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Case Studies

The Case For and Against Plumathon Studies

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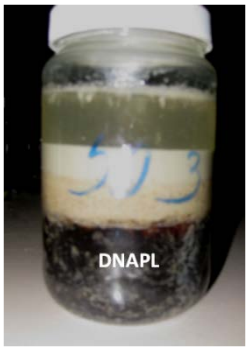
Objective, multiple-site analyses of the performance of different remediation technologies can provide valuable information on the comparative effectiveness of those technologies. These types of studies have been colloquially named "plumathons," a term used since at least 1999 in reference to a multiple-site study conducted by Lawrence Livermore National Laboratory and used in an EPA Superfund Record of Decision for the Natick Laboratory Army Research, Development and Engineering Center. These studies generally utilize published data from multiple sites to derive a comparative assessment of performance. For example, one study (McGuire et al., 2006) compared the performance of four broadly grouped technologies (in-situ chemical oxidation, enhanced bioremediation, thermal treatment, and surfactant/cosolvent flushing) at 59 chlorinated solvent dense non-aqueous phase liquid (DNAPL) sites. Their study evaluated reductions in groundwater concentrations of the chlorinated VOCs, and assessed rebound one to five years following the treatment. Other plumathon studies have focused on specific technologies, including in-situ chemical oxidation (Krembs et al., 2010), monitored natural attenuation (Newell et al., 2006), or thermal technologies (Kingston et al., 2010).



Plumathon studies offer a number of important benefits. For example, the studies are conducted by independent researchers (as opposed to technology vendors), utilize a consistent methodology, and are based upon published site data from verifiable sources. The case studies represent the spectrum of "real world" sites. As a result of the rigor, independence, and breadth of these analyses, the results have been widely accepted and used in a number of ways. For example, the results of these studies can be used to assess the potential to achieve remediation objectives at other sites by providing "order of magnitude" estimates of remediation performance (e.g., Interstate Technology & Regulatory Council, 2011). The results of these studies have also been cited as evidence for recognizing the practical limits of DNAPL site remediation (Stroo et al., 2012).

But plumathon studies also have a number of limitations, which are not as well recognized but should be understood in order to place the results of these studies in proper context. One concern is that the published case study literature may be biased towards successful sites. It is much less common to see *unsuccessful* case studies documented in the literature or conference proceedings, which would act to overestimate the actual technology performance. Other concerns may result in an underestimate of the technology performance. Our understanding of the strengths and weaknesses (and therefore the likely success of an application) of each technology improves over time, yet plumathon compilations include older case studies when the limitations of technologies were not as well understood and for which the technology may not have been appropriate. In some cases a remedy may be halted when a specific remedial goal is achieved, even though greater contaminant reductions could be achieved if the remedy was operated for a longer period of time. Plumathons may also include pilot-scale tests, for which the objective is to gather full-scale design data and to provide a preliminary assessment of potential performance rather than complete cleanup, as with full-scale remedies. Another concern is that these studies have not utilized an objective mechanism to identify and reject case studies that were poorly designed and implemented. Important questions that should be evaluated when considering inclusion of a case study is how complete the site investigation was, how well the technology was designed and implemented (i.e., appropriate reagent selection, groundwater chemistry, injection methodology, etc.), and how well the monitoring program was designed to evaluate performance. There are few restrictions preventing an inexperienced practitioner from buying a drum of chemical oxidant or bioremediation substrate, injecting it into the ground, and publishing the results regardless of the quality of the remedial design or the final outcome.

Plumathon studies provide an important benefit by summarizing a large amount of case studies and remediation performance data for a range of technologies into a

digestible and comparable format. However, the data and their interpretation must be placed into proper context. The performance of a remedy as reflected in a plumathon study may give insight into general patterns and a basis for comparison with other technologies, but it is not necessarily a good predictor of the technology performance at any one specific site. The best predictors of technology performance rely upon the experience of the design and implementation team, along with consideration of the site-specific conditions and remedial objectives.

You can also find this article in this month's [Pollution Engineering Magazine](#).

For additional information regarding this article, please contact Dr. Dan Bryant at dbryant@geocleanse.com

Upcoming Conferences & Presentations

REDOX TECH, LLC

March 4-5, 2014 in Raleigh, North Carolina

A Novel and Sustainable "Combined Oxidant" In-Situ Remediation Approach for Brownfield Redevelopment in New Jersey - **Dr. Dan Bryant**

Successful Implementation of CHP within a Sensitive and Active Brownfield Property **- Will Moody**

April 4-6, 2014
Destin, Florida

2014 Annual Conference
Changing Tides & Shifting Sands

April 7-10, 2014
St. Petersburg, Florida