



**COMPLIANT SOLUTIONS TO MEET THE  
EMISSION CHALLENGES OF THE FUTURE**







# THE NEW NAME IN WORLD CLASS EGC SYSTEMS

**After shareholder changes, raising significant capital and under new leadership, Feen Marine Scrubbers Inc. has become FMSI.**

A new name, but as a global top 10 EGCS manufacturer, FMSI is the established, superior brand you can trust.

Some of the world's largest shipping and trading companies, including Frontline, Navig8 Group and Trafigura have chosen FMSI as their EGCS partner. Recent investment by shareholders, including Frontline, highlights the long-term confidence in, and commitment to, our high quality scrubber systems.

FMSI designs, manufactures, commissions and services exhaust gas cleaning systems to meet the evolving environmental, technical and regulatory needs of the maritime industry.

Our marine heritage spans more than two decades, and we are committed to pioneering new systems to help clients remain compliant. EGC systems are produced at our new, state-of-the-art facility in Batam.

This is just a summary of our services. We look forward to discussing the needs of your vessels in detail.

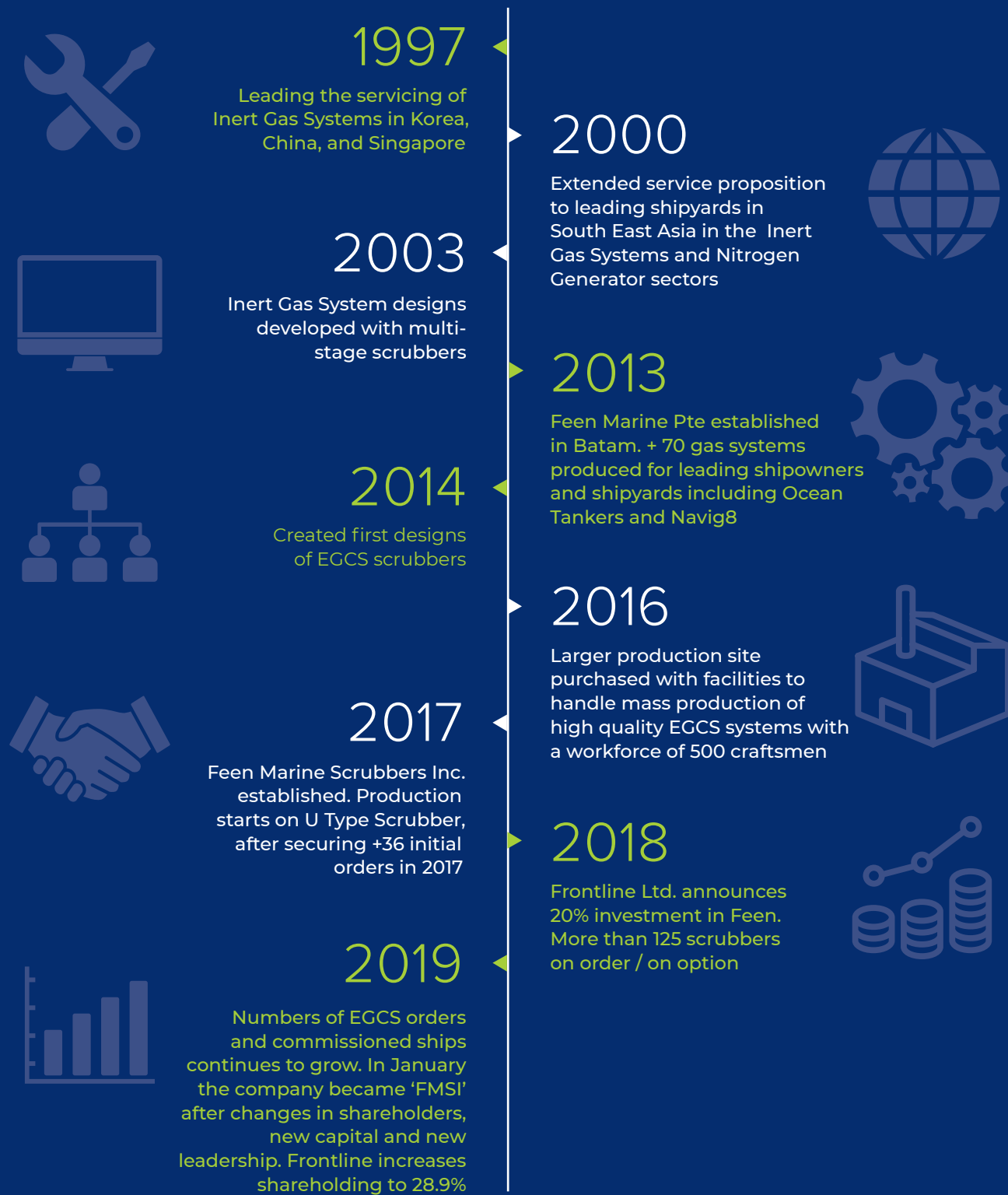
- GLOBAL TOP 10 EGCS PRODUCER
- SIGNIFICANT CAPACITY
- FAST DELIVERY TIMEFRAMES
- GLOBAL AFTER SALES SERVICE
- FIRST CLASS QUALITY





