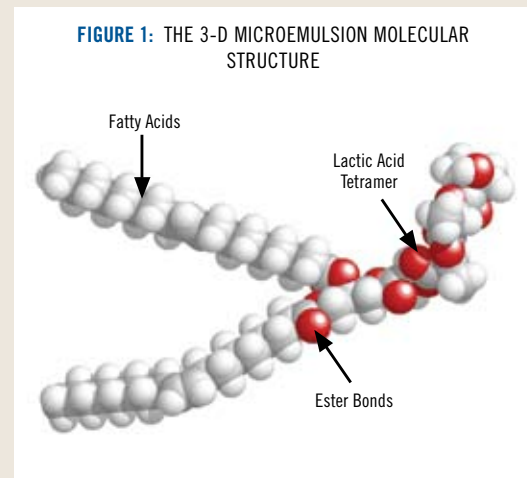


PRODUCT FEATURES

- **Three Stage Electron Donor Release – Immediate, Mid-Range and Long-Term Hydrogen Production**
  - Provides free lactic acid, controlled-release lactic acid and long release fatty acids for effective hydrogen production for periods of up to 3 to 5 years.
- **Low-Cost**
  - 3-D Microemulsion is 25¢ to 42¢ per pound as applied
- **Maximum and Continuous Distribution via Micellar Transport**
  - Unlike oil products, 3DMe forms micelles which are mobile in groundwater and significantly enhance electron donor distribution after injection.
- **Wide-Area/High Volume Microemulsion Application**
  - High volume application increases contact with contaminants and reduces number of injection points required for treatment – minimizes overall project cost.

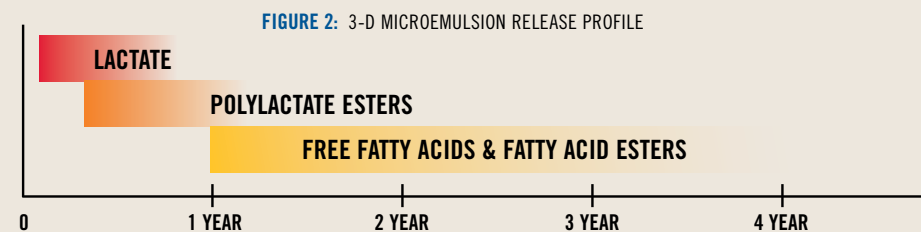


PRODUCT COMPOSITION

3-D Microemulsion (3DMe)™ is a form of HRC Advanced® and has a molecular structure specifically designed to maximize the cost-effective anaerobic treatment of contaminants in subsurface soils and groundwater. This structure (patent pending) is composed of free lactic acid, controlled-release lactic acid (polylactate) and certain fatty acid components which are esterified to a carbon backbone molecule of glycerin (Figure 1).

3DMe produces a sequential, staged release of its electron donor components. The immediately available free lactic acid is fermented rapidly while the controlled-release lactic acid is metabolized at a more controlled rate. The fatty acids are converted to hydrogen over a mid to long-range timeline giving 3DMe an exceptionally long electron donor release profile (Figure 2). This staged fermentation provides an immediate, mid-range and very long-term, controlled-release supply of hydrogen (electron donor) to fuel the reductive dechlorination process.

Typical 3DMe single application longevity is rated at periods of up to 3 to 5 years. With 5 years occurring under optimal conditions, e.g. low permeability, low consumption environments.



APPLICATION AND DISTRIBUTION

3DMe applications can be configured in several different ways including: **grids, barriers and excavations.** The material itself can be applied to the subsurface through the use of **direct-push injection, hollow-stem auger, existing wells or re-injection wells.**

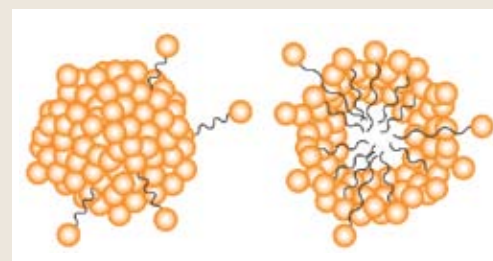
3DMe is typically applied in high-volumes as an emulsified, micellar suspension (microemulsion). The microemulsion is easily pumped into the subsurface and is produced on-site by mixing specified volumes of water and delivered 3DMe concentrate. Detailed preparation and installation instructions are available at [www.regenesis.com](http://www.regenesis.com).

