Vinyl Chloride Remediation Field Results

Contaminants	Application Method	Soil Type	Groundwater Velocity
Vinyl Chloride	Risk Reduction	Silty Clay	0.2 ft/day

In the anaerobic degradation of certain chlorinated hydrocarbons such as TCE, a highly toxic intermediate, vinyl chloride (VC), can form. Technical Bulletins in the 2.2.2 series give further details on the subject. Essentially oxygen can be both a preventative treatment (since a positive redox potential will inhibit VC formation), or it can be used to remediate the aerobically degradable VC if it does form. According to several recognized experts in the remediation of chlorinated hydrocarbons, *there is no record in the literature to date documenting the aerobic remediation of VC in the field.* The observation has only been made under laboratory conditions.

The initial phase of a simple preliminary investigation was recently completed and it shows that oxygen generated by ORC has an effect on VC levels in the subsurface. Concurrent laboratory results, using samples taken from the field, confirm that ORC has the same remedial effect that is observed in-situ.

The opportunity to place ORC in the field, at the site in question, was limited. Full details identifying the site awaits completion of the experiment and approvals from the cooperating parties. In the interim the results are as follows. The site where the experiment took place has the following generic description; the areas used in the study consist of monitoring wells 6S and 6I and 3S.

1. 6S is a monitoring well about 10 feet downgradient of a test pit about 8' X 5'. In this pit a single 2" diameter X 1' long ORC filter sock was buried just beneath the surface of the saturated zone. Therefore, VC contaminated groundwater flows through the test pit, contacting the filter sock, and then moves toward MW 6S. Flow rates are being determined, however, they are on the order of several inches per day or less as the groundwater is moving through clay with silt.

2. 6I is another monitoring well about 10 feet south of 6S. It is contaminated with VC as presented in the table. A 2" X 1' sock was hung in the well in contact with groundwater.

3. 3S is another monitoring well about 40 feet south of 6I. It is contaminated with VC as presented in the table and was used as a control, i.e. no ORC was applied. The results are presented below. Background data from 8/14/94 existed in the records and the experiment began with baseline measurements on 6/1/95. The first data set was collected on 8/30/95 and another is due on 11/7/95.

DATE	VC in ppb at 6S	VC in ppb at 6I	VC in ppb at 3S
8/14/94	442	130	36
6/1/95	230	235	40
8/30/95	160	74	36

These results indicate the following:

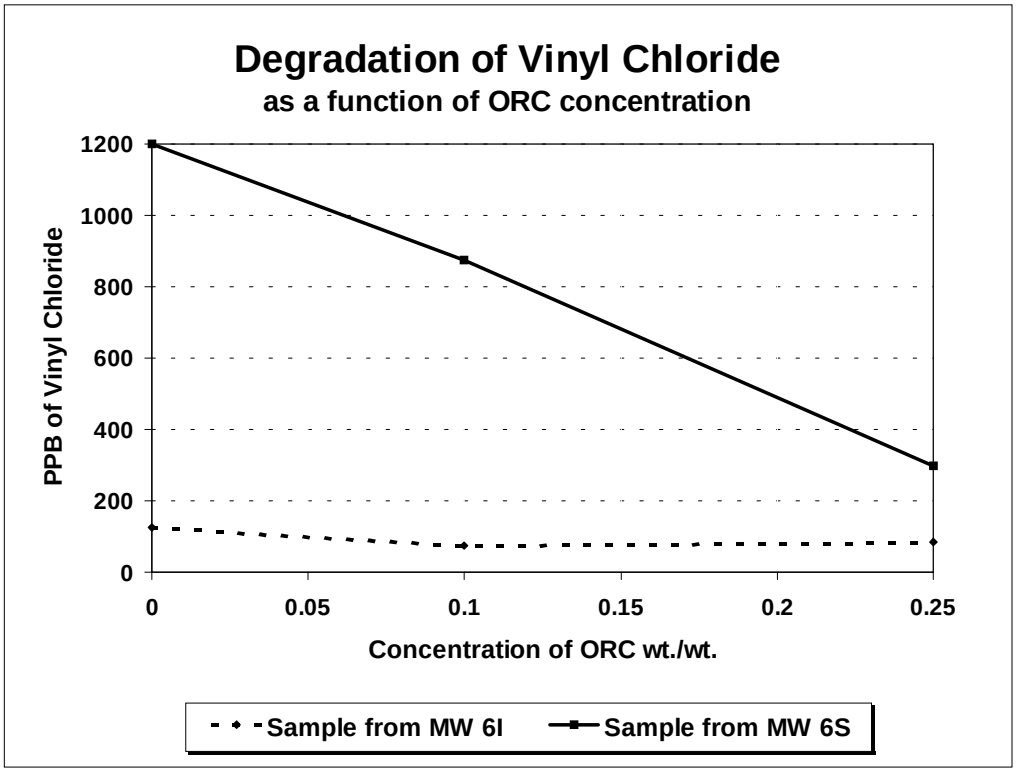
1. The control well (3S) has a constant contaminant level in this site which experiences a slow ground water velocity. Contaminant levels did not attenuate naturally, presumably due to the lack of oxygen.

2. The levels in the vicinity of 6S appear to have attenuated naturally, however, the rate of this degradation was apparently accelerated in the presence of ORC. Assuming a first order decay rate for VC, the rate of degradation was 2.4 times greater between 6/1/95 and 8/30/95 than what would be expected from the rate as it is calculated between 8/14/94 and 6/1/95. The level of VC on 8/30/95 should have been 200 ppb rather than 160 ppb. It should be noted that a single 2" diameter filter sock only supplies about 18 g of oxygen in 6 to 12 months. Therefore, these results were achieved with only 4.5 to 9 grams of oxygen, **from one sock**, released slowly over 3 months into a test pit area about 2 cubic meters in volume.

3. The most dramatic results are seen where the ORC is placed directly into the well. VC levels had risen from 130 ppb to 235 ppb in this region over the year preceding ORC installation. Three months after the ORC was applied the concentration was down to 74 ppb.

Laboratory results were carried out which complement these results. A soil and water mixture was gathered from the site in the vicinity of 6S and, in a separate smaller experiment, from 6I . These contaminated materials were set up in flasks and treated with .1 and .25% ORC on a wt./wt. basis. In the first set of flasks, using 6S material, the initial condition in the soil/water inoculum was 1,200 ppb. In the second set of flasks, using 6I material, the initial condition of the soil/water inoculum was 140 ppb. Each flask was assayed after two weeks. Figure 1 presents the results as a function of dose response to ORC.

Figure 1



1011 Calle Sombra, San Clemente, California 92673
Ph: 949-366-8000 Fax: 949-366-8090 email: orc@regenesis.com