MRO Service

PANASIA

PANASIA's Maintenance,
Repair and Operations
Service

PANASIA

HEAD OFFICE&FACTORY	55, Mieumsandan3-ro, Gangseo-gu, Busan, 46744, Korea TEL: +82-51-831-1010 FAX: +82-51-831-1399 www.worldpanasia.com E-mail: marketing@worldpanasia.com
CHINA CORPORATION	RM C-205, No.2080-50, Lianhua Rd, Shanghai, China / Post Code: 201103 TEL: +86-21-6235-1601~3 E-mail: china@worldpanasia.com
JAPAN CORPORATION	No.600, Osaka Ekimae Dai.3 Building 6F, 1-1-3, Umeda, Kita-ku, Osaka, Japan / Post Code: 530-0001 TEL: +81-6-4795-8748 E-mail: japan@worldpanasia.com
EUROPE B.V.	Rivium 3e Straat 25a, 2909 LH Capelle aan den IJssel, Netherlands TEL: +31-10-79-53-005 E-mail: europe@worldpanasia.com
PANASIA EM	98, Mieumkukjae 3ro, Gangseo, Busan, 46747, Korea TEL: +82-70-4860-8075 FAX: +82-70-4860-7984 E-mail: sh.han@worldpanasiaem.com

31st May. 2024

ENG

WATER SOLUTIONS

Ballast Water Treatment System (UV type)	Measurement Control System	WTS for Exhaust Gas System (Chemical / Membrane)

AIR SOLUTIONS

De-SOx System (Scrubber)	De-NOx System (SCR)	Engine Exhaust Recycling System (iCER)

ENERGY SOLUTIONS

Hydrogen Generation System	Carbon Capture and storage System(CCS/OCCS)	Fuel Supply System (LNG/Ammonia/Methanol)	Alternative Maritime Power System

Panasia Group

We are heading to the future with eco-friendly solutions

PANASIA Headquarter & 1st Factory	PANASIA 2nd Factory	PANASIA 3rd Factory
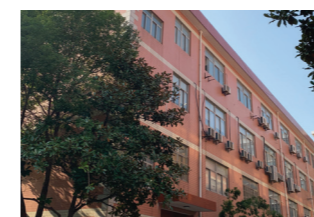
PANASIA CHINA Corp.	PANASIA JAPAN Corp.	PANASIA EUROPE B.V.	PANASIA EM
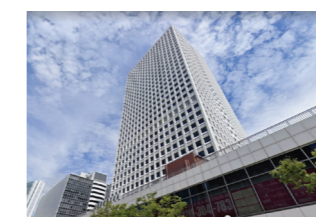
Regulation Status

BWTS Regulation

2013 VGP

2.2.3.5.1.1.3 Ballast Water monitoring equipment calibration

Most ballast water treatment systems have control and self diagnostic equipment such as sensors that continuously measure treatment parameters to verify performance. The metrics to be monitored are based on common approaches used in ballast water treatment systems. As new approaches become commonly available, EPA will develop new monitoring parameters as appropriate.
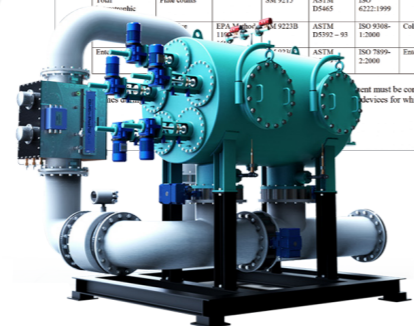
At a minimum, all applicable sensors and other equipment must be calibrated annually. Additionally, all applicable sensors and other control equipment must be calibrated no less frequently than recommended by the sensor or other equipment manufacturer, or by the ballast water treatment system manufacturer or when warranted based on device drift from a standard or calibrated setting.

