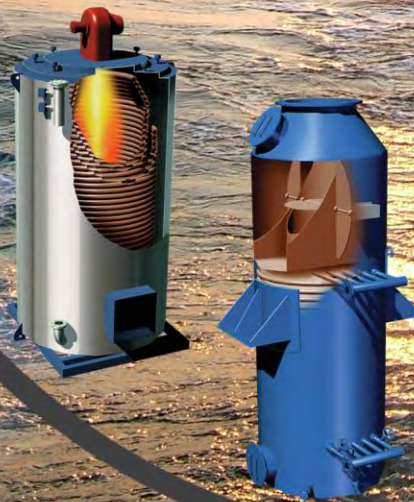



**HEAT TRANSFER & NO<sub>x</sub> REDUCTION SYSTEMS**





WE HAVE MORE THAN  
45 YEARS OF EXPERIENCE  
IN DELIVERING HEATING  
SYSTEMS FOR MARINE  
APPLICATIONS.

WE CUSTOMIZE HEATING  
SOLUTIONS FOR VARIOUS  
TYPES OF VESSELS  
ACCORDING TO THE  
CLIENTS DEMAND.

**GESAB**  
*Heat transfer & NO<sub>x</sub> reduction systems*

- ▶ **GESAB is a private owned company founded in Göteborg, Sweden in 1987.**

## **GESAB group consists of:**

- ▶ GESAB, Göteborg, Sweden (HQ, Sales, Engineering & manufacturing)
- ▶ HTI-GESAB Ellerau, Germany (Sales, Engineering & manufacturing)
- ▶ GESAB, Frauenfeld, Switzerland (Sales & Engineering)
- ▶ GESAB Shanghai, China (Sales & Engineering)
- ▶ GESAB Emission Systems, Sanjie China (Engineering & manufacturing)
- ▶ Total numbers of employees in group: 85 persons
- ▶ Total revenues of group: EURO 15M
- ▶ Total supplied systems since start: Abt 1.500

# Production plants



**GESAB Göteborg**



**GESAB Shaoxing**



**HTI-GESAB Germany**



## Heating Systems

Thermal Oil Systems

Hot Water Systems

Steam systems

## Inert Gas Systems

Inert Gas Boiler/  
Generator

## NOx Reduction Systems

SCR

Catamiser®

SCR & Silencer

SCR Multi Engines

# Sales Areas





**CATAMISER®**  
Catamiser® is a combined SCR reactor and Economiser. The unit will meet future NO requirements according to IMO Tier III and makes the engine system more efficient.

**EXHAUST GAS HEATERS (Economiser)**  
The exhaust gas heater transfers energy from the flue gases to the heat carrying thermal fluid.

## GESAB THERMAL FLUID HEATING SYSTEM IS PROVEN TO BE ONE OF THE MOST EFFICIENT SYSTEMS FOR MARINE AND INDUSTRIAL USE

**THERMAL FLUID HEATERS**  
The thermal fluid heaters are built according to the classification societies' pressure vessel regulations. The heater is designed as a radiating heater with a succeeding convector heating surface and constructed as a triple-pass flue gas system.

**ACCOMMODATION HEATING**  
Tailor made accommodation heaters provide the optimal indoor climate for personnel and equipment.

**SCR (Selective Catalytic Reduction)**  
SCR system reduces NO<sub>x</sub> emissions from Diesel engine exhaust gases.

**BUNKERS HEATING**  
Heating coils of smooth or fin tube types provide well heated fuel for reliable and economic operations in all waters and climate.

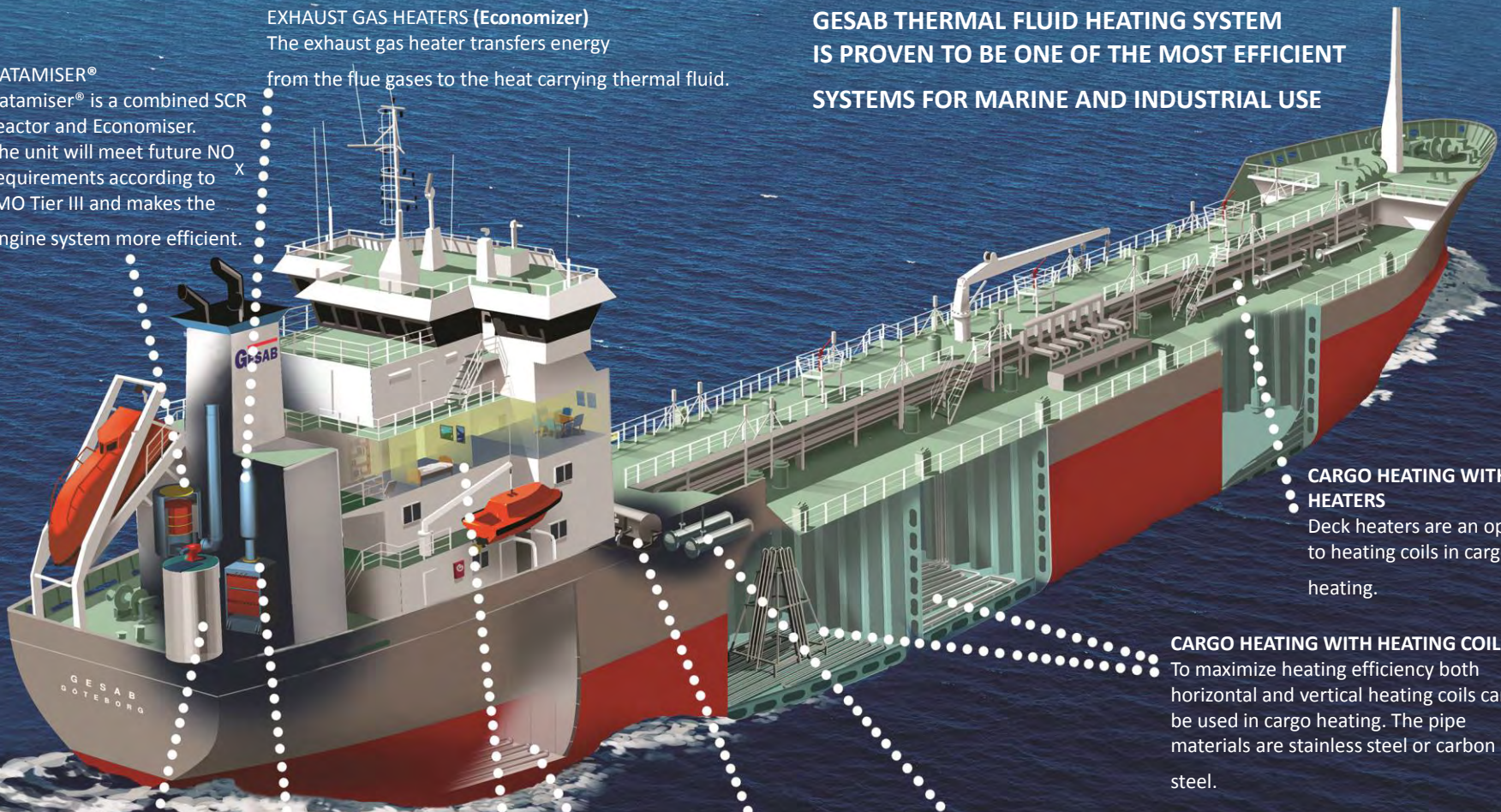
**STEAM GENERATORS**  
Steam generator for cargo tank cleaning.

