

Panasonic

Ballast Water Management System

ATPS-BLUEsys



● Disinfection Method

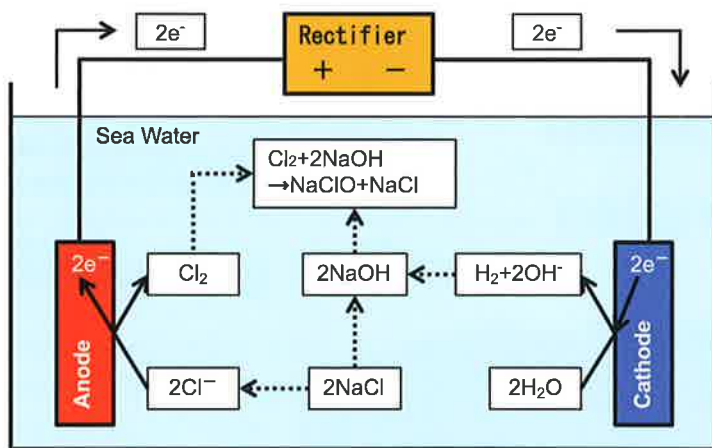
ATPS-BLUE_{sys} instantly disinfects microorganisms and bacteria in ballast water through variety of effects by the electrolysis unit and stirring device.

01 Active Substance

● Generation of disinfectants

On electrolyzing seawater, the electrochemical formulas in the diagram as shown below occur continuously around the vicinity of electrodes. As a result, various disinfectants are generated. The representing examples are shown as follows. (Note; the order according to much generation)

- sodium hypochlorite
- hypochlorous acid
- hydrogen peroxide
- OH radical



Mechanisms of electrolysis in seawater

● Effect of disinfectants

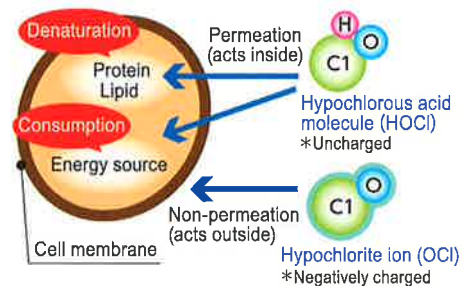
Sodium hypochlorite and hypochlorous acid are the main substances in the generated disinfectants. These disinfectants have effects as follows, acting to organisms at the level of cells.

Quick-acting performance

Sodium hypochlorite generated from electrolyzing attacks outer side of microorganism cells. Hypochlorous acid with strong disinfection performance attacks inner side of the cells.

Long-lasting ability

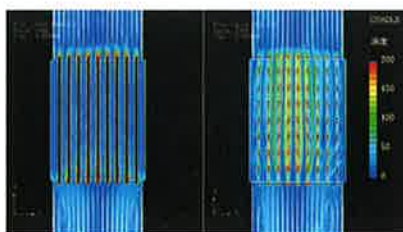
Disinfection effect lasts for long time. (Suppressing reproduction)



Disinfectants affect cells

02 Turbulence

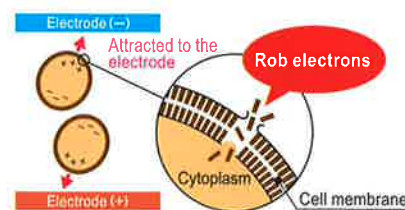
By generating turbulence in PEU (electrolysis unit), marine organisms are moved to the vicinity of electrodes where various disinfectants exist with high concentration, to be disinfected.



Hydrodynamic simulation in PEU

03 Potential

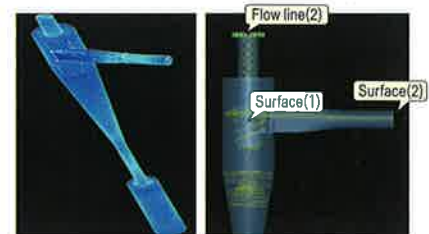
Hypochlorous acid (HClO) with stronger disinfection ability is unstable. Thus, Cl⁺ robs electrons from other substances to become Cl⁻. At this moment, the cell membranes with higher electron-density are selectively attacked. This means the partial damage shown in the below.



