training course in Johannesburg for delegates from Glencore-Rhovan Vanadium Mine, NEA Mining and SPH Kundalila (pictured). Jan also conducted on-site oil analysis training for delegates from Nkomati Nickel Mine in Mpumalanga

Daniel Boakye is the sales/technical manager for WearCheck Ghana. Daniel is pictured 4th from left, where he recently conducted on-site oil analysis training for PW Mining at Asanko gold mining site

MAROONED IN MALI

Jaco Willer, WearCheck's reliability solutions sales manager, sporting his Resolute Mining suit while marooned in Mali during lockdown

Jaco Willer, WearCheck's reliability solutions sales manager, was in West Africa conducting customer training in March when the continent went into lockdown. He was stuck 8 597km away from home on a trip that turned from 8 days into 62 days, with all sorts of adventures. This is his story...

'I travelled to Mali to perform Mobius Category 1 vibration training for Syama Mine. At this stage I had seen my wife only for one day in March due to an earlier work trip to Burkina Faso.

The Syama Complex, located in the south of Mali, is approximately 30km from the Côte d'Ivoire border and 300km Southeast of the capital Bamako. It comprises the Syama Underground Mine and the Tabakoroni Open Pit Mine.

I arrived in Bamako on 14 March 2020 and was scheduled to fly back to South Africa on 22 March – this did not work out as planned! After a night at the Resolute guest house in Bamako, I flew to the mine site on a private charter plane. Once at Syama, I was accommodated in their expatriate camp in a one-bedroom converted container with a bathroom – clean and neat with an air-conditioner. We were not allowed to leave the camp again without permission, for our own safety.

On 17 March, rumours of a "lock-down" in Mali emerged, but there wasn't enough time to make any arrangements, and I wasn't finished with my training in any case. The lock-down was confirmed the following day. After the training course was concluded, I spent the next few days trying to make sense of the implications of Mali's lock-down for me and for the mine – nobody seemed to have any clarity.

At the end of that week I made peace with the fact that I might be in that camp for quite a while, so I discussed the possibility of conducting some additional training rather than just sitting waiting possibly till year end – at that stage, this was when travel was expected to resume.

The training idea and quotation was accepted by the customer and we started training the next Monday. The mine management team helped make this possible, as well as my line manager, WearCheck reliability solutions manager Philip Schutte. While Philip's first priority was always to get me back to South Africa, he assisted me with all I needed to make the best of the situation. Thanks to the extra training, we ended up profiting on the Mali lock-down, rather than a making loss.

I heard there were talks of WearCheck chartering a plane just for me to repatriate me – I must say, I was quite flattered that my company would do something like that for me. The cost was astronomical, and we agreed that it was unnecessary at that stage, and that idea was left for an emergency only. Four weeks of training flew by so fast. I performed Mobius laser alignment training for two weeks, and WearCheck oil analysis 1 and 2 training for two weeks. We awarded certificates to all the delegates afterwards which they appreciated.

While I was there, we planned a special training platform, and technical audit plan should my stay be extended. The mine management always went out of their way to make me feel valuable and appreciated, and even gave me my own Resolute mining outfit!

Fortunately, I have worked as an expatriate contractor many times before in and around

Maintenance workers from Syama Mine in Mali completed several reliability solutions and oil analysis training courses while Jaco Willer from WearCheck in South Africa was stuck on-site during lockdown

almost all of Africa. My longest stint (for over a year) was for WearCheck's customer Rio Tinto in Madagascar, where we had to stay on-site for more than three months at a time, so this lock-down blur in Mali wasn't really something that made me uncomfortable.

Actually, the days spent in quarantine back in SA were the worst! At Syama, I integrated well with the other expatriates there. The day I flew into Bamako, I met another South African – Hennie Grobler – who was a Resolute employee. We became firm friends and thanks to him, I had plenty of assistance. WearCheck also supported me with what was needed, and this made my time in Mali much better.

I moved into my room at Syama with a small bag containing only what was needed for one week, and when I left, thanks to everyone's generosity, I had a fully-filled room – cutlery, glassware, a microwave, food, new clothes and even Robertson Steak and Tjops Spice all the way from SA. LOL!

After the fourth week's training it started sounding as if I might be going home so I had to be travel "jump" ready packed.

There started the waiting game. This was 24 April. I ended up waiting until 28 April with my bags ready to go, when the call was finally made to transport me via road with a Land Cruiser SUV from the Syama site to the guesthouse in Bamako, a 300km drive. This was not normally acceptable for expatriates due to terrorism in the area, but they assured me that it was safe, and we did it. Not once did I feel unsafe on the road. I was, however, worried that the repatriation flight would be cancelled, in which case I would be stranded at the safe-house in Bamako. At that stage there was already unrest in the capital which recently ended in a coup d'etat.

