Fully networked
Power grids get clever

Railway guide
What comes next for emissions

Tutto di Parma
What ham and biogas have in common
Dear Readers

Has it had the same effect on you? The horrific disaster in Fukushima is now six months past – but I still have the images engraved in my mind. In Germany, that catastrophe led to a change in energy policy that many people were very surprised by. In 2022, the last German nuclear power plant will be shut down, by which time the proportion of renewable energies is to be increased to 35 percent to compensate. An ambitious target, to which we – even though we continue to offer emergency power generators for nuclear plants – aim to make our contribution. In our cover story, my fellow board member Christof von Branconi and Stephan Kohler from the German Energy Agency explain what the energy mix of the future will look like and where our products will find their place within it.

At the Formula 1 Indian Grand Prix in October, our power generation modules will have a trackside position. They supply the necessary horsepower off the track to generate the electricity that the power grid is unable to provide. Our editor met the architect of the new track and talked to him about the challenges of designing motor racing circuits. It makes for a fascinating story about the world of Formula 1 that starts on page 48.

Finally, a few words on a personal note. On September 30, I will be leaving the company to take my retirement. Of course, I am looking forward to what lies ahead, but saying goodbye is still difficult. After Daimler’s exit at the end of 2005, taking a new company direction and undergoing the period of transition with EQT was not always easy, but it led to what Tognum AG stands for today – a modern-day company with a committed workforce, fascinating products and a clear focus on growth – and I thoroughly enjoyed the challenge. I know that with my successor, Joachim Coers, I am leaving the corporation in good hands. The strategy we have in place today is the culmination of my many years of work with him. While he can be counted upon to maintain continuity, I also know that he will work with our new owners, Daimler and Rolls-Royce, to make the most of the opportunities presented by the new constellation – for the benefit of our customers and of our workforce.

I wish all of you personally and the company as a whole the very best for the future.

Volker Heuer
Social network: in the energy mix of the future, vast numbers of different electricity generators and power consumers will have to be linked together in so-called smart grids.
If national power plants operate, we will have to adjust demand to production much more in the future. Primarily, and from an economical viewpoint, that relates to industry and commerce. By adjusting the demand from plant and machinery that is not production-related, such as compressed-air systems, cooling systems, etc., more flexibility can be obtained.

Is that worthwhile for the operators?

Christof von Branconi: As ever, that is a question of supply and demand. But I assume that the prices for the regulating energy will increase in future because the fluctuations in the grids will increase due to the greater use of renewable energies. And in the end, the operator has the plant in any case. So if they generate electricity and sell it, they are earning more money. We are very occupied at present with the consequences that such increased demand for regulating power will have for our clients. One consideration is, in conjunction with a maintenance contract, to offer customers modules that will allow them to enter that market in future.

So what will happen if the genset is actually needed as a backup generator just at the time it is being used to supply regulating power to the mains grid?

Christof von Branconi: The emergency backup function will always take precedence over supplying regulating power. The generators will always be controlled as part of a pool. And that will always be larger than the quantity of electricity that the operator of that pool is allowed to supply. As soon as a power module has to supply emergency power, it is taken out of the regulating-power supply pool.

Stephan Kohler: “We have to adjust demand much more to production.”

Christof von Branconi: In addition, our power generation modules can balance out those demand fluctuations. For example, backup generators sitting in the basements of tower blocks waiting to be called into action in an emergency can provide that regulating supply. It can be called upon flexibly by grid operators whenever there is too little supply within the public power grid to maintain the voltage. For that to work, the generators simply have to be differently configured and the connection between the energy module and the mains grid set up so that the backup generator can be brought on stream as required. With our CHP plants, we already provide that capability because the majority of the operators feed their electricity into the national grid.

Distributed power generation modules from MTU Onsite Energy can balance out those fluctuations. They are flexibly deployable, easy to control and can be brought into action whenever electricity is required.
**Are our power grids already prepared for drawing as much as 80 percent of their supply from renewable sources in extreme cases?**

**Stephan Kohler:** No, the supply grids are not yet sufficiently adapted to the requirements of system integration of renewable energy sources. That relates not only to the high-voltage, but also the medium and low-voltage grids. There is need for considerable work to be done in that area. The dena grid studies I and II that we carried out identified the need for an extra 4,500 km of high-voltage grid cabling in order to be able to incorporate a share of 38 percent for renewables.

**What happens if you don’t succeed with that?**

**Stephan Kohler:** Then wind farms will have to be increasingly limited in good wind conditions because it will not be possible to carry the power. In the long term, as well as feeding directly into the mains grid, we also have to consider the possibility of hydrogen generation. With the power-to-gas strategy, we can then also utilize the natural gas networks, especially in terms of storing electricity.

**Are our power grids already prepared for drawing as much as 80 percent of their supply from renewable sources in extreme cases?**

**Stephan Kohler:** When it comes to storage technology, we have to distinguish between hour, day, week and season stores. We need to expand the number of pumped storage hydroelectric plants with a capacity of around 2,500 megawatts still possible in Germany very quickly. At the same time, we have to extend power management cooperation with the alpine countries in order to utilize the pumped storage hydroelectric plants available and yet to be built there.

Battery storage will be used more in the future, for example in electric modes of transport – though that also represents an additional source of demand. With hydrogen production and the use of the natural gas network, pipelines and stores, we also have a storage technology available that will enable longer-term storage. To make it economically and efficiently usable, however, intensive research and development work is required.

**Looking at consumers in Germany, will they soon change from simple power consumers to power suppliers who generate their own electricity with a CHP module in the cellar or photovoltaic panels on the roof?**

**Stephan Kohler:** In the course of implementing the power reform, we will see marked decentralization of power generation but also extensive centralization, such as by the development of offshore wind farms. Photovoltaic panels on the roof, micro-CHP plants in the basement, community wind farms and cooperatively run biogas plants will become the norm. And that will permanently change the energy landscape. That can be illustrated by these figures: in 1990 roughly 1,000 power stations covered around 90 percent of electricity needs; in 2010 there were 1,800 power stations supplying 30 percent; in 2020 there will be over 6,000 power stations supplying 10 percent.

**We could avoid many of these measures if we could store electricity so that it would be available when needed. Is that likely to be possible soon?**

**Stephan Kohler:** Yes, we can avoid many of these measures if we could store electricity so that it would be available when needed. Is that likely to be possible soon?

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**The energy reform should not be a purely German affair, but should be coordinated with our European neighbors.**

**Stephan Kohler, Chief Executive of the German Energy Agency**

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**Photovoltaic systems only supply electricity when the sun shines. Localized power generators can be brought on stream flexibly when necessary.**
Biogas plants are another environmentally friendly option for decentralized electricity generation.

Christof von Branconi: “Our future system must ensure optimum networking of millions of plants.”

Stephan Kohler: “With distributed energy generation, you can use not only electricity but also heat”.

Christof von Branconi: “That is undoubtedly efficient because decentralized energy generation has three great advantages in my view: you can always produce just as much energy as you need at any time. You can also use not only the electricity but also the heat that is always created as a byproduct of power generation. And thirdly, there is the much greater efficiency that localized energy plants have. Whereas more than 60 percent of the centrally generated energy is lost in the process of delivering it to the consumers, the figure is no more than ten percent with localized power generation.

Let’s move away from Germany for a moment. How will the electricity markets in Europe develop?

Stephan Kohler: The European electricity market will continue to develop in future and gain in importance. Germany will take on an important role in that process as it is geographically at the center of Europe. Especially in terms of the integration of the eastern European neighboring countries into the European electricity market, Germany has a key role. But Europe is also an important region for the use of renewable energies. We already utilize the power grids of our European neighbors as electricity consumers in low-demand periods and during high winds. That will increase in the future. And the European network will be called upon more heavily in the provision of regulating reserves as that can’t be effectively controlled within national constraints. Therefore, the energy reform should not be a purely German affair, but should be coordinated with our European neighbors.

Interview: Lucie Dammann
Pictures: Robert Hack, David Oliveira
Illustration: Robert Hack

To find out more, contact:
Clemens Krämer, clemens.kraemer@tognum.com, Tel. + 49 7541 90-6839

More on this...
…download the smart grid graphic
How it works – see page 3 or log onto http://bit.ly/oMc4nf
Download the VDMA study "Electricity Mix in the EU" at http://bit.ly/oGgMfI
In the future, MTU engines will also be made in Russia. A joint venture between Tognum and Russia’s largest railway rolling stock producer, Transmashholding (TMH), will soon be assembling MTU engines in Russia. The two partners are planning to build a new plant in Kolomna, south of Moscow, for the purpose. It is envisaged the facility will start producing the current Series 4000 models for locomotives, mining vehicles and localized energy generation plants from 2013. The aim is to employ several hundred people at the new factory and produce 1,000 engines a year. In the medium term, however, Tognum and TMH are planning more. A jointly operated development center staffed by engineers from both companies is to design a new engine. It is to be tailored specifically for the markets in Russia and other eastern European and central Asian countries.

The first jointly marketed engines for Russia will come from the MTU Friedrichshafen plant in Germany. Then, from 2013, the joint venture will supply engines assembled, tested and painted in Russia. The partners plan to subsequently increase local production in Russia step by step.

Russia is one of the countries known as the BRIC group, i.e. Brazil, Russia, India and China. The Tognum corporate strategy is aimed at substantial future growth in those regions of the world especially. To date, Tognum has largely supplied the Russian market with MTU engines produced in Germany. In addition, MTU engines have been fitted in agricultural equipment and machinery for the oil and gas industries destined for Russia. But now that some of the value is to be added in Russia itself, Tognum will be able to sell larger numbers in future. The joint venture will be fronted by the company Tognum-TMH Diesel Technologies in Russia. It will be responsible for sales and distribution, and eventually production as well.
Daimler and Rolls-Royce will shortly take over Tognum AG – as soon as the final legal obstacles have been negotiated. It is a move that will offer Tognum greater opportunities for growth, because, as a joint subsidiary of Daimler and Rolls-Royce, Tognum will be able to combine the technological, support and system engineering expertise and the market access of all three corporations. The MTU, MTU Onsite Energy and L’Orange brands and the Tognum name are to be retained.

The plan envisages that Rolls-Royce’s Bergen business in Norway will become part of the new joint venture. It includes medium-fast diesel engines, gas engines and gensets. Thus, the Tognum product portfolio will expand and, with it, the corporation’s market presence – especially in the marine and decentralized energy generation application sectors. Added to that, the expansion of the market presence through shared service networks with Daimler is on the agenda. The collaboration successfully operated for decades with Daimler in the lower power sector will continue with the Series 1000, 1100, 1300 and 1500 engines.

Daimler, Rolls-Royce and Tognum set down the key points for collaboration in a joint basic agreement in March. Thus all Tognum Group sites worldwide will remain in existence. Tognum will continue with its customer-oriented business model and retain responsibility for its own operational sections of the company. The group headquarters will remain in Germany, as will research, development and production of drive systems and energy plants. The new owners will support the growth of Tognum by investing a billion euro over the next three years. The money will be spent on research, development and plants.

*“Together, we will successfully continue the history of growth at Tognum,”* states Volker Heuer, Chairman of Tognum AG. “The possibilities offered by Daimler and Rolls-Royce will bring us a large step closer to our vision of being the preferred partner for the best solutions in the engines and energy sectors.”

At the time of going to press (5th August 2011) Daimler and Rolls-Royce had already secured over 94 percent of the Tognum shares through their joint subsidiary Engine-Holding GmbH. However, there were some official approvals, on which completion of the takeover deal is dependent, still to be obtained. Daimler and Rolls-Royce are nevertheless confident that they will be forthcoming by the end of September. Engine-Holding submitted the public takeover bid to the Tognum shareholders in April of this year.
Vive la France!

MTU France recently celebrated its 10th anniversary together with clients and business associates from France and French-speaking countries in Africa. In his speech, Christian Courcelles, CEO of MTU France, recalled past milestones of the history of MTU France: in a decade, the Tognum subsidiary developed from a mere yacht service operation on the Côte d’Azur to a complete sales and service unit in France and francophone Africa covering all applications.

