

Marine

Reducing CO₂ emission

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Grontmij | Carl Bro – Member of Green Ship of the Future

In general the shipping trade is an environmentally sound way of transportation. For many years Denmark has been a front runner with regard to eco-friendly shipbuilding and operation.

Members of "Det Blå Danmark" (organization consisting of Danish ship owners, maritime trades and industries and institutions) have decided to launch an open joint venture project called "Green ship of the Future" between Danish authorities and companies within the Danish maritime industry. The main objective for the project is to decrease the CO₂ emission from ships through the development of environmentally and energy effective technologies.

Grontmij | Carl Bro has now joined the "Green Ship of the Future" with a specific project "Optimisation of pump- and cooling water systems" under one of the "Green Ship Of the

Future" headlines "Optimization of Auxiliary Pipe Systems". This project is made in co-operation with the pump supplier DESMI and the heat exchange supplier APV.

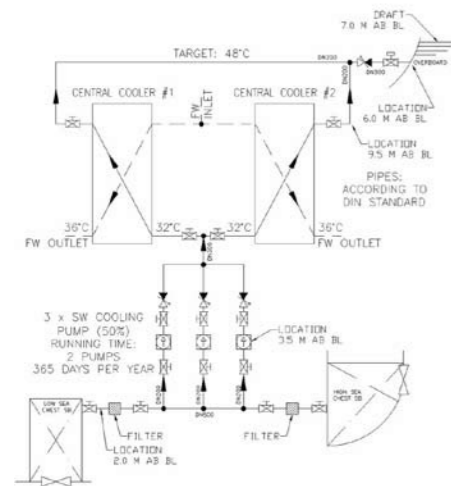
The overall target for the optimization of the central cooling water system (seawater system, fresh water, low- and high temperature circuit) is to reduce the overall vessel CO₂ emission with more than 1.5% corresponding to 20% of the daily auxiliary generated power for a conventional bulk carrier.

During the first phase Grontmij | Carl Bro and the co-operation partners have focused on the seawater system in different optimisation case studies, evaluated in a powerful design and simulation fluid calculation program. As a result of these case studies, savings of 1% of the overall 1.5% CO₂ reduction is obtained solely through optimization of the pipe layout, cooler design and selection of a high- efficiency flow equivalent centrifugal pump.

DESMI, APV and Grontmij | Carl Bro will continue the research work with the low/high temperature fresh water cooling circuits in the future, in order to reach our overall target for the vessels with regard to reduction of CO₂ emission.

More Information

Karsten Elland
karsten.elland@grontmij-carlbro.dk



Typical seawater cooling system

Contact Marine



Michael H. Schmidt
General Naval Architecture, Steel
T +45 4348 6561
E michael.schmidt@grontmij-carlbro.dk



Peter Smith Bendtsen
General Naval Architecture, Stability
T +45 4348 6876
E peter.bendtsen@grontmij-carlbro.dk



Bjørn Moving
General Naval Architecture
T +45 4348 6816
E bjorn.moving@grontmij-carlbro.dk



Karsten Elland
General Naval Architecture, Machinery
T +45 4348 6031
E karsten.elland@grontmij-carlbro.dk

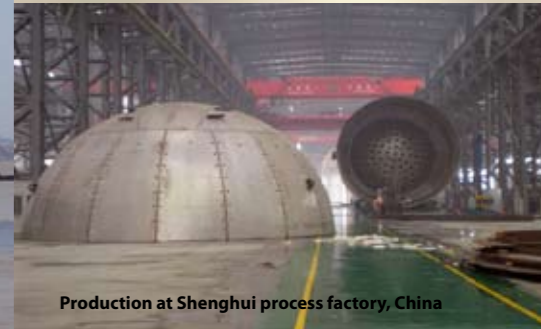
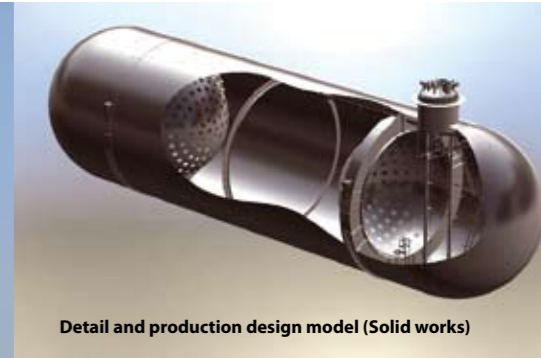


Allan Andersen
General Naval Architecture
T +45 4348 6021
E allan.andersen@grontmij-carlbro.dk



Jan Kærgaard Lang
General Manager, Shanghai
T +86 21 6219 6065
E jan.kaergaard.lang@grontmij-carlbro.dk

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Design and production of LNG cargo tanks

In September 2008 the first LNG carrier for IM Skaugen was launched from Wuzhou shipyard in Taizhou, China. After ordinary outfitting, the vessel will be moved to the tank and process factory in Shenghui for cargo tank installation and process plant outfitting.

