



Langh Tech



UNIQUE HYBRID SCRUBBERS





OUR MISSION

Langh Tech's mission is to find the best solutions for cleaner air and seas for the coming generations. We work tirelessly to seek out the most effective methods to reduce SOx emissions and waste in the maritime industry. The research and development of Langh Tech technology stems from a strong history in industrial cleaning technology. It is the latest of Langh companies, established to provide technical advantage to combat exhaust gas emission and related waste management in all types of ships.

STRONG ROOTS IN INDUSTRIAL CLEANING AND MARITIME TECHNOLOGY

LANGH TECH designs and produces scrubbers for SOx removal from exhaust gases, water treatment units for closed loop scrubbers, as well as ballast water treatment systems.

Langh Tech is one of the Langh companies, which also include ship owning Langh Ship, steel carriage and bulk container specialized Langh Cargo Solutions and Industrial and Ship Cleaning Services Hans Langh. The knowledge for water purification originates from the industrial cleaning company that Hans Langh founded in 1973.

The work of Hans Langh, founder of the Langh companies, is characterized by innovation and the desire to find new solutions to practical problems. The Langh companies have grown to provide solutions in agriculture, seafaring, transportation and industrial cleaning.

The insight gained through decades of experience gives the Langh companies the edge in technological solutions. Langh Tech is one of these prime examples.



LEADING THE WAY WITH STATE OF THE ART SO_x REMOVAL TECHNOLOGY

LANGH TECH STARTED with the scrubber development project during year 2011, when there was a need to find alternatives how to solve the upcoming 0,1% sulfur in fuel limit for Langh Ships vessels. Langh Tech started to develop a fully closed loop scrubber, where water treatment plays a key role. The first full scale closed loop installation was done in May 2013. Further development lead to a hybrid scrubber with the option to operate the system also in open loop.

FLEXIBILITY TO MEET THE NEEDS OF OUR CLIENTS

TODAY LANGH TECH IS well established in the demanding market providing scrubbers and closed loop water treatment systems to cargo and cruise vessels. In addition to component delivery, Langh Tech takes care of commissioning and offers installation supervision, crew training and after-sales services. Collaboration is done with ship owners and with shipyards in their scrubber development projects to provide flexibility and to meet the client's needs for better emission reductions. Langh Tech provides a complete solution for cleaner results.



SO_x REMOVAL

LANGH TECH's scrubber is environmentally friendly as it can be operated continuously in closed loop, without any time limits or big holding tanks. The efficient water treatment system continuously cleans the closed loop process water and the cleaned water can either be let out to sea or fed back to the closed loop process. The scrubber is equipped with a packing bed which has better performance than multi-level water sprays only. The required amount of wash water is less which means smaller pumping capacity and smaller pipe dimensions and of course lower electrical consumption.

Dry waste from the scrubber lifted ashore

MINIMAL WASTE COSTS

THE AMOUNT OF WASTE that is left over after the closed loop water treatment process is marginal compared to other wet scrubber solutions. Langh Tech solution manages to extract almost all water from the scrubber sludge and the end result is a dry black waste. The highly concentrated dry sludge is unitized in IBC containers or barrels. Waste disposal is effortless and cost-effective.

Soot, particles and heavy metal that are removed from the exhaust gas





LIGHT WEIGHT SCRUBBER

THE COMPONENTS do not require large footprint which has made it possible to fit all scrubber and water treatment components in existing machinery spaces without massive conversions. Process tanks are small loose tanks and can be dimensioned according to the vessel in concern. The small and lightweight Lanhg Tech scrubber can replace the silencer. The system is fully automated and requires only little attention during operation. Exhaust gas as well the effluent water quality is monitored and all data is stored in the tamper proof data logger. The scrubbers are suitable to be installed on newbuildings and also retrofitted to existing vessels.

