
Lloyd's Register

LIFE MATTERS

Ballast Water Management

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Ballast Water Management

- The BWM Convention an overview
- Approval process (both active substance and without)
- Overview of the treatment process and technologies
- Overview of the guide (how we got the data - and hence its limitations- and what the columns mean)
- System selection and installation considerations
- Impact of the regulations on the industry (supply and demand issues)
- US BW regulations



What is the problem?

Every 9 weeks a new species is introduced somewhere in the world

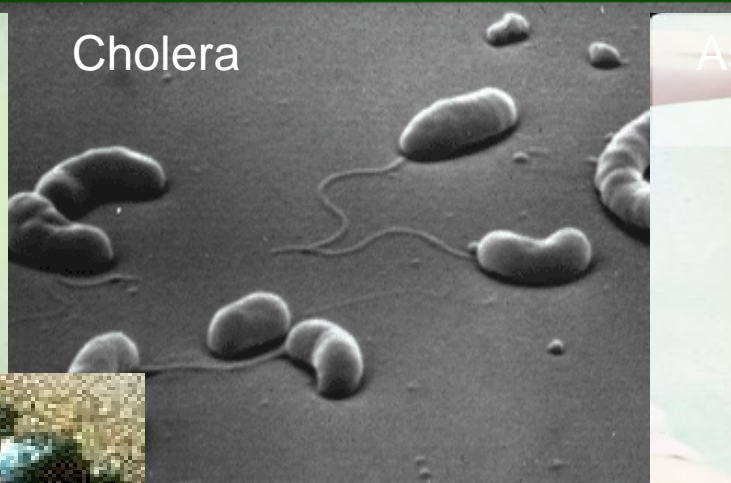
Every day, 7000+ species of plants and animals are transported in ballast

Every year the world's fleet moves 3 - 5 billion tonnes of ballast around the world

Some Species Found in Ballast Water



Plankton



Cholera



Asian Sea Squirt & green alga



Zebra Mussel



Rainbow Jellyfish



Mitten Crab

International Convention
for the Control
and Management
of Ships' Ballast Water
and Sediments

Adopted Friday 13 February 2004

When will the Convention enter into force?

The convention will enter into force 12 months after at least 30 States, the combined merchant fleets of which constitute at least 35% of the gross tonnage of the world's merchant shipping have ratified the Convention.

As of 1 May 2012 there are 33 ratifications of the Convention representing
26.46 % of the GT of the worlds shipping.

Albania, Antigua and Barbuda, Barbados, Brazil, Canada, Cook Islands, Croatia, Egypt, France, Iran, Kenya, Kiribati, Lebanon, Liberia, Malaysia, Malaysia, Maldives, Marshall Islands , Mexico, Mongolia, Montenegro, Netherlands, Nigeria, Norway, Palau, Republic of Korea, Saint Kitts and Nevis, Sierra Leone, South Africa, Spain, Sweden, Syrian Arab Republic , Trinidad & Tobago, Tuvalu

Which ships will the convention apply to?

The convention will apply to all ships including submersibles, floating craft, floating platforms, FSUs and FPSOs

- The convention will not apply to:
 - ships not designed to carry ballast water
 - warship, naval auxiliary or other ship owned or operated by a State, only on non-commercial service
 - permanent ballast water in sealed tanks

What does the convention require?

All ships will be required to:

- carry out ballast water and sediment management on all voyages
- have on board an approved ballast water management plan and a ballast water record book
- Ships of 400 gt and above subject to surveys and certification



What do I have to do and when

Vessels constructed in or after 2009:

Ballast water capacity less than 5,000m³; **Treatment only**

Vessels constructed between 2009 and 2012 **:

Ballast water capacity more than 5,000m³;

Exchange until 2016; **Treatment only** after 2016.

Vessels constructed in or after 2012:

Ballast water capacity more than 5,000m³; **Treatment only**.

What and when?

Built	BW M ³	2009	2010	2011	2012	2013	2014	2015	2016	
pre 2009 **	1500 - 5000	D1 or D2					D2*			
	<1500 >5000	D1 or D2							D2*	
2009	<5000	D2								
2009 to 2012 **	>5000	D1 or D2							D2*	
2012	>5000			D2						

D1 = exchange D2 = treatment

** comply by the first intermediate or renewal survey, which ever comes first, after the anniversary date of delivery – in the year it should comply

What do the national regulations require?

