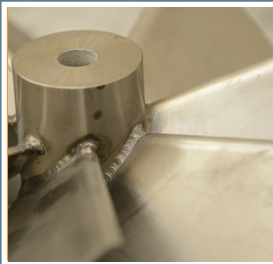


COLDHARBOUR



GLD™ Ballast Water Treatment System



Future-Proof Ballast Water Technology

The Coldharbour GLD™ BWTS

The Coldharbour GLD™ Ballast Water Treatment system. Specifically designed and optimised for large oil tankers, LNG vessels, large bulkers and ore carriers.

Type Approval Status



IMO Type Approval
Awarded February 2015
by the UK Maritime &
Coastguard Agency
(UK MCA)



Lloyd's Register
Type Approval
Awarded July 2016



USCG AMS
Awarded June 2015
Full USCG Type Approval
In progress

**Certified and Type Approved for vessels
with total ballast capacities from
20,000m³ up to 345,600m³**

Reliable, future-proof technology

We listened - the thinking behind the technology came from you, the customer

'Must have' features for a BWT system as expressed by ship operators worldwide	Coldharbour GLD™ BWTS
No disruption to terminal operations	✓
Gravity ballasting / de-ballasting allowed	✓
No extra power capacity required	✓
Future-proof technology	✓
Robust, simple to use - small footprint	✓
Low running costs, minimal downtime	✓
No specialist maintenance required	✓
No risk of damage to tank coatings	✓
No regrowth on long ballast voyages	✓

Robust system with no moving parts

The GLD™ units inside the tanks have no moving parts and use no electrical power. The inert gas is fully diffused through the ballast water by the action of natural fluid dynamics in the diffuser pipes.

The system has no mechanical filters to block or back flush, and there are no complex electrical systems to manage or additional seawater control valves required. No extra power generating capacity is required as the system operates during the ballast voyage.

The system is capable of handling water with high levels of suspended solids and is not affected by the temperature or salinity levels of the ballast water at uptake.

Why choose the GLD™ system?



Guaranteed not to disrupt critical port operations.



No risk of regrowth even on the longest ballast voyages



Not affected by temperature, salinity or high TSS levels



No adverse effect on tank coatings. Tests show 60 % reduction in tank corrosion



The logical choice for large oil tankers, LNG vessels, large bulkers/ore carriers

In-tank and in-voyage - how it works

The GLD™ Ballast Water Treatment system is a unique in-tank technology using the inert gas output from the Sea Guardian™ Inert Gas Generator linked to specially designed GLD™ units located inside the ballast tanks of the ship.

During a part of the ballast voyage, inert gas is pumped to the GLD™ units located inside the ballast tanks. As the inert gas diffuses into the ballast water, oxygen is stripped from the water whilst the elevated level of CO₂ in the inert gas temporarily reduces the pH level, inducing hypercapnia and hypoxia, conditions which are fatal to marine organisms.

The de-oxygenation of the ballast water effectively kills the air-breathing organisms present in the ballast water. The anaerobic organisms and bacteria (*E. coli* for example) which are not affected by de-oxygenation are treated inside the GLD™ by a patented method of gas-induced ultrasonic shock-waves, which rupture the cell wall causing cellular destruction.

