

**PANASIA**

**PANASIA**



**GLOBAL LEADER IN  
SMART & GREEN TECHNOLOGY**



To reflect PANASIA's corporate philosophy of seeking eco-friendly and sustainable value, this booklet was printed with naturally biodegradable soy ink that makes paper recycling easier.

[www.worldpanasia.com](http://www.worldpanasia.com)

ENG



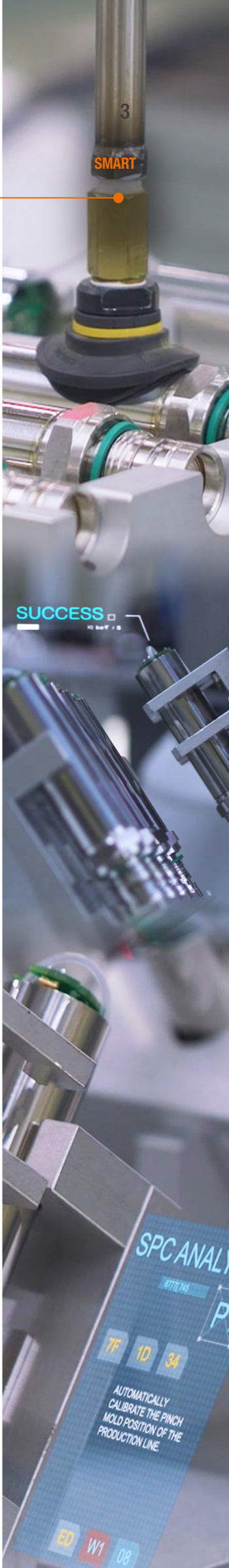
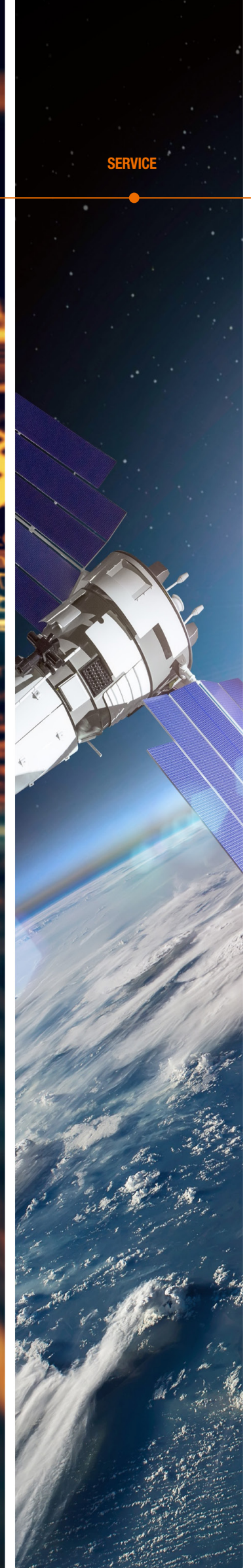
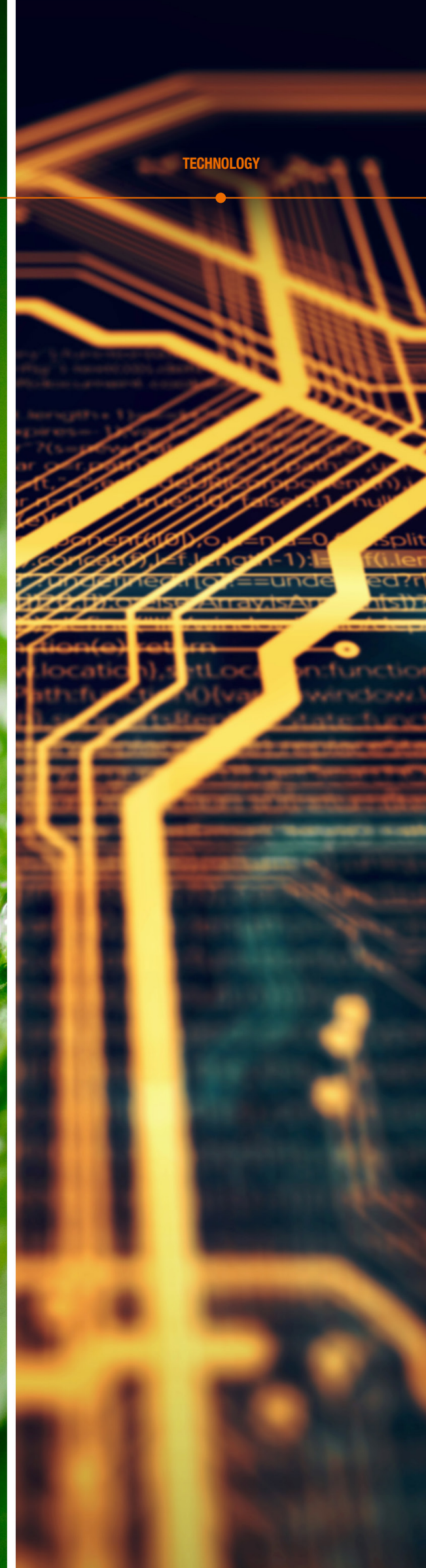
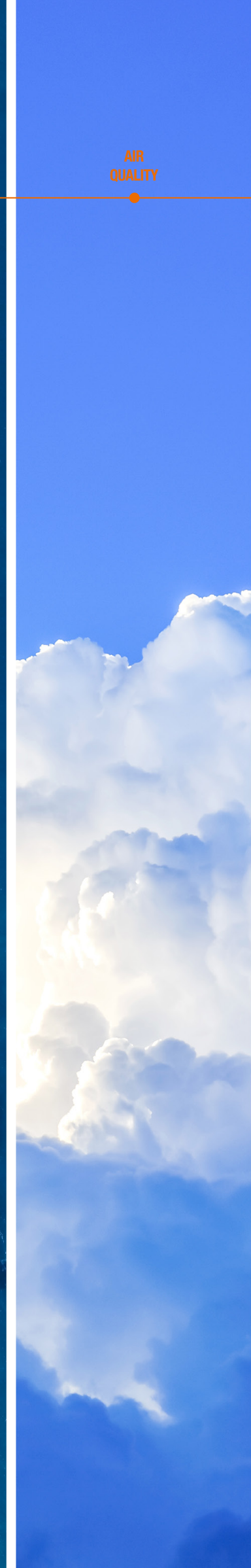
**PANASIA**

PANASIA: A global leader that challenges  
new creation using eco-friendly technologies

# Global Leader in Smart & Green Technology

Global eco-friendly and energy system expert that increases the value of living and opens doors to a sustainable future

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# Creation with the sprit of challenge



At PANASIA, we are creating a future where humans and nature coexist.