# OUR +20 YEAR MARINE HERITAGE

Pioneering and managing marine gas systems since 1997



"FMSI has gained market share since our initial investment, and we are pleased to see our ownership stake in the company increase. Setting aside potential financial benefits, our ownership in FMSI has allowed Frontline to source high specification scrubbers on short notice, which we believe will present a challenge to many owners as the deadline for sulphur emissions compliance approaches."

– Frontline Ltd, January 2019

# OUR EGCS EXPERIENCE

**Whilst EGC systems are relatively new for the broader shipping market, our engineering expertise is long-standing.**

We are an Original Equipment Manufacturer, proud of our origins in Inert Gas Systems (IGS) and Inert Gas Generators (IGG). We understand ships, their operating systems and the time / cost pressures that owners face.

The knowledge gained from IGS and IGG products has enabled us to pioneer new Exhaust Gas Cleaning Systems that are simple, flexible and cost effective. We develop Open Loop and Hybrid Ready systems that meet the evolving needs of our customers in a changing regulatory environment. We create systems for retrofit and new build vessels.

With our history of innovation, reliability and high quality manufacturing, FMSI is acknowledged as the go-to innovator for exhaust gas systems.

**Our +20 year heritage has built a trusted global network for after sales and service support.**

## AT THE FOREFRONT OF EGCS DEVELOPMENT

- Heritage of engineering innovation
- Fast manufacturing & delivery timeframes
- Comprehensive turnkey solution
- Highest quality products and materials
- Skilled craftsmen, experienced managers
- Committed after sales and parts service
- Customer trust and loyalty

## FLEXIBLE DESIGN

- To meet the regulatory and environmental needs of the future
- Can be scaled to fit space available and working practices

## INTEGRATED ON-SITE SERVICE

- Single site facility, with easy access
- One location ensures a cohesive production and management approach

## ONGOING GLOBAL SUPPORT

- Flexible maintenance plans
- Crew training
- Global servicing and parts service
- Comprehensive warranties

## COMPLIANT AND SAFE

- Approved systems, compliant with IMO regulations
- Proven to reduce sulphur emissions to 0.1%
- Reduces SOx and particulate matters

## HIGH QUALITY YET SIMPLE

- First class quality materials and craftsmanship
- Small scale footprint reduces installation logistics and costs
- Design simplicity means reliability - to reduce OPEX and maintenance
- Easy to operate

## COST EFFECTIVE AND FAST

- Payback can be months, depending on vessel type, trading pattern and fuel cost fluctuations
- Minimal downtime
- Short delivery timescales (3-5 months)



“

**DELIVERY** TIMEFRAMES  
OF **THREE** TO **FIVE** MONTHS

”

## SIGNIFICANT **CAPACITY** AT OUR **EXPANDED FACILITY**

FMSI operates at our state-of-the-art facilities in Batam, Indonesia. Currently under expansion to increase production capacity, the fully integrated manufacturing complex houses management, design, procurement, manufacturing and servicing in one location.

