

**Experts**

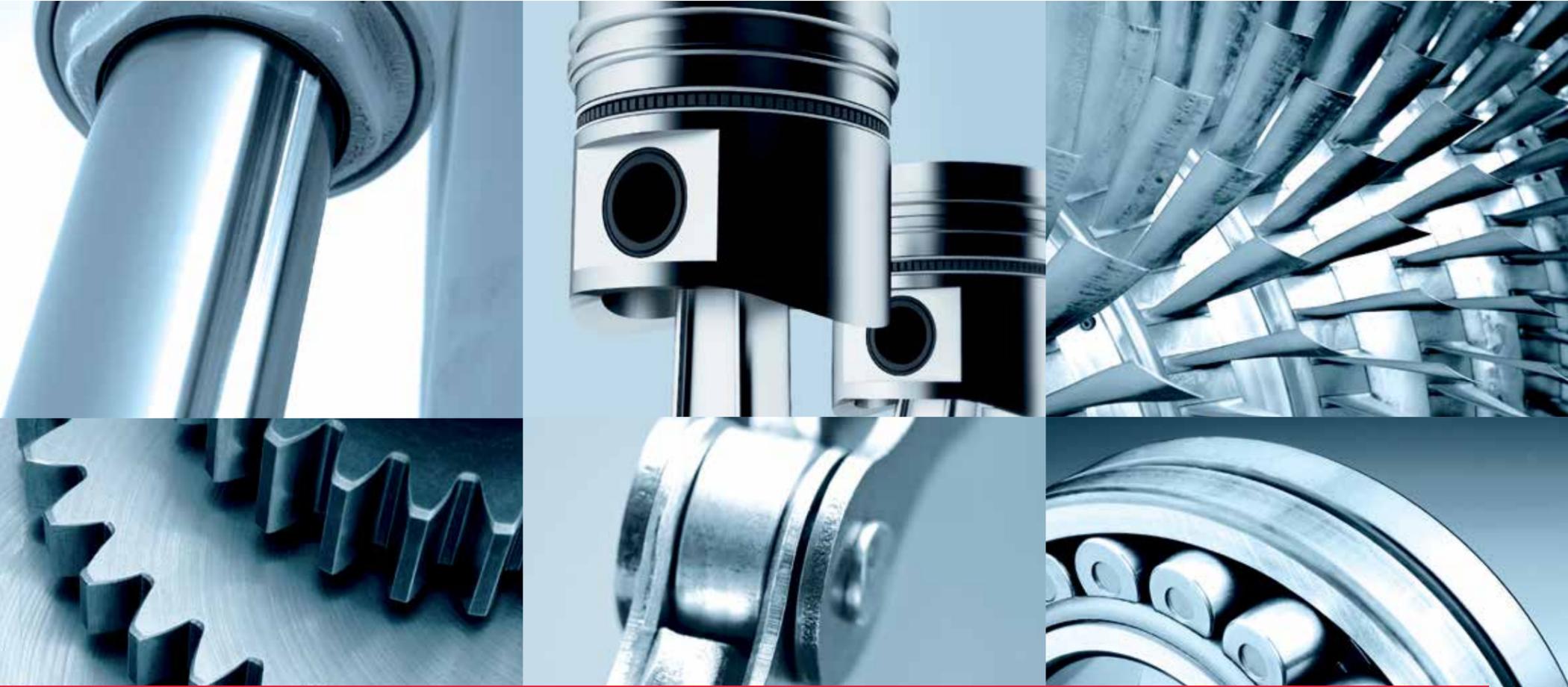
Presses under extreme loads require special gear oils displaying superior Brugger values. → Page 6

**Inhouse Testing**

Chemico-physical analyses and mechanico-dynamical tests establish the foundation of our product development. → Page 7

**Product News**

New arrivals to the ADDINOL range. We provide the optimum solution for any lubrication-related challenge. → Page 8



**ADDINOL High-Efficiency lubricants reduce costs and conserve resources**

High-Efficiency lubricants made by ADDINOL do not only ensure reliable lubrication and long lifetimes of plant components. At the same time they carry enormous potential for the efficient utilisation of energy as well as reduction of energy consumption. They provide for maximum reliability of operation and help conserving resources and reducing operating costs. ADDINOL High-Efficiency lubricants create added value in the long run – tailored to the latest technologies and to the requirements of our customers, developed with our know-how and in close cooperation with leading OEM and research institutes. They are available for a multitude of applications.

**Cover larger distances on roads, tracks and the seas**

The performance level of ADDINOL High-Efficiency engine oils clearly exceeds the requirements as defined by international specifications. They are distinguished by lower evaporation losses which entails a higher viscosity stability. In turn, fuel consumption decreases and one tankful actually holds additional kilometres or miles. By the way, this is not only true for motor and rail vehicles but also for ships on the high seas.

**Champion for saving energy in industrial applications**

In order to optimise energy efficiency in industry, costly investments are not necessarily called for. The use of ADDINOL High-Efficiency lubricants already can make the difference. Each gear requires energy for the transmission of power. By using ADDINOL High-Efficiency gear oils of the Eco Gear series, less energy is needed for this process. Lower oil sump temperatures prove a considerable improvement of energy efficiency, i.e. significant energy saving potential. This unique advantage has been demonstrated by a number of tests carried out by independent and well-known research institutes. ADDINOL High-Efficiency gas engine oils are being successfully applied in biogas plants and in the utilisation of sewage, landfill, mine and natural gas. Being individually tailored to the plants, they achieve operating lives exceeding the ones of conventional gas engine oils by up to 50 %.

