

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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# SERVICE





SUCCE

AUTOMATICALLY CALIBRATE THE PINCH MOLD POSITION OF THE PRODUCTION / INC

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## Panasia Group\_ We are heading to the future with eco-friendly solutions

PANASIA is a green energy solution provider that leads the way in building a future in which humans and nature coexist.

At PANASIA, we are continuously working to take risks and develop technologies powered by nature based on the standards of nature across various areas, from the air solutions to the water solutions, and to our energy solutions.

We offer high-quality ICT-based products by adopting our unique "SMART PANASIA" system, which encompasses all processes from product planning to design, production, and to services, and allows our technologies to learn and evolve on their own.

With its core technologies and years of experience, PANASIA has become a global leader that uses its technology to respond to demands in various environmental areas.



WATER SOLUTIONS



Treatment System (UV type)

**AIR SOLUTIONS** 



De-SOx System (Scrubber)

**ENERGY SOLUTIONS** 

**EM SOLUTIONS** 



System



Alternative Maritime Power Amine Based Solvent System (AMP)





Measurement Control System



De-NOx System (SCR)



Hydrogen Generation Carbon Capture and storage System(CCS/OCCS)





WTS for Exhaust Gas System (Chemical / Membrane)



Engine Exhaust Recycling System (iCER)



Fuel Supply System (LNG/Ammonia/Methanol)

CO<sub>2</sub> Liquefaction System



N<sub>2</sub> Generator



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## **Creation with** the spirit 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.

## I 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.



- Developing technologies in the fields of Water solutions, Air solutions, and Energy solutions - 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

- 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

- 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



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## **Process**

**Design – Delivery Process** 





Product Review and Ordering

- Online AR & VR Exhibition

**Overall Planning and** Scheduling

- Advanced Planning and Scheduling System [APS]

(07)





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

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

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



- Maintenance and repair training

service that is available anytime,

Product Training

- E-learning Program

anywhere



Product Management

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

## 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.





**Robot Manufacturing** 



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



Material Management - Warehouse Management System [WMS]







After-Sales Service (A/S)

- Remote notifications of fault diagnosis and handling methods
- On-site visit



After-sales (A/S) Management

- Claim Handling Service [CHS] - Managing inspection results and
- handling outcome history



## Carbon Capture and Storage System (CCS)

**Energy Solutions** 

# Pan-ĈCS

Pan-CCS<sup>™</sup> (Carbon Capture and Storage System) 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.



## **Application**

## Pan-OĈCS

## Pan-ĈCS



for Ship Capacity 1 / 2 / 3 CO<sub>2</sub> ton/h ~ Purity 99.9% CO<sub>2</sub> feature Changing concentration of CO<sub>2</sub> Space limitation CCS for marine condition Load change of engine



for Industrial Plant Capacity 5 / 10 /15 CO<sub>2</sub> ton/h ~ Purity 99.9% CO<sub>2</sub> feature Large scale of CCS Long-term Stability Cost efficient



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for Hydrogen Generation System Capacity 80 / 200 / 400 CO<sub>2</sub> kg/h Purity 99.9% CO<sub>2</sub> feature High concentration of CO<sub>2</sub> Modular design High purity of CO<sub>2</sub>

## Main Components



## I Carbon Capture Diagram

#### • Pre-treatment of flue gas

Flue gas is cooled in the quenching tower. When the particles and sulfur oxide are removed, the gas is pressurized by the intake fan and transferred to the absorber tower.



## 8 Regeneration

A solvent that has absorbed  $CO_2$  is transferred to the stripper tower. The high-temperature vapor in the reboiler causes  $CO_2$ to be removed from the solvent. In the cooling tower, it breaks down into water and  $CO_2$ . Then, the water is recovered and sent to the stripper while  $CO_2$  is transferred to the liquefaction process.

#### **2** CO<sub>2</sub> absorption

Once cooled, the gas comes into contact with the chemical solvent in the absorber, and  $CO_2$  is selectively absorbed. To ensure efficient delivery of the substance and keep the tower size to a minimum, high-performance packing and an appropriate layout of the internal components are required.

#### **4** Liquefaction & storage

Adding pressure and cooling for liquefaction purposes to meet the needs of storage containers and buyers.

## **Fuel Supply System**

**Energy Solutions** 

## PanFGSS

device that vaporizes alternative energy such it to the ship engine.

