

MARITIME

# Ballast water treatment –status and solutions

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21.05.2015

# Agenda

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- **Regulation status**
  - Ratification status for IMO
  - Application and implementation of BWM requirements
  - USCG/EPA requirements
- **Installation requirements**
  - Certification
  - Plan approval
- **Update from last MEPC/IMO meeting**
- **Type Approved technologies**
  - DNV GL experience
  - Overview of tests
  - Technologies and BWM systems

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# Status

## 44 countries has signed the BWM Convention

- Albania
- Antigua & Barbuda
- Barbados
- Brazil
- Canada
- Congo
- Cook Islands
- Croatia
- Denmark
- Egypt
- France
- Georgia
- Germany
- Iran (Islamic Republic of)
- Japan
- Jordan
- Kenya
- Kiribati
- Lebanon
- Liberia
- Malaysia
- Maldives
- Marshall Islands
- Mexico
- Mongolia
- Montenegro
- Netherlands
- Nigeria
- Niue
- Norway
- Palau
- Republic of Korea
- Russian Federation
- Saint Kitts and Nevis
- Sierra Leone
- South Africa
- Spain
- Sweden
- Switzerland
- Syrian Arab Republic
- Tonga
- Trinidad & Tobago
- Turkey
- Tuvalu



32,86% of world fleet  
(target 35%)

## Not signed the BWM Convention

Country	GT
Panama	18,87 %
Hong Kong	7,37 %
Singapore	6,38 %
Bahamas	4,73 %
Malta	4,49 %
China	4,20 %
United Kingdom	4,11 %
Greece	3,54 %
Cyprus	1,82 %
<b>Italy</b>	1,46 %
United States of America	1,44 %
<b>Indonesia</b>	1,19 %
<b>India</b>	0,78 %



## Application of the BWM Convention

### Applies

- Party to the Convention; or
- Sailing in waters of a Party

### Does not apply

International  
BWM Certificate

Exemptions  
(Reg. A-4)

Ballast  
free  
ships

Local trade  
(flag and  
operation  
only under  
same  
party)

Local trade  
(flag of  
party and  
operation  
under  
another  
party only)

Navy  
ships

Permanent  
ballast  
water

Exceptions  
(Reg. A-3)

Between  
specified  
ports

Five  
years  
period

Based on  
risk  
analysis  
according  
to G7

Emergency

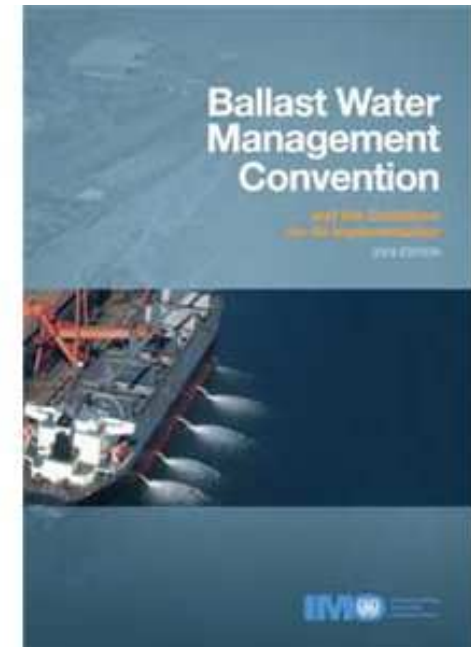
Accidental

Uptake  
and  
discharge  
in high  
seas

Uptake  
and  
discharge  
in the  
same  
location

## Ballast Water Management Convention

- Ballast Water Management Plan (approved)
- Ballast Water Record Book
- Ballast water exchange (standard D-1)
  - Sequential exchange method (s)
  - Flow-through exchange method (f)
  - Dilution exchange method (d)
  - 95% (3 times)
- Ballast water treatment (standard D-2)
  - 10 viable organisms / m<sup>3</sup> (> 50 micrometres)
  - 10 viable organisms / ml (10-50 micrometres)
  - Indicator microbes (toxic *Vibrio cholerae*, *Escherichia*, Intestinal Enterococci)
- Sediment management
- Surveys (initial, annual, intermediate, renewal)
- International Ballast Water Management Certificate



## MEPC 65 - new implementation schedule - BWTS



### Case A: BWM Convention enters into force before 31 December 2016

constructed year		BW capacity (m <sup>3</sup> )	new schedule
before 2009		between 1500 and 5000	first IOPP renewal survey after entry into force of the Convention
		less than 1500 or greater than 5000	first IOPP renewal survey <b>after the anniversary date</b> of delivery of ship in 2016
2009 or after		less than 5000	first IOPP renewal survey after entry into force of the Convention
	between 2009 and 2011	5000 or more	first IOPP renewal survey <b>after the anniversary date</b> of delivery of ship in 2016
	after 2011	5000 or more	first IOPP renewal survey after entry into force of the Convention

### Case B: BWM Convention enters into force after 31 December 2016

The applicable date of compliance with D-2 standard is **first IOPP renewal survey after entry into force**, for all ships. Ships constructed after entry into force will be required to have a treatment system installed at delivery.



