

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 for over six years with both good success and sometimes ambiguous results. One of the key design parameters 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 is maintained over 10.5 pH units. The results from numerous bench scale tests and field pilot studies emphasize the critical nature of this design parameter.

A soil buffering test is normally used to determine the proper amount of sodium hydroxide to use. Unfortunately, most ISCO practitioners use a wide variety of design parameters during the performance of soil buffering testing. For most soil buffering tests, sodium hydroxide (caustic) is slowly titrated into a water and soil mixture (typically a 2 to 1 weight ratio) and the resulting pH change is measured. The procedure recommended by FMC Corporation (the sole manufacturer of sodium persulfate in the U.S) is to measure the amount of caustic required to raise the pH to over 10.5 and maintain it for 30 minutes. It has been determined from more exhaustive bench scale tests that the pH of soil can change quickly back to baseline levels (7 to 7.5 pH range). In fact, for highly buffered soils (predominant in the western U.S.), the pH can change from pH 10.5 back to baseline levels (7.5 pH) within 48 to 72 hours. When the buffering test is run for a four-day (96 hour) duration, a larger and more optimal dosage of sodium hydroxide is attained. This has been verified by results of bench scale treatability testing. When using the lower dosage of caustic from the short-term buffering test, treatability tests have typically attained only moderate destruction efficiency (50-60%) of VOCs. However, much improved destruction efficiencies (80-95%) of VOCs have been attained when using higher doses of caustic from a four day buffering test.

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