

PROVIDING
TOTAL
SOLUTION
FOR YOUR
FLEET



ELECTRO-CLEEN™ SYSTEM

Ballast water management system developed by Techcross

Techcross Electro-Cleen™ System (ECS) is one of the most effective ballast water management systems utilizing electrolysis.

ECS treats all incoming ballast water by in-situ production of hypochlorite with combined effects of electric shock and hydroxyl radical in the Electro Chamber Unit (ECU). This simple disinfection processing is so powerful that it destroys cell membrane of microorganisms and prevents re-growth, needing only one-time treatment. It means ECS contributes to reduction in time and operating cost.

Techcross has upgraded ECS through continuous research and development involving tests and approvals with classification societies for better performance. ECS obtained the world's first IMO Basic Approval in 2006

and many Type Approvals from the flag states and classification societies. In addition, ECS accepted as an AMS (Alternate Management System) from USCG (United States Coast Guard) in 2013 and the USCG Type Approval now under way is expected to be achieved within 2017.

Techcross has closely cooperated with classification societies to conduct various risk assessments including HAZOP (Hazard & Operability), hydrogen gas safety tests, FMEA (Failure Mode & Effects Analysis) and software verification. The FMEA was carried out in 2013 with the ABS in Houston, and was considered to be the industry's first one with class for BWMS. With all these risk assessments, Techcross has shown a strong commitment for improving safety of products.



IMO Final Approval
2008



Korean Government
2008



KR Type Approval
2008



Liberian Government
2011



ABS Type Approval
2011



Japanese Government
2012



USCG AMS
2013



RS Type Approval
2013



BV Type Approval
2013



RINA Type Approval
2013



Cyprus Government
2014



LR Type Approval
2015



Australia Government
2016



DNV&GL Type Approval
2016



CCS Type Approval
2017

*USCG Type Approval in process



- | | | |
|-------------------------------------|----------------------------------|---------------------------------------|
| ① ECU (Electro Chamber Unit) | ④ ANU (Auto Neutralization Unit) | ⑦ FMU (Flow Meter Unit) |
| ② TSU (TRO Sensor Unit) | ⑤ CPC (Control PC) | ⑧ CSU (Conductivity Sensor Unit) |
| ③ PDE (Power Distributor Equipment) | ⑥ T-strainer | ⑨ FTS (Freshwater Temperature Sensor) |

Ballasting



All the incoming ballast water passes through T-strainer before it is treated by ECU. ECU can disinfect marine organisms in the ballast water with one time treatment during ballasting.

Deballasting



A main process during deballasting operation is neutralization of the treated water by ANU. ANU is designed to automatically neutralize the treated water according to data about flow rate and TRO concentration by FMU & TSU.

Advantages of ECS

- Strong disinfection efficacy
- Low power consumption
- Low operational costs
- Largest reference list
- Convenient installation and maintenance
- Automation of system
- Global network

SPECIFICATION OF ECS

Specific information of Electro-Clean™ System

ECU (Electro Chamber Unit)		
Specification	ECU is the core component killing marine organisms in the ballast water ranging from ECU 150B to ECU 1000B. Each model can be combined in parallel to achieve higher TRCs (Treatment Rated Capacity).	
Size	ECU 150B	W790 X D540 X H862 (mm), 390kg
	ECU 300B	W1,243 X D763 X H862 (mm), 490kg
	ECU 450B	W1,490 X D763 X H862 (mm), 660kg
	ECU 600B	W1,840 X D763 X H862 (mm), 830kg
	ECU 1000B	W2,000 X D1,124 X H914.5 (mm), 1,210kg
Power Supply	AC 440V, 3ph, 60Hz (FROM PDE)	
Component	EM(Electro Module), PRU(Power Rectifier Unit), EPJ(ECU Power Junction box), ESJ(ECU Signal Junction box)	
Ex-Certificate	Ex II 2 G Ex de IIB T4 Gb : LCIE 12 ATEX 3095X / Ex de IIB T4 Gb : IECEx KGS 12.0008X	



< ECU 150B >



< ECU 300B >



< ECU 450B >



< ECU 600B >



< ECU 1000B >

PDE (Power Distributor Equipment)		
Specification	PDE supplies AC 440V from the ship to all other components of ECS and controls communications of all other components.	
Size	PDE 12A	W600 X D630 X H1,500 (mm), 175kg
	PDE 24A	W700 X D700 X H1,900 (mm), 310kg
	PDE A4	W700 X D530 X H1,500 (mm), 250kg
Power Supply	AC 440V, 3ph, 60Hz / AC220V, 60Hz	