Destruction of cell membranes by reduction potential

04 Stirring

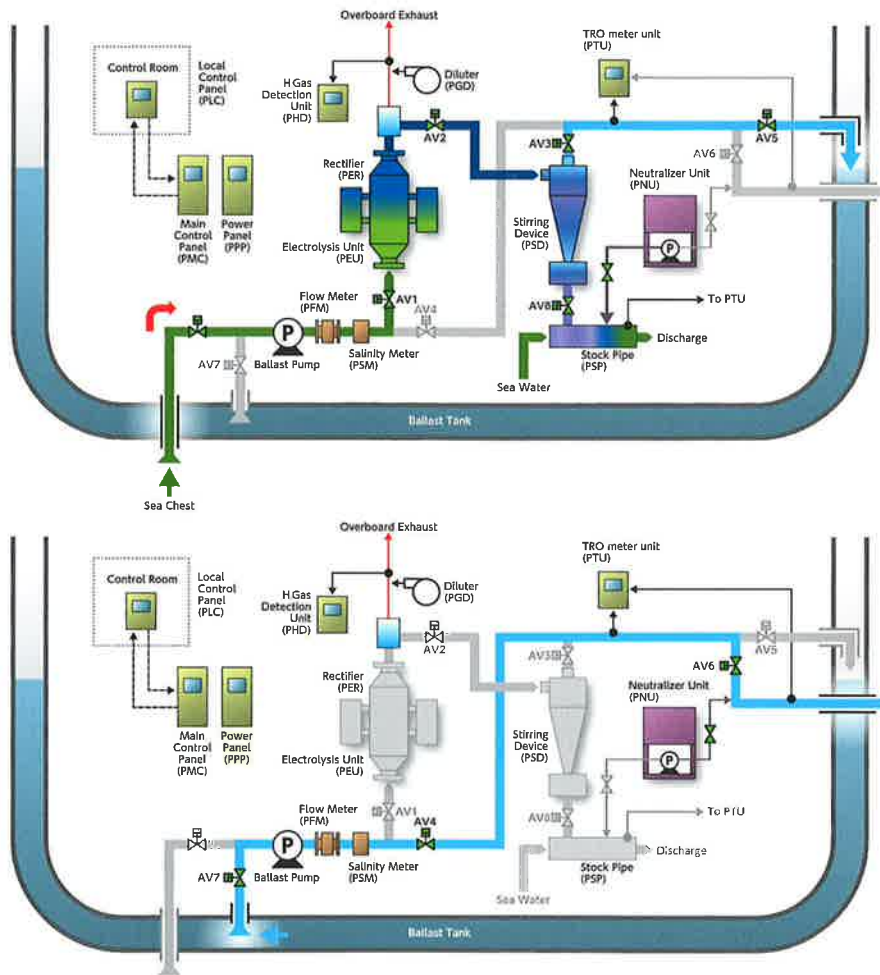
By the strong 3-D stirring ability, organisms and bacteria attached to seaweed or others can be disinfected without fail. In addition, this ability helps electrolysis-byproducts such as metal hydroxides and solids/dust/particles in ballast water to be separated or removed efficiently.



Hydrodynamic simulation in Stirring device

Filter-less, low-cost and space-saving system achieved by adopting an in-line electrolysis method.

Flow Diagram



Ballasting

Total amount of ballast water can be electrolyzed at PEU (Electrolysis unit) of "in-line electrolyzing". PEU generates not only disinfectant but also other disinfection effects whose characteristics have the higher performance of disinfection. And not only can Stirring Device with "3D-stirring effect" disinfect microorganisms and bacteria attached to solids without fail, but also remove byproducts from electrolyzing and mud/sand/solids/ etc in seawater.

Deballasting

The measurement of residual chlorine-concentration and the amount-control of injecting neutralizer are performed automatically. And the ballast water can be harmless and be discharged overboard. In addition, there is an only neutralization process without disinfection process during discharging ballast water, which means that there is "no fear" of decreased discharge-ability.

Advantage



"High performance in-line electrolyzer" just for BWMS!

Electrodes specialized for BWMS have been developed. The high disinfection-performance is realized by electrolyzing all the ballast water under "in-line".

- Many sorts of disinfectants ⇒ Not only depending on the concentration of sodium hypochlorite.
- Multiple disinfection with the chemical, electrical and physical effects ⇒ Realizing high performance of disinfection.



No filter for eliminating organisms!

Combination of electrolysis unit and stirring device with high disinfection performance realizes erasing pre-process of eliminating L-size organisms of "50 μm over".

- Risk of mal-filtering extremely decreases without "passing" or "breaking" filter.
- Ballast flow-rate and its time is stable without "clogging" to prevent water flow.



Decreasing maintenance cost!

Even in case of low salinity, disinfectant can be generated in vessels. And high cost of consumables can be minimized due to "no filter".

