

# MADENİ YAĞ DÜNYASI LUBRICANT WORLD

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## Upcycling brings supply security in base oils and second prime of life for waste oils

Options in Group I  
replacement strategies  
with naphthenics

Infineum launches broad  
portfolio of dedicated  
e-fluids globally

Air Nostrum selects  
NYCO turbine oil  
or its mixed fleet



# FROM PRIMARY PRODUCTION TO FINAL CONSUMPTION



Drilling  
Chemicals



Production  
Chemicals



Refinery  
Chemicals



Lubricant  
Additives



Fuel And  
Biodiesel Additives



Finished Petroleum  
Products





## Editor's Letter



Every year, we celebrate with great enthusiasm the brand new page turned in our country with the declaration of the republican administration by the Turkish Grand National Assembly on October 29, 1923. Happy 98<sup>th</sup> anniversary of the Republic of Turkey!

In the last two months, lubricant consumption in Turkey has increased, and we have reached 463 million dollars in lubricant exports. Engine oils, compressor oils, turbine oils product group comes first in our exports. Likewise, Turkey recorded an increase in exports in the automotive sector. However, in September, there was a 1 percent decrease in Turkey's automobile production.

In this issue, we focused on the fluctuations in the base oil supply and the problems reflected on the manufacturer. Along with the decreasing fuel consumption during the pandemic, there was a decrease in the production of Group I base oils, and we faced a serious shortage in supply with the increasing freight costs. The same problem still persists to a certain extent. In this context, the search for alternatives in the supply of raw materials has gained importance against such problems that may occur in the future.

TAYRAŞ Refinery, which we have on our cover, is the first and only upcycle refinery in Turkey that produces Group II+ base oils. TAYRAŞ brings a breath of fresh air to the market by producing high quality base oils through a comprehensive refining of waste oils. In our conversation with Aydın Özbey, TAYRAŞ General Manager, he stated that base oils produced from waste oils are always a savior in case of shrinkage that has been experienced so far and will be experienced in the future, and they have many other benefits as well.

Nynas, an expert in naphthenics, offers Group I substitute products that can be used both directly and with special formulations in the face of Group I shrinkage. Technical Manager and Senior Specialist Thomas Norrby from Nynas explained in our webinar that the Group I market will continue to shrink and new capacities can be added to Group II and III. Stating that there are many ways to obtain products with the same technical specifications, Norrby emphasized that naphthenics are a good alternative when cost and environmental concerns are considered.

I hope you enjoy reading.

**Cansu Tuncer**

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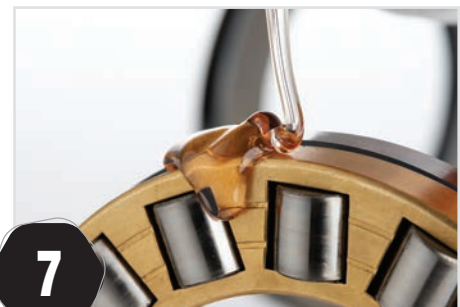




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**Lanxess expands production capacities in Asia**





## Air Nostrum selects NYCO turbine oil for its mixed fleet

NYCO announces that Air Nostrum Engineering & Maintenance SLU, the leading regional airline headquartered in Spain and operating as a franchisee of Iberia as Iberia Regional, has extended the strategic partnership with NYCO to continue operating its mixed fleet with the TURBONYCOIL® 600 engine oil.

Air Nostrum LAM S.A. has been using the TURBONYCOIL® 600 since 2017 for its regional fleet of 43 aircraft operated by CRJ100s, CRJ200s, CRJ900s, CRJ1000s and ATR72s. "We have been using the TURBONYCOIL 600 in our fleet for several years with a very good operational experience. Engine teardowns and shop inspections confirms the outstanding oil performance for our demanding operations. The NYCO team has been very supportive and comprehensive during this challenging time," said Fermin Tirado, Air Nostrum Engineering & Maintenance Accountable Manager.

"We are really glad to renew our support to Air Nostrum during this exceptional time for the aerospace industry with our field proven turbine engine oil TURBONYCOIL® 600. We do thank Air Nostrum, being one of the leading and industry-recognized regional airline, for the trust and the confidence in our products and our people," said Pedro Dasi, NYCO Head of Sales & Marketing Aeronautics.

## Nyco Grease GN 3058 is now available on the market

Approved against SAE AMS-3058, MIL-PRF-32014A, AIMS 09-06-003 and listed in Boeing D50255, Nyco Grease GN 3058 is today's most advanced grease technology based on lithium complex with outstanding anti-corrosion properties, even in presence of salt water. Nyco Grease GN 3058 delivers outstanding performances in four key properties for applications such as wheel bearings, propeller bearings and highly loaded landing gear areas: the base oil viscosity, the load wear index, the resistance to water washout and the oil separation.

In the context of the development of new tyres that allow a lot more of landing cycles, Nyco Grease GN 3058 is the high-performance grease that will preserve the wheels of aircraft. Nyco Grease GN 3058 is designed to operate in humid environment in a very wide temperature range going from -54°C to +175°C and offers high load carrying capabilities, outstanding resistance to water and runaway deicing fluid washout, very stable at the high temperatures encountered during landing, very good protection against corrosion even in the presence of salt water.







## Lanxess expands production capacities in Asia

Lanxess, based in Cologne, Germany, is expanding its production capacity for light-color aminic antioxidants at its Taiwan site by several kilo tons. The specialty chemicals company is investing an upper single-digit million Euro amount to expand its facility in response to growing demand in APAC and further regions. The additional volumes are expected to be available by end of 2022.

"We have seen rapid market growth in aminic antioxidants in the recent months and years," says Martin Saewe, Head of Lanxess's Lubricant Additives Business (LAB). "With our strategically located three assets in Canada, Italy and Taiwan and our backwards integration into the key raw material, we stand for supply resilience in the industry. We intend to use the additional capacity to strengthen our market position and to grow with our customers."

Veronika Sauer, Head of Marketing Lubricant Additives, says "To be ahead of the curve, we continue to develop safer, more sustainable, and higher performing antioxidants that are capable to meet changing market requirements. We are evaluating to offer some of these from our Taiwan site as well".

### New investments to meet the growing demand

Lanxess markets its aminic antioxidants under the brand name Naugalube. The investment at its Taiwan site will support globally harmonized specification of its flagship product Naugalube 438L – all sites will produce the antioxidant in light color. The liquid antioxidant is used in a broad range of transportation and industrial lubricants. With excellent high temperature performance, Nauglaube 438L reduces oil oxidation, prolongs lubricant life and extends service intervals.

In August, Lanxess also announced that is expanding its production capacity for light-color sulfur carriers used in industrial lubricants manufacture, at its Mannheim, Germany, site by several kilo tons. The specialty chemicals company is investing a double-digit million Euro amount to expand the facilities in response to growing demand. The additional volumes are expected to be available beginning in 2023.





## Infineum launches broad portfolio of dedicated e-fluids globally

**I**nfineum has announced the launch of a broad portfolio of dedicated e-mobility fluids, covering all of the major hybrid and full battery electric vehicle models and tailored for every type of electrified transmission application.