< PDE 12A >



< PDE 24A >



< PDE A4 >



< ANU 5T >



< ANU 10T >

ANU (Auto Neutralization Unit)		
Specification	ANU is designed to automatically neutralize treated ballast water prior to its discharge so that the discharge of Residual Biocides may not exceed 0.1ppm (instantaneous maximum limit) according to TRO level measured by TSU.	
Size	ANU 5T	W800 X D733 X H1,655 (mm), 220kg
	ANU 10T	W1,200 X D733 X H1,655 (mm), 308kg
Power Supply	AC 220V, 60Hz (FROM PDE)	
Neutralizer	Sodium Thiosulfate	
Mixture Ratio	2 (Fresh water) : 1 (Neutralizing agent)	
Tank Capacity	ANU 5T	100 Liter for each tank (Both : 200 Liter)
	ANU 10T	200 Liter for each tank (Both : 400 Liter)



TSU (TRO Sensor Unit)	
Specification	TSU measures concentrations of TRO (Total Residual Oxidant) generated by ECU during ballasting operation. TSU also checks the TRO level in the treated ballast water for proper neutralization of ballast water before its discharge.
Size	W470 X D450 X H1,347 (mm), 100kg
Power Supply	AC 220V, 60Hz (FROM PDE)
Ex-Certificate	II 2 G Ex px IIC T4 Gb / ITS11 ATEX 17384



CPC (Control PC & S/W)	
Specification	Control PC features an upgraded touchscreen interface which is easy & simple to operate ECS. In addition, the CPC shows all the data saved relating to ECS operation.
Size	W480 X D119 X H660 (mm), 35kg
Power Supply	AC 220V, 60Hz (FROM PDE)



T-strainer	
Specification	T-strainer with a 3mm mesh filter is used during ballasting operations to filter out large marine species and foreign materials in the incoming ballast water. It helps protect electrodes inside the ECU to maintain an optimal performance of ECU for a strong disinfection efficacy.
Size	W550 X D366 X H503 (mm), 87kg
Type	Straight, Angle
Pressure Range	-1 ~ 10 Bar



FMU (Flow Meter Unit)	
Specification	Measures flow rate of ballast water during ballasting and deballasting operation.
Power Supply	AC 220V



FTS (Freshwater Temperature Sensor)	
Specification	Measures temperature of cooling water supplied to a rectifier from vessel.
Power Supply	DC 24V



CSU (Conductivity Sensor Unit)	
Specification	Measures electrical conductivity of seawater passing through ECU during ballasting operation.
Power Supply	DC 24V

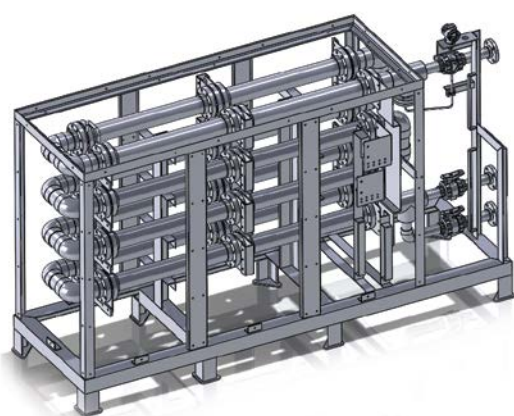


GDS (Gas Detection Sensor)	
Specification	Detects a possible leak of hydrogen gas from ECU.
Power Supply	DC 24V