**ADDINOL High-Efficiency lubricants are available for many further applications.**

**We are happy to support you individually and are looking forward to your questions! Welcome to the world of ADDINOL!**



**ADDINOL Engine oils – the future is now**

There are two trends having major impact on the technology of future engines and exhaust treatment systems. The ambitious aims of industry can only be achieved with engine oils of a new design. → Page 3



**Following in the tracks of Archimedes – NBR-crawlers are made for all terrains**

NBR-crawlers can move freely and level out uneven underground. The vehicles achieve a climbing rate of up to 44%! The revolutionary power packs use ADDINOL high-performance lubricants. → Page 4



**Pulkovo – Energy for the hub at the Baltic Sea**

In 2013 a new passenger terminal was opened at Russia's third-largest airport. Siemens gas turbines ensure its energy supply. And ADDINOL Turbine Oil MT 46 takes care of their optimum lubrication and maximum reliability of operation in turn. → Page 5



## Editorial

Georg Wildegger

Management  
ADDINOL Lube Oil GmbH



## ADDINOL – a large prospering network!

Driven by the internet, both real and virtual world merge increasingly; digitalisation also affects companies. Being called "internet of things" or industrial internet, it replaces traditional business models and breaks up prevailing structures. Industry 4.0 awaits us with revolutionary and radical changes. Customer-supplier-relationships will be affected by these changes as well. So far they have been organised in stable supply chains, in future they will rather be integrated into networks. Opportunities of competitors to intervene are expected to become wider and suppliers will have to prove themselves permanently. Reading the description of these predicted trends, one might be reminded of a vast digital monopoly game. However, probably it will not be as easy as that, because at the centre of it all, there are human beings.

Know-how, state-of-the-art production processes and intelligent communication as well as information technology are highly important to ADDINOL, but they are not the only keys for success. Our company is vivid and has its own personal identity! People working for and with ADDINOL are not a simple community of purpose but rather a large network acting at its best. There are manifold relations between employees, distributor partners, customers, suppliers, research institutes and OEM (Original Equipment Manufacturer). And thanks to myriad co-operations and constructive communication the network creates win-win situations for all parts involved.

We appreciate the active exchange with our customers and partners as it provides us with important and innovative ideas for the development of new products tailored to customer requirements and the improvement of our established product portfolio. Over and above that, the service around our range of products plays a key role. After all, we intend to offer solutions for all lubrication-related challenges and not just lubricants. Thanks to co-operation with leading OEM and research institutes we are familiar with latest trends in mechanical engineering and plant construction as well as new requirements and specifications. Close co-operation with additive suppliers gives us the chance to be one step ahead of competition when it comes to the development of innovations.

In all these activities, communication is not a one-way road. Additive manufacturers, for instance, make use of our knowledge about latest trends in gear construction, OEM benefit from our experience with special additives. We enjoy sharing our knowledge and support the linking of new connections within the network.

Merging of real and virtual world holds many new and exciting opportunities to us. Our ADDINOL network can only benefit from these!

## ADDINOL – at international fairs and events



### WindEnergy Hamburg – The gateway to the world of wind energy

Between September 23rd and September 26th, 2014 the internationally leading fair of the wind energy sector opened its doors for the first time in Hamburg and exceeded all expectations. More than 33,000 visitors from all over the world found their way to the Hanseatic city; roughly 1,200 exhibitors from 33 nations presented their plants, components and services to the international public ...



### Hanover, Bremen and Cremona – ADDINOL Gas engine oils on stage

Lubrication of gas engines is one of our core competencies and ADDINOL gas engine oils are real trend-setters. Operators pay increasing attention to the efficient and safe operation of their engines. These are perfect conditions for presenting our comprehensive range of gas engine oils for biogas and other special gases at three events even in Germany and in Italy ...



### Interalpin Innsbruck – The summit of alpine technologies

Interalpin Innsbruck is the leading trade fair of the cable car world. It is the place to be for everybody looking for the latest alpine technologies at maximum concentration. ADDINOL participated at Innsbruck for the second time. We are system supplier of many cable car operators and our high-performance lubricants are listed at the large buying syndicate Pool Alpin ...



### Museum Sinsheim – The large special show about Simson

The museum presents one of Germany's most important collections all about technology. Located directly at the highway near Heilbronn it greets its visitors from afar with one TU 144 and a Concorde. Until January 10th, 2016 the museum presents a large show with bikes of the cult brand Simson. The better part of the exhibits is lent by MZA Meyer-Zweiradtechnik GmbH ...



... At the ADDINOL stand they received information about our high-performance lubricants and their capacity to increase plant efficiency. On top of that, we scored with "Longlife Plus!" once again. This programme guarantees a service life of four years for the mineral-oil based gear oil ADDINOL Eco Gear M and of five years for the synthetic gear oils ADDINOL Eco Gear S and W, without oil changes being required.



... We participated at the Energy Decentral in Hanover in November 2014 and at the Biogas Trade Fair in Bremen in January 2015. Our Italian distributor partner FG Tech s.r.l. in turn presented ADDINOL high-performance lubricants for biogas plants and agriculture at the International Dairy Cattle Show in Cremona with our support.



... High-performance lubricants for the application at snow cats, snowmobiles and off-road vehicles, hydraulic fluids for tensioning devices of ropes or long-term greases of the ADDINOL Eco Grease PD series – the ADDINOL product range holds the perfectly fitting product for any application. Our products were presented together with Josef Pirchl and Eng. Willi Ortner of ADDINOL Austria.



... The company is official licensee of the Simson brand and long-time distributor partner of ADDINOL. MZA recommends the original lubricants made in Leuna for the legendary vehicles. Many of these, as Transmission oil GL 80 W for instance, have been approved for Simson right from the start. Therefore, the large show in Sinsheim also presents our lubricants for motorbikes, of course.



## ADDINOL Engine oils – The future is now

Today, decreasing consumption of fuel as well as lubricants and reduction of exhaust emissions are major trends and have an impact on the technology of engines and exhaust treatment systems. Development aims high. If the aims can be achieved at all, then only by the help of engine oils of the respective design. Being the product manager for automotive lubricants, Grad.-Eng. Sven Köhler already today encounters the future trends in his daily work.

### Reduced emissions

The current exhaust emission standard Euro VI for commercial vehicles reduces the limits of particles by about 67 % and of nitrogen oxides by 80 % even compared to Euro V standards. For passenger cars in turn, the European Parliament has passed a limit value of 95 gram carbon dioxide (CO<sub>2</sub>) per kilometre for all new cars from 2021. Starting 2020, 95 percent are supposed to comply with this demand. However, these values probably are not the end of the line.

Neither current nor future standards can be achieved without engine oils of the respective design. Emission standards are reflected for example in different maximum shares of ash-forming substances contained in engine oils. Depending on the content of sulphated ash, phosphorous and sulphur, engine oils are being classified as Low and Mid SAPS oils respectively. Sulphur and phosphorous, which had been standard additives of engine oils in the past, today must be reduced to a minimum. In order to meet the requirements placed on Low SAPS oils just the same – such as long oil drain intervals, less friction and good wear protection – totally new additive packages need to be developed and perfectly fitting base oils must be selected.