The automotive industry's focus is shifting to electrification. However different types of electrification, from full battery electric to hybrid options, bring distinct challenges and opportunities for lubricant and transmission fluid developments. E-fluids must balance the need to maintain outstanding gear and bearing protection, cleanliness and performance while meeting new e-specific requirements. To meet these needs, Infineum's new generation of step-out e-fluid additives offer enhanced electrical properties, materials compatibility and heat transfer performance that electrified vehicles demand.

"Infineum has always maintained close cooperation with world-leading OEM and transmission manufacturers to ensure that our additive formulations can be used to help the industry meet the ever-increasing hardware technical challenges. We started working on electrifications over 20 years ago as the first hybrid vehicle began to penetrate the market, and we have been perfecting and evolving our technology since then. With proven worldwide field performance of more than 800 billion miles with e-motors, Infineum's e-specific fluids will continue to protect the very latest electrified vehicles," comments Maurizio Abbondanza, Infineum Sustainability and Business Growth Director.

## Infineum acquired ISCA UK emulsifiers business unit

**I**n August, Infineum signed a contract to acquire ISCA UK emulsifiers business unit in a deal that secures ISCA's ISCAMUL emulsifier brand and formulation expertise. This acquisition signals a move back into the Emulsion Explosives market by Infineum, where existing capabilities can be leveraged to better serve existing and potential new customers.

"I am really pleased that Infineum is moving into this area as mining technology is crucial for E-mobility, which relies on the supply of precious metals. This is a more sustainable method than other types of mining explosives, creating fewer fumes and gases which aligns with Infineum's sustainability agenda going forward," says CEO Trevor Russell.



## Chevron partners with AML for lubricants license & manufacturing in East Africa

Chevron Brands International LLC (Chevron) and AFAL Manufacturing Limited (AML) of the Tristar Group have signed a long-term license agreement encompassing production, distribution, and marketing of Caltex™ lubricants in Kenya, Uganda, Tanzania, Rwanda, Burundi and Democratic Republic of the Congo (DRC). With the signing of this agreement, Chevron has strengthened its already growing presence in East Africa and entrusted its operations to AML as a licensee.

Caltex branded lubricants have been available in East African countries since 2013 through a distributor agreement with Africa Fuels & Lubricants Ltd (AFAL), also of the Tristar Group. The mutual trust and satisfaction from this successful collaboration was a major factor in the realization of the long-term license agreement. Under the new scope, Chevron will provide its world leading technology, and AML will blend, market, and distribute Caltex branded lubricants through its extensive network. The relationship seeks to leverage the synergy of Caltex's strong brand strength and AML's extensive market reach to successfully carve out a share in the competitive East Africa lubricants market.

"Chevron has a history in East Africa spanning seven decades and we have collaborated with AFAL since 2013. Over the last eight years, our relationship with AFAL has grown from strength to strength and we are excited to begin a new chapter with AML, which will take the Caltex brand across Eastern Africa," said Douglas Rankine, GM Middle East & Africa - Fuels & Lubricants. "Both parties worked through the pandemic to deliver the agreement, reflecting an enhanced relationship based on trust, integrity and performance."

"Being selected by Chevron for this significant responsibility is a major show of confidence in the long-term relationship between Chevron and the Tristar Group since AFAL was first awarded a lubricants distributor agreement by Chevron in 2013, and will serve as a launch pad for Caltex branded lubricants to expand sales in the East African region. We are confident that local blending is a move in the right direction for this business to remain competitive, and we will spare no effort to strengthen the position of Caltex brand in East Africa," said Mr. Eugene Mayne, Tristar Group CEO.





## Cepsa appoints Maarten Wetselaar as CEO

Cepsa, the global energy company, announced the appointment of Maarten Wetselaar as Chief Executive Officer of the company, effective 1st January 2022. Mr. Wetselaar joins from Royal Dutch Shell where he served on the Executive Committee for the last 6 years as the Director for Integrated Gas, Renewables and Energy Solutions. He is a global industry and energy transition leader with over 25 years' experience covering Renewable Energies, E-mobility, Downstream, LNG and Upstream.

Ahmed Yahia Al Idrissi, Chairman of Cepsa, said: "We are delighted that Maarten is joining Cepsa. His

knowledge and wealth of experience will be invaluable for the company as it builds on its strong 2021 performance to accelerate the implementation of its energy transition strategy to offer our customers and partners more differentiated and sustainable energy solutions."

Maarten Wetselaar said: "Over the past 2 years, the company has proven its resilience as it successfully navigated the COVID-19 pandemic whilst continuing to deliver on critical energy needs. It has also re-designed its business strategy and operating model to become more agile, customer-centric and play a leading role in the global energy transition. I look forward to working with Cepsa's talented people, leadership team and Board members as we build on these achievements."

## Nynas appoints Vice President Group Strategy & Sustainable Development

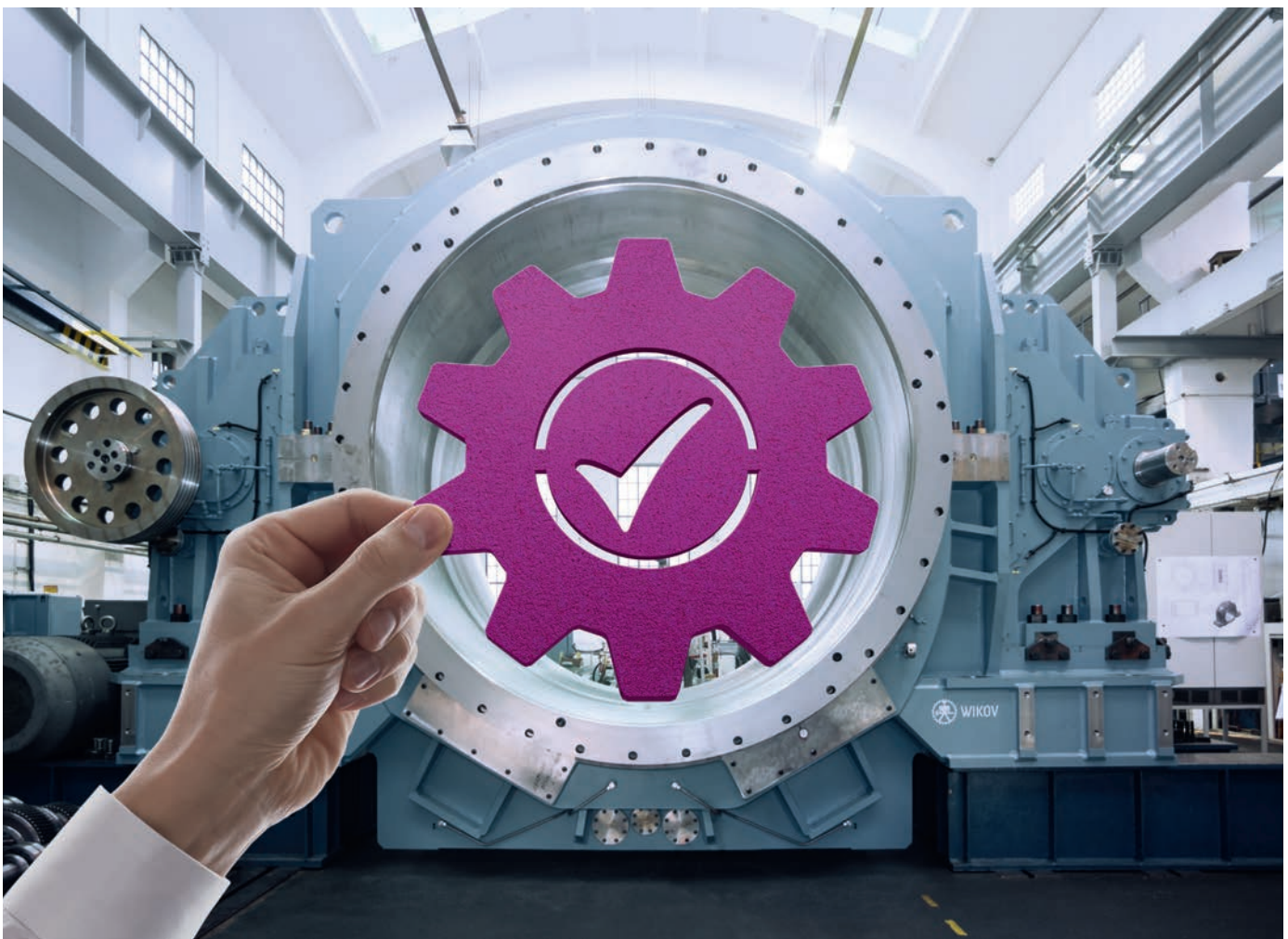
Johan Andersson is appointed Vice President Group Strategy & Sustainable Development in Nynas. The combined position marks Nynas intensified ambitions. Johan Andersson leaves the position as CEO of the National Oil Industry Association in Sweden, Drivkraft Sverige. As the CEO he has since 2019 launched a roadmap for climate-neutral competitiveness for the industry, restructured the industry association and repositioned it as an organization for innovative and sustainable mobility.