**HEATING OF TANK WASHING SYSTEM**  
The Butterworth heaters feed fixed and mobile washing machines for cargo tank cleaning. The operation is usually designed based on maximum utilization of the heating system.

**CARGO HEATING WITH HEATING COILS**  
To maximize heating efficiency both horizontal and vertical heating coils can be used in cargo heating. The pipe materials are stainless steel or carbon steel.

**CARGO HEATING WITH DECK HEATERS**  
Deck heaters are an option to heating coils in cargo heating.

- EASY TO OPERATE AND CONTROL
- CONSIDERABLY REDUCED MAINTENANCE
- EXTENDED LIFE SPAN
- ENVIRONMENTALLY SAFE
- REDUCED HEATING COSTS
- NO CORROSION DAMAGES
- HIGH HEATING TEMPERATURE WITHOUT EXCESS PRESSURE





## Typical components

- ▶ Fired Heaters
- ▶ Exhaust gas heater (Economizer)
- ▶ Overcapacity control of the exhaust gas heater (Economizer)
- ▶ Circulating pump(s)
- ▶ Expansion tank
- ▶ Deaerator tank
- ▶ Flow control unit (by-pass)
- ▶ Control panel
- ▶ Consumers (tanks, pre-heaters, accommodation heaters)

# Thermal Fluid Heater

**Capacities: 100 kW – 20.000 kW**

- 1** Oil/Gas Burner
- 2** Combustion Chamber
- 3** Heating Coil Section
- 4** Flue Gas Passes
- 5** Exhaust Gas Outlet
- 6** Thermal Fluid Inlet
- 7** Thermal Fluid Outlet

