



**Providing right solutions
for your ships**

I NTRODUCTION

Techcross is a leading company in ballast water management system.

Our effective and reliable product, Electro-Cleen™ System (ECS), obtained the industry's very first IMO Basic Approval in 2006, and Final Approval in 2008.

Also, ECS has won numerous eminent awards including New Excellent Product **NEP** by MKE (Ministry of Knowledge Economy) in Korea, National Green Tech Award and Jang Young-Shil Award by KOITA (Korea Industrial Technology Association) in 2011.

As of _____, the accumulated system order numbers to _____. Out of this total number, _____ have already been delivered to the world's renowned ship owners and shipyards.



PRODUCTS



ECU 150B

Electro Chamber Unit and Power Rectifier Equipment combined model for ballast pump capacity 150m³/h



ECU 300B

Electro Chamber Unit and Power Rectifier Equipment combined model for ballast pump capacity 300m³/h



ECU 450B

Electro Chamber Unit and Power Rectifier Equipment combined model for ballast pump capacity 450m³/h



ECU 600B

Electro Chamber Unit and Power Rectifier Equipment combined model for ballast pump capacity 600m³/h



ECU 1000B

Electro Chamber Unit and Power Rectifier Equipment combined model for ballast pump capacity 1000m³/h



ECU 300A / ECU 600A

Electro Chamber Unit for ballast pump capacity 300m³/h and 600m³/h



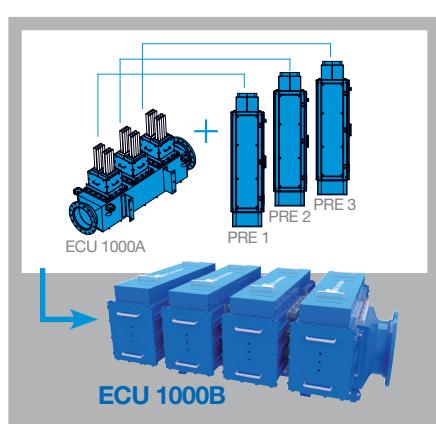
Ex-ECU 300A / Ex-ECU 600A

Explosion-proof type Electro Chamber Unit for ballast pump capacity 300m³/h and 600m³/h



ECU 1000A

Electro Chamber Unit for ballast pump capacity 1000m³/h



ADVANTAGES



Strong efficacy

- ECS meets California's standards (SB497) which is 1000 times stricter than IMO D-2 standards.
- No organisms regenerated within 30 days according to KORDI re-growth test nor 50 days according to Techcross R&D Center.



Low power consumption

- ECS uses maximum 1.7kw to treat 100m³/h of normal sea water(>30PSU).
- Low power consumption compared to other BWMS technologies.



One time treatment during ballasting

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



No filter, low pressure drop

- ECS complies with IMO standard without filtration which can cause flow interruption.
- Maximum flow loss is only 0.2 bar.



Low operation cost

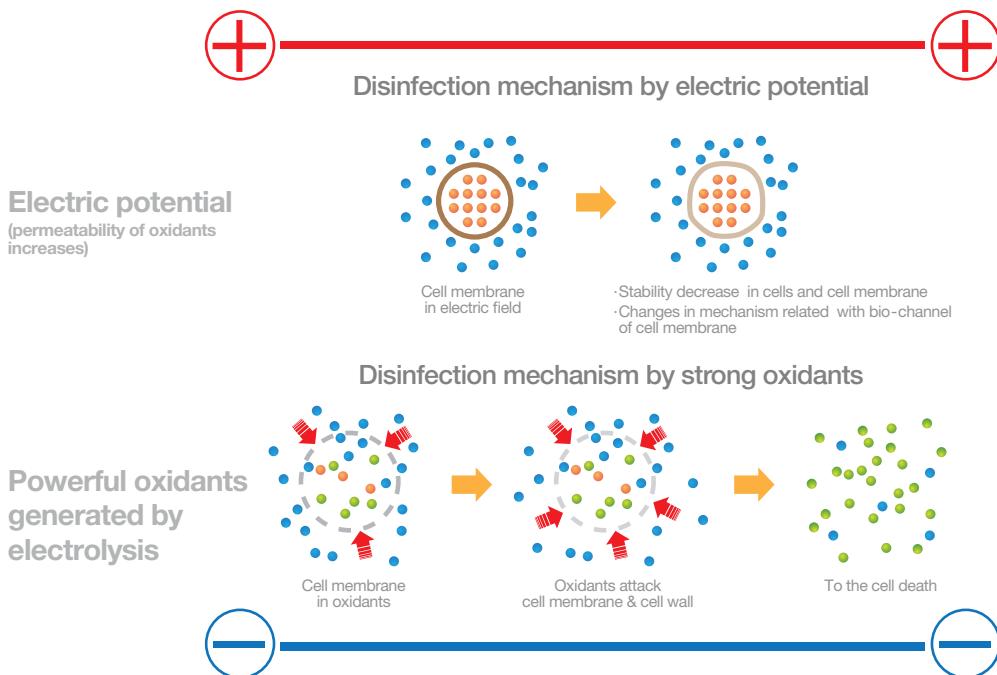
- Low power consumption results in low fuel cost.
- Long lifetime of Electrode Module.



