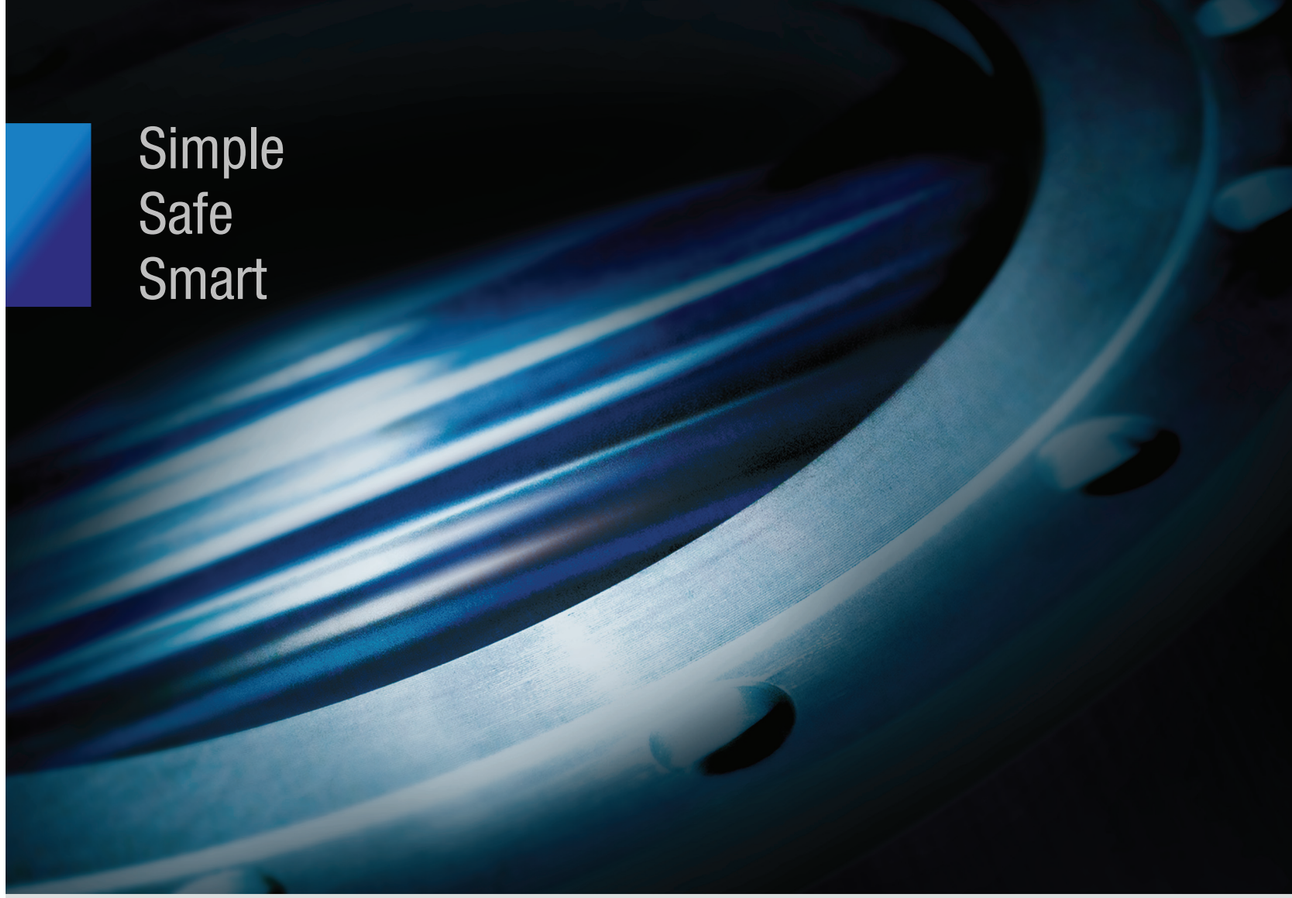

BALLAST WATER TREATMENT SYSTEM

GloEn-Patrol™

ENGLISH

PANASIA

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PANASIA CO.,LTD.

