2020 BWMS Operational Survey Results
Greener Shipping Summit 2021

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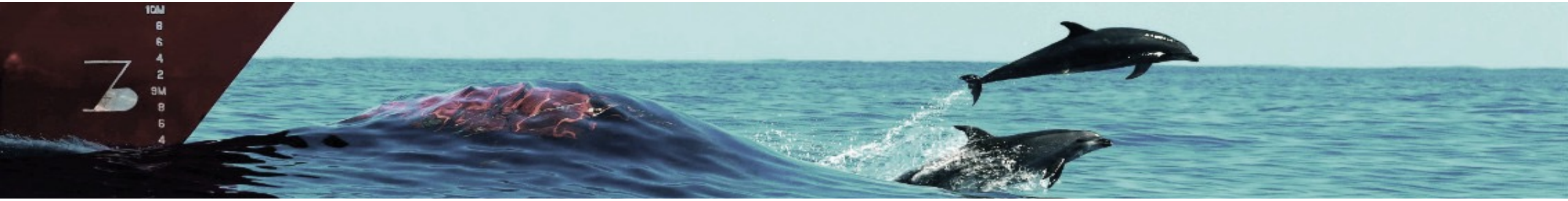
BWMS Survey Overview



- The joint Ballast Water Management Systems Operational Experience Survey was initiated by DNV and MARTECMA on 1 February 2020 and completed on 13 March 2020. A few additional responses to the survey were received from members of both the international dry-bulk and tanker owner associations, INTERCARGO and INTERTANKO respectively.

- Data were voluntarily provided from the members of the participating associations and were not based on formal statistical sampling analysis. Thus, the data received per model varies from 1 up to 146 installations. All responses to the questionnaire were aggregated and anonymized and no information attributed to any of the individual organizations.

- Operators requested to complete a questionnaire providing information on the following:
  - System maker, Vessel Type, Vessel Size (dwt), Installation date, New building or retrofit
  - Number of systems installed, System working in Auto or Manual, System not working
  - Recurring Problems with Control System, Filter or other.
  - Maintenance Cost, Service Experience and any other comment/remark

Biological testing of BWMS at commissioning

- MEPC 74 (May 2019)

MEPC 74 (May 2019) approved amendments to regulation E-1 2of the BWM Convention. This amendment requires biological efficacy testing when commissioning a BWTS on board a vessel.

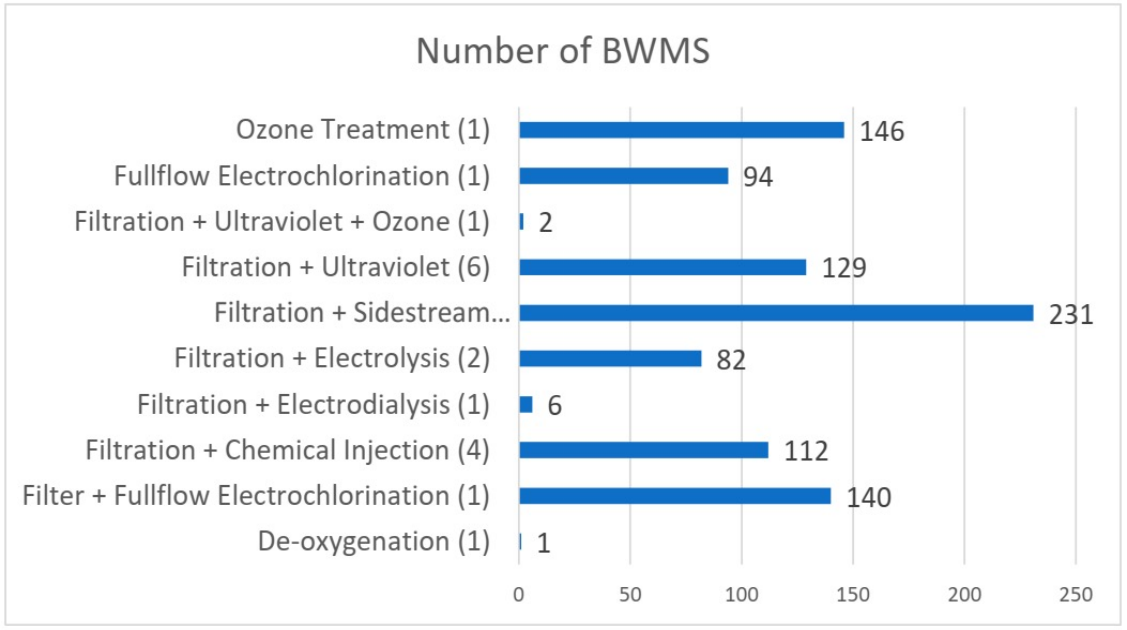
This amendment will come into effect at the earliest in October 2021, but the MEPC has encouraged flag administrations to start with commissioning testing as soon as possible. The first administrations explicitly requiring sampling and biological testing at commissioning survey are Singapore, Panama, Cyprus, Australia and Greece. Circulars have been published by the Administrations accordingly.

