Ballast water regulations

Assessing the options for compliance

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TECHNOLOGY AND EFFICIENCY | BALLAST WATER COMPLIANCE
November 2018

Industry must act now to plan ballast w compli

Bottlenecks could drive prices up

September 2024 seems far away, but from this date onwards, ships must have a ballast water management system installed, certified and ready to use, or use other methods to comply with the discharge standard. Penalties may apply for non-compliance.

Installing a ballast water management system? Planning is key:

- Which system will work on your ship? There is a range of technologies to choose from. No one system fits all. If choosing a chemical-based system, pay careful consideration to the safety of the crew, availability of chemicals in all ports and the increased operating expenditure because of the use of the chemicals.
- Most systems are sold as a package and, while it should be easy to replace simple components, it could be problematic to find more complex spare parts in all parts of the world in case of a problem or breakdown of the system.
- Is the system approved for the US as well as for the rest of the world? For US-approved systems, each component must be US approved. If one of these spare parts becomes unavailable, the US approval may become void.
- Carry out due diligence of the manufacturers to assure global availability of spare parts and shore maintenance – also long term.
- Who will train your crew to operate the system in which you have invested a large sum?
- Investing in, and installing, a good ballast water management system can increase the resale value of the ship, but recycling a ship using the chemical-based system could be more expensive.
- If your ship is nearing the end of its operational life, is now the time to invest in expensive new equipment or is it time to recycle?

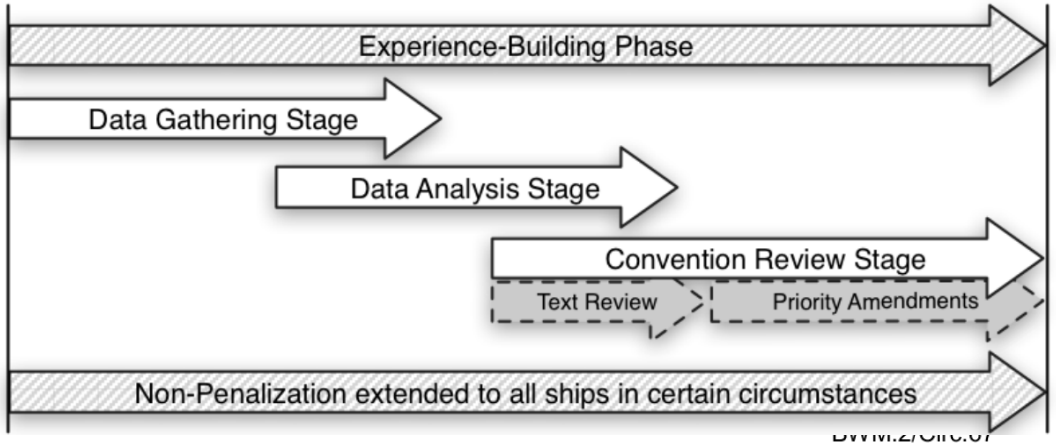
Onboard training and all information in one place

Ballast water management

Today's Focus

- Experience Building phase (EBP)
- Non-penalisation
- Scrutinising indicative testing
- Future regulation around biological sampling and testing methods affect crew testing procedures
- Possesing non- complaint water
- Future challenges

