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VOL.18 • JULY - SEPTEMBER 2016



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RAILWAY PROJECTS CREATE NEW LUBES MARKET

PLUS: New ASTM Test to Evaluate Diesel Engine Oil Oxidation P.24



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EDITOR'S DESK

VOL 18 • JULY - SEPTEMBER 2016

EDITORIAL



A change of guard



Born in the year 2010, Lubezine magazine has continued to make consistent strides towards establishing itself as the premier source of information about Africa's ever-growing lubricants industry.

Throughout this time, the zeal and depth of knowledge of the magazines contributors, together with the support of the advertisers, have ensured the magazine remains relevant, and continues to highlight lubrication issues across the African continent.

This 18th edition marks a change of guard, a transition to a new phase for the publication. After years at the helm of Lubezine's editorial desk, it is my great pleasure now to hand over the mantle to my colleague and friend, Mr. James Wakiru. Mr. Wakiru is in the league of the finest lubricants professionals that the region has ever produced, and will without a doubt propel the magazine to even greater heights. Please join me in welcoming him to the driver's seat.

Africa is a continent teeming with maintenance challenges. However, Africa's remarkable resilience is helping to overcome these problems. That low quality oils still find a ready and sizeable market in the region is testament enough that a lot needs to be done to increase awareness of use of quality products for increased machinery health and life. Mr. Wakiru's, plate is therefore full as he takes over the noble goal of improving the lubrication standards of Africa, through Lubezine.

I take this opportunity to thank the editorial board of Lubezine magazine for having accorded me the opportunity to guide the publication from infancy to this 18th edition. This edition, as has always been the tradition, is packed with news from across the continent and expert opinions by some of the leading lights in the lubricants industry.

With Africa renewing and constructing afresh its railway network, the lubrication requirement of locomotives will come into sharp focus. From South Africa to West Africa and East Africa, there is a new dawn as iron tracks crisscross the continent. We have highlighted the technical requirements of lubricants that the trains will require. We have also featured in our technology feature how new transmission system in the automotive sector, such CVT is resulting in development of specialized transmission fluids.

Finally our market report has interesting news ranging from new product launches, massive investment in new blending plants and appointment of distributors for distribution of some of the most recognizable global lubricants brands.

I am very grateful to all those who supported Lubezine magazine over the years and I remain confident that the publication will continue with its great march forward. ■

Joseph Ndungu



Mr. Wakiru is in the league of the finest lubricants professionals that the region has ever produced, and will without a doubt propel the magazine to even greater heights.



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THE MARKET REPORT

NEWS • BRIEFING • NEW PRODUCTS • TECHNOLOGY

Engen's new oil targets public transport motorists



Engen Kenya acting Managing Director Anthony Mbugua (right) pose for a photo with Matatu Owners Association Chairman, Simon Kimutai (center) and IBD Business Development Manager Hassen Zalgaoanker after the unveiling of Engen Dieselube products at the Carnivore Grounds

Regional oil marketer Engen has launched into the market a new diesel engine lubricant that targets the lucrative matatu industry. The company in a ceremony graced by Engen Acting Managing Director Mr. Anthony Mbugua launched the lubricant named Engen Dieselube Matatu. Other invited guests included, Engen South Africa Business Development Manager Christian Li, IBD Business Development Manager Hassen Zalgaoanker and Matatu Owners Association chair Mr. Simon Kimutai among others.

Speaking during the launch, Mr. Mbugua, stated that the company has been working closely with the Matatu Owners Association in creating partnerships that create value to the matatu industry. "We are happy to come up with a new product for our partners in the matatu industry. This is the only product of its kind that has ever been designed and localised to service the big and ever expanding industry," He said.

Matatu Owners Association Chairman Mr. Simon Kimutai speaking during the launch stated that the matatu industry is expanding in the recent years. "We have over 80,000 units of matatus operating in the country. Matatu industry is almost saturated and can turn into a loss-making venture. We appreciate the partnership we have with Engen for a long time in the supply of fuels, oils and greases to our members through various initiatives we have with them," he said. "While our vehicles are

serviced every 2 weeks, you can appreciate the volume of lubricants and greases we consume," He added.

Mr. Mbugua pointed to the commitment that Engen has in ensuring the matatu owners get value for their investment while ensuring they have the right protection for their vehicle. "It's not cheap to own a matatu in Kenya with trends changing every few years. With 80 percent of matatus on the roads being on loan, maintenance is a key factor in ensuring that these investments are always on the road," he said. "We thought around it and brought out a product which is more affordable, that is quality guarantee for the matatu industry and one that the matatu industry can be attached to, something that will give them value for their money," he added.

Mr. Mbugua stated that majority of the cost of operating a matatu goes to fuel, tyres, and service. He notes that Engen has geared itself towards providing the industry with a lubricant with the right ingredient to ensure adequate engine protection at an affordable price.

Matatu Owners Association chair Mr. Kimutai also noted that counterfeit lubricants are rife in the industry and urged members to buy genuine oils and not back street lubricants which are recycled and sold as new. "I urge member to support such initiatives. When we have reliable oils, our engines last longer and we save money. It is important for us to do business that is meaningful," he added. ■

Bharat Petroleum seeks distributors in Kenya

Bharat Petroleum, India's government-owned oil company is seeking to establish operations in Kenya with plans already in place to create a distribution network in the country. Oil distributorship deals had already been struck for its "Mak" range of lubricants by India's Prime Minister Narendra Modi's visit to Nairobi on July 10th, 2016, reported the Business Daily.

The firm is owned 54.93 per cent by the Indian government and its range of lubricants targets diesel and petrol engines, gear oils, aviation, transmission oils, specialty oils and greases.

"Bharat Petroleum invites applications from reputed business firms having experience in the field of sales and distribution of automotive/fast moving consumer goods/industrial products/ and having robust financial background," the firm said in a notice published in local newspapers.

Interested firms will have to pay a \$200 (Sh20,000) non-refundable application fee to Bharat Petroleum via wire transfer according to the Business Daily.

Unlike motor petrol, the price of lubricants – a byproduct of oil – is not controlled by the Energy Regulatory Commission (ERC) and analysts reckon that the oil and greases offer high profit margins, the Business Daily observed.

In September 2015, Bharat Petroleum disclosed that it was in talks with Tullow Oil to acquire a 10 per cent stake in exploration blocks 10BB and 13T where the Irish explorer has discovered over 600 million barrels of crude. The Mumbai-based firm in July 2008 signed a \$15 million equal joint venture deal with Kenya Pipeline Company to set up a liquefied petroleum gas plant in Nairobi.

Bharat Petroleum's impending entry into Kenya's lucrative lubricants market further deepens the oil giant's presence in the Kenyan market. ■

Vivo (Kenya) rewards Shell lubricants resellers



Vivo Energy is leading the way in forging rewarding business relationships with channel partners by rewarding four lubricants resellers in Kenya. Each of the four resellers was awarded KES 250,000 worth of home makeover under the Shell Lubricants rewards programme.

Speaking during presentation of the rewards, Mr. Stephen Gikonyo, the Lubricants Sales and

Marketing Manager said, “We at Vivo Energy are committed to working with all our channel partners to make Shell Lubricants available to consumers in every corner of Kenya” He added “It is with this in mind that we are recognising these and we shall continue to do so for those partners that stand out from the rest from time to time”.

The resellers that were awarded included Kasinga Auto Spares, Nairobi region, Prayosha

Hardware, Rift Valley region, Mko Kenya Ltd, Western and Malindi Auto Tuk Tuk Coast Region.

Vivo Energy Kenya is part of the larger Vivo Energy Group which is the Shell Licensee for distribution and marketing of the Shell brand in Africa. In Kenya, the company has invigorated the Shell brand and has made great strides in restoring the Shell retail network foot print across the country. ■

VIVO (Kenya) opens motorbike service centres at Shell stations



Vivo Energy Kenya has partnered with Bajaj Auto Limited - through Dubai Auto Gallery, DAG - the company that distributes Bajaj motorcycles to open Motorbike Service centres at Shell service stations across the country dubbed Shell Advance MotoCare Express.

This concept is a first in Kenya, and will offer a designated motorbike service centre providing oil change and general bike service using Shell Advance motorcycle oils and genuine motorbike spare parts. The first Shell Advance MotoCare Express centre will be opened at Shell Bidii service station in Eastleigh, with similar centres planned across Shell service stations in

Kenya.

