WHITE PAPER

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PROJECT CARGO MARKET

The Challenges of Ballast Water Management Compliance

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INTRODUCTION

If one word could sum up the issue of invasive alien species, the most fitting word would probably be "expensive." It is estimated that around 4000-7000 species are transferred daily in ballast water, and the cost of containing the damage caused by these globetrotting ocean critters rings in at approximately $14.2 billion per year in the USA, and €1.2 billion per year in Europe.

The resultant regulations, including the imminent International Maritime Organisation (IMO) Ballast Water Management (BWM) Convention and the United States Coast Guard (USCG) Ballast Water Management Regulations, aims to prevent the occurrence of transferring invasive alien species in ballast water by imposing limits on the number of viable organisms allowed in ballast water discharges. Albeit a positive step in the direction of an environmentally friendly shipping industry, the current regulatory situation is unequivocally confusing, and is the cause of a great deal of uncertainty among vessel owners and operators about how to comply.

Operators in the project cargo market are faced with particularly challenging issues, as the existing methods of compliance can prove difficult to implement on heavy lift transportation vessels, and, in particular, barges.

The aim of this paper, therefore, is to provide assistance to operators in the project cargo market, who may currently be experiencing uncertainly regarding what the new ballast water treatment regulations will mean for their ongoing business. Section 1 of this white paper will give an overview of the applicable legislation governing ballast water management, discuss how operators can expect the regulations to be enforced, and finally discuss the issues relating to compliance with these regulations. Section 2 of the paper will then proceed to discuss the various challenges faced by operators in the project cargo market in ensuring compliance.

[1] Barge Ballasting During Load Out of Carrier Section

SECTION 1 - CURRENT REGULATORY SITUATION

Around the world, different nations and regions are dealing with the transfer of invasive species by ballast water in different ways; In some areas, such as Canada and Panama, discharge of ballast water is prohibited entirely. In many countries such

as Brazil and Australia, ballast water exchange is allowed. Until the enforcement of the BWM Convention and the USCG ballast water treatment standard, ships won't be required to conduct ballast water treatment - however there are already some areas which are choosing to enforce legislation ahead of the official entry into force. For up to date information on "early adopter" areas currently enforcing legislation please visit our website.

This section will give an overview of current and upcoming ballast water management regulation, focusing particularly on the IMO's BWM Convention and the US Coast Guard Ballast Water Treatment Standard.

IMO Ballast Water Management Convention

The Ballast Water Management (BWM) Convention is a global regime which will enter into force 12 months after it has been ratified by 35% of the worlds shipping tonnage. As of January 2016 the ratification status stands a mere 0.5% from final ratification and looks likely to take place in 2016. For more up to date ratification status please visit our website via the link at the end of this paper.

Applicability

The BWM Convention shall apply to all vessel types operating in the aquatic environment which are designed to carry ballast water and are entitled to fly the flag of a party to the Convention. The BWM Convention includes two regulations covering ballast water management standards, aimed at reducing the risk of aquatic organism and pathogen invasions. These standards can be summarized as follows:

- D1 - the Ballast Water Exchange Standard
- D2 - the Ballast Water Performance Standard

Additional Requirements

In addition to these standards, the BWM Convention also requires every vessel to have onboard and implement the following:

- Ballast Water Management Plan – specific to each vessel and includes a detailed descriptions of the actions to be taken to implement the BWM Convention requirements onboard
- Ballast Water Record Book

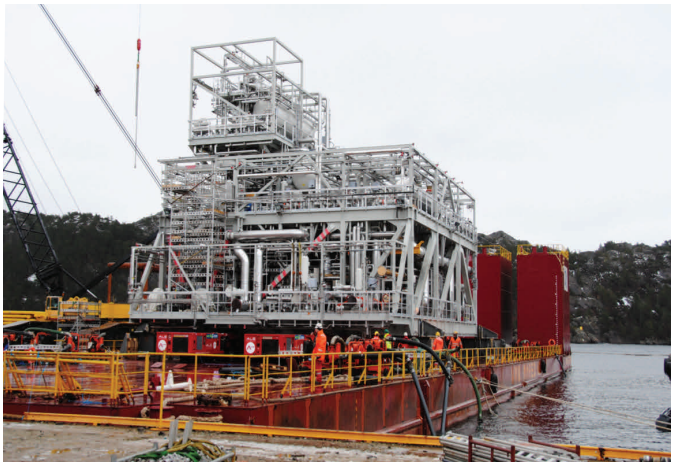
Constructed Year		Ballast Capacity (m3)	New Compliance Dates
Before 2009		Between 1500 and 5000	1st IOPP renewal survey after entry into force of the BWM Convention
		Less than 1500 or greater than 5000	1st IOPP renewal survey after the anniversary date of delivery of vessel in 2016
2009 or after		Less than 5000	1st IOPP renewal survey after entry into force of the BWM Convention
	Between 2009 and 2011	5000 or more	1st IOPP renewal survey after the anniversary date of delivery of vessel in 2016
	After 2011	5000 or more	1st IOPP renewal survey after entry into force of the BWM Convention

