

Engineering Excellence: Where Innovation Meets Expertise

Goltens stands as a beacon of reliability and strength, offering unparalleled solutions to the global marine and power sectors. Our seasoned engineers, both on-site and in our specialized workshops, bring a wealth of knowledge and experience. We are committed to delivering top-tier services that protect your investments and drive your business forward. Trust Goltens to navigate you toward success.

Crankshaft replacement in Bahrain
Page 18



Goltens Green – ESG Compliance and Beyond

Page 4

Goltens Green’s reach extends far beyond Ballast Water, supporting customers as they navigate EEXI/CII regulations and deadlines.



Strategic Investments in Next-Gen Engine Services

Page 14

Investments in the latest tooling make Goltens the “go to” partner for maintenance and reconditioning on the latest generation engines.



Leadership in the Middle East Docking Market

Page 20

Investments in infrastructure, technology, and resources continue to make Goltens a force in the Middle East docking market.

MESSAGE FROM THE CEO

Constantly Evolving to Remain *Your* *Trusted Partner*

For almost 85 years, Goltens has been a trusted partner to customers across industries and across the globe, supporting critical requirements for essential equipment. Our slogans have evolved from, in the early days, 'Keep 'em Sailing' and 'Around the Clock, Around the World', through 'The Trusted Alternative' to today's 'Trusted Globally'. Our 1,200 dedicated employees work diligently every day to ensure that we truly are 'Trusted Globally' in every major marketplace.

We stand out because, as a specialized engineering service company rather than an engine OEM or product vendor, our success depends on meeting the ongoing, critical operational needs of our customers, rather than just selling the next piece of equipment. Whether it is routine and reliable maintenance support, upgrades of obsolete equipment, restoration from catastrophic failure, or expert engineering and retrofit support to meet ever-changing environmental regulations, our focus is always on responsiveness and precision delivery.

LOCAL, REGIONAL AND GLOBAL

Over my 20-plus years working in the maritime industry with Goltens, I have come to realize that while many companies support specific requirements within a given port or location, few have the core competency and capacity to match what

Whether it is routine and reliable maintenance support, upgrades of obsolete equipment, restoration from catastrophic failure, or expert engineering and retrofit support to meet ever-changing environmental regulations, our focus is always on responsiveness and precision delivery.

Goltens' full solutions suite brings to bear almost anywhere in the world. Meeting customer needs by quickly mobilizing across borders, skillfully navigating logistical and bureaucratic obstacles, and efficiently deploying teams of specialist engineers and precision equipment to address critical operational needs whenever and wherever they arise, is what we do day in and day out.

Goltens works on 5,500 vessels annually and is trusted by over 3,200 loyal customers. Furthermore, operating out of 26 locations in 14 countries, Goltens' ability to coordinate closely among its sister stations to mobilize the most effective teams to meet requirements is unmatched. While many companies profess to have 'global reach', claiming they can travel from their home base anywhere in the world, few can coordinate services locally with their customers in one region and engage effectively with resources resident in other regions. At Goltens, this coordination happens in a cost-effective and efficient manner with a consistent level of quality, limiting delays, and reducing attendance costs.

OUR PEOPLE

I thought it important to share some insight into what makes Goltens such a respected and successful company at our core. On the next page, you will see some statistics on the remarkable people who make up that foundation. From our newest engineers and support staff to our most senior technical service specialists and management, our strong culture drives a focus on generating the response and delivering the quality of service that truly make us 'Trusted Globally'. Moreover, our commitment to developing our people ensures that our most valuable resources stay with us and become the 'experts' customers have utmost confidence in to solve their challenges, knowing they don't have to worry because 'Goltens is on the case'.

To reinforce this, we have invested in creating the Goltens Training Academy, where we will educate our primary resources in our culture, technical methodologies, and standardized and consistent processes for execution and reporting, further reinforcing consistency of delivery and predictability of results.

OUR CONSTANT EVOLUTION AND COMMITMENT TO CHANGE

Goltens founder, Sigurd Golten, recognized early on that Goltens needed to constantly evolve and adapt or risk becoming irrelevant over time. This drove a continuous expansion of service locations to major ports around the world to meet the needs of the global maritime market and our stationary power and industrial customers, closer to where they are



Sandeep Seth
Chief Executive Officer
Goltens Worldwide

When coupled with our monitoring, advisory, design, engineering, retrofit installation capabilities, project management, and after sales services we have become the natural choice to help solve any challenge.

located. Coupled with this geographic growth was the expansion of workshop reconditioning and field services, as well as the invention of tooling, to become the first company to machine a crankshaft in situ (without removing it from the engine), which truly put Goltens on the map as a critical supplier to industry.

These expansions gave us a global reputation for being specialists. However, as markets and technologies have continued to advance, so have we. Since Sigurd Golten's passing in 1986, Goltens has been in a constant state of growth and specialized service development to meet the ever-evolving regulatory environment, address the requirements of newer generations of engines, and apply the latest technologies – all focused on improving the efficiency and precision of the services we deliver.

In the last decade or so, key advancements in crankshaft machining and annealing, applications of laser scanning technologies to speed up retrofits, expansion of our energy control solutions, major investments into our design engineering

capabilities, and our investments in servicing and reconditioning the latest electronically controlled engines, have all been part of this evolution and adaptation to stay relevant.

MOVING FORWARD

With the constant push towards a more environmentally responsible mode of operation and a transition away from traditional fuels, we remain focused on expanding our partnerships with leading OEMs within the engine space and with companies laser-focused on bringing state-of-the-art environmental solutions to the market to address regulatory compliance requirements in maritime and ESG regulations affecting land-based industry. These partnerships enable us to present valuable insights into which solutions may best suit a given challenge. When coupled with our monitoring, advisory, design, engineering, retrofit installation capabilities, project management, and after sales services we have become the natural choice to help solve any challenge. We are also developing digitization and cybersecurity solutions.

In this issue of InService, we have once again tried to provide you with insights into what we are doing to address these challenges and share relevant case studies that demonstrate exactly why we are 'Trusted Globally' as a go-to partner for a wide range of solutions. While not all-encompassing, I hope you will find something of interest and gain a better understanding of some of the solutions we bring to our highly regarded customers each and every day.

On behalf of all of my Goltens colleagues around the world, I want to thank you for the faith you continue to place in us to support you. It is a privilege to be your trusted partner. ■

Champions of Service: The True Power Behind Our Service Excellence

Our people and culture are the bedrock of our success as a service company.

Since our inception in 1940 in Brooklyn, NY, Goltens has always relied on a multinational and culturally diverse workforce. Back then, our personnel comprised mostly Americans and a broad cross-section of immigrants from across Europe. With the passage of time, Goltens has expanded across numerous continents and our workforce demographics have shifted to a much broader base of nationalities. These talented people unite the technical capabilities, breadth of experience, and diversity that defines who we are as a company, helping to shape and reinforce our culture of excellence and inclusion.

The diversity of Goltens' workforce isn't just an internal strength; it's also a strategic advantage in serving our global customer base. With over 1,200 employees of 41 nationalities and operations in 14

countries, we're better able to understand, communicate, and empathize with the different needs and perspectives of our customers all over the world, as well as being better equipped to deliver the right solutions wherever they are needed. By embracing diversity, fostering inclusivity and advancement, nurturing a culture of education and learning, and prioritizing customer-centric attitudes, we continue to set new standards of excellence in everything we do.

TENURE AND RECOGNITION

At Goltens we celebrate our diversity globally, recognizing significant employment milestones in different regions around the globe. Our 10 longest-serving tenured employees have been part of Goltens from 31 to 45 years. Overall, Goltens' employees have a global average of nine years' employment and an average age of 46.

Below are some recent photographs of tenure recognition events from around the Goltens Group. ■



Goltens Rotterdam tenure recognition at 60th anniversary celebration



Goltens UAE regional celebration with Shareholders and global leadership



Goltens China tenure celebration in Shanghai



Goltens UAE 30-year Awardees with UAE and Goltens Worldwide leadership

Goltens Green Technologies – a Constant Evolution of Service

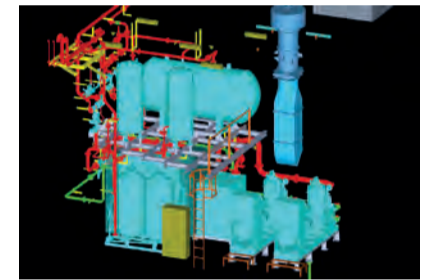
Working Hand-in-Hand With Clients To Meet Their Decarbonization and Digitalization Goals

Having completed over 1,000 Ballast Water Treatment System (BWTS) installation projects between 2010 and 2023, Goltens Green Technologies enjoys a global reputation and unquestioned leadership in the retrofit space. With the world's maritime industry currently focusing on complying with various US, EU, and IMO regulations, including but not limited to EEXI, CII, EEDI and SEEMP, Goltens Green is leveraging and expanding its capabilities and skills to meet new demands beyond BWMS in both the marine domain and beyond.



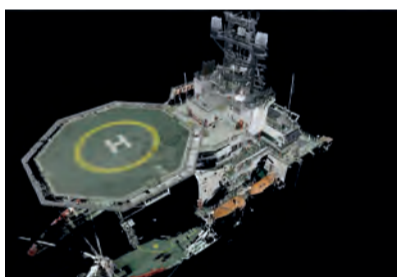
3D SCANNING OF OSV FLEET – SINGAPORE

Goltens' 3D scanning expertise prompted a leading offshore support vessel (OSV) owner to approach Goltens Singapore with an interesting request. Having more than 60 vessels in the water amid an ever-increasing fleet, they were looking for a solution that would enable their seafarers to familiarize themselves with different vessel layouts and equipment, without actually going onboard each ship. Goltens proposed that each vessel could be scanned in entirety, with 3D models serving as a digital repository of key information. Goltens also suggested that, apart from crew familiarization, the same data could be used for marketing purposes and digital twin development in future. Information related to each ship, such as data sheets and engineering drawings, can also be stored in the 3D database for easy access. The scans were tailored to the client's requirements for high data and image quality. Based on the success of the first project, Goltens was able to secure an extended contract to digitalize a significant percentage of the owner's fleet for further development. ■



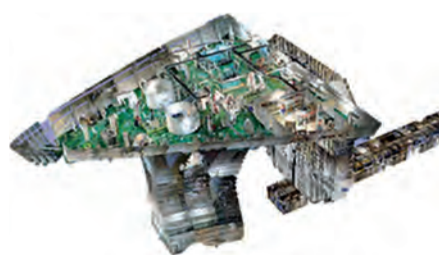
N2 PLANT RETROFIT – CHINA

The owner of a 50,000-dwt chemical/oil tanker required a 1,250 m³/hr Atlas Copco N2 generator to be retrofitted onboard. The retrofit was intended to improve the commercial viability of the vessel by allowing it to carry an extended range of valuable cargoes. To minimize downtime and ensure seamless execution, Goltens leveraged its well-proven process using 3D scanning and modelling to feed the design engineering and ultimate fabrication and installation of the generator. Goltens had to tailor our project management approach to this unique case as the installation location and size of the components required detailed lifting plans among other considerations. The owner was so pleased with the final outcome that Goltens also secured installation orders for the vessel's sisterships. ■



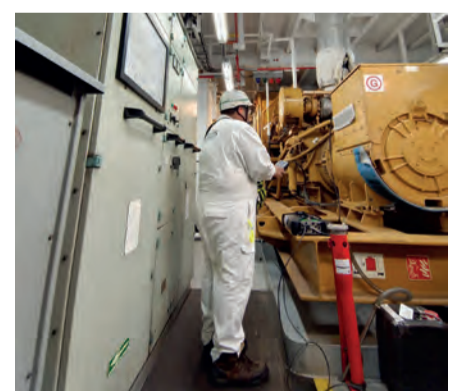
HELICOPTER REFUELING MODIFICATION – NORWAY

An offshore vessel operating in the North Sea required a retrofit to enable it to refuel helicopters offshore. Goltens Green Technology engineers attended the vessel and conducted a 3D laser scan of the area of interest. The scan provided an accurate point cloud that was used to create a concept design incorporating all the required equipment and piping. After implementing minor change requests by the client, Goltens Green was given the green light to proceed with detailed design to produce an engineering package, including all piping and foundations specified by the system OEM. All required materials and components were purchased from selected suppliers, taking into account key factors such as price, quality, and delivery time. Specific non-destructive testing (NDT) requirements were also considered during the prefabrication process to minimize the amount of NDT work that needed to be performed on-site. Goltens Green successfully executed the system installation, coordinating transportation, labor, tools, additional materials, and supervision in Norway within the time window where the vessel was moored. ■



3D SCANNING FOR AIR LUBRICATION SYSTEM RETROFIT, LNG CARRIER – SINGAPORE

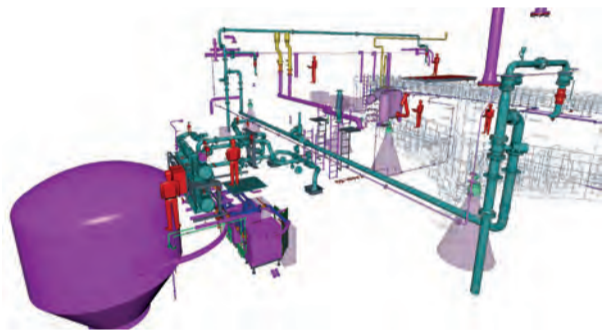
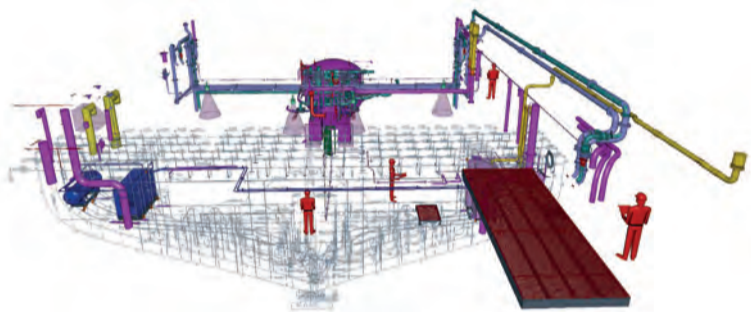
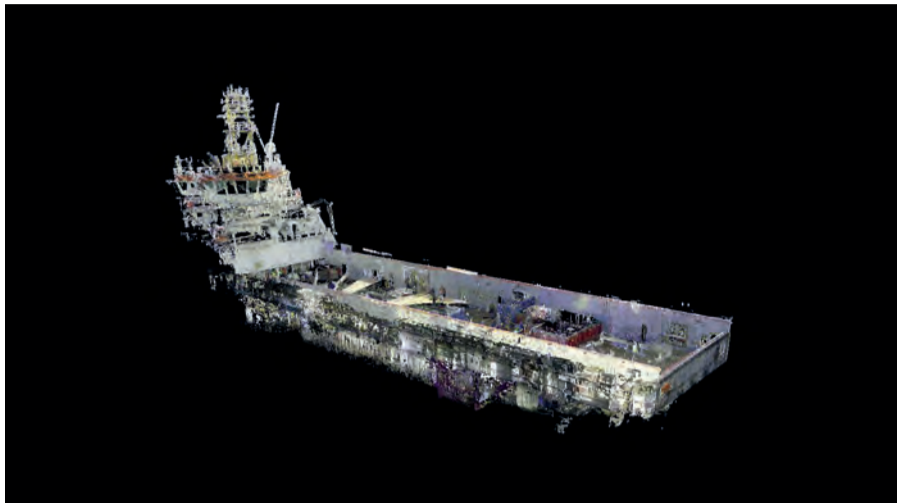
The deep technical knowledge gained from our years of BWTS and Exhaust Gas Cleaning System (EGCS) retrofits has also proven invaluable as shipowners look for experts to install major energy-saving devices (ESDs) such as air lubrication systems and rotor sails. As a result, a major local shipyard approached Goltens Singapore to conduct 3D scanning to plan for the installation of an air lubrication system on an LNG Carrier. Although the yard had engaged different 3D scanning vendors in the past, they realized that the scale of the job called for the services of a more established partner; hence they approached Goltens. Scanning for the project began after multiple meetings with the yard's engineering division team to ensure the areas of interest were fully defined, as well as the required high-resolution scan parameters. The areas in question were vast, ranging from the forward main deck to the duct keel pipe tunnel. Goltens Singapore received a glowing testimonial from the yard's engineering manager after the final data submission, attesting to the quality of the work of the Goltens team. ■