Global Leader in Smart & Green Technology

- Since 1989

Established Date

Oct. 10th, 1989

Product List

- Ballast water treatment system
- Fuel Gas Supply System
- DeNOx SCR system
- SOx Scrubber system
- Cargo monitoring system
- Tank level gauging system
- Sensors (Pressure, Temperature)

Achievement in PANASIA

2015. Jan. — IR 52 Jang Young Sil award * (11week's) - MEGA UV

* The award given weekly in the name of the Minister of Science and Technology is so widely recognized to be one of the highest for innovation in Korea that even the general public can approve the value of the award.

2015. Jan. — Grand prize of technical commercialization from Research & development special zone

2014. Jun. — World Class 300

2013. Dec. — Gold tower order of industrial service merit at 2013 Korea Technology

2012. Dec. — Korean world-class Product

2011. Aug. — IR 52 Jang Young Sil award * (32week's)

* The award given weekly in the name of the Minister of Science and Technology is so widely recognized to be one of the highest for innovation in Korea that even the general public can approve the value of the award.

2010. Dec. — Bronze award at 2010 Korea Technology Awards

GloEn-Patrol™

Ballast Water Treatment System

- Filtration & UV Irradiation

▲ Test barge

With experiences specializing in shipbuilding industries and skilled people understanding the characteristics of shipping industries, PANASIA came up and provided the **easiest, safest, and simplest solution for ballast water treatment system** based on effective filtration and UV irradiation since 2010 when acquired its type approvals. This technology has been proved and widely used to disinfect the harmful organisms in the ballast water without producing any toxic substance.

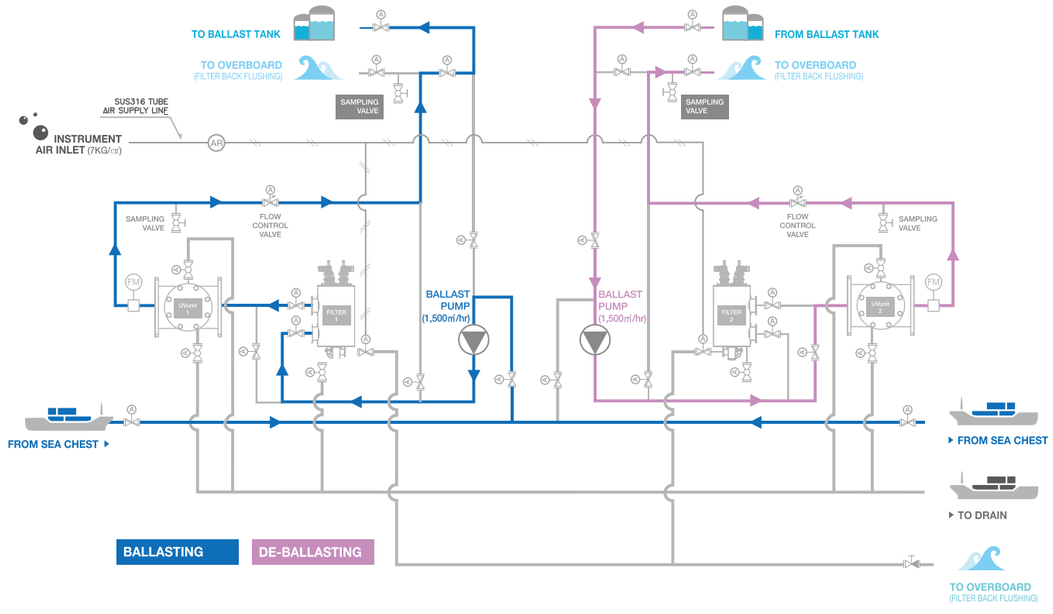
This simple configuration of GloEn-Patrol™ is combined the filtration unit with 50㎛ filter element which provides the most effective and efficient back flushing function than any other conventional filters can do and medium pressured UV lamps which give customers assurance to last long life to treat and disinfect the ballast water in ballasting and de-ballasting stage. In addition, this uniquely engineered and designed filter and UV lamp are manufactured by PANASIA's own technologies to provide the upmost quality, reasonable price and on time delivery to the customers.

