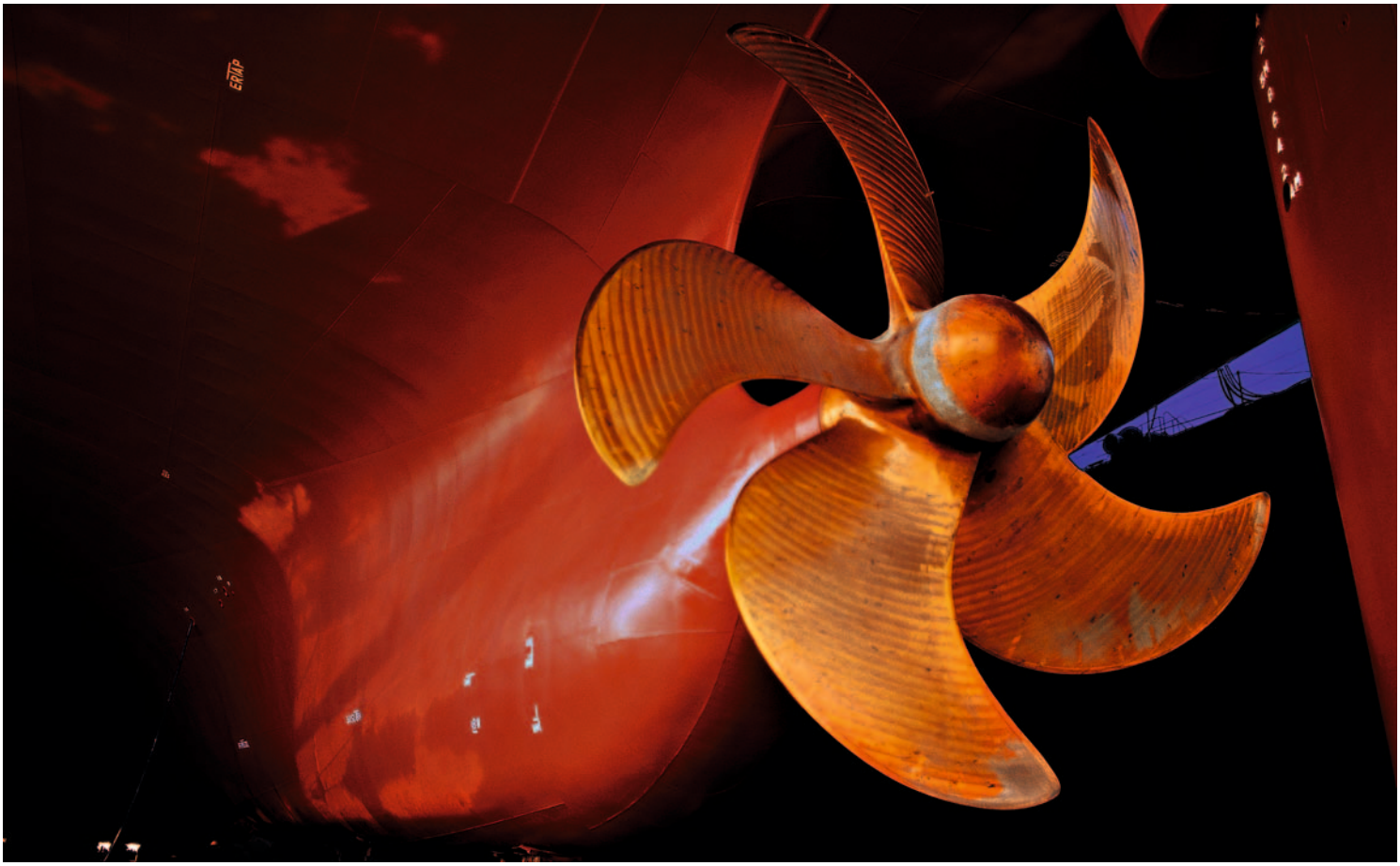
charge!

2|13

The customer magazine
of ABB Turbocharging
Switzerland



Powering thrust

Power and productivity
for a better world™

charge! 2|13

Magdalena Okopska
Head of Market Communication
ABB Turbocharging

In fulfilling one of ABB Turbocharging's mission statements, namely that "We make a real difference in how our customers' engine products perform", we focus on what our customers really need and what will add value to their business, while driving innovation forwards.

A look at some recent technological developments and how the benefits they produce address customers' needs in the current market underlines this.

Highly efficient, high-pressure single-stage turbochargers, such as the A200-L and A100-L, enable engine builders to meet IMO Tier II emissions limits while consuming as little fuel as possible. Our Valve Control Management (VCM) variable valve timing system makes diesel engines more powerful and greener at the same time, while using technology that is both reliable and affordable. The second generation of Power2 ensures a gain in engine efficiency and lowering of emissions well beyond the potential of any single-stage system, and it is more robust and space-efficient, plus easier to service and overhaul. Last but not least, to improve the fuel consumption of modern electronically controlled two-stroke engines at low and part load there is High Pressure Tuning (HPT), which was developed for a leading engine designer and licensor.

You can find out more about all of these in this issue of charge! Or just visit our stand at one of the upcoming trade fairs.

At Marintec in Shanghai from December 3 until 6, our main focus will be the A200-L, VCM, the new generation of Power2 as well as service offerings such as our Maintenance Management Agreements (MMA). We heartily invite current as well as potential customers, business partners and other guests to come along and engage in interesting discussions in Hall N1 (booth no. J21).

We look forward to seeing you in Shanghai. In the meantime, please enjoy the current issue of charge!.

Technology

News

Service

Applications

Tips for the operator

Recipe

A step up from retrofits

Upgrades improve engine performance by allowing a more efficient solution with greater tolerance for deviation. Reinier Bakker explains.

Interview Victoria Maier, **Photography** Michael Reinhard

Upgraded power plant in the Dominican Republic.

An upgrade is the process of essentially redeveloping a turbocharger for an engine so that it will run more efficiently.

So let's start by putting things into context. What is an upgrade?

An upgrade is the process of essentially redeveloping a turbocharger for an engine so that it will run more efficiently. A turbocharger is an air machine; it provides compressed air to the combustion chamber of an engine. Large engines today need to have a turbocharger because without one, an engine would be four times as large or would not be able to power the machine in question. So an engine needs a turbocharger, and the two need to fit together really well. In order to do that, to create a turbocharger with the right specifications, ABB Turbocharging works together with the engine manufacturer to achieve the best fit by means of a process of matching and simulation.

What is the difference between a retrofit and an upgrade?

With a retrofit, you are talking about a like-for-like exchange. So you might exchange an ABB turbocharger for another brand of turbocharger. But you're looking to use the ABB turbocharger with the most identical specification and characteristics, so that you can just "drop in" a turbocharger that will fit on the current solution, the engine, with few if any modifications. It's the same solution, but our brand instead of someone else's. That's a drop-in.

A simple, elegant solution?

