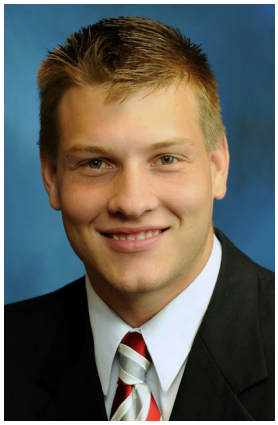
POWERING EFFICIENT FLEETS

How lubricants can help achieve the lowest cost per kilometre

FOREWORD

A message from John Walters, Shell Lubricants Global Sector Manager for Fleet



Working closely with fleet operators of all types and sizes, all over the world, Shell Lubricants understands that in today's industry, transport operators are under pressure to achieve high standards of reliability, safety and emissions compliance, whilst at the same time minimising total operating costs to stay competitive.

Many successful transport operators already consider Total Cost of Ownership (TCO) to guide decisions on equipment maintenance and operational performance. This often involves monitoring 'cost per kilometre' of the vehicle fleet, on which vehicle availability, maintenance costs and fuel expenditure all have an impact.

Maintenance spend typically amounts to around 10% of total operating costs. When looking to make savings, lubricants are often one of the first areas where transport operators seek to cut costs. However, while buying cheaper oils and greases may achieve immediate cost savings, the detrimental effect on equipment can prove more expensive over time. The best value is found in choosing competitively-priced, high-quality lubricants that deliver excellent equipment protection and, in doing so, can help deliver cost savings.

According to an international industry study commissioned by Shell Lubricants, over half of the fleet operators surveyed admitted their errors in lubrication had led to vehicle breakdowns. This can prove costly – one in three of those surveyed estimate that this unplanned downtime has cost their business over $100,000 in the last three years.

Shell Lubricants works with customers to help improve the cost-efficiency of their fleets both in the short and long-term. **Over the last five years, we have delivered $21 million in documented savings to fleet customers**[2], primarily by focusing on two key areas:

1. Sharing advice on **selecting the right lubricant**, with the aim of achieving excellent wear protection, longer oil drain intervals, and enhanced fuel economy.
2. Helping customers **upgrade lubrication management.** This can help maximise oil drain intervals (ODIs), resulting in lower lubricant costs and helping keep vehicles on the road for longer between services, and thereby helping drive profit for their business.

In this paper, we explore the **tangible, cost-saving benefits** possible from effective vehicle lubrication. When considering the potential savings, the definition we use for TCO includes costs related to lost productivity resulting from unplanned vehicle downtime[3].

Case studies illustrate how fleet operators worldwide have successfully worked with Shell Lubricants to extract value by reducing TCO and increasing vehicle availability.

I hope you find the paper both informative and useful.

1 This survey, commissioned by Shell Lubricants and conducted by research firm Edelman Intelligence, is based on 395 interviews with Fleet sector staff who purchase, influence the purchase or use lubricants / greases as part of their job across 8 countries (Brazil, Canada, China, Germany, India, Russia, UK, US) from November to December 2015

2 Documented Shell fleet customer savings 2011-2015. More information available upon request.

3 Total Cost of Ownership (TCO) is defined by Shell Lubricants as the total amount spent on industrial equipment, including cost of acquisition and operation over its entire working life, including costs of lost production during equipment downtime

CONTENTS

1. TOTAL COST OF OWNERSHIP: UNDERSTANDING THE POTENTIAL

Shell Lubricants believes that there is potential for lubrication to deliver significant business value by helping lower the cost per kilometre of fleets. However, the potential impact of lubricants is often significantly underestimated.

Understanding how lubricants contribute to Total Cost of Ownership (TCO) is the first step to realising potential savings.

LUBRICANT PRODUCT PERFORMANCE IS OFTEN OVERLOOKED.

Only 52% of fleet managers consider lubricant product performance an important purchase consideration[1]

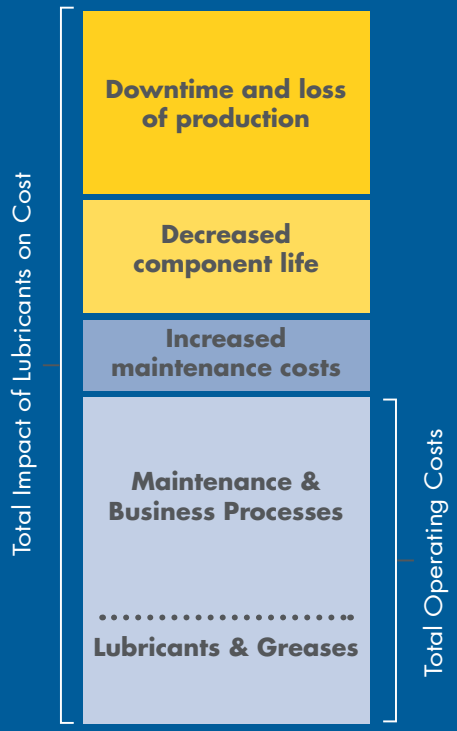
Total Cost of Ownership (TCO)

