

Purimar™



- **BWMS RULES**
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- **Installation**

BWMS RULES

BWTS Regulation Implementation Schedule

		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
IMO	Existing Vessels				Constructed in 2009, BW ¹ Capacity < 5,000m ³									
									Constructed before 2009, 1,500m ³ ≤ BW Capacity ≤ 5,000m ³					
											Constructed before 2009, BW Capacity < 1,500m ³ and > 5,000m ³			
	New building				Constructed in 2010 & 2011, BW Capacity < 5,000m ³									
					Constructed in/after 2012									
US (HR2830)		First Drydocking after Dec. 31 2008, Complying to IMO Regulation												
					First Drydocking between Dec. 31 2011 and Jan. 1 2014, Complying to US Standard									
California (SB497)	Existing Vessels								1,500m ³ ≤ BW Capacity ≤ 5,000m ³					
											BW Capacity < 1,500m ³ and > 5,000m ³			
	New building				Constructed in/after 2010, BW Capacity ≤ 5,000m ³									
					Constructed in/after 2012, BW Capacity > 5,000m ³									
New York (CWA 401)					All vessels from 2012									

- US regulation & IMO convention : From 2010 depending on ballast water capacity.
- New York States : From 2012 any vessels that operate in New York waters may not discharge untreated ballast water in to New York Waters.

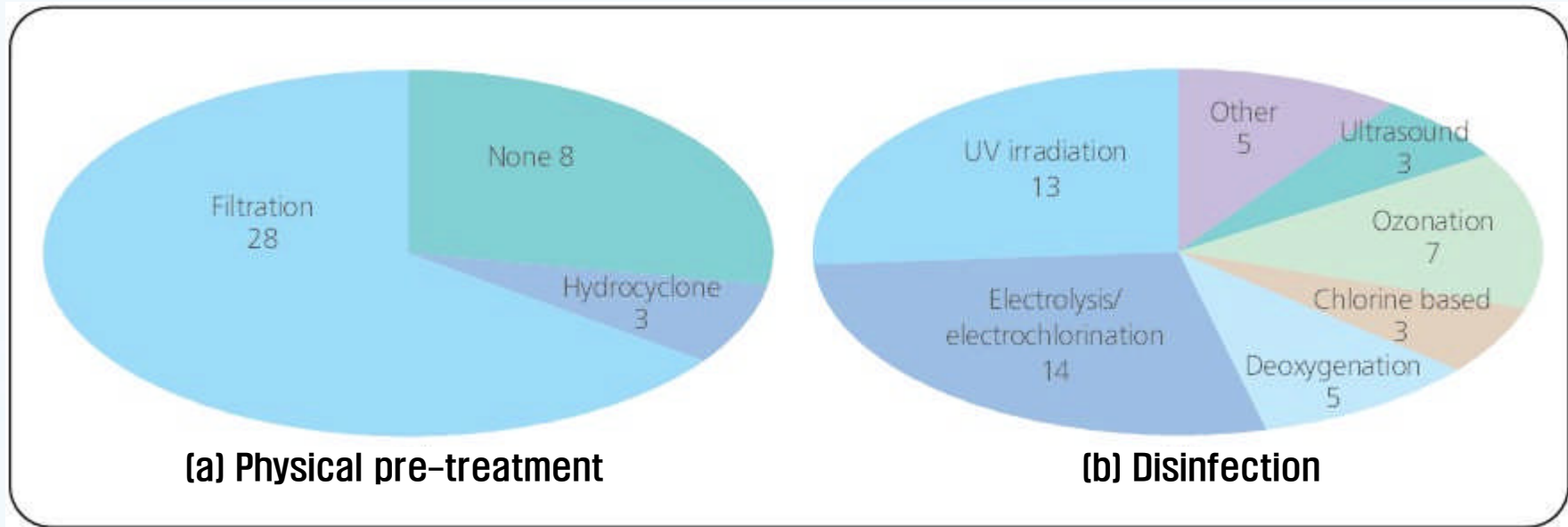
- IMO Convention shall enter into the force twelve months after thirty states with thirty five merchant shipping tonnage have signed it.
- Now, 26 states and 24.6% merchant shipping tonnage (OCT.1. 2010)



It is anticipated that the rule will be come into the effect in the end of 2011 or in the beginning of 2012.