For the biological efficacy testing, a test organization needs to go on board the ship to take samples (both at ballasting and de-ballasting). The analysis of the samples is typically performed on board the ship (organism counts must be carried out within a few hours after the samples were taken). Some bacteriological sample analysis might be required to be done at the laboratory.

If this test confirms that the treated ballast water meets the discharge standard D-2, a full-term International Ballast Water Management Certificate will be issued.

BWMS Survey Overview

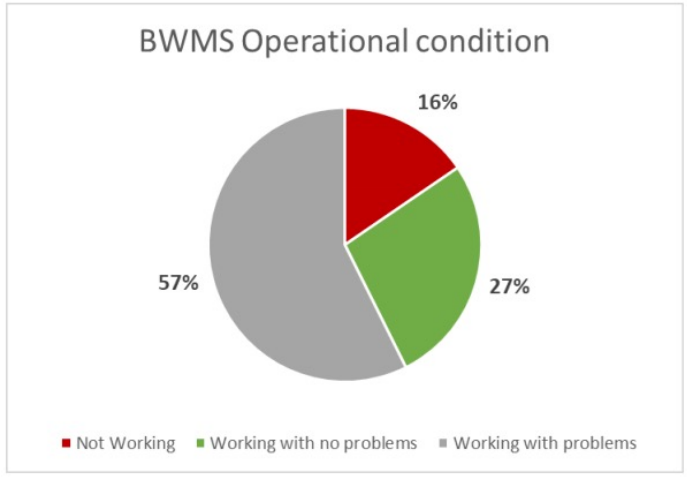
- Through the Survey, completed responses received from **more than 60 owners** worldwide for total **943 BWMS** installed on **845 ships**. From the collected information, we have specified **10 technology types** and **21 BWMS models**.



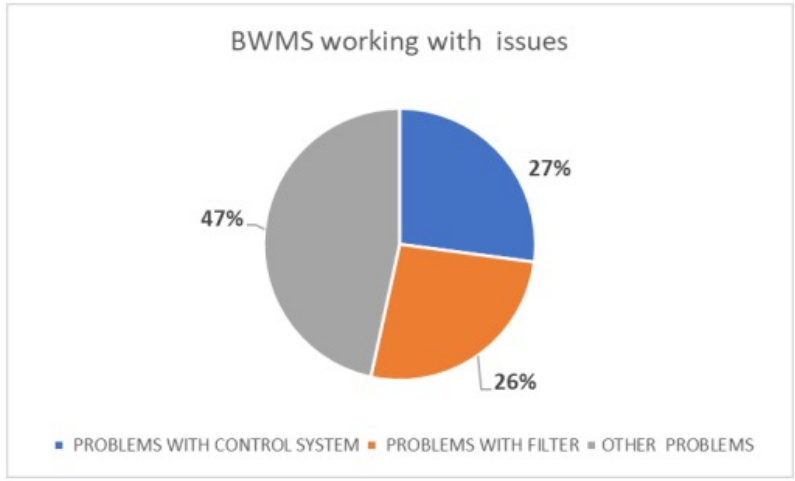
Graph 1: Number of BWMS per Technology
(the number in parenthesis presents the models involved in each technology)

