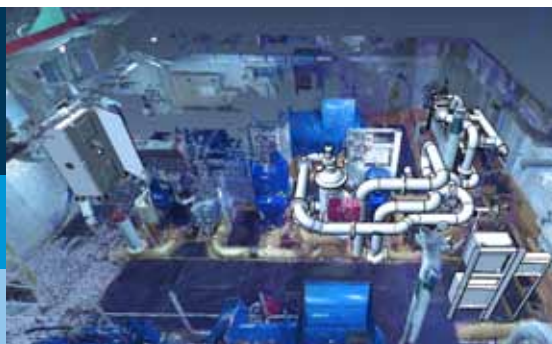


Moving mountains

In-Situ Machining and Diesel Engine teams complete a challenging project on a barge-mounted power plant
p. 2



3D scanning solves BWT challenges

p. 4

Laser scanning followed by 3D modeling and prefabrication as an efficient solution for retrofits



Saving large crankshafts

p. 13

Long term R&D investments help complete machining and repairs in a fraction of the time



Turning up the heat with annealing

p. 12

Salvaging condemned crankshafts and restoring customer assets to operation in a fraction of the time



Unloading the engine block in the Port of Singapore



Offloading the engine block in the Goltens Singapore workshop, using a mobile crane



Engine block being loaded for the shipment to Bangladesh

Moving mountains

Relocation and reconditioning of 80-tonne Wärtsilä engine block

Goltens Singapore mobilizes In-Situ Machining and Diesel Engines teams to complete a challenging project on a barge-mounted power plant.

Goltens is not new to undertaking the most demanding repairs in the marine industry. Expanding the company's horizons, Goltens Singapore was awarded a turnkey contract to complete a challenging project on a barge-mounted power plant, as part of Goltens' global initiative to increase its activities in the power generation market.

The 120-MW barge-mounted power plant in Haripur, Bangladesh, owned and operated by power generation providers NEPC and Covanta Energy, has been in operation since 1999. One of its eight Wärtsilä 18V 46GD engines required significant repair work, including the supply of a fully reconditioned engine block.

The full scope of work was carried out in three locations, culminating in the re-building of the engine and commissioning on-site in Haripur, near Dhaka, Bangladesh in February 2012. This was an extremely challenging project that required complicated logistical arrangements and operations between the Philippines, Singapore and Bangladesh.

Goltens' specialists started the work by dismantling and extracting the 80-tonne engine block from an existing power plant in a rural location in the Philippines. At this stage, visual inspection and nondestructive testing were performed to confirm suitability of the block for the project. Once ready for land transportation, the engine block was transported 50 kilometers to the port by multi-wheeler trailer. The engine block was then loaded onto a heavy lift vessel for onward transportation to Singapore.

BACK TO LIFE

Upon arrival at the Port of Singapore, the engine block was unloaded and moved overnight to the Goltens workshop, accompanied by a police escort for increased safety. Goltens Singapore experts carried out the modification and conversion of the used diesel engine block into a gas-diesel engine block using specialized In-Situ Machining equipment. Following reconditioning in Singapore, the engine block was shipped to the Port of Mongla in Bangladesh by a heavy lift vessel, then loaded onto a barge for onward river towage to the final location.

Goltens' specialists dismantled the existing engine, jacked up the damaged engine block from its original position and shifted the crankshaft aside. A full inspection of the existing crankshaft was carried out on-site, resulting in honing of the crankpins and main journals, as well as milling counterweight contact landings.

A delicate skidding operation was then performed whereby the existing engine block was removed and replaced by the reconditioned block. Goltens' diesel team then rebuilt the engine culminating in successful commissioning and handover in February 2012.

DELIVERING VALUE

"We are very satisfied with the outcome of the project and our working relationship with the customer," says Vice President of Goltens South East Asia Tom Boyle. "The engine is running smoothly to the satisfaction of both ourselves and the customer. The In-Situ Machining work on the block and crankshaft, as well as the re-building and commissioning of the engine, were routine tasks for our experienced Diesel and In-Situ Machining teams, but the logistics were complicated due to various geographic challenges."

Project facts

Project scope: supply of a fully reconditioned engine block for a barge-mounted power plant in Haripur, Bangladesh
Owned and operated by: NEPC, Covanta Energy
Total electric output: 120 MW
Engine Type: Wärtsilä 18V 46GD
Locations: Philippines, Singapore, Bangladesh

"The work on the block and crankshaft, as well as the rebuilding and commissioning of the engine, were routine tasks for our experienced teams, but the logistics were complicated due to various geographic challenges."



Modification of the fuel pump mounting



Laser alignment inspection of the main bearing pockets



Calibration of main bearing pockets



Preparing to remove the timing gears



Boring of the lower liner seating area and installation of a bushing



Masking the engine block parts before sandblasting



Painting process completed as per paint maker's recommendations



Primer coating after full sandblasting



Inspection of bearing saddle landing surfaces



Preparation for the shifting of the new engine block, from the river barge to the power barge



Looking in from the river barge



Old engine block removed, and crankshaft lowered to the oil sump



Preparing to move the engine block to the barge



Finishing touches for the new engine block



Cleaning and re-tapping all the threaded holes

Ivo Sisis – 40 years of dedication and service

GOLTENS NEW YORK

October 4, 2012 marks an incredible professional milestone for Goltens New York Managing Director Ivo Sisis. This date marks the 40th year that Sisis has been working with Goltens New York.



This is a remarkable achievement for any person and an especially noteworthy accomplishment in an industry characterized by difficult and demanding work, both intellectually and physically.

After completing maritime schooling in Dubrovnik, Croatia, Sisis started his career as a merchant engineer, sailing on passenger vessels and honing his skills hands-on in the engine room before joining Goltens.

From his first interactions with Sigurd Goltén, the company's founder, it was obvious to Goltén that Sisis was special and was highly regarded by him for his tireless work ethic, broad technical knowledge, ability to learn quickly and his unrivaled success in completing the most challenging of jobs. Sisis started his career with Goltens as an Afloat Diesel Mechanic, but quickly worked his way to Foreman, Supervisor, Technical Manager, and in 2002 was promoted to Managing Director for Goltens New York.

"Ivo is relied upon day in and day out to provide technical direction and counsel on sophisticated and complex repair projects all over the group. His depth of technical knowledge and skill is truly remarkable and his energy and work ethic are unparalleled. To have Ivo as an integral part of the Goltens Group has always been an enormous asset to Goltens in New York and around the world," notes Vice President of Goltens Americas Roy Strand. |||

New facility to serve marine and industrial markets

GOLTENS PHILIPPINES

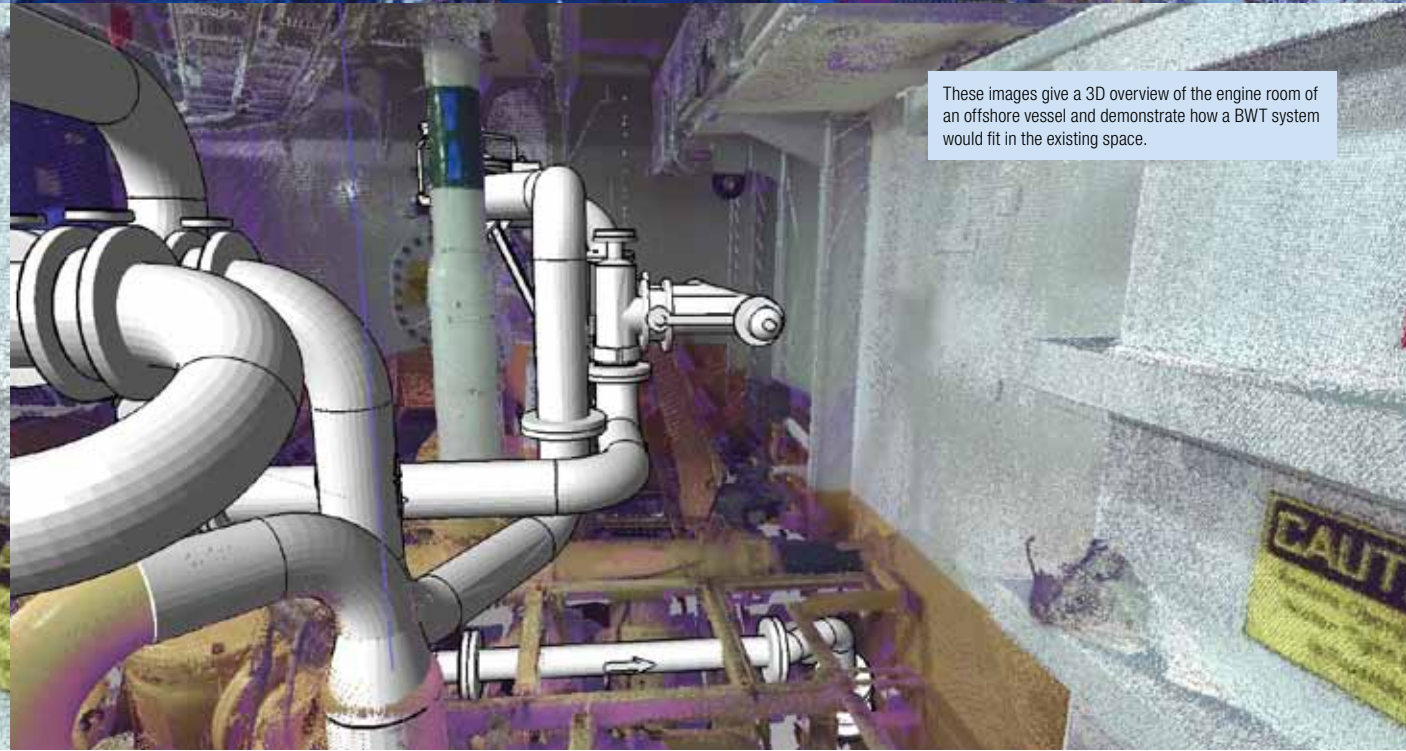
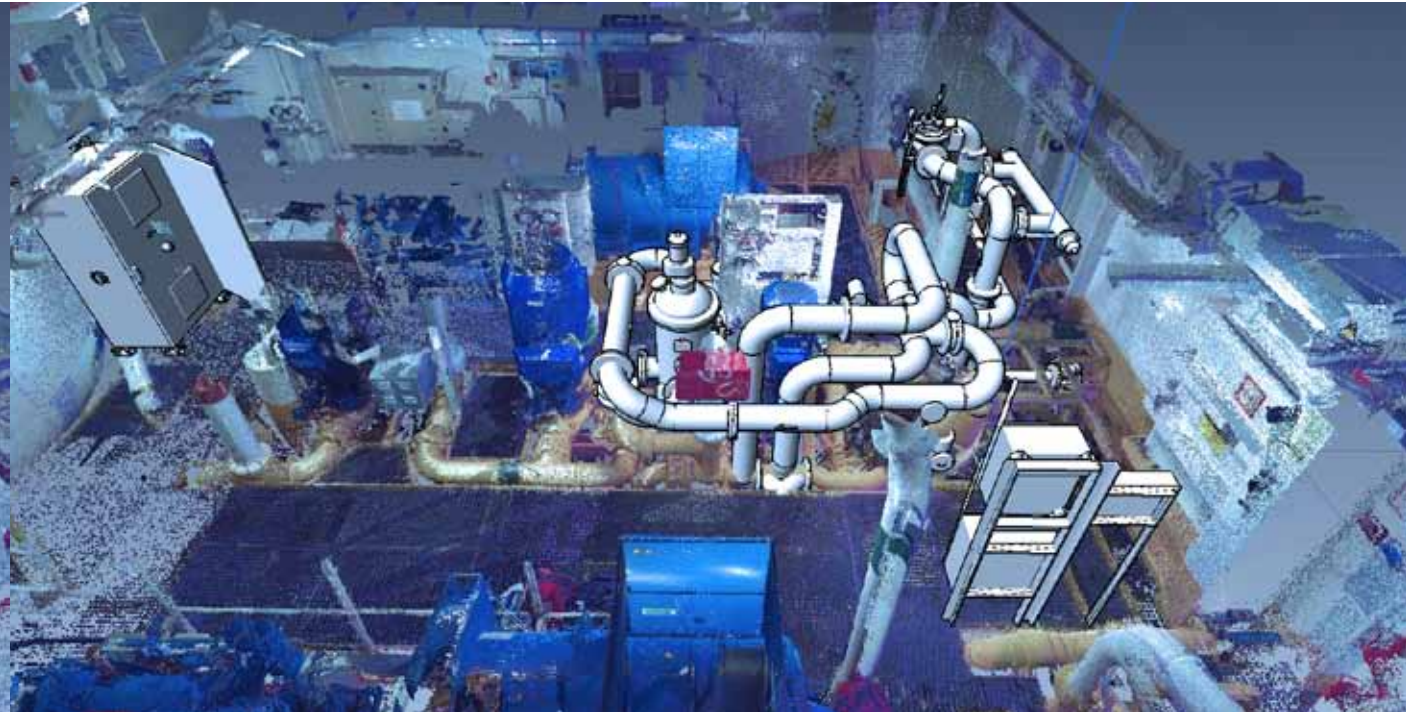
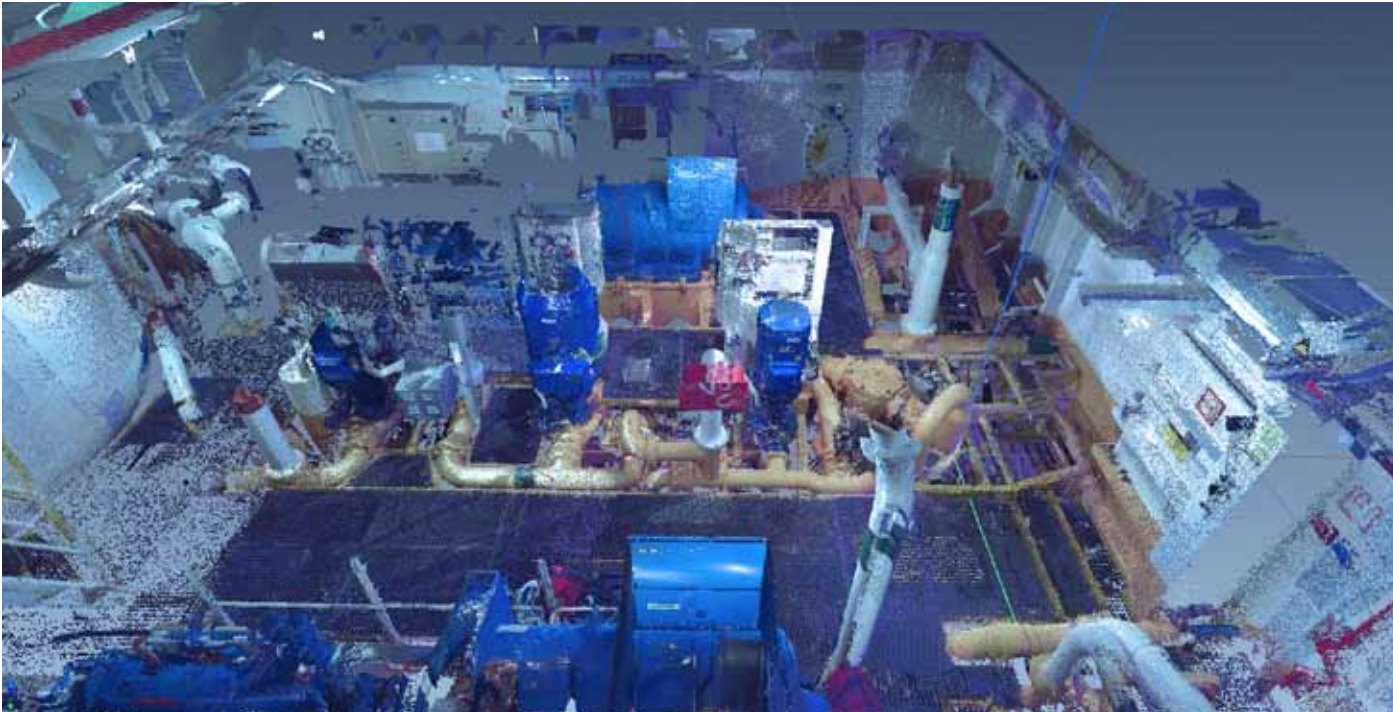
Two years after establishing a representative office in Manila, Goltens opened its latest workshop facility in Clark, Philippines.