GloEn-Patrol™ Instruction Manual

Technology	Measurement	Monitoring Sensor or Equipment	Data Recording	Calibration	Service on-board	Time interval	Option
	Flow rate	Flow meter	"Flow rate" on graphic panel	Required	N/A	1 year	Third parties
Filtration	Pressure differential	Pressure transmitter	"Inlet and differential pressure" on graphic panel	Required	Available	1 year	Pressure calibrator
	Back-flushing frequency	Motor and limit switch	Operating Log message: #OO Filter cycle finished	N/A	-	-	-
	Power consumption, voltage and current	A tester (multi meter) and clamp meter (not included in GloEn-Patrol)	UV power monitoring method	N/A	-	-	-
	Lamp status and age	N/A	"UV lamp on time" on system status screen of graphic panel	N/A	-	-	-
UV unit	UV Intensity	UV intensity sensor	Manual logging (Calculation Required)	Required	Available	1 year	Intensity calibrator
	Transmittance	Portable meter (UV Transmittance)	Manual logging	N/A	Available	-	Portable UV transmittance meter
	Flow rate	Flow meter	"Flow rate" on graphic panel	Required	N/A	1 year	Third parties
	Temperature	Temperature transmitter	N/A	Required	Available	1 year	Temperature calibrator

NOTE: According to the VGP 2013 regulations, calibration should be conducted once a year. So if compliance with VGP 2013 regulations is not required, there is no need to do calibration once a year.

SCRUBBER Regulation

MEPC. 340(77)

8. Onboard Monitoring Manual (OMM)

8.1 An OMM should be prepared to cover each EGCS installed in conjunction with a fuel oil combustion unit, which should be identified, for which compliance is to be demonstrated.

8.2 The OMM should, as a minimum, include:

…

> **5. the zero and span check procedures of the exhaust gas analysers and calibration of washwater, discharge water and inlet water analysers together with reference materials to be used and the required frequency of those checks;**

10.2 Discharge water monitoring

10.2.2 The permissible deviations of the discharge water monitoring equipment should not exceed the following:

pH	0.2 pH units
PAH	5% of nominal standard test concentration used. That nominal concentration value should be not less than 80% of the scale range used.
Turbidity	2 FNU or NTU

Calibration intervals should be such that the above performance requirements are met. Calibration and calibration checks should be done according to the manufacturer's specification.
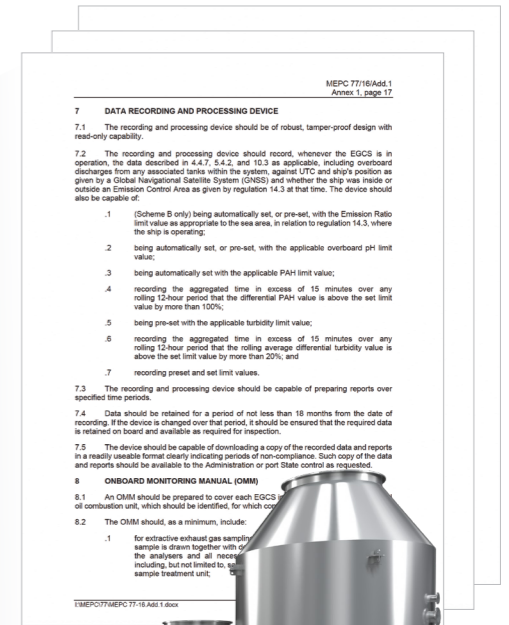
PaSOx™ smart Onboard Monitoring Manual

3.3 Maintenance

Description	Weekly	Monthly	Yearly	Every 2years	Remark
Visual Check for sensors	●				
Check the flow rate	●				
Sensor Cleaning		●			
Calibration of PH sensor		● (3Months)			*Replacement Six-Monthly
Calibration of PAH sensor				●	Replacement Ten-yearly
Calibration of Turbidity sensor				●	Replacement Five-yearly
Air purging cleaning					When required
Cleanig of Deaerator			●		When required

*pH sensors can be used once calibration with buffer solutions (pH 4 and 7) is complete.