Technology	Models
De-oxygenation	Coldharbour GLD
Filter + Fullflow Electrochlorination	ErmaFirst Fit
Filtration + Chemical Injection	Ecochlor
	JFE BallastAce
	JFE BallastAce (Granules)
	Kuraray Microfade
Filtration + Electrodialysis	TeamTec OceanSaver
Filtration + Electrolysis	Wartsila Aquarius EC
	Headway OceanGuard
Filtration + Sidestream Electrochlorination	SunRui BalClor
	Hyundai Hi-Ballast
	Samsung Purimar
Filtration + Ultraviolet	Wartsila Aquarius UV
	Panasia GloEn-Patrol
	Hyde Guardian
	Miura BWMS
	Optimarin (OBS)
	AlfaLaval PureBallast
Filtration + Ultraviolet + Ozone	DESMI OG OxyClean
Fullflow Electrochlorination	TechCross Electro-Clean
Ozone Treatment	NK-O3 BlueBallast

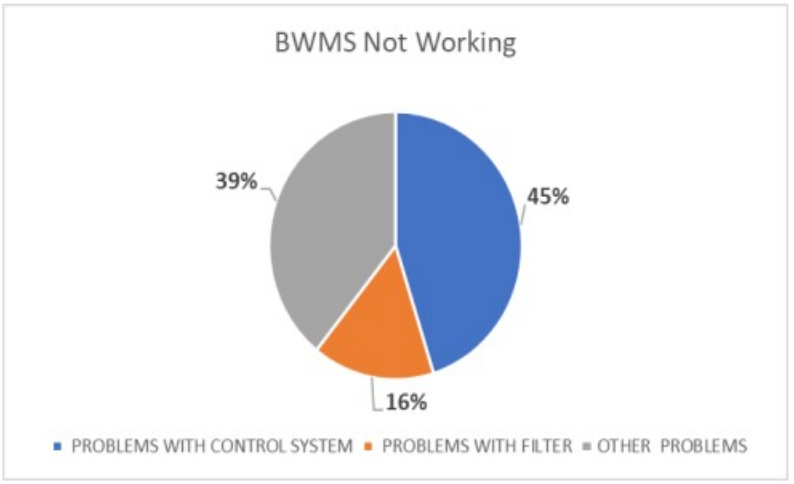
Table 1: Models per Technology



Graph 3: BWMS Operational condition (%)



Graph 5: BWMS Working with issues



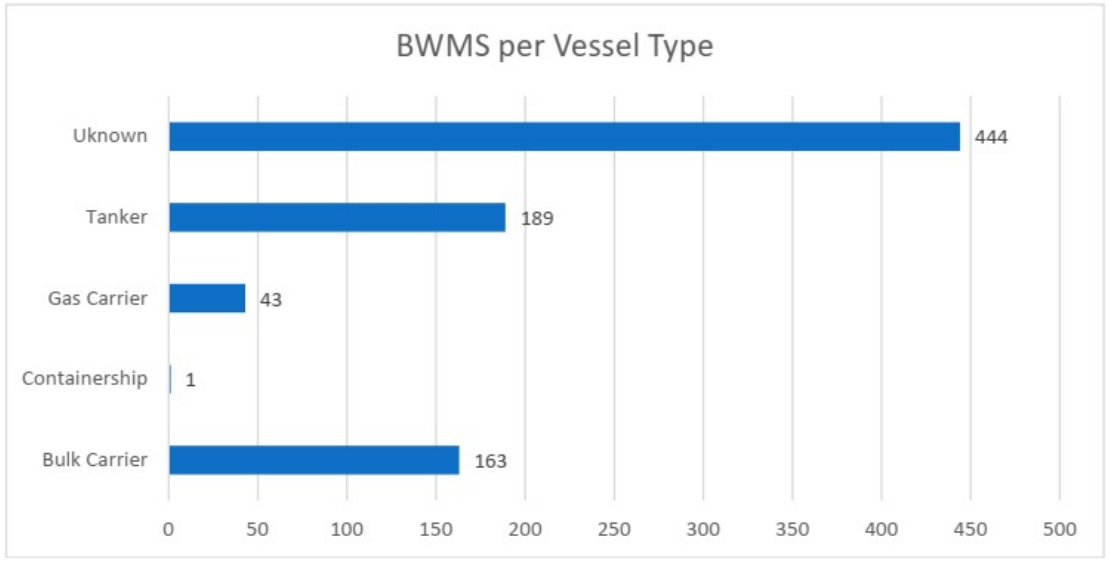
Graph 4: BWMS Not Working related issues

