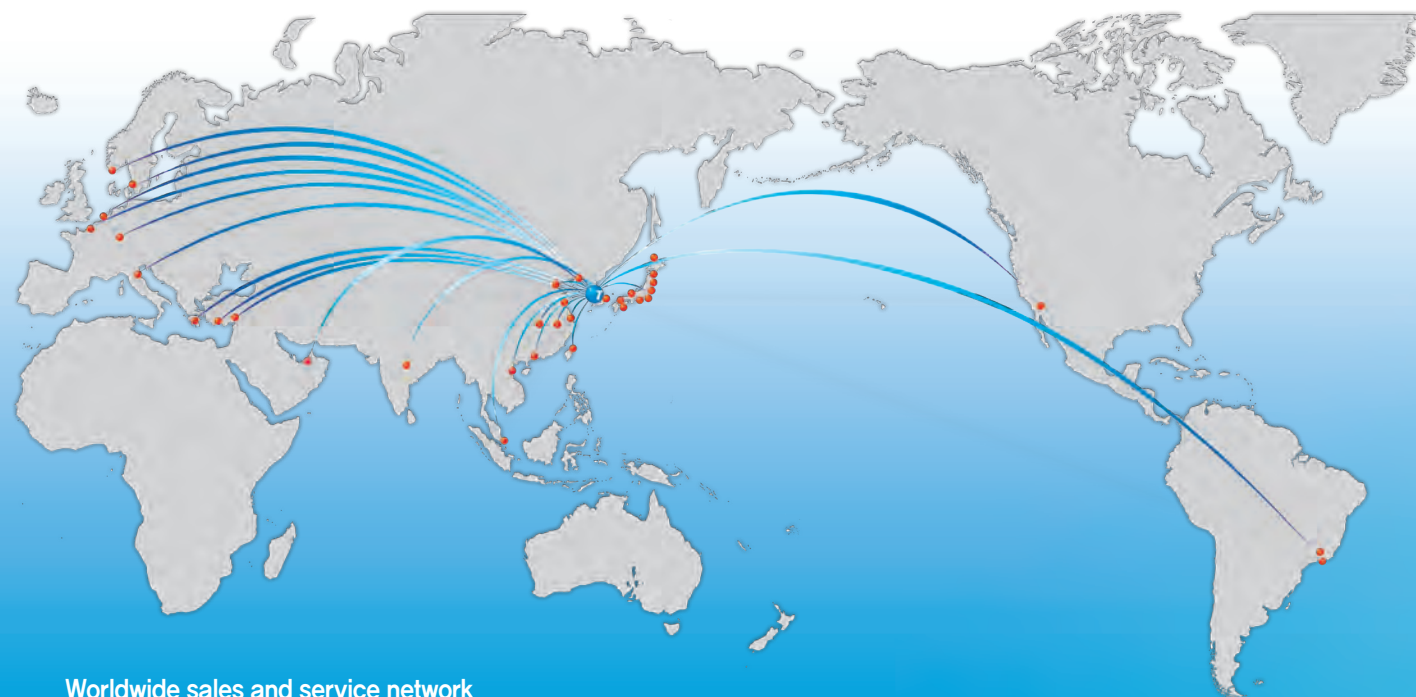


Worldwide Network



Worldwide sales and service network

We provide prompt installation, commissioning, on-board test and warranty service with our worldwide sales and service network.

Asan Factory

[336-833] 25-1, Gwanam-Ri, Inju-Myeon, Asan-Si, Chungcheongnam-Do, Korea
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Busan Office