With engine oils of lower performance and/or minor quality it is not possible to meet limit values defined for exhaust emissions. The operation of engines and exhaust treatment systems is impaired, damages might occur and operating lives might be shortened! Unsuitable engine oils form ash-like deposits which quickly block fine pores of diesel particulate filters and slash their operating lives.

” **Sven Köhler:** “With our Low and Mid SAPS engine oils we do not only master ecological challenges but also extreme requirements regarding lubrication. The development of future engine oils meeting tightened standards regarding the reduction of exhaust emissions does not pose a quantum leap for us anymore. Many engine oils of ADDINOL, which are approved by leading OEM, already outperform highest ACEA and API specifications. Furthermore, we closely cooperate with major vehicle manufacturers.” ”



Future cars will achieve exhaust emission standards and fuel efficiency with specially designed engine oils only.

### Cutting consumption of fuel and oil

Engine oils contribute a considerable share to fuel-efficient engine operation. Here, particular attention should be paid to the oil's evaporation losses. They are caused by extreme temperatures at piston rings and piston under crowns. Engine oils displaying high evaporation losses tend to thicken which does not only impair their multi-grade characteristics but also prevents the optimum operation of oil scrapers which are supposed to remove oil from the cylinder-piston-complex. Therefore, larger shares of the engine oil are being burnt and its consumption increases in turn. Moreover, the oil loses some of its fuel-efficiency characteristics and triggers higher fuel consumption. This means, low evaporation losses entail better stability of the oil's viscosity which promotes lower consumption of both engine oil and fuel.

Evaporation loss according to Noack is determined at 250 °C and given in weight percent (w%). ACEA E6, for instance, gives a limit of ≤ 13 w%. However, there are also engine oils clearly outperforming these limits. One example with impressive values is the new formulation of our ADDINOL Extra Truck MD 1049 LE of SAE-grade 10W-40. While ACEA E6 demands evaporation losses ≤ 13 w% and Mercedes-Benz actually lays down 12 w% for MB-Approval 228.51, the high-efficiency engine oil of ADDINOL achieves 6.9 w%. This definitely ensures significant reduction of both oil and fuel consumption for operations using this lubricant. In consequence, the product possesses higher viscosity stability as well.

Still, future engine oils are expected to achieve higher fuel saving even and API, for instance, already has defined a respective specification called “API SN with Resource Conserving”. In line with these demands, we have developed the high-efficiency engine oils

ADDINOL Economic 020 and Economic 0520 which both display decreased HTHS-viscosity. Yet, the trend still is towards “thinner” oils. Insiders expect engine oils of SAE grades 0W-8 or 0W-4 indeed. Technically, thinner oils mean that engines run more smoothly and use less fuel. Still, it is not as simple as that. Due to reduced film thickness, film stability might be impaired. After all, the oil film is supposed to prevent the contact between moving components to a large extent and to ensure best wear protection. Moreover, the oil's evaporation loss increases with decreasing viscosity. Stronger evaporation at the same time entails oil thickening. This means, the oil loses its fuel-efficiency and engines require more fuel as a result.

” **Sven Köhler:** “The HTHS viscosity can only be reduced to a certain degree if you want to avoid negative effects. Still, the trend definitely moves towards oils of particularly low viscosity. Low viscosities in themselves are not the challenge. The balancing act rather is to ensure low evaporation losses and the other essential characteristics of engine oils at the same time. This topic definitely is a focus for us and we assess possible base oils and additives having this challenge in mind. We aim at creating powerful, low-viscosity engine oils displaying both high viscosity index and low evaporation losses. Still, we need to be aware that such engine oils will be priced accordingly. But without these, demands for reduced fuel consumption will not be fulfilled.” ”



Grad.-Eng. Sven Köhler

ADDINOL's product manager for automotive lubricants



## In the tracks of Archimedes – NBR Offshore Logistics GmbH

The movement of heavy loads has occupied mankind for millennia. “Give me a place to stand and with a lever I will move the whole world.” – Speaking these words Archimedes laid the foundation for the development of mechanics back in ancient Greece. The safe movement of heaviest cargo on all terrains was one of the aims in the development of the novel NBR-crawlers. Thanks to the self-propelled crawlers some installations can do without the use of cranes even. The Swiss NBR Offshore Logistics only makes use of components provided by well-known manufacturers including high-performance lubricants supplied by ADDINOL.

NBR-crawlers are a modular system of crawler units which are put together depending on the requirements posed by the respective transport job. With the single units being connected, the crawlers can be controlled as a whole. Main applications are the offshore sector and surfaces with lower load-bearing capacity. When using modified chains and particle filters, also indoor applications are possible. The ground-breaking Heavy Lift Transport System has been designed under the direction of manager and head of development Nikolaus Berzen Ratzel. Today, there is a whole line-up of NBR-crawler types available covered by patents.

### Going ahead on any terrain

Thanks to their construction, cargo can be positioned at the centre of the special platform and hydraulic cylinder. If required, NBR-crawlers can be placed directly under the component. The calotte on the hydraulic cylinder makes the transport of any construction possible. Depending on demand and application there are various lift-heights (400–800 mm) and track widths available.

The vehicle's climbing ability achieves up to 44 % and 24° respectively! Thanks to their special construction, the crawlers can move freely and level out uneven underground. Since load is applied as distribution rather than wheel load, they can be used on undergrounds which only have been compacted before. Moreover, crawlers are equipped with an automatic levelling unit ensuring that the cargo is being balanced all the time.

### Flexible and highly powerful when combined

NBR-crawlers can be disassembled into their single units to be transported in containers. For assembly on the spot and disassembly after successful operation only forklifts or a small mobile crane are required. Each crawler is equipped with an own power pack and can move self-sufficiently. Depending on type, crawlers reach a speed of up to 0.56 km/h under full load.

As a group, the crawlers achieve extraordinary performance. At the moment, up to 20 units can be connected via cable connection in order to manage loads of about 12,500 t; they are being controlled flexibly and monitored by data lines. However, NBR Offshore Logistics is already working on combining 40 crawlers in order to provide a total loading capacity of 20,000 t!



Any construction can be placed on the specially designed platform and its hydraulic cylinder.