· Natural Gas Fuel Supply System · Methanol Fuel Supply System · Ammonia Fuel Supply System



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## **I** Natural Gas Fuel Supply System

## 1. HP/LP Type



- HP Pump Dis. Press. 300 bar reciprocating pump X 2 sets • LNG Feed Pump Dis. Press 12 bar submersible centrifugal
  - type pump X 2 sets
- LP Vaporizer Temp:  $-163^{\circ}C \rightarrow 45^{\circ}C$  (Cold side)
- **HP Vaporizer** Temp:  $-163^{\circ}C \rightarrow 45^{\circ}C$  (Cold side)
- Glycol Skid Glycol Water (Water 50 : Glycol 50) Glycol Water Pump : Vertical Inline Centrifugal type X 2 sets Heat Exchanger : Shell&Tube or Equivalent Glycol Water Tank : abt. 0.5 m<sup>3</sup>
- LNG Storage Tank IMO Type-C Single Shell Tank IMO Type-C Double Shell Tank IMO Type-C Lattice Tank Material 9% Nickel Steel or Equivalent

## 2. LP Type



- LNG Feed Pump Dis. Press 18 bar submersible centrifugal type pump X 2 sets
- LP Vaporizer Temp:  $-163^{\circ}C \rightarrow 45^{\circ}C$  (Cold side)
- Glycol Skid Glycol Water (Water 50 : Glycol 50) Glycol Water Pump : Vertical Inline Centrifugal type X 2 sets Heat Exchanger : Shell&Tube or Equivalent Glycol Water Tank : abt. 0.5 m<sup>3</sup>
- LNG Storage Tank IMO Type-C Single Shell Tank IMO Type-C Double Shell Tank IMO Type-C Lattice Tank Material 9% Nickel Steel or Equivalent
- LP BOG Comp. Injected Screw Type (16 bar) X 1 set

## Methanol Fuel Supply System





#### Reference



13 ± 0.5 bar Value



Fuel Heater

G/E+G.W LINE SKID





M/E LINE SKID

Fuel Filter Fuel Strainer Fuel Pipe Material Main Frame Material

Methanol Supply Pump

Fuel Heater



# Glycol water system

N<sub>2</sub> Purge & Drain System

ONE SKID

Safety Automation

## Ammonia Fuel Supply System

#### Design Data

- LP Pump Dis. Press. 18 bar Multi-stage centr. Pump X 1 set
- HP Pump Dis. Press. 88 bar Metering Pump X 1 set
- BOG Compressor Dis. Press. 18 bar Oil Injection Screw Water Cooled X 1 set
- **Vaporizer** Temp: -24°C → -18.7°C
- Water seal Temp: -24°C → 60°C
- NH<sub>3</sub> Supply Skid IMO Type-C Single Shell Tank. (abt. 5m<sup>3</sup>) Material 9% Nickel Steel or Equivalent LP, HP Pump
- Heat Exchanger Shell&Tube or Equivalent
- · NH<sub>3</sub> Liquefaction Skid BOG Compressor & Seperator
- NH<sub>3</sub> Dilution Skid, NH<sub>3</sub> Catch Skid IMO Type-C Single Shell Tank. (abt. 5m<sup>3</sup>)
- Heat Exchanger Shell&Tube or Equivalent
- Aqueous NH<sub>3</sub> Pump Dis. Press 7 bar Diaphragm pump X 1 set

	Temperature to engine	Inert Gas Used	Heating Media	Cooling/Heating Water	ATEX Classification
g	25 ~ 50 °C	Nitrogen	Glycol Water (25wt.%)	L.T.C.F.W(36°C)	Zone 1

#### **Propulsion Engine Fuel Supply Application**

Dis. Press. 6 bar.g / Sealless VFD Control Dis. Press. 13 bar.g (Diff. Head 71 m) / Sealless VFD Control Temp : -18 deg.C -> 25 deg.C / Glycol water 25~40%wt. Shell & Plate or Equivalent Duplex / 10 micron 100 micron Austenite Stainless Steel (A213-TP316)

#### **Generator Engine Fuel Supply Application**

Dis. Press. 8 bar.g / Sealless VFD Control Temp : -18 deg.C -> 25 deg.C / Glycol water 25~40%wt. Shell & Plate or Fauivalent Duplex / 10 micron Y Strainer / 100 micron Austenite Stainless Steel (A213-TP316) SS400 or eq.

#### **Common Utility System for MeOH LFSS**

Vertical Inline Centifugal x 2 set Medium : Glycol water 25~40%wt. / LT water (36 deg.C) Glycol water tank : abt. 0.5 m3 N<sub>2</sub> Supply train with valve (Automatic Purge system as an option) Penumatic acting drain pump : 60LPM / Drainage level control buffer Leak Detection Sensor (LEL 25% H/C) Control Panel & HMI





## **Hydrogen Generation System**

**Energy Solutions** 

# PanaĠen



## **I** Application

### for Houses(Small-capacity)



1~300 Nm³/hr Capacity Purity 75% ~ 99.999% H<sub>2</sub> SMR / Membrane Туре Purification PrOx / Membrane / PSA method

## for Ship



100/150/300 Nm³/hr Capacity Purity 99.999% H<sub>2</sub> SMR / Membrane Туре **Purification** PSA / Membrane method

## for Industrial Plant



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

## **I** Ammonia Cracking Hydrogen Generation System

System Flow (PSA include)







Feed Gas	Pressure
Methane (Biogas and etc)	9.5 bar.g

	1 E	
Capacity	H <sub>2</sub> Purity	Pressure
Customized	99.999%	6 bar.g

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## Energy Solutions

## **Alternative Maritime Power System** (AMP)

AMP (Alternative Maritime Power) is a facility shore while they are docked in port without using generator engines.

ship engines during docking, resulting in fuel

## | AMP Cable Reel (Cable Management System)



## Features

- Encoder + inverter control enables cable automatic tension control
- AMP Cable tensile strength is **11,100N**
- Use **TPU (Thermoplastic Polyurethane)** for AMP cable outer sheath material
- AMP cable is non-hygroscopic and resistant to oil, SEA AIR & SEA WATER, UV and Ozone.