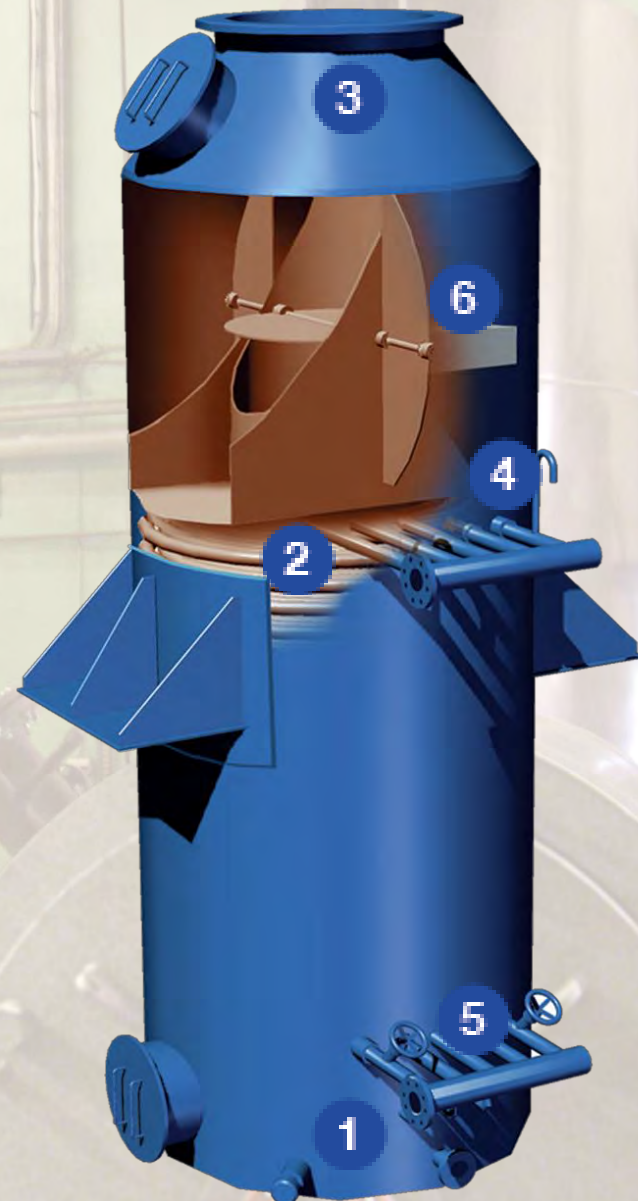


# Exhaust Gas Heater (Economizer)

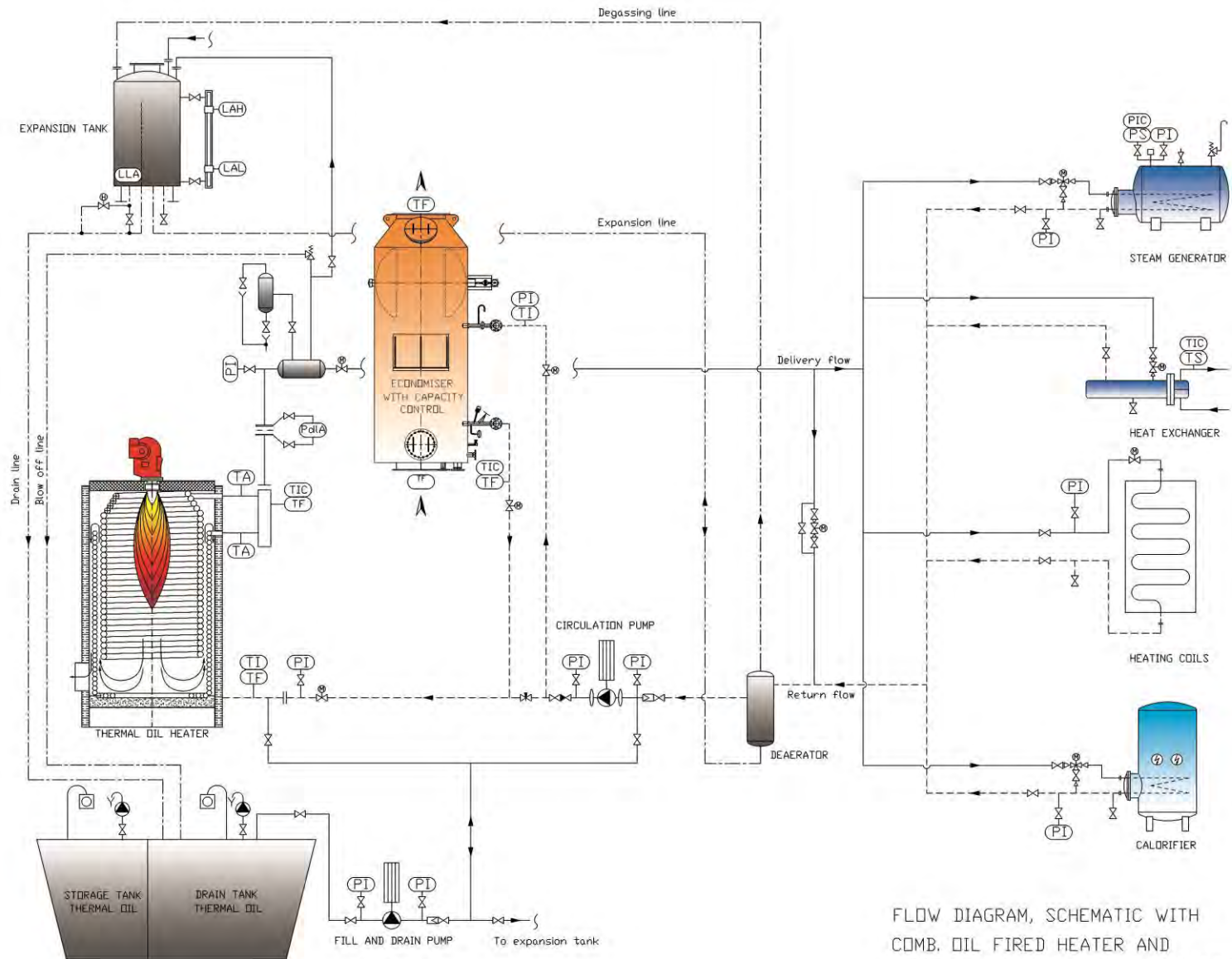


Capacities: 100 kW – 5.000 kW

- 1 Exhaust Gas Inlet
- 2 Heating Coil Section
- 3 Exhaust Gas Outlet
- 4 Thermal Fluid Inlet
- 5 Thermal Fluid Outlet
- 6 Bypass Damper/Temperature Regulating



# Exhaust Gas Heater P&ID



FLOW DIAGRAM, SCHEMATIC WITH COMB. OIL FIRED HEATER AND EXHAUST GAS HEATER (ECONOMISER)

# Electric Fluid Heater



**Capacities: 10 kW – 3.000 kW**

- ▶ Electric Heater – Thermal Oil
- ▶ Electric Heater – Hot Water
- ▶ Electric Heater – Steam
- ▶ Can be supplied as Skid unit or loose



# Heating Coils & Cargo Heaters



Heating Coil panels with Towers typical for high temperature requirements



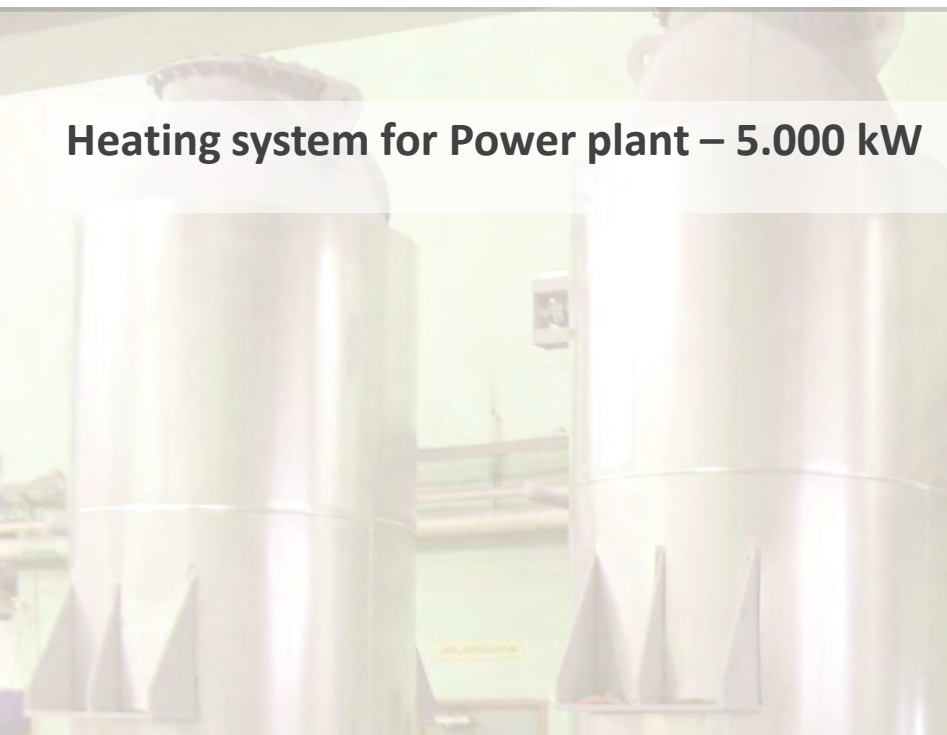
Cargo Heater (Deck Heater) in stainless steel material



# Container installations



Heating system for Power plant – 5.000 kW



Mobile Heating system for barges – 1.000 kW



# Skid installations

Thermal Oil Heater Skid – 350 kW



Natural Gas Fired Heater w. Economizer – 4.000 kW



# Heating system accessories



*Fig: Pump Unit Horizontal Circ Pumps*



*Fig: Horizontal Steam Generator*



*Fig: Pump Unit Vertical in-line Circ Pumps*



*Fig: Typical Control Cabinet*

# Heating system accessories



Pressure Jet Burner  
MGO/MDO/HFO

Rotary Cup Burner  
HFO/Sludge



Dual Fuel Burner LNG/Oil with  
Gas Valve Unit (GVU)

