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Looking to the future

Have you ever asked yourself what our lives will be like in 20 years’ time? Will ships still need a captain? Will we be using drones to fly to work? Will you still be able to buy diesel engines from us? I can already answer that last question with a very definite ‘Yes’. At this point I will not anticipate the answers to any of the other questions, but I would recommend that you take a look at the main section of this issue because it focuses our attention on the future.

The future really is a fascinating place. Throughout history, those who attempted to predict the future often got it very wrong. In 1895, for example, Gottlieb Daimler, a true genius in his own field, predicted that the number of vehicles in the world would never exceed 1 million. The Danish physicist Niels Bohr was not so far off the mark when he said that predictions were difficult – especially when they concerned the future. Nevertheless, when I say that megatrends like digitalization or Industry 4.0 will fundamentally change our company, I suspect I am not leaving myself open to any overwhelming risk. These phenomena offer entirely new possibilities for working together with our customers and our suppliers. To be certain that we are maximizing the potential and ensuring that MTU is future-proof, we are currently taking a very close look at every area of our company. We want to keep a firm hold on our own future and to develop new ideas for creating products that exactly match our customers’ needs even more quickly and efficiently. And we aim to do that in a company where everyone involved feels comfortable in the knowledge that they can contribute to our success.

That is our program. But it is also part of a transformational process initiated by our parent company, Rolls-Royce. We are currently one of five Rolls-Royce business divisions, and we work very closely with our British colleagues. Together, we are working to create an even better future for our company and thus also for you, our customers. I look forward to that future – whether it sees us using drones to get to work or continuing to commute in cars powered by combustion engines.

Yours,
Dr Ulrich Dohle
Crane whispers

Where are the biggest construction machines with MTU engines? What are the main show trends? Who is buying from MTU? And what is MTU offering its customers? The answers to these questions can be found at the Bauma show – the world’s leading trade fair for construction, building material machines, mining machinery, construction vehicles and construction equipment. And anyone who is unable to be there in person can find the answers online at www.mtu-report.com/Bauma2016. Checking back in to the site is always worth the effort, because it is constantly updated before, during and after the show.
Engine rebuilds at a fixed price

They might be old, but there’s life in them yet. MTU’s ‘classic’ series—the 538, 595, 538L, 183, 396 and 493 are almost legendary. These are powerful, high-class, reliable engines ‘oldtimers’—that many customers are loath to part with. That’s why a lot of customers take the opportunity to have their classic engine—which might be 30 or 40 years old or even older—completely rebuilt as an owner’s unit. This complete MTU service package is named ‘Factory Rebuild’ and is available at a fixed price, with a warranty for top-quality. "A factory rebuild involves a complete major overhaul—from disassembly and inspection to reconditioning, reassembly, testing, repainting and packaging," said Christian Halder, service sales manager of the global service sales team in Friedrichshafen. During the rebuild, the engine components are inspected using certified methods and overhauled in the owner production section, where the highest level of process reliability is assured. Each overhaul in production takes place according to specifications provided by engineering departments and is approved by them. A Factory Rebuild provides the customer with an as new engine at a fixed price with full warranty cover. This distinguishes it from the normal major overhaul.
The gas engine learns how to swim

A new ferry powered by an MTU gas engine is due to go into service on Lake Constance in 2019. Rolls-Royce and the city of Constance public utility company joined forces on the project. The new ferry will be the first in Europe to be powered by a high-speed pure-gas engine. It will feature low pollutant emissions and improved cost effectiveness, while delivering the accustomed high performance.

Marcus A. Wassenberg, Chief Financial Officer at Rolls-Royce Power Systems AG, speaking in Constance, added: “We are convinced that gas engines will become increasingly important as supplements to tried and tested diesel engines for shipping. Natural gas is an important fuel for the future. It will be available for a longer period of time and is cheaper in many regions throughout the world, in addition to having a far better carbon footprint than either heavy oil or diesel. With the development of the new gas engine and its trials in the ferry operated by Stadtwerke Konstanz, we are taking up the challenge of further improving the emissions and efficiency levels of gas engines, in order to be able to meet future emission regulations and the needs of our customers. The development of gas engine technology and the associated fuel infrastructure will also require state funding until they become economically viable.”

The new 8-cylinder gas engine with a rated output of 750 kilowatts now to be developed by MTU, is based on proven MTU Series 4000 diesel engines for workboats. The clean combustion concept will make it possible to meet the IMO Tier III emission standards without the need for additional exhaust aftertreatment.

Dr. Norbert Ruter, Managing Director of Stadtwerke Konstanz GmbH, at the announcement of the cooperation agreement on 10 December 2015 in Constance said: “We are delighted that MTU, our partner of many years’ standing, is developing a natural gas propulsion system for our new ferry. The deciding factors for us to venture into a new world of propulsion for our fleet are the excellent environmental compatibility of the gas engines and the possibility of saving fuel costs, while maintaining our current requirements in terms of the performance and maneuverability of the vessel. As a ferry operator on Lake Constance, Europe’s largest reservoir of drinking water, it is very important for us to guarantee safe and environmentally sound operations.”

The biggest from Turkey

MTU Turkey has signed a contract with Istanbul-based Bilgin Yachts for the supply of six MTU engines. These will be deployed to power two 47.6-m Bilgin 156 motor yachts, as well as the largest yacht ever built in Turkey in its class – the Bilgin 263. Bilgin Yachts recently won the construction order for the 80.1-m super yacht from a long-standing customer. It will be powered by two MTU 16V 4000 M63R engines. Bilgin also decided to embark on the construction of two 47.6-m motor yachts – each of which will be powered by an MTU 12V 2000 M72 unit. MTU is part of Rolls-Royce Power Systems.

The 80.1-m super yacht will also be the largest vessel that Bilgin Yachts has been entrusted to build. Bilgin CEO İsmail Şengün said: “Realization of this large-scale project will enable us to continue our excellent cooperation with MTU. We may be increasing the engine order to eight units, as another contract for an 80-m vessel is on the way.” Construction is scheduled to begin in March 2016, and delivery is planned for 2019.

Speeds up to 60 knots help save lives at sea

The majority of rescue vessels are capable of speeds up to 35 knots. However, in Italy, a rescue vessel that boasts twice this speed and can move at 60 knots (111 km/h) is currently undergoing trials. The SAR 60 is aimed at the coastguard market where boats have to carry out both patrol and life-saving duties. “To reach our design speed of 60 knots, I needed engines that had a good power/weight ratio and engines that were totally dependable,” said Fabio Buzzi from FB Design.

Research showed that around 80% of lifeboat rescues were carried out in moderate or fine sea conditions where speed can be important,” commented Buzzi. “Most current lifeboat designs operate at around 30 knots but I knew we could double that speed potential and still create an all-weather lifeboat design. The SAR 60 is aimed at the coastguard market where the boats have to carry out both patrol and life-saving duties.”

