



# UNLOCKING THE HIDDEN POTENTIAL OF MANUFACTURING

How lubricants can help increase productivity  
and reduce total cost of ownership



# FOREWORD

A message from Yin Jie,  
Shell Lubricants Global Sector Manager  
for General Manufacturing



Evolving technology, changing consumer demands and tightened regulations are just a few of the forces behind the ongoing transformation of the global manufacturing market.

To stay competitive, manufacturing companies are striving to increase productivity and reduce downtime

in order to meet deadlines while still maintaining product quality.

Many companies already apply Total Cost of Ownership (TCO) evaluations to measure operational performance, knowing that reducing TCO over the lifetime of machinery enables them to extract the best possible value from the asset. However, **the impact of lubrication on TCO is too often underestimated.**

An international survey of manufacturing companies commissioned by Shell Lubricants found that while the majority (59%) of companies recognise that effective lubricant selection and/or management can help reduce costs by 5% or more, they undervalue the opportunity - fewer than 10% realise that the impact of lubrication could be up to six times greater<sup>1</sup>.

**Shell Lubricants believes lubrication can deliver significant business value.** When considering the potential savings, we expand upon the typical definition of TCO to include productivity, and the costs of lost production resulting from equipment downtime<sup>2</sup>.

In general, the cost of lubricants accounts for around 1% to 2% of a manufacturing company's total maintenance expenditure. Shell Lubricants technical experts have helped **manufacturing companies achieve savings that equal their total lubricants spend and further impact up to 30% of maintenance budget**, by adopting the right approach to lubrication. Savings derive primarily from lower maintenance costs, reduced equipment downtime and productivity improvements.

There are two key elements to seizing this opportunity; the first is **selecting the right lubricant or grease**, the second is **effective lubrication management**.

This paper explores the **substantial business benefits** possible from effective lubricant procedures. Case studies illustrate how manufacturing companies have successfully worked with Shell Lubricants to upgrade their lubrication and extract value by reducing TCO and improving equipment productivity.

I hope you find it both informative and useful.



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1. This study commissioned by Shell Lubricants and conducted by research firm Edelman Intelligence, polled 493 decision-makers in the manufacturing industry in eight countries (Brazil, Canada, China, Germany, India, Russia, the UK and the US) from November to December 2015

2. 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

# 1. TOTAL COST OF OWNERSHIP: UNDERSTANDING THE POTENTIAL

Shell Lubricants believes that there is potential for lubrication to deliver significant business value by contributing to improved productivity and reduced costs. 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.

## Total Cost of Ownership (TCO)

When evaluating the effect of lubricants on TCO, Shell Lubricants considers the end to end impact on maintenance budget and processes, but also any costs related to lost production during equipment downtime. Optimising lubrication can have a significant impact on component life, maintenance costs, and unplanned downtime so 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 company'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

### THE IMPACT OF LUBRICATION IS UNDERRATED.

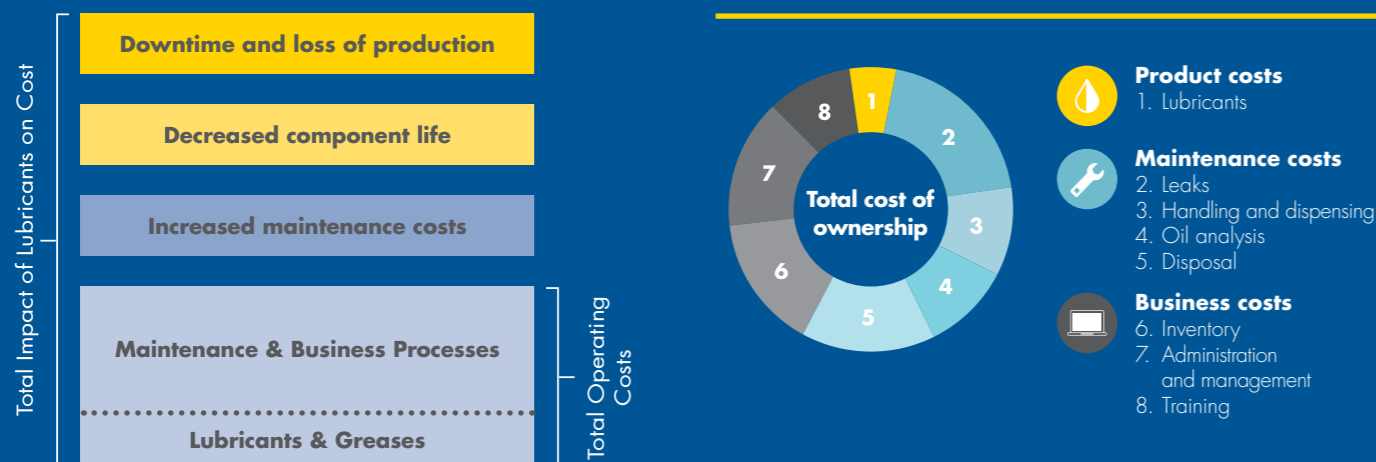


59% of companies believe they can reduce costs by >5% through lubricant selection and/or management.



But only 1 in 4 think savings could exceed 10%.<sup>1</sup>

## COMPONENTS OF TOTAL COST OF OWNERSHIP



# 2. LUBRICANT SELECTION

Each piece of manufacturing equipment made by different original equipment manufacturers (OEMs) has its specific lubrication requirements. OEMs define the minimum requirements from a lubricant or grease, but not all products that meet these standards deliver the same level of performance.