TABLE 1—IMO COMPLIANCE DATES (Ref – IMO Assembly Resolution A.1088 (28))

- International BWM Certificate – valid for 5 years before being subject to annual, intermediate and renewal surveys

Compliance Timetable

Ultimately, once entered in to force, the BWM Convention will require all vessels to install a BWMS that can meet the ballast water performance standard (i.e. Regulation D-2). However, the specific compliance dates for a vessel depend on the ships age and its ballast water capacity, as outlined in Table 1.



[2] Barge Ballasting During Load-Out of Module

Sampling

Under article 9 of the BWM Convention, port authorities can inspect vessels in order to verify the possession of a certificate and an approved BWM plan, inspect the ballast water record book and sample the ballast water. Under the G2 Guidelines and the MEPC Circular "BWM.2/Circ 42," the sampling and analysis for compliance is recommended to follow a two-step process:

1. Indicative Analysis (quick assessment of compliance potential)
2. Detailed Analysis (thorough analysis of compliance)

Whilst the regulations specifically restrict the port authorities from "causing undue delay to the vessel," the very nature of sampling ballast water of vessels is likely to be a time consuming exercise. Not only are there challenges in ensuring a representative sample is taken (sampling a few litres from a vessel carrying 1,000 tonnes of ballast water being a prime example of this issue), but the methods of testing compliance are still to be developed fully.

Delays due to port authority inspection and sampling therefore seem to be inevitable. Whilst not necessarily a huge problem for conventional vessels, any potential delays through inspection or sampling could pose a significant commercial risk for operators in the project cargo market as unplanned delays to the discharge of a cargo can result in significant incidental demurrage costs on labour, marine assets, land based plant and trailers. It is therefore of prime importance that the necessary documentation and procedures are in place, if nothing more than to minimize the potential delays, in the event that port authorities do turn up.

Enforcement

If a vessel is found not to be in compliance with the BWM Convention, then the Port Authorities can take action to warn, detain or exclude the vessel. A vessel may be allowed to exit the port to conduct ballast water exchange.

The BWM Convention makes it clear that sanctions for non-compliance will depend upon the law of the country.

US Coast Guard Ballast Water Discharge Standard

The USCG regulations for ballast water management entered into force on 21 June 2012. The USCG ballast water discharge standard requires that all ships entering US waters who intend to discharge ballast water, must carry out fouling and sediment management in addition to complying with the discharge standard. The USCG allow a number of methods of compliance, namely:

- Install and operate a USCG Type Approved BWMS
- Use only water from a US public water system
- Perform complete ballast water exchange in an area 200nm from any shore prior to discharging ballast water, unless required to use a BWMS
- Use an alternate management system (AMS) unless required to use a BWMS
- No discharge of ballast water
- Discharge to a facility onshore or another vessel for treatment purposes only

Note that the USCG will accept a BWMS that possesses an AMS approval, which permits the vessel owner to use the BWMS for a period of 5 years. Thereafter, the manufacturer of the BWMS installed must have obtained USCG Type Approval for the system, or the system must be replaced with a compliant, USCG Type Approved BWMS, or use another method of compliance. This process provides leeway for operators needing to comply but restricted by the fact that, as of January 2016, there are no USCG Type Approved systems available. There are, however, many systems with IMO Type Approval and AMS Approval.

