HiBallast EcoBallast

Nominated BWTS Partner of
HYUNDAI
HEAVY INDUSTRIES

Ballast Water Treatment System

THE MOST OPTIMAL CHOICE FOR YOUR FLEET

HYUNDAI
WELDING

BWTS Business of Hyundai Welding Co., Ltd.

HiBallast and EcoBallast are the brand name of Hyundai Heavy Industries Co., Ltd. (hereinafter HHI) BWTS, and the proprietary right belongs to HHI.
Hyundai Welding Co., Ltd. is an authorized OEM company of HHI BWTS and covers sales, design, fabrication, commissioning and training.

Hyundai Heavy Industries Co., Ltd.	Sales (for HHI group), IP right, certificate (IMO & USCG)
Hyundai Global Service Co., Ltd.	BWTS retrofit sales, global service and spare parts
Hyundai Welding Co., Ltd.	BWTS sales, global service and spare parts

Sustainable and Reliable Business Partner Hyundai Welding Co., Ltd.

Established	1975
Employee	1,341
Global Production Plant	Korea – Pohang plant 1, Pohang plant 2, Gochang plant Vietnam – Dongnai plant China – Kunshan plant
Main Business	BWTS Welding Consumables & Machine Logistics

BWTS Facilities

BWTS factory and FAT facility in Pohang

BWTS Training Center in Pohang

Engineering Center in Ulsan

Global Network

For BWTS only,
Rotterdam, Houston, Singapore, Korea

Overseas Branches
23 offices in 14 countries

Ballast Water Management Regulations

IMO BWM Convention Implementation Schedule

CASES

	2014	2014–2017	2017–2019	2019–2024	2024–
New build-constructed after EiF	At delivery ›››››››››››››				
No IOPP decoupling prior to EiF		R		● First IOPP renwal after EiF	
	R		R	● Second IOPP renwal after EiF	
Ships with decoupled IOPP prior to EiF	R	RD		● First IOPP renwal after EiF	
Ships decoupling IOPP survey after EiF		R	● First IOPP renwal after EiF		
	R		R ● Second IOPP renwal after EiF		
Ships without IOPP	‹‹‹‹‹‹‹‹‹‹‹‹‹				Latest

R IOPP renwal survey　RD Decoupled IOPP renewal survey　● D-2 requirement applies　I EiF: Entry into Force, 8 September 2017

IMO BWMS Code (Revised G8)

	28 Oct. 2018	28 Oct. 2020
BWTS to be approved based on BWMS Code	››››››››››››››››››	››››››››››››››››››
BWTS to be installed based on BWMS Code		››››››››››››››››››

USCG BWM Regulation Implementation Schedule, 33 CFR 151.2035

USCG

Keel laying	BW tank capacity(㎥)	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Existing vessels : Vessels constructed before December 1, 2013													
Before Dec. 1, 2013	Less than 1,500	First dry docking after January 1, 2016.							Phase I				
	1,500 – 5,000	First dry docking after January 1, 2014.					Phase I						
	Greater than 5,000	First dry docking after January 1, 2016.							Phase I				
New vessels: Vessels constructed on or after December 1, 2013													
On or after Dec. 1, 2013	All	On Delivery					Phase I						

Introduction of HiBallast

HiBallast,

HiBallast is designed to satisfy IMO regulation, Revised G8 test procedure and USCG Phase I. HiBallast is the first maker in Korea and fourth maker in the world which satisfied the Revised G8 test procedure. HiBallast relieves you from the concerns about the regulation compliance and is providing customers with the most optimal solution in installation, operation as well as maintenance in order to protect the marine ecosystem from harmful organism.

The HiBallast produces Sodium Hypochlorite (NaOCl) to disinfect harmful marine organisms, which uses in-situ sea water electrolysis to produce high concentration (less than 1,000mg/LasCl2) of disinfectant (NaOCl) from brackish water or sea water. To produce disinfectant, only 1% of total ballast water capacity is fed to electrolyzer. The disinfectant generated in electrolyzer is directly injected into the ballast pipe during ship's ballasting operation. The filter unit is installed before the injection point and it can significantly reduce the sediment load from the ballast water and also remove some of the marine organisms and sediment larger than 50μm resistant to disinfection in the ballast water. The filter unit is fully automatically operated and cleaned, and back washing water is returned into seawater in situ. During de-ballasting, the ballast water is neutralized by dosing of neutralization unit and the filter unit is by-passed.

