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NAPHTHENIC OILS
ADVANTAGEOUS IN GREASE MAKING

TÜRKİYE'DE KİMYA SEKTÖRÜNÜN

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THE CORNERSTONE OF CHEMICAL INDUSTRY IN TURKEY: İKMİB

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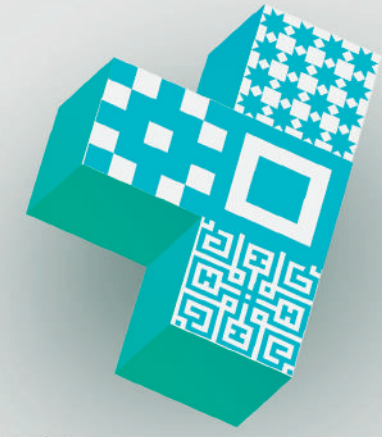

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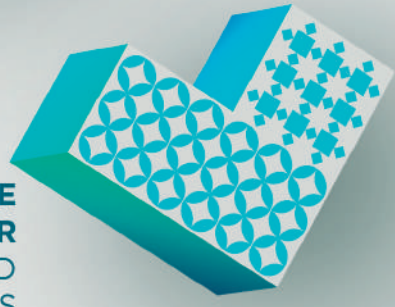

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Editor's Letter

Prepared Additives for Light Mineral Oils product group exports increased by more than 100% in January 2022

Electrification will continue to be a hot topic for the lubricants industry in the time to come. There are certain environmental concerns and new product developments with this in mind. However, there are also challenges and limitations in terms of raw materials. Nyco published a white paper on synthetic esters in the formulation of fluids and lubricants for electrified vehicles. This paper helps us understand the benefits of synthetic esters in today's formulation needs, while helping us see the challenges and solutions. We shared a shortened version of the paper in our Product Review section. You will find a lot more information in the full paper.

In our article section, Nynas tells us the advantages of naphthenic oils in grease making. The basis for these advantages lies in the favorable solubility properties of naphthenic oils. The results of the study conducted by Nynas show that even a small nominal difference in the solubility parameter means a big difference in soap consumption.

Lubricant consumption in Turkey decreased by almost 9 percent. Prepared Additives for Light Mineral Oils product group exports increased by more than 100% in January 2022 whereas no exports were made in the waste oils and bio-based & recyclable lubricants product groups in January 2022.

Our columnist Umut Arslan draws attention to the importance of oil analysis in transformers. He shares valuable information on how oil analysis can help operators solve problems more easily. Filiz Karaosmanoğlu provides us with interesting and valuable information on the history of biolubricants, you must read it for certain.

This is the last issue I prepared as the editor of the Lubricant World magazine. I bid farewell to our magazine, which I have worked hard for since 2016, and which I have embraced like a baby growing in my hand. Now I pass the torch to my teammates. I hope I contributed to the magazine and the industry during these valuable years, which have given me a lot. I owe a debt of gratitude for everyone I have worked with…

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New high viscosity base oil.

NYNAS® T 600 is the latest addition to our base oil portfolio. Clear and bright, NYNAS T 600 is a highly refined naphthenic oil with a viscosity of approximately 600 cSt at 40°C, and further extends the range of solutions which Nynas offers the grease and lubricant industry. NYNAS T 600 naphthenic base oil can also be used in combination with paraffinic oils to increase viscosity, improve low temperature performance, and enhance additive solubility as a result of its excellent solvency.

For more information visit www.nynas.com or contact your local Nynas sales office.

APPLICATIONS

NYNAS T 600 is suitable for all applications where high viscosity and appearance are critical. The new base oil performs very well in lubricating greases, where it improves process economies with a reduction of Lithium soap up to 50%. The base oil is also suitable for use in several industrial lubricant formulations, such as gear oil, metal rolling and forming.

FEATURES

In addition to its high viscosity, NYNAS T 600 offers several advantages over paraffinic oils, including excellent low-temperature properties and unrivalled solvency power.

AVAILABILITY

Committed to providing consistent and high-quality naphthenic oils worldwide, Nynas is making NYNAS T 600 available on a global scale through its outstanding supply and distribution network.

NYNAS

Afton completes phase 3 expansion of Singapore additive plant

Afton has completed its phase 3 expansion to add Gasoline Performance Additives (GPA) blending capabilities at its Singapore plant

Afton Chemical Corporation has completed its phase 3 expansion to add Gasoline Performance Additives (GPA) blending capabilities at its Singapore Chemical Additive Manufacturing Facility. The expansion is in line with Afton's 'Made In' strategy that focuses on effective localized supply chain solutions to its customers in Asia.

It is the first GPA blending unit in Asia Pacific by Afton and complements the company's global network of blending and terminal operations in the Americas and Europe. The unit and its capabilities will provide the additional infrastructure required to support the company's long-term global growth plans and meet the increasing demands for GPA in the region.

"The GPA new blending unit is now fully operational, and we completed our first commercial fulfillment to a key customer. We have now connected our manufacturing and blending capacities globally, supporting regional and global business continuity. It will also provide security of supply and shorter lead times for our customers," said Mr. Kevin Keller, VP, Global Supply, Afton Chemical Corporation.