BWMS Survey Overview

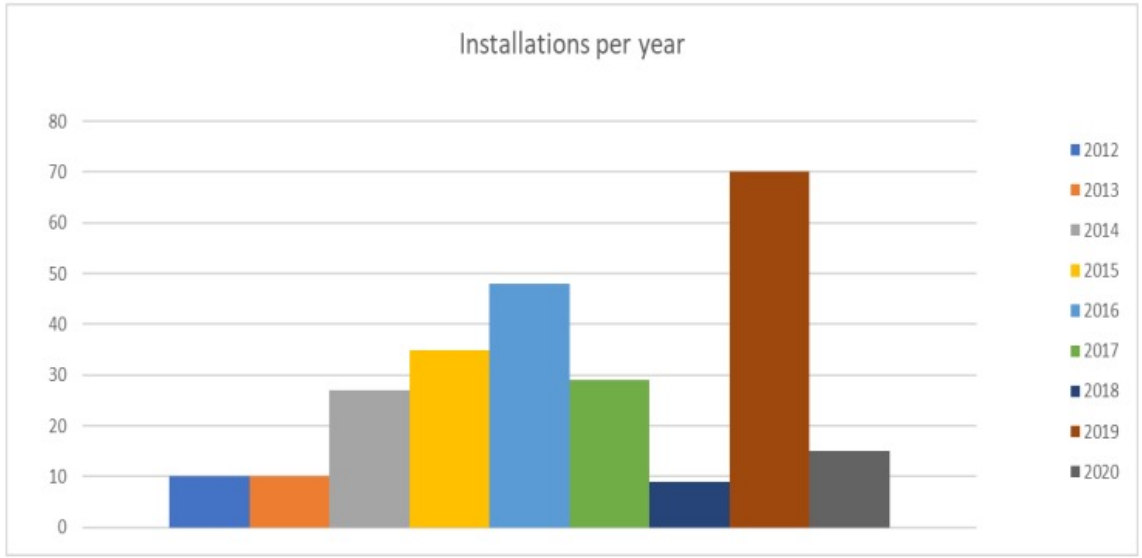
- The survey showed that from the 943 systems, 146 systems (16%) reported as not working, 256 systems (27%) working with no problems while 541 systems (57%) working with problems.
- From the 146 systems reported as “Not Working”, 45% of the issues related with the control system, 16% with the filter and 39% with other issues.
- From the 541 systems reported as “Working with Issues”, 27% of the issues related with the control system, 26% with the filter and 47% with other issues.

BWMS Survey Overview

- In most of the responses the vessel type is missing. For those provided feedback on the ship type, tankers and bulk carriers are the two main ship types.
- From the 253 systems that provided date of installation, most of the systems were installed in 2019.



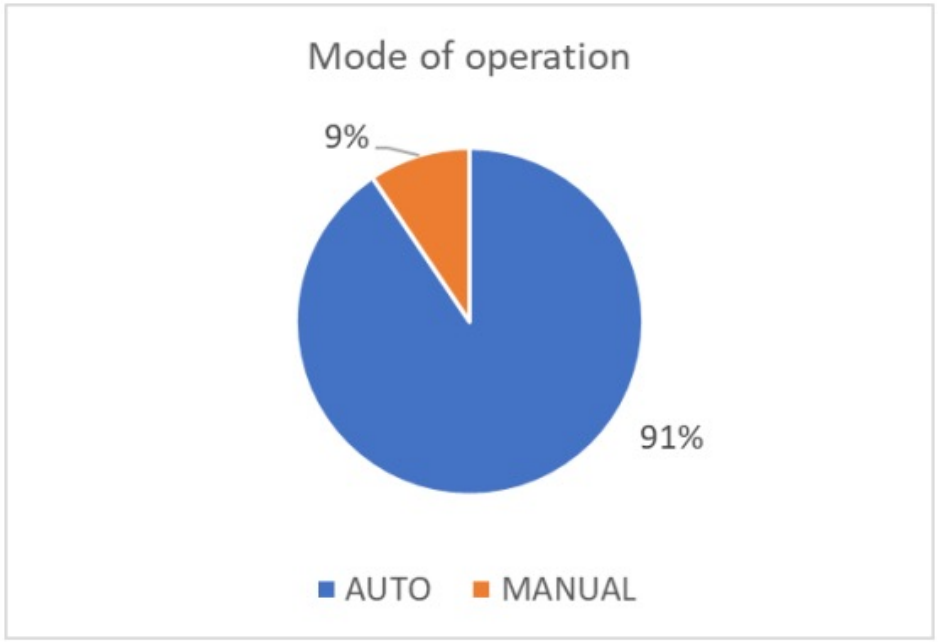
Graph 6: 2020 Ship types (%tankers, % bulkers, % other)