Easy installation and maintenance

- Modular type system
- Easy replacement by ship crews.

ELECTROLYSIS

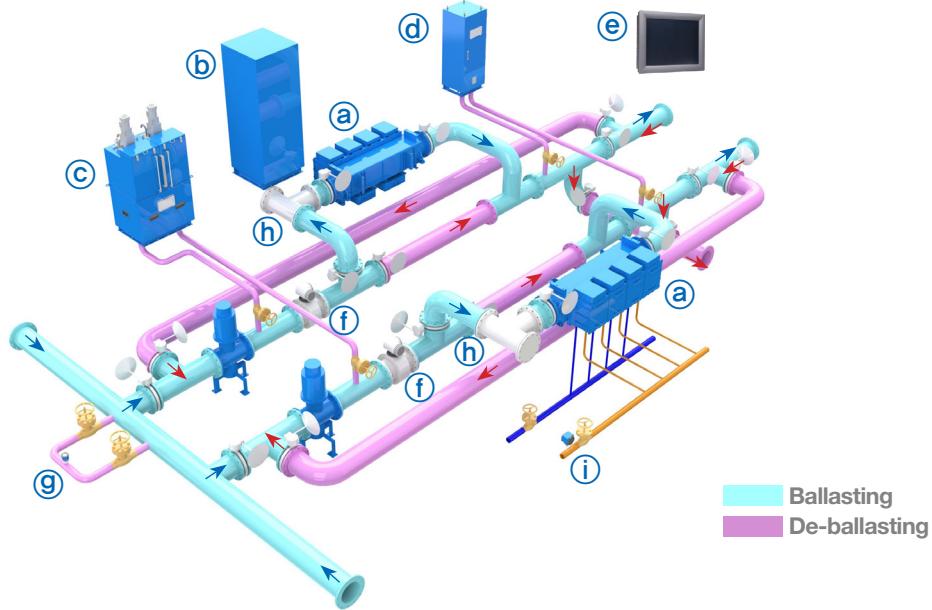


Electro-Cleen™ System (ECS) is the most effective disinfection system using electrolysis technology. With in-situ generation of electric potential and oxidants from Electro-Chamber Unit (ECU), ECS treats all of the incoming ballast water. Among the oxidants, hypochlorite remains in the ballast tanks to continuously disinfect residual organisms.

More specifically, when sea water passes through the ECU, a maximum 10ppm of hypochlorite is produced within the ECU. At the same time, two more effects occur to increase disinfection efficacy. One of these effects is the electric energy from the electrodes which physically shocks organisms resulting in the weakening of cell membrane stability enhancing the disinfection efficacy of the oxidant compounds generated by the ECU. The other effect is the production of oxidants such as hydroxyl radical and hypobromite (in addition to hypochlorite) which can oxidize cell membranes and cell walls to disinfect organisms.

Among the two types of oxidants, hydroxyl radical is a powerful oxidant which is instantly generated during electrolysis but also very short lived. On the other hand, the residual oxidant, hypochlorite is able to remain active for a much longer period to eliminate residual organisms in ballast tanks and prevent re-growth.

PROCESS



(a) ECU (Electro Chamber Unit)



- Disinfects ballast water
- ECU 600B : 1840mmx663mmx799mm
- ECU1000B : 2000mmx774mmx1124mm

(b) PDE (Power Distributor Equipment)



- Supplies power to ECS components and monitors the state of power supply in real-time
- Capacity : Up to 1200m³/h
- 700mmx700mmx1900mm

(c) ANU (Auto Neutralization Unit)



- Neutralizes TRO at discharge
- Capacity 5000m³/h :
- 800mmx600mmx1600mm

(e) CPC (Control PC & S/W)



- Window based S/W(software)
- Main control of ECS at cargo control room

(g) CSU (Conductivity Sensor Unit)



