Ballast Water Treatment Systems

An overview of compliance, standards, and challenges challenges in maritime ballast water management management

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Presentation Agenda

- **My experience on ships**
  BWTS issues we faced
- **Convention and Compliance**
  International regulations and compliance requirements
  D1 and D2 ballast water management standards
- **Treatment Technologies**
  Different methods and systems for treating ballast water
  Operational effectiveness and implementation challenges
- **Current Issues and Challenges**
  Operational difficulties faced by vessel operators
  Compliance challenges and enforcement consideration

My experience with BWTS

- My experience with D1 and D2 standards
- Hand-on experience with Electrolysis and UV technologies
- Issues faced on ships
- Operational constraints
- How we dealt with it

My experience with BWTS

Some key issues faced on my ships

- Clogging of filter due to turbid waters (Led to clogging of mind?)
- UV Lamp issues
  - Reduced UV intensity in fresh and muddy waters
  - Frequent UV lamp failures through burnout or breakage – CIP unable to cope
- Failure of BWTS components
- TRO readings and sensor malfunction
- Availability of spare parts
- Technician roles

Convention and Compliance

- BWM convention came into force on 8th September 2017
- D1 and D2 standards were both accepted under convention
- September 2024 - D1 standards became redundant
- Most of the ships retro-fitted BWTS to comply with the convention
- Inadequate training and/or experience vessels faced many challenges during the period from 2017 to 2024, as D1 was removed from their IBWMC
- Exchange BW (D1) or BW Treatment or discharge shore reception or NO discharge

Treatment technologies

- 10 approved by USCG
- Different manufacturer – different issues
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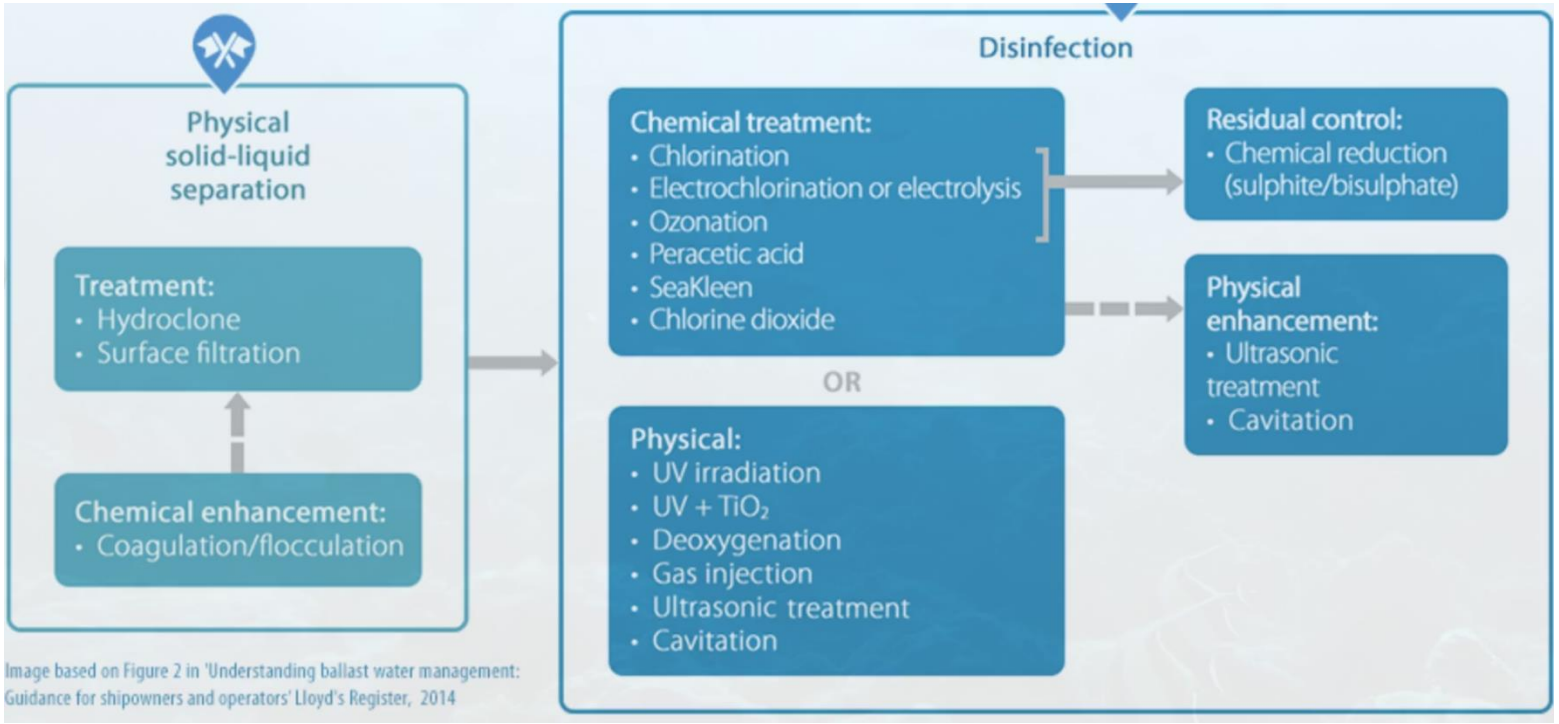


