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The Evolving World of BWMS Approvals

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ABSTRACT

Revisions to the Guideline 8 (G8) type approval procedures for ballast water management systems (BWMS) were recently completed during the seventieth session of the International Maritime Organization's (IMO) Marine Environment Protection Committee (MEPC 70). Key changes to G8 and their potential to impact the testing and availability of approved BWMS are considered. The additional approvals, such as US Coast Guard type approval, classification society approvals, and flag State approvals that BWMS manufacturers are required to obtain are also proving to be evolutionary. These various BWMS approvals, their complexities and how they interplay with each other are discussed. Further, conceptual solutions related to streamlining BWMS approvals in support of ballast water regulation implementation are presented.

Keywords: ballast water management system type approval, IMO type approval, USCG type approval, classification society approval, Guideline 8

1. Introduction

Approval of ballast water management systems (BWMS) is complicated and a manufacturer must obtain an array of approvals. An IMO type approval is obtained by successfully passing the Guideline 8 (G8) engineering reviews and biological efficacy testing requirements to demonstrate compliance with Regulation D-2 of the 2004 Ballast Water Management Convention (BWMC). For BWMS using chemicals, an additional two-phase approval under Guideline 9 (G9) is required to evaluate ship, crew and environmental safety. Collectively, these approvals can span 2-4 years.

Many flag States require BWMS approval prior to installation onboard vessels sailing under their flag. Often this is based on an existing IMO type approval, but the approval process for each flag can vary from lengthy (6+ months) and comprehensive, to brief (±4 weeks) and superficial.

The United States Coast Guard (USCG) has its own BWMS type approval program. From start to finish, this process can take 2-3 years, with the testing phase requiring ±18 months. If the BWMS is chemical-based, registration under the US Environmental Protection Agency's (EPA) Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) may also be required. This approval can take years for a new chemical, but typically less than one year for chemicals previously registered under FIFRA. Additionally, under the FIFRA regulation, individual US States may require separate approval, which can typically be obtained on the weeks-to-months' timescale.

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Classification society BWMS approvals are often administered in two ways: 1) overall BWMS equipment type approval, and 2) BWMS installation approval for each vessel. Equipment type approval requires substantial resources, taking up to one year to complete, while installation approval takes approximately 4-6 months. Figure 1 and Figure 2 provide an overview of the various approvals that a BWMS may require.

Figure 1: Overview of BWMS Approvals - General

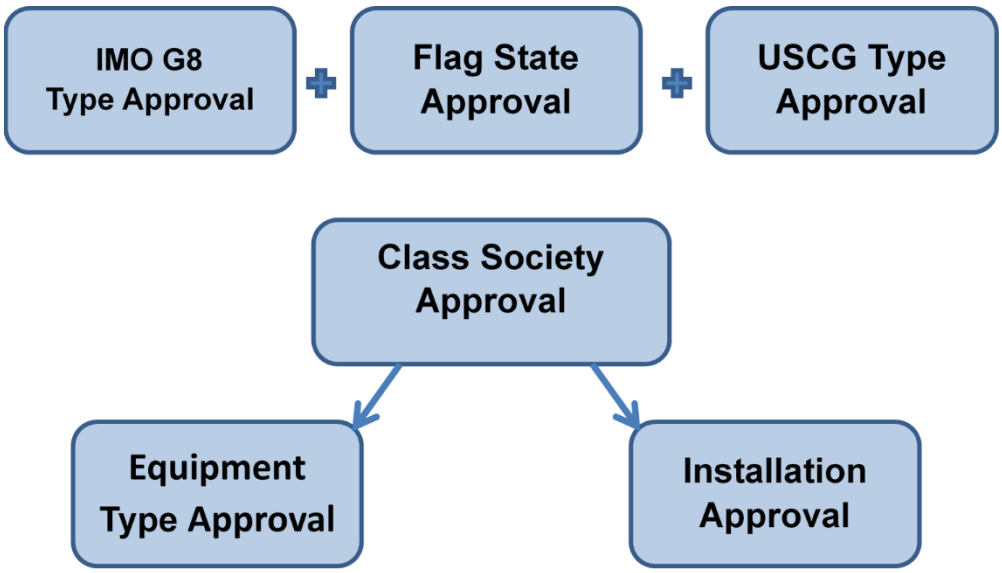
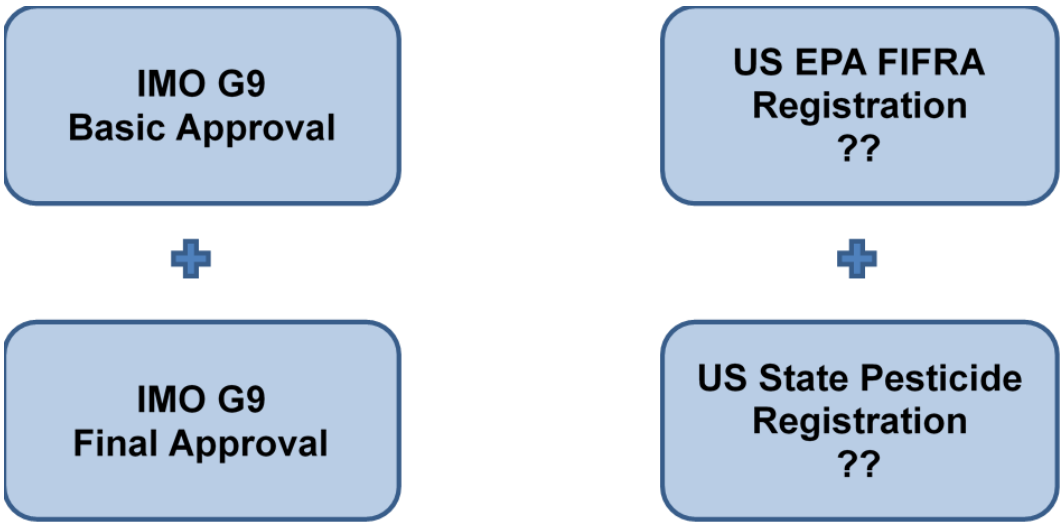