- No need for caring for delivery of disinfectant! (Lead-time, place and cost)
- Daily check for BWMS assures disinfection-performance. (Decreasing device-malfunction)

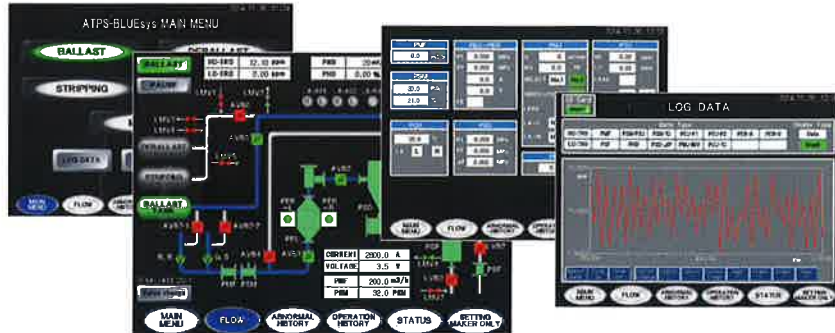
Control Method

Our BWMS ATPS-BLUE_{sys} has the feature of disinfection by electrolysis. In order to eliminate mal-operation by crews, automatic control operation is realized.

Four types of operation modes are prepared

Operation-preparation is also automated for equipment under control system

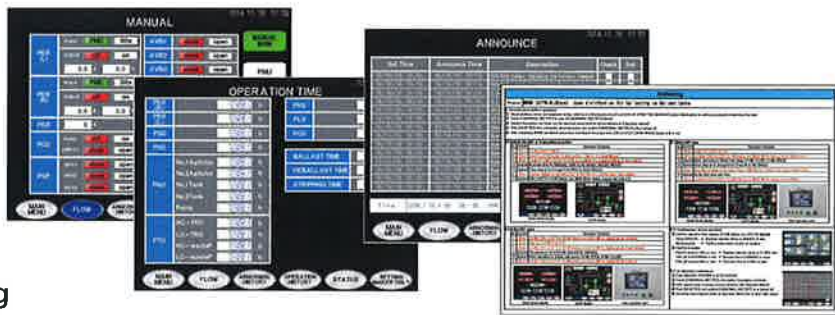
- BALLAST
- DEBALLAST
- DISPLACE *1
- STRIPPING



*1 If untreated ballast water exists in system at the time of stopping operation, it becomes difficult to keep D-2 level. After the end of BALLAST, operation with this mode enables the system to be filled with treated water to maintain the ability of disinfection.

Well-arranged maintenance functions

- Maintenance by manual modes
- Equipment-diagnosis by well-arranged confirmation-display
- Announcing function for consumable-change periods
- Well-mastered operation-training by easy-version manuals



Securing safety

Whenever producing sodium hypochlorite by electrolysis, hydrogen gas is surely generated at cathode. Thus, the countermeasures by separating hydrogen gas and ventilating this gas overboard safely are used in order to prevent explosion accidents.



Gas detector



Air vent

Counter measures for explosion

Never keeping the gas in the system

Preventing abnormal gas-generation

Prohibiting abnormal gas-generation

The methods in ATPS-BLUE_{sys}

- Inside of PEU ⇒ Flat structure of inner surface
- Electrodes ⇒ Shape of preventing gas-attaching
- System ⇒ Ventilation by Air Vent

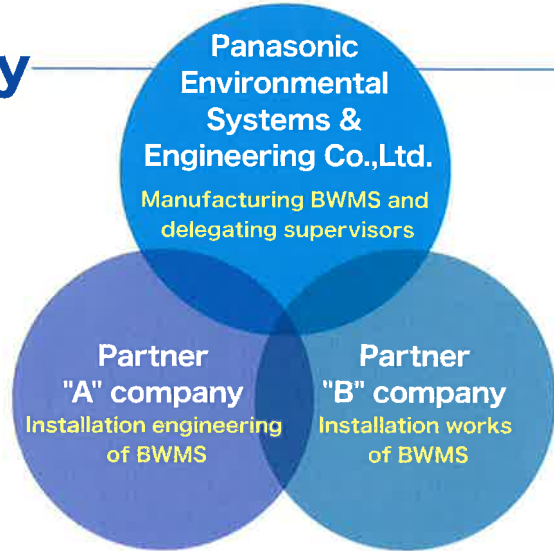
Prohibited PEU operation under "Shut State"

- Confirming water-flow of PEU
 - Confirming valve-open-state of inlet/outlet of PEU
 - Monitoring pressure in the cell
- Arranged Interlocks, Breaking rectifier-power

Monitoring hydrogen gas concentration (alarm at LEL1/4, stop at LEL)
Dilution to safe concentration to be ventilated

● Retrofitting-ability

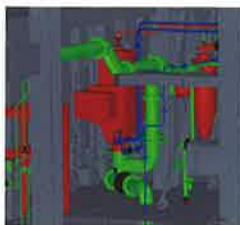
"International Convention for the Control and Management of Ships' Ballast Water and Sediments" will be applied not only to newly-built ships but also to now-operated ships. In the business of ATPS-BLUEsys, not only manufacturing/selling the equipment but also establishing "Head-to-tail formation" for customer-needs.



