



The challenge of achieving compliance – is it physically possible?

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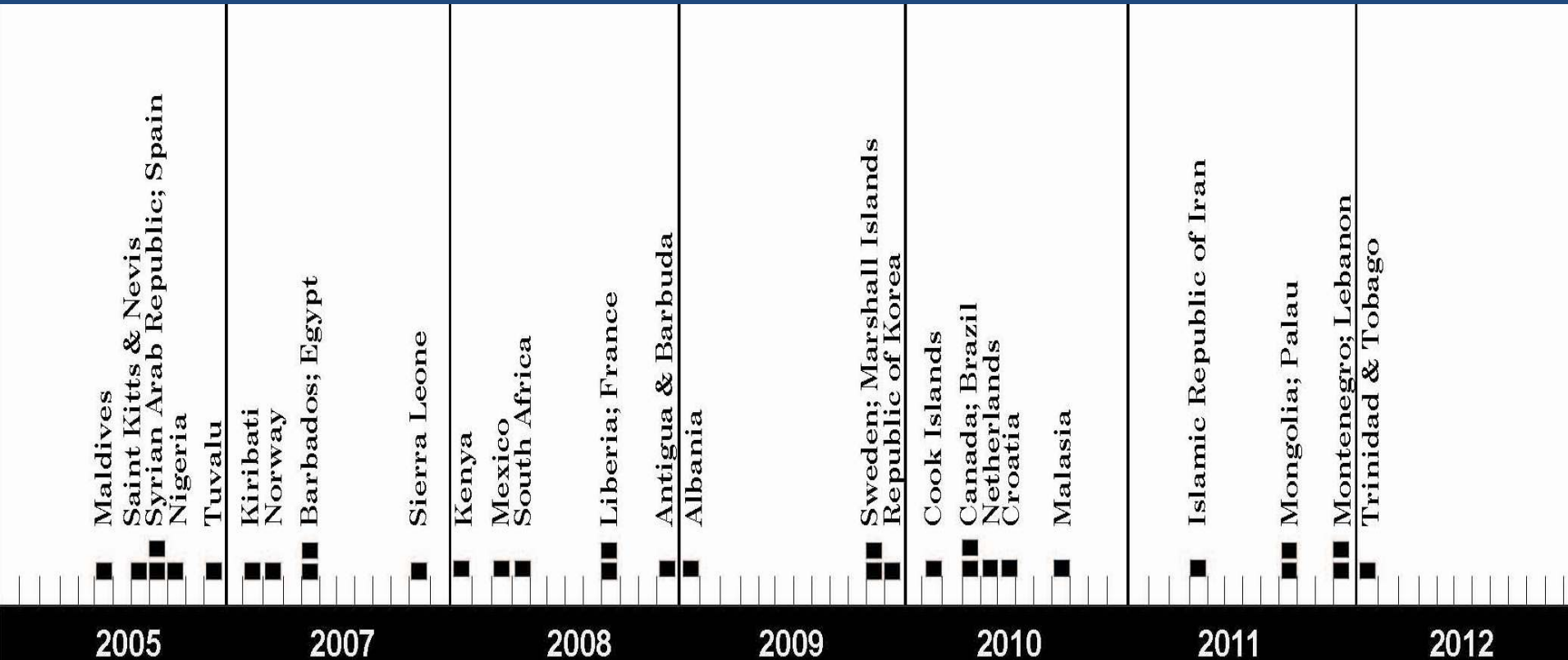
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Science & Technology

IMarEST involvement with Ballast Water Management Convention

- Ballast Water Experts Group (BWEG) formed in 2010 is an IMarEST Special Interest Group, works closely with:
 - Globallast, North Sea Ballast Water Opportunity (NSBWO), European Maritime Safety Agency (EMSA), International Chamber of Shipping, Lloyd's Register.
- Information papers: 'Logistics of Compliance Assessment and Enforcement of Ballast Water Convention' *MEPC 62/INF.31*, July 13, 2011), Preview of Global Ballast Water Treatment Markets. *MEPC 63/INF.11*, Feb, 2012).
- One of the IMarEST's objectives is to promote and disseminate awareness of BW Management Convention. IMarEST's particular focus is on enhancing awareness through its international network (>15,000 members in >100 different countries, with >50 regional branches).

Website - www.imarest.org.

Ratification Time-Table for IMO Ballast Water Management Convention (as of February 2012).



There are now 33 contracting parties, which represent 26.46% of the world tonnage. 35% needed for the Convention to enter into force.

IMO BWMC Timetable.