Figure 2: Overview of BWMS Approval – Chemical Systems



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2. Review of Guideline 8 revisions

Recent revisions to IMO's BWMS type approval guidelines required approximately two years of work by a large group of dedicated people. Producing new guidelines that incorporated a wealth of experiences since G8 was last issued in 2008, and which all stakeholders could agree to, presented significant challenges. While every aspect of G8 was reviewed and many updates were made, this paper considers revisions related to test cycle holding times, evaluation of organism regrowth, BWMS performance at temperature extremes, approval of scaled systems and BWMS self-monitoring requirements.

The application schedule for revised G8 allows time for testing facilities and manufacturers to implement the changes, and provides for acceptance of BWMS approved and installed under the prior G8. Installation of BWMS type approved in accordance with the prior G8 will be accepted until 27 October 2020. Shipowners who have already installed BWMS approved under the prior G8 will not be required to replace those systems due to revised G8 implementation. Systems installed after 28 October 2020 will require type approval in accordance with the revised G8. The MEPC suggested that Administrations do not approve BWMS under the prior G8 after 28 October 2018. Further, G8 type approval requirements will become mandatory after BWMC entry into force (IMO 2016a).

3. Test cycle holding time and evaluation of regrowth

Prior G8 testing required a minimum five day holding time for land-based biological efficacy test cycles. Revised G8 allows the manufacturer to specify the minimum holding time applicable to their system. However, if this is less than five days, then at least two of the five land-based test cycles in each salinity are to be done using a five day holding time. This allows for an evaluation of organism regrowth over time.

If a manufacturer specifies a holding time shorter than five days, there is some possibility that the overall time needed for land-based testing may be reduced. In theory, this could mean completion of land-based testing faster, although other factors such as water quality conditions and test facility scheduling influence the timeline. Therefore, this G8 revision is not envisioned to have substantial impacts on the availability of approved BWMS, but will aid in testing systems at the holding time a manufacturer indicates as most appropriate for their technology.

BWMS Effectiveness at Temperature Extremes

During the G8 revision process deliberations involved the need to verify BWMS effective performance at extreme temperatures of 0ºC (2ºC for fresh water) and 40ºC (IMO, 2016b). Shipowners need assurance that the BWMS they will invest in will work in all locales their vessels may transit; however, questions remain about the practical implementation of testing at these temperatures. For instance, the organisms that can be used for testing at these temperatures without yielding false biological efficacy results, as well as if they will meet the required densities, requires consideration. For aspects such as overall equipment operation and/or active substance generation at temperature extremes, identifying appropriate test

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facilities or vessels to conduct this verification testing could prove challenging.
The revised G8 allows for testing of temperature-dependent effectiveness at land-based, shipboard or bench-scale. Depending on how test facilities perform this testing and the time it requires, there is some potential for impacts to the availability of approved BWMS. The G8 revisions specify that the temperatures at which BWMS testing was conducted are clearly indicated on the type approval certificate (TAC), along with any other limiting conditions. If the testing will require substantial time, manufacturers may opt for obtaining a TAC that lists narrower temperature ranges, and revise the TAC at a later date after testing is completed.

Approval of Scaled Systems

This aspect of G8 now specifies that the unit used for shipboard testing should be of a capacity that allows validation of the mathematical modeling and calculations used for BWMS scaling, preferably at the upper treatment rated capacity (TRC) range. Depending on how this is implemented, this could potentially affect the availability of BWMS approved at TRC's suitable for many oceangoing vessels. One reason is that most test facilities have capacity to test BWMS at TRC's from 200 – 400 m^3/h, which falls short of the ±10000 m^3/h TRC offered by some manufacturers. Test facility limitations and the need for shipboard testing at the upper TRC range will require a shipowner to install and operate a BWMS that has not been tested at full-scale. Clearly, there are owners who have already done this. However, to accommodate testing, the owner must agree to having a scientific team come onboard and giving at least some consideration to vessel schedule. These shipowners may be rare, but thankfully they do exist.