Scrubber tower being lifted onboard during the installation process




CLOSED LOOP WATER TREATMENT

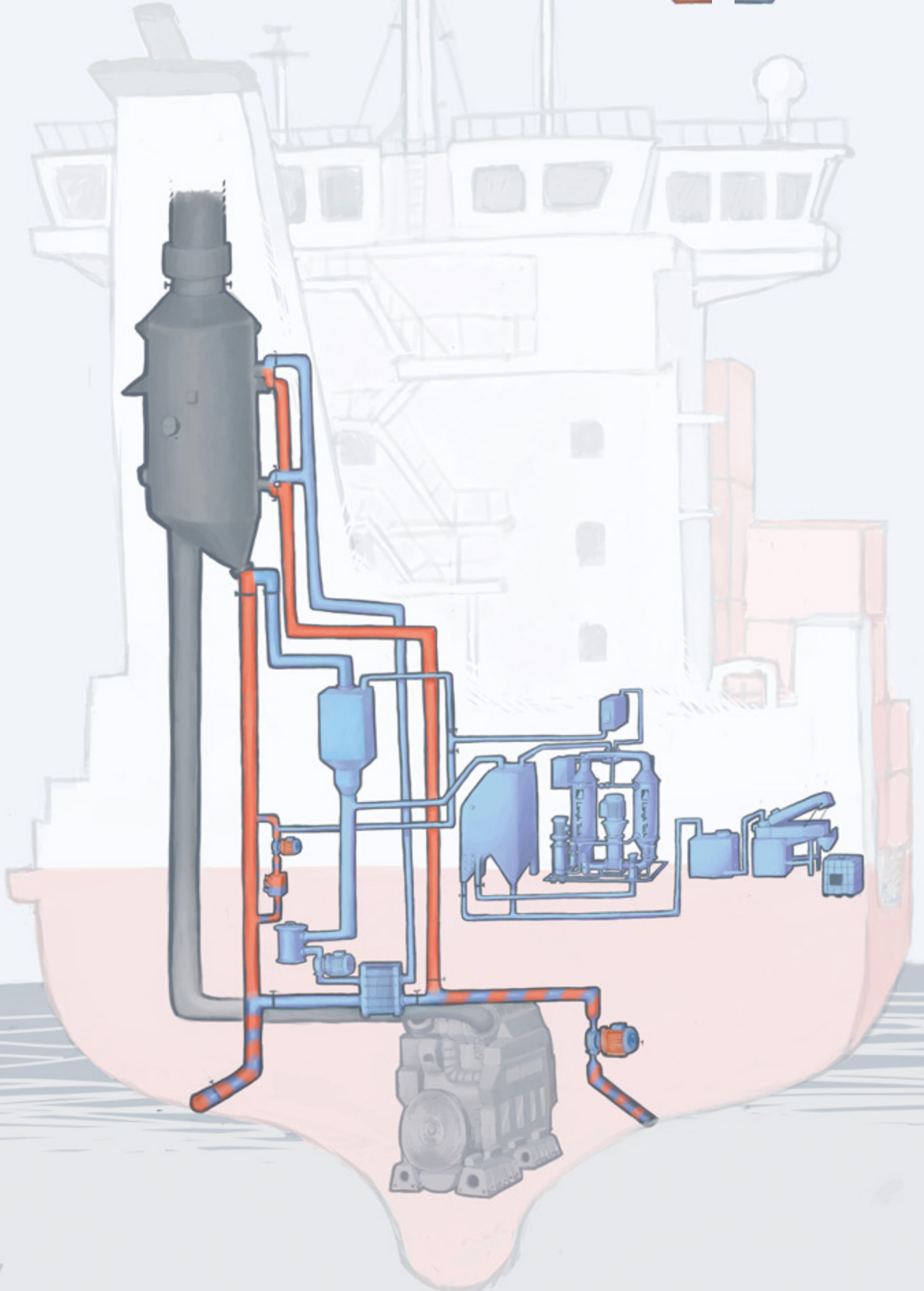
LANGH TECH IS KNOWN for its reliable, efficient and easy-to-use closed loop water treatment system. The system is fully automated and it can be monitored and controlled via the user interface, either on a touch panel or on the traditional computer display.

The water treatment system is manufactured in Finland in Lanhg Tech's own production facility. This way high quality control and innovative product development can be maintained. For service and commissioning Lanhg Tech uses its own engineers, who are trained on board Lanhg Ship's vessels and know the system thoroughly.