NEW SYSTEMS

Different technologies applied to new systems

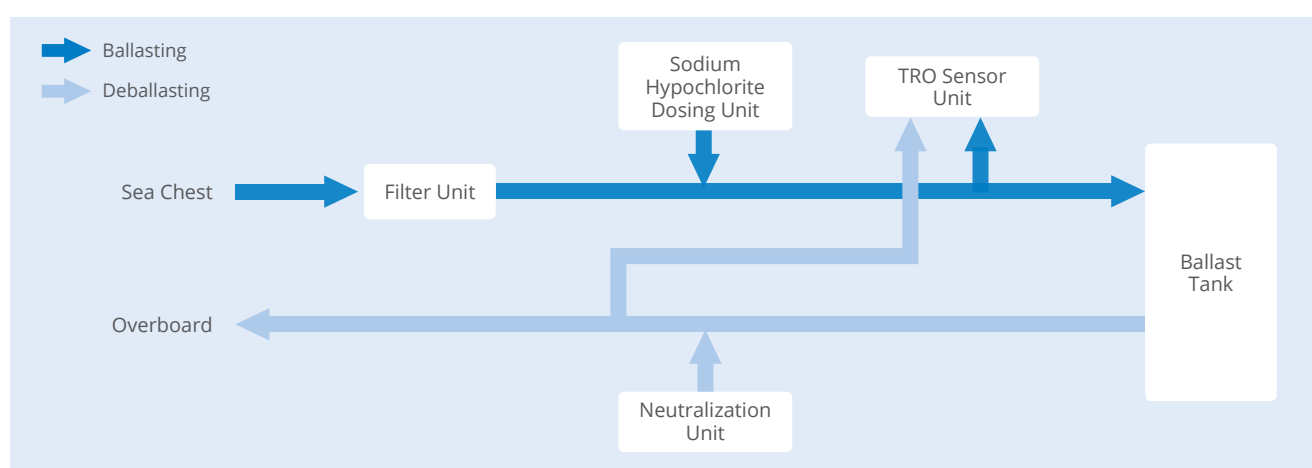
ECS-HYCHLOR™ SYSTEM



Specification

Division	Specification
Filtration	50µm Auto Backflushing
Active Substance	Sodium Hypochlorite
Operation Performance	Less than TRO 5mg/L
Neutralization Performance	Less than TRO 0.1mg/L
Neutralizing Agent	Sodium Thiosulfate ($\text{Na}_2\text{S}_2\text{O}_3$)
Operation Method	Automatic (Remote/Local)
Operation S/W	Human Machine Interface
TRC	150 ~ 6,000m ² /h
Salinity	Above 8 PSU
Temperature (Amb.)	0 ~ 55 °C
Humidity	Max 95%

Flow Diagram



Approval Status

Test / Approval	Progress	Remark
IMO Basic Approval	May 2015 Basic Approval obtained	2015. 05. 15 MEPC 68
IMO Final Approval	April 2016 Final Approval obtained	2016. 04. 18 MEPC 69
USCG Type Approval	Expected by early 2018	

RETROFIT SERVICE

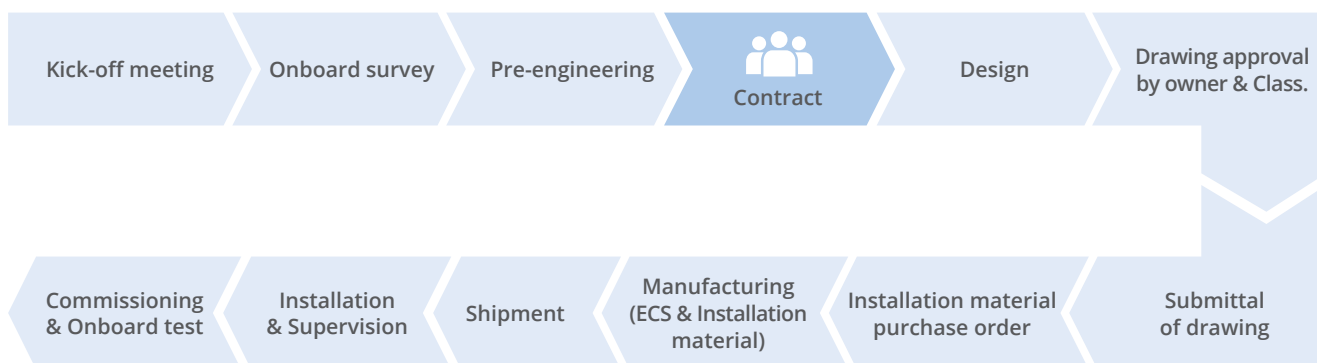
Prompt and accurate service in retrofitting

Techcross provides ship owners who are looking for retrofitting Ballast Water Management System with the total engineering solution.