Prior to his present position, Johan's experience includes several senior, global leadership roles in BP during 19 years within the specialty oil segment, and before that BASF. In recent years his focus has been

on our times most pressing challenges, where the oil industry needs a balanced approach to societal demands, competitive forces and the need to create sustainable solutions.

"For Nynas, strategy and sustainability are closely linked together. We now strengthen our organization with the experience Johan brings to intensify our work in these areas. I am very pleased to welcome Johan Andersson as a member of Nynas Executive team and to be part of our journey going forward", says Bo Askvik, Nynas President and CEO.





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## “We are the manufacturing hub of the region in liquid engineering”

Ayhan Köksal, General Manager of Castrol Turkey, Ukraine and Central Asia, and Nilay Tatlısöz, Marketing Director, evaluated the post-pandemic period for the sector and for Castrol. At the online press conference, Ayhan Köksal commented on the pandemic-hit 2020 and the global recovery year 2021 and shared information about the sector.

Stating that the lubricants industry has grown in parallel with the automotive industry, Köksal said: “The industry has grown by 6-7 percent in the last two or three years in Turkey, and by 9 percent last year despite the pandemic. In the first 6 months of this year, we see that the market has grown by more than 30 percent. We anticipate that the growth will be somewhat more balanced in the rest of the year and 2021 will end with growth.”

Emphasizing that the pandemic has affected Turkey just like every other country in the world, Ayhan Köksal said: “In 2020, Turkey became the only country to achieve volumetric growth in the Castrol world. We have increased our market share in multi grade motor oils by more than 3 percent in the first 6 months, reaching 31 percent. We also maintain our leadership by simultaneously increasing our market share in passenger car, heavy duty and industrial oils segments. With this growth, we are one of the countries of Castrol that stands out with its performance in the world. Turkey is the second fastest growing market, following China. We are also the fifth largest market in the world.”

He stated that they produce approximately 90 million liters of lubricants annually at their Gemlik plant, which is one of Castrol’s 8 production facilities in Europe. He also added that they plan to invest a total of 30 million dollars in the plant in the next 5 years.

Nilay Tatlısöz, Marketing Director of Castrol Turkey, Ukraine and Central Asia, stated that as a company operating in Turkey for more than 65 years, they aim to be more than just an oil brand by observing the needs of all stakeholders and all customers from industry to automotive in the best way and by benefiting from the technological innovations they have developed. “According to the Brand Health Survey conducted in 2021, Castrol is the first choice of foremen this year as well. In the survey conducted with the owners and foremen of authorized services, private services, oil change points engaged in passenger car maintenance and repair, 90 percent of the participants indicate Castrol as their first choice,” she said. Tatlısöz emphasized that Castrol is the first choice, especially when the decision on a lubricant brand decision is up to the foremen’s choice.



## Total Turkey Pazarlama introduced its Ceran grease portfolio in Iskenderun

TotalEnergies reported that its new generation grease product group, Ceran, will meet the high performance requirements of equipment in industries such as iron & steel, cement, paper and food.

Total Turkey Pazarlama introduced its Ceran grease portfolio to its stakeholders at the International Steel Rolling Symposium and Exhibition held in Iskenderun, Turkey on September 23-24. Participants showed great interest in the Total Turkey Pazarlama's booth, which supported the organization as a platinum sponsor. The metal rolling industry in economic, technological and scientific terms at the event, and latest developments were shared and discussed in detail.

Mine Altinkurt, Technical Services Manager, said that they have been developing innovative and high-performance products and solutions for industrial segments for more than 50 years. "Our main goal is to be customer-oriented. In this organization, we had the opportunity to introduce our Ceran grease product portfolio by meeting with both local and foreign representatives of the sector for two days, and listened to their expectations and needs. It is of great importance to reduce operating costs and increase efficiency in sectors where competition is intense, such as iron & steel, automotive, cement and energy production. We, as Total Turkey Pazarlama, help to get the highest efficiency from the equipment with our Ceran grease portfolio and offer the needed reliability and competitive advantage. We developed the calcium sulfonate complex technology grease with Ceran. Ceran offers resistance to high pressure, water and high temperature, mechanical stability, and also excellent protection against corrosion and oxidation," Altinkurt said.

It is very important for Total Turkey Pazarlama to take part in such a large organization in Iskenderun, Turkey, where the heart of the metal rolling industry beats.