All the national regulations have two basic requirements:

1 - Ships should exchange ballast prior to arrival – when and where exchange must take place may be defined but is usually 200nm from land and in water of 200m in depth or more

2 - Ships should have on board a ballast water management plan - for Brazil and Norway approval of the plan is required.

3 - Additionally some regulations require a report form to be completed and either sent prior to arrival or made available on arrival.

In all cases keep clear records in the log book or in a ballast water record book

Ballast Water Treatment



LR Ballast Water Technology Guide

Download plus a
March 2012 update
from :

www.lr.org/bwm



Ballast Water Treatment

- Must be safe (For ship and crew)
- Must be environmentally acceptable.
- Must be cost-effective.
- Must work
- Must be approved



Treatment Processes

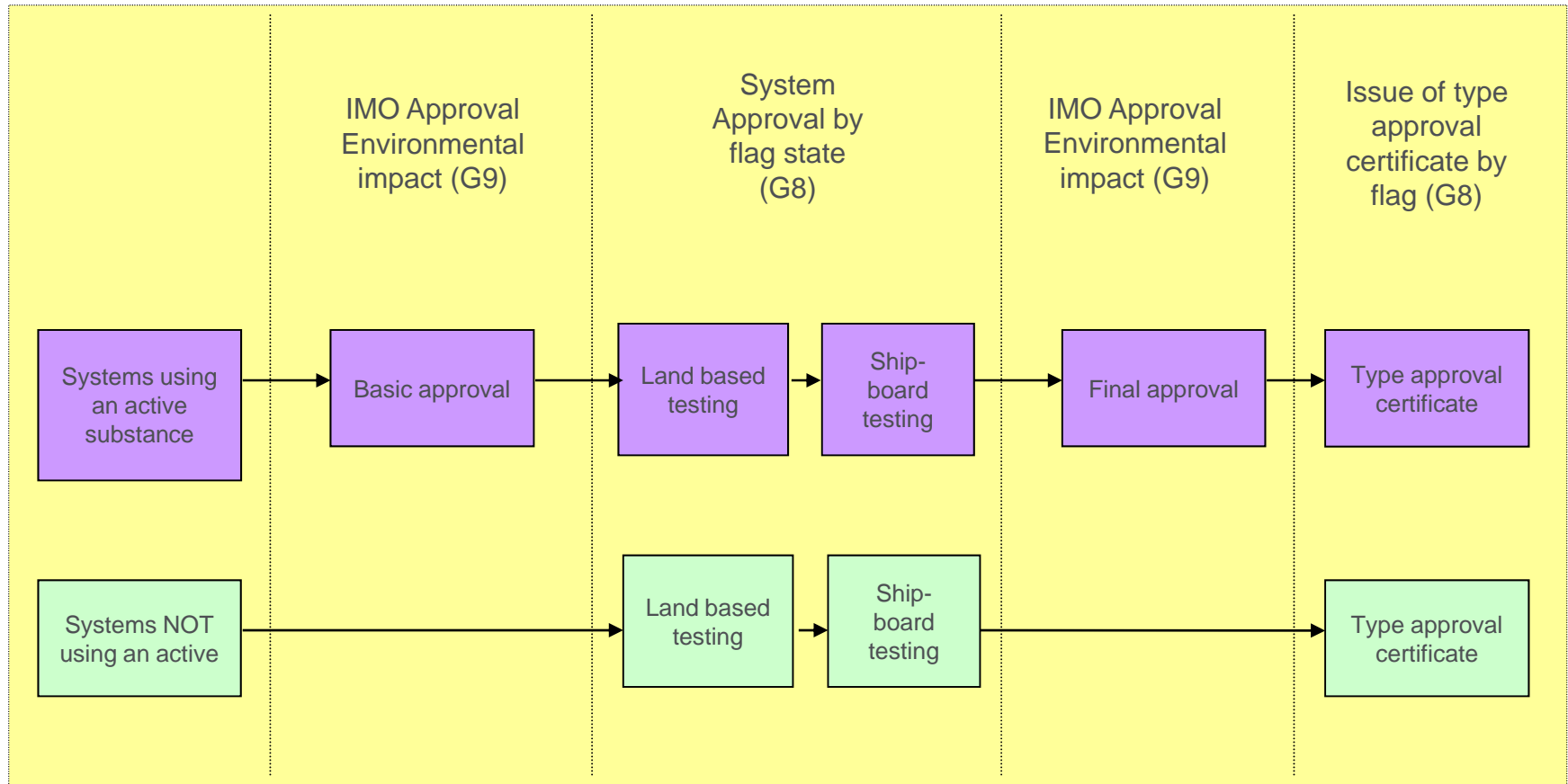
Physical solid-liquid separation	Disinfection	
	Chemical	Physical
Filter	Chlorination	De-oxygenation
Hydrocyclone	Electro Chlorination	Ultraviolet
	Chlorine Dioxide	Ultrasonic
	Hydrogen Peroxide	
	Peracetic Acid	
	Vitamin K	
	Ozonation	