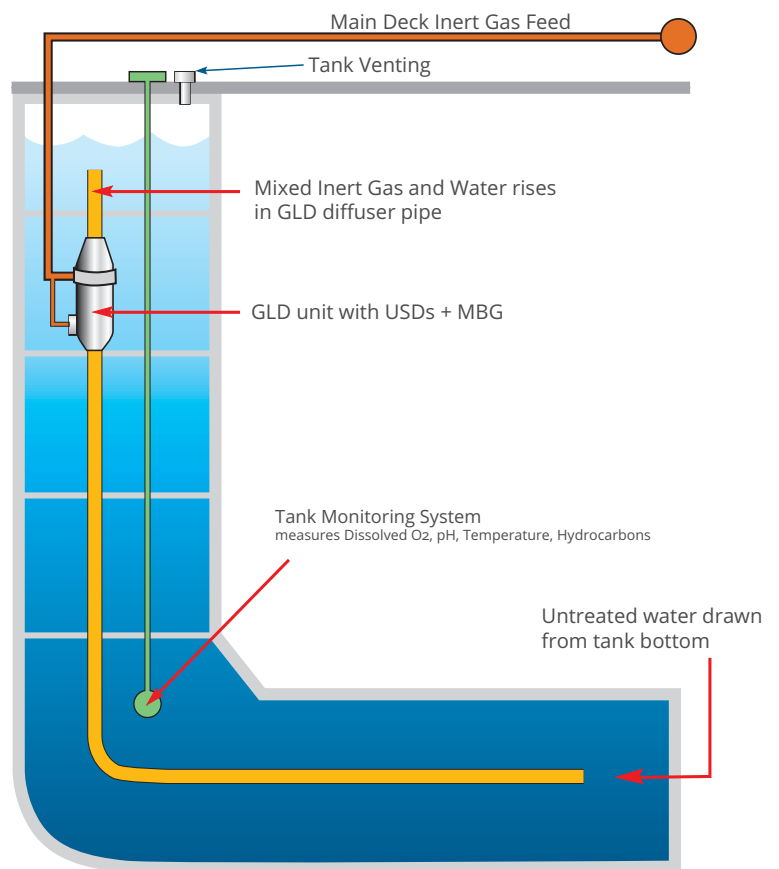
The GLD™ units and ultrasonic generators require no power and have no moving parts. Natural fluid dynamics, caused by the mixture of inert gas and seawater in the GLD™ diffuser pipes, ensures that the ballast water is thoroughly stirred and that the inert gas is fully diffused.



In-tank installation



GLD™ unit installed in the ballast tank of a VLCC



Typical in-tank J-Tank GLD™ Section

Microbubble Generator

The microbubble generator (MBG) introduces a stream of inert gas microbubbles into the GLD™ unit.

The microbubble stream passes into the base of the GLD™ unit and as the water rises through the GLD, the microbubbles are carried into the ultrasound shock zone where they micro-cavitate, amplifying the cellular destruction created by the ultrasonics.

Natural Fluid Dynamics

The ballast water is stirred by the action of the mixture of inert gas and water rising in the diffuser pipe, drawing untreated water from the bottom of the tank. The action of natural fluid dynamics ensures that the water is thoroughly stirred and the inert gas is fully diffused through the ballast water during the treatment.

The GLD™, ultrasonic device and micro-bubble generator have no moving parts and are therefore practically maintenance free.

No risk from regrowth

Regrowth - a scientifically proven fact!

No treatment type or make of system can kill all organisms present in the ballast water at uptake. The organisms that survive the treatment have an abundant source of suitable food with no competition or predators. On longer ballast journeys, surviving organisms and bacteria will regrow and multiply in the warm dark environment of a ballast tank.

Remove the risk of regrowth.

No treatment system eliminates regrowth – including the Coldharbour BWTS. However, because the Coldharbour system operates during a part of the ballast voyage, the treatment can be scheduled to complete just prior to de-ballasting, thereby ensuring that the ballast water will not fail D-2 discharge standards. This removes the risk of Port State Control fines for failing D-2 discharge standards, and the delays and costs associated with ballast exchange in international waters.

Tested beyond requirement.

During official testing for IMO Type Approval, awarded by UK Maritime & Coastguard Agency, the Coldharbour BWT system passed D-2 discharge standards a full **11 days** after treatment (including the re-oxygenation phase), thereby proving the performance of the system to a much more rigorous standard than required for both IMO and USCG Type Approval.

*IMO requirement = achieve D-2 discharge standard 5 days after treatment
USCG requirement = achieve D-2 discharge standard 1 day after treatment
(correct at time of printing, September 2017)