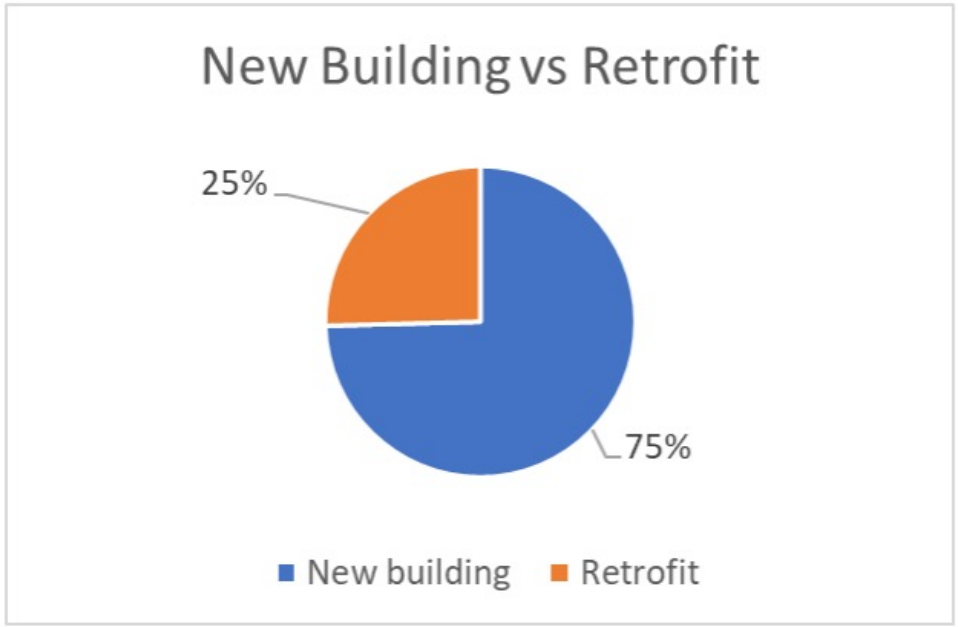
Graph 7: 2020 BWMS Models vs. BWMS Installation Year

BWMS Survey Overview

- Information on whether the system is working in Auto or Manual received for 773 systems. Most of the systems (91%) work in Auto mode.
- In total 295 systems installed in 233 ships which reported information on whether the system has been installed during new building phase or retrofit. Most of the 295 systems (75%) have been installed during NB phase.



