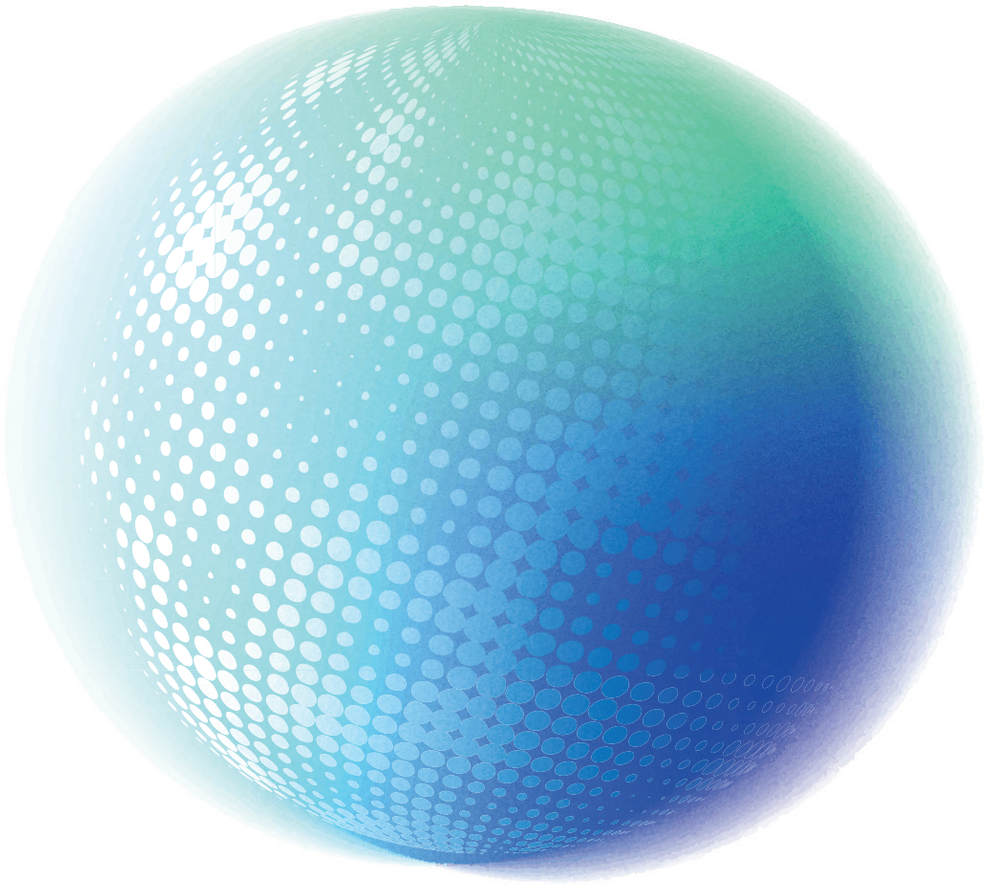
A global leader in eco-friendly energy systems,
**enhancing** quality of life
and **advancing** a sustainable future



PANASIA


02 About PANASIA

03 Smart Technology

04 Solutions

Emission
Fuel Supply
Measurement & Control
Service
Global Network

# About PANASIA

PANASIA is a global eco-friendly energy solutions company dedicated to creating a sustainable future in harmony with our planet. From air quality and water treatment to hydrogen solutions, PANASIA develops technologies that align with nature and advance environmental standards. Backed by core technologies and proven expertise, PANASIA continues to lead through innovation, tackling diverse environmental challenges worldwide.



PANASIA Head quarter / Happy Work Campus

55, Mieumsandan3-ro, Gangseo-gu, Busan, 46744, Korea
T +82-51-831-1010 F +82-70-4369-3701 E panasia@worldpanasia.com



PANASIA Energy Solution Center

98, Mieumgukje 3-ro, Gangseo-gu, Busan, South Korea (46747)



PANASIA Green EPC Center (GEC)

350, Mieumsandanro, Gangseo-gu, Busan, South Korea (46747)




Subsidiary Company

55, Mieumsandan 3-ro, Gangseo-gu Busan, South Korea (46744)





# Smart PANASIA

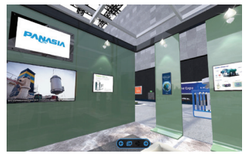
Smart PANASIA
**- Advanced Technology, Global Excellence**

From design and production to distribution and sales, PANASIA elevates product quality through AI-powered robotics and advanced manufacturing systems. By integrating and managing every process with smart technologies, we ensure flawless production and on-time delivery. PANASIA is your trusted innovative partner, delivering both efficiency and reliability.

