



STAGED RELEASE, pH NEUTRAL, FACTORY EMULSIFIED ELECTRON DONOR

DESCRIPTION

Factory emulsified 3-D Microemulsion is a unique electron donor material that offers an engineered, 3 stage electron donor release profile, pH neutral chemistry and is delivered on-site as a factory emulsified material. This new molecule also exhibits a novel hydrophile-lipophile balance (HLB) which provides maximum subsurface distribution well beyond that of emulsified vegetable oils.

FEATURES & BENEFITS

- **3 Stage Electron Donor Release Profile Avoids Multiple Re-applications Saving Time and Money**

This feature optimizes start to finish timing of the enhanced reductive dechlorination process through an immediate, mid-range and long-term electron donor release. Without a 3 stage release profile, bioremediation efforts are inefficient, causing gaps in electron donor supply and requiring multiple injections. Factory emulsified 3-D Microemulsion offers a 3 stage electron donor release for optimal results (Figure 2).

Stage 1 - Immediately available free lactic acid (lactate) is fermented rapidly

Stage 2 - Controlled-release lactic acid (lactate esters and polylactate esters) are metabolized at a more controlled rate

Stage 3 - Free fatty acids and fatty acid esters are converted to hydrogen over a mid to long-range timeline giving factory emulsified 3-D Microemulsion an exceptionally long electron donor release profile

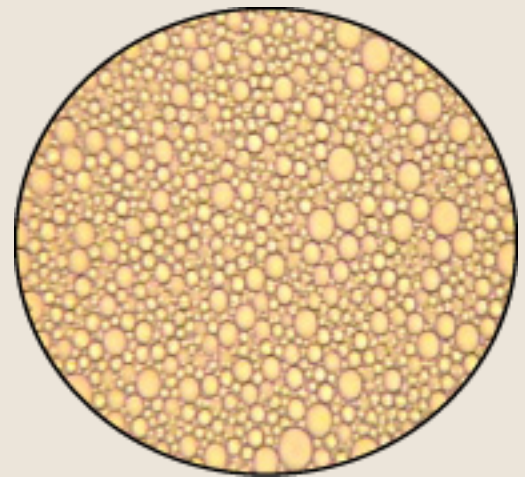
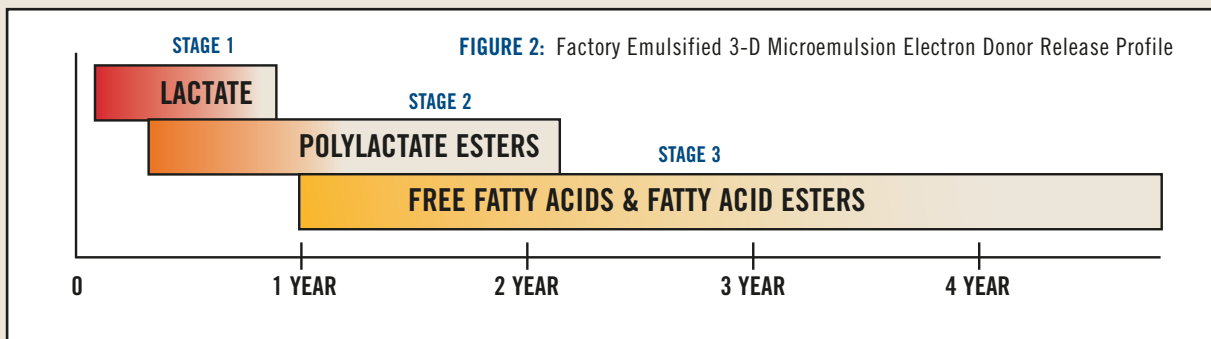


FIGURE 1: Microscopic view of factory emulsified 3-D Microemulsion.





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FEATURES & BENEFITS

- **A Unique Hydrophile/Lipophile Balance (HLB) Enhances Distribution and Limits Reduction in Hydraulic Conductivity**

The HLB feature allows the product to distribute in the subsurface via micellar movement. During this process, microscopic colloidal aggregates (micelles) continuously propagate from areas of high concentration to those of lower concentration moving the factory emulsified 3-D Microemulsion electron donor material into areas beyond those affected by the initial injection. This enhanced distribution mechanism allows for greater spacing between injection points and less time required for material application. Additionally, due to its unique hydrophile-lipophile balance, applications of factory emulsified 3-D Microemulsion have not resulted in the significant aquifer blockage as seen with the use of emulsified oil products.

- **Highly Efficient Application Designs**

When designing an *in situ* remediation project with factory emulsified 3-D Microemulsion, application designs are based on mass balance and stoichiometric demand from the contaminant, competing electron acceptors and a minimum total organic carbon (TOC) loading. This often results in a more efficient dosing requirement compared to design methods employed by other electron donor suppliers.

- **Neutral pH**

Neutral pH minimizes potentially harmful impacts to beneficial biodegrading microorganisms required to metabolize chlorinated contaminants. This feature can be highly valuable when the microemulsion is used in conjunction with pH-sensitive commercial bioaugmentation cultures

- **Injection-Ready Formulation, Simple and Easy Application**

3D Microemulsion is delivered on-site as a factory emulsified, injection-ready product. It can be applied as delivered or further diluted and mixed with additional site water to form a higher-volume ready-to-inject microemulsion. This material can be applied through a variety of application techniques including permanent or temporary injection wells and direct-push points.

- **Choose from a Range of Packaging Options**

Factory emulsified 3-D Microemulsion can be delivered in 400 lb. drums, 2000 lb. totes and large volume tanker trucks making shipping, receiving and application on any site simple and convenient (Figure 3).



FIGURE 3: A 2000 lb. tote of factory emulsified 3-D Microemulsion. The material can be delivered in drums, totes or tanker trucks.