DNV·GL

MPV UPDATE

2016

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Open top transport

Structural assessment

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Cover photo: BBC Chartering

Jost Bergmann
DNV GL Business Director MPV
jost.bergmann@dnvgl.com

DEAR READER,

Welcome to the first MPV UPDATE magazine by DNV GL. MPVs are an important segment for DNV GL. With about 1,400 vessels and a market share of about 21 per cent (GT, based on IHS Fairplay), DNV GL is the leading class in this segment. In this UPDATE we would like to share technical and operational trends and the latest developments related to rules and regulations, and present selected remarkable projects in the MPV segment. When we speak about "MPVs", we wish to address a broader range of vessels, from general dry cargo ships carrying non-standardized break bulk, bulk or ro-ro cargo, and from geared multi-purpose ships carrying the same type of cargo but in addition having grain, bale and/or container capability, to heavy-lift ships and premium project carriers with a combined lifting capacity greater than 100 t and 250 t respectively, through to semi-submersible MPVs.

In this first issue we take a closer look at relevant DNV GL class notations in our new DNV GL rule set. We give a more detailed overview of the new design loading conditions applicable to future MPVs with long cargo holds and their practical implications. IMO and IACS are continuously developing new rules and regulations for our industry. Read a summary of "hot topics" and expected future developments.

Voluminous project cargo must sometimes be transported with partly or fully open hatch covers. Although this is basically a violation of the load line convention, there are alternative solutions possible for newbuilds as well as for existing vessels on a case-by-case basis.

The German owner and operator Briese and its partners have launched a large newbuilding programme. Find some interesting insights into their state-of-the-art MPV design and the underlying considerations and rationale in our interview feature.

Due to changes in trade patterns, Japanese owners and yards are currently confronted with new market requirements, which are expected to lead to new MPV designs, as currently considered by NYK.

Finally we briefly present two exceptional DNV GL services: warranty surveys for the carriage of unique project cargo, and AIS-based data analyses providing insight into trading patterns and vessel conditions as the basis for performance improvements.

Enjoy the read and send us your feedback.

MPV
UPDATE

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Peter Lindemann (PL)

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A UNIQUE DESIGN BASIS FOR FUTURE MPVS

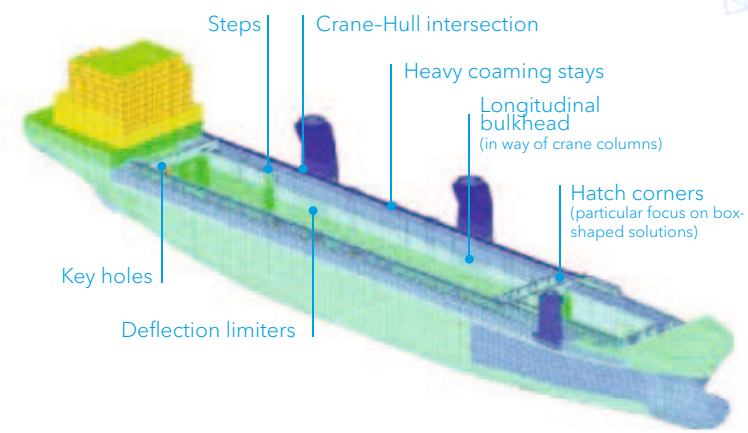
Since DNV and GL joined forces, a huge effort has been made to consolidate the existing knowledge of both legacy companies and further enhance their standards to serve as a reference for the maritime industry. The new DNV GL rules are now available to support state-of-the-art shipbuilding and operation.

The new DNV GL class rules and notations are geared towards today's and tomorrow's needs and provide more flexibility than ever.

The new rules, which represent the best of the combined expertise and experience of two leading classification societies, have been evaluated for critical issues and improvement potential by our most experienced technical experts. The rule set was scrutinized with respect to clarity, practical application and its positive contribution to the overall safety and reliability of vessels. The process involved more than 200 technical experts at DNV GL and the rule set was improved by extensive input from more than 800 shipyards, designers, shipowners and managers.

The total effort made to establish these rules is unprecedented in the industry and has resulted in a unique rule set which is efficient, future-ready, consistent, transparent, modern and adaptable.

Typical areas of attention for today's MPV designers.



Harvesting operational experience

With around 13,000 ships classed by DNV GL, the experience the class society has gained through supporting its customers in their day-to-day operations constitutes an unrivalled knowledge database which continues to grow day by day.

In parallel with the development of the new DNV GL rules, a research project performed a thorough statistical review of the DNV GL fleet. The aim was to identify possible areas of further rule improvement. More than 3,000 ships in service were closely monitored for design-related defects. Typical defects and their frequency of occurrence were analysed, and the insight gained was incorporated into the new rules.

A new and improved technical foundation

The incorporation of equivalent design waves (EDW) into the DNV GL rules marks a significant change in the way dynamic loads are calculated. The advanced load concept is a major step towards a more realistic and accurate representation of environmental loads. Along with the state-of-the-art DNV GL capacity models, it implements a more consistent safety level for the entire hull structure while helping overcome challenges related

to the development of innovative designs. This provides a basis for achieving an ideal distribution of structural strength, ensuring every ton of steel is used efficiently.

With more precise load-related requirements and more advanced capacity formulations, the new DNV GL rules call for more extensive computational capabilities and are supported by powerful software tools ensuring an efficient design process.

New set of design loading conditions for modern MPVs

To make the implications of various loading patterns of MPVs with one large cargo hold more transparent, a set of new structural design loading conditions has been defined to support ship-owners, yards and designers. Details of this approach are lined out in a separate article in this magazine.

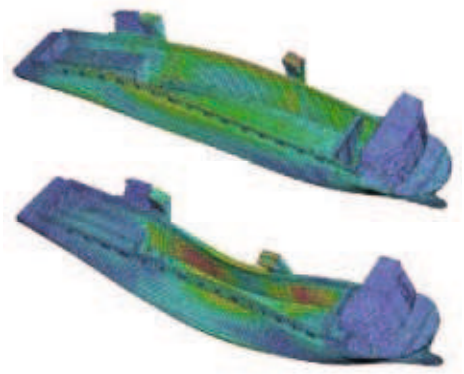
Wider range of relevant class notations

To enable owners to efficiently customize vessels to suit their needs, the new rules offer a variety of both new and well-proven class notations, inherited from the legacy societies. For MPVs the new rule set is offering two ship type notations:

- General dry cargo ship
- Multi-purpose dry cargo ship

General dry cargo ships are typically focused on break bulk and dry bulk whereas multi-purpose dry cargo ships have a hold arrangement optimized for project cargo but can also carry break bulk, bulk cargo and containers and are mostly geared and often equipped with tween decks. But the choice of the ship type notation rests with the customer.

In addition the rules offer a number of voluntary class notations which ensure that a vessel is designed and equipped for its intended operation. The following areas are addressed:



Tandem operation of cargo gear can lead to excessive hull deflections – upper image: load hanging outside; lower picture load hanging inside. By means of global FEM analysis, ref. RSD notation, this challenge can be controlled.

- Structural strength and integrity
- Propulsion, power generation, auxiliary systems
- Navigation, manoeuvring and position keeping
- Cargo operations
- Equipment and design features
- Cold climate
- Environment protection and pollution control
- Survey requirements

The new DNV GL rules thus hold many benefits for the MPV segment, enabling new approaches in ship design and operation along with unprecedented choices and flexibility. ■ **JR**

DNV GL Expert
Jan Rüde (JR), Ship Type Expert MPV,
Ship Structures and Outfitting
Phone: +49 40 36149-4172
E-Mail: jan.ruede@dnvgl.com

TYPICAL CLASS NOTATIONS RELEVANT FOR MPVS

DNV GL worked closely with its customers to make sure the new rules and class notations reflect the realities in the MPV segment.

Notation	Rule reference	Explanation
Grab	Pt6 Ch1 Sec.1	The inner bottoms and/or coamings and longitudinal bulkheads are strengthened for the use of grabs.
Strengthened	Pt6 Ch1 Sec.2	Weather deck hatch covers (HA), tween decks (DK) and/or inner bottom (IB) strengthened for heavy cargo.
HC(x)	Pt6 Ch1 Sec.3	Vessel strengthened for heavy cargo in bulk. Applicable to vessels with L ≥ 150 m. Qualifiers A, B, B*, C and M specify additional requirements.
Holds may be empty	Pt6 Ch1 Sec.4	Indicates which holds may be empty at full draft.
RSD	Pt6 Ch1 Sec.8	Hull structure has been analysed by means of global finite element analysis according to class guideline and analysis procedure.
LCS	Pt6 Ch4 Sec.7	On-board computer system running a combination of software modules for stability and strength verification. Additionally, these requirements may include integrated systems developed to assist the master, as a decision aid, if the vessel has been subject to damage and subsequent flooding.

Notation	Rule reference	Explanation
LC	Pt6 Ch4 Sec.10	Lashing computer system, mandatory for vessels carrying containers.
RSCS	Pt6 Ch4 Sec.11	RSCS (Route Specific Container Stowage) may be applied to vessels carrying containers based on route-specific load assumptions. Container stowage flexibility and capacity is optimized.
Container	Pt6 Ch5 Sec.1	Mandatory design and outfitting requirements for vessels equipped for carriage of containers.
Hatchcover-less	Pt6 Ch5 Sec.2	Requirements for vessels operated with "open top" = without hatch covers in line with MSC/Circ. 608.
Crane	Pt6 Ch5 Sec.3	Voluntary notation specifying additional requirements for vessels equipped with cargo gear. Intended to improve safety and reliability of crane operation.
DG	Pt6 Ch5 Sec.2	Vessel arranged for carriage of solid dangerous goods both in bulk (DG-B) and in packaged form (DG-P) pursuant to SOLAS Reg. II-2/19.
DBC	Pt6 Ch5 Sec.2	Arranged for carriage of dangerous goods in solid bulk pursuant to the technical provisions of the IMSBC Code.

Photos: DNV GL, terskov-fotolia

NEW DESIGN LOADING CONDITIONS

Along with its new class rules, DNV GL has developed a set of new loading conditions, assisting shipowners and designers in agreeing on realistic load assumptions at an early design phase that account for the realities of MPV operation.

The basis for determining vessels' longitudinal strength is the IACS Unified Requirement URS11/11a. However, this is not very specific and may not reflect owner's requirements regarding later loading flexibility, requiring vessels to be designed for ballast condition, homogeneous loading, short voyages and ports. Alternate loading conditions, required only "where applicable", are however critical from a hull girder strength point of view because they generate the most severe still-water

The placement of very heavy block loads in the cargo hold and the use of on-board cranes have implications for structural strength considerations during the design phase.

bending moments and shear forces. In addition, the IACS rules do not explicitly account for block loading scenarios, tandem crane load cases, deck cargo cases and tween deck loads, which they leave to the discretion of designers and owners. To provide owners and designers with improved transparency and guidance regarding the new IACS rules, DNV GL joined hands with industry representatives to define standard loading conditions for multi-purpose vessels. Combining the operational know-how of both DNV GL and its customers, the loading conditions cover relevant operational requirements for these complex ships.