The cargo tanks are currently under construction at Shenghui, where IM Skaugen has the facilities for outfitting and installation. The cargo tanks will be finalized and lifted onboard the vessel in December followed by the process plant installation. The first vessel will be ready for sea trial mid 2009.

Grontmij | Carl Bro (GMCB) has developed the cargo tank design as well as vessel and process plant; i.e. basic design, strength calculation, detailed design and production

documentation. The cargo tanks are designed according to ASME and USCG norms for pressure tanks type C with class approval from Germanischer Lloyd's.

The vessel will be equipped with two cargo tanks with capacity of 4.000 to 6.000 m³ each and one small deck tank. The cylindrical stainless steel tanks are designed for a pressure of 5 bar gauge, temperature of minus 165 degrees Celsius and a cargo density of max. 970 kg per m³.

Main cargoes for the vessels will be Liquefied Natural Gas (LNG), Liquefied Petroleum Gas (LPG), ethylene and Vinyl Chloride (VCM).

During the GMCB design phase the tank was evaluated with regard to material, size, support type, etc. The final construction has been

minimized for internal structure and optimized with regard to the production. The tanks will be supported at two positions in the vessel (cradles with fixed and sliding wood support). These support rings are the major internal strength members along with only one vacuum ring.

Nippon Steel in Japan has supplied steel for the cargo tanks. A total of 7,000-8,000 tonnes of plates has been reserved for the confirmed vessels. The tank and process factory in Shenghui has been certified for production and welding of pressure tanks in stainless steel.

A total of 6-8 vessels of this type will be delivered in 2009 and 2010.

More information

Peter Smith Bendtsen
peter.bendtsen@grontmij-carlbro.dk

Five years have passed since our Design Office in Shanghai opened and last year we welcomed General Manager Mr. Jan Kær-gaard Lang. Mr. Lang's main objective has been to coordinate the projects between our office in Denmark and Shanghai. Today the office also includes staff from Grontmij | Carl Bro's industrial department Plant & Process Technology (PPT). PPT is involved in our process of designing a unique series of multipurpose gas and chemical ships for our client Skaugen Marine Construction.

In October the Danish Prime Minister, Mr. Anders Fogh Rasmussen, brought with him a Danish Business Delegation to visit China in order to discuss energy and climate prior to the Climate Convention in Copenhagen in 2009. CEO of Grontmij | Carl Bro, Mrs. Birgit Nørgaard, participated in the delegation and during the visit Mrs. Nørgaard had the opportunity to meet the Shanghai Management of Skaugen Marine Construction.

Furthermore, we had the opportunity to tell the Danish Prime Minister about Grontmij | Carl Bro's activities in China. Mr. Kær-gaard Lang shared our viewpoints about the future potentiality and challenges on the Chinese market with the Danish Prime Minister.

One of the challenges we are all facing is how to protect the environment. Much has already been done to reduce the emission of CO₂ such as wind mills, central heating, bio-ethanol, etc. Within the shipbuilding industry efforts are made to reduce the CO₂ emission from ships and Grontmij | Carl Bro's Marine department has entered in to collaboration about auxiliary service system optimization on ships in order to reduce the CO₂ emission. You can read more about this project on page 4.

From left: Danish Prime Minister Mr. Rasmussen, GIMCB CEO Mrs. Nørgaard and General Manager Mr. Lang



Safe Cargo Rail



Cargo rail before rebuilding

Maersk Supply Service has decided to upgrade some of their platform supply vessels in order to make the cargo deck a safer place to work.

The open cargo rail structure on many ships, also new ones, allows water to access the deck

Maersk Frontier ready for delivery from Fredericia Shipyard.



when operating in areas such as the North Sea which increases the risk of cargo shifting.

Grontmij | Carl Bro has assisted with the arrangement and structural drawings of a closed cargo rail with safe passage in the area between bulwark and cargo railing and a new access gallery on top to which cargo valves and other necessary equipment have been extended.