Yes. And you do a retrofit for a whole host of reasons, some of which have nothing to do with improving performance. You might do a retrofit to address safety issues, for example. But it's always the same: It's a like-for-like exchange. Hypothetically speaking, if it were to fit mechanically, you could also think about installing a more powerful turbocharger onto an engine at its original specification, but you would never do that, because the customer wouldn't really stand to gain. It wouldn't be worth the effort and resources. Together with the engine builder, we took that basic idea one step further and asked ourselves what would happen if we were to make changes to both the turbocharger and the engine specifications. That's when we began talking about upgrades. If you put a new turbocharger on an old engine, your turbocharger efficiency goes up, your aerodynamics get better, and that means that you have to be able to change things with the engine. The improved engine performance is made possible through improved turbocharger performance. So with an upgrade, you are not replacing like-for-like. Instead, you are looking for improvement in engine performance. And an upgrade makes it possible to have a more efficient solution with greater tolerance for deviation; there's also more freedom in terms of what a customer can do with the engine. With a retrofit, you don't have that type of freedom. So we have begun to look for these combinations where we can make changes to both the turbocharger and the engine to improve performance, because then we can really make a difference for our customers.

What has the response been from customers so far?

We've already had several contracts – quite a lot, really, given that we only started offering the upgrade option in 2013. Take Brazil, for example. There is a conversion of something like 15 engines there and these power plants supply to the grid. We are talking about upgrading 30 cartridges and one spare cartridge on multiple plants. So this upgrade is a great way to meet – or even increase – productivity above and beyond what you'd be able to do in the engine. And for engine providers who have to show their customers that their engines will be as productive as possible, such gains are a real advantage, especially for companies with contracts stipulating productivity targets.

The upgrades expert

After his studies in Applied Physics at the Delft University of Technology (NL), Reinier Bakker held managing positions at DSM R&D and at GE Plastics Europe. He was Account Director at Honeywell Turbo Technologies from 2003. Bakker joined ABB Turbocharging in April 2011 as Senior Manager OEM Service Sales in Baden, Switzerland. He has spearheaded the company's worldwide commercial promotion of upgrades from its inception.

Reinier Bakker.

HPT: High Pressure Tuning for MAN Diesel & Turbo two-stroke engines

Slow steaming container vessel.

In 2011, ABB Turbocharging introduced a new way of reducing fuel consumption on low-speed diesels. Fast forward 18 months and High Pressure Tuning is indispensable for getting the best out of MAN two-strokes.

Text Klaus Fußstetter, **Photography** iStockphoto, ABB Turbo Systems Ltd, Michael Reinhard

Owners and operators in a global merchant fleet comprising more than 50,000 ships are constantly looking for ways to improve the profitability of global transportation.

Among their wide range of focuses, reducing fuel costs is an evergreen. It provides a major incentive for improving their economic situation, since a vast majority of total operating costs are attributable to their fuel bills when their ships are at sea. The continuous rise in bunker prices, coupled with the implementation of new emissions control regulations has turned industry attention to fuel efficiency and slow steaming – i.e. operating vessels at reduced speed.

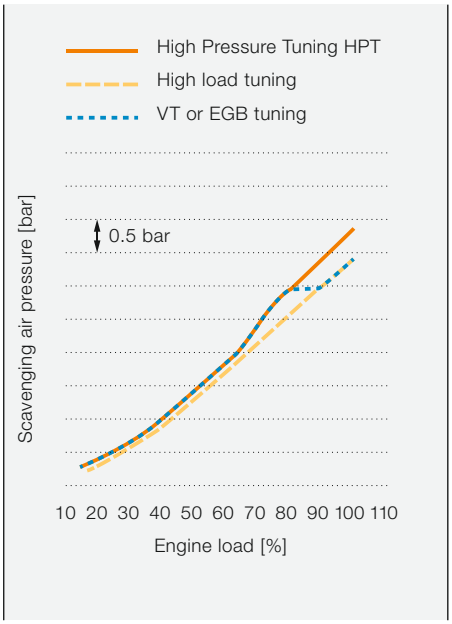


Fig. 1: Scavenging air pressure tuning curve.

HPT is a way of improving the fuel consumption of modern electronically controlled two-stroke engines at low and part load.

In 2009, ABB Turbocharging launched a new highly efficient high pressure turbocharger generation – the A100-L. It opened up operating modes that were not hitherto fully utilized by engine designers. As the next step, and with the new market requirements of the current market in mind, ABB Turbocharging turned its attention to innovations which support the marine industry's efforts by employing the latest turbocharger technologies.

Late in 2011, the innovative concept of High Pressure Tuning – or HPT – was presented to leading engine designer and licensor MAN Diesel & Turbo for the first time.

Enhancing efficiency

HPT is a way of improving the fuel consumption of modern electronically controlled two-stroke engines at low and part load. By increasing scavenging air pressure (Fig. 1) it results in higher peak firing pressures in the engine's cylinders. The laws of physics say that the efficiency of a diesel engine cycle can be enhanced with higher cylinder peak pressures. A variable exhaust valve controls the engine's compression ratio at high engine loads in order to avoid excessive firing pressures in the cylinder. To achieve this, under hydraulic control the exhaust gas valve is closed later compared to standard operation (Fig. 2). The engine control system ensures that all engine parameters are well adjusted, according to design requirements. The start of injection remains unchanged in order to achieve the most efficient com-

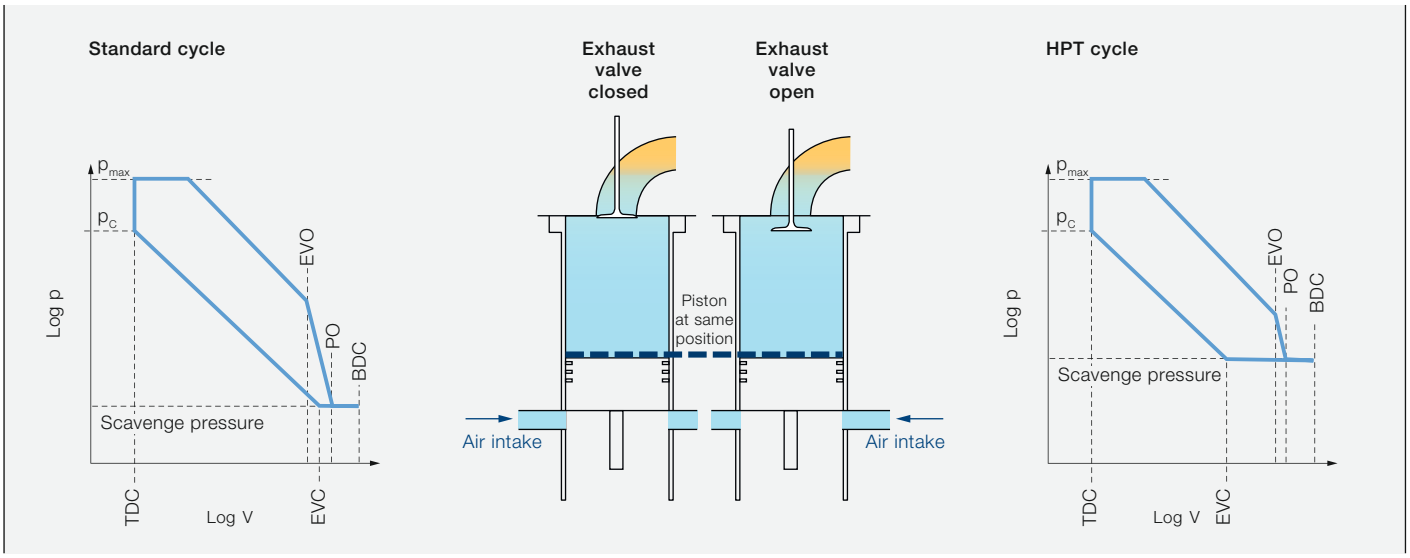


Fig. 2: Standard versus HPT cycle.