PANASIA MRO Service
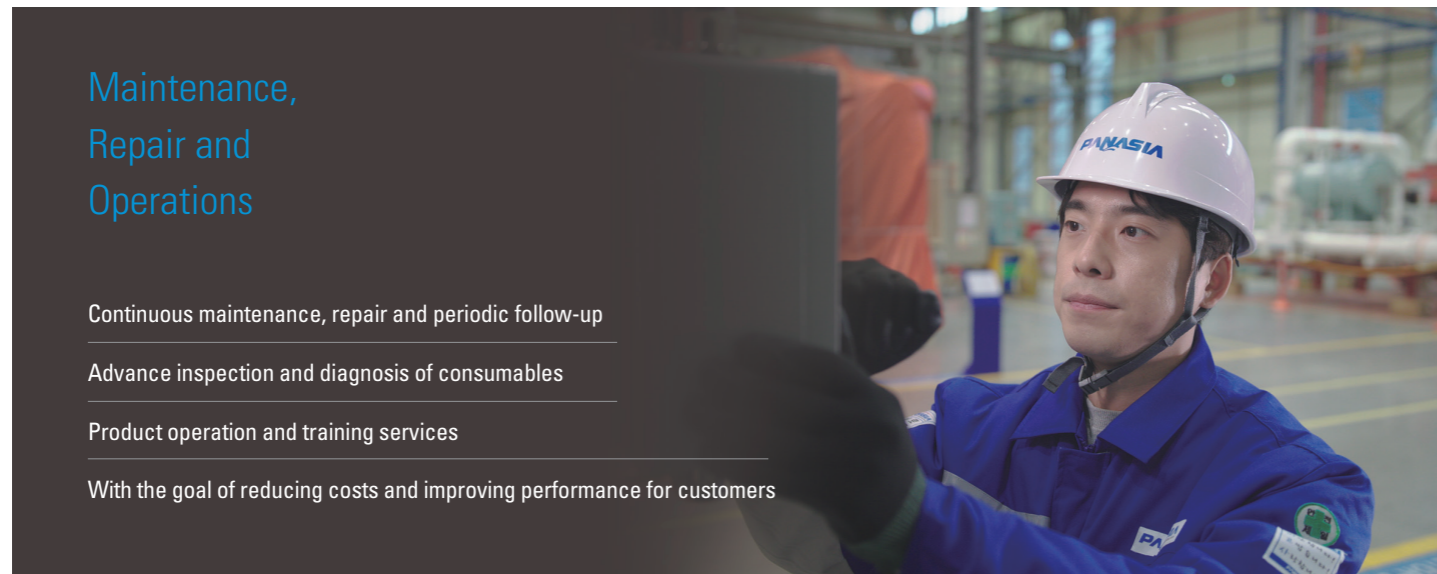
Maintenance, Repair and Operations

Continuous maintenance, repair and periodic follow-up

Advance inspection and diagnosis of consumables

Product operation and training services

With the goal of reducing costs and improving performance for customers

Key Benefits

| Easy & convenient management | Cost savings of preventive care | Safe navigation | Risk management with skilled experts |

At PANASIA, we provide a smart service solution that allows us to treat customer satisfaction as a top priority, instead of just selling products. We offer unique services aimed at increasing customer convenience, from the MRO service for the maintenance, repair and efficient operations of products to our retrofit service using our advanced technology.

Service Areas

Global Network

47 Global Service Networks in
37 Countries

No matter where you or your ship are located, our team can efficiently and effectively meet your needs.
Through our worldwide MRO network, you get responsive local customer support, a global network of service for repair facilities and innovative online management solutions.

MRO Service Feature Matrix

Choose a package to fit your needs.

Category	Basic	Plus	Premium
Sensor Calibration	●	●	●
Condition Audit	●	●	●
Service Kits	●	●	●
Onboard Training	●	●	●
Software for Crew Training	●	●	●
Service Report	●	●	●
Pan-MSCS™ - Vessel Monitoring - Product Diagnostics - Spare part - PSC Response	●	●	●
Added Maintenance Task[1]		●	●
Pan-Hawk™ Remote Trouble Shooting System[2]			●

1) Added Maintenance Task
Detailed maintenance task list for each product (Scrubber, BWTS) can be found on the Page 16-17.

2) Remote Trouble Shooting System
Detailed information can be found on the Page 18-19.