Experience building phase (EBP) – Sep -2017 to Autumn 2022



Annex, page 3

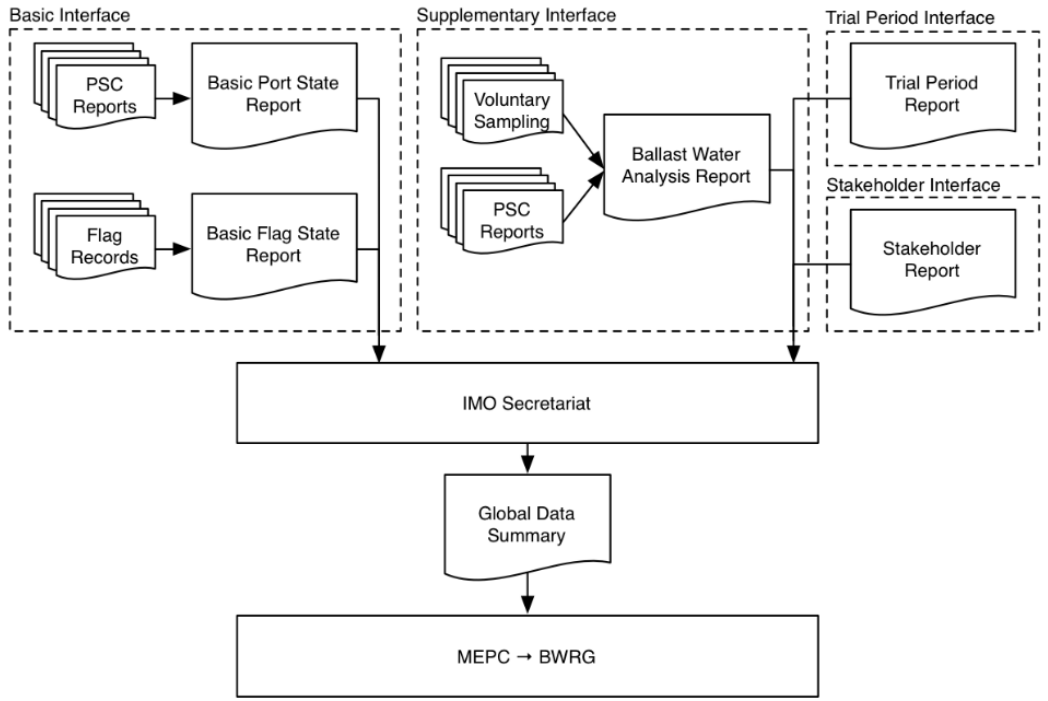


Figure 1: Flowchart of data gathering

Stakeholders are encouraged to share commissioning testing results, as well as good and bad experiences

Source: IMO circular - BWM.2-Circ.67

Experience building phase

Summary of EBP timeline

Timing	Milestone	EBP/IMO action
Autumn 2018	Convention has been in force for one year	
Spring 2019		First year of data available
Spring 2020	Convention has been in force for two years	Second year of data available. Stocktaking of EBP timeline
Autumn 2020	Convention has been in force for three years	Partial third year of data available, enough to agree to data analysis report terms of reference
Spring 2021		Full third year of data available, draft analysis report received
Spring 2022	Convention has been in force for four years	Final analysis report received. Convention issues agreed.
Autumn 2022	Convention has been in force five years	Package of amendments submitted to parties

Source: IMO circular - BWM.2-Circ.67

Non-penalization of ships

- MEPC 290(71)