The system flow has four types. In order to acquire an appropriate dose of UV lamps, system uses warming up mode in which sea water passes filter & UV but not flow into ballast tank. When system sets up, ballasting mode starts. In the mode, the ballast water from sea chest enters through the inlet pipe into the filter and flows through the cylindrical filter element from inside out. Organisms larger than 50㎛ are eliminated and those smaller than 50㎛ will pass into UV unit for disinfection. During filtration, sediments are accumulated on the surface of filter element and it is flushed out to overboard by the back-flushing function without any disturbance on filter operation. During de-ballasting mode, the ballast water from the ballast tanks passes through the UV unit to prevent reproduction of organisms and flows out to overboard. During Bypass mode, the ballast water skips filter and UV unit and simply flows out to overboard.

FEATURES

- Effective disinfection of harmful aquatic organism
- Component concept for stabilized capacity expansion
- Less power consumption
- Low maintenance cost
- Simple operating system
- Automatic back flushing in the filtration unit
- Automatic Wiper cleaning in the UV unit
- Easy installation - skid / vertical, horizontal arrangement, separate components
- Irrespective of water condition such as water salinity, temperature
- No requirement of dosing liquid or powder chemicals for disinfection
- Not producing active substance

FLOW DIAGRAM (GloEn-P1500)



GloEn-Patrol™

Simple, Safe and Smart

PRODUCT LINE UP

	GloEn-Patrol™ G Ⅰ	GloEn-Patrol™ G Ⅱ	GloEn-Patrol™ G Ⅲ
			
Component	Original Filter Unit Original UV Unit	MEGA Filter Unit Original UV Unit	MEGA Filter Unit MEGA UV Unit
Treatment Capacity	50 ~ 750㎥/h	800 ~ 3,000㎥/h	800 ~ 3,000㎥/h
Feature	Small capacity in single unit	Less footprint & Power consumption in large capacity	Large capacity in single unit with high efficiency

CERTIFICATES

IECEx Type Approved Jan. 2015

DNV Type Approved Sep. 2014

CCS Type Approved Mar. 2014

JG Type Approved Mar. 2014

BV Type Approved May 2013

USCG AMS Approved Apr. 2013

ABS Type Approved Mar. 2013

LR Type Approved Aug. 2012

RINA Type Approved Aug. 2012

CR Type Approved Sep. 2011

RMRS Type Approved Sep. 2011

Netherlands Flag Approved Aug. 2010

EX-PROOF Type DNV ATEX Approved Jun. 2010

G8 IMO Approved Mar. 2010

G9 IMO Approved Mar. 2010

INSTALLATION COMPARISON BETWEEN GI AND GIII MODEL

Treatment capacity
3,000㎥/hr

Improved
In space & Power Consumption

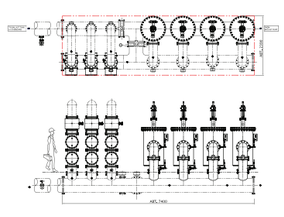
Treatment capacity 3,000㎥/hr

High Efficiency _ **40%** *of power consumption is reduced.*

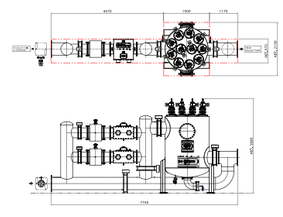
Model	Treatment Capacity	Power Consumption			Reduced by
		GloEn-Patrol™ Ⅰ	GloEn-Patrol™ Ⅲ		
			Min.	Max.	
P1000	1,000㎥/hr	120kW	56kW	77kW	36%
P1200	1,200㎥/hr	160kW	65kW	90kW	44%
P1500	1,500㎥/hr	174kW	80kW	110kW	37%
P2000	2,000㎥/hr	240kW	113kW	155kW	35%
P2500	2,500㎥/hr	320kW	131kW	180kW	44%
P3000	3,000㎥/hr	360kW	164kW	225kW	38%