"We are committed to developing cost-effective and differentiated GPA solutions 'Made For' the region. This addition to our supply network ensures that the total solution combining "Made For" and "Made In" will help provide our customers with a competitive edge in their markets," said Mr. Sean Spencer, Vice President and Managing Director of Afton Chemical Asia.

Gulf Formula Elite becomes McLaren Automotive first fill lubricant

Gulf is proud to announce that Gulf Formula Elite is now the first fill lubricant in all McLaren Automotive supercars and hypercars

As part of a long-term partnership, McLaren Automotive will also give its customers access to Gulf Formula Elite, a high-performance lubricant, as its preferred supplier. The technology teams at Gulf and McLaren Automotive have worked collaboratively to develop and test a lubricant that offers the ultimate protection for McLaren's high performance V8 and V6 engines even in the most extreme conditions, to deliver sustained peak performance. Gulf Formula Elite uses Thermoshield Technology to meet McLaren's exacting performance and efficiency demands by forming a robust coating on all critical engine parts for enhanced wear defence. Gulf Formula Elite maintains optimum temperature by helping to dissipate heat, actively prevents oil deterioration, and helps to provide greater deposit control.

Mike Jones, CEO, Gulf Oil International said, "Our technical partnership with McLaren Automotive enables Gulf to offer its industry-leading expertise and world class R&D capabilities to accelerate the development of high-performance technologies like Gulf Formula Elite."

Gareth Dunsmore, CMO, McLaren Automotive said, "McLaren and Gulf's long-standing partnership is all about technical excellence enabling high performance so we are delighted that our supercar and hypercar customers will experience and benefit from Gulf Formula Elite." Gulf's link with McLaren started in 1968 and has continued in both Formula 1, the Can-Am series, in which the partnership won over 40 races, and at the Le Mans 24 Hours in the 1990s, with the famous McLaren F1 GTR. The two iconic brands reunited in July 2020.

Cepsa launches new lubricants for hybrid and electric vehicles

Cepsa, has launched its new range of XTAR lubricants and fluids for hybrid and electric vehicles

The company has developed a wide range of products to meet the new requirements of this type of vehicles, designed to ensure their protection and prolong the good performance of their mechanisms. Cepsa's Lubricants business, together with the company's Research Center, has designed a range of products with advanced technology and a low viscosity grade, favoring less friction in the engine and reducing fuel consumption, CO_2 emissions, and the emission of other polluting gases and particles (in the case of hybrid vehicles).

Niurka Sancho, Cepsa's Director of Lubricants, highlighted: "At Cepsa, we are committed to sustainable mobility and we promote it in many different areas. In this case, it is through the development of advanced lubricants and fluids that, thanks to our technical and innovative capabilities, not only meet all the needs of hybrid and electric vehicles, but also significantly reduce their environmental impact."

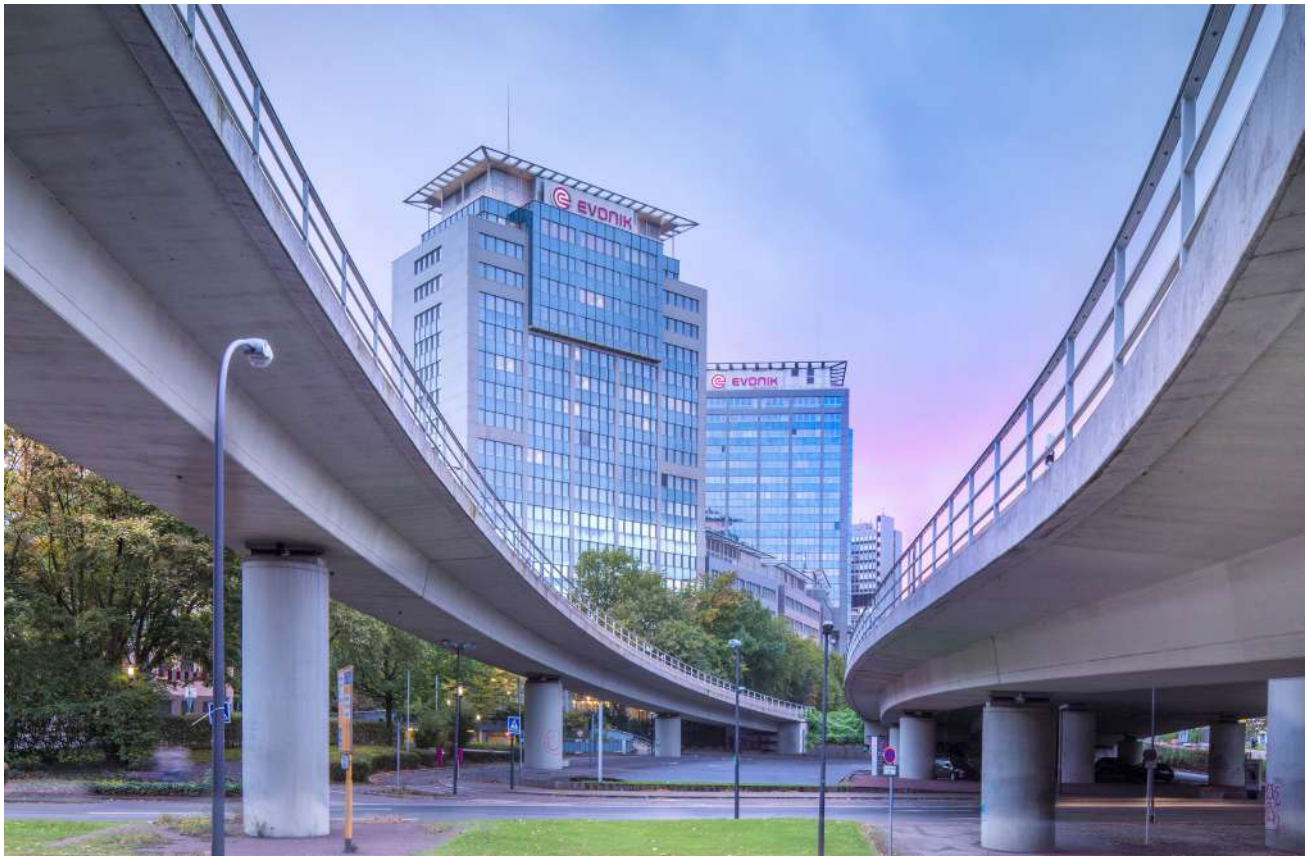
This new range of products is considered to be highly durable, reducing waste generation and contributing to increasing the life cycle of the products. In this regard, Cepsa's Lubricants business has been committed to sustainability for years through various initiatives, such as the use of 30 percent recycled plastic containers, the replacement of drums with reusable IBC containers, and the optimization of distribution logistics, which reduces the carbon footprint of their transportation.