The new SAR 60 built by FB Design incorporates a wide range of safety features developed over 50 years of experience in building fast boats. “The boat is self-righting in the event of a capsize, it is built using our Structural Foam system to give added integrity and we increased the length/beam ratio to give the propulsion system a higher thrust. In addition we have developed special Tecno seating to protect the crew and used our anti-stuff bow shape to improve following sea performance,” said Buzzi.

The two MTU 10V Series 2000 engines each produce 1,200 kilowatts and they drive through 2P Trimas surface drives. The engines are fitted with the MTU ‘Rough Kit’ that enables the engines to operate reliably in extreme conditions. Buzzi’s Tri-Tab flap concept gets the boat quickly onto the plane and gives better controllability and acceleration, features vital for operating in rough seas. “We think this is the first time that surface drives have been used on a lifeboat but our drives keep the propellers within the hull depth for added safety.”

MTU will supply the engines for the 47.6-m yachts in September 2016 and delivery is planned for the 80.1-m vessel in late 2016.
Joint Venture in China

MTU and China Yuchai International Limited’s main operating subsidiary, Guangxi Yuchai Machinery Company Ltd (GYMCL), have today signed an agreement to set up a 50/50 joint venture for the production, under license from MTU, of MTU diesel engines in China. Each party will invest 75 million RMB (around 10.5 million Euro) in the joint venture.

The joint venture will be based at GYMCL’s primary manufacturing facilities in Yulin City in Guangxi Province, south China, and is expected to begin production in 2017. The joint venture will produce MTU Series 4000 diesel engines compliant with China Tier 3 emission standards with power outputs ranging from 1,400 to 3,490 kW, primarily for the Chinese off-highway market, in particular for power generation and oil & gas applications.

The joint venture will open up new growth opportunities for both partners, particularly in China and Asia. The joint venture will enable better access to the Chinese market for the MTU Series 4000 diesel engines, via the extensive sales and service network operated by GYMCL. GYMCL will, as a result of the joint venture, be able to offer its customers technologically advanced engines that have a proven record on the global market. The joint venture engines will be marketed by GYMCL and MTU Suzhou within China and by MTU and its subsidiaries exclusively outside China.

Argentina buys locomotives in China

MTU will deliver a total of 100 MTU Series 4000 engines from Chinese locomotive manufacturer China Railway Rolling Stock Corporation (CRRC). The total contract value is above €30 million. The 16V 4000 R43 type engines will be delivered to CRRC to build 100 freight locomotives, which is part of the contract with the main contractor CRMEC (China Machinery Engineering Corporation). In turn they will be exported to Argentina for service with Belgrano Cargas y Logisticas S.A. of the Argentinean Ministry of Interior and Transport. The MTU 16V 4000 R43 type diesel engines each have a power output of 2,200 kilowatts. The MTU brand is part of Rolls-Royce Power Systems.

“We are pleased that again CRRC trusts MTU to deliver engines for one of its important projects,” said Dr Ulrich Dohle, CEO at Rolls-Royce Power Systems. “This order underscores the importance of our relationship with CRRC and our presence in the Chinese market”, Dr Dohle added. The 100 new locomotives will be built by CRRC subsidiaries CRRC Dalian, CRRC Quishuyan, CRRC Beijing and CRRC Ziyang. CRRC is scheduled to receive all engines by 2016. Produced in Friedrichshafen, Germany, the first 70 engines have already been delivered.

Grinding power from MTU

The new AK 560 Eco Power multi-purpose grinder from environmental technology specialist Doppstadt is powered by an MTU Series 1300 engine delivering 390 kW. The engine meets the Tier 4 final emissions standard without the need for a particulate filter. “This engine’s electronic engine management means it can deliver extremely high torque within an optimum torque band,” explained a Doppstadt specialist. “In addition, the MTU engine is quieter than the previous diesel engines, and it uses considerably less fuel.”

Its high throughput capacity and load-sensing material feed system mean the AK 560 Eco Power is particularly efficient for processing wood waste, wooden pallets, forestry cuttings, tree trunks and roots, bio-waste and substitute fuels. The Eco Power grinds the material fed in by holding it against a pressure plate and reducing it with hardox teeth or cutter bars. The machine also comes in an AK 560 Eco Power Plus version, and since January, both vehicles have been in series production with MTU engines.

In brief:

CHP on the Danube

A 20V Series 4000 Combined Heat & Power Module (CHP) from MTU Onsite Energy has been delivered to the public utility company of Neuburg an der Donau, a major district town located on the Danube in Germany. The 20-ton powerhouse is to go into service in March 2016.

MTU Onsite Energy wins

An MTU Onsite Energy gas-fueled genset has taken the coveted “CHP of the Year 2015” award. The low-emission system supplies lighting company Osram’s plant in Eichstätt, Bavaria, with cooling, heating and electrical power. An expert panel from the Federation of Cogeneration Associations (B.KW) selected the CHP from a total of 11 plants previously presented as “CHP of the Month” in the January to November 2015 issues of the “Energy & Management” journal.

Partnership with Sanmar

MTU and the Turkish shipbuilder Sanmar Shipyards have signed a letter of intent for the supply of MTU engines. The Class RAstar 2800-E Azimuth Stern Drive tugs currently being built by Sanmar are to be powered solely by MTU Series 16V 4000 M63 and M63L engines and by a Rolls-Royce or Schottel propeller system.

Sanmar AS is the biggest tugboat operator and builder in Turkey and is recognised as being amongst the leading specialist tug constructors worldwide.
In brief:

MTU America receives award

MTU America was recently honored with the South Carolina Chamber of Commerce’s inaugural Workforce Innovator Award for a medium-sized business, in recognition of its innovative youth apprenticeship program. Award winners were recognized for using their own resources and ingenuity to implement private sector workforce development solutions.

One million injectors

L’Orange, the large engine injection systems specialist, has produced its 1 millionth injector. The diesel injector for an MTU Series 4000 engine was made at the company’s Black Forest production facility in Glatten. L’Orange products featuring common rail technology have been a big success around the world for almost 20 years and set standards for performance, fuel consumption and emissions.

100 MW in Mozambique

In Ressano Garcia, a new power generation plant designed to provide electrical power supply for Mozambique’s rapidly expanding economy, went into operation. Core equipment includes thirteen 20-cylinder gas-based Rolls-Royce engines, which have the capacity to generate a total of 120 MW. The medium speed engines are of type B35:40V20AG2, supplied by Bergen Engines, like MTU Friedrichshafen a Rolls-Royce Power Systems subsidiary. This is the biggest medium speed power plant powered by Rolls-Royce.

