

General Description of the Plant

Cross-Flow Scrubber

1. Function principle

The principle of the cross-flow scrubber is the wet separation of contaminants from the gas phase into the liquid phase. The waste gas and its malodorous particles streams through a packed bed horizontally while washing liquid streams from top downwards. Thus, the gases to be cleaned are led in a crossflow manner to the washing liquid.

During this contact between waste gas and washing liquid the contaminants and solid particles are separated by physical or chemical absorption, oxidation or condensation. The contaminants accumulate in the liquid phase and can be eliminated after a while. When high concentrated contaminants are present in the waste gas, chemicals such as oxidants, acid or caustic are added to the washing liquid to increase the separation.

Cross-flow scrubbers are constructed with 1-stage, two-stage or multi-stages. This offers a separation of variable contaminants in one plant.

We use high performance packing material, which can warranty optimal mass transfer by lowest pressure lost. The special geometry and arrangement of them force the constant splitting and formation of scrubbing liquid droplets, which boost the transfer of air pollutants to the liquid phase. Depending on the type of contaminants acidic, alkaline or oxidative scrubbing liquid will be applied. The chemicals will be dosed automatically through pH-regulated Dosing pumps.

1.1 Air flow

The waste gas streams horizontally through a packing material bed and gets in contact with the washing liquid sprayed out from the irrigation system located above the packing material bed. This principle using a co-crossing system of gas and liquid circulation leads to the lowest pressure loss and enables to use several washing stages one after another without additional connecting duct lines.

Crossflow scrubbers are used mainly for waste gases with several components of different physical quality. One application is the treatment of NH_3 with acid washing liquid in the first stage and the treatment of H_2S with alkaline washing liquid and oxidation with H_2O_2 at the same time in the second stage.

Crossflow scrubbers are generally operated with under-pressure. Therefore, the fan can be installed behind the separation stages and operates only with cleaned gas. This way, it works with nearly no contaminants, dust or high temperature.

Crossflow scrubbers are in particular applied in the following sections: chemical industry, food industries, metal processing, composting plants, sludge dryers, wastewater treatment plants, and mechanical-biological solid waste treatment.

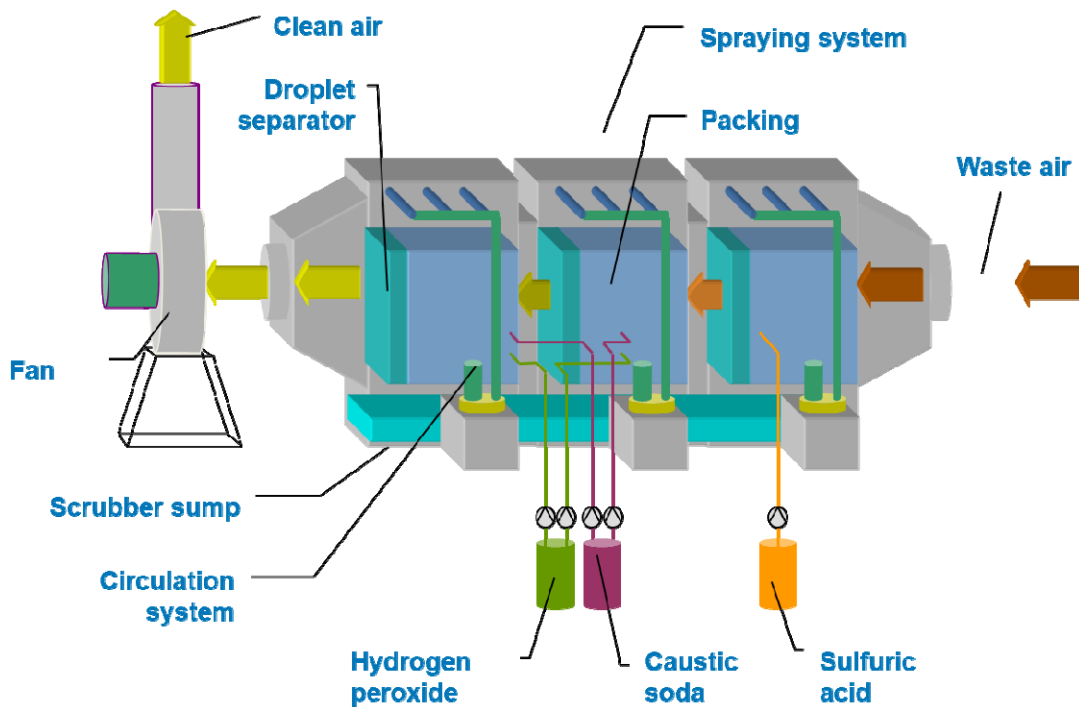


Figure 1 Function principle

2. Components of plant

2.1 Washing liquid circulation / irrigation system

Each stage has its own, separated from other stages, liquid system. A recirculation pump sucks the washing liquid from the integrated scrubber sump providing a constant liquid flow through the duct line and the spraying nozzles. The spiral full cone nozzles are very widely opened, nearly plugging-free and able to spray the liquid homogenously on the packing bed.