3DMe is usually applied throughout the entire vertical thickness of the determined treatment area. Once injected, the emulsified material moves out into the subsurface pore spaces via micellar transport, eventually coating most all available surfaces. Over time the released soluble components of 3-D Microemulsion are distributed within the aquifer via the physical process of advection and the concentration driven forces of diffusion.

**MORE ON MICELLES**

Micelles (Figure 3) are groups (spheres) of molecules with the hydrophilic group facing out to the water and the "tails" or lipophilic moiety facing in. They are formed during the 3-D Microemulsion emulsification process and provide the added benefit of increased distribution via migration to areas of lower concentration.

**FIGURE 3: MICELLE REPRESENTATION**



MORE ON APPLICATIONS



3-D Microemulsion is delivered in 55 gallon drums, 300 gallon totes, tankers or buckets.



The microemulsion is easily prepared on-site and applied in high-volumes for maximum subsurface distribution.

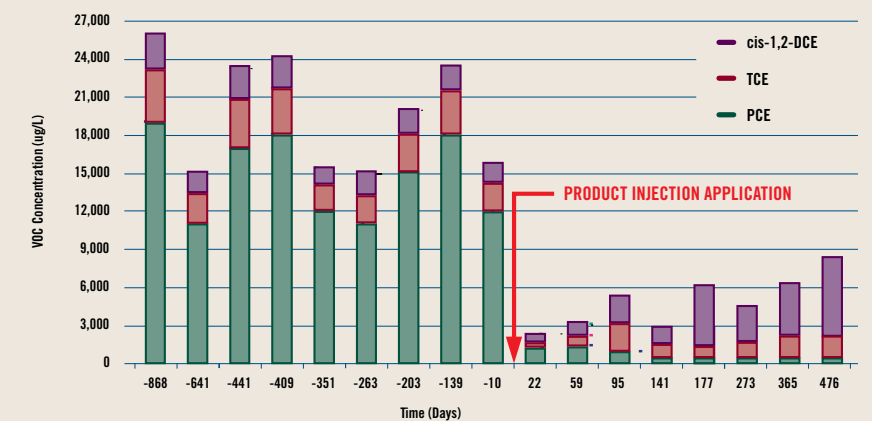


3-D Microemulsion is typically applied through permanent wells or by using direct-push injection.

**PERFORMANCE**

**Case Study #1**

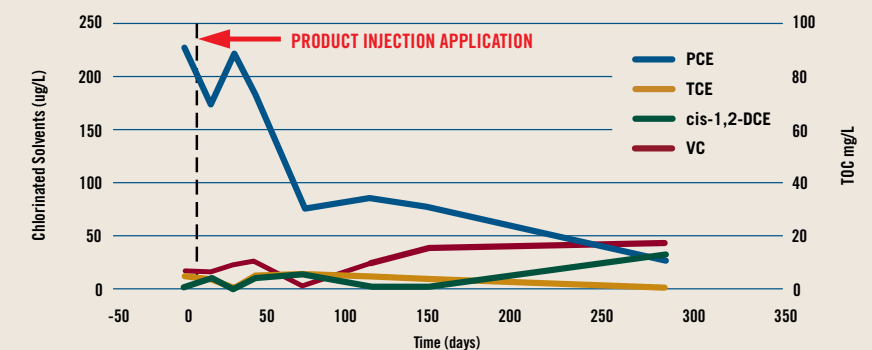
A site in Massachusetts showed high levels of PCE and its daughter products TCE and cis-DCE which had been consistently present for more than two years. 3DMe was applied in a grid configuration around monitoring well #16. In Figure 4, the contaminant concentration results indicate a rapid decrease in the parent product PCE and evidence of reductive dechlorination as demonstrated by the relative increases in daughter products TCE and cis-DCE.



**FIGURE 4: MW-16 CONTAMINANT CONCENTRATION DATA**

**Case Study #2**

A site in Florida was characterized with PCE contamination approaching 225 ug/L. A total of 1,080 pounds of 3DMe was applied via 16 direct-push injection points to reduce PCE concentrations. Monitoring results in well MW-103 indicated a PCE reduction of approximately 67% within 75 days of the 3DMe application. PCE concentrations continued to decline by 96% one year after application and daughter products remained at low levels. Total Organic Carbon (TOC) levels remained elevated at 17-19 mg/L after 275 days demonstrating the longevity of 3DMe (Figure 5).



**FIGURE 5: MW-103 CONTAMINANT CONCENTRATION DATA**

PERFORMANCE