## 2a. LUBRICATION CHALLENGES

Equipment design, operational parameters and surrounding environment can all pose different challenges for lubrication.

**Selecting the right lubricant or grease is a critical first step in improving productivity and realising significant TCO savings.**

The hydraulic system is at the heart of many critical pieces of manufacturing equipment. Most companies understand that proper equipment maintenance is essential to operational efficiency, but **the impact of the hydraulic fluid is often underestimated.**

### THE BENEFITS OF HIGHER QUALITY LUBRICANTS ARE OVERLOOKED<sup>1</sup>



61% do not expect a higher quality lubricant to help reduce unplanned downtime.



**Only 46%** of companies believe product performance should be an important consideration when purchasing lubricants.



## FACTORS INFLUENCING EQUIPMENT RELIABILITY



# THE CRITICAL ROLE OF HYDRAULIC FLUIDS

Hydraulic fluid plays a vital role in ensuring continuous and smooth equipment operation, energy savings and long machine lifespan. This can help to reduce maintenance costs and increase productivity, thereby helping maximise the return on investment.

## Wear protection

The hydraulic fluid helps keep moving components apart to avoid metal-to-metal contact and wear. To help ensure equipment remains protected in all conditions, the hydraulic fluid must remain thin enough in cold environments to circulate quickly to critical components, and then thick enough when equipment is operating at higher temperatures to continue to protect against abrasive wear.

## Longer equipment life

Oxidation of the lubricating fluid can result in the formation of acids that can corrode equipment. A lubricant that offers greater resistance to oxidation helps equipment operate under higher stresses for longer.

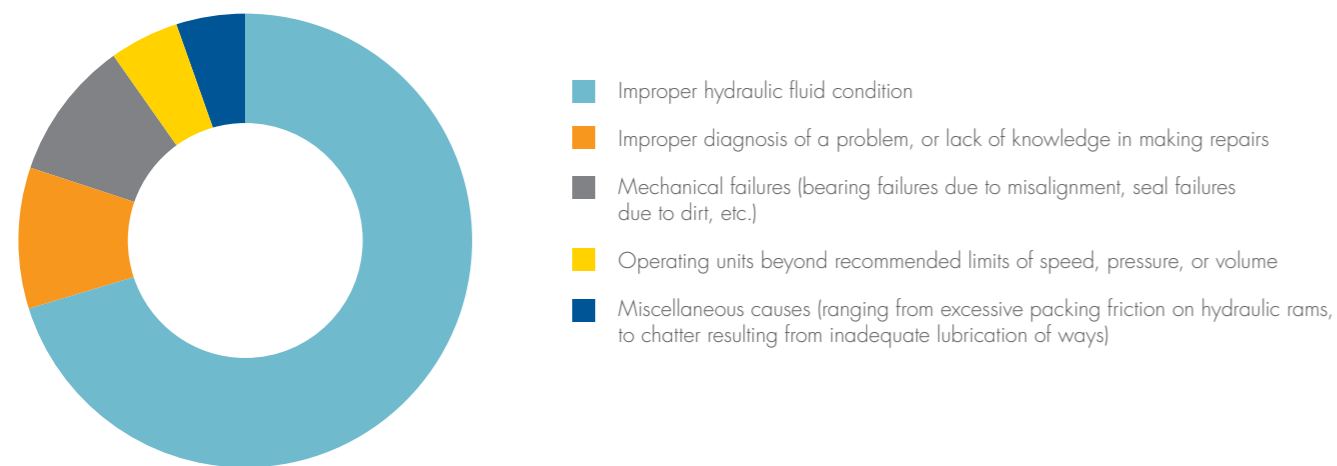
## System efficiency

A hydraulic fluid needs to protect, lubricate and transmit power efficiently. A product that offers excellent air release, foam control and filterability helps enable equipment to operate more efficiently.

Multiple surveys conducted by hydraulic equipment manufacturers and other industry bodies have shown that 50% to 70% of equipment failures are related to 'improper hydraulic fluid condition'<sup>3</sup>.

Selecting the proper type and grade of hydraulic fluid and then performing proper fluid maintenance can help reduce the severity and frequency of equipment malfunction.

## KEY CAUSES OF OPERATING DIFFICULTIES IN INDUSTRIAL HYDRAULIC SYSTEMS



<sup>3</sup> Source: multiple surveys by industry bodies including additive companies, filter manufacturers, hydraulic equipment manufacturers. One source includes Parker Hannifin GmbH Bulletin: HY30-3248/UK: Hydraulic Fluids for Parker Axial Piston Pumps Series PV

“EVEN IF A HYDRAULIC SYSTEM IS PERFECT IN DESIGN AND CONSTRUCTION, IF THE HYDRAULIC FLUID IS UNSUITABLE OR IN IMPROPER CONDITION THE EQUIPMENT’S OPERATION WILL BE UNSATISFACTORY AND MAY RESULT IN DAMAGE TO THE UNIT. SELECTING THE RIGHT, HIGH QUALITY HYDRAULIC FLUID AND THEN ENSURING IT IS PROPERLY MANAGED IS JUST AS IMPORTANT TO THE EFFICIENT OPERATION OF A HYDRAULIC SYSTEM AS THE CHOICE OF THE EQUIPMENT ITSELF.”

