In Situ Thermal Remediation:
State of the Practice in South America

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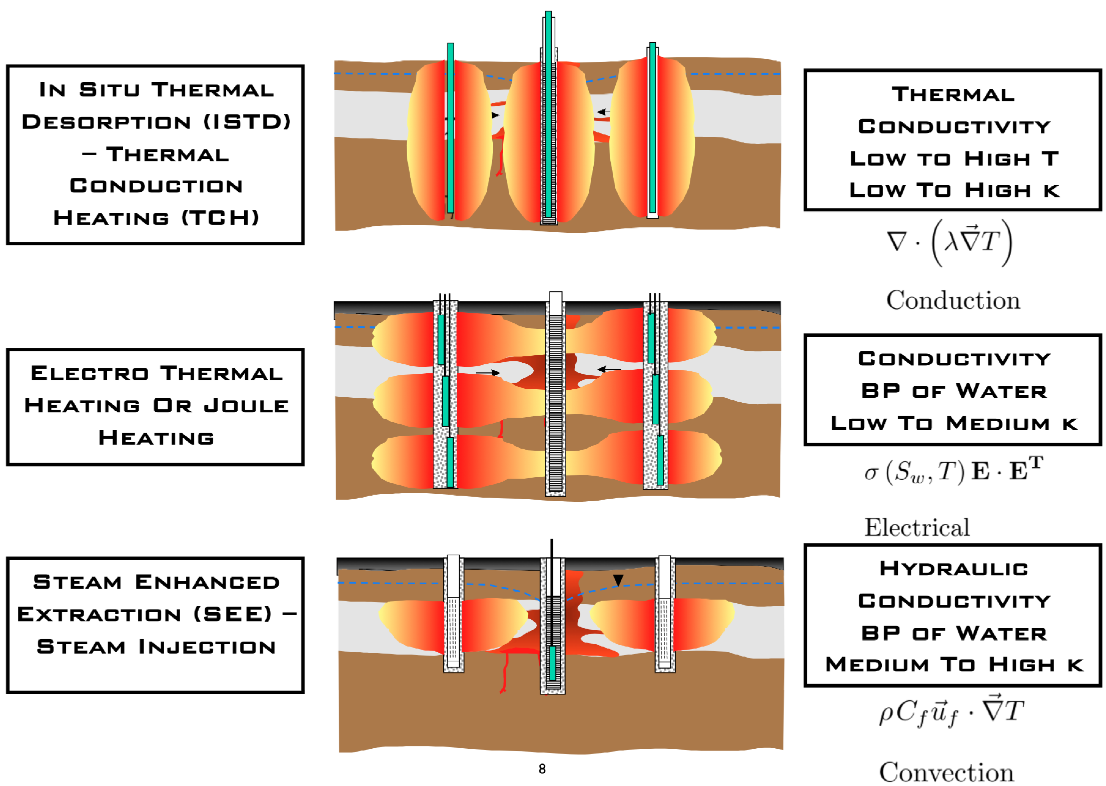
Abstract
A review of the three primary methods for in situ thermal remediation will be reviewed and include Thermal Conductive Heating, Electro Thermal Dynamic Stripping Process (ET-DSP) or Electrical Resistance Heating, and Steam Injection and Stripping. Each of these ISTR approaches are successful under the correct site conditions and for destruction of specific target organic contaminants. However, no single ISTR technology is appropriate for all applications.



In situ thermal remediation (ISTR) offers rapid soil and groundwater remediation that can reduce the time to remediate volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs) from years to months. From multiple years of applying this technology on many different contaminants and site lithologies, ISTR now provides site owners with both performance and financial certainty in their site-closure process. The ability of the technology to remediate soil and groundwater impacted by chlorinated solvents and petroleum hydrocarbons, regardless of sediment type and in some cases fractured bedrock, proves to be extremely beneficial over conventional *in situ* technologies that are dependent on advective flow. The technology is very tolerant of subsurface heterogeneities and in some cases performs as well (if not better) in low-permeability silts and clay as it does in higher-permeability sands and gravels. By utilizing simple engineered controls, ISTR is routinely implemented around and under buildings and public access areas without upsetting significantly normal business operations. ISTR may also be combined with other treatment technologies (such as bioremediation or chemical oxidation) to optimize and enhance its performance.