Sales & Marketing Division, Engineering Center

[600-755] 3F Hanjin Shipping Bldg., 79-9 Jungang-Dong, 4-Ga, Jung-Gu, Busan, Korea
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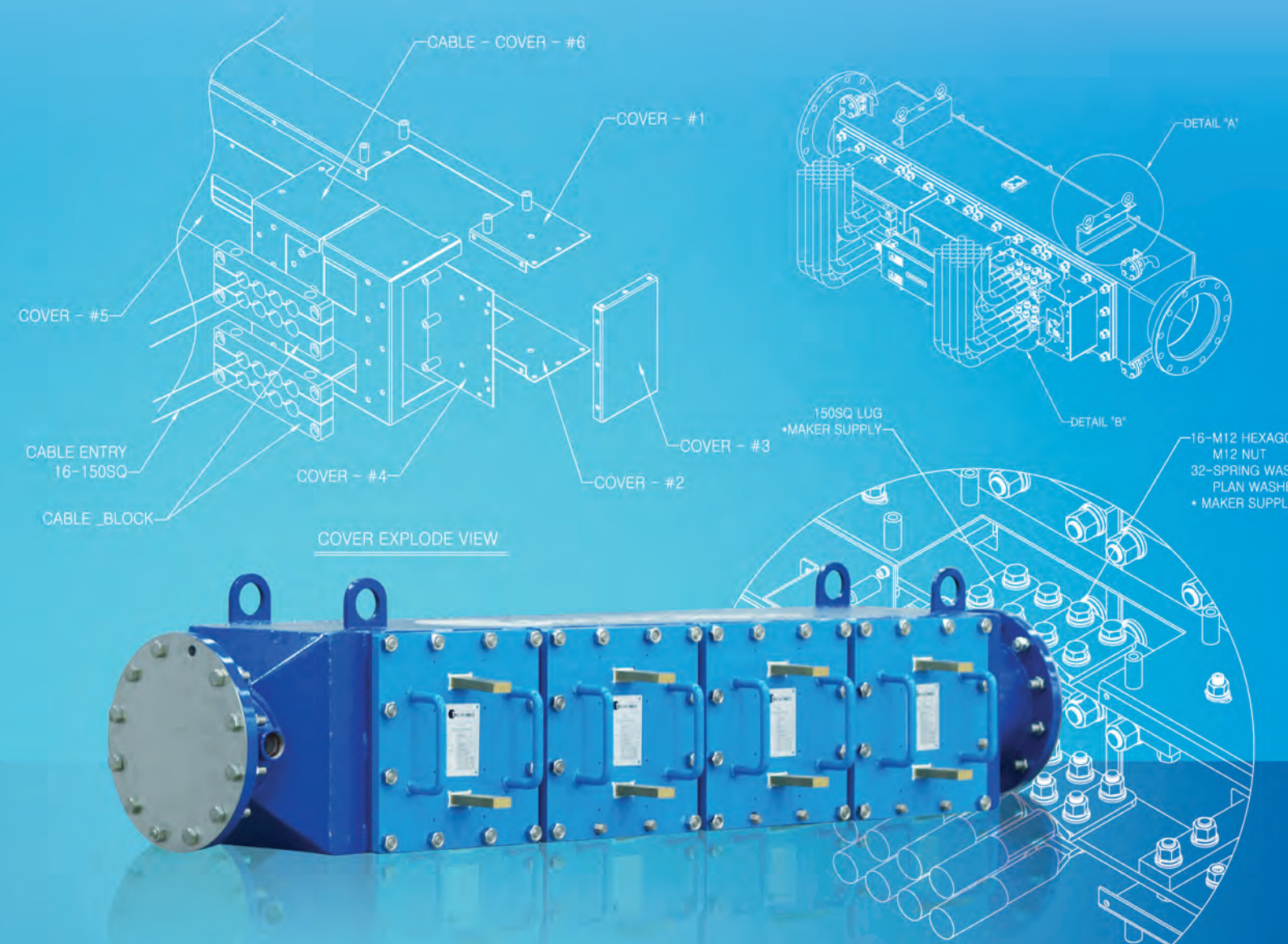
Singapore Liaison Office

