WHAT'S NEW

Legislation: Is this the end of the two-stroke engine? **P.13**

MAINTENANCE FEATURE

Used oil analysis results assessment P.24

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Focusing on Africa's lubrication needs

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MAIN FEATURES

ROSE FOUNDATION S.A. – SAFEGUARDING THE ENVIRONMENT

USED OIL ANALYSIS – A HOLISTIC ASSESSMENT

PLUS: LUBRICATION AND MAINTENANCE OPTIMIZATION P.28

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CONTENTS

VOL 26 | SEPTEMBER 2018

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NEWS • INDUSTRY UPDATE • NEW PRODUCTS • TECHNOLOGY • COMMENTARY

REGULARS

2
Editor's Desk

4-7
The Market Report
Oman Oil launch in Kenya through Hass targets key markets in the region

Engen acquisition in Kenya to move Vivo to pole position

Total Tanzania seeks regulatory approval to acquire Fuchs Petrolube lube blending plant

Engen Ghana educates key lubricant distributors

Shell lubricants plans to expand production

Glencore set to acquire Chevron's subsidiary

National Oil Corporation of Kenya introduces new range of mineral and fully synthetic motor oils

8
Lubes Diary

10
Frequently Asked Questions

12-13
WHAT'S NEW: PRODUCTS AND INNOVATIONS
New Lubrizol PV2500 Series for the next generation of mid SAPS lubricant performance

Chevron Oronite introduces heavy-duty engine oil package

14-15
IN OTHER WORLDS
Exxon Mobil invests to expand Singapore refinery

Citroën and Total celebrate a 50-year partnership

Klüber lubrication receives innovation award

22
10 QUESTIONS FOR LUBRICANTS PROFESSIONALS
Richard Mugambi, In continuous provision of premium services to the region

28
LAST WORD
Role of lubrication condition monitoring in maintenance optimization

INSIDE

COVER IMAGE: Inspecting used oil tank farm at Rose Foundation. PHOTO | COURTESY

18

USED OIL MANAGEMENT

With a clear objective of encouraging cleaner production before waste reduction and minimisation, Rose Foundation aims to recycle or reprocess used oil into economically valuable products

IN OTHER WORLDS

Chevron expansion plans in China 14

10 | FREQUENTLY ASKED QUESTIONS
Synthetic engine and transmission lubricants

13 | ADDITIVES FEATURE
Could Euro 5 emissions legislation mean disappearance of two-stroke engines?

20 | COUNTRY FEATURE
Taking steps to limit proliferation of counterfeit lubricants

24 | MAINTENANCE FEATURE
Used oil analysis - a holistic assessment

13

24

OPTIMIZATION

Optimizing maintenance – central role of lubrication

James Wakiru
Lubezine Magazine
Editor-in-Chief

Dear readers, I take this opportunity to welcome you warmly to our 26th edition of Lubezine magazine.

In this issue, we focus on the aspect of optimization of maintenance and examine how good lubrication practices and programs can be utilized to achieve this goal. For example, used oil analysis is a tool that can be used not only to check on the general health of the machinery but also to aid in decisions such as extending the drainage interval. Extended drainage intervals not only reduce the overall cost of maintenance but also minimize machinery downtime.

However, as Mr John Evans of Wear Check argues in our lead article, used oil analysis data must be assessed holistically if proper judgement and conclusions are to be made. It is never a simple matter of comparing data against some published limits. Consideration must be taken of all the information the customer has supplied, all the tests from the laboratory, all the history on the component along with knowledge of how similar components behave in similar situations for oil analysis to be a useful tool.

Used oil analysis data must be assessed holistically if proper judgement and conclusions are to be made

Another aspect of maintenance optimization is the use of long drainage interval lubricants, notably the synthetic grades. In our FAQ provided courtesy of Motul, questions regarding benefits and why to use synthetic lubricants are answered. Africa has seen a surge in usage of synthetic lubricants both for automotive and industrial applications, a clear indicator that the continent is trudging along the right path, maintenance wise and sustainability-wise.

Often overlooked are the detrimental effects of used oil on the environment. One way of dealing with used oil is to limit its generation by extending the drainage interval. Here the use of oil analysis and synthetic lubricants play a leading role.

Another way is to ensure handling the generated used oil in an environmentally friendly manner. We feature the Rose Foundation of South Africa and get to see the commendable role they play in the safe disposal of used oil in South Africa, Africa's largest lubricants market and invariably the biggest generator of used oil. It is high time other African countries emulated the commendable job done by the Rose Foundation in caring for the environment.

Before I put my pen down and officially welcome you on a lubricants journey from Cape Town to Cairo, Lagos to Nairobi, let me take this opportunity to give special thanks to all our partners for their continued support.■

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LUBES DIARY: The 7th ICIS African Base Oils & Lubricants Conference, Cape town, South Africa | FAQS: Why is synthetic oil better for the environment?

FROM LEFT: Abdirashid Mohamed Jabane, Issa Mohamed CEO Hass, David Kalife CEO Oman Oil Marketing, John Munyes CS Petroleum and Mining present at the Oman Oil launch in Nairobi. PHOTO | COURTESY

KENYA

Oman Oil launch in Kenya through Hass targets key markets in the region

Oil marketer Hass Petroleum Group has signed a partnership with Muscat-based Oman Trading International to market its lubricants in East Africa, having launched in Kenya. This comes barely a year after Oman Trading International (OTI) acquired a 40% stake in Hass Petroleum Group.

"Today marks a significant growth strategy that will see our partners market and sell our oil lubricants across its market reach," said Oman Oil Marketing Company Chief Executive David Kalife. Oman Oil Marketing Company is a subsidiary of OTI.

"Moving forward, we are focused on identifying new business leads and expanding the geographical reach of our products beyond Oman's borders."

Mr Kalife said he was confident the partnership with Hass Petroleum would not only reinforce the trade relations between the Sultanate and Kenya, but also help establish new streams of collaboration between the two nations and her neighbours.

Kenya boasts of tremendous business opportunities as the most developed nation in East Africa.

Its location and strong logistical infrastructure makes it an ideal port for imports to inland countries – a factor that Oman Oil intends to take advantage of by breaking into new neighbouring markets like Uganda, Tanzania and DR Congo.

"When you look at the Kenyan lubricants market, you realise that there is a lot of potential. Going by recent numbers, the market is valued at about Sh18 billion ($180 million). Majority of this comes from the transport and industrial sectors," noted Hass Petroleum Group CEO Issa Mohamed.

Mr Mohamed said part of the agreement was that OTI would provide technical expertise and financial backing to Hass Petroleum as it seeks to penetrate key African markets.

Combining the most advanced technology with ongoing research and development, Oman Oil Marketing Company produces high-quality lubricants that are sold across the Middle East, North Africa and Indian sub-continent including Bahrain, Yemen, Ethiopia and Bangladesh. ■

KENYA

Engen acquisition in Kenya to move Vivo to pole position

Towards the end of 2017 Vivo announced acquisition of Engen facilities in several African countries which was subject to regulatory approvals in the respective countries. Upon completion of this transaction, Vivo Energy's total presence will total to over 2,100 service stations, across 24 African markets.

In Kenya, the Competition Authority of Kenya (CAK) has approved the transaction. In a statement appearing in local media, the authority said the transaction was unlikely to lessen or prevent competition in the participation of oil marketers in the industry. However, CAK did not approve acquisition of two fuel stations due to dominance concerns. This means that Vivo only managed to acquire 13 out of the 15 Engen service stations it had initially targeted.

This acquisition is expected to further boost Vivo's market share after knocking off Total from the pole position. Data from the Petroleum Institute of East Africa shows that Vivo's share of local petroleum sales volume rose to 17.6 per cent in the review period, up from 15.9 per cent in 2016 when it was ranked second. ■

P.6

Shell lubricants plans to expand production

TANZANIA

Total Tanzania seeks regulatory approval to acquire Fuchs Petrolube lube blending plant

Fuchs blending plant. PHOTO | COURTESY

Total Tanzania has applied to the Fair Competition Commission (FCC) for approval to acquire the Fuchs Petrolube lubricant blending plant in Dar es Salaam for an undisclosed amount.

The facility includes a base oil tank farm with 2,200 metric tonnes storage capacity and can process 22,000 tonnes of lubricants and 2,000 tonnes of grease per annum. The firm was appointed sole distributor for the region. The firm manages an 8,000 square-metre plant that makes use of computerised automated batch blending systems based on sophisticated Supervisory Control and Data Acquisition (SCADA).

According to a public notice issued by FCC to local dailies, the commission is investigating the intended acquisition in line with the laid down procedures and rules under regulator docket. "FCC has powers to investigate, inter alia, entry into and exit from markets with the objective of promoting and protecting effective competition," the notice read.

The notice intended to serve as a notification to any part that is objecting the merger in the next 14 days from the date of application. However, the notice failed to disclose the amount of funds involved.