# US Ballast Water Management Regulations



- The US BW regulations will require all ships to:
  - Clean ballast tanks to remove sediments
  - Rinse anchors and chains when retrieved
  - Remove fouling from the hull, piping and tanks on a regular basis
  - Maintain a BW management plan that includes procedures for fouling and sediment removal as well as ballast water management (plan need not be approved)
  - Maintain records of ballast and fouling management
  - Report to be submitted 24 hours before arrival

	Ballast water capacity	Construction date	Compliance date
New ships	All	On or after 2013-12-01	On delivery
Existing ships	Less than 1500 m <sup>3</sup>	Before 2013-12-01	First scheduled drydocking after 2016-01-01
	1500 m <sup>3</sup> to 5000 m <sup>3</sup>	Before 2013-12-01	First scheduled drydocking after 2014-01-01
	Greater than 5000 m <sup>3</sup>	Before 2013-12-01	First scheduled drydocking after 2016-01-01

Vessel's management may apply extension of implementation schedule, ref CG-OES Policy Letter No. 13-01 found at [Homeport USCG](#)

- **EPA - VGP** has additional requirements on BWTS calibration of sensors, sampling of biological indicators and sampling of residual biocides. Records to be retained on board for 3 years.

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# Installation

## Type Approval of BWTS

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### IMO

- BWMC require a TA certificate by the Administration (flag State) or that such flag State acknowledge another Administration's TA certificate, in writing (ref Reg. D-3 and G8 6.3-6.5)

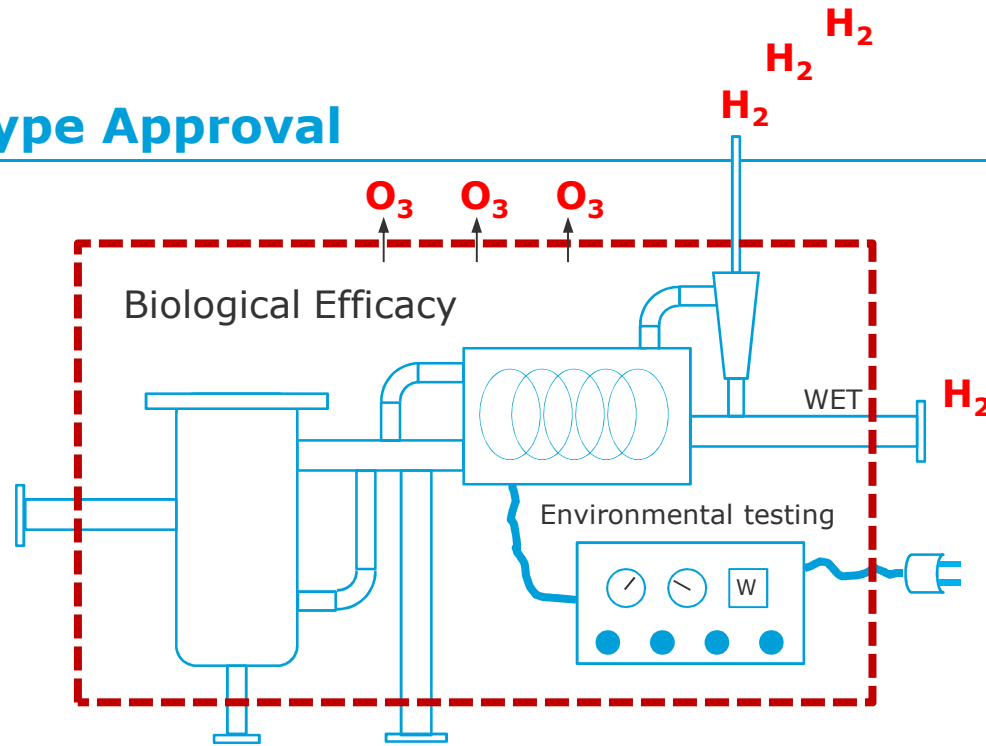


### USCG

- USCG requires (ref 33 CFR 151.2025) a TA certificate, issued by USCG in accordance with 46 CFR 162.060
- BWTS with IMO TA certificate (by and Administration) can after a review process by USCG be listed as AMS (Alternate Management System)
- An AMS system can be used 5 years from the date vessel is required to have a BWTS installed.
- DNV GL delegated Independent Laboratory/Recognized organization