– Ahmet Guven, Shell Lubricants Product Application Specialist for hydraulic and circulating oils.

“SELECTING A LESS EFFECTIVE LUBRICANT MAY NOT RESULT IN IMMEDIATE EQUIPMENT FAILURE, BUT CAN LEAD TO INCREASED MAINTENANCE EXPENSES OVER TIME. THESE MOUNTING COSTS CAN FAR OUTWEIGH THE SAVINGS FROM SELECTING A LOWER PRICED LUBRICANT. AS SUCH, IT IS IMPORTANT FOR COMPANIES TO THINK ABOUT LUBRICATION AND EQUIPMENT MAINTENANCE HOLISTICALLY, RECOGNIZING THAT SHORT-TERM COST SAVINGS MAY BE LEADING TO BIGGER, PREVENTABLE EXPENSES OVER THE LONG TERM.”

– Yin Jie, Shell Lubricants Global Sector Manager for General Manufacturing.

## 2b. DELIVERING SAVINGS WITH HIGH QUALITY LUBRICANTS

A high quality lubricant or grease that keeps equipment clean of deposits and effectively protects against wear and corrosion can help extend equipment life, reduce frequency of breakdowns and increase the machine’s availability. This could significantly decrease spend on spare parts and maintenance.

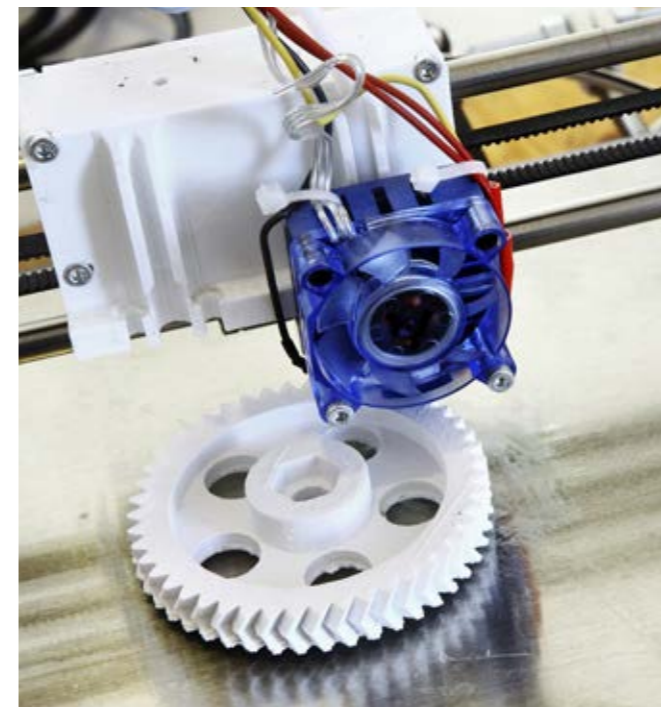
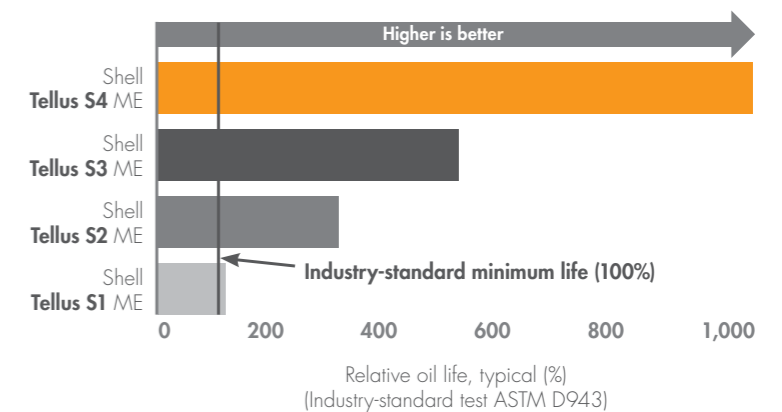
43% do not believe choosing higher quality lubricants can help improve productivity<sup>1</sup>.



### The reality of better product performance

Shell Tellus S4 ME hydraulic fluid lasts up to **10 times longer**<sup>4</sup> than the industry minimum-standard oil life. Long oil life enables customers to operate equipment for longer without interruption, and helps prolong hydraulic pump life through excellent wear protection.

The product is also proven to help improve energy efficiency. In a controlled test cycle, one injection moulding equipment maker measured energy savings of **up to 4%**<sup>5</sup> in the hydraulic systems using Shell Tellus S4 ME.



## SELECTING THE RIGHT LUBRICANT HELPS REDUCE TCO - CASE STUDIES

The following case studies demonstrate how Shell Lubricants has worked together with manufacturing companies to support them in selecting high quality lubricants and greases to help generate substantial cost savings.<sup>6</sup>

<sup>4</sup> As demonstrated in Shell laboratory testing. Actual savings/benefits will vary based on operating conditions and application

<sup>5</sup> The actual energy savings depend on the application, the current oil, the maintenance procedures, the equipment condition, the operating conditions and the intensity of hydraulic power usage

## UPGRADING HYDRAULIC FLUID HELPS SAVE USD \$10,708 BY REDUCING MAINTENANCE COSTS AND EXTENDING OIL DRAIN INTERVALS<sup>6</sup>

### The Challenge

Plastics manufacturer Amaray specialises in injection-moulded covering inlays for DVD trays. The company was looking to lower the operating costs of its two Engel Victory VC 500/150 Plastic Injection Molding Machines. The customer turned to Shell Lubricants for advice.