EMISSIONS TESTING ON JACKUP RIG – BRUNEI

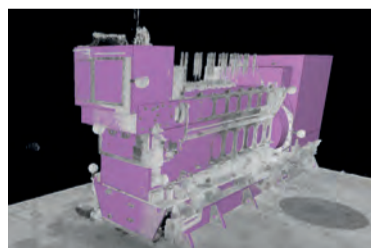
While many shipowners are just starting out on their decarbonization journey, some have been monitoring emissions proactively for some time to ensure compliance. One of the world's largest drilling rig operators engaged Goltens to perform emissions testing on one of their operational jackup rigs. The last test had been done during an earlier drydocking and the owner wanted to verify if emissions from the rig's various generators were within limits and comparable to previous measurements. Goltens' engineers deployed a portable gas emissions analyzer and particulate matter collector on the rig to carry out the job. The project was completed ahead of schedule and our engineers analyzed the data and presented the results to the rig owners' satisfaction. ■

Towards a Greener Future



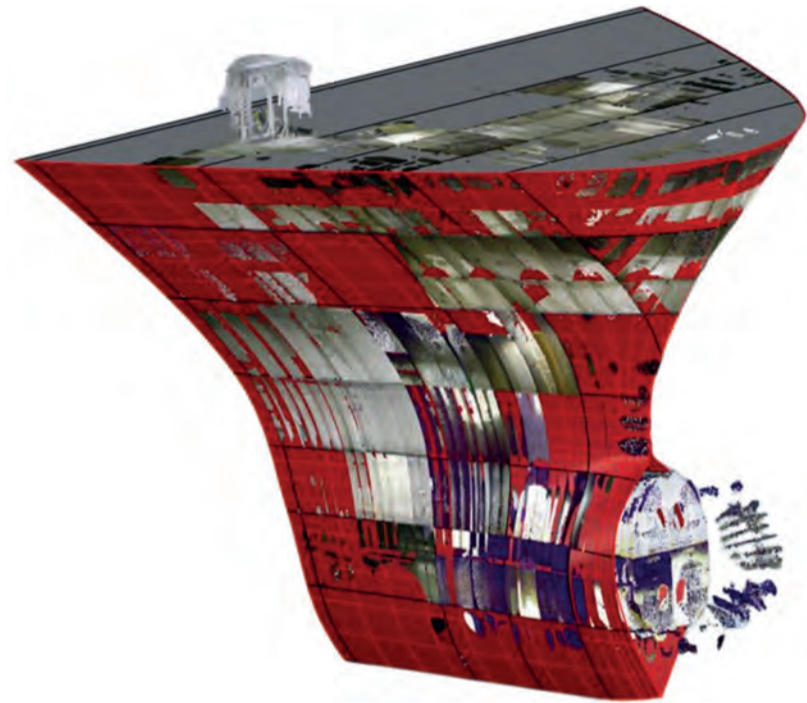
SPECIAL PRODUCT SYSTEM CONVERSION FOR 4,700-DWT PLATFORM SUPPLY VESSEL – NETHERLANDS

A PSV with an upcoming scheduled drydocking looming, needed its existing Low Flammable Liquid System converted to a Special Product System. With only six months from concept design to installation, the project had to be well executed and carefully managed. The conversion entailed significant modifications and enhancements, and to accommodate the Special Product System, all piping had to be upgraded to withstand the required pressure of 19 bars and the specific requirements for the polymer. Additionally, a tank blanketing system was installed, serving the dual purpose of maintaining product integrity while facilitating inerting when necessary. Several key adjustments were made to facilitate the integration of the polymer system, including the location of the polymer pumps, equipped with frequency drives, to the tween deck of the cargo room and mounted on foundations, as well as relocation of the air dryers. To ensure structural integrity, additional reinforcement – including new flat bars aligned with existing stiffeners – was installed below the pump foundations. Foundations were prepared and equipment strategically placed to ensure seamless integration and operational effectiveness. Goltens supervised the installation in the shipyard in Norway. ■



3D SCANNING AND ENGINEERING FOR AUXILIARY GENERATOR REPLACEMENTS – UAE

One of the world's largest containership owners contacted Goltens Dubai to conduct a feasibility study and design for the replacement of two of its 21-year-old SKL 8VDS 29/24 AL-2 engines, which were to be replaced with STX 7L21/31 engines. The 3D scan and survey were performed around the diesel generators (DGs) No.1 and No.2, rendering precise details of the existing DG foundations and piping connection to the engines, which included fuel-oil supply and return line, low-temperature (LT) freshwater piping, high-temperature (HT) piping, exhaust piping, lube oil drain, and starting air and air breather line. Goltens scanned one of the replacement DG sets in our Dubai workshop, preparing a 3D model that was then superimposed on the engine-room scan to carry out the feasibility check. Considering the overall dimensions and possible clashes/modifications, the foundation was successfully designed to replace the existing DGs with new, refurbished DGs. ■



BULBOUS BOW MODIFICATION SCANNING, VEHICLE CARRIER – NETHERLANDS

Having previously carried out around 60 BWTS retrofit projects with Goltens, a Dutch shipowner commissioned us to perform 3D scanning in support of a bulbous bow redesign/replacement. Goltens scanned the 18-year-old, ice-class ship's bow from inside the vessel during normal operations. To enable the most efficient and rapid 'nose job' replacement of the vessel's bulbous bow, the owner recognized the value of the tight tolerances provided by 3D scanning to ensure a perfect fit of the prefabricated bow, rather than relying solely on the vessel's design drawings. ■



MAIN SEAWATER CROSS-OVER REPLACEMENT, OFFSHORE VESSEL – NETHERLANDS

This particular vessel required replacement of its main seawater cross-over pipes, however there was a requirement to limit the downtime impact of the job. To avoid a protracted fabrication and replacement operation, the owner recognized the value of high-tolerance 3D scanning to enable a first fit prefabrication of the pipes. Goltens scanned the affected pipes and created as-built drawings incorporating the new pipes into the 3D model. Once the pipes were fabricated, another round of scanning was undertaken to ensure proper dimensions and fit. As the pipes were to be lined with a special ceramic coating, the Goltens team knew they only had one chance to get it right. Once coated, the pipes were seamlessly integrated into the 3D model and delivered to the ship for installation. ■

Foundation⁰: Pioneering the Future of Zero-Emission Superyachts

Goltens Green Supports the Creation of a Digital Twin

A REVOLUTIONARY APPROACH TO GREEN MARITIME TECHNOLOGY

The Dutch initiative Foundation⁰ (Foundation Zero) is breaking new ground with the development of the world's first zero-emission superyacht. By leveraging open-source and innovative vessel design, complete with a versatile digital twin, Foundation⁰ aims to pave the way for a sustainable future in the maritime industry.

ORIGINS AND VISION

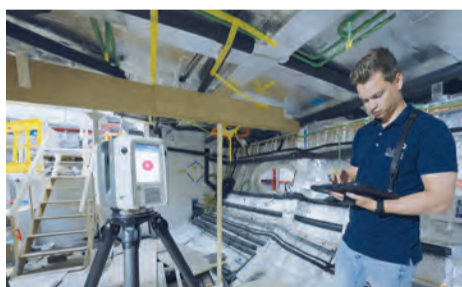
Founded by a forward-thinking group of dedicated professionals and companies, Foundation⁰ was established with the belief that through focused effort and commitment, they could transform energy usage and harness its potential in revolutionary ways. Their mission is to act as a "catalyst for change by offering practical solutions and novel ideas that create new concepts, shared on an open-source basis."

THE ZERO-EMISSION SUPERYACHT PROJECT

One of Foundation⁰'s pioneering projects involves the construction of the world's first zero-emission sailboat, currently being built by Vitters Shipyard in Zwartsluis. This ambitious project seeks to rethink fundamental issues related to propulsion, cooling systems, and energy management, without compromising on aesthetics and comfort. The ultimate goal is not just the realization of the yacht itself but to use the insights and technologies developed during the project to drive positive change across the marine industry.

GOLTENS' ROLE AND CONTRIBUTIONS

Since late 2022, Goltens has been a key partner in this groundbreaking project. Our primary task is to create a robust platform for monitoring, analyzing, and optimizing the yacht's operational performance using an as-built 3D model or digital twin. This digital twin is built on data from more than 10,000 sensors installed onboard, with Cadmatic software providing near real-time visualization. This enables performance parameters to be adjusted in real time, ensuring optimal efficiency and functionality.



CHALLENGES AND SOLUTIONS

Vitters Shipyard is responsible for delivering the 3D model, but Foundation⁰ recognized that not all data might be captured initially, and some critical reference data could be lost. Therefore, significant detailing is necessary on-site to ensure every component is included in the final model. Accurately locating and understanding the performance of each sensor is crucial for comprehensive life-cycle analysis.

To achieve this, Goltens conducts regular scans of the vessel throughout production. As walls and decks close off access to many critical sensors, these scans ensure that every sensor is accurately represented in the digital twin. The resulting 3D model created by our engineers will provide a 100% accurate digital twin, serving as a crucial tool for the yacht's ongoing performance optimization.

A GREEN FUTURE FOR MARITIME INDUSTRY

Foundation⁰'s innovative approach and commitment to open-source development aim to create a ripple effect in the maritime industry. By sharing their developments and insights, they hope to inspire and facilitate broader adoption of zero-emission technologies, ushering in a greener future for maritime operations worldwide. ■



Digital Twins – What Are the Benefits?

A digital twin of a maritime vessel is a virtual replica in 3D. This digital representation mimics the physical ship's structure, systems, and operations, integrating real-time data from sensors on board. The digital twin serves as a dynamic model that provides actionable insights into the vessel's performance, condition, and operational efficiency.

Key Features:

- 1. Real-Time monitoring:** Continuously collects and processes data from on-board sensors
- 2. Simulation and prediction:** Uses advanced algorithms and simulation techniques to predict future conditions, potential failures, and different operational scenarios
- 3. Data integration:** Combines data from multiple sources to provide a holistic view of the vessel's status
- 4. Visualization:** Offers visual representations of the vessel's systems and operations, enabling intuitive monitoring and analysis

Key Benefits:

- 1. Enhanced operational efficiency** (route and fuel optimization)
- 2. Predictive maintenance** (condition monitoring and downtime reduction)
- 3. Safety and regulatory compliance** (e.g., automated reporting)
- 4. Improved decision making** (operational insights and scenario analysis)
- 5. Sustainability** (emissions monitoring and minimized environmental impact)

Implementing a digital twin of a vessel and opportunities for advanced analysis offer strategic advantages for shipowners, operators, and fleet managers with significant potential improvements in performance, reliability, competitiveness, and profitability.

Carbon Capture in Ports and Power Plants – A Budding Partnership with GPS

Joining Forces to Mitigate Pollution From Ships and Land-Based Process Industries

In August 2024, Goltens signed a Memorandum of Understanding (MOU) with South Florida-based Greener Process Systems (GPS), a specialist in carbon capture technology, to collaborate on developing and deploying carbon capture solutions for maritime ports and industrial/power applications.

GPS has developed a patented, revolutionary, modular system to capture maritime and industrial emissions, as well as CO₂. Their ship emissions capture technology, SETH®, reduces air pollution to near zero from oceangoing tonnage such as tankers, freighters, cruise ships, ferries,

etc.) docked in ports close to urban areas. Air pollution is currently estimated to cost society hundreds of billions of dollars per year. SETH® offers a standardized solution for ports that does not require retrofitting or costly modifications to either port infrastructure or ships in general.

Applications for GPS' Industrial Emissions Management (IEM) systems include glass, paint, cement, steel, aluminum, food, incinerators and kilns, power generation, and chemicals processing factories. The company's solutions are capable of capturing gaseous pollutants including CO₂ (thus providing principals with Carbon Credits) and

producing significant energy (and revenue) from waste heat recovery (WHR).

By leveraging Goltens' engineering, and retrofit expertise and GPS' innovative and patented technology, the fledgling partners intend to provide sustainable solutions for ports and power plants to meet stringent environmental regulations.

Pollution mitigation is one of core necessities of our time and underscores both Goltens' and GPS' commitment to environmental sustainability and a proactive approach to supporting the transition to greener practices in the maritime and power generation industries. ■



GPS' IEM technology enables the capture of industrial exhaust while adding controls to the gaseous stream without the need for difficult retrofitting.

Installation of Biogas RNG Treatment Plant on Dairy Farm in US Midwest

Goltens Green Technologies Performs Successful Installation of Biogas Upgrading Plant on a Dairy Farm in Midwest, USA



The Biogas RNG market in North America is currently experiencing unprecedented growth due to favorable policies and its environmental benefits. Goltens Worldwide's green division, Goltens Green Technologies, has responded fast to this expanding demand, undertaking several RNG projects during 2022 and 2023, including on dairy farms.