The potential fuel saving on a large container vessel tuned with HPT could amount to several hundred thousand dollars in just one year.

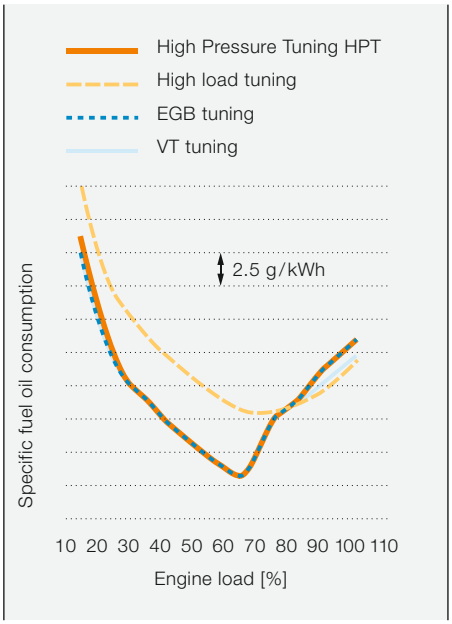


Fig. 4: Specific fuel oil consumption tuning curve.

bustion process for the fuel injected. By this so called "two-stroke Miller effect", emissions of oxides of nitrogen (NO_x) are reduced at higher engine loads, which makes a further reduction in fuel oil consumption possible at part loads, while keeping the NO_x emissions within the limits of the IMO E3 cycle. Lowering the fuel consumption of an engine means, at the same time, a reduction in emissions of the greenhouse gas carbon dioxide (CO_2).

HPT tuned engines can be turbocharged without any additional devices, such as exhaust gas bypass valves (wastegates) or turbochargers with other variable devices (Fig. 3).

HPT for MAN

HPT offers engine builders, ship owners and operators financial benefits, thanks to the reduction of extra hardware and installation costs, and hence lower initial investment and first costs. The elimination of moving parts and additional components also removes their related service costs. Engines tuned with HPT are fuel efficient, from the lowest loads right up to higher part load operation, with a fuel saving of 5 g per kWh (Fig. 4), compared to an engine with standard tuning. The potential fuel saving on a large container vessel tuned with HPT could amount to several hundred thousand dollars in just one year.

Based on successful engine testing, MAN Diesel & Turbo and ABB decided to make High Pressure Tuning (HPT) available to their customers. Consequently, HPT is now offered on ME and ME-C engines from the current MAN engine portfolio with bore sizes from 50 cm right up to the largest 98 cm models.

Late in 2012, ABB Turbocharging introduced the new A200-L generation, which in combination with HPT enables the marine business to further increase the profitability of global seaborne transport. The number of project inquiries for HPT engines with A100-L and A200-L turbochargers proves that ABB has precisely fulfilled the market's requirements.

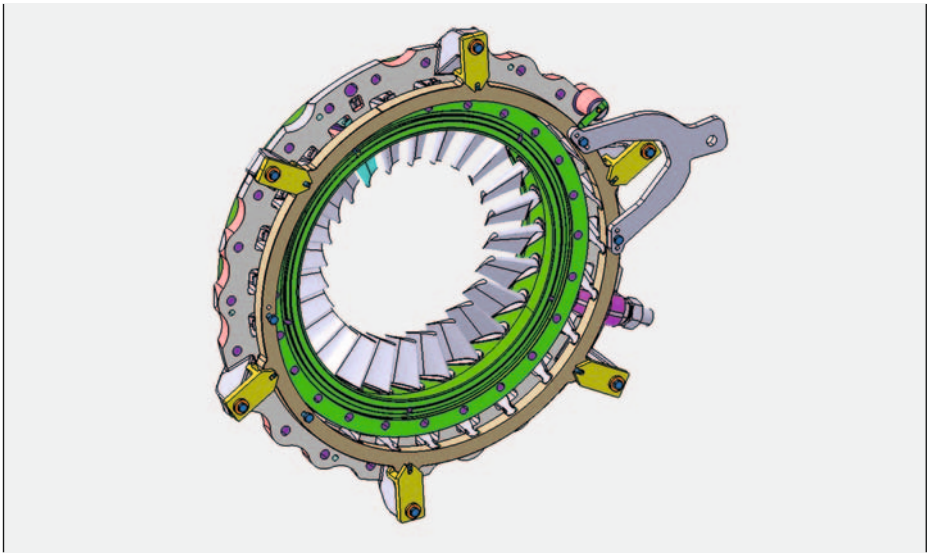


Fig. 3: Moving parts – VTG.

Klaus Fußstetter graduated as a mechanical engineer from the Technical University Munich (TUM) and joined ABB Switzerland in 1993 as a simulation specialist for turbocharging systems. As senior manager for project and application engineering, he is responsible for ABB's important customer, MAN Diesel & Turbo.

A200-L: Well underway

Excellent debut for newly launched A200-L. Engine test results are positive and orders are booked for almost all frame sizes.

Text Arie Smits, **Photography** Michael Reinhard

The A200-L, ABB Turbocharging's new turbocharger generation for low-speed engines, has done well in recent engine tests for an application in a new container vessel for a German shipping line.

With orders booked for almost all frame sizes, this success reflects an overwhelming market response to the A200-L generation. As per the original schedule, all the sizes will be released by 2014.

It was around a year ago, during the SMM marine trade show in Hamburg, that ABB Turbocharging officially launched these second generation turbochargers for two-stroke engines: the A200-L is the successor to the very successful A100-L, of which close to a thousand have been sold or specified.

The rapid release of the second generation resulted from a tremendous development step in turbocharger volume flow. Building on the proven A100-L comes a massive 30 % rise, allowing smaller turbochargers to be used over virtually the complete global two-stroke engine portfolio.

So, while ABB Turbocharging's continuing focus on ensuring lowest fuel consumption remains strong, the compactness of the new A200-L means not only less weight has to be installed in less installation space, but also lower first costs – a very important factor for engine builders in the current market.