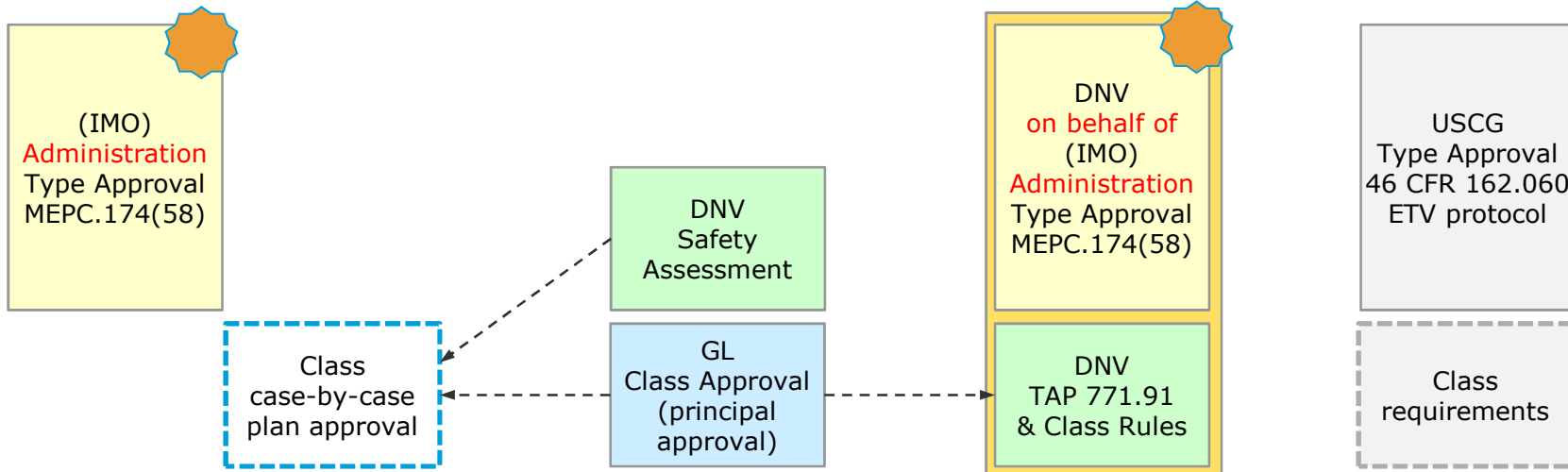


# Scope of Type Approval



## Class focus

- safe installation
- pressure vessels
- pipng
- electrical installation
- EMC
- power balance (retrofit)
- marine standard equipment
- enhanced environmental testing on control and switch boxes



## Approval and survey

- Plan approval
  - Multidiscipline:
    - P&ID
    - I/O list
    - Power supply arrangement
  - Approval/examination of BWM Plan
    - DNV GL template available ([www.dnvgl.com/bwm](http://www.dnvgl.com/bwm))
- Installation survey
- Periodical survey (A/In/R)