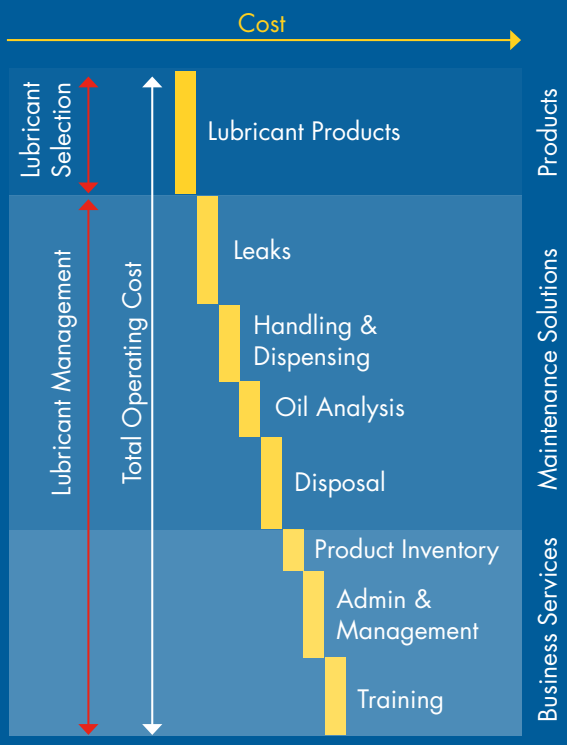
When evaluating the effect of lubricants on TCO, Shell Lubricants considers the end to end impact on maintenance budgets and processes, but also any costs related to lost production during vehicle downtime. Optimising lubrication can have a significant impact on component life, maintenance costs, and unplanned downtime, so it can contribute to cost savings far higher than the price of the lubricant itself.

Seizing the Opportunity

Lubricant product selection or management can impact many elements of a fleet manager's maintenance budget. Seizing the cost-saving opportunity depends on addressing two equally important elements:

1. Selecting the right lubricant or grease – the right product
2. Effective lubrication management – including the right storage & handling, the right place, the right time, the right amount, the right monitoring and the right people





2. LUBRICANT SELECTION

From heavy duty diesel engines to transmissions, axles and wheel bearings, every component of a truck or bus made by different original equipment manufacturers (OEMs) has its specific lubrication requirements. OEMs define the minimum requirements for lubricants or greases, but not all products that meet these standards deliver the same level of performance.

To ensure that a lubricant or grease delivers consistent performance in the field while meeting OEM requirements, Shell Lubricants conducts controlled laboratory and engine tests, plus countless hours of field testing on all products during the development process.

2a. LUBRICATION CHALLENGES

and some of their specific lubrication challenges. In all Choosing the correct lubricant or grease often comes down to a combination of the equipment's design characteristics, how it is fuelled, operational parameters and the surrounding environment. All pose different challenges for lubrication.

Below are two of the transport industry's primary lubricant applications and some of their specific lubrication challenges.

In all cases, selecting the right lubricant is a critical first step in improving productivity and realising significant TCO savings.

THE BENEFITS OF HIGHER QUALITY LUBRICANTS ARE NOT UNDERSTOOD.

56% of fleet managers do not expect higher quality lubricants to help cut maintenance costs[2]

HEAVY DUTY DIESEL ENGINES

Effective engine lubrication is critical to protect high-cost equipment, and minimize downtime due to frequent oil changes, maintenance or even component failures.

Protection against deposits

Modern high output heavy-duty diesel engines run at hotter temperatures, which can make component cleanliness a challenge. Dirt in the engine, whether piston deposits or crankcase sludge, can reduce operating efficiency and increase fuel costs. A higher-quality engine oil actively works to remove deposits, helping keep the engine clean and protected.

Wear protection

is particularly critical at high-pressure contact points, such as the valve train. A heavy duty engine oil that includes adaptive molecules helps protect the engine by reacting under heat and pressure to form a protective film between key components that helps to reduce wear.

Corrosion protection

Gases and acids are generated as a natural by-product of the combustion process but can cause corrosion of vital components, increasing the risk of engine failure. Through oxidation and acid control, the lubricant helps neutralise these acids.

Fuel economy

To help ensure increased fuel economy without compromising on wear protection or oil life, the latest low-viscosity heavy duty diesel engine oils need to deliver exactly the same wear protection and oil life as their thicker counterparts.

Long Oil Life

Oxidation, soot accumulation and oil thickening, and the build-up of acids in the lubricant all contribute to oil aging. High quality synthetic engine oils with the right base oil and additive technology -including anti-oxidant additives -can maintain performance characteristics for longer in the presence of contaminants and by-products.

4 Compared to lower quality mineral oil alternatives

"WITH FUEL COSTS AMOUNTING TO AS MUCH AS 39% OF TOTAL FLEET OPERATING COSTS, A LUBRICANT THAT HELPS DELIVER EVEN A SMALL INCREASE IN FUEL EFFICIENCY HAS THE POTENTIAL TO GREATLY IMPACT TOTAL COST OF OWNERSHIP."

– John Walters, Shell Lubricants Global Sector Manager for Fleet

AXLES AND TRANSMISSIONS

The quality of transmission or axle oil can significantly impact component life, vehicle downtime, oil drain intervals, and therefore cost per kilometre of the fleet.

