ORC TECHNICAL BULLETIN #2.3.2

Oxygen Release Compound, ORC®

Qualitative Guidelines for Soil Remediation Applications (Biopiles)

Once the qualitative need to use ORC has been established there are several ways to calculate use rates. One must know the weight of soil either by direct measurement or by soil type estimate. Since ORC is most appropriate for heavy clay soils a value of 3,000 lbs/cubic yard will be used in this example. Under these conditions one would need 3 lbs. of ORC for every .1% of ORC applied on a wt./wt. basis, noting that ORC is 10% oxygen by weight.

Calculation of the hydrocarbons that can be remediated from the oxygen applied through ORC is not straightforward; unexpectedly high results have been noted in field tests. Given a straight calculation based on the standard 3:1 ratio, 3 pounds or 1,362 grams of ORC with 10% oxygen, would be able to remediate 45 grams of hydrocarbons. This would be enough to remediate 34 parts per million (ppm) of hydrocarbon in a cubic yard of the soil as described. If the ratio approached 1:1, which more realistically includes some biological incorporation of carbon in addition to mineralization to carbon dioxide, there would be a capacity to remediate about 100 ppm of hydrocarbon for every .1% of ORC used on a wt./wt. basis.

In a test of ORC on the remediation of weathered crude oil, about 7,000 ppm of hydrocarbon was remediated in 200 days (1 application) with 1% ORC. By the above calculations, even under the best of conditions (1:1 ratio), only 1000 ppm should have been remediated. One of the reasons the higher remediation rate may have occurred is related to the physical nature of ORC. Because it is a very fine insoluble particle it has the capability of being intimately mixed throughout a tight soil mass. The result is that one has countless micron-sized particles releasing oxygen simultaneously effecting a mass transfer phenomenon for oxygen that is not possible with forced air. This generates the observed "yeast effect," in which the pile expands.

What may be happening is that numerous microchannels are being created such that ambient air can more readily permeate the pile. It must be noted that even though a volume of ambient air entered the system upon mixing, the experiments were done *under saturated conditions* to effect an anaerobic environment. With the extant oxygen being flushed out, the remediation effects could have been due to a combination of ORC and the facilitated diffusion of ambient oxygen as mediated by the ORC induced yeast effect.

Practically speaking, under the right conditions ORC would best be used in the remediation of several thousand ppm of hydrocarbons, either initially in a low contamination situation, or as a polishing agent after basic forced air applications. Concentrations of hydrocarbons that make the soil oily would be hard to manage as the insoluble ORC particle can become obstructed by coating.

Regenesis personnel are available to assist you with a specific analysis of your needs.

Technical Bulletin Index||Regenesis Home Page