### The Solution

Shell Lubricants technical experts evaluated the injection moulding machines and identified that savings depended on reducing maintenance costs, extending oil drain intervals (ODIs), lowering energy use and reducing production loss during equipment downtime.

They proposed switching the hydraulic fluid to Shell Tellus S4 ME 46, which offers longer ODIs than the lubricant previously used by the customer. Shell Tellus S4 ME 46 worked without any problems in the machine for over 45,000 hours – over 7 times longer than OEM recommended oil change of 6,000 hours. The product is also designed to help improve energy efficiency for hydraulic systems without compromising system protection.

In addition to upgrading the product, the recommendation was also to make use of the Shell LubeAnalyst oil and equipment monitoring service.

### Results

The company reported savings of **\$10,708** or 14% for the two machines

Savings derived from

- Lower maintenance costs
- Longer ODIs resulting in lower lubricants costs and savings on oil change
- Reduced production loss during oil change and maintenance



<sup>6</sup> Case study savings/benefits were reported by one customer. Actual savings/benefits will vary. More details available on request

## HIGH QUALITY MULTIPURPOSE GREASE REDUCES GREASE CONSUMPTION BY OVER 16%, SAVING ALMOST USD \$10,000<sup>6</sup>

### The Challenge

A year after installing a new production line, a fibreboard manufacturer based in China's Shandong Province, Dongying Artificial Board Factory, was experiencing frequent failures of its spherical roller bearings and high grease consumption. The company wanted to reduce operating and maintenance costs by changing the grease used to lubricate the bearings, and approached Shell Lubricants for advice.

### The Solution

Shell Lubricants technical experts recommended Shell Gadus S2 V220 2 to help the company cut its grease consumption and thus reduce costs. This high-quality, multipurpose, extreme-pressure grease is designed for heavy-duty plain and rolling-element bearings operating under harsh conditions, including shock loading in wet environments and at a wide temperature range. The technical team also held a customised seminar for the factory on equipment maintenance and lubricant storage.

### The Results

- After changing to Shell Gadus S2 V220 2, the company reduced its grease consumption by **more than 16%, from 600 to 500 kg** a year
- The company has experienced **fewer bearing failures** and consequently **less production downtime**
- Reported annual savings amount to **US \$9,848**
- The company is also benefiting from **frequent on-site visits** and **advice on equipment maintenance** provided by the Shell Lubricants technical experts



## COMPRESSOR OIL UPGRADE AND LUBRICANTS TECHNICAL TRAINING HELPS SAVE USD \$12,185 PER YEAR<sup>6</sup>

### The Challenge

Dissatisfied with the poor performance of its existing compressor lubricant and seeking to reduce operational costs, Turkish plastics technology and production capacity company Pilsa Plastic Products Inc. turned to Shell Lubricants for support. Oil analysis indicated the oil had poor thermal and oxidation stability, which resulted in the need for an oil drain every 5,000 hours.

### The Solution

Shell lubricants technical experts monitored and analysed the existing oil's performance using the Shell LubeAnalyst service, and recommended that the company should change to Shell Corena S4 R 68, which would suit its operation better.

Designed to deliver excellent protection and compressor performance, Shell Corena S4 R offers:

- Long oil life - capable of providing oil maintenance intervals of up to 12,000 hours (where allowed by manufacturers) even when operating at maximum discharge temperatures in excess of 100°C.
- Outstanding wear protection - helps provide exceptional protection and protection of internal metal surfaces from corrosion and wear.
- Maintains system efficiency - designed to provide rapid air release without excessive foaming to give trouble-free operation even under cycling conditions

Technical training in lubricant handling and application was also recommended, to better equip the company's staff to manage ongoing lubrication management.

### The Results:

- Changing to Shell Corena S4 R 68 reduced the company's operational costs by 50% and increased the oil-drain intervals from 5,000 to 10,000 hours.
- The cost savings resulted from lower oil consumption and labour costs, less oil waste for disposal and improved maintenance practices.
- The company reports saving US\$12,185 a year.



## HELPING IMPROVE PRODUCTIVITY AND ENERGY EFFICIENCY OF HYDRAULIC EQUIPMENT

By protecting, lubricating and helping transmit power effectively, the hydraulic fluid can help maintain or even improve the efficiency of hydraulic systems, contributing to lower costs of operation.

Customer field trials validate lubricant performance in real-life scenarios. This contributes to the development of products that are designed to help improve performance, productivity and profitability.

The following examples demonstrate how Shell Tellus S4 ME helped improve hydraulic equipment productivity and energy efficiency.



### 1. Shell Tellus S4 ME 46 delivers overall energy efficiency gain of 2.4% per unit production<sup>7</sup>

The hydraulic fluid in a model FN3000 injection moulding machine was changed to Shell Tellus S4 ME 46. After two runs, each based on a fresh charge of Shell Tellus S4 ME 46, an average energy efficiency gain of 1.2% and a productivity gain of 1.3% was observed.