## Process

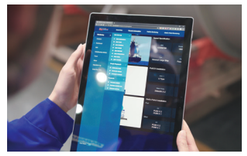
### Design-Delivery Process

01



Product Review and Ordering

02



Overall Planning and Scheduling
- Advanced Planning and Scheduling System [APS]

03



Customized Design
- Design automation program [EPLAN]
- Product Data Management [PDM]

04



Material Ordering
- Supply Chain Management System [SCM]

08



Quality Inspection and Shipping
- Integrated Quality Management System [QMS]

07



Robot Manufacturing
- Factory robotic automation
- Automated Welding System [Super-TIG]

06



Production Management
- Manufacturing Execution System [MES]
- Point of Production System [POP]

05



Material Management
- Warehouse Management System [WMS]

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

01



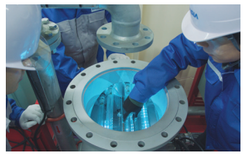
Product Training
- E-learning Program
- Maintenance and repair training service available anytime, anywhere

02



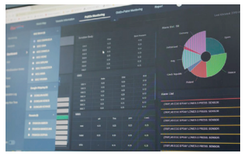
Product Management
- Integrated Control System
- Integrated monitoring and management of product conditions and operating status

03



After-Sales Service (A/S)
- Remote notifications of fault diagnosis and handling methods
- On-site visit

04



After-sales (A/S) Management
- Claim Handling Service [CHS]
- Managing inspection results and handling outcome history

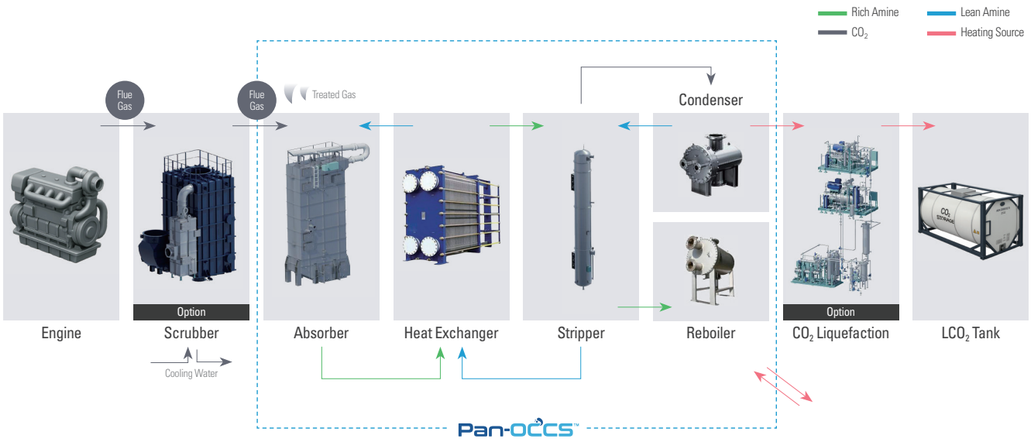
Pan-OCCS™

# Onboard Carbon Capture System

The Pan-OCCS™ (Onboard Carbon Capture System) is designed to capture and prevent carbon dioxide emissions from ships from being released into the atmosphere. PANASIA OCCS is an eco-friendly technology that captures and stores $CO_2$ from ship exhaust gas in real time using an amine absorbent, enabling compliance with carbon emission regulations enforced by the IMO(International Maritime Organization) and EU.



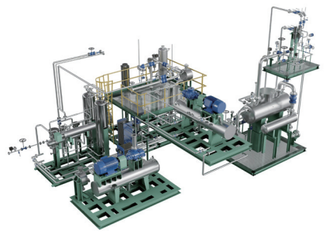
## Flow Diagram




## Optional items



Scrubber



$CO_2$ Liquefaction




Solvent

PaSOx™

# De-SOx Scrubber System

The PaSOx™ system reduces sulfur oxides (SOx) generated during vessel combustion, helping to prevent air pollution. This seawater-based wet scrubber lowers SOx emissions produced when burning high-sulfur fuel oil—the primary fuel used by many vessels—thereby protecting air quality and supporting regulatory compliance.




**U-Type** | 1-80MW



**I-Type** | 1-80MW



**Square Type** | 1-70MW



**Micro Type** | 1-6MW



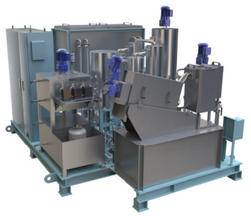
## Main Component



Water Monitoring System



Gas Monitoring System



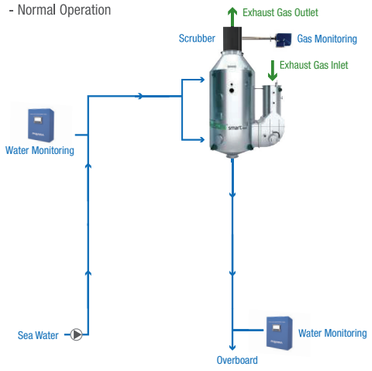
Water Treatment Unit

### Physical-Chemical Type

PANASIA's scrubber features a hybrid process system that combines physical-chemical treatment with membrane technology. Through high-speed coagulation, sedimentation, and membrane filtration, it effectively purifies wash water.

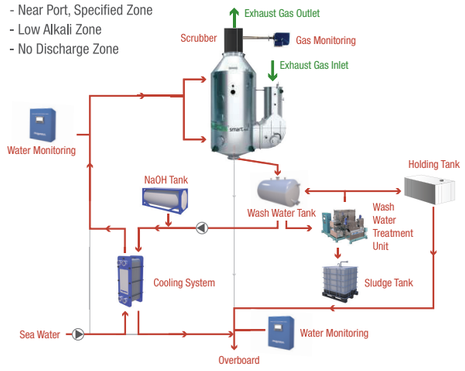
**Open Mode**

- Normal Operation




**Close Mode**

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








Emission

PaNOx™

# De-NOx SCR System

The PaNOx™ system applies Selective Catalytic Reduction (SCR) technology to decompose and reduce nitrogen oxides (NOx) in exhaust gases into harmless water ($H_2O$) and nitrogen ($N_2$), delivering a clean and eco-friendly solution.




