

Increased Energy Efficiency and Reduced CO₂ emissions

With SEG's new Flue Gas Condensator and Condensate Treatment System, flue gas condensation on straw burners is now available in a robust and financially attractive version.

Challenges related to chemically aggressive condensate have been solved and this opens the door to significant increase in efficiency.

This case from Thisted Varmeforsyning cover the implementation of a complete turn-key flue gas condensation plant including flue gas scrubber and condensate treatment.

SEG High Efficiency Flue Gas Scrubbers And Condensate Treatment Systems

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SEG Flue Gas Condensation Plant at Thisted Varmeforsyning

Increase your boiler efficiency by 10-20%

Straw is a dry fuel compared with wood chips. But there are still significant efficiency improvements to be achieved by addition of a flue gas condensation system, allowing for a lower stack temperature of down to 25°

For several years, Thisted Domestic Heating supply has been looking for a solution for increased efficiency on their straw boiler for. And in 2019 they decided to implement a solution from Danish supplier SEG A/S.

The straw boiler, originally installed in 2005, has a capacity of 12MW and was designed by Hollesen Energy and is equipped with a Linka Straw shredder and a fully automated handling system for large bales.

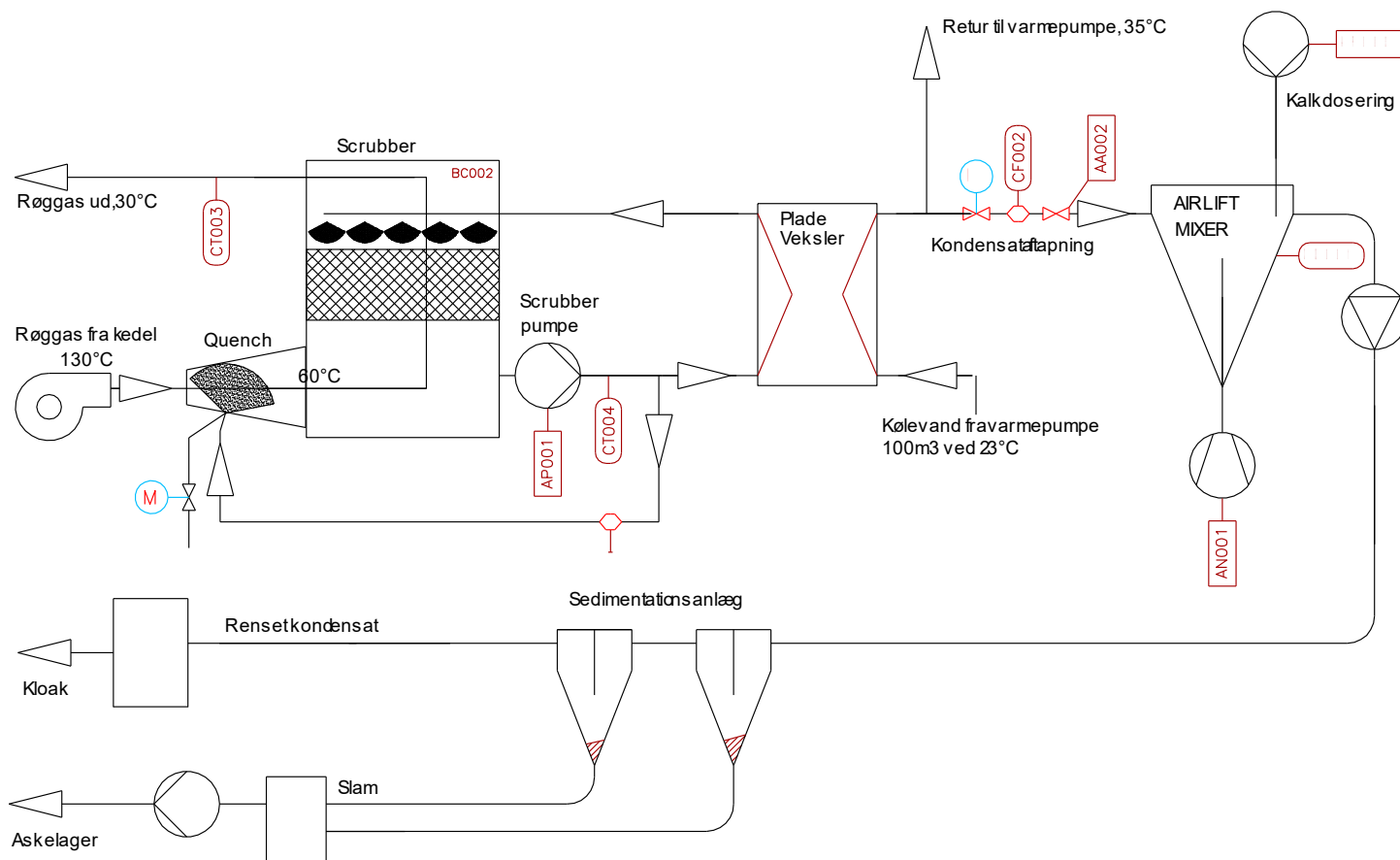
The condensation solution from SEG A/S has included the following scope:

