



FLUE GAS CONDENSATION

Maximizing Energy Efficiency

ANDRITZ Clean Air Technologies is a well-known provider of flue gas treatment solutions across multiple industries. ANDRITZ's equipment is not only designed for the reduction of pollutants

and by-products consumption but also targets an optimized use of reagents and energy in the process. By expanding the focus from mitigating harmful pollutants to enhancing energy utilization,

the moisture in the exhaust gases becomes a valuable resource. ANDRITZ Flue Gas Condensation (FGC) technology recovers energy from exhaust gases and provides thermal energy to other processes.

ANDRITZ



Mälarenergy 7 (Sweden)

FLUE GAS CONDENSATION

Condensing scrubbers are typically installed just upstream of the stack in conjunction with additional flue gas treatment equipment.

DESIGN

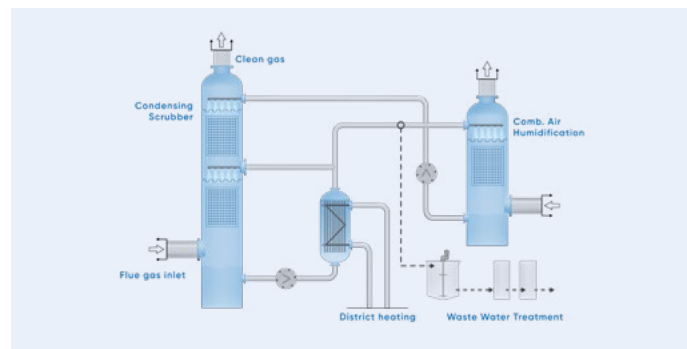
Our integrated FGC is usually designed as a direct contact condensing tower, often using packing materials that enable exceptional mass and associated heat transfer while minimizing pressure drop. In specific cases, ANDRITZ can provide a shell- and tube-type condenser, but this depends on operational and commercial aspects and requires the customer to assess the advantages and disadvantages of the various designs.

The overall design includes various stages; combining all of them in the same tower is the simplest and most robust solution.

PROCESS CONSIDERATION

In the quenching stage, the flue gas is cooled efficiently and saturated prior to entering a scrubbing stage if additional pollutant reduction is requested. There it undergoes substantial removal of HCl, ammonia

gases, and other components present in the flue gas. The condensing stage follows this. It is not only a heat recovery stage but also an additional purification step, which effectively removes SO_2 , resulting in lower HCl emissions. Due to intensive interaction of the flue gas with the cooled condensate, a substantial portion of the water vapor condenses.



This condensate will be collected in the sump, and the recaptured energy in the heat of the condensate can be transferred via a heat exchanger to other systems, such as district heating or process heat systems. Further improvement can be achieved by use of a suitable cooling medium, such as the boiler combustion air.