> ***"The facility includes a base oil tank farm with 2,200 metric tonnes storage capacity and can process 22,000 tonnes of lubricants..."***

Petrolube, being an affiliate member of the global lubricants group Fuchs Group, was established almost two decades ago. It was founded by Feroz Kassam in 1999 and thereafter quickly formed an alliance with Fuchs.

The blending plant was designed to Fuchs Petrolube AG specifications and built by Petroserv, the specialist Dubai engineering company.

Total Tanzania, which is now set to take over Petrolube plant, is a subsidiary of Total SA and was incorporated in 1969.

Total Tanzania is wholly owned by the Total Group, with 99 per cent shares owned by Total Outre-Mer and 1.0 per cent owned by Total Africa SA. ■

GHANA

Engen Ghana educates key lubricant distributors

Engen Ghana Limited, one of the leading players in the petroleum downstream sector recently organized a two-day training session for its key lubricant distributors in Accra.

The training is meant to fit into a Lubes Key Distributor concept being rolled-out under the name The Oil Centre (TOC) which is a tried and tested Engen Petroleum SA channel strategy for distributing and marketing lubricants in Engen's countries of operation.

Mr. Francois van Schalkwyk, Technical Manager, International Business Division (IBD), Engen Petroleum, South Africa, lead resource person for the training course spoke to Ghanaian Times and said the company would use the opportunity to train incoming TOC distributors, key staff and front-liners in various Engen Ghana service stations.

Mr. Henry Akwaboah, MD, Engen Ghana, added Ghanaian vehicle owners have lost investments made into vehicles because of the wrong choice and use of lubricants and greases. He said the company's mission was to act more responsibly by ensuring that right skill sets are imparted to customers.

He said Engen lubricants were better priced and backed by years of innovative research by various research partners globally. ■

A worker at one of Shell's warehouses. PHOTO | COURTESY

EGYPT

Shell lubricants plans to expand production

Shell Lubricants Egypt's MD, Saher Hashem, recently stated that the company plans to increase its production capacity to 100m litre of motor oil, are underway. He told *Daily News Egypt* in an exclusive interview.

"We began implementing the plan to develop the factory and increase its production capacity to exceed 100m litres of motor oil in the coming years," confirmed Hashem.

He also said that there is great potential for the growth of the automotive oils market in Egypt.

"Shell Lubricants Egypt's ambition for the industrial sector in the country is to push forward oil consumption to rates higher than the currently prevailing rates," added Hashem.

As for the oil market in Egypt, Shell's share exceeds 17% of the total value of the market.

Saher Hashem noted that Shell is currently focusing on meeting local market needs of oil therefore, the process of exporting their production abroad is not currently their goal, but it is within their future plans.

» ***The company plans to increase production capacity to 100m litres of lubricants in the coming years***

Shell's Downstream Director, John Abbott, stated that the company has consistently invested in upgrading and growing its world-class supply chain, to align with demand in emerging markets.

According to Abbot, Shell invested hundreds of millions of dollars in its lubricants supply chain, upgrading three lubricant blending plants, building four new lubricant blending plants, and constructing a new grease manufacturing plant as well as one new Group II base oil manufacturing plant. ■

SOUTHAFRICA

Glencore set to acquire Chevron's subsidiary

South Africa's Competition Tribunal has conditionally approved Glencore's proposed $973 million acquisition of Chevron Corp's subsidiary in the country, all but scuppering a rival bid from China's Sinopec. This is according to Reuters.

The assets include a 110,000 barrel-per-day oil refinery in Cape Town, a lubricants plant in Durban as well as 845 service stations and other oil storage facilities.

It also includes 220 convenience stores across South Africa and Botswana. Glencore is providing funding to, and making its bid through, its Black Economic Empowerment Partner off the Shelf Investments (OTS), a minority shareholders' group, which already owns virtually all the remaining shares in Chevron SA.

» **845**
Among the assets are 845 service stations

South Africa's competition watchdog approved the bid in August, but the Competition Tribunal makes the final ruling on deals.

Sinopec's bid was also approved by the competition authorities, but the Tribunal said Glencore-backed OTS had right of first refusal to close the transaction.

Some of the conditions for the proposed merger included the preservation of jobs after the deal. ■

KENYA

National Oil Corporation of Kenya introduces new range of mineral and fully synthetic motor oils

Hyrax Oil Malaysia has signed a milestone lubricant partnership agreement with National Oil Corporation of Kenya (NOCK) to grow the NOCK lubricant business full range of products from automotive lubes, industrial lubes, marine lubes and specialty products such as transformer oil. NOCK plans to increase its Supadel brand footprint by doubling its market share in the next three years in Kenya and expand its lubricant business to neighbouring regions.

In an interview with Mr Simon Matthew, Chief Operating Officer International Trade of Hyrax Oil Malaysia heading the Pan African business unit said the partnership will include aftersales support marketing, training and technical support to increase the efforts of NOCK.

"The partnership will be a good branding exercise for NOCK to assure its customers a steady and continuous supply of top range quality products meeting International standards, OEM requirements and compliance," observed Matthew.

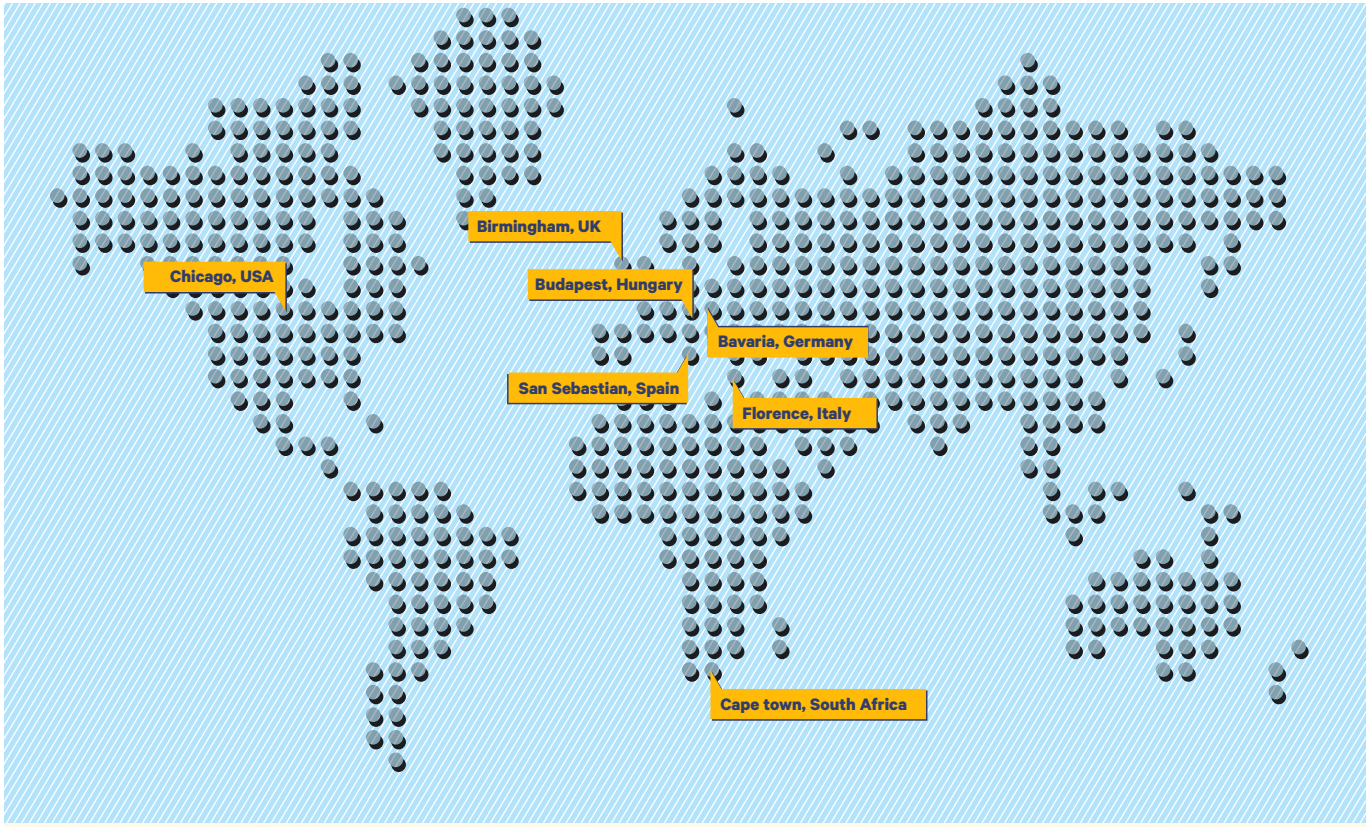
He continued to state that Kenya's lubricant industry in the recent past has presented new market opportunities. "Firm growth in the Kenyan automotive, heavy equipment and heavy vehicle sector has been a boon for lubricant manufacturers and marketers as consumers migrate to genuine and higher-grade lubricants. As a result, both mineral multi-grade and fully synthetic products are benefitted."