## Current figures in Turkish lubricant exports



Turkey exported a total of \$463 million in September 2021 according to the export figures of the mineral oils and mineral fuels sector prepared every month by İKMİB using the TIM Export Database and Trademap data. As per the HS Code, the top 10 product groups and export figures in the export of lubricants are as follows:

HS CODE - DEFINITION	September 2020 (\$)	September 2021 (\$)	Diff. (%)
271019810000 – Engine oils, compressor oils, turbine oils	12.461.916,32	17.613.815,83	41,34
271019990025 – Other lubricating oils	2.483.252,43	4.697.119,84	89,15
271019830000 – Hydraulic fluids	1.822.974,75	3.161.211,18	73,41
271019870000 – Gear and reducer oils	1.663.542,03	2.283.133,12	37,25
340399000000 – Preparations for lubricating machines, devices and vehicles – other	77,85	2.280.611,43	2929394,45
271012210000 – Light oils and preparations – special gasoline – white spirit	258.998,01	726.102,83	180,35
271019930000 – Dielectric oils	457.909,46	191.865,20	-58,10
271019850000 – White oils, liquid paraffin	54.035,02	180.595,06	234,22
271019290000 – Middle oils – other		117.170,92	
271019910000 – Metalworking fluids, molding oils, anti-wear oils	232.397,93	97.277,86	-58,14

Source: Istanbul Chemicals and Chemical Products' Exporters Association

The product groups with the highest increase in exports in the January–September 2021 period compared to previous year are 381190001011 – Prepared Additives for Heavy Mineral Oils, 340319200000 – Lubricating Oils that Contain Min. 25% Biobased Carbon and that can be Recycled up to 60% by Volume, 381129001000 – Prepared Additives for Mineral Oils/Similar Lubricating Oils – Containing Petroleum Oils, 271019830000 – Hydraulic Oils, 271019910000 – Metalworking fluids, molding oils, anti-wear oils, 381121009000 – Prepared Additives Containing Oils Obtained From Petroleum Oils/Bitumen Minerals.



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For more information please contact [eniadditives@eni.com](mailto:eniadditives@eni.com)



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## Upcycling brings supply security in base oils and second prime of life for waste oils

**TAYRAŞ Used Lube Oil Refinery, Turkey's first Group II+ base oil refinery and the technology leader in this field, offers second useful life for used lubricating oils. In addition to its environmental benefits, it also comes to the fore in security of supply with the recent fluctuations in base oil supply. We had a nice conversation with Aydın Özbey, General Manager of TAYRAŞ, and asked him about everything on upcycling and the obligation that comes with the legislation in Turkey.**

**Mr.** Aydın, could you please tell us about yourself?

I have been the General Manager of TAYRAŞ for about 7 years. I graduated from Petroleum and Natural Gas Engineering Program at the Middle East Technical University in 1999. I worked on hydrocarbons in my entire career and most recently, I am working on waste oils, which are their waste. I had the opportunity to work in the leading companies of our country in the field of crude oil, fuel, LPG, especially in operational terms. I acted as a coordinator for lubricants and waste oils at the Petroleum Industry Association for about 8 years. After that, I took office at TAYRAŞ.

Could you give us information about the TAYRAŞ Refinery, Turkey's first and only upcycling facility? We would like to know how it was established, what your production and employment capacity is, and what you offer to the market.

TAYRAŞ was established in 2011 with the aim of making an industrial scale integrated environmental investment in Turkey on used oil refining, which has been a successfully applied method in the world for many years.

I owe a debt of gratitude to all our shareholders, especially Mehmet Afşin, our Chairman of the Board, who made this dream come true. I would like to thank the public, sectoral non-governmental organizations such as



the Petroleum Industry Association, MAPESAD, and the valuable people of the fuel, lubricant and waste recycling sector, who believed in our dream and always supported us.

As covered in the EU targets and Turkish legislation, waste is an important raw material. It is the raw material for the green transformation and the circular economy. At TAYRAŞ, we produce base oils by adding value to used lubricating oils with the most advanced refinery technology available, one step ahead of recycling.

TAYRAŞ has an annual refining capacity to process 60 thousand tons of lubricants that have completed their useful life. With the Group II+ Base Oils we produce, we aim to contribute 30 million dollars per year to the current account deficit. Currently we create employment for 250 people.

We completed the construction of our refinery in early 2021 and produced Turkey's first Group II+ base oil as clear as water. As the TAYRAŞ family, we are very happy to have reached this stage after more than 10 years of effort. It is a great excitement for us to have implemented such an important project for our country.

With our capacity to meet roughly ten percent of Turkey's base oil demand and with our sustainable, resource efficient production cycle in which we follow Zero Waste procedures and implement the best energy, water and waste management, we put on market low carbon and low water footprint, high value-added base oils under the TIDRABASE brand. We aim to be a pioneer and a good example with our technology and application leadership.

For the first time in our country, Group II+ Base Oils, which will be produced from waste, will be supplied as a strategic raw material for use in three areas of application, including the lubricants industry, the defense industry and the automotive industry, where high performance is much needed.

While carrying out this production, we use environment and climate friendly technologies and follow zero waste principle, and we continue our Zero Waste Certification process with this aim.

### **What is upcycling? Can you please tell us about the hydrotreatment process?**

As an introduction to this question, I would like to give some information about the form of the lubricant at the end of its useful life. When lubricants and especially engine oils reach the end of their useful life, friction-induced metals and combustion-induced pollutants may accumulate within the oil while it functions under high pressure and temperature conditions. Besides, some additives are depleted.

At the TAYRAŞ Upcycling Refinery, the waste oil undergoes a distillation process in which all pollutants in the waste oil are removed by physical and chemical reactions.



**Aydın Özbey**  
*General Manager of TAYRAŞ*

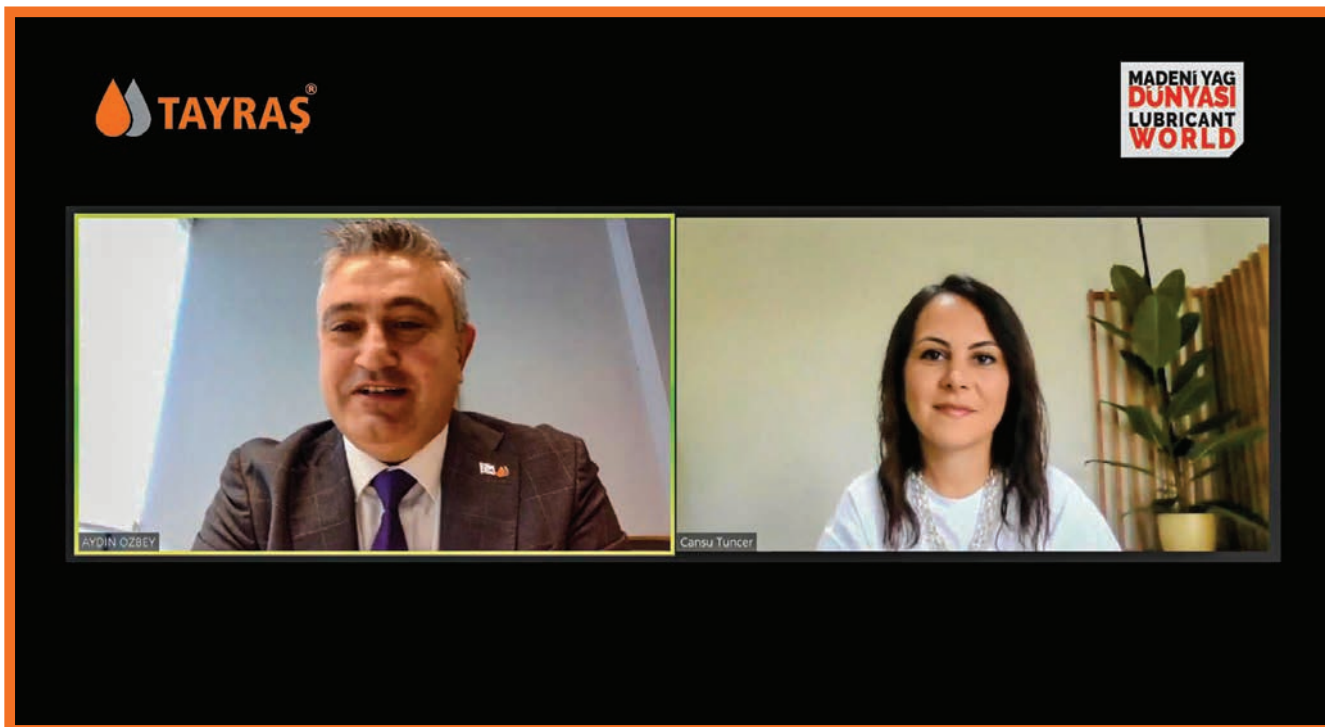
As a result, we get the original base oil in its content.