<u>Existing Vessels</u> Ballast Water Cap. (m3)			2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	20..
< 1500 OR > 5000	A				Exchange or Treat (D1 or D2)							TREAT (D2)		
1500 to 5000	A			Exchange or Treat (D1 or D2)							TREAT (D2)			
<u>New Vessels</u> BW Cap. (m3)	BUILD YEAR													
> 5000	2009 - 2011				Exchange or Treat (D1 or D2)							TREAT (D2)		
> 5000 m3	2012 →									TREAT (D2)				
< 5000 m3	2009 →	*)		Exchange or Treat (D1 or D2)						TREAT (D2)				
< 5000 m3	2010 →	**)							TREAT (D2)					
<p>A = shall comply, NOT later than the first intermediate or renewal survey, whichever occurs first, after the anniversary date in the year of compliance with the D-2 standard.</p> <p>*) MEPC.57 postponed requirement to second annual survey or latest by the end of 2011. To be updated.</p> <p>***) MEPC.59 recommends to Administrations to start fitting ships with BWMS technology.</p>														

Qualification to timetable.

By 2017 it is estimated that all existing vessels over 400 tons will be in compliance and the BWTS market will comprise only of newly built ships. It is estimated that approximately 70,000 vessels will require to be outfitted with a functional certified BWTS by that time.

Because of delays in ratification by a sufficient number of countries, IMO granted a delay of the date when the first set of ships subject to the regulations need to comply, i.e. those ships constructed in 2009 or later with a ballast capacity of less than 5000m³. According to IMO Resolution (1005) 25, ships in this category now have until the time of their second scheduled annual survey, but “no later than December 31, 2011, to comply.” As this deadline has passed, the question is “How will the timetable alter from 2012 onwards?”.

Vessel Type by Estimated Ballast Capacity.

(Estimated 68,000 commercial vessels will install on-board BWTS before 2020, King et al. *Preview of Global Ballast Water Treatment Markets*)

Sub Type	Count	Ballast Capacity of <math><1500\text{m}^3</math>	Ballast Capacity of $1500\text{-}5000\text{m}^3$	Ballast Capacity of $>5000\text{m}^3$
Barges	574	0	0	574
Bulk Carriers	8,110	0	0	8,110
Container Ship	4,724	0	0	4,724
Crude Oil Tanker	2,160	0	0	2,160
Chemical Tanker	1,474	0	0	1,474
Chemical/Oil Products Tanker	9,323	0	0	9,323
General Cargo Ship	18,187	0	16,535	1,652
Fishing Vessels	8,001	7,970	30	1
LNG Tanker	327	0	0	327
LPG Tanker	1,194	540	0	654
OSVs	2,000	1,923	0	77
Passenger (Cruise) Ship	515	0	479	36
Passenger-Passenger/Cargo (Ro-Ro)	3,359	3,324	35	0
Passenger Ship	2,942	2,941	1	0
Refrigerated Cargo Ship	2,542	0	2,538	4
Ro-Ro Cargo Ship	1,873	0	1,700	173
Livestock Carrier	101	0	90	11
Vehicle Carrier	784	0	196	588
TOTAL	68,190	16,698	21,604	29,888

USA and Singapore. Examples of logistical issues relating to compliance assessment.

United States. Primary logistical problem would be coverage required to serve their 49 major ports separated by hundreds or thousands of miles, including the Great Lakes and Hawaii.

Singapore. Receives > 70,000 commercial vessels/ year in a single port, not including barges, tugs, ferries and passenger vessels; an average >190 vessels per day. *(This is a comparatively efficient port. The average turnaround time for ships in Singapore is between 6-8h, whereas in other ports, it may take more than 10 times as long for a similar type of vessel).*

Discharge of Foreign Ballast in U.S. (National Ballast Information Center, NBIC, Edgewater Maryland)

8,423 ships discharge annual average of appx. 37 million MT foreign ballast over 34,500 annual visits

Ignoring Great Lakes ports (not in NBIC data base) we can calculate 863 visits per port per year; appx. 2.4 per port per day.

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Certification testing.

Conducted at test centres based in several countries including China, Denmark, Germany, Japan, Netherlands, Norway, S. Korea, Singapore, South Africa, U.K. and the U.S.A., with the aim of obtaining both final approval from the IMO and Type Approval from various classification societies worldwide . Performances of BWTs have been tested almost exclusively against the published IMO D-2 standard and to date have involved both land-based and shipboard components entailing a matrix of replicated trials in different water conditions and seasons.