Products from MTU and MTU Onsite Energy in service in France are not only to be found in the Parisian landmark where MTU engines power the emergency gensets. Many yachts of the shipyard Chantier Naval Couach are equipped with Series 2000 and 4000 engines, the French Railway relies on Series 4000 engines to drive its trains, the Peugeot production facility in Mulhouse and the Smart factory in Hambach generate power with the help of gas systems from MRU Onsite Energy. Other milestones were the inauguration of the ultra-modern After-Sales center in Pégomas near Cannes in 2009 as well as the opening of a branch office in Algiers in the same year and, since then, the continuously growing sales and service network of MTU France in North Africa. Courcelles thanked MTU France’s clients for the trust they had placed in the company.

Recognition

At the end of June, MTU’s parent company, Tognum, presented its awards for the best suppliers in 2010. The award for best supplier of finished components went to the Baden-Württemberg engineering company Spaichingen GmbH which has been supplying control components for MTU Series 2000 engines for many years. A previous Tognum Supplier award-winner on several occasions, Gienanth GmbH from Eisenberg, was named best supplier of raw components in recognition, among other things, of the outstanding quality of the crankcases it supplies for MTU Series 4000. Tognum’s ‘Rising Star’ for 2010 was engine valve manufacturer Märkisches Werk GmbH. The essential criteria for evaluation are quality, logistics and competitiveness together with the new criterion “environmental protection”.

Which way for MTU?

A new worldwide service locator on the MTU and MTU Onsite Energy websites now helps clients find a service agent or dealer much more quickly. The customer simply enters the name of his location or his zip code / postal code in the new Internet tool and selects the application for which he needs a dealer. He can choose between ‘Sales’ and ‘Service’ and can also search by dealer name. The results are shown as hits within a defined radius or the designated dealer is displayed. Customers see the results in a user-friendly Google Maps environment and receive directions to their nearest sales or service partner simply by loading the information directly from the search results to their Smartphone using a 2D code.
The first FPSO ships ever built in Brazil are being equipped with MTU diesel gensets. Eight vessels are each to benefit from one emergency backup and one auxiliary genset driven by MTU Type 16V 4000 P83 power generation engines. FPSO stands for “floating, production, storage and offloading”. The ships are floating platforms that process, store and offload oil and gas. The Brazilian oil and gas producer Petrobras will operate the vessels for servicing oil and gas rigs along the Brazilian coast. The Brazilian ship yard Engevix will build the vessels over the next six years. These FPSOs will be the first ones to be manufactured in Brazil. The generator sets were chosen, amongst others, for their compact size, low fuel consumption and reliability. Two gensets with 1,800 kW power output each will be used on each vessel: the first as emergency standby genset and the second as auxiliary generator set.

Two 90-meter platform supply ships which the Brazilian company would like to operate in the Santos basin off the Brazilian coast are to be equipped with MTU diesel-electric propulsion systems.

The Norwegian shipbuilders Havyard have ordered eight diesel-electric propulsion units with MTU engines and the Genoline ship automation system for two platform supply ships. The Series 4000 engines will give the two vessels a top speed of 15 knots. The craft are 86 meters long and can carry a payload of between 4,300 and 4,700 tonnes. After delivery, they will be used for supply services in international offshore oil and gas production.

The Indian Coast Guard has ordered MTU Series 4000 engines for its coastal patrol boats. The 20 new craft – dubbed the “white elephants” because of their color – are each to be powered by three Type 16V 4000 M90 propulsion units. The Series 4000 engines have a long history and a high standing in India. The navy and coast guard combined have already bought 190 of them in the past. The coast guard values in particular the excellent power-to-weight ratio and reliability of the Series 4000 and the extensive MTU service network. The systems to be supplied for the 48-meter patrol vessels include the MTU “Callosum” ship automation system with an integrated solution for monitoring all ship’s services that also incorporates fire detection and extinguishing systems. In combination with waterjets, the MTU engines can propel the coastal patrol boats at speeds up to 35 knots.

The Indian Coast Guard has put its faith in MTU and is equipping 20 new coastal patrol boats with MTU Series 4000 engines.

**White elephants**

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**Platform support**

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*MTU Report 02/11*
The South Florida Regional Transportation Authority (SFRTA) is modernizing its stock by the addition of ten Brookville locomotives. They will haul trains through the sunshine state with the power provided by MTU Type R43 Series 4000 engines. The rail engines each develop 3,600 bhp and produce substantially lower emissions than the existing fleet courtesy of additional exhaust treatment systems. Brookville is due to deliver the Class BL36PH locomotives to the operator Tri-Rail by the beginning of 2012. SFRTA also has an option for 17 more locomotives. They will operate on the shuttle service between Palm Beach, Broward and Miami-Dade.

Five Madarail locomotives, equipped with MTU 12V 4000 R41 engines have successfully accumulated 15,000 operating hours each in approximately 30 months without any unscheduled downtime. This is another milestone with their engine’s performance and reliability for MTU South Africa in Madagascar. Until 2007 MTU equipped the five new locomotives manufactured by China South Rail – Sifang with engines. The new AD1800 class locomotives have increased the capacity of Madarail freight to 700,000 tonnes p.a. Powered by MTU engines, the locomotives have increased productivity and reduced operating costs through the excellent fuel consumption and low maintenance costs. The engines having reached the 15,000 hour running capacity benchmark; they are now due for QL3 service.

The 168 MTU-engined power cars of the British Class 43 high-speed trains have now clocked up more than 3 million hours of duty and 200 million kilometers. And for First Great Western, one of the five operating companies, that is good reason to celebrate. As part of the celebrations, they renamed one of the power cars “MTU”. The Class 43 power cars travel the length and breadth of the British Isles driven by MTU 16-cylinder Series 4000 engines, so that some trains cover as much as 1,690 kilometers in a day. And so that the trains maintain their reliability in future, the MTU engines are currently undergoing complete overhauls at the MTU Remanufacturing Center in Magdeburg.
From 2015, diesel engines for monster dump trucks and excavators will have to meet the Tier 4 requirements specified by the US Environmental Protection Agency, EPA. To make sure they do not consume any more fuel than the current models despite producing lower emissions, MTU has been testing out a Series 4000 prototype. In mining especially, it is a major challenge to convert the engines, as the components are subjected to such extreme stresses in those conditions. “To maintain the fuel consumption levels of the existing models despite massive reductions in emission levels, we have had to substantially increase the cylinder pressure,” explains Dr. Ingo Wintruff, development project manager for the new generation of the Series 4000 and head of applications technology at MTU. He points out that the high cylinder pressures represent a serious challenge for the crankcase, pistons and cylinder heads, especially under the tough conditions in mining.

The testing ground was the largest copper mine in the world – Chuquicamata in the north of Chile. Its unique load profile and the atmospheric conditions at 3,200 meters above sea level enabled the MTU technicians to test the technologies to their limits. “If the systems work successfully on the engines here, they will do so almost anywhere else in the world,” elucidates Norbert Eisenblätter, Senior Manager Global Application Engineering Surface Mining at MTU.

An MTU Series 500 engine makes the new all-terrain crane from Manitowoc the most powerful in its class. The MTU Tier 4i-compliant power unit is capable of 405 kilowatts. With the aid of an SCR system, the engine meets the requirements of the US Environmental Protection Agency’s Tier 4i emission limits. The GMK6400 6-axis mobile crane has a lifting capacity of 400 tonnes and a boom length of 60 meters. The Series 500 engines are based on Mercedes-Benz commercial-vehicle power units and are designed by MTU specifically for C&I applications. In addition, they use as much as 5 percent less fuel than the previous generation. The SCR technology enables the vehicle manufacturers to convert their products to Tier 4i compatibility with the least possible complexity.

Ready for Tier 4i: The new crane from Manitowoc is powered by a model 8V 502 C52 engine.

Tractor manufacturer Fendt, part of the Agco Group, has launched its first ever forage harvester. Designated the Katana 65, it is also the first Fendt product with an MTU engine. A 650-bhp, eight cylinder Series 502 engine provides the harvester with a top speed of 40 kilometers per hour on the road and delivers ultra-economical operation in practical service in the field. Its SCR system ensures that the engine meets the European EU III B and American EPA Tier 4i emission standards. It also guarantees low fuel consumption combined with high performance. Named after a sharp-bladed Japanese samurai sword, the harvester is designed to deliver a precise and efficient cut. Its enclosed cutter drum with a diameter of 720 millimeters is the largest on the market at present. Twenty-five units are expected to be produced over the coming year.

The Katana 65 harvester is equipped with an MTU Series 502 engine with 650 hp.
Russia goes for gas

MTU Onsite Energy will shortly be delivering localized energy plants based on gas engines to Russia. Six gas-powered MTU Onsite Energy gensets will be going to the end user Sakhalinmorneftegaz, a subsidiary of the Russian oil company Rosneft, whilst a further six are earmarked for Russian natural gas company Gazprom. “These orders illustrate the potential which the Russian market holds for us,” explained Christof von Branconi, Tognum Executive Board member with responsibility for the Business Unit ‘Onsite Energy & Components’. “We have only recently founded a joint venture with the Russian rail vehicle manufacturer, Transmashholding, for the joint development and production of high-performance diesel engines – and now we are also demonstrating our ability to make our mark in the gas-powered genset sector in Russia.”

The contractual partner in the Sakhalinmorneftegaz agreement is the Russian manufacturer of distributed power generation systems, Saturn. Until now, Saturn had concentrated on gas turbine plants but constantly growing demand for smaller-scale generation systems has now led the company to conclude its first contract for gas gensets with MTU Onsite Energy. The gensets scheduled for delivery this year will be going to the Russian island of Sakhalin to deliver heat and power for the oil field now under development. Among other things, these units will drive pumps and drilling plants as well as provide energy for the 500 people living in the area. The chances for follow-up orders from Saturn are good and the Tognum sales team is already working on other potential projects.

The second order involves the sale of gas gensets to the Dutch company Intertech which installs them in containers. Four of the finished container gensets are for power generation in Kursk whilst the other two will be going to Volgograd. The city of Kursk plans to expand the power supply system in the region step by step over the coming years. The consignment of four container gensets producing a total of 8 MW of electrical power represents the first step, with others at the planning stage.

Turkey steamer

Two combined heat and power modules made by MTU Onsite Energy will generate energy for the Turkish textile maker Saray Hali. The turnkey CHP modules supplied by MTU Onsite Energy comprise Type 20V 4000 L63 gas engine, generator, heat module, steam boiler and electronics. Saray Hali has also taken out a maintenance contract with MTU Turkey for a period of ten years. The modules generate an electrical output of 2,145 kilowatts plus 1,210 kilowatts of heat recovered from the engine coolant and 1,150 of thermal energy from the exhaust. The electricity generated is fed into the local power grid, while the steam produced can be used in carpet production. Although the carpet factory is located 1,000 meters above sea level, where many engines are unable to develop their full power, MTU guarantees an efficiency level within the tolerances specified by the DIN standard. Another key factor in securing the contract was the outstanding availability and reliability of the CHP plants. They are operated in parallel but can also cover the factory’s electricity requirements in standalone mode if their is a mains outage.

Tough work at the quarry

From its 15 quarries, Central Stone produces upwards of 800,000 tons of limestone aggregate each year. The company crushes the limestone rock into aggregate of appropriate size using portable rock crushing plants powered by diesel powered generator sets. When one of the company’s portable rock crushing plants was recently upgraded and required more power, they turned to MTU Onsite Energy for a complete remote power solution. The 1.5 MW prime-rated generator set works ten and a half hours every day under extreme conditions. It is powered by an MTU 12V 4000, known for its durability, low fuel consumption and high load factor capabilities. The keys to the superior load acceptance and transient response are the engine’s Advanced Diesel Engine Control (ADEC) system and additional cylinder displacement per kW of output.
Power from 50 gas-based gensets

The Bavarian genset manufacturer Aggretech has ordered 50 gensets from Tognum based on gas engines. "With Aggretech as a major customer, we have succeeded in expanding the high-volume sales business in the gas-powered genset sector," said Christof von Brancconi, Tognum Executive Board member with responsibility for the Business Unit ‘Onsite Energy & Components’. "This order also allows us further access to attractive markets in Russia and Asia.” Aggretech is a global player in the construction of power plants in markets where 50 Hz power grids are in operation. The first ten gensets which Tognum is due to supply to Aggretech are earmarked for power and energy generation in Russia with other units going to Asia.

