

## Removal of phenols with AnoxKaldnes™ Moving Bed Biofilm Reactors (MBBRs)

Industrial effluents can often be loaded with special and complex compounds. Some of these compounds are difficult to remove and can also be harmful to the environment and living organisms if left untreated. One of these special compounds is phenol.

Phenols is a group of organic compounds with one or more hydroxyl groups bonded directly to an aromatic hydrocarbon group and of the phenols, phenol is the simplest molecular compound.

### Why is phenol of concern?

Phenol is toxic to organisms living in the water and is accumulated in nature. It is mutagenic and can cause genetic defects. In addition, phenol is also toxic to humans, through ingestion, inhalation, and skin contact. The toxicity levels usually are in the range 9–25 mg/L for both humans and aquatic life.

If a wastewater treatment plant receiving phenols in the influent also needs to do nitrification, removing the phenols before the nitrification step is a prerequisite since nitrifying bacteria are inhibited by phenol even in relatively low concentrations. Phenol is a priority compound by many EPA:s and the discharge limits are commonly in the lower µg/l range.

### Biological treatment of phenol contaminated wastewaters

Removal of phenol from industrial effluents is usually done through physicochemical or biological wastewater treatment methods. Physicochemical methods are often higher in cost compared to biological methods.

Removing phenol in the conventional activated sludge process is possible but it may require a long sludge age and the process is sensitive to variations in influent phenol concentration. The MBBR process is a fixed film process which uses carriers with a high protected surface area for biofilm development. As such, the phenol degrading bacteria are able to colonize the media and be retained in the reactor, providing a more compact and robust process for the removal of this contaminant.



## Water contaminated with phenol

Phenol is a compound that can be produced naturally through degradation of organic material. Phenol can also be used as feedstock for the manufacturing of different compounds or products such as some synthetic polymers (for example, phenol-formaldehyde resins), some pharmaceuticals (for example, acetylsalicylic acid), chlorophenols (commonly used as herbicides, pesticides, and disinfectants), and dyes. It is also a constituent of coal tar creosote, and appears in coal-coking, coal gasification and refinery effluents.

## Industrial applications for Tracer™ Phenol MBBRs



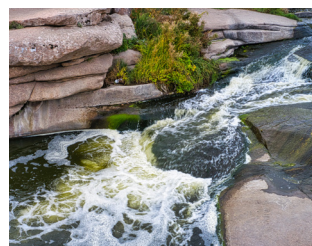
Chemical



Oil and gas



Pharmaceuticals



Groundwater Remediation

## Using AnoxKaldnes technologies to remove phenol

AnoxKaldnes with other Veolia Water Technologies subsidiaries have demonstrated the technical feasibility of using Tracer™ Phenol MBBRs for the treatment of phenol-contaminated effluents from different locations around the world such as USA, South Africa, Canada, Sweden, and Poland, both at bench scale and full scale. Efficient removal of phenol has been achieved for many types of wastewaters including effluents from Oil & Gas, Chemical Industries, Refineries, Specialty Oil Products, and Groundwater Remediation. As such, using Tracer™ Phenol MBBRs we can achieve phenol levels down to the low µg/l range and thus fulfill EPA's strict phenol limit requirements.

Feel free to contact us for more information about how AnoxKaldnes Tracer™ technology creates new possibilities in biologically removing harmful compounds in industrial wastewater.

AnoxKaldnes • Veolia Water Technologies  
Klosterängsvägen 11A • 226 47 Lund • Sweden  
Office: +46 (0)46 18 21 50  
[www.anoxkaldnes.com](http://www.anoxkaldnes.com)

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Water Technologies