1 Cleanliness

When a vehicle is operating under high load, for instance ascending steep inclines or driving through sandy territory, driveline oils can be exposed to very high temperatures. In these demanding conditions, the lubricant must deliver long-lasting protection without degrading or causing build-up of deposits that can reduce transmission efficiency and lead to component wear.

2 Long oil life

The length of time an oil can protect a transmission or axle depends on the quality of both its base oil and special components in the additive package that activate under high pressure metal-to-metal contact. These molecules deplete with use, reducing the ability of the oil to protect components over time. A higher quality oil can deliver longer oil life and performance through a longer drain interval.

3 Cooling

When the transmission or axle oil more effectively cools components, it can help extend oil life by limiting oil degradation, but more importantly helps reduce friction and thus improve efficiency and fuel economy. Field trails and controlled driveline rig testing by Shell Lubricants have shown that high quality synthetic oils can deliver significantly improved cooling of axles and gearboxes compared to mineral products.

4 Cold starts

High quality synthetic oils work more effectively[5] when cold, which enables the oil to fully lubricate the gearbox more rapidly at start-up. They also take less energy from the driveline when heating up, helping to improve fuel economy.

5 Axle seal failure

In some extreme cases, poor lubricant choice can lead to premature seal failure in axles. Undetected, the oil can get onto the braking system rendering it ineffective and causing extensive costly repairs.

4 Compared to lower quality mineral oil alternatives

"THE LIFE FORCE OF ANY FLEET BUSINESS IS ITS VEHICLES, SO UNPLANNED DOWNTIME CAN HAVE A HUGELY DAMAGING IMPACT ON A COMPANY'S EFFICIENCY AND PROFITABILITY. THE RIGHT LUBRICANTS AND GREASES PLAY A VITAL ROLE IN HELPING PROTECT CRITICAL COMPONENTS AGAINST WEAR, DEPOSITS AND CORROSION, GIVING FLEET MANAGERS THE PEACE OF MIND THAT THEIR EQUIPMENT IS PROTECTED IN ALL CONDITIONS, EVEN WHEN OPERATING AT MAXIMUM LOAD."

– John Walters, Shell Global Sector Manager for Fleet

3. LUBRICANT MANAGEMENT

Effective lubrication management can help deliver value from improved productivity and reductions in lubricant consumption, maintenance and operating costs.

EFFECTIVE LUBRICATION REQUIRES A NUMBER OF PROCESSES

Only 33% of fleet companies have all the recommended procedures* in place to manage lubricants effectively[1].

*Shell recommended procedures include: Delivery and storage of lubricants /greases, Oil change procedures, Oil dispensing systems, Efficient grease lubrication systems, Oil analysis, Training employees in lubricant selection and/or management

"EVEN THE BEST PRODUCT CANNOT PERFORM EFFECTIVELY IF IT IS NOT PROPERLY APPLIED AND MANAGED. THROUGH SPECIALIST TECHNICAL SERVICES AND EXPERTISE, SHELL LUBRICANTS AIMS TO HELP FLEET CUSTOMERS REALISE THE FULL VALUE OF A HIGH PERFORMING LUBRICANT AND GREASE PORTFOLIO."

– John Walters, Shell Global Sector Manager for Fleet

DELIVERING BUSINESS VALUE THROUGH LUBRICATION SERVICES

Shell LubeMatch

Lubricant Selection
A free online tool that provides instant lubricant recommendations for a wide variety of vehicles. Available online (www.shell.com/lubematch) or as a mobile app. The most robust oil selector tool in the market, available in 138 countries and 21 languages.

Shell LubeAnalyst

Lubricant Analysis
A global oil and equipment monitoring service that helps customers assess lubricant condition, identify potential problems, and benchmark equipment performance against comparable oil samples from around the world. Available in 95 countries and 28 languages, it has more than 60,000 users worldwide, and analyses over 750,000 samples a year. The service allows customers to monitor equipment without interrupting operations, and provides guidance on interpretation of results.

Shell LubeAnalyst Lite

Rapid On-site Analysis
Shell LubeAnalyst Lite[6] on-site analysers deliver fast, comprehensive test results for machine lubricants including engine and gearbox oils, hydraulic fluids and power steering and transmission fluids. Maintenance staff can test lubricants on-site at any remote location and get results within 15 minutes. The service can help limit downtime and lower maintenance costs by capturing early signs of abnormal wear, and helping extend oil-drain intervals.

Shell LubeCoach

Upskilling Employees
A customised training programme, led by Shell technical experts with substantial in-field experience, which offers practical coaching to customers' staff on lubricant management techniques.

Shell LubeAdvisor

Shell LubeVideoCheck
A cost-effective, efficient and non-invasive service aimed at companies that want to prevent breakdowns and unscheduled maintenance. This state-of-the-art fibre-optic tool enables inspection of key internal engine components, including difficult-to-access areas such as the cylinder head, valves, cylinder walls and pistons without dismantling the engine. All that is needed is to remove the injector or glow or spark plug to gain access. Shell Lubricants technical staff provide a detailed condition assessment, including recommended actions.