Class Notation BWM

Certificate of Compliance /  
Statement of Compliance



When BWMC  
enters into force

International BWM  
Certificate

- Safety requirements as minimum requirement from main class
- MEMO on ship

BWTS installed, but no  
notation or certificate

## DNV GL Approval Centres

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Norway

Germany

Korea

China

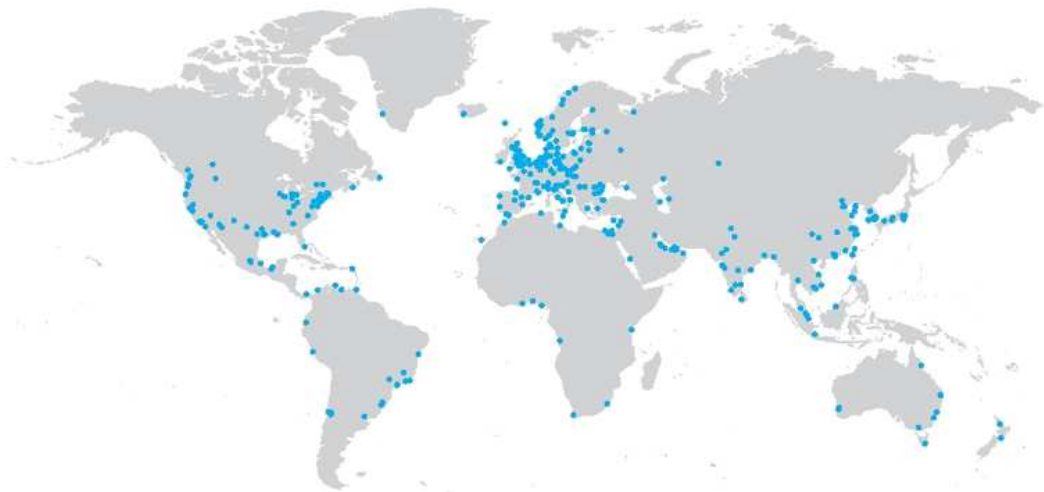
Greece

Poland

Japan

Brazil

DNV GL OFFICES AROUND THE WORLD

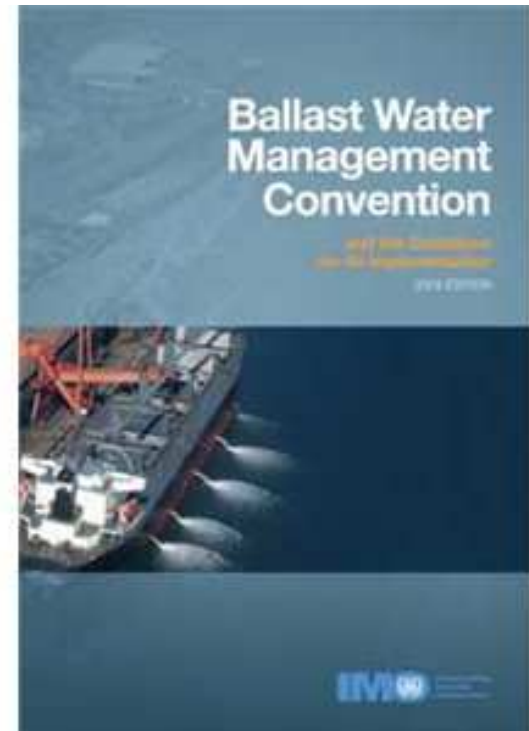


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# MEPC 68

## MEPC 68

- Correspondence group on G8 revision re-established
- Roadmap for not penalizing early movers discussed.
- Exemptions for “same risk area” and definition of “same location” to be further discussed at MEPC 69
- Total number of type approved systems now 57.





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# Type Approvals

## DNV GL – Type Approval experience of BWMS

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- **IMO:**

- 16 type approved systems (5 new in pipeline), worked with 25+ manufacturers

- **USCG:**

- 16 contracts for USCG testing:

- 3 completed testing (UV systems)
- 6 undergoing tests now
- 7 starting up within this summer/autumn

- 4 approved sub-suppliers for bio efficacy testing (DHI DK, DHI Singapore, NIVA, Golden Bear)

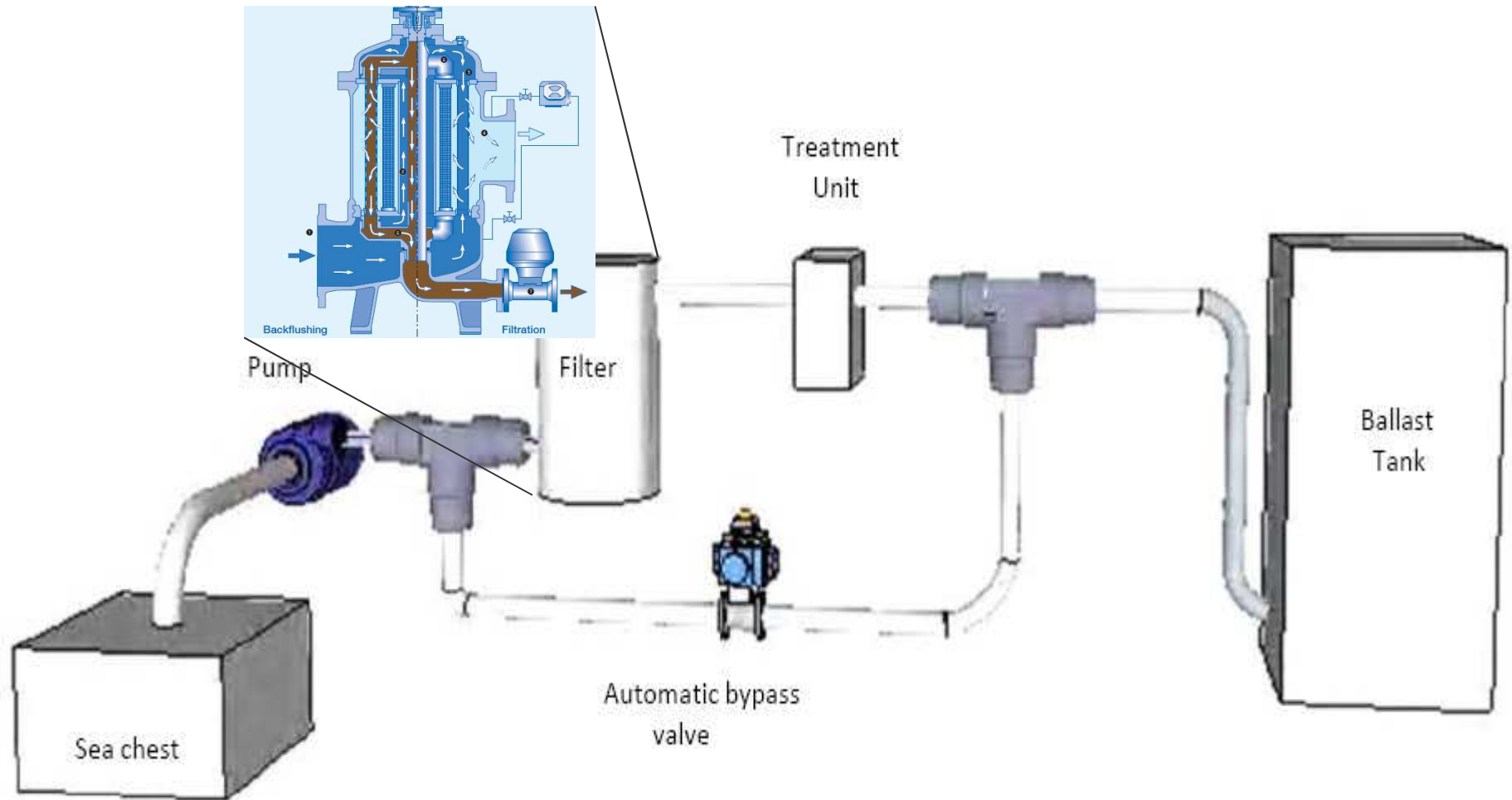
- 5 approved labs for environmental testing (Applica, DELTA DK, Retlif, TUV SUD, Phoenix)

