Goltens Green Technologies – environmental compliance retrofit experts

Compliance with ballast water treatment and sulphur emissions legislation looms as a large concern for shipowners around the world. Finding the right solution to minimize the costs and operational impacts of these non-payback compliance investments is critical.

To help shipowners comply with these regulations, Goltens Green Technologies plans, designs and installs turnkey environmental compliance technology solutions that prolong the lifetime of valuable assets while minimizing vessel downtime in the most cost efficient manner possible.

Goltens has a well-proven process that has been successfully applied to complete turnkey ballast water and emissions control solutions all over the world.

Solutions and services offered include

- Ballast water treatment system retrofits
- Exhaust gas scrubber retrofits and installations
- LSGO cooler retrofits and installations
- LSGO fuel conversions for LNG main boilers
- System commissioning
- Post-installation support and service
- Piping/system renewal
- 3D laser scanning

Benefits of the Goltens Green Technologies process

- System modeling provides increased confidence in investment decision without the need to purchase system
- Phased investment approach possible (proof of concept models, detailed design, full system installation)
- Reduction/elimination in vessel downtime due to precision of design and prefabrication
- Limited onboard work and interruption
- Reduced design costs on sister vessels
- Installation flexibility (installation can be completed by Goltens or other qualified installation partner)
- Proven results in well over 150 BWTS retrofits, LSGO system modifications and exhaust gas scrubber installations

Worldwide Service Network

Goltens

As a leading independent global provider of ship repair services, Goltens has constantly been presented with new challenges by shipowners who have one main objective – how to keep their vessels in operation.

Goltens Green Technologies has refined and proven a repeatable process that enables owners to confidently evaluate, design and install the most appropriate solutions to address environmental regulations with minimal interruption to operation – avoiding unnecessary downtime.

Goltens Green Technologies is a highly skilled and experienced global force with resources in every region in which Goltens operates around the world. Leveraging heavy investments in technical experts and the latest laser scanning and design technology, Goltens delivers turnkey solutions to address a wide array of environmental compliance challenges.

Goltens Green Technologies has the depth of experience to help shipowners select the right system and navigate the process resulting in the execution of a well-planned and swift upgrade of their existing fleet in a time and cost-efficient manner.

www.goltens.com/green-technologies

Green Technologies

Environmental compliance retrofit experts

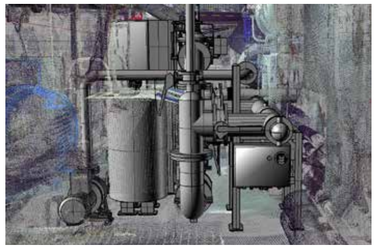
Ballast water treatment retrofits

Goltens Green Technologies' retrofit expertise is unmatched in the market. The company has undertaken well over 200 projects using systems from numerous manufacturers, including Optimarin, Bio-UV, Headway, Severn Trent DeNora, Alfa Laval, Auramarine, NK, Hyde Marine, Wärtsilä and others.

With the IMO Ballast Water Management Convention now ratified, a shortage of systems and design firms capable of facilitating compliance is almost inevitable.

Many forward-thinking owners are acting now. Some are evaluating and selecting systems and determining location and space requirements; some are piloting installations on one of each class of vessels; others are going forward with a phased fleet-wide installation plan.

Whatever approach is chosen, Goltens Green Technologies can support any and all phases of the project and lead to the most efficient installation possible.



Ballast water treatment system modeled on 3D scan results.

3D rendering of modeled system.

Goltens technician preparing a ballast water treatment system for installation.

Installed system per detailed design.

Sulphur emissions compliance

The sulphur emissions controls legislation is in effect and will be phased in to tighten standards globally by 2020. A variety of compliance options are available to shipowners to address these regulations, and Goltens Green Technologies has experience with them all.

Goltens Green Technologies' expertise ranges from scrubber installations with the purpose of removing sulphur emissions while maintaining the ability to run on low-cost heavy fuel, to fuel system modifications that allow the vessel to run effectively on low-sulphur gas oil (LSGO). The second option requires modifications to the fuel system, generally involving the installation of LSGO coolers to increase the viscosity of the fuel, thereby avoiding long-term wear damage to the engine.

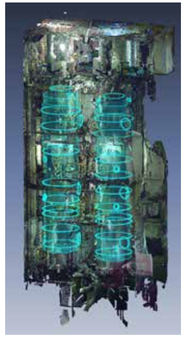
For LNG vessels, a full boiler retrofit to allow for operation on tri-fuel is also being pursued by many operators.

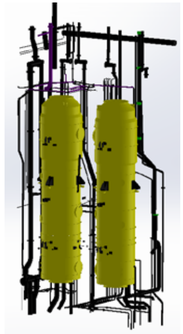
Whatever path is chosen, installation can be more efficiently and confidently completed leveraging 3D scanning and modeling as the basis for highly accurate design engineering.