- Measures electrical conductivity of sea water and sends to CPC

(i) FTS (Freshwater Temperature Sensor)



- Measures temperature of freshwater

(d) TSU (TRO Sensor Unit)



- Checks TRO values during ballasting & deballasting
- 470mmx450mmx1385mm

(f) FMU (Flow Meter Unit)



- Monitors operation of ballast pump and allows ECS to operate upon ballasting

(h) T-strainer



- Protects ECU from sediment



Shipyard	Ship Size	Ship Type	Ballast P'P	ECS Model	Delivery	Shipyard	Ship Size	Ship Type	Ballast P'P	ECS Model	Delivery
China	700 TEU	CNTR	300m3/h x 2 sets	ECS-300A x 1 set	2006	Korea	38K	Combined Vessel	500m3/h x2sets	ExECS600Bx1set	2013
China	27K	Bulk Carrier	500m3/h x 2 sets	ECS-600A x 2 sets	2007	Korea	35K	LPGC	500m3/hx2sets	ECS-600Bx2sets	2012.11
Korea	1.015TEU	CNTR	300m3/hx2Sets	ECS-300Ax2Sets	2009	Korea	175K	BC	2500m3/hx2Sets	ECS-2600Bx2sets	2013
Korea	962TEU	CNTR	300m3/hx2Sets	ECS-300Ax2Sets	2009	Korea	31K	HLV	1000m3/hx2sets	ECS-1000Bx2sets	2013
Korea	4K	White Oil Tanker	300m3/h x 2 sets	Ex-ECS-300A x 2 sets	2010	Korea	170K	LNGC	2600m3/hx2sets	ECS-2600Bx2sets	2013
Korea	317K		4000m3/hx2Sets	ECS-5400Ax1Set	2010	Korea	83K	BC	1000m3/hx2sets	ECS-1000Bx2sets	2012
Korea	12.8K	PC Tanker	300m3/hx2Sets	ECS-300Ax2Sets	2009	China	40K	Bulk Carrier	800m3/h x 2sets	ECS-2000A x 1set	2012
Korea	1000TEU	CNTR	300m3/hx2Sets	ECS-300Ax2sets	2011	China	180K	Bulk Carrier	3500m3/h x 2sets	ECS-3600B x 2sets	2012
Korea	953 TEU	CNTR	300m3/hx2Sets	ECS-300Ax2sets	2011	China	3500TEU	CNTR	500m3/h x 2 sets	ECS-600B x 1set	2012.04
Korea	105K	C.O.T.	1500m3/hx2Sets	Ex-ECS-A3000x1set	2011	China	13K	Gen Cargo	250m3/h x 2 set	ECS-600B x1set	2012.06
China	27K	Bulk Carrier	450m3/h x 2 sets	ECS-900A x 1 set	2009	China	1100TEU	CNTR	300m3/h x 2sets	ECS-600B x 1set	2012.09
China	73K	Bulk Carrier	1200m3/h x 2 sets	ECS-1200Ax2sets	2010	China	10K	Gen Cargo	300m3/h x 2 sets	ECS-600B x 1set	2012.06
China	5K	LPGC	100m3/h x 2 sets	ECS 300Ax1set	2011	USA	63K	MLP HLV	1800m3/hx1Set 3000 3/h	ECS-1800Ax1set ECS 3000A	2011.08
China	84m. Accom Supply Vessel		200m3/h x 2 sets	ECS-300A x 2sets	2012	Japan	73K	Bulk Carrier	750m3/h x 2sets	ECS-1000Bx2sets	2012.06
China	92K	Bulk Carrier	1600m3/h x 2 sets	ECS-1600B x 2sets	2012	Japan	2.2K	Chemical carrier	300m3/h x 1sets	ECS-300Bx1set	2012.08
China	105K	Bulk Carrier	2000m3 x 2 sets	ECS-2000B x 2sets	2012	Japan	3.5K	LPGC	300m3/h x 2sets	ECS-300Bx1set	2012
China	82K	Bulk Carrier	1500m3 x 2 sets	ECS-1600B x 2sets	2012	Japan	82K	VLGC	1000m3/hx2sets	ECS-2000Bx1set	2013
Japan	8.5K	Chemical Tanker	300m3/h x 2 sets	Ex-ECS-300A x 1 set	2009	Japan	120K	Bulk Carrier	1800m3/hx2sets	ECS-1800Bx1set	2013
