



ANNOUNCEMENT- New Product ABC-Olé

Anaerobic BioChem (ABC[®]) and Emulsified Fatty Acids

Redox Tech, LLC, a small environmental remediation firm that provides state-of-the-art *in situ* remediation of soil and groundwater, is pleased to announce the availability of ABC-Olé - an emulsified fatty acid product designed to address anaerobic bioremediation sites where emulsified vegetable oil (EVO) products are being evaluated. ABC-Olé is a modified blend of ABC[®] which contains a fatty acid content ranging from 50-85%. ABC[®], which has been on the market since 2004, is a patented mixture of carbon substrates that historically included lactates, lactate esters (ethyl lactate), alcohols, fatty acids, and a phosphate buffer. The lactate components serve as the short-term (more quickly consumed) components and the fatty acids serve as long-term releasing components. The phosphate buffer provides phosphates and pH control. Phosphates are an essential micronutrient for bioremediation. A pH range of 5.5 to 8.5 is optimal for complete dechlorination. ABC[®] has been successfully employed at over 250 sites in the United States and Europe. One of the main advantages of ABC[®] is that it is completely water soluble, and thus there are no chances for an emulsion to break. Redox Tech originally utilized soybean oil for a long-lasting component, but after having an emulsion break *in situ* in 2005, Redox Tech switched to C18 fatty acids (Oleic Acid).

Let's Talk About Vegetable Oil

Vegetable oil is an example of a triglyceride. All triglycerides react with water to form glycerin and three long-chain fatty acids. Most oils react with water to produce fatty acids with 18 carbons atoms (thus C18), but other fatty acids such as C14 and C16 can be produced. When emulsified oil is used for bioremediation, it is actually the fatty acids that are the slow-release substrate.



ABC[®] is formulated to site-specific conditions and historically has contained 5 to 15% dissolved fatty acids. The fatty acids are typically dissolved into ethyl lactate versus being emulsified. ABC-Olé can contain up to 85% emulsified Oleic Acid (fatty acid). Fatty acid is used rather than oil because the need for the water reaction is eliminated. There are pros and cons associated with using a product that predominantly contains long-chained fatty acids. Redox Tech still feels that there is a balance to be struck between short-lived and long-lived carbon substrates. Our emulsified oil competitors typically add glycerin (or lactate) to their EVO to provide a short-lived component.

Let's Talk About Pros and Cons

ABC[®] was always designed uniquely for each site. Greater amounts of buffer are added for low pH or high solvent sites. For high flowing aquifer systems, we typically added greater amounts of fatty acids because the fatty acids are more likely to sorb to the soil and not be washed out. Ultimately, the goal is to bring the oxidation-reduction potential of the aquifer to around sulfate reducing conditions (ORP of -175 mV). If the carbon substrate is not fermented at a rate sufficient to overcome the flow of oxygen (and other electron acceptors) into the system, the ORP may never become sufficiently reducing. That is one instance where insufficient short-lived substrate can be a problem, and a sign of this problem is cis-DCE stall. On the other hand, a substrate mix with too much short-lived material maybe expended (or washed out) prior to the subsurface being completely remediated and a sign of this can be cis-stall or large amounts of methane formation.

ABC-Olé contains emulsified Oleic acid (thus Olé) so we typically recommend the amount of long-lived carbon substrate to as high as 85 weight percent. For comparison purposes, common mayonnaise (an emulsified oil product) is about 65 weight percent nominally. ABC-Olé is formulated on a case-by-case basis to optimally meet your site remediation needs and provides an alternative to generically blended EVO products on the market. ABC-Olé also contains a pH buffer as part of the formulation so there is no need to purchase an additional component that needs to be mixed separately or blended into a lower carbon product.

Ease of Application

As a specialty remediation contractor, Redox Tech has been field applying *in situ* technologies over the past 18 years. Redox Tech has developed technologies which are accepted by regulators, easily applied, cost effective and specifically designed to optimize the remediation process. ABC-Olé has been accepted as an Innovative Remediation Technology by the Florida Department of Environmental Protection Waste Cleanup Programs. It is shipped in a concentrated formulation which can be applied via Direct Push (DPT), conventional monitoring or injection wells and soil blending applications. Site specific formulations with up to 85% oil derived ingredients are available at less than \$2 per pound. A 100 percent fermentable carbon product is available, but the pH buffer needs to be shipped separately for this mixture.

Let Redox Tech help formulate a remedial program for your site today. For more information visit our web page at <http://www.redox-tech.com> or contact us directly:

John Haselow
200 Quade Drive Cary, NC 27513
haselow@redox-tech.com Phone: 919-678-0140