PROJECT SCOPE

The Goltens team comprised a professional project manager and three multi-skilled

welders who were responsible for all on-site welding, mechanical installation, and commercial insulation of the piping. The comprehensive project scope included tackling the engineering challenge of laying foundations for the upgrading units and supplying crane services to set the gas upgrader containers and H₂S (hydrogen sulphide removal) towers, positioning them within half-an-inch of the required elevation. Dimensionally critical targets were very precisely laid out to ensure the pipework would fit. Goltens' team ensured all work performed was within accepted tolerances and to the strict time deadline.

Goltens fabricated all of the 304- and 316-grade stainless-steel pipework required by the design connecting the H₂S towers to the processing containers.

All metalwork was welded by our class-certified 6G welders. Each of the fabricated pipes went through rigorous pressure testing before final installation and fitting. Once the system was installed, a 5% X-ray test was performed on all of the welds for quality control.

The Goltens team also installed all the analyzer mechanical tubing with compression fittings in 316-grade stainless steel and HDPE (high-density polyethylene). On completion of the mechanical works, Goltens arranged for technical teams to install the insulation, working continuously for two weeks to insulate the entire pipe run before completion of the installation.

FINAL TESTING

The entire system was successfully pressure-tested prior to completion and certification of the project. Once completed, Goltens again pressure-tested the entire system with nitrogen, testing the RNG component for 30 minutes at 10psi.

The client's Site Engineer/ Project Manager commented: "In the past, it has been a challenge to find quality contractors to perform the installs. The Goltens team brought everything to the table that we were looking for. Goltens workmanship is amazing! They performed flawless work, were professional, dedicated, and conscientious of all our requirements. We look forward to continuing success using Goltens as a partner."

As dairy farm RNG projects continue to gain momentum in North America, Goltens is committed to expanding its services in this space, solidifying relationships and partnerships with manufacturers, EPC firms, and general contractors to provide robust, high-quality solutions for customers. ■



Newly installed biogas treatment plant



H₂S and stainless-steel pipe run



Pressure-testing of the entire system

Biogas in Brief

Biogas results from the anaerobic digestion process of organic animal waste. After the waste is fermented in a biogas digester, the resulting gas is upgraded to pipeline quality suitable for commercial use. The upgraded gas can either be compressed in portable trailers or injected directly into a natural gas pipeline for sale. The application of cow manure digestion on dairy farms has shown particularly brisk activity, especially in the US Upper Midwest.

Innovative Engineering: Fishing Vessel Janneke

Showcasing Comprehensive Mechanical System Design Beyond Environmental Retrofits

The successful partnership between Goltens, HR Piping, and Werft Shipbuilding in the Netherlands underscores the importance of precise mechanical engineering in complex vessel construction. Goltens' expertise ensured the *Janneke* project proceeded smoothly, exemplifying our ability to deliver high-quality engineering solutions that meet client needs and industry standards.

Named *Janneke* after the daughter of Captain (and owner) Jelle Hakvoort, the vessel is 27.99 meters long with a beam of 8.25 meters. Designed for beam trawling in winter and twin rigging in summer, the vessel will target plaice and crustaceans.

MECHANICAL ENGINEERING BY GGT

Goltens, by way of HR Piping, was tasked with the mechanical engineering aspect of the project. Despite its modest size, the vessel presented significant challenges in fitting all necessary equipment into a compact space while ensuring accessibility and workability.

ENGINEERING EXCELLENCE

From initial diagrams approved by Class to parts lists, arrangements, and Bills of Materials, Goltens delivered comprehensive engineering solutions to facilitate a smooth and efficient build. Key benefits included:

- **3D engineering insight:** Goltens' 3D engineering models provided the client and owner with a clear view of available space, allowing for input on arrangements before fabrication and installation. This proactive approach ensured optimal space utilization and practical layout.
- **Collision avoidance:** Potential collisions between components were identified and addressed during the engineering phase, preventing costly adjustments during construction and saving significant time and money.
- **Installation supervision:** Goltens' engineers were on site at the yard during construction and outfitting to assist with supervision and the actual installation.

The vessel is set to be delivered in Q3 2024. ■



Design rendering of Z-575 *Janneke*



3-D model of Goltens' mechanical design and machinery placement



The *Janneke* under construction at Werft Shipbuilding in Urk, Netherlands

We have saved many hours at the yard by contracting Goltens and identifying potential issues before they occur. We are very pleased with their work processes, deep technical capabilities, and knowledge. We definitely plan to use them again for our upcoming projects.

Jan Cees Kater, Project Manager, Werft Shipbuilding

Goltens Energy Control Solutions (ECS)

Although Goltens has been a Woodward Factory Authorized Service, Repair, and Overhaul partner since 1994, our reach in supplying control solutions to the world's marine, power generation, oil & gas, and industrial markets continues to expand. With each passing year, our specialists continue to enhance our reputation for delivering the most advanced engineering solutions that integrate cutting-edge product technologies into a wide array of energy and power projects. While we are known for our expertise in overhauling and repairing prime movers, generators, motors, and balance-of-plant equipment, Goltens continues to earn the trust of customers worldwide in both mechanical and electronic engine control projects and conversions leveraging the latest technologies.

This multi-regional expansion enables Goltens to provide full system integration and turnkey solutions for reciprocating diesel, gas, and dual-fuel engine plants, as well as gas, steam, and hydropower turbines and centrifugal compressors worldwide. As specialists in addressing complex control, excitation, and power management challenges across various industries, the robust solutions provided by Goltens' engineers include the evaluation and upgrade of governors and actuators, independent overspeed systems, anti-surge compressor systems, comprehensive prime-mover safety and monitoring systems, generator protection, AVR/Excitation, and power management with Human Machine Interface (HMI), Supervisory Control & Data Acquisition (SCADA), and balance of plant as required.

Below are a few examples of how Goltens ECS continues to support the most challenging projects in some of the most remote regions of the world. ■

Industry Application	Engine Control	Turbine Control	Compressor Control	Power Management	Excitation Control	Protection Relay
Commercial Utility	✓	✓		✓	✓	✓
Agriculture – Sugar	✓	✓		✓	✓	✓
Pulp & Paper		✓		✓	✓	✓
Steel/Aluminium Mill		✓		✓	✓	✓
Textiles	✓			✓	✓	✓
Marine/OSV	✓	✓		✓	✓	✓
Fertilizer	✓	✓	✓	✓	✓	✓
Cement	✓	✓		✓	✓	✓
Downstream						
· Refining	✓	✓	✓	✓	✓	✓
· Ethylene/Propylene		✓	✓			
· Nitric Acid		✓	✓			
· Methanol		✓	✓			
· Polyethylene		✓	✓			
· Polypropylene		✓	✓			
Midstream						
· LNG	✓	✓	✓	✓	✓	✓
· NGL – LPG	✓	✓	✓	✓	✓	✓
Upstream						
· FPSO	✓			✓	✓	✓
· Offshore	✓	✓	✓	✓	✓	✓
Hydroelectric						
Data Centre	✓			✓	✓	✓
Healthcare	✓			✓	✓	✓
Commercial Buildings	✓			✓	✓	✓

Controls Solution Solves Cascading Engine Load Shedding Issue for Critical Iraqi Gas Production Plant

Woodward Flex500 solution restores reliability for regional gas supply and electric power generation.



Goltens Energy Controls Solutions specialist configuring new load-shedding panel

The gas production plant located in remote Northern Iraq operates four Caterpillar G3520 gas generators, supplying critical gas supply to the region's power stations. The plant was experiencing recurrent engine trip issues risking total blackout. The criticality of reliable gas supply to support electrical power generation in this underserved region of the country cannot be overstated and the plant needed a solution to increase its reliability.

CRITICAL PROBLEM

Recurrent engine trips were causing instability in gas supply to end-users

forcing the remaining engines to handle unexpected loads. This can cause a change in the gas/air ratio and cause the remaining gas engines to pre-ignite or detonate resulting in engine knock that can initiate a shutdown of the engine, resulting in increased load on the remaining engines. This in turn could potentially lead to overload and eventual trip of the remaining engines and a complete blackout of power production and gas supply. Additionally, because reliability is vital for the plant, the engines have been run at low load to ensure power, but this in itself can result in carbon deposits that dramatically increase the likelihood of pre-ignition/detonation of these engines.

LOAD-SHEDDING SOLUTION

Team evaluated the complex challenge and upgraded four Woodward EGCP-2 controllers with Woodward easYgen controllers, based on the Woodward Flex500 system. This programmable, real-time, deterministic digital controller optimizes performance and protection while the application software developed by Goltens enabled the plant to shed non-essential loads, equivalent to the load being carried by the tripped engine. This enabled the remaining engines connected to the bus to run unimpeded while corrective actions were taken, avoiding a series of cascading casualties and

eventual blackout. The solution allows the plant to run fewer engines at a higher base load, keeping carbon deposit build-up to a minimum and virtually eliminating the risk of a blackout situation.

The Flex500, programmed by Goltens' engineers, monitors load distribution and calculates which feeders need to trip when a generator trips, maintaining load balance, and ensuring continuous gas supply. An HMI connected to the system provides comprehensive monitoring and alarm status.

PROBLEM SOLVED

The complete system with all network interfaces, simulated and tested in Goltens' Dubai facility during Factory Acceptance Testing (FAT), successfully prevents cascading shutdowns and blackouts. The system was successfully installed and



tested at the plant in Iraq, and now responds within milliseconds to generator trips, protecting the critical gas supply to end-users and ensuring reliable power generation to the region. ■

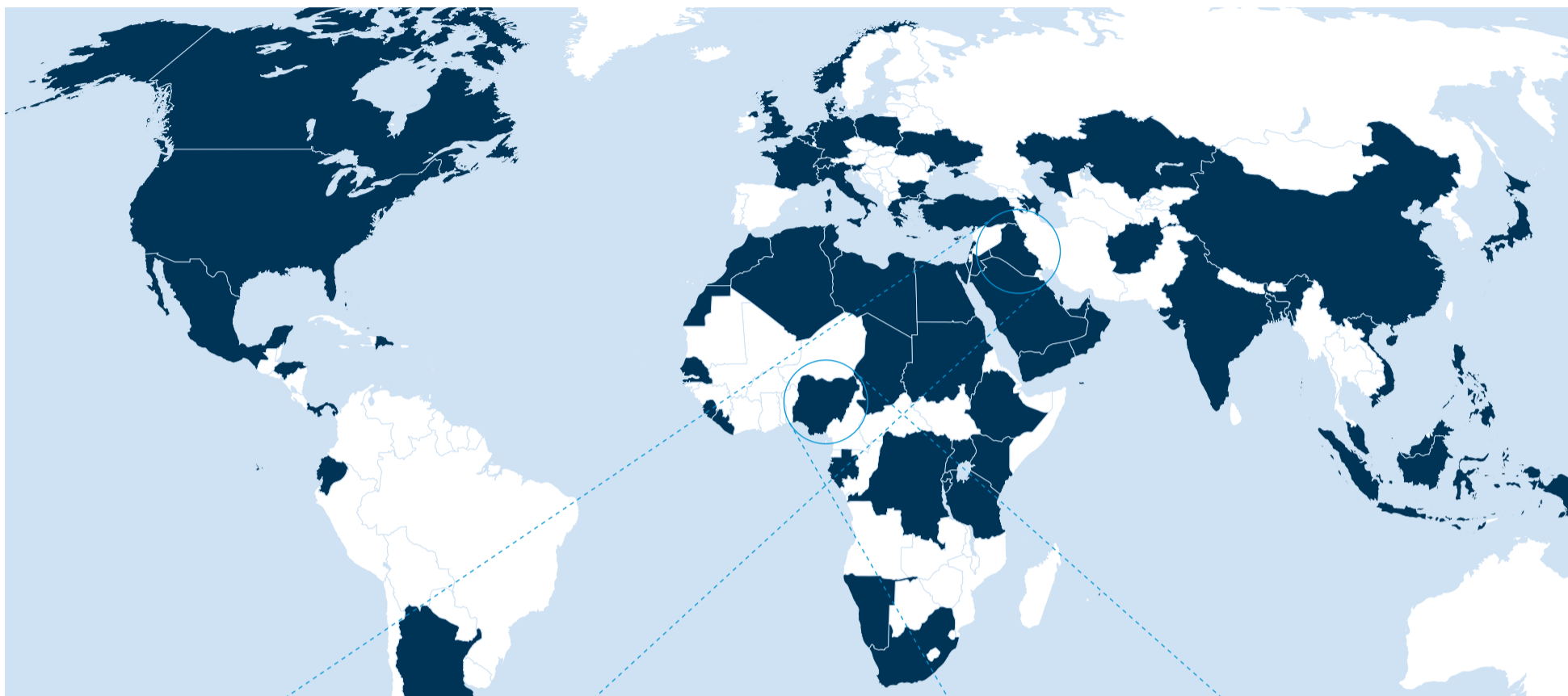


New Load Shedding Panel installed



One of four CAT G3520 Engines

Global Impacts with Leading-Edge Technology



Critical Modernization of Integrated Turbine & Compressor Control (ITCC) Systems at Dangote Fertilizer Plant, Nigeria

Continuous production ensured through well-coordinated upgrade program.

Dangote Fertilizer Limited (DFL) in Nigeria initiated a critical upgrade to its turbine and compressor control systems for Train-1 and Train-2 plants, each consisting of Process Air Control (PAC), ammonia (NH₃), carbon dioxide (CO₂), and syngas turbine-driven compressors manufactured by Mitsubishi Heavy Industries (MHI). With eight aging Woodward Integrated Turbine Compressor Control (ITCC) systems, all over 10 years old, a comprehensive modernization was required to ensure reliable fertilizer production.



Dangote Fertilizer Plant – Africa's largest Granulated Urea Fertilizer complex

CRITICAL UPGRADE REQUIREMENTS IDENTIFIED

Goltens' asset review of the Woodward ITCC MicroNet™ Plus control systems, iFIX SCADA system and protection systems identified obsolete and inactive components and software. We advised that upgrading these systems was essential to avoid the risk of prolonged and expensive unscheduled shutdowns in the event of failures.

PHASED PROJECT EXECUTION

• **Planning Phase:** Uninterrupted production was of paramount importance to the plant owner with continuous high demand for fertilizer. DFL's Operations and Instrumentation teams defined a four-week schedule to ensure continuous production

from at least one train, with only one week of common shutdown. This meant Goltens had to get it right the first time. Detailed planning, including risk mitigation, engineering documentation, parts and materials, supply chain management, as well as ensuring 24/7 availability of Goltens Specialists were all completed.

• **Engineering Phase:** This phase included control software migration, iFIX SCADA updates, Remote Access Program (RAP) implementation, extensive testing, and an update of all documentation for the changes concluding with a successful five-day Factory Acceptance Test (FAT) carried out remotely in Goltens' Dubai office.

• **Installation and Commissioning Phase:** The installation involved risk assessments, hardware updates, new software installations, pre-commissioning checks, and RAP system implementation.



