



**Technologies for the Transition
to Sustainable Energy**

**TECHNOLOGIES FOR
EXHAUST GAS
TREATMENT AND CO₂
RECOVERY**

- solutions for battery testing facilities
- wet scrubbers for volatile alcohols
- venturi scrubbers in combination with chemical scrubbers
- biofilter systems
- activated carbon filters
- Direct Air Capture (DAC) by Polyethylenimin PEI

SOLUTION FOR BATTERIE TEST FACILITIES



Stress tests in battery test benches release toxic exhaust gases. It is not allowed to release these untreated into the ambient air. The special features are the unknown combustion products, quantities and release periods of the current and future battery systems. Solid particles and gaseous air constituents have to be cleaned.

PlasmaAir AG has experience with exhaust air purification for battery test benches in the range of 2500 m³/h to 60000 m³/h and temperatures up to 600 °C. PlasmaAir AG's services start with project planning and can extend to complete implementation and commissioning.



Example of an exhaust system downstream a battery test facility

BIOFILTER AS AN ALTERNATIVE TO INCINERATION



Test plant for process qualification

As an alternative to an exhaust gas incineration a bio filter technology was developed and implemented at a plant for the production of electro motors. The process was qualified with a test plant and based on the results an industrial plant was build consisting of a technical container, a bio scrubber and a bio filter.



Industrial plant for 10.000 m³/h exhaust air

SOLUTION FOR VOLATILE HYDROCARBONS OUT OF THE PRODUCTION OF FUEL CELLS: SIEVE TRAY SCRUBBERS



Plant for 2 x 7500 m³/h,
el. conductive PE



Plant for 2500 m³/h,
stainless steel

Downstream the coating of fuel cells an exhaust gas volume flow of 7500 m³/h containing 2000 mg/m³ ethanol has to be cleaned. The ethanol is scrubbed out in a especially developed sieve tray scrubber. In this absorption process the water-soluble components from the gas phase are separated from the exhaust air by water (absorbent). 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. The waste water carrying the contaminant can be fed to a sewage treatment plant.

SOLUTION FOR GLYCOL CONTAINING EXHAUST GAS: PACKED COLUMN SCRUBBER

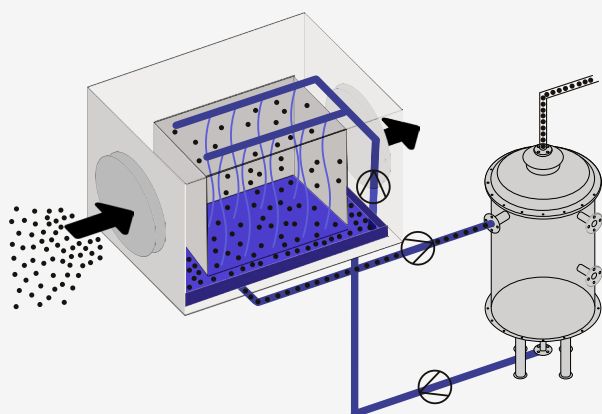


Plant for 1 x 2500 m³/h, PP

In a cleaning and drying process an exhaust gas of 2500 m³/h containing up to 3400 mg/m³ glycol is generated. The exhaust gas is cleaned by a packed column scrubber manufactured out of PP. Due to the high inlet temperature a stainless steel quench is installed upstream. The scrubber was installed at an already existing production plant.

DIRECT AIR CAPTURE (DAC)

Direct Air Capture (DAC) is a process to extract carbon dioxide (CO_2) directly from the ambient air. The basic principle is that ambient air flows through a separator that removes CO_2 . The process is an absorption-desorption process. In the realized absorption process, the carbon dioxide in the gas phase is separated from the ambient air by a liquid (absorbent). The in parallel operated desorber separates the CO_2 out the liquid. The CO_2 is available for further use in highly concentrated and high-purity form. The liquid goes back to the adsorption process.



The further utilization routes of CO_2 are application-oriented, but not task of this pilot project. Possible ways of usage:

- Synthetic fuels
- Raw materials for the chemical industry
- Storage in underground storage facilities

In cooperation with the ZSW (Center for Solar Energy and Hydrogen Research), PlasmaAir AG has built a pilot plant for the capture of CO_2 from ambient air. Both absorber and desorber are installed in containers, which allows an easy scaling.

The system was installed at the ZSW in Stuttgart and is operated there as a test plant for process qualification and customer presentation. It serves as a technology demonstrator and delivers approx. 100 t/a of highly concentrated CO_2 (>99,5%).



DAC pilot plant



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