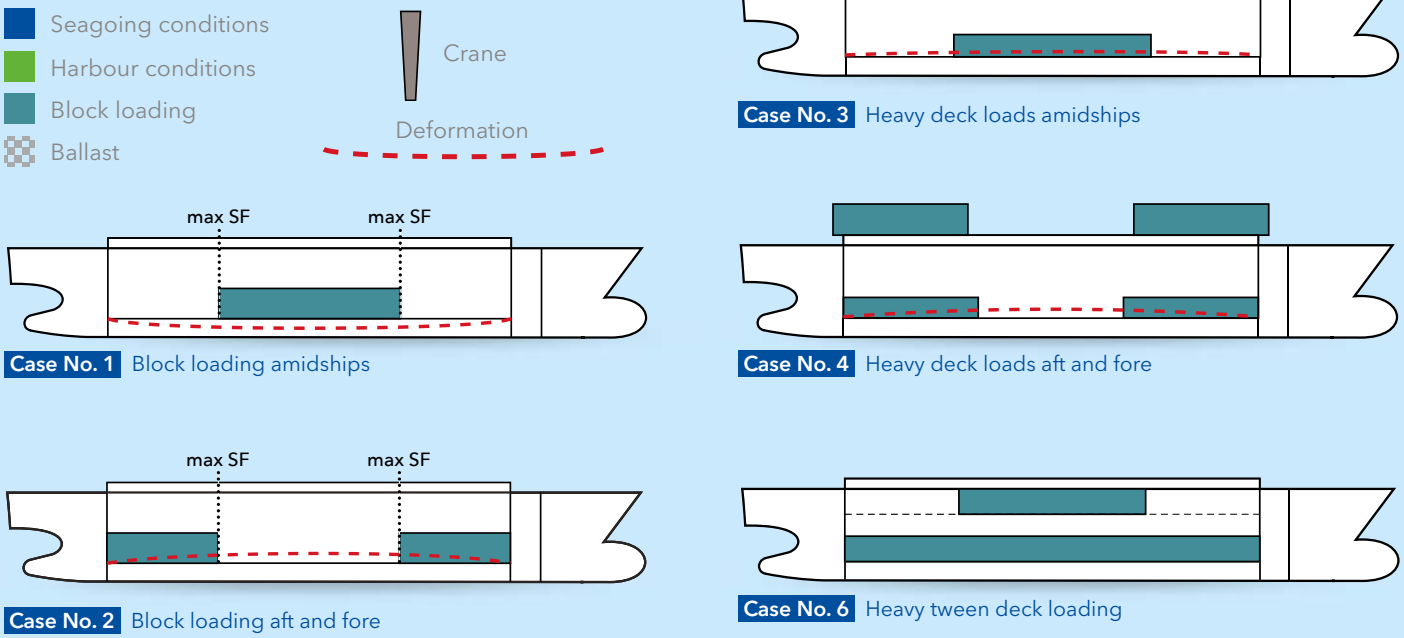
"DNV GL is the first classification society to issue standard loading conditions incorporating load cases far beyond the scope of the IACS requirements," points out Jan Rüde, Ship Type Expert MPV at DNV GL. "They include block loading scenarios, tandem crane load cases, deck cargo cases and tween deck loads." The new loading conditions are out lined in DNV GL rules Part 5 Chapter 1 Section 5 Paragraph 4 "Loads".

Design envelope curve

The permissible still-water design bending moment and shear force curve which define the minimum and maximum loading limits for the vessel are generated using the loading manual. Typically the designer calculates all design loading conditions as agreed with the owner, then draws an envelope curve over all bending moment and shear force values. The designers then agree on a safety margin to be applied to the envelope curve for the steel structure design. The design envelope curve is the basis for class approval of the steel structure drawings. When the ship construction is finished, the envelope curve is fed into the loading >

Photo: Rickmers-Linie

STANDARD FE DESIGN LOAD COMBINATIONS FOR CARGO HOLD ANALYSIS OF DRY CARGO SHIPS WITH A LONG CENTRE HOLD



> computer for planning the loading of cargo. The challenge is to consider all relevant and critical loading conditions in the steel structure design phase to make sure the ship is strong enough to provide the desired operational flexibility during later operation.

Block loading scenarios

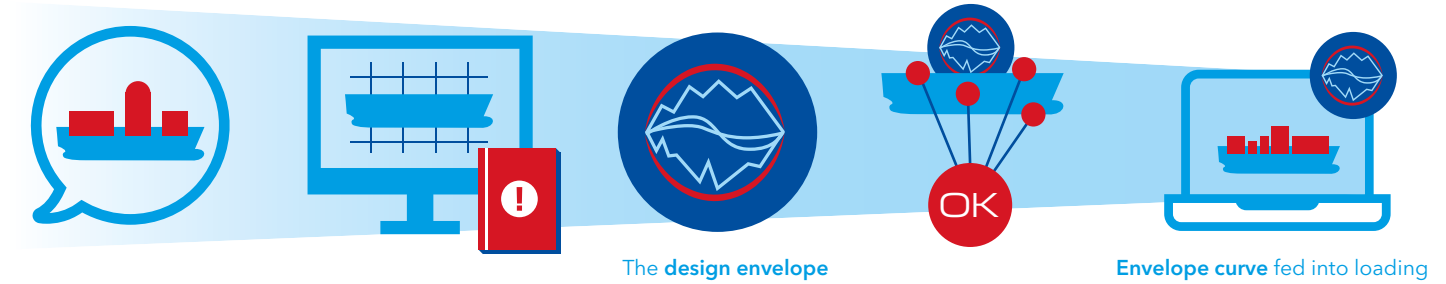
MPVs with a very long cargo hold are often equipped with a reinforced inner bottom designed for a high uniform distributed load such as 20–25 tonnes per square metre. In practice, however, a block load will typically cover only part of the inner bottom, leaving other parts without load. A heavy block load will typically result in excess weight in the loaded parts and excess buoyancy in the empty parts. It should be placed where it creates the most critical conditions from a hull girder point of view. Placing the load block in the middle of the hold creates the worst-case global sagging moment for the hull structure (Case No. 1). Splitting the load block into two units and placing them at the aft and forward ends of the hold results in the worst-case hogging moment (Case No. 2).

Hatch cover and tween deck design

Most cargo vessels have weather deck hatch covers designed for loads as defined by the Load Line Convention, i.e. approximately

DESIGN ENVELOPE CURVE

The design envelope curve translates the initial building and loading specifications into steel design and loading guidelines.



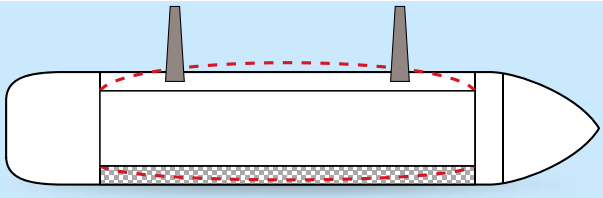
Owner decides on design loading conditions

Designer uses the loading conditions for **loading manual**

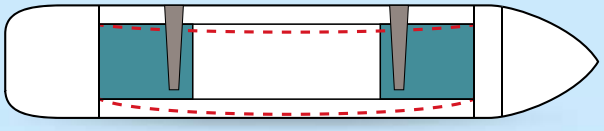
The **design envelope curve** is generated to cover all loading conditions

Steel structure approval based on the envelope curve

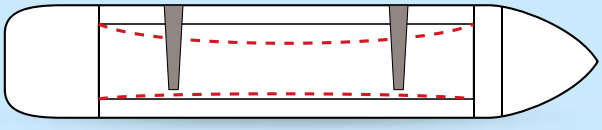
Envelope curve fed into loading computer used for cargo planning to ensure owner requirements are met in practice



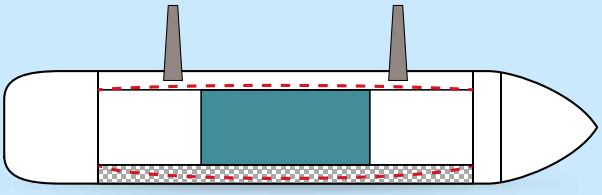
Case No. 10[1)] Crane outboard on partial draught



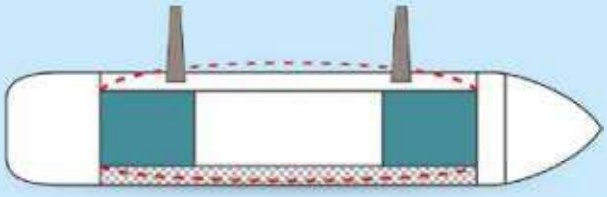
Case No. 13[1)] Crane inboard with $M_{swp\text{-}h}$



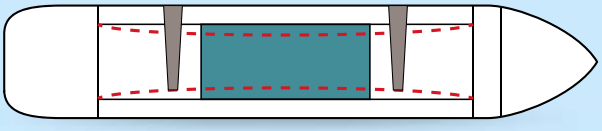
Case No. 11[1)] Crane inboard on partial draught



Case No. 14[1)] Crane outboard with $M_{sw\text{-}p\text{-}s}$



Case No. 12[1)] Crane outboard with $M_{sw\text{-}p\text{-}h}$



Case No. 15[1)] Crane inboard with $M_{sw\text{-}p\text{-}s}$

1) Applicable to cranes with SWL ≥ 150 t only

three to four tonnes per square metre. However, MPVs often have heavy pontoon covers for carrying heavy project cargoes on the weather deck. These loads generate maximum transverse forces in rolling conditions in beam seas and are critical for the transverse side structures (Case No. 3). Here again the load may be centred amidships or be placed at opposite ends (Case No. 4). In addition to weather deck covers, MPVs are typically equipped with heavy tween deck panels capable of handling loads from five to seven tonnes per square metre. The tween deck panels rest on pads integrated into the hull side structure at various levels. The resting pads are exposed to high vertical forces in a magnitude of 100 to 120 tonnes. This loading scenario is critical for buckling of the longitudinal bulkhead under the support pockets and is reflected in Case No. 6.

Cranes complicate the picture

In addition to seagoing cases, it is also necessary to consider crane loading cases for heavy-lift MPVs when operating in port. A heavylift MPV is normally designed for tandem operation of two cranes lifting cargo in and out of the ship. These scenarios are covered by Cases No. 10 to No. 15. A particular challenge for a long cargo hold in combination with heavy-lift cranes integrated into the side structure of the vessel is how to evaluate and limit the inward and outward deflection of the hold structure.

The crane loading cases defined by classification society DNV GL represent the most severe conditions, providing the hatch cover designer with valuable input regarding expected coaming deformation.