Note

Extra maintenance job
If any defects or malfunctions are found during inspection, PANASIA will provide a detailed report and action plan.

Periodic consumable item list
PANASIA will provide long-term consumable spare list.
(2yearly ~ 10 yearly : GMS / FLOW METER / VFD / WMS / EHS ACTUATOR / ETC)

MRO Basic

This is the basic service provided when using Panasia's MRO service.
Through PANASIA's MRO service, our engineers visit your ships periodically to perform checkups on the delivered products and proactively diagnose any potential issues in need of further inspection. Also, following the inspection, prepare for a report that contains any information and solutions you may need to ensure efficiency in your operations.

Contract

1st Service Engineering
- Condition Audit
- Onboard Training
- Sensor Calibration
- Provide Service Kits
- CBT / IBT

1 year

2nd Service Engineering
- Condition Audit
- OnBoard Training

2 years

Sensor Calibration

The sensors installed on the ship need to be calibrated and replaced regularly **every 2 years**. PANASIA helps to implement the schedule by providing suitable calibration and replacement solution for the sensors so the operators can concentrate on the safe ship operation sorely.

PaSOx™ smart
- Water Monitoring System

GloEn-Patrol™
- UV Intensity sensor
- Pressure Transmitter
- Temperature Transmitter

Condition Audit

PANASIA helps the ship crew to continue operating in normal condition by grasping future problems in advance through preventive check-ups and condition inspection activities.

Service Kits PaSOx™ smart

Providing free service kits worths **USD 4,000**

Price: ~~USD 4,000~~ → 0

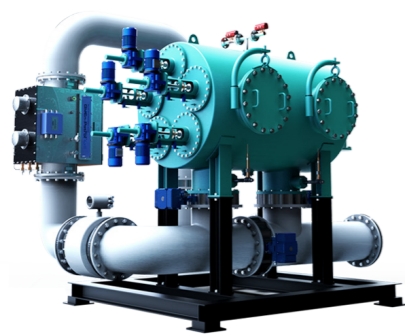### Service Kits List

RELAY + SOCKET FOR MCP	LIMIT SWITCH	LIMIT SWITCH	CONTROL MODULE (CM4)
VALVE FOR GMS SAMPLING PUMP	GMS SEPARATOR FILTER	GMS PRIMARY FILTER	DIAPHRAGM FOR GMS SAMPLING PUMP
WMS SAMPLING PUMP	CERAMIC FILTER	LEVEL3000 PRESSURE TRANSMITTER	LEVEL3000 PRESSURE TRANSMITTER

MRO Basic

Crew Training Programs

Contents

GloEn-Patrol™ Learning Program Contents

Chapter	Contents
1	Introduction of GloEn-Patrol™ system
2	Major system component
3	Standard operating procedures
4	Health and safety issue
5	Installation requirement
6	Maintenance requirement
7	Troubleshooting for Filter unit
8	Troubleshooting fot UV unit
9	Troubleshooting for other components

PaSOx™ smart Learning Program Contents

Chapter	Contents
1	Understanding PaSOx™ scrubber system
2	Standard operating procedures
3	Compliance issues
4	Installation requirement
5	Maintenance requirement
6	Troubleshooting for the system/unit
7	Troubleshooting for the component/device

Onboard Training

After regular crew changes, it takes a long time for the system operators to adapt to the various equipment installed on the ship. Therefore, PANASIA provides customized operation training for sailors and conducts detailed and professional training through direct action learning.