Water treatment unit



-  **CLOSED LOOP**
-  **OPEN LOOP**
-  **HYBRID**



AFFORDABLE SO_x REDUCTION PRODUCTS FOR DIFFERENT OPERATIONAL PROFILES

- ▶ Open loop scrubber with closed loop readiness for later upgrade to hybrid system
- ▶ Closed loop scrubber for continuous closed loop operation
- ▶ Hybrid scrubbers that combines the best features of both

FLEXIBLE SO_x REDUCTION SOLUTIONS FOR ANY KIND OF VESSELS

- ▶ Suitable for new buildings and retrofits.
- ▶ Scrubbers for one main engine installations as well as systems for vessels with multiple engines
- ▶ Size and shape of the scrubber tower can be tailored
- ▶ Inline scrubber tower to replace the silencer
- ▶ Modular closed loop water treatment system that can be adapted to different engine powers and installation spaces
- ▶ Unique Langh Tech closed loop water treatment system can also be combined with other manufacturers' scrubber

SO_x REDUCTION TO MEET THE REQUIREMENTS

- ▶ Cleaned water discharge fulfils MARPOL Annex VI
- ▶ Class approved system with required documentation
- ▶ SO₂/CO₂ ratio, PAH, PH and turbidity monitoring
- ▶ Tamper proof data logging, values saved every 4 minutes and stored during 18 months