### Selected components and high-performance lubricants

Particular attention has been paid to reliability and worldwide availability of spare parts when the power packs were developed. ADDINOL high-performance lubricants are being used as first fill and service products. Head of development Nikolaus Berzen Ratzel particularly appreciates superior operating lives typical of the quality products made in Leuna. Many lubricants make extended service intervals possible increasing flexibility where the crawlers are being used. Besides, the vehicles are in use under very different



A strong team! Up to 20 crawlers can be combined to work together.

climatic conditions. ADDINOL high-performance lubricants are not only available all over the world but at the same time ensure maximum reliability even under most extreme operating conditions.

Each NBR-crawler is equipped with a hydraulic drive and a PPU (PowerPackUnit). Here, 6- and 8-cylinder engines of MTU and Mercedes-Benz with a power between 240 and 450 kW have been chosen. The engine's reliable lubrication is ensured by ADDINOL's fuel-efficient engine oil Extra Truck MD 1049 LE. It meets strict requirements of Euro VI commercial vehicles and reduces both fuel and engine oil consumption. Even at low outdoor temperatures the engines achieve best cold-start and warming-up performance and display highest ageing and shearing stability even under difficult operating conditions.

Hydraulic units ensure the reliable levelling of the whole unit and therefore are exposed to particularly high loads. This application calls for the effective ADDINOL hydraulic fluid HVLP 46. Based on its superior viscosity-temperature behaviour it achieves highest performance both at low temperatures and temperature peaks, the hydraulic system reacts quickly and reliably and reaches increased hydraulic power under full load.

### From wind power to the construction of bridges

NBR-crawlers can be used for the installation of wind turbines in the field but also for the transport of ships and ship sections or tripods. They also manage mono-piles for offshore plants or components of bridge constructions. The power packs of the Swiss NBR Offshore Logistics are being manufactured in co-operation with selected companies and tailored to the respective customer requirements. The team – consisting of manager Nikolaus Berzen Ratzel, marketing expert and service agent Jens Monsees and Heiner Birck, responsible for engineering and design, as well as three sales agents – wants to conquer the markets of Europe, Africa and the Asia-Pacific region with their NBR-crawlers. They are well prepared and chances are good – after all they already today have impressive references from co-operations with world-famous companies.



With a diameter of 7.80 meters, it is currently the biggest in the world – moved by NBR-crawlers the first Steelwind Mega-Monopile has rolled out of the plant just in time for the opening of Steelwind Nordenham.

## Pulkovo Airport – Energy for the hub at the Baltic Sea



14 million passengers per year and an immense cargo volume, St. Petersburg has the largest airport at the Baltic Sea.

With about 14 million passengers Pulkovo is the third largest airport of Russia behind Domodedovo and Sheremetyevo in Moscow. The growth of the boom town St. Petersburg, which is only a few kilometres to the north, of course does affect the volume of passengers and cargo in Pulkovo. Modernisations have been carried out over the last years and a new passenger terminal has been erected following this development. A new station ensuring energy supply has been installed as well – its Siemens gas turbines are being operated with ADDINOL Turbine Oil MT 46.

Apart from being a popular European tourist destination, St. Petersburg holds an impressive economic potential. Well-known companies of sectors such as automobile industry, mechanical engineering and the production of consumer goods have established subsidiaries in St. Petersburg, millions have been invested and thousands of new jobs have been provided. To handle the increasing volumes of passengers and cargo, a new terminal building has been put into operation in 2013. Terminal 1 has a capacity of up to 17 million passengers a year and awaits its visitors with most modern infrastructure at an area of 110,000 square metres.

There are 73 airlines ensuring the connection between the metropolis at the Baltic Sea and 164 destinations. About 4,000 people work at the airport which has been run by an international syndicate since 2009. The Russian VTB Bank and the German Fraport AG, which operates Frankfurt Airport among others and is one of the leading players in airport business, hold major shares in the NCG (Northern Capital Gateway).

### Energy provided by gas turbines

The airport has an enormous power demand. The power station of “Pulkovo 1” operates Siemens gas turbines at the latest state-of-the-art. These turbines are required to yield highest performance all the time and so are their lubricants. Applications compressing gas to transform rotational into

mechanical energy are characterised by high loads, speeds and temperatures. Turbine oils must meet a whole range of various tasks with specific requirements. Their main function is the lubrication of bearings, but depending on plant type and design often they serve as lubricating oils for gears and as hydraulic fluids for control mechanisms as well.



Siemens gas turbines – operated with ADDINOL Turbine Oil MT 46.

### Number one choice – ADDINOL Turbine Oil MT 46

In September 2013 the airport operators called for tenders for the first fill of Siemens gas turbines in “Pulkovo 1”. The decision made in favour of ADDINOL Turbine Oil MT 46 was a clear one. After all, with the official approval issued by Siemens, the high-performance turbine oil from Germany meets the major condition. On top of that, when critically compared with competitive products of international manufacturers, ADDINOL Turbine Oil MT 46 convinced by its superior performance.

ADDINOL high-performance Turbine Oils MT 32 and MT 46 are tailored specifically to the demanding operating conditions of modern turbines. They are based on carefully selected synthetic base oils of high-quality combined with an optimised

composition of zinc-free additives. Minimum requirements on turbine oils under increased thermal loads used in turbines and machines powered by these are defined in DIN standard 51515-2 (Turbine oils TG). These standards are being tightened by current requirements laid down by turbine manufacturers Siemens Energy AG and MAN Diesel & Turbo SE. ADDINOL Turbine Oils MT 32 and MT 46 outperform even the strict demands of both OEM.

### These advantages pay off

In practice, ADDINOL Turbine Oils MT 32 and MT 46 convince by maximum ageing stability and effective prevention of deposits. This is highly important for operators since lacquer-like deposits, so-called varnish, speed up bearing wear and have negative effects on load-bearing capacity, they impair the control of the turbine by plugged servo valves and filters and impede heat dissipation. With the use of ADDINOL turbine oils there is no strain at all on the circulating systems.

During operation the agitation and aeration of the lubricant cannot be avoided. Entrained air disturbs steady power transmission and efficient plant operation. Moreover, it holds the danger of cavitation on machine components and promotes oil ageing. Because of increased oil circulation speeds there is less time for the turbine oil to “calm down”. Therefore entrained air bubbles must be quickly separated and released from the lubricant. ADDINOL Turbine oils of the MT range display excellent air separation capacity. In the air separation test at 50 °C (DIN ISO 9120) ADDINOL Turbine Oils MT 32 and MT 46 achieve complete air separation within 3 minutes being clearly beyond standard. The release of entrained air usually causes foam formation on the lubricant’s surface which is minimised by the help of silicone-free defoaming agents and carefully selected base oil components when ADDINOL Turbine Oils MT 32 and MT 46 are being used. That way, stable operation is ensured and power drops in the system are being prevented.