Speaking during the launch, Vivo Energy Kenya, Retail Manager Lena Munuve said that the company is committed to serving the motorbike market which is steadily growing year on year. “Vivo Energy Kenya values all its customers in equal measure. The motorbike industry has, over recent years, witnessed a spike in growth. The launch of the motorbike service centre at Bidii Shell service station is the start of offering a differentiated service to our motorbike customers, and an affirmation that Vivo Energy Kenya recognises and appreciates their business. Shell Bidii service station is the first, and we will replicate this service across selected other Shell service stations in the country,” said Ms Munuve.

Also present at the launch was Lubricants Sales and Marketing Manager Vivo Energy Kenya, Stephen Gikonyo who commended the partnership and the products that will be offered at the Shell Advance MotoCare Express centres. He noted, “We are delighted by this

great partnership with Bajaj. We know this is for a long haul and look forward to a strong relationship with them in this venture. Shell is well known for its innovation and differentiated products and Shell Advance is the best oil for motorbikes. Shell Advance MotoCare Express service centres represent our promise of a professional oil change and general service for all types of motorbikes at Shell service stations.

Speaking during the launch, the Chief Commercial Officer Bajaj Motorcycles, Mr. Rahul Dhawan expressed satisfaction with the partnership as the two leading brands complement each other for the benefit of the motorbike industry. He commended Shell high quality products and was optimistic that the partnership in Kenya will mark the beginning of a long journey for the two brands across other markets where both Dubai Auto Gallery (DAG) and Vivo Energy operate in Africa.

During the launch, the first 200 motor bikes were offered free oil change using Shell Advance AX5 20W-50 premium motorcycle oils and free reflector jackets. ■

TOTAL QUARTZ ECONOMY RUN 2016



Oliver Biyogo, the Total Kenya Lubricants sales manager Manager flagging off TOTAL Economy run competitors at the ABC Total service station.

The TOTAL Quartz Economy run is an annual competition organized by the Alfa Romeo Owners Club (Kenya) since 1981 when it was known as the Economy Run. It covers an 84 kilometer route between Nairobi and Naivasha. Unlike other competitions where the first to finish is the winner, the TOTAL Quartz Economy run rewards the competitors with the best fuel economy and uses the least fuel.

Total Kenya began sponsorship of the competition in 2009 to highlight the benefit of using TOTAL Quartz Engine Oil and

driving safely to cut the cost of motoring by conserving fuel. The TOTAL Quartz Economy Run continues to use the original route with competitors registering at the ABC Total Service Station on Waiyaki Way with the finish control at Moi Road Total service station in Naivasha.

According to the company, TOTAL quartz range of lubricants is developed with an anti-aging solution for engines (Age Resistance Technology). This range of new generation oils for petrol engines gives exceptional performance and fuel economy. They are formulated with advanced additives technologies to increase

engine life and offer better protection against wear and premature engine failure and meet even the most demanding car manufactures' requirement.

Driving a 1982 Alfa Romeo Giulietta, Shailesh Chandaria captured his fifth TOTAL Quartz Economy Run victory in the 34th annual series. He used only 1.85 litres of fuel to cover the 84 kilometer route with an average fuel consumption of 45.4 kilometres per litre. Peter Wanday was placed second in his newly-acquired Alfa 156 sports saloon with third spot was taken by Vanu Chavda in an Alfa 155. ■



Shailesh Chandaria (right) and his co-driver Paul Mbuvi (left) receiving the trophy for first place from Oliver Biyogo (centre), Total Kenya lubricants sales manager



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PURSuing
NEW FRONTIERS

Tanzania standards agency impounds 46 million units of fake oil



Stern measures will be taken against those making counterfeits and substandard lubricants, Tanzania Bureau of Standards (TBS) has warned according to Tanzania Daily News.

Talking to journalists in Dar es Salaam, TBS Acting Director General Egid Mubofu said there will be no leniency for the culprits, urging those involved in the dirty deal to stop.

“We have in recent days nabbed some unfaithful people engaging in this illegal production of lubricants in Temeke and Ilala districts,” he said, noting that during the operation, an unregistered factory in Temeke was identified and closed, pending prosecution of its owners. He said 12,296 litres of substandard engine oil and 811 litres of brake fluid were impounded.

There were also 1,241 litres of ATF lubricant, with the entire consignment valued at 46m/-. Dr Mubofu called upon producers and importers of lubricants to ensure that they sell standard and quality products.

“Tanzanians should learn to use products with TBS mark for those produced within the country,” he said. He also said the Bureau will intensify checks on all products entering the country to ensure they meet required standards.

He also noted that TBS will continue to collaborate with other agencies like the Police Force and Tanzania Revenue Authority (TRA)

among others in enforcing laws and regulations.

“We depend on information from citizens,” he said, urging Tanzanians, especially at border areas to provide the bureau and other government officials with information that can help to crackdown on suspecting illegal conducts regarding counterfeits.

The move to curb the importation and supply of substandard lubricants by the TBS has been hailed by the lubricant dealers in Tanzania according to Tanzania Daily News.

The Marketing Manager of Oryx Energies Tanzania, Pendu Bahebe, said the intervention by the state organs has significantly eradicated fake lubricants in the market.

“The police force and TBS have done a commendable job in fighting substandard products in the market and this is good news to traders of genuine lubricants,” he explained.

He urged the two organs to continue working closely with traders by carrying out frequent inspections to identify substandard grease in the market.

“The demand for grease is expected to increase even more as the country gears up for massive industrialization as outlined in the Second Five-Year Development Plan - 2016/2017 to 2020/2021,” he explained. ■

ICIS Base Oil and Lubricants Conference set for Tanzania in November

ICIS have announced Dar es Salaam, Tanzania as the next venue for the 5th ICIS African Base Oils and Lubricants Conferences 2016. The event which starts from 1st – 3rd November 2016 at the Hyatt Regency, Dar es Salaam is the first of its kind to be held in the east Africa region with previous meeting recently hosted in South Africa.

The event themed “Supplying the African market: capitalizing on growing demand” is expected to attract over 90 attendees working in various industries from 22 countries across Africa and rest of the world. Some of the industries to be represented include Base oil producers, Additives suppliers, Lubricant blenders, Original Equipment Manufacturers (OEMs), Trade distributors and supplier, Petroleum economists, Consultants, Government representatives among others. Confirmed speakers include Valentina Serra-Holm, marketing Director Nynas; Jonathan Mwangi Njine, Chief executive Lubesol; Peter Hermes, Managing director Tanzania Mines among others.

The event which begins with a preconference seminar and conference is expected to touch on key issues including:

- Adapting to market conditions: a lubricant blender’s perspective from Fuchs Lubricants
- Driving automotive developments: demand for quality products from BMW
- Changing dynamics in the West African market: Focus on Nigeria from Lubcon Limited
- Supplying the East African market from Lubesol
- Regulating quality and imposing minimum standards from Intertek ■

Droplex launches Klüber lubes into Kenya, Uganda



Klüber Lubrication, a German specialty lubricants manufacturer, has entered the Kenyan and Ugandan markets, in collaboration with Droplex Industrial. The launch of the company's new products, held at the Ole Sereni Hotel along Mombasa Road in April 2016, brought together industry experts and engineers from various manufacturing sectors including beverage, food, cement and pharmaceuticals. There was a training program at the event, organized by Droplex Industrial Chief Executive Officer Mr. Crispin Mbogo.

Speaking during the launch in an exclusive interview with Lubezine, Klüber Lubrication Senior Sales Area Manager for South America and Central Europe Global Sales, Mr. Andreas Wilms stated that Klüber Lubrication decided to enter the East African market through a strong channel partner to tap into the potential that the market offers.

"East Africa industrial segment is growing

and the need for specialty lubricants is also growing in the region. Key issues in the market are raising the production output with increased demand for equipment while having a constrained budget," he said.

"A strong local presence is needed in the East African market. After the Kenyan launch, there will be a launch in Tanzania through a local partner called MIST Industries later in April. With the growth in the mining segment in Tanzania, we want to offer East Africa a strong network to provide customers value and benefits that go along with Klüber Lubrication products," he added.

Lauding the launch, Droplex Industrial president Mr. Crispin Mbogo acknowledged that Klüber Lubrication is one of the leading Specialty lubricants manufacturer in the world, saying that while Klüber Lubrication's entry into the market is not new, client's sales were handled from overseas and clients have been using Klüber lubricants for a long time.

"Klüber lubricants have been used in specialty applications for decades and are one of the most preferred specialty lubricants by original equipment manufacturers (EOMs) all over the world" he said. "The availability of Klüber specialty lubricants locally means that old and new clients can now benefit by using the right products to extend their equipment and component life," he added.