Treatment systems

Items to consider when selecting a treatment system include

- Ship type
- Ballast capacity
- Space required (foot print and volume)
- Flexibility of location of system components
- Effects of pressure drop
- Integration with existing systems
- Certified intrinsically safe
- Power availability
- Health and Safety
- Hazard evaluation
- Effects on tank structure/coatings
- Availability of consumables, spares and support (servicing)
- Additional crew workload
- Crew training
- Capital and Operating Cost
- System availability – delivery time

The approval process



Approval Requirements

- Treatment systems to be approved in accordance with (**MEPC. 174(58)** **or MEPC.125(53))**) - the G8 guidelines
- If the system uses or produces an 'active substance' – the active substance will have been (basic and final) by the IMO (G9) Guidelines (MEPC.126(53))
- Currently **23 systems available and fully type approved** (in accordance with G8) others expected in the coming months

LR BWTS Type Approval



- Conducted on request from BWTS Manufacturer
- Independent certification and Product conformity:
 - To LR TA procedures 2002
 - To LR Rules as applicable
 - With reference to IMO Res. MEPC.174(58)
 - Other recognised standards as applicable

- Review covers:
 - Production facility visit – for quality control measures
 - Mechanical component appraisal
 - Electrotechnical appraisal – LR Test Spec No.1
 - Operational hazards assessment etc

LR BWTS Marine Design Appraisal

At request from the manufacturer

Review for compliance with LR Rules as applicable covering:

- BWTS general arrangement diagrams
- Piping and mechanical components
- Technical installation specifications
- Operational hazards and contingency measures