# Heating system accessories



Calorifier



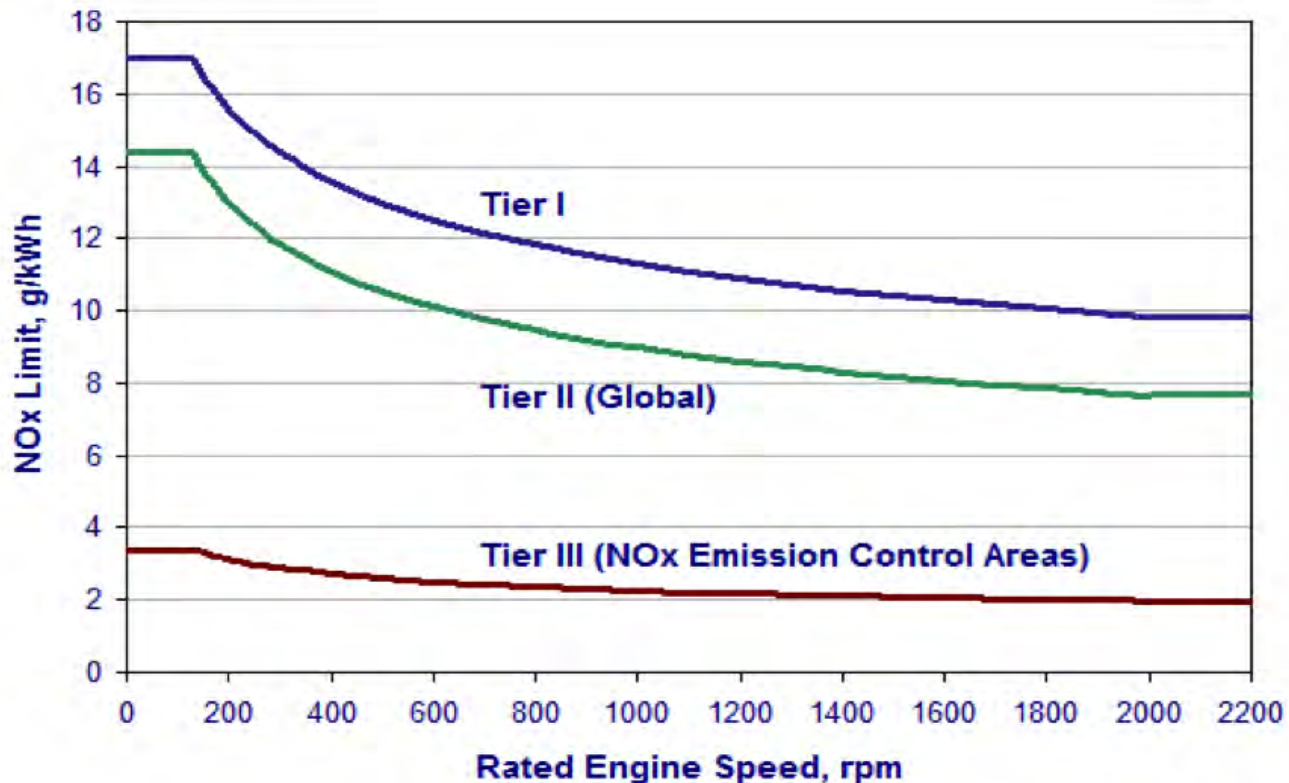
Plate heat-exchanger



Shell and Tube heat-exchanger

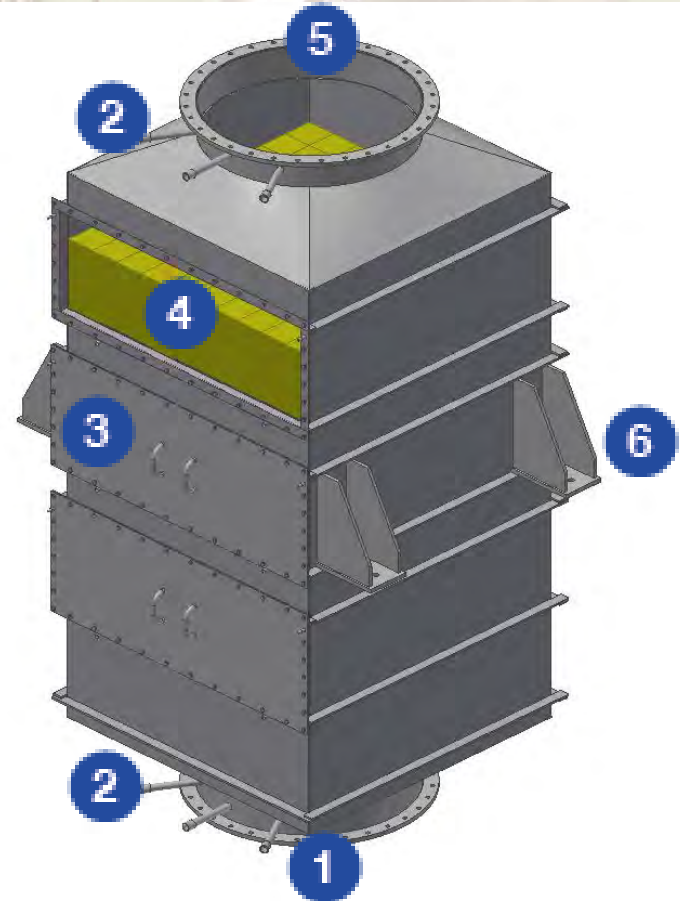
# Selective Catalytic Reduction (SCR)

- ▶ The third stage of the International Maritime Organization emissions regulations, “IMO Tier III” is planned for 2016 and can be achieved with a SCR system.
- ▶ IMO Tier III represents approximately a 75% reduction in NO<sub>x</sub> from Tier II and applies to vessels traveling in Emission Control Areas (ECA).