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Electro-Cleen™ System

Ballast Water Treatment System



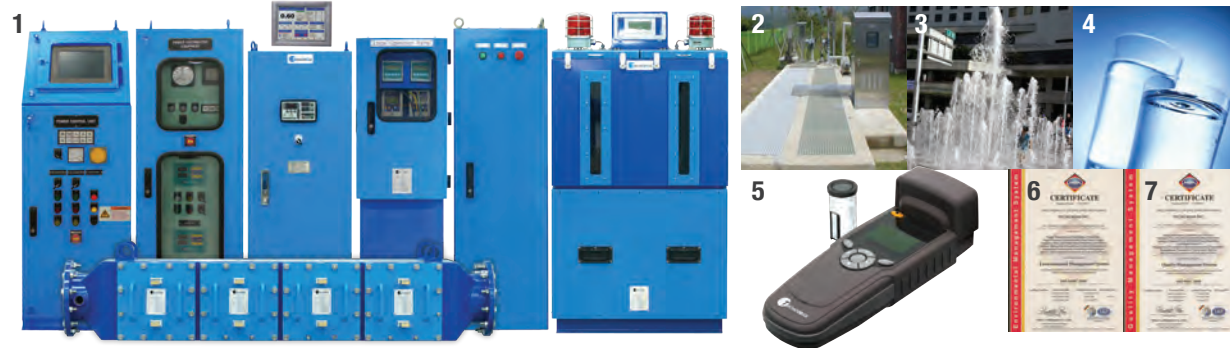
Inquiry | ecs@techcross.com

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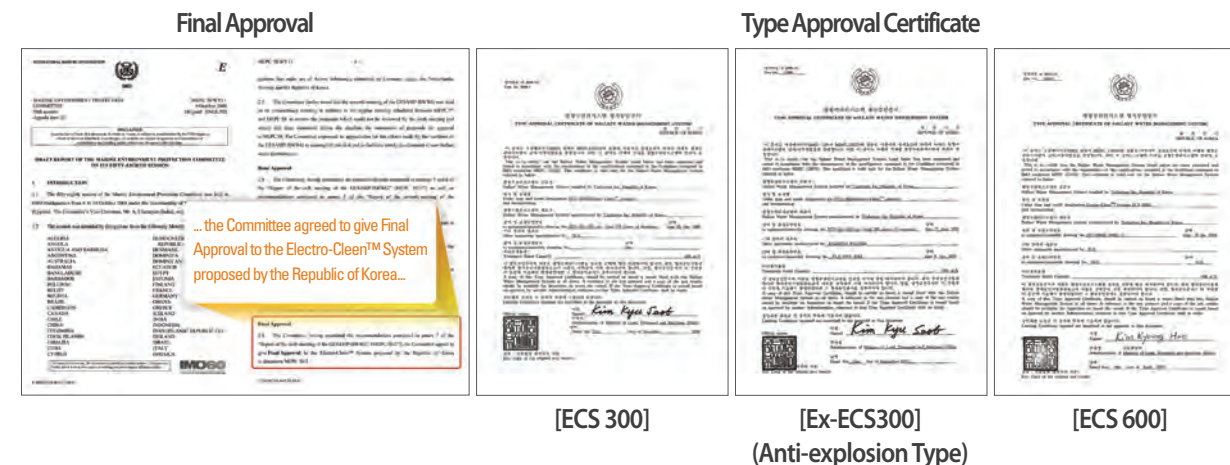
Techcross Inc. has grown into a leading company in the field of electrolysis water treatment through constant research and development. Electro-Cleen™ System(ECS) is the ballast water treatment system developed by Techcross Inc.



1. Electro-Cleen™ System(Ballast Water Treatment System) 2. TES(Sewage Treatment System) 3. TEC(Circulating Water Treatment system)
4. TED(Drinking Water Purifier) 5. Eco Colorimeter 6. ISO 14001 7. ISO 9001

Certification

Techcross Inc's Electro-Cleen™ System was granted Final Approval of Ballast Water Management System that makes use of active substance by IMO (International Maritime Organization) at MEPC 58th and Type Approval Certificate from the Korean Administration.



Asan Factory

Busan Office

Singapore Liaison Office

Laboratory Truck

Laboratory Barge

Electro-Cleen™ System 2 | 3

“Making a clean environment with our technology”

- 2000**
 - Established Techcross Inc.
 - Established R&D center
- 2002**
 - Achieved KT mark from Ministry of Science & Technology
 - Won award for the contribution to the environment by Seoul Metropolitan and Ministry of Environment
- 2004**
 - Registered patent #0425773 'Electrolysis Disinfection System for Sewage Treatment'
 - Registered utility model #0357600 'Electrolysis Disinfection System for Drinking Water Treatment'
- 2006**
 - Achieved ISO 14001: 2004
 - Developed Electro-Cleen™ System (Electrolysis Disinfection, Patented with KORDI)
 - Achieved IMO Basic Approval on Active Substances for Ballast Water Management System for the first in the world
 - Launched a barge ship for land-based test
 - Contracted for Electro-Cleen™ System with a Greek ship owner
- 2007**
 - Completed full scale land-based test and shipboard test
- 2008**
 - Achieved Final Approval by IMO
 - Achieved Type Approval Certificate by MLTM (ECS-300)
 - Established worldwide sales & service network / Completed exclusive production facility for ECS in Asan City
 - Contracted to install ECS on 10 container ships
 - Contracted sales distributorship with Marubeni Group and Ataka Daiki Engineering in Japan, KOMAC and Jiangxi Marine Valve Plant in China
- 2009**
 - Established Busan Engineering Center
 - Achieved Ex-Proof Type Approval Certification by MLTM
 - Installed ECS on 11 vessels (Bulk carrier, Container, Chemical Tanker and PC Tanker)
- 2010**
 - Achieved Type Approval Certificate by MLTM (ECS-600)
 - Installed ECS to 317K VLCC first in the industry
 - Installed ECS on 98K Post Panamax.
- 2011**
 - Contracted to deliver more than 40 ships.

Status on Ballast Water Management Convention

As of February 1th 2011, 27 states, representing 25.32% of world merchant shipping tonnage, ratified Ballast Water Management Convention.