Certification

IMO Type Approval

First maker of IMO Type Approval based on Revised G8 in Korea

KG | Norway (Revised G8) | Greece | Liberia | Malaysia

USCG Type Approval

USCG Type Approval (Phase I)

Class Type Approval

DNVGL (Revised G8) / RINA / KR / BV

DNVGL (Revised G8) | RINA | KR (Revised G8) | LR (In progress) | BV (In progress)

Government Approval(Flag)

Algeria, Bahamas, Bermuda, Greece, Hongkong, Isle of Man(IOM), Japan, Liberia, Malta, Marshall Islands, Panama, Turkey, Singapore, Malaysia, UAE, Cyprus, Barbados, France and etc.

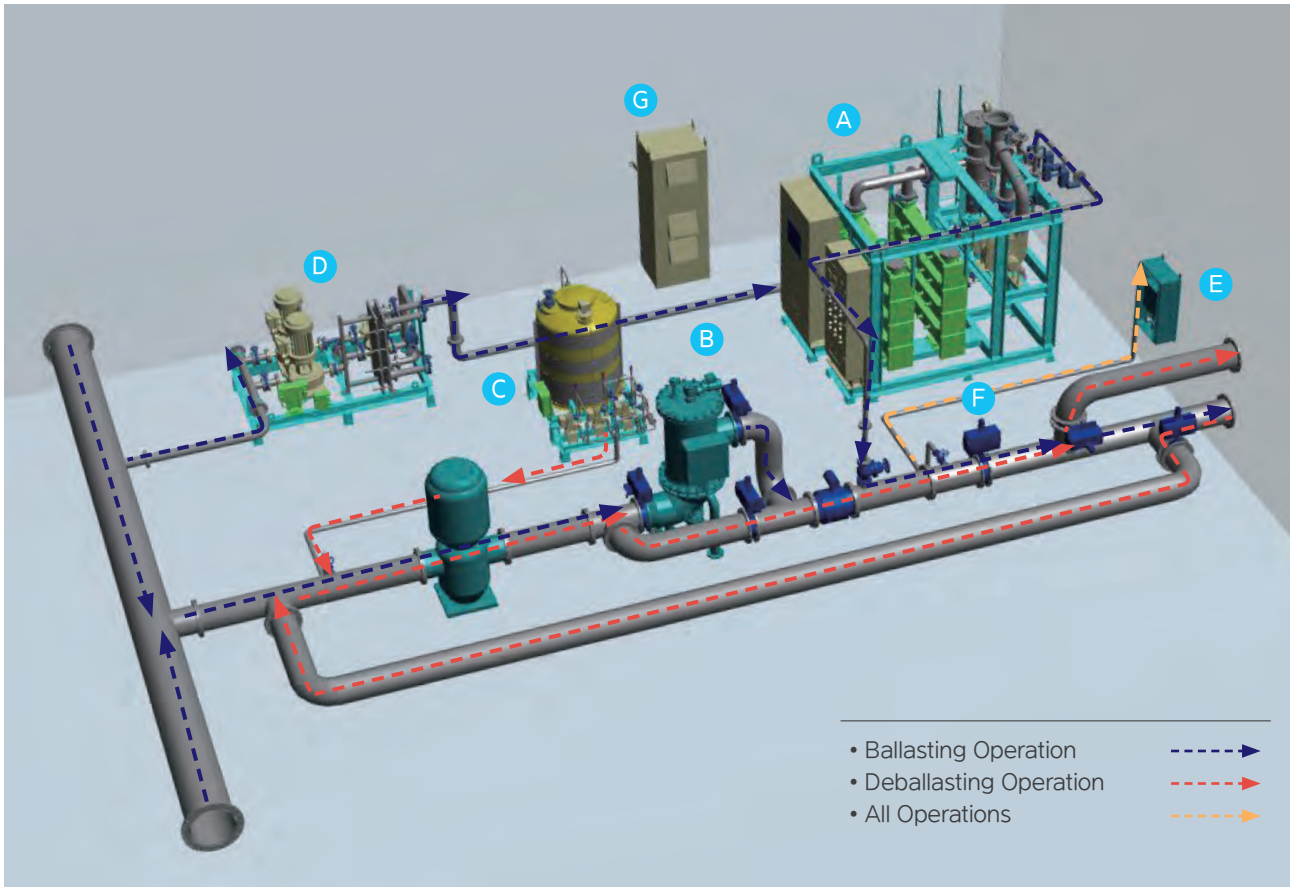
HiBallast Model & Flow diagram

HiBallast Model

MODEL	Treatment Capacity (m^3/h)	EU Dimension LxWxH (mm)	EU Weight (kg)	Filter Dimension LxWxH(mm)	Filter Weight (kg)	Power Consumption (kW) (at 30 PSU)
HiB–500	500	2800x2500x2800	2,400	650x650x2100	450	11
HiB–1000	1,000	2800x2500x2800	2,750	1100x1100x2350	780	23
HiB–2000	2,000	2800x2500x2800	3,095	1300x1300x2500	880	46
HiB–4000	4,000	3500x2500x3050	4,200	1650x1650x2700	1,950	91
HiB–6000	6,000	4300x2500x3200	5,030	2150x2150x3500	3,550	136
HiB–8000	8,000	5300x2700x3200	5,900	2200x2200x3500	5,000	182
HiB–10000	10,000	6100x2700x3200	6,700	2300x2300x3700	6,650	227

*Power consumption may be subject to water condition.

Flow diagram



HiBallast Main Equipment

Main Equipment

A. Electrolysis Unit

Main function Generating disinfectant

Component Electrolyzer, Blower, Gas Separator, Control Cabinet, Motor Control Cabinet

Advantages SKID base (easy installation), easy maintenance, multiple electrolyzers, multiple blowers, separate SKID available

B. Filter Unit

Main function Removing organisms bigger than 50㎛

Component Filter element, Geared Motor, Back-flushing Valve, Filter Panel

Advantages Simple configuration, High area efficiency (candle type), Easy maintenance

C. Neutralization Unit

