

Chemical Oxidation Treatment Using Stabilized Hydrogen Peroxide

By: Gary Cronk, Wally Jensky, Greg Gibbs, and Stan Jackson

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Bench scale treatability testing performed at several contaminated groundwater sites was used to evaluate the chemical oxidation treatment performance of stabilized hydrogen peroxide (SHP) along with activated sodium persulfate. SHP uses a stabilizing agent to slow down the rapid decomposition of hydrogen peroxide which normally occurs during the catalyzation of hydrogen peroxide (CHP). Catalyzed hydrogen peroxide (CHP) typically involves addition of a ferrous iron catalyst or can even rely on the naturally occurring transition metals in the soil to catalyze the peroxide. Stabilizers used in SHP testing include sodium phytate and sodium citrate.

The SHP testing showed excellent contaminant destruction (89% to 100%) of recalcitrant petroleum hydrocarbons, such as MTBE, TBA, benzene, and styrene. SHP testing also showed excellent destruction of recalcitrant chlorinated compounds, such as vinyl chloride and 1,2-DCA. CHP testing demonstrated nearly identical destruction of these hard to treat constituents.

Residual peroxide testing was performed during the Bench Tests and the stabilized samples showed a peroxide longevity of 7 to 10 days. Meanwhile, the catalyzed samples showed peroxide consumption within 2 to 4 days. The net effect of this observation is that during field injections the peroxide can disperse outward for much longer periods of time using stabilized peroxide.

Use of CHP in the field commonly results in chemical daylighting and causes health and safety issues due to potential worker exposure. The CHP reaction is a Fenton's type reaction that generates excess heat (up to 140 degrees F), rapid decomposition of the peroxide, and a rapid increase in subsurface pressure due to buildup of oxygen gas. The SHP reaction does not generate the excess heat nor the rapid oxygen release which are responsible for the daylighting of chemicals. The use of SHP in the field is expected to minimize the occurrence and severity of chemical daylighting, while still providing excellent VOC destruction efficiency.

Gary Cronk, P.E.

JAG Consulting Group, Inc. 3340 S. Crawford Glen, Santa Ana, CA 92704.
gary@JAGConsultingGroup.com Telephone: 714-241-7722, Fax: 714-241-9922

Wally Jensky, PG

JHA Environmental, Inc., 2645 Palma Drive, Suite 450, Ventura, CA 93003.
wjensky@jacobandhefner.com Telephone: (805) 654-9611 Fax: (805) 654-9613

Greg Gibbs, PE

JHA Environmental, Inc. 15375 Barranca Parkway, Suite J-101, Irvine, CA 92618.
ggibbs@jacobandhefner.com Phone: (949) 453-1045 Fax: (949) 453-1047

Stan Jackson

JHA Environmental, Inc. 15375 Barranca Parkway, Suite J-101, Irvine, CA 92618.
sjackson@jacobandhefner.com Phone: (949) 453-1045 Fax: (949) 453-1047

Presenting Author: Gary Cronk