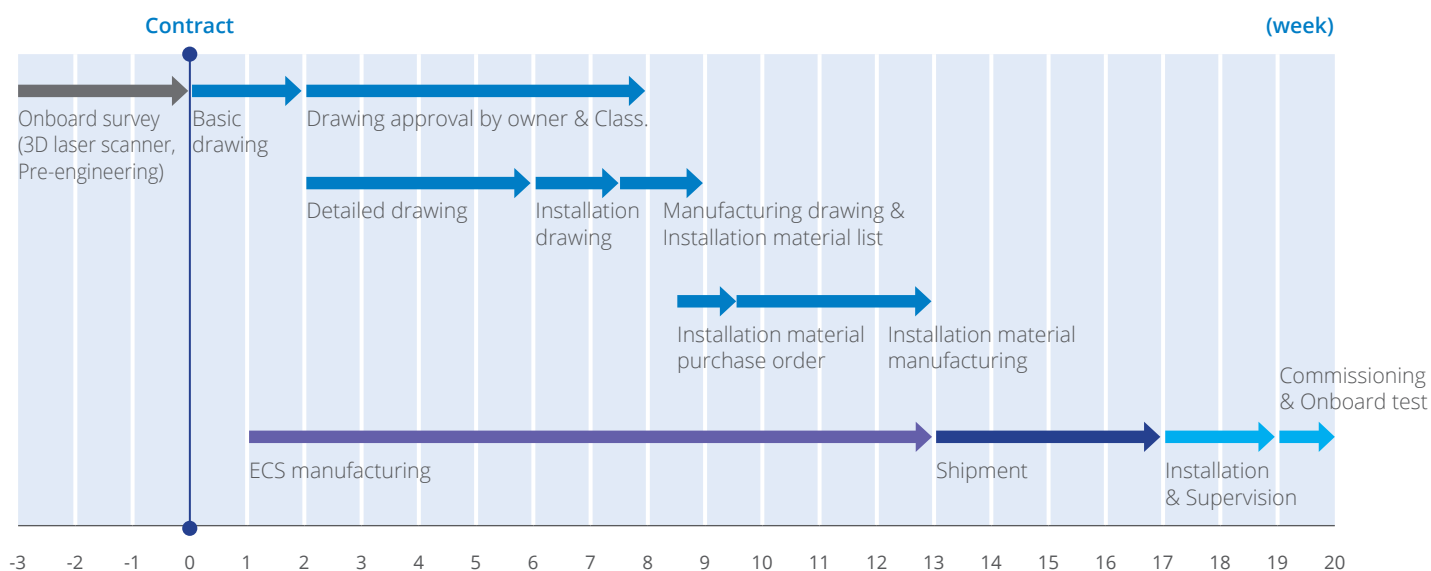
Service Scope

Option 1	ECS supply + Commissioning
Option 2 (Engineering Solution)	Onboard survey + Design + ECS supply + Supervision + Commissioning
Option 3 (Turn key Solution)	Onboard survey + Design + ECS & Installation material supply + Installation + Supervision + Commissioning