Main function Dosing neutralization agent for deballasitng.

Component NA tank, Dosing pumps

Advantages SKID base (easy installation), Big tank volume, Automatic control of dosage

D. Seawater Feed Unit

Main function Supplying seawater to Electrolysis Unit

Component Seawater Feed Pump, Heat Exchanger, Strainer

Advantages SKID base (easy installation), Full redundancy, No filter

E. TRO Sensor

Main function Measuring TRO concentration

Component LCD Display, Buffer, Indicator Solution, Chiller

Advantages Packaged unit (easy installation)

F. Flow Control Valve

Main function Main ballast water flow control

Component Valve body, Actuator, Positioner

Advantages Electrohydraulic type (No need for additional utilities such as compressed air and hydraulic tube line.)

G. Rectifier

Main function Supplying DC power to electrolyzer

Component Power modules, Main PCB

Advantages Small foot print, Air cooling type

HiBallast Features

Key Features

- Filter + Electrolysis
- Indirect (side stream) type
- Low operation cost
- No filter for feed water
- Full auto operation
- Redundancy operation
- Stable performance in low salinity & temperature seawater
- Electrolyte feed salinity : 〉15 PSU
  (NO LIMITATION with back-up solution)
- Electrolyte feed temperature : 〉4℃
  (NO LIMITATION with back-up solution)
- Filter inlet pressure : 〉1.5 bar
- Total residual oxidant (TRO) : 8 mg/L
- Treatment capacity : 75 ~ 10000 m^3/h

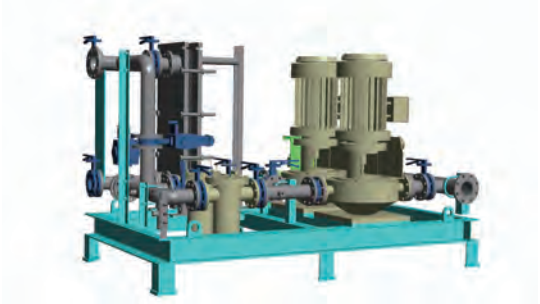
Innovative Solution Provider

Back Up Solution

To provide
stable operation

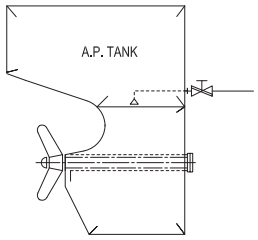
To provide
low power consumption

Low Temperature Solution



HiBallast can operate without limitation of feed water temperature for Electrolysis Unit by applying of plate heater in Seawater Feed Unit. A steam heater (Option) is also available.