The compactness of the A200-L turbochargers also translates into a 25 % reduction in spare part prices – an attractive bonus when engine operators come to service their turbochargers. And, of course, with features like the well proven bearing design inherited from the A100-L and the TPL-B generation before it, all of the above have been achieved without jeopardizing the reliability and efficiency for which ABB Turbocharging products are very well known.

Arie Smits was Head of the ABB Turbocharging Rotterdam Service Station before he moved to Switzerland in 2001. Until October 2012 Smits was responsible for the global low-speed two-stroke turbocharger new business. Now he is Senior General Manager Global Turbocharging Projects, active in pursuing major new-building projects.

Positive engine tests for the A200-L.

Second award for ABB Turbocharging Bolingbrook (USA)

Bolingbrook. ABB Turbocharging in Bolingbrook, Illinois, an ABB Service Station dedicated to re-manufacturing services for Caterpillar, was awarded Supplier Quality Excellence Process (SQEP) Gold certification by Caterpillar earlier this year. This is the second time that this Service Station has received a special recognition from Caterpillar, having been awarded the Bronze level in 2011.

Caterpillar's SQEP certification recognizes their supplier's dedication to providing superior quality and is only awarded to those who demonstrate such world-class performance on an ongoing basis.

Caterpillar Lafayette.

Turbocharging Service Network update

Baden. ABB Turbocharging is adapting its global Service Network in line with current market needs to better serve its customers. With 100+ Service Stations in 50+ countries, the company's global service network is among the strongest in the industry. As ever, turbocharging service at ABB offers cutting-edge expertise, the benefits and lessons learned from having a global database, and Original Parts and Original Service. If these changes affect your operations anywhere, your ABB Turbocharging Service Station will contact you in due course.

New facility in Ballò di Mirano.

Service Station opened

Venice. This year ABB Turbocharging opened a new Service Station in Ballò di Mirano, Venice, Italy. It replaces the Marghera facility and offers a larger workspace for improved technical performance. The new facility will serve customers in the maritime sector operating in the Adriatic Sea and in the power generation industry located in Central and Northern Italy (particularly in the north-east).

What about IMO Tier III?

Baden. The International Maritime Organization (IMO) is considering postponing IMO Tier III, which is currently scheduled to come into effect on 1st January 2016. Were IMO Tier III to be postponed, ABB Turbocharging's plans for developing and implementing its solutions would remain unaffected, as they are not just for IMO Tier III compliance. Current technologies would be adapted accordingly.

Expanding in the Middle East

New Service Points in Dubai, Bahrain and Iraq to meet customers' growing demands.

Text John Fyfe, Tiziana Ossola Auf der Maur, **Photography** Drydocks World Dubai, ABB Turbocharging in Dubai

ABB Turbocharging in Dubai is currently embarking on expansion plans that involve the establishment of Service Points within strategic locations around the Arabian Gulf and the Middle East. They allow ABB Turbocharging to serve both local and global ship owners with detailed onsite inspections, repairs and rotor balancing of their turbochargers.

During the last year the customers' voice was heeded. ABB Turbocharging took account of their need for more local service options. This is driven by two factors: firstly by the need of shipowners to reduce their operating costs against the background of the global economic slowdown; secondly, by the need to enhance communication with the ships' superintendents and support them in their decision making during technical inspections.

A new collaborative agreement with Drydocks World in Dubai, a leading player in ship repair, ship conversion, ship building and offshore fabrication, is in an advanced stage of finalization. Given the strategic importance of Drydocks World to customers who are also ABB customers, this initiative provides for the implant at Drydocks World of the key equipment required for the overhaul of turbochargers, thus enabling rapid turnaround times and round-the-clock onsite technical support.

Strategically important: Drydocks World Dubai.

Approved service quality, here in Dubai …

… soon in Bahrain …

… and Erbil, Iraq.

The agreement will promote the sharing of mutual benefits to enhance the business of both companies, ensure quick turbocharger service to customers in the yard and offer one-stop ABB turbocharger solutions at Drydocks World. ABB Turbocharging in Dubai will provide international factory warranties to all service jobs done at Drydocks World, including dedicated engineering staff and equipment at a workshop implanted within the shipyard facility.

Expanded presence in Bahrain and Iraq

The second Service Point will be located in Bahrain, a major ship repair hub. The Service Point in Bahrain will be designed to handle both main engine and generator set turbocharger overhauls, with key tooling and equipment in place to ensure faster and more efficient overhauls.

The third will be a fully-fledged Service Station based in Erbil, Iraq. Due to the country's high demand for power, its number of large to mid-size diesel power plants is destined to grow. With that comes the need for OEM qualified engineers and OEM maintenance, repairs, overhauls and, naturally, spare parts. ABB Dubai has already established a sales office in Iraq and – together with the fully qualified local engineer – already started on-site repairs. The Erbil Service Station is scheduled to open in the first quarter of 2014.

ABB Turbocharging Service Station in Dubai.

Iraq's high demand for power means that the number of large to mid-size diesel power plants will continue to grow.

Supplying electricity in Iraq

Since 2008, the ABB Turbocharging equipped diesel power station in Samarra, Iraq, has been making an important contribution to meeting power demand in that historic city.

Text Tiziana Ossola Auf der Maur, **Photography** Corbis, ABB Turbocharging in Dubai

After five years of planning, building, installing and commissioning, 2009 saw the 350 MW diesel power station some 120 km north of Baghdad start to generate electricity. Of the twelve power plants in Iraq equipped with ABB turbochargers, Samarra is the largest. The city is also historically significant and a UNESCO World Heritage Site. In the aftermath of years of conflict, the power plant has been able to satisfy at least part of the demand for electricity in the city with its population of 348,000. Still, there is a gap between supply and demand. According to estimates reported on the Middle East Economic Digest (MEED) website, an average Iraqi house-

Samarra: ABB turbochargers help to supply electricity to its 348,000 inhabitants.

hold received power for only 7.6 hours a day in 2012. The Ministry of Electricity of Iraq (MoE) declared power generation as its top priority, issued an energy master plan and began placing contracts.

Upgrade for the 36 turbochargers

Local cooperation for the Samarra power plant with the MoE was handled by engine builder Wärtsilä, who subcontracted ABB Turbocharging. The two companies worked together to establish a framework, the scope of service on offer and parts supply for the turbochargers.

Under its contract, Wärtsilä supplies MoE with follow-up maintenance work and uses ABB Turbocharging for service based on Original Parts. The first overhauls of the 36 turbochargers were completed in 2012 and 2013 at the ABB Service Station in Dubai. All the 36 turbochargers were upgraded to HPP design to reduce wear rates of turbine blades and to maintain their high performance. HPP consists of six coated blades and a new deformation-resistant turbine diffuser. The second round of overhauls is scheduled to start in mid 2014.

Wärtsilä and ABB joint meetings in Baghdad with the MoE management have been taking place for technical discussions, followed-up by visits to the plant for inspections.

A home in the Middle East

John Fyfe, Local Business Unit Manager in Dubai.