1. Applied technologies in the world

- Pre-treatment is being applied about 80%.
- Dominant Disinfection Solutions : UV, Electrolysis, Deoxygenation, Ozonation



< Ballast water treatment technology >
Lloyd's Register February 2010

※ Latest Trend

Thirteen(13) Makers that have suggested documents for Basic and Final Approval at MEPC 61 have applied Filter in their system.

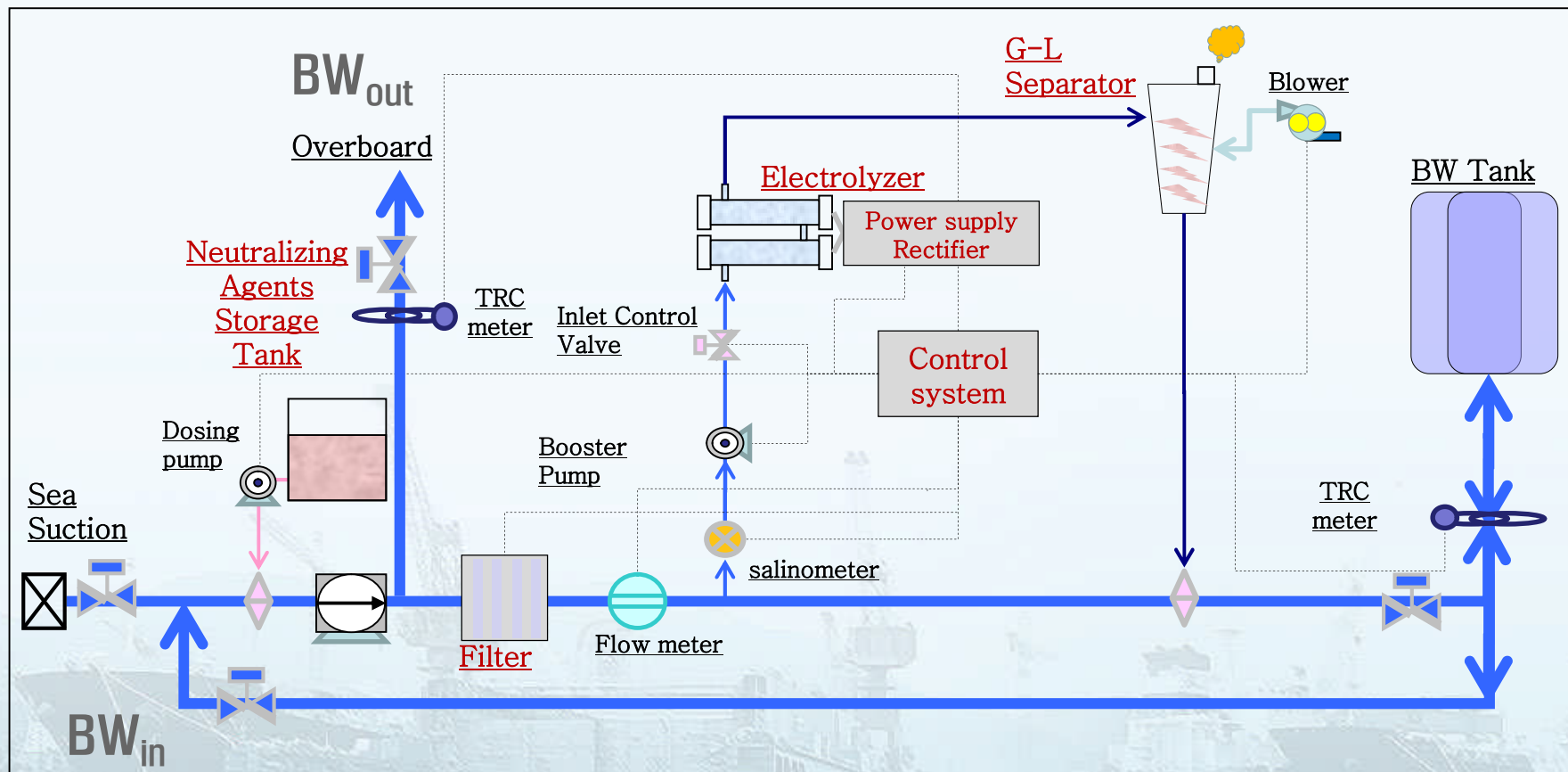
2. Merit and demerit for each Technology

