

IMPULSE

MAHLEMobility
magazine
for the
workshop02 // 2020
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DIFFERENT? BETTER!

Why change is
an opportunity

DIGITAL DOOR OPENER

Don't let security gateways get
in the way of your diagnostics

PRINTED CLASSICS

3D printing—
technology of the future

A VIRTUAL SUCCESS STORY

The MAHLE sim racing team in digital pole position





From professional to professional,

Digital transformation is one of the main drivers of change in industry, trade, and workshops. But this isn't something to fear. Rather, it's an opportunity that brings with it greater efficiency, convenience, and safety for your workshop during diagnostics, maintenance, and repairs. At MAHLE, we're putting every effort into the ongoing development of digital solutions so that you can continue to offer your customers the best possible service experience.

This year, we celebrate 100 years of MAHLE. By moving forward with a diversified powertrain approach through our dual strategy, we intend to remain an active driver of mobility and a reliable partner for you.

But we want to take this opportunity to salute you, not ourselves! You and your team have done tremendously well to ensure mobility while almost everything else has come to a standstill during the coronavirus crisis. Thank you, you're doing a great job!

In this issue, we present to you our innovations in the areas of diagnostics, driver assistance systems, A/C and automatic transmission services, and emissions testing that will support you in your work. There's a great deal for you to look forward to.

We hope you enjoy reading it!

Olaf Henning
Corporate Executive Vice President and
General Manager MAHLE Aftermarket

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Register now at mpulse.mahle.com, and get your subscription delivered to your door free of charge.



DIFFERENT? BETTER!

The world is in a state of flux. The requirements of both our and your customers are constantly changing—and so are all of our work routines. But different does not have to mean worse. In fact, change is an opportunity. Some things may be different, but perhaps all the better as a result. At the end of the day, change means progress. That's why we examine what drives us each day anew—and how we at MAHLE can drive tomorrow's world together with you.



» TRANSFORMATION

WELL CONNECTED

Digital solutions will be essential to providing good customer service in the future.

Connectivity (interfaces on digital devices) and autonomous driving are topics that will open up new sales potential for wholesalers and workshops like you. But it's also necessary to have the right knowledge and tools. Going forward, MAHLE will continue to help you diagnose, calibrate, and maintain cars efficiently and reliably. We are also forging ahead with service and diagnostic tool connectivity. At MAHLE Service Solutions, we include Wi-Fi and Bluetooth functionality in all kinds of equipment as standard, for example. Tools can then be directly integrated into the workshop network, share vehicle data, receive automatic updates, and provide you with the latest information on the next service at all times.

Convenient, fast, and safe

You'll follow a different process for ordering parts too. MAHLE already shows you how with its online catalog. The various filters and functions provided there help you to identify and order the parts you need in a flash. Once your order has been placed, a digitalized logistics organization gets to work in the background to ensure fast, reliable delivery. Because internally, too, MAHLE takes advantage of everything digitalization has to offer. Not for the sake of digitalization itself—but always with a view to adding value for you, our customer in the workshop and trade.

SEIZING THE E-OPPORTUNITY

Our 100th anniversary is a good opportunity for us to look to the future: vehicles with alternative drives are set to change workshop routines. Cause for worry? On the contrary!

Over the coming months and years, we will begin to see the new repair potential relating to these new drives: whether in the chassis, power electronics, charging infrastructure, or other components entirely. Experience also shows us that there will definitely be new repair needs: For everything from turbochargers and direct injection to electric starter motors—time and again it's been said that there will be fewer repairs and thus less work for workshops. And, without fail, the exact opposite has been the case. We now know that new technology mainly affects the nature of repair work, rather than the number of repair jobs.

Thermal management, for example, is becoming increasingly important (more on this on p. 20). Particularly with alternative drives: the right temperature is crucial for batteries, traction motors, and power electronics. Thermal management is our biggest segment in the original equipment business and is even ahead of parts for combustion engines. Workshops can be hopeful that hybrid and fuel cell drives will require a similar level of repair. We expect a very diversified powertrain landscape and will also offer the products needed for this—from simple mechanical parts through power electronics. For you, this means that you can continue to rely on MAHLE parts in the aftermarket in the future—and on our OEM competence, of course.





»TRANSFORMATION

VARIED AND INTER- ESTING

AS CORPORATE EXECUTIVE VICE PRESIDENT AND GENERAL MANAGER MAHLE AFTERMARKET, OLAF HENNING KNOWS THE NEEDS AND WANTS OF THE AFTERMARKET. WE ASKED HIM WHAT ELECTRIFICATION AND DIGITAL TRANSFORMATION MEAN FOR THE SECTOR.



Mr. Henning, the whole world is in the grip of the coronavirus. How has MAHLE Aftermarket been dealing with the situation so far?

I can honestly say that we've never experienced anything like this. MAHLE's operations also ground to a halt—worldwide. We're a multinational group with an international production network. We will remain focused on doing everything we can to maintain the best possible supply service for our customers in the aftermarket, no matter the country. Because one thing is clear: individual mobility is a vital asset in this difficult situation. I can only take my hat off to all of the workshops that have kept their doors open and their customers on the road, especially in the first few weeks. I hope we have been able to play our part in this.

Changing the subject, what opportunities and risks does the mobility transformation entail for workshops?

As with any change, simply recognizing it and acting accordingly is already half the battle. It's important to stay on the ball on all issues. And that's where I also see the greatest opportunity: the enterprises that put in place and implement a forward-looking strategy always emerge the most successful from any change. Whoever is determined to offer good service will find a way, no matter what. New service models, training, and workshop digitalization help pave the way for a successful future.