The gas-powered MTU Onsite Energy gensets which Tognum will supply to Aggretech are 20V 4000 L62 R units assembled in Augsburg and consisting of an engine and control system from MTU Onsite Energy together with a generator and base raft from Aggretech. After delivery, Aggretech will adapt the units to match the end users’ specific requirements. The scope of the order placed with Tognum is supplemented by a service concept tailored specifically to Aggretech’s needs. Each genset will deliver around 2 MW of electrical power and up to 2.6 MW of thermal energy.

Turbo service

Paper producer Stora Enso Sachsen GmbH has taken out a maintenance contract with MTU Onsite Energy for its gas-turbine plant covering 100,000 hours of duty. Based on annual operating time of 8,600 hours, the MTU_ValueCare maintenance contract will cover a term of around eleven years of service. MTU Onsite Energy engineers installed and handed over the plant at the end of 2009. Based on a Type LM 2500-RD gas turbine with an output of 32 megawatts, it produces electricity and heat and achieves an electrical efficiency of over 37 percent. "For us, the decisive factors in continuing to place our trust in MTU were our high level of satisfaction with the project handling, how well the cooperation worked and the flexibility offered in the design of the maintenance contract," states Ralph Wurlitzer, technical manager at Stora Enso Sachsen GmbH.

In brief:

tognum top again

For the third time in succession, Tognum has been voted “Top Employer Germany 2011” and “Top Engineering Employer 2011”. And that makes the company one of the most attractive employers in Germany. What is more, Tognum improved several places in the overall rankings in both categories compared with the previous year.

Sustainability research

Tognum AG and the Zeppelin University have concluded a cooperation agreement for developing a European center for sustainability research. The new center will scientifically examine questions relating to sustainability in the areas of climate, energy and water. The research center will be of national and international significance.

Silver award for MTU Report

We are delighted to reveal that MTU Report has been awarded the silver medal in the Industry/Energy/Pharmaceuticals category of the Best of Corporate Publishing (BCP) awards. The jury especially praised the magazine’s layout design and quality of content. The BCP Award is bestowed annually. With over 600 publications submitted, it is the largest corporate media competition in Europe.
Interview with British Navigator Dag Pike

Living life to the limit
A movie about the life of Dag Pike might well not get rave reviews – it could prove a little too fantastical and implausible for many audiences. But it is nevertheless a fact that the British navigator has been through situations which do not even come up in movies very often. He has been rescued from drowning at sea eleven times and, two years ago, he won the legendary “Round Britain” yacht race for the second time – at the proud old age of 75. 25 years ago, he crossed the Atlantic in the Virgin Atlantic Challenger II, a boat which was about as seaworthy as a Formula 1 car is roadworthy. In an interview with MTU Report, Dag Pike recalled his 5,500 kilometer record voyage from New York to the Scilly Isles. The self-styled “fastest grandfather in the world” explained why he was scared at the time, what points you have to watch in a boat like the Challenger II and whether or not he has actually now retired.

Dag Pike, 25 years ago, you crossed the Atlantic in the record time of 3 days, 8 hours and 31 minutes. What were the biggest challenges you faced at that time?
Well, we actually did two trips. We originally attempted it the year before but the boat sank just 120 miles from the finishing line. So the biggest challenge we had on the second trip was overcoming the fear that the same thing was going to happen to us again. It was not a nice thought when we set off from New York. I think noone said it, but we were all very frightened.

Can you describe the atmosphere on the boat at the time?
The voyage was really hard. During the crossing you have things to do and you just have to get on and do them. But this is in a boat that is moving all the time. The comfort level is very, very low and the pain is quite considerable when the boat is flying out of the water, landing again, banging and crashing the whole time. I still don’t understand how we managed to do it. It was total exhilaration and we were just so, so tired. We had to stay awake for three days and three nights. And then there was this enormous sense of relief when it was all over and we didn’t have to fight anymore.

What was the most exciting moment during the crossing?
There were quite a few exciting moments, I think. In the beginning we had to cross some very shallow water. It had not been surveyed for 30 years but we took the risk. I was the navigator and I knew our chances of finding our way through the narrow, shallow channels but it was still a nail-biting experience. But taking that shortcut across the shallow water saved us two hours. The most exciting and scary time was the second night when we were going through the icebergs off Newfoundland – in the dark and in thick fog. We could see the icebergs on the radar, but you don’t see all the small pieces of ice around the icebergs. It was both dangerous and exciting. Memories of the Titanic in the back of your mind. It was intense concentration. We went for 800 miles in thick fog, running on 50 knots. If we had got it wrong, it would have hurt a lot.

On that trip, you were in a boat belonging to the British entrepreneur Richard Branson. What points are especially important when you’re building a vessel for such a challenging voyage?
Reliability is absolutely vital. That’s why we had MTU engines, because we wanted something that could keep going for three days and three nights. If one engine had failed, the record would have been lost. Reliability is absolutely paramount. We had two Series 396 units on board, producing 1,442 kW. They were completely standard series-production engines which had to work under the toughest conditions. Everything depended on them. And, in fact, we did have a problem with one of the engines, but that was due to a fuel hitch at our second refuelling when the refuelling ship sent across a lot of water as well as the diesel. That was terrible, we were so depressed when that happened. We thought we would have to go back and try again later. We wasted 10 hours trying to get the water out of the fuel tanks and we thought there was no chance of the record after that. At that point, our plan was to give up and go back. But then we couldn’t turn back because there was a big storm behind us. So we thought: Let’s keep going, let’s get across the Atlantic. And that’s what we did. We made it by just two hours – that’s nothing at all.

« Reliability is absolutely vital. That’s why we had MTU engines. »
If one engine had failed, the record would have been lost.

What equipment did you have on board to help you plot the fastest and safest course to England?

We had land-based navigation systems which were not as precise as today’s satellite-based systems. It wasn't easy to do the navigation and we had to concentrate on the task all the time. Right at the finish, when we were only 20 miles away from the line, we hit a big thunderstorm with very heavy rain. We couldn't see anything on the radar and the thunderstorm upset all the navigation equipment because we were using electronic systems. Visibility was down to one mile and so, after 3,000 miles, we found ourselves running towards the rocks at 50 knots, unable to see anything and with little idea of where we were. It was that tense, right to the end. Then we finally saw the lighthouse just two miles away and I can tell you, as a navigator I was just so relieved to see that beacon.

If you had to build another vessel for a trip like this again, what would you do differently?

The boat was actually almost perfect. But if I was going to attempt the record, I would want to go in a boat that is much larger. Size does matter enormously on that kind of journey. A bigger boat gives you more fuel and more comfort. That small boat we had was 24 meters long. It was a tiny speck on a huge wide ocean and it felt incredibly small outside. I saw the boat last year – she is still sitting out of the water in Mallorca – and I thought “We couldn’t have crossed the Atlantic in that, it’s much too small!”

Which engine would you take?

The MTU engines we had then were fantastic. They ran and they ran and they ran. Apart from the water in the fuel, the engines kept going the whole time with no worries at all. Doing that journey convinced me how good MTU engines are. I think today it would be impossible to break the record without gas turbines. I did a study about five years ago on what type of boat we would build to break the record. We came up with a vessel that was 49 meters long with two gas turbines.

How many hours do you think you would be able to shave off the old record with the new boat?

With a new boat we could probably take five hours off the existing record. But everything depends on the weather. At that speed you must have good weather. That was my job also, to organize the weather; I was pretty good at praying! I studied all the weather reports and forecasts, and then I simply had to make a decision.

And after your success, you didn’t stop breaking records. You were fastest on the London – Monte Carlo route, you set a record for circumnavigating Ireland and you’ve won the legendary ‘Round Britain’ twice. You recently described yourself as the fastest grandfather in the world. Have you now finally stopped hunting for records or do you still have ambitions?

It was two years ago and they had a race around Britain. I was asked to be the navigator on that race. I was 75 years old at the time and I thought I was too old. I wasn’t sure I wanted to do it. But I did join them. I went on the race and we won. I was quite pleased about that. I think my grandchildren were quite proud of me too.

And if you were invited a third time – would you go again?

No. I say no in public, but I’m not sure – it depends.

You are widely recognized as one of the world’s greatest navigators. A deliberately provocative question: Who needs a navigator in the age of GPS?

That’s why I retired! But you still have to navigate ships. You have to look out for other ships and you have to negotiate the weather. Modern navigation devices can tell you reliably where you are at a given moment, but they won’t tell you what the safest course is and what the weather is like on the way. You have to make the decisions yourself about what is safe and what is the right thing to do. Even with GPS today, over the last 10 years there has been a 100% increase in shipping casualties. That shows you how dangerous it can still be, unless you understand navigation.

Finally, a rather personal question: You have been rescued a total of eleven times at sea. Do you know the meaning of the word ‘fear’?

Yes, and I have been scared many times. But a lot of the things I was doing had never been done before. Nobody had ever tried to cross the Atlantic in a small boat like that. When you undertake these projects, you don’t know where the limits are until you find them. And sometimes you go beyond the limits and the boat can be wrecked. It’s all about finding the limits and hopefully you know where the limit is before the boat crashes or sinks. But there is no one who can tell you how far you can go. That’s how progress is made. I have been rescued many times, but I am still here – that’s what is important.

INTERVIEW: Lucie Dammann
PICTURES: Dag Pike, Tognum Corporate Archive

To find out more, contact:
Bruce Phillips
bruce.phillips@mtu-online.com
Tel. +44 1342 335-459
1 When Pike and his crew arrived at the Scilly Isles on Sunday, 29. June 1986, they were greeted by wildly cheering crowds.

2 “I just can’t tell you how glad we were to sight Bishop’s Rock lighthouse;” recounted Pike during the interview. That was when the crew finally knew they had made it.

3 The British navigator continued to take part in extreme races after his Atlantic crossing. At the age of 75, he won the 'Round Britain' race for the second time.
The perfect landing craft has to be fast, it has to deliver a high payload and it must be able to beach even where other vessels would run aground. To meet all these demands, provider of technology-based solutions QinetiQ, has developed its PACSCAT (Partial Air-Cushion Supported CATamaran) landing craft concept for the UK Ministry of Defence.

Moored in the harbor with the water lapping around its 30 x 8-meter hull, the vessel looks like nothing more than a rectangular brown and black box. Then the engines start up. The sonorous growl of the two 16-cylinder MTU engines swells and the box begins to move, gliding slowly out of the placid harbor. Then, as soon as it reaches open water, it accelerates and unfolds its full potential. Despite the characteristic catamaran contours, the faster it moves, the more it becomes obvious that this is no normal catamaran. The vessel rises out of the water on air cushions because this is a semi-hover, catamaran landing craft. The idea is based on a concept developed
Marine

The Royal Marines put the PACSCAT landing craft through its paces in trials on the North Devon coast.

by John Lewthwaite who was actually looking for ways to enable inland waterways vessels to carry higher payloads whilst also travelling at higher speeds. QinetiQ has now made use of the concept to produce a special landing craft, the PACSCAT, for the British MoD.

Landing craft are military transport vessels. They take vehicles and personnel on board from a larger ship at sea and transport them ashore – and they have hardly changed in appearance since the Second World War. Their task of carrying extremely heavy cargo means that up to now, they have been comparatively slow, reaching only eight knots (around 15kpm) on average, and have had limited maneuvering capabilities. All that is now set to change in response to the UK Ministry of Defence's new requirements: the vessel must be faster and more maneuverable than previous landing craft but must still be able to deliver heavy payloads. In addition, it has to be very stable when beached to enable personnel to load and unload it safely.