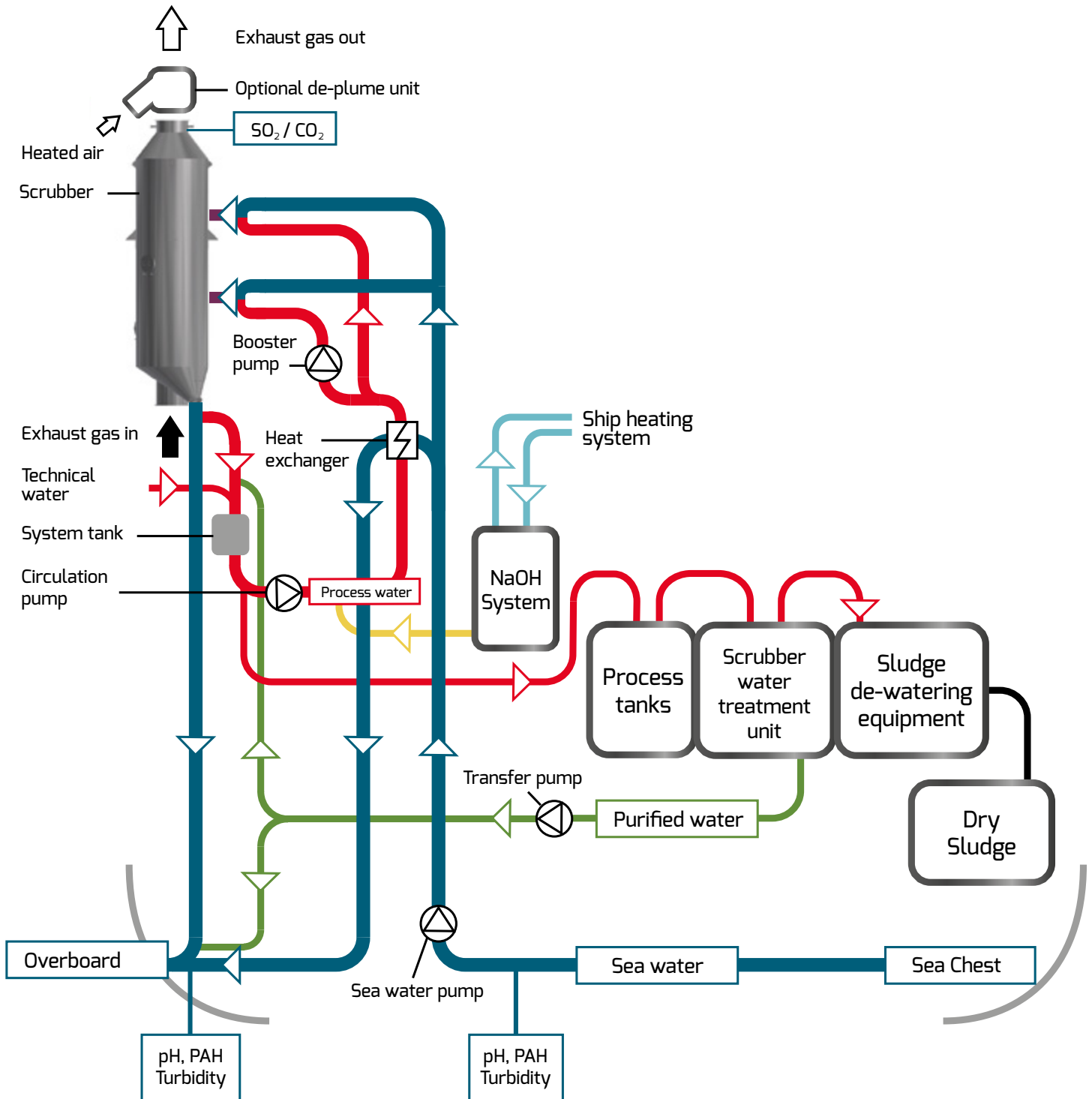
EASY AND SECURE OPERATION WITH ADEQUATE AFTER SALES AND OPERATIONAL SUPPORT

- ▶ Automated control system easy to operate
- ▶ Automatic switch over between open and closed loop modes
- ▶ Low maintenance cost
- ▶ First full scale installation has been in use since 2013
- ▶ All five Langh Ship's vessels are equipped with Langh Tech scrubbers and they function as continuous scrubber development platforms and are used for training and demonstration purposes
- ▶ Commissioning, installation supervision, crew training and after sales services by the experienced Langh Tech team

LOW OPERATIONAL COST

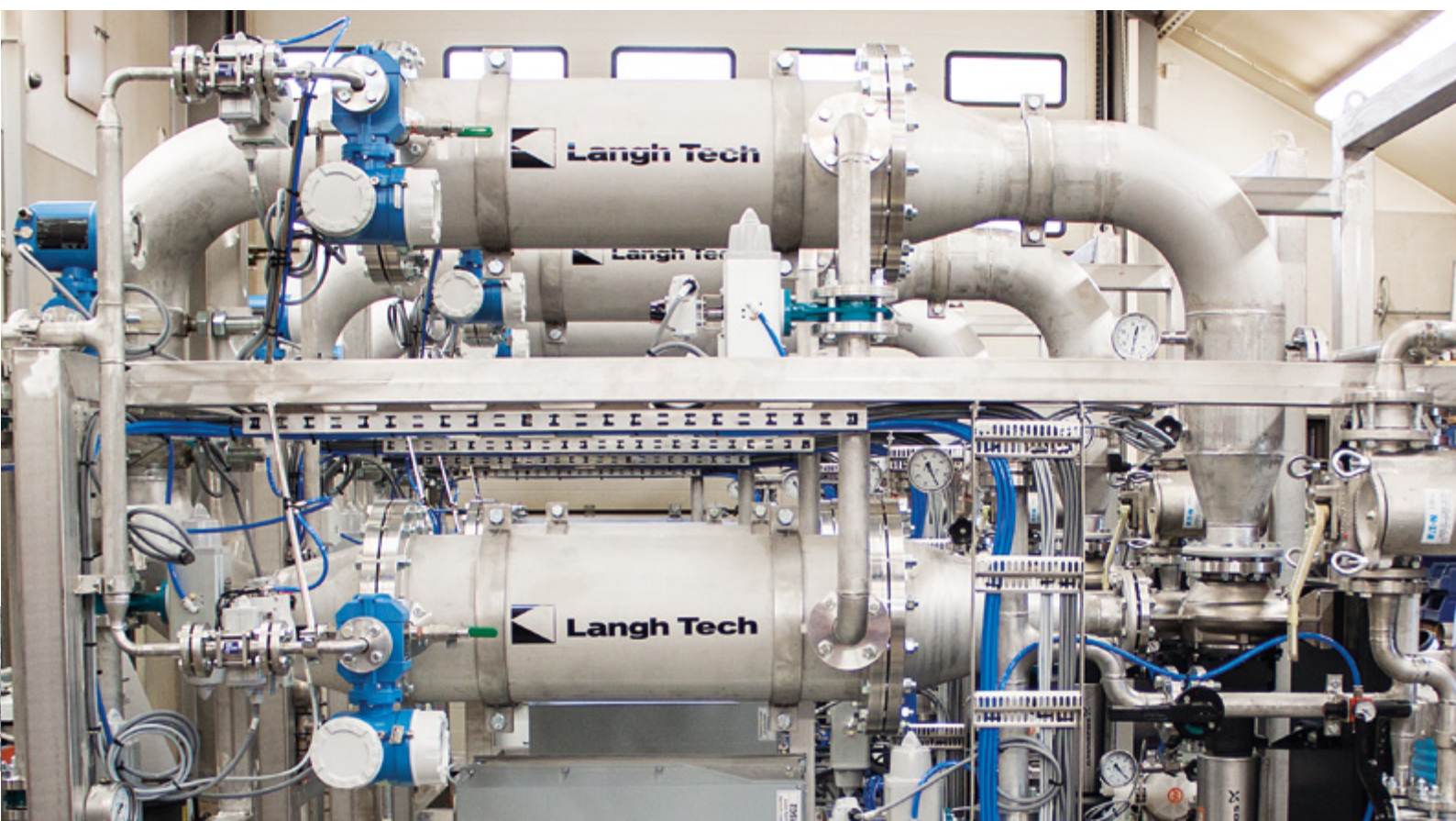
- ▶ Low energy consumption
- ▶ Minimal amount of dry sludge waste to be disposed ashore
- ▶ Low technical water consumption

