iSOC® YOUR ULTIMATE MANAGED ATTENUATION TOOL

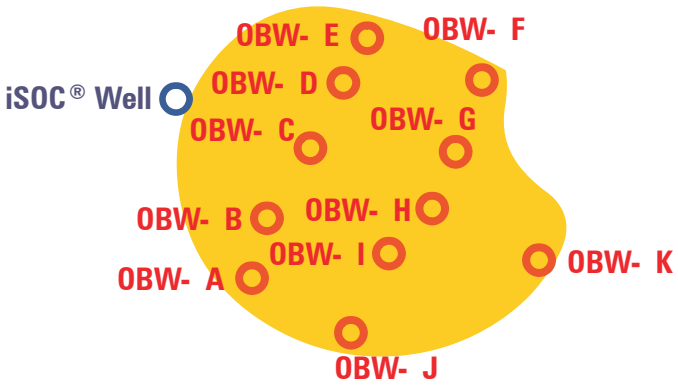
PILOT CASE STUDY: GROUNDWATER BIOREMEDIATION OF A RAILROAD XYLENE SPILL NORTHERN GEORGIA

A spill of approximately 50,000 gallons of pure xylene occurred as a result of a train derailment in north central Georgia in 1988. The spill resulted in two separate xylene plumes in the groundwater. Heterogeneous layers of interbedded sands, silts and silty clays underlie the site. Most of the site can be characterized as having low permeability. Depth to bedrock at the site is generally at 7 to 15 feet.

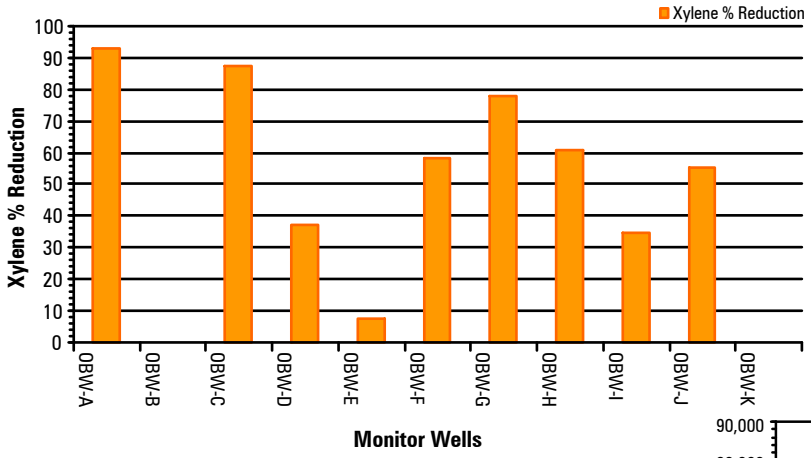
Groundwater remediation at the site was initially accomplished using a biosparging/soil vapor extraction system. In an effort to reduce capital and O&M costs, the site consultant began a pilot test in April 2004 using the iSOC® technology. This system is particularly successful in low permeability sites. The pilot test was initiated in one of the xylene plumes referred to as the south plume. This plume is approximately 500 feet long and 80 feet wide, has xylene concentrations ranging up to 180,000 ppb, and is moving in a southerly direction toward a creek. The pore velocity of the groundwater is 78 ft/year though the xylene is moving slower. One iSOC® injection well was installed in groundwater with xylene concentrations up to 82,000 ppb. To measure changes in groundwater quality downgradient from the injection well, 11 observation wells were installed in lines perpendicular to groundwater flow at distances of 10, 20, and 30 feet from the injection well. The first two rows had 5 monitor wells spaced 5 feet apart. BTEX and heterotrophic bacteria plate counts were measured.

Site analysis has shown that there was iSOC® influence in each of the 11 monitoring wells down gradient of the injection well (IN-1) within only one month of pilot startup. Within this area of influence and within one month of pilot startup, each of the 11 monitor wells down gradient of the injection well showed substantial increase in hetrotrophic bacteria colonies. This area of influence has a minimum width of 20 feet and minimum length of 30 feet down gradient of the single iSOC® injection well. Four months after pilot startup, xylene has been reduced in a total of 9 of 11 monitor wells in the study area. Within the first 20 feet down gradient of the iSOC® well, xylene concentrations have been reduced by an average of 57% in 9 of 10 wells. A full scale system is planned.