Software for Crew Training

PANASIA MRO Service offers free product training programs that can be accessed anytime, anywhere. Each of these program worths **USD 1,200** The training program is also beneficial in cases where an inspection of the crew's familiarity with safe equipment operation is required. PANASIA's training program service is available both online and offline. You can also watch videos and try running the product offline using a tablet PC or laptop. Our training program includes product descriptions, operating instructions, maintenance and troubleshooting, and other details to allow you to operate your product professionally.
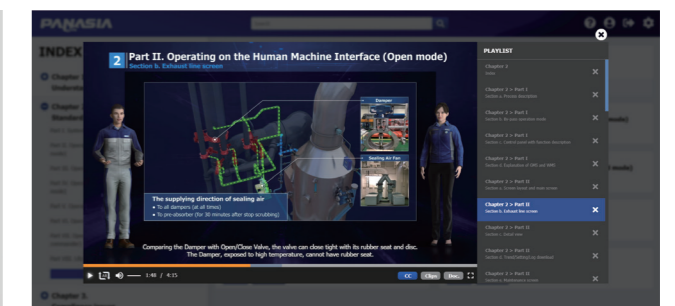

※ **Available for individual purchase**

CBT (Computer Based Training Program)

Price: ~~USD 1,200~~ → 0

IBT (Internet Based Training Program)

Price: ~~USD 1,200~~ → 0

MRO Basic

Crew Training Software Preview

Experience each training program and access the website by scanning the QR code as below to proceed with PANASIA's IBT program.

GloEn-Patrol™ System Training Program

After scanning the QR code and closing the login window that pops up, you can experience Part 1 of Chapter 1.

PaSOx™ System Training Program

After scanning the QR code and closing the login window that pops up, you can experience Part 1 of Chapter 1.

Training Certification

Get ready for your vessel inspection

Complete self-assessment questions evaluating your own learning progress and outcomes every chapter, you can receive PANASIA Type-specific training certification in IBT (Internet Based Training Program).

Certification of PANASIA IBT
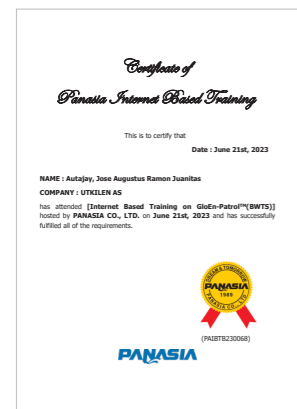
Training Program (CBT / IBT)

Equipment	Training Course	Price Policy		Account Validity	Remark
		Account order less than 10	Account order 10 or more		
SCRUBBER	CBT	$ 1,200	$ 1,000	1 year	Issue certificate per account
	IBT	$ 1,200	$ 1,000		
BWTS	CBT	$ 1,200	$ 1,000		
	IBT	$ 1,200	$ 1,000		

· CBT: Computer Based Training Program (generally for a vessel without internet connection)
· IBT: Internet Based Training Program (either for a vessel or office with internet connection)

Service Report

PANASIA provides 2 types of reports after the MRO work.
Summary report, Preventive check up list report, reviewed by PANASIA headquarter, will be provided within two weeks. This makes it easy to understand the operating status of the equipment at a glance. It becomes easy to follow-up management by reporting the necessary measures when diagnosing a fault.

Report Preview

Summary Report

Preventive Check up List Report

Contents

General Vessel Information

Compliance Monitoring(Gas, Water)

Alarm List

Outstanding Check Point

Spare

Comments

Contents

Gas Monitoring System

Water Monitoring System

Pump (Sea Water, Wash Water, Dosing Pump, Circulation, etc)

VFD

EHS Valve, Damper

Sealing Air Fan

Pressure, Temperature, Gas Pressure, Flowmeter

Inside of the Scrubber Unit including Gas / Water Piping Lines

MCP (Log Data & GPS Position Check)

Each Mode Operation

MRO Basic

MSCS

Pan-MSCS™

Pan-MSCS™ is a Marine Satellite Control System that manages PANASIA products, including BWTS and SOx scrubbers. It collects data via satellite and provides various maintenance services on the web based on the collected data. With tailored ICT services enabling real-time management of product status, it helps customers operate vessels more efficiently, leading the way in fostering a smart ship ecosystem. Providing MSCS service worths USD 2,500

Price: ~~USD 2,500~~ → 0

Pan-MSCS™
Smart Control Center

Benefits

Vessel Monitoring

Monitor connected product status and real-time data.

Product Diagnostics

Diagnose product status and provide instructions for your product

Spare Part

Receive notification of spare part changes based on big data analysis.