- The key points to select the BWMS solution are footprint and price.
- The Electrolysis is strongly recommended.

	Electrolysis	UV	Ozone
Merit	<ul style="list-style-type: none"> - Small dimension - Low price - Long time disinfection - Easy to handle & maintain - No chemicals 	<ul style="list-style-type: none"> - No chemicals - No hazardous products - Easy to maintain - Easy installation by module base 	<ul style="list-style-type: none"> - Easy to install & arrange - No pressure drop - Low electrical power consumption - Small footprint
Demerit	<ul style="list-style-type: none"> - Low Disinfection efficacy at low salinity - Corrosive properties at pipe & tank - Generation of hydrogen gas 	<ul style="list-style-type: none"> - Low disinfection efficacy at high turbidity - Large dimension - Operate at ballasting & deballasting - Toxicity by photoreactivation - Hard to measure the efficacy immediately 	<ul style="list-style-type: none"> - Corrosive to pipe & tank - Leakage of ozone gas

3. Purimar™ Introduction

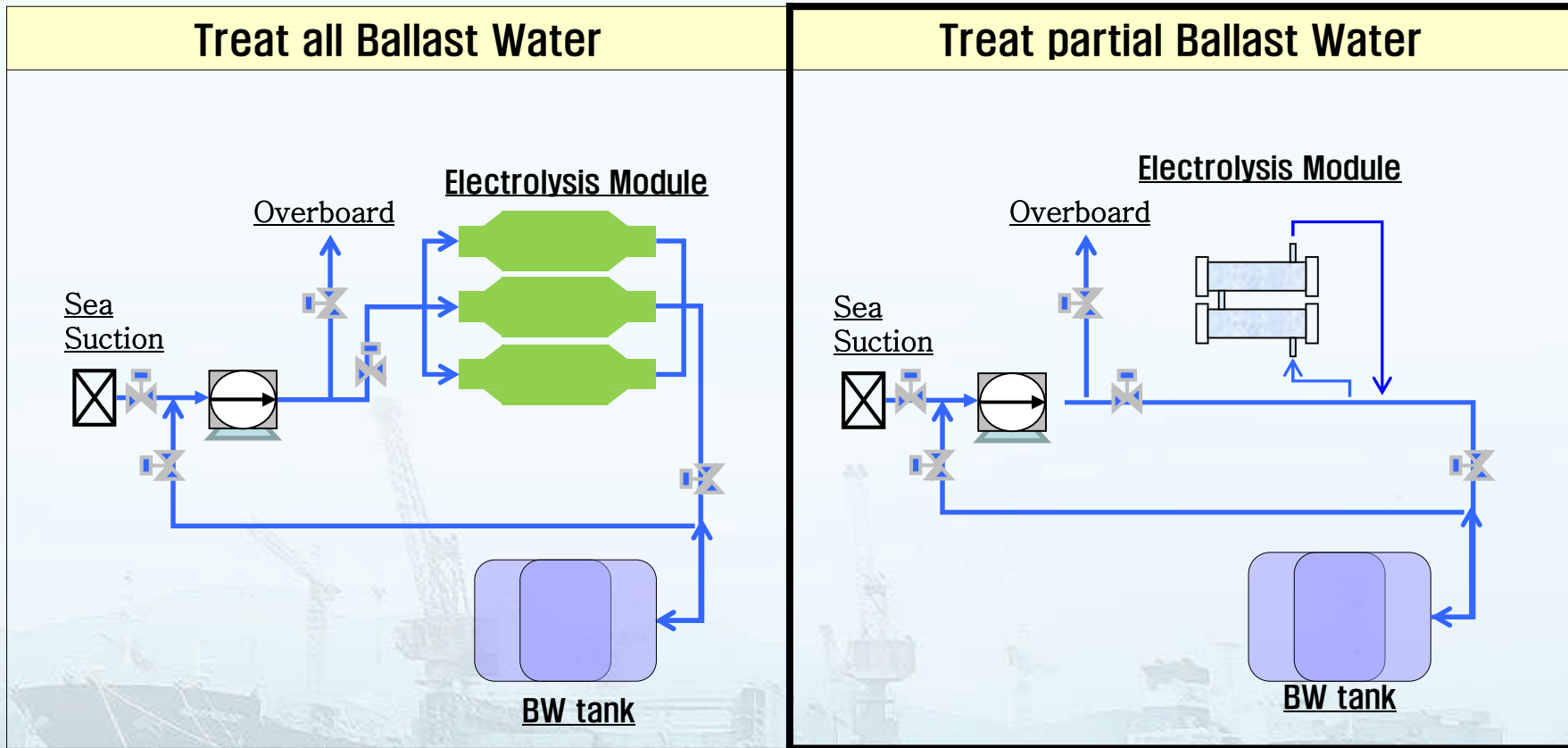
- 1) Meaning : Purify + Mar(Mar is marine in Spanish)
- 2) Treatment technology : Filter + Electrolysis (indirect)
- 3) System configuration