6 Shell LubeAnalyst Lite complements the off-site, laboratory-based service offered by Shell LubeAnalyst. Shell LubeAnalyst remains the recommended analysis service when extreme precision is more important than fast results. Shell LubeAnalyst Lite is not currently available in all regions.

4. HELPING LOWER COST PER KILOMETRE WITH EFFECTIVE LUBRICATION

Shell Lubricants regularly works with fleet businesses of all sizes, helping them to improve vehicle reliability and lower maintenance costs by implementing effective vehicle lubrication.

In the following sections, we provide real-world examples of how this has been achieved by customers in Americas, Asia, and Europe.

EFFECTIVE LUBRICATION REQUIRES A NUMBER OF PROCESSES

Over half of fleet operators surveyed admit their errors in lubrication have led to vehicle breakdowns

32% believe this has cost their business **$100,000 or more** over the last three years[1]

"A COMMON MISTAKE IS REDUCING THE OIL DRAIN INTERVALS, EVEN THOUGH THE LUBRICANT IN USE REMAINS SATISFACTORY. IMPLEMENTING AN EFFECTIVE OIL MONITORING PROGRAMME CAN ALLOW PLANT MANAGERS TO INCREASE ODIS AND, ULTIMATELY, ACHIEVE EVEN BIGGER SAVINGS."

– Praveen Nagpal, Shell Global Product Application Specialist

4a. REDUCING COST PER KM OF FLEETS BY OPTIMISING VEHICLE LUBRICATION

MANY FLEET COMPANIES UNDERESTIMATE THE INFLUENCE OF LUBRICATION ON VEHICLE AVAILABILITY, MAINTENANCE COSTS AND FUEL EXPENDITURE

Only **31%** understand how lubricants can help **improve fuel efficiency**

37% understand how effective lubrication can help **reduce unplanned downtime**

Only **1 in 3** companies have all the **correct lubrication management procedures** in place[1]

THE BENEFITS OF HIGHER QUALITY LUBRICANTS ARE OFTEN OVERLOOKED

Only **52%** consider **lubricant product performance** an important purchase consideration

56% do not expect higher quality lubricants to help **cut maintenance costs**

and **66%** do not expect they can help **reduce unplanned downtime**

THIS IS HAVING A FINANCIAL IMPACT

Over half of companies admit their lubrication errors caused unplanned vehicle downtime

32% believe this cost their business **over $100,000**[2]

and **1 in 5** believe costs **exceeded $250,000**[2]

EFFECTIVE LUBRICATION CAN HELP FLEET MANAGERS **REDUCE UNPLANNED DOWNTIME AND LOWER MAINTENANCE COSTS, CONTRIBUTING TO LOWER OVERALL COST PER KILOMETRE**

SHELL LUBRICANTS WORK WITH CUSTOMERS TO HELP DELIVER TCO SAVINGS

At least **$139 million** savings delivered to customers worldwide (2011-2015)[3]

260 Shell Lubricants technical specialists help customers reduce TCO through effective lubrication

260

OEM and customer collaborations enable Shell Lubricants to develop products that help improve equipment reliability and productivity

Shell Lubricants Services to help upgrade lubrication management:

- Shell LubeAdvisor — Helping identify and seize savings
- Shell LubeExpert — Expert advice on-site
- Shell LubeAnalyst — Lubricant monitoring
- Shell LubeCoach — Staff training

This survey, commissioned by Shell Lubricants and conducted by independent research firm Edelman Intelligence, polled 395 decision makers in the Fleet sector in 8 countries (Brazil, Canada, China, Germany, India, Russia, UK, US) from November to December 2015.

1. Shell recommended procedures include delivery and storage, oil change, oil dispensing systems, efficient grease lubrication systems, oil analysis and training employees in lubricant selection or management.
2. $ figure based on converting local currency into equivalent $ amount
3. Based on savings delivered to Shell Lubricants customers from 2011-2015

SHELL LUBRICANTS
TOGETHER ANYTHING IS POSSIBLE

4b. CASE STUDIES FROM THE AMERICAS

HAULAGE COMPANY SAVES USD $35,680 BY REDUCING LUBRICANT CONSUMPTION AND MAINTENANCE COSTS[7]

The Challenge

Venezuelan haulage company Vencarga Internacional SA operates a fleet of trucks across the country on short- and long-haul journeys in average temperatures of more than 30°C. The company sought to reduce its operational costs through best practices in lubrication and approached Shell Lubricants for advice.

The Solution

Shell Lubricants technical experts suggested that the company should trial Shell Rimula R6 M and utilise the Shell LubeAnalyst service to measure oil performance and identify the correct oil-drain interval. The team also offered training to the company's staff to help improve maintenance practices and thereby reduce operational costs and improve margins.

The Results

- Oil-drain interval extended from 15,000 to 25,000 km
- Total reported annual savings of approx. USD $35,680 through reductions in lubricant consumption and maintenance costs
- The company has benefited from increased equipment availability, more reliable operations and improved maintenance practices as a result of staff training

7 Savings indicated are specific to the calculation date and mentioned site. These calculations may vary from site to site, depending on application, operating conditions, current products used, condition of equipment and maintenance practices.