Service Process



Service Schedule (Standard time table) : 20 weeks



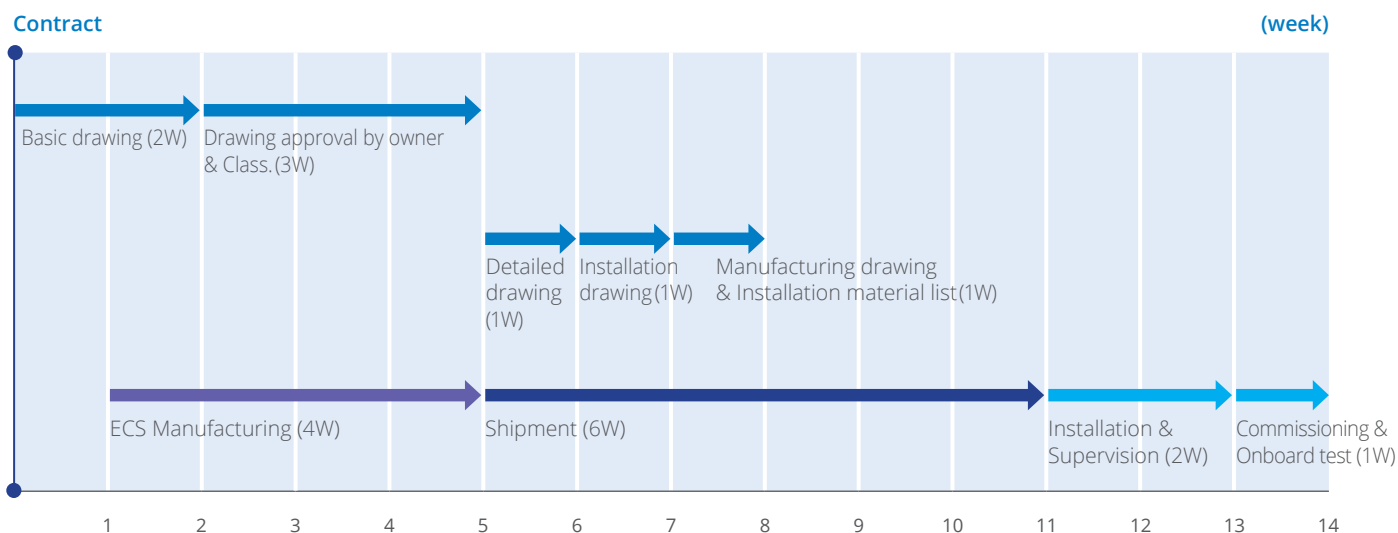
Case Study

LPG Carrier Project

Ship type	7,200 CBM LPG Carrier	Installation location	E/R
B.P capacity	450m³/h X 1set	Installation site	Dry-dock (Denmark)
ECS model	ECS 450B X 1set	Date	2014



Project Schedule (Fast track with limited time) : 14 weeks



Advantages



Efficient Engineering

- Most extensive organization in BWMS
- Skilled engineering manpower
- Optimized design using 3D laser scanner



Competitive Cost

- Competitive engineering cost through in-house retrofit team
- Minimized design & installation cost through a variety of project experiences and installation alternatives



Superior Partnership

- Global training center
- Close partnership with repair shipyards
- Global service network

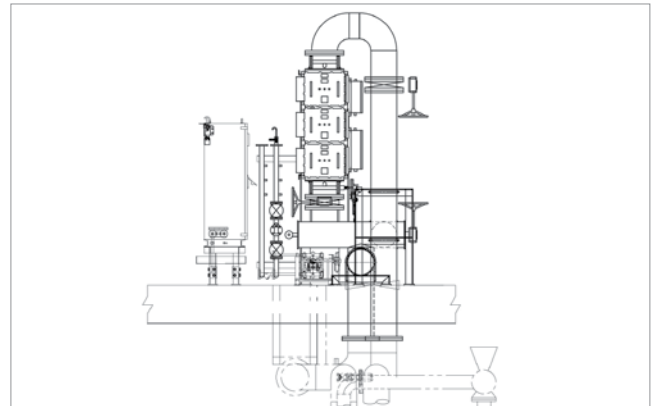
REFERENCES

An abundant installation references on new and existing vessels

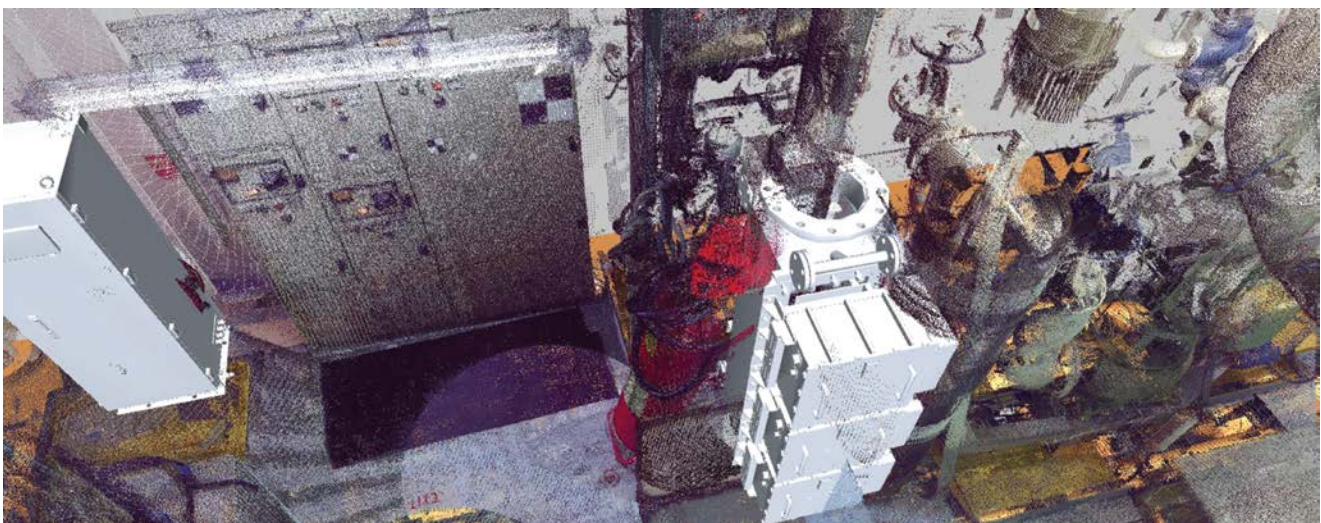
Case 01 [retrofit]