Techcross satisfies California standards

Techcross Inc. satisfies California’s standards with highest efficacy test data. California SB497 is 1,000 times stricter than IMO regulation. This standard is also equal to Clean Water Act Section 401 of New York states.



Global ballast water risks protected by “World No.1 Electro-Cleen™ System”

Ballast Water Treatment Implementation Schedule

		2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
IMO	Existing Vessels		Constructed in 2009, BW Capacity<5,000m³								
			Constructed before 2009, 1,500m³≤BW Capacity≤5,000m³								
									Constructed before 2009, BW Capacity<1,500m³ and >5,000m³		
	New building	Constructed in 2010&2011, BW Capacity<5,000m³									
			Constucted 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	Existing Vessels				1,500m³≤BW Capacity≤5,000m³						
								BW Capacity<1,500m³ and >5,000m³			
	New building	Constructed in/after 2010, BW Capacity≤5,000m³									
			Constructed in/after 2012, BW Capacity>5,000m³								
New York			All vessels from 2012								

Assessment of BWTS by CSLC (California)

Table 1. Summary of Electro-Cleen™ Systems for assessment of efficacy

> 50 µm		10 - 50 µm		< 10 µm (bacteria)		Escherichia coli		Intestinal Enterococci		Toxicogenic Vibrio Cholera	
IMO	CA	IMO	CA	IMO	CA	IMO	CA	IMO	CA	IMO	CA
<10/m³	0	<10/ml	<1/ml	-	<10/ml <100/ml	<1cfu/100ml	<1cfu/100ml	<250cfu/100ml	<126cfu/100ml	<100cfu/100ml	<33cfu/100ml
Y	Y	Y	Y	N/A	Y	Y	Y	Y	Y	Y	Y

**Systems with at least one replicate in compliance with the performance standards are denoted by a “Y”. Non-compliance is denoted by an “N,” and those systems with data in metrics not directly comparable to the performance standards were designated as “unknown.” A blank cell or hashing indicates that no data was available.

Table 2. Summary of environmental assessment and approval of Electro-Cleen™ System

Active Substance	Environmental Related Approvals	CA TRC Compliant
hypochlorite, hypobromite, ozone, hydroxyl radicals, hydrogen peroxide	IMO Basic and Final	Y

**CA Ocean Plan instantaneous maximum for Total Residual Chlorine = 60 micrograms/liter (µg/l)
Source by 2009 ASSESSMENT OF THE EFFICACY, AVAILABILITY AND ENVIRONMENTAL IMPACTS OF BALLAST WATER TREATMENT SYSTEMS FOR USE IN CALIFORNIA WATERS

Flow Diagram

A ECU (Electro-Chamber Unit)

- Disinfects ballasting water
- Closed/chamber modular type
- Capacity: 300 m³/h, 600 m³/h
- 1840mm X 690mm X 537mm

B PRE (Power Rectifier Equipment)

- Converts the input voltage from 440V AC to 10V DC
- Rated voltage : 30kW
- 430mm X 450mm X 1820mm

C PDE (Power Distributor Equipment)

- Power distributor & Multifunctional relay
- Supplies power to ECS components and monitors the state of power supply in real-time
- Capacity : Up to 1,200m³/h
- 700mm X 530mm X 1500mm

D PCU (Power Control Unit)

- Secondary control of ECS at engine room
- Provides power to LOP
- 500mm X 530mm X 1500mm

E ANU (Auto Neutralization System Unit)

- Neutralizes TRO at discharge
- Automatically operated by PLC
- Capacity : 5,000m³/h
- 800mm X 600mm X 1465mm
- Capacity : 10,000m³/h
- 1200mm X 600mm X 1465mm

F TSU (TRO Sensor Unit)

- Checks TRO values during ballasting & deballasting
- 470mm X 450mm X 1275mm

G CPC (Control PC & S/W)