## Main Component

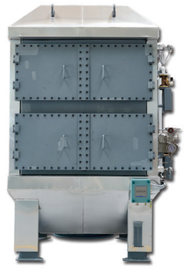
**PaNOx smart V2**
(Under 6 sets of Engine)

The existing Pump Unit & Dosing Control Unit can be manufactured with one equipment called the IDU (Integrated Dosing Unit) for more efficient installation.

**PaNOx smart V3**
(Under 4 sets of Engine)

The IDU equipment in V2 is combined with the Control Panel and manufactured with a single equipment called PanSIS (SCR Integrated Control System) to secure footprint and price competitiveness.

SCR Reactor



CI (Compact Injector)
- Mixer + Injector



Control Panel



Integrated Dosing Unit



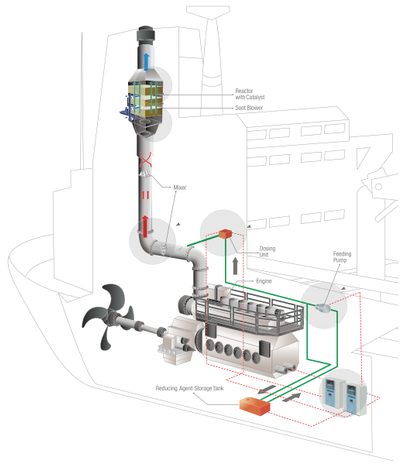
PanSIS
(Control Panel + Dosing Unit)



## SCR Reactor

| Capacity | PaNOx smart V1.0 | | | PaNOx smart V2.0 | | | Reduced by |
|---|---|---|---|---|---|---|---|
| | Length | Height | Length | Capacity | Height | Width | |
| 1000kw | 970 | 970 | 2750 | 953 | 947 | 2680 | 6.52% |
| 3000kw | 1293 | 1284 | 3240 | 1189 | 1181 | 3240 | 15.42% |
| 4000kw | 1613 | 1601 | 3240 | 1425 | 1415 | 3240 | 21.92% |
| 4500kw | 1923 | 1605 | 3362 | 1661 | 1649 | 3240 | 14.48% |
| 8000kw | - | - | - | 2133 | 2121 | 3240 | - |

Volume Down
**14.6%**




## I.D.U

| Component | | Length | Height | Length | Surface Area($m^2$) | |
|---|---|---|---|---|---|---|
| PaNOx smart V1.0 | Pump Skid | 1630 | 900 | 1516 | 10.6 | 14.86 |
| | Dosing Unit | 1200 | 320 | 1150 | 4.26 | |
| PaNOx smart V2.0 | IDU | 1070 | 500 | 1360 | 5.34 | - |
| Reduced by | | | | | 64.06% | |

Volume Down
**64.1%**



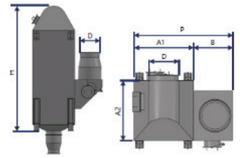
Pan-iCER

# iCER

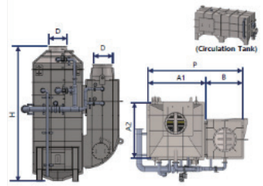
## Intelligent Control by Exhaust Recycling

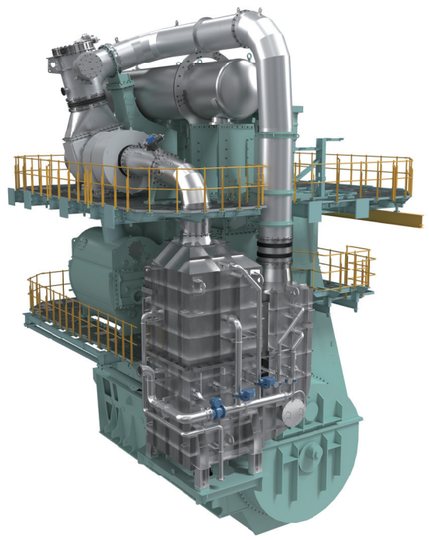
The iCER system cools and recirculates a portion of the engine's exhaust gas back into the combustion chamber. As a key eco-friendly technology for modern vessels, it supports both marine environmental protection and cost-efficient operation.

**Type.1 :**
On Engine-Micro type (Integrated Circulation Tank)

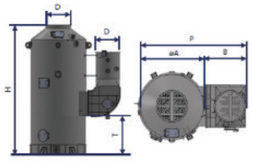


**Type.2 :**
On Engine type (With Circulation Tank)



**Type.3 :**
Off Engine type (Integrated Circulation Tank)



Pan-EMS

# CEMS

## Continuous Emission Monitoring System

The CEMS provides continuous, real-time monitoring of gas concentrations and volumes from vessels and industrial facilities, ensuring accurate emissions management.



## Key Benefit

| Measured Gases | All in one System | Automated Regulatory Reporting | Real-Time Remote Monitoring |
|---|---|---|---|
| Nitrogen oxides ($NO_x$, $NO_2$)<br>Sulfur dioxide($SO_2$)<br>Carbon monoxide (CO)<br>Carbon dioxide ($CO_2$)<br>Methane ($CH_4$)<br>Nitrous oxide ($N_2O$)<br>Oxygen($O_2$) | Integrates all gas monitoring functions required for vessel operation into a single system, enabling efficient reporting | Generates reports automatically in compliance with international formats such as IMO and EU MRV, enhancing management efficiency | Enables real-time remote monitoring through the maritime satellite control system (MSCS) |



Emission

PanFGSS™

# LNG Fuel Supply System

The LNG Fuel Gas Supply System (FGSS) provides ships with liquefied natural gas (LNG) as fuel. Depending on the engine model, it is classified into high-pressure (HP) and low-pressure (LP) types.