## USCG Type Approval requirements

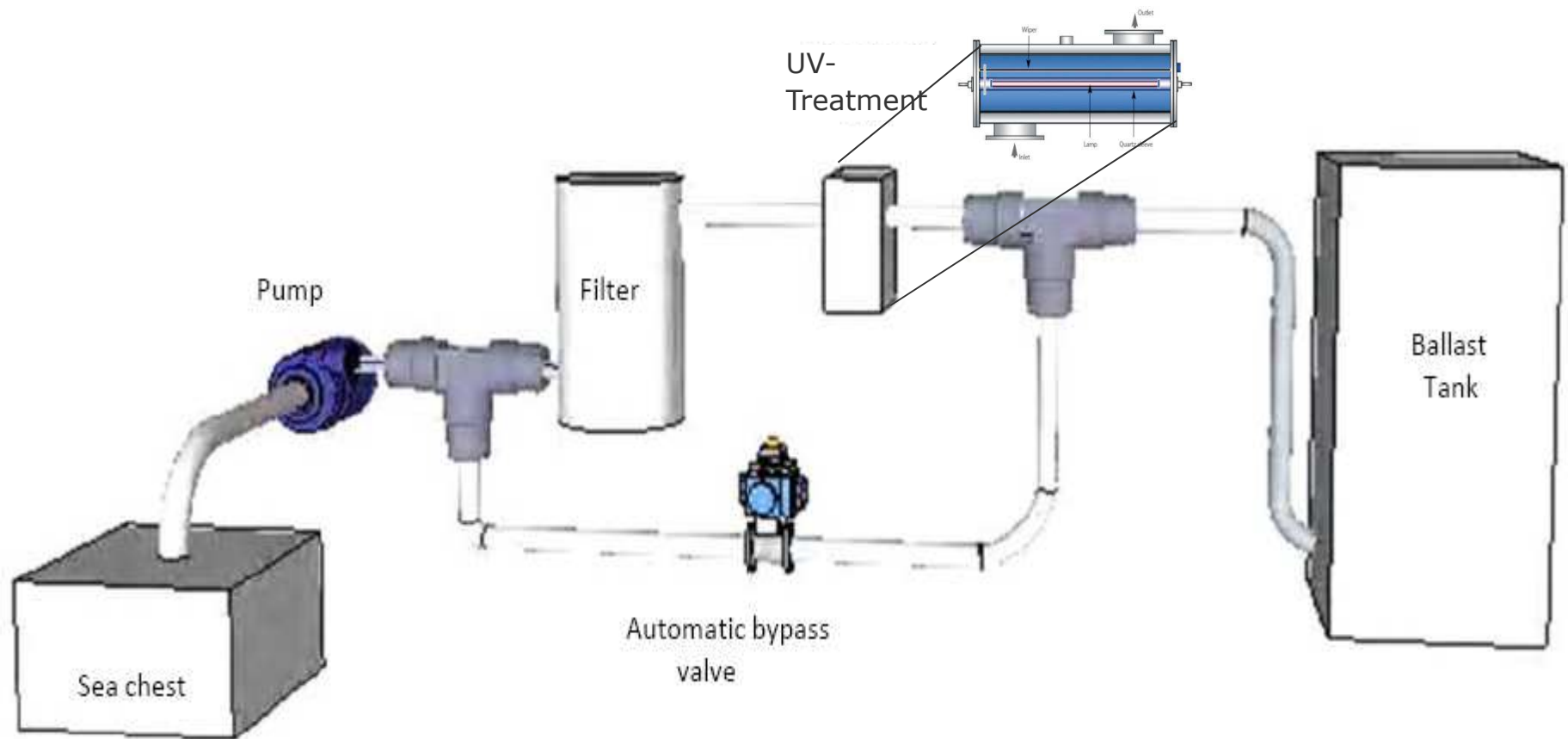


- **Readiness testing** – system confirmed ready, then design and treatment claim is sealed
- **Documentation review and approval**
- System using active substances shall have approval by EPA.
- IL overseeing type approval
- TF shall operate equipment during testing only assisted by a pre approved operational manual
- **Land-based testing**
  - 5x **consecutive** Biological Efficacy tests in all intended TA water qualities.
  - Toxicity testing (if active substance)
  - Treat >200 m<sup>3</sup> and hold for **at least 24 hours** before discharge
- Verification of test lab's sample handling and laboratory practice
- QA/QC of test lab .- **Only USCG pre approved facilities**
  
- **Shipboard testing**
  - **5x consecutive** Biological Efficacy testing on board ship during >6 months
- **Environmental testing** (electric components)
  - enhanced req. on vibration (**4h** VS 2h for IMO), **specified sequence**

# Technologies filter



# Technologies UV-unit



## Filter – UV technologies

(Updated May 2015)