At the guest house another waiting game started. The repatriation flight that was supposed to leave from Bamako to Namibia and then SA was delayed twice. Go-ahead for this special (Namibian Airways) repatriation flight was given on 30 April and I boarded the plane along with about 22 other South Africans on 1 May. In their Covid-compliant outfits, the crew looked as if they were working with nuclear waste. That was a new experience for everyone.

We touched down in Windhoek and remained on the tarmac over five hours due to crew issues. The crew that was supposed to fly us from Windhoek to SA did not want to undergo quarantine in SA for 14 days, so they did not want to fly. Eventually we took off for Johannesburg.

We disembarked on the runway and boarded three small people-carrier buses. There were police all around and we raced with lights flashing at speeds way above the legal limit to our quarantine destinations. There, we were booked into our rooms from which we could only leave for a Covid test on the 6th or 7th day for 20 minutes. I ended up staying in quarantine for 13 nights and finally arrived home on 14 May. The quarantine part was the worst. Knowing I was within walking distance from home but not being allowed to leave was so frustrating!

This is my story – I certainly won't forget it in a hurry! All in all, not too bad at the end of the day – it ended up being 62 days and almost 90 days away from the "wifey", instead of a trip that should have been only eight days.'

Airline staff on the repatriation flight were kitted out as if they were dealing with nuclear waste, due to strict Covid regulations

TECHNICAL TIP:
THE LUBE SERIES BY STEVEN LUMLEY, TECHNICAL MANAGER: WEARCHECK

PART 1: THE LUBE KITCHEN – A LITTLE BIT OF THIS AND A LITTLE BIT OF THAT.

A fully-formulated lubricant can have many functions, but they generally fall into five fundamental groups. Lubricants are used to reduce friction and wear, dissipate heat from critical machine components, remove and suspend deposits that may affect performance, protect metal surfaces from degradation and corrosion as well as act as a structural material.

Lubricants serve a diverse range of applications, everything from your car's engine to the water pumps at a nuclear power station to even the bobbin case of a small sewing machine, with each requiring a different combination of base oils and additives.

The blending of a lubricant is a complex process that requires a high degree of engineering and some pretty complex chemistry in the lube kitchen, as formulating lubricants requires an in-depth understanding of the chemical qualities of everything that goes into the mix and how those chemicals interact. Quite a balancing act when you think about it!

Base oils themselves perform most of the functions of lubricants. But they can only do part of the job. Additives are needed when a lubricant's base oil doesn't provide all the properties the application requires. They're used to improve the good properties of the base oils and minimise the bad. Typical lubricants are composed of a base oil, an additive package and, optionally, a viscosity index (VI) improver. Lubricant additives are organic or inorganic compounds dissolved or suspended in oil.

Not all lubricants contain the same combination of additives and certainly not in the same treat rates. Additive concentrations can range between 0.1% to 30% of the oil volume, depending on the application. For example, turbine, hydraulic and industrial gear lubricants demand much lower treat rates of additive packages compared to automotive gear, transmissions, petrol and diesel engines, which are the most demanding and require the most additives.

There are many lubricant additives available, and they are selected for use based upon their ability to perform their intended function. They are also chosen for their ability to mix easily with the selected base oils, to be compatible with other additives in the formulation and to be cost effective. Added to this, the geometry and metallurgy of the components, operating temperatures, load, potential exposure to contaminants, combustion products as well as typical drain intervals are also taken into consideration when selecting the ideal cocktail of additives for a specific application.

Ultimately the optimal combination of base oils and additives allows the finished lubricant to meet specified properties and performance characteristics outlined by OEMs and lubricant standards organisations.

In the *Monitor* newsletters to follow, we will take you on a journey through the world of lubricant additives detailing their function, how they work and their application. So be sure to look out for the next instalment of this lube series, where we will introduce you to the incredible world of lubricant additives.

Long-serving staff honoured

'WearCheck's successful growth is the direct result of the work put in by our valued employees, especially those who have dedicated many years of service to the company. Your commitment serves as a vital link in the chain which drives our operation, and your service is appreciated.' So says HR manager Michelle Padayachee.

'We are fortunate to have many team members who have been part of the family for many years. This month, we recognise some important milestones – three of our staff members have been with WearCheck for 15 years – Sytwell Ndlovu, Gloria Ncama and Mmamokete Hadebe.'

SYTWELL NDLOVU

Driver Sytwell Ndlovu has worked at WearCheck for 15 years

GLORIA NCAMA

Sample room assistant Gloria Ncama has worked at WearCheck for 15 years

MMAMOKETE HADEBE

DP admin clerk Mmamokete Hadebe has worked at WearCheck for 15 years

Upskill your workforce with WearCheck training

WearCheck runs a range of oil analysis and condition monitoring training for maintenance practitioners operating at various levels within an organisation. WearCheck has been an accredited training partner for the internationally-acclaimed Mobius Institute since 2015, and all the Mobius courses can be run online.