> ***"The fully synthetic API SN grades for gasoline and diesel passenger and commercial vehicles are among the new range of lubricants."***

According to NOCK, the complete range of lubricants will be able to serve the Kenyan consumers well by introducing the fully synthetic API SN grades for both their gasoline and diesel passenger and commercial vehicles owners. NOCK stressed that the new of products is aimed at keeping the vehicle engines cleaner, providing extended drain interval, top performance, fuel economy, reducing exhaust emission as well as being helpful during the stop-and-go traffic.

National Oil Corporation of Kenya now offers a complete range of their newly formulated automotive engine oils both for gasoline and diesel mineral to fully synthetic gear oils, transmission fluids, industrial oil, marine oils and locomotive oils. The oil marketer has described the new range of oils to be of fine quality and that their correct usage ensures longer engine life, trouble free operation and cleaner environment. ■

THE LUBES DIARY



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www.easyfairs.com/advanced-engineering-2018/advanced-engineering-2018/exhibiting/

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November 28-29

The 2018 European Base Oils & Lubricants Interactive Summit Florence, Italy

www.wplgroup.com/aci/event/base-oils-lubricants-summit 2019

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Shamrock

Synthetic engine and transmission lubricants

1. Why is synthetic oil better for an engine or transmission?

There are several key factors that make synthetic oil superior to mineral oil here;

Synthetic oil is free of impurities such as aromatics, sulphur and contaminants such as silicon which helps increase the oil's service life and cleanliness.

At the molecular level a synthetic oil's particles are all the same shape and size which allows them to move past each other very easily, effectively reducing internal friction. This allows synthetic oil to improve engine performance (power and fuel economy) and reduce wear.

Synthetic oil is less vulnerable to oxidation due to the lack of unstable molecules which readily react with oxygen. This property further helps to increase the oil's service life. Oxidation of oil leads to sludge formation which is detrimental to an engine or transmission.

Synthetic oil has a higher viscosity index (VI) than mineral oil which means that its viscosity doesn't decrease as rapidly as mineral oil does as temperature increases. If comparing a 15W40 mineral oil to a 5W40 synthetic oil (these both provide the same viscosity at 100°C – important for protection at operating temperature), the synthetic oil will be thinner than the mineral oil at any temperature below 100°C (which allows the oil to circulate more quickly, reducing start-up wear and the time it takes reach operating temperature), but it will also be thicker than the mineral oil at any temperature above 100°C which means that it will offer better protection if the engine or transmission is running hot or overheating.

2. Why is synthetic oil better for the environment

Synthetic oil helps vehicle manufacturers reduce fuel consumption and emissions due to friction reduction. Some types of synthetic oil are made from non-petroleum based materials and are therefore not reliant on crude oil. Lastly, synthetic oil can be used for longer periods of time in an engine or transmission and therefore doesn't need to be drained as often resulting in less oil being disposed of, much of which is still disposed of irresponsibly (toxic to the environment) in many countries.

3. By how much will synthetic oil increase the drain interval?

This depends on several factors including engine condition, fuel quality, driving conditions, and standard drain intervals so it is impossible to give a definite answer to this question. However, in general, a synthetic oil can double the drain interval of a mineral oil in engines and transmissions. In Europe, synthetic oil enables vehicle manufacturers to increase their engine drain intervals up to 50 000km in cars and 150 000km in trucks. In African countries with acceptable fuel qualities, safe engine drain intervals of 20 000km and 40 000km in cars and trucks, respectively, have been achieved with synthetic oil.

4. What problems may arise when changing to synthetic oil?

Although high quality synthetic oil has no compatibility issues with vehicles newer than 1980, there are situations where a synthetic oil may bring about problems. In engines or transmissions that have been worn excessively through the use of inferior and incorrect lubricants, the low viscosity of many synthetic oils may result in leaks or excessive noise.

It's quite common that consumers change from SAE 15W 40 or SAE 20W50 mineral oil to SAE 5W30 synthetic oil (instead of perhaps SAE 10W40 or SAE 15W50 synthetic) and then land up facing these issues.

5. Is it worth the extra money for a synthetic oil?

When it comes to high quality synthetic lubricants from reputable and experienced lubricant manufacturers, such as Motul, yes it is. The initial cost of purchasing the synthetic lubricant will quickly be offset by the reduction in oil changes (including oil filters), which saves time and money, as well as the increased long-term reliability of the engine or transmission in question. An additional benefit is the improvement in performance that will be gained, which can be as high as 3% in healthy engines switching from mineral oil. ■

Q&A Courtesy of MOTUL in Kenya. Motul is a world-class French company specializing in the production and distribution of premium lubricants for various sectors among them automotive, heavy-duty and powersport. Motul is proudly the first lubricant company to release a semi-synthetic (1966) and a 100% synthetic automotive engine oil (1971). DT Dobie has been the official distributor for Motul in Kenya since 2016. Contact them via email: infodtdaftermarket@cfao.com or visit website at www.motul.com Facebook: #MotulinKenya / #DTDobieAftermarket

Chevron

group II base oils

this is what progress looks like

Non-conformance from 28% to zero

Deojay, a dynamic independent lubricant company in Durban, South Africa, struggled with losses. Non-conformance averaged 28% due to the high variance in quality of imported Group I base oils.

The technical director at Umongo, their additives supplier, recommended that Deojay switch to Chevron Group II across the board.

Today Deojay has zero non-conformance, a 19% growth in sales, and a hydraulic oil recognized as the cleanest in Sub-Saharan Africa!

Let's talk about your business.

We can be reached at Chevronbaseoils.com

Jackie Le Roux
Managing Director
Deojay Petroleum

ADDITIVES

New Lubrizol PV2500 Series for the next generation of mid SAPS lubricant performance

Ohio-based, specialty chemicals producer, Lubrizol Corporation, recently announced its new Lubrizol PV2500 series additive technology designed to address the increasing lubrication demands of modern gasoline and diesel automotive hardware.

According to Lubrizol, the challenges associated with gasoline direct injection and turbocharged gasoline direct injection (TGDI) engines mean that mitigating low speed pre-ignition (LSPI) and chain wear is critical to enable more reliable engine performance.

"Lubrizol PV2500 series

> ***The new lubricant series is designed for the modern gasoline and diesel automotive hardware***

represents the next generation in mid SAPS lubricant additive technology, developed for ACEA 2016 and European OEM approved performance, while addressing LSPI field concerns to ensure new industry requirements, such as licensable API SN Plus are also met," says Anthony Smith, Lubrizol product manager, Passenger Car Engine Oils.

Lubrizol worked closely with European OEMs to combine LSPI protection for gasoline engines with the latest mid SAPS requirements for diesel powertrains. Smith continued, "Diesel particulate filters (DPFs) have long been a feature in diesel emissions control and now the automotive market is expected to see a rise in demand for mid SAPS lubricant solutions going into gasoline vehicles as OEMs start to introduce gasoline particulate filters (GPFs). This will be particularly important for the European and Chinese markets with new emission regulations such as China 6 on the horizon."

"We are pleased to bring our new Lubrizol PV2500 series solution to the market as the latest addition to our established range of market leading Lubrizol ACT additive technologies," says Colin Morton, Lubrizol regional business manager for Europe, Passenger Car Engine Oils. "This family of additives provides proven durability and protection for engines and aftertreatment systems. It now goes even further to provide LSPI protection and gives oil marketers access to the coverage needed to supply aftermarket workshops servicing European vehicles."

The company further observes that success in today's automotive industry depends on higher performance, and that they are committed to helping their partners get there.

With headquarters in Wickliffe, Ohio, Lubrizol owns and operates manufacturing facilities in 17 countries, as well as sales and technical offices around the world. ■

ADDITIVES

Chevron Oronite introduces heavy-duty engine oil package

Chevron Oronite recently introduced OLOA 61011, its new top-tier additive package suitable for both heavy- and light-duty commercial vehicles meeting Euro V and Euro VI emissions requirements, as well as vehicles meeting EU stage IIIA, IIIB and IV, and U.S. Tier 4 emissions standards in a broad range of off-road applications.

According to a statement issued by Chevron, this new additive package is in line with their commitment to deliver value and flexibility to its heavy-duty engine oil (HDEO) customers, the company said in a statement. "This new additive package has been designed to help lubricant manufacturers respond to the latest market requirements in terms of emissions, fuel economy and durability," said Teri Crosby, global product manager, Automotive Engine Oils, Chevron Oronite. "It meets the latest industry and OEM specifications and is ready for the next generation of heavy-duty specifications such as ACEA 2016, API CK-4 and VDS 4.5."

The additive package is available in SAE 10W-40 and 10W-30 grades, both in low and high HTHS (high-temperature high-shear), and Chevron assures that it has been developed with the globally available paratone enhanced Olefin Copolymer (OCP) and is formulated with a majority of Group II base oil, which provides formulation flexibility to the blender and makes it a competitive alternative.