The new branch, opened on June 29th 2012, will focus on specialist Diesel Engine and In-Situ Machining services. In addition to that, the Philippines workshop will be an Authorized Independent Service Facility for Woodward governors and aims to become the leading Governor repair centre in the region.

"We are proud to be the latest addition to the Goltens' network of workshops and confident that we can maintain the highest standard of service to our customers that the Goltens Group is renowned for," said Goltens Philippines General Manager Alan Capistrano during the opening ceremony.

Goltens Philippines is also undergoing accreditation for the ISO 9001 quality management system, expecting to complete the process before the end of 2012.

"In addition to the marine market, the Philippines offer Goltens a substantial industrial market heavily populated with diesel engines and governors," said Vice President of Goltens South East Asia Tom Boyle. "We are delighted to open this facility and we have high hopes for its future success." |||



These images give a 3D overview of the engine room of an offshore vessel and demonstrate how a BWT system would fit in the existing space.

3D laser scanning and modeling

An efficient solution for BWT retrofits

Lack of precision while measuring ballast water treatment system installation space can result in the equipment not fitting exactly as planned, leading to unforeseen costs.

To avoid unexpected complications during the installation process, Goltens Green Technologies recommends laser scanning of the installation space, followed by 3D modeling and prefabrication. Laser scanning provides an accurate and efficient solution for fitting a ballast water treatment (BWT) system onboard. It also eliminates most of the risks associated with manual measurement and fabrication onboard without prefabrication.

SCANNING

Often, particularly for older vessels, existing drawings are inaccurate, and having a 3D laser scan ensures that the subsequent engineering design is based on the actual configuration of the ship.

Goltens Green Technologies experts need less than 10 hours onboard a vessel to scan the entire area where the BWT system will be

installed. The scan does not disturb the vessel's operation and it is not even necessary for the crew to leave the engine room during the scan.

The laser scanner has an accuracy of 2 millimeters, allowing for precise measurements and the creation of highly detailed three-dimensional images of the engine room.

As the scanner rotates, the laser beam hits the surface of an object, generating a measurement in both distance and angle. One complete turn of the scanner creates a point cloud of 10 million dots containing information that is used to create a 3D image. The scanner is moved around the engine room to ensure all areas are captured by the laser beam. Afterwards, all the images taken from different points are pieced together to create a complete 3D image of the space.

PROCESSING THE SCAN RESULTS

The point cloud generated by the scan is put directly into a 3D CAD program to start modeling the BWT system into the existing space. At this point, it becomes possible to see exactly how the BWT system would fit and whether there would be sufficient space left to walk around

and service it. It is also possible to compare different options in case the shipowner has shortlisted more than one BWT system and is not sure which one would fit best. Shortlisted systems can be modeled to show which would be the optimal solution in terms of fit.

One of the advantages at this stage is that both shipowner and chief engineer can clearly see how the system will fit before any further actions are taken. They can voice their thoughts and suggestions if they want anything to be rearranged, and Goltens Green Technologies experts will look into the options for implementing their requests.

PRODUCTION DRAWINGS

Due to the high accuracy of the laser scanner, it is possible to make production drawings directly from the scan results. "We have tried this on one of our recent installations, and the accuracy was so high, that we didn't have to use fitting pipes," says Goltens Green Technologies Business Development Manager Jurrien Baretta.

It is common to use steel for BWT system installations, which is left ungalvanized to allow for adjustments. When all the adjustments are

done, the steel can be welded and galvanized. This means, however, that about five extra days need to be calculated into the schedule, allowing time for the steel to return from a galvanizing plant. Laser scanning can save this valuable time that would be otherwise needed onboard.

Goltens Green Technologies experts also prepare drawings for the foundations. Baretta points out that with a laser scan shipowners can have a comprehensive overview of all the parts needed for an installation, which can save time and effort.

It is important to realize that the production company should have the same accuracy as the laser scan used to make an onboard survey. Otherwise, the advantage of having such a highly accurate scan is lost. "We have witnessed this in action," says Baretta. "If a

shipyard can't make the pieces fit, they have to remake the pipes. This is a very costly exercise as it requires the shipyard to install, uninstall, refabricate and reinstall all of the piping. This costs the yard and the owner precious time and money."

MATERIALS LIST

Goltens Green Technologies specialists also prepare a detailed material list. This way, the shipowner gets a complete production package that they can use at any shipyard of their choice. This also helps keep track of the costs by projecting a realistic price estimate based on the amount of materials needed. Baretta points out that it makes it easy to compare estimates from different shipyards and to choose the optimal solution. |||



Goltens' specialists help carry out a BWT system installation onboard a vessel.

Saving time and money on sister ship BWT system installations

Coupling the latest technology with industry expertise can make ballast water treatment (BWT) system installations on sister vessels a time and cost efficient task. Goltens Green Technologies shares insight on how to make the most out of the task involving a number of nearly identical vessels.

Using laser scan technology to survey the installation space and to create a 3D model and prefabrication can save time and money for shipowners with fleets of sister ships. Instead of manually measuring the engine room of every vessel, Goltens Green Technologies experts recommend a much more efficient process.

"Large shipowners generally tend to be more proactive with fitting their fleets with BWT systems, yet often they do not realize that they can save time and money on sister ship installations," says Goltens Green Technologies Business Development Manager Jurrien Baretta.

THE PROCESS

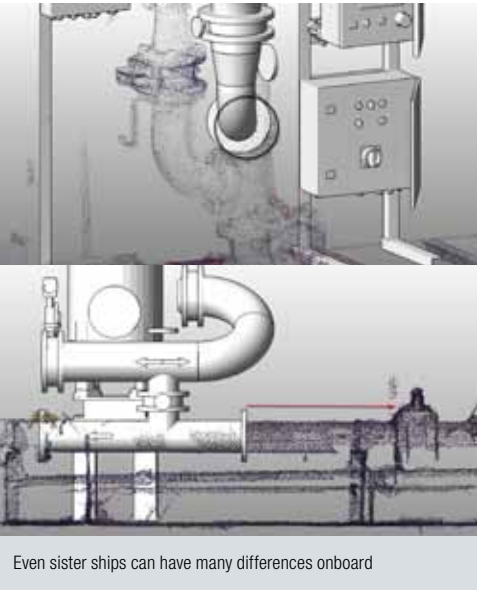
Each of the sister ships is scanned – it only takes up to 10 hours for a complete scan, and the vessel can continue operating as normal during the process. After the scan is complete, a 3D model showing how a BWT system would fit into the existing space of one of the ships is created. When this step is completed, the proposed design can be applied to the scan of her sisters. Instead of creating a 3D model from scratch for each of the sister ships, the initial design can be used throughout the sister fleet with some modifications, saving time and costs.

To ensure that the piping design for the first ship fits the sister vessels, a collision check needs to be performed. This is a crucial step because no matter how similar sister ships may look they are rarely exactly the same. If the piping does not fit exactly as it would on the first vessel, the 3D model of the system can be modified.

"We have been working on sister vessel installations, and I have rarely seen ships that were so similar. Still, when we compared them,

we found eight collisions," says Baretta.

Sometimes the differences can be quite vast and may require major modifications to the 3D model. In this case, the vessels are no longer considered sisters, and Goltens Green Technologies experts create a new design for the second vessel.



Even sister ships can have many differences onboard

IN PRACTICE

One of the recent sister ships installations that Goltens Green Technologies experts have been working on involved a vessel operating in Southeast Asia. The shipowner requested a scan of the vessel and needed to get results quite fast. It would take at least a week, including the time needed for travel. "I looked up the information online and saw that there was a sister of that ship operating nearby. My suggestion was to scan the sister ship and make a proposal based on that. We did not make the final detailed engineering at that point, as we needed to survey the actual vessel, but scanning the sister ship helped save time initially," says Baretta. |||

Zero downtime for the vessel

Goltens Green Technologies experts have experience in designing and installing BWT systems during normal operation. One of the latest installations involved a number of complex and challenging tasks. Despite that, the vessel did not have a single minute of downtime.

THE CHALLENGE

A shipowner that operates offshore supply vessels approached Goltens Green Technologies with a request to create an engineering package for five sister ships.

Initially, the shipowner had chosen a specific BWT system for the vessels. The systems were already purchased and the installation had already been initiated on one of the ships when it turned out to be more complicated than expected. The shipowner decided to involve Goltens Green Technologies to integrate the BWT system into their engineering plan.

"At this time, I found out that one of these ships appeared to be trading in the area where we have our office," says Goltens Green Technologies Business Development Manager Jurrien Baretta. "We contacted the shipowner and asked if it made sense for us to provide the installation. The shipowner was quite enthusiastic about it, and we received the order for completing the installation."

The vessel was collecting bottom samples by drilling to determine suitable locations for placing windmills, and would work when the weather was quiet. Goltens experts would come onboard when it was in port due to rough weather. "As soon as we could see approaching storms on the online weather forecast, we would contact the shipowner and ask if it was

possible to come onboard the next day," says Baretta. "As soon as the weather would calm down again, we would go ashore and the vessel would leave. That worked out really well."

The complete installation including piping, foundations and the electrical installation was completed in a total of five days without causing the vessel any delays.