- A new 30 meter stack with GRP core
- Vents and connections between existing flue gas fan and the scrubber.
- A Flue Gas Quench for cooling of flue gasses prior to entering the scrubber.
- A SEG FGS-01-1500 Flue Gas Scrubber
- A condensate-pump with no metal parts
- A SEG CCS-CA-2500 Condensate Treatment System
- Electrical cabinet and PLC control of the plant
- Design and commissioning of the plant



Processes involved in a SEG Flue Gas Condensation Plant:

1. Quench: Cooling of flue gasses from e.g. 130 °C to 60 °C.
2. Scrubber: Cooling and condensation of flue gasses at 25-30 °C
3. Heat Exchanger: 1.5 MW Heat Exchanger in SMO254
4. AHP: Thermax Absorption Heat Pump for cooling of the condensation loop
5. AIRLIFT MIXER: pH adjustment of condensate
6. Sedimentationplant: Sedimentation of solids



Condensate from the scrubber has a pH of 1.5, and due to the aggressive chemistry, all “wet” parts in the scrubber and water treatment are manufactured from plastic and GRP. The heat exchanger is manufactured in the extremely durable alloy SMO254

In the Airlift Mixer, burnt lime is added to achieve the ideal pH for precipitation of heavy metals. The condensate is then fed through the sedimentation plant, where it is allowed to settle for 24 hours before a final pH adjustment and subsequent delivery to recipient at a pH between 6.5 and 9.

The plant is controlled and supervised by a PLC control system, that is integrated with the SRO-system of the heating plant.