● Established "Head-to-tail formation" for ships for retrofitting



Investigating "in-ship"



Design for installation

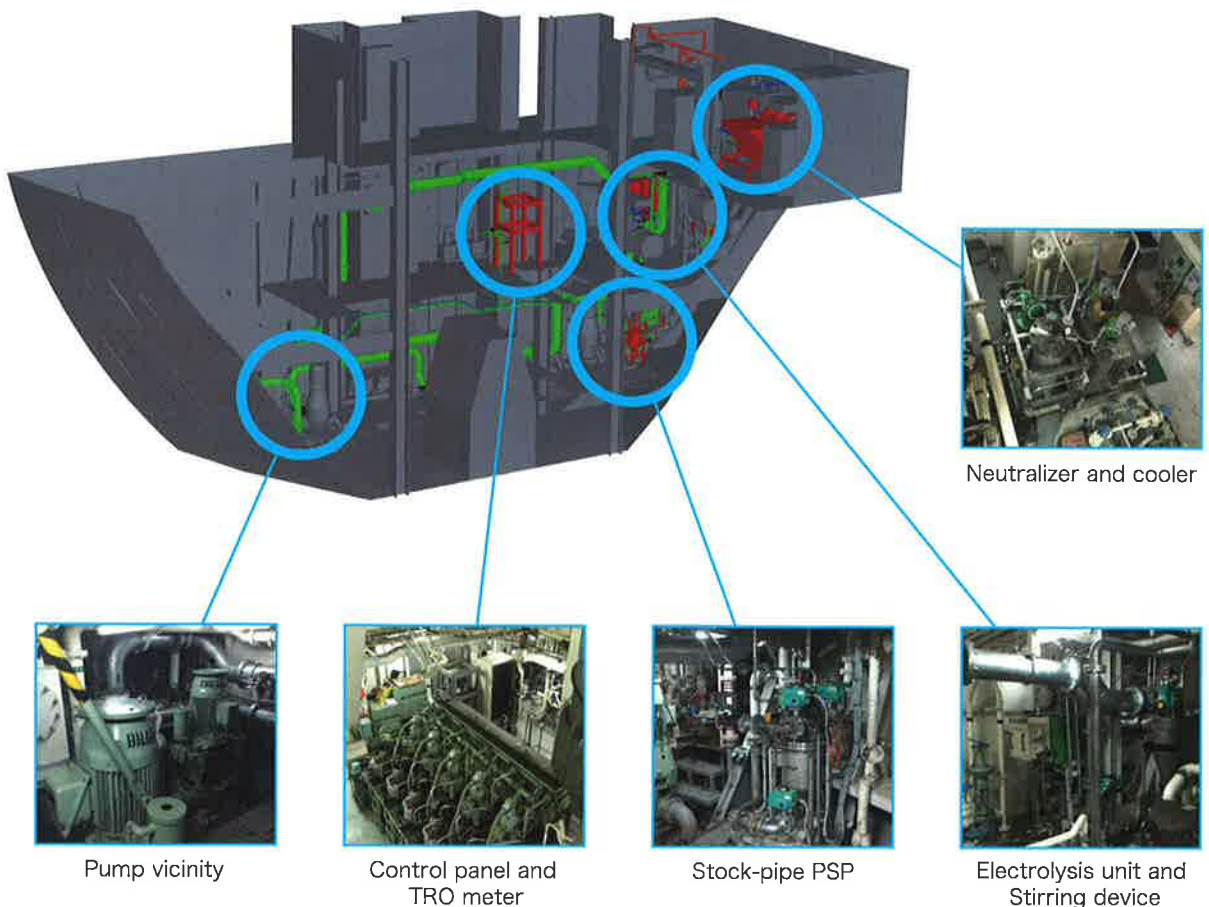


Works for installation



Operation training

● Installation Examples



Pump vicinity



Control panel and TRO meter



Stock-pipe PSP

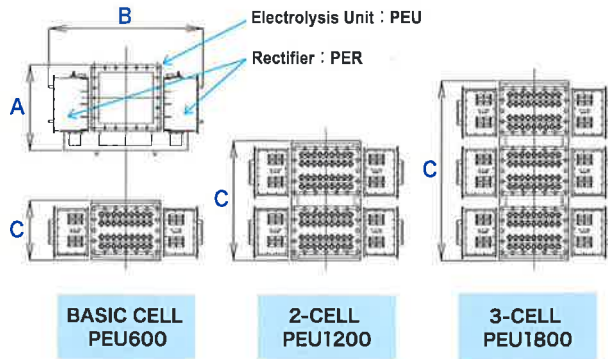


Electrolysis unit and Stirring device



Neutralizer and cooler

Electrolysis Unit and Rectifier PER

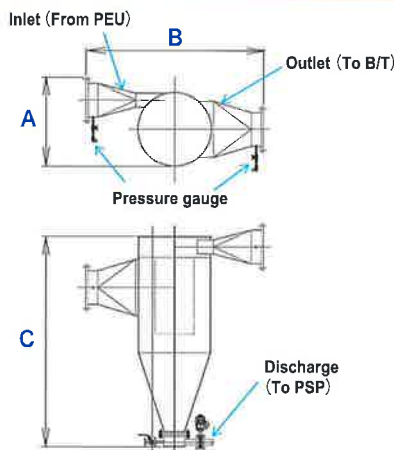


MODEL	CAP. (m ³ /h)	DIMM (mm) *2	WEIGHT (kg)	POWER Consumption (kW) *1
PEU300	~330	A : 800 B : 1375 C : 600	TTL 450 (PEU:340) (PER:110)	30PSU:13 1.5PSU:49
PEU600	~600	A : 800 B : 1375 C : 1125	TTL 870 (PEU:650) (PER:220)	30PSU:28 1.5PSU:100
PEU1200	~1200	A : 1000 B : 1800 C : 1250	TTL 1685 (PEU:1325) (PER:360)	30PSU:56 1.5PSU:200
PEU1800	~1800	A : 1000 B : 1800 C : 1825	TTL 2495 (PEU:1955) (PER:540)	30PSU:84 1.5PSU:300

- Specialized for improved disinfection ability!
- Line-up with types of "PEU with PER"!
- Flexible installation-direction (vertical/horizontal)!
- Operation condition of 1PSU over and 2°C over!
*Depending on the combination-conditions of salinity, water temperature and flow rate.
- High performance of reliability and durability!
- Low pressure loss (approx. 0.01MPa)

*1 Values are for Sea water temperature at 10°C.
Contact us in case of Low Sea water temperature operation.
*2 Reduced 'B' dimension approx. 700 mm once PER separate installation is applied.