Applicability

The USCG discharge standard applies to all vessels, US Flag and non US Flag, equipped with ballast tanks and operating in waters of the US unless specifically exempt. The USCG will exempt the following vessels from the discharge standards, however this does not exempt the vessels from the reporting or recordkeeping standards:

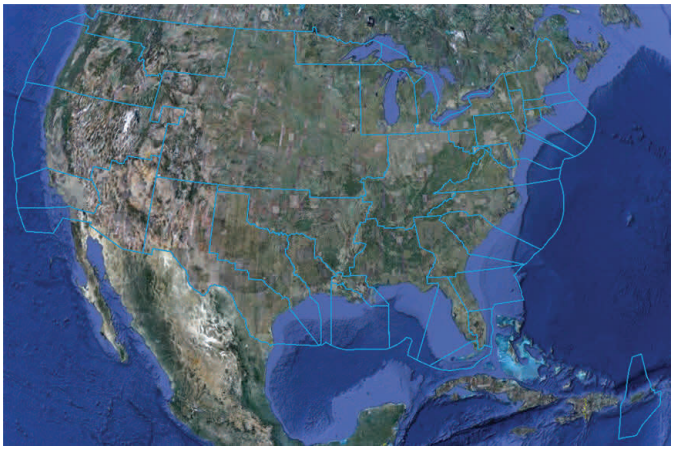
	Ballast Capacity (m3)	Date Constructed	Compliance Dates
New Vessels	All	On or after 1 December 2013	On delivery
	Less than 1500	Before 1 December 2013	First scheduled drydocking after 1 January 2016
Existing Vessels	1500–5000	Before 1 December 2013	First scheduled drydocking after 1 January 2014
	5000 or more	Before 1 December 2013	First scheduled drydocking after 1 January 2016

TABLE 2–USCG COMPLIANCE DATES (Ref – USCG 33 CFR Part 151 and 46 CFR Part 162)

- Seagoing vessels that operate in more than one Captain of the Port Zone (COTP), do not operate outside of the Exclusive Economic Zone (EEZ), and are less than or equal to 1,600 gross registered tons
- Non seagoing vessels
- Vessels that take on and discharge ballast water exclusively in one COTP zone

COTP Zones

The U.S is split into several COTP zones, as outlined in Image [3].



[3] USCG COTP Zones (Ref – Floridamarine.org – Based on USCG Title 33, Code of Federal Regulations Part 3)

Exclusive Economic Zone

The U.S. EEZ extends no more than 200 nautical miles from the territorial sea baseline and is adjacent to the 12 nautical mile territorial sea of the U.S., including the Commonwealth of Puerto Rico, Guam, American Samoa, the U.S. Virgin Islands, the Commonwealth of the Northern Mariana Islands, and any other territory or possession over which the United States exercises sovereignty.

Additional Requirements

In addition to having a USCG Type Approved or AMS Approved BWMS, each vessel must also ensure the following:

- Regularly clean ballast tanks, and dispose of sediments in accordance with local, state and federal legislation
- Only discharge the amount of ballast water necessary
- Rinse anchor and anchor chains when the anchor is retrieved
- Regularly remove fouling organisms from the vessels hull, piping and tanks, and dispose of any removed substances appropriately
- Maintain a ballast water management plan for each vessel on board

Compliance Timetable

The USCG requirements are currently in force, and are not subject to further ratification or review prior to entering in to force. Vessels will be required to comply with the dates identified in Table 2.

Sampling

The COTP must have access to the vessel to carry out inspections and take samples of ballast water and sediments. The master of the vessel must provide the COTP with the following information upon request:

- The vessels name, port of registry, official number or call signal
- Name of the vessel owner
- Whether ballast water is being carried
- Original location and salinity of ballast water taken on, before an exchange

- Location, date and time of any ballast water exchange
- Salinity of ballast water to be discharged into territorial waters of the US
- Intended discharge port and location for disposal of sediment, if sediment is to be discharged
- Signature of the master

The USCG regulations state that vessels with a BWMS installed can expect an USCG inspection. The issues of sampling and potential delays to vessels under the USCG Regulations are broadly identical to those of the IMO Convention, as discussed above. Ensuring the correct documentation is in place is of prime importance to help minimize these delays.

Enforcement

If a vessel is found to have violated the ballast water discharge standard, then the person/persons will each be liable for a civil penalty of up to $27,500 ($35,000 for vessels operating in the Great Lakes). Every subsequent day of continued violation will count as a separate violation.

Any person who is found to have knowingly violation the regulations will be charged with a class C felony.

SECTION 2 – BARGES – THE CHALLENGES OF COMPLIANCE

Estimated to make up only 3% of the world's tonnage, the barge industry is somewhat of an afterthought for most BWMS manufacturers. With such a huge commercial opportunity available in the remaining 97% of the BWMS industry over the next 5 – 7 years, and the complexities and engineering challenges associated with barge compliance, manufacturers have had very little motivation to adapt their systems for barge applications. Nonetheless, for barges involved in international trade, compliance is a very real and sobering thought.