SHELL LUBE VIDEOCHECK HELPS COMPANY AVOID COSTLY ENGINE REBUILD, SAVING USD $54,000[7]

The Challenge

Maxim Crane Works, based in Texas, USA, specialises in the rental and sales of lifting equipment and mobile cranes. One of the company's heavy-duty truck cranes had a small fire in the engine compartment while on the highway, as a result of hydraulic fluid leaking into the engine and igniting on contact with the turbochargers. The company's mechanics were uncertain about the extent of the damage to internal engine parts and were prepared to rebuild the engine.

The Solution

Shell Lubricants technical experts worked together with the company's mechanics to inspect the internal components of the engine using the Shell LubeVideoCheck service. The service uses a flexible videoscope to enable engineers to look inside an engine to inspect for deposits or evidence of wear, or, in this case, fire damage. This inspection of the cylinders and turbochargers revealed that the crane's engine had sustained only minor damage as a result of the fire, with broken impeller blades on one turbocharger and debris in the intercooler.

The Results

- The Shell LubeVideoCheck inspection demonstrated that rebuilding the engine was unnecessary, and Maxim Crane Works was able to avoid this expense.
- As a result, the company reported savings of approximately USD $46,000 in parts and labour costs.

7 Savings indicated are specific to the calculation date and mentioned site. These calculations may vary from site to site, depending on application, operating conditions, current products used, condition of equipment and maintenance practices.

PARCEL COMPANY SAVES USD $46,0001 IN ENGINE REBUILDS WITH SHELL LUBEANALYST[7]

The Challenge

A prominent parcel delivery company in the USA was looking to prevent costly breakdowns in its extensive vehicle fleet. Its aim was to assess the condition of its vehicles so that the vehicle manufacturer could rectify problems within the warranty period. The company approached Shell Lubricants, which was already supplying its lubricants, for help.

The Solution

Shell Lubricants technical experts recommended the Shell LubeAnalyst oil condition monitoring service. The service provides lubricant sample analysis that helps to identify oil or equipment failures before they become critical. By using the Shell LubeAnalyst service, the parcel delivery company was able to identify issues in three engines and to return these to the manufacturer while they were still under warranty.

The Results

- The company reported savings of approximately USD $46,000 in engine rebuilds, money that would have been spent had the problem been identified after the warranties had expired.
- The company also benefited from a reduction in downtime through avoiding the problems identified by Shell LubeAnalyst.

7 Savings indicated are specific to the calculation date and mentioned site. These calculations may vary from site to site, depending on application, operating conditions, current products used, condition of equipment and maintenance practices.

LUBRICANT UPGRADE EXTENDS OIL DRAIN INTERVALS BY 50%, RESULTING IN USD $126,000 ANNUAL SAVINGS[7]

The Challenge

Major western US concrete company, Robertson's Ready Mix, wanted to extend oil drain intervals to increase overall efficiency and reduce operating costs. They looked to Shell Lubricants for answers.

The Solution

Shell Lubricants technical experts recommended that the customer run a field trial, using Shell Rotella T5 synthetic blend oil and Shell LubeAnalyst Oil Condition Monitoring in 10% of their fleet.

The Results

- The combined product and service offering from Shell Lubricants enabled the company to:
- Extend oil drain intervals by 50%, from 800 hours to 1,200 hours, reducing oil consumption and vehicle downtime.
- Achieve total reported savings over USD $15,000. When implemented across the full fleet, this will provide an annual savings of USD $126,000.

7 Savings indicated are specific to the calculation date and mentioned site. These calculations may vary from site to site, depending on application, operating conditions, current products used, condition of equipment and maintenance practices.

4C. CASE STUDIES FROM ASIA

CHINESE COMMERCIAL VEHICLE DEALER USD $136,0851 PER YEAR BY UPGRADING DRIVELINE LUBRICANT AND LUBRICATION MANAGEMENT PRACTICES

The Challenge

Beijing Qichi Mechanical and Electrical Co Ltd (Beijing Qichi M&E) is a Scania dealer and operates a service centre for commercial vehicles such as haulage trucks manufactured by Hongyan, Scania, ShanQi and ZhongQi. The company also has its own fleet of 300 Scania vehicles.

The company wanted to enhance the efficiency of its operations by identifying the most appropriate lubricants and vehicle maintenance intervals, so sought advice from Shell Lubricants and its distributor in Beijing.

The Solution

After assessing the company's operations, Shell Lubricants technical experts recommended that the company should use the Shell Lubricants driveline portfolio of products: Shell Rimula R6 LM diesel engine oil, Shell Spirax S6 AXME transmission and axle oil, and Shell Gadus S3 V220C grease. To support with lubrication management, they also offered the Shell LubeCoach training programme and the Shell LubeAnalyst oil and equipment condition monitoring service.