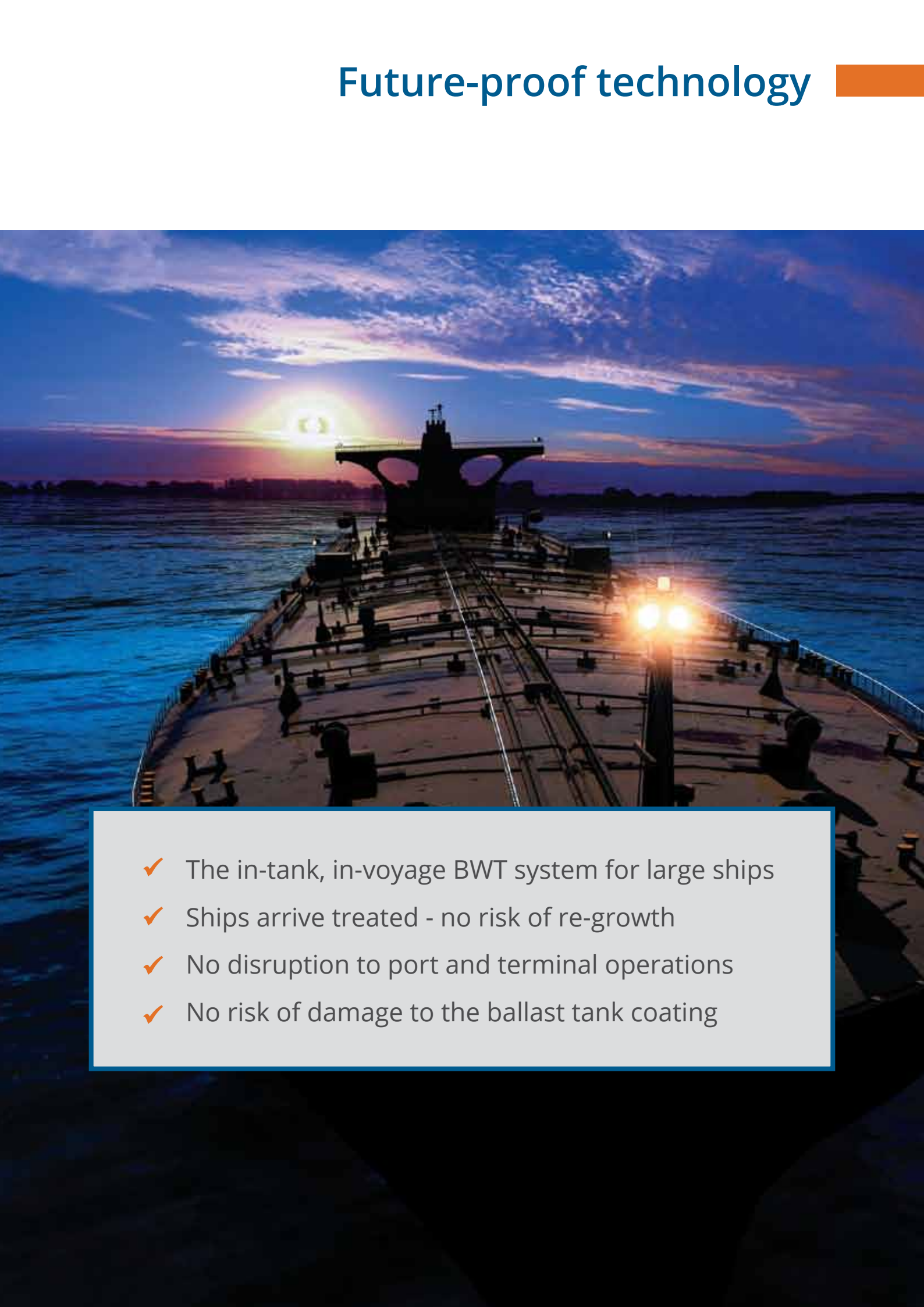
The scientific evidence for organism
regrowth in treated ballast water

Dr Carolina Grob

*Ask for your copy of the report prepared by
Coldharbour's Lead R&D Scientist,
Dr Carolina Grob*



Future-proof technology

- 
- ✓ The in-tank, in-voyage BWT system for large ships
 - ✓ Ships arrive treated - no risk of re-growth
 - ✓ No disruption to port and terminal operations
 - ✓ No risk of damage to the ballast tank coating

Retrofit experience



The first BWT system to be successfully retrofitted to a VLCC



The Coldharbour GLD™ BWTS can be retrofitted to a VLCC in just 10 days

Installation takes place during normal dry docking, without impacting other work being carried out on board

To watch a video of the Alfa Glory VLCC retrofit, visit www.coldharbourmarine.com/ballast-water-treatment



In just
10
days



Cost effective for new builds



Cost-effective and space saving for new builds of large tankers, LNG vessels, bulkers and ore carriers.

The GLD™ BWT system can be located in the machinery space and it's modular format allows for some elements of the system to be positioned in separate areas when space is at a premium.

The IG system can be located in a suitable area on deck, protected by a custom-built deck housing.



Dual Duty IGGS

Inert gas from the IGG can be used for both BWT and for cargo blanketing top-up duty, thereby removing the need for two separate systems on board.