Mr. Mbogo added that partnering with Klüber Lubrication introduces a lot of opportunities in the market allowing old and new clients who encounter or have special conditions in their plants get a solution locally. Mr. Mbogo notes that the major challenge in the industry is the lack of knowledge of the existence of specialty lubricants that can meet any industrial condition be it extreme temperatures, high loads, speeds, and exposure to media.

"A lot of clients see it as normal replacing bearings regularly and actually believe that such components have a short lifetime yet they can last a lifetime if properly lubricated with the right lubricants," he said. "We expect to solve these challenges in the industry by spending time with our clients and impacting them with knowledge. Having been trained by Klüber Lubrication, we are very knowledgeable and technically capable to solve most of the lubrication challenges that our clients encounter and are aware of as well as those they have no idea are lubrication related," he concluded. ■

KenolKobil, Castrol to build lube blending plant in Mombasa

KenolKobil has announced it is set to begin the construction of a lubricants plant in Mombasa in a joint venture with Castrol after the UK-based oil major approved its share of investment in the project.

"Four weeks ago, we received notification that the head office of Castrol approved the budget for the project in Kenya," David Ohana, KenolKobil's chief executive, said during the release of the firm's half-year results in August.

"We still do not know when they will decide to launch the project. However, their go-ahead means we are now certain that we will be going to blend in Mombasa with Castrol."

KenolKobil has in the past indicated that the

construction of the plant is expected to begin by mid-2017 and will cost the two partners between \$10 million (Sh1.01 billion) and \$15 million (Sh1.51 billion).

The upcoming unit will have a monthly capacity of 1,000 tonnes of lubricants. KenolKobil has another smaller lubricants plant in Kenya with a monthly production capacity of 600 tonnes, producing its own brands.

KenolKobil currently imports the Castrol lubricants from South Africa, attracting an import duty of 25 per cent. The oil marketer is seeking to import only inputs that attract 10 per cent duty for local blending, critical in cutting costs.

Unlike motor petrol and diesel, lubricant

prices are not controlled by the Energy Regulatory Commission and analysts reckon that the products offer high profit margins.

In May 2015, BP Southern Africa and KenolKobil signed a deal giving the latter exclusive distribution rights for Castrol products, ending a tussle that had seen BP attempt to repossess the brand from Kenol and award it to former partner Shell.

KenolKobil recently announced that its half-year net profit for the six months to June rose 30 per cent growth to Sh1.2 billion on back of lower financing costs which stood at Sh97.9 million compared to last year's Sh379.4 million. ■

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Frequently Asked Questions

FAQS



Q How can driving conditions affect my vehicle's transmission?

Extremely hot or cold weather and poor driving conditions may affect the life expectancy of your transmission. Vehicles that are rarely driven or driven mostly short distances are in many cases subjected to unusual wear and strain. For example, cars that are driven short distances consistently never have the opportunity for the engine to warm up to the normal heat range. This can cause excessive engine wear.

Q Does a vehicle's transmission affect its gas mileage, and if so, how?

A good transmission operates at a higher speed, the engine has an easier

time doing its job. In most cases, this means a smaller engine can be used in the vehicle. This results in the vehicle getting better fuel economy, also known as gas mileage.

Q How will I know if my vehicle's transmission is having problems and needs repair?

A faulty transmission will give you various warning signs. For example, you might notice a burning smell, which could be a sign of overheating, dirty fluid, or a leak. You may see transmission fluid on your driveway or garage floor, which could be caused by a leak. Hearing unexpected sounds while the vehicle is on neutral mode is another signal that you need to get your transmission serviced or scheduled in for repair. Various other unusual sounds could

also be warning you of a transmission problem.

Q Why does the transmission fluid change to a dark brown or a blackish color when it was just changed recently?

The reason it changes color so quickly is that the red dye is temperature related, and if your fluid is changing color quickly, then the transmission is overheating for some reason. The problem could possibly be slippage in the transmission, or lack of lubrication. If you have this problem then it is time to have it checked out by an authorised service provider in your area. ■

Major Oil Companies announce new API CK-4 and FA-4 diesel engine oils



The American Petroleum Institute in March 2016 announced the first release date for appearance for the API service Symbol 'Donut' on December 1, 2016. While most truck manufacturers recommend API licensed CJ-4 oils, this will cause a shift to using the licensed API CK-4 oils as soon as they are available. According to the American Petroleum Institute, FA-4 licensed oils are designed to protect diesel engines that are expected to be on the roads sometime in 2016 or 2017. While it is believed some engine manufacturers will likely recommend API FA-4 oils for their previous model-year vehicles, but it is likely manufacturers recommending API CJ-4 oils today will just recommend API CK-4 for

these vehicles when the new categories are introduced.

Major oil companies have announced new engine oils meeting the new CK-4 and FA-4 categories following the first allowable use of December 1, 2016. Shell lubricants in July 2016 announced the new Shell Rotella heavy duty diesel engine oils. According to the company the Shell Rotella T4 15W40 and 10W30 and Shell Rotella T5 10W30 are formulated to meet the specification criteria for the new API CK-4 service category. The Shell Rotella T5 Ultra 10W30 will meet the API FA-4 category will be released in December according to the company in a statement.

Total Canada has announced the launch of its new Rubia Optima lubricants range meeting the

API CK-4 and API FA-4 oil categorist sing effect from December 2016 the company announced in September 2016. The company will launch the full range of Rubia Optima lubricants in October 2016 stating that the CK-4 oils will be backward compatible.

Chevron lubricants has unveiled its new line of Delo 400 API CK-4 and API FA-4 oils in August 2016. The Delo 400 range includes 6 oil viscosity categories expected to meet the new standards. The company in a statement states that this new oil categories have been designed with ISOSYN Advanced Technology. The first API CK-4 oil will be ready in September 2016 according to the statement.

Other majors to announce the launch of their new line of lubricants meting the new oil categories include Phillips 66, Valvoline and Amsoil among others.

According to API the new category FA-4 oils are neither interchangeable nor backward compatible with API CK-4, CJ-4, CI-4 with CI-4 Plus, CI-4, and CH-4 oils. It recommends users to refer to the engine manufacturer recommendations to determine if API FA-4 oils are suitable for use. The new FA-4 oils are also not recommended for use with fuels having greater than 15ppm sulfur. ■

New ASTM test to evaluate diesel engine oil oxidation

by OEM News

A newly proposed ASTM International standard (WK52873 Test Method for Evaluation of Diesel Engine Oils in the Volvo T-13 Diesel Engine) will evaluate diesel engine oils for oxidation performance characteristics. This will help ensure that industry guidelines are used and trucks and other vehicles are receiving the proper oil for T-13 engines.

Committee D02 on Petroleum Products, Liquid Fuels, and Lubricants developed this standard with support from ASTM International's Test Monitoring Center (TMC).

The Volvo T-13 test method covers an engine test procedure for evaluating diesel engine oils for oxidation performance characteristics, utilizing a turbocharged 500 horsepower, Volvo eight cylinder engine equipped with exhaust



gas recirculation (EGR) and running on ultra-low sulfur diesel fuel. The test is run at 1,500 RPM for 360 hours, maintaining the oil gallery temperature at 130 degrees C since oxidation is induced by high temperatures.

"We welcome industry stakeholders who want to use and improve this important test method," says ASTM member Hap Thompson, president of Global PPL Standards Associates in Saint John's, Florida. "In particular, the TMC is providing reference oils as well as engineering and statistical services to laboratories that desire to produce test results that are statistically similar to those produced by laboratories previously calibrated by the TMC."

The primary users of this standard will be company and independent lubricant laboratories, oil blenders, and lubricant manufacturers that want to compete in the marketplace and follow industry guidelines. Regulatory agencies will also use the standard to ensure their fleets are receiving the proper oil for their equipment. ■



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Railway infrastructural projects herald new market niche for lubes



One of the delivered engines to be used in the SGR rails when completed/Source: Mega Projects Kenya

In recent years, Africa has seen a renewed vigour in development and upgrading of its mostly colonial-era rail network. According to a report released by the Africa Development Bank Group (ADB) titled *Railway Infrastructure in Africa – Financing policy options* released in May 2015, the opportunities for railway development in Africa stem from various factors.

First, growing urbanization and industrialization pose new challenges that railways are well-suited to handle. Second, growing mining industry producing bulk mineral and commodities present a natural market for railways in Africa. Third, the huge continental mass of Africa and the existence of many landlocked countries encourage the development of high capacity and efficient transport corridors.

