



## BIOREMEDIATION

### ANAEROBIC BIOCHEM (ABC<sup>®</sup>) PLUS ZVI

Redox Tech, LLC has developed a proprietary formulation to promote anaerobic biodegradation of halogenated solvents in groundwater. The product, Anaerobic Biochem ABC<sup>®</sup>-1, is a patented mixture of lactates, fatty acids, and a phosphate buffer. ABC<sup>®</sup> contains soluble lactic acid as well as slow- and long-term releasing components. The phosphate buffer provides phosphates, which are a micronutrient for bioremediation. In addition, the buffer helps to maintain the pH in a range that is best suited for microbial growth. Using a

GeoProbe<sup>®</sup> and proprietary injection equipment, Redox Tech is able to inject ABC<sup>®</sup> in most geologic environments, including low-permeability silt and clay. For low permeability environments, Redox Tech utilizes hydraulic fracturing.

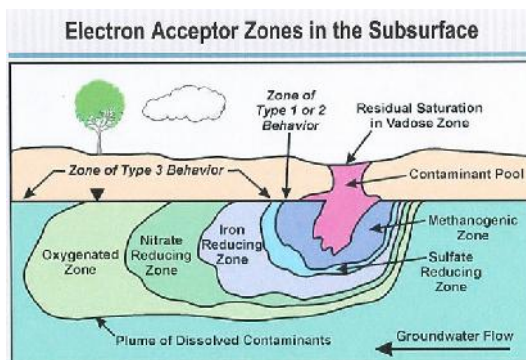
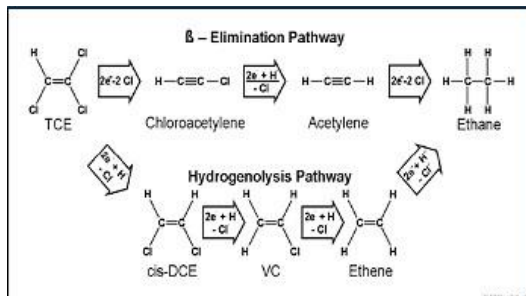
Many common organic groundwater contaminants can be treated *in situ* by enhanced anaerobic processes. These types of contaminants include chlorinated solvents, some chlorinated aromatics, nitroaromatics, inorganics (e.g. nitrate and perchlorate), and metals (e.g. chromium). With anaerobic biodegradation, the target contaminants are "reduced" with hydrogen, unlike chemical oxidation or aerobic processes where oxygen is the working chemical. For optimal anaerobic degradation to occur, more energetically favorable electron acceptors such as oxygen, nitrate, manganese, ferric iron or sulfate must first be consumed. There also must be sufficient carbon source or food for the bacteria to thrive. Carbon sources can include co-contaminants such as petroleum hydrocarbons or natural organic matter. If these carbon sources are not metabolically available or are not sufficient, the anaerobic process can be enhanced by introducing a food source into the subsurface. One of the most effective and environmentally benign food sources are fatty acids, which are found in ABC<sup>®</sup>. However, care must be taken not to overstimulate the bacteria, because in some instances, the desired bacteria may be overwhelmed by other bacteria (such as methanogens). This is why ABC<sup>®</sup> has slow- and long-term release compounds. In addition, in some instances, the bacteria that are necessary to obtain the desired results are not at the site. Often review of the site-specific data *a priori* can determine this. In some instances, fairly simple microbiological tests may be recommended.

Because enhanced anaerobic degradation can be different for every site, Redox Tech carefully reviews site-specific data before formulating a mixture. Redox Tech provides the added value of working closely with the client in order to help avoid costly and embarrassing failures.

ABC<sup>®</sup> is buffered because anaerobic biodegradation results in the product of metabolic acids, which can lower the pH and adversely affect the results. The pH buffer also provides a source of phosphate, which is known to be a micronutrient (aka vitamin) for the bacteria.

Perhaps one of the biggest advantages of ABC<sup>®</sup> results from its viscosity at ambient conditions. ABC<sup>®</sup> has roughly the same viscosity as a mixture of sugar water. This means that labor-intensive pre-heating is not necessary for injection. More importantly, the radius of influence that can be obtained with conventional injection is much larger for ABC<sup>®</sup> because it will not become noticeably thicker as it comes in contact with often colder soil and groundwater.










### ABC+ (ABC & ZERO VALENT IRON)



Through a license agreement provided by Envirometals and Adventus, Redox Tech is now the only licensed and approved company able to add zero valent iron to lactate products. We distribute and market this product as ABC+. With this product, you can enjoy the benefits of combining chemical and biological reduction. More information is provided below for ABC+, including a product description and field data.

Let Redox Tech help formulate an enhanced anaerobic [program](#) for your site today. For more information [contact us](#).

ADDITIONAL INFO

BROCHURES & PRESENTATIONS	 <a href="#">ABC Product Brochure (55.95 kB)</a>
	 <a href="#">ABC+ Presentation (713.91 kB)</a>
	 <a href="#">ABC+ Presentation (58.6 kB)</a>
CASE STUDIES	 <a href="#">ABC Case Study #1 (107.57 kB)</a>
	 <a href="#">ABC Case Study #2 (177.09 kB)</a>
	 <a href="#">ABC Case Study #3 (101.76 kB)</a>
	 <a href="#">ABC+ TCA Case Study (101.76 kB)</a>
OTHER DOCUMENTS	 <a href="#">Site Profile for Cost Estimate (27.11 kB)</a>
	 <a href="#">Florida Remediation Conference (2.23 MB)</a>
	<a href="#">Lactate</a> (webpage)

<sup>1</sup>ABC® is protected by [US Patent](#) 6,001,252 and 6,472,198