To gain IMO and/or Flag State approval and certification, each BWT system undergoes a set of land and ship based trials which have a relatively common set of criteria based on a range of environmental conditions. Whilst it may be possible to determine system efficacy in reasonably precise terms in the carefully controlled almost laboratory-like conditions during this approvals process, the reality of compliance testing during a ships trading life presents a wholly different picture.

The Challenge.

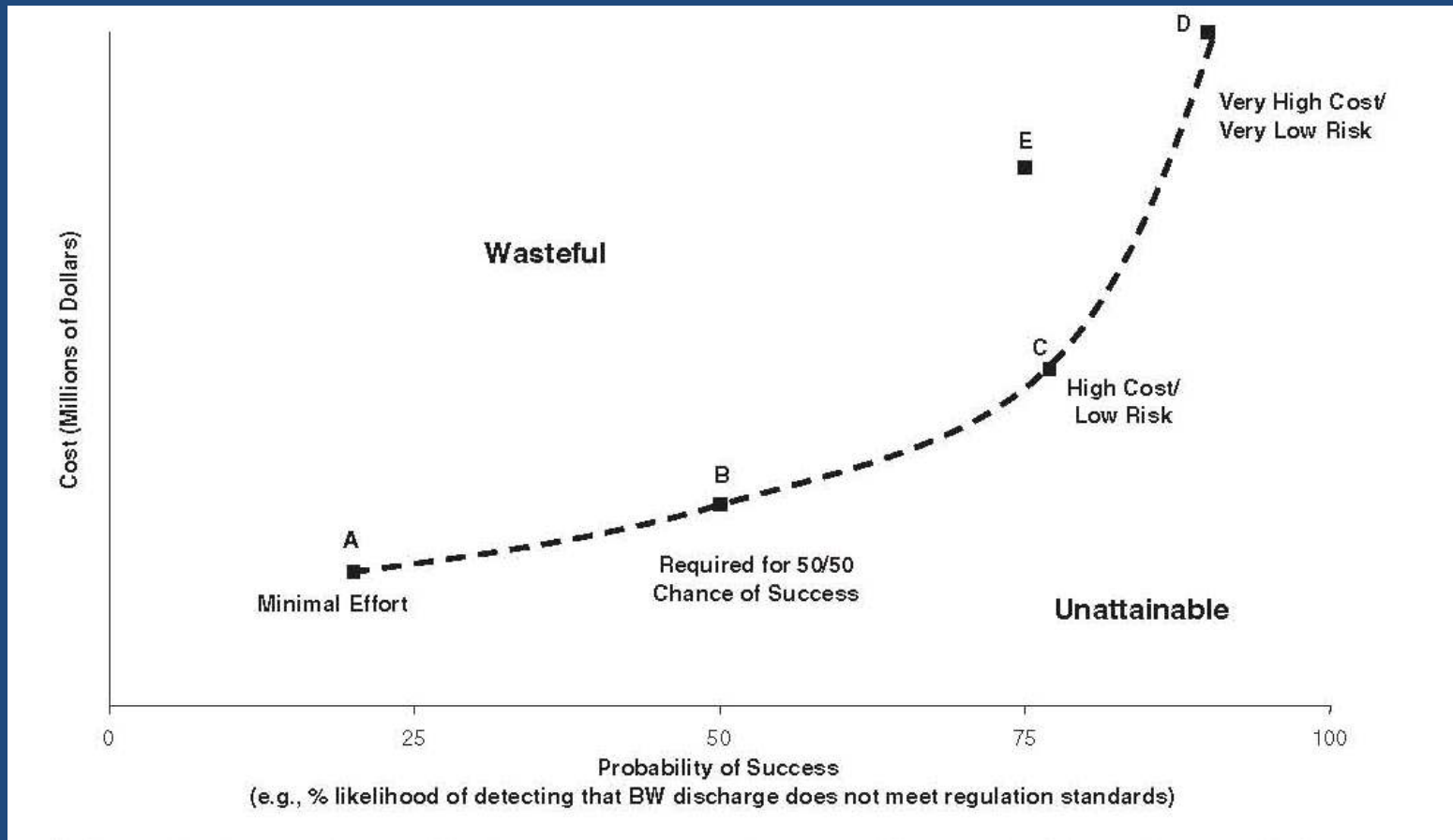
Section 6.2.2 of the G-2 guidelines states that “*the sampling protocol should result in samples that are representative of the whole discharge of ballast water from any single tank or any combination of tanks being discharged*”. A suitable sampling scheme is required to obtain a “representative sample”, and considerable effort has been devoted to the definition of this term within the context of compliance testing.