The Sea Guardian™ IGG is also multi-fuel compatible and can be configured to run on LSMGO/MDO, LNG and LNG boil-off gas, making it suitable for all applications on LNG and LNG fuelled vessels.



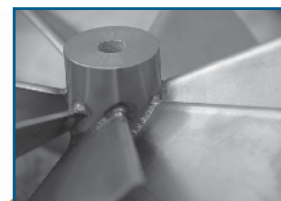
The Coldharbour BWTS combines two operations in one system, thereby saving space and offering cost reductions for new builds.

Sea Guardian™ Inert Gas Generator

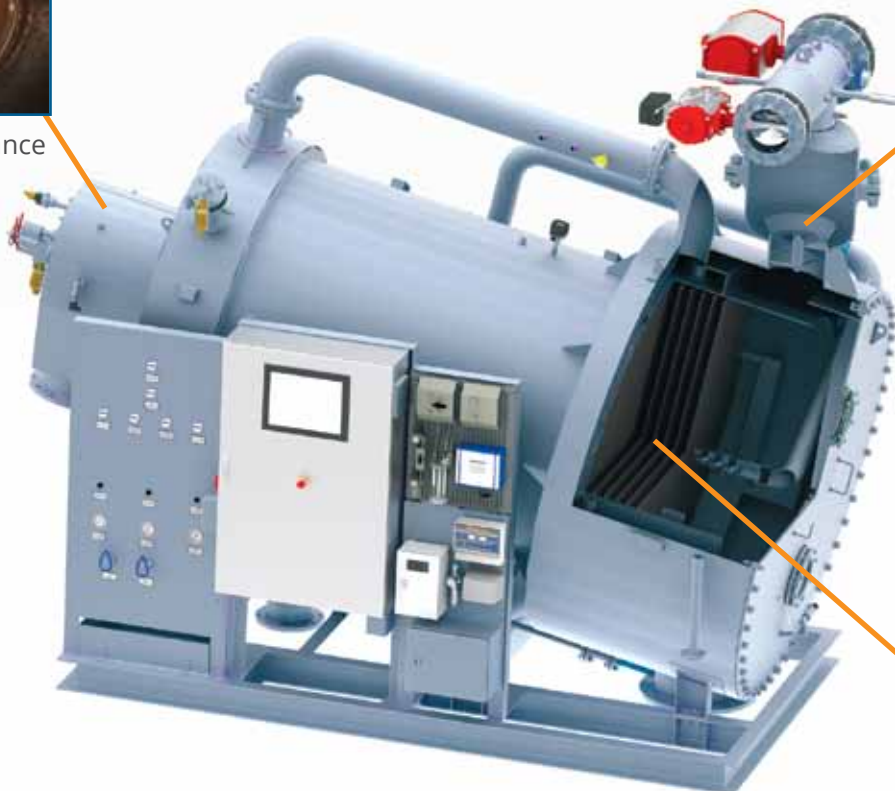
The Sea Guardian™ IGG incorporates innovative design features which resolve many of the problems inherent in IGS systems by combining separate parts and sections into one cost-effective, space saving, reliable module.



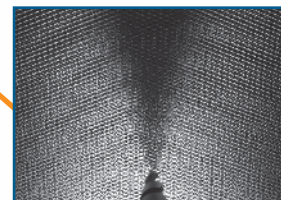
Venturi Burner Lance



Swirl Vane Separator



Sea Guardian™ Inert Gas Generator



Mesh Screen Matrix

Venturi Burner Lance

High and low-pressure airflow through the burner casing achieves an even burn with a controlled flame without the need for a burner cone.