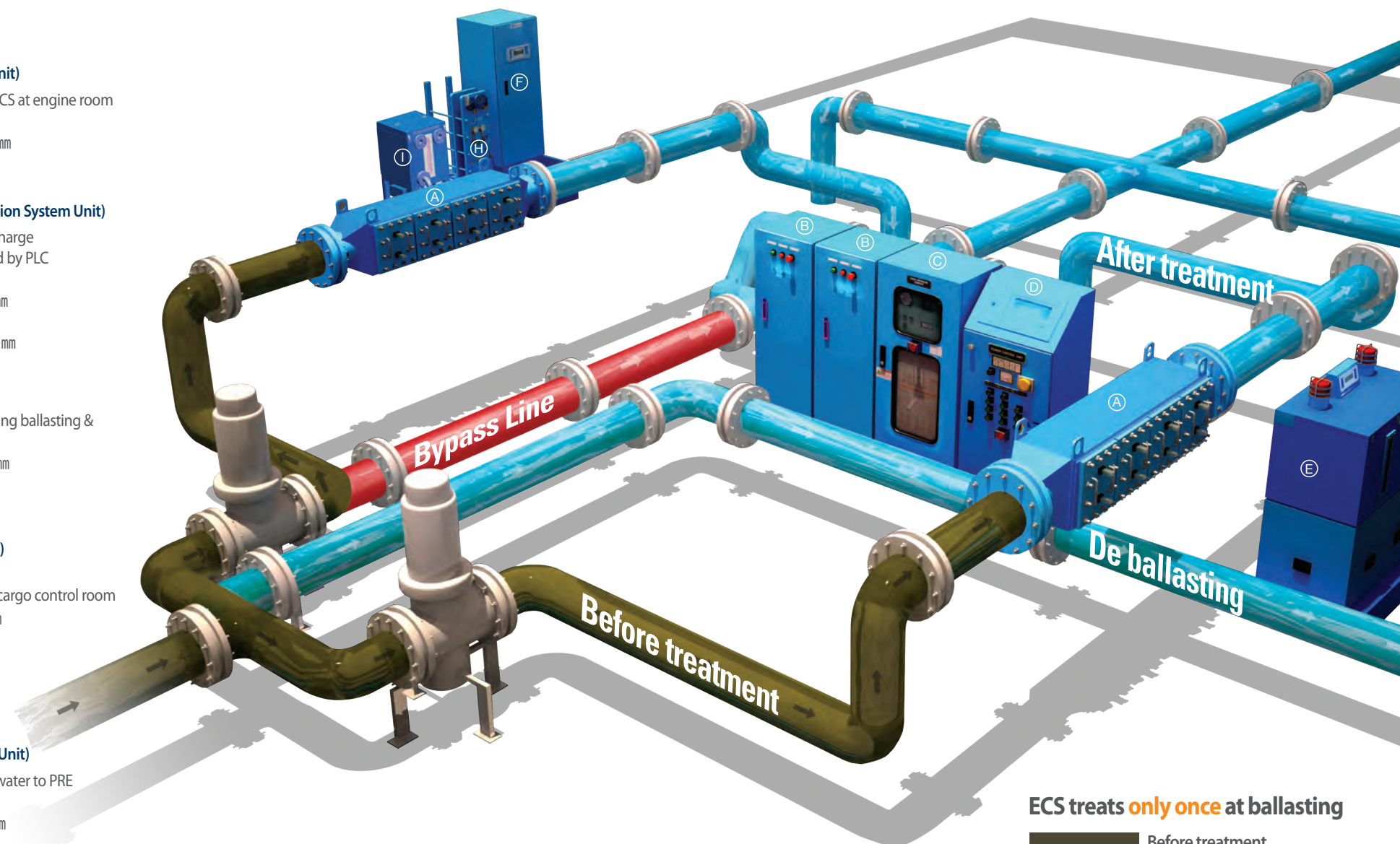
- Window based S/W
- Main control of ECS at cargo control room
- 383mm X 120mm X 507mm

H HEU (Heat Exchanger Unit)

- Efficient heat transfer with plate heat exchanger
- Capacity : Up to 6,000m³/h
- 430mm X 630mm X 929mm

I FTU (Fresh water Tank Unit)

- Provides cooling fresh water to PRE
- Capacity : 100m³/h
- 450mm X 700mm X 1095mm
- Capacity : 300m³/h
- 660mm X 830mm X 1325mm



ECS treats **only once** at ballasting

- Before treatment
- After treatment
- By Pass Line

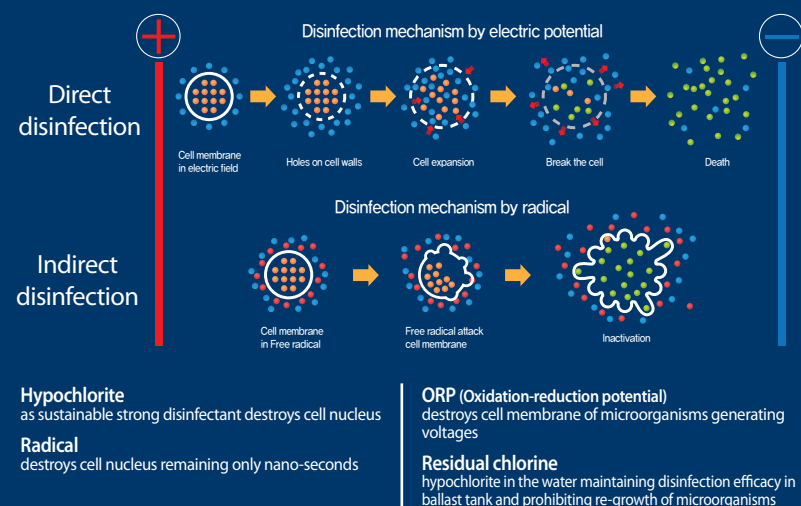
Option

Electrolysis

Electro – Clean™ System (ECS) is the most effective BWTS using electrolysis technology.