PIPE OVERBOARD

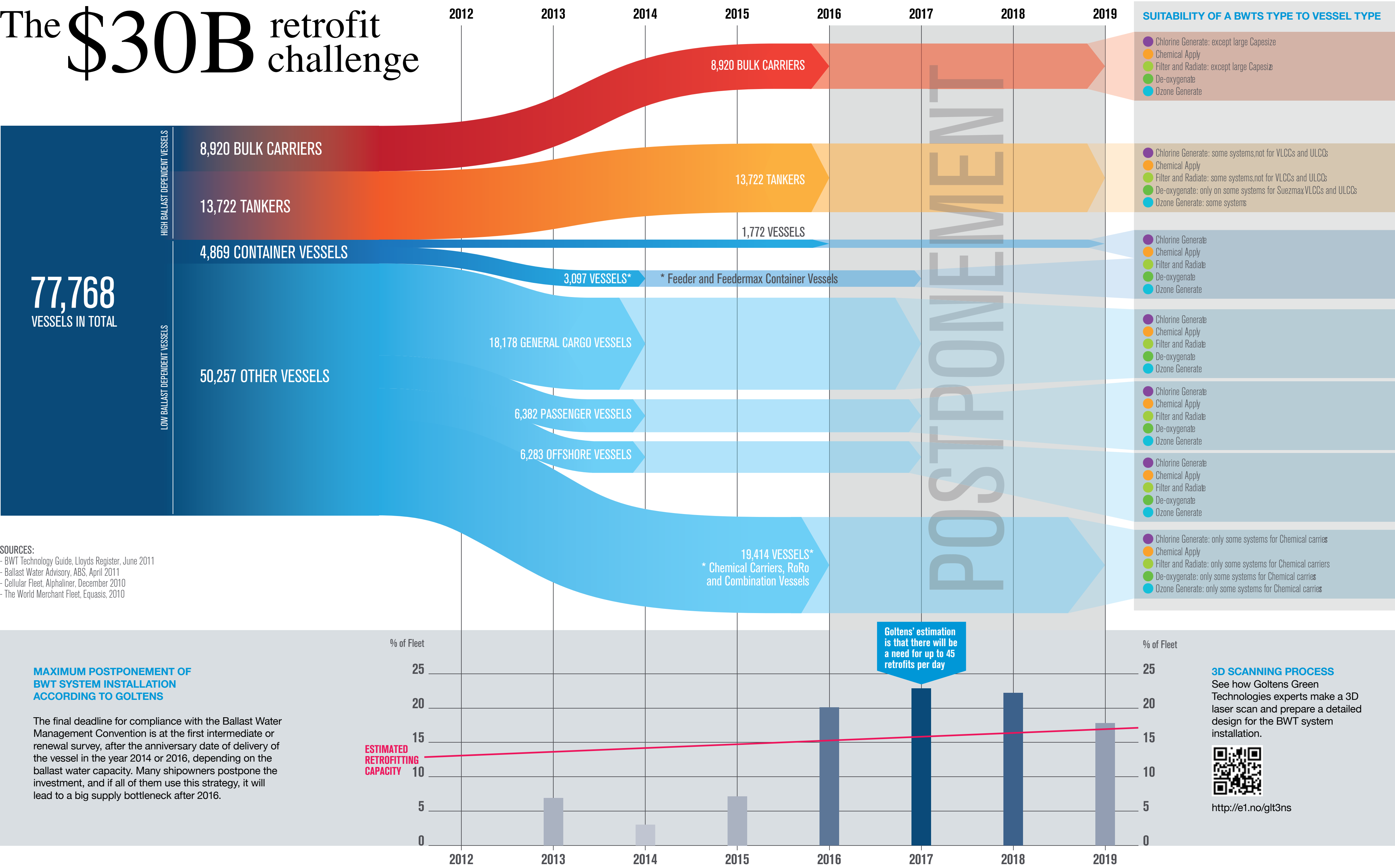
One of the biggest challenges during this installation was that the design and space constraints required the overboard pipe to be placed under the waterline. Operational commitments required a safe, class-approved process to complete the through-hull bore with the ship in the water.

"We discussed some of the options with the classification society to make sure that whatever we considered at that time was going to be safe," says Baretta. As a result, Goltens Green Technologies experts decided to weld a pipe in the area where they would have to drill the hole. They then drilled a hole in that pipe when the vessel was in port and connected a valve that closed quickly to stop the flow of the water.

The next step involved drilling a bigger hole from the outside of the hull. To be certain that the divers were drilling in the right spot, Goltens Green Technologies experts put compressed air in the pipe welded from the inside of the hull to initiate bubbling from the outside. This enabled the divers to align the drill at the exact spot and to drill the hole. The divers even managed to apply conservation treatment to make sure there was no corrosion.

"Completing this all safely without dry-dock and without schedule interruption was a very interesting challenge for us," says Baretta. |||

The \$30B retrofit challenge



Goltens signed MoU with Drydocks World

GOLTENS DUBAI

Goltens has signed a Memorandum of Understanding with Drydocks World, the largest ship repair, conversion and new-building facility in the Middle East.



Drydocks World is an international entity known for its infrastructure, strong reputation in ship repair, ship conversion and shipbuilding and sizeable workforce. The collaboration with Goltens will produce a strong brand leverage for both companies, locally and internationally.

"We believe in working in partnership with like-minded individuals and organizations to broaden our reach and support the industry with our considerable combined expertise," said Khamis Juma Buamim, Chairman of Drydocks World and Maritime World.

According to Buamim, the strategic alliance of Goltens and Drydocks World will enable both companies to achieve better market penetration and develop it further in a mutually beneficial manner through increased market share, reduced competition and larger business volumes.

"The underlying basis of the cooperation is to produce a cohesive brand to the marine industry," said Paul Friedberg, President, Goltens Worldwide Services. "Synergizing different skill strengths of Drydocks World and Goltens will serve as an added advantage in providing quality service including specialized services with adequate infrastructure, technological knowhow, leading to increased business and earnings for both companies."

The combination, Friedberg believes, will provide both companies a critical edge to mitigate new competition arising in the regions and assimilate increasing business volumes.

Goltens, with a strong presence in the Middle East, is currently part of a long term Musataha ground development agreement for two plots within the Dubai Maritime City. The plots measuring about 23,000 square meters are leased to Goltens for a period of 25 years. |||

New workshop in Indonesia

GOLTENS JAKARTA

Goltens has opened a new workshop in Surabaya, Indonesia as part of its strategy to operate small workshops in Indonesia to be in close proximity to the customer and to develop the local market further.

The workshop in Surabaya provides specialized governor repair and maintenance services as an Authorized Independent Service Facility for Woodward. Other services offered include Goltens' core in-situ machining and diesel engine services.

Goltens' workshop in Surabaya is located in Angtropolis, a rapidly growing industrial and commercial area in Jalan Raya Margomulyo near Tanjung Perak, the second busiest seaport in Indonesia. It is also within close reach to the PAL Shipyard, the largest shipyard in the country.

The new workshop has an area of about 600 square meters and is set up to sustain and grow the turnover for specialized services offered by Goltens in the Surabaya area and the broader eastern part of the country. |||

Myths & facts about ballast water treatment systems

Numerous myths about ballast water treatment system installations are filling the vacuum created by the lack of the hands-on experience and knowledge in the industry. Pressured by regulatory deadlines and driven by uncertainty, many shipowners find it challenging to make the right choice and keep postponing the decision. *InService* looks at these widely circulated myths with the help of Goltens Business Development Manager Jurrien Baretta who helps clarify some common misconceptions.

MYTH #1 IT ONLY TAKES A COUPLE OF MONTHS TO INSTALL A BWT SYSTEM

FACT At the moment, the delivery of an average BWT system takes about six to eight months. As the Ballast Water Management Convention deadline approaches, driving the demand up, the time needed for delivery is likely to increase. Another thing to consider is the time needed to have the system approved by a classification society, which can take an additional three or four months. Altogether, at least nine months of total preparations are needed for delivering the system and getting the installation class approved.

MYTH #3 THE SHIP ALWAYS NEEDS TO BE IN DRY DOCK FOR A BWT SYSTEM RETROFIT

FACT In some cases, BWT systems can be installed during normal operation if all the necessary preparations are taken care of, purchasing is complete and piping is ready. Goltens Green Technologies experts have executed numerous design and retrofits during normal operation of the vessel. System requirements and design constraints are the determining factors.

MYTH #2 INSTALLING A BWT SYSTEM IS EASY

FACT Some of the BWT system suppliers make it seem simple to shipowners during their sales pitches. As a result, shipowners often underestimate the complexity of an installation. "It is much more than just buying a system and plugging it in. It should be integrated with the existing systems and devices onboard a ship that was not built with the capacity for having an additional large piece of equipment installed," says Baretta. "Piping conflicts, through hull connections, deck space and power requirements all add degrees of complexity that are very often underestimated."

MYTH #4 ENVIRONMENTAL FACTORS DON'T AFFECT PERFORMANCE

FACT Salinity, turbidity and temperature all affect performance in one way or another and affect different systems differently. Water temperatures below 15°C can be an issue for many of the chlorination systems because water temperature needs to be increased to make the system function well, which requires additional power. The same is true for salinity in systems that use salt as material to generate a chlorine compound or where the ballast water functions as a conductor (electrolysis, advanced oxidizing). For UV systems, water turbidity influences the effectiveness of the UV radiation, so proper filtration is essential.

MYTH #5 PRICES OF BWT SYSTEMS WILL SOON GO DOWN AS MORE PLAYERS ENTER THE MARKET

FACT The demand will be significantly higher in a few years, and the suppliers will feel no need to lower the prices. There are 19 fully type approved BWT systems on the market as of March 2012, but even if there were twice as many systems by 2016, the demand would still outstrip the supply. At the moment, some of the manufacturers may offer their BWT systems at an attractive price, as they need reference projects and the experience for improving their products. Shipowners that postpone installations until the last minute risk ending up with the 'leftovers'— systems that were not chosen by others because they are too complex, too big, consume too much power, etc. "The perception of many shipowners is that once the production of BWT systems gains more volume, they can be produced more efficiently and hence the prices will go down; just like it was with plasma televisions, to give an example. I don't feel that this is going to be the case. The demand and regulatory pressure will be so high that the prices will certainly go up instead of going down," says Baretta.

MYTH #7 IT IS TOO LATE TO DO ANYTHING ABOUT THE ENVIRONMENT ANYWAY WITH ALL THE BALLAST WATER BEING CARRIED AROUND THE WORLD

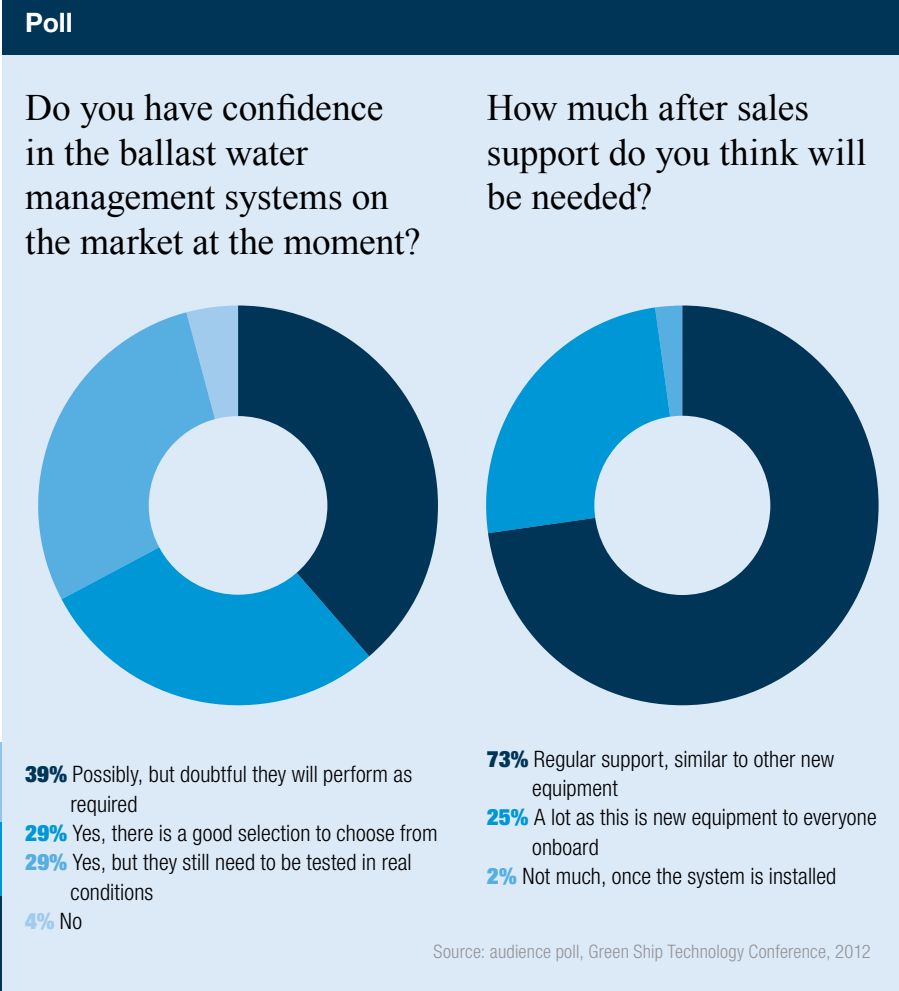
FACT Every nine weeks an alien invasive species gets successfully introduced somewhere in the marine environment. It is an irreversible process that causes vast financial losses for numerous states and can potentially endanger human lives. The damage caused cannot be undone, but it is vital to do something about the problem. "Everybody recognizes an oil spill as a terrible environmental disaster," says Baretta. "Still, if we look at the big disaster in the Gulf of Mexico, one year after the spill 95% of the oil was gone. The environment has absorbed the problem and has taken care of it. With invasive species, one year after they have been introduced in a new area, there is only going to be more of them. It is a disaster that is much graver than an oil spill but not as visible to the public."