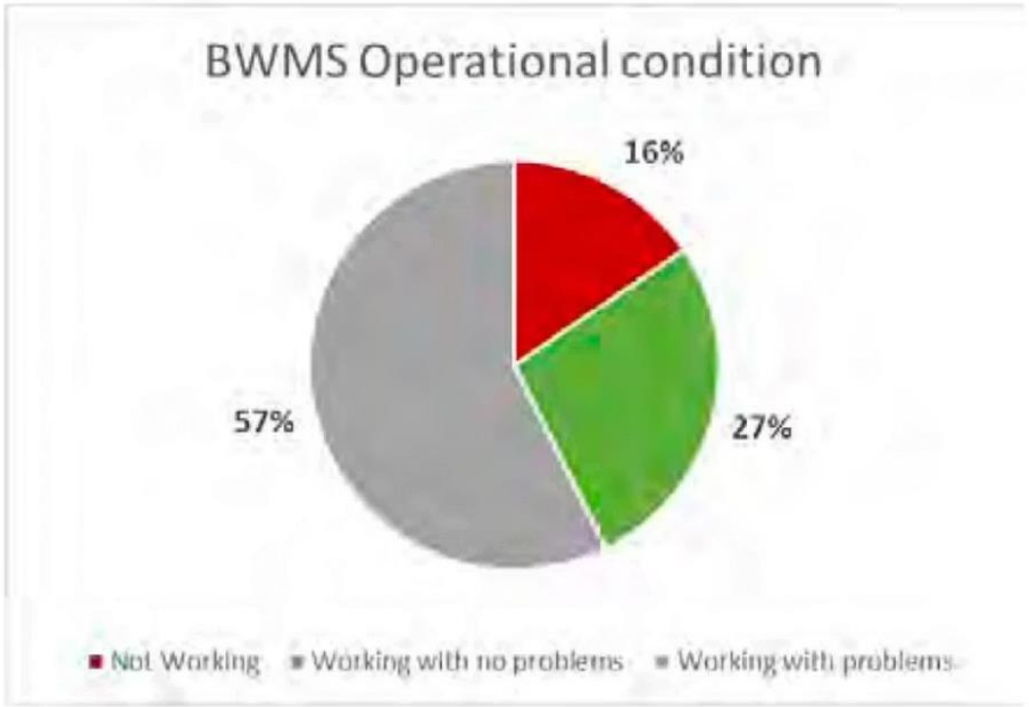
Image based on Figure 2 in 'Understanding ballast water management: Guidance for shipowners and operators' Lloyd's Register, 2014