SCRUBBER DIAGRAM



PERFORMANCE FIGURES

NaOH consumption l/h	5-6 liters x MW x S%
Fresh water consumption	40 liters /MWh
Sludge formation	0.5 kg/MWh
Water cleaning capacity	0.2 m ³ /MWh
Cleaned effluent back to process	0.08 m ³ /MWh
Cleaned effluent to sea	0.12 m ³ / MWh
Back pressure	Max. 150 mmWc





EGR WATER TREATMENT SYSTEM

WATER TREATMENT SYSTEM FOR EXHAUST GAS RECIRCULATION (EGR)

- ▶ For reducing NOx emissions to meet Tier III requirements
- ▶ For MAN Diesel & Turbo two-stroke main engines
- ▶ Langh Tech is the first company to combine water treatment technology for both SOx scrubber process water and EGR process water

THE EGR PROCESS

- ▶ Approximately 1/3 of the exhaust gas is washed with a scrubbing unit
- ▶ Particles are removed from the exhaust gas before it is recycled back into the engine
- ▶ The process water is continuously cleaned during EGR operation using Langh Tech water treatment technology

THE COMBINED WATER TREATMENT SYSTEM FOR EGR AND SOX SCRUBBER

- ▶ Saves space onboard
- ▶ Only one chemical compound, caustic soda (NaOH) is used for NOx and SOx emissions
- ▶ No need for urea, which is used in Selective Catalytic Reduction

FOR ALL KINDS OF VESSELS

DRY CARGO AND CONTAINER SHIPS

Newbuildings, Eimskip and Royal Arctic Line

Fully automated hybrid system with EGR
Customer: Guangzhou Wenchong Shipyard Co. Ltd, China

2,150 TEU container vessel

Main engine: MAN 7G60ME-C9.5-TIII with EGR, 17,000 kW
Auxiliary engines: 3 x 1,980 kW, 1 x 1320 kW



RORO/ROPAX SHIPS

M/V Corona Sea, M/V Hafnia Sea

Open loop scrubber system with hybrid readiness
Customer: Ellingsen Shipping Group