[4] Barge Load-Out of "Cold Box" Module

This section of the paper seeks to outline the key issues of barge compliance and the key considerations that should be made when examining the options available.

Are Barges Required to Comply?

While intuitively unlikely to transport anywhere near as much ballast water as other vessel types, barges are indeed still required to comply with the regulatory requirements. The good news, however, is that there is some, albeit limited, scope for individual exemptions.

As outlined in Section 1, under USCG regulations, barges which operate within one COTP zone and don't travel outwith the EEZ are not required to comply with the discharge criteria, however must still comply with the reporting criteria, as outlined

in Section 1. Barges, however, that do trade between more than one COTP zone and/or outwith the EEZ, will be required to comply with the discharge requirements. The USCG also allows for applications to be made for exemptions on the grounds of the lack of Type Approved USCG systems. As of January 2016 there are no USCG Type Approved systems. These exemptions must be made at least 12 months ahead of a vessel's respective compliance date.

[5] Barge Load-Out of Decommissioned Platform

Under the IMO Convention, exemption applications can be filed for individual barges. The granting of exemption certificates will be based on the likelihood of the barge's trade transporting non-indigenous species, and the onus is on the applicant to demonstrate this likelihood. The BWM Convention outlines the criteria and risk analysis procedures required for exemption applications. Outwith barges operating exclusively on specific trade routes, as is the case with vessels such as ferries, exemptions may be costly and difficult to obtain.

It pays to be prepared and stakeholders should establish a dialogue with the relevant Flag State well ahead of the documented compliance dates, to ensure adequate time is available to undertake steps required for either compliance or exemption applications.

Compliance Responsibilities

With the capital investment required for compliance so high (at peak demand the cost of retrofitting a barge with a BWMS could cost as much as $1,000 per m3/hr ballast flow rate), it is important to understand with whom the responsibility for compliance lies. Within the project cargo market, on a typical transportation project, there are generally various operators involved. The ultimate responsibility for compliance, prior to implementation of the regulations, is somewhat ambiguous and is likely to vary, contractually, from project to project. Post implementation, however, the responsibility is likely to fall on the barge owner. A compliance solution that bridges this gap is needed.

Compliance Dates & Fleet Profile

Based on the documented compliance dates, it is important from an early stage to examine the fleet profile and develop an understanding of the ultimate compliance dates for each vessel in the fleet. At the time of writing, the typical lead time for a BWMS was around 4 – 6 months, and the entire retrofit process from concept study through to Class Approval of the installation design package, could be as long as 4 months itself, so the development of a comprehensive fleet compliance profile is critical to ensure adequate time is allowed for each vessel.

The penalties for non compliance are, as evident above, very strict, and as the industry begins to gather momentum, there is a strong likelihood that many end clients insist on chartering only vessels (or barges) that have a method of compliance in place. Building an understanding of the fleet profile and compliance dates is therefore not only critical to ticking the regulatory box, but could ensure the fleet remains competitive in future charter markets.

BWMS Technologies

Industry wide, the currently accepted method of compliance is to permanently retrofit a BWMS within the vessel. The capital costs of the BWMS itself, combined with the complexity of installation generally dictate the total cost to retrofit, however, at the time of writing, an average of $500 per m3/hr ballast flow rate is a sensible figure to work from.

With well in excess of 40 BWMS available on the market the selection of the most suitable system for a particular vessel has become a complex task. These 40 systems incorporate a wide range of treatment technologies, each of which offers their own benefits and drawbacks depending on the particular vessel applications. Ultimately there is no "one size fits all" solution, and the purpose of this paper is not to discuss each treatment technology in detail, however, BWMS can broadly be broken in to two categories:

- Inline treatment – whereby the treatment system operates as an integral part of the vessels ballast system and treats the ballast water as it is taken onboard/discharged
- In-tank treatment – whereby the treatment system acts to treat the ballast water within the ballast tanks after they have been filled

With in-tank treatment systems requiring up to 4 days treatment time, these tend to suit larger vessels with huge ballast tank volumes and long ballast journeys. It is therefore likely that inline treatment systems will be the most suitable for barge applications.