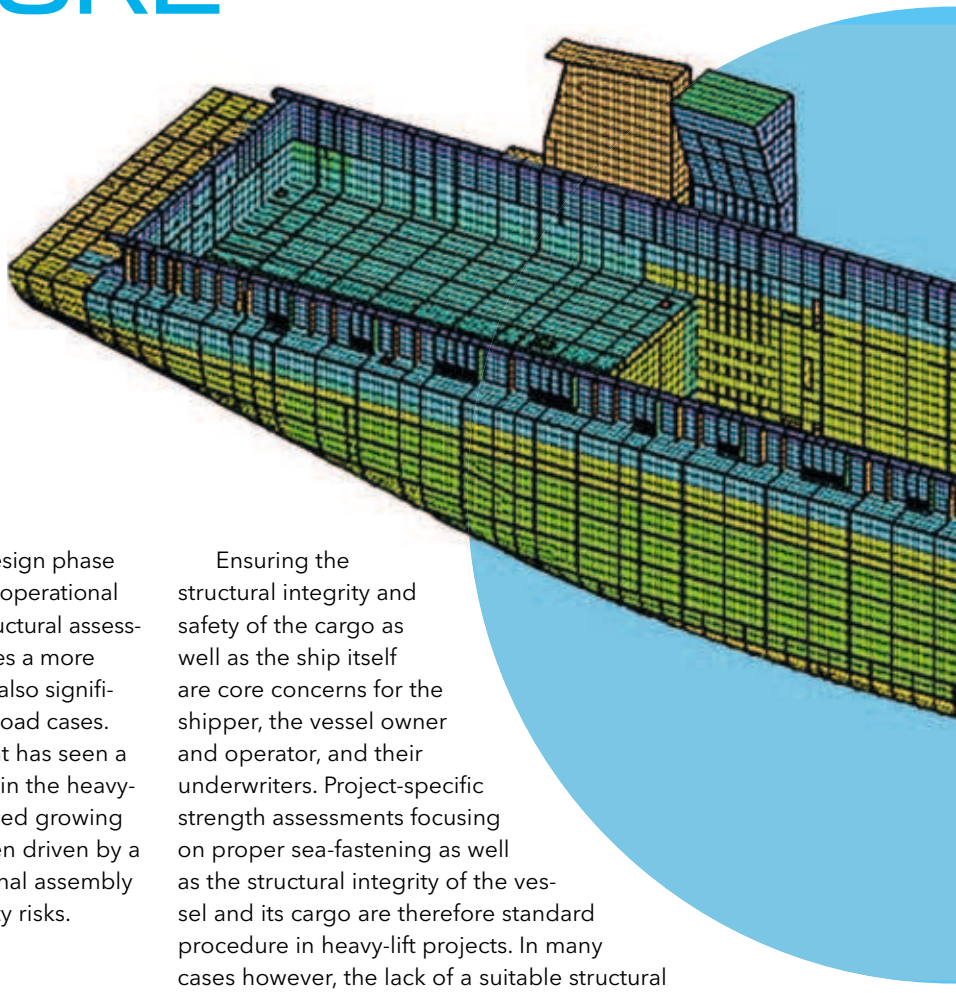
> "DNV GL is the first classification society to issue standard loading conditions incorporating load cases far beyond the scope of the IACS requirements."
>
> **Jan Rüde,** Ship Type Expert MPV, DNV GL

"The new DNV GL rules on Standard Loading Conditions for Multi-Purpose Vessels represent a major milestone for us and our customers," says Rüde. "They benefit both ship designers and owner's who must jointly define the design loading conditions for planned newbuilds at an early project phase as they will ensure that the vessels will have the intended operational flexibility whilst taking into account the impact on production costs." **JR**

DNV GL Expert
Jan Rüde (JR), Ship Type Expert MPV,
Ship Structures and Outfitting
Phone: +49 40 36149-4172
E-Mail: jan.ruede@dnvgl.com

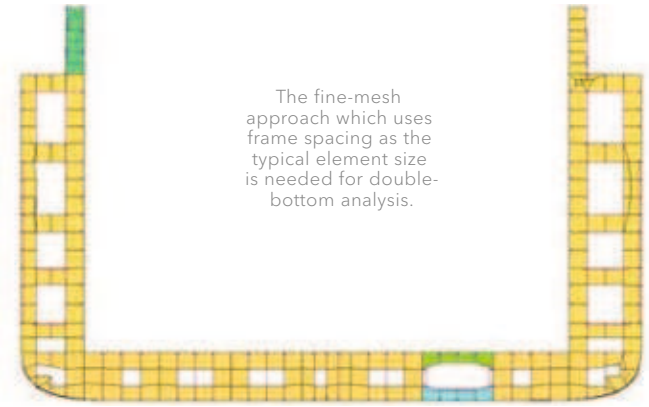
STRUCTURAL SIMULATION MODELS CAN DO MORE

The structural assessment process required for heavy-lift transport projects on board MPVs can benefit vastly from existing models. DNV GL has developed a new approach.



Structural simulation models generated during the design phase of a vessel can and should be reused throughout the operational lifetime of the ship, for example when performing structural assessments for heavy-lift projects. Doing so not only enables a more sophisticated approach to technical assessments but also significantly reduces the cost of modelling and generating load cases.

In recent years, the multi-purpose vessel segment has seen a growing trend towards individualized transport jobs in the heavy-lift and project cargo businesses, with the items carried growing in size and weight. This development in turn has been driven by a general tendency to minimize the scope of on-site final assembly work to mitigate the associated economic and quality risks.



The fine-mesh approach which uses frame spacing as the typical element size is needed for double-bottom analysis.

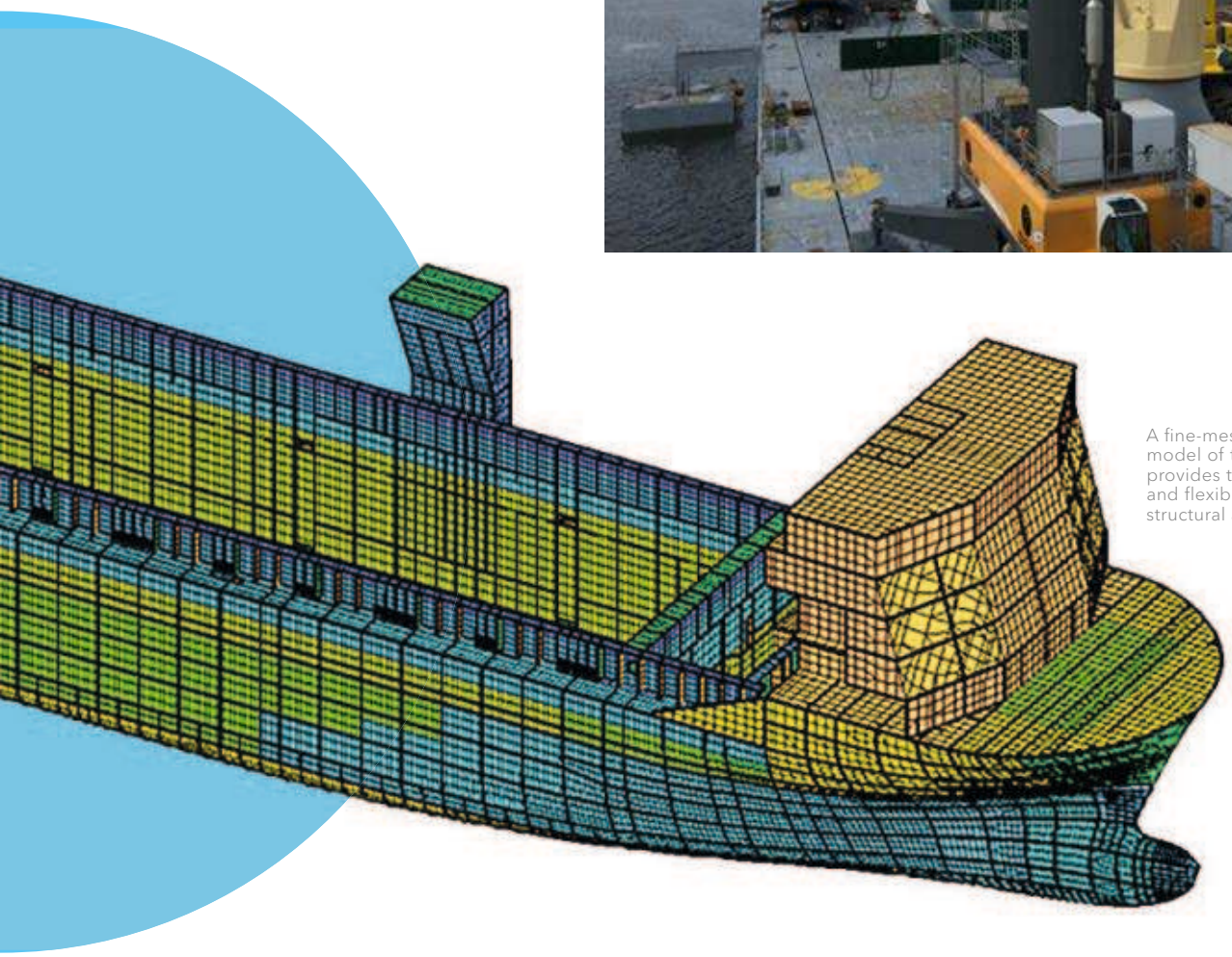
Ensuring the structural integrity and safety of the cargo as well as the ship itself are core concerns for the shipper, the vessel owner and operator, and their underwriters. Project-specific strength assessments focusing on proper sea-fastening as well as the structural integrity of the vessel and its cargo are therefore standard procedure in heavy-lift projects. In many cases however, the lack of a suitable structural Finite Elements (FE) model for the strength assessment is a bottleneck which can cause delays and additional costs.

Combined approach

Considering the variety of heavy-lift and project cargo jobs, a global 3D FE model of the entire vessel offers the greatest flexibility and coverage for structural assessment. Traditional global FE models with web frame spacing as a typical element size do not provide the required level of detail and structural resolution, especially when assessing the double-bottom area.

A new modelling approach developed in a joint development project (JDP) by DNV GL and Samsung Heavy Industries (SHI), called Advanced Whole Ship Analysis (AWSA), can help overcome this issue. AWSA combines global strength and cargo

Special cargo items transported by MPVs are getting bigger and heavier. A structural assessment of every project is crucial.



A fine-mesh AWSA 3D model of the entire ship provides the resolution and flexibility needed for structural assessment.

hold analysis based on fine mesh, i.e. frame spacing as a typical element size, with global FE models. Reusing these fine-mesh global structural FE models from the design phase for strength assessment calculations in heavy-lift projects during the operations phase is a very cost-efficient – if technically sophisticated – approach. Its flexibility makes it suitable for a wide range of applications, from simple double-bottom checks through to full-scale global strength analyses accounting for specific loading and sailing conditions.

Depending on the given organization, the available capabilities, and the required scope or level of analysis, strength assessments for heavy-lift cargo projects may be carried out either by the owner or operator of the vessel, or with support from DNV GL.

Development work on the AWSA-based life cycle approach continues, and the method is being streamlined to optimize it as a technically and commercially viable solution. Key items on the agenda include the question of ownership of various structural models, integration of the as-built status, and enabling fast and efficient load generation. **OD**

DNV GL Expert
Dr Olaf Doerk (OD), Head of Department – Structures, Maritime Advisory Germany
Phone: +49 40 36149-4861
E-Mail: olaf.doerk@dnvgl.com

Photos: DNV GL, courtesy of SAL Heavy Lift

SAFE TRANSPORT WITH AN "OPEN TOP"

Multi-purpose vessels (MPVs) carrying oversized cargo too large to close the hatch covers face a regulation dilemma. Working with industry stakeholders, DNV GL wants to close this gap.