PSC Response

Access Portal State Control(PSC) reports from any location where the service is connected.

Satellite data usage (Expected)

Type	Min 5 min cycle)	Max (1 min cycle)
Scrubber (Open mode)	7MB	50MB
Scrubber (Close mode)	15MB	100MB
BWMS	3MB	20MB

- Event data (Alarm, operation) is collected every time and included in the figures in the table above.
- We can control satellite data usage by changing the RTU's data collection cycle.

Procedures for system building

Ship owner ⟶ Wired connection
PANASIA ⤏ Satellite communication

Step 2

Step 4

Satellite

Step 1

RTU

Step 3

Pan-MSCS™
Smart Control Center

Step 1	Step 2	Step 3	Step 4
Ship owner	**Ship owner**	**PANASIA**	**PANASIA**
- Connect the ship's satellite system to the main control panel (BWTS/EGCS) using a LAN cable - Specification of cable : STP Cat.5 or higher with RJ45 connector	Modify satellite configuration by satellite service provider	- Install the RTU near the BWTS, SCRUBBER system (133(W) x 125(D) x 40(H) (mm) / DC-24V / <10Watts) - Check satellite communications	Register a ship owner or vessel in Pan-MSCS™

Price (Unit : Dollar)

USD 2,500
Per a vessel

2 years

MRO Plus
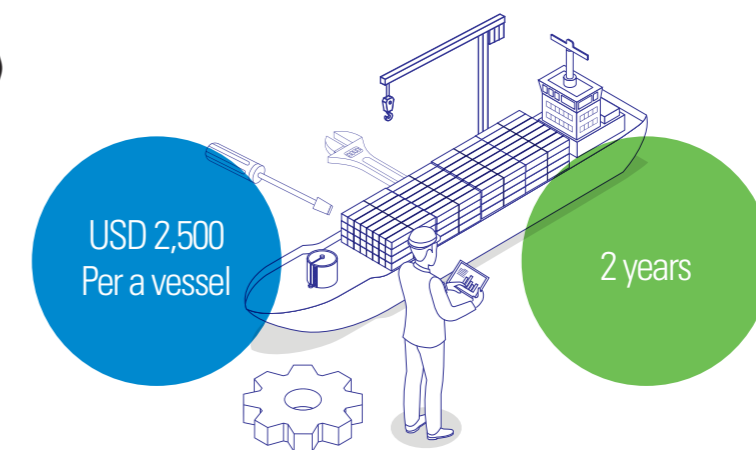
MRO Basic + **Added Maintenance Task**

- Inspection of Scrubber inside / Scrubber body (Outside of insulation) / Panel cable status
- Inspection of EHS actuator and function test / Level switch and function test / VFD and cleaning of main cooler, Heat SINC, Filters

Scrubber - Maintenance Task List By Period (In port)

Item	Category	Sub Category	3 month	6 month	9 month	12 month	Maintenance description
SCRUBBER Unit	Demister	Inspection	●	●			3 month : Check the bolt/nut for tightness 6 month : cleaning by dismantling
	Pre-absorber	Mesh guide	●				3 month : visual inspection(pin hole on welding point)
		N₃ nozzle	●	●			3 month : cleaning of filed soot scale 6 month : visual inpection(pin hole on welding point)
		PV-001 piping leakage	●	●			3 month : cleaning of filed soot scale 6 month : visual check(pin hole on welding point)
		Pin hole(welding point)		●			6 month : visual inspection(pin hole on welding point)
		Crack of material				●	12 month : visual inspection(pin hole on welding point)
	Absorber	Spray nozzle(blockage)		●			6 month : visual inspection(nozzle inside)
		Pin hole(welding point)		●			6 month : visual inspection(pin hole on welding point)
		Crack of material				●	12 month : visual inspection(pin hole on welding point)
Piping	GRE	Overboard line	●				3 month : visual inspection of damage and leakage
	Steal and SUS S.W supply line	Each piping	●				3 month : visual inspection of damage and leakage
Expansion Joint	Absorber	Top	●				3 month : visual inspection of damage and leakage
		Bottom	●				3 month : visual inspection of damage and leakage
Expansion Joint	Pre-absorber	Top	●				3 month : visual inspection of damage and leakage
Expansion Joint	Pre-absorber	Bottom	●				3 month : visual inspection of damage and leakage
Panel	MCP	Cable	●				3 month : inspection of insulation and connection status
		Cleaning panel inside		●			6 month : cleaning of dust and foreign material
		Temperature check	●				3 month : wisual inspection of heat damage
		Fan	●				3 month : cleaning and operation status
	RCP	Cable	●				3 month : inspection of insulation and connection status
		Cleaning panel inside		●			6 month : cleaning of dust and foreign material
		Temperature check	●				3 month : wisual inspection of heat damage
Panel	Sealing air fan starter A	Cable insulation	●				3 month : inspection of insulation and connection status
		EOCR test		●			6 month : parameter setting, function test
	Sealing air fan starter B	Cable insulation	●				3 month : inspection of insulation and connection status
		EOCR test		●			6 month : parameter setting, function test