The Results

- The integrated offer of Shell Lubricants driveline lubricants and lubrication management services enabled the company to benefit from reduced engine oil and grease consumption, lower maintenance costs and increased vehicle availability.
- Engine oil-drain interval of its vehicles extended from 20,000 to 30,000 km
- Re-greasing interval extended from 300 to 400 hours
- Reported total savings of USD $136,0851 per year:
- USD $107,935 from reduced engine oil and grease consumption
- USD $16,085 from reduced maintenance intervals
- USD $12,065 from reduced downtime

8 Savings indicated are specific to the calculation date and mentioned site. These calculations may vary from site to site, depending on application, operating conditions, current products used, condition of equipment and maintenance practices

CHINA'S QINGDAO PUBLIC TRANSPORTATION GROUP SAVES USD $264,000 PER YEAR WITH SHELL RIMULA FOR NATURAL GAS ENGINES[8]

The Challenge

Qingdao Public Transportation Group is a large-scale state owned bus company, responsible for the entire public transportation system of Qingdao City, a huge second-tier city in China. The company has more than 5,500 buses, nearly 2,200 of which are equipped with Natural Gas engines. In recent years, with pressure to reduce emissions in China's cities, the prevalence of Natural Gas engines has increased dramatically.

The company was using another brand of oil for natural gas engines, which delivered an oil drain interval (ODI) of 14,000 Km. As the buses frequently drive more than 1000 Km per week, this meant each vehicle was taken out of circulation once every 3 months while they went to the workshop for an oil change. The customer wanted a solution to avoid this frequent downtime and reduce the cost of lubrication.

The Solution

The local Shell Lubricants technical experts learned of the customer's challenge and contacted them to recommend a cost-efficient engine oil for natural gas vehicles, Shell Rimula R3 ND 10W-40, showing examples of other public transportation companies who had realized the benefits of switching to this product.

The company agreed to run a field trial to test the impact on ODIs. Two vehicles were selected to trial the new product, and oil samples were taken at intervals of 16,000, 24,000, 30,000 and 33,000 Km using the Shell LubeAnalyst service. Satisfied with the results, the company implemented the product across its whole fleet of natural gas buses.

The Results

- ODI more than doubled, from 14,000 to 30,000 Km
- Reported savings totalled USD $264,000 per year, thanks to extended ODIs and reduced vehicle downtime

8 Savings indicated are specific to the calculation date and mentioned site. These calculations may vary from site to site, depending on application, operating conditions, current products used, condition of equipment and maintenance practices

MALAYSIAN FLEET COMPANY SAVES USD $207,438 FROM ENGINE OIL UPGRADE AND IMPROVED OIL MONITORING[8]

The Challenge

Malaysian fleet company Sin Chuan Aik runs a fleet of vehicles that operate for long hours (12 hours per day), carrying heavy loads in a hot, dusty environment. Aware that the operating conditions place great strain on the vehicle engines, and facing increasing fuel costs, the company was looking to reduce costs and improve operational efficiency.

The Solution

Shell Lubricants technical experts recommended that the company upgrade the existing engine oil to Shell Rimula R6 MS 10W-40 synthetic engine oil, which could help extend oil drain intervals. In addition, the Shell Lubricants technical experts recommended that the customer use the Shell LubeAnalyst oil condition monitoring service.

The Results

- As a result of implementing the recommended upgrades to lubrication processes, the company achieved:
- Oil Drain Intervals (ODIs) almost doubled, reaching 45,000 Km
- Longer ODIs helped reduce lubrication costs by almost 44%
- Annual cost savings of USD $207,438

8 Savings indicated are specific to the calculation date and mentioned site. These calculations may vary from site to site, depending on application, operating conditions, current products used, condition of equipment and maintenance practices

REDUCED MAINTENANCE COSTS AND EXTENDED OIL DRAIN INTERVALS SAVES INDONESIAN TRANSPORT COMPANY USD $42,667[8]

The Challenge

Indonesian bus and coach company Hino Bus operates a fleet of vehicles that drive approximately 700 km per day in dusty, hilly conditions, with temperatures reaching up to 36°C. The company wanted to reduce maintenance costs by extending oil drain intervals and reducing frequency of gear parts replacement.

The Solution

Shell Lubricants Technical experts recommended that the company upgrade its transmission oil to Shell Spirax S2 A 85W140 and make use of the Shell LubeAnalyst service.

The Results

After implementing the changes, the company benefited from:

- Oil drain intervals extended from 20,000 to 30,000-35,000 km
- Reduction in parts replacement, leading to savings in maintenance costs
- The company reported annual cost savings of USD $42,667

8 Savings indicated are specific to the calculation date and mentioned site. These calculations may vary from site to site, depending on application, operating conditions, current products used, condition of equipment and maintenance practices

4D. CASE STUDIES FROM EUROPE

CHINESE COMMERCIAL VEHICLE DEALER USD $136,0851 PER YEAR BY UPGRADING DRIVELINE LUBRICANT AND LUBRICATION MANAGEMENT PRACTICES

The Challenge

OAO Volgogradneftegeophisika performs geophysics research across a vast region from Iran to the northern regions of Russia. The company regularly operates 13 Sercel vehicles with Volvo Nomad 65 engines. These vehicles are used perform research work in different climate zones, in areas where the quality of diesel fuel can vary greatly, and often where proper maintenance and vehicle servicing are unavailable. As such, reliable lubricants are critical. The company was looking to reduce costs, extend oil drain intervals (ODIs) and achieve more reliable equipment performance.