Evonik keeps growing

After a very successful year in 2021, Evonik expects further growth in 2022

Sales, adjusted EBITDA and free cash flow all increased more than 20 percent in 2021 compared with the previous year. "We achieved really strong earnings and have consistently implemented our strategy," said Christian Kullmann, Chairman of the Board of Management. "We are now gearing the company towards future growth. Evonik is becoming more sustainable, more profitable and more diverse." Adjusted earnings before interest, taxes, depreciation and amortization (adjusted EBITDA) were €2.38 billion, up 25 percent from the previous year. Significantly higher raw material, energy, and logistics costs were successfully offset. Adjusted net income rose 54 percent to €986 million with adjusted earnings per share gaining from €1.37 to €2.12. For the full year, Evonik expects sales to increase to between €15.5 billion and €16.5 billion. Adjusted EBITDA is expected to increase to between €2.5 billion and €2.6 billion.

Specialty Additives Division's sales rose 15 percent to €3.71 billion in 2021. Products for the construction and coating industries as well as for renewable energies achieved significant sales growth in all regions after a noticeable increase in demand. Additives for polyurethane foams for durable goods such as mattresses and refrigerators also recorded a good volume development and achieved significantly higher sales. In the second half of the year, the increase in sales was partly limited by disruptions in global supply chains and the associated lack of availability of some raw materials. Adjusted EBITDA increased 7 percent to €920 million.



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İstanbul Chemicals and Chemical Products Exporters' Association

Current figures in Turkish lubricant exports

Turkey exported a total of $554.9 million of the mineral oils and mineral fuels in January 2022

Turkey exported a total of $554.9 million in January 2022 according to the export figures of the mineral oils and mineral fuels sector prepared every month by IKMIB using the TIM Export Database and Trademap data. Prepared Additives for Light Mineral Oils product group exports increased by more than 100% in January 2022 compared to January 2021 figures. Other Waste Oils, Lubricants with Bio-Based Carbon Content of Min. 25% and Recyclable up to 60% by Volume product groups, which were exported in January 2021, were not exported in January 2022.

For the Mineral Oils and Mineral Fuels Sector, the top 5 countries to which Turkey exported the most in January 2022 are the Netherlands, Lebanon, Greece, Belgium and Malta, respectively.

As per the HS Code, the top 10 product groups and export figures in the export of lubricants are as follows:

HS CODE - DEFINITION	January 2021 ($)	January 2022 ($)	Diff (%)
271019810000 - Engine oils, compressor oils, turbine oils	11,923,369.56	16,092,125.51	35.0
271019990025 – Other lubricating oils	2,653,648.35	4,029,647.78	51.9
271019870000 – Gear and reducer oils	1,757,178.28	2,678,206.45	52.4
271019830000 – Hydraulic oils	1,901,058.68	2,387,595.35	25.6
271019710000 – Lubricating oils. Other oils – those to be processed		1,707,500.00	
340399000000 – Preparations for lubricating machines, devices and vehicles - other	795,009.21	1,129,216.00	42.0
271019850000 - White oils, liquid paraffin	378,890.90	538,772.61	42.2
271019910000 - Metalworking fluids, mold release oils, anti-wear oils	251,630.41	194,010.87	-22.9
381121001000 – Prepared additives for mineral oils/ similar lubricating oils – containing petroleum oils	60,865.08	102,840.74	69.0
271019990098 – Other lubricating oils and other oils	33,170.48	59,825.46	80.4