Sulphur emission limits

Outside an ECA established to limit SOx and particulate matter emissions	Inside an ECA established to limit SOx and particulate matter emissions
4.50% m/m prior to 1 January 2012	**1.50%** m/m prior to 1 July 2010
3.50% m/m on and after 1 January 2012	**1.00%** m/m on and after 1 July 2010
0.50% m/m on and after 1 January 2020	**0.10%** m/m on and after 1 January 2015

Rigging of new exhaust gas scrubber section aboard a cruise ship.





Sample 3D models of scrubber system and connections.

Other process applications

Not all scanning and design work is related to compliance. Goltens applies the same process to a wide range of complex projects throughout the globe to speed up and improve accuracy.

Dual fuel retrofits of diesel engines
Goltens has the ability to undertake the retrofit of installed diesel generators to run on dual fuel, closely cooperating with market leading manufacturers. These retrofits involve the installation of complex piping and control systems, and the scanning and design process increases accuracy and speeds the installation.

Reverse engineering
Goltens Green Technologies has experience in reverse engineering to create complex models used for risk mitigation and integration into detailed engineering packages for upgrades and modifications. Typically applied to compound curvature of hulls and propellers.

Piping renewals
Goltens Green Technologies is also able to create detailed isometric drawings of piping systems and prefabricate the pipe spools to dramatically reduce installation time.

Piping database
For vessels subject to excessive wear and tear on their piping systems, having a predesigned set of drawings "in the box" can be very beneficial. All details with regard to exact size and material specification are in the Goltens database for prefabrication at the location of choice.

Challenging rigging work
Goltens utilizes scanning and modeling to determine the optimal routes for machinery movement and removal with the minimum possible disruption and hull cutting.

Goltens technicians performing quality checks on pre-fabricated piping prior to installation.

Goltens stations also represent, sell and service a wide variety of market leading brands of environmental compliance products such as:

- Sewage/waste water treatment plants
- Oily waste water treatment systems
- Marine waste compactors
- Glass crushers
- Bale, oil filter and paint bucket compactors
- Solid and liquid waste marine incinerators
- Marine gas oil coolers
- Portable oil purification machinery

Process

Goltens Green Technologies follows a well-proven, flexible process that leverages 3D scanning technology as the foundation for efficient retrofit execution. Shipowners can engage Goltens Green Technologies for portions of the system selection, planning and design, or for executing a complete turnkey solution.

SYSTEM EVALUATION AND FEASIBILITY

1 System shortlist or selection

An array of regulations, a variety of technological solutions to address them and the need to efficiently coordinate implementation fleet-wide require an independent partner with in-depth experience and global capability to help navigate the process. Goltens Green Technologies is a highly qualified discussion partner in assessing new and often unproven technologies.

2 Onboard survey and 3D laser scanning

Highly detailed 3D laser scanning is an accurate and efficient solution to determine the feasibility, impact and conflicts associated with installing various solutions on board vessels. It also eliminates most of the risks associated with manual measurement and fabrication on board without prefabrication. Scanning can generally be completed with no disruption to the vessel's operations.

SYSTEM MODELING AND DETAILED SPECIFICATION

3 Modeling and concept design

Data generated by a 3D laser scan is used to model the chosen or shortlisted systems into the existing space. At this point, both the shipowner and chief engineer will be able to clearly see that the final system location will not obstruct normal ship functions, and verify available space for maintenance. Several systems can be modeled to show which would be the optimal solution in terms of fit.

4 Detailed engineering

The accuracy of the 3D scan output makes it is possible to create a precise production package containing drawings that show all foundations, mechanical and electrical components, as well as a comprehensive overview of all the parts needed for installation. Piping, connections and foundations can be prefabricated with high precision, eliminating the time-consuming pipe fitting process.

EFFICIENT INSTALLATION OF DESIGNED SYSTEM

5 Purchasing and prefabrication

Goltens Green Technologies delivers a detailed material specification along with the engineering design. This way, shipowners get a complete production package that they can rely on Goltens to install, or they can use it at a shipyard of their choice. This gives a realistic price quote based on the materials needed, making it easy to compare estimates from different installation alternatives.

6 Installation and commissioning

Goltens Green Technologies can provide installation, commissioning and crew training services worldwide. Minimizing operational downtime can involve partial work done during dry-docking, alongside or at sea. The worldwide availability of installation teams means voyage patterns can be maintained with minimal disruption.

WORLDWIDE SERVICE AND SPARE PARTS

7 Service

This is possibly the most crucial step in the long-term perspective. Goltens Green Technologies provides ongoing post-installation support and service through its worldwide network.