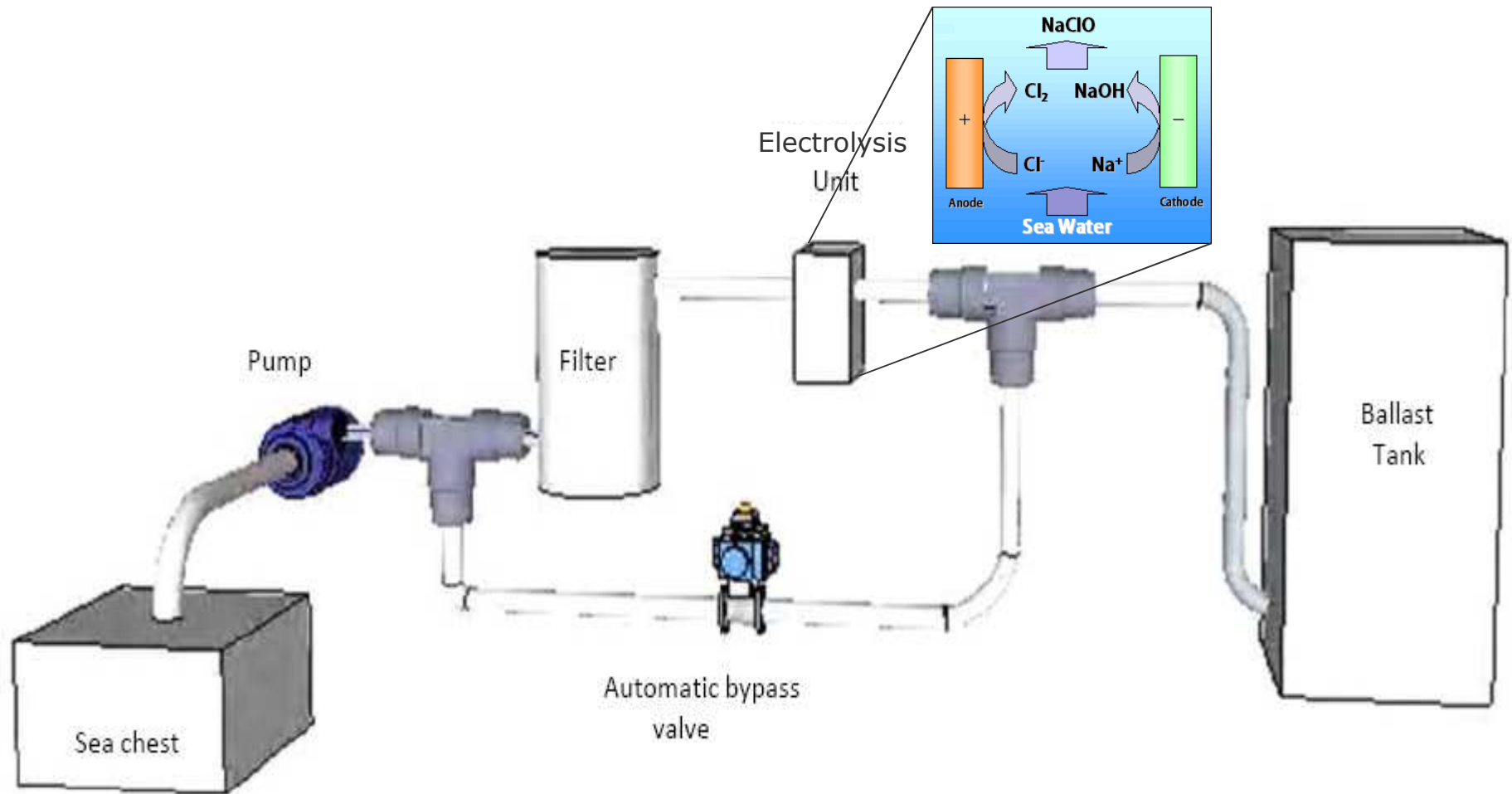
manufacturer	ctry	BWT System	technologies	active subst.	stage of approval	Admin.	DNV GL TA	AMS
Alfawall AB	SE	PureBallast 2.0/2.0 Ex	advanced oxidization + filtration	Yes	Type Appr.	Norway	Yes	2013-04-15
Alfawall AB	SE	PureBallast 3.0/3.0 Ex	UV+ filtration	No	Type Appr.	Norway	Yes	2014-06-19
Auramarine	FI	CrystalBallast	UV + filtration	No	Type Appr.	Norway	Yes	2014-01-07
Trojan UV	US	Trojan Marinex	UV + filtration	No	Type Appr.	Norway	Yes	2014-08-27
MMC	NO	MMC BWMS	UV + filtration	No	Type Appr.	Norway	Yes	2013-08-29
Optimarin	NO	Optimarin Ballast System (OBS)	UV + filtration	No	Type Appr.	Norway	Yes	2013-06-18
Hyundai HI	KR	EcoBallast	UV + filtration	No	Type Appr.	South Korea	No	2014-12-22
Panasia Co., Ltd.	KR	GloEn-Patrol	UV + filtration	No	Type Appr.	South Korea	Yes	2013-04-29
GEA Westfalia	DE	BallastMaster UltraV	UV + filtration + ultrasound	Yes	Type Appr.	Germany	No	2013-11-11
BIO-UV SAS	FR	BioSea	UV + filtration	No	Type Appr.	France	No	2014-03-24
Hyde Marine Inc.	US	Hyde Guardian	UV + filtration	No	Type Appr.	UK	No	2013-04-15

