

Waste gas and
process gas scrubbing systems
High-tech and
compact solutions

Waste gas scrubbing systems

High-tech and compact solutions

Problem definition – problem solution

Waste gases highly contaminated with pollutants occur during the incineration of solid, liquid and/or gaseous wastes from chemical production processes. The combustion gases frequently contain very high concentrations of predominantly inorganic and gaseous substances.



Waste gas scrubbing 1,500Nm³/h

Typical pollutants are elementary halogenes such as Cl₂, Br₂, J₂, hydrogen halogenes (HCl, HBr, HI) and sulphur compounds such as SO₂, SO₃, H₂S. In addition, particulate and aerosols are often discharged. High temperatures, corrosive and abrasive contamination with varied compositions call for stringent requirements where waste gas scrubbing is concerned.

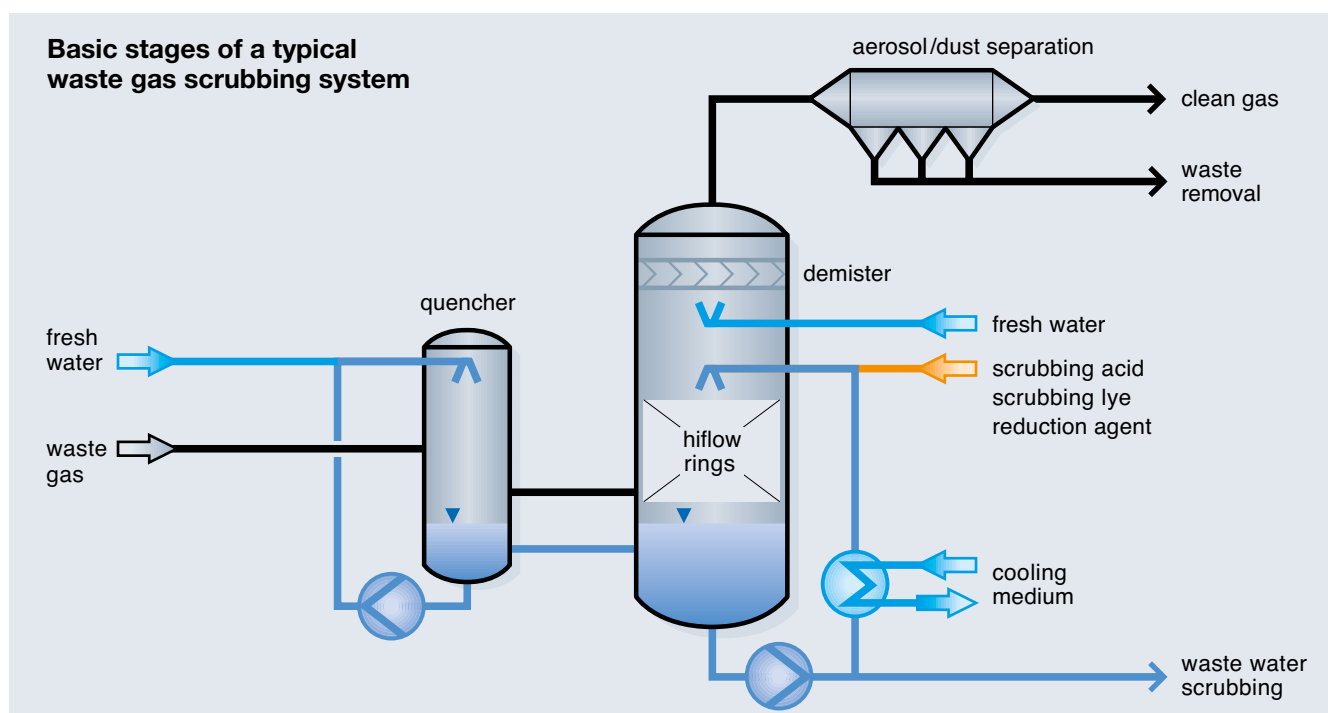
As a result of high pollutant concentrations, multi-stage wet-type waste gas scrubbing systems are deployed for maintaining low emission levels. In most cases, these plants consist of a particulate separation process, a quenching stage, one or several wet scrubbers as well as an aerosol separation stage.