### 2. Boosting energy efficiency and productivity with Shell Tellus S4 ME 46

In two separate trials with the same company, Shell Tellus S4 ME 46 was introduced into a Cincinnati Magna 500 ton injection moulding machine and Husky Hyelectric 650/1000V model machine. After monitoring energy consumption of both machines, the results showed<sup>8</sup> an overall specific energy efficiency gain in the Cincinnati machine of 3.6% per manufactured part (energy efficiency 1.0%; productivity gain 2.7%) and 2.6% per manufactured part in the Husky (energy efficiency 1.1%; productivity gain 1.5%).

### 3. Shell Tellus S4 ME 46 Delivers Energy Savings of 3.2%<sup>9</sup>

Trials aiming to improve energy efficiency were carried out in a System 160/840 injection moulding machine. Two different viscosity grades of hydraulic oil were tested; Shell Tellus S4 ME 46 and Shell Tellus S4 ME 68. The oils were tested by operating the machinery with three different types of manufactured part at two different fluid temperatures<sup>10</sup>. After ten minutes under each set of conditions, the mean power and cycle time was determined. Compared to the reference oil, Shell Tellus S4 ME 68 delivered average energy savings of 2.2%, while Shell Tellus S4 ME 46 achieved 3.2%.

<sup>7</sup> Shell Global Solutions Field Demonstrations of Shell Tellus S4 ME energy efficiency. More details available upon request

<sup>8</sup> Field trial results are from a single charge of Shell Tellus S4 ME 46 in each machine. More details available upon request

<sup>9</sup> Shell Global Solutions Field Demonstrations of Shell Tellus S4 ME energy efficiency. Performance compared to the company's in-house reference oil. More details available upon request

<sup>10</sup> The oils were tested under Euromap 60 conditions: a standard method for assessing energy consumption of injection moulding machines published by European trade association for plastics and rubber machinery manufacturers, Euromap

# 3. LUBRICANT MANAGEMENT

## SHELL LUBRICANTS' SIX STEPS TO GOOD LUBRICATION MANAGEMENT

- 1 **Right storage & handling** – the lubricant must be stored in the right conditions and handled correctly to avoid contamination and preserve its key characteristics
- 2 **Right place** – for the oil or grease to reach the right surface it must be properly applied to the equipment
- 3 **Right time** – the correct frequency of oil change or re-greasing ensures the lubricant reaches the surface at the right time. Delays can result in accelerated wear
- 4 **Right amount** – the correct volume of lubricant or grease applied and topped up to protect moving parts effectively
- 5 **Right monitoring** – regular sampling and analysis to ensure the lubricant remains fit for purpose and check for early indications of equipment wear. Inspections also ensure the consistent application of the first four steps. For a complete analysis service, Shell offers LubeAnalyst
- 6 **Right people** – the competence of those who lubricate equipment can greatly affect its positive impact, particularly when it comes to ensuring all of the above happens.

Even the best product cannot perform effectively if it is not applied and managed correctly.

**Effective lubrication management is vital to unlock potential TCO savings.** It helps deliver value from improved productivity and reductions in lubricant consumption, maintenance and operating costs.

### LACK OF TRAINING AND LACK OF PROCESS ARE OBSTACLES TO EFFECTIVE LUBRICATION

63% of businesses think they do not conduct staff training on lubricants and greases as regularly as they should and only 42% have all the correct lubrication management procedures\* in place<sup>1</sup>



### 3a. CHALLENGES AND SOLUTIONS

The following examples highlight some of the different lubrication management challenges commonly faced by companies, the importance of taking action to address these, as well as the available Shell Lubricants Technical services.

#### The Challenge: Right storage and handling

Contamination control is critical to maximising the overall performance of the lubricant in equipment. How the oil or grease is stored, handled and transported through the manufacturing site greatly impacts the likelihood of contamination.

Storing drums in a sheltered place and wiping the top clean before it is opened will help limit the risk of contamination by water and particles. Applying filtration can also help maintain and enhance product cleanliness before oil enters equipment.

#### The Solution: Expert advice and staff training

Underpinning good lubrication management practices is industry knowledge and expertise. One of the core lubrication management services offered by Shell Lubricants is building technical competency across a customer's organisation. This is delivered through Lubricant Technical Advisors, supported by a team of Global Product Application Specialists and Lubricants Services Experts. They regularly visit manufacturer sites to share expertise with customers about lubrication management.

#### The Challenge: Right Monitoring

Regular monitoring and analysis is critical to ensure the lubricant or grease is functioning well and remains fit for purpose. Lubricant analysis is vital to business continuity. Owners and operators of mission-critical assets need advance warning of mechanical problems that are likely to damage equipment, reduce productivity and increase maintenance costs.

#### The Solution: Oil Condition Monitoring Services

Oil condition monitoring services, such as Shell LubeAnalyst, can provide early warning of equipment wear or lubricant degradation, enabling the lubricant to be changed before issues escalate and thereby helping reduce the frequency, time and cost of maintenance. This also helps improve productivity due to greater equipment availability.

## DID YOU KNOW?

Shell Lubricants has one of the world's largest teams of technical lubricants experts. This 260-strong team of Shell Lubricants technical specialists supported by distributor partners, provides a suite of lubrication management services across various industries. They combine a thorough understanding of equipment, usually resulting from years working for a manufacturing company or OEM, with in-depth knowledge of lubrication. This enables Shell Lubricants to help manufacturing customers maximise equipment productivity whilst reducing TCO.