When an MPV carries oversized project cargo in its cargo hold, the hatch covers must sometimes remain open. However, the load line convention and other rules prohibit ships from operating with open hatch covers on the open sea because of the risk of taking on water and losing stability. Open hatch covers also can pose fire safety risks. The IMO MSC Circular No. 608 "Interim Guidelines for Open-Top Container Ships" define measures and precautions to establish a level of safety equivalent to that of closed-hatch vessels. DNV GL offers its "Hatchcoverless" class notation which confirms compliance with relevant requirements. However, since MSC/Circ. 608 is tailored for container vessels, it cannot simply be applied to MPVs, due to the different type of cargo carried; the relevant flag states need to be involved in all projects subject to these interim guidelines.

Freeboard

Voluminous project cargo is often not very heavy and rarely utilizes the full deadweight capacity of the vessel. Assigning a second load line at a reduced draft for open-top operation to increase the freeboard reduces the likelihood of water entering the cargo hold, which again has a positive effect on the mandatory model test and on intact stability in flooded condition. Most flag states have issued instructions for switching from one load line mark or certificate to the other, which is quite common among tankers.

Model testing

MSC/Circ. 608 requires seakeeping model tests to determine the likelihood of water ingress into the open hold. An important parameter is the vertical centre of gravity (KG) or metacentric height (GM) value. The IMO guidelines require model tests to use a GM value that is most relevant for real-life operation. While container vessels generally use a GM value close to the limit curve, MPVs are expected to sail with higher GM values because of their cargo characteristics.

Working together with the Hamburg Ship Model Basin, DNV GL developed an approach using a worst-case GM value, caused by a resonance of the wave encounter frequency with the ship's rolling period in beam seas. This assumption would cover all conceivable loading scenarios. An alternative approach would be to use a maximum GM chosen by the customer as an upper limit for open-top conditions in the GM limit curve. Additional

Open-top operation is a specific challenge for multi-purpose vessels.

tests using the minimum GM from the limit curve for the three worst wave directions from the first test using the maximum GM value are to be run in this case.

Damage stability

An important input parameter for damage stability analysis is the assumed permeability of the cargo hold. While for container vessels the value ranges between 0.7 for a loaded and 0.95 for an unloaded cargo hold, an MPV carrying project cargo may have low displacement even when the load is extremely voluminous. A permeability value of 0.9 would be adequate for a reasonably conservative calculation for both the subdivision draft and partial draft.

Intact stability

MSC/Circ. 608 requires proof that the vessel is able to survive the accumulation of water in the cargo hold, also referred to as a flooded cargo hold condition. For container vessels, a flooding level up to the hatch coamings is required. This appears to be rather extreme even in a worst-case scenario. Water ingress into the hold can either be caused by green seas or heavy rainfall. The amount of green water entering is determined during the model tests. The capacity of the vessel's bilge system must be designed to handle the expected amount of green water. As for heavy rainfall, the worst precipitation ever recorded worldwide reached a 1,825 mm water column within 24 hours, according to the World Meteorological Organization. Based on this information, a water ingress equivalent to around a two-metre water column in 24 hours would be a very conservative assumption. What is more, under normal circumstances the crew will use the ship's bilge system to remove the accumulated water and manoeuvre the vessel out of the affected area by means of weather routing. It should also be noted that open-top vessels are required to carry redundant bilge pumps. Assuming a cargo hold completely filled with water doesn't appear reasonable as it would mean both redundant bilge pump systems being out of order and heavy rainfall eventually combined with rough seas lasting for several days, which is extremely unlikely to happen and conflicts with the idea of "one failure at one point in time" – a key principle normally assumed in SOLAS regulations. DNV GL suggests revising the water level assumption for the analysis of an MPV under flooded cargo hold condition to a more realistic value.

MSC/Circ. 608 main requirements	Adaptations needed for multi-purpose vessel
Freeboard	Dual load line recommended
Strength in "intact flooded condition"	
Initial & periodical surveys	
Open-top model test	GM in resonance or upper limit for GM to be considered
Damage stability	Cargo hold permeability to be adjusted for maximum draught and partial draught
Intact stability	Cargo hold flooding level to be redefined, based on realistic rainfall assumptions
Hold bilge dewatering system	
Fire protection	Water spray system with suitable subdivisions or fire monitors
Dangerous goods	No DG in "open-top" mode

MSC/Circ. 608 main requirements and areas requiring modification for MPVs.

Fire protection

A fixed CO_2 firefighting system would be ineffective with open hatch covers. A water spray system must be used instead. On an MPV, it should be subdivided into sections of suitable length, for example 20–25 metres each, arranged along the cargo hold so that at least two sections operate simultaneously. An alternative solution would be to install a fixed power monitor system with at least two water monitors located on deck, one at the aft and one at the forward end of the cargo hold. On an MPV carrying project load, this would allow the cargo hold to be covered entirely by the monitoring system and conventional firefighting equipment, and a water spray system for cooling the sides of the cargo hold could be omitted.

Dangerous goods

For dangerous goods in packaged form the provisions given in MSC/Circ. 608 are to be followed. Dangerous goods in bulk are expected to be carried in closed spaces only, in line with IMBSC code.

Single voyage exemption

Ships intended for frequent open-top carriage of large project cargo should be designed accordingly. When a vessel operates in open-top condition only occasionally, DNV GL can help the owner obtain flag state approval for a single-voyage exemption, which typically involves a freeboard increase, wind and weather restrictions, weather routing, fitting of additional submersible pumps, daily inspections of the hold and bilge alarm, isolation of the cargo hold CO_2 fire extinguishing system, prohibition of combustible cargo and a DNV GL survey of the arrangements before the voyage starts.

Outlook

DNV GL plans to further refine and finalize its guidelines for open-top MPVs in an open dialogue with industry stakeholders. With appropriate support from the industry, in particular from flag states and some additional experience, the DNV GL guidelines may eventually form the basis of a submission to IMO. **JB/MB**

DNV GL Experts
Jost Bergmann (JB), DNV GL Business Director MPV
Phone: +49 40 36149-6756
E-Mail: jost.bergmann@dnvgl.com

Mark Bronsert (MB), Senior Approval Engineer
Stability, Load Line & Tonnage
Phone: +49 40 36149-5315
E-Mail: mark.bronsert@dnvgl.com

Photos: DNV GL, courtesy of SAL Heavy Lift

KEEPING PACE WITH ENVIRONMENTAL REGULATIONS

The environmental impact of the shipping industry remains a topic of keen interest for regulators, with agreed regulations entering into force in the near future and new regulations being developed around the world. Understanding the evolving regulatory landscape is of strategic significance when making business decisions.

Over the past decade, shipping has seen a surge of environmental regulations. Political pressure and an increasing focus from society at large have driven the International Maritime Organization (IMO), various countries and regions such as the EU to develop steadily more stringent regulations. The consequence is a patchwork regulatory system, where numerous overlaps create challenges for operators. There are unfortunately no indications that this will change. It is important for operators to both understand the existing regulatory framework and be aware of forthcoming developments, both at IMO and elsewhere, in order to make the right business decisions.

Ballast water management

Ballast water management has been a hot topic for a number of years. As of end-July, the Ballast Water Management (BWM) Convention is only 0.13 per cent short of the gross tonnage ratification, with in particular ratification by Finland appearing to be both imminent and sufficient. DNV GL thus believes the threshold will be crossed sometime this year. The convention will then enter into force one year later, requiring all ships to comply within the following five years. The content and interpretation of the convention are still evolving. Presumably the IMO Marine Environment Protection Committee (MEPC) 70 will finalize the revision of the technical guidelines in October. There are presently 65 IMO-approved BWM systems on the market.

The national ballast water management regulations of the United States entered into force in 2013. New ships now have to comply upon delivery, while existing ships must comply by the first scheduled dry docking after 1 January 2014 or 2016, depending on ballast water capacity. US type approval is required for the ballast water treatment systems of affected ships; so far no such approvals have been granted. To address the obviously paradoxical situation of having to install approved systems when none have obtained type approval, the US Coast Guard (USCG) has issued more than 50 so-called Alternate Management System (AMS) approvals for systems accepted by IMO. These approvals are limited to a five-year validity period. To ease the transition further the US is also liberal in granting time-limited exemptions to individual ships. We believe that once US-approved systems

DNV GL SOFTWARE TOOL FOR UPCOMING RULES

To help owners stay ahead of new developments related to upcoming IMO and ILO regulations, DNV GL offers a software tool called "RequirementExplorer", which allows customers to browse upcoming new rules and regulations. The tool is available on My DNV GL. It enables efficient searches using ship type, keel-laying date, size and other properties as search criteria.

Protecting marine ecosystems is an important goal for the shipping community but the regulatory ecosystem causes headaches.

Photos: DNV GL, Talia Cohen/Unsplash

become available the extension policy will become significantly more stringent.

For more information on different ballast water topics such as treatment systems and approval process please visit **dnvgl.com/bwm**.

SO_x regulations

Discussions at IMO are centred on the question of whether the global 0.5 per cent sulphur content requirement should enter into force in 2020 or 2025. An IMO commissioned fuel availability study has been submitted to MEPC70 and will provide a discussion basis for IMO deliberations. It is worth noting that a separate, independently commissioned study also has been submitted, and that the two studies reach very different conclusions. >

DNV GL ECO INSIGHT PROVIDES VISIBILITY INTO FLEET PERFORMANCE

With its performance monitoring tool "ECO Insight", DNV GL offers a convenient means to keep abreast of upcoming MRV requirements and ensure timely compliance:

- ECO Insight's proven onboard data recording application integrates all traditional ship-to-shore reporting into one solution.
- Extensive technical and ship-specific plausibility checks deliver high-quality data without "MRV non-conformities".
- Data is automatically compiled in EU and IMO formats for uploading to the respective servers.
- Data serves as basis for comprehensive fleet performance management using ECO Insight, helping to cut operating costs.

The ECO Insight portal is a gateway to higher operational efficiency.

> It therefore remains in doubt whether the IMO will be able to conclude at MEPC70 in October 2016. A further complicating factor in the discussions is the EU Sulphur Directive, which stipulates a maximum 0.5 per cent sulphur content for all EU waters by 2020, irrespective of the IMO decision. If different dates are decided by IMO and the EU, shipping will for a period face a three-tier sulphur content regime. From an operational perspective, this will be challenging.

It should also be noted that the Water Framework Directive is putting constraints on the discharge of scrubber water in certain EU countries. Belgium and Germany have in essence prohibited the discharge of scrubber water in most areas, severely constraining the operation of open-loop scrubbers. Other EU countries are following suit to a lesser or greater degree, with no common EU practice likely to be agreed. China has recently published regulations for SECA-like fuel requirements in certain coastal areas (see box below).

More information and our updated Sulphur guideline are available at **dnvgl.com/lowsulphur**.

NO_x regulations

NO_x Tier III requirements have entered into force in the North American ECA for ships constructed on or after 1 January 2016. In essence, anyone constructing a ship today needs to consider potential operation of the vessel in the North American ECA, whether upon delivery or at some time in the future. If such an operation pattern is conceivable, NO_x control technology will be needed for that ship. In contrast to the North American ECA the ECAs in the North Sea and the Baltic do not yet include a NO_x requirement. Joint North Sea/Baltic NECA applications have now been made to MEPC 70. Assuming agreement at IMO these Tier III requirements will apply to ships constructed on or after 1 January 2021.