To address these challenges, African countries have over the past several years undertaken to build better railway infrastructure. One of the most ambitious projects is the Kenya SGR railway line. According to Kenya's Ministry of Transport and Infrastructure, the new standard gauge railway (SGR) line will be used for passengers and cargo transportation between Mombasa, the largest port in East Africa, and Nairobi, the capital city of Kenya.

Billed as the largest infrastructural project in Kenya since independence, the new line will cost a whopping USD3.2 billion for the Nairobi – Mombasa section a distance of about 500

km. Upon completion in December 2017, this section will shorten passenger travel time from Mombasa to Nairobi from more than ten hours to a mere four hours while the Freight trains will complete the journey in less than eight hours.

Eventually, this line will be extended to Malaba, a border town between Kenya and Uganda, from where it will snake through Uganda to the border with Rwanda, with another branch reaching the border with south Sudan. Each of these states will then be expected to take up the construction of the line through their country. It is not very clear if Rwanda will take up construction from here as the country has opted to connect to a new SGR line through neighboring Tanzania.

Ethiopia has made giant steps towards modernization of its railway infrastructure. In 2015, the country unveiled the first phase of its Addis Ababa Light Rail, the first electrified light rail transit system to open in South-Saharan Africa. The railway system, developed in collaboration with China cost \$475 million.

Another project in the offing is the 700 km Djibouti to Addis Ababa line. The railway is due to become fully functional later this year and aims to provide the link to landlocked Ethiopia with improved access to sea providing the country with a dramatic improvement in socio-economic development according to a report appearing in the railway technology website. The Addis Ababa - Djibouti line falls within the Ethiopian government's ambitions to transform the Horn of Africa nation into a middle-income

country by 2025, the report further added. After an average economic growth of more than 10% of GDP over the past decade, one of its aims is to have 5,000km of new-built rail lines working across the country by 2020 according to this report.

In the western part of Africa, Nigeria has embarked on a modernization initiative aimed at replacing the existing narrow gauge system with the wider standard gauge system, while allowing high-speed train operations on the railway network. The \$8.3bn contract for the Lagos-Kano standard gauge modernisation project awarded to CCECC in 2006 marked the beginning of the initiative. This line is to be completed in phases with the Abuja -Kaduna segment being the first to be implemented.

The 186km line with standard gauge railway tracks from Idu, near Abuja, to Kaduna in the north-western region of Nigeria was completed in 2016 and has rapidly transformed movement of passenger and cargo between the two cities. The passenger trains on the line, with a capacity of 5,000 commuters can operate at a speed between 200km/h and 250km/h cutting down the travel between Abuja and Kaduna to one hour. The cargo trains, carrying 800t of goods, will take one and half hours to travel between the two cities.

The next segment to undergo standard gauge renovations is the 312km-long Lagos-Ibadan rail line followed closely by Lagos-Benin City (300km), Benin-Abakiliki (500km), Benin Obudu Cattle Ranch (673km), Lagos-Abuja high-speed (615km), Zaria-Birnin Koni (520km), Ega nyi-Otukpo (533km) and Ega nyi-Abuja. Other projects scheduled are the Port Harcourt-Maiduguri line (1,657km), Ogoja-Maiduguri, Kano-Gamboru Ngala, Kano-Jibia, and Ilela-Minna rail lines

It is these massive projects and others still in the planning stages, which will see the oil marketers paying a keener interest to the lubrication requirements of the locomotive industry. Although there will be a dip in heavy duty automotive lubricants following a significant shift of cargo transport from road to rail, it will be interesting to see if the new loco lubes will plug this shortfall.

Although there will be a dip in heavy duty automotive lubricants following a significant shift of cargo transport from road to rail, it will be interesting to see if the new loco lubes will plug this shortfall.

Common lubrication points in locomotives

The Locomotive Maintenance Officers Association (LMOA) is tasked to develop along with the engine manufactures and lubricants suppliers the locomotive engine lubricants. LMOA operates a classification system which defines the performance of diesel locomotive engine lubricants. Railways operators, engine manufacturers, and lubricant suppliers all recognize the LMOA "Generation" nomenclature.

Some of the critical features that LMOA seeks to develop in the lubricants are:

- Reduction in oil consumption
- Extended oil drain intervals
- Oxidation resistance
- High levels of detergency

High and adequate level of alkalinity

The main locomotive engine manufacturers are the General Electric (GE) and Electro Motive Diesel(EMD).

To achieve improved fuel and oil efficiency, diesel locomotive engine manufacturers have field- tested and approved multigrade versions of Generation 4 and 5 oils. Locomotive engine oils are mainly zinc-free as they protect silver bearings and helps provide for minimum wear of rings, pistons and liners. They are also chlorine-free to reduce environmental and disposal impact.

Gear boxes

Rail vehicle gearboxes are subject to unique conditions due to the operations of the locomotives. Some of the conditions include high stress, high loads, high speeds and vibrations. The lubricants used in the gear boxes must withstand these stresses while providing high efficiency and reliability. A lubricant of SAE 75W90 or 80W90, API GL5 is applicable. In the modern locos, a fully synthetic PAO based is preferred. Some of the OEMs include Wateeuw, Voith Turbo, Siemens-Flender, Bombardier, CSR Zhuzhou and Deutsche Bahn AG.

Traction motors

These are used for propulsion of the rail vehicles. They are expected to run reliably, which is why the lubricants used should be effective in practice. The traction motors failure or repair can cause high downtime as the access to the bearings would require separation of the motor and gear box. A grease is mainly used which is semi fluid with high viscosity base oil and EP additives.

Rail Track lubrication

This lubrication is designed to reduce friction and wear between curved steel rails and railcar wheels. A grease that is water resistant, NLGI No. 1, calcium soap based grease containing graphite work well. Lubrication of the rail curves is also important. This is due to the fact that the gage face and wheel flanges require to

be protected hence a rail curve grease is used.

Transmission and brakes

The hydrodynamic transmission system as well as the hydrodynamic brake system uses a power transmission fluid. It is worth noting that different lubricants are approved for electrically and non-electrically controlled turbo-transmission system.

Bearing Lubrication

Most journal bearing generate high friction and usually heavily loaded. Bearing oil that is rust inhibited with high VI base oil with good low temperature characteristics and contains an additive system that assists in breaking in new bearings is suitable.

Other areas include Radiator Cooling, coaches connectors, and air compressors. ■

The Locomotive Maintenance Officers Association (LMOA) alongside Locomotive engines OEMs and lubricant manufacturers develop locomotive engine oil specifications.

Table 1 : LMOA Locomotive oils classifications.

| | |
|------------------------------|---|
| Generation 1 (1940) | Generation 1 oils included straight mineral oils, as well as some which were lightly compounded |
| Generation II (1964) | Generation 2 engine oils introduced ashless dispersants and moderate levels of detergency. Oils of this performance were developed to reduce engine sludge and extend filter life. Generation 2 engine oils had a BN of around 7 |
| Generation III (1968) | Generation 3 engine oils demonstrated improved alkalinity retention, detergency and dispersancy. With a Base Number(BN) of around 10, Generation 3 oils were introduced to overcome increased piston ring wear. |
| Generation IV (1976) | Generation 4 oils provided added protection under severe operating conditions, and were designed to allow 90 day oil change intervals. The LMOA set higher base number(13) detergency and dispersancy characteristics. As well as being approved by both GE and EMD, |
| Generation V (1985) | Generation 5 called for extended oil performance to meet the requirements of new generation "fuel efficient" and low oil-consumption diesel locomotive engines, and is designed to provide 180 day oil change intervals. The LMOA does not specify a minimum Base Number for Generation 5 oils. These products have improved alkalinity reserve, detergency, and anti- oxidation performance. Oils meeting LMOA Generation 5 must also meet API Service Classification CD, and have been field tested and approved by both GE and EMD |

Impact of environmental regulations on lubricants enterprises – Part 1



President, K&E Petroleum Consulting, LLC
Oklahoma City, Oklahoma USA

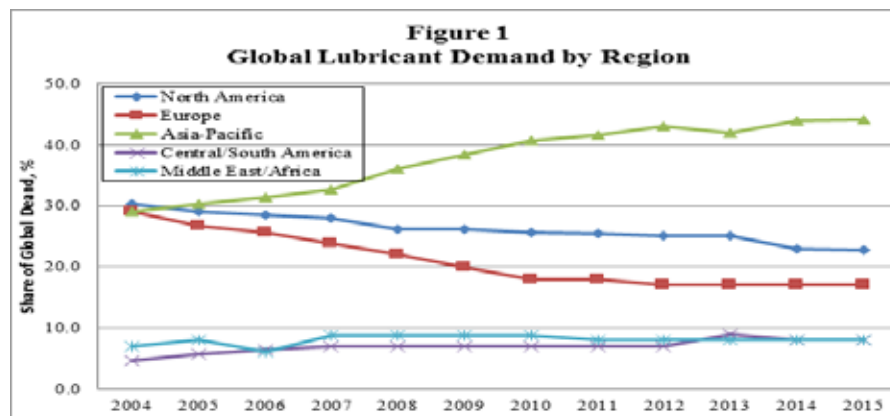
Ernest Henderson, PhD

The world is in a state of ongoing change. From population and economic changes to new and advanced sources of energy, the world continues to advance. Each region of the world also is undergoing changes though the type of change and pace of change may differ from the overall pattern. Yet there is change and it will continue.