Power Consumption
40%

Minimized Footprint _ **44.5%** *of installation area is reduced.*



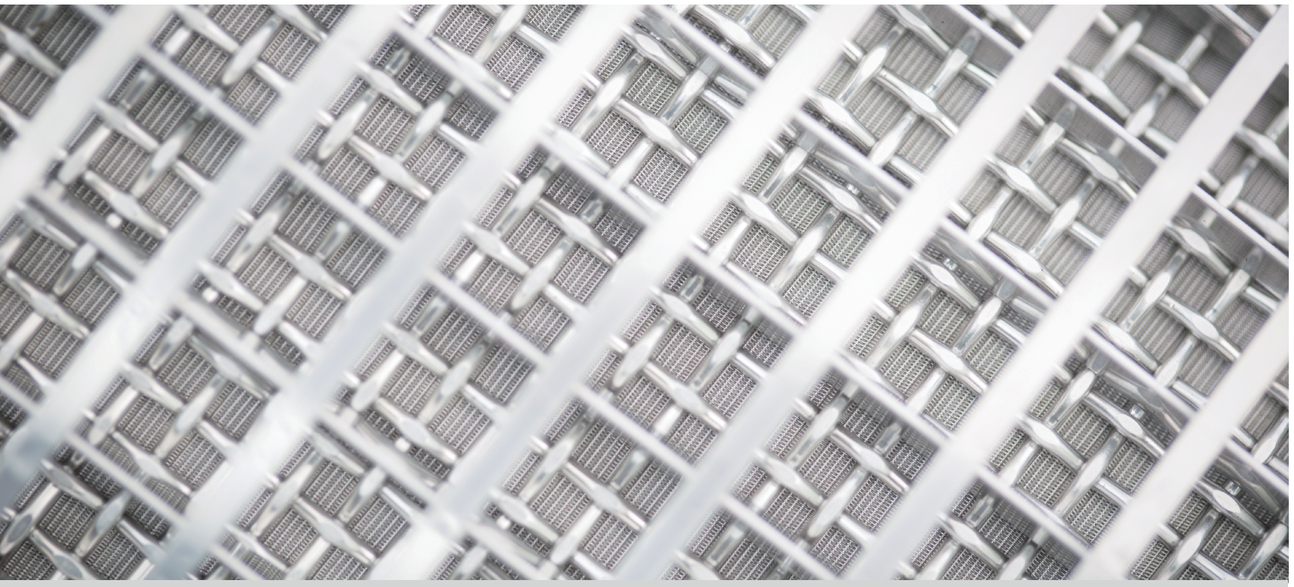
GloEn-Patrol™ GⅠ
2.39m X 7.4m = **17.7m²**



GloEn-Patrol™ GⅢ
2.19m X 1.9m +0.97(1.17+4.67) = **9.83m²**

Minimized Footprint
44.5%

Simple Configuration
Filter Unit



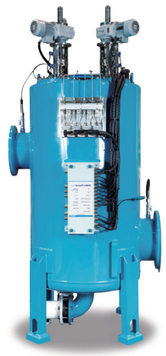
SCREEN TYPE FILTER

The ballast water enters into the filter and flows through the cylindrical filter element from inside out. The filtration cake accumulating on the filter element surface causes pressure difference to develop across the filter element. The back-flushing begins when the pre-set pressure difference between inlet and outlet on the filter is reached or pre-determined lapse of time is met. During the back-flushing cycle, the filtering is not interrupted and continues to flow downstream of the filter in the normal manner.