Before installation



Installation drawing



3D scanning & modeling

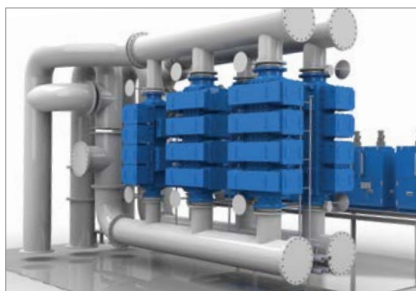


After installation

Specification

Division	Specification
Ship type	7,200 CBM LPG Carrier
Class	BV
Capacity	450m³/h X 1set
Model	ECS 450B X 1set
Installation location	E/R
Installation site	Dry-dock (Denmark)
Date	2014

Case 02 [New building : SKID mount type]



Modeling



Installation

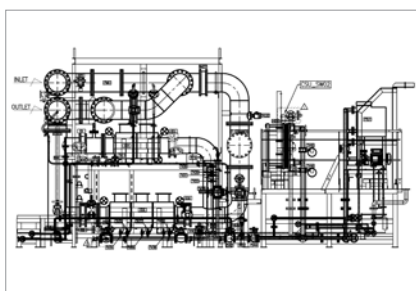


Installation

Specification

Division	Specification	Division	Specification
Ship type	170K LNG	Model	ECS 2600B X 2sets
Class	DNV	Installation location	E/R
Capacity	5200m³/h X 1set	Date	2013

Case 03 [New building : On-deck room]



Drawing



On-deck room (Port side)

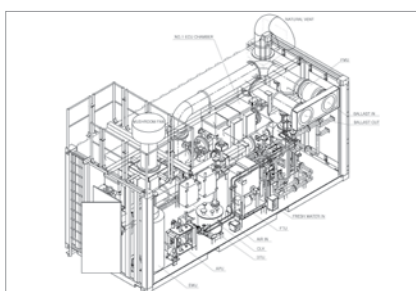


Before delivery

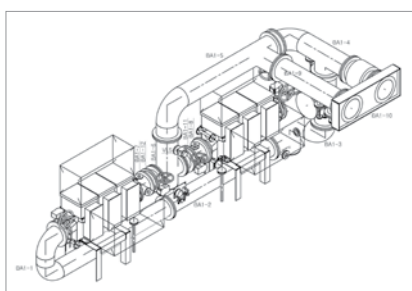
Specification

Division	Specification	Division	Specification
Ship type	37K PC Tanker	Model	Ex-ECS 750B X 2sets
Class	KR	Installation location	On-deck
Capacity	750m³/h X 2sets	Date	2014

Case 04 [New building & Retrofit : Container SKID]