To book a WearCheck training course, please contact Michelle van Dyk on training@wearcheck.co.za or call 031 700 5460 or 082 381 3321

Course	Days
Precision Shaft Alignment	2, incl. practical
Precision Balancing	2
Vibration Analysis ISO CAT I	4, incl. exam
Vibration Analysis ISO CAT II	5, incl. exam
Vibration Analysis ISO CAT III	5, incl. exam
Asset Reliability Practitioner - advocate (ARP-A)	3, incl. exam
Asset Reliability Practitioner - engineer (ARP-E)	5, incl. exam
Asset Reliability Practitioner - leader (ARP-L)	5, incl. exam
Lean Maintenance Planning	1
Operator Asset Care	1
Transformer Oil Analysis	1
Oil Analysis 1	2
Oil Analysis 2	1
WearCheck Practical (English / Zulu)	½
WearCheck Customised	2

OIL ANALYSIS COURSES

** Due to the ongoing Covid-19 situation, please contact WearCheck to confirm whether the courses will be held at a venue or online, as we strive to comply with lockdown regulations and keep our course delegates safe and healthy.*

	Oil Analysis 1: Understanding oil and its analysis	Oil Analysis 2: Report interpretation
Course length:	**Two day workshop**	**One day workshop**
Johannesburg	February 16, 17	February 18
Middelburg	March 16, 17	March 18
Rustenburg	May 11, 12	May 13
Northern Cape	June 8,9	June 10
Bloemfontein	July 20, 21	July 22
Durban	August 17, 18	August 19
Johannesburg	September 8,9	September 10
Namibia	October 13, 14	October 15
Cape Town	November 9,10	November 11

WearCheck offers other on-site courses on request:
- WearCheck Practical (in English or Zulu) (half day)
- WearCheck Customised – oil analysis for workshop technicians

For more details on course content and prices, please view Training at www.wearcheck.co.za. To book the above courses, please contact Michelle van Dyk on training@wearcheck.co.za or call 031 700 5460 or 082 381 3321

Course	Operator Asset Care (3 day workshop): 3 CPD points
Johannesburg	March 23 - 25
Middelburg	June 23 - 25
Bloemfontein	Aug 24 - 26
Rustenburg	Oct 20 - 22

Course	Root Cause Failure (1 day workshop): 1 CPD point
Johannesburg	February 19
Middelburg	March 19
Rustenburg	May 14
Durban	August 20
Johannesburg	September 10

Course	Lean Maintenance Planning (3 day workshop): 3 CPD points
Johannesburg	February 24 - 26
Middelburg	May 18 - 20
Bloemfontein	July 27 - 29
Rustenburg	November 16 - 18

WEARCHECK 2021 TRAINING

PUBLIC / ONLINE MOBIUS COURSES*

Course	CPD points	Feb	Mar	May	Jun	Aug	Sep	Nov
Vibration Analysis – CAT 1	3	1 - 4			7 - 10			
Vibration Analysis – CAT 2	4	22 -26				16 - 20		
Vibration Analysis – CAT 3	4			10 - 14				8 - 12
Precision Maintenance - Balancing	2							
Asset Reliability Practitioner – ARP A (advocate)	2		29 - 31		21 - 23			
Asset Reliability Practitioner – ARP E (engineer)							13 - 17	
Asset Reliability Practitioner – ARP L (leader)								

To book a Mobius training course, please contact Christene on christenef@wearcheck.co.za or call WearCheck Johannesburg on 011 392 6322.

*All courses are presented at various venues throughout Africa, and many of them have an online option. When booking, please confirm date and venue, as some of these details may change due to Covid-19 restrictions.

All courses can be presented online or on-site at a customer's premises for a minimum of seven delegates. For on-site training, there may be an additional charge for the lecturer's travel and accommodation.

HIGHLIGHT YOUR SUCCESS

If oil analysis has helped prevent a major failure or saved your company money, we would like to feature this in Monitor. Our writer will contact you for the details and will write the article for your approval. Simply email prinda@wearcheck.co.za and we will contact you.

TECHNICAL BULLETIN TOPICS?

Is there a particular subject you would like to see featured in a Technical Bulletin? Simply email your suggestion to prinda@wearcheck.co.za. Before you do this, why not check out the more than 60 titles already available on the web site: www.wearcheck.co.za/useful-info/publications/technical-bulletin.html

Planet-friendly option ♻

If you would prefer to receive future issues of WearCheck Monitor and Technical Bulletin via e-mail in pdf format instead of in printed form, please e-mail a request to: support@wearcheck.co.za. This option also applies to printed reports.

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