Since 2013 8,000 litres of ADDINOL Turbine Oil MT 46 have been applied in the Siemens gas turbines at “Pulkovo 1”. The decision in favour of the high-performance lubricant made in Germany was a good choice: the gas turbines are supplying energy for the large airport without any interruptions or difficulties.

Requirements	DIN 51515/2	MAN Diesel & Turbo SE	Siemens Energy AG	ADDINOL Turbine Oil MT 32 and 46
Viscosity index	90	≥ 95	≥ 90	130
Purity level	20/17/14	≤ 17/15/12	≤ 20/17/14	17/15/12
Air separation ability at 50 °C (min)	< 5	≤ 5	≤ 4	< 3
Foaming characteristics at 24 °C	max. 450/0	≤ 50/0	≤ 450/0	0/0
at 93,5 °C	max. 50/0	≤ 50/0		0/0
at 24 °C after 93,5 °C	max. 450/0	≤ 50/0		0/0
Water content (mg/kg)	≤ 150	≤ 150	≤ 200	< 10
Water separation ability (s)	max. 300	≤ 300	≤ 300	< 100
Ageing behaviour RPVOT (min)	> 750	≥ 600	≥ 750	> 1.400
Load stage FZG (A/8.3/90)	8	≥ 8	≥ 8	≥ 9

ADDINOL Turbine Oils MT outperform DIN standards and strict demands of leading OEM.



## ADDINOL Hydraulic and Gear oils – the lubricants of choice for hydraulic presses



Hydraulic presses are indispensable to the large scale production of automobiles and many other goods. Under particularly high loads the presses demand special gear oils with Bruggger values clearly above the average.

**“For the trouble-free operation of our presses and plants the selection of the best possible lubricants is of utmost importance.”** Already with the first sentence of the general information in their lubrication manuals, Schuler Pressen GmbH gets to the heart of it. Their manual lists by name all hydraulic fluids and lubricants which are approved to be used in their presses. Special attention is being paid to gear oils for particularly high loads. ADDINOL is one of only four international lubricant manufacturers listed in this section and offers the suitable products in four viscosity grades even.

Hydraulic presses with a power output between 1,000 and 100,000 kN press capacity are needed in the large scale production of automobiles, in energy as well as electrical industry and in the manufacturing of household appliances. Most of these presses bear the quality sign “Made in Germany” and are in operation at places all over the world. The Schuler Pressen GmbH located in the Swabian Göppingen is one of the best-known manufacturers of this branch. In 2007 Schuler took over Müller Weingarten AG, including Umformtechnik Erfurt. Today, the company is majority-owned by the Austrian Andritz AG.

### Playing it safe with ADDINOL

Low rotation speed and high impact loads are typical of compact gears in large presses. Since their bearings are exposed to high thermal stress, lubricants must be chosen carefully. Although minimum requirements on conventional gear oils (CLP-type) are defined according to DIN 51517-3, not all lubricants meeting this standard are up to particularly high loads. The same is true for hydraulic fluids. DIN 51524 defines minimum requirements on wear protection, yet,

the actual loading capacity of the fluids might vary vastly in practice. If, for instance, stick-slip or vibration occurs at hydraulic cylinders and hydraulic pumps achieve poor delivery rates, this might be a sign of hydraulic fluids of insufficient performance.

The use of unsuitable lubricants does not only impair functioning and lifetimes of machines but also endangers their warranty. Operators play it safe with tested and approved high-performance lubricants made by ADDINOL. This is true especially for ADDINOL Hydraulic fluids HLPD and ADDINOL Gear oils CLP MW.

### The Bruggger-Test for assessing loadability

Specifications laid down in the DIN-standards for hydraulic and gear oils are not the measure of all things and no guarantee of lubricants meeting the requirements of presses under particularly high loads. Constructing engineers in charge at Müller Weingarten AG discovered this many years ago already. However, there was no test method available for assessing the load-bearing capacity of lubricating films under mixed and boundary friction conditions. Therefore, Kurt Bruggger and Dr. Eng. Claus-Peter Neumann themselves designed a new test method. To this day, the Bruggger-Test is the only testing procedure for judging adhesive strength and wear protection capacity of lubricating oils at moving components in line with actual practice.

The test set-up consists of a rotating test ring and a test cylinder which exerts a specified test load on the ring. Prior to start, the lubricant is applied to the test ring. The size of the wear scar resulting from the test depends on the performance of the lubricant. The smaller the scar, the

higher is the load-bearing capacity of the lubricant. In order to reflect the behaviour of different oils in numerical values and to compare them, the ratio between pressing force and produced wear scar is given as load-bearing capacity B calculated in (N/mm<sup>2</sup>) according to Bruggger. Bruggger and Neumann discovered that the load-bearing capacity of lubricants might range from 25 to 88 N/mm<sup>2</sup>, even if they belong to the same DIN-group. On top of that, they monitored the behaviour of machines in long-term operation and focussed on difficult cases in particular. That way, they established the relation between test results and the behaviour of lubricants under practical conditions.



The Bruggger lubricant tester is an important test bench of the ADDINOL laboratory. Tests under mixed and boundary friction conditions are defined according to DIN 51347-1.

### Superior Bruggger values for ADDINOL lubricants

The Bruggger value is the decisive criterion for assessing the load-bearing capacity of lubricants. According to this value, Schuler distinguishes between gear oils with a Bruggger value of at least 50 N/mm<sup>2</sup> for normal loads and of at least 75 N/mm<sup>2</sup> for high loads in their lubricant manual DT 55 005. ADDINOL gear oils of the CLP MW series belong to the few products which are explicitly approved by Schuler and have a Bruggger value of > 80 N/mm<sup>2</sup> which is clearly above the average! ADDINOL CLP 68 MW and 100 MW have been developed for the operation of stamping presses, ADDINOL CLP 150 MW for large presses respectively. ADDINOL hydraulic fluids HLPD 46 and 68 approved by Schuler stand out due to their remarkable load-bearing capacity. They achieve a Bruggger value of > 50 N/mm<sup>2</sup> which is exceptional for hydraulic fluids!