CO_2 and energy efficiency

Climate change remains the driving political force behind CO_2 and energy efficiency regulations. In the EU, regulations for Monitoring, Reporting and Verification (MRV) of CO_2 emissions have entered into force, requiring all ships above 5,000 GT sailing to or from European ports to comply. Ships must also report cargo data and average energy efficiency. The EU will make the data publicly available on an annual basis. Monitoring plans are to be submitted to verifiers by 31 August 2017, with 2018 being the first year of reporting. Data will be published by the EU in mid-2019. There is extensive work in progress to develop the practical framework and the EU is expected to finalise most practical details towards the end of 2016.

Part of the purpose behind the EU MRV regulations is to encourage IMO to work on a similar mechanism with global, not only regional, coverage. The EU has stated that if this happens it will mothball its regulation. It is therefore of great significance that MEPC 69 did agree on a global mechanism for mandatory

CHINA IMPOSES SULPHUR LIMITS AND MIGHT ESTABLISH SECA ZONES

China has published regulations to establish SECA-like sea areas outside Hong Kong/Guangzhou (Pearl River Delta) and Shanghai and in the Bohai Sea. In a staged approach, the new regulations impose an initial 0.5 per cent sulphur limit for fuel burnt in key ports within these areas, gradually expanding the coverage to finally encompass these sea areas entirely from 2019 onwards. The sulphur limit might be lowered to 0.1 per cent as of 2020, and a formal ECA application may be submitted to IMO.

Photos: DNV GL, Talia Cohen/Unsplash

monitoring, reporting and verification of fuel consumption data for all ships above 5,000 GT. The scheme is expected to be adopted at MEPC 70, in which case 2019 will likely be the first year of operation. However, the scheme differs from the EU MRV in several important aspects, including confidentiality of data, calculation of efficiency metrics and requirements regarding the verification of data. While the European Commission sees the IMO work as an important step forward it seems unlikely to view the mechanism as robust enough to reverse its own course on the MRV scheme. DNV GL expects that the shipping sector will have to deal with two different but overlapping reporting regimes for at least some years.

IMO is also seeing a reinvigorated discussion on long-term CO_2 emission goals following the global climate change agreement reached in Paris last year. There is as yet no agreement within IMO regarding the need to move beyond establishing a fuel data collection system, and it remains to be seen whether consensus can be reached. DNV GL sees a very real risk that unless significant progress is quickly made at IMO, other bodies outside the shipping industry may attempt to issue regulations. This would not be of benefit to anyone, least of all the shipping sector itself.

Open questions regarding the upcoming EU MRV scheme

The new EU MRV regulation is coming: in August 2017 shipping companies will have to hand over their new "monitoring plans" to their verifiers, and monitoring of "CO_2 emissions based on fuel consumption" will begin in January 2018. How exactly verification is to be performed remains somewhat unclear. DNV GL expects most issues to be settled towards the end of this year, but with a few left open until summer 2017.

Some shipping companies are bracing themselves for the new regulation. DNV GL MPV customers like Jüngerhans (Germany) or Masterbulk (Singapore) have invested in advanced fleet performance management and are using the DNV GL ECO Insight portal. ECO Insight includes voyage reporting software which automatically delivers pertinent MRV reporting data. The solution also makes the verification process much easier by giving the DNV GL verification team access to relevant information.

Shipping companies facing the issues described in the info box on the right are advised to take action now to ensure compliance with the EU MRV regulation. ▮ **EN**

All technical and regulatory news can be found at **dnvgl.com/tecreg**.

DNV GL Expert
Eirik Nyhus (EN), Director Environment
Phone: +47 926 23 818
E-Mail: eirik.nyhus@dnvgl.com

ISSUES TO CONSIDER WHEN PREPARING FOR THE UPCOMING EU MRV REGULATION

There is no voyage reporting available / taking place
In shipping it is widely accepted practice to report the position, time, speed, distance, consumption, cargo, weather and other key data at key points of a voyage, including the departure, beginning of sea passage, noon and end of sea passage. If no such reporting routine is in place, or if reports are sent to the charterer only but not to the owner, this needs to be changed. Only vessels sailing exclusively in EU waters or executing more than 300 voyages in one year are exempt from voyage reporting.

Voyage reporting is done via plain e-mail without any further onshore processing
Many voyage reports are simple, daily e-mails in a defined format which are sent by the master to a list of recipients. Most of the recipients use these messages to simply confirm that the vessel is still "alive". The data stays on the mail server without undergoing any further onshore processing. DNV GL believes that a proper electronic voyage abstract will be required for verification. Creating such a record manually from hundreds of e-mails every year for every vessel of a fleet will be an impossible task.

Voyage reporting data is not processed further / data quality is unknown
Even if the voyage data is electronically available in an onshore database, the biggest challenge remains: without further processing for purposes such as post-voyage calculations or performance management, the quality of the data may be compromised by issues such as a broken voyage event sequence, missing reports, incorrect time stamps or positions and implausible consumption, cargo or speed data. Under the MRV scheme, this will result in denial of verification or even a poor EEOI ranking and damage to the owner's and operator's reputation.

Shipping companies facing at least one of these issues should address them now. Where a proper voyage reporting system is in place, the data should be processed, for example as part of a performance management scheme. Apart from the obvious benefits of performance management, doing so will improve data quality. Where no voyage or noon-time e-mail reporting is customary, an appropriate software-based voyage reporting system should be implemented which will deliver MRV reports automatically and run internal checks to ensure proper data quality. The DNV GL ECO Insight on-board reporting tool Navigator Insight is the most common application worldwide.

Find more DNV GL blogs at
blogs.dnvgl.com/performance

THE NEXT WORKHORSE

Being able to rely on in-house operating expertise when designing a new ship is definitely an advantage. The German MPV owner Briese and its partners have developed a next-generation vessel for their fleet that combines all the features tomorrow's ships will need to prevail in the market.

It is all about fleet performance, and at Briese Schiffahrt, nothing is left to chance. Based in Leer, Germany's second largest ship-owning centre after Hamburg, the company is a leading global owner of heavy-lift and multi-purpose cargo vessels. In a highly competitive market environment plagued by overcapacities, Briese manages a fleet of roughly 150 ships. Most of them are operated by Briese's subsidiary, BBC Chartering.

Any port, any cargo – wherever something big and heavy needs to be transported, BBC is never far. "Our ships are designed for flexible deployments and reliable carriage of practically any conceivable cargo," says Raymond E. Fisch, Senior Vice President Strategic Projects at BBC Chartering.

But the demands are getting tougher. "There is a clear trend towards bigger and more expensive cargo, especially in the project business, and it forces us to be even more flexible," says Fisch. To cope with stricter environmental regulations, the growing importance of the "environmental footprint", and enormous cost pressures, and to prevail in the market, shipowners must invest in innovative technology. In Leer, the future is now: together with its partner shipowners Krey Shipping and Auerbach, Briese has launched the next MPV/HL generation, the 12,500 dwt Eco Trader MPV 500. Six ships, built at the Chinese shipyards Jiangsu Hongqiang Marine Heavy Industry and Jiangxi Jiangzhou Union Shipbuilding, will be commissioned, with unique characteristics designed to meet future market requirements.

This is the second time Briese and Krey have jointly developed a multi-purpose vessel with heavy-lift capability in the 12,000 dwt category. The last one, first built around the turn of the millennium, became the workhorse of the business segment. Its innovative successor promises to follow in its footsteps as the next workhorse of the industry – and an icon of eco-friendly trading. Based on market observations, new technologies, and statistical evaluations of the company's fleet and its operating profiles, the Briese newbuilding team identified seven areas on the legacy vessel with wide-ranging improvement potential (see info box).

Flexible and economically feasible

"We call it the Magic Seven of optimization," says Bernd Boening, Newbuilding Manager at Briese Schiffahrt. The first Eco Trader, the *BBC Birte H.* owned by Krey Shipping, is in service already. "The data from her virgin voyage have exceeded our expectations. We hope that our long-term findings

FACTS & FIGURES

- **Classification:** GL + 100 A5 E3 BC G IW BWM (D2)DG DBC LC EP-D + MC E3 AUT strengthened for heavy cargoes, equipped for the carriage of containers and dangerous goods
- **Deadweight (summer):** abt. 12,500 mt
- **Max. draft (summer):** 8.10 m
- **Length o.a.:** 147.00 m
- **Breadth moulded:** 22.80 m
- **Service speed:** 15.0 knots
  Fuel consumption: 16.0 mt RMG 380 fuel per day at sea
- **Cargo hold capacity:** 17,600 cbm / 621,537 cbft
- **Main hold dimensions:** 76.50 m x 17.60 m
- **Floor space under deck:** 2,950 sqm / 31,753 sqft
- **Floor space on deck:** 2,170 sqm / 23,357 sqft
- **Crane capacity:** 2 Liebherr cranes situated portside
  at 18 m outreach: 250 mt capacity each / 500 mt combined
  at 33 m outreach: 120 mt capacity each / 240 mt combined
  Lifting height: > 35 m at 10 m outreach

will confirm this first impression," says BBC Senior Vice President Fisch. Drawing the right conclusions from practical experiences is standard procedure at Briese Schiffahrt, and a key success factor for the current newbuilding project. "You have to be intimately familiar with the interrelated requirements of the shipowning and affreightment businesses that the new vessels will have to live up to," says project head Boening. It is extremely helpful to work closely with the charterer, who can provide all the relevant information regarding long-term market trends as well as cargo types and their handling requirements, he adds.

"The most important criteria for the design concept are economic feasibility and flexibility," says Boening. It begins with determining the size of the ship, followed by the optimization of the hull for the intended cargoes and operating modes, and the performance requirements for the cranes and their interaction with the hatch cover system, through to the selection of the best propulsion system. "A good hull shape is always the fundament for fuel efficiency," says Boening. A statistical analysis of the speed, draught, and trimming records from roughly two dozen ships in the Briese fleet was the starting point for developing the future operating profile and defining the optimization targets for the Eco Trader's lines plan.