Source: *Istanbul Chemicals and Chemical Products' Exporters Association*

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NAPHTHENIC OILS

Advantageous in grease making

Instead of creating new methods of analysis, we have taken as our starting point methods that are already familiar

In the manufacture of grease, naphthenic base oils in most cases have great advantages compared with paraffinic oils. This is a generally recognized fact in many parts of the world. The basis for these advantages lies in the favorable solubility properties of naphthenic oils. Hans Bäckström here comments on different ways of measuring solubility properties and the way these properties are connected with the consumption of soap during grease making, an important economic consideration. Test results show that different solubility concepts, such as aniline point, VGC and solubility parameters do not always correlate. One method alone perhaps does not give all the information needed for all applications.

Up until the 1980s, most grease manufacturers used oils with a low degree of refinement and a high aromatic content. With increased environmental awareness many chose to abandon highly aromatic oils and use instead more highly refined solvent-extracted paraffin and naphthalene based oils. Formulations had to be changed and the amount of

soap used increased. In the latter part of the 1980s Nynas Naphthenics and others started producing naphthenic oils which were highly refined and thereby low in polyaromatic compound content (PAC). Similarly, aromatic content in paraffinic oils was also repressed, causing further deterioration of their solubility properties.

SOLUBILITY IN FOCUS

In many parts of the world it has been hard to find naphthenic base oils with a low PAC content which are of high quality. Because of this, many have carried on using paraffinic oils. In Europe, however, the naphthenic oils with a low PAC content have become the standard for grease manufacture. The main characteristic to consider when choosing which oil to use is the solubility. The metal soap in a grease is a compound with strong polar characteristics. An oil's ability to dissolve soap is dependent on the degree of polarity possessed by the molecules in the oil. Aromatic molecules are most polar, after which come naphthenic molecules, while paraffinic are the least polar.

Two of the most common ways of describing solubility are by using the aniline point and the viscosity-gravity-constant (VGC). The aniline point is determined by mixing equal parts of oil and aniline and stirring vigorously while the temperature is raised. The aniline point is the temperature at which it becomes possible for both liquids to become wholly mixed. VGC is calculated from the values for viscosity and density. Both these characteristics correlate with solubility since they are linked to the oil's composition. Oil's contain a mixture of aromatic, naphthenic and paraffinic molecules. These three groups of molecules have different densities at the same molecular weight. Aromatic molecules have a higher density than naphthenic molecules which in turn have a higher density than paraffinic molecules. Since aromatic molecules have a higher solubility than naphthenic molecules, which have a higher solubility than paraffinic molecules, the density gives us information about solubility, but only if the value is put in relation to how big the molecules are. A measure of that can be obtained by looking at the viscosity. The values for aniline point and viscosity are put into a formula that gives a value for VGC.

NYNAS NAPHTHENICS DEVELOPING NEW PROCEDURES

At Nynas Naphthenics R&D department, we have started work on developing serviceable tools and procedures to evaluate the relationship between the oil's properties and its ability to satisfy the grease manufacturers' needs when it comes to function and economy. It is not about creating new methods of analysis, we have taken as our starting point methods that are already familiar. It is about measuring the oil's solubility in a simple way and then determining

whether this measurement correlates with the oil's effect on the results of the grease production. One measure of solubility is solubility parameters. We use Hildebrand's one-dimensional solubility parameters (calculated from heat and volume of steam formation), since the further dimensions that Hansen introduced (hydrogen binding and polar forces) have shown to be of little significance when it comes to oil. The solubility parameters are defined in such a way that it is easy to determine them for individual chemical compounds. To determine the solubility parameters for an oil one approach is to use an indirect method, i.e. To compare the oil's solubility with various substances whose solubility parameters are known.

We chose to test the temperature at which zinc stearate dissolves in different solvents, giving a "critical solution temperature" (CST) for zinc stearate in squalene, hexadecane, propyl benzene and toluene (Table 1). Descriptions of this method have been previously published. On the curve produced (Figure 1) we can then insert various different oils' CST values and thereby interpolate a value on the solubility parameter. In choosing the soap zinc stearate we have increased the prerequisites for the values obtained being of relevance to grease manufacturers in particular. In a way it might have been even better if we had chosen lithium stearate, but then the solubility temperatures would have been so high that the method would have been of less use. After that we tested six oils (Table 2), of which one was

Table 1

	Solubility Parameter	CST °C
Squalene	6.80	117.9
Hexadecane	8.00	114.4
Propyl benzene	8.60	103.5
Tolune	8.90	94.17