Dangote turbine with Woodward actuator

KEY UPGRADES

• **Woodward ITCC MicroNet™ Upgrade:** New cyber-secure CPU and smart I/O modules were integrated, utilizing existing MicroNet™ Plus chassis, power supplies and HD digital I/O modules. Inactive and non-preferred modules were replaced, and software was updated to the latest versions.

• **GAP™ application upgrade:** Application software and libraries were upgraded to the latest core and coder libraries files.

• **iFIX SCADA PC upgrade:** All of the PCs related to both trains were upgraded with the latest compatible hardware and operating system required to support the latest iFIX and Historian versions, enhancing cybersecurity. The existing human machine interface (HMI) application backup was migrated to the latest iFIX version.

• **ProTech® GII Upgrade:** The ProTech® GII Model Software was upgraded to a math-enhanced version with voted input functionality to ensure state-of-the-art overspeed protection for the ITCC trains.

• **Remote Access Program (RAP):** Woodward Remote Access Program (RAP) was implemented allowing communications directly with the MicroNet™ Plus and SCADA systems from anywhere in the world utilizing a cybersecurity-certified system. This allows remote access to the control system, enabling quick diagnostics and support, reducing the need for on-site field service.



Goltens working on ITCC Cabinet with MicroNet Plus™



DFL Operations team system operations classroom training

RESULTS

The upgrade was executed flawlessly and to schedule – a testament to the close cooperation between DFL, Goltens, and Woodward. The key benefits of the extensive project included:

- Availability of supported hardware
- Enhanced system reliability and security
- Reduced risk of unscheduled shutdowns
- Improved operational efficiency and uptime
- Instant remote support capabilities

Multiple hands-on training courses were held for plant operators to ensure that DFL's Operations team had the knowledge and skills necessary for the smooth operation of their upgraded ITCC. DFL's decision to upgrade their ITCC systems with the latest controls technology from Goltens and Woodward highlights their commitment to reliability, security, and operational life of their manufacturing processes. ■

Saving Customers Millions and Minimizing Downtime – 12 Years of Crankshaft Annealing

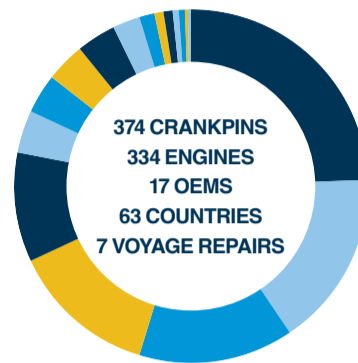
Consider This Basic Question: Why Spend Precious Money on Replacing a Crankshaft When You Can Repair it?

Since securing Marine Class Approval in 2012 for our well-proven process for crankshaft annealing on 4-stroke engines, Goltens' specialists have salvaged a total of 374 crankpin journals on 334 engines in over 60 countries. We are proud to say we have never failed to reduce the hardness values to within acceptable limits.

This a staggering figure considering how much unnecessary cost has been avoided and how much operational downtime has been minimized over that period. As the process is minimally invasive and requires only a partial disassembly of the engine, and the repairs are carried out in a matter of weeks, comparing this to the high cost of replacing a crankshaft and the associated downtime is substantial. With our process

so well proven in the field, choosing not to anneal when appropriate is practically choosing to throw your money away.

Absent leveraging an annealing repair, there are essentially two options: The first is to machine the journal surface to eliminate the high hardness. However, this is less than ideal in that hardness depth often permeates below the minimum rated diameter for the crankpin, resulting in a condemned crankshaft, or, if the hardness can be machined away, the user is left with a crankshaft with much less material on the crankpin journal, limiting its potential lifespan. The second solution is to replace the crankshaft. This requires purchasing a new or reconditioned crankshaft (if readily available), transport costs, and



92 MAN B&W	10 RUSTON
60 MAK	5 MIRRLEES BLACKSTONE
53 WARTSILA	3 DAIHATSU
50 BERGEN	3 NIIGATA
37 SULZER	2 GMT
15 MITSUBISHI	2 HIMSEN
14 PIELSTICK	1 SKL
13 DEUTZ	1 ALLEN
13 SWD/WARTSILA	

disassembly and full reassembly of the engine. The unnecessary costs associated with replacing the shaft come on top of excessive engine downtime.

Those who are aware of this repair method generally seek a second opinion to that dictated by the OEM, saving themselves a huge amount of time and money. ■

Comprehensive In-Place Machining Solutions Revitalize Caribbean Power Plant Engines

Wartsila 18V46 and 16V32 Engines Restored with Crankshaft Machining, Annealing, Bore Alignment, and Bluing

Goltens' specialists were asked to inspect two Wartsila engines at a large power plant in the Caribbean. Damage was reported on Crankpins No.3 and No.7 of Engine No.1 and Crankpins No.2 and No.3 of Engine No.9, which required inspection to determine repair options.

ENGINE NO.1 (16V32) – ANNEALING AND SIMULTANEOUS MACHINING OF JOURNALS TO LIMIT DOWNTIME

Goltens discovered significant damage and high hardness levels on the bottom of the engine crankpins, with readings as high as 630HB, far exceeding safe operation limits. The team recommended machining the journals to clear surface cracks for further evaluation. Despite this, the journals still had large hard spots (approximately 360mm x 180mm), and annealing was recommended to reduce the hardness. Machining the hardness out would have resulted in the crankpins being below the minimum allowable diameter, condemning the crankshaft.

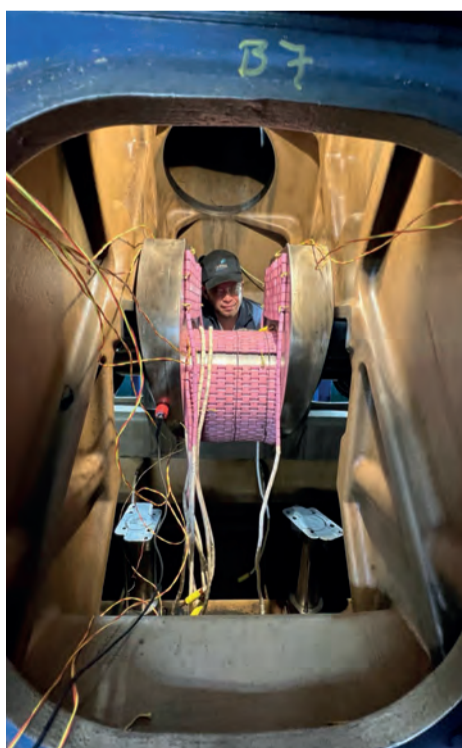
Goltens' specialists mounted ceramic annealing pads, temperature sensors, insulation materials, and dial indicators (to monitor linear thermal expansion of the crankshaft) and conducted the computer-controlled annealing process on the journals. After the cooling process, the hardness values were below 320HB. The team then set up two sets of crankshaft tools to finish-machine the journals' running surfaces to -2.00mm with a surface roughness of 0.29 Ra.

ENGINE NO.9 (18V46) – BORE ALIGNMENT CHECKS, JOURNAL MACHINING AND RIDGE WEAR RECTIFICATION

Inspection of Crankpins No.2 and No.3 revealed water damage on the surface of the journals, which required machining. Due to a previous crankshaft casualty, Goltens decided to mount line boring equipment in the cylinder liner bores and use dial indicators to ensure there were no legacy alignment issues with the engine. Satisfied that the engine/crankshaft were in alignment,

Goltens machined a new radius on the No.2 journal, previously machined to -4.00mm, and removed another 1.00mm to finish the surface at -5.00mm. Similarly, Goltens machined the No.3 journal to -1.00mm to rectify the damage. To complete the job and ensure new bearings would not encounter point load failures, Goltens fabricated and shipped bluing and lapping dummies to the site and removed all ridge wear from the other crankpins on the engine.

Both engines were successfully load tested and returned to service with no further issues. ■



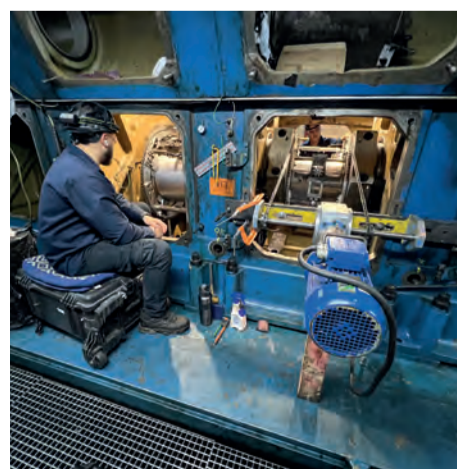
Annealing pads installed on damaged journal



Installation of line boring equipment and dial indicators to check alignment of shaft to block and landing surfaces



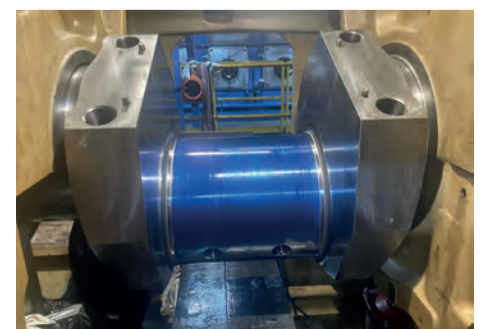
Goltens' specialist monitoring heating and cooling process on crankpin



Simultaneous machining of Crankpins No.2 and No.3



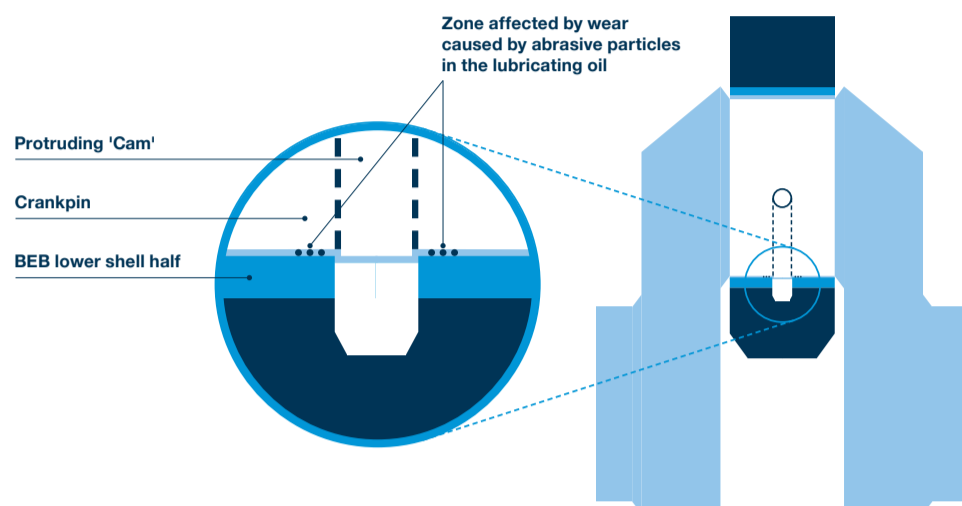
Lapping dummy employed to remove ridge wear found on Engine No.9 to reduce 'point load' risk on rebuild



Rectified crankpin showing removal of ridge wear and full surface contact after repair

Four-Stroke Crankpin Journal 'Cam Effect' – a Surprisingly Common, and Overlooked, Cause of Many Major Crankshaft Failures

Ridge Wear is the Root Cause of Many Preventable Crankshaft Failures That Goltens Sees Every Year



Many operators assume that since there were no issues with the crankshaft before an overhaul, installing new bearings during the overhaul will simply improve the life-cycle and performance of their engine. In reality, absent a detailed and thorough evaluation of the running surface of the crankpins, you may just have pulled the pin on a potential crankshaft hand grenade.

WHAT IS THE 'CAM EFFECT'?

The Cam Effect, or ridge wear, is a non-uniform wear phenomenon resulting in an uneven running surface on the crankpin. Over time, abrasive particles in the engine's lube oil will cause wear of the crankshaft running surfaces, however, in the areas that are not in constant contact with the bearing surface, such as the bearing oil groove and between the bearings, little or no wear will be experienced.

1) With new bearings installed, in accordance with the OEM's technical manual, why should there be a problem?

Despite the previously installed bearings doing their job, and the lubrication system operating to spec, long-term wear patterns emerge on the surface of crankshaft journals resulting in high points or ridges. These ridges, often invisible to the naked eye, present pressure points that cause 'point loading' (localized overloading of newly installed bearings leading to overheating and potential bearing failures).

Point loading would not have been present on the original running bearings as the bearings wear with the shaft over time, and this only becomes an issue once new bearings are installed.



Technician using custom-manufactured mandrel to remove ridge wear

2) What should be done during a major overhaul?

At every major overhaul a crankshaft inspection should be carried out by a qualified professional using a machinist's straight edge and Prussian Blue, as well as a calibrated outside micrometer to evaluate the bearing running surface. If any abnormality in the journal running surface is found, the protrusion should be removed and the crankshaft surface rectified to the maker's recommended tolerances for flatness, taper, ovality, and roughness. This is not a routine undertaking, and the delicate process should be carried out by highly skilled crankshaft specialists from Goltens or the OEM, using a combination of filing, lapping, and bluing. In addition, custom-fabricated mandrels specifically built for the diameter and width of the engine's crankpins should be used.



Checking running surface for ridge wear with straight edge

3) What if you can't address the ridge wear immediately and need the ship to operate?

If found, the worst thing quality-minded engineers can do is not address the Cam Effect (ridge wear) and assume that installing a new bearing will solve the problem. If ridge wear is found and can't be dealt with at once, it is usually better to leave the existing bearings (assuming they are in a reusable state) in place for a limited amount of time until the problem can be rectified. This critical decision should be evaluated looking at all criteria including but not limited to: bearing condition, age, and how many times a unit has been opened. ■

In-Place Annealing and Machining on Three Crankpins Saves Otherwise Condemned Sulzer Crankshaft in Japan

Critical Bearing Failure in Kumejima Powerplant's Sulzer 6ZL40 Engine Prompts Expert Repair Evaluation and Solution.

MACHINING ALONE WOULD BE INSUFFICIENT

The damage was much more severe than initially reported. Inspection revealed that not one, but three, bearings had failed and that the crankpins had unacceptable levels of hardness (640HB) and extensive heat cracks in the journal surfaces. Additionally, the remaining three crankpins unaffected by the bearing failures all required machining to an under-size in order to correct ovality.

Initial machining of the journal surfaces to remove cracks revealed that the hardness levels could not be reduced to a diameter where the crankshaft could be salvaged. Goltens advised that the only recourse to avoid the downtime and high costs of a crankshaft replacement was to anneal all three crankpins.

JOURNAL ANNEALING

Leveraging Goltens' well-tested annealing process, the three journals with high hardness were gradually heated using computer-controlled equipment to the correct temperature for the required time. Controlled cooling was then carried out to avoid thermal shock and ensure uniform hardness. Once cooled, mild peening was completed to ensure straightness of the crankshaft.