How is MAHLE helping workshops to prepare for this future?

We have already positioned ourselves very strongly in terms of future technologies and can therefore offer workshops the expertise and parts that will be required in the future. But our new workshop technology is also designed to help businesses move forward. With further exciting solutions being worked on by my colleagues in Service Solutions as we speak, workshops have a great deal to look forward to.

What we really want to know is which drive will prevail in the future?

I'm sure that getting the right technology mix on the road is what will matter. The most important thing is to reduce fossil fuel consumption as much as possible. While battery-powered drive systems are being actively promoted in our country, it hasn't gained the same popularity in rural areas, where cruising range is key. Plug-in hybrids make more sense in such scenarios. Looking at all key indicators, diesel engines are actually still the most efficient choice for heavy vehicles. Fuel cell technology is sure to play an even more important role in the future as well. All of this means that workshops can expect more varied and interesting tasks in the future—but certainly not less work.

Thank you for the interview, Mr. Henning.



You can find the complete interview at atr.de/en/media from p. 26 onwards in issue 1/2020 of blinklicht.



THE FUTURE OF YOUR WORKSHOP WITH MAHLE

The job of workshops is becoming increasingly more complex. So, it's good to have a partner like MAHLE at your side. After all, MAHLE not only gives you access to the vehicle via the OBD interface and opens up new business segments such as driver assistance system calibration and A/C service, but also safeguards your business with exhaust gas measurement. In any case, we're in this together: whatever new path you take, you can count on us.



»SERVICE SOLUTIONS

DIGITAL DOOR OPENER

Fiat Chrysler Automobiles (FCA) is the first vehicle manufacturer to protect its OBD interfaces with a security gateway. MAHLE has thus moved fast to conclude an agreement with FCA, ensuring you can still offer a full range of diagnostics in the future with our tools (TechPRO® and CONNEX).

Vehicle diagnostics via the OBD interface is one of the most important tasks of a workshop. Since this was brought in, mechanics without the necessary authorization for vehicles with such protection have only been able to perform the OBD diagnostics guaranteed by law and read out the control unit fault memory, but not write or delete entries. And original FCA testers have been required for any changes to vehicle systems. That's why MAHLE responded swiftly when FCA introduced a security gateway to protect its OBD interfaces from unauthorized access.



We have the solution for complete diagnostics on FCA vehicles: as a MAHLE customer, you can purchase an annual subscription and then access the FCA portal. Where a certificate is required for certain diagnostic and service tasks, your MAHLE diagnostic tool will switch quickly to the FCA server in order to download it. This enables vehicle workshops to carry out all relevant active diagnostic tasks for basic setup, calibration, coding, error code deletion, service interval resets, and the like.

Danger: unauthorized access

Today's cars are computers on wheels. And as connectivity is becoming increasingly more important in this area too, the risk of unauthorized access to vehicle systems has emerged. Hackers in the US have already shown this by remotely hijacking a Jeep. With the problem becoming acute, FCA has integrated a security system into its vehicles that allows or blocks active over-the-air and OBD interface access on the basis of authorization groups.

Other manufacturers are working on similar firewalls. Volkswagen and Mercedes-Benz will launch new models with restricted access to the vehicle data bus before the end of this year. Volkswagen will use a security system that transmits data about dangerous situations from vehicle to vehicle. The Wolfsburg-based company has chosen the name SFD (Vehicle Diagnostic Protection) for its CAN bus protection. The CeBAS (Certificate Based Automotive Security) system is intended to protect future Mercedes models against unauthorized data access. With MAHLE as your partner, you can rest assured that we're working with manufacturers to do all we can to ensure that you continue to have full access to the OBD interfaces of modern vehicles with our diagnostic tools.





»SERVICE SOLUTIONS

BECOME AN ADAS EXPERT WITH MAHLE



DAC2
Digital ADAS Certificated Calibration

With DAC2 (Digital ADAS Certified Calibration), MAHLE is the first company in the aftermarket to offer you an official certification process for its TechPRO® Digital ADAS. So that you too can become a true specialist in driver assistance system calibration.

Safety is paramount. That's why automobile manufacturers are equipping more and more models with driver assistance systems. It's important that workshops are able to calibrate these systems if they want to remain fit for the future. But there's also a flip side to the coin: so far there is no law regulating type approval or measuring requirements for calibration systems, as is the case with exhaust emission equipment. Work documentation and proper care are therefore a major topic of discussion in expert circles at the moment. At the end of the day, this concerns not only us as a manufacturer and you as the workshops carrying out the work, but also insurance companies and vehicle owners.

THE CERTIFICATION PROGRAM

At MAHLE, we say that our calibration produces the same results as calibration by the automobile manufacturer. And we stand by this. We're now also proving it with our DAC2 certification program, which covers the entire supply chain—manufacturer, technician, and workshop. The DAC2 program has been developed in cooperation with two independent certification bodies: TÜV Rheinland for the production process and CEPAS (Bureau Veritas) for the training program for technicians and workshops.

Three certification levels

- 1) Product certification:**
Every TechPRO® Digital ADAS manufactured meets the TÜV Rheinland certification requirements.
- 2) Certification of technicians:**
The technicians perform the initial calibration of TechPRO® Digital ADAS and periodically inspect the system. In this way, we want to create a network of specialists that will monitor each Digital ADAS system in the market on behalf of MAHLE. At the end of the training, technicians receive a tutor/senior tutor qualification that must be renewed periodically.
- 3) Certification of workshop employees:**
The CEPAS-certified training program gives workshops the ability to correctly calibrate vehicles with driver assistance systems in accordance with MAHLE's defined standards. Following the training, workshops/employees receive a certificate stating that they are a **SPECIALIST IN THE CALIBRATION OF ADAS SYSTEMS**.