ISO view



Ballast line ISO view

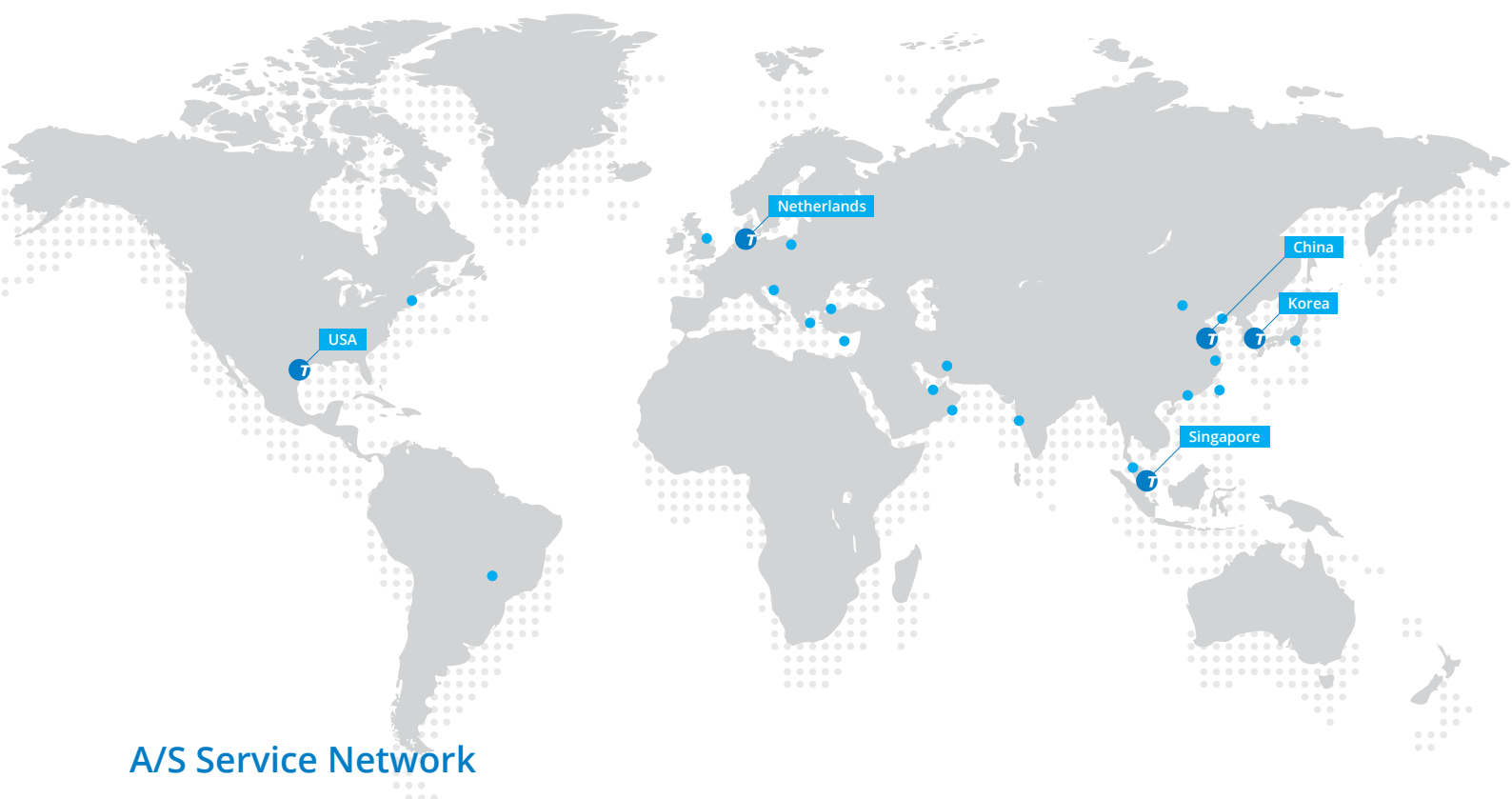
Specification

Division	Specification
Ship type	Tanker
Container size	20ft
Model	Ex-ECS 900B X 1set
Installation location	On-deck

*New installation solution for Tanker

GLOBAL NETWORK

Techcross' service agents all over the world



A/S Service Network

	Country	Company	Address
	Head Office	 TECHCROSS	433 Noksansaneopbuk-ro, Gangseo-gu, Busan, Korea
Asia	Korea	Lastech	433 Noksansaneopbuk-ro, Gangseo-gu, Busan, Korea
		Olive Shipping Co., Ltd.	253-11, Gamcheonhang-Ro, Saha-Gu, Busan, Korea
	Singapore	Jason Electronics	194, Pandan Loop#06-05, Pantech Business hub, Singapore
	China	 Winkong Marine Engineering Co., Ltd	Floor 17, Zhongxin Building, No.263, Liaoning Road, Qingdao, China
	Japan	Dowa Line Co., Ltd.	2-37-5, Nishishinbashi, Minatoku, Tokyo, 105-0003, Japan
		Uzushio Electric Co., Ltd.	105 Noma, Imabari City, Ehime Pref. 794-8582, Japan
	Taiwan	Reson Electronics Int'l Inc	12F, No.1-26, Kuoh-Jiann Road, Chien-Chen Dist., Kaohsiung, Taiwan
	India	Norinco	301, Orbit Plaza, New Prabhadevi Marg Prabhadevi, Mumbai - 400025, India
	UAE	DINTEC	No. 201, Tameem House Building, TECOM C, PO Box 34064, Dubai, UAE
Europe	Turkey	Amat Engineering	Guzelyali Mah. Bagdat Cad No : 54 Kat : 1 34903 Pendik, Istanbul, Turkey
	Netherlands	Wetering Trade & Services B.V.	Bunschotenweg 134 3089 KC Rotterdam The Netherlands
	Germany	Maresystems GmbH	Kupferhammer 7, 22399 Hamburg, Germany
Americas	USA	 Far-East Marine Service	8833 Knight Road, Houston, Texas 77054 USA