Because of the rarity of larger ($>50\mu\text{m}$) organisms the largest possible volume of water must be filtered in order to obtain an accurate estimate of their number.

Summarizing the Challenges.

- To provide the necessary precision to accurately assess compliance with IMO D-2 regulation, very large volumes of water would have to be sampled, concentrated and examined (issues include sample variance, live/dead assessment).
- However, logistical and time constraints (e.g. a short port visit, lead time to analytical facility) may dictate that counts would have to come from smaller samples.
- A further constraint is the limit number of laboratories equipped to take and analyse samples with sufficient rigour.

General cost-effectiveness curve showing wasteful, unattainable, and cost-effective alternatives for achieving varying levels of success*.



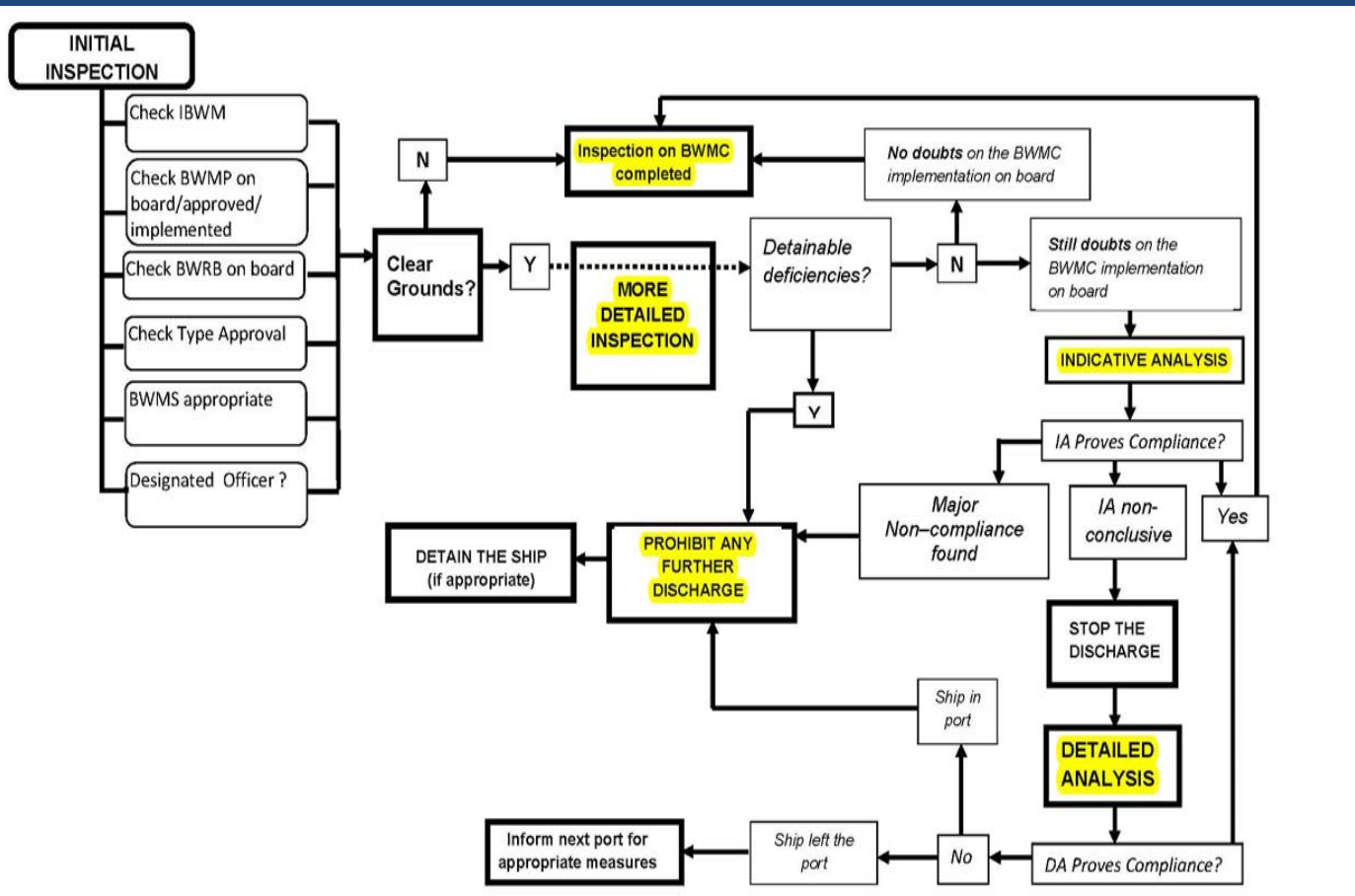
* King and Tamburri (2010) Verifying Compliance with Ballast Water Discharge Regulations. *Ocean Development & International Law*, 41:152–165.