Summary:

DAC2 is an important tool for proving the quality and professionalism of your workshop. At the end of the day, only an **ADAS SPECIALIST** can issue an official calibration certificate. This documents the vehicle parameters before and after calibration and certifies that the highest standards have been maintained during the process. This is especially important for insurance companies because they accept the certificate as proof that the ADAS systems have been restored to full functionality. The DAC2 program has already been launched in Italy and will now be gradually rolled out to other markets.



»SERVICE SOLUTIONS

TRACKING DOWN THE POLLUTERS

Counting beans? It's simple! Diesel particles are a different matter, however, and can only be measured using a high-precision tool such as the new EmissionPRO® PMU 400 from MAHLE. And this is what vehicle workshops with the relevant approval will need for emissions testing in the future.

As announced in the last issue of MPULSE (1/2020), we have developed a particle counter for emissions testing: MAHLE's EmissionPRO® PMU 400 is now ready for launch. With this, you will have an innovative and future-compliant measuring tool, because, after a simple upgrade, our particle counter can measure particles from gasoline engines with a size of only around 10 nanometers. And the experts agree on one thing: particle measurement for all Euro 6 gasoline engines will be part of a future statutory emissions standard.

Exhaust gas contains not only the soot particles to be measured but also gases that can condense during cooling, which can lead to incorrect measurements in some cases. The EmissionPRO® therefore has an integrated heating section. And the tube between the probe and measuring

tool is also heated. In spite of the tool's complexity, our developers have still ensured that it is easy to use.

Suitable for any workshop

You can purchase the new PMU 400 as an upgrade module and simply attach it to the side of our emissions testing stations (MAHLE EmissionPRO® 180 and OMNIBUS from BRAIN BEE) next to the opacimeter and four-gas analyzer. However, you can still use our particle counter even if you don't have a MAHLE emissions testing station. The PMU 400 can be operated as a stand-alone solution as it has its own display and keyboard. Alternatively, the tool can be connected to a PC or laptop via Bluetooth or USB. This allows you to print out the test log and attach it to the emission test report.

ALL THE BENEFITS AT A GLANCE:

- › Innovative
- › Ready for future challenges (10 nm particles in gasoline engines)
- › Industry-leading technology
- › Easily integrated into existing emissions testing equipment
- › Stand-alone and PC-based operation possible
- › Easy to operate



Good business

Tail pipe emissions testing represents good business potential for workshops with the relevant approval. After all, any problems in the exhaust gas aftertreatment systems have to be detected by means of diagnostics using, for example, the MAHLE TechPRO®. Excessively high readings may result from a defective particulate filter, a faulty pressure load cell, or the EGR valve in the wrong position. And ultimately this means additional business.

THE EmissionPRO® SERIES: MODULAR AND FLEXIBLE

The EmissionPRO® 150 (standard) and 180 (professional) exhaust gas measuring tools meet your requirements for professional and highly accurate emissions testing—including for official tests. For this purpose, the tools are approved under various national regulations for checking the exhaust systems of gasoline and diesel vehicles, motorcycles, and commercial vehicles. Thanks to the modular principle, you can put together your own individual station by selecting different MAHLE modules and connecting them to a PC. The modules range from the new PMU 400 contamination measuring system through gas analyzers and opacimeters as well as revolution counters and accessories. All modules are available in the MAHLE and BRAIN BEE brands.

Designed as an open system, the EmissionPRO® series is compatible with all common software and hardware systems. You only need to do three things with this plug-and-play solution: connect, switch on, and start measuring.





reddot winner 2020
smart product

The ACX 480 A/C service unit wins the Red Dot Award 2020 in the Smart Products category for its ergonomic and intuitive operating concept and modern aesthetics.

During an A/C service, vehicle workshops now have to deal with two different refrigerants that must not get mixed up: R134a and R1234yf. With the IDX 500, MAHLE offers you an analysis unit that tells you precisely which of these refrigerants is in the air conditioning system.

Was the correct refrigerant added during the previous A/C service, or simply whichever was on hand or the cheapest option? The MAHLE IDX 500 reliably identifies the refrigerant in the system and the A/C service unit needed to recover it. Workshops must absolutely avoid a situation in which different refrigerants are mixed within service equipment and the A/C circuit. However, such situations can arise if you don't know which refrigerant with which level of purity is in the customer's vehicle. Without the IDX 500, such a refrigerant mix would be unknowingly distributed further. As a result, the vehicle could have its registration withdrawn. So, stay on the safe side during an A/C service by analyzing the refrigerant beforehand using the MAHLE IDX 500.

Safe, quick, efficient



A refrigerant identifier like the MAHLE IDX 500 is a key element of the VDA specifications. Workshops can use this analysis unit to detect in advance the purity of refrigerant in bottles or in vehicle air conditioning systems. The new analysis unit can only be used in combination with a MAHLE ACX A/C service unit. It's faster than the previous model and offers the greatest possible protection for the A/C service unit.