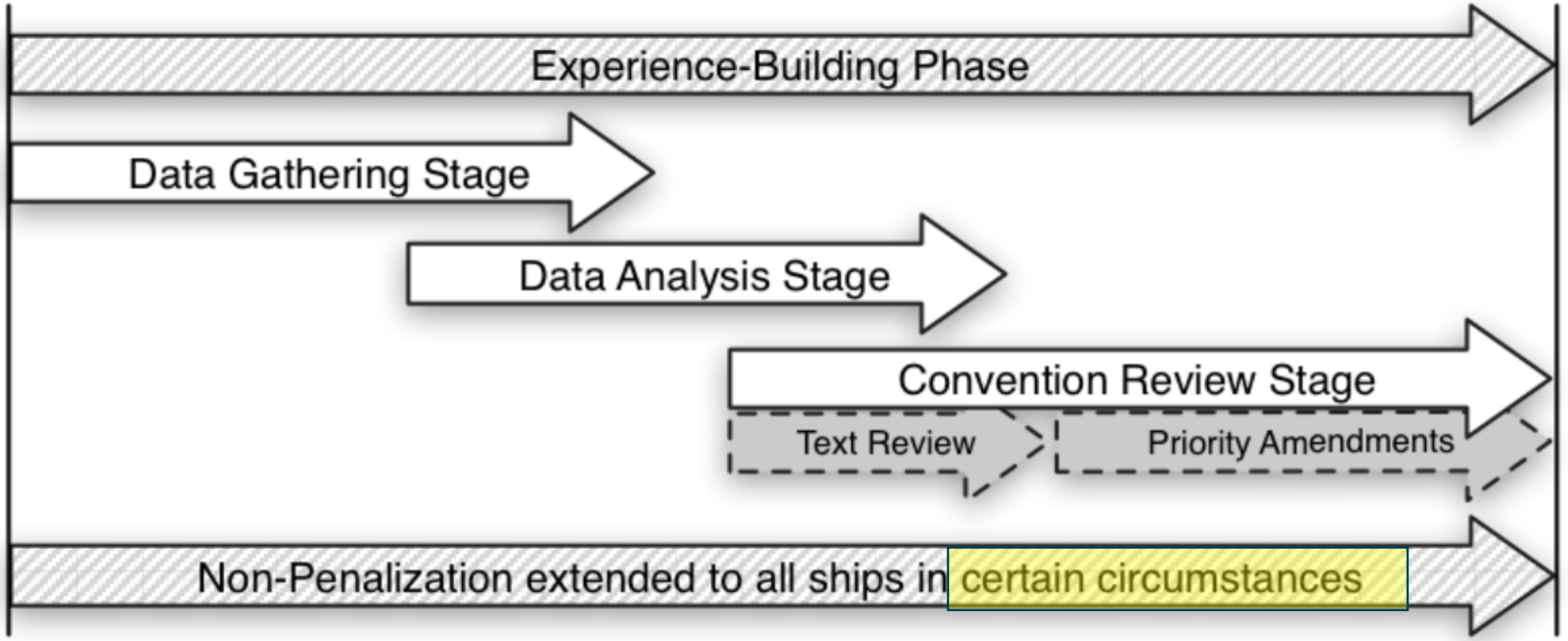


Figure 1: Stages of the ballast water experience-building phase and non-penalization

Source: MEPC 290(71)

Non-penalization of ships

IMO - MEPC 290(71)

Non-penalization

6 By way of the resolution adopting the EBP, the Committee has adopted certain non-penalization measures that will be in place during the EBP. These measures are intended to recognize and address concerns expressed by the shipping industry regarding the potential penalization of shipowners and operators during the implementation of the Convention due to non-compliance with the ballast water performance standard described in regulation D-2 of the Convention despite the use of a proper ballast water management system (BWMS). The measures also recognize the need to protect the environment, human health, property and resources in port States from the discharge of non-compliant ballast water.

7 Ships should carry documents on board demonstrating that the preconditions associated with the non-penalization measures have been met (e.g. relating to approval, installation and maintenance of the BWMS). The crew should adhere to the operational instructions and manufacturer's specifications of the BWMS (which should be carried on board). The crew should also attend to the self-monitoring system of the BWMS.

Source: MEPC 290(71)

Testing - Indicative

Table 3: Indicative analysis methods for use when testing for potential compliance with the D-2 standard[2]

Indicator	General approach	Standard method	Notes	Level of confidence or detection limit and citation for validation studies
Viable organisms ≥ 50 µm	Visual counts or stereo-microscopy.	No international standard for ballast water analysis at this time.	Can be expensive and time-consuming, needs moderately trained personnel. (Note that OECD Test Guideline for Testing of Chemicals 202, "*Daphnia* sp. Acute immobilization test and reproduction test" could be used as basis for standard methodology.)	To be determined.
Viable organisms ≥ 50 µm	Visual inspection.	No international standard for ballast water analysis at this time.	Visual inspection is likely to only register organisms bigger than 1,000 micro-metres in minimum dimension.	To be determined.
Viable organisms ≥ 10 µm and < 50 µm	Variable fluorometry.	No international standard for ballast water analysis at this time.	Only monitors photosynthetic phytoplankton and thus may significantly underestimate other planktonic organisms in this size fraction.	To be determined.
Viable organisms ≥ 50 µm and ≥ 10 µm and < 50 µm	Photometry, nucleic acid, ATP, bulk fluorescein diacetate (FDA), *chlorophyll a*.	No international standard for ballast water analysis at this time.	Semi-quantitative results can be obtained. However, some of these organic compounds can survive for various lengths of time in aqueous solution outside the cell, potentially leading to false positives. Welschmeyer and Maurer (2012).	To be determined.

Source: BWM2. Circ 42 – Rev.1

Testing - Indicative

Indicator	General approach	Standard method	Notes	Level of confidence or detection limit and citation for validation studies
Viable organisms ≥ 50 µm and ≥ 10 µm and < 50 µm	Flow cytometry.	No international standard for ballast water analysis at this time.	Very expensive.	To be determined.
Enterococci	Fluorometric diagnostic kit.	No international standard for ballast water analysis at this time.	Minimum incubation time 6 h. Semi-quantitative results from portable methods (see paragraph 2.2.2 of annex 1).	To be determined.
Escherichia coli	Fluorometric diagnostic kit.	No international standard for ballast water analysis at this time.	Minimum incubation time 6 h. Semi-quantitative results from portable methods (see paragraph 2.2.2 of annex 1).	To be determined.
Vibrio cholerae (O1 and O139)	Test kits.	No international standard for ballast water analysis at this time.	Relatively rapid indicative test methods are available.	To be determined.
Viable organisms ≥ 50 µm and ≥ 10 µm and < 50 µm	Pulse counting fluorescein diacetate (FDA).	No international standard for ballast water analysis at this time.	Sampling kit can be larger than that for bulk fluorescein diacetate (FDA).	To be determined.