The 100 MW plant is located close to the border between Mozambique and South Africa just outside the town of Ressano Garcia. It is owned and operated by the independent power producer Gigawatt Mozambique, and will supply electrical power to the national grid through a power purchase agreement with the state-owned utility, Electricidade de Moçambique (EDM).

Dieter Klingenberg, technical director of Gigawatt Mozambique, said: “The decision to buy the Rolls-Royce generation sets was based on a detailed technical, commercial and financial evaluation, taking the full term of the power purchase agreement into consideration. We are looking forward to a long and healthy partnership with Rolls-Royce and plan to make this plant the flagship for Gigawatt Mozambique, and will supply electrical power to the national grid through a power purchase agreement with the state-owned utility, Electricidade de Moçambique (EDM).”

MTU Onsite Energy and VPower strengthen partnership

MTU Onsite Energy and the VPower Group have recently signed a strategic agreement that strengthens their partnership in power generation markets across China and the rest of Asia. A framework agreement for 2014 was also signed for the supply of 160 MTU Onsite Energy gas gensets based on 16V 4000 L32 units, each with 1,560 kW electrical power output. Those agreements cement a long-lasting collaboration between MTU Onsite Energy and VPower, a world leader in decentralized power generation. By signing the framework agreement, VPower is able to secure production capacity within MTU Onsite Energy enabling it to meet the needs of its customers at short notice. The MTU Onsite Energy brand is part of Rolls-Royce Power Systems. Royce Au-Yeung, Co-CEO, VPower Group said: “Our past successes in cooperation with Rolls-Royce on numerous power plant projects have motivated us to develop our partnership. The high rates of efficiency, outstanding reliability and low service costs of gas gensets from MTU Onsite Energy make them the ideal product for this application.” VPower customers also benefit from the worldwide service networks that MTU Onsite Energy and VPower have in place to ensure swift delivery of spare parts. Matthias Vogel, Vice-President Power Generation, Rolls-Royce Power Systems, said: “China and the Asian region as a whole are key strategic markets where MTU Onsite Energy is very keen to grow by joining forces with a strong partner such as VPower.”

Future

Today in 2016, every child is running around with a computer in his or her pocket. Anyone who had predicted that in 2006 would have had a hard time. But the smartphone is now part of our everyday lives – just as robots may be in 10 years’ time. Or driver-less cars. What will happen to the internal combustion engines that everyone is talking about electric vehicles? What role will be played by artificial intelligence? And will unmanned ships become reality? The next few pages reveal how exciting, fascinating, and sometimes difficult looking into the future can be.
Two for the future

How can we increase the availability of engines, reduce their maintenance costs and run them more economically? And where will natural gas be the dominant fuel? What part will hydrogen play? What opportunities does the fourth industrial revolution bring? MTU development chief Dr Andreas Lingens and futurologist Lars Thomsen take a peek into the future.

Robots and drones will be as much a part of our lives as the smartphone is today. People still wanting to drive their cars themselves will have to pay higher insurance premiums. Artificial intelligence will govern our lives in the very near future.

MTU engines are getting smarter all the time. That helps our customers because it makes their engines more economical, more predictable and more reliable in operation.

Dr Andreas Lingens has held the post of Executive Vice-President of the Series engines development division since 2012. With a doctorate in mechanical engineering, he previously worked at Deutz, Daimler and the US truck manufacturer Paccar.

Lars Thomsen is one of the world’s leading futurologists. Born in Hamburg in 1968, the trend forecaster and future studies expert is one of the most influential authorities on the future of energy, transport and smart networks.
“Our engines are getting smarter”

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According to a set maintenance schedule. In future, engines will be able
combustion engines in 2020?

Will dump trucks, trains and ships still be powered by internal
efficiency of MTU engines and reducing maintenance costs.

As yet there are only a few hybrid applications in the off-highway
areas will be powered by diesel engines. At the same time, we are increasingly using exhaust
depending on application. And although emissions reduction works
consumption by moving towards a hybrid system.

In which areas will natural gas be the dominant fuel?

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’dark factory’ in which there are no people will not happen. But we
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What will the life of a child born today be like when it is as old as its

Interview

“Artificial intelligence will change our lives”

Below and above will be needed as part of our lives in the future. We need
machines to work with us. So it will be a question of finding new
solutions and methods on both sides. To do so, it will be necessary to
understand the potentially different roles these machines can
play. After all, there are various viewpoints: To the layman, it makes
sense – for instance, if you think of a robot that can help you
one that can teach you to drive. As far as I can see, a new kind of
responsibility will dawn for us. Yes, but what this responsibility
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we will get a much better understanding of the question of what
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actors will have to be increasingly complemented by robots.

Interview

“Wherever the cost of fuel is a major factor. For continuous-duty power
applications, as in continuous-duty pumps or in mining vehicles, we are testing gas engines for marine applications. But even locomotives,
whether on rail or road, will continue to be powered by IC engines. I think there will be two options:

Designing a hybrid drive system is very complex and more costly when
there are only a few applications, as has been the case so far. But I
think there will be a great number of applications in the near future. The situation is on the
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80% reduction in CO₂ emissions is possible for locomotives – that is
an interesting target. And as for other applications, I would say that
the targets we are aiming for right now are realistic. I don’t think we
will achieve 100% electric vehicles within the next three or four years.
It is an ambitious target that might even be unattainable. There will
always be a need to travel long distances, and this is why electric
vehicles are not the solution. The electric vehicle is a very convenient
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Unmanned ships are still a vision of the future, but Rolls-Royce is working hard on making that vision a reality within the next decade. In this picture, there is a noticeable lack of a bridge. This is because the bridge is on the shore. Thanks to cameras and thermal imaging technology, the captain actually has a better overview on the shore than would be possible on the ship.

More employees, less fuel, greater safety

The advantages of unmanned ships are clear to see. If fewer crews members are needed, you can save on labor costs. At the same time, the number of accidents can be reduced. The Allianz Insurance Institute has calculated that in 2012, between 75 and 96% of accidents at sea were attributable to human error. Tiredness and lack of concentration are frequent causes. On an unmanned vessel, on the other hand, modern sensors can detect small objects in the water faster than the human eye. Fuel consumption is lower too if the ship is controlled remotely from the shore rather than by a captain on the bridge. Unmanned ships are also less attractive to pirates because they carry no potential hostages.

As yet that is still a vision of the future – but it is not a question of if, but only of when, according to Oskar Levander, Vice-President Innovation at Rolls-Royce. The Rolls-Royce-led AAWA (Advanced Autonomous Waterborne Applications) project is currently looking into the technical aspects of unmanned shipping. Together with experts from a number of Finnish universities, from companies in the shipping business and the classification society DNV GL, Rolls-Royce is investigating how such a sea-going craft would have to be built and how automation and control systems could be integrated – using existing technology wherever possible. The project participants will also be considering the social, legal and economic questions involved, leading to the definition of legal provisions for crewless shipping to ensure safety at sea.