A general review of limitations for each technology will be presented highlighting where each technology has specific limitations dependent on geology, hydrogeology and contaminant chemistry. Specifically, we will review the applicability of ISTR on the following conditions potentially present in Brazil for groundwater remediation:

- Unconsolidated alluvium
- Fractured bedrock
- Deep contamination of 30m depth

The following types of organic contaminants will also be discussed:

- Chlorinated solvents such as PCE and TCE
- Petroleum hydrocarbons
- Heavy end hydrocarbons such as coal tars
- Chlorinated hydrocarbons (i.e. Chlorobenzenes)
- Dioxins and pesticides

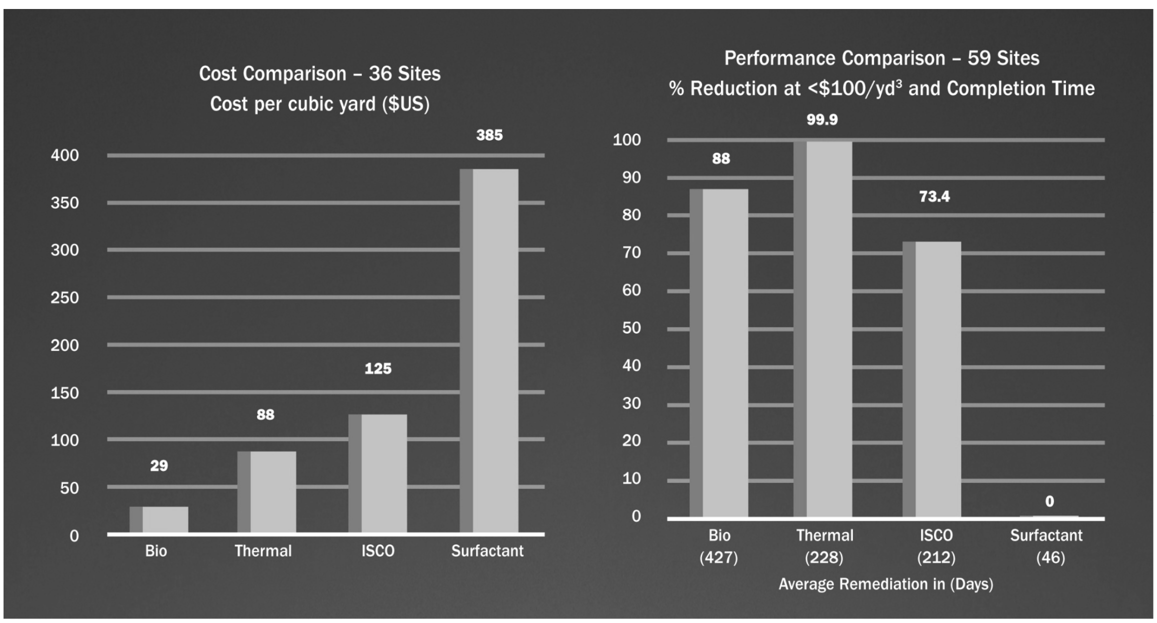


Fig. 1. The figure reveals the results of cost and performance at 36 and 59 remediation projects respectively utilizing bioremediation, ISTR, in situ chemical oxidation (ISCO) and surfactants. The results show that ISTR is lower in cost than ISCO and surfactants and results in better sustained results than all options considered / presented in the study..

CONCLUSIONS

A review of the globally available and proven in situ thermal remediation technologies will be presented along with comparisons about equipment, approach and applicability for each of the technologies. Some discussion about the availability of the technologies and service providers in Latin America will be mentioned in the context of experience in Latin America and future of ISTR in Brazil and Latin America.

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