« MTU engines deliver the best power-to-weight ratio. That is vital in a project like this where every kilo counts, »

Chris Ross, Chief Naval Architect at QinetiQ.
QinetiQ selected extremely experienced partners for the project: Griffon Hoverwork for construction, BMT Nigel Gee for design and BMT Marine Projects for project management support and together they planned, developed and built the new hovercraft-catamaran. The extensive cargo bay can accommodate five amphibious vehicles, a tank or troops. The craft is propelled by twin waterjets powered by two 16-cylinder, Series 4000 high-speed diesels from MTU. Two further engines inflate the hover cushions which allow the vessel to achieve even higher speeds whilst the catamaran hull design lends the PACSCAT the stability it needs on shore. At least, that is how it works in theory.

Faster than expected

After three years of planning and construction, the project moved into its practical phase in fall 2010, initially at its home port of Instow (England) and then in Scotland. After only a few hours afloat, R&D personnel began to realize just what the hovercraft landing craft was capable of. It mastered the first 100 hours and the speed trials with no problems, and it was fast – so fast that it reached almost 40 knots (74 kph) unladen. The powerful MTU engines actually propel the PACSCAT whilst the inflated air cushion allows it to achieve its top speeds by lifting the hull in the water and reducing drag. "MTU engines deliver the best power-to-weight ratio. That is vital in a project like this where every kilo counts," explained Chris Ross, Chief Naval Architect at QinetiQ. In addition to the 2,720 kW of power which the MTU engines generate, they have the extra benefits of robustness and reliability, essential features when the task involves getting soldiers and vehicles out of the danger zone as fast as possible.

Training with the Royal Marines

Following the speed trials in England, tests continue off the Scottish coast – this time on duty with the Royal Marines. The PACSCAT is given the task of taking cargos of different weights on board and transporting them. The trials start on the beach where its twin hulls give the craft stability in the shallow water. One after the other, five amphibious vehicles roll slowly off the beach into the water and toward the landing craft. Half-submerged and with their headlights still just visible, the vehicles float through the water like crocodiles until they slowly begin to creep up the PACSCAT ramp onto the craft. With all five on board, the flap closes and the vessel casts off. The waves swell, forming a barrier against the catamaran, but present no appreciable problem for the vessel, especially not after the air cushions are inflated. That means the second task has been mastered: the PACSCAT is not only fast, it can also transport heavy payloads.
The third task is tricky. The PACSCAT has to be transported in a dock landing ship from which it has to disembark in open seas carrying a payload. Dock landing ships transport troops and equipment to theatres of action but can only dock in a harbor, not on a beach. The job of transporting people and cargo onto unprepared terrain falls to PACSCAT. The ship’s floating dock is open, waiting for the catamaran which advances slowly into the vessel – this is, after all, the first time it has attempted to enter a larger vessel. Then it docks, takes its cargo on board and leaves the other vessel’s hull again. Mission accomplished without difficulty once more. “The trials went off very successfully for us. The PACSCAT was able to demonstrate what it can do with the air-cushion support and the catamaran hulls and it showed where its limits lie. We are really proud of our landing craft,” said Chris Ross enthusiastically at the conclusion of the Scottish trials. 

A really successful marathon program of trials. The Royal Marines and the vessel’s manufacturer QinetiQ are both well satisfied: “This technology demonstrator will allow us to arouse interest in the defence and commercial sectors alike,” commented Ross. So far, the PACSCAT has not advanced beyond the trials version but there is great optimism that the vessel will herald a new generation of landing craft. It has effectively demonstrated what it is capable of achieving and has shown that far from being just an oversized box, it represents real change in the world of landing craft. Chris Ross is certain: “This vessel can meet the toughest requirements.”

The acid test
But the PACSCAT’s trials are not yet completely over. Now at Plymouth, England, a final tough test still remains to be mastered: the landing craft has to transport a main battle tank, a 62-ton, olive-green monster, the Challenger II. This is the heaviest load that the craft has yet had to carry and it is a real gamble. But here, too, the PACSCAT displays no sign of weakness and moves apparently effortlessly through the English Channel with the colossus on board.
The European Union is using a Series 4000 engine as an emissions oracle. The CleanER-D research project aims to develop recommendations for future emission legislation phases.
Is further improvement possible? Can engines be made even cleaner? That is the subject exercising the minds of experts. The next and, as things stand, the final phase of European Union emissions legislation for limiting the levels of nitrogen oxides and diesel particulates produced by rail engines is due to come into force in 2012. But what will happen after that? We can assume the limits will be tightened still further. But by how much? The “CleanER-D” (Clean European Rail-Diesel) research project financed by the European Union aims to produce recommendations in that regard. Together with Deutsche Bahn, MTU is involved in a CleanER-D subproject called “Lightweight Demonstration”. It involves fitting a Class 225 freight locomotive with a highly advanced MTU Series 4000 engine. It will start circulating on Germany’s rail network in the fall and so provide clues as to future developments in emissions requirements.

Slowly, as if wanting to spin out this special moment a little longer, the crane lowers the engine down. Another three, two and then only one meter for the blue twelve-cylinder to descend as it hovers above the locomotive in a shed at the DB repair depot in Bremen. Then it disappears inside. A truly special moment and a milestone in the CleanER-D project.

Where a 1971-vintage MTU engine previously provided the power, a sparkling new twelve-cylinder MTU Series 4000 unit capable of 1,600 kilowatts now resides. By no means just any engine, because the MTU power unit is ahead of its time. It is the first rail engine in the world to meet the European Stage 3B emission restrictions, which do not become compulsory until 2012. But not only is the engine itself the future, the railways are using it to see further into what lies in store for train makers after 2012.

No need for SCR

So that the emissions produced by the engine are as low as possible, the MTU developers have utilized every inch of available scope. A major contribution is made by the cooled exhaust recirculation system. A proportion of the exhaust is first cooled and then fed back into the fresh supply of intake air. That reduces the combustion temperature so that less nitrogen oxide is produced. Closely associated with it is the regulated two-stage turbocharging system incorporating three MTU turbochargers. It ensures that the engine is always supplied with ample fresh intake air even at high exhaust recirculation rates. Thanks to those technologies, the new Series 4000 only emits 3.5 grams of nitrogen oxides per kilowatt-hour. Consequently, an SCR catalytic converter – which chemically renders such emissions harmless – is not required. “And we still have room for higher rates,” reveals Dr. Dirk Bergmann, the man in charge of pilot development at MTU. That is because, up to now, only a quarter of the exhaust is recirculated through the engine, but it would be pos-
MTU and Deutsche Bahn are to get together to test an engine in a Type 225 freight locomotive. The test findings are to be used to provide the EU with recommendations regarding future emissions stages for rail applications.

sible to increase that figure to 50 percent. “In that way we can further reduce nitrogen oxide emission,” Bergmann states with certainty.

Injection at 2,200 bar for sootless combustion
To keep the soot particulate emissions as low as possible, the developers also increased the injection pressure of the common-rail system. The fuel now squirts into the combustion chambers at 2,200 bar instead of “only” 1,800 bar. That may sound like just another number but it is actually a major milestone in fuel injection technology. So that the system can operate at such high pressures, the individual components have to fit together with micrometer accuracy. For the same reason, the engine designers have also halved the weight of the pilot valve, which controls injection by the injector. And their efforts have been worthwhile. As a result of the higher injection pressure, the fuel now burns even more cleanly and almost no particulate matter is produced. But to prevent even those last few particles escaping into the atmosphere, they are trapped by a diesel particulate filter. The filter also acts as an exhaust silencer and so saves space by taking the place of the silencer. As the soot levels produced by combustion are already so low, the filter can be regenerated passively, in other words during normal engine operation without the need for an additional heat source. Only when it is exceptionally cold or the locomotive is working at very low speeds over a long period does the exhaust temperature have to be raised to clean the filter.

Powerline simplifies retrofitting
But where is the filter in the locomotive? So far, only the engine is evident inside the red locomotive body. Is it so small as to be hardly noticeable? “No,” laughs a railway worker who is just fixing the engine subframe to the base plate inside the locomotive with a ratchet, “we don’t fit that until later; the engine has to be in properly first.” Having offered enlightenment, he returns immediately to the task in hand. Thanks to the MTU Powerline automation system, it is a simple matter integrating the engine in the 40-year-old locomotive. The system’s standardized interfaces enable straightforward connection of the engine to the existing train control system. A DC-DC convertor installed in the MTU switchgear cabinet converts the 110-volt supply available in the locomotive to the 24-volt rating required by the electronic components. The CaPoS starting system (Capacitor Power System) also allows the use of much smaller batteries. It replaces the starter battery set and, unlike the starter batte-ries, is not filled with acid, but works on the basis of capacitors.

Real conditions test for goods loco
The refitted locomotive is due on the track in July. And it will be fully integrated in the absolutely normal freight services: “There are no special concessions, even if the loco is something special. It has to show what it can do in everyday operating conditions.”

A glimpse of the future for emissions technology
From the results of this trial, a study will be produced next year. Its purpose is to provide the European Union with recommendations for what a possible Stage 4 emission legislation phase might look like. MTU pilot development manager Dirk Bergmann is certain that, “The limits will be tightened.” As far as soot particulates are concerned, however, he sees little scope for further reducing the mass emitted, because the levels are already nearly undetectable on engines that meet the requirements applicable from 2012. “There is still some scope with the nitrogen oxides, however,” he optimistically observes. He is reluctant to talk about precise figures at this stage. But he is more definite about the technological possibilities for reducing nitrogen oxide emis-
“The technology is advancing at a startling rate; we can continue developing our present technologies so that our engines produce substantially lower levels of nitrogen oxides during combustion than before right up to 2020,” the developer predicts. Nevertheless, he hopes that the authorities will provide assistance for the end users to make the necessary investments. “Trucking companies pay lower highway usage levies if they fit their vehicles with more eco-friendly engines, and there should be similar incentives on the railways,” Bergmann believes. And he adds that, “Politicians, industry and operators have to work together to find a solution that everyone can support. We have to find the middle ground between what makes sense for the environment and what is economically viable. For the future of the railways.”

Words: Lucie Dammann
Pictures: Michael Bahlo

To find out more, contact:
Dr. Dirk Bergmann
dirk.bergmann@mtu-online.com
Tel. +49 7541 90-2904

www.cleaner-d.eu

1 Deutsche Bahn workers at the DB repair depot in Bremen fitted the engine in the locomotive.
2 Where there used to be a 40-year-old engine there is now a new power unit that meets the EU 3B emission standard. The diesel particulate filter takes the place of the exhaust silencer so that the overall system requires no more space than before.
3 As well as by the diesel particulate filter, minimal emission levels are assured by injection pressures of 2,200 bar, cooled exhaust recirculation and two-stage controlled turbocharging.
Shuttle to paradise
Is there a better job than transporting people to paradise? Certainly not for captain Simon Say from Singapore. He ferries his passengers to the Bintan Resorts and proudly boasts never to have cancelled a crossing for the past 16 years. To make sure that record is maintained, his company has now taken out a Value Care maintenance contract for the engines of its two newest catamarans. It will provide for reliable cover combined with predictable costs.
It’s 9.30 am on a Friday morning – and the Sathish family is ready to board the ferry to Bintan for the very first time. The kids are running around excitedly as Mrs Gagi Sathish keeps a watchful eye from afar. “I’ve heard from friends and family that it’s a really nice place”, she says, as she calls for them to approach. Sachin and Shakthi, 10 and 5 years old respectively, run towards their mother, speaking excitedly of the activities they will be embarking on at Bintan. “I’m going to go swimming and do all kinds of water sports for two days!” declares Sachin, whilst pestering his mother to show off his new toys purchased specially for the trip. Amidst the excited chatter and laughter rising in the air, it is clear that their weekend will be focused on enjoying authentic Indonesian cuisine, water activities, jungle trekking, heritage tours and other exciting plans.

**Singapore to Bintan: Less than an hour to Paradise**

Bintan, an island in the Riau archipelago of Indonesia, houses a population of about 200,000 people with an exotic mix of cultures like Malay, Bugis, Chinese and the Orang Laut (sea people). This island acts as a major domestic seaport for the Riau Islands and is a port of call for shipping companies today. Spanning a land area of 1,140 square kilometres, this island is a little piece of paradise that is also home to nature’s deep tropical forests, a paradise of water sports and an idyllic weekend destination. With sunny blue skies and warm weather averaging 26 degree Celsius all year around, Bintan island is the perfect weekend getaway for families and couples, providing a restful break from city life.