HP Type



LP Type



HP Pump



LP Pump

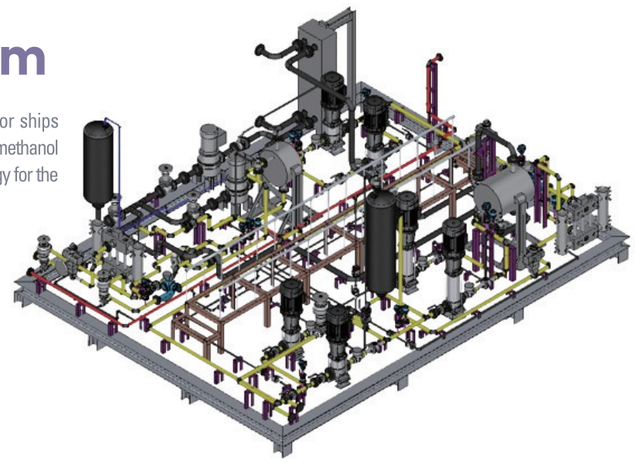


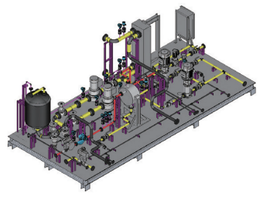



PanLFSS™

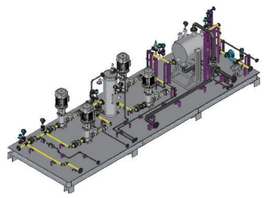
# Methanol Fuel Supply System

The Methanol Fuel Gas Supply System is designed for ships operating on methanol fuel. It safely stores and transfers methanol in its liquid state to the engine, serving as a core technology for the adoption of eco-friendly alternative fuels.

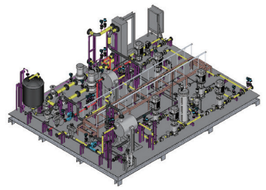




G/E+G.W LINE SKID



M/E LINE SKID



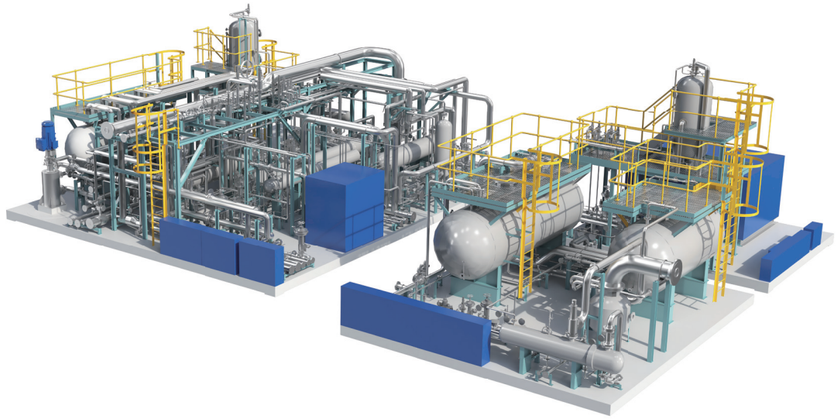
ONE SKID

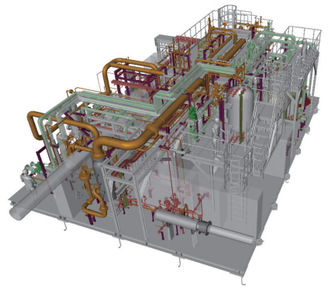




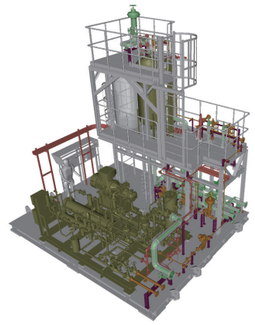
# Ammonia Fuel Supply System

PANASIA's Ammonia Fuel Gas Supply System is designed for ships operating on liquefied ammonia fuel. Sharing a common architecture with LNG, LPG, and methanol supply systems, it ensures the safe delivery of liquefied fuels to the engine and helps ships achieve zero-carbon operation.

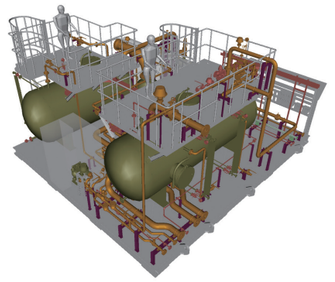




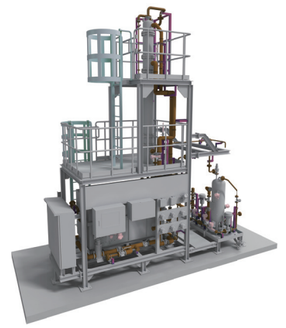
$NH_3$ Supply Skid



$NH_3$ Liquefaction Skid



$NH_3$ Dilution Skid



$NH_3$ Catch Skid

# Cargo Monitoring System

This system accurately measures and monitors liquid levels, temperature, and pressure inside tanks, while also providing alarm functions. It enables real-time monitoring of cargo, ballast, fuel, and draft tanks, and integrates with ship control systems to ensure safe, stable, and efficient vessel operations.