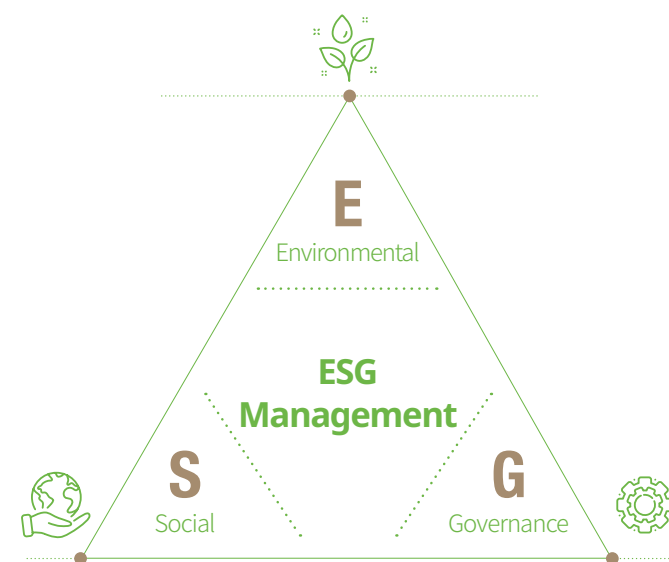
Since its inception in 1989, with the goal of "becoming a technology pioneer," PANASIA has become a global leader in the fields of air quality, water quality, and hydrogen business by developing proprietary technologies and expanding its product lines.

Our infinite passion for eco-friendly technologies has connected PANASIA locally, to Asia, and then to the whole world. Currently, we are operating local subsidiaries in Europe, China, and Japan, all the while working closely with retailers all over the world to strengthen our global competitiveness.

Founded under the motto, "Seeking creative challenges," we at PANASIA have worked continuously to take risks and create a sustainable future, not just a better tomorrow.

## ESG Management

Since its inception, PANASIA has continued its sustainability efforts to grow together through ESG management integrating environmental, social, and governance practices, instead of just pursuing profits.



- E Environmental**
  - Developing technologies in the fields of air quality, water quality, and hydrogen business
  - Eco-friendly R&D in keeping with global trends and government policies
  - Operating an environmental management system since obtaining ISO14001 certification in May 2009
  - Building eco-friendly facilities to reduce use of coal energy
- S Social**
  - Living with communities by providing support to the neglected and the underprivileged
  - Helping talent become self-sufficient by creating jobs and fostering human resources
  - Eco-friendly social services to preserve the environment and mitigate climate change.
  - Employee-engagement volunteering activities
- G Governance**
  - Legal compliance and ethics on the basis of our social responsibilities, which involves ethical management, win-win management, and environmental management
  - Transparent business operations by operating internal/external reporting mechanisms

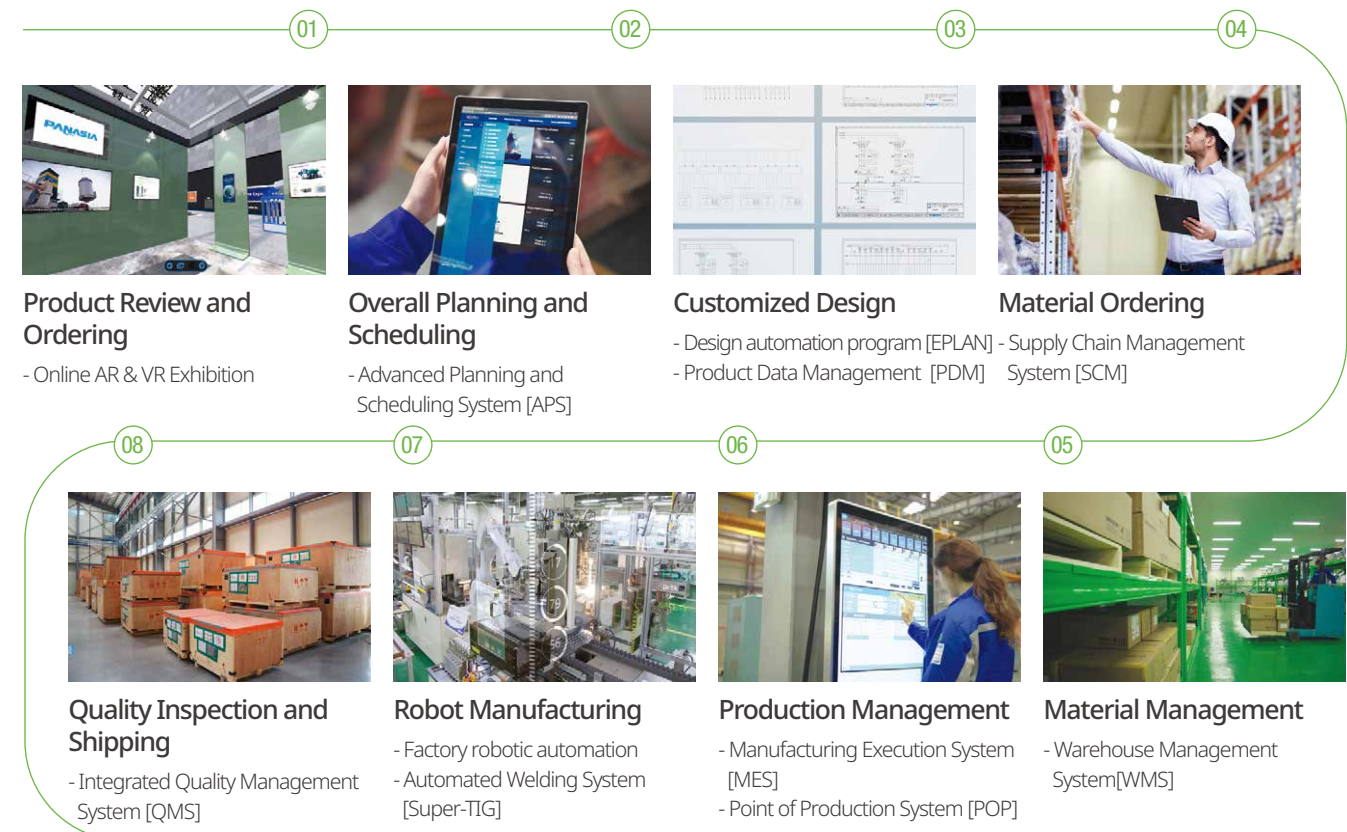
# Smart PANASIA

## Advanced technology for building best-in-class equipment

Smart PANASIA produces 'customized products' at the minimum cost and time by utilizing ICT to integrate all processes, from product planning and design to production and service. Also, even after delivery, it supports the integrated control system, which is used for maintenance and repairs, and services such as our E-Learning Program to increase convenience for our customers.

### Process

#### Design - Delivery Process



#### Training - After-sales service (A/S)



# Business Category



**Hydrogen Business**  
 -Hydrogen generation systems

**Air Quality Environment**  
 - Carbon Capture, Utilization and Storage (CCUS) system  
 - De-SOx Scrubber system  
 - De-NOx SCR system

**Water Quality Environment**  
 - Water treatment system  
 - Measurement & Control System

**Services**  
 - RETROFIT Service  
 - MRO Service  
 · Preventive Check-up Service & Calibration  
 · Training Center & Engineer Training  
 · E-Learning Program  
 · Integrated Control System



# Hydrogen Generation System



PANASIA's hydrogen generation system PanaGen is a renewable energy solution designed to generate hydrogen and achieve carbon neutrality in the hydrogen energy industry. The hydrogen generation system that employs natural gas reforming combines the reforming system and fuel cells. The hydrogen generation system for use in buildings to generate power and the mid- and small-sized hydrogen generation system that can store and utilize the hydrogen generated on-site can be used on ships, which use hydrogen as a propulsion fuel.