## Filter – UV technologies

(Updated May 2015)

manufacturer	ctry	BWT System	technologies	active subst.	stage of approval	Admin.	DNV GL TA	AMS
COSCO	CN	Blue Ocean Shield BWMS	UV + filtration	No	Type Appr.	China	No	2013-11-19
Shanghai Cyeco Env. Technology	CN	Cyeco BWMS	UV + filtration + ultrasound	No	Type Appr.	China	No	2014-07-17
Wuxi Brighsky Electronic	CN	BSKY BWMS	UV + ultrasonic + filtration	No	Type Appr.	China	No	2013-10-04
DESMI OceanGuard AS	DK	RayClean BWMS	UV + filtration	No	Type Appr.	Denmark	Yes	2015-02-09
Elite Marine	CN	Seascape BWMS	UV + filtration + ultrasound	No	Type Appr.	China	No	2014-10-06
Sumitomo	JP	EcoMarine	UV + filtration	No	Type Appr.	Japan	No	2014-12-01
Miura	JP	Miura BWMS	Filtration + UV	No	Type Appr.	Japan	No	2014-11-24
Yixing PACT Environmental Tech.	CH	PACT marine BWMS	Filtration + UV	No	Type Appr.	China	No	2015-04-06
21 <sup>st</sup> Century Shipbuilding	KR	ARA Plasma BWMS	UV + filtration + high energy plasma	No	Type Appr.	South Korea	No	2013-10-29
Cathelco	DE	Cathelco	Filter + UV	No	Type Appr.	Germany	No	2014-11-13
Shanghai Hengyuan	CH	Shanghai Hengyuan BWTS	Filter + UV	No	Type Appr.	China	No	2014-09-14

# Electrolysis



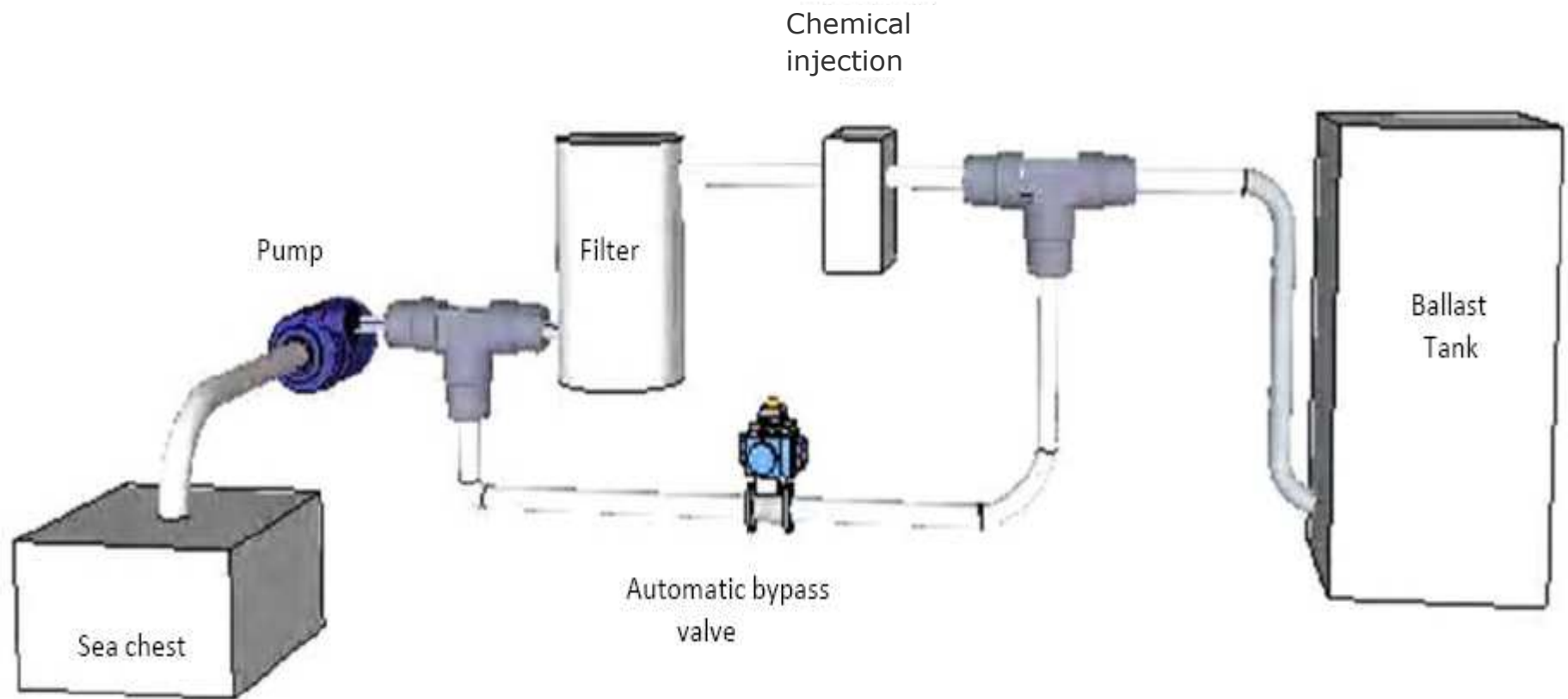


# Electrolysis

(Updated May 2015)