Marta Sabater Ferret, automotive engine oil product line manager, Europe-Africa-Middle East Region, Chevron Oronite added, "The new package exhibits first-rate engine protection features. Its outstanding wear protection, ability to help keep pistons clean, and excellent corrosion control performance have been demonstrated in various tests." ■

EURO 5 AND MOTORCYCLES

Could Euro 5 emissions legislation mean disappearance of two-stroke engines?

From January 2020, tough Euro 5 limits will apply to new motorcycles and mopeds. Designed to ensure this category of vehicles will pollute less, the regulation sets stringent limits for a number of tailpipe emissions that could be tough for two-stroke applications to meet.

Since 1997, the European Commission has been implementing Euro standards to reduce air pollutant emissions from two and three wheelers (L-category vehicles). The primary objective of this activity has been to reduce the share of total road transport emissions from these vehicles compared to other on-road sources. The first iterations of the regulation (Euro 1 to 3) focused on reduction of hydrocarbons (HC), carbon monoxide (CO) and nitrogen oxides (NOx).

To ensure compliance, manufacturers have introduced more precise fuel injection and advanced combustion technologies to manage the fuel and added catalytic converters to treat the exhaust gases. The protection of these sensitive catalysts has been a topic high on the industry agenda for some time. In the future, some degree of lubricant phosphorus restriction or in-use performance targets for catalytic convertors could be required. However, there's need to strike a balance with gear pitting performance, which currently sets a minimum lubricant phosphorus level.

Euro 4 and 5

In January 2013, Regulation (EU) No. 168/2013 expanded the number of L-categories and established implementation dates for future standards.

Euro 4, representing a huge leap compared to Euro 3, was introduced for all new motorcycles in 2017. To pass, bikes not only need to meet tougher emissions limits but also pass an evaporative emissions (SHED) test, run on-board self-diagnostic systems (OBD1) and prove they would still pass the tests after 20,000 km of service.

The next round of emissions cuts is on the horizon. Euro 5 is scheduled from 2020 for new motorcycles and for all L-category vehicles by 2021.

However, once again the change doesn't stop at tightening emissions limits. The required Euro 5 performance must now be achieved under the new world motorcycle test cycle (WMCT) driving cycle - which is designed to represent typical driving conditions. Additionally, the bike must be able to meet the Euro 5 requirements over its lifetime, meaning a new style of on-board diagnostic system (OBD2) will be required. This will allow the bike to self-diagnose and self-correct to ensure emissions control is maintained.

Tightening Euro emissions limit

When we look at Euro 5 parameters, particulate number (PN) limits are significant by their absence from the list. It appears that regulators deem PM restrictions alone to be sufficient at this stage; meaning that widespread use of particulate filters on this category of vehicle is unlikely for the foreseeable future.

	EURO 1	EURO 2	EURO 3	EURO 4	EURO 5
CO (g/km)	13.0	5.5	2.0	1.14	1.00
HC (g/km)	3.0	1.0	0.3	0.17	0.10
NOx (g/km)	0.3	0.3	0.15	0.09	0.06
PM (g/km)	–	–	–	–	0.045
SHED* test	–	–	–	Yes	Yes
On-board diagnostics	–	–	–	Yes (OBD1)	Yes (OBD2)
Durability	–	–	–	20,000km	Lifetime

*Evaporative emission
Source www.motorcyclenews.com

No CO2 or fuel economy mandates

Perhaps more of a surprise than the lack of any PN limits is that there appear to be no plans for the new Euro 5 standard to impose carbon dioxide (CO2) emissions limits or fuel economy performance targets.

This is possibly because, when compared to other on-road sources, the CO2 contribution from motorcycles is very small. Additionally, fuel economy targets would result in only small reductions in consumption, which would be unlikely to repay the regulatory effort required to introduce and enforce them.

To comply with the new Euro 5 regulation, CO2 emissions must be determined and fuel consumption calculated or measured. Both must be reported as part of the type-approval process and indicated on the certificate of conformity.

2-stroke demise

The tightening emissions limits and generally tougher requirements being introduced in Euro 5 will be tough for two-stroke (2T) applications to meet. This is mainly because 2T engine design allows some of unburnt fuel/oil mixture to pass direct into the exhaust, producing high HC and PM emissions.

Direct fuel injection (DFI) is one option that's being looked at by some 2T OEMs - notably Honda and KTM - to reduce these emissions. However, it's not without its drawbacks. First, the injectors can be very expensive. Second, DFI engines can be prone to deposit build up behind the rings since they run hotter than conventional 2T engines.

It seems likely that lubricants with strong dispersancy will be required to ensure trouble-free operation.

Some manufacturers are developing catalyzed high porosity wall flow particulate filters for two-stroke exhausts that, in addition to reducing CO and HC, significantly reduce PM.

The use of oils specifically formulated for 2T applications can also be used to help reduce PM emissions.

It is evident that changes in the motorcycle world are coming. It's unclear if readying 2T engines for Euro 5 will be more complex and costlier than switching to four-stroke.

Perhaps this could mean the disappearance of 2T applications from L-category.

Whatever the outcome, we expect the change to create opportunities for development of motorcycle-specific lubricants to support OEMs in the evolution of their equipment. ■

Inside a Chevron lubricant plant. PHOTO | COURTESY

MARKET PENETRATION

Chevron expansion plans in China

Global additive manufacturer, Chevron Oronite has made the final investment decision to move forward on its plan to build a wholly-owned additive manufacturing plant in Ningbo, a seaport city in northeast Zhejiang Province, in the People's Republic of China.

Oronite stated previously that the initial plan is for the Ningbo manufacturing facility to open as a blending and shipping operation, followed by a phased expansion into component manufacturing as lubricant additive demand grows. The company anticipates that ground-breaking will occur in the fourth quarter of 2018 with an estimated completion date in late 2020. Commercial production is anticipated to begin in 2021.

"Oronite has experienced firsthand the steady increase in additive demand throughout the Asia-Pacific Region, and especially China, over the past several years, and we believe that growth will continue for the foreseeable future," said Bruce Chinn, president, Chevron Oronite.

"After a steady stream of expansion projects at our Jurong Island manufacturing facility in Singapore since it was commissioned in 1999, this investment in a new facility in Ningbo demonstrates, one more time, the seriousness of our commitment to meeting the needs of our customers and the demands they face in the region."

> ***4th Quarter of 2018; the period ground breaking will commence 2021; anticipated year of commercial production***

The company signed an initial investment agreement in China in March 2015 and later that year created a wholly foreign-owned enterprise based in Ningbo. In December 2016, Oronite announced that it had advanced to the engineering and design phase of the project. Throughout that period, the company also expanded its technical support and product development capabilities at its growing technology centre in Shanghai.

"The dedicated work of the employees of Oronite, along with the strong support of our partners at the Ningbo Economic & Technical Development Zone (NETD), are making this project a reality," said Koon Eng Goh, general manager, Manufacturing and Supply Chain, Asia-Pacific Region, Chevron Oronite.

The land where the manufacturing facility will be located is part of the NETD, which is located near the Ningbo Port, one of the largest ports in the world in terms of annual cargo throughput.

Headquartered in San Ramon, California (USA), Chevron Oronite maintains regional offices in Houston (Americas Region), Paris (Europe-Africa-Middle East Region), and Singapore (Asia-Pacific Region); operates manufacturing sites in Belle Chasse, Louisiana (USA), Gonfreville (France), Singapore, and Mauá (Brazil); an affiliated blending and shipping plant in Omaezaki, Japan; technology centres in the USA, France, The Netherlands, Japan and China.■

PRODUCT BOOST

ExxonMobil invests to expand Singapore refinery

ExxonMobil recently announced plans to make a final investment decision in 2019 on what it called a "multi-billion dollar" project that would expand its clean fuel and lubricant output at its Singapore refinery.

The project is aimed at increasing the competitiveness of ExxonMobil's Singapore refining-petrochemical complex, which is one of the company's largest integrated fuels, lubricant base stocks and chemicals production sites in the world, the company said in a statement.

If the project proceeds, the new output is expected in 2023, the company said, without disclosing exactly how much it plans to invest.

"This investment will move it to the top quartile worldwide in terms of refining competitiveness and increase the site's competitive advantage from crude cracking," said Bryan Milton, president of ExxonMobil Fuels & Lubricants Company.

The expansion would enable ExxonMobil to introduce a new high-viscosity base stock to the market, it said. Base oil is the raw material for lubricants used in machinery motor parts.

"The project will also increase ExxonMobil's output of marine fuels with lower sulphur content that will comply with a new requirement from the International Maritime Organisation," ExxonMobil said.