Table 2

Oil	Kin. Viscosity (40 °C cSt)	CST (°C)	VGC	Aniline point °C	Solubility parameter
LRN (older type)	94	111.2	0.889	66.2	8.18
T110	104	113.2	0.854	85.1	8.07
NS100	94	113.7	0.841	94.8	8.04
SR130	135	114.1	0.841	94	8.02
S100B	100	115.7	0.826	104	7.55
500 SUS (paraffinic)	89	117.6	0.812	111	6.89

a low refined naphthenic oil of the older type (LRN), four were Nynas' naphthenic oils and one was a paraffinic oil (500 SUS). LRN is an oil with a high aromatic content. The naphthenic oils have a lower aromatic content the lower down the table they are. S100B fulfils the FDA's requirements

Table 3

	Oil	The oil's solubility parameter	Grease consistency* (mm/10)	Soap consumption
Grease A	NS100	8.04	306	11.8
Grease B	T110	8.07	295	8.8
Grease C	LRN	8.18	300	7.6

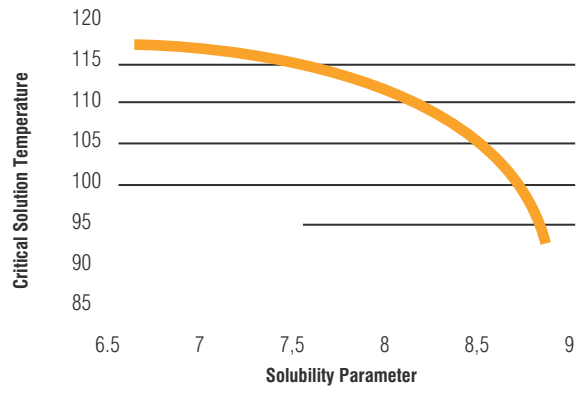
Table 4

	Viscosity cSt, 40 °C	Solubility parameter	Aniline point °C	VGC
T110	110	8.07	85	0.856
Other N oil	100	7.93	84	0.864

for technical white oils. The interesting thing to note is that even the technical white oil has a clearly higher solubility parameter than the paraffinic oil. To the test whether the value of the oil's solubility parameter correlates with soap consumption, three greases were prepared in co-operation with grease maker AB Axel Christiernsson of Sweden (Table 3). The result clearly show that soap consumption is dependent on the oil's solubility. They show that even a small nominal difference in the solubility parameter means a big difference in soap consumption. However, two oils with the same aniline point can have different solubility parameters and VGC. Examples are T110 and a similar naphthenic oil of different crude origin. The method of production and the degree of refining are the same.

At approximately equal value aniline points the VGC is lower for T110 (i.e. Lower solubility) while the solubility parameter is higher (i.e. Higher solubility). The solubility for these two oils to zinc stearate (and perhaps also lithium stearate) therefore does not unequivocally correlate to VGC or aniline point. Consequently, one should not focus on one single way of measuring solubility to the exclusion of all others, but should instead, dependent on the application, take into consideration different solubility concepts.

FIGURE 1



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Synthetic esters in the formulation of fluids and lubricants for electric vehicles

E-mobility is becoming a major, unstoppable industrial movement

It is definitely changing the landscape of lubrication in the automotive industry, and it is generating a need for new performance fluids with specific requirements. NYCO's white paper explains why synthetic esters may be precious tools for the formulation of fluids for electrified vehicles. E-mobility, or electro-mobility, refers to the use of electricity to power any means of transportation, in an attempt to gradually walk away from fossil fuel powered vehicles and reduce emissions of greenhouse gases.

This technology therefore appears as an essential pathway towards achieving the goals of the fight against global warming, as targeted by various agreements, programs, initiatives and coalitions (Paris agreement and the Race to Zero, EV100, EV30@30...), provided the energy used by electric vehicles is decarbonized. Even though the real benefit of e-mobility on CO_2 emissions sometimes raises controversy and electric cars may only be one of the many leverages that will have to be used to reach the ambitious targets of carbon neutrality, it appears like the electrification movement is now unstoppable.

According to latest projections shared by IEA in the Global EV Outlook 2019, sales of BEV and PHEV will jump from 2.1 million cars in 2019 to 23 million and up to 43 million in

2030 depending on the scenario, representing nearly 1 out of 2 new car sales in the world. The electric car fleet would then increase from 7 million units in 2019 to 140 million and up to 245 million in 2030, worldwide.

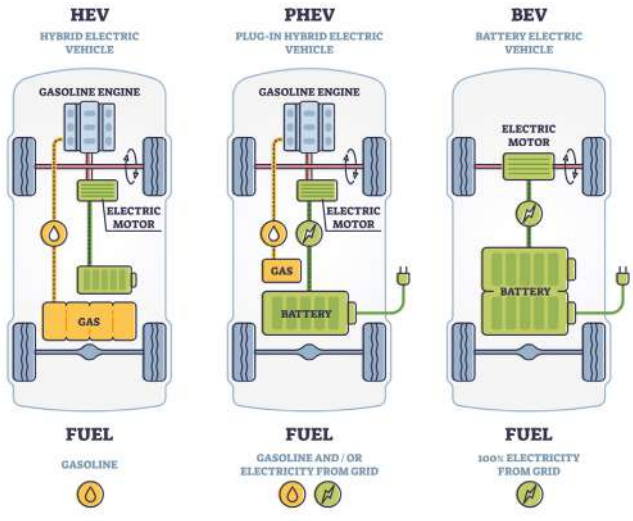
The annual battery production capacity is predicted to raise from roughly 110 GWh in 2017 to 440 GWh in 2023 and 1.5 TWh in 2030. Even though some analysts say projected figures on the production of electrified cars may be overestimated, there is no doubt the revolution is on the march.