FINAL MACHINING

With the hardness successfully reduced to maker tolerances, final machining, polishing,

and blue fitting were performed on the three crankpins damaged by the bearing failures and the three out-of-tolerance journals to leave all journals at required dimensions. Additionally, all eight main journals were polished to restore a smooth-running surface to reduce friction and wear going forward.

OUTCOME

The engine was restored to full operational status within acceptable tolerances, saving significant downtime and cost, with the result that another costly and unnecessary crankshaft replacement was avoided with the help of our experts. ■



Machining of one of the successfully annealed crankpins



Installation of ceramic tiles on one of the crankpins in preparation for annealing



Hardness checks on crankpin journal after annealing and cooling

Replacement of Stern Tube Bearings on Containership – Goltens China

Mobilizing the Right Tools and Technical Specialists Solves the Problem and Minimizes Downtime

During transit, the crew of a 14-year-old, 16,000-TEU container ship discovered a high-temperature alarm in the stern tube bearings. During the vessel's subsequent special survey in China, the shipyard removed the forward and aft stern tube bearings and discovered they were damaged. The customer requested Goltens China to carry out an inspection and laser alignment check of the shaft center line and submit a proposal for repair.

the vessel completed successful sea trials and returned to service.

RESULTS

Goltens' service team worked around the clock in the drydock and completed the work two days ahead of the initial planned schedule. Both yard and owner were very satisfied with Goltens' responsiveness, excellent service quality, and efficient schedule. ■

WORK SCOPE

The team conducted initial inspection of the stern tube bearing and housing condition, and performed laser alignment checks of the shaft system center line. Goltens was subsequently engaged to perform in-situ line boring of the aft and forward stern tube housings in the drydock. Once completed, Goltens inspected and calibrated the new stern tube bearings, including laser alignment checks of inner bore slopes. Our technicians machined the new stern tube bearings' outside diameters and provided technical guidance for press-fitting of the bearings.

Goltens performed a final laser alignment check of the shaft system center line after press-fitting the forward and aft stern tube bearings. The team completed clearance measurement, scraping of white metal, adjustment of clearance, and blue testing of intermediate shaft bearing shells and journals prior to completing a jack-up test of the shaft bearing load. Once this was finished, alongside the other yard scope,



Scraping of intermediate shaft bearing



Measurement of new stern tube bearing



In-situ line boring of stern tube housing



Laser alignment of in-situ boring equipment

Metal Stitching Salvages Badly Damaged Compressor Casings

Over Six Meters of Damage Repaired in Only 11 Days Working Around the Clock

A machinery repair specialist contacted Goltens with an urgent request for repair support on badly damaged high-pressure (HP) and low-pressure (LP) compressor casings.

When large cast components develop cracks, often the only viable repair option is to metal-stitch the cracks. Generally, traditional welding methods are not effective for repairing cast iron and other cast metals and, in many cases, can result in more damage to the piece being welded.

THE INSPECTION AND SCOPE

Goltens deployed a specialist team to inspect the damage and propose a repair protocol to complete the job as soon as

possible. The inspection report from the customer had indicated extensive cracks and Goltens found over five meters of cracks during the preliminary inspection. Once the pieces were fully sandblasted, an additional meter of cracks were discovered around the casings giving a total of over six meters of damage.

With an aggressive repair requirement of only 14 days, Goltens immediately mobilized the necessary tooling and sent three specialist teams and a project manager to begin the extensive works on a day shift, subsequently adding another two teams of specialists to enable work around the clock to meet the aggressive deadline.

FOUR DAYS AHEAD OF SCHEDULE

The five teams worked 24/7 to complete a phased approach addressing the more badly damaged HP casing first. Each crack was drilled and tapped for the stitching pins to be inserted along the length of the cracks prior to being machined clean. Subsequently, using a drilling template, precision hole patterns matching the dimensions of the metal locks were made at various points along the stitched

seam to enable the insertion of the lock inserts perpendicular to the cracks. Once completed, the lock surfaces were also machined clean and crack tested before moving on to the next set of cracks.

The overall job was completed in only 11 days, with the team of machinists utilizing over 1,200 stitching pins and over 60 locks to finish the repairs on the 6.1 meters of cracks. ■



Tapping holes for second set of stitching pins



Stitching pins installed, surface dressed prior to metal lock installation



Tapping drilled holes along crack for stitching pins

Line Boring Restores CAT 3616 for Gold-Mining Field in Indonesia

The regional CAT dealer engaged Goltens Indonesia to attend a gold mining-field in Papua for an urgent inspection of one of its CAT 3616 engines to check the engine block and crankshaft. The troubled engine was in the process of being overhauled and options for repair needed to be understood to get the engine back in operation as soon as possible.

A Goltens machining specialist flew out to the site and completed a thorough inspection of the engine block and crankshaft to determine if there were any misalignments, cracks or bends. NDT, calibrations, laser bore alignment, and flatness checks were performed.

The bore inspections revealed that the bearing pockets were misaligned and out of limit, requiring line boring. Inspection of the crankshaft revealed damage at a level where replacement was recommended. Goltens mobilized line-boring tooling and technicians and completed line boring on the bearing pockets (265mm diameter) to meet the maximum 0.02mm tolerances.

The job was carried within the agreed timeline. Once final checks were made and validated, the customer's engine team was able to proceed with completion of the overhaul and replacement of the crankshaft. ■



Line boring of CAT 3616



Crack test on bearing pockets

In-Place Machining Saves Money and Time – Wind Turbine Generator (WTG) Hub Machining in India



Goltens specialist performing calibration of the WTG hub inner diameter before machining



Machining the two-step inner diameter of the WTG hub to required dimensions

A Difficult Solution – In-Place Machining of Main Engine Thrust Collar Surface

Bespoke Solution for Tight Space with Tight Tolerances

A major engine maker approached Goltens China to evaluate the possibility of an In-Place Machining repair of the main engine thrust collar surface on a newbuilding. The damage had occurred during sea trials and the deadline to rectify the problem was critical.

A Goltens machining specialist attended the vessel to inspect the damaged thrust collar surface and measure the available space to guide the design and fabrication of special grinding tools suited to the limited space. (As with all damaged thrust collar repairs, space is the limiting factor when determining how to execute the repair.) Goltens' tool builders spent the next two weeks designing, fabricating, and testing the tools in Goltens'

Shanghai facility to ensure proper fit and function before deploying the teams to site.

Working around the clock, the team was forced to make modifications to the equipment due to the turning gear running slower than expected and the high hardness found on the thrust collar face. The team quickly modified the tooling from grinding stones to machining tools to speed up the process. With the tools modified, the work pace improved, and milling and final polishing were completed to achieve a surface roughness within maker tolerances. Once completed, the components were reassembled and the vessel went on to a successful sea trial before delivery to the owner. ■



Damage to thrust collar during sea trial before repair



Thrust collar surface honing after machining



Tools and technician working in highly confined space with limited clearance



Customized In-Place Machining tools developed by Goltens installed for repair

Detailed Scope

- Design and fabrication of customized grinding and machining tools
- In-situ grinding of thrust collar surface
- In-Place Machining of thrust collar surface
- In-situ milling and polishing of thrust collar surface after machining
- Sea trial

Following shipment of the WTG hub to a remote site in Andhra Pradesh, India, an Indian energy company discovered the inner diameter of the hub that didn't match the equipment size and needed to be machined. Transporting the hub back to a machine shop was not economically viable, so the customer called Goltens India to inspect and advise if the diameter could be rectified onsite.

After inspection, Goltens' In-Place Machining specialists advised that they could fabricate a special feature to mount the boring machine and tool holder to the hub to complete the repairs on-site, avoiding the cost and interruption of transporting the piece to a workshop. Goltens completed the tool modifications, calibrated the interior diameter, and machined the interior diameter in two steps as required by the customer. Final machining of the two steps measured 1158.30mm x 40mm and 1158 x 130mm with a final surface finish of 6.3Ra to an E9 tolerance as per the specifications.

Goltens India completed the job on time and according to the specifications, thus eliminating the cost and delay associated with a workshop repair. ■

Pioneering Investments in Advanced Electronically Controlled Engine Services (ECES)

Launching the First of Three Multi-Way Valve Testing Units in Singapore

Goltens Singapore introduced a new state-of-the-art Multi-Way Valve Tester in its ECES Service Center to provide the highest level of services for ME-GI, ME-LGIP, ME-GA engines, and other gas and electronically controlled engines. These multi-way FIVA (Fuel Injection Valve Actuation) valves play a critical role in operating newer 2-stroke engines that are now approaching key operating-hours service intervals. This is the first of three testing units deployed globally, with the other two pending delivery in China and Dubai.

the relevant MAN B&W engine valves. As co-operation partners with Hyundai Engine Manufacturers, we also have access to the latest engine service technologies. Moving together with the latest engine trends, Goltens is embarking on service capability for MAN ME engines.

To date, we have carried out several projects on fuel booster pumps, cylinder lubricating systems, exhaust valve actuator, and FIVA/ELFI valves. ■

Designed to assess FIVA, ELFI (Electronic Fuel Injection) and ELVA (Electronic Valve Actuation) for MAN B&W engines across ME, ME-GI, and ME-GA series, this cutting-edge machine boasts a range of capabilities, including:

- Calibrate zero settings in accordance with manufacturer specifications
- Verify precision of main spool positions
- Analyze feedback sensor responsiveness

Moreover, the unit can scrutinize proportional valve functionality and inspect internal leakage volume, ensuring valves meet the same standards of performance and safety as newly available products in the market. This advancement will bolster Goltens' existing overhaul services for FIVA, ELFA, and ELFI valves.

Prior to delivery, Factory Acceptance Testing (FAT) was attended by observers from HD Hyundai Marine Solution Tech (HMST), a subsidiary of HD Hyundai Marine Solutions. Goltens collaborated closely with HMST to guarantee the machine meets all rigorous testing standards for



Goltens and HD Hyundai Marine Solution Tech employees after successful FAT

The Engines We Are Able to Service Include:

- MAN ME-C engines (full capability)
- MAN ME-B engines (full capability)
- MAN ME-LGIM engines (partial capability)
- MAN ME-GA engines (partial capability) machining
- MAN ME-GI engines (partial capability)



Software and programming being configured for all Multi-Way Valves, including FIVA-I-45, FIVA-II-60, ELFI, ELVA, ELWI, WIVA, and PEVA



Continuing Robust Connections With Renowned Engine OEMs

New Partnership Agreements Signed During 2023 Prove Goltens Remains a Trusted Partner with a Focus on Service Excellence

Goltens has always enjoyed strong and constructive relationships with the world's leading engine OEMs. Our experienced technical teams are familiar with OEM specifications no matter how old the engine, and we often consult with makers to ensure we deliver the best possible service and solutions to our customers. We are essentially OEM agnostic; we aim to do the best job on the engines we work on regardless of maker. However, we do have OEM partnership agreements in place with a number of OEMs, and in 2023 we were proud to expand our relationship with Bergen Engines, Hyundai Global Service, and STX Heavy Industries. These agreements are testament to the confidence these and other OEMs have in the consistent quality of work and reliability Goltens provides around the world.

BERGEN ENGINES



In February 2023 Goltens teamed up with Norwegian medium-speed engine producer Bergen Engines in a sales and service agreement to support our marine offerings in Singapore, China, India, Germany, and the Netherlands. Goltens will promote the company's engines for newbuilds, sell spare parts, and perform maintenance services for Bergen Engines' marine customers. Aftermarket support will include planned maintenance using original spare parts and components from Bergen Engines' worldwide exchange pool, which guarantees quality overhauled parts ahead of dismantling, thereby saving time and cost for customers.

The formalized agreement allows Goltens to increase its level of support to our mutual customer base in strategic locations in Asia and Europe, setting another milestone in an already long relationship with a highly regarded European engine manufacturer.

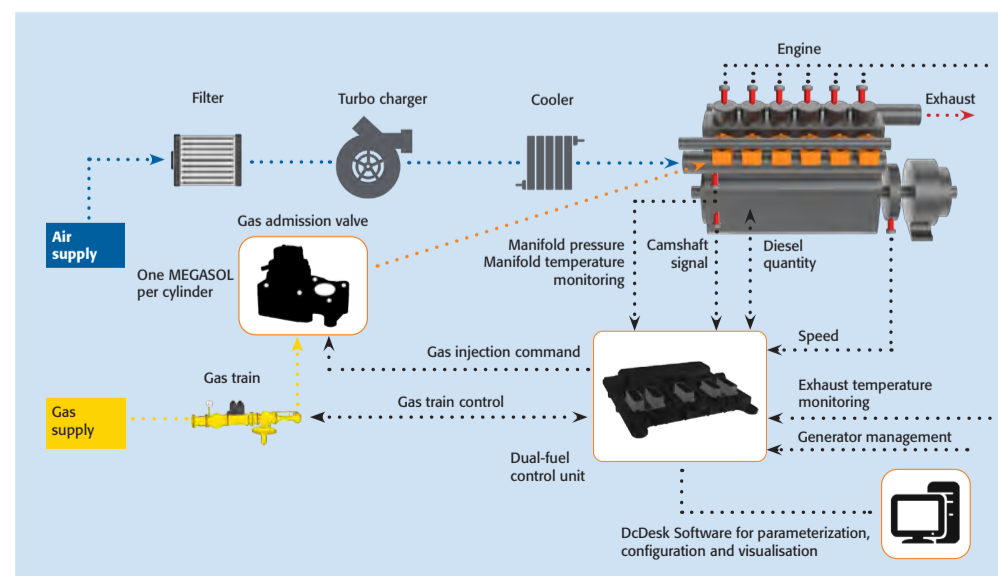
HYUNDAI GLOBAL SERVICE



In June 2023, Goltens Singapore widened their existing Cooperative Services Agreement with Hyundai Global Service to include all services related to Hyundai Heavy Industries electric and electronically controlled 4-stroke, gas, and 2-stroke ME engines. Under the agreement, Goltens will act as the 'Preferred Service Provider' for all service requirements from Hyundai and its customers in Singapore and the surrounding region. Services will include, but not be limited to, overhaul of fuel injection valve activation (FIVA), hydraulic cylinder units (HCU), hydraulic power supply (HPS), and other related components either onboard vessels or in the Goltens Singapore workshop.