The 40,000m.sq facility enables significant output of our exhaust gas systems, supported by our skilled workforce of more than 500. We have R&D and sales representatives worldwide and customers are supported by a global service network.

Batam's location offers easy access for vessels and our logistics network. Such geographical proximity to our customer markets helps timely delivery of our products and after sales service.

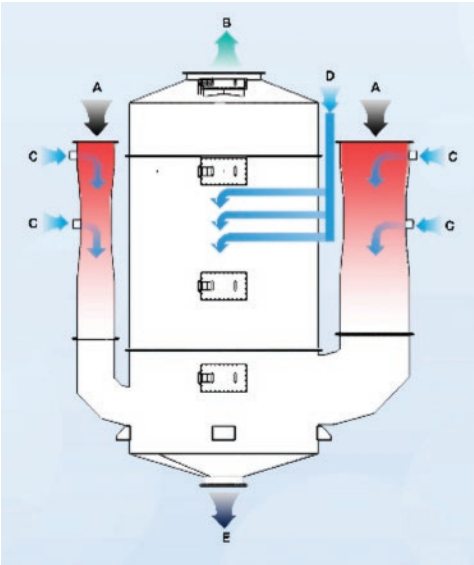
267m

150m



# U-TYPE EXHAUST GAS CLEANING SYSTEM

REDUCTION IN SULPHUR CONTENT FROM 3.5% TO 0.1%



A. Gas Inlet  
B. Gas Outlet  
C. Sea Water Inlet Cooling  
D. Sea Water Inlet Cleaning  
E. Discharge Water

The U Type EGCS is designed to comply with IMO resolution MEPC 259 (68) Scheme B (continuous emissions monitoring and parameter checks). The SO<sub>2</sub> reduction efficiency of our scrubbers corresponds to a reduction in fuel sulphur content from 3.50% to 0.1% - exceeding the required level of compliance with the global cap of 0.5%.

The system uses open loop wet scrubber technology with exhaust by-pass functionality. The overall system has been designed to minimise:

- Power consumption
- Pressure drop
- General maintenance requirements

The scrubber unit is designed with as few internal parts as possible to meet emission level limits to air and sea. They incorporate the following design and operational features:

### QUALITY MATERIALS

High quality material sourced from leading European and US suppliers

### QUALITY SYSTEMS

Production in accordance with ISO standards

### CRAFTSMANSHIP

Design team supported by an in house developed production team

### FLEXIBLE DESIGN

EGCS units tailored to all vessel sizes with open and hybrid ready versions suitable for newbuilding or retrofits

### MULTI-SETTINGS

Flexibility to achieve 0.5% or 0.1% Sulphur elimination during operation

### ALLSTREAM DESIGN

Single scrubber for all exhaust from main engine, auxiliary engines and boilers

### OPTIMALLY SIZED

Reduced installation costs and space allocation

### SIMPLICITY

No 'moving parts' or critical process parameter to control

### USER FRIENDLY

Operation aligned to reducing complexity and crew intervention

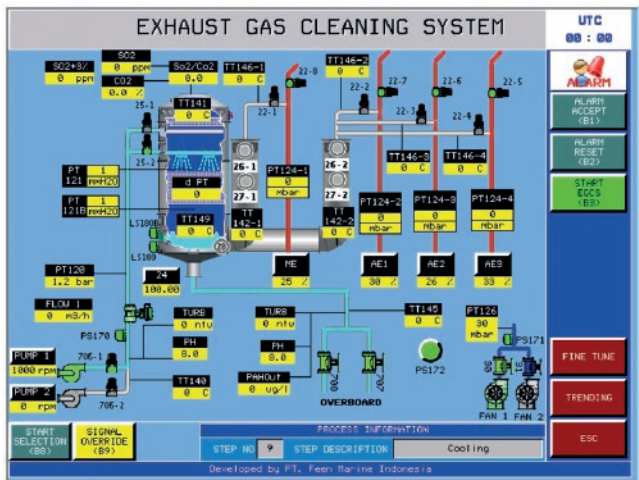
### ENDURING

Built to last the life of the ship

## PERFORMANCE DATA

Emissions to air	
SO <sub>2</sub> eq. Exhaust Gas	0.1% ECA mode
Emissions to sea (Process water)	
pH	Min 6.5 (min) 4 meter from discharge overboard
Turbidity ( outl - inlet)	25 NTU (max)
PAH ( outl - inlet)	50 ug/L (max)
Outlet temperature	5-10°C above seawater temperature