In the petroleum industry and in particular the lubricants industry, change has been rapid paced over the past several decades. This rate of change has had a significant impact on the lubricants that are used today versus those that were used in the 1970s or 1980s. The blending components, both base stocks and additive chemistries, have continued to advance and the technologies to produce these materials have also changed. Blending techniques and overall logistics have improved, and the lubricants industry is now considered to be a truly global business with base stocks, chemical additives and finished lubricants being transported on a frequent basis between regions of the world.

The first interesting observation is global lubricant demand that has essentially remained flat over the past 20 years. Lubricant demand in 2015 was estimated by KEPC at 38.5 Million MT that is only 0.6 Million MT over estimated demand in 1990. This very slight increase occurred despite a continued increase in global population, double digit economic growth in countries such as China and India, increased use of automobiles that has now exceeded 1 Billion globally and continued increases in manufacturing and new housing to support the growing population.

By contrast, continued implementation of new standards for reduced emissions and



increased fuel economy combined with the introduction of new and advanced operating equipment with smaller oil sumps and higher operating efficiencies has reduced lubricant demand. In addition, there have been several economic downturns, both regional and global, in the past several decades that have resulted in a rationalization of existing business and in some instance its transfer to other regions of the world.

Figure 1 shows the changes in lubricant demand on a regional basis over the past decade. In 2004, lubricant demand in North America, Europe and Asia-Pacific was equivalent and represented slightly less than

90% of global demand. The remaining demand was split between the Middle East and Africa regions, and Central/South America.

However, with the strong economic growth in developing regions such as China and India the demand for lubricants has undergone a significant shift with Asia-Pacific now representing approximately 40% of global demand. A small increase in share of global demand has been observed in the Middle East-Africa and Central/South America with the balance represented by continued declines in the advanced regions of North America and Europe. Here is an area where economic changes, particularly in the European

Table 1; Automotive Performance Trends and Impact on Base Oil Properties

| PERFORMANCE NEED | BASE OIL IMPACT |
|-------------------------------|---|
| 1. Energy Efficiency | <ul style="list-style-type: none"> Shift to lower SAE grades requires lower viscosity base oils with excellent VI and low temperature characteristics (e.g. CCS). Hydro-dewaxing is an important part of the base oil process for low temperature performance. |
| 2. Retained Energy Efficiency | <ul style="list-style-type: none"> Oil should not oxidize during performance tests as products of oxidation will result in oil thickening and competition with friction modifiers for engine surfaces. Requires improved volatility to reduce oil thickening associated with volatilization of low boiling components. Excellent oxidation stability achieved through use of highly saturated base oils and high performance additive system. |
| 3. Environmental Awareness | <ul style="list-style-type: none"> Reduced oil consumption due to improved volatility challenging industry as it moves to lower viscosity base oils and SAE grades. For North America, the recently updated DEXOS1™ and future ILSAC GF-6 standards will provide volatility challenges consistent with premium European standards. Environmental awareness through extended drain requires use of high performance (i.e. highly saturated) base oils and strong complimentary additive chemistries. Fuel economy promotes environmental awareness through reduced energy requirements. |
| 4. Equipment Reliability | <ul style="list-style-type: none"> Extended engine and equipment protection relates to longer ODI. This requires highly saturated base oils and strong complimentary additive chemistry. |



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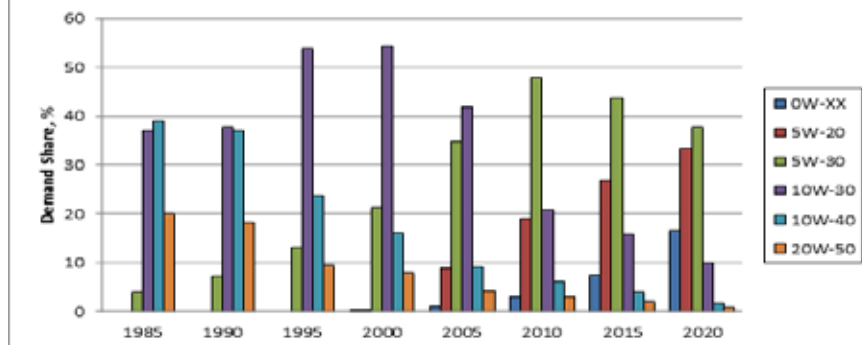
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The shift towards thinner viscosity oils during the start-up mode has been a key contributor towards improved fuel economy.

Figure 1
North American Passenger Car Engine Oil Demand - 1985 to 2020 - Source KEPC



economy, combined with the impact of new environmental regulations have significantly impacted demand in these regions.

Despite the changes in demand, the overall quality of lubricants in North America and Europe has undergone a significant change that is now spreading to other regions of the world. Some of the key features associated with these changes are summarized in Table 1.

It is interesting to note that in Europe with the changing emission standards that one car in 1970 produced as much pollutants as 100 cars combined today. This represents the significant efforts that the global industry (automotive and industrial) has made towards the reduction of emissions. In North America, the Environmental Protection Agency (EPA) recently issued new guidelines to raise the fuel economy and emissions standards for heavy- and medium-duty vehicles, including school buses, delivery vans, garbage trucks and large long-haul tractor-trailers. Although heavy vehicles represent only 5% of road traffic, they account for approximately 20% of carbon pollution resulting from the transportation industry. These efforts are not only regional based but with time will become incorporated into the global initiative to be more environmentally responsible.

It should be noted that the challenges to improve emissions has been multifaceted involving changes to the vehicle and its engine operation in addition to the fuel that is used where sulfur limits have been drastically reduced. Because of these changes, the lubricant has also changed, both in terms of the base stock types and qualities that are used and chemical additives that are used to enhance the properties of the base stock to the level required from the finished lubricant.

Formulation Impact

With new emission and fuel economy standards, the choice of lubricants has changed dramatically. Fuel economy, for example, is

linked to the viscometrics of the lubricant under both high and low temperatures. A significant amount of friction is created during the start-up process and efforts have been made to reduce friction that in turn can be applied to better lubrication. For fuel economy, the shift towards thinner viscosity oils during the start-up mode has been a key contributor towards improved fuel economy. At the same time, it is imperative that fuel economy remain a key contributor to engine operation during the life of the oil in the vehicle. Therefore, fuel economy is now determined under both fresh and aged conditions to ensure continued reliability and performance over the life of the oil.

The impact of fuel economy standards on the North American passenger car engine oil (PCEO) market is shown in Figure 2.

During the past 30 years, the industry has shifted from one dominated with medium and high viscosity oils like SAE 10W-30, 10W-40 and 20W-50 to one that is now dominated by SAE 5W-20, SAE 5W-30 and now the new SAE 0W-16 grades. The selection of base stocks to support these trends has also changed significantly with high volatility API Group I base stock evolving to Group II and now Group III where base stock Viscosity Index properties have increased from a nominal 90-100 (region dependent) to ≥ 120 .

One should recognize that change takes time. In the North American passenger car industry, it took over 20 years (i.e. 1985 to 2007) until the demand for SAE 5W-20 and SAE 5W-30 engine oils exceeded SAE 10W-30 and SAE 10W-40. Similar changes are occurring in other regions of the world; however, it will take time in terms of customer education, product availability and price competitiveness.

When you look at the PCEO market and the changes in SAE grade selection that has occurred, you can relate it to the average base oil quality to support the market. Table 2 provides a breakdown of the PCEO market in 1985 and 2015 and the average base oil quality that is required to support the market. Each SAE viscosity grade was reformulated to identify its average base oil quality; this was then consolidated into a single base oil quality based on the demand for the various SAE grade at that time.

