

## Oxygen Release Compound, ORC<sup>®</sup>

### Use in Existing Monitoring Wells

In many cases it may be desirable to convert monitoring wells to remediation wells to reduce monitoring costs and help enhance intrinsic bioremediation. In some cases, there may be many excess wells on a site to effect the treatment to a greater extent. Also, sometimes specific wells with elevated contamination levels can be the direct target of remediation to facilitate closure.

To determine the effect of ORC in the monitoring well and its immediate vicinity, the following protocols are recommended:

When groundwater conditions allow use of a peristaltic pump, Regensis recommends installation of a length of 3/8-inch OD and 3/16-inch ID tubing (dedicated) to a depth of 2-4 feet below the groundwater surface. This tubing could be inserted into the well at the time of ORC installation or immediately prior to the first sampling event. Enough tubing should be left outside the well to allow connection to the peristaltic pump. After removal of approximately a volume of groundwater equal to the length of the Teflon tubing, collect a dissolved oxygen (DO) concentration reading and a groundwater sample using the peristaltic pump. This sample should be taken prior to purging groundwater from the monitoring well. For data analysis reliability DO concentrations should be determined using a HACH titration kit Model OX-2P.

When groundwater conditions preclude the use of a peristaltic pump and ORC socks are suspended in the well, Regensis recommends that the ORC be gently lowered 2-3 feet within the well and a sample collected from 2-3 feet below the air/groundwater interface using a disposable bailer. DO measurements should be measured using the HACH Kit Model OX-2P. If the ORC filter socks fill the entire saturated zone within the well, Regensis recommends slowly removing the top section of the ORC and collecting a DO and groundwater sample approximately 2-3 feet below the groundwater surface prior to purging the well.

When ORC is used in a monitoring well it is difficult to measure the effect of the ORC treatment outside of the well. For example, removal of a typical 15 foot section of ORC from a 4-inch diameter well will cause a volume of groundwater (calculated to be approximately 9 gallons) to move into the well casing in order to fill the displaced volume of the ORC. The groundwater movement will likely cause turbulence and mixing of groundwater within and around the well casing. A high percentage of the ORC "displacement volume" could be filled with "unoxygenated" upgradient groundwater. This often occurs at sites with moderate to fast groundwater velocities where the upgradient groundwater is oxygen depleted. The expected effect on groundwater samples collected after introduction of this "untreated" groundwater into the well would be an artificial lowering of the DO level and increase in hydrocarbons. The effect of purging of 3-5 casing volumes will magnify the problem.

A recommended alternative to using ORC in monitoring wells, is to use bulk ORC prepared as a slurry and directly applied into the aquifer in the area surrounding the well. By using ORC slurry in direct-push bore holes, monitoring wells continue to maintain a monitoring well status. Thus, typical sampling techniques and protocols can be followed to collect reliable data from these wells. Furthermore, the remediated area is larger than that of a well containing ORC filter socks.

The cost for this local "spot treatment" using ORC slurry will be higher than simply using ORC socks in an existing monitoring well. However, the probability of achieving site closure is significantly increased.