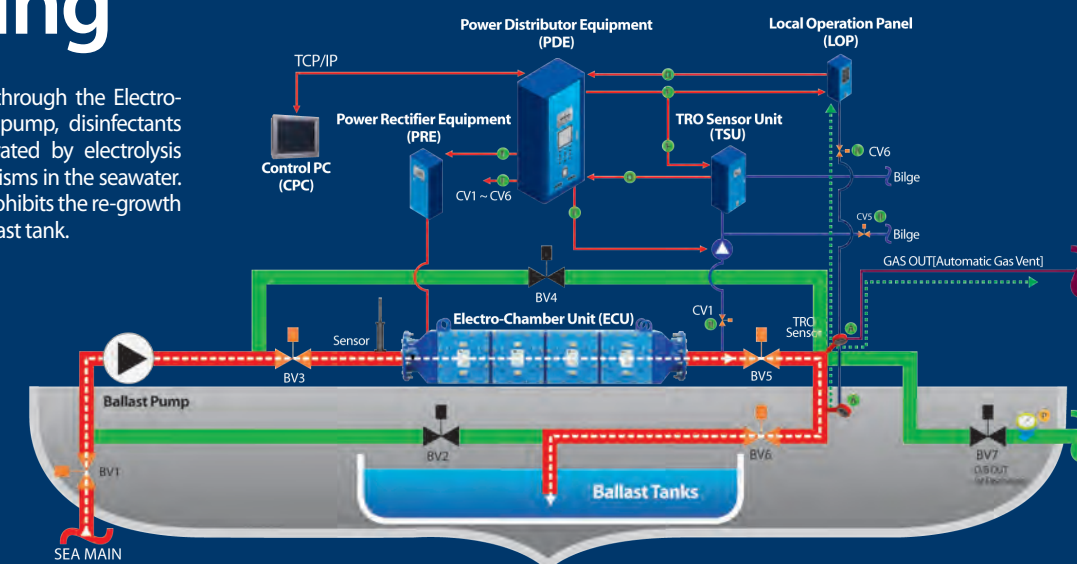
ECS is different from typical electro chlorination system. Treatment process of system which uses electro chlorination is electrochemical generation of the biocide solution on board and high concentration of hypochlorite solution is injected directly into the ballast pipe line.

ECS uses electrolysis, however, with the application of electric currents, electric potential increases disinfection efficacy by destroying cell membrane of micro-organisms generating voltage. In addition, OH- radical generated during the electrolysis procedure by titanium electrodes also disinfects micro-organisms. Through electrolysis, enough amount of TRO is generated, preventing the re-growth of micro-organisms and maintaining efficacy



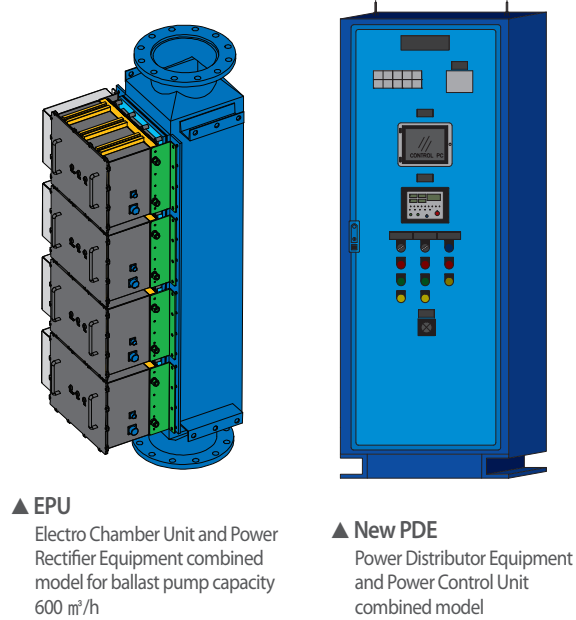
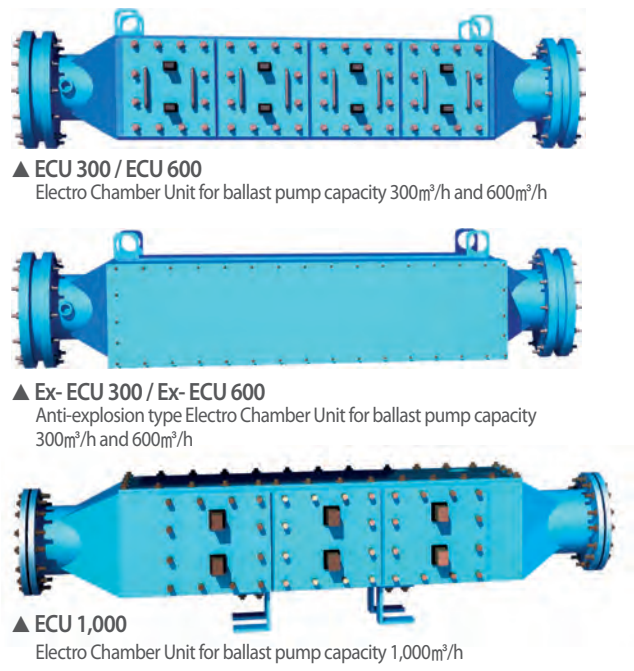
Ballasting