The Solution

Shell Lubricants technical experts recommended that the customer implement a complete portfolio of lubricants for the whole driveline (Shell Rimula R4 L 15W-40 for engines, Shell Spirax S3 AX 80W-90 gear oil, Shell Omala S4 GX 220 drive gear oil, Shell Tellus S2 V 32 hydraulic oil). To help optimise ODI for the whole driveline, they also recommended Shell LubeAnalyst service.

The Results

- ODIs increased for all products across the driveline, helping reduce equipment downtime:
  - Engine oil from 150 to 250 hours
  - Gear oil from 800 to 1000 hours
  - Drive gear oil from 2000 to 2500 hours
  - Hydraulic oil from 2000 to 2500 hours
- As a result, reported savings totalled almost USD $35,005 per year

9 Savings indicated are specific to the calculation date and mentioned site. These calculations may vary from site to site, depending on application, operating conditions, current products used, condition of equipment and maintenance practices

DUTCH HAULIER SAVES USD $132,273 IN FUEL COSTS WITH SHELL RIMULA R5 LE 10W-30[9]

The Challenge

Dutch fleet company Van der Lee Transport specializes in transporting dangerous goods, chemicals and other liquids in bulk, using tank-trucks. The company has a fleet of 230 trucks in the Netherlands, driving on average 100,000 Km per year. Around 70% of the fleet are Volvo trucks. The company is always searching for solutions to optimize operations. Considering fuel consumption and fuel costs one of their biggest costs, improving the fuel efficiency of its trucks is always an area of focus.

The Solution

Shell Lubricants technical experts suggested that the company implement a field trial to compare the fuel economy benefits of Shell Rimula R4 L 15W-40 to Shell Rimula R5 LE 10W-30. Six Volvo trucks running more or less the same duties were selected for the trial, which took place over a period of six months. Three trucks started with Shell Rimula R4 L 15W-40, the other three with Shell Rimula R5 LE 10W-30. After 3 months, this was switched to prevent any possible truck-specific deficiencies. Throughout the trial, fuel consumption was closely monitored by Volvo Fleet management on-board computers.

The Results

- Test results showed an average fuel saving benefit of 2.1% for Shell Rimula R5 LE 10W-30 compared to Shell Rimula R4 L 15W-40.
- Based on this significant benefit, Van der Lee decided to switch over to Shell Rimula R5 LE 10W-30 for all Volvo-trucks of their fleet.
- Total reported cost savings, calculated based on 160 trucks driving on average 100,000 Km per year amount to USD $132,273 per year

9 Savings indicated are specific to the calculation date and mentioned site. These calculations may vary from site to site, depending on application, operating conditions, current products used, condition of equipment and maintenance practices

5. WHAT'S NEXT?

As well as helping transport operators find opportunities to maximise vehicle reliability and reduce costs in the present day, Shell Lubricants is always looking ahead to develop the next generation of products and services that will continue to give transport companies a competitive edge.

Improving efficiency

Looking at current industry trends, there is a worldwide need to improve heavy duty diesel engine fuel efficiency. Shell Lubricants was actively involved in the introduction of CK-4 and FA-4 lubricants to the North American market, another milestone on the road to greater efficiency.

As fuel economy targets and the associated penalties become increasingly important for manufacturers globally, engine oil has a role to play as a critical enabling technology. Getting this right requires out-of-the box thinking and long-term technical partnerships.

- For example, a Shell-sponsored PhD project at Imperial College London, UK, aims to further understanding of the mechanisms behind soot-induced engine wear using a range of state-of-the-art experimental techniques.
- Shell has also been working with AirFlow Truck Company to co-engineer a new hyper-fuel mileage Class 8 tractor-trailer nicknamed the StarShip. The vehicle aims to break current fuel efficiency records through advances in engine, vehicle and drivetrain technology.

Specialist Lubricants for Alternative Fuels

- The advent of CNG & LNG fuels as an alternative to traditional diesel fuel is another exciting development. Shell supplies this new, lower CO2 and cleaner-burning transport fuel in several markets including the US, Canada and the Netherlands. In addition, Shell Lubricants developed a range of heavy-duty engine oil products specifically designed to address the specific lubrication challenges for natural gas engines: Shell Rimula R3 NG, Shell Rimula R5 NG and Shell Rotella T3 NG.

6. APPENDIX

LUBRICANTS TECHNOLOGY - KEY FACTS

REDUCE FRICTION

Lubricants form a fluid barrier between moving surfaces to reduce friction between them, helping maintain smooth running and limit wear.

COOL

Lubricants absorb excess heat from high friction zones and transfer it away for cooling. This allows the equipment to function efficiently. (Not a critical function of greases).

CLEAN

Lubricants flush away contaminants, removing dirt and wear particles from vital areas for removal via filtration. Many also contain active detergents for more powerful cleaning.

PROTECT

Lubricants and greases form a protective barrier between moving surfaces, preventing metal-to-metal contact and wear. They also contain additives that neutralize harmful acids such as combustion by-products that can impact equipment life. Enhanced protection helps limit wear and extend the life of components, helping to reduce spend on spare parts.

LUBRICANT FORMULATION

A lubricant's precise blend of base oil and additive package helps ensure that it is able to deliver optimum performance for the longest possible time in a cost effective manner.

