CASE STUDY: MTBE REMOVAL & HOLLOW FIBER MEMBRANES

Innovative Treatment of MTBE in Groundwater, Soil, and Air: A Case Study

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Treatment of soil, water and gas creates a unique challenge in MTBE remediation. This article discusses a technique to deal with all three phases of contamination.

MTBE is a hydrophilic which translates into high solubility and low Henry´s constant. MTBE does not sorb well onto soils, activated carbon or other common absorbents. These particular problems require innovative approaches to address the remediation of MTBE with cost efficiency.

At sites with low flow rates, up to 10 gal/min, a recent study indicated that hollow fiber membranes (HFM), patent pending, combined with heated spray aeration vacuum extraction (patented Remediation Service Int´l.) could be a cost effective alternative for the treatment of MTBE in groundwater. Studies show that both technologies can offer success in cost effective removal of MTBE in groundwater.

Hollow Fiber Membranes

Hollow Fiber Membranes (HFM) are used by applying a vacuum on the exterior of the hydrophobic fiber while contaminated water flows in the lumen side. Water will not pass through the fiber because of the hydrophobicity. A high percentage of removal efficiency can be accomplished, with a lower air to water ratio, thereby reducing air treatment costs.

Hydrophobic HFM processes offer an alternative opportunity for removal of MTBE and other highly soluble organic compounds from contaminated water. HFMs have been developed to efficiently deliver oxygen to aeration treatment systems, and to strip VOCs from water.

In some applications, air is delivered through the center of the membrane and diffused into the water surrounding the fiber. Another process has been developed, passing contaminated water through the inside of the fiber and passing clean air on the outside. Hydrophobic VOC molecules diffuse out of the water, through the membrane, and into the flowing air phase. At this point, the molecules can be adsorbed or destroyed through other remediation processes.

Spray Aeration Vacuum Extraction

The S.A.V.E.™ system combines Spray Aeration and Airstripping technologies for groundwater treatment, coupled with an internal combustion engine (ICE) used for power generation, high vacuum dual phase SVE extraction and off gas abatement. The Spray Aeration system uses the same principles as a conventional air stripper but enhances the stripping process by maximizing the surface area between groundwater and air using a finely atomized spray, and through the introduction of heat and vacuum. Waste heat generated by the ICE is used to increase the temperature of the

contaminated groundwater, increasing the vapor pressure of the organic contaminants and favoring their vaporization into the air phase.

The vacuum generated by the ICE lowers the overall operating pressure which further enhances the transfer of contaminants to the air phase. Water in the Spray Aeration tank is re-circulated through the spray nozzle at a rate 80 gpm, which maintains a high water-to-air transfer rate. The combination of these four improvement over a conventional air stripper significantly reduces the air / water ratio, which results in less vapor phase treatment.

The Internal Combustion Engine (ICE) is similar to conventional thermal oxidizers, except that it generates its own power, and it is also the vacuum source for the extraction processes. The ICE also process higher VOC concentrations by volume than conventional oxidizing technologies, therefore requiring less dilution air from atmosphere when concentrations exceed the lower explosion limit (LEL). In the case of petroleum hydrocarbons, the vapor phase contaminant becomes a fuel source for the internal combustion engine.

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