## Product Line-up

**Small-capacity Hydrogen generation system**  
(for houses and general buildings)

**Capacity** 1~10 Nm<sup>3</sup>/hr  
**Purity** 75% H<sub>2</sub>  
**Type** SMR / Membrane  
**Purification method** PrOx / Membrane



**Mid-sized or small-sized Hydrogen generation system**  
(for industrial use)

**Capacity** 30/100/150/300 Nm<sup>3</sup>/hr  
**Purity** 99.999% H<sub>2</sub>  
**Type** SMR  
**Purification method** PSA



**Mid-sized or large-sized Hydrogen generation system**  
(for industrial plants)

**Capacity** 500/1,000/10,000 Nm<sup>3</sup>/hr  
**Purity** 99.999% H<sub>2</sub>  
**Type** SMR / Membrane  
**Purification method** PSA / Membrane

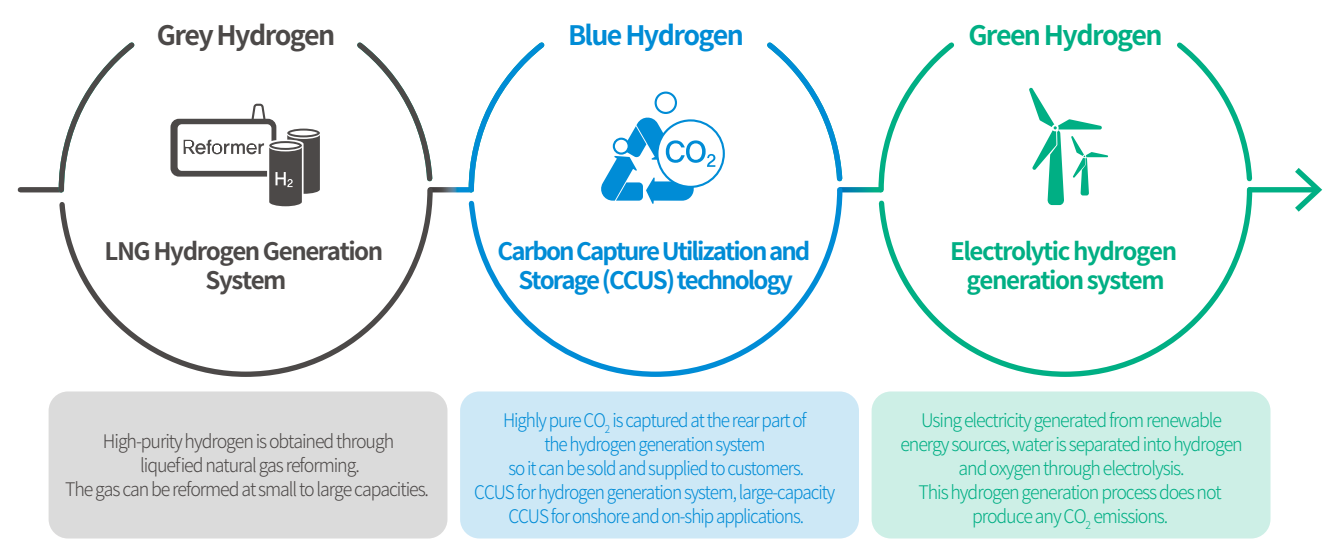


**Hydrogen generation system for ships**

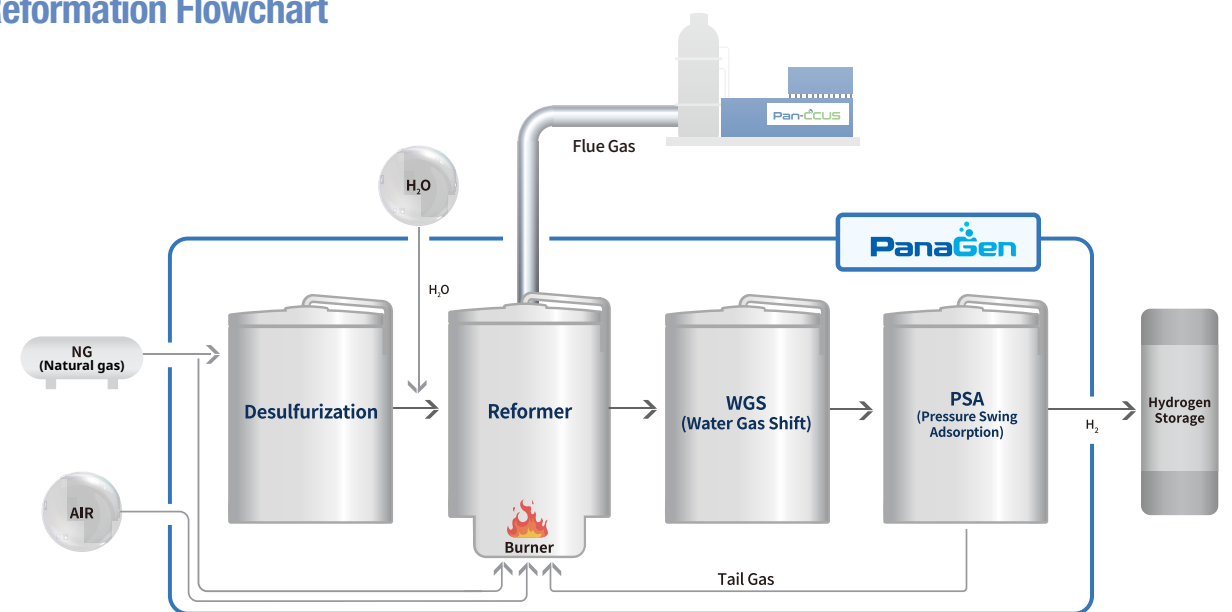
**Capacity** 100/150/300 Nm<sup>3</sup>/hr  
**Purity** 99.999% H<sub>2</sub>  
**Type** SMR / Membrane  
**Purification method** PSA / Membrane



## Hydrogen Roadmap



## Reformation Flowchart



## Smart Integrated Control System



- Safety management** Real-time operating status monitoring and prevention of problems
- Efficient management** Providing the consumables replacement notification service through big data analysis  
 ➔ Keeping operating losses to a minimum
- Product diagnosis** Fault Diagnosis and Analysis



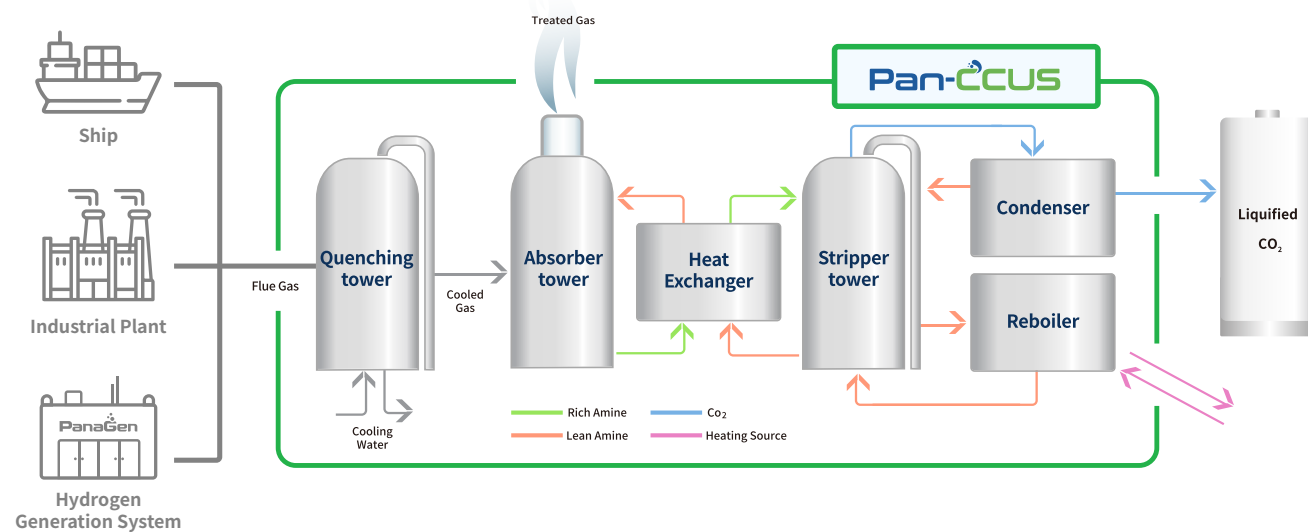
# Carbon Capture, Utilization and Storage system(CCUS)



