
PlasmaAir AG

ABLÜFTREINIGUNG

The sieve tray scrubber and its industrial applications



PlasmaAir AG
Am Lindenberg 8
71263 Weil der Stadt - Hausen
Germany

The sieve tray scrubber and its industrial applications

PlasmaAir AG has engineered a sieve tray scrubber especially designed for the removal of volatile water-soluble hydrocarbons from exhaust airstreams. This scrubber (Fig. 1) consists of a column which holds several sieve trays in its interior. This apparatus removes alcohol from waste air flows through physical absorption. The process wastewater can regularly be reintroduced into the local wastewater treatment plant. The scrubber construction is adjusted individually to the specific needs of the client's system.

The Process

In the absorption process water-soluble components from the gas phase are separated from the exhaust air by a liquid (absorbent). Water is used as the absorbing fluid. The liquid phase is introduced in countercurrent to the gas phase on the sieve trays in the interior of the column. The liquid phase flows through a shaft outlet in the sieve tray from one sieve tray to the next. The gas phase flows through the sieve tray, whereby a bubble zone forms on it. In the bubble zone the gas exchange takes place. The gas molecules which have polar functional groups are absorbed in the liquid phase.

For a given raw gas concentration, the removal of contaminants down to a clean gas concentration below existing limit values is ensured by dimensioning the sieve trays, their number and the flow rate of the liquid.



Fig. 1: Sieve tray scrubber

The waste water carrying the contaminant can be fed to a biological clarification stage (waste water treatment plant). However, this is only possible if the concentration of the contaminant is not hazardous to the environment. This should be discussed with the operator of the treatment plant in advance in order to meet sustainable environmental protection.

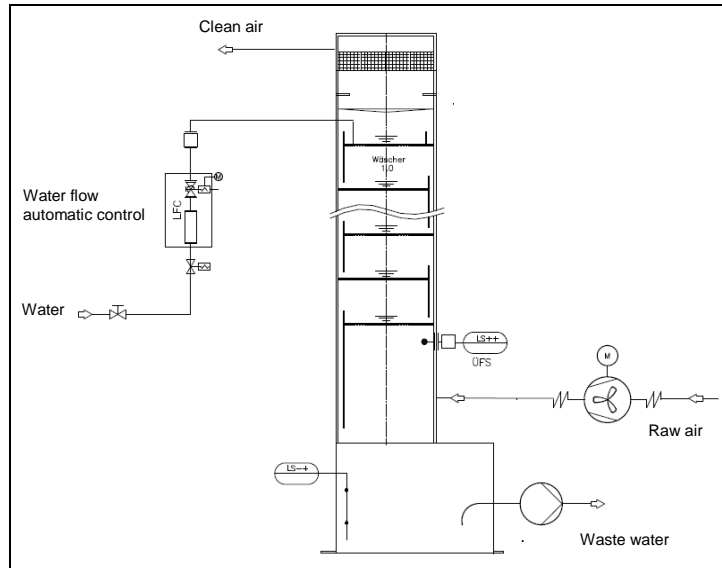


Fig. 2: Functional diagram of the exhaust gas cleaning with a sieve tray scrubber

The method has the following advantages:

- low complexity of equipment involved
- low pressure loss through sieve trays
- no need for recirculation pumps
- resistance to corrosion (construction in plastic)
- low investment and operating costs

Ethanol removal

With ethanol present as a contaminant in the gas phase several qualification measurements were carried out for the procedure. For example, with a raw gas flow of 1,200 m³/h and with an ethanol concentration of 1,000 mg/m³ the scrubber plant was able to diminish the concentration down to 40 mg/m³ in the clean gas (Fig. 3). The water throughput was 500 l/h.

A sieve tray column is installed for the separation of the ethanol from the exhaust air of a plant for coloring chicken eggs (three rolling machines). The operation point of the column is given at a volume flow of 675 m³/h and a concentration of ethanol of more than 3,500 mg/m³. The adjusted water volume flow is 0.75 m³/h. Through measurements carried out by a certification company (TÜV) compliance with legal emission limits was verified.

