HRC TECHNICAL BULLETIN # 2.4.4

Hydrogen Release Compound HRC®

Simple Field Pilot Test Designs

In the initial stages of HRC testing, the efficacy of HRC was studied in single monitoring wells. HRC was placed in PVC canister measuring four feet in length and three inches in diameter. These small scale field studies were designed to observe the immediate impact of HRC on water passing through the monitoring well. Each study consisted of five rounds of sampling over a period of twelve weeks. Sampling was fairly intensive, consisting of the following parameters:

1. EPA method 8260 (chlorinated VOCs)

2. Gases (methane, ethane, and ethene)

3. Nutrients, electron acceptors, and inorganics (nitrogen, nitrate, phosphorous, sulfate, sulfide, iron, chloride, and manganese)

4. Volatile organic acids (lactic acid, pyruvic acid, acetic acid, and propionic acid)

5. Alkalinity, TOC, and conductivity

6. DO, redox potential, pH, and temperature

7. Microbial (total anaerobes and sulfate reducing bacteria)

The sampling intensity that was utilized over the twelve weeks of testing was crucial in determining the early performance characteristics of HRC. In all studies the initial impact of HRC was the reduction of redox potential and DO levels in the well as lactic acid was released from HRC. Over time pyruvic and acetic acid concentrations increased as the lactic acid underwent metabolism by indigenous microorganisms. At the same time electron acceptors (nitrate and sulfate) were reduced as indicated by concentration decreases. This initial process can collectively be called "driving" the aquifer anaerobic.

Once the aquifer was driven to a reduced, anaerobic state, reductive dechlorination of the CAHs began occurring, as described in Technical Bulletin 1.1.2. At some sites reduction of CAHs began to occur within the first two weeks of application, while at other sites appropriate reducing conditions were not reached until after eight weeks of application. This was mostly due to initial aquifer conditions, in which aquifers with highly positive redox potentials, measurable levels of DO, and high levels of competing electron acceptors took much longer to be driven to anaerobic, reducing conditions. Results from one representative study are discussed in detail in technical bulletin 3.1.2.

HRC Technical Bulletin Index||HRC Homepage