The first rebuilding is performed at Fredericia Shipyard on Maersk Frontier built in 1992. This involves relatively non complex steel work, as most of the existing bulwark and cargo rail can be maintained without having to involve structures under deck.

More information

Bjørn Moving
bjorn.moving@grontmij-carlbro.dk

Maersk FPSO for Brazil

Maersk FPSO has started the conversion of a 308,000 DWT tanker recently delivered from Dalian Shipyard. Projects of this nature are typically valued in excess of \$250 million.

The transformation from a crude oil tanker to a Floating, Production, Storage and Offloading (FPSO) vessel is conducted at Képpel Shipyard. The work is expected to be completed first half of 2010. The FPSO will be operating some 30 years, ultimately, in the Peregrino field with a water depth of 100 m, which is located in the Campos Basin approximately 45 nautical miles offshore Brazil.



Grontmij | Carl Bro has assisted with all structural interfacing, outfitting to FPSO, arrangements and marine pipe systems. The main challenge of this project has been offshore standards and fatigue life of 30 years along with Maersk FPSO's high documentation standard.

Besides main structural design tasks such as foundations for top-side modules with weights of up to 2,100 tonnes, a 54 m flare tower, helideck capable of hosting a Sikorsky S-92 and large deck cranes, the accommodation is also being extended to 100 persons.

More information

Bjørn Moving
bjorn.moving@grontmij-carlbro.dk



Jens Sørensen rebuilt

Sea Bed Mapping

The inspection vessel "Jens Sørensen" was built in 1994, has a length of 46 m, and is owned by the Danish Maritime Safety Administration. The vessel has been reconstructed by Granly Marine A/S in Esbjerg and is being used for sea bed mapping. Since it was delivered this summer, the vessel has been operating in Kattegat Sea.

Grontmij | Carl Bro assisted with arrangement and installation drawings for new equipment and facilities.

A new sonar room has been installed in the fore body with lifting gear for multi-beam echo sounder protruding the hull through a gate valve with a diameter of 1100 mm along with motion sensor, current profiler, pressure transducer, etc.

Lines for calibrating equipment are towed from two new A-frames mounted in the stern with wire run down to new installed oceanographic winches in steering gear room and data processing in separate server room.

The accommodation is extended with two double cabins, extra space in the mess as well as four pc work stations in the wheel house.

More information

Bjørn Moving
bjorn.moving@grontmij-carlbro.dk

DIAMOND 53 in China

Chengxi Shipyard has signed up for the delivery of 44 DIAMOND 53 vessels to various prominent ship owners, such as Spar Shipping, Parakou, Norden, Cosco, Wah Kwong, Nomikos and Shanghai Times Shipping.

Considerable productivity gains have been reached by Chengxi Shipyard. When Chengxi Shipyard signed the first DIAMOND 53 contracts with the Norwegian Owner, Spar Shipping, back in 2003, they were capable of building three vessels per year on one slipway. Today Chengxi Shipyard has reduced the slipway time from approx. 120 days per vessel to approx. 35 days and over the next two years they will deliver 10 DIAMOND 53 vessels per year.

DIAMOND 34 in China

Two DIAMOND 34 vessels are being built at Shandong Baibuting Shipbuilding in WeiHai in China. The yard has been developed over the last two years. New owners, Spar Shipping, have taken over the yard and the management has been changed. The DIAMOND 34 vessels are currently delayed, but the new management at the yard is determined to speed up the delivery of the vessels. In connection with a recent visit at the yard, good quality steel and paint work was presented. The first vessel is on the slipway and the steel block for the cargo hold section has been erected.

DIAMOND 34 in Vietnam

The first out of 10 DIAMOND 34 vessels was launched on 31 July 2008 from Pha Rung Shipyard in Vietnam. The first vessel is expected to be delivered mid-2009.

More information

Michael Højsholm Schmidt
michael.schmidt@grontmij-carlbro.dk

DIAMOND 53 in Vietnam

The DIAMOND 53 vessels being constructed at two major yards in Vietnam are now becoming well established series of vessels from Vietnam. A large number of vessels are in the pipe line and the first 5 vessels are delivered to date.

DIAMOND 53 in India

The first of six DIAMOND 53 is materialising in Vizag in India. Keel laying of the first vessel was conducted at the beginning of the year and the vessel was launched recently. The vessel is now undergoing outfitting before delivery in spring 2009. The vessel is being equipped with Wärtsila common rail main engine and will be well prepared for the future.

More information

Allan Andersen
allan.andersen@grontmij-carlbro.dk