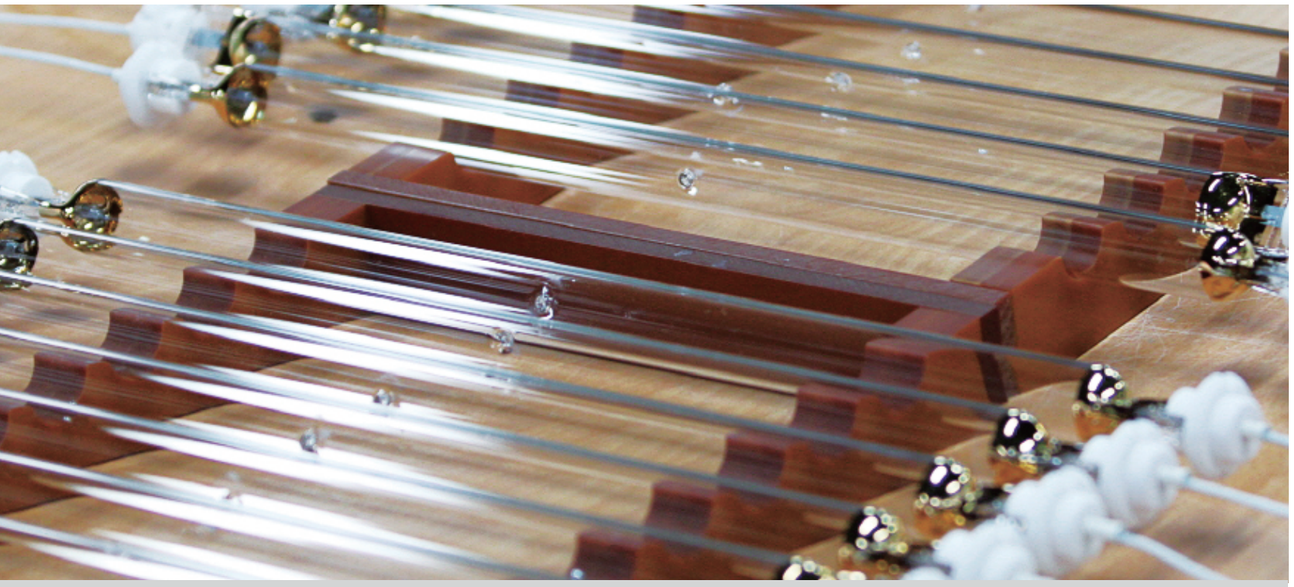
Regardless of this outstanding technology, Original Filter has met challenges when pump capacity gets bigger, the number of filter units increase simultaneously, requiring more footprint reluctantly. As a solution to this concern, we've developed MEGA Filter Unit to appropriately apply for bigger capacity(from 900㎥/hr up to 3,000㎥/hr), providing multi-cylindrical filter elements to maximize the performance for the filter unit with less footprint(approx. 44.5%) compared to Original Filter.

COMPONENT LINE-UP

	Model	Treatment Capacity
Original Filter Unit	PF 250	250㎥/h
	PF 500	500㎥/h
	PF 750	750㎥/h
MEGA Filter Unit	PF 900	900㎥/h
	PF 1200	1,200㎥/h
	PF 1500	1,500㎥/h
	PF 2000	2,000㎥/h
	PF 2500	2,500㎥/h
	PF 3000	3,000㎥/h

Original Filter Unit		MEGA Filter Unit	
			
Type	Single screen type	Type	Multi cage screen type
Capacity	250 ~ 750㎥/hr	Capacity	900 ~ 3,000㎥/hr
Max.Operating Pressure	10 bar	Max.Operating Pressure	10 bar
Grade of filtration	50㎛	Grade of filtration	50㎛
Filter Element Material	SUS 316L / Hastelloy	Filter Element Material	SUS 316L / Hastelloy
Backflushing control	Differential Pressure-dependent	Backflushing control	Differential Pressure-dependent