RVT Process Equipment offers high-tech and economical solutions to handle the above mentioned general conditions.

From application evaluation to plant commissioning, we are a single source for complex waste gas scrubbing systems.



Packed tower scrubber
for SO₂ separation for 6,000Nm³/h



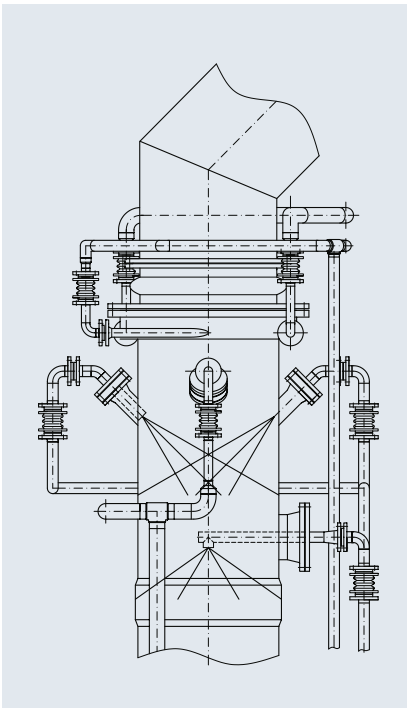
Coordinated stages for emission reduction

Quench stage

After incineration the hot waste gas flow of up to 1,300°C is led through the quench. In the direct heat exchange, the gas is cooled to saturation temperature by the evaporation of recirculating water. For two reasons in particular, this step requires a very sophisticated process engineering:

Cooling hot waste gases must be ensured under all circumstances in order to prevent damage to the equipment downstream, even in such a case where a total breakdown of the energy supply occurs. In addition, the transition zone between the dry and hot waste gas and the water distribution in the quench require a careful selection of suitable materials as well as a well-planned design layout of the transition zone. Back-flows which may cause salt deposits must be prevented and a uniform wetting of the apparatus surface with cooling liquid must be ensured. For quenching alternative designs include jet-spray, spray nozzle, pipe or venturi configurations.

Example of a jet-spray quencher



Jet-spray quenchers made of corrosion-proof GRP and wear-resistant nozzles made of SiSiC are preferably used. Due to the particular distribution of the cooling water these quenchers can be applied up to gas temperatures of 1,300°C.

Jet-spray quenchers are insensitive to load changes of the process gas and show a good performance in dust separation due to the high relative speed.

For the subsequent process stages and as a result of the temperature reduction in the quench cooling phase, it is possible to use inexpensive synthetic and compound materials.

Pollutant absorption

After quenching, the water vapour saturated gas stream enters the actual absorption stage. Contaminant removal is performed in a packed tower column.

The raw gas flows through the column from the bottom in upward direction. A scrubbing solution flows countercurrently to the gas flow. If required, chemicals can be added to enhance the absorption of contaminants.

Key to the effective operation of the packed column are internals manufactured at our own manufacturing facilities. Hiflo®-Rings are used in addition to modern distributor designs, support plates and collecting elements. The open lattice structure of the Hiflow®-Rings makes them extremely insensitive to fouling.

Additional advantages of the Hiflow™ Rings are their low weight, high resistance and mechanical stability. Energy is saved because of the extremely low pressure loss involved.



Absorber with electrostatic separator of aerosols (throughput 2,500Nm³/h)

Droplet and aerosol separation

In order to reduce the entrainment of droplets and mists, the scrubbed gas is led to an aerosol separator. On fine mesh configurations or lamellas, the liquid particles are coalesced and separated either in film or droplets.

Our systems can be fully flushed in order to prevent incrustation.

Systems for process gas treatment

Gas cooling and scrubbing



Bypass plant for recovering hydrochloric acid from flue gas

Gas scrubbing and recovery of recyclable wastes

Besides waste gas scrubbing systems we are offering scrubbing systems for the separation of inorganic and water soluble organic substances and water soluble organic contaminants out of process gases and/or waste gases.