There are many technologies licensed for all these processes around the world. What distinguishes hydrotreatment technology from other methods and makes it the most advanced technology in the world is the removal of sulfur compounds in the light and heavy distillates from distillation processes, the saturation of unsaturated hydrocarbons, and raising them to a level called Group II as per API Base Oil classification.

Our upcycling motto here is to bring the lubricant, which has reached the end of its useful life, back to its original form and make it available as a raw material to our lubricant manufacturers for the same purpose.

**Using waste oils to produce base oils with Group II+ quality is very valuable for both the national economy and our environment. What are the technicalities of obtaining this product?**





First, let me give some information about the method in order to better explain the details in the process of obtaining this product. The lubricants in the waste oil storage tanks at the facility are first neutralized by caustic processing. It is then subjected to a dewatering and then a three-stage distillation process, a total of four stages. All processes here are carried out under vacuum conditions.

The subsequent hydrotreatment process is the most important stage. We produce the hydrogen we need in a separate unit in our facility by steam reforming the natural gas we take from the system.

This entire process is an integrated process, just like the system operating in a crude oil refinery. On the one hand you have heating, on the other hand you have cooling; you need steam, boiling oil, vacuum, and hydrogen all at the same time. In the meantime, you have to manage the resulting gases and wastewater. This whole system has a brain. We collected everything in the control room. From start to finish, we can monitor the whole process, all these systems from the control room.

We have a laboratory with TÜRKAK 17025 Accreditation. We can perform the tests stipulated by the regulation on waste lubricants, as well as certain tests on base oil as the final product in this well-established laboratory. At the same time, we have a simulation device in our laboratory that can

pre-measure the quality and quantity of the distillates, that is, intermediate products that we can obtain from waste. In other words, before we feed the waste oil into the system, we know the efficiency and quality of the base oil we can produce with the products contained in the waste oil.

Today, TAYRAŞ is the only refinery in the world that carries out the hydrotreatment process at a pressure of 125 bar. This is a very important value in terms of product quality.

**What does the base oil produced by TAYRAŞ stand in the global market?**

We offer base oils in three different grades in our country and in the world market: N70, N110 and N220. These are the base oils that can be used in the production of metalworking oils, process oils, hydraulic fluids, textile oils, heat transfer oils and high performance engine oils. According to the GEIR data, the demand for base oils in 2018 was around 3.7 million tons in EU countries. 17% of these are obtained from re-refined base oils. In this regard, there is an important market in the EU.

Following the decrease in the supply of crude oil refineries during the pandemic, we have seen that especially EU countries continued uninterrupted supply of base oil. Re-refining plants assumed an important role in this process and this is a source of happiness for our industry.



**As TAYRAŞ, what are your future goals and plans regarding waste oils, which we can say is among the top agenda items for our industry?**

To realize a continuous and uninterrupted production with Group II+ quality, to ensure that both environmental and economic benefits are known, and to be a source of inspiration for new investments to be made in this field and in the field of waste.

**One of the hottest topics on the agenda of the lubricants industry is the obligation imposed by the Regulation on Waste Oil Management. According to this;**

**“In lubricant production, it is obligatory to use base oils produced from waste oils at 8% for 2022, 12% for 2023, 15% for 2024 and at the rates to be determined by the Ministry for the following years. Imported base oils are not included in the mandatory usage rates determined in this paragraph.”**

**As a facility that collects waste oils, what does TAYRAŞ think about this?**

We see that this issue has also started to be discussed in the EU Commission. Since the circular economy is seen as the raw material of green transformation, there is a voluntary use of 17%, as I have just mentioned. There are of course several reasons for this. There are carbon taxes. The carbon footprint of a lubricant that you blend using a base oil made from waste oil is about twice as low as a base oil derived from crude oil. The world has set very strict targets for reducing the carbon footprint. This issue should be handled from this perspective. Even before the European Union, this was added to the legislation as an obligation in our country. In this context, we hear that the Turkish model is also being discussed in the EU.

**Is there a quality and proper waste oil producer in Turkey?**

There are existing investments in this field in our country. There are 3 or 4 companies that have obtained a license from our Ministry in this context. It has also been certified by TÜBİTAK that these investors produce products that can be supplied as base oils. New investments will be made over time.

We, as TAYRAŞ, produce base oils with a Group II+ quality. These companies may produce Group I base oils. Someone else may produce Group III in the future. Each product group has their own consumer group and areas of applications.

Facilities certified and authorized by TÜBİTAK will determine the supply in this sense. There is an obligation, but of course blending is not possible without supply. The development of the waste oil upcycling sector will contribute to both the lubricant sector and the fuel sector. It is very important to support and encourage base oil producers.

**Do you encounter with any problem in waste oil collection? Is it paid or free?**

This subject is as important as establishing a refinery. We have huge drawbacks in waste logistics. To date, PETDER has established the most perfect system in terms of management. It is a wonderful structure that includes many elements such as health, safety, environment, customer relations management, raising awareness of the society, and supports this with social responsibility projects. We must accomplish that as well. There is a need for refining facilities with a waste logistics management system that will serve as a model for Turkey’s waste management. We have taken important steps in this direction. We have established a large team, prepared our infrastructure, established important collaborations. We have created transfer points in certain areas. We have established a beautiful model and we want to be a source of inspiration for our entire industry with this model.

The fee is a key issue for sure. After all, waste oil is a raw material. If you do not pay a fee, this product may be used for other purposes. We pay a fee and tell them what this product will be used for and which product will be obtained.

In Turkey, approximately 400 thousand tons of lubricants is consumed every year, and approximately 275 thousand tons of lubricants that have completed their useful life come out. A major part of this amount cannot be collected as the legislation obliges (i.e. in a registered system) and cannot be used for environmental and economic benefits and employment.

As TAYRAŞ, we wish to establish a logistics model just like in our refinery. I would especially like to point out that anyone who wants to be inspired by us, to get information from us and to understand us is always welcome.