Simple Configuration
UV Unit

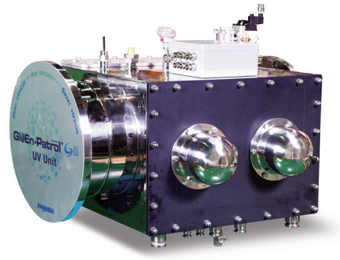


For the BWTS based on the filtration and UV technology, the other important part for an assurance of its operation is to guarantee the performance of UV lamps. GloEn-Patrol™ uses the UV lamps which are especially engineered, designed and manufactured by PANASIA in ballast water disinfection purpose. The intensity of UV lamp is automatically adjusted by three levels according to flow rate, and transmittance to assure stable UV lamp performance. GloEn-Patrol™ uses medium pressure UV lamps that output a variety of wavelength and enables to treat more various micro-organisms compared to any other UV lamps. To maintain the cleaned quartz sleeve condition, automatic wiping function is adopted that cleans the quartz sleeve by wiper's back and forth movement. Although this excellent performance is guaranteed, there's no harmful and toxic chemicals neither required nor produced for running our system. Basically it is 100% safe treatment method.

With the attitude of listening customer's thoughtful comments, we have developed, a brand new MEGA UV Unit, treating even bigger capacity with less footprint by reducing the power consumption of approx. 40% compared with Original UV unit so that GloEn-Patrol™ can be confidently supplied for bigger vessels.

COMPONENT LINE-UP

	Model	Treatment Capacity
Original UV Unit	PU 250	150㎥/hr
		250㎥/hr
		350㎥/hr
	PU 500	500㎥/h
		700 ㎥/hr
MEGA UV Unit	PU 1000	1,000㎥/h
	PU 1250	1,250㎥/h
	PU 1500	1,500㎥/h

Original UV Unit		MEGA UV Unit	
			
Capacity	150 ~ 700㎥/hr	Capacity	1,000 ~ 1,500㎥/hr
Max.Operating Pressure	10 bar	Max.Operating Pressure	10 bar
Automatic cleaning wiper		Automatic cleaning wiper	
Explosion Proof Type (option)		Explosion Proof Type (option)	

Simple Configuration
Panels

CONTROL PANEL

The monitor & control panel is PLC based and configured to activate and deactivate UV lamps via UV power supply panels in order to maintain the sufficient UV dose while conserving power.
The monitor & control panel offers a real time monitoring of the status of system operation while logging the data required by the convention at the same time.

- Smart HMI system
- Data logging for 24 months
- Main data real time display
  (Position, Pressure, Flow, Temperature, etc)
- Alarm function (Interface with AMS or Load master)
- Controller: Siemens PLC
- Touch screen
- Operation Temperature: 0 ~ 55℃

UV POWER SUPPLY PANEL

The major function of Power Supply Panel is to operate the medium pressure UV lamps UV. It controls the strength of UV lamps with the capacitors mounted in the Panel. Also it detects whether the UV lamps are functioning properly or not. The temperature sensor is mounted inside to monitor temperature in order to give an alarm to an operator and shut down the system in case of overheating.

- Operation Temperature: 0 ~ 55℃
- Prevent high heat dissipation

GloEn PSR

Pit Stop Retrofit Service

USCG's final ballast water regulation already came into force back in June 2012, along with IMO's BWM Convention to be enforced sooner, will impose ship owners to install a reliable Ballast Water Treatment System for their vessels with given implementation schedule.

PSRS(pit stop retrofit service) is to provide ship owners with exact, prompt and competitive retrofit service in order to save time and cost. Based on well-proven technology, we also offer ship owners complete retrofit solutions such as project consulting, equipment, engineering, installation as well as supervision and commissioning.