CLEAR DYNAMICS BUT UNDEFINED, EVOLVING FLUID TECHNOLOGY

Electric vehicles may be distinguished between:

- Full electric vehicles, including Battery Electric Vehicles and Range Extended Electric Vehicles (REEV) where the battery may be refueled by a combustion engine to increase autonomy
- Hybrid vehicles, where both electric and combustion engines power the wheels; they include Plug-In Hybrid Vehicles that may be recharged from the grid.

Market acceptance relies on 3 essential notions: autonomy (sometimes described as "range anxiety" for consumers), charging time, and cost. These parameters will be major drivers for the choice of the right technologies in the design of electrified vehicles, and in turn, for the formulation of their fluids. The components in electric vehicles that need fluids and lubricants include the electric motor, the battery, the transmission organs, and the power electronics – let alone the conventional, possibly adjusted, lubricants for the combustion engine in hybrid vehicles, as well as bearing greases. Whilst conventional fluids and lubricants



Various types of electrified vehicles

Integration of e-motor in transmission

from existing technologies have been widely used so far in electrified vehicles, and no dedicated products have been designed until recently, this time is now over, and specific products need to be developed. However, there is no industrial consensus or clear technical requirements for EV fluids, as equipment design is still evolving.

Tight control over temperature is key. Operating temperatures for batteries must be tightly controlled and should ideally remain in a range of 15 to 35°C – which calls for a thermal management system, meaning batteries need to be cooled down, but also heated at low temperatures. This is not only a matter of battery efficiency – it is also a serious fire safety issue. More power requires better cooling. Reduced charging time means increased charging power. The heat generated by strong currents going through these systems and batteries will go increasing. This evolution comes at a price: more efficient cooling technologies for battery electric vehicles.

ELECTRIC MOTORS AND TRANSMISSION

E-transmission fluids must combine the requirements of transmission lubricants and those of the electric motor cooling fluids. These requirements are based on 3 key notions:

1. Lubrication (in particular, extreme pressure properties and low traction coefficients)
2. Dielectric properties and compatibility with copper
3. Thermal management (ability to remove heat).

Whilst essentially conventional lubricants (Automatic Transmission Fluids in particular) have been used so far, adapted lubricants for dielectric properties have also been developed, and specific, dedicated fluid formulations are on their way to fill e-transmissions. It is important to stress here the role of e-transmission fluids on the energy efficiency of the e-transmission. Whether that be through efficient heat transfer to ensure optimum operating temperatures of the

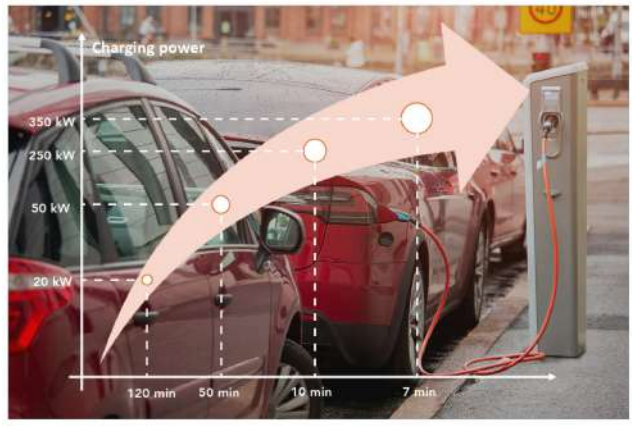
motor or through low traction coefficients for minimum energy losses in gears, this fluid will contribute to optimize the "kilometers per kWh", thus potentially impacting battery design and cost.

SYNTHETIC ESTERS: A FORMULATION TOOL

The technology of synthetic esters as base fluids demonstrates the following precious features: design flexibility, purity and cleanliness. These features not only bring a high level of performance, but they also allow for some level of adjustments to meet application-specific requirements. Formulations based on synthetic esters are able to deliver:

- Superior heat transfer performance, thanks to the availability of ultra-low viscosities and high thermal conductivities
- An excellent compromise between viscosity and fire safety
- High stability and cleanliness in elevated temperature operations
- Low traction coefficients for optimized energy efficiency in transmissions.

The lack of industrial consensus or standards for the design of thermal management systems for batteries and electric motors makes it difficult to identify one ester technology that suits all equipment. Ester manufacturers, thanks to their fine knowledge of esters, will be able to adapt their product recommendation to a great variety of requirements. Synthetic esters therefore provide precious tools for the optimization of fluids for e-mobility applications. They are compatible, for the most part, with other base fluids, allowing possible blends.