manufacturer	ctry	BWT System	technologies	active subst.	stage of approval	Admin.	DNV GL TA	AMS
Aqua Eng. Co., Ltd.	KR	AquaStar AquaStar-Ex	filtration + electrolysis	Yes	Type Appr.	South Korea	No	2014-01-07
Hyundai HI	KR	HiBallast HiBallast-Ex	filtration + electrolysis	Yes	Type Appr.	South Korea	No	2013-06-24
Headway Marine Technology	CN	OceanGuard BWMS	electrocatalysis + filtration + ultrasound	Yes	Type Appr.	Norway	Yes & China	2013-04-15 2013-09-23
OceanSaver	NO	OceanSaver Mk II	filtration + electrolysis	Yes	Type Appr.	Norway	Yes	2013-09-23
Samsung Heavy Industries	KR	Purimar System	filtration + electrolysis	Yes	Type Appr.	South Korea	No	2013-10-04
STX Heavy Industries	KR	Smart Ballast BWMS	electrolysis	Yes	Type Appr.	South Korea	No	2014-01-07
Techcross	KR	Electro-Cleen System	electrolysis	Yes	Type Appr.	South Korea	No	2013-10-04
RWO	DE	CleanBallast	filtration + electrolysis + electrochlorination	Yes	Type Appr.	Germany	No	2013-04-15
Severn Trent De Nora	US	BalPure	filtration + electrolysis	Yes	Type Appr.	Germany	No	2013-04-15
Erma First	GR	Erma First BWMS	filtration + hydrocyclone + electrolysis	Yes	Type Appr.	Greece	No	2013-10-11
Evoqua	DE	SeaCure	Filtration + electrolysis	Yes	Type Approved	Germany	No	2014-10-06

# Chemical injection



## Chemical injection

(Updated May 2015)

manufacturer	ctry	BWT System	technologies	active subst.	stage of approval	Admin.	DNV GL TA	AMS
Ecochlor	US	Ecochlor BWMS	chemical injection (ClO <sub>2</sub> )	Yes	Type Appr.	Germany	No	2013-04-15
JFE	JP	JFE BallastAce	chemical injection + filtration	Yes	Type Appr.	Japan	No	2013-10-15
Kuraray	JP	Microfade	filtration + chemical injection	Yes	Type Appr.	Japan	No	2013-10-28
NYK	JP	SKY-SYSTEM BWMS	Chemical injection	Yes	Type Appr.	Japan	No	

## Other treatment technologies

(Updated May 2015)

manufacturer	ctry	BWT System	technologies	active subst.	stage of approval	Admin.	DNV GL TA	AMS
Knutsen OAS	NO	KBAL	pressure drop + UV	No	Type Appr.	Norway	Yes	2014-03-07
NK Co., Ltd.	KR	NK-O3 BlueBallast System	ozonation	Yes	Type Appr.	Norway	Yes & Korea	2013-04-15
Mahle	DE	Ocean Protection System (OPS)	filtration + pre-filtration + filtration	No	Type Appr.	Germany	No	2014-02-12
Hitachi	JP	Hitachi BWMS (ClearBallast)	filtration + coagulation + magnetic separation	Yes	Type Appr.	Japan	No	
Mitsui Eng. and Shipbuilding	JP	FineBallast OZ	cavitation + ozonation	Yes	Type Appr.	Japan	No	2014-09-17
Jiangsu Nanji Machinery	CN	NiBallast BWMS	de-oxygenation + micromembrane + filtration	No	Type Appr.	China	No	2013-11-15
NEI	US	Venturi Oxygen Stripping	de-oxygenation	No	Type Appr.	Liberia	No	2013-12-16
Bawat AS	DK	Bawat BWMS	de-oxygenation + heat treatment	No	Type Appr.	Denmark	Yes	2015-02-13
Coldharbour Marine	UK	Coldharbour	de-oxygenation	No	Type Appr.	UK	No	
Jiujiang Research Institute + SMU	CN	OceanDoctor BWMS	filtration + photocatalization	Yes	Type Appr.	China	No	2014-12-22

## Other treatment technologies

(Updated May 2015)

manufacturer	ctry	BWT System	technologies	active subst.	stage of approval	Admin.	DNV GL TA	AMS
21 <sup>st</sup> Century Shipbuilding	KR	Ara Plasma BWTS	Filter + plasma	No	Type Appr.	South Korea	No	2013-10-13

# Thank you!

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