ADDINOL Hydraulic fluids HLPD and gear oils CLP MW are being applied worldwide in presses of Schuler, Müller Weingarten, Umformtechnik Erfurt, Siempelkamp and many other well-known manufacturers. They convince by their superior performance and prove our core competence: namely research and development!

## Subject to thorough inspection



Judging the damage stage of tooth flanks of a pinion after FZG test run (DIN ISO 14635) where micropitting resistance of gear oils is being tested.

Skills, experience and technologies of a lubricant manufacturer are of particular importance when it comes to research and development. Being design elements, lubricants are essential for the stable operation of plants and units. In practice they encounter manifold requirements. Yet, how do lubricant manufacturers ensure that their lubricants meet both general requirements and the challenges of specific applications?

Today, technical innovations arise rapidly and within a short time span. Increased power density, narrow tolerances, new materials and rising loads add to the demands placed upon lubricants. They are expected to achieve stable and high performances under difficult conditions even. Lubricant manufacturers are supposed to react to technological trends promptly and to adapt their products to specifications and manufacturer demands in the best possible manner. Testing lubricants in practice would not only be costly but also time-consuming. Field tests are conducted at the end of the development process only and are not suited for development work as such. When it comes to new machines and units, there is no opportunity for testing given anyway.

### Combining test procedures

For this reason, laboratory tests are the foundation of our development work. There are chemico-physical analyses on the one hand and mechanico-dynamical tests on the other. Only by combining both methods, one can assess the suitability of lubricants for specific applications. By the help of **chemico-physical test methods**, such as determining viscosity, corrosion and oxidation tests, infrared spectroscopy or ICP-OES-elementary analysis, the composition of a lubricant and specific parameters are analysed at our laboratory. Based on the results, different lubricants can be judged and compared. The performance of lubricants in practical use, however, can be predicted by

means of these data only to some degree. In practice, the single load parameters influence the lubricant simultaneously and sometimes even interact. For these reasons, chemico-physical methods are completed by **mechanico-dynamical test runs**. With these methods, lubricants are analysed under simultaneous exposure to load, speed and temperature with the single parameters being adapted to different applications. Only that way, one can make well-founded statements on the suitability for specific applications.

### Testing facilities in Leuna – chances and limitations

Mechanico-dynamical testing has a long-standing tradition in our company. The first in-house laboratory including technical testing facilities was opened in 1939 already.



Four-ball wear tester (DIN 51350) for assessing lubricity when exposed to high pressures or wear stress. Welding load or wear scars allow a statement on the lubricant's performance.



Shear stability test with Diesel fuel injector (DIN EN ISO 20844): hydraulic fluids and engine oils are being analysed for the stability of VI-improvers and the oil's shear stability.

Asked for the advantages of in-house testing facilities Christian Retschke, engineer for test benches at ADDINOL, explains: "The testing facilities provide the opportunity of checking ideas and formulations at an early stage of development. By adjusting operating parameters we can refine and improve formulations. Practical tests are only conducted at the end of the process with the best possible version. Thanks to our in-house tests we possess a remarkable data pool by now; our experiences find their way into our day-to-day work and are being expanded in the process." Retschke admits, that costs for acquisition, maintenance and servicing might seem high at first, but should be considered with regard to the obvious advantages: "We do not depend on the capacities of external institutes and can start test series right away. There is no further delay caused by shipping the samples. On top of that, we can repeat tests on short call, react to provisional results and adjust test runs if necessary. We have full control of all data measured during the test runs which really pays off in the end."

However, an in-house laboratory does not only hold advantages for the development of new products or the improvement of existing compositions. The facilities also are employed during quality control of raw materials and finished products and simplify these processes considerably. Of course, in-house tests complete the cooperation with external research institutes and laboratories only and cannot replace these. Sometimes, results of independent institutions are demanded. Besides, the options of in-house facilities are limited, special testing procedures therefore are realised together with leading research institutes. After all, in the development of lubricants ADDINOL does not only cooperate closely with internationally leading OEM but also with established research institutes.

## For four-stroke engines of fast bikes – ADDINOL Pole Position SAE 5W-40



Being an all-rounder meeting highest specifications and having a viscosity of SAE-grade 5W-40 it is the perfect addition to our Pole Position engine oil series for four-stroke bikes! ADDINOL Pole Position SAE 5W-40 ensures both reliable lubrication of wet clutches even under sporty driving conditions and optimum engine performance at full power.

The new oil for four-stroke engines outperforms the requirements of JASO MA-2, which are demanded for motorbike oils applied in machines of Japanese manufacturers. This specification includes the specifications below this level, this means ADDINOL Pole Position SAE 5W-40 can be used in engines requiring an oil according to JASO MA as well. European and U.S.-American manufacturers on the other hand, mainly require lubricants complying with API. The new engine oil meets API SN, which presently is the highest specification for four-stroke engine oils. With meeting the main specifications currently laid down for four-stroke engine oils ADDINOL Pole Position SAE 5W-40 is the perfect all-rounder for workshops.

## For heavy workers in agriculture and forestry – ADDINOL UTTO Plus

The new multi-functional oil ADDINOL UTTO Plus is the ideal addition to our range of tried and tested universal tractor oils of the ADDINOL UTTO (Universal Tractor Transmission Oil) range. It is distinguished by best viscosity-temperature behaviour for the application also at low temperatures. ADDINOL UTTO Plus provides reliable lubrication for transmissions, hydraulic units, differentials, wet brakes and power shift clutches of tractors. In addition, it can be used in final drives with or without limited slip differential.



The new multi-functional transmission oil of SAE-grade 5W-30 and 75W-80 respectively is based on a balanced combination of high-quality, semi-synthetic base oil components and powerful additives. It can be applied throughout the year and ensures reliable response behaviour of both transmission and hydraulic unit at low outdoor temperatures. Transmissions, hydraulic units and final drives safely are protected against wear, sludge deposits and sticky, varnish-like residues. Highest stability is ensured even when exposed to high loads over long periods. ADDINOL UTTO Plus prevents slipping and sticking of wet brakes and clutches efficiently and achieves longest lifetimes thanks to its extraordinary ageing stability.