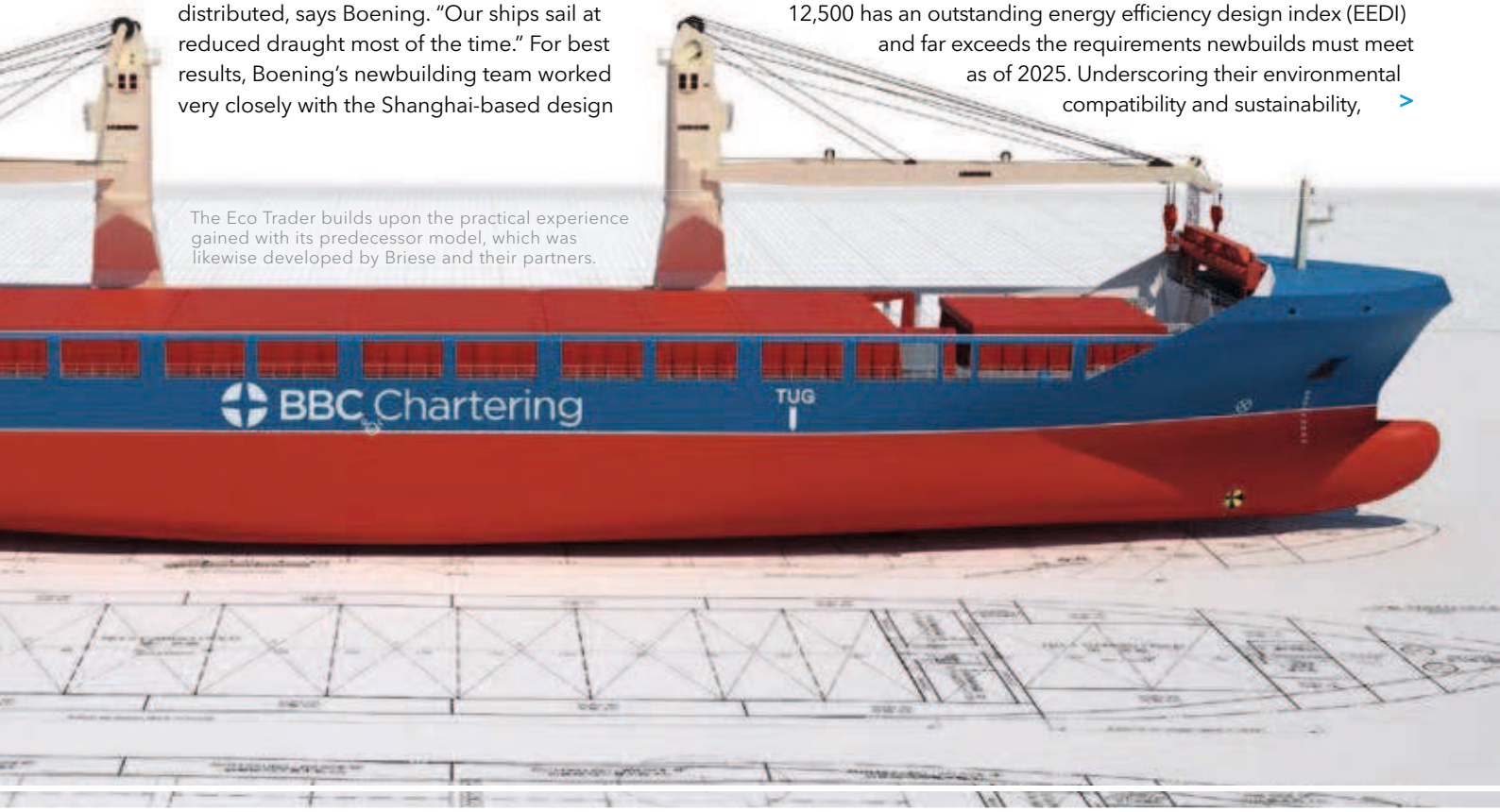
Photos: Briese Schiffahrt, BBC Chartering

Typical project cargo with large block dimensions usually doesn't exhaust the ship's carrying capacity, an important aspect for the designers to consider.

Team spirit and top technology

A single-point optimising of an MPV hull only for full draught would be a grave mistake. Plenty of volume but often little weight: in the project business, where an MPV may haul rotor blades for wind turbines or FPSO accommodation topsides, the ship's payload is rarely fully utilized. What is more, the load is often not evenly distributed, says Boening. "Our ships sail at reduced draught most of the time." For best results, Boening's newbuilding team worked very closely with the Shanghai-based design team, overseeing and directing its activities. After all, the quality and sustainability of the vessel will influence its value on the used ship market later on. "We reviewed a total of more than 300 design drawings," the project manager points out.

The classification society plays a key role in such a scenario. A host of topics needed to be discussed with the DNV GL ship type expert, says Boening. "Cooperation with DNV GL was excellent, we were supported by expertise and advice throughout the entire project." The result proves the Leer engineers right. The Eco Trader 12,500 has an outstanding energy efficiency design index (EEDI) and far exceeds the requirements newbuilds must meet as of 2025. Underscoring their environmental compatibility and sustainability, >



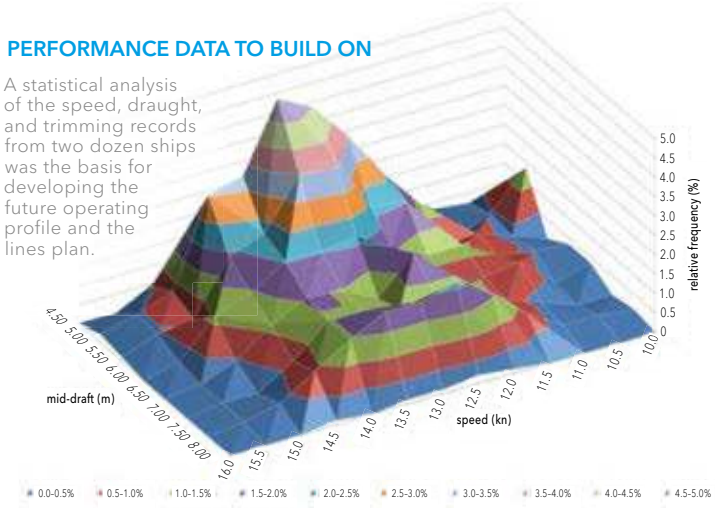
The Eco Trader builds upon the practical experience gained with its predecessor model, which was likewise developed by Briese and their partners.

Photos: DNV GL, Briese Schiffahrt, BBC Chartering

BBC Birte H. is the first Eco Trader to be commissioned. She will be followed by identical sister ships which can be used interchangeably.

PERFORMANCE DATA TO BUILD ON

A statistical analysis of the speed, draught, and trimming records from two dozen ships was the basis for developing the future operating profile and the lines plan.



> the DNV GL-classed vessels bear the additional EP-D class notation. "We are delighted to have contributed to this next-generation heavy-lift multi-purpose vessel," says Jan Rüde, Ship Type Expert MPV at DNV GL. "Market-leading DNV GL know-how in this segment has helped maximize cargo flexibility and minimize operating costs and risks so the vessel can meet future market demands."

All in all, the Magic Seven improvements have cut fuel consumption and CO_2 emissions by roughly 30 per cent compared with existing tonnage. Apart from the hull design and the application of a low-resistance, anti-fouling paint system which performs exceptionally well over the wide range of operating conditions the new MPVs will be exposed to in their deployment regions, the propulsion system is also of extraordinary importance.

A milestone for the segment

The MAN B&W 5G45ME-C9.5 engine is the vessel's new heart. The concept combines a low-speed, ultra-long-stroke design with full electronic control. The new G45 series, built by STX in South Korea under licence by MAN Diesel & Turbo and certified by DNV GL, is considerably more fuel-efficient than comparable engines. Taking advantage of this advanced engine technology is a milestone achievement for the MPV/HL segment.

The most important opportunity to reduce the required propulsion energy however is the use of a larger propeller. "The new G-type engine with its lower rpm range enables us to enlarge the propeller diameter from the legacy vessels' 4.9 metres to 5.7 metres, which gives the efficiency a real boost," explains Boening. Apart from the measures taken concerning propulsion power, speed-controlled cooling water pumps and engine room fans as well as an intelligent power management system for heat consumers will limit the demand for auxiliary power.

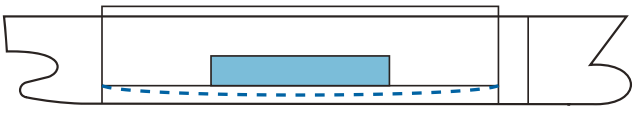
Fuel consumption and the propeller shaft power output are continuously measured and evaluated by an intelligent Performance Monitoring System. The data is available quickly and transmitted to the inland office as well. If the vessel is found to be operating outside its most efficient range, action can be taken immediately. "But the most important benefit is that the system raises the crew's awareness of efficient operating practices. That alone will make a big difference," says project head Boening.

Improved fuel efficiency is one major benefit of the new Eco Traders; increased flexibility and cargo handling performance is another. The cranes are the most important equipment on board a heavy lifter. "Customizing a standard product to make it an optimal fit for the ship and its cargo requirements is an art," says Boening. But capacity is not everything. Crane outreach, lifting heights, and the fine-tuning between the crane and the hatch cover system are major performance-enhancing features.

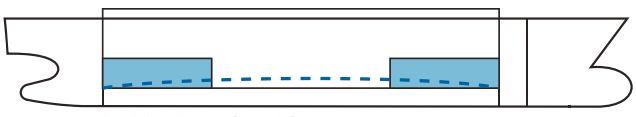
Each Eco Trader has two 250-ton Liebherr cranes capable of delivering their full 500-ton capacity in tandem operation with an outreach of 11 m from the ship's side over the pier when using a lifting beam. The cranes can utilize a major portion of their lifting capacity across the entire deck area, which makes it easier to load and transport extremely bulky cargo items. The cranes are

SPECIAL LOAD CASES

Briese instructed the designers to account for special load cases which involve block loads (r.) and HL crane operation to determine the stability and strength limits. Class rules did not require this in the past. Briese amended their stability manual to provide the crew with reliable information for extreme cases. DNV GL has incorporated these specific load cases for project shipping into its new rule set.



Case 1: Midships block loading



Case 2: Block loading aft and fore

MAGIC SEVEN OF OPTIMIZATION

1 LOWER FUEL CONSUMPTION

- Achieved by: individual hull line optimization to owner specifications, reviewed by FutureShip and the Hamburg Ship Model Basin (HSVA)
- Two-stroke main engine plus fixed propeller with largest possible diameter
- Low-resistance anti-fouling hull coating system
- Performance monitoring system
- Speed-controlled cooling water pumps and fans
- Power management system for heat consumers

2 FAST LOADING AND UNLOADING

- Combined weather deck hatch system with folding covers and only two pontoon covers which are self-driven
- Tween deck covers can be moved using the cranes' auxiliary hoisting gear
- Cranes can be used in continuous bulk operation
- No stabilization pontoons

3 NO SHIPPING ROUTE RESTRICTIONS

- Great Lakes / AMSA / US fitted
- E3 ice class
- Draught allows to call draught-restricted ports

4 DESIGN OPTIMIZED FOR PROJECT CARGO

- Long hatch (no. 2 hatch – 76.5 x 17.6 m), hold is near-box-shaped, no steps, width narrows to 12.5 m only over the final 9.75 m of the aft portion of the long hatch
- High permissible deck loads (tank top: 18 t/m²; in three areas 25 t/m²; LR2 tween deck: 4 t/m² / LR1: 2.5 t/m²; weather deck: 4 t/m² on folding covers / 8 t/m² on pontoon covers)
- Enlarged usable deck area thanks to lateral cargo rails; bridge panel between hatches 1 and 2 and superstructure above engine room
- In ballast, the ship can lift 500 tons
- Crane outreach in tandem operation with heavy lift beam, 2 x 250 tons: 10.9 m from side of ship over the pier
- Extended crane lifting height (more than 35 m with 10 m outreach / more than 30 m with 20 m outreach)
- Meeting room for project meetings on poop deck
- Two guest cabins plus one spare cabin for customer representatives

5 FLEXIBILITY

- Interchangeable with sister ships as well as (conditionally) legacy 12,000 dwt vessels (identical hold width)

6 LOWER OPERATING COSTS

- High-quality equipment ensured by makers list

7 "GREEN SHIP" IMAGE

- EP-D class notation (Environmental Passport)
- EEDI below 2025 limit

"Cooperation with DNV GL was excellent, we were supported by expertise and advice throughout the entire project."