Sales Network

Country		Company	Address
Head Office		 TECHCROSS	433 Noksansaneopbuk-ro, Gangseo-gu, Busan, Korea
Asia	China	Dalian Ftz Zhongyi Int'l Industry&Trade Co., Ltd.	No. 16 Zhu Qing St. DaLian China PC : 116001
		Hipson Marine Limited. Guangzhou Office	Room 2702, No.699-13 Dongfeng Road East, Guangzhou, 510080, China
		For Win Equipment&Engineering Co., Ltd.	Room205, House Hao Bai C2 Block Building, No.50, Xisanhuanbeilu, Beijing, 100044 China
		Whale Marine Limited	Room 1903, No11, Lane 803, Shuangcheng Road, Baoshan district, Shanghai, China
		HuaHai Equipment&Engineering Co. Ltd.	Room 4B-4C., Yindong B/D, No.58 New Jin Qiao Road, Pudong New District, Shanghai, China
		 Winkong Marine Engineering Co., Ltd	Floor 17, Zhongxin Building, No.263, Liaoning Road, Qingdao, China
	Japan	MMSL Japan, Ltd	4-2, Ohtemachi 1-chome, Chiyoda-ku, Tokyo 100-8088, Japan
		Chart Shipping Co., Ltd.	6F Shimbashi Daiichi BLDG., 6-9-2, Shimbashi, Minato-ku, Tokyo 105-0004, Japan
	Taiwan	Soonex	10F, No.57, Sect.2, Tun Hwa South Road, Taipei 106, Taiwan, R.O.C
	Malaysia	MOGbiss Sdn. Bhd	No. 6-1 First Floor, Jalan Kemuning Prima E33/E, Seksyen 33, 40400 Shah Alam, Selangor, Malaysia
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	India	Norinco	301, Orbit Plaza, New Prabhadevi Marg Prabhadevi, Mumbai - 400025, India
	UAE	System Dynamics	FZE P.O. Bo 51288 HFZA. Sharjah, UAE
	Oman	Deyyar International LLC	PO Box 1815, Post Code 133, Al Khuwair, Sultanate of Oman
Europe	Greece	Pera Marine Ltd.	5, Akti Miaouli Str. Piraeus 185 35 Greece
		MIE	Kanari 1, GR-185 37, Piraeus, Greece
	UK	J & G Associates Ltd.	93 Passingham Avenue, Billericay, Essex, CM112 TB, UK
	Poland	Vegamar Ltd (Marine Technical Services Ltd : MTS)	Lubieszynska 5, 72-006 Mierzyn, Poland (Plac Batorego 4 70-207 Szczecin Poland)
	Netherlands	 Techcross Europe Office	Vasteland 78 3011 BN Rotterdam, Netherlands
		Wetering Trade & Service B.V.	Bunschotenweg 134 3089 KC Rotterdam The Netherlands
	Croatia	BEL Marine d.o.o	Crcniceva 7, Rijeka Croatia
	Cyprus	DMS Deck & Machinery Ltd.	3 Thalias Street 4011 Limassol
	Turkey	Amat Engineering	Guzelyali Mah. Bagdat Cad No : 54 Kat : 1 34903 Pendik, Istanbul, Turkey
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	Italy	Mistral Suisse Sagl	Via Cantonale 11, 6900 Lugano, Switzerland
	Americas	USA	MJLF International
Brazil		Gehr International	Av. Rio Branco, 123-conj 1508/1511, Cetro Rio De Janeiro- RJ

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