*Scan the QR code to watch the interview with Aydın Özbey, General Manager of TAYRAŞ.*







# Options in Group I replacement strategies with naphthenics?

**Group I base oils are solvent-refined base oils with a viscosity index range of 80 to 120. They have long been the cheapest base oils on the market but have shown considerable price and supply fluctuations lately. Nynas offers various options for the successful replacement of Group 1 base oils.**

**G**roup I base oils may have many application areas but in today's world, money is not the only criterion when selecting base oils. Environmental concerns, supply security problems, higher performance expectations are driving manufacturers to seek Group I replacement strategies.

Nynas naphthenic base oils are offered with a broad

range of viscosity and properties, and they can be used in several application areas including lubricating greases, metal cutting and removal fluids, metal forming fluids, industrial lubricants and refrigeration fluids among others.

At our webinar with Nynas, Thomas Norrby, Technical Manager and Senior Specialist, explained us how naphthenic base oils can be a good alternative to Group I base oils.





## Base oil markets and market dynamics

There are around 700 oil refineries in operation globally, but only a small part of these refineries are producing base oils, around 150 base oil plants globally exist. They display a high degree of vertical integration in the crude to final product value chain. There are different base oil refineries built and adapted for Group I, II or III production. There are only a handful of standalone base oil plants in the world, globally less than 10. Nynas operates two of these standalone base oil plants.

Base oil refining industry is evolving. The pandemic is accelerating the ongoing trends. Requirements from the automotive industry drove demand for higher quality base oil, such a Group II, Group II+, Group III and triggered investments into new refining capacity. Consequently, Group I base oil production capacity was reduced from about 74 percent back in 2007 to around 30 percent of the total in 2020. About nine million metric tons per year of Group I has disappeared forever, though. However, nearly eighteen million tons per year on new Group II and almost seven million tons in new Group III capacity have been added during the same period of time.

Despite different specifications and different refining techniques, the various base oil groups compete in the same markets, and the total refining nameplate capacity has grown substantially. Base oil market has not expanded significantly in growth in recent years. And the finished lubricant demand has stagnated. This has led to a significant overcapacity in the base oil market and a significant decrease in Group I capacity.

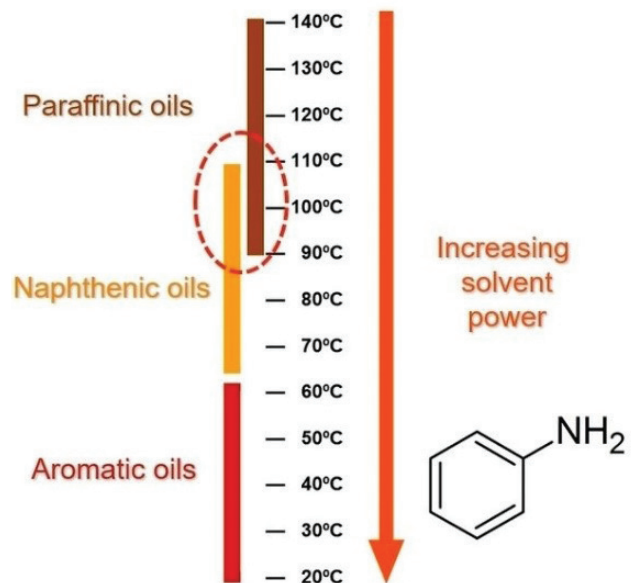
Why is there a shortage of Group one base oil? There is a lower demand overall for crude based products, fuels, base oils, etc. The Group I base oil train is an add-on to fuel refiners, tied very much to the fate of the of the fuel refinery. It is not the main product category and is not the main driver of the business. The demand patterns are shifting and changing. There are also economic reasons. Base oil refining is not carrying the whole cost of the refinery if it is a standalone. But it is an important contributor in a typical base oil train and fuel refining.

The impact of the pandemic in the short term has been on lower demand for crude based fuel products, especially for aviation fuels. In the post Covid-19 reality, we can see that the deep green recovery will push electrical vehicles and further decreases the fuel demand. The base oil needs are changing as well. We had the impact of the severe

winter early in 2021, which caused the short-term impact on availability and highlighting the connection and the need for formulation and flexibility in many applications.

## Key physical properties of base oils

There are key physical properties that are important for the base oil formulator and for the end user. These are viscosity, viscosity index, density, volatility, flash point, pour point and aniline point. Solvency is another key property that dictates compatibility with polymers and resins. It sets limits to a pigment and filler wetting, in lubricants, the additive loading. Saturation limits are very dependent on the solvent power of the base oil. It affects emulsion stability and solubility of impurities that arise due to oxidation or to wear during operations. The oxidation products themselves need to be soluble in the oil. Otherwise, there will be sludge formation, filter blocking or varnish.



**Figure 1: Aniline point, (oC) ASTM D 611**

ASTM D 611, the aniline point test, shows us that the lower the aniline point, the more polar the oil and the higher the solvent power. As can be seen in Figure 1, aromatic oils are in the low mid temperature range where aromatic oils and aniline readily dissolve. Naphthenic oils are in an upper zone where it displays an important overlap with paraffinic oils. This overlap means that the formulations that work in this range will work equally well in Group I and naphthenics.



### Properties of the NYBASE range

Nynas has a wide product range, including BBT grades that blend with asphaltenic oils, and naphthenic grades: T grades, NS grades, S grades and NYBASE grades.

NYBASE grades are the Group I replacement products. They closely match the kinematic viscosity and aniline point of the Solvent Neutral (SN) Group I paraffinic base oil ranges.

It allows industrial lubricant manufacturers to maintain key properties of their products by offering retained viscosity and solvency properties. These key properties are quite different in Group II base oils. NYBASE's allow direct drop-in Group I replacement or with minimum re-formulation work needed. It has been successfully proven in many applications since their launch. And minimal labels, PDS and other marketing material changes are required.

Characteristics, unit	Test Method	NYBASE® 70	NYBASE® 100	NYBASE® 150	NYBASE® 300	NYBASE® 500	NYBASE® 600
Density 15°C (60°F), kg/dm <sup>3</sup>	ASTM D4052	0.863	0.867	0.871	0.886	0.889	0.879
Viscosity 40°C, mm <sup>2</sup> /s (cSt)	ASTM D445	14	22	30	60	98	120
Viscosity 100°C, mm <sup>2</sup> /s (cSt)	ASTM D445	3.20	4.20	5.0	7.30	10.1	12.6
Viscosity index	ASTM D2270	77	88	89	80	87	98
Viscosity 100°F, SUS	ASTM D2160	74.0	115	155	312	514	628

Unit		Test Method	SN 80	SN 90	SN 100	SN 145	SN 150	SN 220	SN 300	SN 500	SN 500D	SN 160	SN 170
Density, 15°C	g/ml	ASTM D128	0.865	0.865	0.870	0.865	0.875	0.875	0.890	0.885	0.890	0.910	0.910
Viscosity, 100°C	cSt	ASTM D445	3.30	3.50	4.20	4.90	5.20	6.40	8.20	11.0	12.0	33.0	37.0
Viscosity, 40°C	cSt	ASTM D445	--	11.5	>20.5	27.0	32.0	43.0	62.0	98.0	115	525	621

Figure 2: NYBASE range vs. Solvent Neutral Group I typical properties



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Many application studies with NYBASE have been made by Nynas and by other lubricant blenders. NYBASE range is compared with a typical Solvent Neutral Group I. In this case, it is from the Repsol product range. As you can see in Figure 2, there are a number of parameters describing the properties for the base oils. Many properties closely match. For example, NYBASE 100 compares well to the SN 100 with the same viscosity and the same aniline point. NYBASE 150 is a tit for tat for the SN 150 with same viscosity, the same solvency, and the same aniline point. Furthermore, we see that the key characteristics are mirrored between the NYBASE 500 and this SN 500.