Reduced charging time means increased charging power

Additionally, they may display biodegradability and renewable carbon contents should such features become requirements in the near future – a likely scenario.

This is a shortened version of the White Paper on Synthetic Esters in the Formulation of Fluids and Lubricants for Electric Vehicles prepared by NYCO. To read the full paper, please visit: https://www.nyco-group.com/site/content/uploads/Synthetic-esters-e-mobility.pdf

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Biolubricants from past to present

The discovery of the wheel, the use of tools, and the start of constructions brought the concept of lubricant and the advantages of lubrication into life. While the chemical industry and oil refining were developing, the lubrication industry advanced as engines, machines, and vehicles developed with the industrial revolution. Today there are a wide variety of lubricating oils, greases, and hydraulic fluids on the market. While the industry and energy sector progressed with fossil-based raw materials, plant and animal-based resources have always maintained their importance. It is known that many liquids, including water, were used as lubricants in ancient Rome. In ancient Egypt, olive oil was used to mobilize stone and timber in the construction of huge pyramids. The earliest known hydraulic fluid is water-based. In the 19th century, tallow oil was the lubricant for tram wheels, and whale sperm oil was the lubricant in spinning-weaving machines. These vegetable and animal oils, biolubricants, became important building blocks of industrialization. The start of oil drilling in Pennsylvania in 1859 was a milestone. It was discovered by chance that mixing sperm oil with petroleum would extend machine life. Then petroleum-based lubricants dominated the market. The early 20th century saw an important development regarding biolubricants. Charles Wakefield achieved the positive results of adding Castor Seed (Ricinus Communis L.; Castor Bean) oil in their new lubricating oil development work and named the new product Castrol. In 1919, John Alcock and Arthur Brown used Castrol as engine oil in the first transatlantic flight. This is how one of today's leading lubricant brands was born. Castor seed oil, which was used for lighting in ancient Egypt, is also one of the first biofuels. Today, the plant is an energy crop species and is also used in the production of biodiesel. The Ottomans also used olive oil as fuel in mosques. Castor bean, which is a small tree with oil seeds and non-edible oil, is important for the industry. Castor oil has a different fatty acid composition than other vegetable oils. The hydroxy fatty acid, ricinoleic acid ($C_{18}H_{34}O_3$) in its composition is unique, making the properties of the oil incomparable, creating options for different areas of use in industry (such as lubricants, paints, coatings, inks, pharmaceuticals, plastics). The raw materials of biolubricants are vegetable oils, animal fats and biowaste, and nowadays safflower, canola, palm, cotton and soybean oils are gaining prominence.

Biolubricants have been increasingly used in applications since the 1980s, due to limited oil reserves, environmental and climate change concerns due to fossil resources, and the search for biodegradable and non-toxic lubricants. Today, rapidly biodegradable lubricants and waste biolubricants, which are friendly to plants, animals, microorganisms and human health and which are not toxic to soil and water, have a special place in the green transformation of the industry. In short, nature, environment, and climate-friendly biolubricants are important throughout the life cycle. In addition, there are ongoing studies to develop biobased additives. All of them should be considered as green chemistry solutions in the bioeconomy under the roof of biorefinery.

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Oil analysis in heavy-duty equipment

Vehicles and equipment (scoops, trucks, crusher reducers, etc.) serving in the industries such as construction and mining are exposed to harsh environmental conditions. They are expected to fulfill their duties with maximum efficiency under these conditions. In case of any malfunction or downtime, significant cost and time losses may be encountered if it is not possible to supply spare parts or make on-site maintenance and reparation due to the conditions of the work site. This may lead to serious consequences such as being out-of-use, being unable to deliver the work on time, financial losses as well as moral losses such as damage to the company prestige.

Oil suppliers have developed specially formulated lubricants for diesel engines, differential and planetary gear sets, transmissions and hydraulics. However, in the event that basic maintenance methods are ignored, regardless of the properties of the oil, it can reach the end of its useful life before expected. Therefore, close monitoring of wear, contamination and characteristics of the oil guides in determining their effects on equipment performance. The monitoring of these parameters is possible with oil analysis, which we consider like a blood test for equipment and vehicles. Let's take a closer look at the common causes of failure that we identify with oil analysis.

- In diesel engines, common failures are high fuel consumption as a result of fuel mixing, coolant leaks, high soot due to insufficient air filters. If not detected, it causes piston locking in the upper engine and overheating in the lower engine.

- In differentials and transmissions, corrosion and high metal wear can be observed as a result of pollutants such as water, dust, etc. and if not detected, this may lead to adverse outcomes such as power losses, rough running and subsequent gear breakage.

- In hydraulics, micron-level particles or other pollutants may enter the system due to insufficient air filters or damaged sealing elements, and this may cause the deterioration of the oil film, inability to transfer power as a result of contact of metal surfaces, cavitation or abnormal wear.

- As a result of using wrong oil in the equipment or the vehicle, the oil may not fulfill its duty due to lack of effective oil film and serious malfunctions may occur.