Specific ship installation Approval

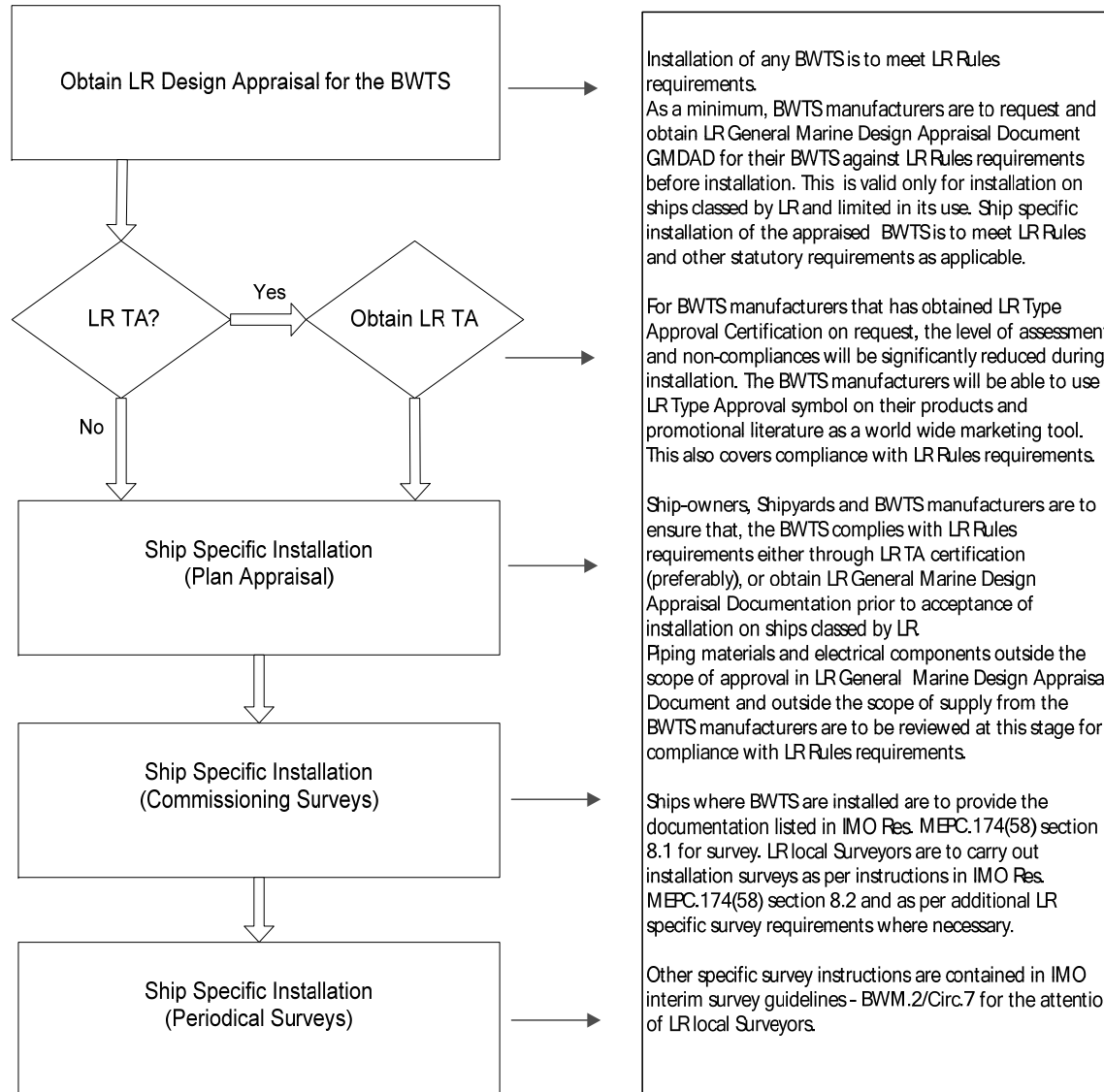
At request from ship builder or owners for retrofits

Submission and review of ship's specific installation plans against LR Rules which covers:

- Safe integration of BWTS with other systems
- Effects on other shipboard systems
- Installation location
- Stability, structural, fire and watertight integrity
- Piping and electrical cable routing
- Contingency measures to mitigate operational hazards
- Appraisal of components outside scope of supply from BWTS manufacturer
- Electrical installations in hazardous areas
- Safe storage and handling of chemicals
- Installation to manufacturers recommendations etc

Steps for installation on LR Classed Ships

RESPONSIBILITIES



Technical installation considerations

- Submission of plans
- Risk assessment
- Piping materials and components
- Provision for by-pass valve, alarms and records
- BWTS Filter
- Chemical supply, storage and handling
- Installation location
- Chemical/material compatibility
- Structural, fire and watertight integrity
- Suitable electrical equipment protection
- Provision of sampling points
- Restrictions of supply from hazardous to non-hazardous zones
- Apt peak tank connection
- Handling of hazardous by-products from the BWTS
- Handling of drains, cleaning fluid, filter backwash etc

BALLAST WATER TREATMENT SYSTEM PLAN APPRAISAL GUIDANCE

NOTES

PLANS AND PARTICULARS

The following plans (in diagrammatic form) and particulars are to be submitted for approval. Additional plans should not be submitted unless the arrangements are of a novel or special character affecting classification:

ENGINEERING

General arrangement of vessel
Ballast water arrangement
Type approval certificate for ballast water treatment unit
Ballast tank vent arrangement
Form Z500

ELECTRICAL

System block diagram
Description of operation
Test Schedule Hardware certification details
Software quality plan for programmable systems
Arrangement drawings for the hazardous locations As per Part 6, Chapter 1.2.5 & 6

BYPASS VALVE

Flanged valve only, cannot accept wafer or lug-type. Part 5, Chapter 12 Section 5.7.7 The required fire endurance level of the pipe is to be maintained in way of pipe supports, joints and fittings, including those between plastic and metal pipes.