Graph 8: Mode of Operation

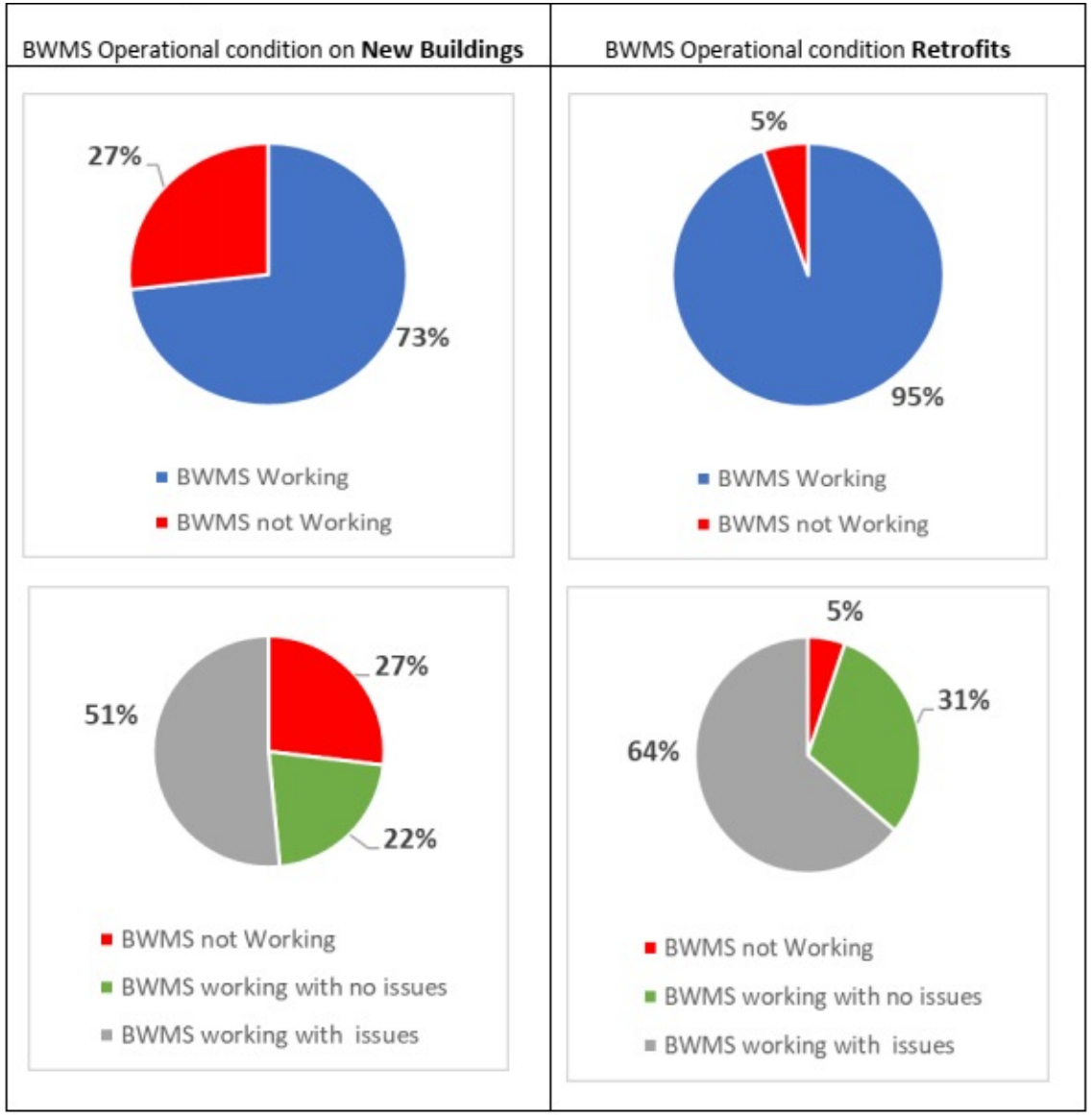


Graph 9: 2020 BWMS installation (% New build vs % retrofit)

This trend is now changing fast !