### Out in the Field

Ahmet Guven is a Global Product Application Specialist for Shell Lubricants, specialising in hydraulic and circulating oils. With over 24 years' experience in the industrial application of lubricants, his role is to provide technical advice and support to customers across Europe and North Africa, whilst also working closely with major hydraulic OEMs and applying his extensive field-based experience to help guide product research and development.



Only 31% of companies are clear on how contamination control can correspond to TCO savings<sup>1</sup>



\* Procedures include: delivery and storage of lubricants and/or greases, oil change procedures, oil dispensing systems, efficiency of grease lubrication systems, oil analysis and employee training on lubricant selection and/or management



# DELIVERING BUSINESS VALUE THROUGH LUBRICATION SERVICES

## 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 LubeAdvisor

### Identifying and Seizing Value Opportunities

Specialised Shell Lubricant Technical Advisors (LTAs) conduct site surveys to help customers identify areas for improvement in lubrication. All stages of the lubrication process are addressed, including product selection, delivery, storage, distribution across the site, product application and disposal of used lubricants. Changes are implemented and measured through 'Value Improvement Projects'.

## 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 LubeMatch

### Tailored Lubricants Advice

An easy-to-use online service that recommends the right choice of oil and grease for specific industrial applications. It provides jargon-free guidance on the benefits of different lubrication products. It is available in 120 countries and 26 languages, making it the most comprehensive and integrated lubricant selection tool on the market.

## 3b. UNLOCKING VALUE THROUGH EFFECTIVE LUBRICATION MANAGEMENT – CASE STUDIES

The following case studies demonstrate how Shell Lubricants technical experts have worked together with manufacturing companies to help upgrade lubrication management processes and generate substantial cost savings<sup>11</sup>.

Over the last five years, Shell Lubricants has documented \$139 million in savings delivered to customers worldwide; \$72 million of which resulted from Shell Lubricants services<sup>12</sup>.

These savings represent only a portion of the real-world total, and indicate great potential for TCO reduction and productivity increases across the industry through lubrication excellence.

## PRODUCT UPGRADE AND IMPROVED LUBRICATION MANAGEMENT EXTENDS OIL DRAIN INTERVALS BY 50%, SAVING USD \$21,000<sup>13</sup>

### The Challenge:

Granite and ceramic manufacturer Seranit Granit Seramik Sanayi ve Ticaret produces 25% of the total granite products in Turkey. While working with an alternative supplier, Seranit's hydraulic tile press was experiencing frequent oil changes: approximately every 4,000 hours. As the existing supplier offered limited technical support and advice to address the issue, the company turned to Shell Lubricants for a solution.

### The Solution:

Shell Lubricants technical experts conducted an extensive oil analysis using the Shell LubeAnalyst oil and equipment condition monitoring service. Following this, Shell Tellus S2 V 46 was recommended for use in the hydraulic press. The solution also included ongoing oil condition monitoring and reporting using Shell LubeAnalyst, and on-site technical visits and training of maintenance staff.

### The results:

- Oil-drain intervals increased **from 4,000 to 6,000 hours**, which resulted in annual oil consumption being **reduced by 6,400 kg**
- Total reported annual savings from reduced product consumption was approximately **US \$21,000**
- Using Shell LubeAnalyst to monitor oil condition enabled the company to benefit from **lower maintenance and labour costs** as fewer mechanical failures reduced maintenance needs

<sup>11</sup> Case study savings/benefits were reported by one customer. Actual savings/benefits will vary. More details available on request

<sup>12</sup> Documented customer savings from 2011 to 2015. More information available upon request.

<sup>13</sup> Savings/benefits reported by one customer. Actual savings/benefits will vary. More information available upon request

## IMPROVING LUBRICATION MANAGEMENT AND UPGRADING GEAR OIL SAVES USD \$106,787<sup>13</sup>

### The Challenge

Water company Sino French Water Development Company Limited (Sino French Water) provides six core services across China: water production, full water services, industrial water treatment, municipal waste water treatment, sludge treatment and O&M services.

The company had recently purchased 30 machines, including secondary settling tank scraper, concrete mixers, sludge dewatering, and a submersible mixer. After running the equipment 24/7 for 900 hours (almost one month), the company experienced an unplanned shutdown due to overheating of the gearbox oil. Oil temperature had reached 100°C, the lubricant was dark brown in colour and could no longer be used, forcing equipment shutdown.

### The Solution

Shell Lubricants technical experts visited the company's site and inspected the equipment to analyse the reasons for the oil overheating. It became apparent that, contrary to OEM recommendation, gearbox oil of the same viscosity had been used in all the different pieces of machinery in an attempt to simplify lubrication management.

Shell Lubricants technical experts recommended flushing all of the gearboxes and changing the gear oil to Shell Omala S4 GX 460, which met OEM recommendations. The technical team also offered follow-up support with the Shell LubeAnalyst service, conducting regular visits to sample and test the oil.

### The Results

- The company reported savings of USD **\$106,787** (CNY 667,834)
- Six months later, equipment was still working smoothly with no unplanned downtime. Easier management of the lubricant system meant the company had experienced no operational errors causing machine downtime



## UPGRADING HYDRAULIC FLUID AND IMPROVING LUBRICATION MANAGEMENT HELPS EXTEND OIL DRAIN INTERVALS, SAVING USD \$16,500<sup>13</sup>

### The Challenge

Plastics processing company, Alpla D.O.O., was using OEM-recommended VG 68 hydraulic oil in its Netstal-Maschinen AG plastic injection moulding machine. The product delivered oil drain intervals (ODIs) of 5,000 hours. The company was looking to extend the ODIs as a way to help reduce costs, and contacted Shell Lubricants for advice.