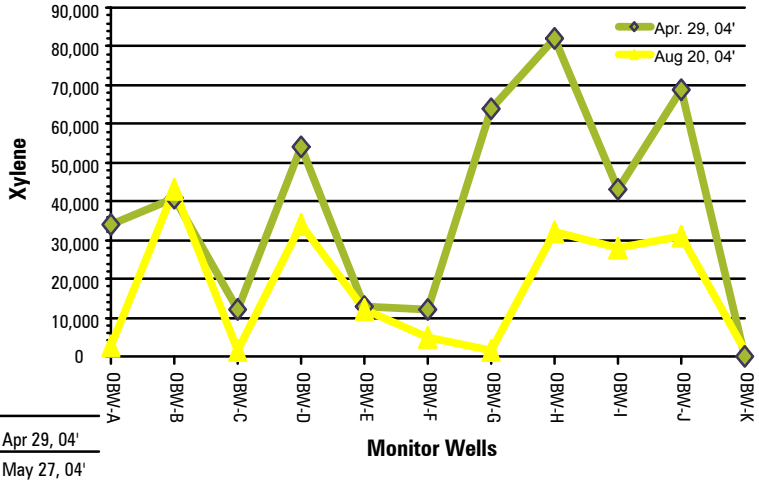
PILOT LAYOUT



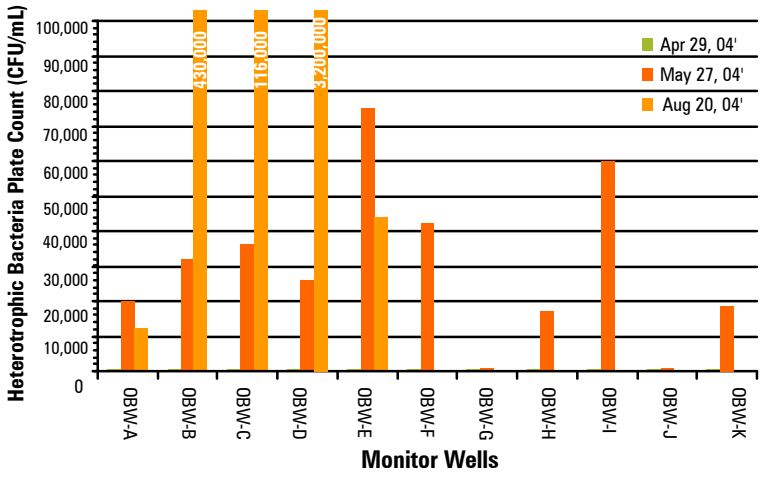
XYLENE PERCENTAGE REDUCTION



XYLENE PLOT



HETEROTROPHIC BACTERIA PLATE COUNT (CFU/mL)



iSOC® AND BIOREMEDIATION ENHANCEMENT

iSOC® is an ingenious gas delivery system based on inVenture's patented Gas inFusion technology - a unique method of infusing supersaturated levels of dissolved gas into liquids. At the heart of iSOC®, the proprietary structured polymer mass transfer device is filled with micro-porous hollow fiber that provides an enormous surface area for mass transfer - in excess of 7000 m^2/m^3. It is hydrophobic and therefore excludes water. Maintaining gas pressure less than the surrounding liquid pressure ensures that ultra efficient mass transfer takes place without sparging.

In an aerobic bioremediation application, the iSOC® supersaturates the monitoring well with low decay dissolved oxygen (DO), typically 40-200 PPM depending on depth in groundwater. A natural convection current and a designed release bubble from the top of the iSOC® fills the well with a uniform DO curtain. The supersaturated DO curtain of water disperses around the well into the adjacent groundwater and enhanced bioremediation removes organics through natural attenuation. Placement of injection wells depends on site-specific conditions. The system is installed in a few hours and easily moved from well to well to optimize performance and remediation strategies.