The process of creating a new lubricant or grease – from selecting components, to rigorously testing the formulation and conducting field trials – is highly complex and can take several years. In some cases lubricants evolve over decades, with developments in chemistry and technology innovations.

DID YOU KNOW?

FOR DECADES, SHELL HAS LED THE WAY IN ADVANCING LUBRICANTS TECHNOLOGY FOR THE BENEFIT OF CUSTOMERS.

1933

Shell develops the four-ball load and wear test. Now a standard lubricants industry test, this assesses wear prevention in highly loaded contacts, like rolling element bearings and open gears.

1936

The first oil company to invent lithium-based greases. An important shift for the industry, lithium greases now represent >80% of all greases used worldwide.

1990s

First to market with a 'low SAPS' heavy duty engine oil. Lower levels of sulphated ash, phosphorous and sulphur help reduce diesel exhaust emissions by protecting after-treatment devices.

2014

First to introduce lubricants formulated from natural gas, with Shell patented gas-to-liquid technology.

2016

Shell introduces Shell LubeAnalyst Sensors, designed for real-time oil condition monitoring

BASE OILS AND ADDITIVE PACKAGES

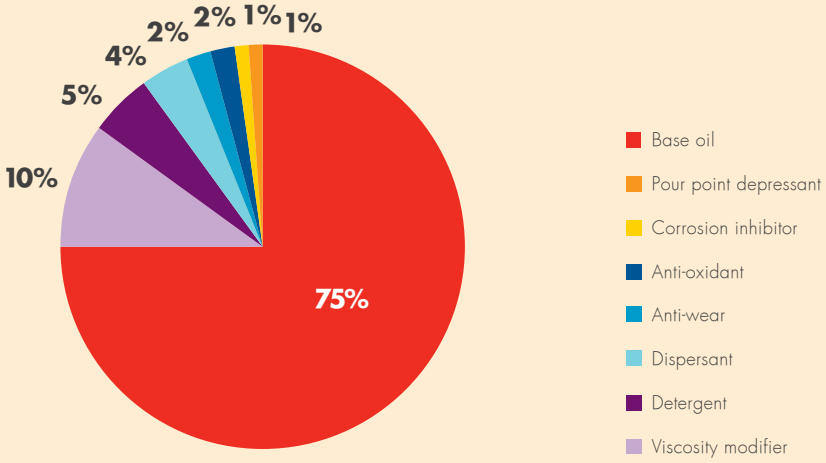
Base oils typically make up 75% to 95% of the finished product and influence many of its key characteristics. They are key to determining factors like viscosity and lubricity.

The additive package comprises up to 25% of a lubricant's composition and works to enhance key performance aspects of the base oil, to achieve optimum performance of the finished product.

Examples of how this is achieved include:

- **Protection against wear** to extend component life and help reduce maintenance costs. This is delivered through anti-wear additives that prevent metal-to-metal contact, extreme pressure agents that separate metal surfaces at high pressure and sometimes solid fill additives that protect against shock loads at low speeds.
- **Operating performance,** delivered through detergents and dispersants that help manage the accumulation of soot and other impurities. This helps avoid abrasive wear that can impair equipment performance.
- **Reduced cost of lubrication** as a result of longer oil or grease life. This is achieved through anti-oxidants that help the oils deal with higher temperatures and loads, prevent corrosion, and guard against lubricant breakdown.

Typical composition of base oil and additive package for a heavy duty diesel engine oil



GREASE THICKENERS

Greases are designed to release lubricating fluid under pressure and then reabsorb it. The life of the grease is determined by its ability to do this without changing consistency – its mechanical stability.

Base oils and additives are critical to grease formulation. In addition, grease thickener is a key component of grease and impacts its quality. In most countries, lithium or lithium complex thickeners are used for the majority (~80%) of all applications. These deliver good water resistance, excellent mechanical stability and corrosion resistance, and remain thixotropic (fully viscous) at high temperatures.

The importance of greases is often overlooked as they generally represent only 3% of transport equipment's total lubricant needs. However, selecting the right greases and applying them correctly can have a significant effect on reducing TCO by extending the life of components such as wheel bearings and chassis components.

PARTNERING FOR INNOVATION EXCELLENCE

Committed to delivering value to customers, Shell invests significant resources in developing new lubricants and greases.

A network of collaborations strengthens the innovation capabilities of Shell Lubricants Research & Development teams located in Technology Centres in Shanghai, Hamburg and Houston.

- Technical Partnerships with OEMs help ensure that Shell Lubricants oils and greases are optimised for the latest equipment technology
- Field trials with customers validate performance in real-life scenarios and help steer the development of products that improve performance, productivity and profitability. For example, Shell has accumulated approximately 40 million real-world miles on API CK-4 and FA-4 prototype technologies.
- The Shell Lubricants portfolio for the transport sector has over 2600 approvals and certifications from leading transport industry OEMs, such as Daimler, Volvo, MAN, Cummins, ZF, Voith, Allison and many more.
- Innovation is key to addressing the next generation of lubrication challenges. The Shell Lubricants Discovery Hub is a global, multi-disciplinary team focused on pushing the boundaries of current lubrication technology and addressing the next generation of lubrication challenges.