Separately, the company said it expects to start producing new base oil and fuel from an expanded hydrocracker at its Rotterdam refinery in the Netherlands by the end of 2018.■

TECHNICAL COLLABORATION

Citroën and Total celebrate a 50-year partnership

Total and Citroën branded vehicles. PHOTO | COURTESY

This year, Citroën and Total are marking 50 years of partnership. Since the partnership began in 1968, Total has helped drive Citroën's industrial growth worldwide by supplying a wide range of automobile lubricants.

Over the decades, the two companies have jointly developed lubricants, specifically for Citroën engines, to make them ever more fuel efficient and environmentally friendly.

The environment is a core concern for Citroën and Total have had the environment as a core concern thus pledging to drastically curtail their environmental impact, notably by reducing carbon emissions.

According to Citroen, both of their R&D teams co-develop specific solutions that fit the bill. Today their efforts have culminated in the new Total Quartz Ineo First 0w-20, a synthetic oil for pollution control systems that improves fuel economy by as much as 4%.

The Citroën-Total partnership, as described by Citroen, is dedicated to excellence; from meticulous oil analyses to trackside checks and from individual rally races to the World Rally Championship, tests and racing events have enabled Total to experiment with lubricants under extreme conditions and make sure that Citroën's racing and mass-produced cars deliver the best performance.

> ***The environment has been a key concern and the partnership has been working toward carbon emissions reduction***

The strength of the Citroën-Total motorsports partnership dates all the way from the Morocco Rally in 1969. Citroën began racking up wins with the Citroën DS 21, and continued its rally racing saga, stringing together 36 victories and five constructors' titles in the FIA World Touring Car Cup.

An incredible run of successes followed between 2003 and 2012, including eight constructors' titles and nine drivers' titles in the World Rally Championship (WRC).

In 2014, Citroën and Total decided to race in the WTCC championship, notching up three constructors' titles, three drivers' titles and 50 wins.

Just recently in 2017, the two brands made a fresh start in the WRC with the C3 WRC, a two-time winner, in Mexico and Catalonia.■

FETED

Klüber lubrication receives innovation award

Klüber Lubrication has won the German Innovation Award presented annually by the German Design Council. The global market leader for speciality lubricants was recognised in two categories: in "Material Surface" for the innovative technology of its hydro lubricants and in the "Design Thinking" category for the equally cutting-edge process used to develop them.

"Our new hydro lubricants represent a revolution in lubricant technology," explains Samira El Allam, innovation manager at Klüber Lubrication. "Using water as a functional constituent in lubricants opens up entirely new applications that offer our customers in various industries sustainability and performance advantages. These advantages range from extremely low friction coefficients to improved workplace safety and sustainability."

Klüber Lubrication released its first hydro lubricant for gear lubrication in early 2018; hydro lubricants for other applications are currently in development.■

Klüber officials display award.
PHOTO | COURTESY

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lubricants

USED OIL

Rose Foundation, South Africa, on the forefront to ensure clean environment

It is no doubt that either directly or indirectly, we consume lubricants in our day-to-day activities. That is not a problem until time for its disposal arrives. Basically, there are two main categories of used oil generators: industries and transport companies who dispose of large quantities of used oil as well as service stations and small scale mechanic garages who dump small quantities of used oil. Motor vehicles, mining equipment and agricultural equipment are also culprits.

The way we dispose used oils should be in a manner that ensures safety of human beings, animals and thegeneral environment. To help conserve and protect the environment, prevent irresponsible burning and dumping of used lubricating oil, the Rose Foundation in South Africa has stood out and come forth to collect as much used lubricant oil as possible and add as much value to it within the strictest environmental standards possible.

With a clear objective of encouraging cleaner production before waste reduction and minimisation, Rose Foundation aims to recycle or reprocess used oil into economically valuable products.

> ***With a clear objective of encouraging cleaner production before waste reduction and minimisation, Rose Foundation aims to recycle or reprocess used oil into economically valuable products***

Founded in April 1994 after the government pulled back from supporting used oil refining industry, Rose Foundation came up as a result of major companies operating in South Africa coming together and taking up the responsibility of protecting the environment.

Since its formation, members of Rose Foundation have totally changed South Africa's narrative of the used oil industry and have seen an investment of over R100 million go to the following projects:

- Building of used oil storage depots
- Manufacturing of used oil mini tanks
- Environmental awareness advertising and stakeholder communications

A collector pouring used oil into a tank.
PHOTO | COURTESY

- Collection and safe disposal of used oil
- Encouraging collectors and processors of used oil to meet environmental standards

The foundation has strategically managed to influence collection of all collectable used oils and associated waste while concurrently supporting government in implementing legislations that help manage such disposals in an environmentally responsible manner.

Since it is illegal to dump used oil or burn it before it has been processed, it is crucial that all used oil is collected and responsibly recycled, including the smaller amounts generated by mechanics, farmers and small industries.

With this regard, the Rose Foundation has sensitised the public and ensured that their used oil is harnessed effectively. On its website, it has encouraged users to either arrange for their used oil to be collected or drop them off at their designated drop off points which have been listed.

Collectors are also encouraged to ensure that oil is safely transported responsibly, in a manner that is compliant with all current legislation and delivered to licensed processors to ensure proper recycling.

Legislatively, used oil is a hazardous substance and must be recycled by licensed collectors and processors. Generators must also store used oil safely in compliant metal or plastic drums and containers.

Additionally, some municipal refuse sites and agricultural organisations have oil storage facilities.

Given the fact that reprocessing used oil into industrial fuel is the most commercially attractive option in South Africa, the reprocessed products are afterwards sold as substitute for heavy fuel oil derived from crude oil.

Among other treatment processes used in South Africa, Rose Foundation uses the following:

- Mechanical separation of contaminants by filtration and centrifuging
- Chemical separation to remove unwanted components
- Thermal refining to improve the quality of the fuel

With the sole aim of ensuring a smooth transition of used oil from its generators to the collectors, aggregators, processors , subsequently end users, Rose Foundation has and is striving to accomplish just that! ■

COUNTERFEITS

Taking steps to limit proliferation of counterfeit lubricants

Busy traffic in Lagos, Nigeria. PHOTO | COURTESY

Majority of lubricants imported into the Nigerian market are below approved standards. This is according to a report by the Standards Organisation of Nigeria (SON). The organization says that the percentage of sub-standard products stands at 64 percent.

Gabriel Abah, Desk Officer, Base Oil and Lubricants at SON, raised the alarm at a recent one-day sensitization workshop on reduction of substandard engine lubricant in the markets in Awka in the country's Anambra state. It is during the workshop that ran by the theme: "Imbibing Quality Culture in made in Nigeria Product" that Abah talked of statistics pointing toward 30 per cent of the substandard products having found their way into the country's lubricant market.

The desk officer said SON was doing everything possible to protect the lubricant sub-sector which contributes about eight per cent to Gross Domestic Product as of 2017.

Abah recommended increase of import duty on lubricants from 10 to 30 per cent and reduction of same on base oil, a major input in production of lubricant as possible solution. He stated that some of the consequences of substandard lubricants include loss of integrity, low return on investment, facility loss, knocking of engines, low engine performance, low fuel economy and environmental pollution.

"Concerted efforts and collective resolve from both public, private institutions and sectoral stakeholders in enforcing compliance with codes of practices will constitute formidable arsenal to fight the menace," added Abah.

In his keynote address, Osita Aboloma, Director-General of SON, noted that the organisation had been mounting campaigns against the influx of substandard products into the country.

Aboloma said the workshop in Anambra was in view of the relevant role the residents play in contributing to the economy of Nigeria in manufacturing, importation and market for engine lubricants.

> ***"Consumers should watch out for lubricant products with SON certification logo..."***

In her address of welcome, Nwaoma Olujie, Head of SON in Anambra, emphasized that the workshop was to inform stakeholders in the sector on the development. Olujie, who warned those manufacturing or circulating substandard lubricants in the state to desist from it or face the wrath of the law, added that SON should not compromise on ensuring value for customers. She said: "Consumers should watch out for lubricant products with SON certification logo, while urging manufacturers to protect their brands by subjecting them to SON process and obtaining its seal."

The revelation by SON comes shortly after 11 PLC decried the influx of fake lubricants and attributed this to shortage of quality lubricants with the remedy to this being an assurance to flood the market with genuine lubricants.

Manager, Lubricant Sales and Marketing, 11Plc, Steve Ezendiokwere, gave the assurance recently at a ceremony organised by the company to reward winners of the on-going Mobil Super Peel and Win Promo in Port Harcourt.

Speaking to *Vanguard Newspaper* Steve said, "Before now, Ikoku Automobile Spare Parts market is hub of those involved in the adulteration of the lubricants. We are not saying everybody is involved but unavailability of products in the past paved way for adulteration of lubricants."

He went on to state that with 11 PLC, the era of unavailability of product is gone as they have taken steps to ensure steady availability of products. "Mobil lubricants will always be available for purchase, forthwith," assured Steve.

"We are aligning with changing trend in the country and the promo is our way of saying thank you to loyal customers," observed, General Manager, Lubes, 11Plc, Umesh Malik, on the promo that was first of its kind for Mobil in Nigeria.