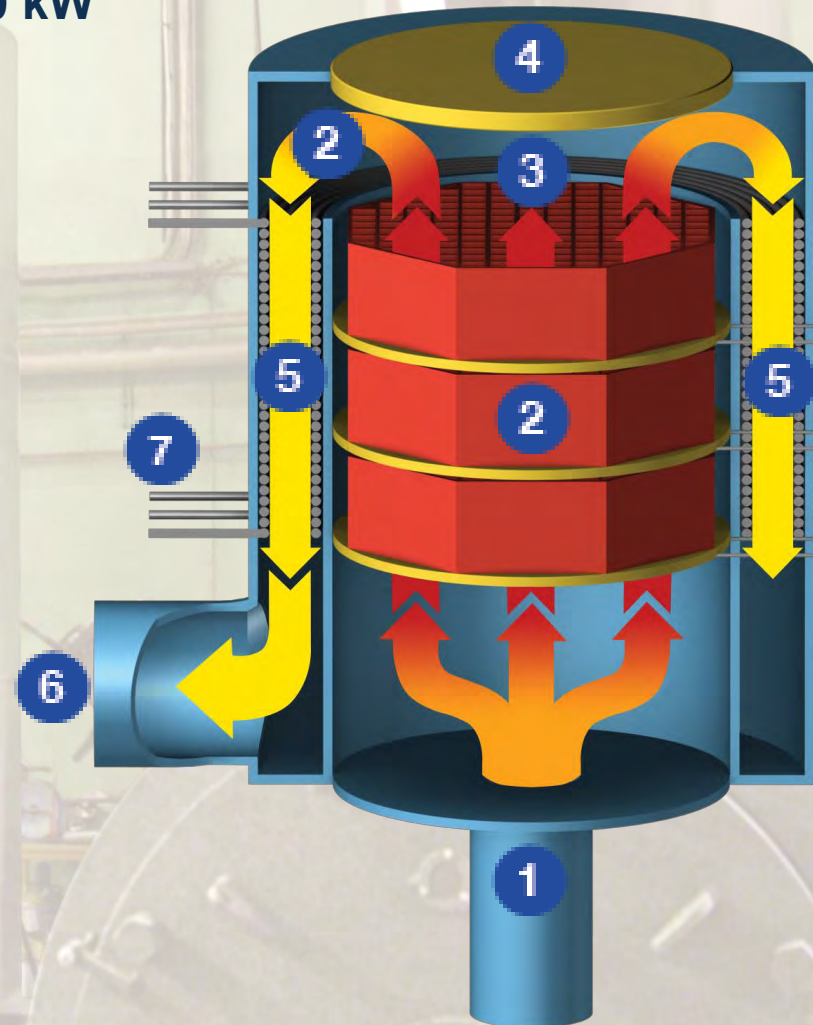
Engine power: 400 kW – 12.600 kW

- 1 Exhaust Gas Inlet
- 2 Gauge connections
- 3 Service hatch
- 4 SCR Catalyst
- 5 Exhaust Gas outlet
- 6 Support



Capacities: Engine Power 500 kW – 9.000 kW  
Heat Power 120 kW – 1.200 kW

- 1 Exhaust Gas Inlet
- 2 SCR Catalyst
- 3 Turning chamber
- 4 Service hatch
- 5 Heating Coil Section
- 6 Exhaust Gas Outlet
- 7 Soot Blowing (Option)



- ▶ Reduce NOx emissions to < 2 g/kWh (IMO Tier III)
- ▶ Waste heat recovery of up to 25% of engine power
- ▶ Integrated silencer in Catamiser® (turning chamber)
- ▶ Type Approval from DNV
- ▶ Catamiser® is a registered Trademark by GESAB

## Advantages of Combined unit:

- ▶ **Cost of a combined unit is less than of two separate units**
- ▶ **Weight will be approximately 35% less and requires significantly less installation space than a conventional installation**
- ▶ **Service and maintenance on Economiser and SCR-unit can be carried out at the same time – more cost effective**



## Catamiser® - Silencer performance

- ▶ Extensive Catamiser® attenuation measurements has been performed
- ▶ Catamiser® was compared with a 30 dB silencer
- ▶ Catamiser® performance was better on low frequencies (50-600 Hz) and equal on high frequencies (600-2500 Hz)
- ▶ Possible to further improve attenuation

## Catamiser® - Heat recovery performance

- ▶ Heat recovery from Main or Auxiliary exhaust gases leads to lower fuel consumption\* and thereby lower CO<sub>2</sub>, SO<sub>x</sub>, NO<sub>x</sub>, PM and HC emissions
- ▶ NO<sub>x</sub> reducing SCR => ~90 % reduction of remaining NO<sub>x</sub> emissions

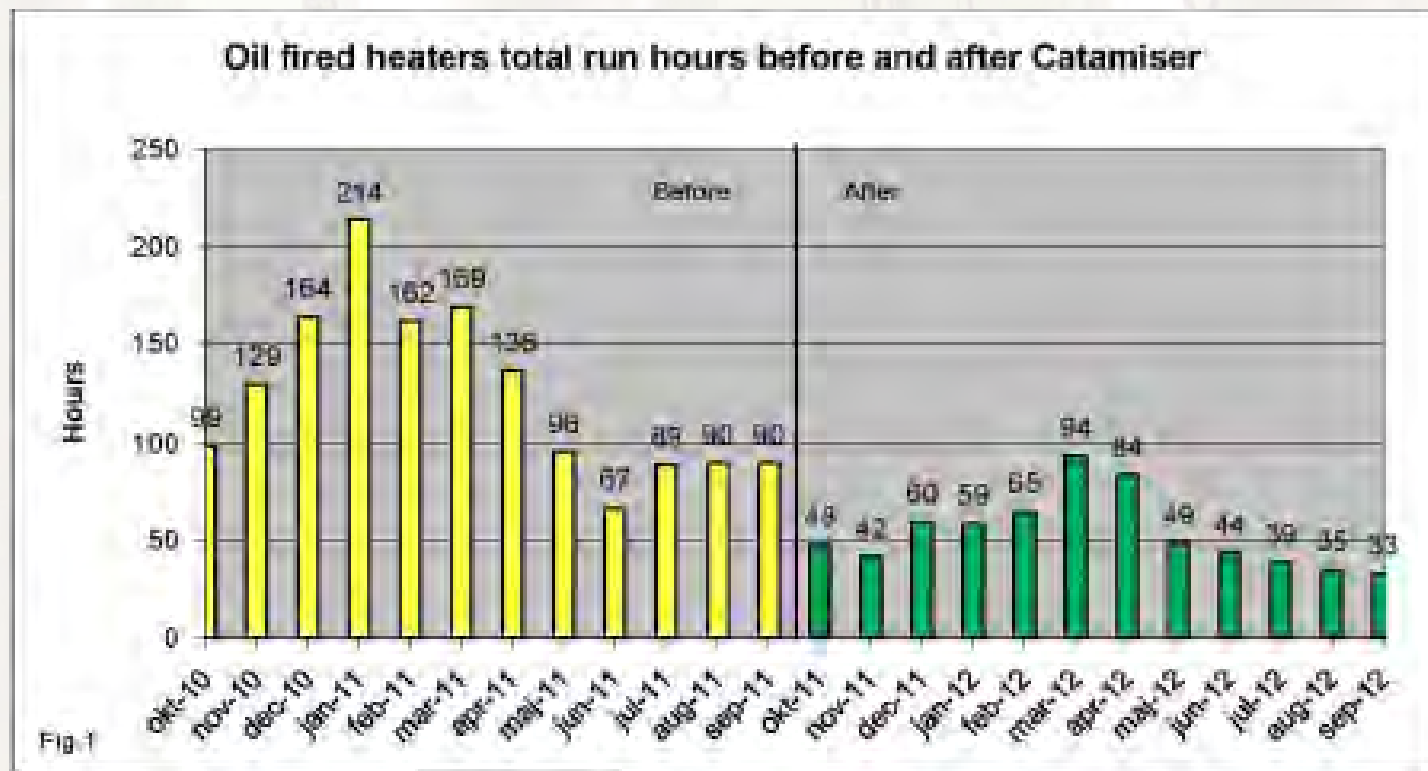
\*Assumption on lower fuel consumption is based on that waste heat recovered from exhaust gases will reduce need for oil fired boiler operation