- Radar Beam Type Cargo Tank Monitoring System
- Magnetic Float Type Cargo Tank Monitoring System

# Tank Level Gauging System

The level gauging system accurately measures and transmits the status of various tanks and draft on board, enhancing the safety and efficiency in vessel operations. By converting pressure or hydrostatic head into electrical signals, it enables stable level monitoring and reliable maintenance.



LEVEL 3000™

- Electric Pressure Type Level Transmitter
- Air Purge Type Tank Level & Draft Gauging System
- Electric Pneumatic Type Tank Level & Draft Gauging System
- High Precision Electric Pneumatic Type Level Transmitter

# Level Gauge

The level gauging system is designed to intuitively and reliably indicate and monitor liquid levels in tanks using various methods—such as glass reflection, float, dial, and capillary—without the need for external power or complex devices. It is simple to install and easy to operate.



- Flat Type Glass Level Gauge
- Magnetic Float Type Level Gauge
- Self-Powered Contents Gauge
- Dial Type Float Level Gauge

# Level Switch

The level switch product line is available in multiple types—including horizontal and vertical magnetic floats, displacement models, and reed switches. It accurately detects liquid levels in tanks and provides reliable on/off signals for alarms and control systems



- Horizontal Mounted Float Type Level Switch
- Vertical Mounted Float Type Level Switch
- Displacement Type Level Switch
- Reed Switch Type Float Level Switch

# Alarm System

This system quickly detects hazardous conditions such as cargo overflow or flooding and triggers alarms to prevent marine pollution while ensuring the safety of crews and vessels. Compliant with international regulations including USCG, SOLAS, and IMO, it provides early warning in emergencies to safeguard lives and support safe navigation.



- Magnetic Float Type High & Overfill Alarm System
- Water Ingress Alarm System
- Vapour Monitoring System
- Fixed Gas Detection System

# Others



- Pressure Switch(PPS-100)



- Temperature Sensor(PPT-100 series)



- Pressure Transmitter(PTX- 100)



- Electric Indicator



- Baragraph Type Indicator



- Alarm & Display Monitor





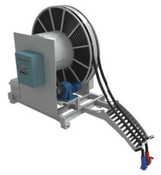
Measurement & Control

## Pan-AMP

# Alternative Maritime Power

AMP(Alternative Maritime Power) is a system that enables vessels to receive electrical power from onshore sources while at a berth, allowing auxiliary engines to be shut down. By switching to shore power, ships can reduce fuel consumption and significantly lower air pollution from exhaust gases.

AMP Cable Reel



Shore Conn. Panel






AMP Incoming Panel



Socket Box



Transformer



## Pan-$N_2$GEN

# $N_2$ Generator

$N_2$ Generator produces nitrogen onboard the vessel and delivers it to various shipboard systems as required. It serves multiple purposes—including fire prevention, cargo protection, and purging—ensuring stable and efficient operation while eliminating dependence on shore-based nitrogen supply.



- PSA Type
- Membrane Type



## Pan-ORC

# Organic Rankine Cycle

ORC (Organic Rankine Cycle) is an eco-friendly power generation system that produces electricity from low- to medium-temperature waste heat. Onboard vessels, the system recovers heat from engine exhaust gases or cooling water and converts it into stable electrical power for ship operations.



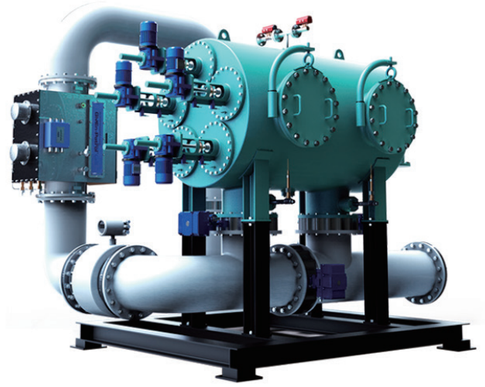

### Benefits

- **AMP & PMSG Type**
- **Integrated expander-generator design**
- **Non-explosive & non-flammable working media**
- **Applicable to waste heat above 75°C**

## GloEn-Patrol™

# Ballast Water Treatment System

Ballast Water Treatment System disinfects microorganisms in ballast water to protect the marine ecosystem. Utilizing a 100% physical treatment process—filtration combined with UV lamp sterilization—it provides safe, reliable, and eco-friendly ballast water management.