The base stock changes required to advance the PCEO industry to where it is today have been dramatic. Traditional base stock solvent processing has been replaced by hydroprocessing resulting in a significant increase in the level of saturated versus aromatic components in the base oil itself. Sulfur contents have essentially been eliminated. Despite the shift to the use of lower viscosity base stocks, volatility characteristics have been dramatically improved that one would not expect with the use of "lighter" base stock. However, these changes have occurred and have been linked to the Viscosity Index of the base stock.

It is not surprising that these changes are impacting other finished product areas such as heavy duty engine oils, driveline fluids and industrial oils. The second segment in this series will look at base stocks in more detail and the features that have been identified and optimized to meet the demands of a more environmentally conscious global industry. ■

Table 2; Base Oil Quality Requirements for the North American PCEO Market

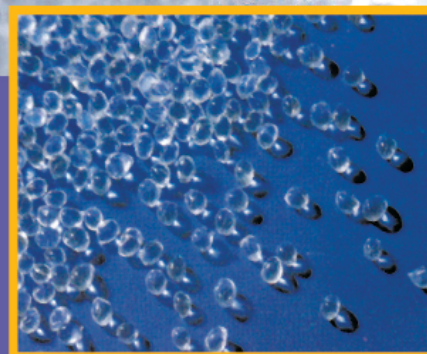
| Property | Average Base Oil Quality | | |
|---------------------------|--------------------------|--------------|---|
| | 1985 | 2015 | Change |
| KV @ 40°C, cSt | 37.5 | 25.0 | Lower KV for FE |
| KV @ 100°C, cSt | 5.9 | 4.8 | Lower KV for FE |
| SUS Viscosity @ 100°F | 195 | 130 | Lower KV for FE |
| Viscosity Index | 97 | 113 | Higher VI for FE, Emissions, Oxidation |
| CCS Viscosity @ -25°C, cP | ~6,000 | ~1,700 | Lower CCS for FE |
| Noack Volatility, wt% | >20 | <15 | Lower Noack for Emissions, Oxidation |
| Base Oil Type | Group I | Group II-III | Solvent to hydro-processing, higher saturates, lower sulfur |

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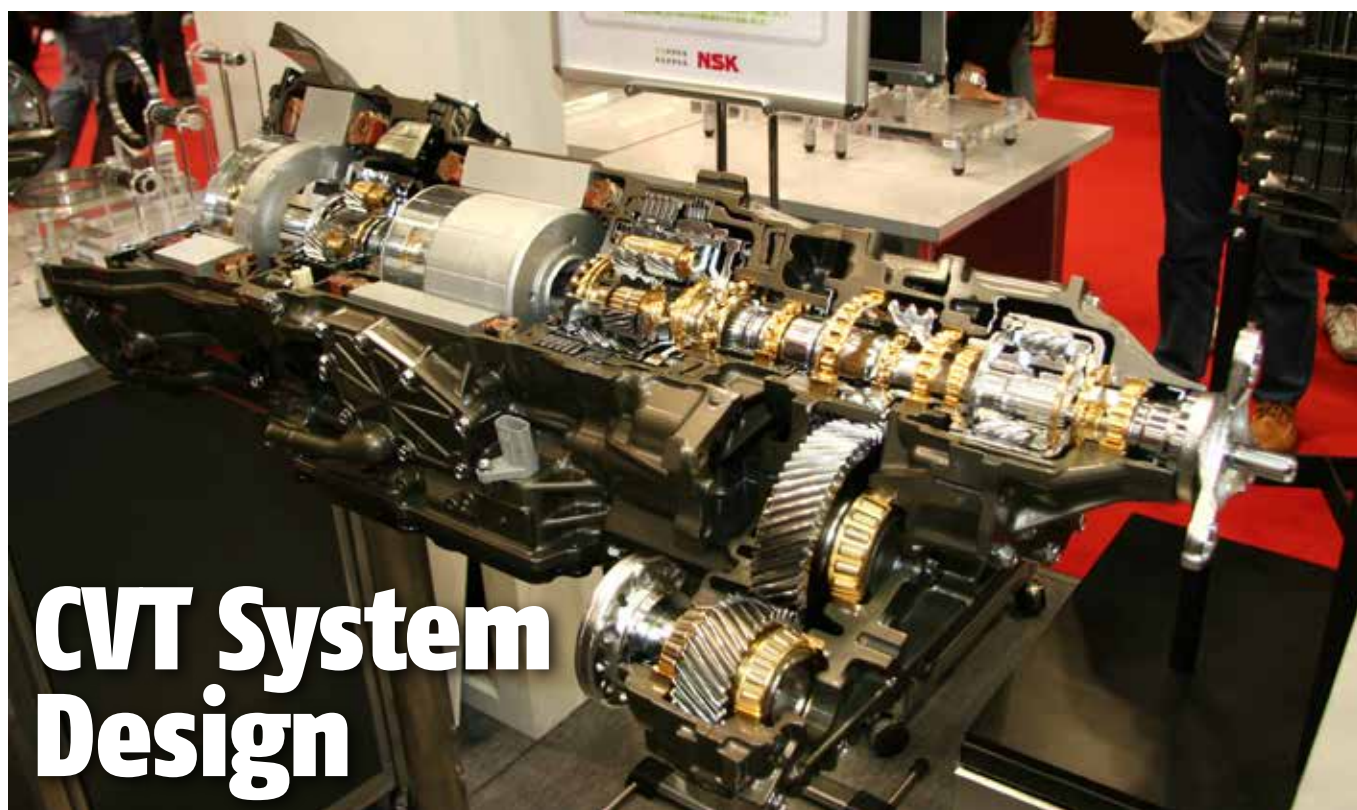
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CVT System Design

The fuel economy advantage delivered by continuously variable transmission systems is driving more OEMs to offer the technology in their vehicles. **Ed Post, Infineum North American Specialties Market Manager**, reviews the advantages of the latest hardware and explains why CVT fluids are being designed as part of the total system to ensure the required level of performance is achieved.

As CO2 emissions regulations tighten the world over, OEMs continue to look for every opportunity to improve the efficiency of their vehicles. The transmission system is a key target, and in conventional stepped automatics we have seen the trend for lightweighting and an increase in the number of gear steps. OEMs have also introduced new hardware including dual clutch transmissions (DCT) and continuously variable transmissions (CVT). So far, the uptake of these different transmission types has varied from region to region. Amongst other factors, their popularity is typically a reflection of the driving preferences in each region.

CVTs offer a number of benefits. They continuously and seamlessly select the optimum ratio for the engine as driving conditions change, without the fixed ratio constraint of step-gear transmissions. This variable ratio flexibility, within the minimum and maximum limits of a CVT design, allows the engine to operate at peak efficiency with uninterrupted torque transfer to the drive wheels.

It is the ability to optimise engine operation

that provides CVTs with an advantage in overall vehicle fuel efficiency over other transmission designs.

CVTs will continue to be popular in Japan and Korea, and we expect to see strong growth in China and in North America, where technical advancements enable their use in larger vehicles.

CVT deployment

Automatic transmissions are being deployed at an increasing rate worldwide, even in regions that had been bastions of manual transmissions. However, even though there have been advances in conventional planetary gear transmissions, we expect their use to plateau. In our view, much of the future growth will come from the deployment of unconventional CVT and DCT designs.

While OEMs including VW, Audi and Hyundai are leading the deployment of DCT systems, CVTs are currently seeing wider use across a broad range of OEMs including Nissan, Honda, Subaru, and Toyota. These OEMs are likely to deploy CVTs across all regions. However, China and South Asia are forecast to lead the growth since the lower torque engines

used in these regions present fertile ground for CVT technology. We could expect to see more than a 10% CAGR as these regions shift away from manual transmissions towards this advanced technology.

CVT and OEM activity

Dedicated transmission manufacturer, Jatco, is expected to remain the largest global CVT manufacturer and has announced that its global production volume of CVTs reached 30 million units at the end of March 2016.

The company has introduced the CVT8 for medium and large vehicles up to 3.5 litres, which it says combines better environmental performance and a stronger, sportier drive. The transmission is reported to improve fuel economy by up to 10% compared with a conventional Jatco CVT.

The company has also launched the 'one-motor two-clutch' CVT8 Hybrid, for medium and large FWD vehicles. Jatco says it offers a significant friction reduction and wider ratio coverage, using a built-in motor and a clutch for engaging or disconnecting the engine within the torque converter housing.