## For Dual Clutch Transmissions – ADDINOL ATF DCT

Dual clutch transmissions (DCT, DSG/direct shift gearbox) consist of two separate sub-transmissions which are independent of each other. By means of dual clutch technology both transmissions are interchangeably connected to the



engine by the help of two drive shafts depending on the gear. For the automatic transmission without interruption of tractive power dual clutch transmissions require the latest development of automatic transmission oils: ADDINOL ATF DCT. It has been specifically designed for the requirements of dual clutch transmissions and is based on fully synthetic oils and modern additive technology. It is exclusively recommended for direct shift gearboxes with wet clutches.

## Fuel savers for passenger cars – ADDINOL Economic 020 & 0520

Both engine oils made in Leuna meet the specification “API SN with Resource Conserving” which corresponds to the current requirements of US-American and Asian vehicle manufacturers. The international specification accounts for demands regarding fuel and oil consumption which is expressly stated not only in the requirements issued by the engineers of API (American Petroleum Institute) but in the name “API SN with Resource Conserving” as well.

The high-efficiency engine oils ADDINOL Economic 020 and Economic 0520 are characterised by their pronounced fuel-efficiency and have an enormous potential of reducing fuel consumption. Excellent wear protection and highest cleaning capacity ensure best protection and maximum engine lifetimes. Outstanding ageing stability guarantees longest oil change intervals also where flexible service systems are in use. ADDINOL Economic 020 and Economic 0520 are engine oils with decreased HTHS-viscosity. Due to superior flowability at low temperatures both products display best cold-start behaviour and achieve reliable lubrication under all operating conditions. ADDINOL Economic 020 is highly suited for applications at cold climates.

### Special tip for gas engines

## ADDINOL Cooler protection – pre-mixed and approved

Reliable lubrication and optimum heat transfer are decisive for the save operation of gas engines. By using high-quality cooler protecting agents, operators can ensure optimum heat transfer and the reliable protection against freezing, corrosion and cavitation at the same time. The cooler protecting agent ADDINOL Antifreeze Extra 4060 is pre-mixed with special mixing water, which meets the technical requirements of the respective OEM. By using pre-mixed agents the negative effects of insufficient water qualities on the cooling unit can be avoided. The product is ready to be used and stable qualities are achieved independent of local conditions. This is a clear benefit for service providers, but not only for them. Especially at conditions with very hard water, the use of Antifreeze Extra 4060 has decisive advantages. Thanks to minor deposition tendency and highest engine cleanliness the cooling agent ensures excellent heat transfer, foam formation is prevented effectively. ADDINOL Antifreeze Extra 4060 is approved by leading manufacturers and has been successfully tried and tested in practical application.

→ ADDINOL develops and produces modern high-performance lubricants at the latest state-of-the-art. Our portfolio includes more than 650 products ranging from powerful engine oils for motor vehicles, nearly all oils and greases for industrial application up to innovative special lubricants for highly demanding applications. We offer the solution for any lubrication-related challenge – our sales representatives are looking forward to your questions!

## TOP-OIL Albania – this name tells it all



Here the manager takes care of the customers himself! Luan Saraci has successfully been managing TOP-OIL SH.A. since 1997.

Since 2002 TOP-OIL SH.A. has been official ADDINOL distributor partner in Albania. Together with his team of 12 employees, owner and managing director Luan Saraci markets a broad range of ADDINOL high-performance lubricants in one of the most beautiful countries of South-East Europe and they are very successful in doing so.

Rruga e Kavajës Number 162 is a top address in the heart of Tirana. There you find the headquarters and a prestigious well-stocked shop of our ADDINOL distributor partner TOP-OIL SH.A. Successful companies of good reputation have their headquarters or at least a subsidiary at the Rruga e Kavajës, which is one of the capital's largest boulevards. The shop of TOP-OIL is hard to miss: the friendly turquoise greets the visitors from afar already. On 200 square meters the customers find everything to do with cars. The product range does not only include the high-performance lubricants from Germany but also filters, batteries, care products and further accessories. Apart from the shop in the centre, TOP-OIL runs another one at Teodor Keko street in Tirana. At both locations customers get comprehensive advice and might even be served by the manager and owner himself with a little luck. In Diber, which is in the eastern part of the country, TOP-OIL keeps an additional distribution centre. Albania covers an area of 28,748 square kilometres and has about three million inhabitants. In the west, the country borders on the Mediterranean Sea with its alluring beaches. In the east, the territory is covered by highlands with heights of up to 2,700 metres. Nearly all main roads are heading to Tirana and deliveries are carried out quickly and flexibly with TOP-OIL's own fleet.

### The road to success

TOP-OIL has been founded in 1997 and has become an official ADDINOL distributor partner in 2002. Luan Saraci has 12 employees and they successfully sell a broad range of ADDINOL high-performance lubricants in Albania. Customers receive competent advice on products for passenger cars, heavy commercial vehicles and motorbikes

as well as on selected lubricants for agriculture, construction industry and other industrial sectors. After all, the team of TOP-OIL is very experienced in questions about lubrication and knows the high-performance lubricants from Germany inside out.

TOP-OIL looks back on a successful history of nearly 20 years. The achievements of Luan Saraci and his team are really impressive. After all, the economy of their country has seen turbulent times and the development from a former socialist planned economy to a modern and open market economy has been a highly difficult one. In spite of this background and the activities of numerous international competitors, TOP-OIL did not only manage to establish a successful company but even earned a leading position in the sale of lubricants.



The premium TOP-OIL shop at the Rruga e Kavajës, one of Tirana's largest boulevards.

### In the long run it is only quality that counts

TOP-OIL – for Luan Saraci the company's name has been reflecting the idea behind the enterprise right from the start. Already when founding the company he knew: in the long run it is only quality that counts! Because of that, he decided in favour of ADDINOL in 2002. Luan Saraci: "The ADDINOL Lube Oil GmbH is a highly innovative company. The high-performance lubricants which are developed and produced in Leuna really deserve their name. On top of

that, ADDINOL offers a vast product range and provides active support to their distributor partners. All products are 'Made in Germany', which is a highly important factor for us; their reputation should not be underestimated!" However, it is not only the high-performance lubricants themselves imported from Germany which ensure the success of the brand in Albania. TOP-OIL offers first-class advice as well as additional service contributing a major share to establishing ADDINOL in Albania. TOP-OIL is well-known as reliable supplier for both the automotive branch and industry. Nevertheless, the company is really pushing it and for instance presents the products at exhibitions in the capital's ExpoCenter.