Malik also thanked the leadership of National Automobile Technicians Association for robust relationship with the company over the years, expressing hope that a member of the association wins the Grand Prize. SON and 11 PLC are among the industry stakeholders vowing to combat the supply and presence of counterfeit products in one of Africa's largest lubricants market, Nigeria. ■

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10 QUESTIONS
FOR LUBRICANTS PROFESSIONALS

10 Questions with Richard Mugambi, Lubricants
Lubricants Manager, Gulf Energy Limited

PHOTO | COURTESY

In continuous provision of premium services to the region

With its inception in 2005, Gulf Energy has set up retail outlets in their largest market, Kenya, with the main purpose being to provide solutions to the advancing energy sector. The industry player has since spread its operations out to Central Africa. Lubezine's Kanyingi Kuria caught up with Lubricants Manager RICHARD MUGAMBI who gave insights on the industry from his experience as he also narrated how Gulf Energy is remaining relevant despite dynamics in the industry.

1. What led you into joining the lubricants industry?

Dealing with lubricants has been my professional career since the year 2005. This was shortly after completing my university studies. My first job in the lubricants industry was at Chevron and since then I have been dealing with lubricants at different capacities.

I have now been in the industry for close to 15 years.

2. What does your work entail as the Lubricants Manager?

I manage quite a number of operations on a daily basis. There is obviously the management of the day to day sales of lubricants with the sales team and lube engineers across various customer sectors.

I also coordinate operations at the blending facility. Strategizing on the sales roll out plan also falls under my docket.

3. What do you think is Gulf Energy's X factor given the pres-

ence of other major and highly competitive lubricants manufacturers in East and Central Africa?

Focus. Our focus is customer centric and we leave nothing to chance when dealing with consumers.

This entails attending to their inquiries and concerns for instance on a given product for their specific machinery and especially through technical support.

By doing so, we are able to connect with the customer, a key factor in building long term business relationships with them.

Our legacy also speaks for itself. Gulf Energy lubricants are produced at premium quality therefore designed to meet the needs of the market.

4. What does your marketing look like and what's your focus during campaigns?

Our marketing campaigns are out there to the masses and the main objective is to engage with them.

It's from this kind of interaction that we understand the market needs in a more informed manner thus designing products that are relevant to the market.

Our campaigns also seek to expand audiences across the regions of operation which effortlessly comes with increased sales volumes.

5. Lubricants by large are regarded as sophisticated technical products. Do you think thorough knowledge by a company's employees about the product have anything to do with the success of the given brand?

Absolutely. The sales team like in our case here at Gulf Energy has to have a technical background.

This is essential in dealing with customers whose needs may extend to the technical aspects of the equipment they seek to lubricate.

The sales team has to really understand technical aspects to help them identify the needs of the customer.

For growth we also reinforce their skills through in-house trainings; quarterly trainings just to keep abreast with the industry trends and new products we are launching or developing.

6. How would you rate lubricants knowledge in Kenya right now on the side of customers?

Average. See, with the liberalization of the industry, many players have come in and so have products which the customer may not be well informed about when making choices. This is quite dangerous given the malpractices that may slip through due to lack of knowledge and strict rules and regulations.

However, the support in the industry through the Petroleum Institute of East Africa (PIEA), Kenya Bureau of Standard (KEBS) plays a critical role to influence implementation of proper standards.

7. Additives technology. It has driven by great extent the innovation of lubricants. How does Gulf Energy ensure that lubricants formulated locally keep up with the latest global trends?

We work with international additive suppliers whose products are not only globally recognized but highly trusted. That sets the foundation for production of world-class lubricants.

We are also enlightened on new technologies from our additive partners with whom we have established long term relationships.

8. You have been in the sector for quite some time now. What's one challenge that continues to clobber the industry and what can be done to address it?

Substandard products are a serious concern. Most of these products come from Asia and Middle East and upon arrival they are sold at really low prices. This sets an unfair and uncompetitive market from the start and the dealers take advantage of the uninformed customers by claiming that the products meet the specifications while they do not.

This is closely linked with the price-driven market in Eastern African. Customers tend to flock at the dealer whose products are lower priced much to the detriment of their equipment.

How have counterfeits affected your brand? What measures are you putting in place?

At this point our products have not been counterfeited yet but we have put measures in place should such contingencies occur. Our new packaging e.g. for the jerry can has a seal which if delivered broken; is a direct indicator that the product has already been tampered with. That and other features of our packaging help customers to recognize real from fake products.

> ***"...with the liberalization of the industry, many players and products have come in which the customer may not be well informed about when making choices."***

9. What do you think is the least explored opportunity when it comes to the Kenyan and by extension, East African lubricants market?

Food Grade Lubricants (FGLs). They are not as commonly used as it should be the case. This could be due to the fact that there lacks clear standards and policies on their use.

In fact, most of the food manufacturing or processing industries that use them are mostly multinationals who have set up business in Africa or the few processors that export food to regions such as Europe and therefore have to comply with measures that govern usage of FGLs.

10. To the young minds aspiring to join the lubricants industry. What would you say are the academic qualifications and character traits for them to have a successful lubricants career?

An undergraduate degree in Engineering is a good start and preferably with a bias in petroleum. Other supporting professional courses are marketing and supply.

An individual willing to venture into this must genuinely have a liking for machines and an interest in technology.

Continuous learning is equally important. This enables one to know the evolving industry trends and the different equipment technology being invented each day. ■

DIAGNOSIS

Used oil analysis - a holistic assessment

John Evans, B.Sc.

Diagnostic manager at WearCheck

Oil analysis involves drawing a small sample of oil from a lubricated piece of machinery and analyzing it for the presence of wear debris and contaminants, as well as an assessment of the health of the oil itself. The oil (or grease) can be subject to a whole battery of physical and chemical tests which, in turn, can provide upward of 50 (in the case of a fully comprehensive analysis) different parameters that need to be assessed in order to determine the health of the machine, the health of the oil and the levels of contamination. How does this assessment take place? A question commonly asked by users of oil analysis is 'Can I have a copy of the limits that you use?' The use of limit tables is highly simplistic and in some cases can be very badly misleading.

There are many reasons why wear limits can be dangerous (although they do have their uses in some situations). The problem with limits is that they look at laboratory readings in isolation: 0 – 50 is okay, 50 – 100 is a problem and over 100 is critical.

In its simplistic form that is fine, but it is often the case that 50 – 100 might only be a problem depending on what the other readings are doing. 75 might be critical in one situation but perfectly normal in another.

Sources of silicon

Silicon provides a wonderful example of how vital it is to look at the whole picture. To most people familiar with oil analysis, silicon is used as an indication of dirt entry. Dirt is mostly composed of a chemical called silicon dioxide, and silicon can be easily detected by a laboratory instrument called a spectrometer.

The important thing to note here is that the instrument is detecting the chemical element silicon, not the compound silicon dioxide. Unfortunately, life is never simple, and the silicon found in oil can have many other sources.