The unit is equipped with an LP coupling for safe analysis. It can thus be instantly integrated into the A/C service unit using plug-and-play functionality. The fully automatic analysis process produces a reliable measurement result in an instant. For a yf purity of less than 92 percent, vehicle manufacturers such as Mercedes-Benz stipulate, for example, that the A/C system must be evacuated and flushed, and the refrigerant separated and disposed of. The A/C service unit must also be cleaned. All of this can easily run to EUR 2,000 (for the refrigerant, drier, etc.), plus labor on top. You can avoid these costs with our device.

ALL THE BENEFITS AT A GLANCE:

- › Clear identification of the refrigerant in the system
- › Precise indication of the equipment to be used for recovery
- › Certainty of knowing that the wrong refrigerant won't get into your unit
- › One analysis module for both refrigerants
- › Protection against system and unit malfunction and contamination
- › Expensive cleaning and unnecessary disposal avoided
- › Time and money savings

LOUIS RECOMMENDS

ON THE SAFE SIDE

DAIMLER-APPROVED FLUSHING

In addition to the A/C service, the automatic transmission service is a lucrative component. We have also launched a new device for this purpose: the ATX 190.

When the transmission stutters or stalls, action is needed. A simple transmission oil change is often not enough in such cases. This is because only 40 to 50 percent of the used oil is removed from the system in oil changes using an oil drain plug. Most of the deposits and contamination that prevent the automatic transmission from working smoothly are left in the transmission. With our FluidPRO® series, MAHLE's range already includes fully automatic solutions for flushing automatic transmissions. And now we've added another model: the ATX 190. The new automatic transmission flushing unit meets all requirements in the manufacturer's specifications and is so effective—with a replacement rate of 100 percent—that it has been approved by Daimler.



A white car is shown from a front-three-quarter view in a workshop. The hood is open, revealing the engine compartment. The car is parked on a dark surface, possibly a lift or platform. The background is a blurred workshop environment with some equipment visible.

A/C SERVICE: POTENTIAL FOR YOUR WORKSHOP

The A/C service is a key service component that will become even more important with electric and hybrid vehicles, because thermal management components are playing an increasingly significant role. No longer simply a comfort feature, they are now also responsible for the service life of the other components and the functioning of the electrified powertrain. It's therefore crucial that you focus on quality—on products from MAHLE—for important A/C components, such as the compressor and compressor oil.



» THERMAL MANAGEMENT

A POWERFUL OPERATOR

Air conditioning compressors are at the heart of the refrigerant circuit and thus of automotive air conditioning. Air conditioning compressors take on an even more important role in electric vehicles, where they are transformed from a comfort feature to a component that ensures reliable operation.

Air conditioning compressor: the powerhouse

Air conditioning compressors recover refrigerant gas from the evaporator, compress it, and pass it to the air conditioning condenser, where it is liquified again. Heavy labor, around the clock. The role of the air conditioning compressor is becoming even more important with the increasing shift toward e-mobility, as it must also ensure the right temperature and cooling of the battery (which has a crucial impact on the service life, charging speed, and cruising range), electric motor, and power electronics (protection from damage). This makes the air conditioning compressor a central component of the powertrain.

On-demand operation

Electric vehicles use electrically driven air conditioning compressors because of their lack of a circumferential ribbed belt. But hybrid vehicles also benefit from electric air conditioning compressors because they can be controlled according to demand. This reduces fuel consumption and, with it, CO₂ emissions. The air conditioning system runs even when the engine is turned off and also cools the coolant for the battery cooling when necessary. "The extended functionality of the air conditioning compressor in the area of e-mobility and in hybrids is boosting the significance of the A/C service, thereby creating greater service volumes for workshops," says Olaf Henning, Corporate Executive Vice President and General Manager MAHLE Aftermarket.

100 years of experience, 1,100 air conditioning compressors

MAHLE has around 1,100 different air conditioning compressors in proven quality in its range, ensuring you can offer your customers a premium A/C service. One thing is clear: the air conditioning compressor's new role in alternative drives makes the A/C service an even more important and lucrative service component for workshops. It's up to you to make sure that drivers of hybrid and electric vehicles understand the consequences of a system failure.



» THERMAL MANAGEMENT

COMPRESSOR OIL: THE LIFEBLOOD

A damaged air conditioning compressor is a costly affair. Avoid this by always using high-quality compressor oil. After all, the oil plays a crucial role in compressor durability.

Why make life difficult for yourself when there is an easy way? When it comes to compressor oil, the solution is: PAO 68 oil from MAHLE. This multigrade oil reliably lubricates the air conditioning compressor and is an economical solution for you. After all, the AA1 version of our PAO 68 oil (without a leak detecting agent) is approved for use in almost all air conditioning systems in vehicles with a combustion engine and in electric and hybrid vehicles. The PAO 68 AA1 oil without leak detecting agent is suitable for R134a and R1234yf refrigerants and for conventional piston and electric air conditioning compressors. Truly an oil for any situation. There is one exception: vane compressors. But you will still find the right compressor oil for these and any other needs in our range.

Lubricated and protected

The major advantage of our PAO 68 oil is its versatility. And, unlike PAG oils, it isn't hygroscopic. You'll be familiar with this from the brake fluid, which absorbs moisture over time and must therefore be regularly changed. By using MAHLE multigrade oil, you can also prevent and counteract humidity-related problems, such as the icing up of components or the formation of acids in the air conditioning circuit. In comparison with conventional oils, the PAO 68 oil thus offers considerably improved possible uses, protects against wear, and ensures the proper function of the air conditioning compressor. Of course, we also offer PAG oil in all the usual grades in case you still want to use it.

WHAT IS PAO 68 OIL?