For two years Scotsman John Fyfe has been Area Manager Middle East and North East Africa at ABB Turbocharging. For him, settling in Dubai is to return to a familiar location.

Text Tiziana Ossola Auf der Maur
Photography ABB Turbocharging in Dubai

"For me Dubai is home," says John Fyfe who, since January 2012, has guided the destiny of ABB's turbocharger business in the Middle East and North East Africa from there. Fyfe knows the Emirate like the back of his hand. Altogether, the 37 year old has spent fourteen years here. The fascinating vastness of the desert, the mountains and the sea: Dubai is an ideal place for John's personal development, both as a family man and a businessman.

Indeed: Fyfe has been in the Middle East longer than in his native Scotland. He came to Kuwait as the eleven year old son of an ABB manager and as a teenager. After a short detour to South Africa, he settled in Dubai in 1992.

Many goals in Iraq

"I wanted to go for a challenge," says Fyfe about his move to Kobe, Japan where, as a 26 year old, he got his chance to become a service manager at ABB Turbocharging's joint venture Turbo Systems United Co. Ltd. Five years later, he was promoted to General Manager for the West Japan region, and since 2012 the father of four is now in his dream location – back in Dubai.

Part of John's business activity in the Middle East centers on Iraq, where ABB Turbocharging has equipped a number of power plants. In a country rebuilding itself after years of conflict, providing electricity to the estimated 32 million people has become a primary target for the government. The growing installed capacity of diesel engined power plants demands the highest levels of workmanship, quality and reliability in the most challenging of locations. ABB in Dubai must be equal to this task and ensure the engine's turbochargers continue to perform at the highest level for the Iraqi people.

Demand for power keeps on growing. The installed base has doubled in the last four years and the trend is upwards. Iraq's recovery and growth demands optimum service from a committed on-the-spot ABB Turbocharging presence (see article on page 12).

Further expansion projects in Dubai, together with development plans in Bahrain, have recently been competed under Fyfe's supervision. "But they are accomplishments by the team as a whole," Fyfe is eager to emphasize. "After all, we are talking about a goal we are all committed to: the best possible service, courtesy of close customer proximity."

Mercedes-Benz facility in Rastatt.

A100 technology in operation

Efficient and reliable A140-H ABB turbochargers run on the most powerful MWM gas engine TCG 2032V16 in Rastatt, Germany.

Text Mirko Lepel, MWM GmbH, **Photography** Daimler AG, MWM GmbH, ABB Turbo Systems Ltd, Michael Reinhard

The A140-H turbochargers delivered to MWM belong to the first A100-H machines delivered by ABB from series production. In addition to various mine gas applications this engine is, above all, used in cogeneration plants all over the world for the efficient production of electrical power and heat.

For the specific application on gas engines for power generation and combined heat and power such as the Daimler AG cogeneration plant, the A100-H offers significant advantages compared to previous turbocharger generations, including higher pressure ratios and higher turbocharger efficiency. This enables the customer to increase both nominal engine output and operational flexibility under severe ambient conditions such as high temperature and high altitude, without the need to derate the engine.

For the specific application on gas engines, the A100-H offers significant advantages.

Mercedes-Benz in Rastatt: Third cogeneration plant commissioned.

Assembly of an A100 turbocharger.

The new turbocharger technology increases availability of the genset: improved output under non-ISO conditions.

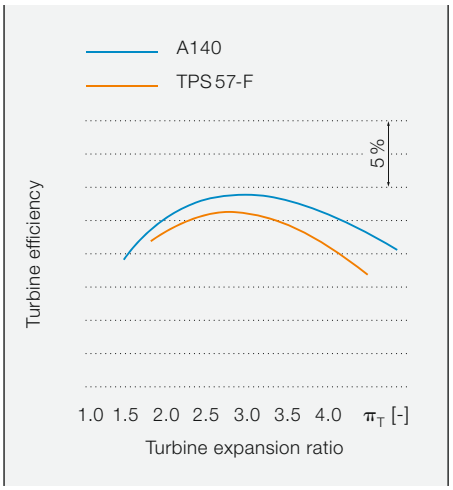
These benefits are highlighted in the product description of the MWM TCG 2032 engine:

- New turbocharger technology increases availability of the genset: improved output under non-ISO conditions.
- High output of up to 4,300 kWe possible through use of A140 high-pressure turbocharger.
- Turbocharger achieves higher pressure ratio and enables operation under full load up to 45 °C air intake temperature.

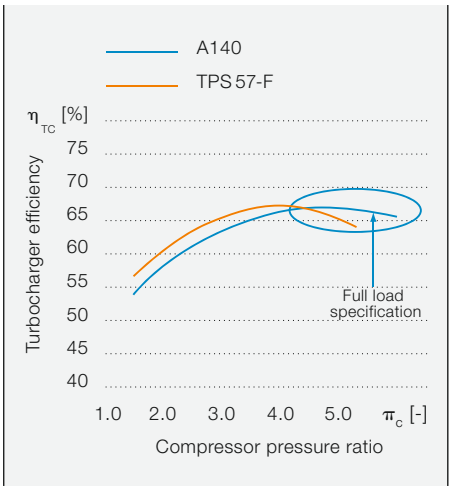
A100: suited for many applications

A new generation of mixed-flow turbines has been developed for use with the A100. Powering the new compressor stages, a characteristic of this new turbine family is their extensive operating range, allowing the high pressure ratio potential of the new compressor stage to be utilized over an even wider range of applications. The turbine's design has been optimized in each specific volume flow range, so that the individual stages exhibit outstandingly high turbine efficiencies. Further development of sealing technologies has reduced blow-by, so that flow losses are also lower. In particular, this has allowed a substantial improvement in turbocharging performance at higher boost pressures.

A wide range of available compressor and turbine specifications makes the A100 ideally suited for applications on engines in the marine, industrial and power generation fields as well as for rail traction and mobile equipment drives. The outstanding thermo-dynamic potential of the A100 becomes clear in the case of a full load-optimized turbocharger specification.



Turbine efficiencies, A140 and TPS 57-F.



Turbocharger efficiency of A140 with full load-optimized specification.

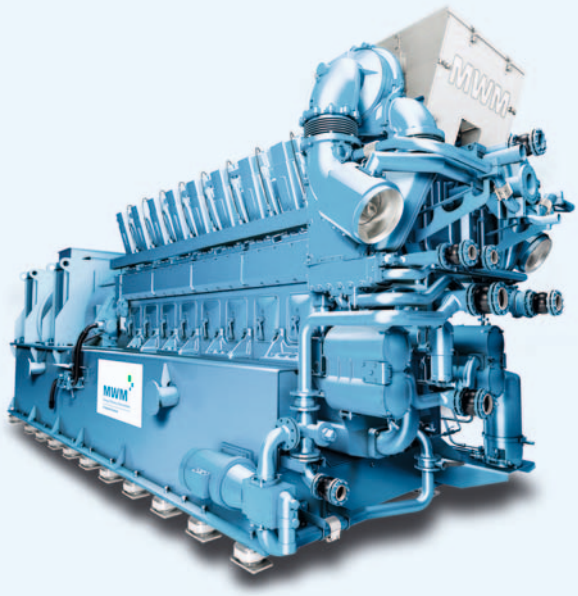
The A100 turbocharger represents a striking example of overall low TCO. The long maintenance intervals of TPS turbochargers have been matched by the A100, even though the demands made on its thermodynamic and mechanical performance are higher. The turbochargers of the new A100 generation will satisfy all demands in respect of high reliability and low maintenance operation. As well as long maintenance and overhauls intervals.