**Compact and powerful engines**

For anyone who doesn’t want to pay the cost of an air ticket, the journey to the island starts on board a ferry operated by Bintan Resort Ferries, which was established in 1994. In a shade under an hour, the high-speed catamarans convey the holidaymakers from Singapore to Bintan. “For Bintan Resort Ferries or any ferry operator, the main thing is having the right machinery parts. The main engine is the heart of the vessel and must be able to perform”, says Mr Kan Yew Fai, Operations Manager, Bintan Resort Ferries. With such high payload vessels, machinery space is a key constraint – hence, small but powerful engines are necessary to transfer the optimum number of passengers to their destination quickly and safely. The four MTU Type 16V 2000 M72 propulsion units can propel each of the ferries at speeds up to 40 knots. Nevertheless, the craft rarely exceed 30 knots as that keeps the crossing more comfortable for the passengers.

« MTU engines are safe; you’ve never heard of anything going wrong in the industry. » Simon Say, Captain Bintan Resort Ferries
“MTU engines are safe and reliable”

It is shortly before 11 a.m. Before the first passengers board his ship, Captain Simon Say completes his routine inspection of the decks. All equipment is set up, the vessel is clean, and he starts the engines and checks navigational systems. The kiosk is ready, where attendants are busy warming delicious hotdogs and pies for passengers, and coffee and tea is ready to be served in Emerald Class, the premium class and latest signature effort to enhance passengers’ travel experience between Singapore and Bintan Resorts. The ten crew on board the vessel are ready with a full load of passengers, the captain clears the passengers manifest and ensures all documentation is in place. “Like any other business, safety in the maritime industry is a key priority”, he says, adding that, “MTU engines are safe; you’ve never heard of anything going wrong in the industry”. He has been sailor for 18 years and can’t imagine a more enjoyable job.

Bintan Resort Ferries typically operate five to six daily trips between Bintan Island and Singapore, ferrying 333,309 passengers last year. “Our reputation is built on the fact that over the past 16 years, we have never cancelled a single ferry trip”, Mr Kan Yew Fai adds. In 2011, their total combined uptime was well over 85% percent, an impressive feat in today’s challenging maritime environment. In the ferry industry, higher level of availability equates higher sales revenue.

1 Four MTU Series 2000 engines power the catamaran on its voyage to paradise. An MTU_Value Care maintenance contract guarantees the highest possible availability.

2 The longer the catamarans are available to the operator, the higher are his revenues.
Operations Manager Kan Yew Fai is particularly impressed by the power of the MTU engines which can take his vessels up to a top speed of 40 knots.

Paradise in miniature: The Bintan Islands are less than an hour’s ferry trip from Singapore and provide a holiday destination for many who are eager to escape the city.

**What we need is effective maintenance support.** Kan Yew Fai, operations manager Bintan Resort Ferries

**Maintenance contract increases availability**
And with high passenger numbers, he needs a team that focuses on preventive maintenance so that engine component failures don’t happen in the first place. With safety as their top priority, they currently invest in a MTU ValueCare maintenance contract, ensuring that their latest 2 state-of-the-art catamaran ferries each powered by four MTU 16V 2000 M72 engines are available for uninterrupted service, 365 days per year. For the next 10,000 hours or 5 years of operation, the ferry operator can expect trouble-free operation from his engines, ensuring safety and peace of mind for all crew and passengers. And if ever necessary for technical reasons, newer versions of the genuine spare parts are fitted for optimum support. Servicing by original engine manufacturers is crucial; as it increases the value of the ships should they be resold at a later date. Mr Davis Ong, Senior Manager Aftersales, Tognum Asia recounts early days of working with Bintan Resort Ferries, and providing ad hoc services for repair and maintenance, before customising an after sales contract that was best suited to their needs. “We believe in providing genuine parts and support – we do it once and do it right. Customers are assured of the lowest downtime from us”, he says confidently. Another special feature is the Remote Service system. It allows MTU Asia technicians to monitor engine data remotely. The information is stored in a small silver box in the ship’s engine room and transmitted to the MTU server via the mobile phone network. If the MTU staff detect problems on an engine, they can respond immediately. Minor servicing operations on the engines are carried out by the Bintan Resort Ferries mechanics themselves; they have been trained by MTU especially for the task.

Maximum cost certainty while ensuring the optimum level of maintenance for MTU engines, safeguarding their long-term operation, performance and value is highly prized. “The comprehensive preventive and corrective maintenance and repair package agreed by Bintan Resort ferries and MTU in Asia includes a fixed hourly rate. This is the first time a ferry customer in Asia has chosen this kind of after sales arrangement,” said Mr. Davis Ong, Tognum Asia.
The islands in the South China Sea offer numerous hotels where holidaymakers can enjoy their vacation.

11.10 am: Captain calls, and we’re ready to go
All of a sudden, the UHF radio crackles and captain Say announces: “East Control, Wan Seri Beni, departing Tanah Merah Ferry Terminal to Bandar Bentan Telani Ferry Terminal, 200 passengers and ten crew on board”, says Captain Say through the VHF (Very High Frequency) radio. With this level of care before every journey, it is no surprise that safety is his utmost priority. “As captain, you are the master or father figure of the ship; you need to take care of safety, security, engineering, and other marine elements. It’s not as easy as it looks”, he says.

The ship departs on time at 11:10 a.m. In bright sunshine under a clear blue sky, it crosses the China Sea at 30 knots while the passengers relax and enjoy the trip. All around there are happy faces as the holidaymakers look forward to a few perfect days in paradise.

On the way, operations manager Kan Yew Fai tells of his cooperation with MTU Asia. “Our aim is the same – we cannot afford any downtime, what we need is effective maintenance support,” says Mr Kan Yew Fai. He considers this an effective working friendship, and it’s easy to see. Conversation flows easily. And when it comes to business, Tognum Asia is responsive and quick on corrective and preventive actions. “They implement upgrading performance measures by replacing new improved spares automatically, troubleshoot and tell you what’s wrong and even suggest more cost effective alternatives”, he exclaims – a rarity in today’s challenging business environment.

Bintan Resorts Ferries’ Chief Engineer, Mr See Ngiap Seng agrees. “Tognum Asia provides good quality of work – it’s very easy to get spare parts and extremely convenient for ferry operators.” As the head of mechanical issues, he explains how it is crucial to keep ferries moving and maintain maximum ticket sales. He explains how these 16V 2000 M72 engines on 2 of their latest vessels use a common rail technology, which results in higher power and fuel efficiency allowing passengers to arrive at their destination safely and comfortably. Fuel efficiency is important in today’s volatile energy price environment as one of the key concerns for ferry operators is fuel cost, which makes up more than 80 percent of its entire operational costs.

Less than an hour after leaving Singapore, the ferry docks on Bintan Island. The passengers disembark excitedly. Ahead of them are several days or weeks in an island paradise in the South China Sea. The destination for the Sathish family is the Nirvana Gardens Resort, one of the island’s four holiday resorts. It is an aptly chosen name as nirvana translates as “perfect happiness”.

Words: Emilyn Ang, Burson-Marsteller
Pictures: Black Box Photography

To find out more, contact:
Davis Ong
davis.ong@mtu-online.com
Tel. + 65 6860-9753
Biogas booming in Italy
Tutto di Parma

“There is no better ham in the world than our prosciutto di Parma.” Gianni Giovanelli isn’t just saying that, he is convinced of it. He welcomes his customers at the Salumeria Rosi in the northern Italian city of Parma with a beaming smile. His shop has a mild and pleasant smell; it is a feel-good place. Gianni Giovanelli lives for ham, and pigs are the best animals in the world in his eyes. But does he know that they are not only the source of his ham but also valuable energy suppliers?

Food of life; Gianni Viovanelli has been selling Parma ham at the Salumeria Rosi for 24 years.
A one-ham man. That might not sound quite fair on Gianni Giovanelli. But actually it is. Gianni Giovanelli lives for ham – to be more precise, for the pale pink, shiny, mildly spicy tasting prosciutto di Parma. He has been selling the northern Italian specialty in the Salumeria Rosi for 24 years. The shop and restaurant in the lively Via Farini in the center of Parma is a magnet for the town’s food connoisseurs. Parma has not only given its name to the famous local ham. Barilla pasta is also made here and – as the perfect complement – the much loved parmesan cheese too.

Carefully and with a smile on his face, he places the gossamer-thin slices he has just cut on the ham slicer onto a plastic sheet. Gianni Giovanelli loves his job – that is plainly obvious just from looking at him. “This here is my life,” he admits. Though he sees himself as much more than a purveyor of fine hams. “Maybe I should call myself a doctor,” he observes with a mischievous grin. He explains that he feels like a doctor advising his customers and showing them how to eat healthily. And his customers trust him. So much so that one of them even called from his holiday in New York for some advice on which ham to buy. Unsurprisingly, Gianni recommended Parma ham – it was the best in the world, after all. And more importantly, “It tastes the same all over the world,” Gianni points out. Regardless of whether you buy it in Parma itself or in New York. That is because the pigs from which the ham is made are all exclusively from the Po region of Italy. There, on the northern Italian plain known especially for its fine wines, they are bred and farmed in a very special way.

“Special diet
How exactly they are kept can be seen in Moscazzano in the northern Italian province of Cremona. About an hour’s drive from Parma, it is where Pietro Beresago lives with his wife, their two children – and their pigs. When you drive into his farmyard, you are certainly not reminded of ham. No, there is none of that delicately spicy and mild aroma of the Salumeria Rosi here. On the contrary – the olfactory organs are assaulted. You are greeted by thousands of flies buzzing around the yard. Here in Moscazzano is where pigs are reared. Two thousand of them. Only a few of them are pink like the picture-book piggies. The majority of these are more a sort of brown with pink patches. They stand crammed close together in a pen inside a gigantic shed. It is dark and noisy.

“We treat our pigs well,” Pietro Beresago states. Though they don’t actually belong to him. Pietro gets his pigs from a breeder when they are two to three months old. He rears them until they weigh 200 kilograms. Then the breeder comes and takes them away in a big truck to be sold. While they are in his charge, Pietro’s main job is to feed the animals and make sure they all eat enough. He feeds them exclusively on, maize, grain, water and milk powder. They are not allowed to eat anything else if their meaty rumps are ever to be turned into the famous Parma ham. To find out how heavy the pigs are, Pietro doesn’t even have to weigh them. “Their feeding is computer-controlled. That means we always know exactly how much the pigs have eaten and can calculate their weight,” he relates. But he also has to check that each pig actually eats what the computer has allocated it. Every farmer’s dream? “No,” reveals Pietro. And his eyes begin to light up when he recounts how he dreams of one day driving over the fields in a tractor again – as he once did when his farm wasn’t so big.

10,000 liters of milk from 500 cows
Giovanni Bertoni has already achieved his dream. He lives a few kilometers away in the small village of Sospiro and owns a 300-year-old estate. It is a property any restorer would lick their lips over. Over 50 rooms with murals and decorations more like a church than a farmhouse. He has already had three of them restored and wants to move in here soon with his wife. The dream life? “Si!” is his decisive response and he quietly tags on another three “Si’s in confirmation. Here he is living his dream.
2,000 pigs live on Pietro and Andrea Beresago’s farm. When they weigh 200 kilograms, it is time for their hind quarters to be made into Parma ham.

As well as slurry, maize and glycerin is fed into the digester tank as well. There, the mixture ferments to form biogas for fueling the combined heat and power plant supplied by MTU Onsite Energy.
So far, however only 500 of his cows are accommodated on this estate. They produce 10,000 liters of milk a day – for the creamy milk foam on the latte macchiato that greets you with its rich aroma at morning breakfast. But Giovanni Bertoni has to work hard for those 10,000 liters. The cows have to be milked and fed twice a day, the cowsheds cleaned out and the farm maintained. Too much for Giovanni on his own. Not only does he have three farm hands, his two sons Sirio and Simone work here too. “Not entirely willingly to begin with,” Sirio relates. He wanted to be a rugby player and didn’t have much affinity with life on the farm. But that has now changed. “I like the life with the animals and nature more and more,” the son reveals. And with a glint in his eye, he adds, “And every now and then you can get a day off. If you organize things properly.”