Source: BWM2. Circ 42 – Rev.1

Testing - Detailed

Table 4: Detailed analysis methods for use when testing for compliance with the D-2 standard

Indicator	General approach	Standard method	IMO citation	Notes	Level of confidence or detection limit and citation for validation studies
Viable organisms ≥ 50 µm and ≥ 10 µm and < 50 µm	Visual counts or stereo-microscopy examination. May be used with vital stains in conjunction with fluorescence + movement.	No international standard for ballast water analysis at this time, but see US EPA ETV Protocol, v. 5.1	BLG 15/5/5 and BLG 15/5/6 BLG 15/INF.6	Can be expensive and time-consuming, needs trained personnel. (Note that OECD Test Guideline for Testing of Chemicals 202, "*Daphnia* sp. Acute immobilization test and reproduction test" could be used as basis for standard methodology.)	To be determined.
Viable organisms ≥ 10 µm and < 50 µm	Visual counts with use of vital stains.	No international standard for ballast water analysis at this time, but see US EPA ETV Protocol, v. 5.1	BLG 15/5/10 (method) BLG 15/5/5 and BLG 15/5/6 (approach) MEPC 58 /INF.10	Requires specific knowledge to operate them. It should be noted that there may be limitations using vital stains with certain technologies.	To be determined. Steinberg et al., 2011
Viable organisms ≥ 10 µm and < 50 µm	Flow cytometers (based on *chlorophyll a* and vital stains).	No international standard for ballast water analysis at this time.	BLG 15/5/5 and BLG 15/5/6	Expensive and require specific knowledge to operate them. It should be noted that there may be limitation using vital stains with certain technologies.	To be determined

Source: BWM2. Circ 42 – Rev.1

Testing - Detailed

Indicator	General approach	Standard method	IMO citation	Notes	Level of confidence or detection limit and citation for validation studies
Viable organisms ≥ 50 µm and Viable organisms ≥ 10 µm and < 50 µm	Flow cameras (based on *chlorophyll a* and vital stains).	No international standard for ballast water analysis at this time.	BLG 15/5/5 and BLG 15/5/6	Expensive and require specific knowledge to operate them. It should be noted that there may be limitations using vital stains with certain ballast water management systems.	To be determined
Viable organisms ≥ 50 µm and Viable organisms ≥ 10 µm and < 50 µm	Culture methods for recovery, regrowth and maturation.	No international standard for ballast water analysis at this time.	BLG 15/5/5 and BLG 15/5/6	Require specific knowledge to conduct them. Densities are expressed as Most Probable Numbers (the MPN method). Most species do not manage to grow using this method therefore cannot be used alone. 2-3 weeks incubation time needed.	To be determined
Enterococci	Culture methods.	ISO 7899-1 or ISO 7899-2	BLG 15/5/5 and BLG 15/5/6	Requires specific knowledge to conduct them. At least 44-h incubation time. EPA Standard Method 9230	To be determined.
Escherichia coli	Culture methods.	ISO 9308-3 or ISO 9308-1	BLG 15/5/5 and BLG 15/5/6	Requires specific knowledge to conduct them. At least 24-h incubation time. EPA Standard Method 9213D	To be determined.

Source: BWM2. Circ 42 – Rev.1

Indicative vs Detailed

Definition and differences between indicative and detailed analysis for the D-2 standard

	Indicative analysis	Detailed analysis
Purpose	To provide a quick, rough estimate of the number of viable organisms	To provide a robust, direct measurement of the number of viable organisms
Sampling		
Volume	Small or large depending on specific analysis	Small or large depending on specific analysis
Representative sampling	Yes, representative of volume of interest	Yes, representative of volume of interest
Analysis method		
Analysis parameters	Operational (chemical, physical) and/or performance indicators (biological)	Direct counts (biological)
Time-consuming	Lower	Higher
Required skill	Lower	Higher
Accuracy of numeric organism counts	Poorer	Better
Confidence with respect to D-2	Lower	Higher

Source: BWM2. Circ 42 – Rev.1

Compliance monitoring sytems

Proposals are put forward to IMO to develop these standards, however, work is still in progress.

