

## PHOTOOXIDATION

### Description

The photo catalytic oxidation describes an air treatment technique, which is an alternative to thermic catalytic oxidation or adsorption techniques. This method was established and successfully implemented by DELTA Umwelt-Technik GmbH.

The process air to be treated passes through the UV reactor with special catalyst material. Particularly powerful is the photo oxidation in desorption plants (stripping) for groundwater treatment with vinyl chloride and DCE contaminations.

### Reaction process

The primary reaction is always the photolysis (see equation A). The formed decomposition products react with the simultaneously formed oxidants in equation B to E.

**A:**  $R-R + h\nu \rightarrow R\cdot + R\cdot$  ( $\lambda < 250 \text{ nm}$ )  
Splitting of the pollutant

**B:**  $O_2 + h\nu \rightarrow 2 O\cdot$  ( $\lambda < 190 \text{ nm}$ )  
Oxygen splitting

**C:**  $O_2 + O\cdot \rightarrow O_3$  ( $\lambda < 190 \text{ nm}$ )  
Ozone generation

**D:**  $O_3 + h\nu \rightarrow O_2 + O\cdot$  ( $\lambda < 260 \text{ nm}$ )  
Ozone splitting

**E:**  $H_2O + h\nu \rightarrow H\cdot + OH\cdot$  ( $\lambda < 190 \text{ nm}$ )

Production of OH radicals due to air moisture

### Advantages

- **No emissions into the atmosphere** through circulated stripping air as internal process stream for desorption (zero emission technique)
- Set up a stable CO<sub>2</sub> balance between effluent and process air
- No pH increase through CO<sub>2</sub> stripping
- No precipitation of oxidation products e. g. Fe(III), carbonates und hydroxides
- **End products are CO<sub>2</sub>, water und HCl**
- Elution of HCl through effluent water in the desorption column at simultaneously low acidification of the effluent
- (especially) Fe(II) stays dissolved
- Prevention of precipitation and sedimentation



Photolysis reactor for ground water treatment

- **Low operating temperature / energy consumption**
- **High operating efficiency due to avoidance of consequential costs (disposal)**