Midnight in the North Atlantic. A 50,000-tonne freighter picks up the latest weather report. A storm is approaching. Quickly, quietly and without human intervention, the ship alters its course. It recalculates its required speed so that it will still arrive on time at its destination port despite the change of course. The new course data is transmitted via satellite to a captain on the other side of the world. The ship changes course again to avoid a vessel on its starboard side.

Not if, but when

The ghostly specter of an unmanned ship sailing on the open sea was the myth at the center of the ‘Flying Dutchman’ legend. Today it is a realistic objective at Rolls-Royce. Smart ships are to pilot themselves without crews. This saves on manpower and fuel, and there will be fewer accidents. Rolls-Royce is predicting that the first commercial unmanned ships – maybe ferries or tugs – will be in service before the end of the decade.

The MTU engines can also be monitored from land. Data loggers record the operating data from the Engine Control Unit and transmit it to the shore, where the land-based captain can see whether there is a problem or if any components need servicing. “We are developing advanced engine maintenance systems and moving away from rigidly scheduled servicing towards condition-based maintenance,” explained Stefan Müller, head of marine applications technology at MTU. He also emphasized that the surveillance system on an autonomous vessel needs such information to respond to problems arising with the engine or propulsion system. Callosum, MTU’s integrated ship automation system, already enables bridge crew to monitor the entire propulsion system, on-board power supply and all ship’s services. “In the future, that data will not be viewed by an officer on board but sent directly to the ship’s surveillance system instead. Processing and transmitting it for that purpose, and then drawing the right conclusions from it is the big challenge,” explained Müller.

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His vision for sea captains of the future is for them to work on land, where autonomous navigation, tracking and propulsion systems will enable them to monitor up to ten vessels that are out on the high seas. So a vessel will maneuver on high sea by remote control.

Remotely controlled or autonomous
Unmanned craft can either be remotely controlled or autonomous. In practice, it will probably come down to a combination of the two. Large vessels could operate autonomously on the open sea. In that situation, the ship automatically finds the best course, navigates and avoids obstacles. But when the ship approaches the shore and enters busy shipping lanes, a captain on the shore takes over and pilots the vessel by remote control. Smaller craft such as ferries that always operate in coastal waters will only ever be remotely controlled.

The land-based captain then sits at a virtual bridge in the remote control center. This is not an identical replica of the ship’s bridge, but a virtual environment from which it is easier to assess the situation than on the actual bridge. If the captain needs an all-round view, images from 360-degree cameras are projected onto the virtual bridge. Besides normal cameras, thermal imaging cameras are also used to provide additional information when visibility is impaired by darkness, rain or fog. “HD and thermal imaging cameras are already more powerful than the human eye today,” Levander points out. And radar scanners can depict objects on augmented reality displays.

International rules yet to be established
The technological requirements for building such vessels already exist. But before ships of that kind can sail the world’s oceans, the existing regulatory framework will have to be rewritten. How will unmanned ships be insured? Who will be liable in the event of disputes? Those are only two of the questions that have to be answered. Safety is thus a major issue. Because only when the technology is really as safe as on conventionally crewed ships will the rules change. So the vessel will have to constantly assess its current situation. If it loses contact with the on-shore control station or if other faults occur, the ship will have to immediately adopt a pre-defined safe mode – it will have to slow down, weigh anchor or enter idle mode.

“We are assuming that the technical solutions will be available before new regulations have come into force,” said Rolls-Royce marine expert Oskar Levander. The trailblazers are likely to be small ferries, tugs or inland waterway vessels. “Such craft also operate within the jurisdiction of a single country, so the operating license will be quicker to obtain,” Levander added. He then expects the next phase to see international commercial trade following suit – but only if the freight being carried is non-hazardous. “Oil and LNG tankers will not be unmanned in the short to medium term, and we will continue to see captains on cruise ships,” said the Rolls-Royce expert. He firmly believes that unmanned ships will become the norm more quickly than driverless cars. “Ships are much more suitable for auto-piloted control than cars,” said Levander. “Cars are in much closer contact with people and so seem more dangerous. What is more, in road traffic, decisions have to be made in a split second. At sea there is much more time to react.”

Words: Lucie Maluck
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All important decisions are made by artificial intelligence.

For more pictures of unmanned ships go to http://bit.ly/1RZjuza.
When computers were the future

Josef Schmitz and Hermann Baumann can look back on 30 years of experience in development. From the introduction of IT as a development tool through to the era of ever stricter emissions limits, the two MTU design engineers have constantly had to overcome new challenges.

In 1986, when Josef Schmitz started at MTU, he worked in the same open-plan office as Hermann Baumann, who had joined the company two years before. In those days, design engineers worked at large drawing boards. “Those were the days of the white coats,” remembered Schmitz. It was their job at the time to get the highest possible power out of an engine – fuel consumption and emissions had not yet become an issue. They drew with pencil and ink and wore white lab coats to distinguish themselves from shop-floor workers. “Although you very rarely ventured into the factory,” Baumann recalls. Today, things are different. The design engineers consult their colleagues in Analytics, Value Assessment, Production, Purchasing and Assembly, and right from the earliest stage of conception. They closely track every phase in the development process. “That’s what makes it so fascinating to work here – you can always see the complete picture and experience the evolution of a product at first hand,” Baumann explained.

In making the transition to digital design. Some were not even prepared to try, as Schmitz remembers: “As time went on, the most complex jobs were gradually assigned to the CAD designers. So some highly regarded designers who couldn’t or wouldn’t work with the new CAD tools were increasingly pushed aside. They then tended to be given less important work that could be done at the drawing board, such as amending older drawings.” According to Baumann, a good deal of knowledge and skill was lost as a result. Nevertheless, the vast majority of designers successfully mastered the change-over from drawing board to CAD system, albeit with a degree of initial skepticism in some cases.

And there was another aspect that created some annoyance at the time, as Schmitz related: “The computers were comparatively expensive and the company only bought a few of them. Whoever got in the office first in the morning often hogged the CAD workstation the whole day long while others whose work was just as urgent were left to wait in desperation for a free computer.” To reduce friction between staff and increase equipment capacity utilization, early and late-shift worktime models were introduced. Today by contrast, it is taken for granted that every designer has his or her own computer workstation. In the early days, that would have been considered a luxury.

But working on computers did have some disadvantages: “One thing that became more difficult with CAD was developing a feel for dimensions, weights, sizes and stresses,” Baumann remembers. On the drawing board, components were represented in their actual size, while on the computer screen they could be magnified or shrunk to any scale. “But a good designer still has to be able to mentally picture the full-scale component at all times,” emphasized Baumann.

