In Situ Chemical Oxidation: Lessons Learned at Multiple Sites

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Background/Objectives. Since implementation of the first in situ chemical oxidation (ISCO) projects in the mid 1990s, ISCO has evolved into a mature technology. Yet, during this time a number of technical advances and lessons learned have been made, though not generally discussed.

Approach/Activities. This talk will compile lessons learned during the completion of multiple projects globally and present a variety of topical areas pertaining to safety, technical and commercial application of ISCO at a variety of sites. ISCO remediation advancements and application trends over time will also be discussed.

Results/Lessons Learned. ISCO was first applied for environmental remediation in North America in the 1990s, although the actual "first" application has not been widely recognized. Since that time, ISCO has become widely used in a variety of manifestations using different distribution mechanisms to remediate contaminated sites in differing geologies. While the benefits of "correct" remedial application are widely known (e.g., cost effectiveness, speed of application, permanence of treatment), the applications have also provided a variety of "incorrect" applications (e.g., unintended flow paths, overpromised performance, incomplete contact) that are less known. These applications provide an opportunity to highlight the technologic improvements (e.g., conceptual site model, detailed characterization, indirect tools, pore dilation, in-situ mixing), as well as several recurring themes in performance (e.g., incorrect technology selection, incomplete site understanding).

In the last 5 years greater emphasis has been placed on sustainable system design and implementation at project sites. ISCO implementation has been slow to quantify the comparative sustainable application of this technology, although this too is changing in dramatic ways.

While the technology basis has not changed significantly, methods of characterization, application and measurement of performance have resulted in innovation, creative experience and global collaboration leading to reductions in energy, cost and time while providing ever safer implementation.

It is expected that ISCO will continue to be an ever more important component of the remediation of sites for the foreseeable future, as is needed to address the large and complex sites that necessitate flexible coupled remedies. This success, however, requires an objective understanding of both the benefits, and the limitations, of the technology.