MYTH #6 IF MOST OF THE SHIPOWNERS MISS THE DEADLINES, PORT STATE AUTHORITIES WILL NOT FINE EVERY SINGLE ONE OF THEM

FACT There are no indications at the moment that Port State Authorities will not proceed with the fines.

MYTH #8 IN THE FUTURE, THERE WILL BE SHIPS WITH HULLS DESIGNED IN A WAY THAT WILL NOT REQUIRE ANY BALLAST WATER

FACT It is difficult to design a ship that requires no ballast and provides good stability in all circumstances – especially in rough weather. Design modifications may help reduce the ballast water dependency, but are not likely to eliminate the use of it completely.



Rapid response at a crucial time

An offshore drilling services provider contacted Goltens after encountering a major problem with a recently manufactured rotary bushing.

At a crucial stage during planned repair of a jack-up rig with a drilling depth of 20,000 feet, the customer discovered that due to improper clearances the shaft did not fit in effectively.

Goltens' specialists responded immediately and carried out a full inspection of the rotary table. Upon evaluating the situation, Goltens suggested in-situ boring as the most efficient solution to resolve the issue.

To match the customer's tight timeline, Goltens' mobilized its In-Situ machining specialists and the necessary boring equipment and had everything in place within 24 hours.

After completing the boring of the bushing to the required size, Goltens specialists per-

formed final calibration, enabling the customer to complete the survey on time and get the work approved by a classification society. |||

Project facts

Rig-drilling depth: 20,000 ft
Hull: 230 ft x 200 ft x 26 ft
Work scope: in-situ boring (rotary table)
Diameter: 954mm**Length of bush:** 188mm
Repairs:
- Calibration of the bore and preparation of suitable fixtures
- Boring of the bush to a required size
- Final calibration and approval



Newbuild project on track

Line boring of brackets holes keeps octagonal FDPPO newbuild project on track.

Goltens received an inquiry to complete in-situ line boring of fairleader brackets for a newbuild octagonal FDPPO (floating, drilling, production, storage and offloading) vessel.

After visiting the shipyard and discussing the technical requirements with the project director at the yard, Goltens' In-Situ specialists discovered that during installation of the fairleaders, welding had caused a misalignment of the centerline and distortion of the brackets. It became apparent that In-Situ line boring would be required to realign the 13 sets of 3 (651mm diameter) bracket holes to a suitable condition.

Goltens' experts prepared a project execution plan including key milestones and a detailed time schedule. Goltens quickly mobilized

line boring tools and machining specialists to the yard and worked 24 hours a day to complete the job.

Goltens' service team completed the entire job within seven days, before the shipyard's deadline and to the full satisfaction of the technical director and approval by the FDPPO owner and class surveyor. |||



Newbuilding breakthrough

When a leading private shipyard in India needed a professional services provider for one of its newbuilding projects, Goltens proved to be the right choice.

Pipavav Shipyard secured an order from a renowned international shipowner to build four bulk carriers of 74,500 DWT. The shipyard was looking for a professional services provider in the Indian market. After thorough examination of strengths and capabilities, the shipowner selected Goltens India to carry out the installation of the engine, main propulsion and rudder and steering systems.

Goltens' In-Situ Machining specialists first supported the shipyard by completing sighting and line boring of the stern tube bushes. The next step included alignment and installation of shafting, rudder steering gear, stern tube bushes and propeller and shaft seals.

After vessel launch, Goltens' specialists lowered the main engine and performed the alignment with shafting systems, including in-situ drilling. To complete the job, bearing load tests and chockfasting were carried out, and final harbor and sea trials were run.

Goltens also supported the shipyard with skilled manpower for piping installation and a vibration analysis team.

Goltens' specialists managed to accomplish the entire task in only 48 days, well ahead of the 62-day schedule, to the satisfaction of the shipyard and a classification society. |||

BALLAST WATER TREATMENT SYSTEM INSTALLATIONS

To wait or not to wait?

Investing in a Ballast Water Treatment system can be a burden for many shipowners while global maritime shipping and trade continues to weather financially challenging times.

This “wait and see” approach by many owners will drive an installation and supply bottleneck that is likely to drive the associated costs up as the deadlines for the Ballast Water Management Convention approach.

This is why Goltens Green Technologies urges shipowners to start preparing for the installation as soon as possible. Business Development Manager Jurrien Baretta talks to InService about the implications of waiting.

Are there any advantages for shipowners to wait with Ballast Water Treatment system installation?

If you wait, you can keep the money in your pocket for the time being. Another advantage of waiting is that there is not yet enough experience with BWT systems. The longer you wait, the more you know about how they actually function in practice.

However, if owners wait too long, they run the risk of the price of the BWT systems being higher when they finally make their decision. There is also a risk that there will not be enough engineering capacity the moment they need it.



The BWM Convention needs to be ratified. I think many shipowners are still waiting for that before they start being proactive.

Are most of the shipowners waiting at the moment?

Not necessarily. We see that shipowners with larger fleets are very busy with shortlisting systems. Some of them do trial installations to get some experience, which is definitely a wise choice. The best experience is always first-hand, and we see more and more shipowners going for it.

What are the biggest uncertainties that shipowners are facing right now?

There is uncertainty in terms of the durability of different BWT systems, as well as about how they will perform in different conditions – for example, in low temperatures or in low salinity waters. There are numerous conditions where BWT systems may not have been tested yet. This is the experience that we all lack; we don’t yet know how durable these systems will turn out to be over a longer period.

How does Goltens Green Technologies address these concerns?

Goltens Green Technologies takes an independent approach and we focus on what we do know. We do not push one system over another and will not tell a shipowner that this or that system will last for 10 years, simply because we don’t know that it will. However, we can tell the shipowner that if we look at certain techni-

cal facts, we can identify certain concerns, or whether a BWT system manufacturer is using good materials. But we cannot look into the future and we do not have the answers to some of the questions and we will not pretend that we have these answers.

What would you say are shipowners’ main challenges at this point?

Choosing the best system that will be both cost-efficient and will still comply when they go through the Port State Control.

How can installation be made as cost effective as possible?

What we see now is that many BWT systems suppliers are trying to get some experience and references. At the moment, they are selling their equipment at a price that is cheaper than what I would expect it to be in the future. In that respect, the sooner the installation is made, the more cost-efficient it can be.

Another important aspect is good preparation. The better prepared you are and the better you know exactly how you will be doing the actual installation, the less expensive it will be. We have already seen a number of installations done without sufficient preparations, and it took forever to fit the system and redo the piping.

We find that laser scanning is a very cost-efficient tool for optimal preparation. It allows for prefabrication of everything that is needed and then the system can be more easily fit into place when the ship is off-hire, or even during normal operation.

Is there a collective position from the shipowners, or would you say it is rather fragmented?

There is no unified formula that the shipowners use. Their position can depend on the trade they are in. If they are in a profitable trade, they would rather not risk detention or losing operational time because of non-compliance at any point. If they have a trade that is losing money, they have other concerns.

I know a number of shipowners that have made their choice and are fitting all their ships with a specific system. Some large shipowners are testing different systems, and my impression is that they are trying to convince the suppliers to offer them good deals, because they will be testing their systems. I also know many examples of new ships that are being delivered now and do not have a BWT system installed.

Why are the shipowners of new build vessels not fitting the systems, knowing that the Ballast Water Management Convention will likely be ratified in 2012?

They postpone the purchase of the equipment because they don’t have to do that just yet. It is largely a money issue; they just think that it is cheaper to wait than to do the installation now. Also, they have reserved the space for making the installation, so it will be somewhat easier to fit the systems later.

What do you think needs to happen for the shipowners to actually start being more proactive?

The BWM Convention needs to be ratified. I think many shipowners are still waiting for that before they start being proactive. When the BWM Convention is ratified, the shipowners will be more certain about issues they have to deal with.

Will there be enough engineers to actually install the systems when the BWM Convention enters into force?

There will definitely be a shortage of engineers. I don’t know how that can be solved. Perhaps, some of the shipowners will be forced to install a system without all the engineering work and



Goltens Green Technologies Business Development Manager Jurrien Baretta

Getting ready for the deadline

Goltens Green Technologies has defined a seven-step guide plan for undertaking a ballast water treatment (BWT) system installation. Business Development Manager Jurrien Baretta comments on each of the steps.

1. SELECTION OF THE BWT SYSTEM

Looking at the ballasting capacity would be one of the key considerations, as well as other factors, such as availability of power and installation space. Another thing to take into account is whether the vessel will sail in salt or fresh water, as some BWT systems have issues with the latter. The system should be type approved; otherwise it will not receive class approval.

2. ONBOARD SURVEY AND 3D LASER SCAN

After a shipowner has shortlisted a number of BWT systems, Goltens Green Technologies experts go onboard the vessel to evaluate the space and perform a 3D laser scan to find the best way to fit the system. A laser scan will reveal any obstacles in the way of piping installation and help us determine the most feasible solution.

3. PRE-ENGINEERING

At this stage the shortlist of the BWT systems will be further refined. Some systems may be dropped off the list because they will not fit or because it might be too complicated to get the piping in. When the owner makes a final choice of system, the detailed engineering work begins.



prefabrication completed. In that case, the installation will take a lot longer and will cost a lot more.

It seems like the entire world fleet is moving towards a situation where there will be increased costs associated with retrofits, as well as penalties for the delays. Is that the picture we are looking at the moment?

Yes. Many shipowners believe that the Port State authorities will accept that they cannot fine everybody. They are just waiting and hoping that there will be a solution.

What is your main advice to the shipowners at this point?

4. DETAILED DESIGN

The next step is preparing the detailed production drawing of the piping, foundations and any constructions that may be needed. Goltens Green Technologies will get the drawings approved by class prior to moving further. This can take a few months.

5. PURCHASING AND PREFABRICATION

It is important to bear in mind that purchasing a BWT system includes a lead time of six months or more. Assorted ancillary materials are included in the purchasing to ensure there are no delays once installation commences.

6. INSTALLATION AND COMMISSIONING

The supplier will need to come onboard and complete the commissioning of the system, and the classification society will need to survey the system for the final approval.

We have found that it is not always necessary to dry-dock a ship for an installation. Often installations can be done without adding new overboard connections – which would require dry-docking.

7. SERVICE

The last step is probably the most critical one long-term. Goltens’ service stations provide ongoing support and service worldwide.



Custom-made equipment

Goltens Singapore recently carried out an in-situ boring operation on a pair of stinger hinges on a newbuild cable-laying vessel constructed in a shipyard in Singapore.

This was a challenging job that involved removing a substantial amount of material from the rough-cut bores of the two hinges, as well as from the faces of the hinges. Additionally, the spec called for the drilling and tapping 96 holes into the faces of the hinges, once the faces were machined.

Goltens mobilized laser alignment, boring, flange facing and drilling machinery, along with in-situ specialists, to the shipyard to undertake the work. Multiple flange facing machines were deployed to allow for machining of multiple surfaces in parallel, as up to 20mm needed to be removed from each face.



Boring of the stinger hinge to 1350mm

Given the hinge pin bore diameter of 1350mm x 600mm long and the substantial amount of material that had to be removed

Avoiding costly shaft removals

Bayonne Drydock & Repair Corp. contracted Goltens to perform an inspection and conduct in-situ machining of two propeller shafts on USNS Watson, one of Military Sealift Command’s large, medium-speed roll-on/roll-off ships. The work had to be completed while the 33,644 DWT vessel was in dry-dock.

Initial inspection revealed that the shaft seals had worn channels in the port and starboard shaft seal liner surfaces during operation. Repairing the shaft seals in place was of critical importance to the customer as the yard estimated it would cost as much as \$850,000 to remove each of the shafts.

Having successfully completed such repairs on one of the Military Sealift Command’s vessels, USNS Sisler, as well as on numerous other vessels around the world, Goltens immediately mobilized its tools and specialists to the shipyard to start working on the repair.

This was not, however, an easy task: a very narrow width of the exposed journal surface gave Goltens In-Situ Machining specialists only about 90 mm width to mount the tools needed

to complete the precision work on the roughly 850mm diameter shafts.

After making some modifications to the standard tools to make sure they fit the purpose, Goltens’ specialists began the machining, aiming to renew the surfaces with as little material removal as possible. As a result, they removed roughly .60 mm from the diameter of the port propeller shaft seal liner and roughly 1.0 mm from the starboard. Afterwards, the Goltens’ team finish polished the port and starboard propeller shaft seal liners to between 0.20 and 0.25 Ra.

Goltens completed the machining of the shafts within the seal manufacturer’s minimum tolerances for remaining shaft seal diameter. Completing the repair in-situ helped avoid the cost and time consuming exercise of removing the shafts to be machined or replacing the seal liners.

“Goltens was able to provide an alternate repair method to the shaft seal liner replacement, which is an exponentially more expensive process for the customer,” said General Manger of Bayonne Drydock & Repair Corp., Ray Staton. |||



Heinzmann/RE authorized governor shop in Miami

GOLTENS MIAMI

At the beginning of 2012, Goltens Miami was authorized as a service and sales provider for Heinzmann and Regulateurs Europa (RE) products.