STX HEAVY INDUSTRIES

Also in June 2023, Goltens Worldwide was appointed as 'Authorized Service Provider' by STX Heavy Industries of South Korea, one of the world's leading engine and marine equipment manufacturers, now under HD HMS umbrella. The non-exclusive agreement covers STX Heavy Industries' ME, gas and dual-fuel engines, as well as other products and machinery including its Green solutions (Engine Power Limitation (EPL) and Emergency Shut Down (ESD)). ■



Transition to Gas and Dual-Fuel Engines: The Shift in Caribbean and Central and South American Power Markets

Conversion Without Costly Capital Replacement – One Project Delivered With 10 More in the Pipeline

The marine and stationary power markets in the Caribbean and Central and South America are undergoing a significant transformation as they move away from traditional diesel and heavy fuel oil to embrace gas and dual-fuel engine applications. This shift is being driven by both economic benefits and Environmental, Social, and Governance (ESG) considerations.

Economically, with the expansion of natural gas infrastructure in many locations, the switch to gas and dual-fuel engines offers considerable cost savings due to the lower and more stable prices of natural gas compared to diesel and heavy fuel oil. Additionally, gas engines often have higher efficiency and lower maintenance costs, further enhancing their economic appeal. Beyond this, many power producers who have traditionally used heavy fuel are finding regulations threatening their ability to deliver power to the grid in the coming years unless they make the transition to gas.

The transition aligns with global trends towards cleaner energy sources. Gas and dual-fuel engines produce

significantly lower emissions of sulfur oxides (SOx), nitrogen oxides (NOx), and particulate matter compared to traditional fuels, helping to reduce the environmental impact of power generation. This shift supports regional commitments to reducing greenhouse gas emissions and promotes better air quality and public health.

Moreover, the adoption of gas and dual-fuel technologies supports energy security and diversification. Many countries in these regions have access to abundant natural gas reserves or can import liquefied natural gas (LNG), reducing dependency on imported diesel and heavy fuel oil.

Goltens continues to be a leader in this developing space, supporting marine and powerplant operators as they chart their course with the latest solutions that enable them to continue operation without the heavy burden of fully repowering their plants and vessels. While it is still somewhat early in the transition, Goltens currently has 10 active pipeline projects with operators seeking to maximize their transition options. ■



Goltens has delivered a 70:30 dual-fuel conversion solution for the four Caterpillar 3616 engines on the 430-gross-ton fast ferry *Atlantic Express* in Argentina. The engines are expected to be fully retrofitted following bench trials at the beginning of 2024, with additional vessels in the pipeline for conversion to dual-fuel operation. The retrofit of the 33-year-old vessel, which operates between Buenos Aires and Uruguay, will be supported by components and engineering supplied by Heinzmann GmbH.



Overhaul and In-Place Machining on Wartsila Dual-Fuel Engine at Caribbean Powerplant

A Multi-Skilled Supplier Makes all the Difference – Ridge Wear and Worn Liner Landings Necessitate Machining Solution to Complete Engine Overhaul



Goltens' technician removing cylinder liner from engine

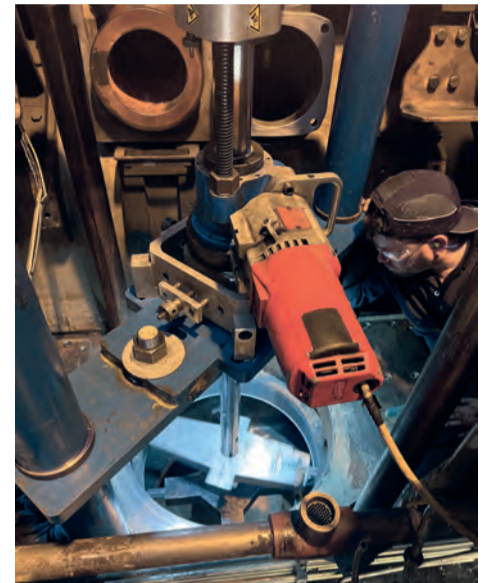
Goltens was engaged to complete a critical 36,000-hour overhaul on a Wartsila 18V50DF dual-fuel engine for a large Caribbean powerplant. During the process, our engine specialists discovered that the engine required in-place machining work on the engine block and polishing of the crankshaft prior to continuation of the overhaul. The liner landing surfaces were worn and ridge wear (i.e., 'Cam Effect') was measured on the crankpins. Left unaddressed, the ridge wear presented a significant point loading risk for crankshaft bearing failure. Luckily for the plant, Goltens was able to deploy its machining specialists to address the issue and avoid the delay of engaging another company to attend.

Working with the plant's personnel, Goltens' service team removed, inspected, overhauled, and replaced all necessary components as per OEM instructions. In parallel, our in-place machinists performed lapping and bluing on all crankpins to remove the ridge wear and machined five lower liner landing surfaces, and fitted insert rings to restore original diameter and surface finish. The team also honed all main journals to restore the running surfaces.

After completing the specialized machining and reassembly, the engine was successfully restored to service. ■



Rigging of one of the piston assemblies to the floor for inspection



Line boring of liner landing faces prior to ring insertion



Calibration checks on connecting rods



Calibration check on one of the engine's crankpin journals

Engineered for Excellence: Goltens opens Technical Training Academy in India



Recognizing the continuous challenges related to maintaining consistent service delivery across a global organization operating out of 14 countries, Goltens recently established its Technical Training Academy in Auto Nagar in the Gajuwaka district of Vizag, India. The primary objective behind the investment is to train and cross-skill new and existing employees in standardized methodologies and processes for the maintenance and repair of rotating equipment, to ensure consistent service quality and reliability regardless of location.

The Academy will serve as a platform for sharing best practices and innovations where experts from different Goltens branches around the world are invited, both virtually and in-person, to conduct workshops and share their knowledge, fostering a spirit of global collaboration and continuous learning.

A VISION OF EXCELLENCE

Capt. Vivek Malhan, a seasoned maritime professional with 40 years of sailing experience, has joined as head of the

Academy. Leveraging his deep knowledge and experience, Malhan is charged with administering the program to ensure that the technical, project management, and leadership tracks are all executed to Goltens' standard of excellence. He aims to ensure that employees return to their respective stations with new skills and an awareness of proper processes to follow in the execution of their roles. Beyond the core curriculum, Malhan's focus is also on creating a center of learning that will not only impart technical skills but also reinforce Goltens' culture of precision, safety, and innovation.

"At Goltens, we believe that the cornerstone of our global success lies in the expertise and dedication of our people," notes Sandeep Seth, Goltens CEO. "The Academy is not just a training center; it's a catalyst for innovation and a cornerstone of our global vision of continuous improvement and excellence, which is critical to our ability to scale our business further in the future."

CUTTING-EDGE FACILITIES AND CURRICULUM

The Academy facilities, when fully finished and outfitted, will include workshops equipped with the latest tools and machinery, advanced simulation labs, and interactive classrooms that support the objective of imparting technical learning as well as hands-on practical training. The underlying curriculum covers a wide range of topics, from basic mechanical principles to complex engine and component overhauls, as well as specialist services like laser alignment, engine troubleshooting, and advanced measurement and calibration techniques.

Overall, Goltens expects that its newly hired graduates will leave with a firm foundation in our culture and technical processes, and that our veterans will leave with a renewed sense of confidence and expertise, ensuring that every engine they work on meets Goltens' rigorous standards of quality and safety. ■

Surge in Liner Diameter Measurement (LDM) Services as Operators Realize Critical Operational Benefits

In recent years, Goltens invested significantly in cutting-edge LDM equipment and services to help owners efficiently enhance engine performance, reduce operational costs, and support environmental sustainability. Increased awareness across our customer base, and the proven value of these assessments, has led to an ever-increasing demand for LDM in major ports around the world.

MASSIVE INCREASE IN INSPECTION EFFICIENCY

Traditionally, liner inspections were completed by disassembling the unit inclusive of cylinder head, piston, piston rod, and liner. This time-consuming process required a team of technicians

and limited the number of liners that could be inspected in a given day. With advanced LDM equipment and well-trained technicians, Goltens can fully inspect all liners on a 2-stroke main engine in a single day without having to disassemble a single unit.

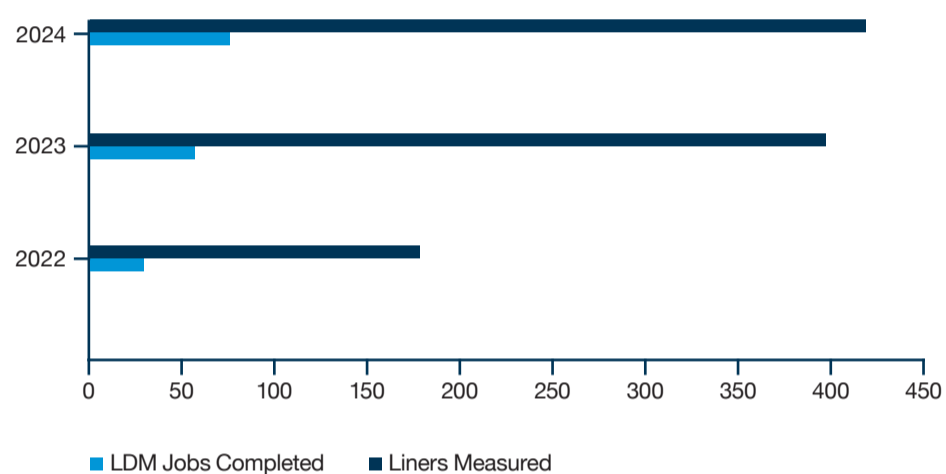
WHY LDM IS CRUCIAL

LDM is a vital service for assessing the wear and tear of engine cylinder liners. Accurate measurement helps predict the remaining life of liners, guiding decisions on reconditioning or replacement. This allows operators to plan effective maintenance and replacement schedules and ensures that their engines operate at peak performance, reducing fuel consumption and minimizing emissions. ■

Key Benefits of Goltens' LDM Services

- Enhanced engine performance** – Regular LDM checks by our experts ensure engines run smoothly, identifying wear patterns early and allowing for proactive maintenance and corrective actions.
- Significant cost savings** – Early detection of wear helps avoid catastrophic engine failures, leading to substantial savings on repairs and minimizing downtime.
- Improved fuel efficiency** – Well-maintained liners contribute to better engine efficiency, reducing fuel consumption and emissions, and cutting operational costs.
- Extended equipment lifespan** – Consistent measurement and maintenance extend the life of cylinder liners and other engine components, enhancing the overall lifespan of machinery and providing a better return on investment.

Increased Global Demand for LMD Services



LDM in Action:

Overcoming Liner Wear Challenges on Oil/Chemical Tanker

A RECURRENT PROBLEM

The owner of a 12-year-old oil/chemical tanker was facing the ongoing challenge of excessive liner wear on its Hyundai MAN B&W 6S50MC-C7 engine. Despite efforts by other parties to rectify the issue, the problem persisted, causing operational disruptions and increased maintenance costs, with the vessel forced to change at least one liner each voyage, causing disruption to its schedule and high maintenance costs.

ANALYSIS AND SOLUTION

Goltens deployed its seasoned engineers to perform LDM on the engine and identify the wear patterns on the liners. Based on the results of the LDM analysis, coupled with deep knowledge of the engine and related systems, Goltens' specialists were able to identify the root cause of the problem: an improperly adjusted Alpha lubrication system.

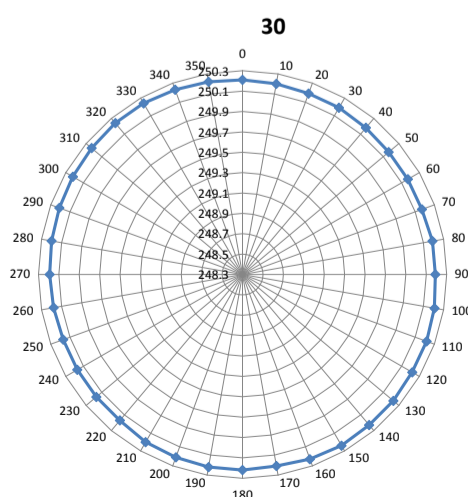
Working with the ship's engineers, Goltens' specialists recalibrated the Alpha system, ensuring optimal performance and minimal wear on the engine liners. Their approach involved not only addressing the immediate issue but also implementing preventive measures to safeguard against future complications.

IMMEDIATE IMPACT

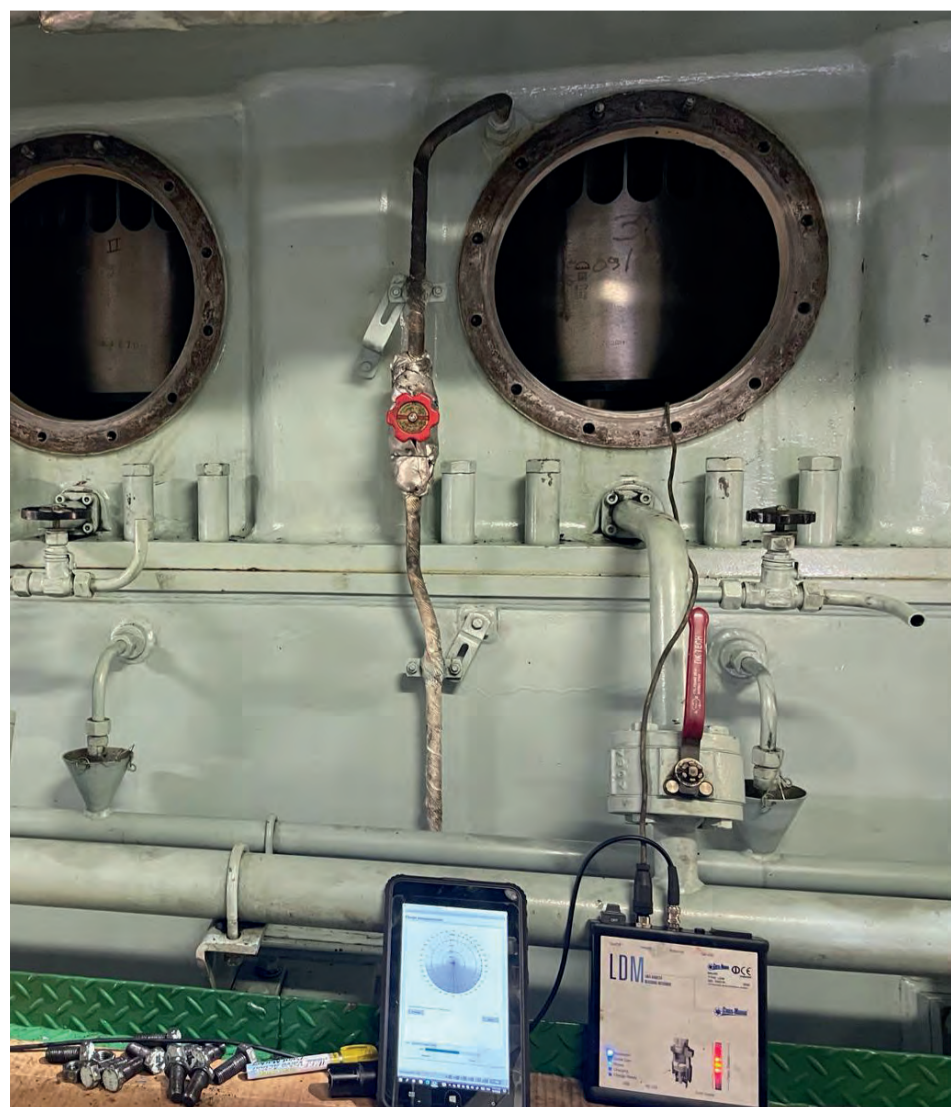
The impact of their intervention was profound. With the LDM accurately monitored and the Alpha system properly adjusted, the vessel experienced a significant reduction in wear-related issues resulting in improved operational efficiency, decreased downtime, and reduced maintenance costs. ■



LDM equipment installed on top of the Liner



Polar plot of LDM data showing ovality/wear pattern



LDM analysis in process on one of the cylinder liners' Alpha lubricators requiring adjustment

Not Every Crankshaft Can

Goltens Meets the Challenges of Large Diesel Engine Crankshaft Replacements

In the maritime and power-generation industries, the reliability of large diesel engines is paramount. Crucial for the propulsion of ships and the generation of electricity, these engines operate under extreme conditions and immense pressures. Over time, even the most robust units may suffer from wear and tear, particularly in critical components like the crankshaft.