Computers replace drawing boards
At the end of the 1980s there were radical changes. Computer-aided design replaced the drawing board. Baumann and Schmitz had already worked with CAD programs as students, but many older-generation designers experienced great difficulty in making the transition to digital design. Some were not even prepared to try, as Schmitz remembers: “As time went on, the most complex jobs were gradually assigned to the CAD designers. So some highly regarded designers who couldn’t or wouldn’t work with the new CAD tools were increasingly pushed aside. They then tended to be given less important work that could be done at the drawing board, such as amending older drawings.” According to Baumann, a good deal of knowledge and skill was lost as a result. Nevertheless, the vast majority of designers successfully mastered the change-over from drawing board to CAD system, albeit with a degree of initial skepticism in some cases.

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New information sources
In the past, the latest stage of development could always be seen on the drawing boards. Heads of department could quickly get a picture of how things were going just by walking round the office, and they could change the drawings directly. Everyone could see right away who was doing what, and so there was no great need for discussion or reporting.

Smoking and drinking in the office were accepted
Whether it was a pipe or cigarettes, smoking in the office was still quite normal until the early 1990s. It was eventually banned not just for health reasons, but also because the computers were damaged by the smoke.

Once the norm, now unthinkable: three decades ago, beer-drinking in the office was nothing out of the ordinary. “When I first worked here, there was a custom known as the holiday drink. Whenever you went on holiday or came back from holiday you bought a round for your colleagues,” recalled Schmitz. Baumann added: “You generally spent more time together in those days - the community feeling was stronger than today.” This also has to do with the fact that daily routines have changed a lot.

More meetings, fewer shared breaks
As a result of flextime working and computer and project-based work patterns, the daily routine has changed considerably. “In the past, you came to work in the morning and started drawing. There wasn’t much telephoning or talking. The design engineer sat in front of his drawing board all day long – interrupted only by coffee and lunch breaks,” recounted Schmitz. Over the years, new development processes and methods significantly changed the working day. The actual process of designing is now only a part of a design engineer’s job - the rest of the time is taken up with co-ordination meetings and project work. And that means that shared break times have become much less common.

From government contractor to global player
In the 1980s, the mission of the business was to develop highly compact engines with as much power output as possible. “Most of our clients were public sector organizations such as Deutsche Bahn or the German Navy. Fuel consumption and emissions were a secondary consideration in those days,” said Schmitz. “And we had a lot of paid development. So pressure on costs was the exception rather than the rule.”

Development and production costs and low fuel consumption have now become the definitive criteria for market success, and compliance with emissions limits is a base-line requirement. MTU has transformed itself into a global player - the engines manufactured at production plants in Friedrichshafen, Aiken and Suzhou
are sold worldwide. In a period spanning 20 years, it launched its brand-new Series 4000, 2000, 8000 and 1600 units on the market, primarily for commercial use in a diversity of applications. In 1994, it introduced standard production Series 4000 units with a common-rail fuel injection system, and was the very first manufacturer of large diesel engines to do so. The new technology enabled injection timing, volume, pressure and multi-phasing to be infinitely varied, opening up a much bigger perspective in engine design.

According to Schmitz, you can tell good design engineers from the way they identify with their products – it is their ambition to improve them continuously. For understandable reasons, deadline and budget constraints place certain limits on those ambitions. However, the enthusiasm of Schmitz and Baumann for their product remains unabated. “Diesel engine development is a discipline covering so many areas of technology. I can hardly imagine a more multi-faceted task than developing a diesel engine,” said Schmitz. His vision for the future is of a drive system that integrates alternative power units. As a marine propulsion specialist, Baumann sees scope for future development in that area. “Sailing silently out of the harbor powered by an electric propulsion system is my vision. And it will happen – I’m convinced of it.”

Engine development at MTU

Engines developed simultaneously across all series MTU now trades in highly diversified markets. In the beginning, there was usually only one engine development project going on at a time. Today – driven partly of course by emissions legislation – we work on new engines for various applications in all series at the same time,” said Schmitz.

Today’s design engineers also work in a much more customer-oriented way. They have more direct contact with clients and know more about what these expect from a quality product. According to Schmitz, you can tell good design engineers from the way they identify with their products – it is their ambition to improve them continuously. For understandable reasons, deadline and budget constraints place certain limits on those ambitions. However, the enthusiasm of Schmitz and Baumann for their product remains unabated. “Diesel engine development is a discipline covering so many areas of technology. I can hardly imagine a more multi-faceted task than developing a diesel engine,” said Schmitz. His vision for the future is of a drive system that integrates alternative power units. As a marine propulsion specialist, Baumann sees scope for future development in that area. “Sailing silently out of the harbor powered by an electric propulsion system is my vision. And it will happen – I’m convinced of it.”

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Hermann Baumann is an engine enthusiast and loves being able to follow the entire evolution of an MTU engine from start to finish. “It’s fascinating,” he says.
“The world-wide demand for motor vehicles will not exceed one million – simply due to the lack of chauffeurs.”

Gottlieb Daimler, inventor of the motor car, 1895

“Nothing that can be invented has already been invented.”

Charles Duell, Head of the US Patent Office, 1899

“Gold has even now but a few years to live. The day is near when bars of it will be as common and as cheap as bars of iron or blocks of steel. Before long it will be an easy matter to convert a truckload of iron bars into as many bars of virgin gold.”

Thomas Edison, American inventor and entrepreneur, 1911

“Rail travel at high speed is not possible, because passengers, unable to breathe, would die of asphyxia.”

Dr. Dionysius Lardner, Irish physicist, mathematician and encyclopaedist, 1850

“E-mail is a totally unmarketable product.”

Ian Sharp, founder and chief programmer of Canadian IT services provider Sharp Associates, 1979

“Almost all of the many predictions now being made about the Internet’s growth are garbage. But I predict the Internet will soon go supernova and catastrophically collapse.”

Robert Metcalfe, co-inventor of Ethernet, MIT graduate, 1995

“I’m sorry, but with all the will in the world I cannot imagine what submarines can achieve in a war – except to expose their crews to death by suffocation.”

Herbert George Wells, English science fiction writer, 1901

“Predictions are difficult, especially when they relate to the future.” – these quotations show just how right Danish physicist Niels Bohr was when he said those words.
High-tech highway

In the state of Illinois, the 77-mile Jane Addams Memorial Highway serves nearly 1 million travelers per day in and around Chicago. The highway is part of Interstate 90 (I-90), the longest interstate in the United States. At more than 3,000 miles long, the transcontinental freeway stretches from Boston, Massachusetts to Seattle, Washington.