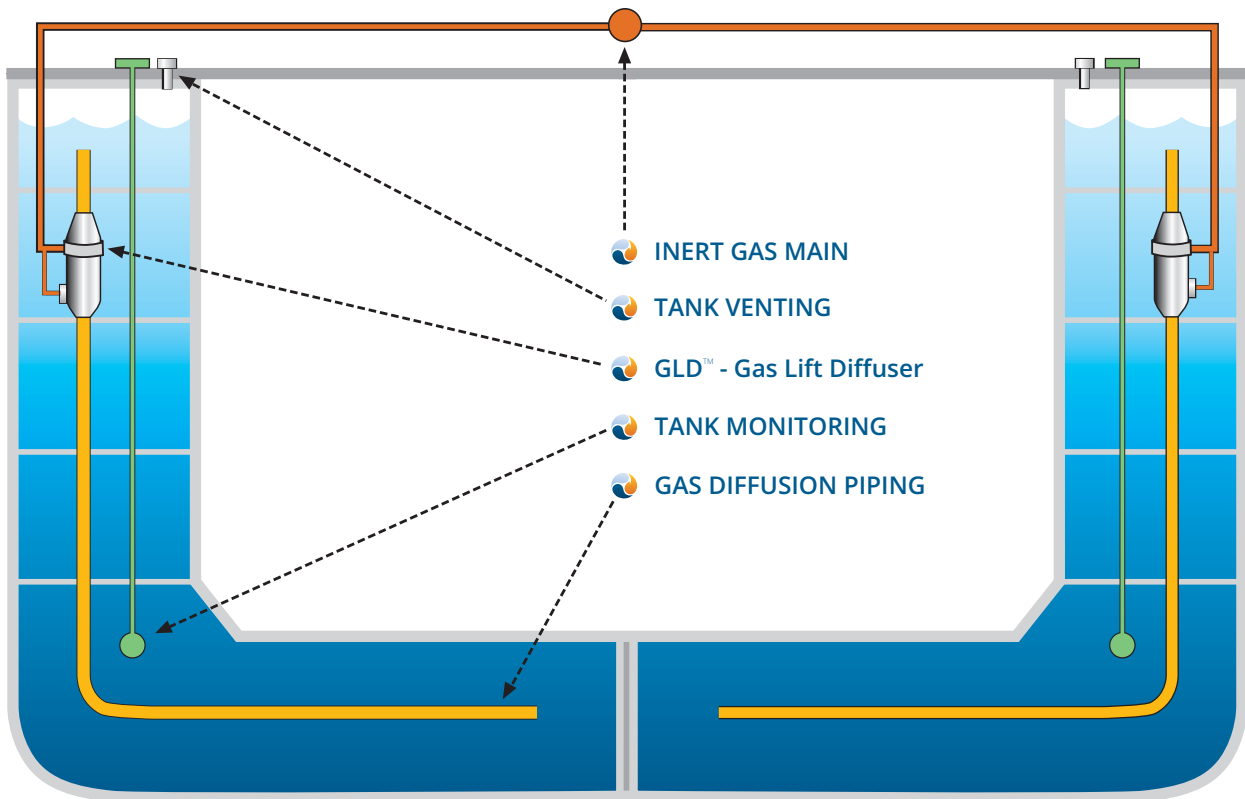
Mesh Screen Matrix

Hot gas passes through a quench scrubber matrix based on an innovative water curtain system comprised of expanded metal mesh screens. The unique design means there is no need for a separate and bulky scrubber tower.

Swirl Vane Separator

A static blade system induces the cooled gas to spin in a vortex, shedding water droplets as it does so, which means that a demister pad section is not required.

- ✓ No burner cone
- ✓ No scrubber tower
- ✓ No demister pads
- ✓ 0.2% residual oxygen
- ✓ Zero soot
- ✓ Low NOx and SOx
- ✓ Compact design
- ✓ Multi-fuel capable



Coldharbour GLD™ BWTS The in-tank, in-voyage, BWT system for large ships

No disruption to port operations	✓
Flow rate & pump size irrelevant	✓
Unaffected by salinity	✓
Unaffected by temperature	✓
Unaffected by turbidity/suspended solids	✓
No regrowth - always arrive treated	✓
Gravity ballasting & de-ballasting possible	✓
Simple inert gas based operation	✓
Minimal maintenance	✓
No power required during peak demand	✓

Designed and optimised for use on large tankers, LNG vessels, large bulkers and ore carriers



COLDHARBOUR



Coldharbour Marine Limited is based in the United Kingdom and has been supplying marine equipment for more than 35 years.

Our products and designs have been used extensively in both the marine and offshore sectors.

We make it our business to understand your requirements and to provide genuinely practical solutions to your technical problems.

We combine engineering excellence, intelligent application, efficient installation and years of experience in order to provide our customers with reliable, robust, advanced technologies for use in extreme environments.

Coldharbour Marine future proofs its technologies. We continually develop and enhance our products to satisfy and exceed both operational and legislative requirements.



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