When the seawater passes through the Electro-Chamber Unit after ballast pump, disinfectants such as Hypochlorite generated by electrolysis disinfect harmful microorganisms in the seawater. Whereas, residual chlorine prohibits the re-growth of microorganisms in the ballast tank.



ECS Models

“Various types & capacity range of ECS models by flow rate for your vessels”



Advantage of ECS

Powerful disinfection system, meets higher standards (California)

- ECS meets California's standards (SB497) which is 1000 times stricter than IMO's.
- Neither of organism grew back in 30 days according to KORAD re-growth test nor 50 days according to Techcross R&D Center.

Low power consumption

- ECS uses maximum 3.4 kw to treat 100m³/h of 8PSU sea water (7.3kw for 100m³/h of 3PSU sea water).
- No need for an extra generator.

Low operation cost

- To operate ECS, only a little fuel cost is needed.
- The Electrode Module as key components has an expected life of 8,000 to 10,000 hours and used for nearly 20 years.

Easy to install and maintenance

- Modular type system.
- Easy replacement by ship crews.

Automatic operation

- Automatic operation is available by Window-based HMI.

Treating once at ballasting

- Residual chlorine in treated water keeps water clean, thus retreatment at deballasting is not required.
- Easy to operate and save so much expense.

No filtration required

- ECS complies with IMO standards without filtration which causes flow interruption.
- Maximum flow loss is only 0.2 Bar.

Mass production available

With several years' worth of know-how, Techcross accumulated engineering ability to accept all of customers demands.

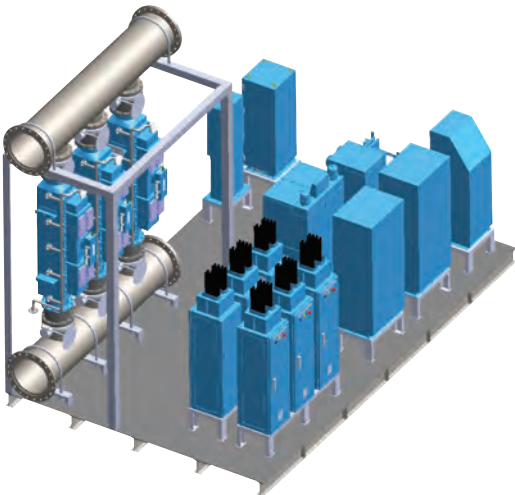
Mass production system is set up so as to produce more than 2,900 sets of ECS 300 per year by factory automation and vendor diversification

Installation

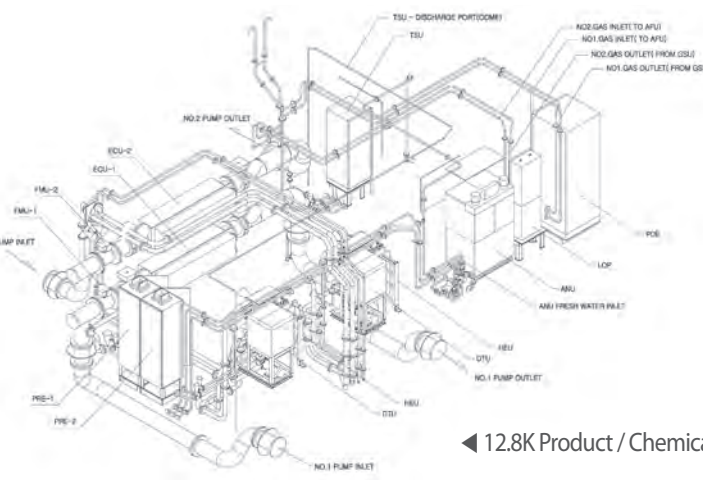
Skid mounting method

Techcross succeeded easy installation by delivering ECS with skid mounting method on a VLCC built by a Korean world No.1 shipbuilding company.