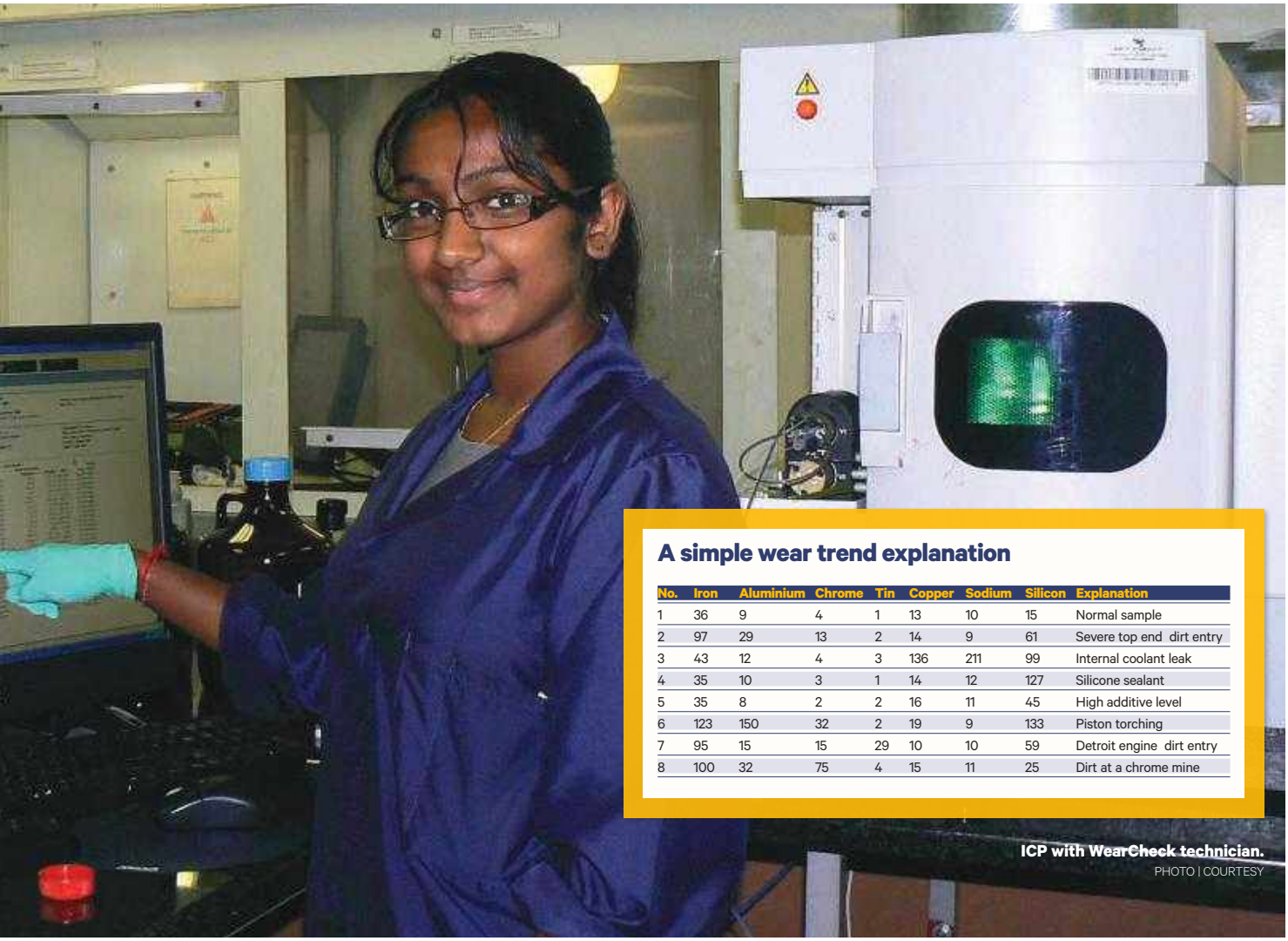
So, how do we tell whether the silicon is due to dirt entry or some other origin? Simple, you have to look at what the other readings are doing in order to determine where the silicon is coming from, in other words, perform a holistic diagnosis.

Dirt is highly abrasive and when it comes in contact with oil it essentially forms a kind of grinding paste that causes accelerated wear of the component being lubricated. In a diesel engine for instance, if fine dust were to get past the air cleaner and into the upper cylinder area, it would cause immediate wear to the pistons, rings and liners. In most cases the pistons are made of aluminum, the rings of chromium and the liners of iron – not only would we expect silicon to go up, but the iron, chromium and aluminium would increase too, and this is exactly what happens, producing a very common wear profile.

In the next scenario the silicon also goes up, the iron, aluminium and chromium hardly increase at all but the copper and sodium go through the roof – what is going on here? This is an example of an internal coolant leak; when this occurs, water leaks from the cooling system, through a pitted liner for example, into the engine oil but at operating temperatures and pressures the water evaporates off. However, the coolant conditioner chemicals get left behind in the oil.

One of the chemicals commonly found in coolants is sodium metasilicate, a compound that contains both silicon and sodium which now show up in the oil. The high copper comes from normal leaching of the cooling system. The next example shows high silicon on its own with no increase in any of the other readings. In this case the origin of the silicon is from a silicone based gasket or sealing compound.

If a repair has recently taken place and one of these compounds has been used then it is possible for them to leach into the oil. The silicon rockets, but because this form of silicon is non-abrasive, no increase in wear is noted. What can be confusing in



A simple wear trend explanation

No.	Iron	Aluminium	Chrome	Tin	Copper	Sodium	Silicon	Explanation
1	36	9	4	1	13	10	15	Normal sample
2	97	29	13	2	14	9	61	Severe top end dirt entry
3	43	12	4	3	136	211	99	Internal coolant leak
4	35	10	3	1	14	12	127	Silicone sealant
5	35	8	2	2	16	11	45	High additive level
6	123	150	32	2	19	9	133	Piston torching
7	95	15	15	29	10	10	59	Detroit engine dirt entry
8	100	32	75	4	15	11	25	Dirt at a chrome mine

ICP with WearCheck technician.
PHOTO | COURTESY

this situation is that the engine might be brand new, results might be elevated due to bedding in and a silicone assembly grease may have been used.

How do you determine what is going on in this case? A further aspect of holistic diagnosis needs to be considered here. If there are only 15 000 km on the truck then it is highly likely that this is a bedding in situation, however, if the truck has over a million on it then it is probably abnormal wear caused by dirt entry.

All the information supplied with the sample needs to be considered. Next we can look at a very similar situation, but here the silicon has only increased slightly, to the point that the silicon is elevated but not critical and once again the wear readings are all normal.

All engine oils contain an additive called poly-methyl-siloxane (yes, another source of silicon). This additive stops the oil from foaming, occasionally oil companies get their blends wrong and can either over- or under-dose on a particular additive. This particular situation has been noted twice in the last ten years. Normally the silicon level in new oil is between five and 10 ppm but new oils with silicon as high as 60 ppm have been analyzed. This has an interesting effect on the particle count that now goes up, but when the oil is filtered and examined under a microscope, no contaminants can be detected; yet another example of holistic diagnosis.

Silicon dioxide is not the only constituent of dirt – it is usually accompanied by aluminium oxide, so if actual dirt entry is taking place one would expect the aluminium to increase in a fixed ratio to the silicon. This is, in fact, what happens in engines, transmissions and hydraulics the Si:Al ratio is around 2:1, in drivetrain components it tends to be a little higher, maybe as high as 10:1.

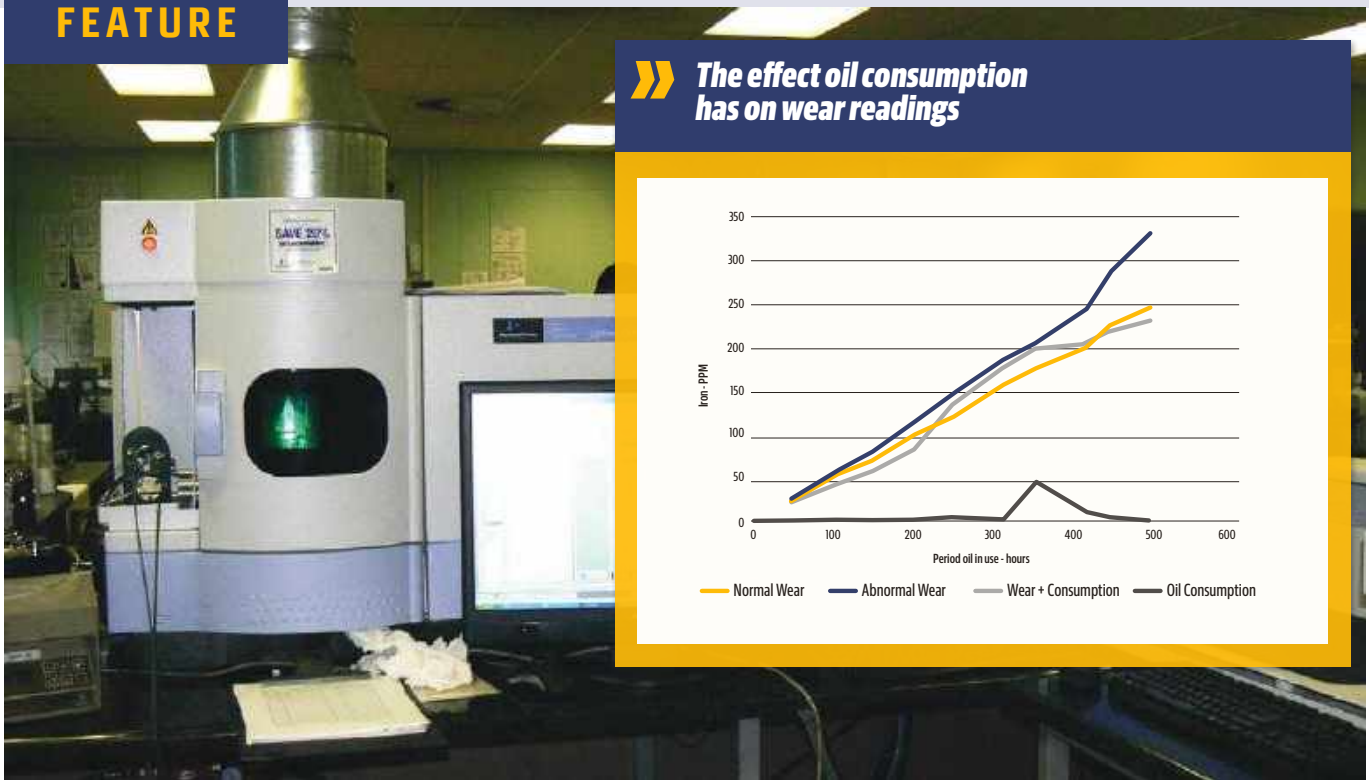
In our next example we see an increase in our familiar four, iron, chromium, aluminium and silicon but in this case the silicon and aluminium readings are almost the same – something does not look quite right. This is a very rare example as it is a sudden death failure that is hardly ever caught by oil analysis. This is a case of piston torching with dirt generally not being involved.