Although verification of BWMS that have been scaled up is needed, how this will be practically implemented without hindering forward progress is unclear. Submissions to MEPC 71 were invited on scaling (IMO, 2016a).

Self-monitoring Requirements

The prior G8 included text regarding self-monitoring of control equipment, which has been expanded to include further specifications on the information that should be reported and available for inspection. This is included in a new Part 5 of the G8 Annex, with future guidance on the technical details expected to be developed by the IMO.

This G8 revision is expected to have little impact on the availability of approved BWMS because most systems already have sophisticated control and monitoring functions. Contrarily, many BWMS lack the ability to produce an easy-to-interpret report of the critical self-monitoring parameters. Therefore, the importance of this revision lies in the ability of operators and inspectors to quickly assess proper BWMS function, which can be used as an indicator of compliance.

Other Regulatory Revisions

Although the US type approval regulations have not officially changed, how they are interpreted and practically implemented has. Originally drafted in 2009 and published as a

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Final Rule in 2012 (DHS, 2012), technology and scientific knowledge have jumped ahead of the written rules. From experience, just during the course of a multi-year US type approval process, stakeholder experiences can result in changes to test procedures and how requirements are interpreted.

Unsurprisingly, other Administrations are also evolving the ways in which they regulate ballast water and BWMS approval. Some are just getting initiated while others are modifying existing rules based on experiences gained. Further, classification society rules are often updated on a two-year cycle, and the experience they are gaining is evident.

Effects of Regulatory Evolution

Changes in regulations over time are inevitable and can be beneficial when based on sound science and made practical for industry to implement. This is an extremely tall order, particularly when regulating a mobile industry that operates in a vast, global environmental asset such as the ocean. The reality is that all stakeholders must adapt to change, which inherently comes at some cost.

For BWMS manufacturers, regulatory evolution causes concern that testing and approval will never be finished. A significant concern is the ability to standardise equipment design and supply. Consider a scenario:

- A BWMS manufacturer has type approval from Administration “A” and class society “B”.
- During approvals with another Administration “C” and class society “D”, an equipment design changed is mandated.
- For the approvals with Administration “A” and class society “B” to remain valid, they must be updated.

The above scenario seems simple, but BWMS commonly have approvals with multiple Administrations and class societies, making the number of TAC revisions needed multiply quickly for each change. Unfortunately, another reality is that not all class societies agree with the design changes required by a different class society, and then the questions become: 1) which rule takes precedence, and 2) how can BWMS reach design “freeze” if multiple entities are simultaneously requiring changes.

Similar to the resources shipowners will expend for ballast water compliance, the resources manufacturers put into the evolutionary approval process is monumental. The number of BWMS manufacturers who enter and stay in the market indicates they are willing to put forth the resources needed to respond to varying demands. Yet, the continually moving target is confusing and becoming more difficult to reach.

5. Path forward to implementation

Recognising that organisations who establish rules have differing purposes and the rules they create are inherently different, further standardisation for BWMS approvals is needed. Although aligning G8 with the USCG rules was attempted where possible, the revision to G8

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again moves the BWMS approval target slightly. After entry into force of the BWMC, the mandatory status of the revised G8 should facilitate more standardised BWMS testing and approval, and hopefully equate to increased industry confidence in approved systems.

Class society approvals would benefit from greater efforts toward standardisation, not only between different class societies, but between offices of the same class society. One possible approach is for class societies that are members of the International Association of Classification Societies (IACS) to more uniformly apply the available Unified Requirements for BWMS (IACS, 2017). Within class societies, delays can arise during BWMS installation reviews by local surveyors, who might request changes to standardised BWMS equipment already approved by their main office. Clear guidance, which is firmly upheld, regarding the BWMS aspects that should be reviewed during installation approvals could be distributed from the main classification society office to their local offices.

6. Conclusion

Although the processes that some approving organisations are applying to BWMS are well established, BWMS are different in that they are complex assemblages of components. This makes approval more intricate compared to individual components such as valves or pumps. Further, the complicated biological efficacy evaluation is different from the majority of other marine equipment approvals.

Operational experience with BWMS is also fairly limited. While some BWMS manufacturers are not new to building marine equipment, experience thus far demonstrates there is room for improvement with BWMS engineering, installation and operation.

The relative immaturity of BWMS regulations, testing, approvals and operation means all stakeholders are learning. This results in regulatory and test protocol updates, equipment modifications, and operational changes over time. These changes appear in the form of revised guidelines or developments in practical implementation.

Approval process modifications such as those suggest herein would allow BWMS manufacturers to engineer systems confidently according to known standards that will apply to more than one approving organisation. Such standardisation would benefit shipowners as well, who frequently express concern over lack of confidence in BWMS. Greater clarity would smooth the review and approval process and benefit all stakeholders. This evolution, although painful at times, is critical and necessary for forward progress.

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