HCl, HF, HBr, Cl₂, NH₃ and SO₂ are frequently occurring contaminants. Furthermore organic compounds like alcohols (methanol, ethanol, isopropanol etc.), aldehydes and ketones (formaldehydes, acetones) can be separated by means of physical scrubbing with water. Special absorption methods with organic cleaning agents can be offered on request.



Scrubbing column with random packing for the separation of SO₂ with a capacity of 6,000Nm³/h

An optimized process conduct achieves mostly concentrated products which can partially be reused.

The acid as well as the alkaline gas components are mainly separated by chemical scrubbing systems while a chemical reaction with the chemical agent is taking place. The scrubbing of highly concentrated hydrogen chloride is a special feature, as for this application special systems for recovering hydrochloric acid can be offered when taking in account the thermodynamic aspects.

For the separation of SO₂/SO₃ (Zahlen tiefer setzen) we offer a multi-stage reaction process.

Gas cooling/heat recovery

Furthermore RVT Process Equipment is providing systems for process gas cooling by direct heat exchanging. Hot gas is getting a direct contact with a circulating liquid upon a sprinkled surface and being cooled down to the temperature of saturation. The thermal energy will be absorbed by the liquid and then transferred to the hot water circuit of the customer. We are mainly operating columns with random packing in a counter current process since they are providing large heat exchanging surfaces.

By cooling the scrubbing liquid, in some processes a direct heat transfer can be realised simultaneously to the mass transfer in the packed bed.

Economic solutions

From one single source



Redundant waste gas scrubber in a chemical plant for 2,000 Nm³/h

For complex requirements, RVT Process Equipment offers complete, high-tech solutions that have proven successfully under practical conditions.

We are specialized in the treatment of highly contaminated waste gases up to a temperature of 1,300°C.

In addition to the removal of acidic and alkaline pollutants (SO₂, HCl, HBr, HF or NH₃) we have experience in the separation of elementary halogens such as chlorine and bromine. Very often these combinations can only be effectively absorbed with a particular process management including the addition of suitable auxiliary chemicals.

Our experience for your problem definition

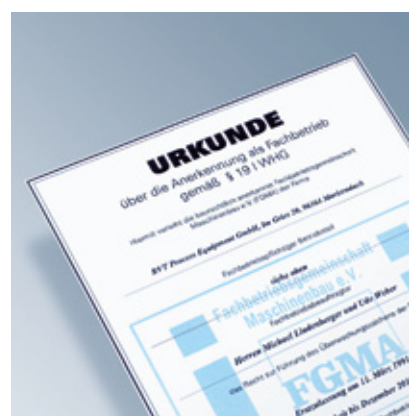
- Complete solutions in high-tech and compact design
- Product application engineering and realisation from one source
- High separation levels
- Low gas-side pressure loss and low energy requirement
- Flexible load reaction and low partial load sensitivity
- Particularly suitable for very hot, corrosive waste gases containing solids
- Use of materials which are extremely low from corrosion and wear aspects
- Insensitive to fouling and proven reliability in practice
- Minimum servicing and maintenance
- Fully automatic plant operation

Following details are required for preparation of a quotation in accordance with your requirements:

- Waste gas volume
- Water content
- Composition/ substances contained
- Temperature
- Pressure
- Required outlet gas concentrations
- Particular requirements

We are a certified and approved specialised company according to § 19 of the Water Resources Management Act (WHG).

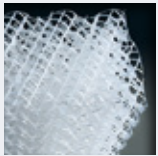
RVT Process Equipment has been certified according to ISO 9001 since 1996, and according to ISO 14001 since 2010.



The way to RVT Process Equipment



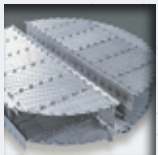
Tower packings for mass and heat transfer



Structured packings for mass and heat transfer



Column internals



Mass transfer trays



Biological carrier media



Turn-key units for waste gas scrubbing



Ammonia recovery processes



Combustion plants for the disposal of exhaust air, waste gases and liquid media



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