## Emission savings – case from M/T Ternvag – Product tanker, DWT 14796\*

- ▶ Catamiser® installed on three auxiliary engines, 3 \* 750 kW
- ▶ Data from first year of operation has been gathered
- ▶ Running time on Oil-fired heaters have been reduced by 57%
- ▶ Total fuel saving is 83 ton MGO

\*all data used by courtesy of Tärntank Ship Management

## Emission savings – case from M/T Ternvag – Product tanker, DWT 14796\*



\*all data used by courtesy of Tärntank Ship Management

## Emission savings – case from M/T Ternvag – Product tanker, DWT 14796\*

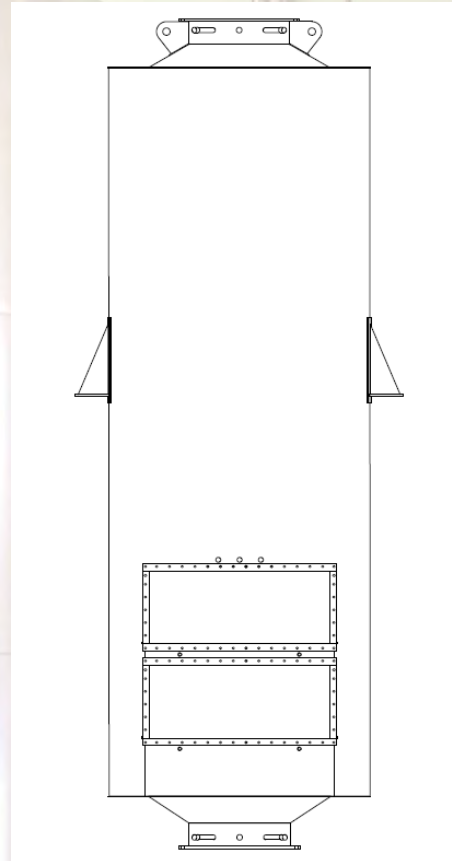
▶ Total Emission reduction per year

<b>SO<sub>x</sub></b>	<b>0,17 Ton</b>
<b>NO<sub>x</sub></b>	<b>9,88 Ton</b>
<b>CO<sub>2</sub></b>	<b>259 Ton</b>
<b>CO</b>	<b>0,06 Ton</b>

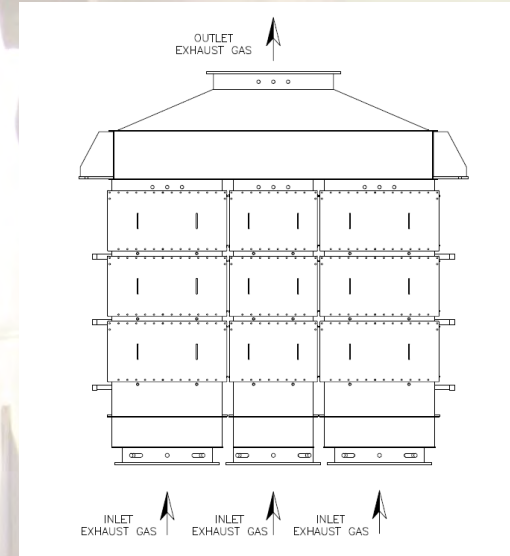
\*all data used by courtesy of Tärntank Ship Management



