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# EVALUATION OF SURFACTANT AND FOAM PROCESSES FOR IN-SITU NAPL REMEDAITION IN A MILITARY BASE, SOUTH KOREA

*Monday, 31 May 2021 18:00 (15 minutes)*

Introduction

Surfactant and foam processes have been widely used in enhanced oil recovery from the petroleum-bearing geological formations [1, 2] and in-situ subsurface remediation from shallow formation and aquifer [3, 4]. This study investigates the potential of using surfactant and foam processes for the in-situ remediation of shallow subsurface NAPL phases within a field in a US/Korea military base, South Korea. It consists of two major components: the first is a history matching of surfactant enhanced aquifer remediation treatment and the second is a prediction of follow-up foam injection treatment. The site has a 5 m x 5 m treatment area with 3 m depth with 3 injection wells and 3 extraction wells.

Results

Surfactant treatment: Over 10-days surfactant treatment exhibits a partial success in terms of NAPL removal. The relatively higher-permeability area contacted by the surfactant chemicals shows a mobilization of NAPL phases because of a reduced level of capillary trapping (i.e., low dimensionless capillary number). It is the area with relatively lower-permeability values, however, that prevents a successful sweep from occurring. History matching from simulations shows why such an early breakthrough happens in some extraction wells, and what roles the subsurface heterogeneity plays in overall in-situ treatment with surfactant solution.

Foam treatment: A foam treatment, proposed as a potential follow-up action, is evaluated see if how foam can overcome subsurface heterogeneity. The outcome seems very promising such that foam can improve the sweep and increase the recovery factor over 80 - 90%. The final results are shown to vary with foam strengths as summarized by using a sensitivity analysis. Foam field test is designed in the near future.

## Time Block Preference

Time Block A (09:00-12:00 CET)

## References

[1] S.I. Kam and W.R. Rossen. A Model for Foam Generation in Homogeneous Media, SPE Journal, 417-425, (2003).
[2] M. Izadi and S.I. Kam. Investigating Supercritical CO2 Foam Propagation Distance: Conversion from Strong Foam to Weak Foam vs. Gravity Segregation, Transport in Porous Media, DOI: 10.1007/s11242-018-1125-z, (2019).
[3] A. Roostapour and S.I. Kam. Modeling Foam Delivery Mechanisms in Deep Vadose-zone Remediation Using Method of Characteristics, Journal of Hazardous Materials, Vol. 243, p. 37-51, (2012).
[4] S. Lee and S.I. Kam. Three-Phase Fractional Flow Analysis for Foam-Assisted Non-Aqueous Phase Liquid (NAPL) Remediation, Transport in Porous Media, Vol. 101, Issue 3, p. 373-400, (2014).

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