BALLAST MAIN

Part 6, Chapter 2 Section 1.5 Essential services are those necessary for the propulsion and safety of the ship. Ballast pumps are included. Materials sensitive to heat are not to be used in piping systems essential to the safe operation of the ship, or containing seawater where leakage or failure could result in fire or in flooding.

If the ballast pipe line is fabricated from plastic it must be subjected to fire endurance test in wet conditions, 30 minutes as per IMO Resolution A.753(18) Appendix 2 refers.

VALVE CONTROL SYSTEM

Part 6, Chapter 1 Section 2.7.1 Where cargo, bilge, ballast, oil fuel transfer and sea valves for engine services are operated by remote or automatic control, the requirements of 2.7.2 to 2.7.5 are to be satisfied.

Part 6, Chapter 2 Section 1.6.3 Electrical equipment is to be suitable for its intended purpose and accordingly, whenever practicable, be selected from the List of Type Approved Products published by LR. A copy of the Procedure for LR Type Approval System will be supplied on application.

REMOTE CONTROL PANEL

Part 6, Chapter 2, Section 16.6 fire stop philosophy to be adopted for water ingress control/mitigation. Part 6, Chapter 2, Section 1.10 location and construction includes materials section 10 for cable. Part 6 Chapter 2 section 1.10.1. For IP ratings of electrical control equipment.

VENT

Part 5, Chapter 12 Section 1.1.2 Any by-products either noxious or flammable to be lead and vented to safe area. This also applies to ballast tank vents. Nitrogen and non-toxic or non-flammable gases are to be considered under other media heading of table 12.1.1 of Part 5 Chapter 12

BALLAST WATER TREATMENT UNIT

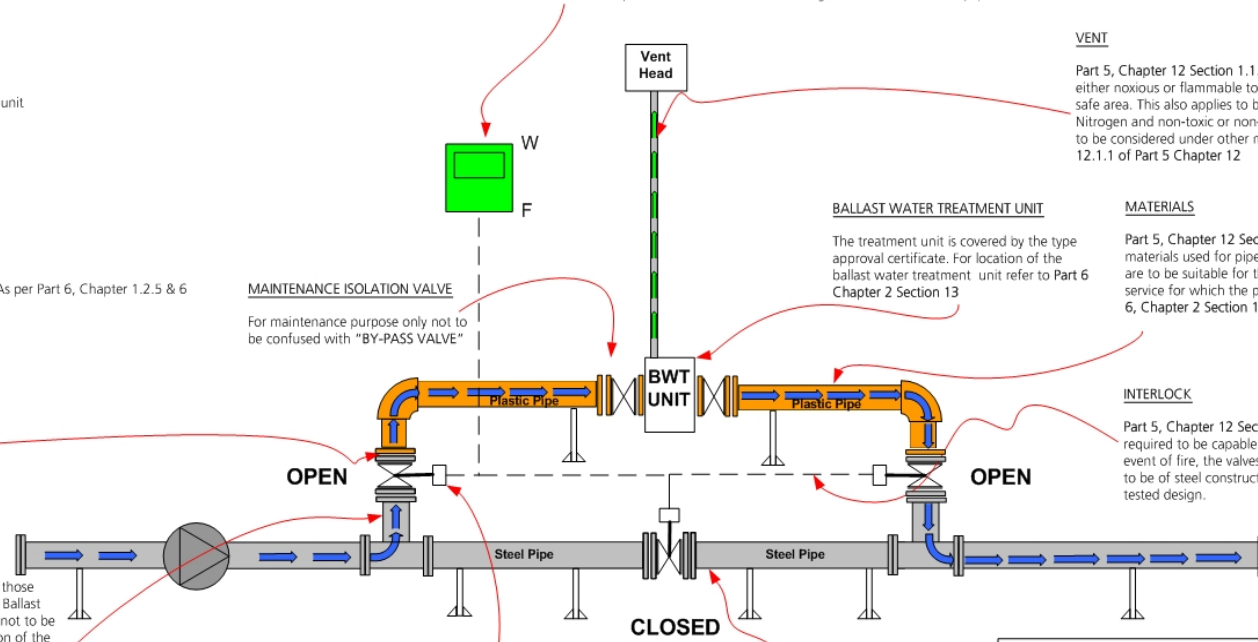
The treatment unit is covered by the type approval certificate. For location of the ballast water treatment unit refer to Part 6 Chapter 2 Section 13

MATERIALS

Part 5, Chapter 12 Section 1.1.2 The materials used for pipes, valves and fittings are to be suitable for the medium and the service for which the piping is intended. Part 6, Chapter 2 Section 1.12 Static electricity

INTERLOCK

Part 5, Chapter 12 Section 6.1.4 Where valves are required to be capable of being closed remotely in the event of fire, the valves, including their control gear, are to be of steel construction or of an acceptable fire tested design.