WATER SOURCE

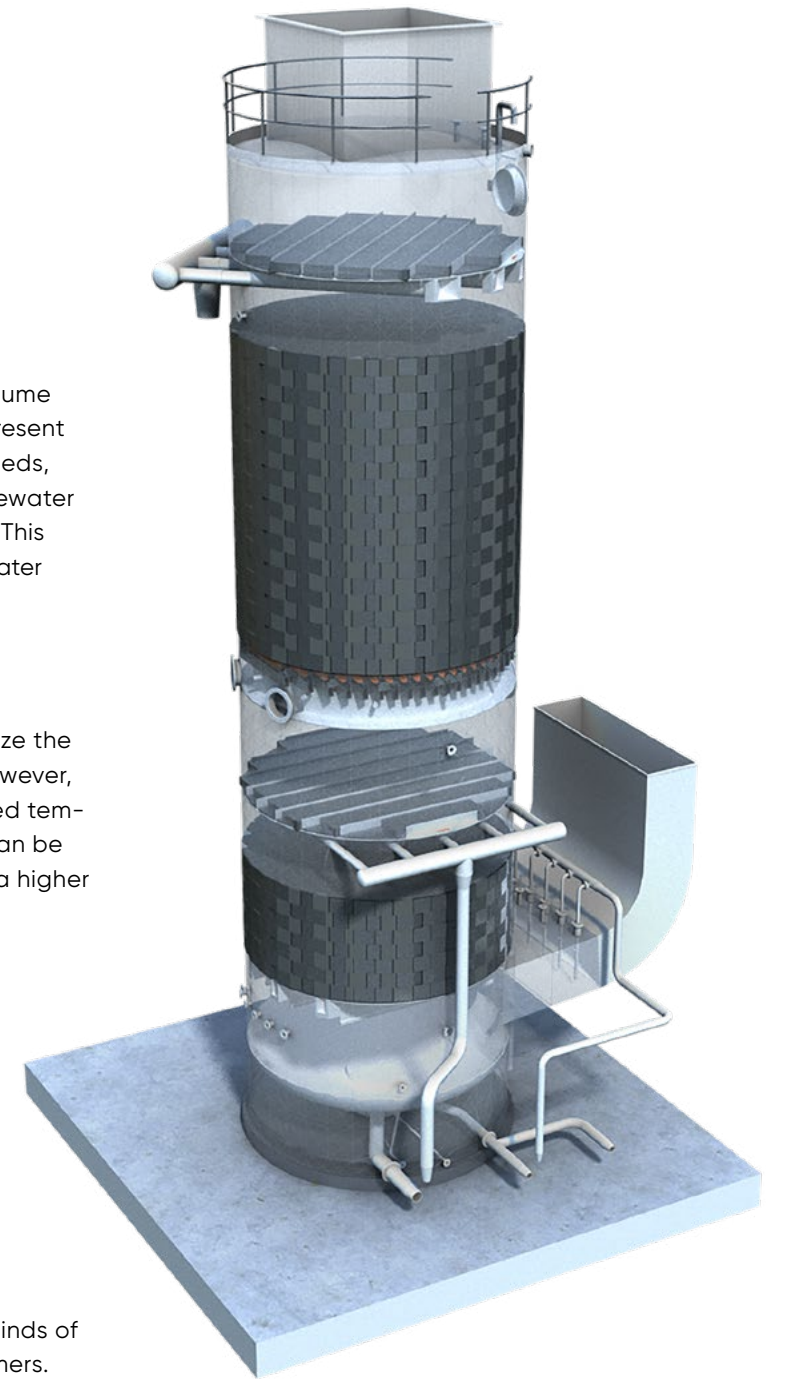
The condensing stage generates a substantial volume of water that is loaded with various substances present in the flue gases. Depending on the customer's needs, ANDRITZ provides a diverse range of flexible wastewater treatment technologies to purify the condensate. This purified condensate can then replace other freshwater sources, providing additional savings in water consumption from different sources.

ADVANCED SOLUTION WITH HEAT PUMP

The presence of an energy sink is essential to realize the full potential of a flue gas condensation plant. However, the recovered energy cannot be used at generated temperature in all scenarios. Absence of such a sink can be overcome by transferring the captured energy to a higher energy potential by using a heat pump.

Such a heat pump increases the temperature of the recaptured energy, enabling additional uses. Moreover, a heat pump provides a lower temperature in the back-flow of the condensate, enhancing the overall efficiency by further cooling the flue gas. Such a combination can extract the full potential of recovered heat from a condensing scrubber installation.

ANDRITZ can help find optimized solutions for all kinds of scenarios, providing additional benefits for customers.



BENEFITS:

- Significant energy efficiency increase: 20%, even much more with a heat pump
- Avoidance of CO_2 emissions thanks to alternative heat source
- Combination of additional flue gas cleaning (SO_2 , HCl, NH_3) possible
- Sustainable water management – provision of a water source, reduction of makeup water consumption
- Compact, proven, and reliable design
- Multi-stage design in a single tower: efficient operation with low pressure loss
- Extensive application experience: successfully applied in numerous scrubber/condenser applications



CLEAN AIR FOR A BETTER PLANET

We provide tailor-made environmental solutions focused on reducing emissions and improving performance and efficiency, helping you meet changing market conditions and comply with your asset strategies. Our offering covers the entire flue gas line to control particulate matter, SO_x and other acid gases, Hg and heavy metals, VOCs/HAPs, NO_x, and CO₂ emissions.

With our broad portfolio of best-available technologies for various industrial processes, combined with innovative engineering and strong project execution, ANDRITZ is the ideal partner to help you meet stringent emission regulations. Regional proximity for service activities further ensures optimal operation and superior lifecycle performance of your key equipment and auxiliary components.

Contact us all over the world.

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