Honda has recently expanded CVT

As new CVT designs come onto the drawing board, with unique lubrication requirements, the transmission fluid (CVTF) has become an integral part of the design

applications in North America, and future growth is expected to be primarily in China and South Asia. The OEM offers CVT options on its compact and mid-size vehicles and says CVTs can increase fuel economy by 5%.

Toyota has recently introduced CVTs in North America. Its '7-speed' CVTi-S is designed to feel more like a conventional automatic in operation, with discrete stepped shift points programmed into the car's acceleration and deceleration curves. The CVTi-S mimics the familiar characteristics of geared automatics by creating a sense of positive shift engagement. Toyota expects most future growth to come from the North American and Chinese markets.

Reports suggest that the focus of Subaru/Fuji Heavy will remain in North America. Their Lineartronic chain CVT has replaced ATs in more than 90% of their vehicles – including those in hybrid electric vehicles (HEV). The system, which the company says allows the engine to operate at lower speeds for longer than conventional automatic transmission systems, reportedly delivers better fuel economy plus a smoother ride and a quieter engine.

Lastly, Hyundai is expanding its use of CVTs beyond its home market into China. The Kappa CVT was developed by Hyundai and has been optimised to provide efficiency via an ultra-flat torque converter specifically for its Kappa engine. The company has also developed an

eco-friendly hybrid electric vehicle CVT.

As we look out six years, we expect quite a difference in the adoption of CVTs by OEMs.

CVTs rely on the fluid

More than any other transmission, a CVT relies on the performance of the fluid for its successful operation. As new CVT designs come onto the drawing board, with unique lubrication requirements, the transmission fluid has become an integral part of the design.

To understand why a conventional automatic transmission fluid (ATF) is not suitable for use in a CVT, it is important to understand how the CVT functions. The heart of a CVT consists of a variator with two pulleys, each built up of

two conical, adjustable sheaves, around which a steel push belt or chain is looped.

The torque is transmitted by the steel-on-steel frictional force generated between the pulley and the belt or chain. With high steel-on-steel friction, it is also essential to minimise wear between these elements. CVT fluids (CVTF) deliver high steel-on-steel friction to allow CVTs to be used in the highest torque applications.

A conventional ATF delivers low steel-on-steel friction, which can lead to belt slippage, wear and severe damage to the pulley and the belt or chain. Shear stability is even more important for CVTF than for conventional ATF because of the high pressure pumps that are used in CVT applications. In addition to these specific requirements, CVTF must also offer advanced wear protection – particularly to control fatigue and sliding wear.

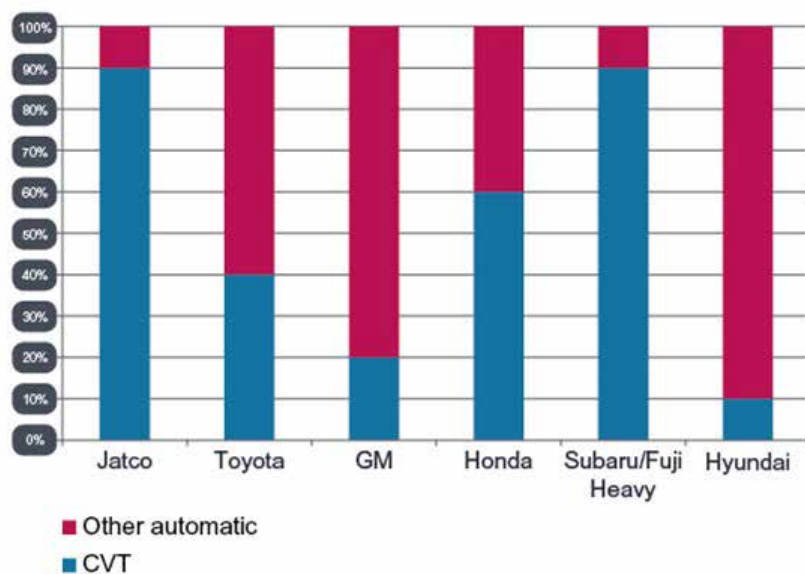
However, the requirements don't stop there, CVTF must also provide extended anti-shudder durability to enable aggressively slipping clutch operation, used by some designs for fuel efficiency, without reducing steel-on-steel friction. They must also deliver good oxidation stability, air release capability and paper-on-steel friction.

Getting the right balance between all of these critical characteristics is a rewarding challenge for fluid formulators. In our view, advances in CVT hardware technology provide fertile ground to develop ultra-advanced fluids. This means formulation expertise will be increasingly important so that technology can be customised for optimum hardware performance in both belt and chain CVT applications. ■

CVTF Requirements

| | |
|----------------------------------|---|
| High steel on steel friction | Enables higher torque applications |
| Wear protection | Prevents fatigue and sliding wear of the belt/chain and variators, as well as in the pump |
| Extended anti shudder durability | Allows aggressively slipping clutch operation for fuel efficiency, without reducing steel-on-steel friction |
| Shear stability | Required as high pressure pumps can shear fluids |
| Oxidation resistance | Essential in hot CVTs environment and as CVTs are fill for life applications |

Estimated automatic transmission installations by OEM in 2022



Source: IHS

Asset management in context of maintenance – Introduction



James Wakiru

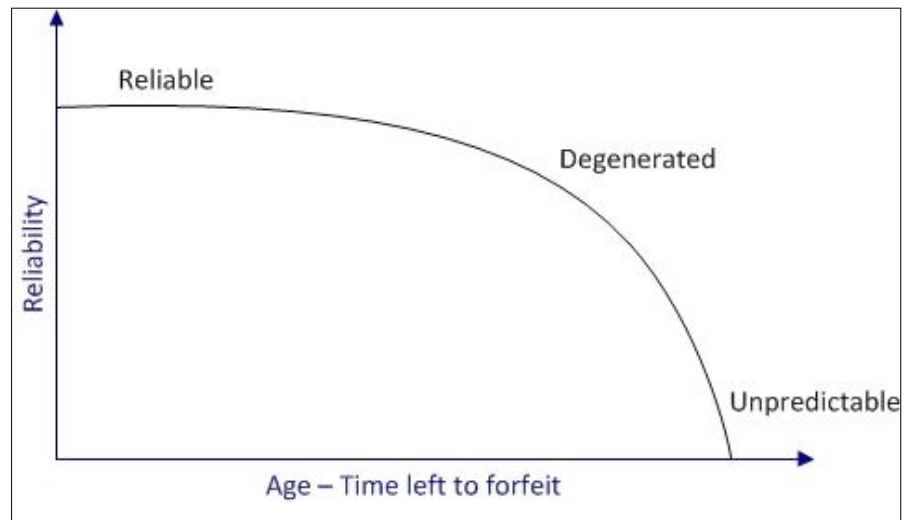
The British Standards Institution (BSI, 1984) defines maintenance as; “a combination of all technical and associated administrative activities required to keep equipment, installations and other physical assets in the desired operating condition or restore them to this condition”. It is also defined maintenance as the combination of technical and associated administrative actions intended to retain an item or system in, or restore it to, a state in which it can perform its required function. Proper maintenance needs technical skills, techniques, methods to properly utilize the assets like manufacturing set-ups, power plants, vehicles, equipment and machines[1].

Some of the objectives of maintenance that also help to define the roles of maintenance [2]

- Ensuring system function (availability, efficiency and product quality)
- Ensuring the system or the plant life
- Ensuring human well-being and finally,
- Ensuring safety.

While addressing the key objectives of maintenance, [1] one of the main objectives is to ensure optimal lifecycle costs through prudent asset management practices.

Asset Management (AM) is a concept designed to examine the assets over its entire life cycle. It is hoped that through a better awareness of the assets value, reviewing the assets in a more satisfactorily way can be carried out. Moreover such awareness allows the asset to provide the best possible service and standards, and thus increase profitability through operating for a longer period of time [3]. Asset Management involves the balancing of costs, opportunities and risks against the desired performance of assets, to achieve the organizational objectives. The AM is commonly applied in different sectors and domains that include finance, equipment maintenance,



Asset aging process showing the reliable, degenerated and unpredictable phases.

software vendors and infrastructure.

In equipment maintenance, the aim is to increase the creditability for certain activities. Maintenance has for a long time been seen purely as a cost driver and thus the focus has been on lowering the maintenance cost.

Aging of an asset has major impact on the reliability, equipment performance, thus negatively impacting productivity. Aging is usually divided into three phases: reliable phase, degenerated phase and unreliable phase[3]. An effective maintenance strategy aims at minimizing the aging process and thereby prevents it from failing too quickly. Eventually, once the asset passes through the three phases, a decision on renewal/replacement becomes crucial. It is therefore important to undertake optimal maintenance decisions often through the aid of various algorithms for reliability analysis for each specific phase.