Dr. Mirko Lepel has a PhD degree in Mechanical Engineering from the University of Bochum, Germany in cooperation with Deutsche Montan Technologie GmbH in Essen. He joined ABB Turbocharging in 2001. He started as an R&D engineer and project leader. Today Lepel is Senior Manager Sales and Application Engineering.

The 140-H turbocharger at Daimler AG

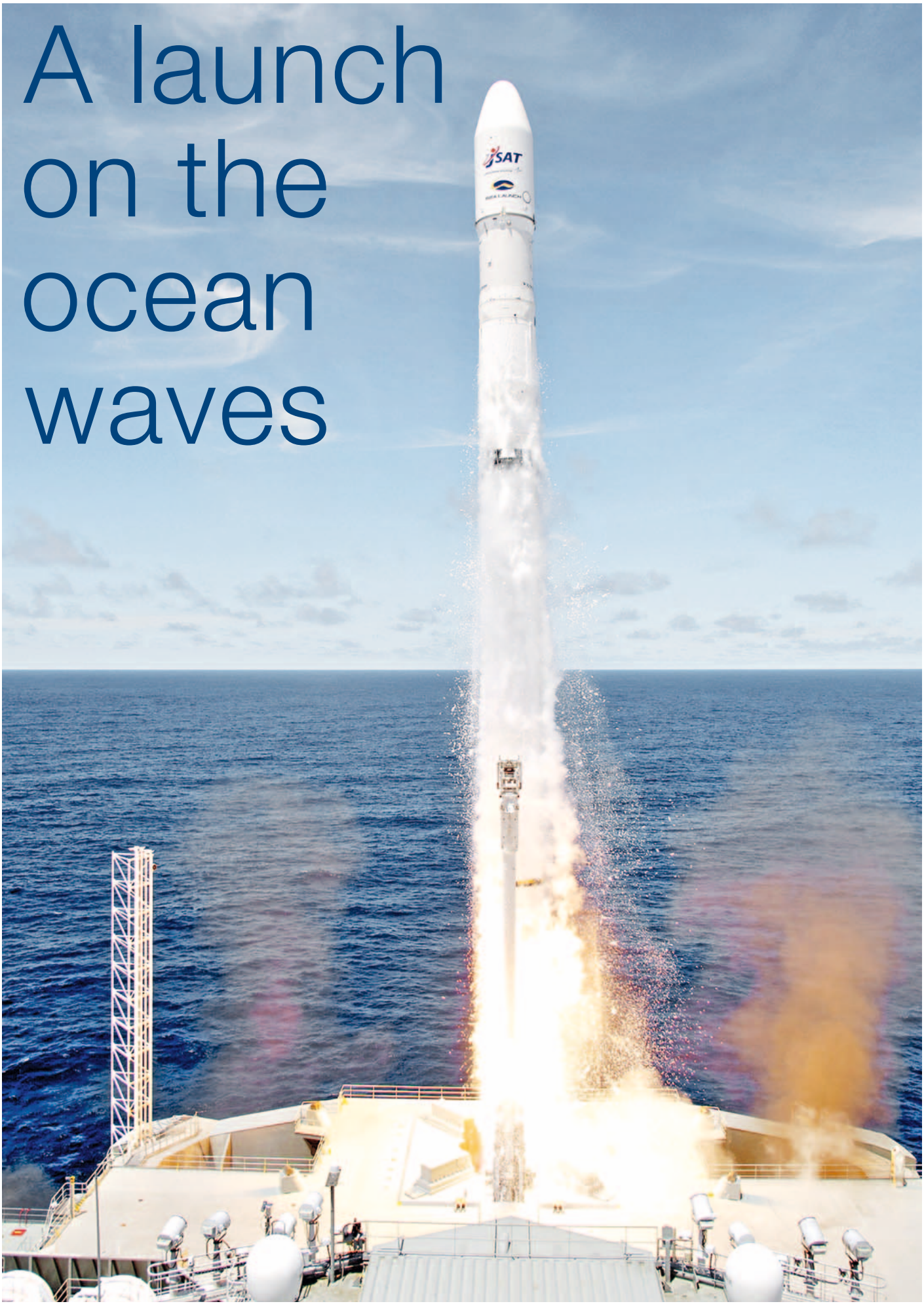
Cogeneration plant commissioning in May 2013: From left to right: Rolf Busch (project owner), Hans Jürgen Pütsch (mayor of Rastatt) and Peter Wesp (head of plant).

In May 2013 Daimler AG commissioned a third cogeneration plant for the Mercedes-Benz plant in Rastatt, Germany. It consists of a gas fuelled piston engine (MWM type TCG 2032 V16) driving an electrical generator. It produces four megawatts of electricity and four megawatts of thermal energy. In addition, an absorption plant was installed capable of producing two megawatts of cooling capacity. In the winter months heat recovered from the gas engine can be used for heating and in the summer months it can be transformed into cooling – in this way the heat can be used for production processes all year round. The efficiency of the cogeneration plant totals over 85 percent, compared to a typical value of 40 percent for a conventional power plant. The two existing cogeneration plants each contribute two megawatts of electricity and two megawatts of thermal energy.



MWM TCG 2032 genset: Its high output of up to 4,300 kWe is possible through use of the A140 high-pressure turbocharger.

A launch on the ocean waves



The Odyssey moves to a partially submerged position of 21.5 meters in advance of the start of launch operations to provide a stable launch platform.

Sixteen ABB turbochargers on eight Ulstein-Bergen engines power the Odyssey, one of the fastest semi-submersible, self-propelled vessels.

Text Francis J. Pelot, **Photography** Sea Launch, Dave Hutsell

Next April, the Sea Launch Commander and Odyssey will be positioned along the equator in the Pacific Ocean preparing for the final launch sequence of the next payload to meet its orbital position in the heavens. Many hours of preparation, calculation, education and perspiration will culminate in another successful launch for the Sea Launch Zenit-3SL system. It will be the 35th such mission since 1999. These missions can last as long as 42 days but average 22 days for the Commander (assembly and command ship) and 29 for the Odyssey (launch platform). Transit time from the home port in Long Beach, California to the launch site is eight days for the Commander and twelve days for the Odyssey. The program can provide up to six missions a year with one launch per mission. The weight of the payload at launch will be in the region of 600 tons including fuel. Typically there are two months of preparation involved before occupying the Commander, and the payload will arrive approximately four weeks before departure. The payload is transported from the Commander to the Odyssey before the vessels' departure to the launch site. Once the vessels have arrived at the launch site the pre-launch protocol begins. Three hours prior to launch, the Odyssey is cleared of all personnel, who are then transferred to the Commander, which will anchor set on Dynamic Positioning (DP) 6,000 meters away before the final launch sequence commences. Once all support staff have been recovered from the Odyssey, launch control is remotely directed from the Commander with the captains of both vessels present. The final launch sequence is maintained by the launch director. During a launch campaign, meals, transportation, office space, services and weather reports/warnings for a limited number of staff is part of the Sea Launch standard service package. The next campaign will begin preparation in November of this year, with the launch scheduled for April 2014.