11,300 DWT ro-ro vessel

Main engine: 2 x MAN L48/60B 9,600 kW

CRUISE SHIPS

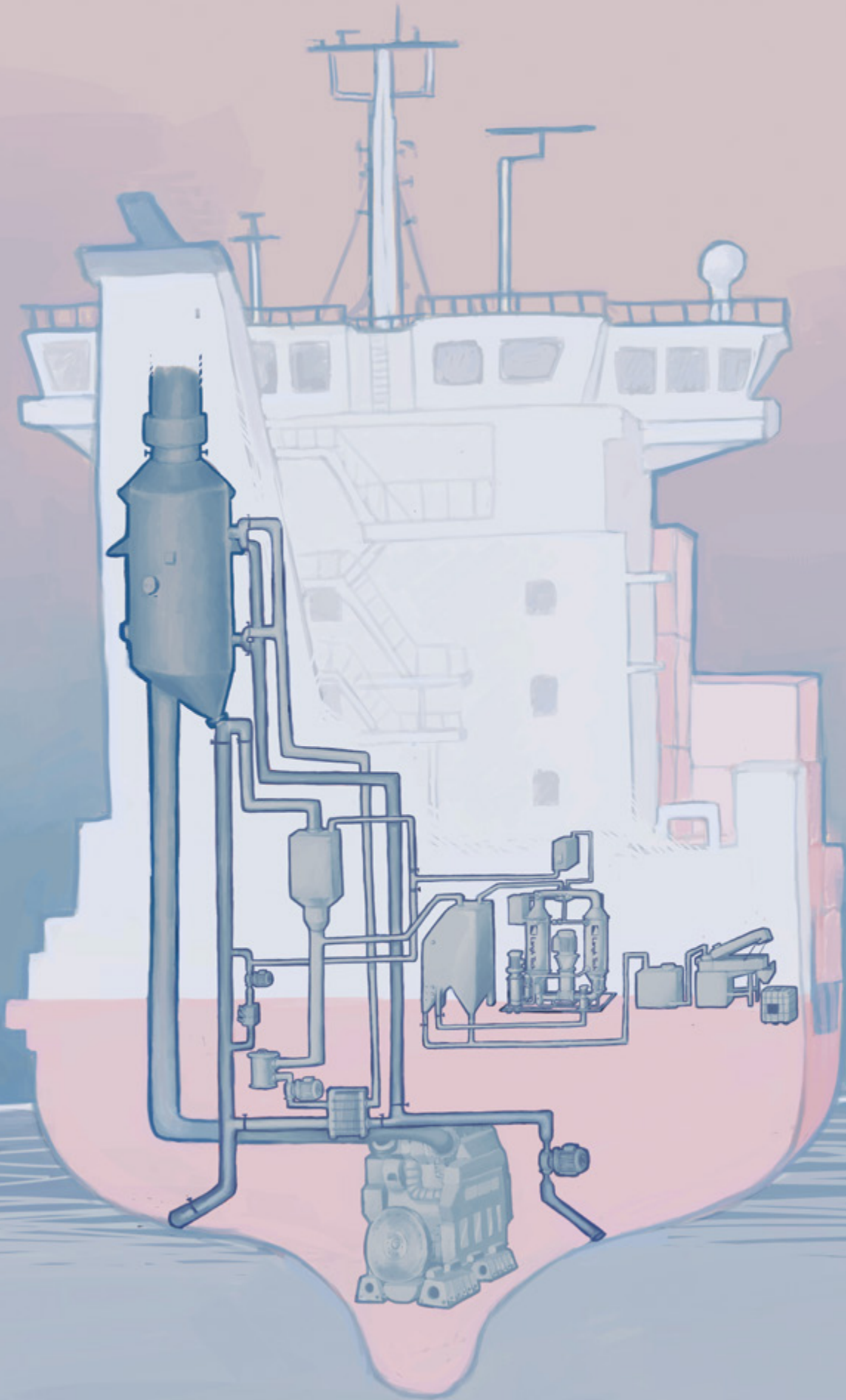
Newbuilding, Breakaway Plus Class

Fully automated hybrid system
Customer: Norwegian Cruise Line / Meyer Werft

165 000 GT cruise vessel

Main engines: MAN 2 x 16,800 kW and 3 x 14,400 kW





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