NYBASE 500 Group I replacement base oil meets the viscometrics typical for the SN 500 grade. It has a VI of 87, a flash point COC 240 °C, very good pour point, good low temperature properties. It is low in sulfur and its aniline point is 111 °C, right in the middle of the useful range.

## Other routes to Heavy Neutrals

There are other routes to have SN 500 or SN 600 at 100 to 120 centistokes. It is possible to use NYNAS T 400 and blend with the Group II like VG 46 (N 220). Different proportions will give SN 500 or SN 600 type products with viscosity index above 80. It is also possible to use NYNAS T 600 and a similar Group II VG 46 with a suitable VI improver to make SN 500 or SN 600.

1. NYNAS T 400 (45%), Group II VG 46 (N220) (55%) to make SN 500 (VI 86)
2. NYNAS T 400 (53%), Group II VG 46 (N220) (47%) to make SN 600 (VI 80)
3. NYNAS T 600 (41%), Group II VG 46 (N220) (59%) + VI improver (ca 5%) to make SN 500
4. NYNAS T 600 (45%), Group II VG 46 (N220) (55%) + VI improver (ca 5%) to make SN 600



These are additional routes to make the SN 500 and SN 600 that can be then directly used in making new blends and finished products.

### Direct routes to Paraffinic Brightstock

There are some direct routes to Paraffinic Brightstock in the viscosity range 500 to 625, corresponding to the BS 160 – BS170. We can use NYNAS T 400 with Group II Neutral 500 and add VI improver. We can also use NYNAS T 600 with Group II N 500 and VI improver. This option is used commercially in Egypt with very successful results. They are making Brightstock with the same properties of the VI 93 and 500 centistokes. We can also make the heavier Brightstock by using more T 600 with Group II N 500, and some VI improver to have properties close to what is normally found in these heavy Brightstocks.

1. NYNAS T 400, Group II N 500 and VI improver
2. NYNAS 600 (50%), Group II N 500 and VI improver (500 cSt, VI 93)
3. NYNAS T 600 (70%), Group II N 500 (30%) and 10% VI improver (620 cSt, VI 98)

### Conclusions

Nynas has a wide range of options for Group II Solvent Neutral replacements covering from 70 to 600 SUS, 14 to 120 centistokes. Nynas has a very wide customer offer in the 500 SUS/100 cSt range (six different base oils in all). Re-refined Group II base oils are quite commonly found and they can be upcycled to SN 500 and SN 600 by blending with naphthenic oils. Routes to paraffinic Brightstock type replacement products have been pioneered. Moreover, target blends like SAE 40 with viscosity of 135 cSt or so does not necessarily have to go via a 500 cSt Brightstock, you can design the base oil blends with this SAE 40 grade or SAE 50 or whatever you like in mind right from the start.

The base oil supply landscape is forever changing. High viscosity and high solvency Group I base oils are disappearing forever. Naphthenic base oils provide solvency and high viscosity and are here to stay. Naphthenic base oils blend very well with Group II and Group III base oils. Desired properties of any Group I base oil can thus be recreated that in skillful blending of naphthenics and Group II or Group III base oils. **Nynas** offers a ready-made solution in the form of the NYBASE base oils, and a wide range of application support and lubricant model studies have been completed already.

## Thomas Norrby

Thomas Norrby is the Technical Manager and Senior Specialist for the application area Lubricants at the Nynas Naphthenics Technical Development and Market Support division, which he joined in October 2014. His main tasks include Naphthenic base oil product development, lubricant application model studies and technical demonstrators, technical marketing, lecturing and presentations, in order to provide technical support and application advice to the global lubricants industry. Thomas Norrby also holds a chair as Adjunct Professor at KTH Royal Institute of Technology (Sweden), at the Department of Machine Design. The focus of his industrial research is tribology and tribochemical investigations of base oils, lubricated contacts and lubricants, with a strong focus on sustainability and lubricant life-cycle aspects.





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Chemical Engineering  
Department  
President of Sustainable  
Production and Consumption  
Association  
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# For a climate resilient Turkey



We, as the Sustainable Consumption and Production Association (SPCA), held the 7<sup>th</sup> Istanbul Carbon E-Summit on September 28, 2021 on a digital platform with the main support of the Ministry of Environment and Urbanization and Istanbul Technical University, and with the partnership of the public, local governments, civil society, business world, media, academia and the youth. The theme of this year's summit was Green Recovery for a Climate Resilient Turkey: Role of Waste and Energy Management. Leading companies in the energy and waste sectors as well as companies from the cement, iron & steel, electrical and electronic goods, chemicals, ceramics sectors, and investment banks showed great interest in the E-Summit.

Istanbul Minerals and Metals Exporters' Association (IMMIB), representing the steel, ferrous and non-ferrous metals, electricity-electronics (TET), service, chemicals (IKMIB), mining and jewelry sectors under the roof of Turkey Exporters' Association (TIM), showed its pioneering stance at the summit. The goods sectors represented by IMMIB makes a total contribution of 35 percent to Turkey's exports, and IMMIB creates a service export of \$ 34.8 billion. In his speech, Tahsin Öztiryaki, Chairman of the Board of Directors of IMMIB, shared some good practices of carbon management in the IMMIB sectors, and elaborated on the utilization of electrical-electronic, marble and plastic wastes, and carbon reduction in the steel sector through improvements, reducing energy-derived greenhouse gas emissions of in mining, recovery of precious elements in the jewelry industry, the importance given to this issue in the R&D project markets,

and the structuring of the Green Deal Committee within the unions. TET and IKMIB R&D project markets will be held in November.

Shell was the petroleum sector companion of the 7<sup>th</sup> Istanbul Carbon E-Summit. Shell's 3D booth at the E-Exhibition attracted great attention. Shell achieved 177.8 tons of CO<sub>2</sub> equivalent/year carbon reduction with its Solar Powered Stations, and it was honored with the 2021 SPCA Low Carbon Hero award. For carbon footprint reduction, Shell is working on the road to climate resilient transportation with Low Carbon Fuels (LCF) such as Biodiesel, Bioethanol, Sustainable Aviation Fuel (SAF), and Renewable Compressed Natural Gas (R-CNG).