Current Issues and Challenges

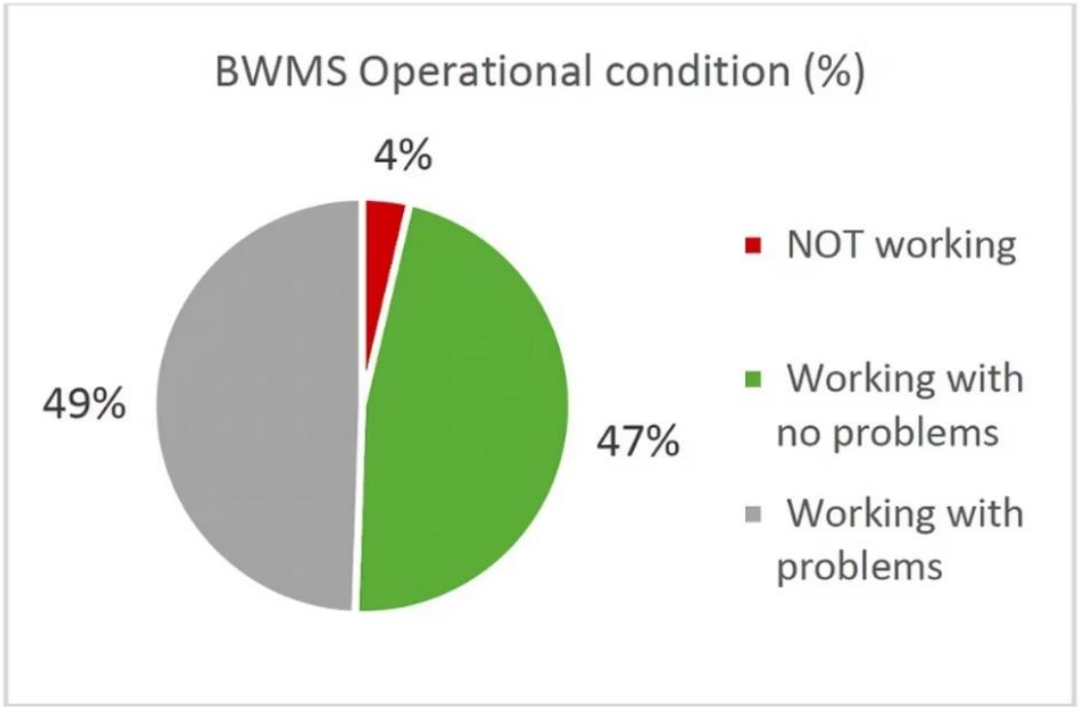
- MARTECMA, collaborating with INTERCARGO and INTERTANKO, published confidential industry reports in 2020 and 2022 documenting these challenges
- 2125 BWTS ships surveyed on **1480 Ships**
- Comprehensive data collected from active commercial
- Results were surprising