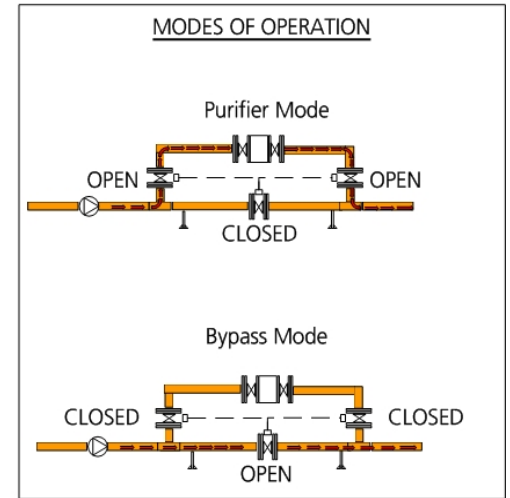
BYPASS VALVE

Part 5, Chapter 12 Section 6.1.3 Valves having isolation or sealing components sensitive to heat are not to be used in spaces where leakage or failure caused by fire could result in fire spread, flooding or the loss of an essential service. Fire test valve to ISO 10497 or equivalent.

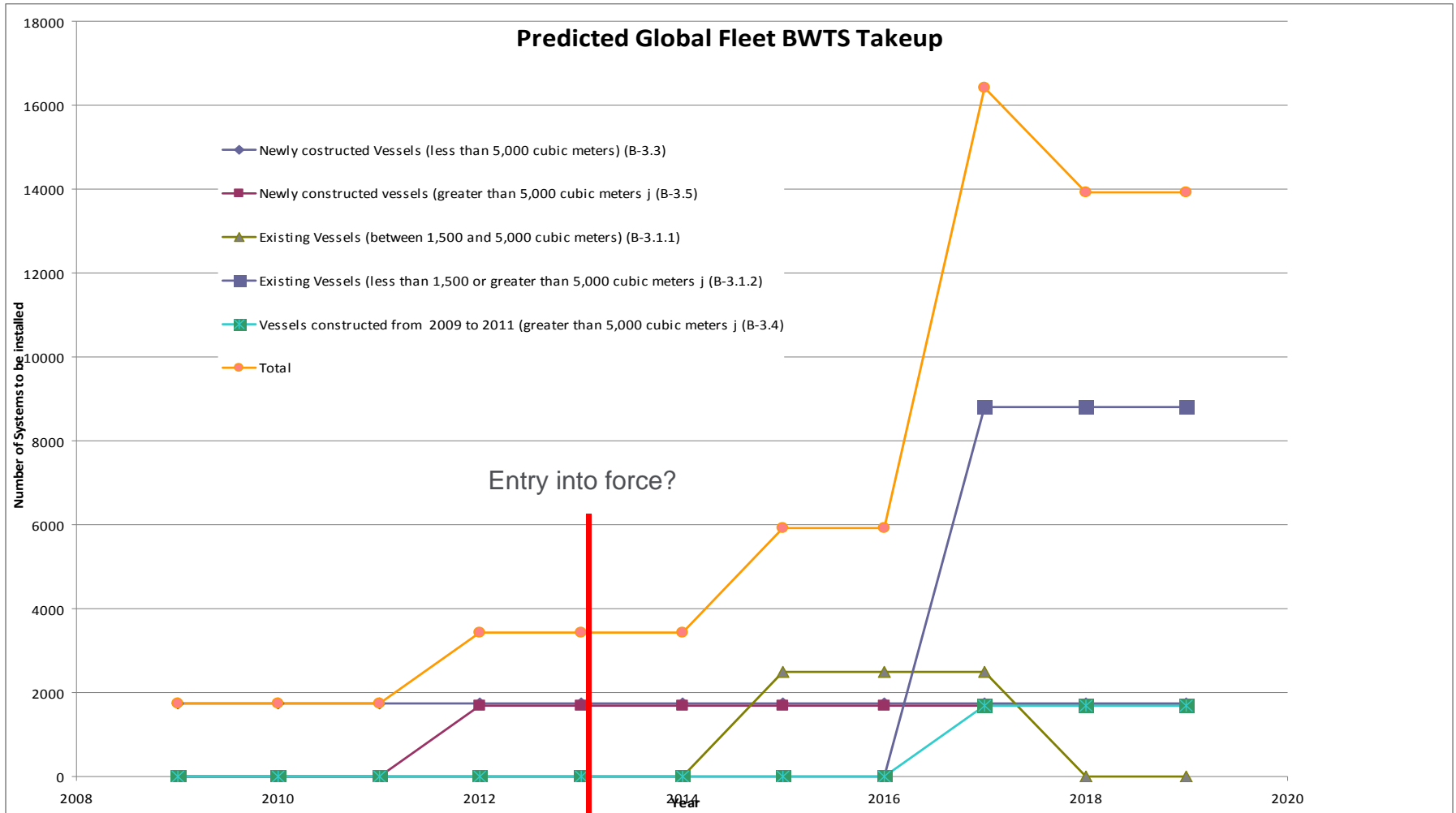
Part 5, Chapter 13 Section 2.5.10. Valves, intended for installation on the ship's side below the load waterline, are to be tested by hydraulic pressure to not less than 5 bar.