**Biogas pioneers**

Pig farmer Pietro no longer runs his farm alone either. His son Andrea works for him. Together, they have expanded the business enormously in recent years. “We started with 18 cows and two pigs; now we only have pigs because we earn more money from them.” Father and son are proud of one thing in particular. They were the first farmers in the region of Cremona to install a biogas plant. That was three years ago. Since then, they have been generating a constant 250 kilowatts of electrical energy using an MTU Onsite Energy Series 400 engine. They feed the electricity into the national power grid. The Italian government pays them 28 cents a kilowatt-hour – more than any other country on Earth. And with the heat recovered from the engine, they produce hot water for heating the pig pens in the winter. The biogas is made just a few meters away from the pens. In a large, green digester tank, maize slurry and glycerine is fermented.

The local government of the province of Lombardy backed the farmers’ courage in making the investment by paying the interest on a loan of one million euro. Pietro and his son aim to have completely repaid the loan in ten years’ time. Meanwhile however, they have already taken out a second loan, because a few months ago they started up a second biogas plant driven by a twelve-cylinder MTU Onsite Energy engine. The new plant also produces 250 kilowatts of electrical output. The advantage is that if one of the plants fails, the other can be stepped up to 370 kilowatts output. Consequently, the potential risks of failure are low because none of the valuable biogas is lost.
High tech on the farm
The biogas plants have also changed the nature of their work. It is no longer just a matter of growing the food for the pigs and rearing them. They now also grow maize for producing biogas. The slurry from the pigs is now used not only as fertilizer on the fields but also in biogas production. Filling the digesters with maize, slurry and glycerine, measuring the temperature in the digester tanks and checking the engine data have all become an established part of their daily routine. Even though the farmstead with its gray brick buildings might not look like it from the outside, this place is full of high-tech kit. And Pietro and Andrea are more like firemen than farmers. “Most of it actually runs automatically. We only have to react if something is wrong,” Andrea relates. If they are worried about the figures from the biogas plant, they call their customer service engineer at MTU Italia. Alessandro Maiocchi can check the engine data, alter settings or send servicing instructions remotely via a special data link. “Working with Alessandro has been fantastic. He knows the system really well and has already given us lots of good tips,” Pietro enthuses.

Biogas completes the cycle
The Bertoni family has also installed an MTU Onsite Energy biogas plant on its estate. It produces 250 kilowatts of electrical output, which is fed into the national power grid. With the recovered heat from the engines, they clean out the cowsheds and warm the drinking water for the cows in the winter. “I want to be self-sufficient on my farm and also establish a complete cycle. Everything that is produced on my farm should be recycled,” Giovanni explains. For him, that includes the dung from his animals. He shovels ten cubic meters of it into the digester every day. To be able to grow enough maize for biogas production, he has bought extra land – he now runs 125 hectares. And there is more to come because the Bertoni family want to expand their farm. At present, they are building a new shed for 150 cows; and with more cows they aim to produce more biogas. “The power output of the MTU Onsite Energy engine is 370 kilowatts. We want to make full use of that,” his son Sirio elucidates.

A new calf is born on his farm almost every day. So he is often called upon to be a midwife too. His wife gives every calf a name because the Bertoni family are close to their cows. Giovanni Bertoni proudly shows off his bull, Cuzulo. He was born prematurely and, as a bull, would normally have been sold because he provides no milk. But his wife took him to her heart and reared him on a bottle. Since then he has always had special treatment – he has his very own pen as the only bull in the herd and watches over the cows.

“No room for sentimentality”
Pietro Bertesago has no such stories from his pig farm. In the past, when he used to breed pigs himself, his relationship with the animals was closer. But today they are on his farm for hardly any longer than six months – no time to establish a relationship. “There is no room for sentimentality here,” he observes while looking over the 800 pigs that are housed and reared in one building to ultimately end up as Parma ham on the counter of Gianni Giovanelli’s shop. As soon as he moves towards them, the timid animals run away. Only the flies are brazen and swarm around him in an instant. They appear untroubled by the acrid smell in the pig pens. When he talks about the future of his farm, Pietro becomes thoughtful. No, there was no future in pig farming, he was sure of that. You couldn’t make much money from it any longer. But he would nevertheless like to keep the pigs on his farm “for as long as possible” he says with conviction. But the future, that was somewhere else. “The future is in biogas,” father and son agree.
The aim of the Bertoni family is to use their biogas plant to process all the waste products generated on their estate. Slurry from the cows, for example, is used to produce biogas. The biogas powers an engine which generates 250 kilowatts of electrical power in a cogeneration power plant. The family uses waste heat from the engine to heat up their water.

500 cows live on the Bertoni estate. 250 of them are dairy cows producing a total of 10,000 liters of milk – daily.

120 to 1,560 kilowatts: The power range of MTU Onsite Energy biogas plants

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<th>Plant designation</th>
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<td>GR 1560 B5</td>
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At 2:00 pm on 30th October the noise levels in India will dramatically increase. That is when the first ever Formula 1 Grand Prix in the country’s history will take place. Racing cars with a combined power output of nearly 17,000 bhp will then be fighting it out on the Buddh International Circuit. Alongside the race track, MTU genset engines with even more horsepower will be making sure that everything runs smoothly. The new circuit was designed and built by German track designer Hermann Tilke. He is a former racing driver himself and is now right at the heart of the Formula 1 organization.

Sometimes it’s a good thing that you can’t plan everything in life. Otherwise, Hermann Tilke would not have become what he is today – an architect and developer of complete Formula 1 racing circuits and facilities. And not just any track designer, one of the world’s most famous. He has already made 50 of them, including the Formula 1 tracks in Malaysia, Bahrain, Shanghai, Istanbul, South Korea and Abu Dhabi. And when the first ever Indian Grand Prix takes place on 30th October 2011, the cars will once again be lapping a circuit designed by Hermann Tilke.

Suddenly an expert
"It was pure chance that it got to this point," he says today. Hermann Tilke was a racing driver himself. He never competed in Formula 1 but raced in touring car and endurance events. On the side, he studied engineering. He got his first permanent job in his mid-twenties. Hermann Tilke wanted to be both – racing driver and engineer. But the two things were difficult to combine because the racing was too time-consuming. So he resigned from his job stating “too little time off” as the reason and decided to go freelance. "It was the only solution, because from then on I was my own boss and could allow myself time off when I had to travel to races." His aim was to plan racing circuits – because he knew his way around them. And it wasn’t long before the first commission arrived. He redesigned a small escape lane on the Nürburgring for a fee of 600 Deutsche Mark. It turned out quite well, and so more work followed. “All of a sudden people were saying I was an expert,” he recounts, as if he still couldn’t quite believe it today. The first big circuits he designed were the A1 Ring in Austria and the Sachsenring in Germany. They were followed by the Sepang International Circuit in Malaysia. “That’s a great circuit – it was the first one where we set standards,” he relates. And not only the circuit was his creation, he also planned and built the whole surrounding infrastructure – the pit lane, the stands, the hotels and the access roads. He doesn’t do the job on his own any more – his engineering consultancy now employs over 300 people and has offices in Aachen, Berlin, Abu Dhabi and Bahrain.
Hermann Tilke is famous as an architect and developer of racing circuits all over the world, including among Formula 1 drivers.

He knows how good a circuit has to be from his own experience: he was a racing driver himself for many years. Not in Formula 1 but in touring car and endurance events. Together with his co-driver Dirk Adorf he won a number of races in 2003 and 2004. He started designing and building circuits while he was still actively racing.
Hermann Tilke and his colleague Peter Wahl designed not only the circuit in India but also the pit lane garages, the main stand, the media centre, the medical centre, the team buildings, the administration offices and the service area.

The circuit in India is 5.14 kilometers long and allows drivers to achieve average speeds of 210 kilometers per hour. Some of the corners can be taken at 250 kph.
The driver who wins is bound to like the circuit. Those who do badly will often criticize it.

Hermann Tilke, circuit designer

More than 18,000 hp trackside
The next of his racing circuits to be opened will be the Buddh International Circuit in India. He designed and built it together with his colleague Peter Wahl. At this moment it is still under construction, so he hasn’t been able to drive round it himself yet. But he is confident it will be ready just in time. “Last minute again.” That is the way it always is. But so far it has always worked out. And in some kind of way, that is the attraction for him. “We can’t manage lengthy testing – for us the premiere is simultaneously the dress rehearsal,” he grins. There is plenty that can go wrong. At the Malaysian Grand Prix, the drainpipes above the room overflowed during the opening press conference attended by the prime minister. The weight of the water eventually caused the ceiling to collapse. “Luckily not before the last journalist had left,” Tilke recalls. The power supply is frequently an issue as well. In India there are six gensets driven by MTU Series 4000 engines for the job. There is actually a public power grid cable running near to the circuit, but it doesn’t supply enough electricity reliably enough according to Tilke. So four gensets driven by 20-cylinder MTU Series 4000 engines each delivering 2.4 megawatts cover the base load demand, while two smaller units with 12-cylinder engines can be brought in as required. The biggest power consumers on the site are the kitchen and the team garages. “When breakfast is being prepared for the 5,000 to 7,000 VIPs in the morning and the teams switch on their heating blankets at the same time, the generators certainly have their work cut out,” Tilke elucidates. Especially sensitive areas such as the track hospital, the lap timing and PA systems have double back-up. The trackside gensets produce a combined output of more than 18,000 hp (13,010 kilowatts). That is more than all the racing cars put together. Each one is capable of around 700 bhp (535 kilowatts). No one is certain of the precise figures, as they are kept secret by the teams.

They arrive at the circuit on the Wednesday or Thursday before the race. And that is when it gets exciting for Hermann Tilke. They all have questions or special requests. On the Friday before the race, the scream of the engines can finally be heard when the first practice session starts. There is tension in the air. The drivers are seeing the track for the first time. Of course, they have learned the circuit inside out on the simulator beforehand and know precisely where to brake and accelerate, and where the perfect racing line offering the fastest route through the bends is. “But on the tarmac it’s still a different feeling altogether,” states the ex-racer from personal experience.

Cornering at 250 kph
Hermann Tilke is naturally keen to know what the drivers think of the circuit. He says it is a fast circuit with a lot of fast corner sequences through which the cars can race at speeds approaching 250 kilometers an hour. He has even built in a 14-meter climb. That makes the circuit a bit more difficult for the drivers, and according to Tilke, they like that. The opinions of the drivers are important to him. “Of course – because we aren’t doing this for ourselves, we’re doing it for the drivers.” Although he thinks their reactions are not always entirely objective: “The driver who wins is bound to like the circuit, and those who do badly will often criticize it,” he observes. He says that with a degree of equanimity that only comes with having been in the business for many years. And with the certainty of knowing the drivers and the technology so well that he can judge what is possible and what isn’t.

Part of the Formula 1 family
Hermann Tilke is somebody in Formula 1. But it wasn’t always that way. He smiles when he thinks back to his first tentative steps in the business. “My colleague Peter Wahl and I had an appointment that we waited the whole day for. We paced up and down the pit lane and didn’t dare to talk to anybody because we didn’t know anyone,” he remembers. Today it is very diffe-
In Formula 1 the drivers are so good they hardly make any mistakes, but we still try to outwit them.

Hermann Tilke, circuit designer

A car is off the track – a disaster for the driver, but Hermann Tilke is happy. Because when drivers make mistakes it means that his circuit design is challenging and the racing exciting.

rent. He is in close contact with Formula 1 boss Bernie Ecclestone and frequently chats with the drivers as well. Over the years, friendships have been made too. Is Formula 1 a big family? “Yes,” is his convinced answer. “But it’s a business too.” An extreme business with a special fascination. Hermann Tilke speaks of highly skilled sportsmen and engineers who are the very best in their fields. “Yes, Formula 1 is extreme,” he muses.