## **I AMP System Application**

## 1. Cable Reel Type



## 2. Socket Box Type



## 3. Fixed Container Type



## 4. Movable Container Type



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## **De-SOx Scrubber System**

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

## 

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.

**Product** Line-up PANASIA's PaSOx<sup>™</sup> provides a customized solution made for various applications, regardless of the plant size, the type or size/shape of the ship.



Main Components

Water Treatment Unit

WATERCOMMANDER





Water Monitoring System



Gas Monitoring System





# **PaNDX**<sup>™</sup>smart

PANASIA's De-NOx SCR system PaNOx<sup>™</sup> is an eco-friendly solution that uses the Selective Catalytic Reduction mechanism (SCR system) to decompose nitrogen oxides from exhaust gas into harmless water  $(H_nO)$ and nitrogen (N<sub>2</sub>) and releases them. We offer PaNOx<sup>™</sup> 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**

**PaNDx**<sup>™</sup>smart

PaNOx<sup>™</sup> 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

Boile

**Main Components** 

V2 / Reactor + Mixer + Control Panel + IDU V3 / Reactor + Mixer + PanSIS (KR+ABS Type Approval)

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.



## **De-NOx SCR System**



## 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

V1 / Reactor + Mixer + Pump Unit + Dosing Control Unit + Control Panel





**Exhaust Gas Cooler for WinGD iCER** (Intelligent Control by **Exhaust Recycling)** 

Air Solutions

iCER (Intelligent Control by Exhaust Recycling) is aimed at minimizing recirculating exhaust gas back to the engine, more emissions are combusted before they enter the atmosphere.

of at least 3% in energy consumption, diesel mode experiencing a 5% decrease in fuel consumption, and up to a 50% reduction in methane slip.



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	Wash water Discharge Crit
Dischargo	Oil content of the b
Discharge	< 15 pp
Discharge	< 15 p

## System Overview



\* Source : ADD MORE CERTAINTY TO YOUR FUTURE for WinGD

## **Composition**

Treatment Capacity: 3 / 6 / 9 / 12 m<sup>3</sup>/h



## Water Treatment Method



## Water Treatment System (for EGR, for iCER)

#### teria

ed-off water



# **Backwash Process**



## Water Treatment System

## **Measurement & Control System**



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.

I Product Line-up		01	02
		Cargo monitoring <ul> <li>Radar beam type</li> <li>Magnetic float type</li> </ul>	High & overfill alarm · Magnetic float type
03 <b>Tank level &amp; draft gauging</b> • Air purge type / Electric pneumatic type • Electric pressure type	04 Vapour emission control	05 Fixed gas detection	06 Water ingress alarm
07	00	00	40
07 Pressure / Temperature monitoring	08 Bilge high level alarm	Local level gauge / Switch	Pressure switch / Temperature sensor / Pressure transmitter

## **Gl**eEn-Patrol





## I Main Components





PANASIA

of just selling products. We offer unique services aimed at

to our retrofit service using our advanced technology.

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## RETROFIT **Service**

## PANASIA's Retrofit Service guarantees the best performance

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, amo ng, installation, materials, and instal you get to choose only those that require

#### **Our Services**

Retrofit

4 Types of

**Contract Cases** 

**Contract Cases** 

## Equipment

- · BWTS Equipment
- SCRUBBER Equipme
- · Commissioning

## **Material Supply**

- · Steel Structures
- · Pipe Spools
- CASE 1 CASE 2 CASE 3 CASE 4

- 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







**PANASIA SMART** 

puts our customers first

**SERVICE** 

- · Demonstration

- Installation Materials
- · Cables



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

	Engineering	Design
nt	<ul> <li>Onboard Survey</li> <li>Basic Design</li> <li>Owner / Class Plan Approval</li> <li>Interface with Existing Automation System</li> </ul>	Installation Drawing     Manufacturing Drawing
	Installation Work	Supervision
	Pipe Spools Installation	Schedule Control

· Laying & Connection Cables

## · Quallity Control

Instruction to Workers

#### ystem + Supervision

System + Engineering + Supervision

System + Engineering + Materials installed (piping, steel outfitting, electrical) + Supervision

ystem + Engineering + Materials installed (piping, steel outfitting, electrical) + Installation + Supervision



## 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**



## GloEn-Patrol<sup>™</sup> Learning Program Contents

Chapter	Contents	
1	Introduction of GloEn-Patrol <sup>™</sup> 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	

#### CBT (Computer Based Training 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.

### **Pasox**<sup>\*</sup> smart</sup> 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

#### IBT (Internet Based Training Program)



#### Services

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.

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## **MRO Service Integrated Control System**

Pan MSCS SMART CONTROL CENTER

## 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



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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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