### The Solution

Shell Lubricants technical experts recommended upgrading the hydraulic fluid to Shell Tellus S3 M 68, designed to deliver long oil life and improved system efficiency. They also recommended making use of Shell LubeAnalyst to conduct regular lubricant condition monitoring, and implementing an additional oil filtration system with a filter of 3 microns. Finally, a technical training session was hosted for Alpla staff, to upskill them in lubrication management.

### Results

- After upgrading to Shell Tellus S3 M 68 hydraulic fluid, implementing regular lubricant monitoring using Shell LubeAnalyst, and using the new filtration system, the company realised savings estimated at **USD \$16,500**.
- Oil life extended from 5,000 to **15,000** hours, helping to **reduce equipment downtime** by extending fluid maintenance intervals.



# 4. REALISING VALUE THROUGH LUBRICATION

## A STRUCTURED APPROACH TO UPGRADING LUBRICATION

A look at companies who have successfully implemented structured, TCO-driven lubrication projects together with Shell Lubricants reveals a number of initial actions that help drive success.

- Senior management support of the TCO-driven approach to lubrication, to help overcome challenges such as resourcing alongside the demands of daily operations
- Appointing a project lead and allocating appropriate time and resources to a team tasked with implementing changes
- A good relationship with the lubricant supplier, whose technical teams play a key role in identifying and delivering value
- A comprehensive analysis to identify, quantify and prioritise TCO-related projects. Importantly, aligning on how value is measured enables savings to be recorded accurately.

For example:

- What is the hourly cost of maintenance and time required for repairs?
- What is the cost of replacement parts?
- What is the benchmark failure frequency?
- What is the monetary value of downtime for each piece of equipment, in terms of lost production?
- Setting measurable targets to ensure that progress can be tracked

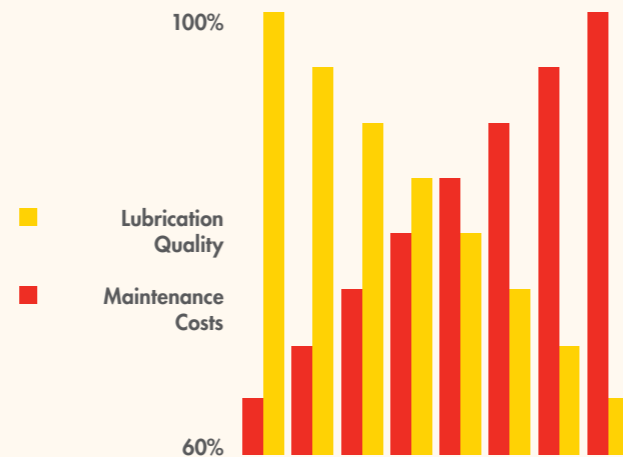
These steps will help companies form a strong foundation from which to successfully incorporate a TCO-driven approach to lubrication into daily operations, carry out lubrication improvement projects, and realise the associated cost savings.

As equipment and lubrication technology continue to evolve, regular review of the approach will help companies continue to focus effort and resources on projects that deliver greatest value.

## Driving down maintenance costs

There are many factors impacting maintenance costs, but a direct correlation can be seen, where all other factors remaining equal, higher quality lubrication leads to lower maintenance costs.

Achieving excellence in lubrication (product selection and management) can result in far more significant cost savings than purchasing lubricants based primarily on product price.



# HELPING BOOST MANUFACTURING PRODUCTIVITY WITH EFFECTIVE LUBRICATION

## COMPANIES UNDERESTIMATE POTENTIAL PRODUCTIVITY IMPROVEMENTS FROM EFFECTIVE EQUIPMENT LUBRICATION

**43%** do not believe choosing higher quality lubricants can help improve productivity



**6 in 10** companies are unclear how lubrication can influence unplanned down time or equipment availability

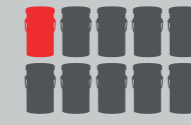


## THEY RECOGNISE BUT UNDERVALUE THE OPPORTUNITY FOR TOTAL COST OF OWNERSHIP<sup>1</sup> SAVINGS

**59%** of companies believe they can reduce costs by >5% through lubricant selection and/or management



But fewer than **1 in 10** think savings could exceed 25%



In reality, lubricants can impact up to **30%** of maintenance budget<sup>2</sup>



## LACK OF LUBRICANTS EXPERTISE, TRAINING AND PROCESS ARE BARRIERS TO SAVINGS

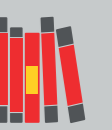
Only **4 in 10** have all the correct lubrication management procedures in place<sup>3</sup>



**43%** do not expect higher quality lubricants to help increase productivity



**63%** think they do not conduct staff training on lubricants as regularly as they should



## THIS IS HAVING A FINANCIAL IMPACT

**20%** believe unplanned equipment shutdowns due to their incorrect lubricant selection and/or management have cost their business **\$250,000 or more<sup>4</sup>**



## EFFECTIVE LUBRICATION CAN HELP COMPANIES REDUCE TOTAL COST OF OWNERSHIP (TCO) THROUGH LOWER MAINTENANCE COSTS, REDUCED UNPLANNED DOWNTIME, AND PRODUCTIVITY IMPROVEMENTS