Japan	3.5K	Chemical Tanker	300m3/h x 2 sets	Ex-ECS-300A x 1 set	2009	Japan	3.5K	LPGC	125m3/hx2sets	ECS-300Bx1set	2012
Japan	5K	LPGC	300m3/h x 2 sets	ECS300A x 1 set	2010	Korea	83K	BC	1000m3/hx2sets	ECS-1000Bx2sets	2012
Japan	3.5K	LPG	300m3/h x 1 sets	ECS-300A x 1 set	2010	Korea	155K	Shuttle Tanker	2600m3/hx2sets +450m3/hx1set	Ex-ECS-2600Bx2sets +ECS460Bx1set	2012
Japan	98K	Bulk Carrier	1800m3/h x 2 sets	ECS-1800A x 2sets	2010.07	Korea	50K	PC Tanker	1300m3/hx2sets	ECS-1300Bx1set	2013
Japan	7.5K	Bulk Carrier	500m3/h x 1 set	ECS-600A x 1 set	2010	Japan	1.6K	Molten Sulpher	130m3/hx2sets	ECS-150Bx1set	2012
Japan	24K	Bulk Carrier	600m3/h x 2 sets	ECS-600Ax 2 sets	2011	Japan	13K	Ro-Ro	150m3/h x 2sets	ECS-300Bx1set	2012.05
Japan	5K	LPGC	150m3/h x 2 sets	ECS-300A x 1 set	2010	Korea	Mars	Tanker	2504m3/h x 1set + 1252m3/h x 1set	Ex-ECS2600B1set+Ex-ECS1350Bx1	2015
Japan	7.5K	Bulk Carrier	500m3/h x 1 set	ECS-600A x 1 set	2010	Korea	LNGC		3000m3/h x 3sets	ECS3000x2sets	2013.03
Japan	12K	Bulk Carrier	300m3/h x 2 sets	ECS-300A x 2sets	2011	Japan	24K	Chemical Tanker	500m3/h x 2sets	Ex-ECS1200x1set	2012
Japan	98K	Bulk Carrier	1800m3/h X 2 sets	ECS-1800A x 2sets	2010.07	Korea	38K	LPGC	500m3/h x 2sets	ECS-600B x 2sets	2013
Japan	24K	Bulk Carrier	600m3/h x 2 sets	ECS-600A x 2sets	2011	China	Heavy Lift Vessel		800m3/h x 2sets	ECS-1000B x 2set	2012.12
Japan	88K	Bulk Carrier	2400m3/h x 2sets	ECS-2400Bx2sets	2012	China	50K	Wind Power Base	800m3/h x 2set	ECS-900B x2sets	2012.10
Japan	250K	Bulk Carrier	3500m3/h x 2sets	ECS-3600B x 2sets	2013	China	40K	Bulk Carrier	800m3/h x 2set	ECS-2000B x1set	TBD
Japan	69K	Bulk Carrier	1500m3/hx2sets	ECS-1600B x 2sets	2013	China	64K	Bulk Carrier	900m3/h x 2set	ECS-900B x2sets	2013
Japan	3.5K	LPGC	250m3/h x 2 sets	ECS-300A x 1set	2012	China	76K	Bulk Carrier	1200m3/h x 2 sets	ECS-1200Bx2sets	2012
Japan	78K	LPGC	750m3 x 2 sets	ECS-1000B x 2set	2012	Korea	52K	PC tanker	750m3/hx2Sets+ 280m3/hx2Sets	Ex-ECS-900Bx2sets+ECS-B300x1set	2012
Japan	88K	Bulk Carrier	2000m3/h x 2sets	ECS-2000B x 2sets	2012.01	Korea	57K	OHGC	1000m3/hx2sets	ECS-1000Bx2sets	2012
Japan	180K	Bulk Carrier	2600m3/h x 1 set	ECS-3000B x 1 set	2012.3	China	82K	Bulk Carrier	1500m3/h x 2 sets	ECS-1600B x 2sets	2012
Japan	82K	Bulk Carrier	1500m3/h x 2 sets	ECS-1600B x 2sets	2012	China	40K	Bulk Carrier	800m3/h x 2sets	ECS-2000A x 1set	2012
Japan	1020TEU	CNTR	300m3/h x 2sets	ECS-300B x 2sets	2012	China	180K	Bulk Carrier	3500m3/h x 2sets	ECS-3600B x 2sets	2012
Japan	58K	Bulk Carrier	950m3/h x 2sets	ECS-1000B x 2sets	2012	China	3500TEU	CNTR	500m3/h x 2 sets	ECS-600B x 1set	2012.04