Current Issues and Challenges

2020 Survey



2022 Survey



Current Issues and Challenges

Among many some of the common issues

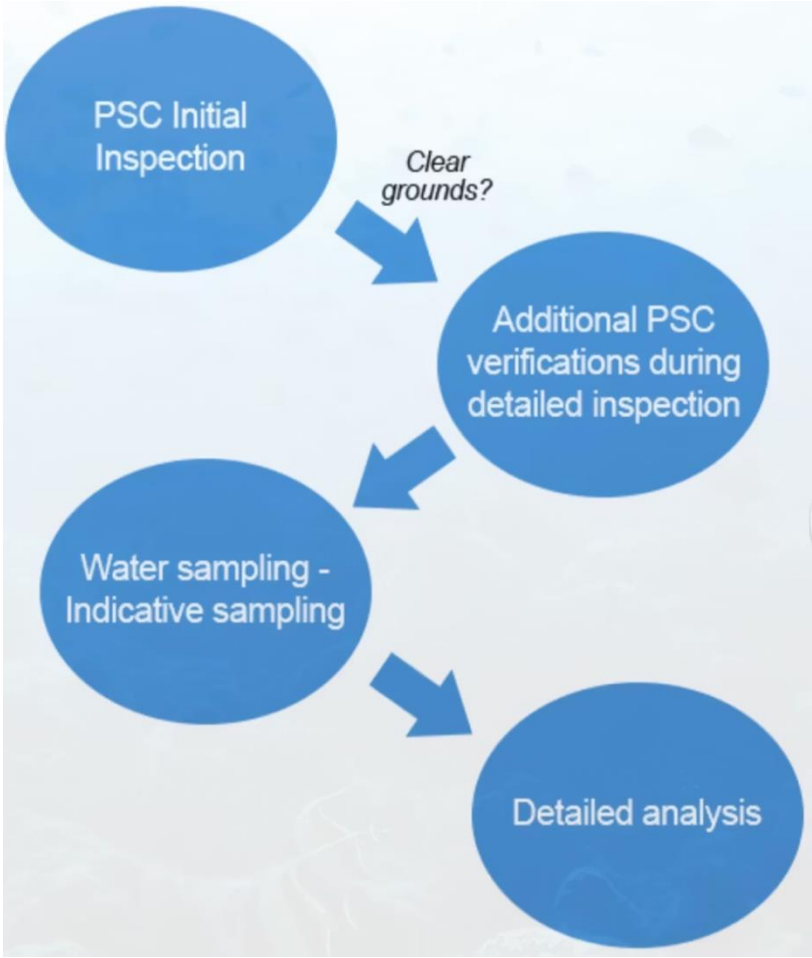
- Chemical handling hazards and safety concerns
- Chlorine leakage incidents exceeding TLV-STEL values
- Chemical handling presents significant crew safety concerns, requiring proper training and protective equipment.
- System bypasses due to filter overload may result in non-compliance with discharge standards.

Current Issues and Challenges

- Persistent issues with level switches, valve actuators, valve positioners, TRO flow regulators, and pressure transmitters
- Rectifier issues
- TRO readings
- Frequent alarms
- Electrolyzer plate damage from high scale concentration
- UV Lamp failures
- Software issues

Compliance, Monitoring and Enforcement (CME)

- Initial inspection
- More detailed inspection
- Water Sampling
  Indicative Sampling
- Detailed analysis



Compliance, Monitoring and Enforcement (CME) (CME)

Some Deficiencies/observations noted in recent inspections

- Officer on Watch displayed limited understanding of the BWTS
- BWTS was found bypassed and not in operation without documented justification or entry in the ballast logbook
- Calibration records for BWTS flow meters, TRO sensors, and other critical sensors were not available on board.
- Multiple historical alarms from the BWTS control panel were not acknowledged or recorded in the ship's maintenance or alarm log.

Compliance, Monitoring and Enforcement (CME)

Some Deficiencies/observations noted in recent inspections

- Training records for key personnel operating the BWTS were not maintained or could not be produced upon request

- BWRB contained incomplete entries, with missing details regarding ballast exchange/treatment operations and relevant times/volumes

Solutions

- **Better Technologies**
- Ships need Better and Reliable BWTS
- Manufacturers must focus on developing more robust systems that can operate reliably in varied water conditions
- **Industry Responsibility**
- Answers must come from manufacturers
- Equipment providers need to take more responsibility for system performance and provide better technical support

Solutions

- **Technology Upgrades**
- Technologies must be upgraded
- Existing systems need technical improvements to address known failure points and operational limitations
- **Environmental Challenges**
- A clear solution should be established for turbid waters
- Special protocols are needed for operating in challenging water conditions common in many

Final Question

- Why have we made D1 standard redundant when D2 systems still systems still face significant operational challenges?
- D1 and D2 standards – more coexistence until issues are resolved? resolved?

- **THANK YOU!**

- **Questions & Discussion**

- For further information and resources:
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