Total Solution for Retrofit

FEATURES

- Comprehensive turn-key proposal
- Highly experienced Engineer with qualified technical skills
- Time, cost saving
- On board Survey & 3D laser scanning for the accurate work
- Certification and Class

SERVICE SCOPE

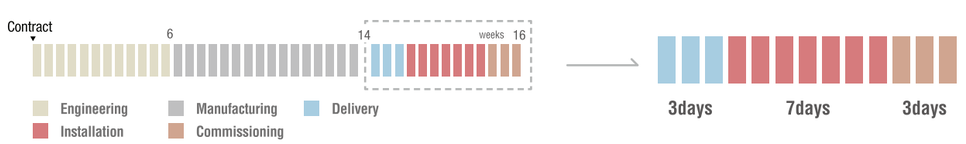
CASE Ⅰ	BWTS Equipment only			
CASE Ⅱ	BWTS Equipment	Engineering		
CASE Ⅲ	BWTS Equipment	Engineering	Supply Installation Materials	
CASE Ⅳ	BWTS Equipment	Engineering	Supply Installation Materials	Installation Work

RETROFITTING SCHEDULE

In Drydock or Quay *Asian Naga Project* 7 Days



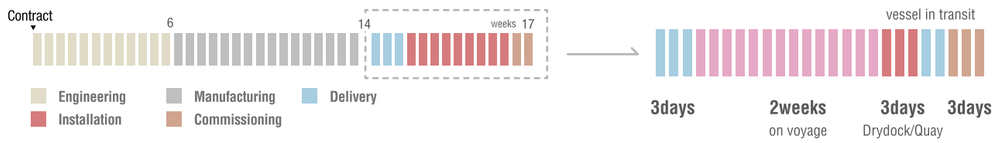
Ship's Type	10K Bulk Carrier
Capacity	150㎥/hr
Model	GloEn-Patrol™ 150 x 1 set
Installation Location	Engine room
Retrofit method	Drydock(Sanwa Dock Japan)



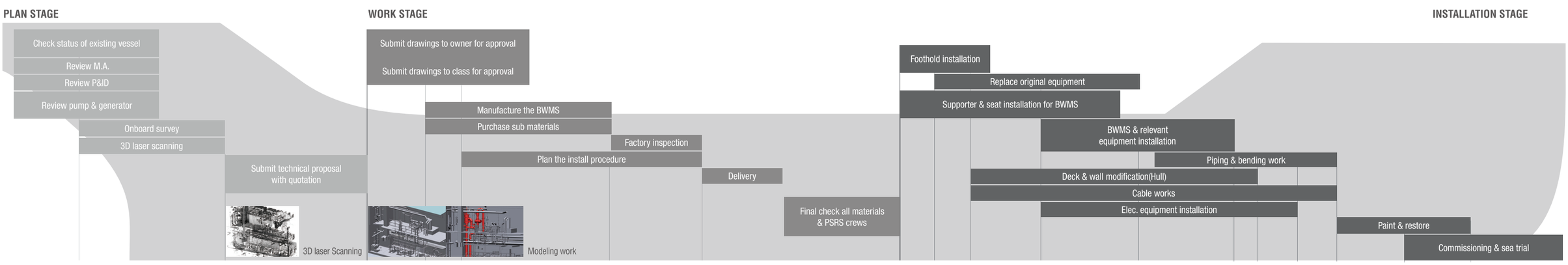
On Voyage *MV Floriana Project* 2 Weeks



Ship's Type	34K Bulk Carrier
Capacity	700㎥/hr
Model	GloEn-Patrol™ 700 x 1 set
Installation Location	Engine room
Retrofit method	On Voyage(Europe)



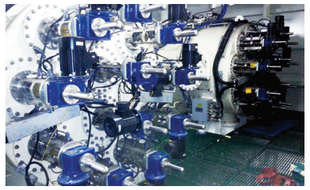
WORKING PLAN



Installation

GloEn-Patrol™ is the answer to all your requirements.