Pan-CCUS™ (Carbon Capture, Utilization and Storage) is a system that isolates from the atmosphere carbon dioxide emissions from large-sized fossil fuel-powered emitters, such as power plants, steel and cement plants, and ships.



## Carbon Capture Flowchart



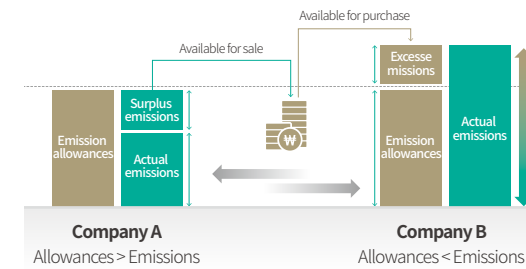
## Carbon emissions regulation for onshore applications

**Overhaul of the Greenhouse Gas Emission Trading Scheme, the key to the 2050 Zero-Carbon Policy**

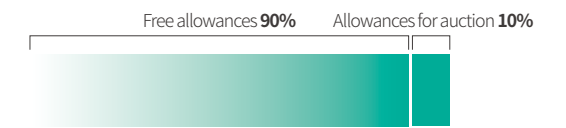
The Greenhouse Gas Emission Trading Scheme is a program in which the government allocates allowances each year to facilities releasing greenhouse gas emissions, evaluates actual GHG emissions from those emitters, and permits the emitters to trade their excess allowances with those with a shortage of allowances.

### Strict limits on emissions

- The government sets clear greenhouse gas (GHG) emission targets and allocates emission allowances to the respective economic agents participating in the Emission Trading Scheme to meet those targets.
- By setting a gradually declining emissions cap, the government can present predictable emission pathways and send long-term market signals to companies and investors.



[ Concept of Emissions Trading Scheme ]



[ Phase 3 of the Plan (2021-25) Carbon Emission Allowances ]

## Carbon emissions regulation for offshore/onboard applications

The International Maritime Organization (IMO) brought into effect the EEDI (Energy Efficiency Design Index) and EEXI (Energy Efficiency eXisting ship Index) as initial strategies for reducing greenhouse gas emissions from ships.

<b>EEDI</b>	<b>Energy Efficiency Design Index (EEDI)</b>	<ul style="list-style-type: none"> <li>• Setting targets to reduce CO<sub>2</sub> emissions per transport work by the Nth year below the 2008 peak</li> <li>• CO<sub>2</sub> emissions generated by a ship when transporting 1 ton of cargo 1 nautical mile; for 13 types of ships of more than 400 tons gross tonnage, the EEDI must be calculated for each new ship</li> <li>• The EEDI applies to newly built ships since 2015, targeting a 30% reduction of greenhouse gas emissions by 2025 (with the base year of 2013)</li> </ul>
<b>EEXI</b>	<b>Energy Efficiency eXisting ship Index (EEXI)</b>	<ul style="list-style-type: none"> <li>• Applies to existing ships just the same as the EEDI does; the EEDI phase 2 or phase 3 reduction requirements apply, depending on the type of the ship.</li> <li>• This marks the beginning of the short-term target to achieve the IMO's 2030 GHG reduction target of 40%.</li> </ul>
<b>EEDI Phase</b>	<b>phase 0 - phase 5</b>	<ul style="list-style-type: none"> <li>• phase 0 - After 2013, newly built ships must meet the initial EEDI reference line</li> <li>• phase 1 - After 2015, 10% reduction below the initial EEDI reference line</li> <li>• phase 2 - After 2020, 20% reduction below the EEDI reference line                             <ul style="list-style-type: none"> <li>- After 2022, 30% reduction below the EEDI reference line for gas carriers, container ships, general cargo ships, and LNG carriers; 40% reduction for larger ships (added to the 73rd MEPC.)</li> </ul> </li> <li>• phase 3 - After 2025, 30% reduction below the EEDI reference line for newly built ships</li> <li>• phase 4 (projected) - After 2030, 40% reduction below the EEDI reference line for newly built ships</li> <li>• phase 5 (projected) - After 2050, 50% reduction below the EEDI reference line for newly built ships</li> </ul>



# De-SOx Scrubber system

PANASIA's De-SOx scrubber system PaSOx™ is an air quality environment solution that reduces sulfur dioxide emissions in exhaust gas caused by burning of engine fuels.

## PaSOx™ smart

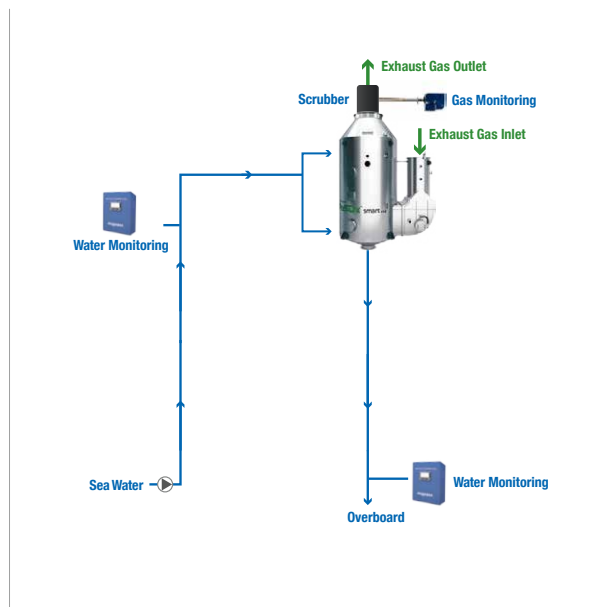
The onshore scrubber is used in power plants or industrial facilities that require reduction of SOx emissions.

The wet scrubber, which uses seawater for ship applications, helps prevent air pollution by reducing sulfur oxide emissions caused by burning of high-sulfur fuel oil.