Low Salinity Solution



(Option 1)
Dedicated Seawater Holding Tank

(Option 2)
Salt Tank, , Tank Volume: 2.7m^3 for 1000m^3/h

AP Tank or one of ballast tank can be dedicated as seawater holding tank for stable ballasting operation in low salinity area. Also, Salt Tank can be applied instead of dedicated ballast tank. Both options are fully Integrated with BWTS controller (Auto operation) when you operate BWTS in low salinity area.

Powerful Contingency Plan

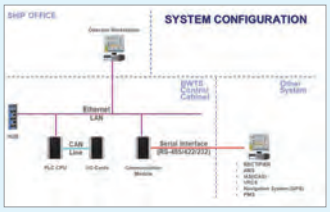
Contingency plan of HiBallast helps its stable operation despite a component failure.

No	Item	Contents	Remark
1	Control station	Main control PC, Local operation panel	100% x 2
2	Electrolyzer	Multiple electrolyzer modules and parallel installation	
3	Rectifier	Multiple rectifier units and separated power modules inside	
4	NA pump	Multiple pumps	50% x 2
5	Blower	Two blowers	100% x 2
6	Sea water feed pump	Two pumps	100% x 2
7	Strainer	Two strainers	100% x 2

No VRC Modification for Retrofit

Existing problem in BWTS retrofit	• High cost for VRCS modification • Long lead time for valve modification
Solution of HiBallast	• Cost saving thanks to HiBallast integrated valve control • Short lead time for valve modification

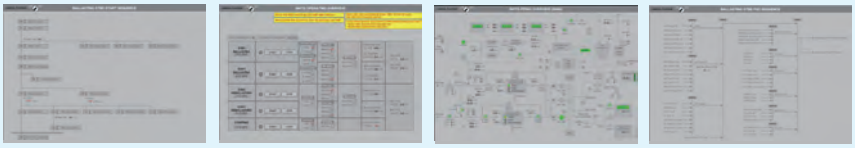
Easy Expandable PLC Program



HiBallast Human Machine Interface (HMI) is easily expandable, helps easy operation, and enables to be flexibly integrated such as:

- Fully automatic operation from the valve line-up to BWTS through VRCS control
- Operation of Sea to Sea Mode and Recirculation Mode through VRCS control
- Heterogeneous communication enables BWTS operation and monitoring in the ICAS

Easy & Simple Operation



HiBallast can be simply operated by ship crews through HMI and find the fault easily thanks to user friendly and intuitive MIMIC.

Small Foot Print & Easy Installation

Standard SKID	Re-configurated SKID
	

Space and transportation of equipment would be challenges for BWTS retrofitting. HiBallast skid can be divided into several units considering installation space and hatch size.

EcoBallast

EcoBallast,

EcoBallast system is designed to satisfy IMO regulation D-2. EcoBallast system had received final approval from IMO and type approval from Korean administration (with Korean Register of shipping). The EcoBallast system removes all marine organisms to prevent the transfer of marine organisms through ship's ballasting and de-ballasting. The ballast water is treated at intake (ballasting) and once again at discharge (de-ballasting). The EcoBallast consists of four units such as filter, UV reactor, CIP (Cleaning in Place) and system control unit.

Certification

- **IMO Final Approval**: March, 2010
- **Government Type Approval**: March, 2011
- **USCG AMS**: March, 2014
- **LR's General Design Approval**: October, 2014
- **USCG Type Approval**: 2019 (expected)

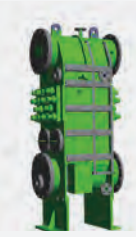
Design Standard

Description Model	Flow Capacity (m^3/hr)	UV Reactor Unit Dimensions L x W x H (mm)	Filter Unit Dimensions L x W x H (mm)	Weight (wet, kg)	Power Consumption (kW)	
					Normal	Max
Eco-350	350	400 x 1100 x 1800	850 x 850 x 2300	1,400	32	62
Eco-700	700	600 x 1100 x 1850	1100 x 1100 x 2350	2,655	64	124
Eco-1000	1,000	1700 x 1100 x 1800	1100 x 1100 x 2350	3,405	96	186
Eco-1400	1,400	1500 x 1100 x 1850	1300 x 1300 x 2500	4,410	128	248
Eco-1800	1,800	3000 x 1100 x 1800	1300 x 1300 x 2500	6,340	160	310
Eco-2100	2,100	2400 x 1100 x 1850	1350 x 1350 x 2700	6,290	192	372

