

Increased Energy Efficiency through Flue Gas Condensation

- ❖ High Efficiency
- ❖ Low Pressure loss on Flue Gas pass and Water Circuit
- ❖ Low Footprint/Height Requirements
- ❖ Corrosion Resistant
- ❖ Easy Installation and Operation
- ❖ Easy serial coupling of several scrubber units
- ❖ Simple Integration with Absorption Heat Pump or Heat Exchanger for Preheating of Boiler Water

SEG High Efficiency Flue Gas Scrubbers

SEG Flu®-FGS 01-XXXX
SEG Flu®-FGS 02-XXXX
SEGFlu®-FGS DUAL-XXX

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Increased Efficiency through Flue Gas Condensation

In commercial heating plants, optimized energy efficiency can be achieved through condensation and cooling of flue gasses from biomass fired burners. The re-claimed energy can be used for pre-heating of boiler water for district heating plants.

At SEG A/S we have developed and installed a range of flue gas scrubbers that out-perform other solutions on the market with respect to CAPEX cost, efficiency, footprint and cost of operation.



Serial coupled scrubbers for two stage cooling of flue gas condensation

Design

The SEGFlu® Modular Design is a unique parametric, modular design that meet or outperform current scrubber designs on the market. Designed with an aim to achieve the highest possible efficiency with the lowest possible pressure drop on the water and flue gas circuit, thus reducing energy consumption and pump sizes to a minimum.

SEG-Flu® Modular Flue Gas Scrubber Solutions

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The SEGFlu® scrubbers are designed with minimum space requirements and minimal flue gas piping.

Corrosion Resistant

The scrubber is available in both stainless steel and GRP (Glassfibre Reinforced Plastic) versions for optimum resistance against corrosion and wear in all environments. In the GRP version the scrubber comes fully insulated, capable of standing as well inside as outside the building with a negligible heat loss to the surroundings.

Low Pressure Drop on both water and flue gas system

Through an innovative design of the nozzle and cooling elements, SEG A/S scrubbers operate with a pressure drop of down to **25-50 kPa on the water circuit** (excluding heat exchanger). This enables very high flow rates at very low energy cost.

The pressure drop is as low as **50-100 pa on the flue gas circuit**, which is unique to our scrubbers through an innovative design of fill elements.

No risk of clogging in dirty applications:

The scrubber is fitted with nozzles and cooling elements with a minimum clearance of 15 mm, which makes clogging a non-issue within most applications.

Simple Serial Coupling

The units are scalable through their parametric design, and can be assembled in serial coupling to allow for a **low cost and low footprint**, covering a wide range of applications such as HCl-reduction, SO₂-Reduction, Condensation, NO_x reduction, etc.

Key figures for SEGFlu® Modular Scrubbers

Key Figures

Output Power range	200-8.000 KW
Pressure Drop Water Circuit	25-50 kPa
Pressure Drop Flue Gas	50-100 pa

SEGFlu® FGS 01

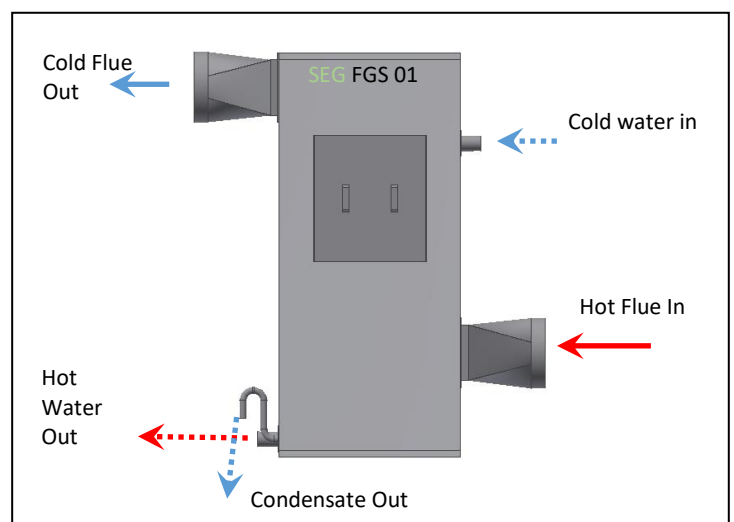
Typical Flue Gas Inlet Temperature	60°C / 140°C*
Typical Flue Gas Outlet	43 °C
Typical Water Outlet Temperature	47 °C

SEGFlu® FGS 02

Typical Flue Gas Inlet Temperature	43 °C
Typical Flue Gas Outlet	<25 °C
Typical Water Outlet Temperature	31°C / 52°C**

* Temperature before/after quench

** Temperature before/after absorption heat pump



The scrubber modules are scaled to size and arranged in serial or parallel coupling, allowing for all parts of the scrubber to be transported with truck, no loads exceeding height and width requirements for normal trucking.