Three hours prior to launch, the Odyssey is cleared of all personnel, who are then transferred to the Commander, which will anchor set on Dynamic Positioning (DP) 6,000 meters away before the final launch sequence commences.

The azimuth/bow thruster positioning system stabilizes the Odyssey to a point with less drift than a human maintaining a standing position.

One system – three segments

The program originated in the early 1990s after the dissolution of the USSR. RSC Energia (Russia) looked to utilize their wealth of space expertise, in association with Boeing, Kvaerner, Yuzhmash and Yuzhnoye, which is a partnership of companies from the United States, Norway, Russia and the Ukraine respectively. The Sea Launch AG headquarters is located in Bern, Switzerland and is responsible for the contracting and management of all launch services. Sea Launch is one of the industry leaders because of the innovation, service, competition and diversity of supply they have delivered to the world's satellite operators. Sea Launch AG provides high quality facilities and services in support of customer spacecraft operations based on the Zenit-3SL launch system. This system consists of three components: the rocket segment, the marine segment and the home port segment. The rocket segment consists of the launch vehicle, ground support equipment and ground control systems. The marine segment comprises the Sea Launch Commander and the launch platform Odyssey and support staff. The home port segment provides a stable base of logistical support for both vessels as well as a state of the art payload processing facility. The customers include well known brands such as Dish Network, Direct TV, XM Satellite Radio and Lockheed Martin. The missions are not considered successful until the customer can take control of the satellite, usually one hour after lift-off.

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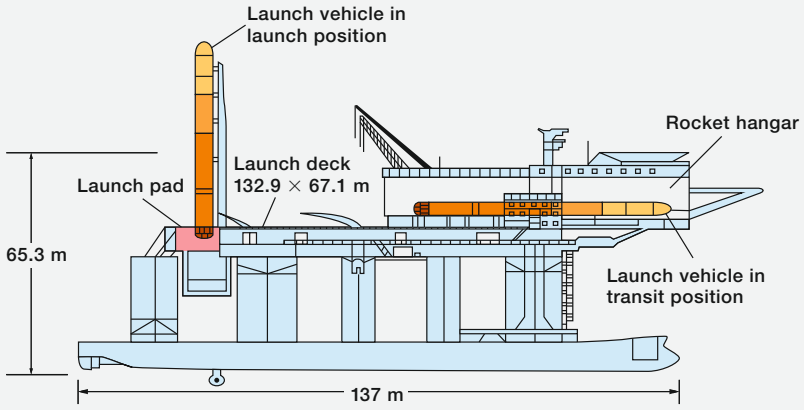
The technology



The Odyssey is powered by eight Ulstein Bergen KVG12TC engines, rated 2,300 kW at 720 rpm. The air requirements are supplied by sixteen ABB VTR 214-11 turbochargers, in a rare but effective combination. The load profile for these engines is unique, falling somewhere between that of a cruise ship and a tug boat.

The Commander, the Assembly and Command Ship (ACS) is powered by two Wärtsilä 8L46B ME diesels equipped with ABB VTR 454-D32 turbochargers and four Ulstein Bergen KRG8/TC auxiliary engines with VTR 254-11 turbochargers. The vessel has a displacement of more than 34,000 tons and a range of 18,000 nautical miles. The Commander is equipped to accommodate up to 240 crew and customers including 20 FAA (Federal Aviation Administration) members.

A brief history

The two vessels first arrived at their home port in Long Beach, California in 1998. The launch platform Odyssey was built in 1983 and was previously a North Sea oil drilling platform named the Ocean Odyssey. It was then refurbished by Kvaerner Rosenberg Shipyard in Stavanger, Norway and then transferred in 1997 to Vyborg Shipyard outside St. Petersburg, Russia where it was modified to its current design. At over 27,400 tons displacement and a submerged draft displacement of 50,600 tons at 70 feet, the Odyssey is one of the largest semi-submersible, self propelled vessels on the seas. The Odyssey is built on two large pontoons which have three ballast pumps each that allow the Odyssey to partially submerge prior to the start of launch operations, plus and a dynamic positioning system that uses a combination of azimuth and bow thrusters with the main propulsion system to hold the platform on station at the launch site.

When asked about the relationship with ABB over the years, Jan Bakke, Senior Superintendent/CSO who has been with Sea Launch since the Commander and Odyssey arrived at their home port in 1998, shares some thoughts. “We find that the key to the success of our launch campaigns is to ensure that the safety and training of the personnel and the maintenance of the equipment is never compromised. The ABB turbochargers fit right in with that philosophy. We have seen, based on their performance history, that the ABB turbochargers are reliable and that is what counts. It speaks to the quality of the ABB equipment. We have had a relationship with the ABB Service Station in Carson, California from the very beginning and have not been disappointed with the service or the performance of the equipment.”

Francis J. Pelot has a Bachelor’s Degree in Psychology from the University of the Pacific, California. He has eighteen years of experience in the metallurgical sector with management positions in operations and production at small to mid-size fabrication and manufacturing facilities. Pelot joined ABB Turbocharging in 2008 as a Business Administrator and was promoted to Account Manager EUS in 2010.

The ABB Turbocharging water washing system allows turbine cleaning while operating at reduced load.

