

Maintaining High pH for Activation of Sodium Persulfate - A Critical Design Parameter

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Platform Presentation

Alkaline activation of sodium persulfate has been used since 2003 with both good success and sometimes ambiguous results. One of the conditions that may be inhibiting consistent VOC treatment efficiency using alkaline activated persulfate has recently been shown to be due to insufficient length of time that the pH of the groundwater and soil is maintained over 10.5 pH units. The results from several bench scale tests and field pilot studies emphasize the critical nature of this parameter.

A soil buffering test is normally used to develop guidance on the proper amount of alkalinity agent (generally sodium hydroxide) to use. However, the general buffering evaluation is approached in different ways by ISCO practitioners. For most soil buffering tests, sodium hydroxide (caustic) is slowly titrated into a groundwater and soil mixture and the resulting pH change is measured. The procedure recommended by the North American manufacturer of sodium persulfate (FMC Corporation) is to measure the amount of caustic required to raise the pH to over 10.5 and maintain it for 30 minutes. Bench scale tests have shown that the pH of soil can rapidly change from pH 10.5 back to baseline levels (typically 7 to 7.5 pH range). When the pH is maintained above 10.5 units for 48 hours duration, a more optimal dosage involving a higher quantity of sodium hydroxide is attained. Much improved destruction efficiencies (80-95% or higher) of VOCs have been attained during field injections when using higher doses of caustic from a 48-hour buffering test.

Testing of pH buffering capacity from six different sites shows that the caustic dose can vary greatly between sites. The buffering capacity can range from a low of 0.17 grams per kilogram to a high of 3.92 g/kg. These results help to emphasize the reason that site specific testing of the buffering capacity is recommended.