### SHELL LUBRICANTS WORK WITH CUSTOMERS TO HELP DELIVER TCO SAVINGS

At least **\$139 million** savings delivered to customers worldwide (2011-2015)<sup>5</sup>



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



**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 study commissioned by Shell Lubricants and conducted by independent research firm Edelman Intelligence, polled 493 decision-makers in the manufacturing industry in eight countries (Brazil, Canada, China, Germany, India, Russia, the UK and the US) from November to December 2015.  
 1. 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.  
 2. Potential impact calculated based on Shell Lubricants site surveys with customers.  
 3. Recommended procedures are delivery and storage, oil change, oil dispensing systems, efficient grease lubrication systems, oil analysis and training employees in lubricant selection or management.  
 4. \$ figure based on converting local currency into equivalent \$ amount.  
 5. Based on savings delivered to Shell Lubricants customers from 2011-2015.

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## 5. WHAT'S NEXT?

With productivity paramount, customers are seeking to increase output capacity by minimising unplanned equipment shutdowns and extending maintenance cycles. Machinery is required to work under higher temperatures, greater power density and higher operating pressures. What's more, as equipment is becoming smaller and more compact, but with better efficiency and higher output demands, this places increased demands on the lubricants.

In many countries, such as China, there have also been rapid technological advances. For example, the growing prevalence of industrial robots are making the need for reliable, precise, unmanned equipment operation more vital than ever. That requires lubricants and greases that can be trusted to deliver efficient performance without close monitoring or interruption.

To respond to the industry's needs and meet future challenges, Shell Lubricants is continually developing products to help reduce energy consumption and operating costs, and to raise productivity, product quality and equipment uptime.

Shell Lubricants has long-standing relationships with many OEMs. Many of these companies supply their equipment containing a lubricant from Shell as an essential component of the machine.

The Shell Lubricants portfolio of products for general manufacturing has over 3,000 equipment manufacturer recommendations or approvals, including approval from:

- The American Gear Manufacturers Association (AGMA)
- The American Society for Testing and Materials (ASTM)
- Deutsches Institut für Normung (DIN)
- International Organization for Standardisation (ISO)

### Collaborating with industry leaders

Shell Lubricants works closely with many of the world's leading OEMs and leading industrial committees. Collaborating with the companies that are leading technology advancements in general manufacturing helps shape the development of advanced lubricants designed to help customers get the best out of their machinery.

OEM collaborations include: Bosch, Schaeffler Group, Husky, Parker, Flender, Hanshin, Honeywell, CompAir, ABB, Bridgestone, Bonfiglioli, Textron, Bosch Rexroth Group, Mitsubishi, SEW Eurodrive

## APPENDIX

### LUBRICANTS TECHNOLOGY – KEY FACTS

#### FOUR FUNCTIONS OF LUBRICANTS

Each key function plays a different role in helping cut TCO. The aim is to achieve the best balance of the four, to maximise the impact of the lubricant or grease on TCO and equipment productivity.



##### REDUCE FRICTION

Each key function plays a different role in helping cut TCO. The aim is to achieve the best balance of the four, to maximise the impact of the lubricant or grease on TCO and equipment productivity.



##### 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.



##### 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)

#### 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:

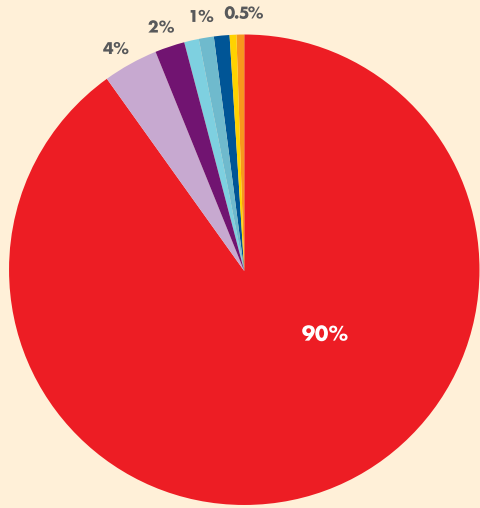
- **Protection against wear** to extend component life and help reduce maintenance costs. This is delivered through **anti-wear additives** that prevent metal-to-metal contact, **extreme pressure agents** that separate metal surfaces at high pressure and sometimes **solid fill additives** that protect against shock loads at low speeds.
- **Operating performance**, delivered through **detergents and dispersants** that help manage the build-up 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.

### 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 oil 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, in line with developments in chemistry, and technology innovations.

### Typical composition of base oil and additives for an industrial oil (Factory Plant Maintenance Oil)



- Base oil
- Anti-wear additives
- Extreme pressure additive
- Anti-oxidant additives
- Corrosion inhibitor
- Rust inhibitor
- Pour point depressant
- Anti foam agents

## 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.

Grease thickener is one key component of a 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 fully viscous at high temperatures.

## PARTNERING FOR INNOVATION EXCELLENCE

**Committed to delivering value to customers, Shell Lubricants invests significant resources in developing new lubricants and greases for the manufacturing industry.**

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 oils and greases are optimised for the latest equipment technology
- Shell Lubricants manufacturing portfolio has thousands of approvals and certifications from manufacturing industry OEMs, such as Denison, Eaton Vickers, Bosch Rexroth, Siemens, Cincinatti -Milacron
- 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

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