Item	Category	Sub Category	3 month	6 month	9 month	12 month	Maintenance description
Panel	VFD	Periodic consumable Item management		●		●	6 month : heat sink cleaning, cooling channel cleaning 12 month : capacitor reform
		Parameter check	●				3 month : inspection of parameter settings
		Filter cleaning	●				3 month : inspection the filter condition and cleaning
		Cable	●				3 month : inspection the cable connection status all terminals
	Auto damper	Leakage and normal function test		●			6 month : function test, inspection the leakage
	Manual damper	Leakage and normal function test		●			6 month : function test, inspection the leakage
Level Switch	LS-001	Normal function test	●				3 month : function test, fork type probe inspection(coat, damage)
	LS-002	Normal function test	●				3 month : function test, fork type probe inspection(coat, damage)
	LS-003	Normal function test	●				3 month : function test, fork type probe inspection(coat, damage)
EHS	Actuator	Oil status					3 month : visual inspection
		Normal function test					3 month : on/of and throtle
		Motor coil resistance check					6 month : mesuring motor coil resistance
		Solenoid valve					3 month : visual inspection

BWTS - Maintenance Task List By Period (In port)

Item	Category	Sub Category	3 month	6 month	9 month	12 month	Maintenance description
Electric Ballast	Capacitor	2uF				●	measuring and check the Ams on each Capacitor
		3uF				●	measuring and check the Ams on each Capacitor
		5uF				●	measuring and check the Ams on each Capacitor
UV Unit		Inspection of NTC		●			visual inpection(replace if it necessary)
		Inspection of UV I sensor housing		●			visual inpection and cleaning
		Inspection of UV sleeve		●			visual inpection(replace if it necessary)
		Inspection of UV lamp	●				visual inpection(replace if it necessary), test with test kit
Filter Unit		Filter overhauling				●	by maintenance manual (disassemble and assemble, cleaning)
		Suction scanner overhauling				●	by maintenance manual (disassemble and assemble, cleaning)
		Filter element over hauling				●	by maintenance manual (disassemble and assemble, cleaning)
EHS	Valve actuator					●	visual inspection, check of motor resistance
MCS		Cable connection				●	inspection of cable connection and insulation
		Fan				●	inspection of cable connection and insulation, collin fan operation
RCP		Cable connection				●	inspection of cable connection and insulation
		Fan				●	inspection of cable connection and insulation, collin fan operation

MRO Premium

| MRO Basic | + | Added Maintenance Task |

+ Remote Trouble Shooting System

Pan-Hawk™ with S-Link software that optimizes satellite communication to provide high-quality video communication services with minimal delay between ship and shore environments. This ensures that ships can stably receive various onshore support services from anywhere in the world.

Main Function of Pan-Hawk™

HD-quality Video streaming

Pan-Hawk™ enables real-time streaming of HD-quality video, providing a clear representation of various issues such as malfunctions, maintenance checks, accidents, and more that may occur with ship equipment. This allows for swift initial diagnosis and response by delivering a precise overview of the ship's situation.