All interfaces are designed for easy assembly, allowing for swift and simple assembly with minimum crane lifting loads.

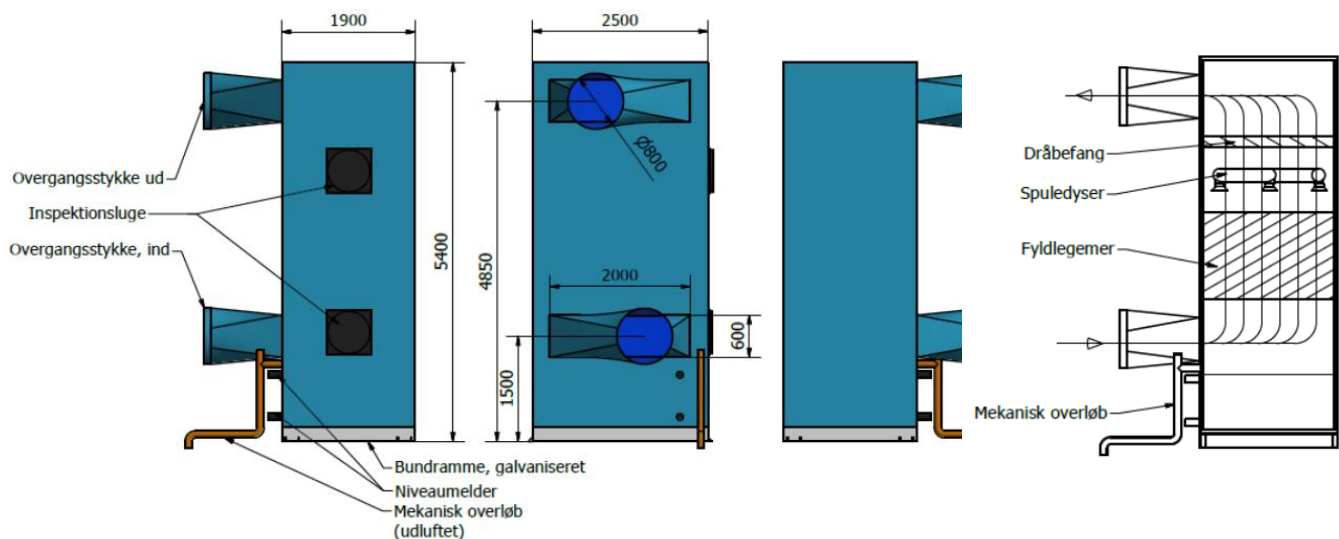
SEG-Flu® Modular Flue Gas Scrubber Solutions

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Examples of applications:

Example 1 – Single Stage Flue-gas condensation

The simplest configuration is a simple flue-gas-condensator as show below



The shown design is a copy of an actual design for flue-gas condensation on a 12 MW wood chip boiler. The inlet and outlet can be placed on all 4 sides independently of each other, allowing for easy integration into most applications.

Example 2 – Two-stage flue gas condensation.

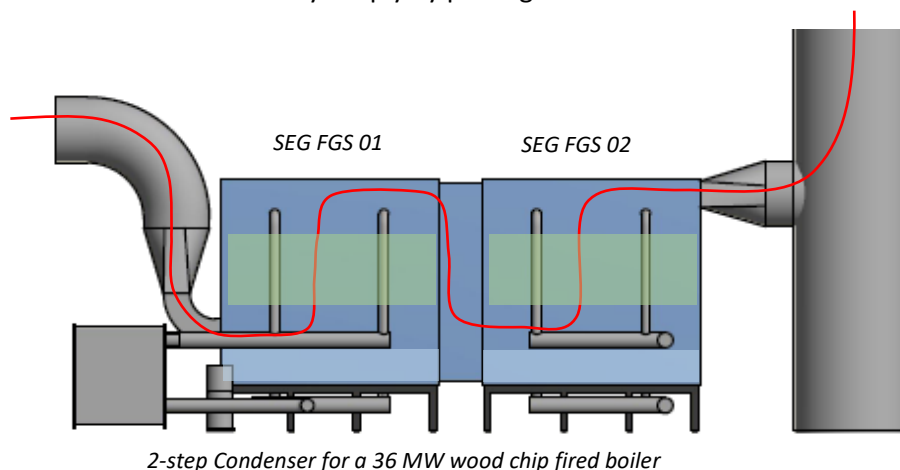
Step 1: SEGFlu® FGS 01 – Cooling of Flue Gas from fired boilers with direct heat exchanger