TOP-OIL supplies the most important industrial and construction companies and customers in every region of Albania such as: Durim Cobo, Thimaq Xhaxho, Astrit Duraku, Niko Gjika, Zamir Mehmeti, Jani Sinanaj, Ilirjan Rapo, Tonin Shmilli, Genti Domi, Auto-Mera, Afrim Lapi, Sefedin Hasani, Auto Servis Osmani, Bujar Alla, Perparim Markja, Leonard Lamce, Petrit Lala, Ndoc Zefi, Marin Nikaj, Fitim Domi, and Shefqet Musabelliu.

### Excellent future prospects

Construction and cement industry will offer excellent opportunities to TOP-OIL in the upcoming years. From 2020 Europe shall be supplied with gas through a Southern pipeline. Preparatory works for the construction of the Trans-Adriatic Pipeline (TAP) in Albania are about to commence now. Before the installation of the pipeline can start, 100 kilometres of road and 42 bridges in the highlands of the Balkan country need to be built or repaired.

TOP-OIL is prepared to meet the upcoming challenges. In order to come up to future demands a large new complex on an area of 12,000 square metres is being built at the moment. The new site is located at the connecting road between city centre and airport. It will accommodate a larger warehouse and logistics centre providing room for offices, a shop and a car service station.



## “Without fitting lubricants the best technology proves inadequate“

**To some people their vehicle is just the means to get from A to B. To others however, it is pure passion. And sometimes it even might be the beginning of an extremely successful business. The enthusiasm for the Audi A3 VR6 3.2 quattro laid the foundation for “Öl aus Böhl”, the online shop of Michael Lorch.**

Talking shop, fiddling about, screwing and tuning – the launch of Audi A3 VR6 3.2 quattro back in 2003 was accompanied by expert speculations and soon the enthusiastic fans set up a website which collected available information and quickly became a proper forum – the Audi A3 quattro Community was born. It saw a rapid growth and today counts more than 7,000 members from all over the world. Followers do not only come from Germany, Austria and Switzerland as well as France and Benelux, actually the fan base of Audi A3 reaches as far as Mexico, the Canary Isles and the USA even.

In 2006/2007 problems occurred at the timing chains of VR6 engines with 3.2 litres in A3, TT and VW Golf IV as well as V R32 models causing heated discussion and a feverish search for a solution. Looking for the suitable engine oils for their beloved vehicles they had carried out a number of tests and oil analyses already, when they came across ADDINOL high-performance lubricants. And this proved to be the solution! Michael Lorch gets carried away when he tells the story: “We learned early, that best technology proves inadequate without perfect lubrication. With ADDINOL lubricants the engines run more smoothly and quietly, they reach operating temperature faster and the engine cleanliness achieved is really astonishing. We are absolutely happy!”

The demand for the high-performance lubricants made in Leuna grew rapidly and followers encountered problems concerning the product availability in the Rhine-Neckar region. In 2011 Michael Lorch, the founder of the Audi A3 Quattro Community, simply took matters into his own hands and contacted ADDINOL. Since 2011 he has been carrying on the Online-Shop “Öl aus Böhl” with success. Starting out just as a hobby, the shop has become very successful in the meantime and the “one man show” sometimes reaches the limits of its capacity even.

The product range does not only cover high-performance engine oils for the favoured Audi A3 but a broad range for the requirements of various passenger cars as well as function fluids, transmission oils, lubricating greases, sprays and engine oils for commercial vehicles and bikes as well. By now, there is a considerable number of workshops among his customers including VW-Audi dealers. Gas engine oils

and lubricants for industrial applications are also being sold by the skilled engineering technician. Containers of up to 20 litres are shipped from his own store or picked up by the customers, drums are dispatched from ADDINOL directly. “That really goes off without a hitch!”, Lorch happily says about the service and support ensured by sales engineer Hans-Ulrich Weinert and the lady from order processing, Doreen Wilhelm. Lorch wants to point to the support provided by the colleagues of ADDINOL applications advice service in particular because they always give the right recommendation very quickly and for tricky questions even: “Me and the community members really feel to be at safe hands here and appreciate the excellent support.”

The second hobby-horse of Lorch is model building and he was really surprised when he discovered the familiar turquoise containers at the booth of a well-known manufacturer of engines for model aircrafts far away in Lehrte/Lower Saxony during an air show. There he learned, that ADDINOL's two-stroke engine oils of the MZ range are perfectly suited for model aircrafts because of their excellent thermal stability, reliable anti-wear properties and cleaning effect. Of course, these lubricants quickly became part of the product range offered by Lorch alongside ADDINOL White Oil WX 15 being preferred as smoke oil.

Concerning the distribution of the products, Lorch comes up with a number of good ideas. After all, he is aware of the wishes of smart mechanics from his own experience: products are offered in complete sets containing everything needed for oil changes at the own garage. Word-of-mouth advertising is particularly valuable according to Lorch. Enthusiastic users like to share their positive experience and that way products are gaining even wider popularity.

A special community event took place in June last year when the members celebrated their 10th anniversary with a workshop at the Audi AG in Neckarsulm/Baden-Württemberg. 60 participants from all over Germany, Austria and Switzerland took part in the event which was perfectly prepared and offered a complete programme including oil workshop, tuning tips, a tombola and a guided tour through the Audi factory. “The event was a complete success”, Lorch recalls, “and the information all about oil presented by Heiko Stephan of ADDINOL applications advice service found an interested audience among the experts even.”

Asked for his future plans, Lorch starts pondering: if business continues to work out that successfully, he will really have to consider hiring support. “But it is so much fun! Is there anything better than turning passion into profession?”



Even after more than 200,000 km in best shape – Highest engine cleanliness and not a trace of wear in Audi A3 4-cylinder 2.0 TDI thanks to ADDINOL MV 0539 LE. Excellent cleaning properties and reliable wear protection are being monitored closely and recorded meticulously.



For generating typical smoke streamers during acrobatic flights ADDINOL White Oil WX 15 is used. It is injected with a pump into the exhaust plume of combustion engine or turbine or by the help of a smoker. The physiologically harmless oil evaporates and small droplets become visible in the sky through light refraction. Copyrights: Moritz Melletat



A heartfelt thank you: At the end of the workshop at the Audi AG, Michael Lorch (right) gives ADDINOL surprise bags to some of the dedicated community members.