As it does on other heavily trafficked expressways, severe congestion frequently cripples I-90 drivers. Built in the 1950s, I-90 became strained beyond its capacity to residential and commercial growth, increasing delays. A 2015 study cites a 12-mile stretch of Chicago’s I-90 with the worst traffic congestion in the nation. American commuters spend upwards of 48 hours a year stuck in traffic. The United States’ federal government is focused on a number of high-priority efforts to help reduce congestion on the nation’s highways.

Easing traffic flow

To modernize and rebuild the aging highway, the Illinois Tollway approved a comprehensive plan in 2004 that included improvements such as lane widening, modernized tolling facilities, resurfacing and the addition of an intelligent transportation system to better manage incidents and increase safety. The state’s ongoing efforts to improve mobility and reduce congestion launched Move Illinois, a 15-year, $12 billion capital program that will rebuild the existing Illinois tollway system, including state-of-the-art 21st century “Smart Corridor” features for the Jane Addams Memorial Tollway. This technology expansion will provide drivers with up-to-date information during their travel as well as increase overall efficiency of the corridor.

To ensure a smooth traffic flow on the Illinois tollway, the cutting-edge program needs reliable backup power. MTU Onsite Energy has been chosen to install 23 natural gas generator sets with 100kW output. The units will provide backup power to updated traffic lane monitoring systems on Chicago’s Interstate 90. The gas generators will be housed in weatherproof aluminum enclosures to protect against common outdoor elements, like salt. The enclosures’ grey color blends in well with the background of the highway, helping to minimize distractions for drivers. Seventeen generator sets have been delivered and will be operational by summer 2016.

Smart improvements

The MTU Onsite Energy generator sets will provide backup power for a number of “Smart Corridor” features on the tollway. Active Traffic Management will provide real-time information to drivers, including nature and status of traffic incidents ahead, advisory speeds, posted alternate routes and real-time lane closures and traffic pattern changes. Roadway cameras along I-90 will be upgraded from analog to digital high-definition, and additional cameras will provide coverage along the full length of the I-90 corridor from O’Hare International Airport to Rockford. State-of-the-art wireless traffic sensors will provide more comprehensive travel time information. In addition to replacing current full-width, monochrome digital message signs with higher-resolution, full-color graphic-cable models, the new I-90 will feature smaller, four-color digital message signs to enhance communications with drivers.

Weather stations along the I-90 corridor will be upgraded with state-of-the-art technology capable of providing pavement monitoring and weather conditions at critical locations, including bridges. Highway infrastructure will be able to communicate with cars over a wireless network, exchanging data about each vehicle’s speed, location and direction of travel and providing developing road situations to drivers.

I-90 will also feature the first Pace Bus “Park & Ride” facilities on the tollway. The project is expected to save drivers nearly 30 minutes of drive time on the average trip from Elgin, Illinois, to the Kennedy Expressway. In addition, the improved roadway will accommodate more than 80,000 additional vehicles per day, saving drivers millions annually by reducing congestion and delays. The Illinois tollway is committed to sustainability, with a key goal of minimizing the environmental impact from construction to completion. At a time when the global demand for energy is rising and reliable electricity supplies are increasingly vital, power generation products are being used more and more to meet environmental demands. MTU Onsite Energy’s natural gas generators complement the tollway’s “Building Green” initiative, which will incorporate renewable energy sources.

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The 23 MTU Onsite Energy gas-engine generators on standby next to the highway can each generate 100 kW in the event of a power outage.
Rock and a hard place

Mud, moisture and clouds of dust are hardly ideal conditions for reliable engine operation. Despite these challenges, Series 1600 engines deliver outstanding performance at the Donskoi Kamen stone quarries in southern Russia.

A siren wails at the Donskoi Kamen stone quarry in Russia. The road down to the workings 50 meters below has been blocked by two trucks. Everyone on site knows that access to the pit is now forbidden because blasting is about to start. An explosion reverberates around the 50-hectare oval pit that the quarrymen have drilled and blasted in the earth over the last nine years, and a yellow-white cloud of stone dust billows upward. The Donskoi Kamen site is an opencast sandstone mine. It provides good access to the workface not too far below the surface and is well located to link with the major M4 highway that connects southern Russia and the port of Novorossiysk with Moscow.

Year on year, the quarry team extracts 6 million tons of stone from the earth at the site, but only a little over half of that goes for the production of aggregates. The rest is spoil that constantly adds to a giant heap. Initially, the stone is loosened by blasting. Excavators then load it onto trucks that haul it to the company’s on-site crushing facilities. Depending on its ultimate use – for highway construction, concrete manufacture or shoreline and riverbank stabilization – the stone is then reduced to different grades. The finished product is dispatched to customers by truck or is stored on site until it is needed.

Founded in 2006, the Donskoi Kamen company swiftly spotted trends during the economic boom of the time: the demand for quarry stone and aggregates rocketed. The first major customer for stone aggregate was a construction...
Company working on the long-distance Moscow to Stoch highway nearby. The work was part of an investment project for the Winter Olympics. Donskoi Kamen is currently supplying two construction sites linked to the 2018 Football World Cup: a new airport and a football stadium in the Rostov region.

In 2009, when the business had found its feet, the company began to look for smaller new generators to power the three large stone crushing plants. These had to be largely immune to the choking influence of dust (a large 2,000 kW engine had just failed due to dust contamination). Company management decided on an initial purchase of three MTU Series 1600 diesels. Producing 668 kW, the units were small, but they fitted in perfectly with Donskoi Kamen’s new energy concept that involved installing small engines in parallel in three production units. That way, if one engine failed, it could be immediately replaced by others.

Today, Donskoi Kamen operates 17 MTU Series 1600 engines. Together, they generate 8.5 MW of electricity for the three large stone crushing plants. The engines are not operated at maximum performance but are regulated to produce 550 kW of electric power, leaving a backup power reserve. The company is now planning the purchase of four more MTU engines. These will provide a reserve in case of problems and can also be called on in periods of particularly heavy load such as during very hot summers.

Never-ending struggle
With its huge, spiderlike crushing plants and its fleets of trucks and shovel excavators, the quarry site is an exciting but hazardous place. The thunder of the grinding machines and the constant roar of engines mean that noise levels remain permanently high.

In January, icy conditions mean the thermometer stubbornly shows temperatures down to minus 10°C. Sleet and slush transform the site into a mire of treacherous puddles and mud. At the other end of the scale, when summer temperatures reach up to 30°C, it is stone dust from the crushing plants that tests both men and machines to the limit. Despite on-site sprinkler systems, the dust is all-pervading.

The production of grit, gravel and chippings keeps the 530-strong workforce hard at work year round. Never-ending struggle. The production of grit, gravel and chippings keeps the 530-strong workforce hard at work year round.

Cosmetic factors are not paramount. The most important thing is that production keeps on running.

Michail Pridanov, head of a service company for large engines near Moscow, advised the quarry, “If you only need 500 kW for one section of the plant.”