Part 5, Chapter 13 Section 2.5.7. Indicators are to be provided local to the valves and cocks, showing whether they are open or shut.

Part 5, Chapter 12 Section 1.5. For valves fitted to Class III systems manufacturers certificate is acceptable (Material Certificate 3.1.) Therefore approved type of valve not Type approved.



Global demand for systems



US BALLAST WATER REGULATIONS

US Ballast Water Management Rules

- Final federal rule making released 23 March 2012
- Effective 90 days later
- Treatment standard same as IMO Convention D-2 standard
- Different compliance dates to IMO Convention
- Treatment system to approved by USCG
- IMO approved system may be acceptable for five years if installed prior to date vessel required to comply with US regs
- USCG to review by 2016 if a higher treatment standard is achievable

US BW Treatment Regulations – compliance dates

	Vessel's Ballast Water Capacity	Date Constructed	Vessel's Compliance Date
New vessels	All	On or after December 1, 2013	On delivery
Existing vessels	Less than 1500 m ³	Before December 1, 2013	First scheduled drydocking after January 1, 2016
	1500-5000 m ³	Before December 1, 2013	First scheduled drydocking after January 1, 2014
	Greater than 5000 m ³	Before December 1, 2013	First scheduled drydocking after January 1, 2016

US Ballast Water Management Rules

The regulations will also require all ships to :

Clean ballast tanks to remove sediments

Rinse anchors and chains when and anchor is retrieved

Remove fouling from the hull, piping and tanks on a regular basis

Maintain a ballast water management plan to includes procedures for fouling and sediment removal and ballast water management –no requirement for the plan to be approved.

Maintain records of ballast water and fouling management

Submit a report form 24 hours prior to arrival

Other US BWM Requirements

- Vessel general permit requirements under review – new VPGP due 2013 may contain BWM requirements that differ from federal final rule
- Washing State has deferred BWM treatment standard pending outcome of VGP
- California BWM and bio-fouling regulations being reviewed

Conclusions - What does all this mean

- For the ship owner the increasing number of available systems and approvals means greater choice.

Does this lead to an easier choice of system?

- Complex decision making process in system selection.
- Must understand hazards associated with the system
- Major capital outlay
- For some ship types there may be difficulties selecting and/or fitting a system .
- Demand for approved systems is likely be greater than can be supplied.
- A huge demand will be placed on the services of flag administrations, RO,s , shipyards , engineering and similar providers.

Will the required services be scalable when required?

CONCLUSIONS

- New BW convention adopted by the IMO 13 February 2004
- The Convention will enter into force soon
- Some countries require ballast management now
- US Federal Regulations released 23 March 2012
- Ship design should take into account BWM and required equipment
- A BWM plan should be produced for ballast management operations to safeguard the ship
- Lloyd's Register can offer assistance

Ballast Water Management

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