### Product Line-up



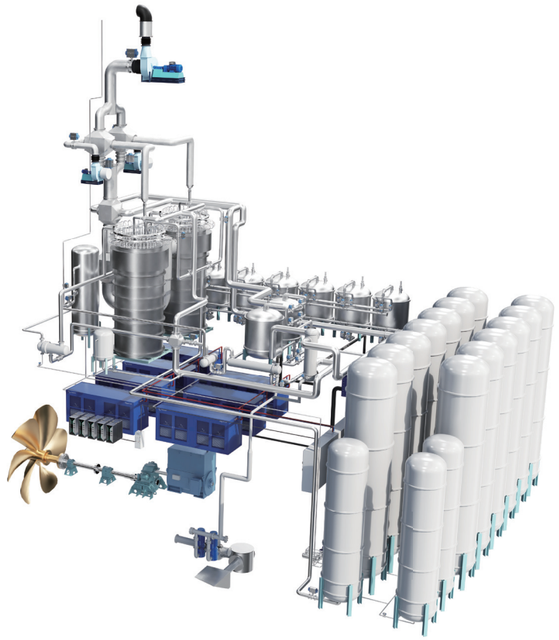


| | GloEn-Patrol™ GI | GloEn-Patrol™ GIII |
|---|---|---|
| **Combination** | Original Filter Unit / Original UV Unit | MEGA Filter Unit / MEGA UV Unit |
| **Treatment Capacity** | 50~700 ㎥/hr | 750~3,000 ㎥/hr |
| **Features** | Small capacity with single unit | High efficiency in power consumption and footprint |

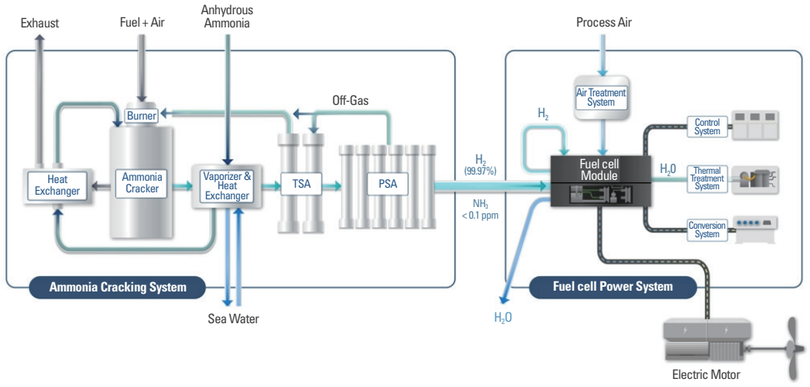
PanaGen™

# Ammonia Cracking System

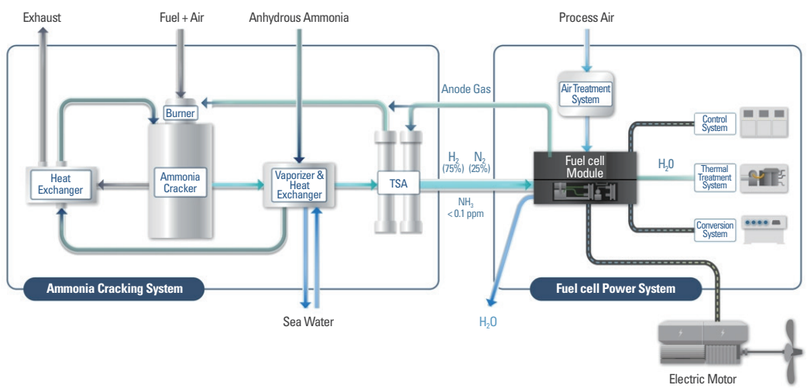
By cracking ammonia, hydrogen is extracted and supplied to fuel cell systems and energy storage devices, generating electrical power for marine applications. This technology can supplement or replace conventional propulsion and auxiliary power systems, enabling vessels to meet increasingly stringent environmental regulations.



## System Flow (PSA include)




## System Flow (PSA exclude)




## Specifications

| Feed Gas | Pressure | Product($H_2$) | | |
|---|---|---|---|---|
| | | Capacity | $H_2$ Purity | Pressure |
| Ammonia | ~15 bar.g | Customized | Above 99.97–98% ($NH_3$ < 0.1 ppm) | 10 bar.g |



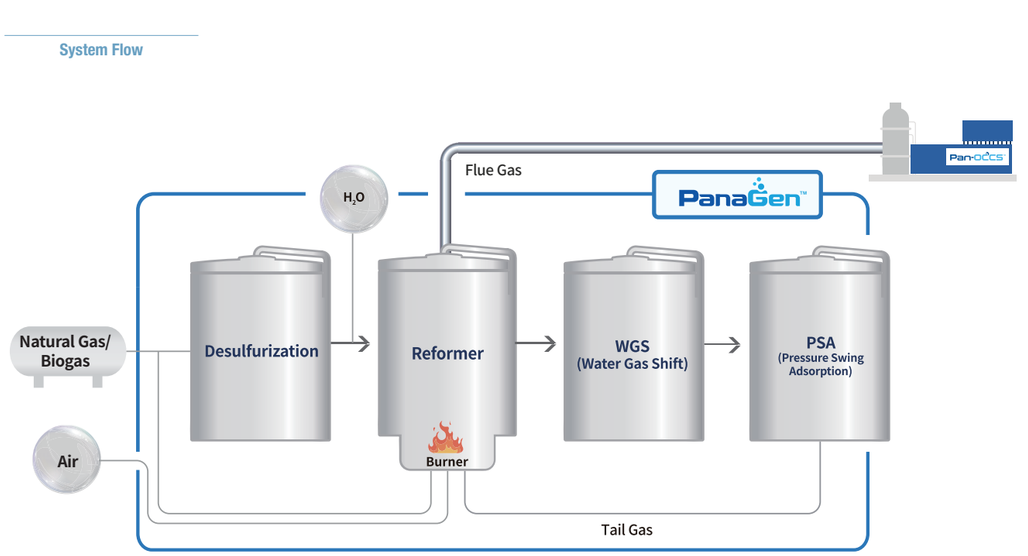
PanaGen™

# Steam Methane Reforming System

Hydrogen is produced through steam methane reforming (SMR) of natural gas. Onsite production enables flexible hydrogen supply for industrial facilities, power plants, and hydrogen refueling stations.