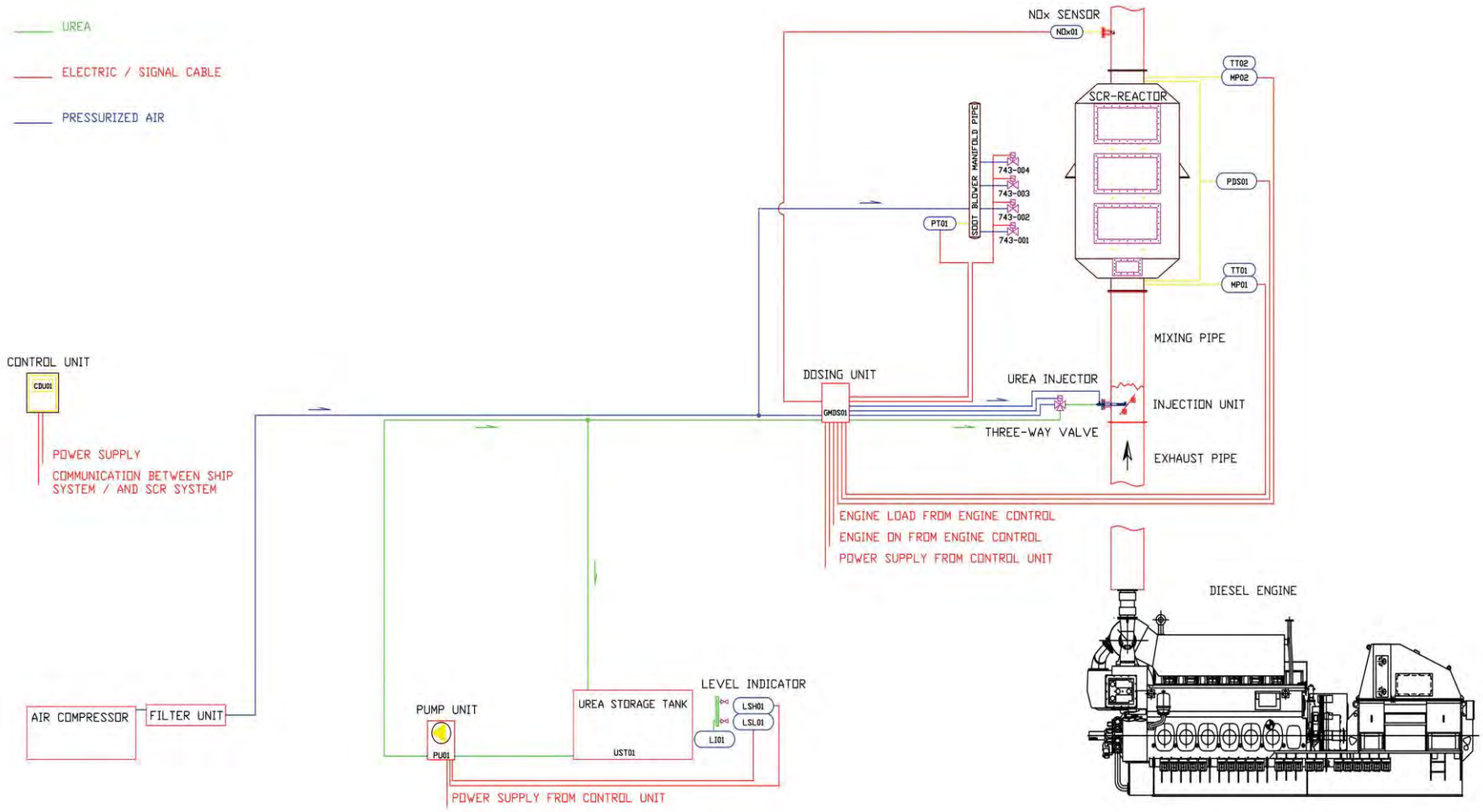
Catamiser® Slim type

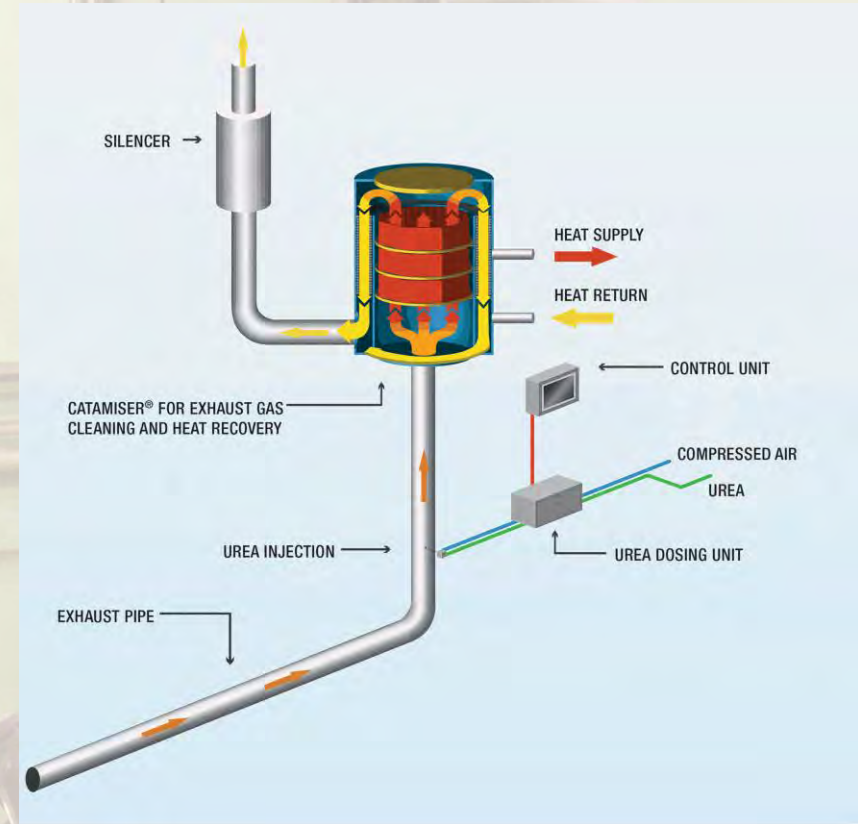
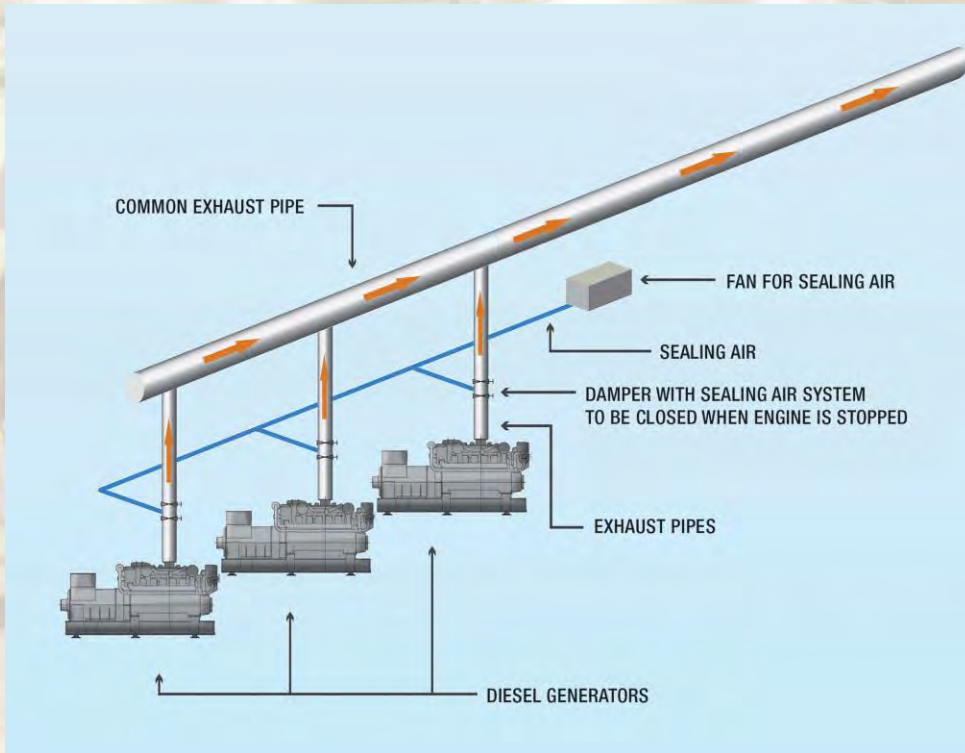