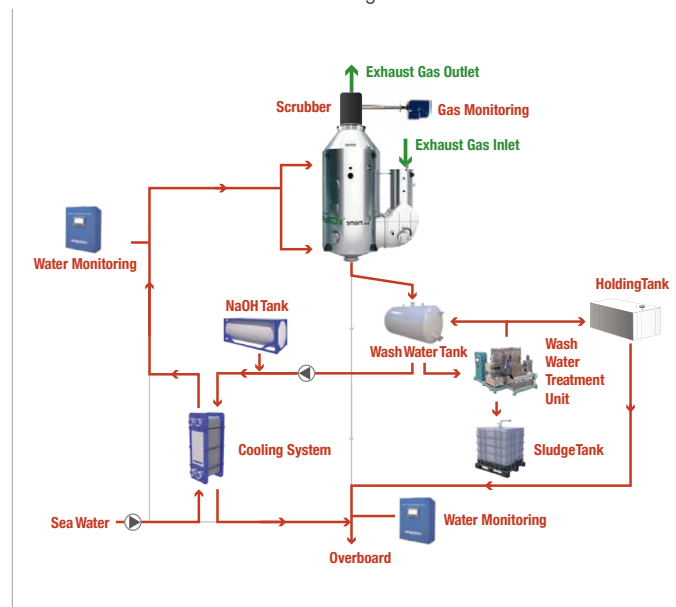
### Open Mode

Normal Operation



### Close Mode

Near Port, Specified Zone / Low Alkali Zone / No Discharge Zone



## Product Line-up

PANASIA's PaSOx™ provides a customized solution made for various applications, regardless of the plant size, the type or size/shape of the ship.

PaSOx™ smart U-Type

1-80MW



PaSOx™ smart I-Type

1-80MW



PaSOx™ smart v.SQ

1-70MW



PaSOx™ smart v.MCR

1-6MW



## Main Components

Water Treatment Unit

**WATERCOMMANDER™**



Water Monitoring System



Gas Monitoring System



## Certificates

PanGMS	ABS	LR	KR	NK	Japan Flag
	Type Approval May. 2020	Type Approval Sep. 2020	Type Approval Jul. 2018	Type Approval Dec. 2018	Type Approval Mar. 2021
PanWMS	ABS	LR	KR	NK	Japan Flag
	Type Approval Mar. 2020	Type Approval Sep. 2020	Type Approval Jul. 2018	Type Approval Dec. 2018	Type Approval Mar. 2021
PanWMS-II	ABS	LR	KR	NK	
	Type Approval Mar. 2020	Type Approval Jul. 2020	Type Approval Oct. 2019	Type Approval Nov. 2019	





## De-NOx SCR system

### PaNOx™ smart

PANASIA's De-NOx SCR system PaNOx™ is an eco-friendly solution that uses the Selective Catalytic Reduction mechanism (SCR system) to decompose nitrogen oxides from exhaust gas into harmless water (H<sub>2</sub>O) and nitrogen (N<sub>2</sub>) and releases them. We offer PaNOx™ for large-scale onshore systems for releasing exhaust gas emissions, such as power plants and boilers, and PaNOx™ Marine for onboard applications, which is designed to meet the IMO Tier III standards.



### Application

#### PaNOx™ smart

PaNOx™ has been continuously installed in fuel-burning facilities with NOx emissions, including onshore power plants such as HRSG and boilers. The system has been actively used not only locally but all over the world to meet the regulatory requirements, from California, where the world's strictest NOx regulations apply, to Iran and Saudi Arabia.



HRSG



Boiler

#### PaNOx™ Marine smart

On January 1, 2016, the International Maritime Organization (IMO) brought into effect Tier III, a convention aimed at reducing NOx emissions from diesel engines by more than 80%. To achieve this certification, products must meet the regulatory requirements of Tier III, such as installing systems like SCR on marine engines that meet the Tier III requirements.



Shipbuilding

### Main Components

PaNOx™ smart has successfully achieved installation space and price competitiveness by utilizing an integrated control panel, which was developed by transforming the IDU, the conventional DCU control mechanism, into the PLC control method.

SCR Reactor



SCR Integrated Control Panel - Control Unit + Dosing Unit

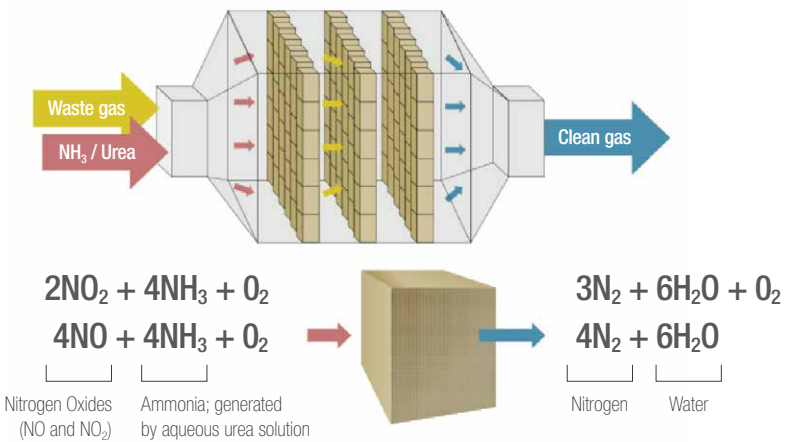


CI (Compact Injector) - Mixer + Injector



### SCR Selective Catalytic Reduction

Our Selective Catalytic Reduction is an eco-friendly solution that turns NOx from exhaust gas into harmless water (H<sub>2</sub>O) and nitrogen (N<sub>2</sub>) and releases them.



### EIAPP Certificates



EIAPP(KR)

EIAPP(ABS)

EIAPP(LR)

EIAPP(BV)

EIAPP(DNV)



# Water treatment system

## GloEn-Patrol™

PANASIA's water treatment system GloEn-Patrol™ is a water quality solution that is recognized as the most eco-friendly and safest system as it uses a filtration process, which is a 100% physical treatment method, and the "UV Lamp," which is UV disinfection technology.



GloEn-Patrol™ is widely used for both onshore and offshore applications where water treatment is required. It can be used for water purification in onshore plants and for water treatment in water mains and sewers. When used for offshore applications, it helps protect marine ecosystems by sterilizing microorganisms in ballast water on ships, which pose one of the most serious threats to the marine environment.

Ships repeatedly take and discharge ballast water to stay balanced, but microorganisms are also taken on board and discharged, having negative effects on the ecosystem.

This problem associated with ballast water has become a global issue, and as per the IMO regulations, it is mandatory for all ships to install ballast water treatment systems by 2024.