Goltens Miami has invested heavily in new, state-of-the-art testing equipment and tooling for servicing governors and electro-hydraulic actuators. While the main focus is on servicing Heinzmann and RE speed control equipment, the Miami workshop also provides superior value on service and repairs for Woodward governors. Goltens Miami stocks both RE and Woodward governors that are available on an exchange basis, as well as most repair parts for these governors.

In addition to governors and speed controls for engines and turbines, Goltens Miami can now offer their marine and power generation customers turnkey diesel/heavy fuel oil conversions to gas or dual fuel systems with Heinzmans’ advanced control and fuel system technology and equipment.

Managing Director of Goltens Miami Vince Rodomista is enthusiastic about this new offering. “Given the significant cost savings associated with operating on natural gas and our capability to retrofit dual fuel or 100 percent natural gas fuel systems, our customers now have an extremely viable opportunity to reduce fuel costs. This is a game changer.”

Goltens Miami is now also able to offer state-of-the-art engine protection and monitoring systems including Heinzmann oil mist detectors, main bearing temperature monitoring and protection systems and complete engine and vessel control and monitoring systems. All of these new offerings come with marine classification certificates.

Headquartered in Dresden, Germany, Heinzmann has been designing and manufacturing power management equipment since 1897. In 2005, Heinzmann purchased RE, popular for its Viking electronic speed control with electro-hydraulic actuators and its high-quality mechanical governors. |||

Extended reach into Southern China

GOLTENS CHINA

In September 2011, Goltens Guangzhou workshop started its first operations with the goal of extending Goltens’ repair business in South China in line with Goltens’ strategy to develop its specialized services in close proximity to its customers.

The 1,000 square meter workshop offers specialized services including In-Situ Machining, Diesel Engine Service and Repairs as well as reconditioning services. Due to its convenient geographic location, the workshop not only serves South China, but is also able to cater to the Hong Kong and Taiwan markets.

State-of-art tooling developed by Goltens backs up the skills of the service engineers and technicians working in Goltens Guangzhou. The workshop is further supported by Goltens Shanghai, which has been successfully serving its customers in China for the past few decades. |||

Goltens Oslo expands its reach in hydropower

GOLTENS OSLO

When Managing Director of Goltens Oslo Finn Moe realized the potential scope of work demanded by the hydropower market in Scandinavia and beyond, he quickly took action by purchasing the necessary capital machinery and expanding the skills of Goltens' specialists.



Machining horizontal surfaces of a 7-ton bear head to within 0.02mm tolerance

Started just over a year ago, this part of Goltens' business has quickly grown, gaining a number of high-profile clients in Norway and exceeding initial expectations of orders coming in.

"Rebabbiting of white metal bearings is an area of competence with limited resources in Norway," says Moe. "Goltens Oslo had all the necessary facilities and equipment, as well as skilled specialists, so I saw that repairs and maintenance for the hydropower market would fit well into the type of work we have been doing here for many years."

One of the first things Goltens Oslo purchased to enter the new market was a 35-tonne vertical milling machine. Another important addition to the workshop was a boring center suitable for working on a wide scale of projects. Other new equipment included a large heating oven and grinding machines.

Further to expanding the equipment range, Goltens Oslo aims to increase the number of skilled mechanics and technicians involved in repairs for the hydropower industry as the order volume is constantly rising. "If things continue developing as they do today, we will soon need to also look at utilizing the machinery further – either by adding another work shift or purchasing more equipment," says Moe.

Another growth area for Goltens Oslo is to offer more its large scale In-Situ Machining services at the hydropower stations. "In Norway, there are about 450 major hydropower stations and at least over 1,000 smaller ones," says Moe. "At the moment, the majority of the jobs are being done at our workshop, but we want to expand and do more work in-situ, offering our expertise to more hydropower stations." |||

Strategic agreement with engine manufacturer ZJCME

GOLTENS OSLO

Goltens Group and Zhenjiang CME Co. Ltd (ZJCME) have signed an agreement, under which Goltens will provide ZJCME with after-sales service of MAN Diesel generators.

ZJCME, a state-owned company under the China State Shipbuilding Industrial Corporation, has been operating as a licensee for MAN Diesel for the past 30 years. During that period of time, ZJCME has manufactured and delivered 4,000 MAN B&W generators.

The formal agreement was signed as a strategic move to bring the two companies' work closer. It is a strategic tie-up between ZJCME and Goltens that will enable customers to access the Goltens global network, receiving timely response and excellent quality, competitively priced service. |||



Goltens' heavy investments in crankshaft annealing process development, education and equipment have generated large returns for our customers.

Goltens' experts can salvage what otherwise may have been condemned crankshafts and restore customer assets to operation in a fraction of the time. This saves customers tens of millions of dollars in unnecessary crankshaft purchases, major engine rebuilds and countless days of lost operational capacity.

Excessive hardness can often be machined away by Goltens, provided there is sufficient material to remain within the manufacturer's maximum allowable undersize. However when this is not possible, the only remaining options



High hardness areas visible on right side of journal after baseline machining

are to either scrap the crankshaft or to remove hardness by annealing.

Goltens performs annealing on many large and medium diameter crankshafts around the world annually and recognizes that it is critical for a market leader to have standard, proven methodology and processes to ensure consistent results for its customers.

Goltens entered the annealing space after witnessing many needlessly condemned crankshafts every year. The historical lack of acceptance by makers and classification societies for annealing crankshafts in the marine market resulted in millions of dollars in unnecessary downtime, repairs and crankshaft purchases. Goltens undertook a deliberate process of extensive workshop trials to refine the process and has received job specific approvals for in-situ annealing of marine crankshafts from numerous classification societies.

RESTORING THE CRANKSHAFT

A recent example of the successful application of this process, coupled with Goltens' single point cutting tooling, is where Goltens' In-Situ Machining and Annealing team restored a Sulzer 12 ZAV 40S crankshaft.

During the running in of new big end bearings and bearing housing aboard a cruise ship cruising in Alaska, the ship's diesel generator #5 experienced a casualty, which resulted in damage to crankpin journal #2.

Goltens met with the cruise line's management and a consultant on the client's side and agreed upon a repair, which consisted of machining the #2 crankpin journal to the next feasible undersize, as well as lapping and blue fitting of the remaining crankpin journals.



Ceramic heating tiles mounted to damaged journal prior to annealing

The vessel was kept in operation throughout the process and was restored to full capability in a cost-effective and efficient manner.

Onboard inspection revealed that the crankpin journal was damaged all around its surface, with scoring and bearing material welded to it. Additionally, technicians found a large area in

the bottom side of the journal with hardness values as high as 600 HB (Hardness Brinell). Run-out measurements showed a maximum deficiency of 0.08 mm.

After assessment, 2.00 mm of material from the 348.00mm journal was machined until the damaged journal surface was clean of foreign material and cracks. Despite that, the high hardness values remained. The customer decided to machine down another 2.00mm to see if the hard area would get smaller and the hardness values would get lower. At a diameter of 346.00mm, the hardness values and area were still out of the maker's specifications.

GOLTENS' SOLUTION

Goltens proposed performing its crankshaft



Machining the crankpin journal after annealing

annealing procedure to save the shaft within the maximum undersize diameter and hardness values given by the engine maker.

The annealing equipment was mobilized to Alaska, and the engine was prepared for the procedure. Once the annealing was completed according to the procedure submitted to the customer and Lloyd's Register, the crankpin was machined down to a final 5.00 mm undersize, leaving the diameter at 345.00 mm. Post-annealing hardness was measured under 300 HB.

Goltens' full spectrum In-Situ Machining capabilities and its well-tested annealing process reduced the hardness of the ship's crankshaft to acceptable levels, saving it and avoiding a costly replacement and unnecessary downtime.

The vessel was kept in operation throughout the process and was restored to full capability in a cost-effective and efficient manner. |||

Saving large diameter crankshafts



Adjustment of the radius ring while machining new fillet radii

As the first company to complete in-situ grinding of a crankshaft back in the 1950's, Goltens has always been considered the leader in this area of in-situ repairs.

With a constant focus on limiting asset downtime for its customers, Goltens has continually invested in the advancement of tooling to increase accuracy and speed the restoration of its customers' equipment to service.

Goltens has always been able to tackle the largest diameter crankshafts in the market, but with traditional grinding, the time required to affect the repairs was often extremely long.

To speed the repairs, Goltens developed its single point cutting tools that enable it to complete crankshaft machining repairs on larger diameter crankshafts in a fraction of the time of traditional grinding. The tools have been deployed globally for the past several years and the effects are seen around the world on a weekly basis giving Goltens a competitive edge over its competition and saving our customers downtime and money.

POWER PLANT ENGINE RESTORATION

One of Goltens' recent successes related to the repair of a large diameter crankshaft involved a Jamaican power plant operator that suffered a bearing failure on one of the crankpins of its MAN B&W 9K80MC-S generator. Goltens' experts were called in to perform an inspection of the crankshaft and propose a course of repair.

Upon completing a full inspection, Goltens' specialists concluded that crankpin #4 had significant surface cracks that would need to be removed. One of the challenges here was that on the type of engine deployed by the power plant the fillet radii were not in line with the crankpin. To solve this, Goltens' specialists needed to machine new fillet radii to create a reference for machining of the crankpin.

Another issue was that there was a long lead time for undersized bearings. Goltens' experts proposed rebabbiting the damaged big end bearings in its centrifugal casting machinery in the workshop, which helped save valuable time.

To accommodate the repair services asso-

ciated with the pin's large size (896.00mm), extent of the damage and urgency of the task required by the customer, Goltens mobilized the tooling and two teams of in-situ machinists.

As a result, the generator was restored to full operation upon receipt of the reconditioned bearings from Goltens in a total of six days on site. Four machinists worked around the clock, completing the fillet radii machining in three days. Crankpin machining and polishing took another three days.

Project facts

Engine Make/Model: MAN B&W 9K80MC-S
Engine Output: 41,670 kW (103 Rpm)
Crankpin Dia. Pre machining: 896.00mm
Crankpin Dia. Post machining: 891.00mm

RETURNING ORE CARRIER TO SERVICE

With the capability to perform all kinds of services related to diesel engine casualty repair and maintenance, Goltens responded immediately to the task of returning an ore carrier to service following a casualty to its Mitsubishi 6UEC85LS main engine. An authorized repair



Single point cutting tools installed on damaged journal

agent for UEC diesel engines, Goltens took on the job to machine the heavily damaged 950 mm diameter journal.

With the ship out of service, Goltens mobilized a team of in-situ machinists and special equipment onboard the vessel in a shipyard in Qinhuangdao in Northern China.

Due to the size of the journal, amount of the material that needed to be removed and the urgency of the job, Goltens joined teams from two stations to shorten the repair time and restore the engine to service as soon as possible.

The inspection of the crankshaft revealed that the fillet radii were damaged and needed to be machined. In addition, the crankshaft dam-



Installation of the radius ring prior to fillet machining

age was quite significant, and to restore the engine to operation, 8-10mm had to be machined from the crankpin surface.

Goltens' experts put together a detailed proposal of the repair procedures and the work scope, which was approved by the customer's superintendent engineer. After that Goltens' technicians performed the complete cutting and polishing job within seven days using Goltens' single point cutting tools.

Through the use of the cutting tools, the repair time was reduced by as much as 30 days, compared to traditional crankshaft grinding. This saved the shipowner significant downtime and helped avoid losing operational costs. |||

Project facts

Engine Type: Mitsubishi 6UEC85LS-II
Engine Output: 22,432 kW
Original Crankpin Diameter: 950.00 mm
Distance between Webs: 335.00mm
Finished Crankpin Diameter : 940.00 mm



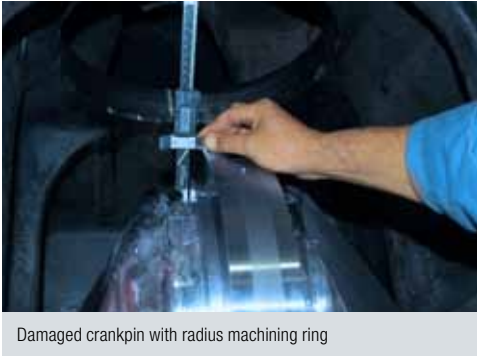


Crankshaft saved after major casualty

A Sulzer 8ZAL 40S diesel engine aboard a cruise vessel suffered significant mechanical damage. An engine overspeed resulted in a broken counterweight stud, severe damage to crankpin #3 and damage to crankpin #1, as well as major damage to the block.

Inspection revealed that the damage on journal #3 went all around its circumference with severe damage to the radius and the deepest damage measured 3.8mm in depth. Additionally, Goltens' experts discovered a sheared counterweight stud and damaged mating surface for the counterweights.

There was little to no room for error on the repair as the diameter limits on the 350.00mm diameter crankshaft were 340.00mm, leaving little margin after the damage would be machined out of the shaft. Goltens' team met with the customer's management and a consultant and agreed upon a repair protocol to rectify the severe damage within manufacturer's diameter limits.



Damaged crankpin with radius machining ring

JOURNAL MACHINING
Journal repair started with machining new fillet radii on crankpin #3, which was needed due to extensive damage and to create a clean reference surface.

