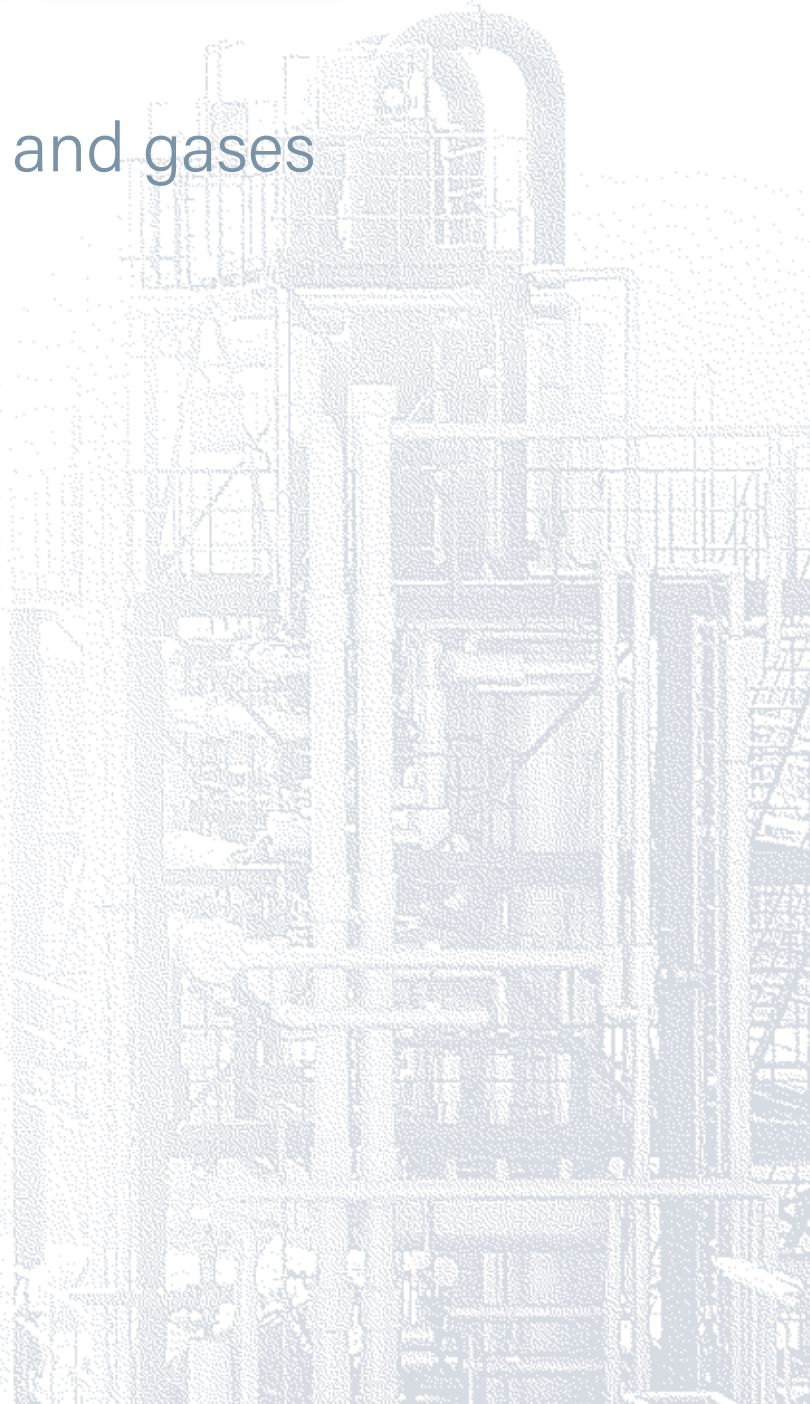




## Ammonia recovery

Removal from liquids and gases



# Steam and air stripping

## Recovery of ammonia

### Problem definition – Problem solution

Industrial and municipal wastewater streams as well as effluents from biogas plants often contain high concentrations of ammonium-nitrogen. Stripping with air or steam is a proven technology in terms of the treatment of ammonia-laden liquid streams. With high solid loads and corrosive contaminants, having a high performance recycling plant is essential.

Our ammonia recovery units offer advanced and economical solutions.

Our scope of supply includes waste water treatment and ammonia stripping up to the production of marketable products.

From project planning up to start-up of the plant, RVT Process Equipment offers all services and equipment from one source.

### The process

#### Pretreatment

Ammonia is only strippable in a caustic solution. By addition of NaOH or limestone, the pH value is raised allowing the ammonia to be dissociated.

In some cases it is recommendable to reduce the consumption of alkaline agent by minimizing the buffering capacity of the waste water. Upstream processes are sometimes used to reduce CO<sub>2</sub> content in an effort to reduce alkaline inventory demands.

The use of NaOH allows for simple equipment construction and maintenance free operation. One disadvantage, however, are higher operating costs.

Limestone is a significantly less expensive alkalizing liquid. Using lime, the alkalization process is slow and demands more technical equipment. The pH adjustment is achieved through multiple mixing operations in a stirred tank reactor. During these operations flocculation of insoluble inorganic components like carbonates, phosphates and sulfates takes place.

Solids are either conveyed through the entire process or in some cases, separated after the alkalization in a further process step.



System to alkalinize influent stream with limestone.



Steam stripper with integrated rectification section.