You can avoid the serious consequences of common failures that we mentioned above and you can keep your vehicles and equipment safe and under control with periodic analyzes. Each test parameter suggested by the laboratory is important for the detection of these malfunction or error symptoms. You can keep it under control as much as you can measure. Therefore, you should include oil analysis in your maintenance plans for heavy-duty equipment as well.

HEAVY DUTY TYPE USED OIL ANALYSIS SERVICES

ENGINE OIL

Routine monitoring of a diesel engine oil's viscosity, as well as its ability to neutralize acids and remove soot particles formed during combustion, is necessary to monitor levels of anti-wear additives and detergents that provide adequate engine protection.

TEST PACKAGE	BASIC TESTS	ADVANCED TESTS
	• 24 Metal Detection by Elemental Analysis • Viscosity @100°C • % Fuel Dilution • Abs/cm Soot • % Water	• Basic Test Package • Base Number • Oxidation/Nitration Levels • Flash Point

GEAR SYSTEMS

Testing the oil used in differential and planetary gear sets, provides guidance for monitoring equipment condition and determining oil drain intervals.

TEST PACKAGE	BASIC TESTS	ADVANCED TESTS
	• 24 Metal Detection by Elemental Analysis • % Water Test by SGS In house Method • Viscosity @ 40°C or 100°C • Appearance • Acid Number	• Basic Test Package • Colour Test • PQ Index Test • Demulsibility Test • Particle Count Test

HYDRAULICS

In order for hydraulic oils to perform power transmission without problems, it is important to closely monitor the oil's properties as well as contamination and wear levels.

TEST PACKAGE	BASIC TESTS	ADVANCED TESTS
	• 24 Metal Detection by Elemental Analysis • % Water Test by SGS internal method • Viscosity @ 40°C or 100°C • Particle Count Test • Acid Number	• Basic Test Package • Colour Test • PQ Index

DISCOUNT CODE: SGS-OCM-22/2

** You can get information about the other tests of SGS OCM Oil Analysis Laboratory, which has TS EN ISO/IEC 17025:2017 TÜRKAK Accreditation, via the file number AB-0812-T.

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WHEN YOU NEED TO BE SURE

SGS

Engine oil
user guide

VISCOSITY GRADE: is the main feature of an engine oil and is important for product selection

Signification of grades

xx W- yy

xx refers to viscosity when cold

(measured at different temperatures)

The lower the viscosity when cold, the more fluid the oil is at low temperatures and the more easily it can be pumped.

For example, a 0W-20 or 5W-30 oil will make start-ups easier and will protect engines during trips to cold regions. These high technology "fluid" oils will meet the requirements of recent engines.

yy refers to viscosity when hot

(measured at 100 °C)

The higher the viscosity when hot, the more viscous the oil is.

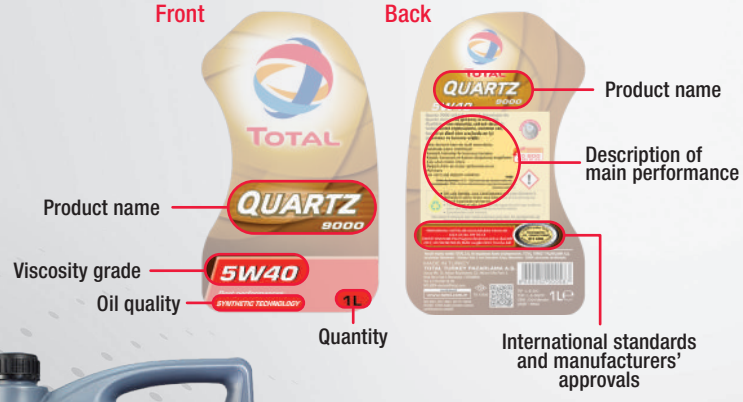
For example, a 15W-40 or 20W-50 oil has been developed for use in hot countries, and their "viscous" nature makes them suitable for older engines.

POINTS TO REMEMBER

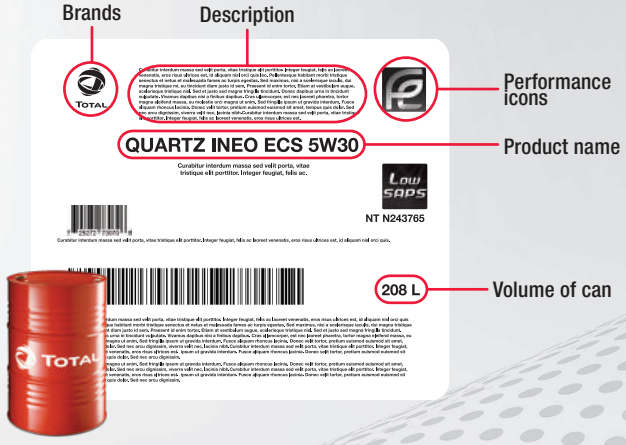
New-generation engine oils and those currently being developed by TOTAL are of increasingly fluid grades: 0W-20, 5W-20, 0W-30 and 0W-16.

How to read a product label for product selection?

Small packaging:



Large packaging:



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