Requesting capacity without standard is available as an option.

Stirring Device



MODEL	CAP. (m ³ /h)	DIMM (mm)			PRESSURE LOSS (MPa)
		A	B	C	
PSD300	300	550	890	1600	Rated:0.04 MAX:0.08 MIN:0.005
PSD600	600	800	1070	2000	
PSD900	900	950	1255	2200	
PSD1200	1200	1050	1420	2700	
PSD1800	1800	1300	1700	3200	

- Stirring ability is decided by flow rate(The much flow, the bigger stirring force)
- Inclined-installation is possible (approx. 25 degree)
- Outlet direction can be flexible under layout conditions
- Removal of mud/sand and byproducts from electrolyzing (decreasing the sediment)
- No clogging and no moveable part (easy maintenance)

*The above-mentioned dimensions are from the conditions in May 2017. Those values are to be changed without foretelling in some cases.

Panasonic Environmental Systems & Engineering Co., Ltd.

Osaka Branch 3-28-33 Tarumi-cho, Suita-shi, Osaka 564-0062
TEL.+81-6-6338-1894 FAX.+81-6-6338-4360

Tokyo Branch Konan Park Building 3F, 2-12-26 Konan, Minato-ku, Tokyo 108-0075
TEL.+81-3-3472-2570 FAX.+81-3-3472-2492

Chubu Branch 3905-3 Kaminakata, Takagi-cho, Kasugai-shi, Aichi 486-8524
TEL.+81-568-81-0599 FAX.+81-568-83-6217

Hokkaido office/ Tohoku office/ Hokuriku office/ Shizuoka office/ Osaka office/
Himeji office/ Center Shikoku office/ Kyusyu office

Head Office 3-28-33 Tarumi-cho, Suita-shi, Osaka 564-0062
(representative) TEL.+81-6-6338-1852 FAX.+81-6-6310-7750

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