

# STARx (Ex Situ Smoldering) for the Treatment of Contaminated Soils and Liquid Organic Wastes: Results from a Full-Scale Application

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**Background/Objectives.** The STARx process uses smoldering combustion to treat contaminated soils and liquid organic wastes. Smoldering is an exothermic, flameless combustion reaction that takes place on the surface of solids or liquids, as opposed to flaming combustion which occurs with gasified fuels. In contrast to other thermal processes that require continuous inputs of energy, the smoldering process is self-sustaining following a short duration, low energy input 'ignition event'. The contaminants provide the energy to pre-heat and initiate combustion of contaminants in the adjacent matrix material, propagating a flameless combustion front through the contaminated media provided that a sufficient flux of air is supplied. The process is very robust and well-suited for treating of oily wastes or oil-contaminated soils with many potential applications to the oil and gas and chemical manufacturing industries.

This presentation describes the results from a collaboration between Savron and Chevron Energy Technology Company to apply the STARx™ in a simple soil pile configuration to treat heavy oil hydrocarbon wastes from an oil/waste separator pond in South East Asia.

**Approach/Activities.** A modular engineered base system was developed to apply STARx via soil piles. These bases, called Hottpads™, are a low profile trafficable surface (rated for 50 tons) containing the heat (resistive heaters) and air distribution systems for ignition and propagation of the smoldering reaction. Each HottPad™ is approximately 3x4 meters, and six Hottpad™ modules were networked together to treat batches of sludge material mixed with site soils. The system was designed for the treatment of 3,500 m<sup>3</sup> of sludge to be co-treated with site soils.

**Results/Lessons Learned.** The treatment costs for the STARx/Hottpad™ technology were found to be competitive with the lowest cost alternatives (off-site disposal). In addition, STAR/Hottpad™ out-performed alternatives with respect to carbon footprint and simplicity of operation. It also resulted in a reduction of vehicle traffic, it is modular and transportable, and has a small physical footprint allowing it to be used on site. Site soils co-treated with the Hottpad™ system, are clean and suitable for on-site reuse / backfill. This presentation will present the design, operational features and performance of the full-scale field operation of the STARx/Hottpad™ technology.