First, 8.0mm were machined off the diameter of crankpin #3, leaving the finished diameter 342.00mm. As the next step, 3.0 mm were machined off the diameter crankpin #1, achieving a finished diameter of 347.00mm.



Journal repairs also included lapping and blue fitting of all the crankpin journals to achieve desired surface contact area and maintain the standard size diameters, matching the engine maker's specifications.

ADDITIONAL MACHINING REQUIRED
To finish the job, Goltens' specialists drilled out the broken counterweight stud located on crankpin #3 web and fabricated a custom jour-

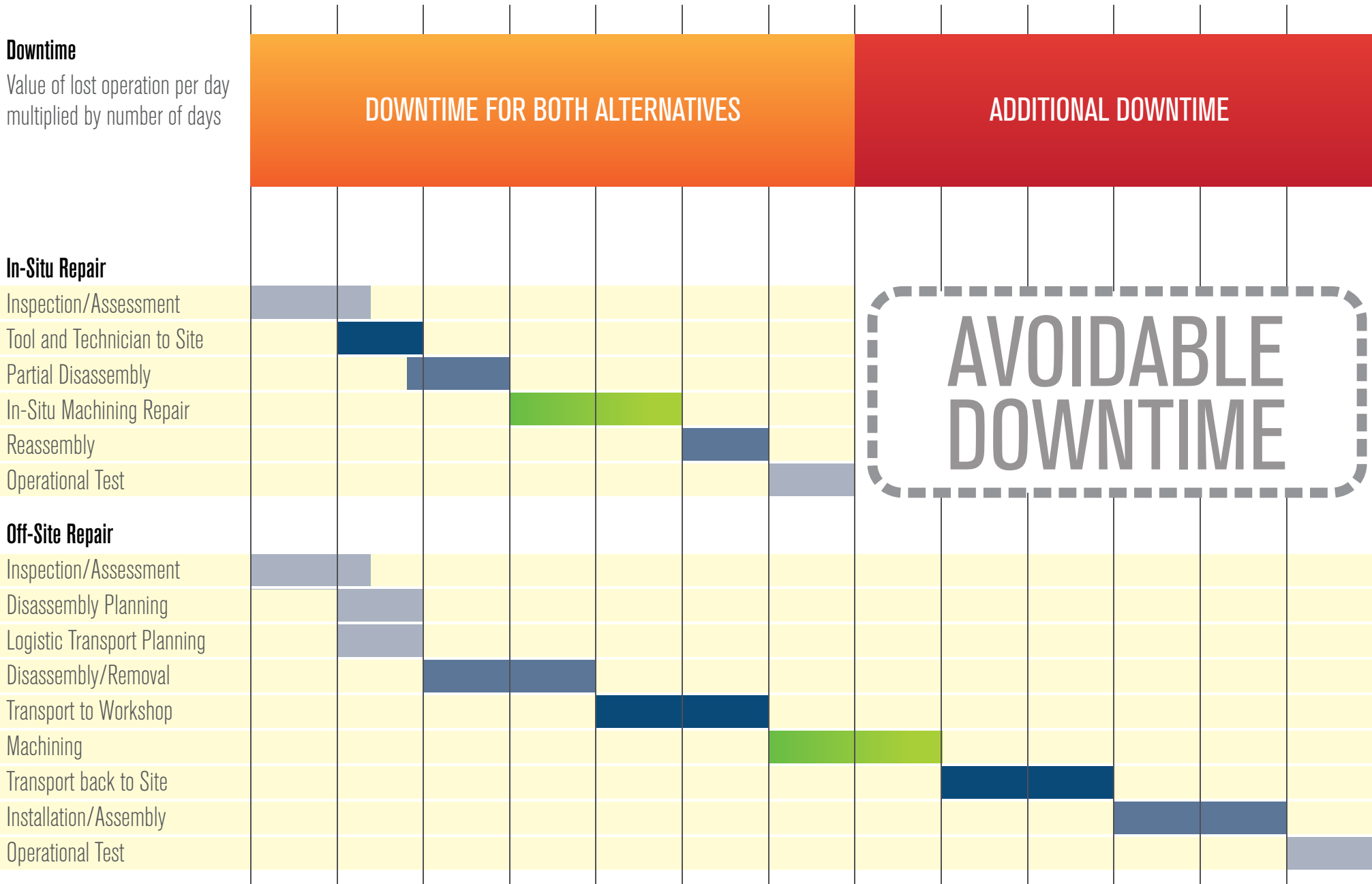


nal mounted bracket for flange facing tools and machined forward and aft counterweight surfaces to -0.80mm.

Goltens' In-Situ Machining technicians salvaged the crankshaft within the rated diameter limits and restored it to full service at rated horsepower. Performing the repairs in-situ avoided a costly disassembly and transport of the shaft to a workshop and saved significant downtime for the engine. |||



What is the value of In-Situ repair?



In-Situ or off-site repair?

CRITICALITY: How will the problem affect our operation/production?
CHECKPOINT #1: Value of lost production per day.

TIME: What will the downtime be?
CHECKPOINT #2: Compare in-situ repair to off-site repair in terms of approximate downtime.

COST: What is the total cost of repair?
CHECKPOINT #3: Compare in-situ repair to off-site repair including the additional costs of planning, full disassembly, two-way transport, reinstallation and assembly.

VALUE OF AVOIDABLE DOWNTIME:
THE EQUATION: The difference in time between the fastest and slowest alternative multiplied by the value of lost production per day.

TYPICAL IN-SITU JOB:
- Critical to production
- Large size/hard to move
- Long transportation to workshop

TYPICAL OFF-SITE JOB:
- Not critical to production or
- Small parts/easy to transport or
- Can be dealt at a nearby workshop

TYPICAL MISTAKES:
- Compare repair only, not total cost
- Compare cost only, not value of avoidable downtime

THE VALUE OF BEST ALTERNATIVE:
Value of avoidable downtime
- Extra cost of chosen alternative
= Net value of the best solution

ACCURATE, EXPERT REPAIRS AND MODIFICATIONS ARE MADE ONSITE, RIGHT WHEN YOU NEED.

Whether your requirements are an emergency casualty response for a damaged crankshaft or journal or a large scale flange facing as part of a planned maintenance shutdown, Goltens has the skills and tooling required to get you up and running in the fastest, most accurate and cost effective manner possible.

- Crankshaft/Journal Machining
- Heat Treatment/Annealing
- Line Boring
- Stern Tubes
- General In-Situ/On-Site Machining
- Laser Alignment

The 4-level repair approach

1 WORKSHOP REPAIR
In cases where the part is non-critical and/or easily moved, the nearest Goltens workshop is the natural alternative.

2 STANDARD PROCEDURE
Goltens has well-proven tools and procedures based on 70 years of experience. We can dispatch an expert within hours for on-site assessment.

3 ADAPTED APPROACH
In most cases where our standard tools will not do the job, a minor modification is what is needed.

4 NEW TOOLS
We are toolmakers in addition to repair specialists. In our own workshops, we create the tools needed for one-off jobs.

ISO certification and Woodward Governor authorization

GOLTENS RED SEA

Goltens Red Sea has seen three successful years since the workshop's establishment and inauguration in 2009, capturing both marine and land-based markets in a short span of time.

Achievements of Goltens Red Sea are key to meeting Goltens' group strategy of developing In-Situ Machining and Diesel Engine services in the region.

During the last three years, the workshop has executed a number of strategic In-Situ Machining and Diesel Service projects and Goltens Red Sea has also been awarded high-value trading orders by local power plants.

Another achievement for Goltens Red Sea workshop is the ISO certification, received from Det Norske Veritas (DNV) classification society at the end of 2011. The scope of certification includes provision of specialized and general repair and trading of engineering components for ships, offshore marine installations, industrial plants and power stations. The workshop has passed the audit conducted by DNV with only a few observations and no nonconformity issues.

Woodward Governor has also acknowledged Goltens Red Sea as an authorized independent service facility, with its governor workshop operational since March 2012. Goltens Red Sea envisions considerable growth in the strong stationary power and marine markets in the Kingdom of Saudi Arabia in the years to come. |||



Breakthrough in drillship newbuildings in Korea

GOLTENS KOREA

Goltens Korea has secured a number of new orders for its principal, M-I SWACO as a result of a two-year long collaboration.

The contract was signed between M-I SWACO and Daewoo Shipbuilding and Marine Engineering (DSME) for the supply of mud gas separators and cutting blowers. M-I SWACO has also signed a contract with Hyundai Heavy Industries (HHI) for the supply of a cutting transfer system. The total contract value for orders signed with DSME and HHI amounts to \$3.5 million.

Goltens Korea signed a sales agency agreement with M-I SWACO in 2010 as part of the new business initiative to penetrate the offshore newbuilding market. The purpose was to diversify into the offshore market at a time when the merchant newbuilding market was witnessing a significant downturn.

M-I SWACO is the leading supplier of drilling fluid systems engineered to improve drilling performance and environmental solutions that safely manage waste volumes generated in both drilling and production operations.

"We are hopeful that this breakthrough will serve as a reference, enabling further penetration in the Korean offshore newbuilding market, especially considering that South Korea is a leading player in production of offshore vessels and rigs," says Managing Director of Goltens Korea K. O. Kim. |||



Restored to service

By the time Holcim Lebanon decided to rehabilitate a 7.5 MW MAN B&W 9L52/55B diesel generator, it had been inoperative for more than five years and required significant repairs and modifications before returning to service.

Goltens was awarded the contract to perform a full overhaul and rehabilitation of the engine and its foundation. The project was of strategic importance to Holcim Lebanon as they viewed the restoration of the engine as an essential step for boosting the plant's total power capacity back to 66 MW. Having the engine restored would mean more operational flexibility and increased back-up power required on an average plant load of 31 MW.

PROJECT SCOPE

The scope of the project was significant as the foundation for the engine required renewal, and the entire engine needed to be disassembled and removed from the foundation.

Goltens deployed a team of one senior supervisor, one foreman and eight technicians to complete the mechanical work. In addition, a team of electrical specialists was called in to complete the engine monitoring system upgrades to increase safety features by installing wireless crankpin bearing sensors.

During operational testing, all operating parameters were demonstrated to be within the maker's specifications and the generator reached 7.0 MW load with a capacity to increase to 7.5 MW.

END-TO-END RESULT

Goltens' full-spectrum capability and expertise in major engine repair, Chockfast application and specialized electro automation work enabled the client to engage the specialist team for an end-to-end completion of this complex task.

As a result of the work, the Holcim Lebanon power plant was restored to its full capacity with increased engine safety features, less vibration and optimized equipment efficiency. ||||



Diesel engine overhaul at Holcim



Modification of the concrete foundation



Installation of a wireless crankpin bearing sensor



Goltens and Tekomar work together as alternative to the Maker

During a voyage from Djibouti to Sharjah, a 15,000 DWT cargo ship owned by Ethiopian Shipping Lines experienced an unfortunate failure on the vessel's camshaft and severe damage was discovered on the second unit's exhaust cam actuator.

Having no other alternative, the ship's crew had to isolate the unit and continued sailing with severe vibrations, crossing the dangerous waters of the Arabian Sea infamous for piracy attacks at half of its normal sailing speed.

The engine maker boarded the vessel at anchorage but was not able to provide an in-house solution due to availability of a specialist.

The shipowner contacted Goltens with a request to attend the vessel, perform an inspection and offer an alternative solution to the problem.

Goltens acted immediately by providing a team of one service engineer and three technicians that started the dismantling work without further delay. The following day, the camshaft sections were out for the actuator replacement.

To complete this job, Goltens engaged an expert with specialized knowledge of this type of repair from Tekomar, the Switzerland-based diesel engine specialist and Goltens' engine service partner.

During the course of inspection, the team discovered the actuator cam on the third unit also required replacement due to aging and material fatigue.

Within 48 hours, the engine was operationally tested with starting kicks both in ahead and astern directions without encountering any problems.

The vessel returned to its operation and sailed on time for her to attend to her commitments. Both Goltens and Tekomar received high praise from the client for their capabilities and response. |||



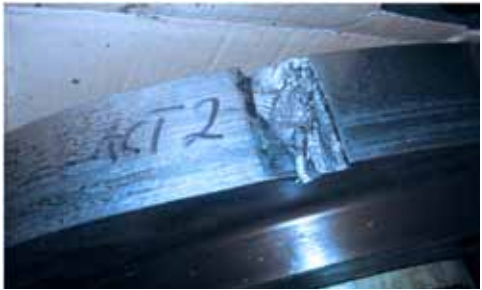
Pressuring cams



Inspection of the linkages



Pressuring cams



Damaged actuator #2



Damaged actuator #3



Complex rebabbitting project

Schlüssel Reederei Bremen required rebabbitting of Sulzer 9RTA-84 main engine crankpin bearings on three sister ships. The main challenge was to complete the task without interrupting the commercial commitments of the three container vessels, APL Kaohsiung, APL Argentina and Mare Superum, regularly calling at the Jebel Ali port, Dubai's major trading hub.