4) Difference between Direct and Indirect Electrolysis

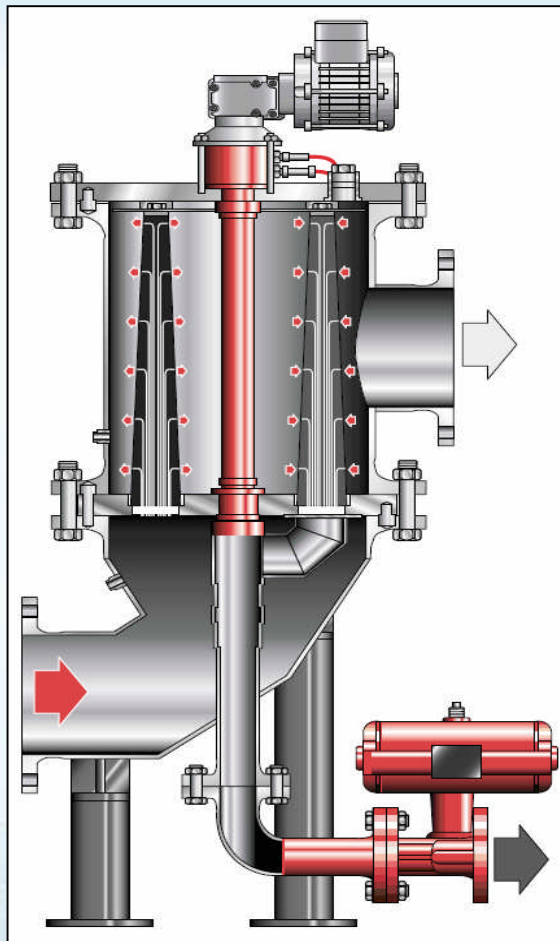
Direct Electrolysis

Indirect Electrolysis



4. System description

1) Filter

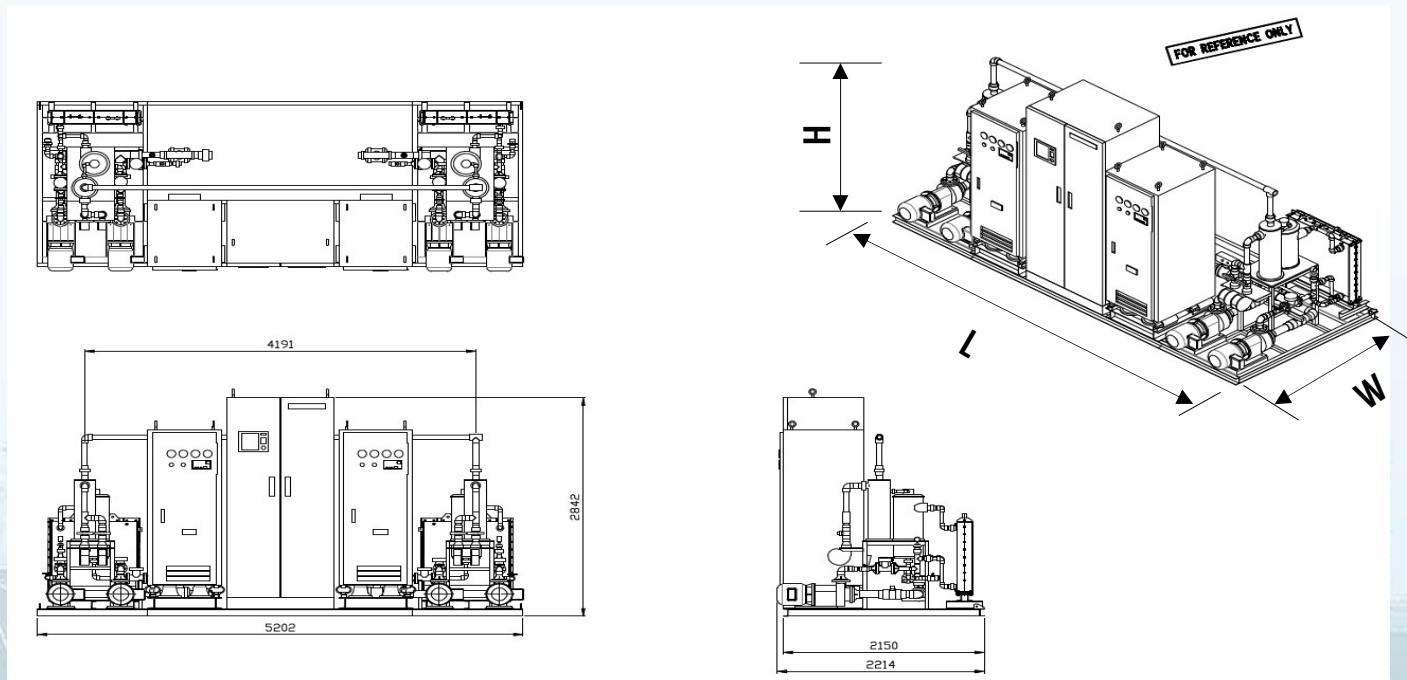


- Maximum operation pressure : 10 or 6 bar
- Operation temperature : Max. 90 °C
- Filtration rating : 15 μm to 3mm
- Energy supply : Electropneumatic, electrical
- Material of filter housing : Carbon steel or stainless steel
- Material of filter elements : Various qualities of stainless steel possible
- Material of internal parts : Stainless steel
- Dimension

	Panamax BC	4500 TEU	Car Carrier (5,500)
Main B.W.	2sets * (1200 φ x 2450H)	2sets * (1000 φ x 2400H)	

2) Electrolysis (skid type)

	Panamax BC	4500 TEU	Car Carrier (5,500)
Capacity (m ³ /hr)	2,000 = 2sets * 1,000	1,000 = 2sets * 500	
Dimension (L * W * H)	4000 x 3100 x 3375	3400 x 2800 x 2000	