Communication between MTU and the customer is made much easier because Pridanov speaks perfect German. He learned the language during his work on transport logistics when the Soviet military withdrew its technology from the GDR in 1994. At the time, Pridanov was in charge of
a repair team and was thus in constant contact with members of the Bundeswehr. His company, Prom Dizel, has been responsible for servicing MTU engines at the quarry since 2009. Major maintenance procedures are carried out at the service company’s facility near Moscow. Prom Dizel has been MTU Russia’s official service partner since 2015. Another reason for buying MTU engines, said Gromov, was that Series 1600 units reacted better to varying load demands than competitors’ engines. During the stone-grinding process, diesel engines are still too expensive, and the modern, hermetically sealed enclosures for engine damage, explained Pridanov. Gromov added that the operators also wanted to avoid the possibility of public grid outages and claims by the electricity company in respect of purported unpaid bills.

Efficient communication with the engineers at MTU is vital for smooth production, and in this context, both Russian engineers are extremely satisfied. To ensure that they are able to deal personally with most eventualities, Pridanov and Gromov have both completed two training courses at MTU-HQ in Friedrichshafen. Instead of having to fly MTU engineers out to southern Russia for every hiccup, the two Russian specialists can now deal with many situations themselves. Gromov now has flash memory card access to MTU engine control systems and can connect his laptop directly to the 12-cylinder units for engine diagnosis. He then simply transmits the diagnostics protocol by Internet to the MTU Service Section, which provides troubleshooting advice. According to Gromov, the MTU Service Section sometimes also provides software updates.

The quarry team extracts six million tonnes of stone every year. Deposits are loosened by blasting before being loaded onto trucks by excavators for transport to the company’s on-site crushing facilities.

Donskoi Kamen has decided not to use dust-tight enclosures for its engines. Heavy-duty air filters with cyclone pre-filters ensure that dust does not penetrate the engines. Nevertheless, the engines need to be cleaned of dust every day.

The synchronization concept also ensures that even the slightest deviations in engine speed are balanced out.

The quarry team extracts six million tonnes of stone every year. Deposits are loosened by blasting before being loaded onto trucks by excavators for transport to the company’s on-site crushing facilities.
Lithuanian Railways opts for remanufacture of the MTU engines in its freight locomotive fleet.
Each of the 44 MTU engines that had been powering Siemens Eurorunner locomotives in Lithuania for the last eight years had 24,000 hours of service on the clock. So it was time for a rejuvenation treatment – or, to put it another way, the MTU reman process. This involves restoring the engines to as-new condition. Remanufactured or ‘reman’ engines are as good as new ones but considerably less expensive and still come with the same warranty.

There is a smell of metal and oil, but it is surprisingly bright and clean in the locomotive shed in the south of Vilnius, the Lithuanian capital. A subsidiary of the Estonian company Baltic Marine Group, an MTU distributor, had the shed renovated only three years ago. At ‘Vilniaus lokomotyvu remonto depas’ as it is called, maintenance and installation work is carried out on behalf of Lithuanian Railways (Lietuvos Geležinkeliai). The rest of the goods traffic is local and supplies sites and businesses in Lithuania.”

**Economical and sustainable**

In July 2013, Lithuanian Railways launched a joint project with Siemens, Baltic Marine Group and MTU to overhaul the 44 locomotives and engines. By September 2015, all of the engines, each of which had completed roughly 24,000 hours of service to date, had to be successively removed from the locomotives at the Vaišnors depot and sent by truck to the MTU Reman Technology Centre in Magdeburg, MTU’s lead facility worldwide for standardized remanufacturing, i.e. standardized industrial reconditioning and complete overhaul of MTU engines. The advantage of reman engines is that they cost less than new units but have the same warranty. What is more, in the course of the complete overhaul, each engine benefits from all technical upgrades so that clients can be certain they are receiving a product with the very latest technical advances. In Magdeburg, the incoming engines are made fit and ready for a new life. The first part of the process is to completely dismantle and examine them. Worn parts and elastomer or defective components are replaced, but the majority of the engine parts, such as cylinder heads, crankshafts or the crankcase, are reconditioned – which is a sustainable process because no raw materials have to be used to produce new components. After successfully completing a bench test, the engines are also repainted, which means they not only meet the same specifications as an equivalent model just off the production line, they also look brand new. Just like the reman unit in locomotive number ER 20032. The Eurorunner’s 2,000 kW traction unit shines brightly in its freshly applied blue livery and is once again fully prepared for service on Lithuanian freight routes.

“The money that we save can be invested elsewhere.” Werner Berger is one of the MTU staff looking after the Lithuanian reman project. “This is our first contract for reman engines from a national railway,” he says, not without a certain amount of pride.

I want to learn how to drive a locomotive.”

“I want to learn how to drive a locomotive, but I am not a train driver,” says Naglis Vyšniauskas, director rolling stock for Lithuanian Railways. His dream is to learn how to drive a locomotive (see memo box below). His dream is to learn how to drive a locomotive (see memo box below). His dream is to learn how to drive a locomotive (see memo box below). His dream is to learn how to drive a locomotive (see memo box below). His dream is to learn how to drive a locomotive (see memo box below). His dream is to learn how to drive a locomotive (see memo box below). His dream is to learn how to drive a locomotive (see memo box below). His dream is to learn how to drive a locomotive (see memo box below). His dream is to learn how to drive a locomotive (see memo box below). His dream is to learn how to drive a locomotive (see memo box below). His dream is to learn how to drive a locomotive (see memo box below). His dream is to learn how to drive a locomotive (see memo box below). His dream is to learn how to drive a locomotive (see memo box below). His dream is to learn how to drive a locomotive (see memo box below). His dream is to learn how to drive a locomotive (see memo box below). His dream is to learn how to drive a locomotive (see memo box below). His dream is to learn how to drive a locomotive (see memo box below). His dream is to learn how to drive a locomotive (see memo box below). His dream is to learn how to drive a locomotive (see memo box below). His dream is to learn how to drive a locomotive (see memo box below).
The engine compartment is then prepared for the reman engine, which is already standing by to be fitted.

The engine compartment is then prepared for the reman engine, while two so-called “swing engines” were used in Lithuania. These were units that had already been reconditioned and were ready to be fitted in the locomotive. “This ensured that the out-of-service times for our locomotives were kept as short as possible,” explains Naglis Vyšniauskas.

The process was tailored exactly to Lithuanian Railways’ requirements. Two engines at a time underwent the reman process in Magdeburg, while two so-called “swing engines” were used in Lithuania. These were units that had already been reconditioned and were ready to be fitted in the locomotive. “This ensured that the out-of-service times for our locomotives were kept as short as possible,” explains Naglis Vyšniauskas.