TANKER



Ship's Type	320K VLCC	Installation Location	Pump Room
Shipyard	Korea	Class	NK
Shipowner	Kuwait	Explosion Proof Type	
Capacity	3,000 X 2 / 500 X 1		

Ship's Type	50.3K PC	Installation Location	On Deck
Shipyard	Korea	Class	DNV
Shipowner	Italy	Explosion Proof Type	
Capacity	750 X 2 / 300 X 1		

LNG

Ship's Type	170K CBM LNG	Installation Location	Engine Room
Shipyard	Korea	Class	LR / RSMS
Shipowner	Russia		
Capacity	3,000 X 2		

LPG

Ship's Type	38K LPG	Installation Location	Engine Room
Shipyard	Korea	Class	ABS
Shipowner	Turkey		
Capacity	500 X 2		

BULK CARRIER

Ship's Type	82K Bulk Carrier	Installation Location	Engine Room
Shipyard	Korea	Class	LR
Shipowner	Greece		
Capacity	1,500 X 2		

Ship's Type	75K Bulk Carrier	Installation Location	Engine Room
Shipyard	Korea	Class	ABS
Shipowner	Russia		
Capacity	1,200 X 2		

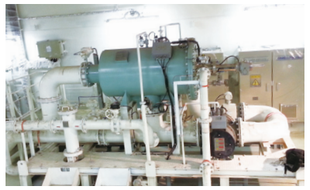
Ship's Type	93K Bulk Carrier	Installation Location	Engine Room
Shipyard	Taiwan	Class	BV / CR
Shipowner	Taiwan		
Capacity	1,000 X 2		

Ship's Type	37K Bulk Carrier	Installation Location	Engine Room
Shipyard	Japan	Class	NK
Shipowner	Japan		
Capacity	700 X 2		

Installation

GloEn-Patrol™ is the answer to all your requirements.

CONTAINER



Ship's Type	14,500 TEU Container	Installation Location	Engine Room
Shipyard	Korea	Class	DNV
Shipowner	U.A.E		
Capacity	1,000 X 2		

Ship's Type	9,400 TEU Container	Installation Location	Engine Room
Shipyard	China	Class	GL
Shipowner	Switzerland		
Capacity	1,000 X 1		

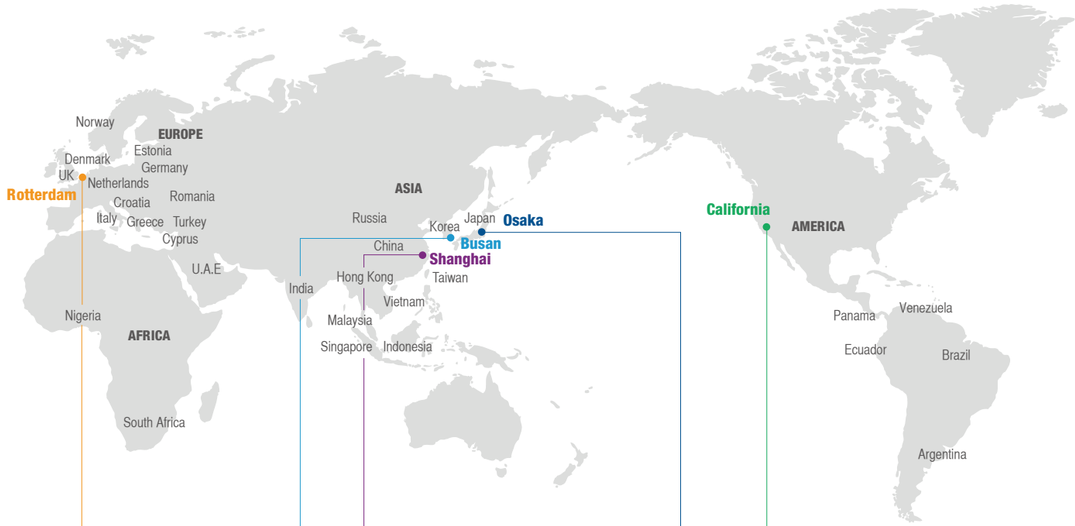
GENERAL CARGO SHIP

Ship's Type	16.5K General Cargo	Installation Location	Engine Room
Shipyard	Japan	Class	NK
Shipowner	Ireland		
Capacity	500 X 2		

Ship's Type	11K General Cargo	Installation Location	Engine Room
Shipyard	Japan	Class	NK
Shipowner	Japan		
Capacity	700 X 2		

Worldwide Service Network

Effective Follow-up Service, Prompt Action for Spare Parts.



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