› During manufacture, special additives are added to the base PAO (polyalphaolefin) to ensure the oil's outstanding characteristics. As a result, the PAO 68 oil from MAHLE is a unique combination of highly refined synthetic oil and performance-enhancing additives.



ADVANTAGES OF THE PAO 68 OIL

- › One oil for almost all air conditioning compressors
- › Non-hygroscopic: does not absorb moisture
- › Compatible with many other lubricants and refrigerants
- › Can be used when topping off and when changing the system's entire oil volume
- › Easier to store

#usethebestparts

“No longer available” is a response that often signals the end of the road for many vintage cars, especially when this is about key engine components. That’s why the MAHLE CLASSIC LINE is now also focusing on 3-D printing technology.

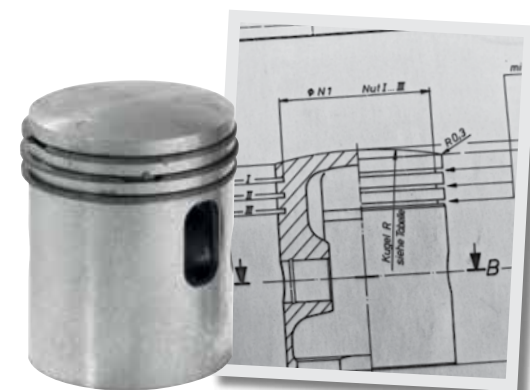
Thanks to its 100 years of experience, MAHLE is fully capable of developing pistons for new vehicles. However, this isn’t as straightforward when it comes to recreating them for classics where the foundry molds are no longer available. After all, these have already been fully designed. The challenge is that all the available data is usually contained in 2-D ink drawings, or sometimes only on microfiche or as samples. A former MAHLE product must then be recreated while maintaining the authentic features—something that is crucial to vintage car enthusiasts.

From 2D to 3D

Producing piston blanks for classic cars is a complex task. The relevant foundry molds and tools may no longer be available, and considerable time is needed to reconstruct inner contours based on old drawings. This is where 3D printing comes in. The first step is to create printable 3D data. MAHLE takes original, sometimes used, samples for this and creates a 3D scan of the inside. A design engineer imports the resulting point cloud into a CAD program with a few tweaks. The data can then be directly transferred for 3D printing or even to produce foundry molds.

Technology with future potential

When finishing these pistons, MAHLE still relies on the same machines used for conventional pistons. After all, it isn’t possible to print a fully ready-to-assemble piston yet due to the production tolerances in the thousandths of a millimeter currently required. However, initial 3D test prints in plastic have shown that this is a technology with future potential. The alloy also plays a major role in the hardenability of the piston. We have already been able to develop a 3D printable alloy. With 3D printing, it will be possible to produce parts cost-effectively with the usual MAHLE quality in even the smallest of quantities to get old engines running again.



A faithful printed reproduction of this Auto Union 1000 S cast piston was needed.



A look inside the printed blank (still in plastic) of a two-stroke piston for an Auto Union 1000 S

PRINTED CLASSICS



YOUR DIRECT CONTACT FOR THE MAHLE CLASSIC LINE:

classicline@mahle.com or peter.riedmayer@mahle.com

Find out more at www.mahle-aftermarket.com/eu/en/products/classic-line.

CONTINUOUS INNOVATION: MAHLE MAKES THINGS HAPPEN

Change is a prerequisite to progress. These pages make that clear. The pictures show our major strength: staying one step ahead at all times so that we can offer the market clever and effective solutions. That's our promise. Now and in the future.



Innovation that lasts

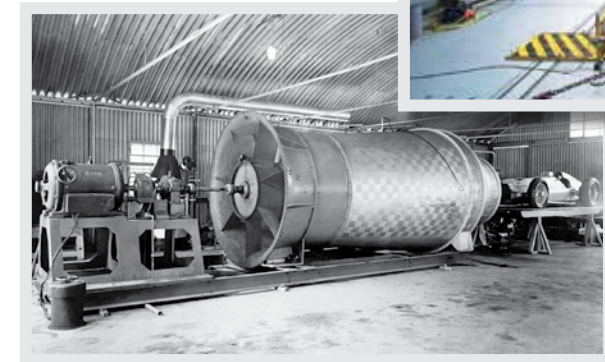
In 1930, Ernst Mahle developed the ring carrier piston, which is still used today in a more advanced form. The piston blank is cast or forged. Now, thanks to MAHLE, there's a third way of producing a blank for subsequent finishing. As part of a groundbreaking project with Trumpf, MAHLE is currently printing piston blanks for the Porsche GT2 RS in a selective laser melting process. This was the first time in the world that an additively manufactured piston has run in a high-performance engine. The new technology allows for topological optimization of the cooling channel piston toward what is known as bionic design. Just like inside bone, material is only built up where force flow takes place. This makes the piston light and stable and therefore ideal for use in a high-performance engine.

But additive manufacturing can do more than this. With its capacity to produce a wide variety of piston blanks without expensive forging tools or casting molds, it's a cost-effective way of manufacturing small series for historic vehicles, for example, for sale via the aftermarket (more on this on p. 26).

You'll find more information on the rapid manufacturing process and the Porsche GT2 RS project under MAHLE INSIDE on mpulse.mahle.com.

Laboratory testing

Since 1936, MAHLE has worked with wind tunnels in the development of thermal management solutions. Today, our air conditioning and cooling wind tunnels in Stuttgart/Germany and Troy/USA allow us to develop and test cooling and air conditioning systems under precisely defined conditions.