Bernd Boening, Newbuilding Manager
Briese Schiffahrt

also approved for continuous bulk operation. The developers at the Rostock-based crane manufacturer Liebherr MCCtec worked closely with the Briese newbuilding team. The list of requirements they received from Leer was long, but the result was well worth the effort: "No other ship in our fleet offers better crane reach and lifting heights," says Boening. Because of the ship's dimensions, there is no need for stabilization pontoons. "This allows us to utilize all of the available space for payload."

A combined hatch cover system consisting of mainly folding covers and only two pontoon covers in the midship area between the cranes will avoid time-consuming cargo turnover. The main cargo hold is 76.5 metres long and 17.6 metres wide, and the tank top can bear deck loads of up to 25 tons per square metre. "The two-hatch system has increased loading flexibility significantly," says Boening. "The new ships can carry large, bulky cargo such as wind turbine rotor blades below deck."

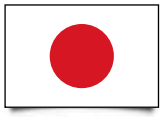
Greater flexibility

Amidships, the two pontoon covers which close the gap between the folding covers can carry 8 tons per square metre. "Using both hatch covers together we can transport very heavy single cargo such as cable reels with a gross weight of up to 3,750 tons not only below deck but also on deck," says Boening. The movable tween decks, which can be lifted using auxiliary hoists, support up to 4 tons per square metre, further increasing cargo loading flexibility. Special attention was given to the vessel's stability and strength limits for safe operation (refer to info box "special load cases").

Any port, any cargo – the fact that each Eco Trader is interchangeable with her sister vessels and, with some limitations, with her predecessor series as well, gives BBC Chartering even greater flexibility in the market. This is especially helpful for fleet performance management, which is much more complex in tramping than in liner or cargo type-specific shipping. "Making the best possible use of a ship's capacity is the high art of affreightment," says Fisch. But competition is tough in tramping, and follow-on jobs are difficult to plan. Innovative, highly cost-efficient and flexible ships make business a lot easier. After all, fleet performance makes the difference. **PL**

DNV GL Expert
Jan Rüde, Ship Type Expert MPV,
Ship Structures and Outfitting
Phone: +49 40 36149-4172
E-Mail: jan.ruede@dnvgl.com

ADAPTING TO CHANGING MARKET EXPECTATIONS



Most Japanese shipping companies have traditionally focused on trades to and from Japan utilizing vessels built at domestic yards. Prompted by changing trade patterns, especially in the project cargo market, Japanese owners are entering new markets where more efficient and flexible MPVs are needed.

For Japan as a high-tech country par excellence, a focus on sophisticated, highly specialized vessels in a fiercely competitive shipbuilding industry is plain common sense. High quality and timely delivery have always been hallmarks of Japanese shipbuilding. Today Japanese yards are strong in efficiency-enhancing and eco-friendly technologies. With the demand for high-value tonnage and leading-edge designs increasing, driven in part by offshore wind energy as well as remote oil and gas exploration initiatives, Japanese shipbuilders are ready to seize the opportunity to develop and build next-generation MPVs.

There is a clear trend towards larger and more sophisticated MPVs, especially ships designed for specific trades or purposes, such as heavy lifters or offshore vessels – fields of expertise where DNV GL can provide the unique know-how highly professional owners appreciate. These ships serve a market where cargo operations are planned precisely, cargo officers attend ships during critical operations, and safety and risk management are on top of the agenda.

At the same time, ensuring flexibility to accommodate a broad variety of cargo types, in particular project cargo, as well as global tradability are key objectives for Japanese MPV owners. Common applications today include open-top transport, voyages with topped-up cranes, or heavy-lift vessels capable of using tandem cranes for extreme loads.

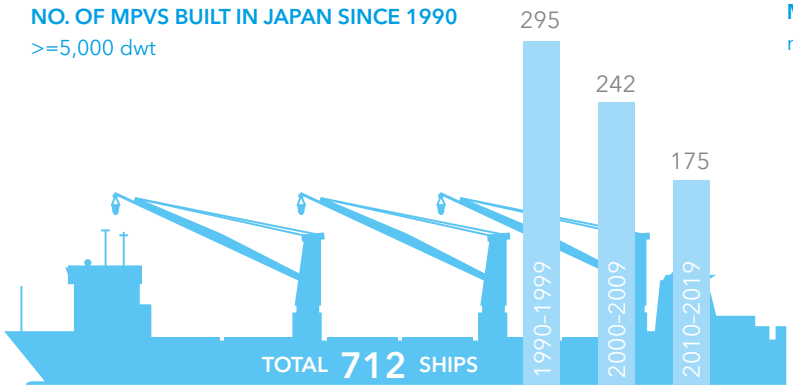
Among Japan's top yards is Shin Kurushima Group whose Shin Kurushima Dockyard Co. Ltd. (SKDY) and Shin Kochi Jyuko Co. Ltd. jointly account for the biggest share of the advanced MPV market. Honda Heavy Industries Co., Ltd. has also been supplying MPVs to European owners in addition to its traditional Japanese market.

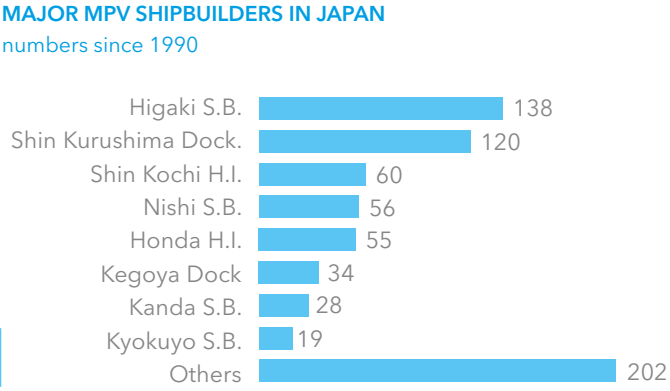
Shifting focus

"Japanese shipping companies have traditionally been relying on exports from and imports to Japan," explains Motoyuki Nose, Managing Director of Tokyo-based NYK Bulk & Project Carriers (NBP; see info box). "We should open our eyes and adopt a more global view. The Japanese economy has matured, and we shouldn't expect much further growth. Rather, we should shift our focus to other countries and regions where further economic growth is expected." For example, opportunities exist in South East Asian countries, such as steel exports from Indonesia and Vietnam, or between West Africa and Europe. "We should be ready to respond to changing industrial structures and markets and be more aggressive in grasping these new opportunities, even though markets may be tough and price competition intense."

In response to changing needs and expectations in the MPV segment, NBP's multi-purpose vessels deployed in the South Pacific accept a wide range of diverse, small-quantity transport tasks but also take on bulk cargo, containers or cars. NBP

Longer cargo holds, more powerful cranes, emission control: NBP Managing Director Motoyuki Nose bets on advanced vessels.





currently operates two heavy lifters equipped with 450t cranes on tramper service mainly in Asia. But market demand calls for MPVs with higher cargo efficiency, so NBP is planning to replace these two ships with newbuilds featuring more powerful cranes that will double their capacity. This will enable NBP to transport bigger project cargo but also larger quantities of conventional cargo between Japan and Europe. The new ships will have longer holds that can be used for a greater variety of goods.

"Future MPVs should be able to carry heavy and large project cargo, which requires more careful and stringent control of cargo handling and securing as well as improved navigation systems to ensure safe and efficient transport," says Motoyuki Nose. "At NBP we have established technical support teams to respond to new challenges facing our next-generation MPVs. Our teams comprise about 20 engineers with expertise in safe navigation, marine engineering and other fields and broad experience in the safe transport of break bulk, project and module cargo."

Market challenges

Today's newbuilding projects must account for the tightening global environmental requirements, such as NO_x and SO_x limits in ECA zones, which inevitably cause newbuilding costs to rise. NBP's motto, "Facing challenges with a pioneering spirit can create new business," defines the company's approach to such issues, reflecting a philosophy which has kept Japan's shipbuilding and shipping industry going in stormy times. "Value-added service sets us apart," says Nose.

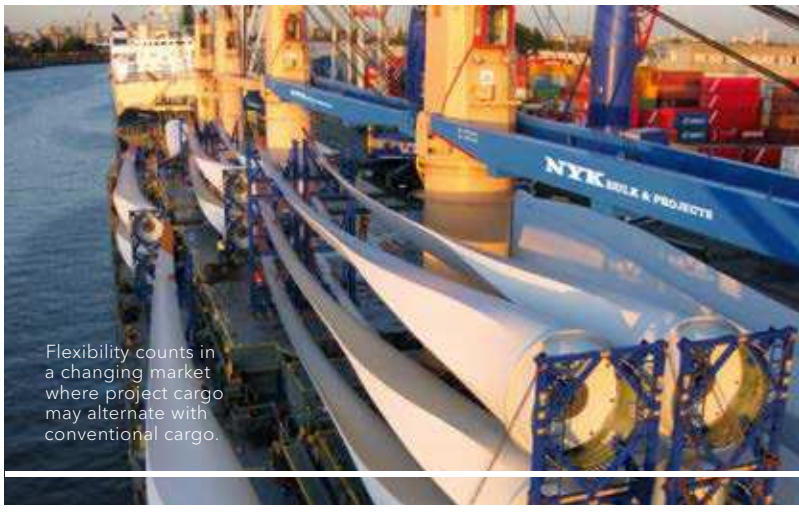
"Using alternative fuels such as low-sulphur fuel oil or LNG is one way to achieve cleaner operation, but the industry is still evaluating what might be the best solution," Nose explains. NBP ships may call at many ports lacking bunkering infrastructure for alternative fuels, so installing scrubbers would be the most realistic option. "However, technical challenges remain," Nose cautions. "This is where we depend on the scientific research and expertise of classification societies such as DNV GL. We are very thankful for the support we have received from DNV GL in ensuring safe ships and fleet maintenance. DNV GL has accumulated enormous knowledge and experience working with German owners specifically in the MPV segment, and we hope to continue benefitting from this knowledge in driving innovation, building better MPVs and launching new services." **YM**

DNV GL Expert
Yoshinori Miura (YM),
Head of Class Operations Japan
Phone: +81 78 291 1301
E-Mail: yoshinori.miura@dnvgl.com

BRINGING VALUE TO LIFE

NYK Bulk & Projects Carriers (NBP) is a wholly owned subsidiary of Japan's largest shipping company, Nippon Yusen Kaisha (NYK), and one of the world's leading ocean carriers of project cargo, heavy lift cargo, steel products and bulk cargo. "Bringing value to life" is the company's philosophy.

NBP was established in 2013 through the merger of NYK-HINODE LINE and NYK Global Bulk Corporation. NBP operates about 180 vessels. Its core fleet of about 140 vessels includes 40 crane-equipped MPVs and project vessels, two module vessels, and 100 Handy/Handymax vessels. NBP provides on-demand and modularized cargo transport as well as traditional semi-liner- and bulk services, covering routes from the Far East to Europe, North and South America, the Persian Gulf, India and the South Pacific including Tahiti and Fiji, as well as inter-Asian trades and routes between Europe and Africa.