### Certificates

<b>Class</b>	DNV Type Approval Aug. 2019	LR Type Approval Jul. 2020	KR Type Approval Jan. 2020	ABS Type Approval Apr. 2020	RINA Type Approval Mar. 2020	RMRS Type Approval Apr. 2020	BV Type Approval Jul. 2020	CR Type Approval Feb. 2020	CRS Type Approval Jan. 2020
<b>Flag</b>	USCG Type Approval Mar. 2020	Korea Type Approval Mar. 2021	Norway Type Approval Aug. 2019	Cyprus Type Approval Nov. 2019	Germany Type Approval Dec. 2019	Saint Kitts And Nevis Type Approval Jan. 2020	Croatia Type Approval Jan. 2020	Palau Type Approval Jan. 2020	Cook Islands Type Approval Feb. 2020
<b>Explosion-Proof</b>	DNV ATEX Type Approval Feb. 2020	IECEX Type Approval May 2015							

### Product Line-up

GloEn-Patrol™ GI



GloEn-Patrol™ GIII



<b>Combination</b>	Original Filter Unit Original UV Unit	MEGA Filter Unit MEGA UV Unit
<b>Treatment Capacity</b>	50~700 m³/hr	750~3,000 m³/hr
<b>Features</b>	Small capacity with single unit	High efficiency in power consumption and footprint

### Main Components

Original Filter Unit



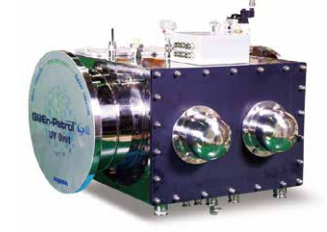
MEGA Filter Unit



Original UV Unit



MEGA UV Unit



Control Panel



- Smart HMI system
- Data logging for 24 months
- Main data real time display
- Alarm function
- Controller: Siemens PLC
- Touch screen

UV Power Supply Panel



- Operation Temperature: 0~55°C
- Prevent high heat dissipation

**Filter Unit**

Original Filter Unit



MEGA Filter Unit



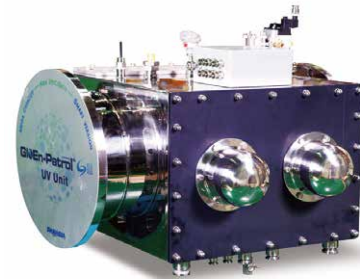
Type	Single screen type	Multi cage screen type
Capacity	50~750 m <sup>3</sup> /hr	900~3,000 m <sup>3</sup> /hr
Max.Operating Pressure	10 bar	10 bar
Grade of filtration	50μm	50μm
Filter Element Material	SUS 316L / Hastelloy	SUS 316L / Hastelloy
Backflushing control	Differential Pressure	Differential Pressure

**UV Unit**

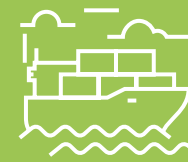
Original UV Unit



MEGA UV Unit



Capacity	50~700 m <sup>3</sup> /hr	750~1,500 m <sup>3</sup> /hr
Max.Operating Pressure	10 bar	10 bar
Automatic cleaning wiper		
Explosion Proof Type (option)		



**Measurement & Control System**



Ships store and carry volatile substances like crude oil. All sorts of risks must be managed to ensure safety on ships and prevent marine pollution



PANASIA's measurement control system monitors the levels of all sorts of critical components on board in real time. Using its alarm and analytics features, the system can also increase efficiency significantly in ensuring vessel safety and prevent marine pollution.

**Product Line-up**

01	<b>Cargo monitoring</b> · Radar beam type · Magnetic float type	02	<b>High &amp; overfill alarm</b> · Magnetic float type
03	<b>Tank level &amp; draft gauging</b> · Air purge type / Electric pneumatic type · Electric pressure type	04	<b>Vapour emission control</b>
05	<b>Fixed gas detection</b>	06	<b>Water ingress alarm</b>
07	<b>Pressure / Temperature monitoring</b>	08	<b>Bilge high level alarm</b>
09	<b>Local level gauge / switch</b>	10	<b>Pressure switch / temperature sensor / pressure transmitter</b>

# PANASIA SMART SERVICE puts our customers first

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, repairs, and efficient operation of products to our retrofit service using our advanced technology.



- Encompassing all processes, from system delivery to engineering, and to construction
- We provide the solutions best suited for customers' ships
- Wide-ranging technology consulting services
- Reliable partner in the retrofitting of existing ships



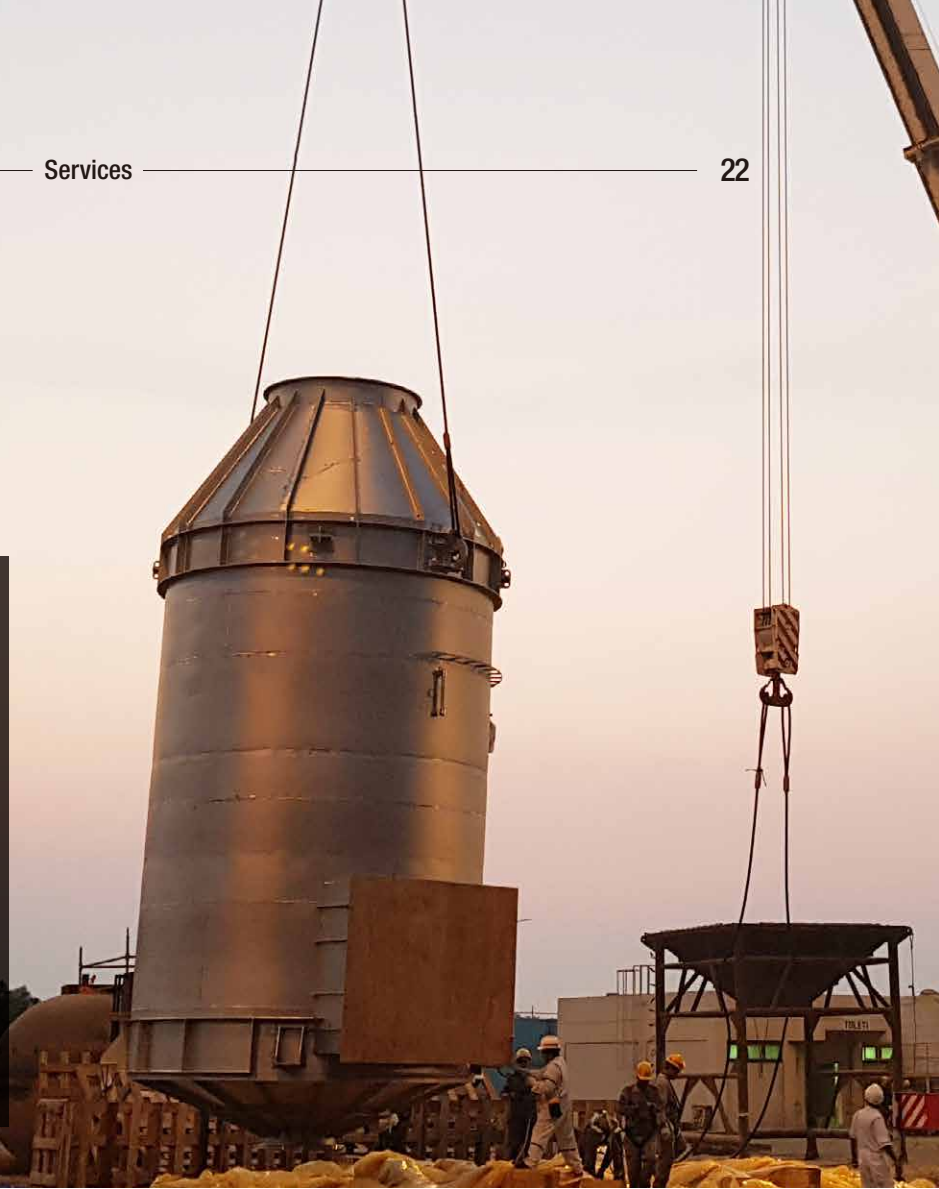
- Continuous maintenance/repairs, periodic follow-up services
- Advance inspection and diagnosis of consumables
- Product operation and training services
- Aiming to reduce costs and improve performance for customers



# RETROFIT Service

## PANASIA's Retrofit Service guarantees the best performance

PANASIA's tested and proven retrofitting service has been widely recognized in Korea and overseas for our top-notch technology and high service quality. We have the technological capabilities that we need to cover all processes, from equipment supply to engineering and construction. Also, among the engineering, installation, materials, and installation processes, you get to choose only those that require retrofitting.