## CONTROL SYSTEM



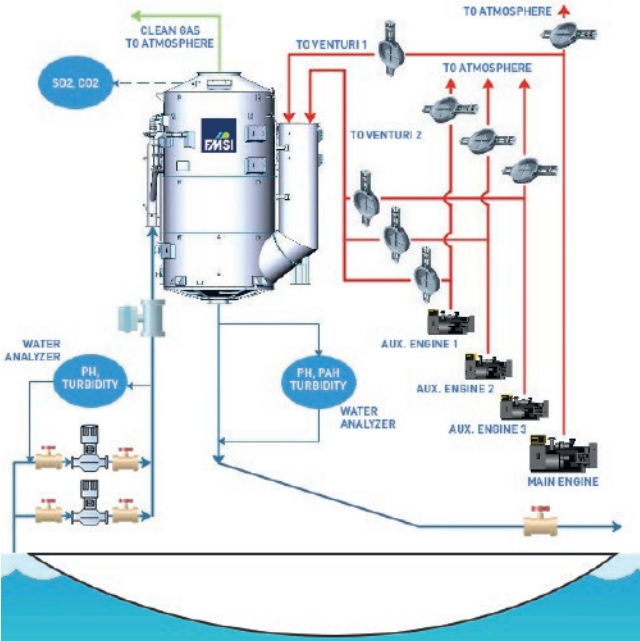
The EGCS is delivered with a PLC based control system (Programmable Logic Controlled) which manages all functionality and provides data logging and storage requirements.

The control system is fully automated with a simple layout. It can be operated and monitored from multiple locations.

Local and ECR HMIs can be used to operate the system and the WH unit is used for monitoring. The control system is designed to be simple and easy to manage. The system can be started and stopped with just one press of a button on the HMI touchscreen.

Should the PLC break down, the control system can be operated manually by given procedures with a hardware interlocking alarm.

## SYSTEM LAYOUT



## DESIGN PARAMETERS

Sea water inlet strainer	Max 5 mm
Sea water flow rate	1500 m <sup>3</sup> /h
Ambient Temperature Outdoor	-18 °C to +45 °C, 95% RH
Ambient Temperature S Room	0 °C to +45 °C, 95% RH
Instrument Air	DIN/ISO 8573-1
Supply voltage	440 V/3phase/60Hz
Control voltage	220 V/1 phase/60Hz
Voltage variance	-15%/+10%
Pressure Drop Over Scrubber assembly	150 mmWC (max)
Sulphur content HFO	Max 3,5 %
SO <sub>2</sub> eq. exhaust gas	0,1 % ECA Mode
Gas Temperature Inlet Scrubber assembly	400 °C
Gas Temperature Outlet Scrubber	Max 10 °C above seawater inlet
Max Seawater Temperature	32 °C
Exhaust gas mass flow	20,000 to 600,000 kg/hr*
Alkalinity of the seawater	2200 µmol/l

\*Larger Gas Flow sizes can be made available subject to available space and power

THIS IS JUST A SUMMARY OF OUR SYSTEM. PLEASE CONTACT US TO DISCUSS YOUR VESSEL'S SPECIFIC REQUIREMENTS.



# EXHAUST GAS SYSTEMS FOR THE MARITIME WORLD



## CONTACT US

We have a global network of sales representatives.  
Please contact us via [sales@FMSIservices.com](mailto:sales@FMSIservices.com)

## MANUFACTURING FACILITY

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