BWTS installation work became even easier by skid mounting the whole system and producing as one module before delivery and being equipped altogether on the vessel.

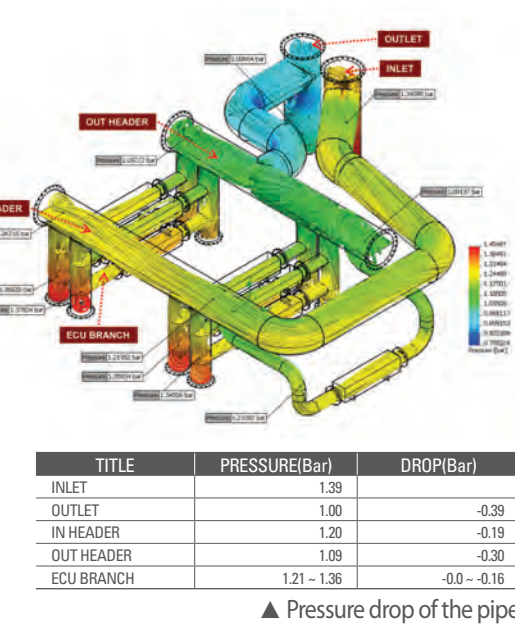
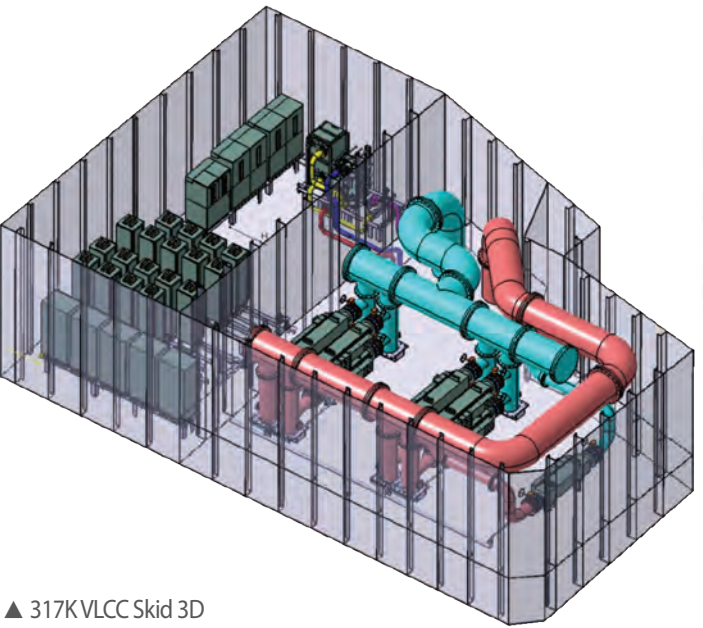


Special installation case – On deck solution



This Product Chemical Tanker has a sub-merged ballast pump. Electro-Clean™ System, which has low pressure drop was the only selected option chosen by the shipyard for this vessel. This is an exceptional case in the world that a shipyard constructed separate space to install just for BWTS. Only Techcross is able to offer this solution with successful know-how and knowledge, for vessels requiring special installation condition

ECS can be customized to suit your needs





Installation References

Bulk Carrier Retrofit

New Irene_Retrofit		Model	ECS1200 X 2 sets
Vessel Type	73K Bulk Carrier	Date	January, 2011
Ballast Pump Capacity	1,200m³/h X 2 sets	Shipyard	China



Tanker Ex-proof Type

SNO1278_New building		Model	EX-ECS300 x 1 set
Vessel Type	8.5K Chemical Tanker	Date	October, 2009
Ballast Pump Capacity	300m³/h X 2 sets	Shipyard	Japan



Bulk Carrier New Building

SS089_New Building		Model	ECS1800 X 2 sets
Vessel Type	98K Bulk Carrier	Date	November, 2010
Ballast Pump Capacity	1,800m³/h x 2 sets	Shipyard	Japan



Tanker on deck solution

B5036_New Building		Model	ECS300 X 2 sets
Vessel Type	12.8K Product / Chemical Tanker	Date	October, 2009
Ballast Pump Capacity	300m³/h X 2 sets	Shipyard	Korea