Asset aging process showing the reliable, degenerated and unpredictable phases[3].

Companies undertake efforts to reduce O&M costs and at the same time improve quality and productivity. Poorly maintained equipment may conversely lead to more frequent failures of the equipment, low utilization rate of the equipment and delayed production schedules. Equipment that is malfunctioning or misaligned may cause a higher scrap rate or produce products with a questionable quality. In addition, the equipment needs to be replaced more often due to shorter life-cycles, which

also is a consequence of poor maintenance [4].

Maintenance has traditionally been considered as a necessary evil, but it is in fact a center of profit rather than just an unavoidable or unpredictable expense[5]. When effective maintenance policies are used, failures can be minimized, thus resulting in great savings. Therefore, the maintenance function plays an important strategic role to the sustainability of the corporate long-term profitability. Moreover, the maintenance function influences aspects such as product quality and related costs, equipment productivity, human safety and



Asset Management involves the balancing of costs, opportunities and risks against the desired performance of assets, to achieve the organizational objectives.

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upholding environmental standards.

Origins of Asset management

The origins of Asset Management were accelerated in the 1980s and early 1990s in the North Sea oil exploration and production industry. Production costs were running at \$15 per barrel. Due to the glut of crude on the market at that time, the price of crude dropped, and in order for companies to ensure survival, they had to take drastic action. One of the actions that was taken was to make the person responsible for each production unit responsible for the profitability too. The results were that production costs were reduced to \$6 to \$7 per barrel and in some cases \$2 per barrel - this enabled survival. Asset Management has now spread to many utility organizations and large and small companies are adopting similar programs.

Proponents of Asset Management

a) Risk Management

This includes reliability, environmental and business risks and goes ahead to spell out plans and strategies to mitigate an event or

action that would increase the probability that a risky event will occur hence compromise the Asset functionality and life. Some of the risks that are assessed are Business or financial risks, Occupational health and safety risks, Environmental risks and regulatory compliance

b) Operating Plan

This is a comprehensive plan that defines and governs how the asset will be used and operated over its entire life cycle. This includes Standardized Work Procedures (SWPs) for:

- Setup and changeovers
- Startup and shutdowns
- Ramp and deceleration
- Cleaning and autonomous maintenance
- Calibration and adjustments
- Materials handling
- Performance monitoring

c) Maintenance Plan (MP):

A Maintenance Plan provides governance of all aspect of the maintenance function required to sustain the asset over its life cycle. It is much more than a simple listing of preventive or predictive maintenance tasks

Without the proper maintenance and support,

systems can become unreliable — leading to unscheduled downtime, product waste and a decrease in profitability. A Maintenance Plan ensures a sustainable proactive organization to minimize costs and improve reliability and availability of plant assets. ■

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Specialty lubes – small investments that bear huge returns



*By Crispin Mbogo
Chief Executive - Droplex Industrial Systems Ltd.*

Specialty lubricant as you may know are basically what they are - specialty. They are the lubricants that you need for those special applications in your plant. These applications for your bearings range from food, exposure water, steam or corrosive chemicals, high temperature, high speed, high loads, electrical, noise level etc

As special as the lubricants are, they have a cost element because of the research and development involved to produce them. The cost is however outweighed by the many benefits from extended bearing life and increased reliability of operation of your equipment.

In this article, I will show you why specialty lubricants are manufactured based on factors that impact on the bearing life and which if addressed extend the life of your bearings and increase the reliability and availability of your equipment.

The following parameters affect the type of grease required for a particular application. They need to be analyzed and calculated where necessary to determine the optimum grease required for your bearing(s): Operating temperature

- Base oil viscosity
- Speed factor
- Load ratio C
- Others - Food grade, resistance to media

1. Operating temperature

Due to internal friction, the inherent operating temperature of a bearing is usually somewhere between 35 °C (95 °F) and 70 °C (158 °F);

HINT: In order to attain a satisfactory grease life, a grease should be selected whose upper service temperature limit is considerably higher than the maximum operating temperatures to be expected.

however, external process-related temperature can influence the bearing such that its final operating temperature may be much higher or sometimes lower. The requirements regarding lubricants can vary substantially. Automotive manufacturers, for example, typically have to consider temperatures between -40 °C (-40 °F) and +160 °C (320 °F). Aviation applications require service temperatures as low as -50 °C (-58 °F), as the bearings are subject to »

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HINT: If $k > 4$, the operating temperature may rise due to increased internal friction from the lubricant.

| Lubrication condition k^* | |
|-----------------------------|---|
| 4 | Full fluid-film lubrication |
| > 4 | In the regime of full fluid-film lubrication + cleanliness + moderate loads = no fatigue |
| < 4 | Mixed friction. Lubricating greases containing antiwear additives have to be used |
| 1 | The basic rating life of the rolling bearing is achieved |
| < 0.4 | Mixed friction with increased solid contact; the grease has to contain EP additives or solid lubricants |

extremely low temperatures when exposed to high altitude. Stoving temperatures for lacquers can easily reach 200 °C (392 °F). In certain applications temperatures may be even more extreme. Therefore, when choosing a grease, one should make sure that the lubricant's service temperature range is sufficient to easily cope with any additional temperature influences that may be encountered in practice.

2. Minimum base oil viscosity

For determination of minimum base oil viscosity, the mean bearing diameter d_m in [mm], the bearing speed and the bearing temperature under standard operating conditions are used. The required minimum base oil viscosity for the example shown at 40 °C (104 °F) = 38 mm²/s

To calculate the correct viscosity ratio for oil and grease, you should use the published base oil viscosities at 40 and 100 °C and apply them to the n-T diagram.

The actual base oil viscosity n should be $n_1 \cdot 1 \dots 4$. The following is generally used as a parameter indicating the expected lubrication condition:

- $k^* = n / n_1$ = viscosity ratio
- n = viscosity under standard operating



Companies that seriously pay attention to costs and downtimes have become the biggest beneficiaries of specialty lubricants.

conditions

- n_1 = required minimum viscosity, depending on mean bearing diameter and speed

3. Speed factor

The speed factor for rolling bearings is determined by the speed of the bearing at the standard operating conditions multiplied by the mean bearing diameter of the bearing (Inner dia. + Outer dia.)/2

Different grease types have different base oil viscosities at 40°C and it is the reason why knowledge of the various grease types is important in determining the right lubricant for your application. Your lubrication engineer should help you with this.

For example, a mineral oil/lithium/MoS₂ has a base oil viscosity of 1000 to 1500 mm²/s ideal for a speed factor of 50,000 while an Ester/Polyurea has a 15 - 30 mm²/s is ideal for a speed factor of up to 2,000,000.

4. Load Ratio C/P

The load ratio is the ratio between the bearing's basic dynamic load rating C in [N] Newtons and its actual equivalent dynamic load P in [N] Newtons. For load ratios

- > 30 - very low loads - Grease type - max. permissible load for silicon grease
- 20 - 30 - Low loads - Dynamically light greases
- 8 - 20 - Medium loads - Greases containing antiwear additives
- 4 - 8 - High loads - A grease with EP and antiwear additives is to be used. Reduced grease/bearing life is to be expected
- < 4 - Extremely high loads - A grease containing EP additives and solid lubricants

is to be used. A considerable reduced grease/bearing life is to be expected.

5. Exposure to media

The type of thickener used to make up a grease determine the application that the grease can be used in. For example, thickeners made out of the Aluminium simple soap are gradually hydrolysed by water and only usable up to 100°C while those made out of Sodium are inexpensive but not water resistant

Those made using complex soaps of barium are usable up to 150°C and resistant to water and steam but weak acid resistance. This just explains that the thickener type determines the ideal application of the grease. Do you know the type thickener used to manufacture your grease?

In Summary

The use of specialty lubricants is now more than ever critical to your plant and ultimately to your overall plant performance. We have all been accustomed to thinking that bearings in special conditions have a shorter life than those in normal applications which is incorrect. With the advance in technology, companies have found solutions to solve industrial challenges and extend equipment life. Companies that seriously pay attention to costs and downtimes have become the biggest beneficiaries of specialty lubricants. ■

Mr. Mbogo has over 18 years industrial engineering experience both locally in the oil industry and with General Electric in USA. He is an expert in Specialty Lubrication Systems & Solutions. Contact him at: Crispin.Mbogo@droplex.com

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