In his message to the delegates, Prof. Dr. Mehmet Emin Birpınar, Deputy Minister of Environment, Urbanization and Climate Change and Chief Climate Change Negotiator, said: "We see climate change as a security issue that knows no borders and is beyond politics. In this direction, we resolutely continue our efforts to combat climate change. There will be a lot to do after the Paris Agreement," he said. After the E-Summit, Turkey ratified the Paris Agreement. The National Climate Change Strategy and the Climate Change Action Plan will be updated in line with the 2050 targets. The United Nations expects us to present our planning as part of the commitment to net zero emissions. From October 31 to November 12, 2021, the 26<sup>th</sup> United Nations Climate Change Conference of the Parties (COP26) will take place in Glasgow. It is time for hard work, climate diplomacy and climate lobbying for a climate resilient Turkey.

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# How to measure and control lubricant contamination

Lubricant forms a thin film between metal surfaces, and with its additive formulation, it ensures the continuity of the system by providing various properties such as cleaning, impermeability, heat transmission, energy transmission, anti-wear, etc. in addition to lubrication. If it fails to fulfill one of these duties, malfunction symptoms occur and eventually cause undesired downtime.

Approximately 70 percent\* of the oils used in a system cannot fulfill their duties due to contamination. Anything not defined for the system is contamination. For example, the element Iron (Fe) is a raw material in gears, it is not found in oil. If this element is detected in the oil, it means wear. The same goes for moisture as well. It is not found in oil; if detected, it is a source of contamination.

We can define contamination sources in 4 main groups as solid, liquid, semi-solid and gas.

1. Solid: Pollution (dust, sand), rust, wear materials, seal particles, filter fibers, etc.
2. Fluid: Water, fuel, oil, antifreeze, process fluids, incorrectly added oil, etc.
3. Semi-Solid: Grease, varnishing, soot, microbial growth, oil additive reactions, etc.
4. Gas: Oxygen, nitrogen, process gases, combustible gases in transformer oils (methane, ethane, ethylene, acetylene), etc.

The contamination control phase starts from the moment the oil arrives at the site, continues with maintaining the current state of the oil with the storage conditions and ensuring its clean transfer to the system, and it is monitored with oil analysis. If its current condition cannot be maintained at first, and if it is stored under inappropriate storage conditions, the oil will

begin to deteriorate before adding it to your system and cause shortening of the life of the relevant equipment. Let's think about a barrel of oil that has just arrived on the field. If we expose this oil to direct sunlight and rain without any protection, the humidity will increase with condensation due to temperature differences, and the oxidation process of the oil will begin. At high temperatures, the barrel cover will expand, letting various contaminants such as air, dust, etc., and the aging process will start. If this oil is then transferred to the system with a dirty tool (funnel, plastic bottle, etc.), the contamination level will further increase. In addition, if the equipment is operating in a polluted environment and/or the air filtration measures are insufficient, the contamination level will reach the maximum level and the oil degradation process will accelerate. As a result, sufficient oil film will not be formed due to insufficient lubrication and it will cause costly malfunctions in the equipment. In order to avoid such situations, it is necessary to strictly comply with the storage conditions specified in the technical data sheet of the lubricant.

Monitoring of contamination measurement differs according to the systems. In hydraulic and turbine oils, you can run the "ISO 4406 Hydraulic fluid power – Fluids Method for coding the level of contamination by solid particles" for measuring solid particles, the ASTM D 6304 tests for moisture determination and the ASTM D 5185 tests for wear. In motor oils, you can monitor the contamination levels by running the ASTM E 2412 test for fuel, soot, water, oxidation and nitration values in the oil.

As a result, by ensuring on-site disposal of contamination sources, you can extend the life of your equipment, reduce your waste costs by optimizing oil change intervals, and most importantly, you can achieve your sustainable environmental goals.

**\*Source: Lubrication Fundamentals D.M.Pirro / A.A. Wesson**

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# Engine oil user guide



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

## Signification of grades



**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

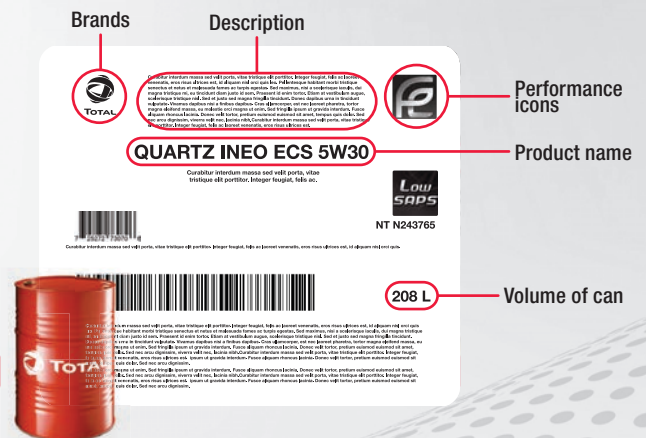
New-generation engine oils and those currently being developed by TOTAL are of increasingly fluid grades: 0W-20, 5W-20, 0W-30 and 0W-16.

## How to read a product label for product selection?

### Small packaging:



### Large packaging:



# EDITORIAL CALENDAR

**MADENİ YAĞ  
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<b>Issue 34</b>	<b>November–December 2021</b>
<b>Features</b>	<ul style="list-style-type: none"><li>• Bio-Based Lubricants</li><li>• E-Commerce in Lubricants</li></ul>
<b>Content Deadline</b>	4 Dec 2021
<b>Advert Deadline</b>	11 Dec 2021
<b>Events where magazine will be distributed</b>	European Base Oils and Lubricants Online Series <i>1 December</i>

<b>Issue 35</b>	<b>January–February 2022</b>
<b>Features</b>	<ul style="list-style-type: none"><li>• Importance of Fleets for Oil Suppliers</li><li>• Electric Vehicle Fluids</li></ul>
<b>Content Deadline</b>	5 Feb 2022
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<b>Issue 36</b>	<b>March–April 2022</b>
<b>Features</b>	<ul style="list-style-type: none"><li>• Oil Analyses</li><li>• Heavy Duty Lubricants</li></ul>
<b>Content Deadline</b>	1 Apr 2022
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<b>Issue 37</b>	<b>May–June 2022</b>
<b>Features</b>	<ul style="list-style-type: none"><li>• Marine Lubricants</li><li>• Turkish Lubricant Exports</li></ul>
<b>Content Deadline</b>	3 Jun 2022
<b>Advert Deadline</b>	10 Jun 2022
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<b>Issue 38</b>	<b>July–August 2022</b>
<b>Features</b>	<ul style="list-style-type: none"><li>• Weapon Lubricants and Turkey</li><li>• Dielectric Fluids</li></ul>
<b>Content Deadline</b>	5 Aug 2022
<b>Advert Deadline</b>	12 Aug 2022
<b>Events where magazine will be distributed</b>	Lubricant Expo <i>6-8 September</i>

<b>Issue 39</b>	<b>September–October 2022</b>
<b>Features</b>	<ul style="list-style-type: none"><li>• Weapon Lubricants and Turkey</li><li>• Dielectric Fluids</li></ul>
<b>Content Deadline</b>	5 Oct 2022
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