### Our Services

You may determine the scope of work for installation on sea-going vessels

Equipment	Engineering	Design
<ul style="list-style-type: none"> <li>· BWTS Equipment</li> <li>· SCRUBBER Equipment</li> <li>· Commissioning</li> <li>· Demonstration</li> </ul>	<ul style="list-style-type: none"> <li>· Onboard Survey</li> <li>· Basic Design</li> <li>· Owner / Class Plan Approval</li> <li>· Interface with Existing Automation System</li> </ul>	<ul style="list-style-type: none"> <li>· Installation Drawing</li> <li>· Manufacturing Drawing</li> </ul>
Material Supply	Installation Work	Supervision
<ul style="list-style-type: none"> <li>· Steel Structures</li> <li>· Pipe Spools</li> <li>· Installation Materials</li> <li>· Cables</li> </ul>	<ul style="list-style-type: none"> <li>· Pipe Spools Installation</li> <li>· Laying &amp; Connection Cables</li> </ul>	<ul style="list-style-type: none"> <li>· Schedule Control</li> <li>· Quality Control</li> <li>· Instruction to Workers</li> </ul>

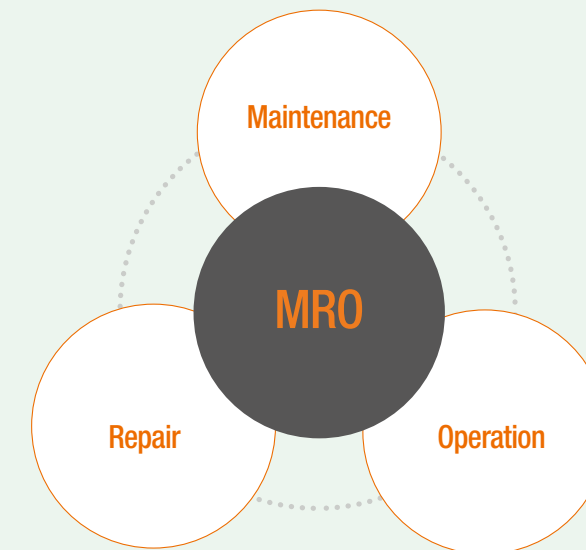
### Retrofit Contract Cases

4 Types of Contract Cases

CASE 1	System + Supervision
CASE 2	System + Engineering + Supervision
CASE 3	System + Engineering + Materials installed (piping, steel outfitting, electrical) + Supervision
CASE 4	System + Engineering + Materials installed (piping, steel outfitting, electrical) + Installation + Supervision

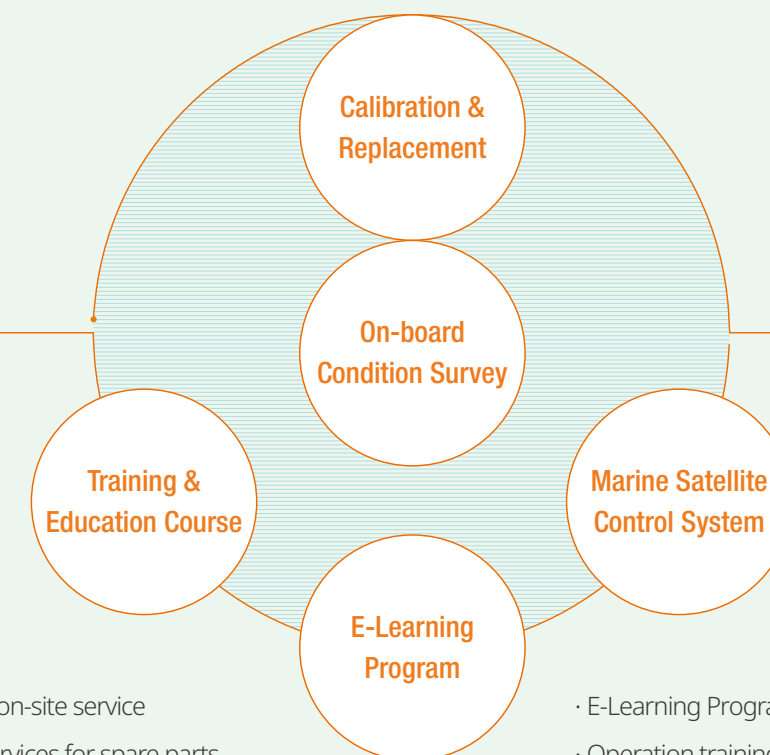
# MRO Services

At PANASIA, we improve customer satisfaction by offering continuous follow-up service for our products.



MRO is a one-stop solution encompassing maintenance, repair, and operations. It involves advance inspection and diagnosis before you perform maintenance/repair work and replacement of consumables, which are essential to operating PANASIA's products.

At PANASIA, ensuring customer convenience and product safety is a top priority. We offer follow-up care and service on a periodic basis to help customers reduce costs and improve their performance.



- Calibration and on-site service
- Replacement services for spare parts
- Remote integrated control system

- E-Learning Program (CBT & IBT)
- Operation training service (Training Center)

## MRO Service Preventive Check-up Service & Calibration



### Preventive Check-up Service & Calibration

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, we prepare a report that contains any information and solutions you may need to ensure efficiency in your operations.

Through calibration, we conduct advance inspection for problems that may occur to make system operation as efficient as possible. Customers do not have to take care of every single one of the complicated sensors with many control points. They can also get maintenance/repair services scheduled immediately when it becomes necessary.

## MRO Service Training Center & Engineer Training

At PANASIA, we operate Training Centers around the world. Through our learning program, we are training professional engineers on the regulatory requirements, which provide the background for making our products, on how to use our products, and how to respond when problems occur.

In addition, we organize annual field engineer training to provide highly satisfactory product training services.

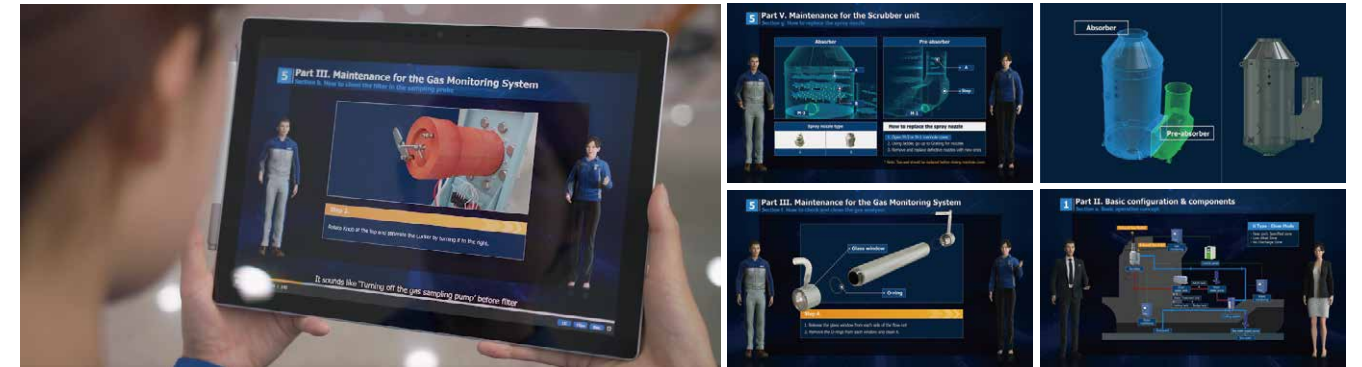
### Components of the Training Program

Chapter	Subject
1	Introduction of Company
2	Basic operating procedure
3	Maintenance requirement
4	Hands on practice (I)
5	Hands on practice (III)
6	Troubleshooting (I)
7	Troubleshooting (II & III)
8	Evaluation & Satisfaction Survey



## MRO Service E-Learning Program

At PANASIA, we offer product training programs you can access anytime, anywhere. PANASIA's training program service called the "E-Learning Program" is available both online and on-site, allowing you access training anytime, anywhere. You can also watch videos and try running products on site using a tablet PC or a laptop. Our E-Learning Program contains product descriptions, operating instructions, crisis response, and other details so you can operate products professionally.