Future regulation around biological sampling and testing

1. MEPC.173 (58) - Guidelines for ballast water sampling (G2)
2. Testing methods will evolve to ensure a faster testing and analysis process
3. Sampling is done via sounding pipes, air pipes, **discharge line**, man-holes using pumps, sampling bottles or other water containers
4. In tank sampling – only when treatment during uptake or when the water is in tank.
5. Alternate sampling methods ??
6. Isokinetic sampling
7. Valve type and flow distribution – not gate/butterfly but more of diaphrapms
8. Sounding pipes – perforated vs non-perforated.
9. Sample handling, transportation and storage may also affect the results.
10. ISO standards for Ballast water sampling point – 11711-1:2019 , sampling probe, sampling method, handling.

EBP needs countries to come with data for IMO to work on

Source: MEPC 290(71)

Contingency measures BWM.2/Circ 62

- When should contingency measures come in place?
- **<u>Ballast water management plan should have predetermined actions</u>**
- Communicate with port state as soon as possible. This means destination port and agree on the action to be taken.
- Consider the following and agree with port state and flag state
  - Discharge ballast water to another ship or land-based facility
  - Operational action such as modifying sailing or ballast water discharge schedules, internal transfer of ballast water, retention of ballast water on board the ship. Port State and ship should consider any safety issues and avoid possible undue delays.
  - Ballast water exchange to an approved plan (Reg B4)
- Port state should report this to IMO

Source: IMO circular - BWM.2-Circ.62 MEPC. 306(73)

Contingency measures BWM.2/Circ 62

- The ship - correct the malfunction of the BWMS as soon as possible
- submit its repair plan to the port state control authorities and the flag state
- The port State, the flag State and the ship should work together to agree on the most appropriate solution
- The Port state should report the information on the use of contingency measures in accordance with EBP

Source: IMO circular - BWM.2-Circ.62
MEPC. 306(73)

PSC inspection
Article 9 vs MEPC 252(67)

Article 9

(c) a sampling of the ship's Ballast Water, carried out in accordance with the Guidelines to be developed by the Organization. However, the time requir analyse the samples shall not be used as a basis for unduly delaying the opera movement or departure of the ship.

RESOLUTION MEPC.252(67)