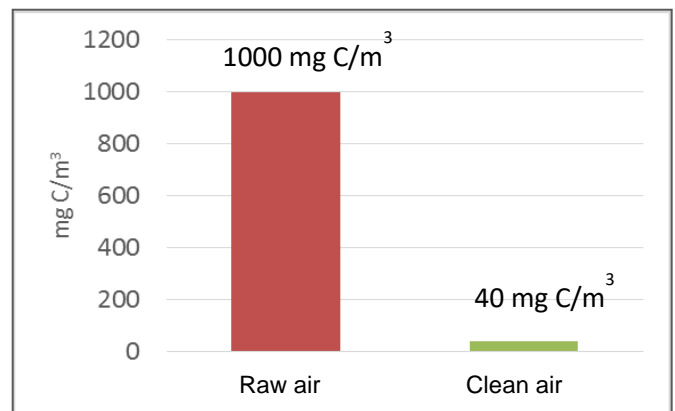


Fig. 3: Example of the performance of an air cleaning system for ethanol (laboratory system)

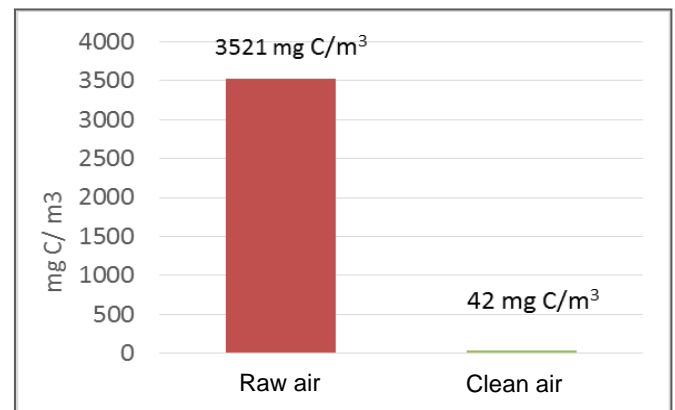


Fig. 4: Example of the performance of an air cleaning system for ethanol in a plant for coloring Easter eggs

Methanol removal

Since 2015, a scrubber has been in operation for the purification of methanol-containing waste gases from a chemical reactor (Fig. 6). The raw gas volume flow is 400 m³/h. The course of the reaction gives a concentration peak of approximately 4 g/m³ of methanol in the raw gas. At a water requirement of 467 l/h, the methanol concentration was lowered well below the legal limit (to about 0.09 g/m³).



Fig. 5: Scrubber for the removal of methanol

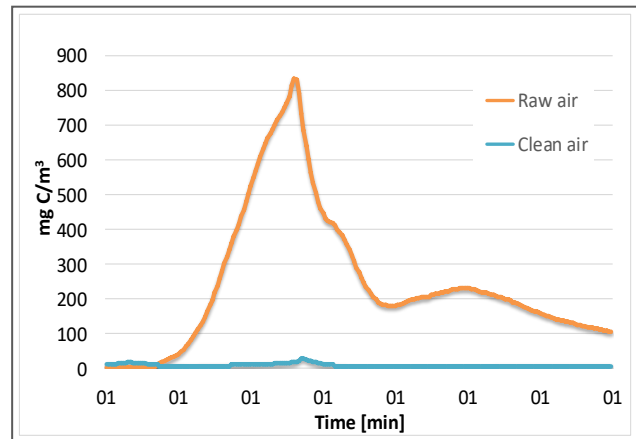


Fig. 6: Methanol removal in a reaction process

Isopropanol removal

Since 2012, several scrubbers have been used for the removal of isopropanol from the exhaust air of cleaning facilities for electrical components in industrial applications. Again, the applicable emission limit values were met.

Since mid-2016, several plants with volume flows up to 5,000 m³/h are in operation. The largest scrubber built to date was designed for a volume flow of 8,000 m³/h containing an alcohol concentration of 2 g/m³.