[6] Barge Transportation of Shore Cranes

Retrofit Practicalities

The practicality and complexity of retrofitting BWMS ranges from vessel to vessel, however barges present some very unique, and in some cases prohibitive, difficulties:

Tank Barges

Tank (or "dumb") barges face the most significant engineering challenges in order to comply. These barges generally don't have any machinery onboard and use portable deck pumps, or other temporary systems installed to the cargo deck for ballasting / de-ballasting operations. Nonetheless, they are still required to comply and will likely have to take drastic action in order to do so.

These barges will likely have to convert an existing ballast tank or void space into a new machinery space, install all required infrastructure (generators, cooling water etc) and ensure it complies with Class and SOLAS rules concerning machinery spaces. Overall a very complex and costly process.

[7] Barge Transportation of Aircraft Carrier Block

Power Availability

An often overlooked but undoubtedly important problem is power availability. BWMS technologies are generally power hungry machines, which doesn't fare well for barges, which tend to suffer from a lack of available power. In many instances the barge may require a whole new generator, and associated infrastructure, simply to provide enough power for the new BWMS.

Ballast Pumps & BWMS System Sizing

Another issue associated with retrofitting BWMS to barges is the disparity between ballasting requirements for operational purposes (load in/loud out operations) and the ballasting requirements for adjusting the sea-going condition of the barge. For operational ballasting, many barges are equipped with high capacity ballast pumps, ensuring the operational ballasting can be conducted as quickly as possible. Given that operational ballasting involves filling and discharging tanks in one location, there is strong likelihood that this ballast process will not require treatment (clarification of this point will be required with the relevant Flag State on a project by project basis).

Sea-going ballasting on barges (which will require treatment) would typically utilize the same, high capacity, ballast pumps, which has a significant impact on the complexity and cost of the retrofit process. A BWMS capable of treating higher flow rates will, intuitively, be physically larger in size, will require larger maintenance envelopes, will be more expensive and, in most cases, will require significantly more power to function.

However, for sea-going ballasting (which will require treatment), the barge does not necessarily require such significant ballast pump capacities and it may be a more cost effective solution for such barges with high capacity ballast pumps, subject to engineering suitability, to retrofit a smaller capacity ballast pump for sea-going ballast operations only, and install a suitably sized BWMS for this smaller pump, avoiding the issues outlined above.

Operators should investigate the various options available, undertake a detailed cost comparison and identify which is the best configuration for each vessel.

Ultimately, the retrofit installation of BWMS to barges is likely to be a complex, and costly engineering challenge with a number of very im-

portant considerations to be made. One way or another, the retrofit installation is likely to have an impact on the barge's future operation/ capabilities and it is important to take appropriate steps to mitigate this impact. It is critical to engage experienced engineers, whether it is internal engineers or an experienced external engineering consultancy, to begin looking at retrofit options well ahead of the documented compliance dates.

Return on Investment

Setting aside the complex engineering challenges associated with barges and BWMS compliance, there is also a very significant commercial decision involved. Even a modest fleet of 4 barges, each of which operating with ballast pump rates of 500m3/hr, could, at peak demand, require an investment in the region of $2million. For conventional vessels which use their BWMS on a daily basis, these figures may be somewhat palatable. For barges, however, which tend to have longer off-charter periods, and long mobilisation/demobilisation phases on each project, the BWMS could be used as little as 2 days per charter.

SUMMARY/CONCLUSIONS

This paper looks to assist the various stakeholders in understanding the key pieces of legislation and the requirements they pose on future operations. In addition to this the paper has sought to highlight many of the key, and often overlooked, engineering challenges associated with compliance.

Overall, operators within the project cargo market are faced with a complicated, costly and uncertain few years with regards to ballast water management compliance. With so few manufacturers, consultants and regulatory bodies willing to step forward and help this niche industry, the likelihood is that various, cobbled together, solutions will be implemented simply to ensure compliance.

For further information on solutions BWC is proposing to assist with these challenges, please visit our website:

www.ballastwatercontainers.com

MALIN GROUP

BWC is part of the Malin Group - a collection of companies under shared ownership which operates across a wide sector of the marine and offshore industries.

Malin Group can trace its origin back to 1899 and is steeped in a history of continued diversification and application of experience, particularly to the heavy lift transportation industry.

Malin Group companies are frequently involved not only as heavy lift contractors, but also as barge charterers. Indeed, BWC's innovative solutions were originally developed to solve the issue of compliance within Malin Group's own heavy lift transportation projects.

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