Adopted on 17 October 2014

GUIDELINES FOR PORT STATE CONTROL UNDER THE BWM CONVENTION

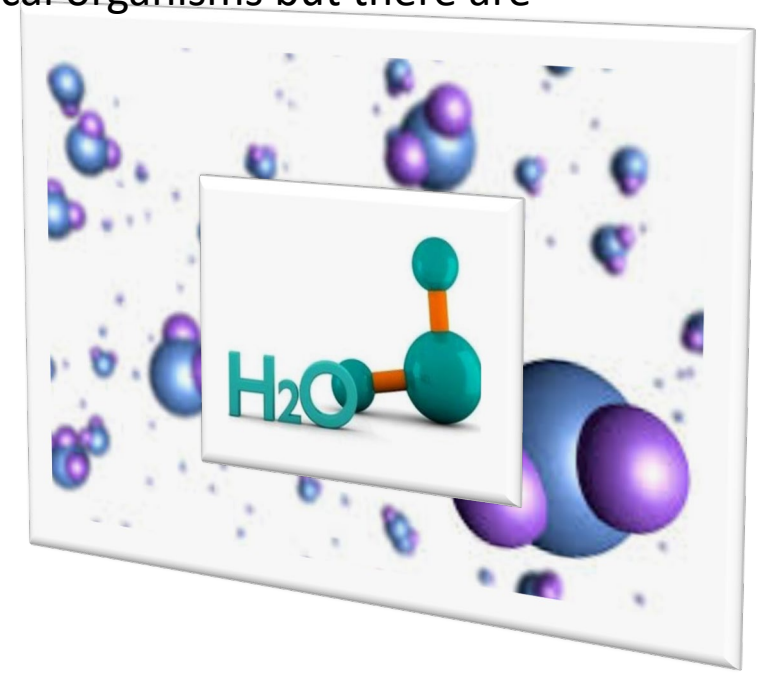
Four stages of inspection

Sampling of ballast water comes only in 3rd stage

Source: IMO

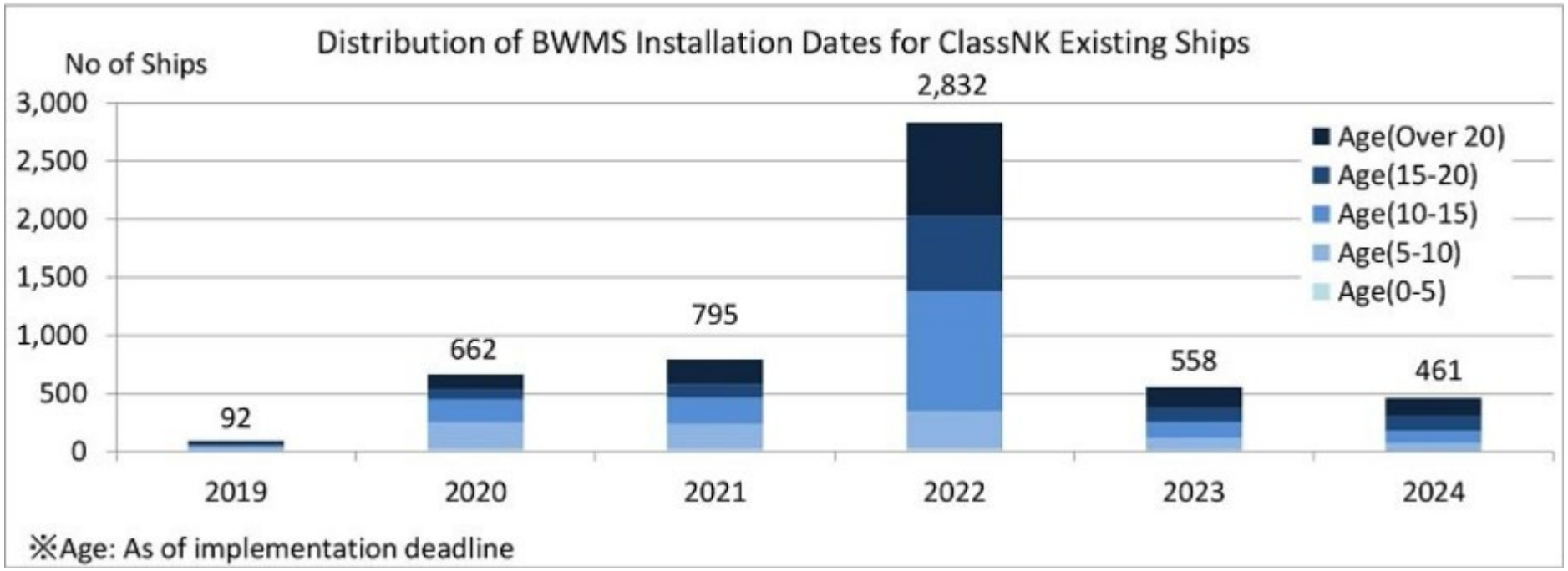
BW self monitoring

- Commercially available products – Easy installation, no crew action needed, real time data.
- Most measure Chlorophyll response as an indication of presence of biological organisms but there are organisms without sufficient Chlorophyll, within the D2 size range
- A higher cholorophyll does not mean bigger organisms and vice versa
- Water chemistry plays a vital role in these results.
- There is no standard to comply with when using these products.
- MOST IMPORTANT – They don't indicate if the BW is D2 compliant



Are the shipowners ready ?

ClassNK warns owners not to wait for deadline to install ballast water systems



Source: Seatrade maritime news

Practical challenges

1. Choosing an appropriate BWTS – to the needs of the ship
2. System Design limitations, Limited Operating conditions
3. Type approval as per BWMS Code vs earlier G8 guidelines.
4. Planning and scheduling a retrofit , typically takes 9 months to a year
5. BWMP – Contingency measures
6. The initial cost – 2M and upwards, depending on the demand
7. Operational cost (Money and resources)

80 systems approved by IMO and 23 systems approved the USCG

Source: Seatrade maritime news

Some takeaways..

1. Non-compliance can be costly
2. Planning is key
3. Start early and avoid bottlenecks
4. Training of crew in all aspects is as important as installing a BWMS

Source: Seatrade maritime news

Thank you!

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