## System Flow

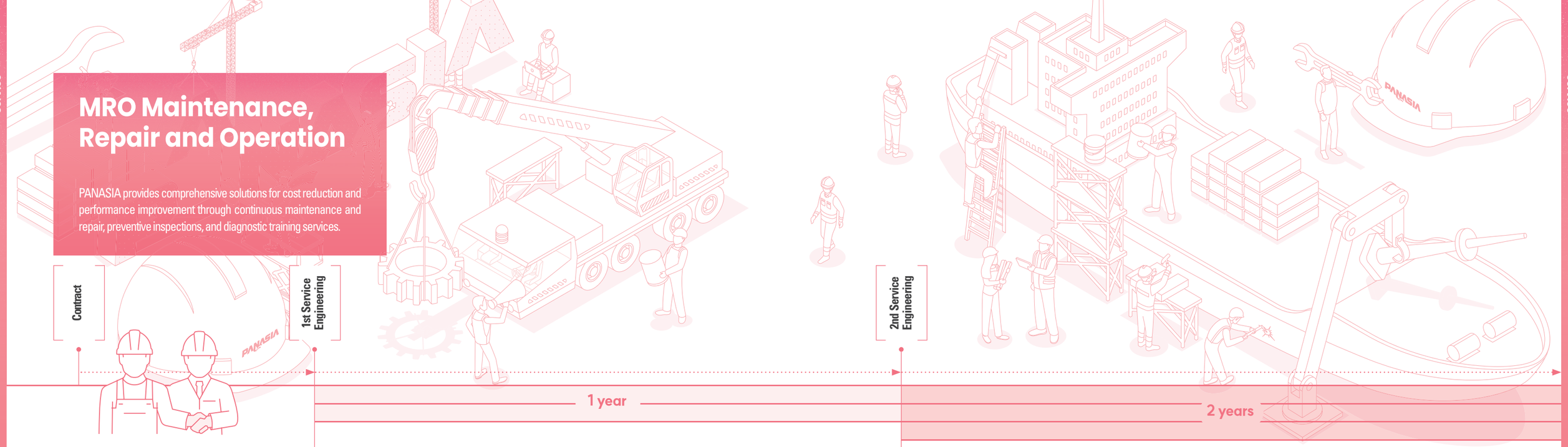



## Specifications

| Feed Gas | Pressure | Product($H_2$) | | |
|---|---|---|---|---|
| | | Capacity | $H_2$ Purity | Pressure |
| Methane (Biogas and etc) | 9.5 bar.g | Customized | 99.999% | 6 bar.g |

# MRO Maintenance, Repair and Operation

PANASIA provides comprehensive solutions for cost reduction and performance improvement through continuous maintenance and repair, preventive inspections, and diagnostic training services.




## Inspection

### Sensor Calibration

Sensors installed on vessels require regular calibration and replacement—every two years for scrubbers and annually for BWTS. PANASIA manages these schedules to ensure reliability, allowing customers to focus on safe and efficient vessel operations.

### 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.

## Monitoring & Control

Pan-MSCS™ is a maritime satellite control system that manages PANASIA products such as BWTS and SOx scrubbers. Using vessel satellite communication, it collects operational data and generates user-friendly reports to support equipment management. With customized ICT services, Pan-MSCS™ enables real-time monitoring of product status, helping vessels operate efficiently and contributing to the smart ship ecosystem.




## Training

### Onboard Training

During regular crew rotations, operators often need time to adapt to the multiple systems installed onboard. PANASIA provides customized operational training for crew members and delivers detailed, professional programs through action learning.



### Crew Training Program (CBT/IBT)

PANASIA MRO services provide product training programs accessible anytime, anywhere. Available both online and offline, the training can be accessed on tablets or laptops for maximum convenience. Covering product features, operating guidelines, maintenance, troubleshooting, and more, PANASIA's training programs support professional and efficient product operation.

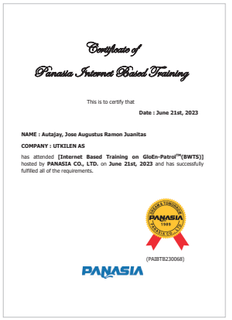
**CBT(Computer Based Training Program)**




**IBT(Internet Based Training Program)**




**PANASIA IBT Certificate**








Service



# Retrofit

PANASIA is recognized for its advanced technology both domestically and internationally, delivering high-quality services. From equipment supply to engineering and construction, PANASIA offers the full range of capabilities to manage every stage of the process.