TPS turbocharger – turbine cleaning in operation

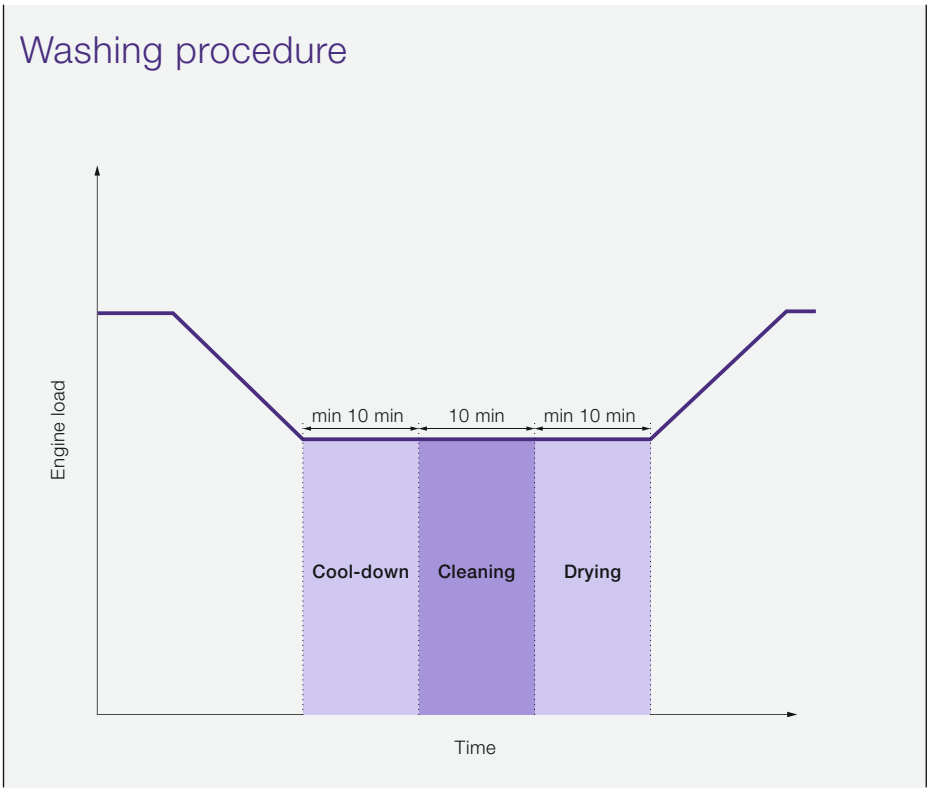
A ten minute turbine washing procedure for TPS turbochargers operating in HFO applications.

Text Fabian Wittmer, **Photography** Michael Reinhard

Turbochargers operated on HFO are exposed to fouling and deposits originating from the engine's exhaust gases. The extent of the turbine side fouling depends on various factors, such as fuel quality, the engine operating point or combustion quality. Fouling reduces the turbocharger's efficiency and results in both higher exhaust gas temperatures and increased fuel consumption. Regular turbine cleaning also helps to keep engine performance up to design power.

Two turbine cleaning methods

The ABB Turbocharging water washing system allows turbine cleaning while operating at reduced load. Two methods are in use. A procedure with a short water injection time (3 × 30 seconds) is permissible on any turbocharger turbine casing. The long water injection procedure (ten minute wash) was first introduced with the latest turbine casings, which feature an additional gasket between the turbine casing and the bearing casing (TH22, TH32 and TH42).



The three phases of the ten minutes washing procedure: Cool-down, cleaning, drying.

Field experience and tests have shown improved cleaning results with the ten minute washing procedure. Especially good results were obtained when washing with the engine idling.

Recommendation

In cases where operators experience inadequate results when cleaning with short water injection, ABB Turbocharging recommends changing to the ten minute procedure, regardless of the casing type.

On turbochargers without the additional gasket, long water injection may lead to minor water leakage between the bearing casing and the turbine casing. This is due to unequal thermal expansion during the long water injection procedure. The water leakage represents no risk to the turbocharger and it is up to the operator to judge whether a potential temporary leakage is permissible from an operational point of view.

Regardless of the chosen washing procedure, the exhaust gas temperature limits described in the operation manual must be maintained carefully. Failure to precisely observe the washing procedures may drastically shorten the service life of the components.

The detailed washing procedures are described in the operation manual. For questions concerning washing, or to obtain the latest operation manual, please contact your local ABB Service Station.

Please get in touch!

Is there any Tip for the Operator you would like to see covered on this page? If there is a particular difficulty you have faced lately and managed to solve, please share your field experience with other operators. Contact us and tell us about your turbocharger technical concerns at charge@ch.abb.com.

Fabian Wittmer was awarded an M.Sc. in engineering science in 2007 from the ETH Zürich. He has been Manager Technical Service at ABB Turbocharging since 2008. His responsibilities comprise technical support for engine builders, end users and ABB Service Stations as well as claims management and technical investigations.

Timeless fare from the Middle East

Tomato and chickpea soup is the tasty recommendation of ABB Turbocharging Sales Manager Zaid Alzubadi. “It is on the menu daily at my house,” says the Iraqi. International recipe No 7.

Text Tiziana Ossola Auf der Maur, **Photography** iStockphoto

Chickpeas have an historic significance in the Middle East. The first examples of the domesticated variety were found in Tell el-Kerkh, Syria, and were dated to the tenth millennium BC. Later there were ancient finds in Turkey and the West Bank. Greece and Italy have known of chick peas since at least the Bronze Age.

Merchants from the Orient or European Conquerors: they all did their bit to spread the small bean. Chickpeas are today enjoyed on every continent, and in many places belong to the population’s staple foods. According to the FAO, India and Australia are the two top producers.

The chickpea is versatile. Many cultures have their own specialities: whether hummus, the Lebanon’s savory purée, a spicy stew in India or “pasta e ceci” (pasta and chickpeas) in Italy – cold or warm, hot, spicy or mild.

There has to be something special about a bean that has spread through the continents and established itself over the millennia. In modern language it sounds like this: Like other beans, chickpeas have slow burning complex carbohydrates and cholesterol-lowering fiber. It is rich in proteins, vitamin B complex and iron. It boosts the immune system, is good for the digestion and wonderful for vegetarians.

Tomato and chickpea soup
(Hasa tamata ma' hummus)
(Serves four)

Ingredients

1 can	(ca. 200 g) of chickpeas (or garbanzo beans), drained and rinsed in water. If you prefer to use dried chickpeas, soak them overnight in ample water and throw away the liquid. Then simmer them for 1 to 2 hours without salt but with some rosemary twigs.
A little	olive oil
1	small onion
1	small shallot
3	cloves garlic
15 g	fresh cilantro
A few	fresh mint and parsley leaves
½ tsp.	ground cumin
¼ tsp.	ground allspice
1	large pinch cayenne pepper
4 dl	tomato juice
4 dl	water
50 g	rice, rinsed
	Salt and pepper

Preparation

1. Finely chop the onion, the shallot and the herbs, crush the garlic cloves.
2. Heat the olive oil in a pan and braise the onion and the shallot.
3. Add the garlic, cilantro, cumin, allspice and cayenne pepper and sauté a few minutes over a moderate heat.
4. Stir in the remaining ingredients – except the mint and the parsley – and bring to the boil.
5. Reduce the temperature and simmer at moderate heat until the rice is cooked (approx. 15 to 20 minutes).
6. Add salt and pepper to taste.
7. Add the fresh mint and parsley to taste.

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Address
P.O. Box
CH-5401 Baden/Switzerland
Phone: +41 58 585 7777
Fax: +41 58 585 5144
www.abb.com/turbocharging
e-mail: charge@ch.abb.com

Editor
Tiziana Ossola Auf der Maur

Photos
Michael Reinhard
iStockphoto
ABB Turbo Systems Ltd
Drydocks World Dubai
ABB Turbocharging in Dubai
Corbis
Daimler AG
MWM GmbH
Dave Hutsell
Sea Launch

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