And designing the circuits is extremely complicated. Tilke has to deal with a whole range of factors that you would hardly be aware of from the outside. A circuit requires a lot of land, at least 250 hectares. Close to large cities he can often get hold of sites that nobody wants. The best example is the Shanghai International Circuit in China. There was a marsh 300 meters deep on the plot. So to stop the track one day sinking without trace, Tilke had 40,000 piles driven into the ground. He then built the entire Formula 1 site complete with its gigantic structures on a layer of polystyrene 14 meters thick.

External factors shape the circuit

Even when you aren’t building the track on top of a marsh, there are many factors to be taken into account. What direction is the prevailing wind, where will the sun be and how do the spectators get to the circuit? Often there are restrictions, such as having to skirt around a biotope, or not being allowed to erect high buildings in certain places. “And then at some point, the blank piece of paper we started with is covered in specifications and requirements,” Tilke recounts.

Once the ideal position for the start/finish line has been identified, it is a case of designing the shape of the track. The aim is always the same – the circuit should make exciting racing possible. But how do you do that? “By inducing the drivers to make mistakes,” Herman Tilke explains with a glint in his eye. Of course, that isn’t easy because in Formula 1 you have the best drivers in the world driving the best cars in the world, but Tilke has few tricks up his sleeve. For instance, a change of camber on a bend that suddenly shifts the weight of the car forwards or backwards is a challenge for the drivers. “The cars start to understeer or oversteer,” he explains bright-eyed and with increasingly rapid speech. “In Formula 1 the drivers are so good they hardly make any mistakes, but we still try to outwit them,” the circuit designer reveals. The sparkle in his eyes gives away the fact that sometimes he is pleased when a car ends up in the gravel trap. “Yes, that’s right,” he laughs, and rubs his hands together.

Safety first

Obviously the pleasure is only there as long as nothing serious happens. When Hermann Tilke designs a circuit, he calculates very precisely how fast the cars will be traveling at every point. He also works out at what speed they might leave the track and how long they need to come to a stop. In that way he can work out where the first barriers or tire walls should be, which the cars then strike at low speeds. Nevertheless, there are still accidents in motor racing, but the circuits have become safer. Every single accident, no matter how inconsequential, is analyzed by Formula 1’s governing body, the FIA. The findings are then incorporated in new safety regulations according to which new circuits are built and existing ones modified.

“Ordinary guys who race cars”

Hermann Tilke knows about accidents from his own racing career as well. Happily, nothing serious ever happened. “It always looks more spectacular than it is,” he assures. He gave up motor racing nearly two years ago, at the age of 55. But he is still at home at the world’s racing tracks. And so he will be trackside at the start of the Indian Grand Prix on 30th October and as excited as a little boy when the engines start screaming. When that day comes, it will mark the end of nearly five years of planning and construction work. “So there will be some butterflies,” he admits. And then, like every other fan, he will watch the 24 drivers fight it out on the track. All of them just ordinary guys who want to race cars, according to Tilke. “Those guys would drive even if they got no money for it,” he is convinced.

And who did he think would be world champion this year? “Sebastian Vettel,” he answers spontaneously before then qualifying his prediction with riders about it being a long season and a lot being possible before it was finished. It wasn’t something you could plan. But as Hermann Tilke knows, that isn’t always such a bad thing.

Words: Lucie Dammann
Pictures: dpa picture alliance, Hoch Zwei, Tilke, Daimler

To find out more, contact:
Wong Hee Lok
heelok.wong@tognum.com
Tel. +65 6860 9788
To Hermann Tilke, Formula 1 drivers are “ordinary guys who want to race cars”. The enjoyment can be seen in the faces of Michael Schumacher (3), Sebastian Vettel (5), Fernando Alonso (4, left) and Jenson Button (4, right).

Speed and exciting duels are an important part of Formula 1. The track designer can play a part in providing both by creating fast, demanding circuits.

3 to 5 To Hermann Tilke, Formula 1 drivers are “ordinary guys who want to race cars”. The enjoyment can be seen in the faces of Michael Schumacher (3), Sebastian Vettel (5), Fernando Alonso (4, left) and Jenson Button (4, right).
Beauty and the Beasts

What a beautiful spot – this would be a nice place to come on holiday. That is a thought that many may have on seeing the fairytale beauty of Nevada and West Virginia in the USA. But out of sight below the ground is a different scene altogether. There, monstrous beasts roar back and forth along dark passages. They bring precious minerals to the surface – gold and coal. And because the rulers of the underworld make very strict laws about what their beasts can breathe out in the labyrinths, they have to be specially adapted to perform their horrible tasks.

Picture-postcard perfection in West Virginia, USA: difficult to believe that below these green hillsides, underworld beasts dig for buried treasure.

This particular animal supplies vehicles and engines with oil underground. The Eimco “lube truck” shows obvious traces of its job.
What a view. Bright blue sky, the sweet sound of birdsong, mountains as far as the eye can see and the smell of summer – the perfect picture-postcard idyll. But only 30 meters below the surface is a scene of frantic activity. Miners are removing slabs of coal from a rock face. It is noisy, dusty and dark. Here, in the picturesque Allegheny Mountains in the American state of West Virginia, 2.5 million tonnes of coal a year are extracted from underground mines. Enough to keep the Mount Storm power plant here in the mountains running. It is one of the largest power stations in the east of the USA. There is a similar picture 2,000 miles away. In Nevada too, the onlooker’s first thought is likely to be of holiday destinations when observing the reddish-brown hills and the deep-blue sky. But a few meters below ground it is clamorous and dingy too. Every day, more than a million kg of rock are brought out of the mine. After processing, only about 13 kg are left over to be sold as precious gold.

Specialized vehicle for underground working
To bring those valuable commodities to the surface, the mine operators need vehicles that are beefy rather than beautiful. They have little in common with the gigantic dump trucks and wheeled loaders that transport minerals extracted from opencast mines. Underground mining vehicles have to fit through openings that can be as short as 50 inches (1.25 meters) and as narrow as 10 feet (3 meters) wide. The turning radii of such equipment is just as critical, given that the widest opening underground might be 50 feet (15 meters), with just 30 feet (9 meters) more typical in many mines – not exactly the place to learn how to perform a “K” turn, and a long, long way from the highway. Down here, slow and steady wins the race for optimal mine productivity and profitability, and the wrong piece of equipment can be expensive and potentially dangerous.

Particulate index for safety
But despite all of those challenges, underground mining in the USA is experiencing an upward trend. According to U.S. government statistics, over the last quarter-century the number of diesel-powered machines in use in underground mining in that country – which includes personnel carriers, small trucks, tractors, locomotives and service vehicles as well as generators, compressors, bulldozers, welding machines, shuttle vehicles, graders and drills – has increased from roughly 150 units to about 3,000. That rapid increase in the industry’s diesel engine population was of course accompanied by a corresponding increase in diesel particulate exhaust. In 1996, the Mining Safety and Health Administration (MSHA), the federal agency that oversees and enforces mine safety regulations in the United States, responded accordingly with strict new emissions standards and engine certification requirements, rules similar to those in Canada and Europe. In the fifteen years that have elapsed since then, engine and mining equipment manufacturers have deployed various technologies and techniques that have dramatically improved the air quality in underground mines and decreased the rate of injuries and fatalities in the industry as a whole. According to MSHA, diesel engine testing and certification, reductions in hazardous particulate emission levels, the introduction of more efficient mining methods, improved mine ventilation, gas monitoring and other measures reduced industry injuries by more than half and fatalities by two-thirds between 1990 and 2004.

The MSHA regulations, recently updated to meet the continuing rapid growth of the mining industry
The mine’s Humvees were previously used by the US army as off-road vehicles. Now, repowered by MTU Series 904 engines, they carry miners down the Mountain View Mine.

The Brookville Locomotive carries supplies into the Mountain View Mine.

Another beast: the DUX-30 dump truck used in the Turquoise Gold Mine has been repowered with an MTU Series 904 engine.
The strict emission limits imposed by the US Environmental Protection Agency, EPA, do not apply underground. Instead, the important statistic is MSHA’s “Particulate Index” (PI), which sets a limit to the amount of equipment you’re running based on how quickly you can circulate clean air into the mine. If you have machinery that generates fewer emissions, you’ll have a much lower ventilation rate and healthier conditions for the miners.

Thankfully, says MTU’s Ran Archer, Sr. Mining Sales Manager for North America, if you’re an MTU customer you can relax: “Simply put, we’re way ahead of the curve on emissions,” he says.

Beasts with MTU engines

“Mining equipment and techniques have come a long way in the last few years,” says Galen “Chick” Rohrbaugh. Rohrbaugh should know; after ten years working as miners, he and his brother David founded a nearby company that builds sophisticated mining support vehicles with the express purpose of making the tough work of a miner easier. From radio-controlled mini-backhoes and bulldozers to rubber-tired utility tractors, ROHMAC Inc. (Mount Storm, West Virginia, USA) meets the need for machines specifically designed and built for underground mining. The choice of power for many of ROHMAC’s larger machines? “The MTU Series 904 and 906 engines perform well and easily meet MSHA requirements and the engineering footprint of our designs,” Rohrbaugh says. The “underground-optimized” Series 900 engine has specialized engine tuning and advanced fuel injection systems and combustion processes, resulting in industry-leading performance and reduced particulate emissions.

The Mountain View Mine has its own supply railway system to transport consumable and construction supplies to the active mining area; here, too, the power for the railway’s Brookville mine locomotives is the MTU Series 906 Tier 2 engine, rated at 201 bhp (150 kW). Likewise the Eimco mobile lubricating oil vehicles (“lube trucks,” in mining lingo) that keep the mining machinery lubricated feature MTU Series 904 Tier 2 engines.

These machines work hard and continuously under extreme conditions and bear proud battle scars to prove it. Safety, size, maneuverability and reliability are paramount— in other words, the focus here is on practicality, not prettiness. There is, however, one kind of work vehicle that attracts more than its share of curious looks: Mountain View’s fleet of MTU Series 904 powered Humvees. The low-slung military vehicles are put to good use here as personnel carriers. Still in their original olive-drab paint schemes, each Humvee can carry six miners and their gear in and out of the mine. Off-Highway Sales Engineer Curtis Bartlett, who handles the Mountain View Mine account for MTU distributor Western Branch Diesel (South Charleston, West Virginia, USA), explains, “The MTU Series 904 engines produce 121 horsepower (90 kW) with MSHA-compliant air quality ratings. By repowering these military surplus Humvees, we saved the mine about half of what a new personnel carrier cost.”

Quiet performer

Turquoise Ridge doesn’t have any customized MTU-powered Humvees but still can nonetheless boast about its own unprecedented application of an MTU engine. Like Appalachia’s Mountain View operation, most of the vehicle fleet at Turquoise Ridge is powered by MTU Series 900 engines. “When MSHA began regulating and monitoring diesel particulate levels underground, mining companies needed to find diesel engines that provided high performance and complied with the emissions standards. The MTU Series 900 engine’s reputation in both areas speaks for itself,” declares John De La Hunt, Branch Manager for MTU distributor Smith Power Products (Sparks, Nevada, USA). That reputation, he adds, results more often than not in the replacement of a competitor’s diesel engine with an MTU product.

Most notably and recently, Smith repowered a 30-ton DUX haul truck used at the Turquoise Ridge operation with the very first MTU Series 460 sold in North America for underground mining. The Series 460 replaced an earlier model MTU Series 60. De La Hunt says, “The Series 460 is providing higher performance, lower emissions and a four- to five-decibel noise reduction. That’s a huge benefit in underground mining. DMC Mining USA (Salt Lake City, UT), the operator of the mine, is very pleased with the engine.” De La Hunt adds that the Turquoise Ridge success story already sparked an additional sale of a Tier 4i MTU Series 460 to another underground mining customer.

And one thing is for certain: the beasts in the Nevada underworld are no tamer as a result by any means. Not even when they venture out of the mine to discover the beauty of a picture-postcard idyll surrounding them.