Japan	58K	Handy max	750m3/h x 2 sets	ECS-600Bx2sets	2012.08	China	76K	Bulk Carrier	1200m3/h x 2 sets	ECS-1200Bx2sets	2012
Japan	19.900DWT.	Chemical Tanker	250m3/h x 2sets	Ex-ECS-600Bx1set	2012.9	Korea	50K	PC Tanker	1300m3/hx2Sets	ECS-1300Bx1set	2013
Japan	38K	Bulk Carrier	650m3/h x 2sets	ECS-1350Bx1set	2012.8	Korea	38K	LPGC	500m3/h x 2sets	ECS-600B x 2sets	2013
Japan	56K	Bulk Carrier	1200m3/h x 2sets	ECS-1200Bx1set	2012.06	China	180K	Bulk Carrier	3500m3/h x 2sets	ECS-3600B x 2sets	2012
Korea	105K	C.O.T.	1500m3/hx2Sets	Ex-ECS-A3000x1set	2011	China	3500TEU	CNTR	500m3/h x 2 sets	ECS-600B x 1set	2012.04
Korea	10100TEU	CNTR	1000m x2Sets	ECS-1000Ax1set	2011	China	76K	Bulk Carrier	1200m3/h x 2 sets	ECS-1200Bx2sets	2012
Korea	-	Drill ship	1000m3 x2Sets	ECS-1000Ax2sets	2012	Korea	50K	PC Tanker	1300m3/hx2Sets	ECS-1300Bx1set	2013
Korea	26K	RoRo CNTR	350m3/hx2Sets	ECS-600Bx1set	2012	Korea	38K	LPGC	500m3/h x 2sets	ECS-600B x 2sets	2013
Korea	84K	LPGC	800m3/hx2Sets	ECS1500Bx2sets	2012	China	64K	Bulk Carrier	900m3/h x 2set	ECS-900B x2sets	TBD
Korea	35K	LPGC	500m3/hx2Sets	ECS-600Bx2sets	2012	China	38K	LPGC	800m3/h x 2set	ECS-2000B x1set	TBD
Korea	52K	PC tanker	750m3/hx2Sets+ 280m3/hx2Sets	Ex-ECS-900Bx2sets+ECS-B300x1set	2012	China	64K	Bulk Carrier	1200m3/h x 2 sets	ECS-1200Bx2sets	2012
Korea	2800TEU	CNTR	500m3/hx2sets	ECS-600Bx1set	2012	Korea	52K	PC tanker	750m3/hx2Sets+ 280m3/hx2Sets	Ex-ECS-900Bx2sets+ECS-B300x1set	2012
Korea	205K	Bulk Carrier	3000m3/hx2Sets	ECS-3000Ax2sets	2012	Korea	57K	OHGC	1000m3/hx2sets	ECS-1000Bx2sets	2012
Korea	3.800 TEU	CNTR	600m3/hx2Sets	ECS-600Bx2sets	2012.04	China	82K	Bulk Carrier	1500m3/h x 2 sets	ECS-1600B x 2sets	2012
Korea	57K	OHGC	1000m3/hx2Sets	ECS-1000Bx2sets	2012	China	40K	Bulk Carrier	800m3/h x 2sets	ECS-2000A x 1set	2012
Korea	8.800 TEU	CNTR	1000m3/hx2Sets	ECS-1000Bx2sets	2012	China	180K	Bulk Carrier	3500m3/h x 2sets	ECS-3600B x 2sets	2012
Korea	10.700TEU	CNTR	1000m3/hx2Sets	ECS-1000Ax1set	2011.11	China	3500TEU	CNTR	500m3/h x 2 sets	ECS-600B x 1set	2012.04
Korea	9.200TEU	CNTR	1000m3/hx2Sets	ECS-1000Bx1set	2012.04	China	76K	Bulk Carrier	1200m3/h x 2 sets	ECS-1200Bx2 sets	2012
Korea	320K	VLCC	3000m3/hx2sets	ExECS-6000Bx1set	2012.06	Korea	50K	PC Tanker	1300m3/hx2Sets	ECS-1300Bx1set	2013
Korea	173K	LNGC	2500m3/hx2Sets	ECS-2600Bx2sets	2012	Korea	38K	LPGC	500m3/h x 2sets	ECS-600B x 2sets	2013
Korea	13.000TEU	CNTR	1200m3/hx2sets	ECS-1200Bx2sets	2012.02	China	64K	Bulk Carrier	900m3/h x 2set	ECS-900B x2sets	TBD

As of _____, _____ of above orders are delivered.



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