### 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 for 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

### CBT (Computer Based Training Program)

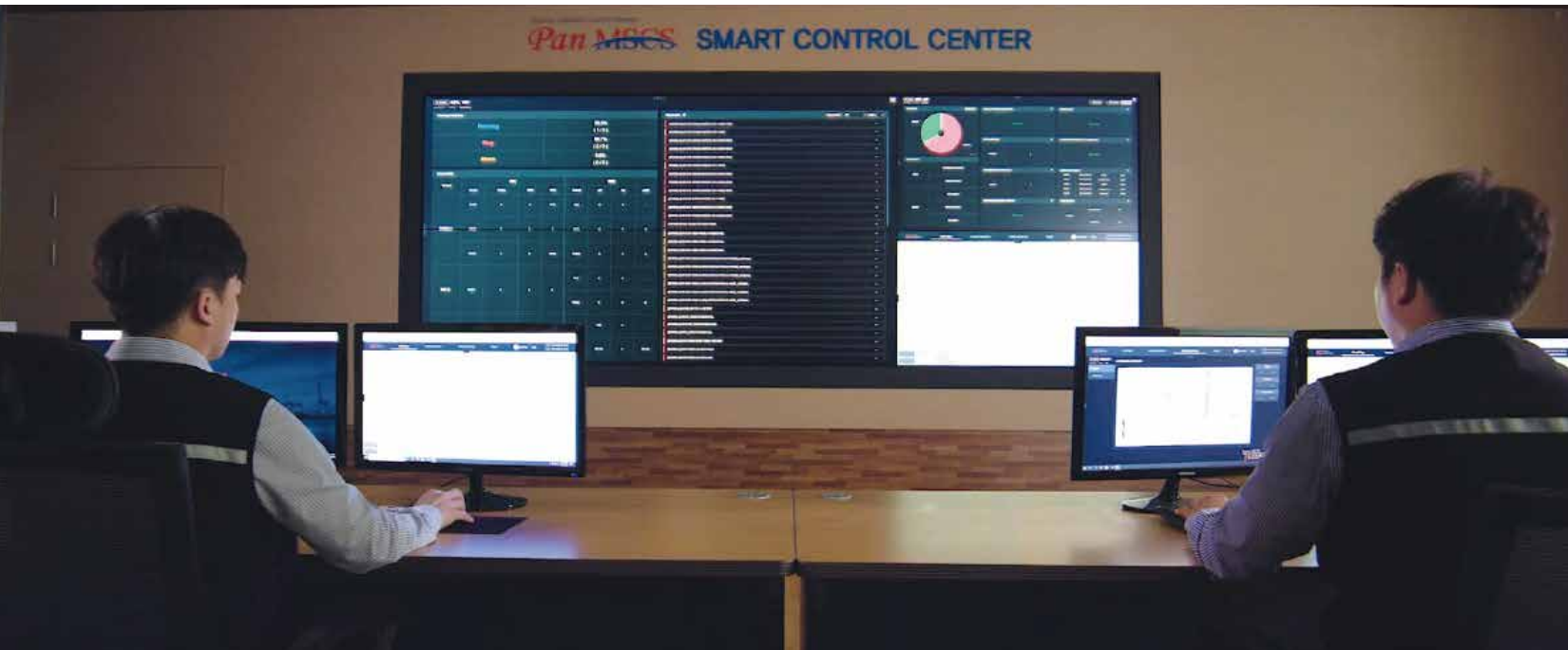


### IBT (Internet Based Training Program)



## MRO Service Integrated Control System

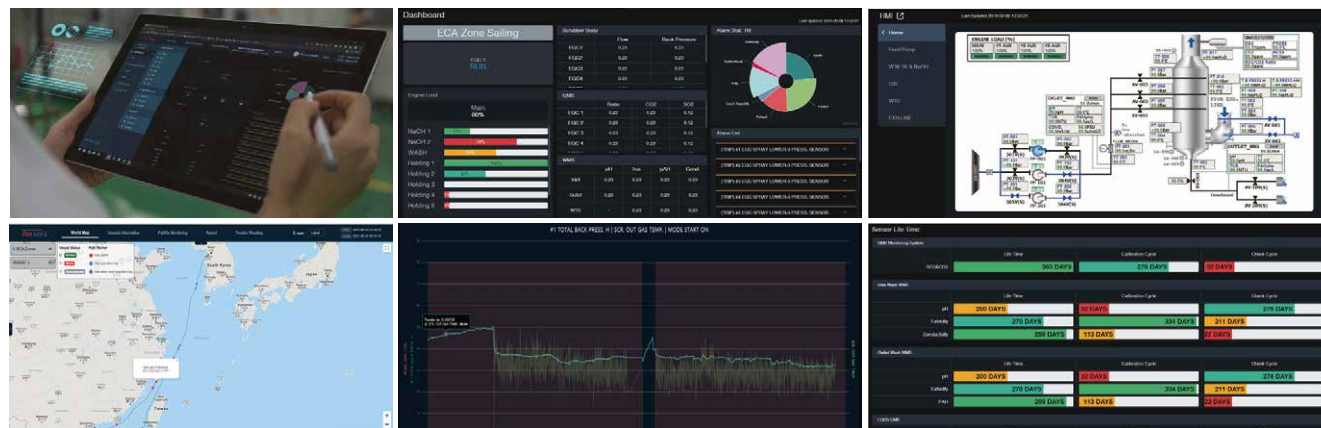
PANASIA's integrated control system is a customized ICT-based service available 24/7, which collects product data in real time and checks the system status remotely to provide customers with prompt and accurate solutions anytime, anywhere.



## Pan-MSCS

Pan-MSCS is a Marine Satellite Control System. This solution monitors in real time, manages, and diagnoses the operating status of PANASIA's products (BWTS, Scrubber) installed on ships. If any problem occurs with any product, the system diagnoses the problem in advance, and notifies the ship of a solution to ensure safer operation.

Through big data analysis, it also notifies the ship of when to replace consumables, allowing the customer to operate the ship more efficiently. It helps us lead the way in creating a smart ship ecosystem.



## Global Network

47 Global Service Networks in 37 Countries



### PANASIA Headquarter & 1st Factory



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### PANASIA 2nd Factory



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