3) Neutralization Unit

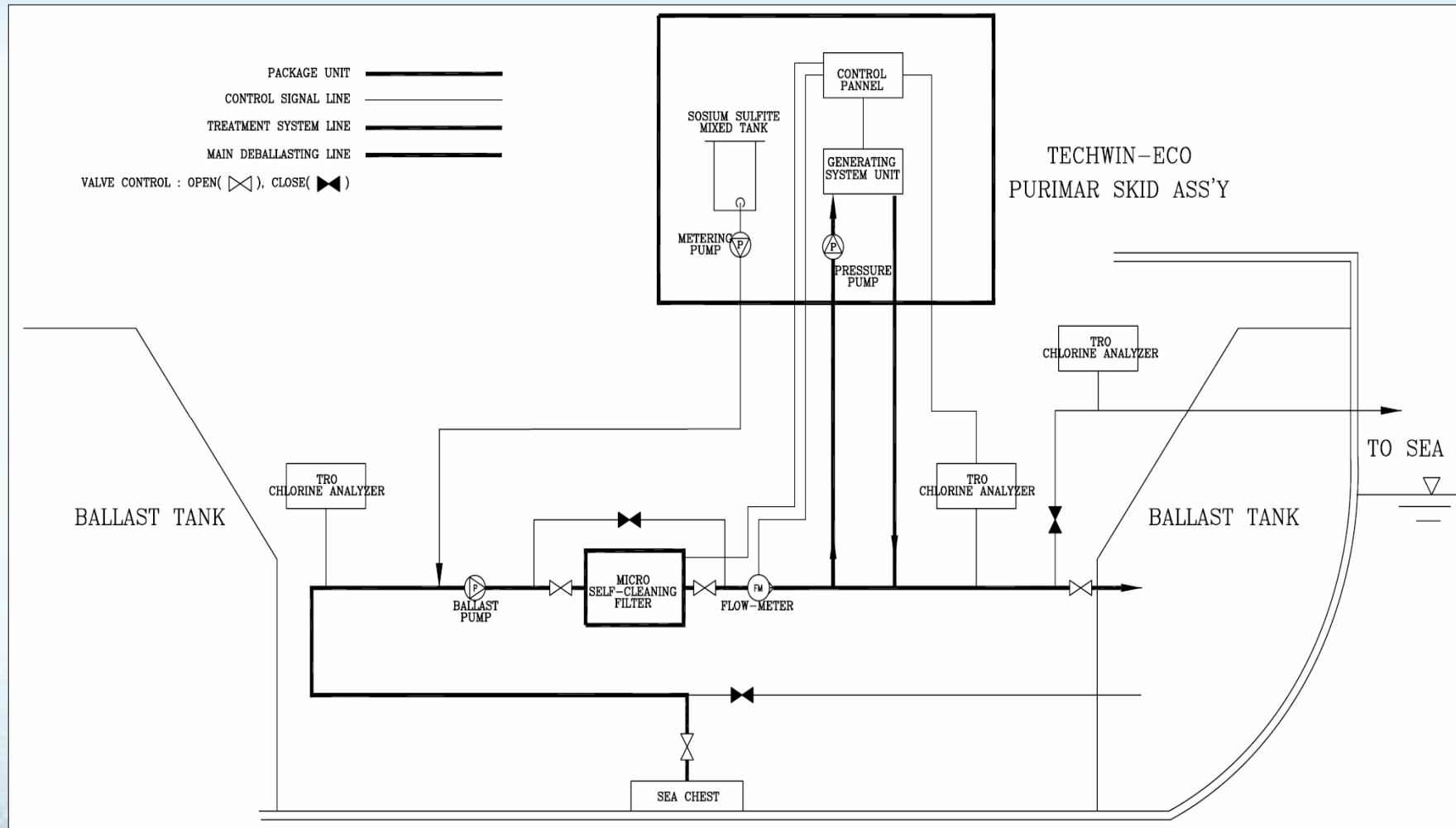


FEATURE

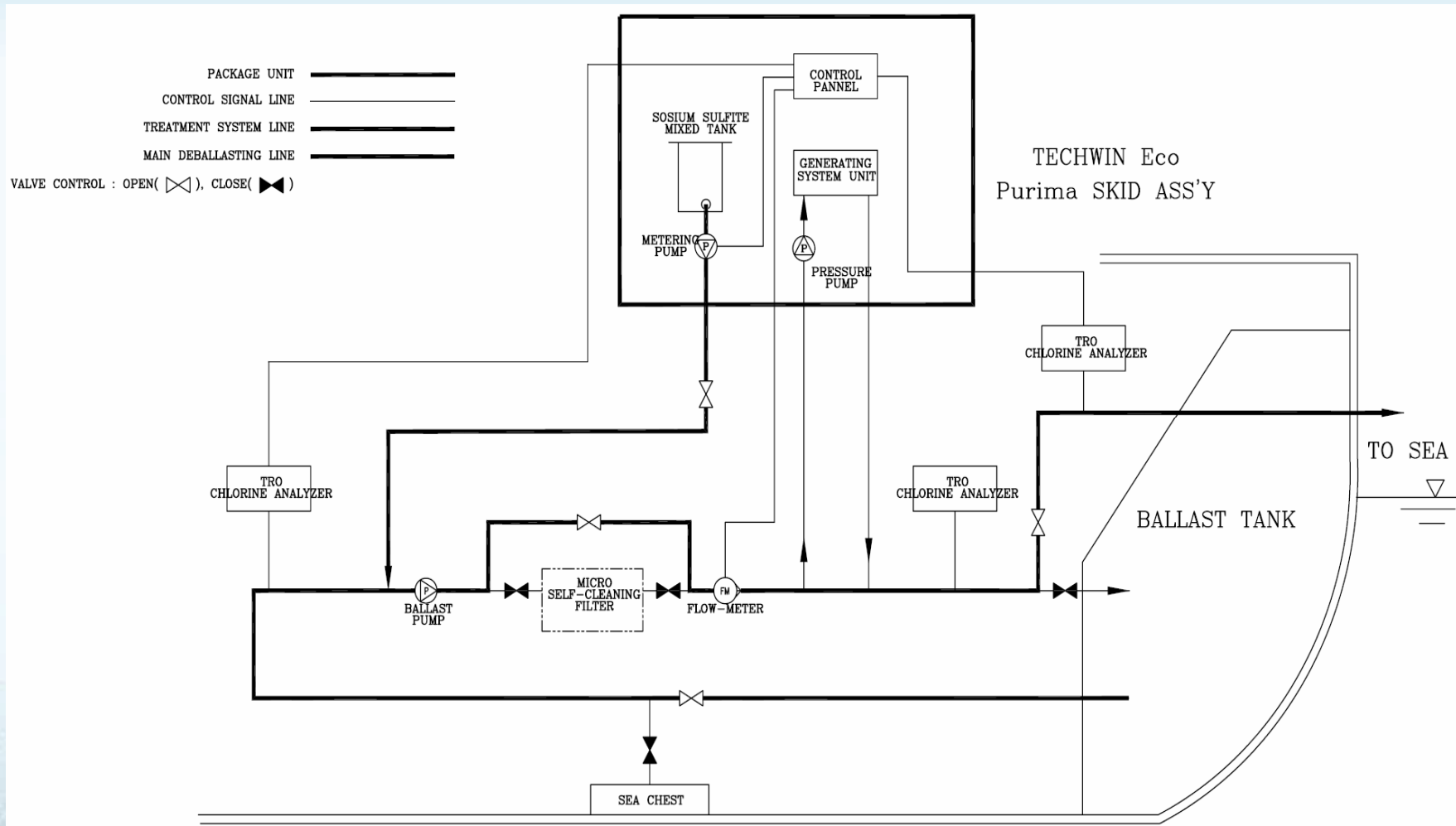
- Storage and Injection of neutralization agents which is 50% sodium thiosulfate pentahydrate solution.
- Automatic/Manual control
- Steady control and monitoring with on-line TR0 sensor
(Shut down : 0.2mg/L, Alarm : 0.1mg/L)

	Panamax BC	4500 TEU	Car Carrier (5,500)
Main B.W.	1950L x 1950W x 2600H	1250L x 1250W x3000H	

4) Ballasting Diagram



5) Deballasting Diagram



5. Operation condition

1) Oxidant (NaOCl) concentration : 3 ppm (Max. 5ppm)