The financial aspect in particular was the crucial factor in the decision to opt for reman engines. “The money that we save by using reman units,” outlines Vyšniauskas, “can be invested elsewhere.” As he is talking, the clanking and whirring of a steam locomotive suddenly disturbs the quiet of the office. The noise comes from a wall clock. On the stroke of each hour, a miniature train runs around the clock face, its sound effects attracting attention.

Out of the locomotive and onto the wooden pallet inside two minutes

In the locomotive shed in Vilnius, Arunas Žėkas and Giedrius Pranckunas of the Baltic Marine Group service team are in the process of lifting the old engine out of ER 2001. Giedrius Pranckunas moves the big yellow overhead gantry crane over the locomotive by remote control. By the time it is in position, his colleague Arunas Žėkas has attached heavy lifting chains to the engine block. Within a few moments, the heavyweight engine is hanging from the hook and being carefully lifted out of the locomotive. The fact that it seems to sway quite considerably in the process does not worry the experienced mechanics - apparently that is quite normal. Finally the engine is hormones just an arm’s width over the wooden shipping pallet. From start to finish, the operation has barely taken two minutes. Now some high-precision maneuvering is required to position the steel colossus on the four bolts of the wooden base. “That’s no problem,” smiles Arunas Žėkas. “After 30 engines, it’s just a routine operation for us.” The two mechanics rock the engine a little, and very soon it has seated itself satisfactorily. Arunas Žėkas grabs a large spanner and tightens the nuts onto the bolts.

Beside him, engineer Arminas Vibrantienė and the director of the Lithuanian branch of Baltic Marine Group, Andžej Mickevič, observe the procedure. “MTU has an excellent reputation in remanufacturing,” says Andžej Mickevič. “They provide support if there are any problems and respond very quickly. Every day matters to us and our clients, Lithuanian Railways.” Arminas Vibrantienė adds, “Everything slotted perfectly into place and is running very smoothly. Our partnership with MTU is very solid, and things are dealt with in a very friendly way.” Herman Schirmer, who looks after the reman project from the Friedrichshafen end, likewise values his colleagues from Estonia and Lithuania. “The team in Vilnius works very self-sufficiently. The work that Baltic Marine Group does as distributor is textbook.”

“The engines are in good hands”

The reman project in Lithuania took two years to complete, and Naglis Vyšniauskas is more than satisfied: “We not only have a partnership, we also have a really close collaborative relationship with MTU and Baltic Marine Group. In these two companies we have partners we can rely on.” Naglis Vyšniauskas saw that trust vindicated when MTU invited its partners to Lithuania and explained the quality standards of the reman engines. “It was nice to see that our engines are in good hands. The plant there has high-tech equipment of the very best quality. And in our discussions I also found out how the MTU experts assess the condition of our engines after such a long period of duty. The positive feedback from MTU about the condition of our engines and, therefore, the standard of work of our maintenance staff gave me a very good feeling.”

Since the first reman engine returned to service in Lithuania in August 2013, it has already clicked up 13,000 hours on the track without the slightest problem – as expected.

As good as new: The basic components, such as cylinder heads, crankshafts and engine block, have been... ...reconditioned. Only worn parts and defective components have been replaced with new ones.

The locomotive now sports a shiny new traction unit. The reman engine not only looks exactly like its predecessor, it also carries precisely the same warranty as a new unit.
Are MTU engines watertight? Actually, most of them aren’t! But they don’t need to be, because the engine compartment is sealed to keep water out. However, the situation is different for tracked vehicles. They do not have sealed engine compartments, and their engines sometimes get wet. To ensure that its electrical equipment is not exposed to moisture, MTU uses a special process to protect engine cabling.

These cables may be anywhere from one to 15 meters long. They have to withstand temperatures from below zero to 450°C and to carry voltages from 24 to 400V. In short, MTU engine cables have to be robust. “These cables provide the interfaces between the high-tech components on our engines and gensets,” said Georg Haas, master craftsman in the cable production section at MTU Friedrichshafen. They have to be sealed absolutely tight to ensure that they are impermeable to dust and water and that no engine control or monitoring faults can occur. However, the cables obviously have to be manufactured before MTU technicians can test the engines for leak tightness.

One pin for each core
To start the process, Zoran Krucican cuts several long, slender white cores to length. Later on, these cores will conduct the signals for the engine electronics. Krucican fits a pin – a sort of silver sleeve – over the end of each insulated core to provide a cable connector. Using these pins, he then inserts up to 64 cores into a round connector. MTU assembly technician Johannes Hecht then fits a gray rubber sleeve over the cores before the sealing process takes place and a drop of liquid adhesive sealant is applied between the connector and the connector housing.

Starting the sealing process
Hecht then fits a braided silver shield over the entire length of the cores to protect against electromagnetic waves. “What we are using here is a tin-plated Tinned Copper Alloy Wire that will prevent signal interference later,” explained Haas. So the cores are electronically sealed, as it were. Once Hecht has drawn the braided copper shield over the cores, he pushes it over the connector housing, secures it with a stainless steel strip, winds it around and presses it back in again. Finally, he fits a black shrink-fit sleeve over the connection as a protective cable sheath before using a specially designed molding to join the sleeve and the connector housing. A hot-air blower then shrinks the heat-sensitive components to form a watertight connection between the connector housing and the cable sheath.

Under water
At this stage, the cables are finished and watertight. However, electrician Daniel Angele still has to immerse the cables to ensure they are tight and will withstand water pressure. Angele places the cable harnesses in an empty bath and lets water in. He uses a pump to simulate pressure – as if the cables were immersed several meters below the surface. “If any air bubbles rise to the surface now, it means the cable is not tight,” said Angele. The cable harnesses are kept under water for 60 minutes to ensure there is no possibility of even the tiniest leak.

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Familiar smells
It was that mixture of oil and metal that immediately hit my nostrils. A smell that is so typical of so many factories and machinery shops and also welcomed me at the railway depot in the Lithuanian capital, Vilnius. This was where my report on the use of MTU reman engines had led me. It is a very special smell that reminds me of childhood days spent in my uncle’s small metal-turning workshop and of the many holiday jobs I took in metalworking shops as a student. So it is a very familiar smell. The gigantic locomotives and massively muscular engines I encountered here, however, were something entirely new and imposing. I was also impressed by the hospitality with which I was received by the staff of Lithuanian Railways and MTU agents Baltic Marine. They were not simply keen to explain their work and offer me an insight into the rail freight sector in Lithuania, they also took the time to show me their home town. So I had the opportunity to get to know a city with a historical heart positively bristling with magnificent churches and declared a World Heritage Site by UNESCO. At dinner I also found out that you can eat ‘zeppelins’ in Lithuania. Airship-shaped potato dumplings with a meat filling are a specialty of Lithuanian cuisine and are as impressively weighty as the locomotives.