Never leave the customer waiting

The availability of spare parts has always been a decisive competitive factor. MAHLE's modern Aftermarket logistics center is located in Schorndorf near Stuttgart. This is where we store some 150,000 spare parts from our entire product range. The products are distributed from there all over the world.

MAHLE taps into new business segments

In 1988, MAHLE launched its first A/C service unit and thus became a pioneer in the sector. This opened up a new business segment for vehicle workshops. Today, our E3 technology in the new equipment generation is synonymous with an environmentally friendly, economical, and efficient A/C service. And the additions to our range now include diagnostic tools, devices and equipment for the transmission oil service, and devices for calibrating driver assistance systems.



MAHLE
Powertrain

ENDURANCE TEST FOR ELECTRIC DRIVES

Did you know that MAHLE is a leading developer and manufacturer of electric motors? MAHLE offers the right drive system for two-wheelers, passenger cars, commercial vehicles, golf carts, mobile machinery, and industrial vehicles. MAHLE Powertrain GmbH in Fellbach/Germany now has a new test bench for any kind of electric axle for battery electric vehicles and hybrids.



Electric motors must meet the same requirements as combustion engines: reliability in all climatic conditions, long service life, and the lowest possible consumption. More than 100 years of experience have made the combustion engine an efficient powerhouse. The automotive industry is still in its infancy with the electric motor, however. MAHLE is already a leading developer and manufacturer of electric motors, consisting of an efficient electric motor combined with a motor control unit and also with the right reduction ratio if necessary. System voltages range from 24 to 800 volts and mechanical output from 1 to 250 kilowatts.

PERFORMANCE TESTS

The e-axle test bench at MAHLE Powertrain in Fellbach can accommodate an entire electric drive unit with electric motor, inverter, transmission, and other electric components. Dynamometers on both sides of the test bench act upon the entire axle with up to 350 kilowatts and 3,500 newton meters per side (wheel). Using these performance parameters, MAHLE Powertrain engineers can perform tasks on the electric drives, such as producing operating maps, performing power measurements, or conducting efficiency, thermal, and endurance tests, dynamic fatigue tests with vehicle simulation, torque vectoring, or wheel slip measurements. The electric axle test bench consists of a mounting bracket for the axle/motor to be tested, two dynamometers, and a battery simulator for high-voltage (up to 1,000 A/1,000 V) and low-voltage applications (650 A/60 V).

HEAT AND COLD

An electric powertrain's performance and service life depend greatly on its environment. As MAHLE is also the expert in thermal management in e-mobility, the test bench has a cooling water conditioning system for simulating extreme operating points. Engineers can expose test objects to temperatures ranging from minus 30 to plus 130 degrees Celsius and determine how these affect the test parameters. Their findings on how the powertrain behaves under these extreme conditions are incorporated into component optimizations and the air conditioning and refrigerant circuits. With these endurance tests, MAHLE ensures the functionality, stability, and reliability of its electric drive systems.



MAHLE POWERTRAIN OFFERS DEVELOPMENT AND CONSULTANCY SERVICES FOR THE DESIGN, TESTING, APPLICATION, SYSTEMS DEVELOPMENT, AND INTEGRATION OF COMBUSTION ENGINES AND ELECTRIFIED DRIVE SYSTEMS AND IS A RECOGNIZED EXPERT IN THE RESEARCH, DEVELOPMENT, AND APPLICATION OF INNOVATIVE DRIVE, CONTROL, THERMAL MANAGEMENT, AND SOFTWARE SYSTEMS THAT LEAD TO HIGH-PERFORMANCE, PRODUCTION-FEASIBLE SOLUTIONS FOR FUTURE POWERTRAINS.

A VIRTUAL SUCCESS STORY

MAHLE is blazing new trails in motorsports and immersing itself in the virtual world of esports. We are one of the first companies to commit to sim racing on a grand scale—and are catapulting the MAHLE RACING TEAM to the top of the podium from a standing start.

Real racing on a forced hiatus? No problem! Obviously, we'd prefer to be showcasing our expertise in real race cars. But in these exceptional times, we're benefiting from the fact that MAHLE also has another horse in the race, so to speak: in sim racing, to be precise. The MAHLE RACING TEAM had already begun competing even before the coronavirus. Although still early, the team has already proved that it's among the best in its class.

Top-level cooperation

Some of the best sim racers in the world have now been regularly competing in virtual race cars in the MAHLE design. We've entered into a cooperation with Williams Esports, one of the world's top teams in the booming sim racing sector. As an offshoot of the Williams Formula 1 team, Williams Esports has a roster of elite sim racers who compete in various racing series and vehicles at events offering increasingly lucrative prize money.

"For companies just getting involved in sim racing, it's a whole new world. You have to build a lot of infrastructure and gain a great deal of experience," says Steven English, Head of Esports at Williams.

"We've now got an established esports project at Williams with everything already in place. This puts us in a strong position to provide the MAHLE team with precisely the support that it needs to be successful and make its mark in sim racing."

This is sim racing

Racing drivers meet in the digital realm to compete against each other in virtual races, using steering wheels and pedals like in real race cars. The most popular platforms include iRacing and rFactor 2, where astonishingly realistic events are staged. Because of the coronavirus pandemic, more and more professional racing drivers are joining the ranks of sim racers from week to week, including Philipp Eng, Bruno Spengler, Mike Rockenfeller, and Matt Campbell. The virtual races are a welcome replacement as they wait for real-life racing to resume.