2) Pressure drop (ΔP) : Max. 0.7 bar

3) Power consumption

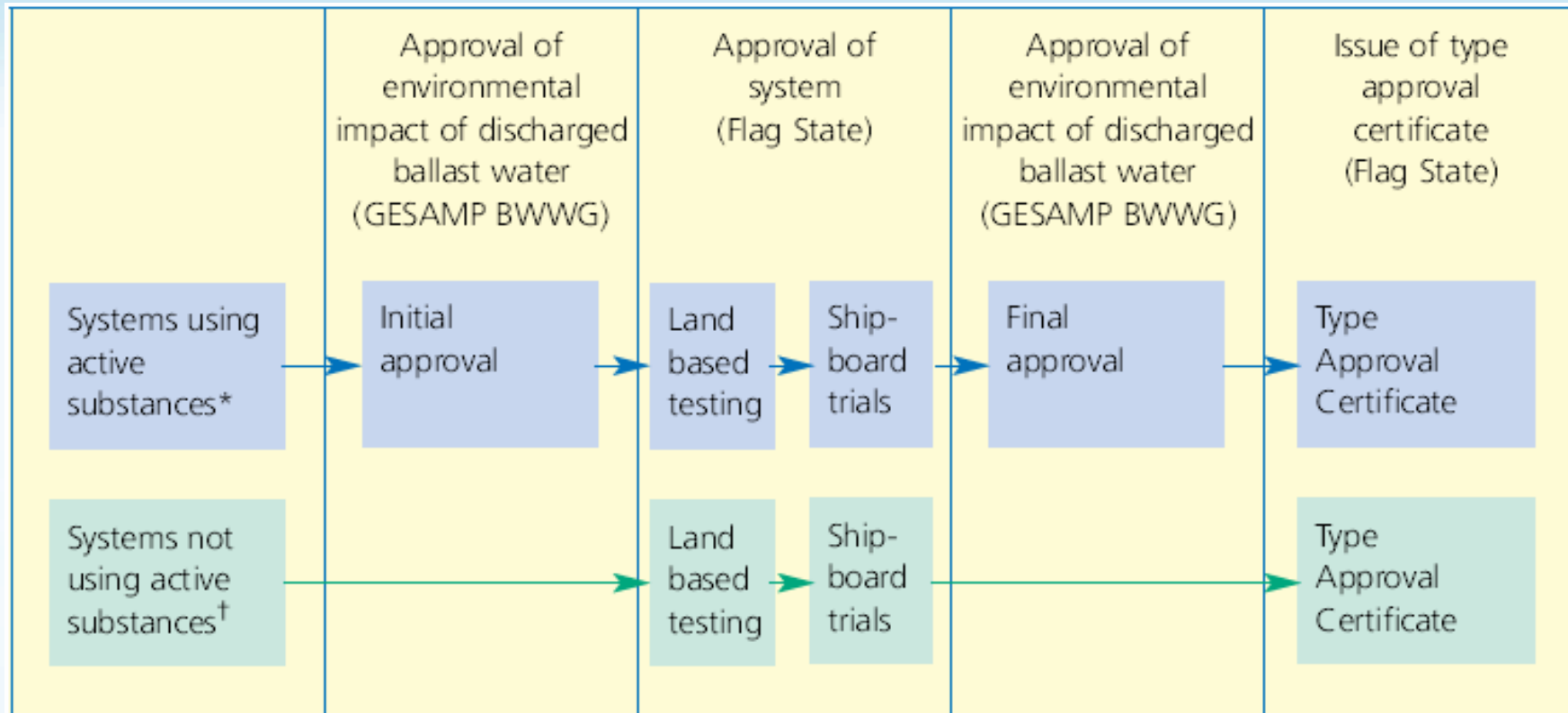
ITEM	Panamax BC	4500 TEU	Car Carrier (5,500)	비고
Power [KW]	82	47		3phase 440V

※ without Back flushing pump

4) Using NaCl storage tank is required at Low Salinity (under 1.5%)

5) Corrosion would be prevented by maintaining oxidant concentration under 10ppm at ballast pipe and ballast tank

6. Approval process timeline



Purimar Approval Timeline

MEPC 61 (October 2010)

MEPC 62 (July 2011)

(October 2011)

7. Pilot plant (5 m³/hr) and Land based (250 m³/hr) test equipment

Pilot plant (5 m³/hr)



Land based (250 m³/hr) equipment



Thank you!