SCR Silencer

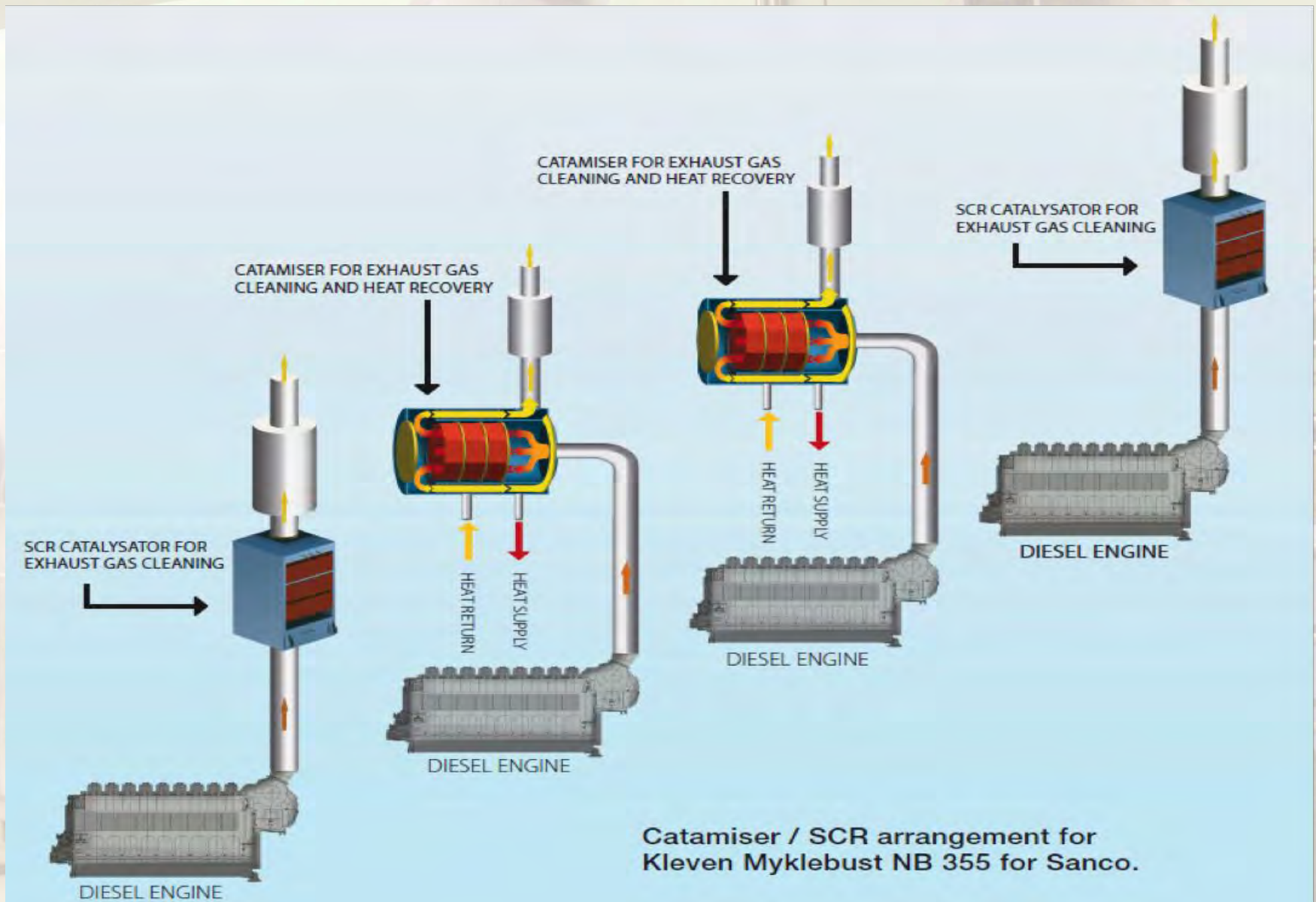


Multi-Engine SCR



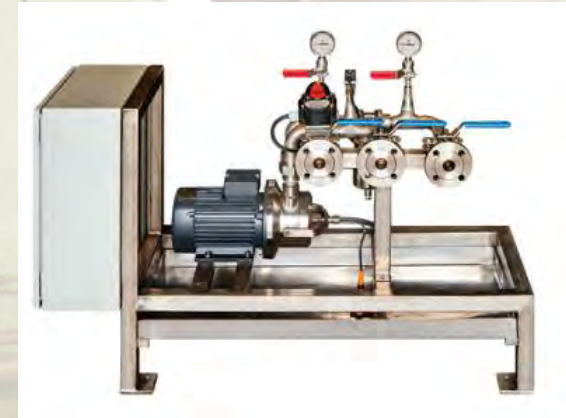








Control and Logger Unit



Pump Unit



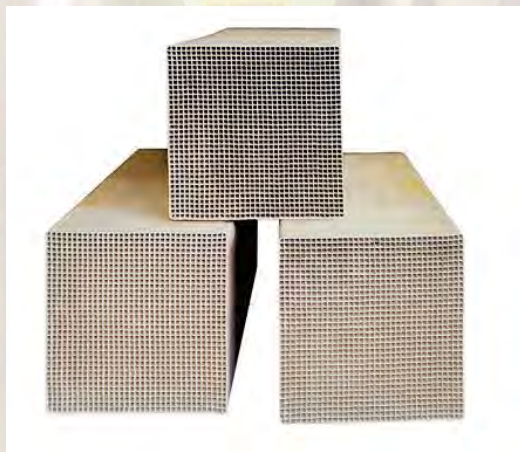
Dosing Unit



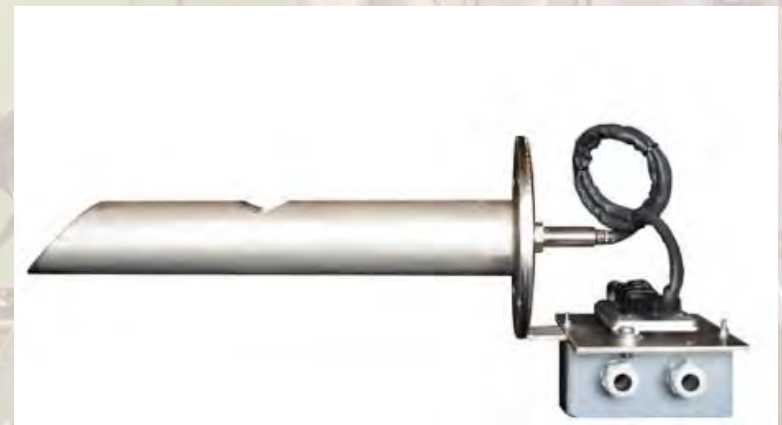
**Injector**



**Soot Blower Valve**



**Catalytic Element**



**NOx Sensor**

# GESAB Production



Thank you for your  
attention!

**GESAB**