3D AR Manual

The AR MANUAL allows for easy and intuitive communication on aspects that are difficult to explain due to differences in expertise or experience between the crew and service engineers. It enables a clear simulation of the disassembly, assembly, and maintenance procedures before actually servicing, inspecting, or repairing the equipment, addressing any challenging aspects arising from differences in specialization or experience.
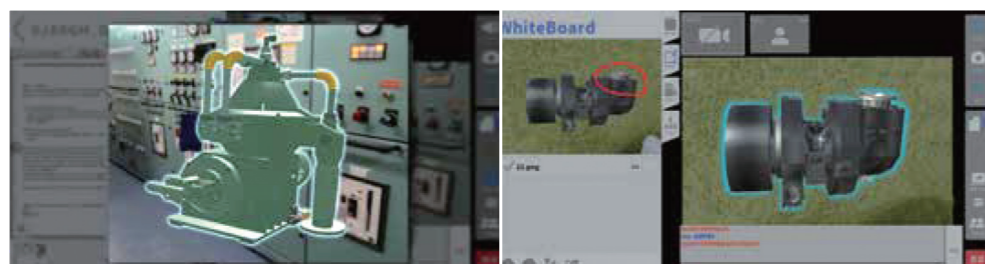
Manual & Any type list

Pan-Hawk™ allows for easy access to manuals or lists for ship equipment and onboard items such as medicines and supplies, registered which is from the ship's inventory. During meetings, external parties or stakeholders can easily access the vessel's information anytime, anywhere.
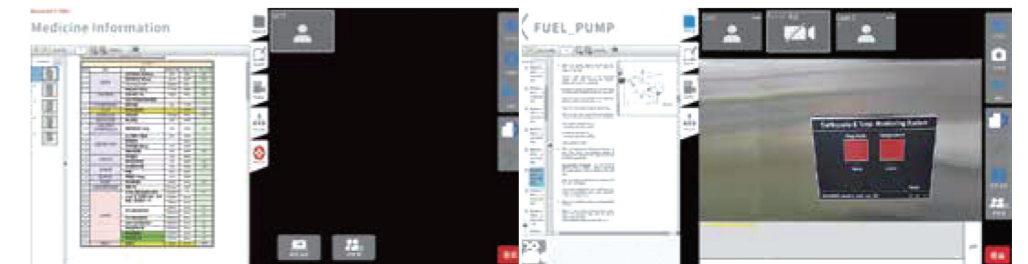

Up & Download

In the Pan-Hawk™ conference room, the UP&DOWNLOAD function allows participants in the room to share photos and video files with everyone. You can share not only previously stored image and video files but also capture and share the current sharing screen during the meeting.

Whiteboard & Drawing

While screen sharing, you can share captured video thumbnails and images that have been shared using the UP & DOWNLOAD function with other participants in the conference room. Additionally, if there are various uploaded image files in the list, you can select and check the desired image file. Moreover, you have the option to share the image file again after drawing or writing on it.
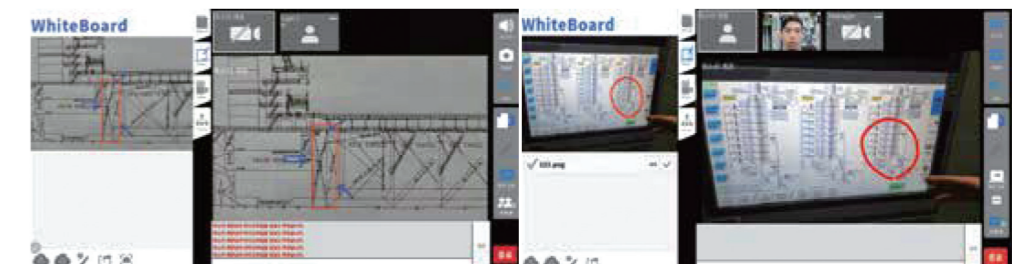
Communication Service for Low Transmission Satellite Speed

The vessel can open a conference room with multiple participants and conduct video communication with minimal communication delay, even in the slow high-altitude satellite communication speed at ocean.