*Normal 〉80% UVT, Max 〈 70% UVT

EcoBallast Main Equipment

UV Reactor



Main function

The UV reactor is specially designed for ballast water application to reduce its installation space and to aximize its efficiency, which employs high-intensity, medium-pressure ultra-violet lamp.

Component

UV Lamp, Ballast cabinet, Junction Box

Filter Unit

Main function

The filter unit is installed to remove some of the marine organisms and sediment larger than 50㎛ in the ballast water.

Component

Geared Motor, Back-flushing Valve, Filter local Panel

CIP (Cleaning In Place)

Main function

The CIP unit is an automatic service device that cleans the quartz sleeves covering the UV-lamps after each ballasting or de-ballasting operation for the maximum treatment efficiency of the UV reactor.

Component

Tank, Circulation Pump, Junction Box

Key Features

- Filter + UV
- Eco-friendly disinfection process
- Simple configuration
- UVT: 〉=65% (Design TRC), 〉=55% (56% of design TRC)
- UV Intensity: 〉= 210W/m^2 (Design TRC), 〉=110W/m^2 (56% of design TRC)
- Water temperature of ballast water: 〈45 ˚C
- Treatment capacity: 350 - 2,100 m^3/h
- Filter outlet pressure: 〉1.5 bar

BWTS Retrofit Specialist

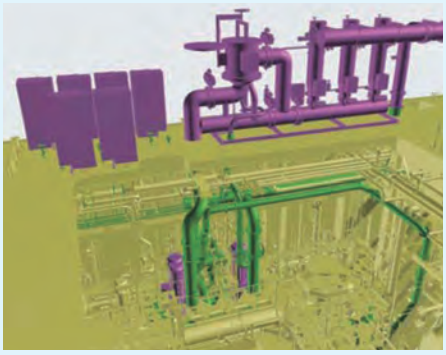
Retrofit Service Scope

- Case 1 PC (Product + Commissioning)
- Case 2 EPC (Engineering + Product + Commissioning)
- Case 3 EPIC (Engineering + Product + Installation + Commissioning)

BWTS Retrofit Procedure

Task Procedures for Retrofit Vessels
Primary equipment arrangement using P&ID and the relevant drawing
Survey and scanning onsite
Recompose and reproduce piping lines to be installed with existing pipes
Approval process
Installation and Commissioning

Minimum Modification for Retrofit



HiBallast requires minimum modification for BWTS retrofit among all BWTS types.

Short Lead Time of Delivery

- Delivery: 3.5 months (Standard: 6 months after contract)

Description	0w	1w	2w	3w	4w	5w	6w	7w	8w	9w	10w	11w	12w	13w	14w	15w	16w
BWTS Retrofit Overall Schedule																	
Contract with fixed layout																	
BWTS Manufacturing																	
Shop Test																	
Shipment																	
Installation & Commissioning																	

HYUNDAI WELDING

Category	Work field	E-mail or address	Telephone
Sales	Quotation, Training	bwts-sales@hyundaiwelding.com	+82-52-283-6903
Technical	Design, Technical support	bwts-tech@hyundaiwelding.com	+82-52-283-6962
Customer Service	Commissioning, After-sales service	bwts-cs@hyundaiwelding.com	+82-52-283-6926
Head Office	-	Wework BLDG, 507, Teheran-ro, Gangnam-gu, Seoul, Korea	+82-2-6230-6042
Ulsan Engineering Center	Technical Center	406 Good prime I building, 641 Jongga-ro, Jung-gu, Ulsan, Korea	+82-52-283-6900
Pohang Factory	Manufacturing, FAT, Training center	88beon-gil 99, Yeongilmansandan-ro, Heunghae-eup, Buk-gu, Pohang, Korea	+82-54-260-0634

HiBallast EcoBallast

Partner Companies

Hyundai Heavy Industries Co., Ltd.
Hyundai Global Services Co., Ltd.