A solution. A tiered approach to compliance assessment

- Reports submitted by vessel operators on the type of certified treatment system onboard and documentation indicating appropriate use and record of maintenance.
- Onboard inspections by an enforcement official who would verify the certified treatment system's use, appropriate operation and maintenance. Start the compliance control sample processing with the "easiest-to-prove" organism group.
- Indirect or indicative water quality measures may be collected autonomously, or by inspectors, demonstrating appropriate treatment conditions have been achieved.
- More complex (time-consuming, expensive) testing will depend on results of preliminary observations.

SUB-COMMITTEE ON BULK LIQUIDS AND GASES
 16th session, Agenda item 4, BLG 16/4, 26 October 2011
**DEVELOPMENT OF GUIDELINES AND OTHER DOCUMENTS FOR
 UNIFORM IMPLEMENTATION OF THE 2004 BWM CONVENTION**

Proposed Flow-Chart of Port State Control Options for BWM Convention Enforcement

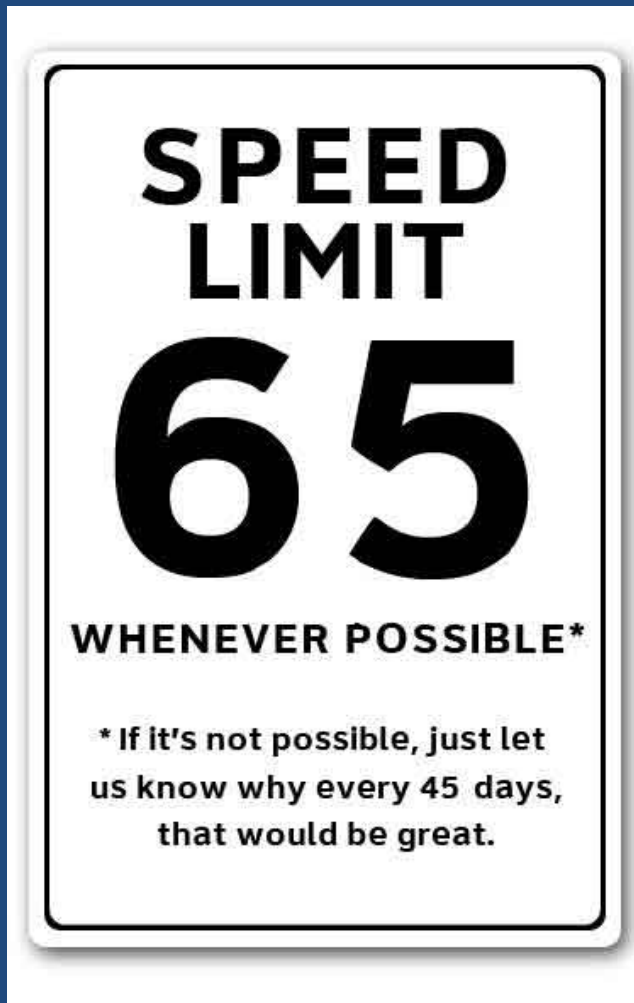


EMSA on behalf of
 European
 Commission

Semi-Quantitative/Qualitative Analytical Methods

- For phytoplankton, pulse-amplitude modulated (PAM) fluorometry has promise. In measuring the photochemical efficiency of photosystem II (F_v/F_m) PAM provides a rapid measure of photosynthetic activity as an indicator of cell viability although results cannot directly be translated into cell numbers without calibration.
- Likewise, determination of biologically important molecules such as nucleic acids and ATP are incompatible with D-2 standard endpoints and may indicate false positives although such methods may be used for an indicative sample analysis. Similar problems of interpretation are also associated with several assays used to determine viable indicator bacteria.

Why Enforcement?



Why Enforcement?

- To achieve environmental improvement or prevent environmental degradation by securing compliance with the law.
- To encourage voluntary compliance measures by changing behavior.
- To keep the playing field level

Keys to Effective Enforcement

- Clarity
- Consistency
- Transparency

Q. Is the challenge of achieving compliance physically possible?

A. Technically, yes, through a legally defensible tiered approach that identifies non- or partial compliance before full compliance is addressed.

Thank you for
your attention!