Flexibility counts in a changing market where project cargo may alternate with conventional cargo.

Photos: DNV GL, NYK Line

A POWERFUL SOURCE OF INFORMATION

DNV GL has successfully used AIS data analytics to help customers in the MPV heavy-lift segment answer some key questions and increase revenue potential while reducing costs.

Originally introduced to improve navigational safety, Automatic Identification Systems (AIS) on board ships collect and transmit information such as the identification, position, and draught of the given vessel along with a time stamp. DNV GL has created a unique tool which combines analytics, processing, and data warehousing capabilities to extract meaningful information from AIS big data. The tool aggregates this information with existing technical ship data, such as installed engines, and granular geospatial objects, such as individual berths. DNV GL customers can use this insight for a great variety of business purposes to gain competitive advantage.

To give an example, the DNV GL tool can calculate a load factor for the main engine by comparing the calculated ship speed with the actual service speed. Based on the installed main engine power, specific fuel oil consumption (SFOC), and AIS-derived load factors, DNV GL can estimate fuel consumption at the speed over ground recorded since the last observation. All AIS records are then combined to generate vessel and fleet performance estimates for specific periods.

DNV GL has broad experience in supporting customers in the MPV heavy-lift segment using this tool and performing additional AIS data mining on billions of data sets and terabytes of preprocessed global fleet data covering several years. Given that all this data is in the public domain, DNV GL is not only able to analyse a customer's own fleet but also anonymized competitor performance data.

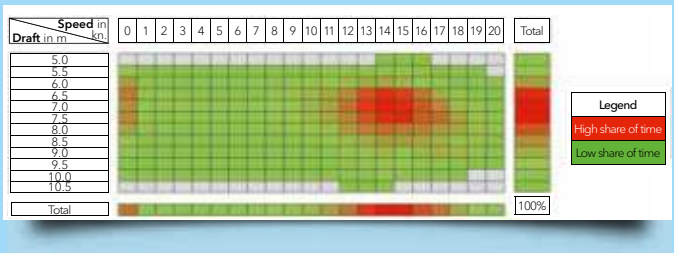
PUTTING THE SHIPPING INDUSTRY'S BIG DATA TO WORK

DNV GL has identified several areas where AIS data analysis can deliver answers to key operational and business questions:

Improvement area	Typical customer questions	DNV GL AIS-based analyses
Vessel design parameters	■ What are the most common actual speed and draft patterns to use as a basis for design parameter optimization? ■ What designs can be operated at higher operational speeds even in rougher sea conditions?	Analysis and benchmarking of actual operational profiles of individual vessels and entire subsegments
Deployment / revenue potential	■ Where do my competitors trade? ■ How well are vessels utilized on key trade routes?	Analysis and benchmarking of fleet and vessel deployment in comparison to utilization / value-adding time
Operational performance / fuel costs	■ What are my waiting times in key ports compared to competitors'? ■ Do my vessels operate with erratic speed patterns?	Analysis and benchmarking of fleet and vessel operational performance

BUSINESS INTELLIGENCE FOR HEAVY LIFTERS

Speed vs draught heat map example – MPV heavy-lift subsegment (share of time at speed / draft combination).



TRADE ROUTES

Deployment heat map example – MPV heavy-lift subsegment.

Improving vessel design

Newbuilding projects can benefit significantly from AIS-based analytical data, such as a specific vessel's actual speed and draft patterns over a chosen period of time, or data for an entire subsegment of the owner's or a competitor's fleet. This is especially valuable for customers planning to enter subsegments in which they have no prior experience and no data of their own. Information on operational profiles can be aggregated, for example in a speed vs draft heat map (refer to box), as a starting point for discussions about optimizing design parameters.

Additional insights can be gained by combining AIS data with other information, such as weather records. For example, a comparison of speed patterns from various ship designs at different wind speeds enables engineers to identify designs capable of operating at higher operational speeds even in rough seas without risking cargo damage.

Optimized deployment

Matching fleet or vessel deployment data with utilization information derived from AIS analyses can be a source of competitive intelligence and helps identify utilization and revenue improvement potential. This may include identification of top-performing loading and unloading ports or evaluating main trades by vessel subsegment or operator. Including navigational status information (such as "underway using engine") and draught conditions can be helpful when analysing big data involving AIS information. DNV GL generally tailors its analyses to the customer's needs, from reviewing specific subsegments or operators to investigating vessels or individual trades.

Operational performance

Analysing AIS data also helps identify potential for cutting fuel costs by benchmarking fleet and vessel performance. A proven approach is to benchmark fuel consumption within the customer's own fleet, then against competitors with similar operational profiles. AIS analysis can also be used to pinpoint specific areas of improvement, such as individual vessels exhibiting more erratic speed patterns than the relevant peer group – an indication of inefficient navigational practices. Excessive waiting times before entering ports would suggest inadequate ship-to-port communications and poor adjustment of ship speed to berth availability. With its AIS analytics services DNV GL can help operators resolve these and many other operational issues sustainably. **MS**

DNV GL Expert
Merten Stein (MS), Head of Department,
Shipping Advisory Germany
Phone: +49 40 36149-4052
E-Mail: merten.stein@dnvgl.com

Photos: DNV GL, Fotolia

TRUSTED EXPERTISE FOR MPV OPERATORS

Insurance providers, operators, authorities and other stakeholders have for decades been supported by the expertise of independent marine warranty surveyors to assess risks and monitor operations. Now the MPV segment can benefit as well.

Marine warranty surveyors (MWS) play a critical role in mitigating risk for major offshore projects and complex marine operations, ensuring that best industry practice and correct procedures are followed. They help protect customers' interests by performing independent reviews, verification and approvals of projects in sectors as diverse as offshore oil and gas, cargo stowage, towage and heavy-lift operations, shipyards, large construction projects, and ports and terminals. This is a consultancy service offered by DNV GL not connected to our more commonly known role as class.

DNV GL is a leading advisor on operational risks and the feasibility of working practices across all aspects of marine operations. Noble Denton marine assurance and advisory services by DNV GL has been active in the marine warranty market for more than half a century. DNV GL surveyors perform technical readiness audits for marine operations and provide independent and impartial advice to vessel owners, operators and underwriters.

Extending services to MPVs

All this experience from the offshore field can also benefit multi-purpose vessel (MPV) customers. Cargo units carried by MPVs are becoming increasingly heavy and voluminous; consequently the transport operations such as loading, lashing, carriage and unloading are becoming more complex and prone to risks. These

Marine warranty surveying experience gained in offshore operations can benefit MPV operators as well.

transports are sometimes part of the project scope, and sometimes arranged separately based on individual contracts. Independent, third-party approval can help shipping companies get better insurance policies at lower rates or obtain coverage within the client's or project CAR insurance policy. DNV GL has acted as marine warranty surveyor for example to verify the sea fastening in the transportation of:

- two huge jack-up installation vessels from Asia to Europe
- pipe reels from the US to Europe
- piles and jackets for wind turbines from Spain to the Baltic
- cables for an offshore wind farm from Korea to the Netherlands
- gantry cranes from China to Germany
- various turbines, generators, transformers and cold boxes.

Global teams of specialist engineers, mariners and naval architects work with customers to review documents related to a wide range of temporary-phase marine operations and land transport. Activities relevant for MPVs include load-out analysis review and approval for lifting, skidding and roll-on/roll-off procedures; transport analysis review and approval for operations such as sea-fastening, stability and motion response; and installation analysis, review and approval for lifting, mooring, float-overs and other procedures.

A digital first

In June 2016 DNV GL published its new standard DNVGL-ST-N001 Marine operations and marine warranty.

"This new standard combines best practices with the technical and analytical strengths and practical guidance from the DNV GL legacy companies," says Kim Rolfsen, Global Service Area Leader – Noble Denton marine services, DNV GL – Oil & Gas. "DNV GL pioneered the concept of marine warranty surveying in the 1960s. Since that time, our legacy businesses have been the industry's only organizations to continually produce industry standards for marine operations and warranty approvals. These have been followed by most marine contractors and even adopted by our competitors."

A digital interface available on the *My DNV GL* customer portal (refer to text box) allows industry professionals to utilize automated search functionality to retrieve project-specific requirements from the new DNV GL standard. This solution spares industry professionals the effort of having to sift through a 500-page standard looking for information relevant to their project. ■ **TH**

DNVGL-ST-N001 ON MY DNV GL

The *My DNV GL* customer portal provides industry professionals with an easy interface to submit details about the specific type of asset, operation and structural code they would like to be audited. The DNV GL online Standards Wizard will then select pertinent requirements from DNVGL-ST-N001 Marine operations and marine warranty. The wizard will generate a simple and clear document showing the elements of the standard needed to get on with the specific job.

DNV GL Expert
Thomas Hoffmann (TH), Head of Section Marine Operations DNV GL – Oil & Gas
Phone: +49 40 36149-4174
E-Mail: thomas.hoffmann@dnvgl.com

Photos: DNV GL, Krey Schiffahrts GmbH

SAFER, SMARTER, GREENER

Regional Maritime offices

Americas
1400 Ravello Dr.
Katy, TX 77494
USA
Phone: +1 2813961000
houston.maritime@dnvgl.com

Greater China
1591 Hong Qiao Road
House No. 9
200336 Shanghai, China
Phone: +86 21 3208 4518
marketing.rgc@dnvgl.com

North Europe
Johan Berentsens vei 109-111
Postbox 7400
5020 Bergen, Norway
Phone: +47 55943600
bergen.maritime@dnvgl.com

South East Europe & Middle East
5, Aitolikou Street
18545 Piraeus, Greece
Phone: +30 210 41 00 200
piraeus@dnvgl.com

Germany
Brooktorkai 18
20457 Hamburg, Germany
Phone: +49 40 36149-8786
region-germany.maritime
@dnvgl.com

Korea & Japan
18F Kyobo Bldg.
Jong-ro 1, Jongno-gu
110714 Seoul, South Korea
Phone: +82 2 734 7326/7
region.korea@dnvgl.com

South East Asia & India
16 Science Park Drive
118227 Singapore
Singapore
Phone: +65 65 0 837 50
sng.fis@dnvgl.com

West Europe & Africa
3 Cathedral Street
Palace House
London, SE1 9DE
United Kingdom
Phone: +44 207 357 6080
london.maritime@dnvgl.com

DNV GL AS
NO-1322 Høvik, Norway
Tel: +47 67 57 99 00
www.dnvgl.com

DNV GL – Maritime
Brooktorkai 18
20457 Hamburg, Germany
Tel: +49 40 36149-0
www.dnvgl.com/maritime

DNV GL
Driven by our purpose of safeguarding life, property and the environment, DNV GL enables organizations to advance the safety and sustainability of their business. We provide classification and technical assurance along with software and independent expert advisory services to the maritime, oil & gas and energy industries. We also provide certification services to customers across a wide range of industries.

Combining leading technical and operational expertise, risk methodology and in-depth industry knowledge, we empower our customers' decisions and actions with trust and confidence. We continuously invest in research and collaborative innovation to provide customers and society with operational and technological foresight. With origins stretching back to 1864, DNV GL's reach today is global. Operating in more than 100 countries, our professionals are dedicated to helping customers make the world safer, smarter and greener.

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