A faulty spray pattern on an injector can cause fuel to lie on the crown of the piston and burn, obviously this will mean the iron, chromium and aluminium will increase but where is the silicon coming from?

Aluminium pistons are often alloyed with silicon carbide which reduces the coefficient of expansion and this is where the silicon comes from when torching takes place. But wait, there's more! What happens in the opposite situation where dirt entry is happening but the aluminium to silicon ratio is close to 1:10?

Another aspect of holistic diagnosis needs to be considered here – the information supplied by the customer. Detroit diesel two stroke engines have a tin flashing on their pistons, and what would be observed here is an increase in iron and chromium and obviously silicon, but with the tin flashing (an efficient conductor of heat) the aluminium

CONTINUED ON PAGE 26



When analyzing oil samples, the ICP (inductively coupled plasma) machine provides data such as contamination and wear levels that can be used as part of a holistic diagnosis of the sample.
PHOTO | COURTESY

CONTINUED FROM PAGE 25

does not go up nearly as much. What you do see is an increase in the tin, an element normally associated with bearing alloys, but in this case its origin is the piston. Before we leave silicon, there is one last aspect that needs to be looked at. Dirt is an environmental contaminant and in the vast majority of cases it will be a mixture of silicon and aluminium oxide, but what happens if these compounds are not in the environment?

The last silicon example shows an increase in aluminium and iron, a massive and disproportionate increase in chromium and virtually no increase in silicon. This is what dirt entry might look like on a chrome mine.

Confusing copper and muddling molybdenum

Silicon is not the only element that can have more than one source. Like silicon, copper can be a contaminant, wear metal and, on very rare occasions, an additive. Copper is a metal found in brass and bronze alloys and makes up bushes and thrust washers in various components.

In a wear situation one would expect associated metals, such as tin and lead to increase and maybe zinc and maybe even iron. As a contaminant, you often see copper leaching from the cooling system. If it leaches from the oil side, astronomically high copper would be noted but none of the other readings would change.

If the copper comes from the water side of the cooling system, then coolant additives such as sodium, silicon, boron or molybdenum would probably be noted. This brings us on to molybdenum, another metal that can be a contaminant from both the cooling system and greases, an oil additive as an anti-oxidant or a solid additive and as a wear metal found as a coating on piston rings or in synchromesh gearboxes.

In fact, most elements detected by the spectrometer can belong to more than one of the three main groups (additive, contaminant, wear metal) and often to all three.

What can be particularly difficult to assess is when an element belongs to more than one group at the same time.

This is why a simple wear limit table is simply just not going to be able to cut it. It requires a huge body of knowledge and years of experience to become a skilled and accurate diagnostician.

When analyzing oil samples, the ICP (inductively coupled plasma) machine provides data such as contamination and wear levels that can be used as part of a holistic diagnosis of the sample

Trends and ratios

Iron can sometimes be used as an internal reference in the fact that in any mechanical system, it is the major wearing element. This can then be used as a benchmark and other readings compared to it. 20 ppm lead (a coating found on main and big end bearings) might be acceptable in an engine, but, if the iron reading is only 25 ppm, then something does not look right as there is so much more iron in an engine than lead.

In this case it is not the actual concentration that is of concern but the ratio of the two elements in question. Trends are another aspect that need to be considered; a trend of 50 ppm iron might be normal, but if it jumps to 85 ppm, that might indicate a problem.

Likewise, a trend of 30 ppm might also be normal but a jump to 50 ppm could indicate something is going wrong. In one situation 50 is acceptable, in another it is not and it is only by looking at the history of the component that its well-being can be assessed.

Finally, customer supplied information is absolutely critical – things like application, environment, oil and fuel types, machine age and oil consumption can have a huge impact on how an oil sample report is assessed. The more information that the diagnostician has, the better the diagnosis will be.

Perhaps the most vital piece of customer supplied information is how long the oil has been in use. 50 ppm iron might be fine after 250 hours of operation, but critical after only 50 hours and suspiciously low for 500 hours. In the case of the suspiciously low iron reading, maybe the oil consumption is elevated.

Every picture tells a story

Only a holistic assessment of the data will provide the correct answer, looking at readings in isolation only gives a blurry picture in black and white and can often miss the rich tapestry of colour that can be achieved from a holistic perspective. ■

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By James Wakiru

MAINTENANCE OPTIMIZATION

Role of lubrication condition monitoring in maintenance optimization

Maintenance optimization entails developing of maintenance actions or tasks and intervals, driven to minimizing downtime while ensuring lowest possible costs. Maintenance optimization seeks to minimize maintenance cost, downtime caused by both maintenance(diagnosis and repair time) and maintenance inventory/ spares policies, while maximizing optimal equipment performance, the time between failures, reliability, revenue and profitability, return on asset and return on investment.

While undertaking maintenance optimization, various aspects related to safety, environment and health objectives, maintenance costs, equipment life, production schedules and demands, and lost production costs require to be considered.

In this regard, various stakeholders across an organization should be involved in a concerted multiple objective optimization, an aspect that echo the importance of communication and knowledge sharing within an organization. Moreover, it is becoming imperative, that close co-operation between management, supply chain, maintenance personnel and analysts is required to achieve a successful optimization.

A lubricant and the lubricant condition monitoring program play a vital role in achieving maintenance optimization. Similar to other variables that also impact the maintenance cost, lubricants and lubrication systems retain a proportionate share constituting the maintenance cost of a facility or equipment. Some factors that could be considered in the LCM program to drive maintenance optimization are briefly discussed in this article.

Preventive maintenance (PM) interval optimization also referred in Lubricant Condition Monitoring (LCM) as Oil drain interval optimization is widely employed to improve the mean time before failure(MTBF) of both the equipment as well as the lubricant. PM interval optimization is becoming the principal focus for plants that striving to reduce maintenance costs related to lubrication. This can be achieved by scheduled Used Oil Analysis (UOA) to ensure maximum exploitation of the lubricant life in terms of its property's depletion and contamination.

Key to the optimization is the evaluation of the deviations of the lubricant properties (physio-chemical, contamination, wear and additive analysis) while considering changes in the intervals. Statistical analysis techniques used to predict the evolution of various properties, for instance, regression analysis could offer insights. However, while considering optimization of the lubricant drain interval, a balanced trade-off between the benefits and cost should be considered.

An extension, which often time represent the expectation, may impact other parameters of the lubricant negatively, which subsequently will affect the equipment condition. This aspect is fundamental to be established, while it varies from one equipment to another.

On the contrary, in some cases optimization would mean reducing the drain interval to address other challenges, like the negative aspects of wear and contamination at varied intervals. For a plant to ensure lower risk exposure while undertaking such measures, risk assessment could be performed, for instance, Lubricants Failure Mode and Effect Analysis (FMEA) or Root Cause Analysis(RCA)

One variant that addresses oil drain interval optimization, represent the use of long drain lubricants. Long drain lubricants demonstrate the potential of reducing downtime especially caused by preventive maintenance(PM) such as lubricant replacement. With the availability of lubricants based on Group II and Group III base oils and improved additive technology, long drain lubricants have been advanced by many players in the market.

> ***A lubricant and the lubricant condition monitoring program play a vital role in achieving maintenance optimization***

Despite the improved optimization by the indicated extension, caution should be taken as this requires a trade-off between the lubricant and reliability factors of the other equipment or components replaced during PM actions. For instance, the lubricant filters being used, may not last a similar interval as the lubricant in use, hence the need to address the two aspects separately.

Synthetic lubricants fulfil a significant role in maintenance optimization. Synthetic lubricants offer a broad range of benefits that could be harnessed while addressing maintenance optimization. With the inherent characteristic of a long drain, synthetic lubricants promote longer equipment life and extend the lubrication intervals. This not only offers a reduction in maintenance cost or impact on the maintenance budget but additionally provides an effective scheduled maintenance program.

Furthermore, superior mechanical efficiency due to reduced internal friction leads to reduced operational costs(due to reduced energy consumption). Unique applications, that portray extreme applications such as high-temperature environments (furnaces, fan bearings), or low temperature applications(refrigeration) are effectively addressed by synthetic lubricants blended to function in the respective environment.

Other factors for instance, the integration of other condition monitoring techniques(e.g. vibration analysis, ultrasound), lubrication automation, modern tools enhancing both data analysis and management for prognosis and diagnosis, filtration systems, training on lubricant condition monitoring and areas where reliability interacts with LCM(e.g. routine inspection, housekeeping), would undoubtedly enhance maintenance optimization and equipment life. ■

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