CRANKSHAFT REPLACEMENT IS NO EASY JOB

Replacing a crankshaft in a large diesel engine is a daunting task, requiring a highly skilled and experienced team, meticulous planning, and flawless execution. The sheer size and weight of the crankshafts, coupled with the delicate running surfaces of the

journals, make handling and installation particularly challenging. Additionally, the confined spaces in which the engines are located further complicate the process.

GOLTENS' EXPERTISE

Goltens' seasoned technicians are trained to handle the complexities of crankshaft replacements. While never a routine undertaking, we perform multiple major crankshaft replacements every month of the year. Our expertise ensures that every step, from disassembly to reassembly, is carried out with precision and care employing a systematic process that ensures efficiency and minimizes asset downtime for vessel owners, powerplant operators, and OEMs all over the world. ■

CRANKSHAFT REPLACEMENT AND RECONDITIONING FOR DREDGER IN BAHRAIN

A trailing suction hopper dredger, which had been in operation for over 50 years, experienced a casualty on one of its crankpin journals due to lack of lube oil lubrication on one of its Allen 6S37G/E engines. Upon inspection, Goltens found the crankshaft could be salvaged but due to the extent of the damage (ovality, high hardness, and bend), reconditioning, annealing, and straightening would best be done in Goltens Dubai's workshop rather than in situ.

Goltens removed the crankshaft at berth in Bahrain and moved it to Dubai for repair of the damaged crankpin (annealing and machining) and polishing of the others. After annealing, the main journals were machined to undersize as required to straighten the shaft. Goltens then reinstalled the reconditioned crankshaft and performed a full overhaul on the engine prior to returning it to service. ■



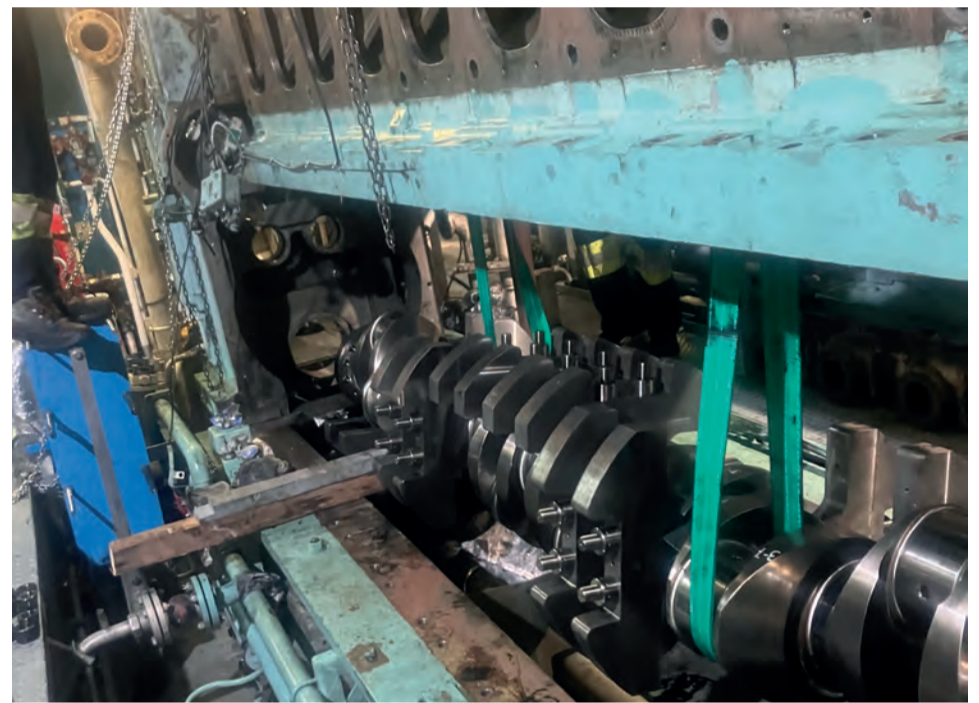
Rigging of damaged crankshaft from below decks for transport to Goltens Dubai



Goltens' specialists rigging crankshaft out of the block in engine room

MAN 8L21/31 CRANKSHAFT REPLACEMENT FOR PLATFORM SUPPLY VESSEL (PSV) IN SPAIN

Goltens Rotterdam attended an 11-year-old, 4,400-DWT PSV that had experienced a crankshaft failure on one of its four MAN B&W 8L21/31 engines. Our team of specialists inspected the engine and components and completed a full disassembly of the engine, lifting the engine block to remove the crankshaft. All bearing caps and other key components were sent to Goltens Rotterdam for machining and reconditioning. Once removal was complete, the new crankshaft was rigged into the engine room, the engine reassembled with the machined caps and components, successfully aligned and operationally tested. ■



Engine block lifted and condemned crankshaft lowered for removal from engine



Rigging of the damaged crankshaft from the engine room to the upper deck

be Salvaged or Repaired!

REPLACEMENT OF BERGEN CRANKSHAFT ON OFFSHORE TUG/SUPPLY VESSEL

Goltens Singapore was engaged to undertake the replacement of a Bergen B32:40L8P crankshaft on one of two main engines on a 16-year-old Offshore Tug/Supply Vessel at the ST Shipyard in Singapore. Inspection of the engine and the crankshaft revealed that, while there were numerous contributing factors to the casualty, the most likely cause was poor maintenance of the engine's lube oil system.

Goltens' specialists handled every facet of the job from disassembly, lifting, and rigging through to full rebuild and successful sea trial. The crankshaft was replaced in conjunction with a complete overhaul of the engine over a period of 30 days. ■



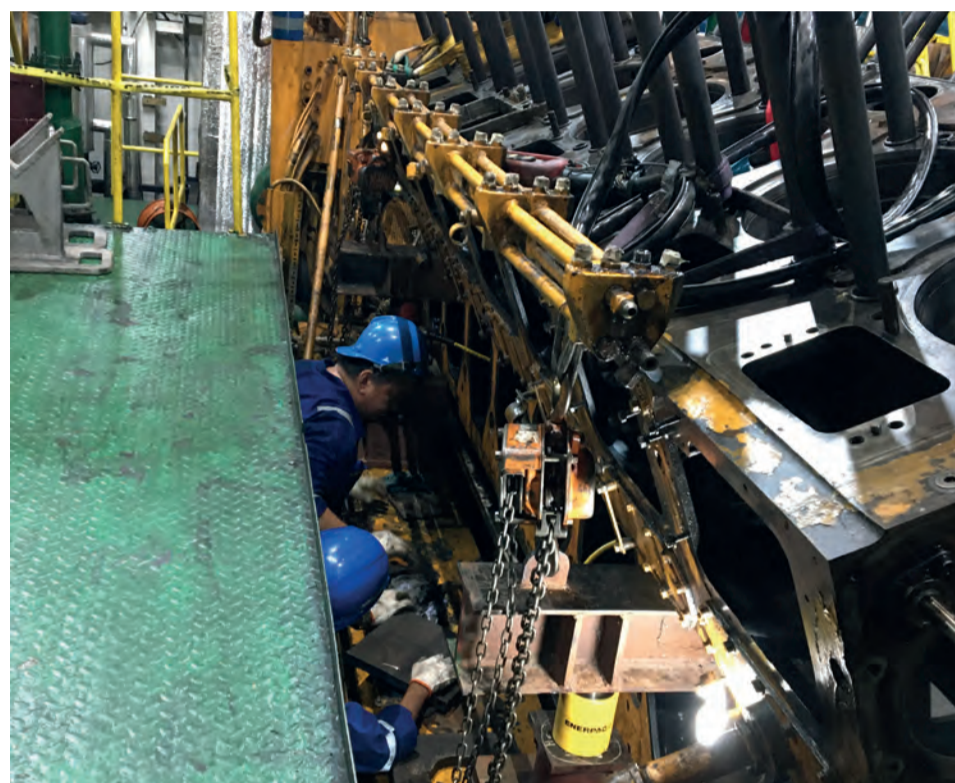
Final cleaning and inspection of new crankshaft prior to assembly



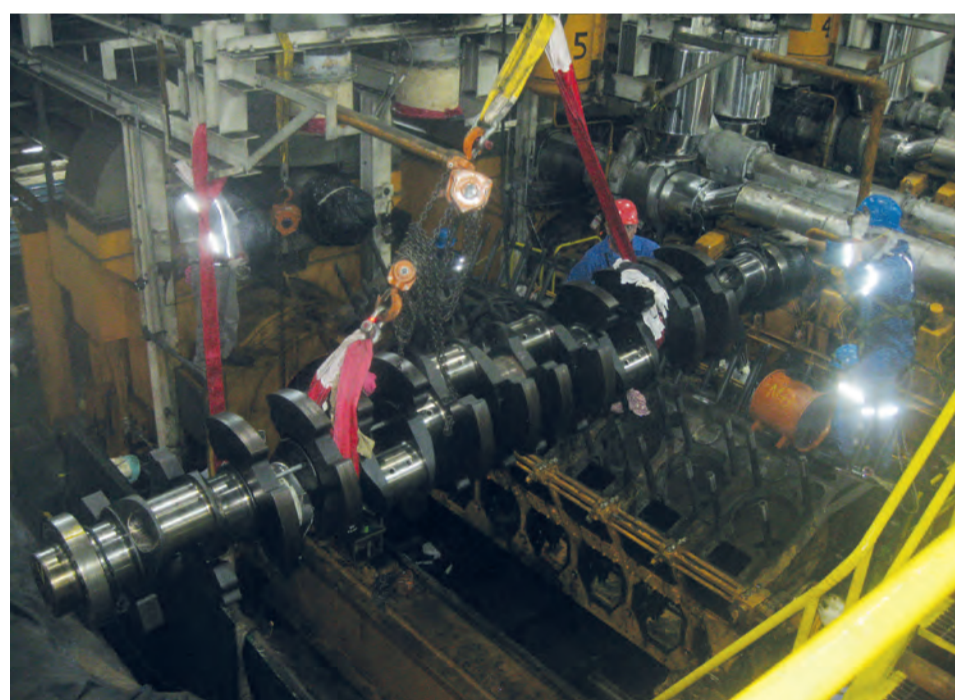
Technician tightening main bearing cap to check the pocket bore alignment

CAT 3616 CRANKSHAFT REPLACEMENT FOR POWER BARGE IN THE PHILIPPINES

A large operator of multiple, floating power barges in the Philippines experienced an engine seizure on one of its Caterpillar 3616 generators. While the inspection of root cause is still undetermined, the crankshaft was deemed beyond repair and required replacement. Goltens deployed tools and technical specialists to the power barge and completed the removal of the crankshaft. Installation of the replacement crankshaft remains pending receipt of parts and plant decision. ■



Engine disassembled and engine block jacked and supported for crankshaft



Rigging of the damaged crankshaft from the engine

Goltens Brings Advanced Ultraguard Antifouling System to the Middle East

Goltens Dubai, along with its affiliates in the Middle East, has partnered with Marine Growth Prevention Specialists Ltd (MGPS) to distribute the next-generation Ultraguard Antifouling Solution. The agreement covers the United Arab Emirates, Saudi Arabia, Bahrain, Kuwait, Oman, Qatar, and Africa, designating Goltens as a key distributor for this innovative product.

Ultraguard uses high-frequency ultrasonic waves to create an environment that prevents mussels, barnacles, and other marine organisms from settling on

surfaces. The system can be installed while the vessel is afloat, typically without any cutting or penetrations required, as all components are fitted on the dry side of the hull, coolers, or pipework.

Ultraguard stands out as a powerful, advanced, and cost-effective system for preventing marine growth in seawater pipes, sea chests, plate coolers, box coolers, and strainer basket casings. It offers a cost-effective alternative to biocides and copper-based antifouling systems.

"The addition of Ultraguard to our portfolio of green technology solutions is critical," said Sandeep Seth, CEO of Goltens. "Our specialists help shipowners navigate various technologies

to comply with and stay ahead of ESG regulations. Providing an ultrasonic solution that is easy to implement, minimizes downtime, and a zero-pollution option is invaluable." ■

ULTRAGUARD
Antifouling



Anchored in Excellence

Goltens Dubai Leads the Way in Vessel Drydocking and Afloat Services



Since entering the market in 1989 with its facilities in Al Jaddaf, Goltens Dubai has continuously invested in and grown its specialist docking-related capabilities to better support Middle East operators. The real step change in this evolution of service level came in 2013 when we opened our purpose-built, 23,000-square-meter (sqm) premises in Dubai Maritime City (DMC), one of the world's largest drydocking complexes for offshore service and cargo vessels. Goltens' state-of-the-art facility includes 14,000 sqm of workshops, 1,500 sqm of offices, and around 9,000 sqm of open yard adjacent to the ship transfer area, enabling us to operate at a larger scale and in closer proximity to our customers.

COMPLETE SOLUTIONS HUB

Beyond routine hull blasting, painting, and steel work undertaken by many of our competitors, what truly sets Goltens apart is our ability to undertake the most complex docking, conversion, and retrofitting

projects with our in-house specialist services that competitors may not offer or subcontract to third parties. Having all of these specialties in-house gives our customers confidence that Goltens has total control of all aspects of their critical projects, including the following aspects.

