

**IN-SITU GROUNDWATER
TREATMENT****CARBON DIOXIDE VACUUM
STRIPPING (CVS)****Application**

The process of Carbon Dioxide Vacuum Stripping (CVS) is a patented and proven technology that remediates groundwater, vadose water, water in permeability zones in rock, and open waters contaminated with organic pollutants. The technology is offered in three systems:

The **CVS-I** strips VOCs such as halogenated solvents, BTEX, certain phenols, plasticizers from the groundwater

The **CVS-II** eliminates semi- and nonvolatile constituents from the groundwater including LNAPLs, combining the CVS concept with the ElectroChemical GeoOxidation

The **CVS-III** is a mobile CVS-well floating in open waters.

The Process

The flow of groundwater to the remediation well is caused by a partial vacuum exercised onto the watertable within the CVS well. This technology has been developed by the British Corps of Engineers in Africa about 150 years ago, which is named „Evacuation Well“. This method increases the throughput of the CVS-well by the factor 8 to 10 compared to the natural throughput of a well.

As to the CVS-I system, the VOCs are stripped (extracted) in wells with PVC or PE casings by carbon dioxide which is injected in the well water in small quantities by a patented custom-built injector. Carbon dioxide also serves as carrier gas evacuating the volatile substances from the well.

As to the CVS-II system, the well casing is made of steel and serves also as an electrode. Combined with a counter-electrode, an in-well anodic or cathodic oxidation of the pollutants, floated by the carbon dioxide, will occur. The direct current required for operation is supplied by a special custom-built a.c./d.c. converter.

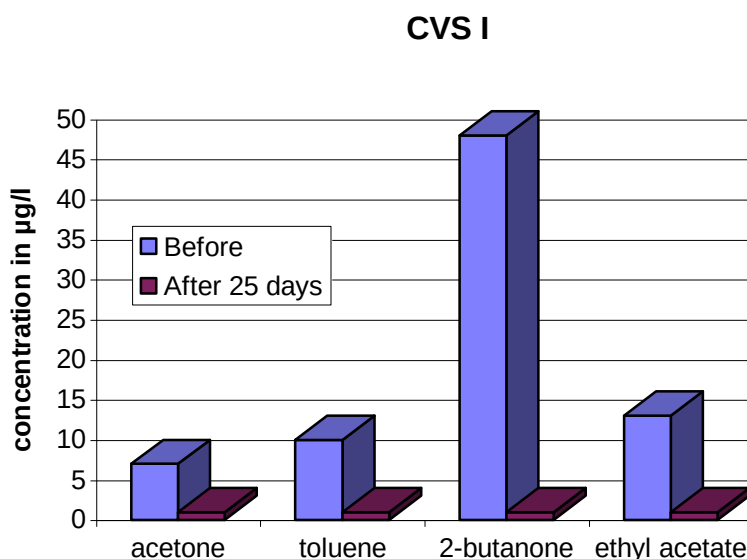
The waste gas stream from the well is – as the special circumstances of the project may require – is treated by adsorption in canisters containing activated carbon, by condensation in cold traps or by incineration in catalytic oxidation plants.

Special features

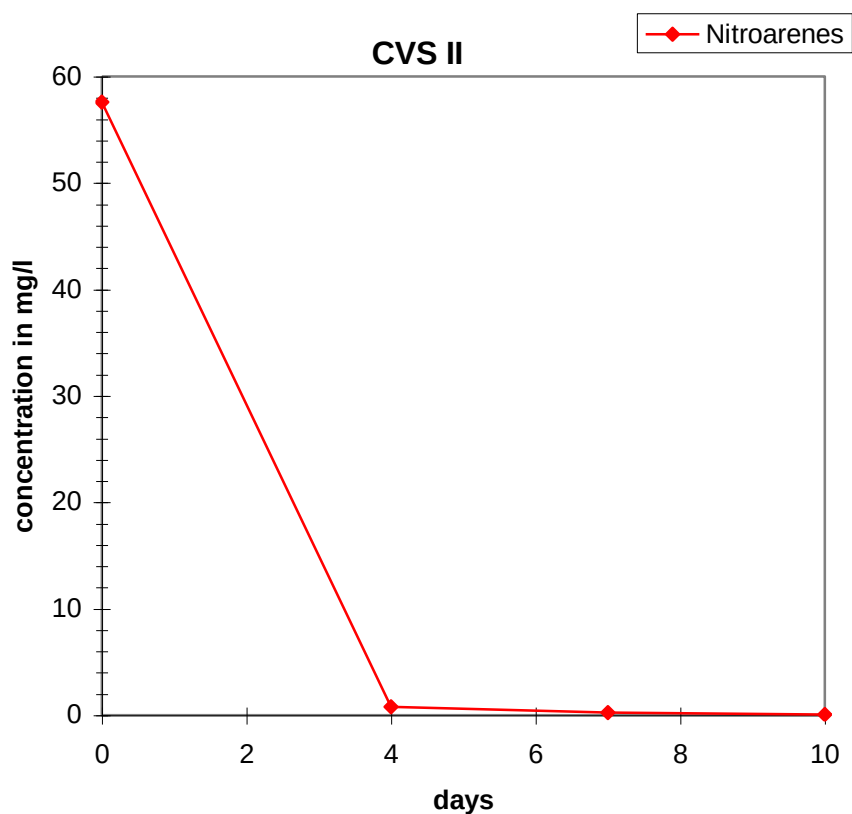
- no water is pumped off and fed back to the aquifer
- the hydraulic head outside the CVS well will not change when operating the CVS-wells
- the process is suitable for urban and developed areas since it does not affect negatively foundations, buildings etc
- The process acts quickly compared to pump & treat arrays and becomes effective within a short period

Performance

The process meets all regulatory clean-up levels. VOCs in most cases are extracted to levels below limits of detection. The Project performance is subject to a Quality Assurance System (QAS) certified in compliance with ISO 9001. The QA system relies on our in-house chemical analysis. Sampling is performed by personnel specially trained and accredited to the competent regulatory authorities. The standard performance is reflected below:



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**Experience**

About 150 CVS, in most cases of the CVS-II type, have been operated commercially.