- Scrubber 1 in combination with a heat exchanger
- Preheating of boiler water through a heat exchanger
- Cooling of flue gas to e.g. 43 °C
- Increased boiler efficiency

Step 2: SEGFlu® FGS 02 – Cooling of Flue Gas from fired boilers with and Absorption Heat Pump

- Scrubber 2 in combination with an Absorption Heat Pump
- Preheating of boiler water
- Cooling of flue gas to <25 °C
- Increased boiler efficiency

Such an arrangement can be achieved very simply by putting two SEGFlu® Modular scrubbers in a serial coupling.



2-stage Condenser for a 36 MW wood chip fired boiler

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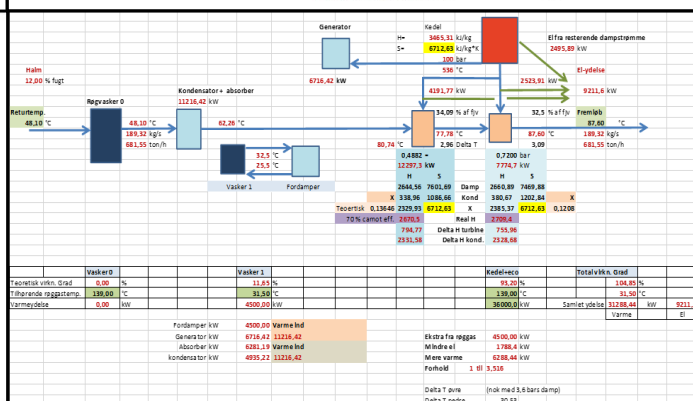
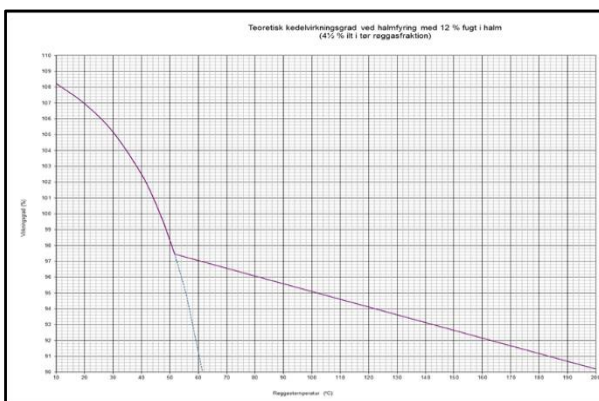
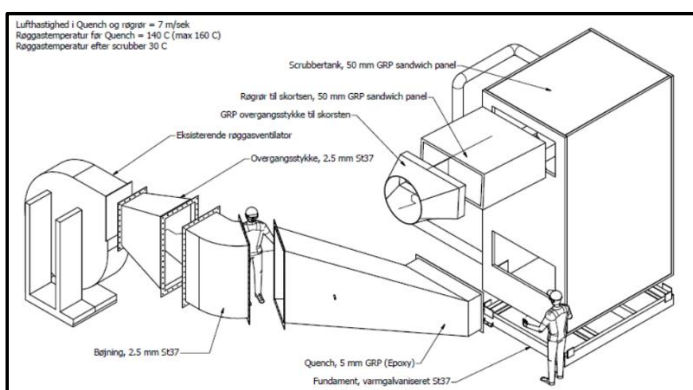
Engineering and experience working for you

SEGFlu® scrubbers are designed to the requirements of each specific capacity and temperature case, using our extensive knowledge and experience from our installed base. As a result, you will get a solution that is ideally matched to your specific requirements and ensures easy installation and run-in of the scrubber solution.

SEG A/S have been supplying absorption heat pumps since 1988 and have extensive knowledge of the thermodynamic processes involved in combustion and absorption cooling, working with clients throughout Europe. We have a lasting partnership with Thermax, who are the worlds leading supplier of absorption heat pumps, allowing us the access to the best proven technology and highest level of support available.

We can undertake all tasks of the project, including

1. Feasibility study
2. Preliminary Design
3. Final Design
4. Delivery and installation
5. Commissioning and hand-over
6. Service & spare parts



Our Core Values are

- Honesty
- Diligence
- Ingenuity
- Frugality

Our Key Technologies are

- Absorption Heat Pumps
- Flue Gas Condensation
- Flue Gas Cleaning
- Condensate Treatment Processes



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