The MAHLE RACING TEAM is competing against all of these big names and more in the Digital Nürburgring Endurance Series powered by VCO on the legendary Nordschleife track. The two Williams Esports drivers Agustin Canapino and Alex Arana have been racking up success after success there since the season opener in late March. And best of all: it's completely emission-free!



You'll find more on sim racing on mpulse.mahle.com in the SWEAT & GASOLINE section. Races are broadcast live on www.twitch.com/iracing and other sites. Cheer on the MAHLE RACING TEAM as it battles for victory on its virtual world tour.

COMPETENCE CENTER

Why do oil filters have a bypass valve?* The answer is clear, isn't it? MAHLE organizes training relating to its product range that enables you, your colleagues, and employees to take day-to-day workshop tasks to the next level. We operate in quite complex fields, which is why we want to help workshops ensure their team can handle any filtration, thermal management, engine, or motor issues that arise. For you, this means fewer complaints, lower costs, no repeat repairs, and happy customers and employees.

In addition to six theory training topics, our current offering includes three special practical training courses that cover damage prevention in passenger cars and trucks as well as agricultural and construction machinery plus training courses that lead to a certificate of competence in air conditioning systems and in the Compressor Warranty Plus program. To ensure that all staff benefit from MAHLE's training, we can also come to you. Simply tell us the topic and when and where you would like the training to be held. And leave the rest to us. Interested? Then ask your MAHLE Aftermarket trading partner or contact us directly at ma.training@mahle.com. By the way, you'll find the answers to the questions above on this page.

THEORY

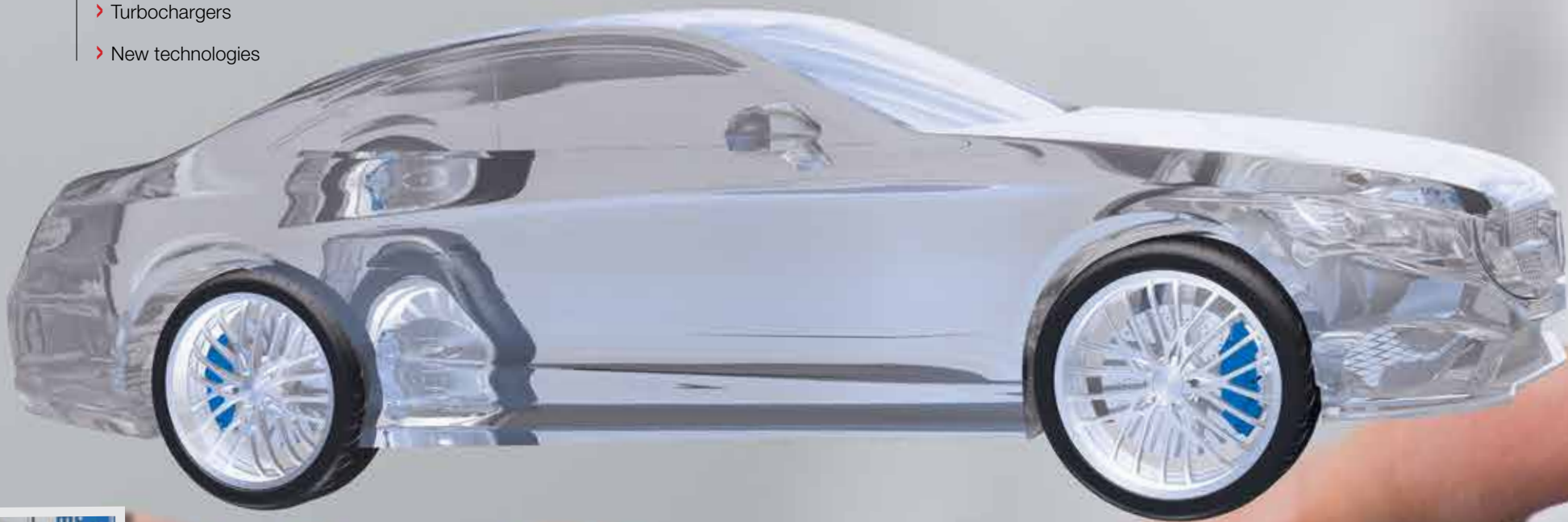
- > Filtration in the vehicle
- > Thermal management
- > Starter motors and alternators
- > Combustion engine in detail
- > Turbochargers
- > New technologies

PRACTICAL EXPERIENCE: DAMAGE PREVENTION

- > Engine periphery
- > Turbochargers
- > Starter motors and alternators

CERTIFICATE OF COMPETENCE IN

- > Vehicle air conditioning systems
- > Compressor Warranty Plus



TERMS AND CONDITIONS OF PARTICIPATION

Theory:

- > Duration: 2.5 hours
- > Participants: Minimum of 10
- > Cost per person: EUR 39.90 plus VAT

Practical experience:

- > Duration: 8 hours
- > Participants: Minimum of 8, maximum of 15
- > Cost per person: EUR 129.90 plus VAT

Certificates:

- Competence in vehicle A/C systems
- Compressor Warranty Plus
- > Duration: 7 hours
- > Participants: Maximum 12
- > Cost per person: EUR 209.00 plus VAT

DO YOU KNOW?

How does a coolant thermostat work?

- A) Using a bimetallic strip
- B) Mercury expansion
- C) Expansion element

* Answer: The valve's task is to protect the filter from damage caused by excessive differential pressure with cold starts and high engine oil viscosity.

NEW ON THE MARKET

We're constantly expanding our extensive offering for workshops. Here we present a small selection of our new products. It's easy to order our products via the online catalogue at catalog.mahle-aftermarket.com.