The washing liquid trickles slowly through the packing bed allowing contaminants to be washed out from the crossflow air stream.

2.1.1 Recirculation pump

We use very robust and corrosion-free vertical or horizontal chemical recirculation pumps made of thermoplastic. All parts in contact with the liquid are very resistant and well suited for the aggressive and abrasive washing medium as well as for the contaminants and chemicals transferred into the liquid phase.

2.2 Packing material

Main function of the packing material is to increase the transfer of the contaminants from the gas phase into the liquid phase. This is mainly possible due to the very high active surface able to hold up a big amount of washing liquid.

We use packing material with over 100 m² surface per m³ filter bed. Through the special construction of the packing material (open structure, widely spaced and therefore high free volume) plenty of washing water droplets is built on the surface. These droplets are segmented and re-shaped constantly allowing the absorption process of the contaminants in the liquid phase to be renewed continuously.

2.3 Droplet separator

Following the packing bed the air is led into a droplet separator. His function is the separation of the washing water droplets from the pre-cleaned gas. Our droplet separators are nearly plugging-free with high efficiency and low pressure loss.

2.4 Measurement and control of the plant

The standard measurement and control of our scrubber includes:

- Level control of the scrubber sump with automatic water re-fill
- Protection against dry running of the recirculation pump
- Pressure gauge to indicate the pressure upstream of the spraying nozzles
- Water meter to register the fresh water consumption
- pH-value-control when acid or caustic is added
- Sump heater with thermostat against frost

The following optional measurement can be offered:

- Temperature monitoring to prevent possible danger originating from hot waste gases
- Fan speed range monitoring
- Under-pressure regulation
- Analytical measurement of the untreated and clean gas
- Operating hours counter for all electrical drives
- Flow monitoring for the recirculation line
- Pipe heating for outside installation
- Measurement of the air volume

2.5 Dosing station

Acid, caustic or oxidants are added by special dimensioned dosing pumps. The pumps are magnetic or motor driven diaphragm pumps. All materials in contact with the washing liquid are suitable for the chemicals.

Each dosing pump is regulated by a signal from the measuring probe and the control panel. This configuration leads to an optimal dosing of chemical without waste.

3 Materials

The scrubber shell, the recirculation duct line and all other equipment in contact with the washing liquid (packing material, grids etc.) are built of corrosion-resistant plastic.

The scrubber shell - our scrubber type - G - is manufactured from corrosion-free glass fibre reinforced plastic (FRP). The shell is produced as a laminate by a filament winding machine. This laminate consists of high quality polyester resin, woven roving and chop strand mat.

The inner side of the scrubber shell is coated with a special chemical protective layer. The outside is provided with a pigment layer containing UV-absorbers (colour according to customer's request). This method allows a durable protection as well as a long lifetime of the scrubber.

Our scrubber type - P - is built of high quality thermoplastic materials, such as Polypropylene or HDPE (high molecular polyethylene). There we use plates or winding tubes depending on size and structure.

4 Delivery / Installation

We deliver our scrubbers mostly in one module. Our well-practiced installation staff installs the complete scrubber on site as follows:

- Supervision of the positioning of the plant equipment
- Installation of the fan and recirculation pump
- Filling-in of the packing and installation of the grids
- Installation of the recirculation pipe
- Connecting of the supply and disposal lines which are provided by the customer
- Installation of the measuring equipment

5 Essentials

- Horizontal air stream
- Several stages in one device / separation of different contaminants at the same time
- High separation results / high efficiency
- Low investment and operation costs
- High flexibility for a variable crude gas amount
- Optimal consumption of fresh water and added chemicals
- Little space demand / compact size
- Low pressure loss
- Corrosion resistant
- Weather resistant
- Low risk of plugging due to the structure of the packing material
- Easy overview and easy handling of the display
- Possible use as a bio-scrubber



Figure 2 3-Stage Cross-flow scrubber