Goltens Dubai responded to this challenge by putting together a plan for rebabbitting a spare bearing, installing it at a port call, then removing the worn bearing for rebabbitting and repeating the removal and installation process at the next port call. This resulted in a much more efficient solution compared to the conventional original



equipment manufacturers' options.

Goltens deployed one foreman and three technicians to attend the first vessel and complete the removal of the worn crankpin bearing and install the reconditioned spare. Goltens specialists then brought the bearing back to the workshop facility and completed the rebabbitting.

This is a large scope project. A total of 27 bearings are scheduled to be reconditioned and installed over a period of 20 months with no interruption to the vessels' schedule.

In the first 12 months, Goltens' specialists have removed, rebabbitted and replaced 10 of the bearings complying with survey requirements of Lloyd's Register maritime classification society and keeping the vessels operational. |||

Three engines, three weeks

One of the world's most powerful self-propelled cutter dredgers, Leonardo Da Vinci, with over 20,000 KW installed diesel power, required a full overhaul and reconditioning of its three main engines. The dredger, owned by Jan De Nul Group, is powered by three DEUTZ SBV8M540 engines, which had been in operation for more than 24,000 hours.

Timelines were extremely tight and logistics for the project were no less challenging. Despite of all the difficulties, this project proved the value of the service agreement between Denis Diesel Services and Goltens Dubai, as the experts from both companies managed to complete the task within a demanding schedule of three weeks.



The "Leonardo Da Vinci"

The day after Leonardo Da Vinci berthed in Al Duqm shipyard in Oman, a team consisting of a senior supervisor, a foreman and six technicians boarded the vessel. They worked around the clock together with four service engineers from Denis Diesel Services to perform the engine dismantling works.

The engine components were transported from the shipyard in Oman to the Goltens' workshop in Dubai. This was a long journey with a total distance of 1,500 km involving two delays due to customs processes between borders. All of the engine components were completely refurbished and dispatched in less than one week.

Only 18 days after the start of the project, Goltens and Denis Diesel Services handed three fully operational engines back to the ves-

sel, enabling it to return to operation with full efficiency.

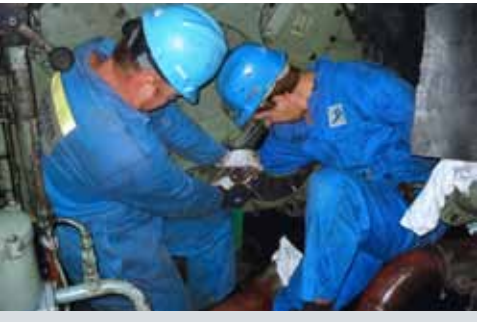
COOPERATION

This project was part of Goltens' ongoing cooperation with Denis Diesel Services. The two companies work together on a number of projects, in particular those related to large diesel overhauls on dredgers. Most of this work takes place in the Middle East and South East Asia.

"We tend to combine our resources in a way that is optimal for the customers both in terms of competence, time and cost efficiencies, which is particularly important in the dredger business, where downtime is particularly expensive in the middle of an assignment," says Goltens President of Worldwide Service Paul Friedberg. |||



Cylinder installation



Completing the work

India integrates office and workshop facilities

GOLTENS INDIA

In March 2012, Goltens India completed the integration of its office and workshop facilities in Navi Mumbai. One of the key goals for the integration was to streamline the organizational processes to further enhance customer response and delivery timeframes.



A clear benefit of the integration will be increased monitoring and control of operational procedures and logistics as well as knowledge and competence sharing across various functions and processes. The operations and sales teams will have more opportunities to share field and customer feedback, boosting product development and the quality of services provided.

The state-of-the-art workshop facilities in Navi Mumbai have been serving as the one-stop solution for the needs of the shipping community and the power generation industry in India since 2009. |||

Goltens expands range of services through new agreement with Shanghai Shipyard

GOLTENS INDIA

Goltens Group signed a cooperation agreement with Shanghai Shipyard Co. Ltd. Ship repair Division to offer a broader scope of services to customers globally.



Under this agreement, Goltens Group will internationally promote Shanghai Shipyard's docking, facilities and capabilities to customers. Goltens will also provide specialized services inside the yard as a resident contractor, performing services such as troubleshooting, overhaul and repairs of a variety of marine and land-based equipment and systems, either in dock, afloat or with riding crews.

Shanghai Shipyard specializes in ship repair of vessels up to 100,000 DWT for both domestic and foreign owners and has an annual repair capability of over 200 vessels.

The ship repair facility, in the downtown area of Shanghai, has a quay line of 300 meters and a dry dock for vessels up to 35,000 DWT. The facility on Chongming Island has a 760-meter quay line and two floating docks for vessels up to 40,000 DWT and 100,000 DWT respectively.

With a complete shipbuilding and repair infrastructure, the company also owns the Shanghai Municipal First Class Qualification for the Steel Structure and Frame Engineering.

Shanghai Shipyard, one of the top shipbuilding and repair bases under the China State Shipbuilding Corporation, has a history of over 140 years and is held in high regard among domestic and international customers. |||

Engine services second to none

Goltens has the capability to do intricate specialist diesel engines work anywhere in the world. Below are some recent examples of work completed by Goltens' Diesel Engine teams worldwide.

A Crankshaft replacement and three engine overhauls

Goltens performed crankshaft change, line boring and complete overhauls on three Yanmar 6ZL-UT engines on a commercial fishing vessel. Goltens sourced all parts and restored the ship to service.

D Dual-fuel modification of Wärtsilä 18V46

For a Bangladeshi power plant, Goltens' specialists acquired a replacement Wärtsilä 18V46 block in Philippines, overhauled and modified it for dual-fuel in Singapore and rebuilt the engine in Bangladesh.

E Restoring power plant capacity

Goltens' experts performed full rehabilitation, crankshaft renewal and concrete foundation modification on a MAN B&W 9L52/55B engine at Holcim Lebanon. The engine had been inoperative for over five years requiring significant repairs to return it to service.

I Auxiliary engine line boring and machining

A highly specialized offshore support vessel suffered a catastrophic failure on one of its MaK 12M282 engines, resulting in total loss of the block. The vessel was kept in operation throughout the repair process and was restored to full capability.

E Three engines overhauled in less than three weeks

A powerful self-propelled cutter dredger required a full overhaul and reconditioning of its three main engines in three weeks. Goltens and Denis Diesel Services completed the work and returned the engines to service on schedule.

F In-situ machining and overhaul of Warstila 16V32

Goltens performed in-situ machining of liner landings and completed the overhaul on one of the mine's eight generators. Goltens supplied the parts kit and performed the overhaul.

G Engine overhaul and In-Situ Machining of crankshaft main journal

A major Indonesian shipping company engaged Goltens to complete an overhaul of their SEMT Pielstick 12PC2-5 engine on one of their container ships and repair one of the main journals. Goltens completed this complicated job and reduced downtime and operational costs for the customer.

H Main and auxiliary engine overhauls on chemical tanker

Goltens was engaged by US Shipping Corp to undertake major repairs on the Sulzer 5RLB90 M/E and overhauls of two of the vessel's three MAN B&W 9L28/32 auxiliary engines.

I Crankshaft replacement on a voyage from Spain to Brazil

After an MAN 23/30 crankshaft was condemned, Goltens sourced a replacement crankshaft and other required parts, delivered them to Spain and replaced the crankshaft and rebuilt the engine on the way to Brazil.

J Wärtsilä 18V38B overhauls in Tanzania

As part of a long-term service agreement with the largest Independent power producer in Tanzania, Goltens recently completed an overhaul of two 18V38B Wärtsilä engines with another seven engines to follow over the next 18 months.

K Auxiliary engine overhaul and machining in Shanghai

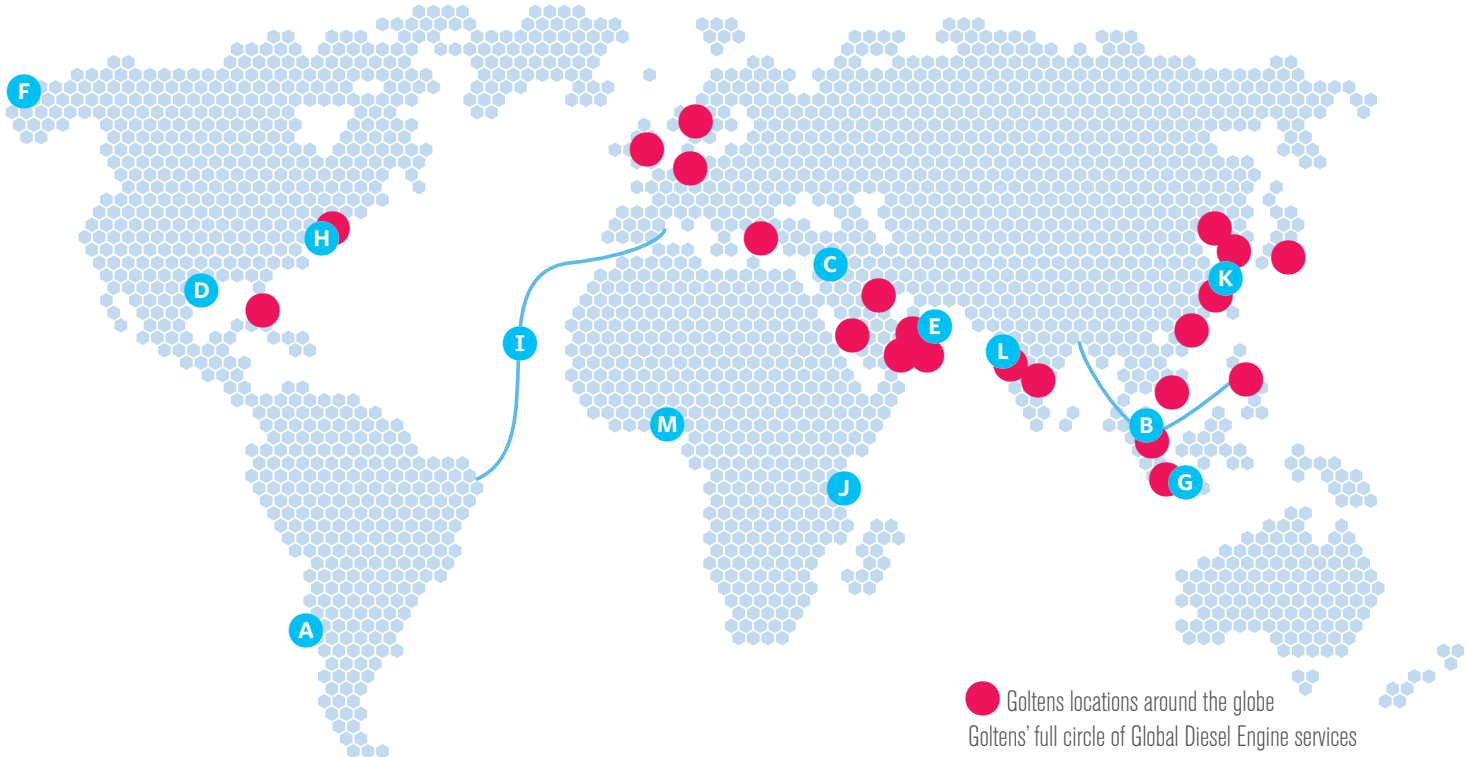
Greig Shipping AS required a full overhaul and reconditioning of their DAIHATSU 8PS-26D auxiliary engine at the Chengxi Shipyard. Goltens' specialists dismantled the engine, repaired the bedplate and the crankshaft, overhauled and commissioned the engine.

L Voyage repair of three engines on an LPG carrier

Due to operational requirements, Goltens carried out an overhaul of all three MAN B&W 6L23/30H auxiliary engines A/E's during the vessel's operational time. Overhauls were completed during a month of sailing to the complete satisfaction of the ship's crew.