Words: Mike Principaton

Pictures: Mike Principato, Turquoise Ridge, Getty Images

To find out more, contact:
Scott Woodruff
scott.woodruff@mtu-online.com
Tel. + 1 313 592-5155
MTU’s home town celebrates bicentennial

Town of the torque

The start of a history of technical achievement not many towns can equal: on 2nd July 1900, shortly after 8:00 p.m., an airship was seen in the skies over Lake Constance near to Friedrichshafen for the first time. It was the LZ 1 designed and built by Count Ferdinand von Zeppelin.
Jericho: over 10,000 years old. Rome: 2,764 years old. Shanghai: 719 years old. Friedrichshafen: 200 years old. The town where MTU has been making diesel engines for around 100 years is only a spring chicken compared with a lot of others. Nevertheless, the small town at the southern end of Germany has a history of technical achievement that not many others can equal. This is where Count Ferdinand von Zeppelin developed his airships, where Claude Dornier made aeroplanes and Karl Maybach manufactured engines and complete drive systems for almost any machine that moved. The engineering developments of all three had an influence on powered travel that extended right across the globe.

Unfortunately there are no longer any Friedrichshafen inhabitants still living who can report on the events of 2nd July 1900 from first-hand experience. But that day must have been difficult to grasp for those living in the small town on Lake Constance. Where previously only a few birds would be flying, a monstrous, cigar-shaped object was hovering over the lake at around 8 o’clock in the evening. An airship, 128 meters long, developed and built by Count Ferdinand von Zeppelin in a floating shipyard on Lake Constance. It was the first of many rigid airships of the type produced by Luftschiffbau Zeppelin GmbH. And they made Friedrichshafen famous – for the first time.

From Friedrichshafen into the wide world
Over the years, not only the shape and size of the airships changed; they traveled further and faster too. Because Count von Zeppelin and his staff continually improved the airship technology. In 1909, Zeppelin brought the ingenious engine designer Karl Maybach down to Lake Constance for the purpose. He built an engine that was designed especially for the needs of an airship. It was a six-cylinder petrol engine with an extremely good power-to-weight ratio. It used two carburetors developed by Maybach which could supply the engine reliably with fuel even when the engine was leaning over at an inclined angle. They were also fire-safe – an extremely important aspect for the zeppelins, as they were filled with explosive hydrogen in those days. The engines were also designed so that the mechanics could replace pistons, valves and cylinders while in flight. That had never been possible before.

The division of tasks between the airship-makers and the engine designer was clear – Maybach developed the engines and Zeppelin the airships. And for a number of years, Friedrichshafen was the center of the air-travel world. After all, it was the rigid airships that, in 1928, first offered transatlantic flights. Aeroplanes weren’t capable of such distances at the time. And crossing the ocean by airship was far faster than by traditional ocean liner. And so, the German airline Lufthansa started flying passengers from Berlin to Friedrichshafen. There, they could board an airship bound for South America or the USA. Between 1928 and 1937, the “Graf Zeppelin” flew a total of 1.7 million kilometers, carrying a total 13,000 passengers. It ran a shuttle ser-
Motor show premiere: Karl Maybach unveiled his first motor car at the Berlin Automobile Show. It was a luxury model and the first German car to feature brakes on all four wheels. Universal thinker from the start: Maybach’s engines were intended to suit all applications. On the road, the railways and the water. Karl Maybach poses in front of a Type SW42 luxury car, a Krauss-Maffei LM 3000 locomotive and a Maybach MD engine for fast boats.
vice between Germany and Brazil alongside occasional more exotic excursions to the Arctic and once around the world. The airships were the shape of air travel — up until 1937. That is when the “Hindenburg” was catastrophically destroyed in a ball of fire when landing at Lakehurst in the USA. Of the 97 people on board, 35 lost their lives. After that, passenger travel on rigid airships came to an end.

One of the first aircraft makers
By then, the people of Friedrichshafen had become used to flying objects. Because even while the Count’s airships were in the ascendant, he was looking for new directions. In that quest, he made use of the ingenuity of his workforce and their interest in aircraft. Under the direction of his long-standing colleague, Theodor Kober, Flugzeugbau Friedrichshafen GmbH was set up in 1912 as one of the first aircraft-building companies in Germany. It made aeroplanes for the army and navy. And the engines for them were once again developed by Maybach, among them the first modern high-altitude engine. With its overdimensioned cylinders and compression ratio, it only developed its full 250 hp output at an altitude of 1,800 meters, so making the planes it powered faster than their competitors. Known as the Maybach Mb IVa, it went into series production from 1917 and sold in large numbers in the First World War.

Most important German aircraft manufacturer
There was also another aeronautical innovator working in the Friedrichshafen offices of Count von Zeppelin: Claude Dornier. He is considered a pioneer of metal aircraft construction and seaplane design, and used Maybach engines in a number of his aeroplanes. Initially, he worked as a development engineer designing aircraft, and later became managing director of the Zeppelin works at Lindau, which subsequently became the Dornier factory. As one of the most important German aircraft producers, Claude Dornier developed over 100 aircraft designs that continue to fly all over the world to this day. As long ago as 1924, he sold the first licenses for production of his aircraft in Japan. He was soon supplying not only Lufthansa but airlines right across the globe. The Dornier “Whale”, his most successful seaplane model, achieved production figures of 250 units and was the most significant cargo plane of the time. Another of his creations was the world’s largest passenger aircraft of the period, the Dornier Do X. It can be considered a predecessor of the jumbo jets of today.

Maybach – a name for quality
In those days, the zeppelins and aircraft produced in Friedrichshafen made the town world-famous. But there was more too. Karl Maybach and his team developed a top quality and highly versatile petrol engine for motor cars. When the first buyer for the engines went bankrupt, Maybach expanded into building the chassis as well as the power units. The first Maybach car, the Type 22/70 powered by a straight-six engine, made its debut at the Berlin Automobile Show. It was a real innovation, too, with its brake balancing system and planetary transmission. The most famous of his models was the Zeppelin series, about which the magazine Motor wrote in 1930, “Commenting on the quality of the materials or the care of the workmanship is a superfluous exercise with a marque such as Maybach.” However, the 1,800 or so automobiles that Maybach produced never made the company any money. The Second World War then brought an end to Maybach car production in Friedrichshafen.

Forerunner of the ICE
Karl Maybach had found a new application for his engines well before the War. It was the railway. In 1924, he unveiled the world’s first high-performance fast-running diesel engine. Before then, steam locomotives

A mecca for air travelers: Lufthansa flew passengers to and from Friedrichshafen to connect with the transatlantic zeppelin flights.
A milestone in high-speed rail travel: the “Fliegende Hamburger” sped from Berlin to Hamburg in an unbelievable time of just 138 minutes.

Maybach and his colleagues worked with the Zeppelin airship company to produce streamlined power car designs that would reduce wind resistance. The result was the “Fliegende Hamburger” high-speed railcar.

Karl Maybach also developed a twelve-cylinder engine for trains. The 410 hp GO 5 was the best-known and most widely used railcar engine in Europe.
“Water. Road. Rail. Air. Powered Transport around Lake Constance.” is the title of an exhibition at the Zeppelin Museum. One section is devoted to railway history in the region. It chronicles developments from the first steam locomotive through the “Fliegende Hamburger” to the modern ICE trains. Friedrichshafen Bicentennial

Friedrichshafen is celebrating its 200th anniversary with a variety of events. Among them is the exhibition “Water, Road, Rail, Air – Powered Transport around Lake Constance” at the Zeppelin Museum. It shows visitors the effects that mechanized travel had around Lake Constance. Exhibits such as locomotives from the early days of the railways as well as art works and interactive displays enliven the topic. The exhibition runs until 11th September.

In 1929, the Maybach G4a engine became the first power unit for railcars that delivered convincing performance in real service conditions. Which is why not only the Deutsche Reichsbahn but also foreign railways were queueing up too. The fast-running diesel engine finally became indispensable when the German railways decided to use diesel trains on main lines some years later. They demanded a 300-hp engine for the purpose, which Maybach produced in the shape of the GO 5. And for the “Fliegende Hamburger” fast railcar, he not only developed a new engine but was also involved in designing the shape of the power car. He tested out models of streamlined power cars in the Friedrichshafen wind tunnel of the Zeppelin airship company. The power car design adopted for the “Fliegende Hamburger” with its low wind resistance and 410-hp (302-kW) Maybach engine, which developed more than twice the power of the previous fast-running diesels, revolutionized rail travel. The “flying trains” carried passengers the length and breadth of Germany at top speeds of 160 kilometers per hour. This was the start of high-speed rail travel. Instead of days, journeys across Germany now lasted only hours. The “Fliegende Hamburger” sped from Berlin to Hamburg in just 138 minutes. It took until 1997 for that time to be beaten, and then only by 38 minutes by an ICE (Inter City Express).

For more than a decade, the twelve-cylinder GO 5 engines were the best-known and most widely used railcar engines in Europe. With its successor, the GO 6, Maybach outdid himself once more. As the first turbocharged fast-running, large-scale diesel engine, it was to go down in technological history.

From workshop to worldwide business

From the small workshops of Dornier, Maybach and Zeppelin have grown global corporations which are largely still based in Friedrichshafen. All of them develop products with an eye to the future and may soon be pointing in new directions again. Luftschiffbau Zeppelin GmbH established a large number of subsidiaries. One of the best-known is the present-day ZF Friedrichshafen. It supplies the automotive industry with transmissions, steering systems and chassis and suspension technology. Part of Dornier was merged with EADS, which produces satellites in Immenstaad near Friedrichshafen for the aerospace and defense industries. And the Maybach engine works became today’s MTU Friedrichshafen, now a subsidiary of the Tognum Group. Employing over 9,000 people worldwide, the group produces drive systems, decentralized energy generation plants and fuel injection technology. And its products continue to leave their mark. One of the world’s biggest mining vehicles is powered by MTU Series 4000 engines. And the Oman ferry “Shinas” achieved a top speed of 56.6 knots propelled by MTU engines – a world record for diesel-powered ferries.

Words: Katrin Beck
Pictures: Archive of the Luftschiffbau Zeppelin GmbH Friedrichshafen, Tognum Corporate Archive, Robert Hack

To find out more, contact:
Dr. Heike Weishaupt
heike.weishaupt@mtu-online.com
Tel. +49 7541 90-3225
A new Tognum corporate movie shows what makes up Tognum with its MTU, MTU Onsite Energy and L’Orange brands. Tognum is the power behind it all, as the film title intimates. The power behind fast motor yachts, monster mining trucks and dependable power generators. Because MTU drive systems represent reliable motive power for trains, ships and heavy-duty off-road vehicles, and MTU Onsite Energy distributed power generation plants ensure that adequate supplies of electricity are always available. And behind all of them are high-technology products and the powerful motivation of a committed workforce. As well as the numerous application sectors and markets in which Tognum operates, the movie takes a look inside the Research and Development, Production and Customer Service departments. “The power behind it all” can be viewed online on the Tognum website and also on Youtube.

More on this...
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How does it work?  – see page 3
or http://bit.ly/o4wigW
Talking of... ...the truth about green energy

See pages 4 and 40 for more info on green energy.
MTU Onsite Energy gensets for Aggretech

Fifty distributed power generation plants powered by gas engines will be going to the Bavarian genset manufacturer Aggretech. Aggretech is one of MTU Onsite Energy’s existing customers for diesel-powered gensets. This is the largest single order for gas-powered gensets ever received by MTU Onsite Energy. The first ten units are scheduled for delivery by the end of 2011 with the remainder going to Aggretech by the middle of next year. (aka)

Luxury Alaska tour boat gets new lease on life

Alaska’s 342-passenger catamaran Klondike Express, was recently repowered with two EPA Tier 2 MTU 16V 4000 M63L engines producing a combined 4,480 kW (6,004 bhp). They propel the 42 m (137 ft) vessel quickly at speeds up to 36.2 knots. “The new MTU engines will reduce nitrogen oxide emissions by about five million pounds annually,” according to captain Gary Sommerfeld. “The engine noise is half of what it was originally,” adds the manager of marine operations; “Absolutely vibration free.” (bm)