## Our Services

You may determine the scope of work for installation on operating vessels

| Equipment | Engineering | Design |
|---|---|---|
| · BWTS Equipment<br>· SCRUBBER Equipment<br>· Commissioning<br>· Demonstration | · Onboard Survey<br>· Basic Design<br>· Owner / Class Plan Approval<br>· Interface with Existing Automation System | · Installation Drawing<br>· Manufacturing Drawing |

| Material Supply | Installation Work | Supervision |
|---|---|---|
| · Steel Structures<br>· Pipe Spools<br>· Installation Materials<br>· Cables | · Pipe Spools Installation<br>· Laying & Connection Cables | · Schedule Control<br>· Quality Control<br>· Instruction to Workers |

## Retrofit Contract Cases

4 Types of Contract Cases

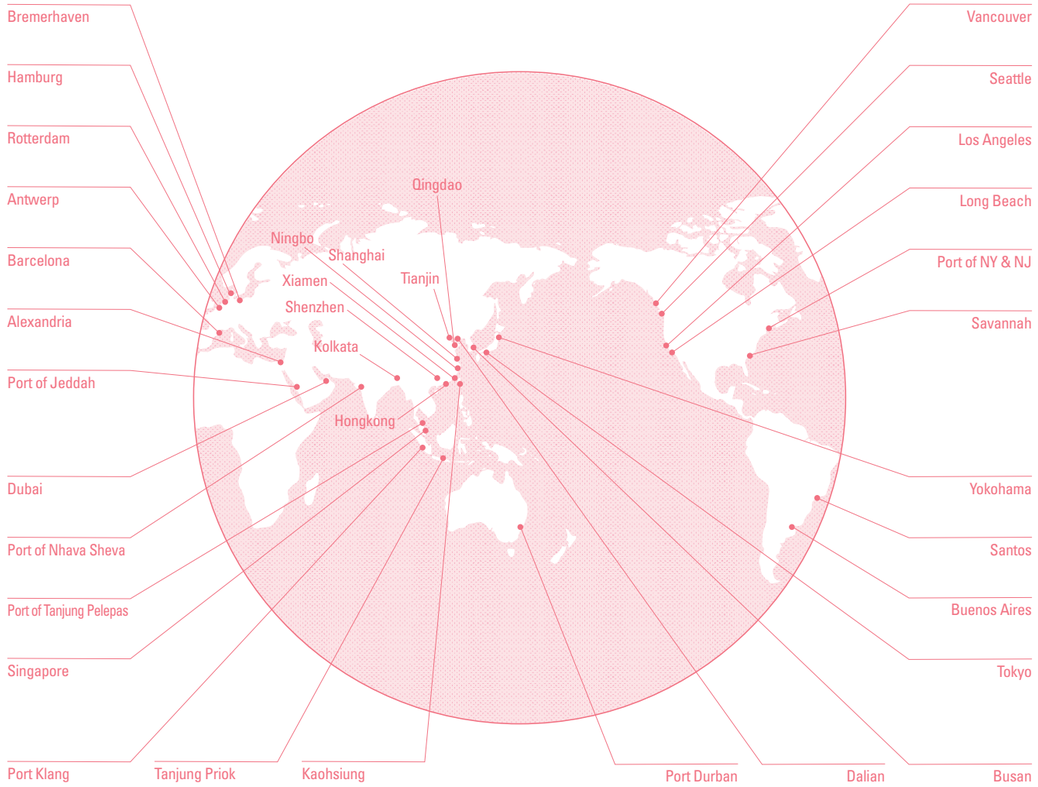
| | |
|---|---|
| CASE 1 | System + Supervision |
| CASE 2 | System + Engineering + Supervision |
| CASE 3 | System + Engineering + Materials installed (piping, steel outfitting, electricity) + Supervision |
| CASE 4 | System + Engineering + Materials installed (piping, steel outfitting, electricity)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





# Global Network

47 Global Service Networks in 37 Countries




### PANASIA CHINA Corp.



RM C-205, No.2080-50, Lianhua Rd,
Shanghai, China (201103)

T +86-21-6235-1601~3
E china@worldpanasia.com

### PANASIA JAPAN Corp.



NO.600, Osaka Ekimae Dai.3
Building 6F, 1-1-3, Umeda, Kita-ku, Osaka,
Japan (530-0001)

T +81-6-4795-8748
E japan@worldpanasia.com

### PANASIA EUROPE B.V.



Rivium 3e Straat 25a, 2909 LH,
Capelle aan den IJssel, Netherlands

T +31-10-79-53-005
E europe@worldpanasia.com

### PANASIA EM




55,Mieumsandan 3-ro, Gangseo-gu, Busan
South Korea(46744)

T +82-70-4860-8075
F +82-70-4860-7984
E panasiaem@worldpanasiaem.com
Contact. Mr. James Han

PANASIA


| | |
|---|---|
| HEAD OFFICE&FACTORY | 55, Mieumsandan3-ro, Gangseo-gu, Busan, 46744, Korea<br>TEL: +82-51-831-1010 FAX: +82-70-4369-3701<br>www.worldpanasia.com E-mail: marketing@worldpanasia.com |
| CHINA CORPORATION | RM C-205, No.2080-50, Lianhua Rd, Shanghai, China / Post Code : 201103<br>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<br>/ Post Code : 530-0001<br>TEL: +81-6-4795-8748 E-mail: japan@worldpanasia.com |
| EUROPE B.V. | Rivium 3e Straat 25a, 2909 LH Capelle aan den IJssel, Netherlands<br>TEL: +31-10-79-53-005 E-mail: europe@worldpanasia.com |
| PANASIA EM | 55,Mieumsandan 3-ro, Gangseo-gu, Busan South Korea(46744)<br>TEL: +82-70-4860-8075 FAX : +82-70-4860-7984<br>E-mail : panasiaem@worldpanasiaem.com |



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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.

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