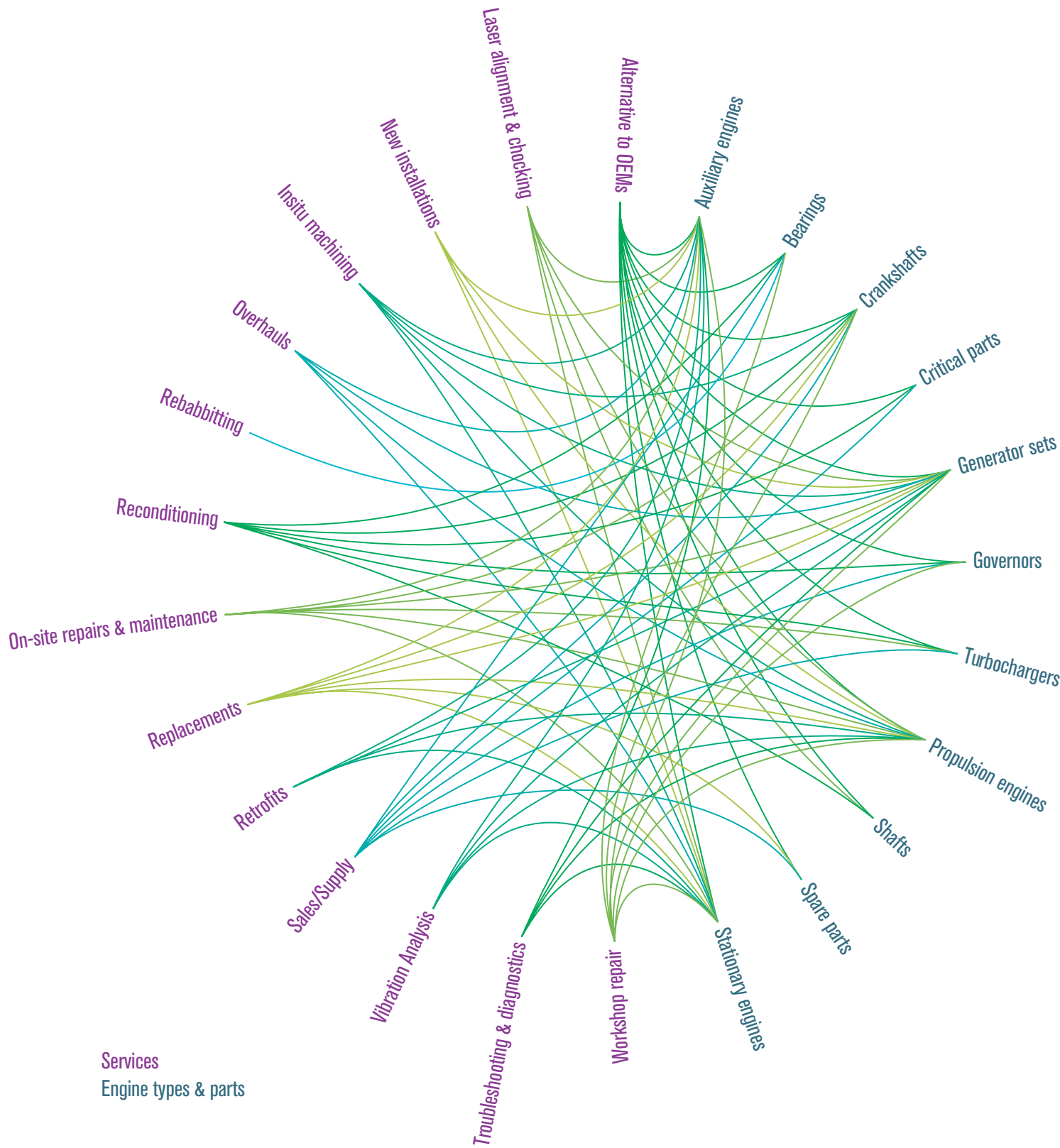
M Replacement of bedplate and crankshaft on Wärtsilä 6TM 410

Goltens supplied and installed a replacement bedplate and crankshaft and performed component overhaul on a Wärtsilä 6TM 410 on an anchor handling supply vessel in Nigeria.



Goltens locations around the globe
Goltens' full circle of Global Diesel Engine services

Goltens' full circle of Diesel Engine services



Services
Engine types & parts

Goltens presses Diesel Services into parallel markets



With over 70 year of leadership and a global reputation for excellence in diesel engine repair and maintenance in the marine industry, Goltens has been executing on a strategy to expand its presence in the land-based, offshore oil and gas and industrial diesel power markets.

SUCCESSFUL EXECUTION

Goltens' focused efforts in marketing its Diesel Engine services to land-based power stations have resulted in this market growing to over 20 percent of the total Diesel Engine revenue in 2011.

"Our strategy has always been to have engine services second to none," says Paul Friedberg, President Worldwide Service. "A few years ago, we recognized that we had a global footprint and strong competence in diesel engine repairs in place and started looking at new market segments to build on that competence and excel and expand further. It was a logical next step for us."

One of the first steps that Goltens experts undertook on the way to succeeding in the stationary power market was carrying out an extensive mapping of the power stations worldwide. After completing this in-depth research, a detailed marketing plan was put together for the stationary market around the globe. Gradually developing these relationships, Goltens has been awarded numerous contracts for carrying out repairs at land-based power stations worldwide. "As a testament to the quality of our work and the satisfaction of our customers, many of our new clients are coming via recommendations from our existing customers in the various regions," says Friedberg.

Goltens has a globally recognized brand and decades of experience in the

marine market, but discovered the stationary power market operates differently.

A number of the businesses are government-owned and it can often take a long time to secure a tender. "The decision process may take longer, but once agreements are in place, we are able to secure long and fruitful relationships," says Friedberg.

Focus geographies for developing the stationary power Diesel Engine business include the Caribbean, South America and Asia, in addition to certain areas in the Middle East and North and East Africa. "Goltens has always been strong in emerging markets, and we continue to develop that strength in all of these regions," says Friedberg. "It has coupled perfectly with our global strategy to push our In-Situ Machining services more fully across market segments as well and the two efforts tend to feed one another. Recent stationary power and offshore jobs in Bangladesh, Lebanon, Alaska, Gulf of Mexico, Tanzania, to name a few, reinforce that we are executing well."

PEOPLE AND SKILLS ARE THE KEY

However, none of these achievements would have been possible without having strong Diesel Engines teams worldwide. "Like any services business delivering 'expert' level services, Goltens' Diesel Engines Services is very much about the skills and competence of the people involved in the work," says Friedberg. "We developed and maintain competency matrices that help us identify the areas where we need to employ more talent and further develop our existing resources. During the last year, we have been extremely focused on recruiting highly skilled people with deep knowledge and experience to fill in all the competence

gaps, as well as invested heavily in the development of our existing workforce."

As examples, Friedberg notes that Goltens Dubai has increased its personnel in the Diesel department from 80 to 100 specialists last year, and the Goltens Red Sea Diesel department has grown from the team of 20 to 30 people. In the Middle East and in Fujairah in particular, Goltens has paid specific attention to increasing competence in two-stroke engine repairs. The goal has been to bring more experts closer to the market.

"Our strategy for continuing the expansion into the land-based and offshore markets is built upon the foundation of quality, response and precision that we have been known for for decades in the marine market."

In addition to recruiting initiatives, Goltens has put considerable effort into training courses. "For the past several years, we have run a number of focused courses aimed at increasing the competence for certain types of services and certain types of engines, as well as send select resources to factory training. We are

focused on increasing the capability of our top talent and developing the next generation of Goltens Diesel Engines experts."

Every quarter, Goltens globally measures the improvement of skills and competence within the Diesel departments to ensure that the goals for staying at the top of the competency are achieved.

MARINE AND OFFSHORE MARKETS

In the marine and offshore markets, which accounted for roughly 80 percent of Diesel revenues in 2011, the key strategy remains unchanged; providing merchant and offshore shipowners with highly skilled engineers available on short notice for repairs anywhere in the world, whether on voyage or in port. Goltens has a detailed plan for visiting customers trading in the areas where Goltens has workshops. Goltens has an updated system for identifying vessel locations and the type of engines they have onboard to be able to offer the shipowners the best competence available wherever it is needed.

PLANS FOR 2012

In addition to the plans for further growth within the marine market – both merchant and offshore – Goltens aims to continue strengthening its presence in the stationary power market through a thorough and systematic approach.

"Our strategy for continuing the expansion into the land-based and offshore markets is built upon the foundation of quality, response and precision that we have been known for for decades in the marine market. We are confident that with quality execution and focused efforts to support our customers, increased opportunities for growth and expansion will continue," says Friedberg. |||

President's message

Best in business

The Goltens Worldwide Group of companies has seen a dynamic and eventful period over the year of 2011 and throughout the first half of 2012.

Despite the challenges facing global maritime shipping and trade, we have managed to increase our resources and have seen significant progress in the level of skills development around the group. We are also proud of the growth we have achieved in both marine and tangent market segments.

Our go-to-market strategies have resulted in an increased market penetration. For us, this is a clear confirmation that we are on the right track with our strategic choices.

EXPANDING BUSINESS HORIZONS

There has been an increased demand for our specialists in oil and gas exploration and offshore services. We have witnessed notable potential for Goltens in most of the major oil and gas markets in the Middle East, South East Asia, South America, Gulf of Mexico and the North Sea. Offshore yards dealing with large oil and gas construction projects in particular have displayed growing interest.

Building on our well-established position in the maritime sector, Goltens has been able to make significant strides expanding its specialist Diesel Engine and In-Situ Machining services via growth in the stationary diesel power, offshore oil and gas and general industrial sectors.

Diesel and In-Situ market penetration in the stationary power markets grew predominantly in the Caribbean, South America and Asia in addition to certain areas in the Middle East, as well as North and East Africa.

Goltens has invested a lot of energy into creating strategic partnerships with large ship repair yards in the Middle East and Asia, particularly within the In-Situ Machining and Diesel Engines services. The latest memorandum of understandings between the Drydocks World shipyard in Dubai and Goltens United Arab Emirates and between Pipavav Shipyard Limited in India and Goltens India Pvt Ltd, reflects a strategic move towards yards using Goltens specialists personnel for Diesel Engines, In-Situ Machining and Mechanical Services.

IN-SITU SUCCESS

Goltens' increased focus within the In-Situ Machining segment worldwide led to positive results during the last year. Not only did we put into action aggressive go-to-market strategies, but we have also continued to make substantial investments both in our tools and resources.

The total revenue growth in In-Situ Machining in 2011 amounted to 10 percent compared to the previous year. We were able to drive a 35 percent increase in our business in the industrial sector and increase our business in the marine segment a further 12 percent for the year.

In 2011, we further expanded our technical resources globally by 28 percent and invested roughly 10 percent of the Group's In-Situ Machining turnover into equipment and tooling R&D and investments.

LEADERS IN DIESEL ENGINES

Our continued investments in maintaining our leadership position in Diesel Engine services, focused on expanded tooling and personnel, resulted in a further 10 percent increase in this part of our business in 2011.

Goltens expanded its diesel specialists by roughly 5 percent, growing the pool of specialists to over 400 working in the field. Additionally, recognizing the benefits of partnerships with other specialized firms, Goltens became more aggressive pursuing cooperative, strategic partnerships with engine specialists and makers with much success.

GOING FOR GREEN TECHNOLOGIES

Additionally, Goltens's decision to establish an independent Green Technologies group to support customers with their ballast water treatment challenges has gained significant traction as well.

In Green Technologies, we have seen an increased demand for engineering and planning services. We expect it to continue growing and we are expanding the team to meet the future demands.

The ability to resolve customer problems quickly and effectively puts Goltens' support teams ahead of the competition and fuels our focus on becoming the leading market alternative

Building a competence center in Groningen in the Netherlands offering independent engineering and advisory services was yet another achievement for Green Technologies.

In 2011, Green Technologies experts were involved in eight projects in ballast water treatment system installation services, ranging from a "space study" using laser scanning to a turnkey installation completed during sailing. Green Technologies have an active schedule planned out for the rest of 2012.

FUTURE OUTLOOK

Going forward, we will continue staying true to our values of Presence, Response and Precision and will continue to concentrate on being the best in the business in our core specialist services. We firmly believe that there is nothing more important than being able to deliver a predictable, precise and responsive service to our customers in a market more dependent on high quality and equipment availability than ever before. |||

Paul Friedberg
President Worldwide Service

Goltens Dubai's big move



Goltens Dubai is expanding its presence in the United Arab Emirates by moving its current Al Jadaf operation to Dubai Maritime City's Industrial Precinct. The company will be positioned in its new state-of-the-art integrated workshop facilities, as well as administration and sales offices, by the end of 2012.

Successfully operating from Al Jadaf since 1989, Goltens Dubai has a long history of servicing customers in the United Arab Emirates, the Middle East and East Africa. Starting with a small workshop, Goltens Dubai has grown to a large facility of 8,500 square meters that today employs about 500 people. The Al Jadaf facility has developed not only in area and number of personnel employed, but also in technical disciplines and competence, diversifying over the years into numerous additional specialist services to serve the marine, offshore and land-based industries.

the layout, creating a workshop with a better material and work flow. As a result, efficiency and the working environment will see significant enhancements, with the goal of further improving customer satisfaction and quality of the end products.

The new workshop will be able to carry out a wide range of repair and maintenance services. Much emphasis has been placed on creating well-equipped and efficient specialist workshops for Goltens' core disciplines of In-Situ Machining and Diesel Engines services, as well as workshops for governor troubleshooting and repairs, fuel equipment and turbocharger repairs and an advanced electrical automation workshop capable of doing both low and high voltage repairs.

The new workshop facility of Goltens Dubai is within close proximity of the DMC ship lifting and dry berthing areas. This enables Goltens to efficiently execute docking and afloat projects. To facilitate that, an area in the new workshop



Workshop and repair facility at Dubai Maritime city

Moving to Dubai Maritime City (DMC) with a plot size of 23,000 square meters, of which 10,000 square meters is dedicated for the workshop area, was the next logical step for Goltens Dubai's growth in this part of the world, following high customer demand, both in terms of volume and technical competence.

Having all the facilities under one roof makes it possible for Goltens Dubai to optimize

facility is specifically designated for steel fabrication, docking services, hydraulics and general mechanical services, which are all key when performing dry-docking and alongside quay repairs.

The 25-year lease agreement for a plot in the DMC's Industrial Precinct was signed in August 2010, and Goltens Dubai is due to move to the new facilities by the end of 2012. |||



Dubai Maritime city to become a world-leading maritime center