### Our experience for your problem definition:

- complete solutions in high-tech and compact design
- turn-key delivery beginning from basic engineering up to start-up operation
- high separation levels
- low gas-side pressure loss and low energy consumption
- flexible load reaction and low sensitivity to partial loads
- particularly suitable for highly contaminated waste liquids and gases
- insensitive to fouling and proven design
- minimum service and maintenance demand
- fully automatic plant operation
- recyclable process products



Air stripper for the treatment of reject effluent water at a wastewater treatment plant.

## Ammonia stripping

The actual separation process is achieved in a random packed column.

The influent stream is introduced at the top of the packed bed and flows down through the column. Countercurrent to this, air or steam flows up and strips ammonia from the liquid phase. Ammonia-laden off-gases exit the top of the column and treated water is collected in the column sump.

We use the following parameters in order to determine whether air or steam stripping should be used for your design:

- local conditions
- waste water stream temperature
- ammonia content
- energy source
- commercial use of the end product

Air stripping in general causes lower operating costs and does not require any steam and cooling water sources.

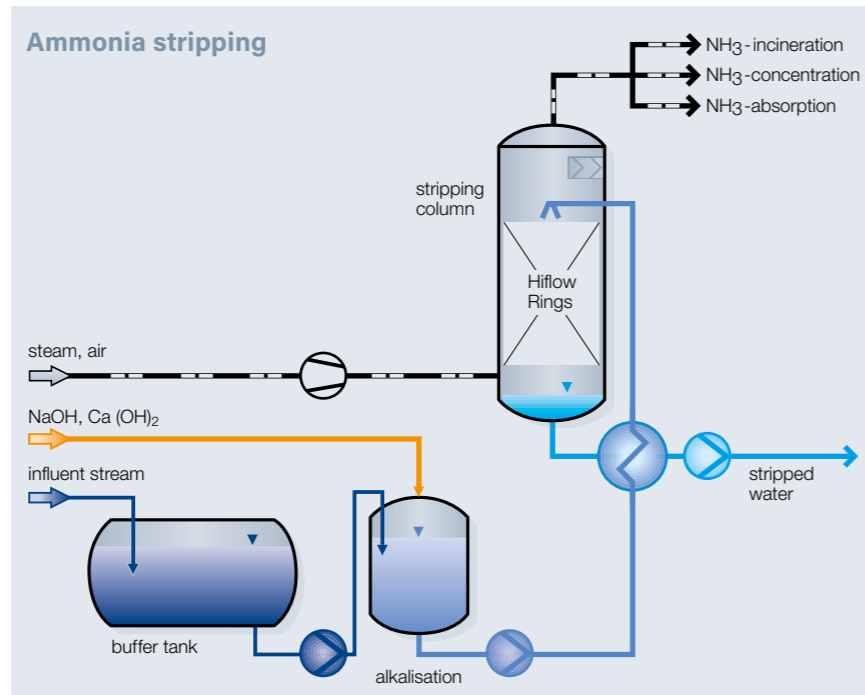
## Off gas treatment

Various possibilities exist for the treatment of off gases including recovery of ammonia water, absorption and combustion.

Steam stripping allows for the off gases to be concentrated in a subsequent distillation column. This process is energy intensive but operates without residuals. The economically usable end product is ammonia water an ammonia solution (appr. 20%  $\text{NH}_3$ ). The purity of this product allows its reuse in DeNOx units, for example.

In air stripping, the ammonia containing off gases can be either by combustion or by absorption in an acid scrubbing process.

In the scrubber stage ammonia is absorbed by sulfuric acid. The end product is a concentrated salt solution which is mainly used as liquid fertilizer.



Ammonia recovery by air stripping.

# Absorption of ammonia from waste gases

## Separation and recycling of ammonia from liquids and gases

Among the systems for the recycling of ammonia from waste water we offer scrubbing systems for the removal of ammonia from waste gases. The alkaline gas component is separated by means of a chemical scrubbing process with sulphuric acid and can be used as a liquid fertilizer.

In some cases, for cooling purposes the gas has to be quenched down to the saturation temperature by evaporation of water before entering the scrubber.

In case the ammonia concentration of the raw gas is really high, the water circuit will be equipped with a heat exchanger for the removal of the heat coming out of the exothermic absorption process.

## Our performance

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

Automatic flushing cycles prevent any scaling and allow an operation with a low maintenance demand. This results into the high availability of our plants.

Our main focus is on the recovery of potential recyclables. We can assure the recycling of the process products. Our systems produce no by-products.

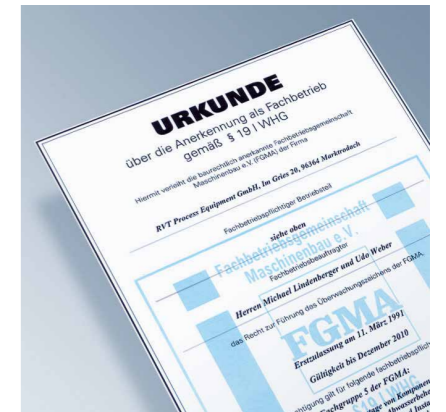
In order to best meet your needs, we require the following information to provide our quotation:

## Steam/air stripper

- liquid flow rate
- temperature
- ammonia concentration
- pH value
- other ingredients
- quality of final product
- quality of outflow
- auxiliary energy sources
- special requirements

## Ammonia scrubber

- waste gas flow rate
- water content
- gas composition
- temperature
- pressure
- clean gas quality required
- special 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



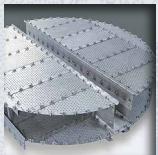
Tower packings for mass and heat transfer



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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