#usethebestparts

» TRANSMISSION OIL FILTERS

Vehicle type:
Passenger cars
Manufacturer:
Audi
Vehicle models:
A4, A5
Part no.:
HX 192D



» CABIN FILTER

Vehicle type:
Trucks
Manufacturer:
IVECO
Vehicle models:
EuroCargo II-IV
Characteristic features:
EuroCargo II from 06/2003
EuroCargo III from 06/2008
EuroCargo IV from 09/2015
Part no.:
LA 1400



» FUEL FILTER

Vehicle type:
Passenger cars
Manufacturer:
Toyota
Vehicle models:
Auris, Avensis
Part no.:
KL 829D



» OIL FILTERS

Vehicle type:
Trucks
Manufacturer:
Mitsubishi
Vehicle models:
Canter
Part no.:
OX 1175D



» THERMOSTAT

Vehicle type:
Passenger cars
Engine:
B/D20 DTH/DTR
Manufacturer:
Opel
Vehicle models:
Antara, Insignia,
Zafira 2.0 CDTI
Part no.:
TM 58 101



» GENERATOR

Vehicle type:
Trucks
Engine:
DC 13.143
Manufacturer:
Scania
Vehicle models:
LPGRS range R450
Part no.:
MG 935



» CONROD BEARINGS

Vehicle type:
Passenger cars
Engine:
CAYC, BLS, BXE, CAYD
Manufacturer:
VW, Audi
Vehicle models:
Golf VI, Touran, 1.6 TDI, 1.9 TDI
Characteristic features:
Sputter
Part no.:
029 PL 20897 000



» STARTER MOTOR

Vehicle type:
Trucks
Engine:
D2676 LF 26
Manufacturer:
MAN
Vehicle models:
TGX 18.440
Part no.:
MS 940



» CYLINDER LINER

Vehicle type:
Trucks
Engine:
OM 470.903 / .904 / .906 / .907 / .908 /
.910 / .913 / .914 / .915 / .917
Manufacturer:
Mercedes-Benz
Vehicle models:
Actros, Arocs, Antos
Part no.:
001 LW 00142 000/
001 LW 00142 001



» CLASSIC LINE PISTONS

Vehicle type:
Passenger cars
Manufacturer:
Mercedes-Benz
Vehicle models:
300 SL Gullwing
Characteristic features:
Returning to the range
Part no.:
001 68 01 (1st oversize)
001 68 02 (2nd oversize)
001 68 03 (3rd oversize)



AFTERBURNER

Latest reports, hot topics, and electrifying news.

CareMetix®: test passed

We've been able to offer you some new CareMetix® filter references as of this year. These include the fourth-generation C-Class. We've also taken another careful look for you at the protection provided by CareMetix®. Our CareMetix® filters protect against pollen, fine dust, soot, tire debris, industrial dust, exhaust gases, ozone, odors, mold, bacteria, and allergens. They also remove more than 99 percent of nitrogen oxides from the air. Find out more at caremetix.mahle.com.



For a truly clean interior: OzonePRO

With OzonePRO from MAHLE*, you now have a professional tool for hygienically cleaning the vehicle cabin. OzonePRO (12 V) reliably eliminates not only unpleasant odors but also viruses, bacteria, and mold. All in one sensor-controlled, fully automatic, safe, and 100 percent environmentally friendly system. All further information on OzonePRO can be found on mpulse.mahle.com, under Equipment in the MAHLE Inside section.

* Available in the MAHLE and BRAIN BEE (O3-NEX) brands

Sealed tight!

Did you know that MAHLE offers a comprehensive range of cylinder head gaskets? Some 1,500 part numbers exclusively for the vehicle parts market in MAHLE original equipment quality cover approximately 93 percent of all registered vehicles in the USA (passenger cars, vans, and trucks). This makes MAHLE the leader in the US vehicle parts market compared with other international suppliers. And, by the way, our silicone sealant (JV8) is also very popular. In addition, we have head sets, piston skirt sets, various small sealing parts, and much more in our range. Your direct contact is enzo.lubusch@mahle.com.



Rapid assistance via video

We're now also cooperating with the largest digital platform in the German-speaking world: FabuCar. This is where 17,000 verified vehicle mechatronics engineers help each other to solve stubborn problems across all manufacturers—via video. FabuCar has a standard search engine that accesses all posts to the platform, and it also has links to the Autodata database. This means that you can find a solution to your issue within seconds. Check out fabucar.de.

MPULSE ONLINE: MPULSE.MAHLE.COM

And the winner out of more than 400 participants is ...
Here are the answers to our anniversary quiz in the last issue:

1. A special heat exchanger that further reduces the temperature of the coolant for the battery
2. December 1, 1920
3. Vanessa Schmitt



We drew the winners from all correct entries. First prize has gone to Esther Bönninghoff from Finntrop! Congratulations, we hope you'll get lots of enjoyment from the special edition of the BMW E30 M3 DRIFT racer in the JP/MAHLE design from Sturmkind, valued at over EUR 250.

Tuning at its best

It's time for round two of our tuning project with JP! All of Jean Pierre's fans are surely familiar with his MAHLE E30 M3 by now. The classic retro design with the MAHLE logo is one of the most popular vehicles in JP's fleet. But quirks lurk beneath those good looks. As various issues have cropped up over time, Jean Pierre decided to install an M4 engine in the E30. And, of course, MAHLE's in the mix again! All videos for the project are available on JP's YouTube channel.



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Automotive Brand Contest
Winner 2020