BWMS Survey Overview

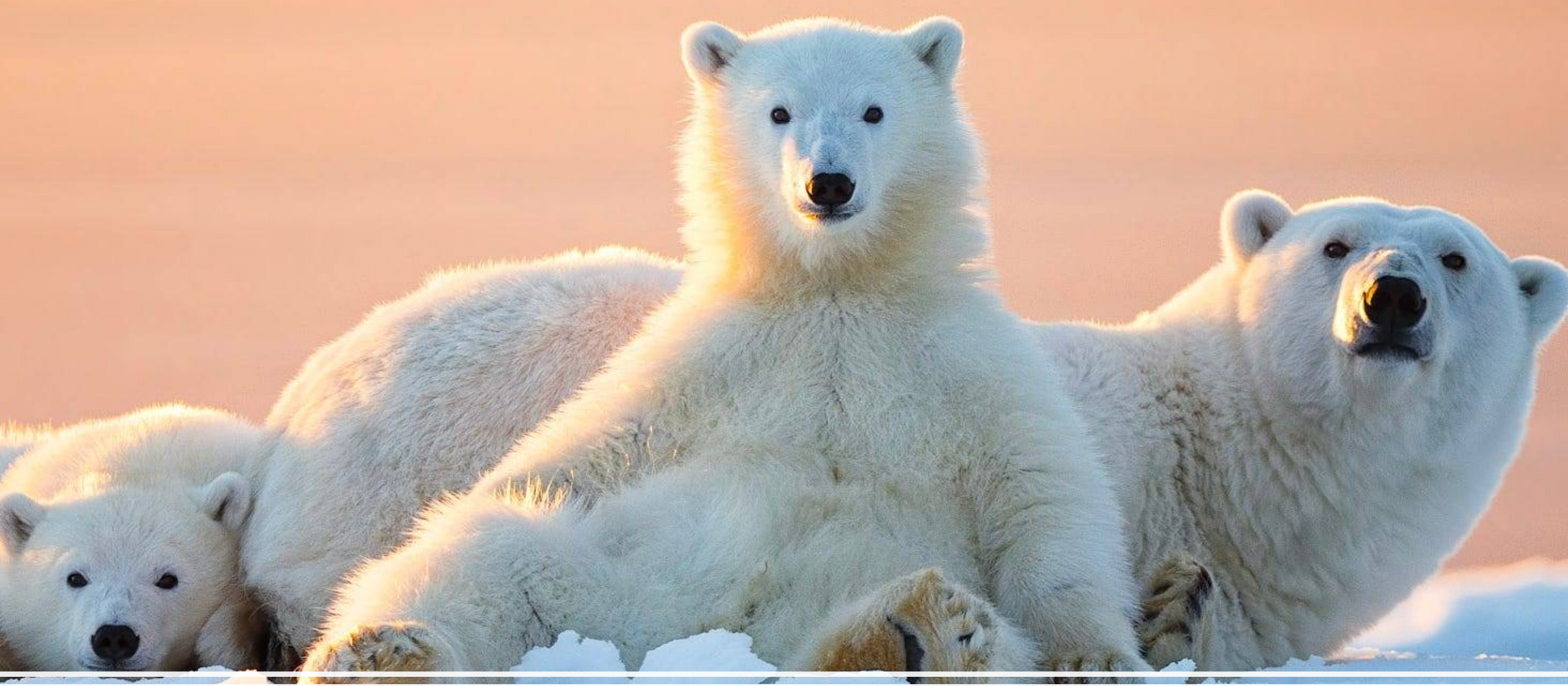
- From the 295 installations, the analysis showed that the systems retrofitted present better operational condition compared with the systems installed during ship's construction.
  - Retrofitted: 5% reported as not working
  - During NB: 27% reported as not working.



Graph 10: BWMS New build vs retrofit operational condition

Thoughts

- The analysis showed that the systems retrofitted present better operational condition compared with the systems installed during ship's construction. The main reason for this could be that systems installed during NB phase (before compliance date) remained unused for a long period of time
- The dirty waters of rivers is the most important limiting factor in the operation of filters (especially affecting bulk carriers). Several makers are exploring the option of removing the filters from their systems (testing is ongoing)
- Most of the systems cannot cope with ballasting or de-ballasting by gravity. This can be a limitation during the quick operations of large tankers and bulkers.
- Several shipowners have opted to install reduced capacity systems on their ships.
- Installed BWMS should be operated frequently (every 2 weeks for example) as part of health check and crew familiarization. This is important for ships engaged in long voyages between loading and discharging ports. Ideally a procedure should be developed by the management company.
- A list of critical spares defined in collaboration with Makers should be maintained onboard.
- Ballast Water Exchange (BWE) is not an alternative option for ships with D2 only marked on the BWM Certificate. BWE can be a contingency measure in case of BWMS malfunction but the Flag and the port authorities have to be informed in advance. This is something that has to be well understood by the crew. It will be helpful if IMO regulate the use of BWE in case of system breakdown and for a few years beyond 2021.



Thank you!!