- Mechanical
- Engine
- Energy Control
- Hydraulic
- Electrical
- HVAC
- Reconditioning
- Turbocharger
- Automation and controls
- Bearing overhaul/repair
- Propulsion/thrusters (fixed, tunnel, CPP, Azimuth and water-jet)
- Laser alignment and in-place machining
- Steering and rudder systems
- Class-approved fabrication and welding
- Engineering and design

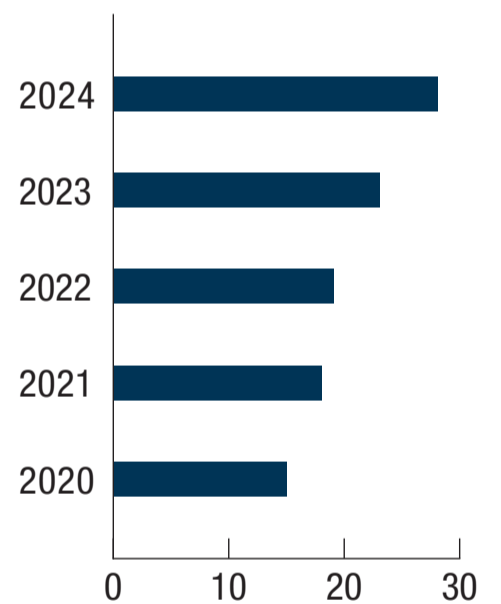
These specialized services, coupled with DMC's capability to drydock up to 42 vessels of up to 6,000 tons and 130 meters long, with over 1,500 meters of wharfage, has proven to be a formidable combination.

INCREASING MARKET SHARE AND DEDICATED CUSTOMER BASE

These investments in facilities, technology, and personnel have paid off well for Goltens Dubai and our dedicated customers. While we are rarely the cheapest option in the market, value-focused operators have come to rely on our ability to deliver on time and with the highest levels of quality.

Since 2020, Goltens Dubai has grown the number of full-service dockings and major pier-side/afloat projects by 86%, with many satisfied operators relying on our team for multiple docking and conversion projects over that time. ■

Docking and Afloat Repairs



ASPHALT/BITUMEN TANKER (BUILT 2012)

Weight: 3,453 dwt
Length: 90.6 meters
Duration: 35 days

Major Scope:

- Overhaul of Daihatsu main engine and Weichai auxiliary engines
- BWTS installation
- New shaft generator installation
- Overhaul of sea suction and PV (pressure/vacuum) valves
- Overhaul of FiFi pump
- Various pipe and steel repair jobs
- Propeller polishing and DP test
- Hull hydro-blasting and painting ■



Tanker being raised by DMC synchrolift for service



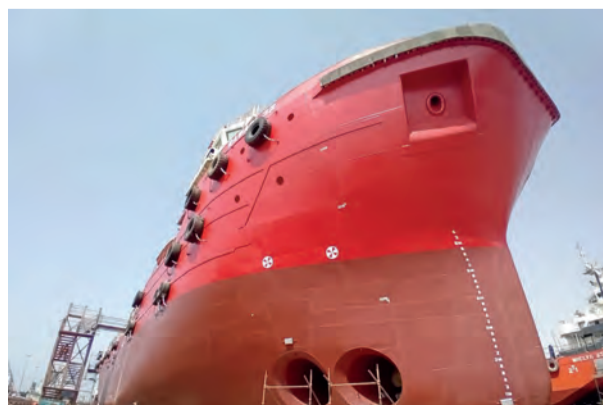
Vessel being lowered after docking for successful sea trial

ANCHOR HANDLING TUG SUPPLY VESSEL (BUILT 2011)

Weight: 2,544 dwt
Length: 70.5 meters
Duration: 35 days

Major Scope:

- Overhaul of GE main engines
- Propulsion system overhaul
- Shaft generator and alternator overhaul
- Overhaul of sea suction and PV valves
- FiFi pump overhaul
- Stern roller maintenance
- Overhaul of various pumps and motors
- Overhaul of air compressors
- Various pipe and steel repair jobs
- Hull hydro-blasting and painting ■



Supply vessel near completion with hull painted and final works in process



One of the many motors and pumps overhauled by Goltens Dubai



Propulsion system overhaul in progress

OFFSHORE SUPPLY VESSEL (BUILT 2012)

Weight: 1,350 dwt
 Length: 60.5 meters
 Duration: 60 days

Major scope:

- DP2 upgrade (including installation of new stern thruster, replacement of bow thrusters, as well as electrical and instrumentation aspects)
- New shaft generator installation
- Overhaul of FiFi (firefighting) pump
- Overhaul of sea suction valves
- Hull hydro-blasting and painting
- Various pipe and steel repair jobs
- Propeller polishing ■



Bow view prior to painting



Propellor and rudder prior to painting



New stern thruster in place



Freshly painted vessel ready for the sea

CHEMICAL/PRODUCTS TANKER (BUILT 2011)

Weight: 8,964 dwt
 Length: 115.6 meters
 Duration: 45 days

Major Scope:

- Overhaul of MAN main and auxiliary engines
- Installation of Ballast Water Treatment System (BWTS)
- Overhaul of anchor winch (including fabrication/machining of new shaft)
- Overhaul of bow thruster
- Overhaul of alternators and motors
- Overhaul and testing of ACBs (air circuit breakers)
- Overhaul of sea suction valves
- Various pipe and steel repair jobs
- Hull hydro-blasting and painting ■



Tanker prior to service



Rudder clearance check



Anchor windlass after overhaul



After painting

Powering Ahead: Goltens Expands Specialized Electrical Services Broadening Horizons in Key Markets and Enhancing Customer Offerings Worldwide

While Goltens is world-renowned for our capabilities with engines, controls, and specialized machining and engineering, many customers remain unaware of the scope and scale of the specialized electrical services we provide in key regions around the globe. Highly specialized teams support our customers across Oil & Gas, Merchant, Offshore, and Power every year throughout the Middle East and US Gulf. Coupled with our other market-leading mechanical and specialized control solutions, Goltens can support almost any requirement end to end.

DEEPWATER STIMULATION VESSEL – VFD REBUILD AVOIDS COSTLY RETROFIT SOLUTION

The Variable Frequency Drives (VFD) on a 13-year-old deepwater well stimulation vessel were older components lacking OEM support for service and repair of these critical systems. Goltens was contracted to provide a full service rebuild of the systems, which included removal of the four VFDs and controllers, working with a third-party control shop that specializes in VFD repairs. Goltens provided all onboard activities including rigging the units out of the control rooms and off the vessel. Once removed, all connections were revalidated and wiring inspected and verified to ensure all wiring and terminations were upgraded as needed. Point to point and continuity were also verified across the control system and drive housings. The rebuilt systems were tested and re-rigged into the control rooms and all system connections were terminated and tested. Successful tests were carried out underway, the system energized and full function tests conducted to validate operational range and control. ■



Electrical installation valve actuators



Installation of overhauled VFD

MOBILE OFFSHORE DRILLING UNIT (MODU) – MPD EQUIPMENT INSTALLATION AND COMMISSIONING

A 10-year-old MODU operating in the Gulf of Mexico for a major regional drilling company required the installation of a new Managed Pressure Drilling (MPD) system onboard. The purpose of the MPD is to enhance safety and control of mud flow during drilling operations, enabling closer monitoring of the well and more accurate detection of any anomalies and therefore enhanced response capabilities.

Goltens deployed a six-man team to undertake the electrical scope to support the MPD equipment installation and commissioning. The installation scope, completed over a two-month period while the MODU was at sea and in transit, encompassed new Exe enclosures for power and IS instrumentations cables, new communication Exe enclosures, new power distribution Exe panels, cable trays, UPS (uninterrupted power supply), server rack in the switchboard room, installation of strategically located HPUs and Mux reels, as well as the installation of all cables (power, control, ethernet, signal, fiber, and Profibus) and new manifolds with valve actuators and safety systems. ■

JACKUP RIG – ONSITE SERVICING AND CURRENT INJECTION TEST OF AIR CIRCUIT BREAKERS (ACBS)



The jackup rig

After adding the SMC RAPTOR C45 to its arsenal of modern high-tech test and calibration equipment to support onsite ACB servicing, test, and calibration, Goltens Dubai was awarded the challenging task of performing ACB servicing and current injection testing on 22 units on an operational jackup rig in the Middle East. The challenge was to complete the service on a 'one for one' basis so as not to impact normal operations.

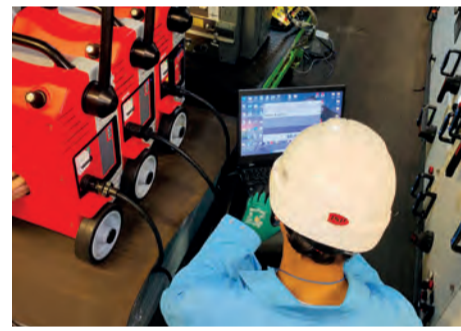
Inspection and overhaul of the ACBs

Goltens' electricians visually inspected and checked all critical components on the 22 units, cleaned, lubricated, and tested the electrical operation of motor operators,

under-voltage devices, shunt strips, and opening/closing devices. Opening and closing mechanisms were inspected and lubricated while the arc chutes were removed and cleaned. The moving and auxiliary contacts and wiring loom were also inspected.

Electrical tests and calibration

Using the Raptor, Goltens carried out primary and secondary current injection tests at each phase of the ACBs, applying primary current to each phase as set in the over-current units. The electrician team also verified LTD (long time delay), STD (short time delay) and INST (instantaneous tripping of the breaker by OCR (overcurrent release), and recorded current level and response time. They also performed UVT (under voltage trip) pickup and release trip, ground-earth fault protection, insulation and ground tests, and contact conductor test, preparing a detailed test report for each ACB tested, ensuring the least downtime and highest safety standards. ■



Primary current injection test

BULK CARRIER – BADLY DAMAGED ALTERNATOR REPAIR

A 15-year-old bulker reported that one of its 450V, 60HZ Taiyo alternators had suffered a casualty and required inspection and repair if possible. Goltens Dubai disassembled and inspected the alternator and found it in extremely poor condition with significant damage to the windings, bearings, oil rings, and rectifiers. After performing electrical and thermography tests on the stator and rotor, Goltens stripped the damaged windings and carried out thorough cleaning. Goltens' electricians rewound the stator and rotor, renewed the core lamination, and varnished and baked the units. The team then completed shaft bearing NDE (non destructive evaluation) calibration, alternator bearing NDE final calibration, and rotor assembly tuning and rotor dynamic balancing. They then reassembled the unit and performed successful factory acceptance testing (FAT). ■



Damaged stator prior to rewinding



Damaged rotor prior to rewinding



Stator after rewinding



Fully reconditioned rotor prior to delivery



Goltens electrician integrating the new HPU unit for an MPD designed by Safekick allowing for communications between UPS, server rack, and HPU to properly function and communicate as per design



Goltens electrician installing a new Server Rack as per Safekick MPD design. This is the main control server for the MPD system

GOLD MINE – LEROY SOMER GENERATOR OVERHAUL

One of the leading gold-mining companies in Indonesia engaged Goltens to overhaul one of their Leroy Somer LSA 56BAL125-6P generators installed on a Wartsila 18V26 engine. After inspection of the 6,931kVA generator and confirmation of the scope, the generator was disassembled and transported to Goltens' workshop in Jakarta. High-voltage, insulation, impedance pole, surge test, and winding impedance tests were conducted and the exciter was prepared for rewinding. Full overhaul scope was performed on the generator including rewinding, cleaning, repainting, and testing on the stator. As expected, Goltens' team completed the work within the agreed timeline and the final inspection and tests showed the parameters were greatly improved and in line with maker specifications. ■



Removal of the stator from generator

KEY ELECTRICAL SERVICES FOR SHELF DRILLING – FIVE YEARS OF EXPERT SUPPORT FOR CRITICAL COMPONENTS

Over the past five years, Goltens' electrical specialists have overhauled and repaired over 400 motors and other critical components to support and sustain drilling operations for Shelf Drilling, a leading contractor in offshore drilling specializing in jackup rigs. The market-leading company operates across Southeast Asia, India, West Africa, the North Sea, and Middle East/North Africa (MENA) region. Known for their strong safety focus and strong relationships with customers and suppliers, Shelf Drilling has relied on Goltens to service and repair a wide range of electrical equipment, meeting all safety and quality standards. This includes DC motors (top drive drilling motors, FiFi motors), crane motors (Type C9 DC hook motors, Type D6 swing motors, Type AC4 boom motors), 4x4 motor-generator sets with exciters, AC motors, high-speed blower motors, jacking motors (Nuttal gearboxes and cycle drive motors), alternators, and Air Circuit Breakers (ACBs). ■



Overhauled components packed and ready for delivery

Back From the Dead: Long Lead Times and Cost of a New Unit Triggers Complete Overhaul of Turbine

Goltens India Overhauls 10MW Steam Turbine and Genset That had Been Unused for a Decade



Performance of clearance checks on rotor placement



CO2 Cleaning of generator stator



Fully reconditioned steam turbine ready for dispatch



Performance of run-out checks on the turbine rotor

A Goltens customer was engaged by an end-user in Europe to supply and install a steam power-generation unit, however having discovered that lead times for a new unit were extensive and the cost prohibitive, the customer located an old turbine generator (TG) set in India that had been unused for roughly 10 years.

Goltens met with the customer and after discussing options for reconditioning and overhauling the TG set finalized the scope of the project.

INSPECTION UNCOVERS NASTY PROBLEMS

While the customer delivered the TG set to Goltens' workshop for inspection, the lack of maintenance records, repair manual, or supporting documentation complicated matters. Our technicians dismantled the turbine, gear box, and generator and inspection revealed the components were in very bad condition, with heavy pitting marks

and significant rust from the long period of storage. Goltens determined that repairing the turbine's high-pressure (HP) and low-pressure (LP) blades and diaphragms would be a major challenge.

HAPPY RESULT

Goltens replaced eight damaged turbine rotor-blade stages, completed dynamic balancing and reassembly, and run-out, while clearances were checked and brought within OEM-allowed tolerances. Blue contact checks were completed followed by a successful joint inspection with the customer and end-user. The entire genset was then sprayed with a preservative coating and reassembled.

This challenging overhaul of an old and dilapidated generator set was completed within the agreed timeframe and delivered to the customer's satisfaction, saving both them and the end-user significant time and expense. ■

Scope of Repair

- Full disassembly of turbine and gearbox
- Fine grit blasting of turbine casing, rotor, and diaphragm
- Non-destructive testing (NDT) testing of all gearbox and turbine components
- Calibration of all parts and measurement of clearances
- Dismantling and cleaning of generator rotor
- CO2 cleaning, heating, and varnishing of stator, rotor, and exciter
- Electrical checks of generator and exciter winding
- Calibration check of turbine, gearbox and generator instrumentation sensors, and gauges
- Electrical checks and overhaul of skid-mounted motors
- Replacement of defective parts in turbine, gearbox, and generator
- Overhauling and calibration of Woodward turbine actuator
- Final assembly with new parts, measurement, and correction of clearances

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