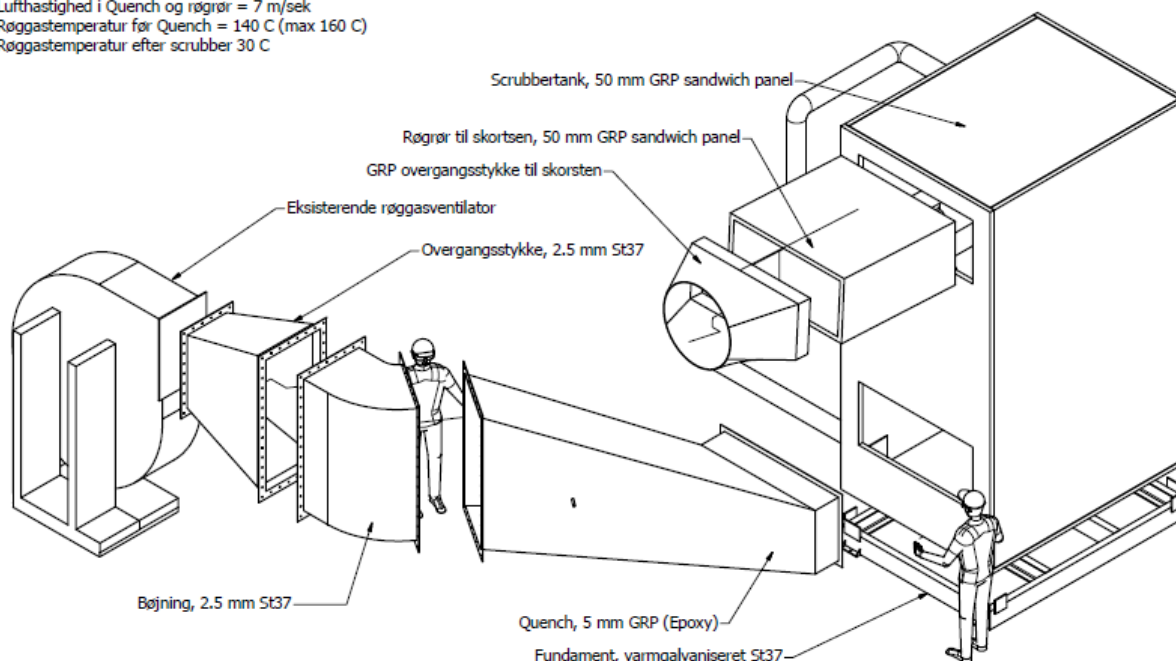
3 independent safety interlocks are in place to avoid over-heating of the scrubber and stack in case of power loss or other un-expected operational stops.

A compact and robust Scrubber with very low pressure drop

SEG have delivered scrubbers for several years with unique design features: High Thermal Efficiency, Compact Design and ultralow pressure drop. The SEG scrubber is manufactured in plastic and GRP to achieve a long lifetime in the most challenging environments.

The scrubber is designed for industrial manufacture, and is one of the most economical scrubbers available.

Lufthastighed i Quench og røgrør = 7 m/sek
Røggastemperatur før Quench = 140 C (max 160 C)
Røggastemperatur efter scrubber 30 C



The SEG scrubber is the most compact flue gas scrubber available today, and can often be integrated in places with limited physical space.

Environmentally Friendly Condensate Treatment.

SEG A/S and Thisted Varmeforsyning have developed a new condensate treatment system which doesn't employ expensive chemical additives or any flogging agents. The plant will process up to 5 m³ condensate/hour, and the only consumable is lime, which is added to achieve the ideal pH for precipitation of heavy metals. Solids and impurities are precipitated in a sedimentation plant, before being release to the recipient.



- Low Cost of Chemicals (burnt lime)
- No flogging agents
- Specially developed reactor with few moving parts
- All wet parts in plastic or GRP
- High cleaning efficiency

Absorption Heat Pump for increased efficiency

The Plant in Thisted is equipped with a Thermax Absorption Heat Pump, ensuring a very low flue gas temperature of down to 20-25°C.

As an alternative, the return water to the boiler can be used for cooling of the flue gasses, in which case you achieve a temperature in the stack of approximately 3° above return water temperature.

Hence, the reclaimed energy dependant on investment and solutions can vary between 10% and 20% of the energy input.



Economy:

In Thisted we reclaim about 12-16% of the heat input, amounting to about **1.4MW Extra capacity / Fuel Savings.**

The low pressure drop on the scrubber means that the electrical consumption is approximately 50% compared with conventional scrubber systems.

The operational cost of the condensate treatment system is limited to 25 kg of burnt lime per day.

Pay-Back: < 3years



Plant Mgr., Søren Damgaard Thisted varmeværk:

"We have been very pleased with the delivery and service provided by SEG A/S.

Apart from an effective scrubber solution, it was important to us to avoid a conventional condensate filter solution, that are high on investment and running costs. We are very pleased with the solution delivered by SEG A/S, the only consumable being burnt lime.



For further information:

Feel free to reach out by email or phone to learn more about our solutions for increased efficiency on biomass boilers.



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