STAR Overview

STAR is based upon the principle of ‘self-sustaining smoldering’ – a controlled burning reaction (similar to charcoal in a BBQ) - that destroys non aqueous phase liquids (NAPLs) embedded in soil while simultaneously generating enough energy to propagate itself through the subsurface. As a result, it avoids the costs and risks of injection/extraction approaches (e.g., surfactant flushing, oxidation) and it is far less energy intensive (and therefore less costly to operate) than traditional thermal technologies.

How STAR Works

STAR is an effective treatment technology for a variety of different NAPLs including coal tar, creosote, petroleum hydrocarbons, diesel range organics, oils & greases, mineral oil, and solvents/oil mixtures.

The STAR process begins by inserting a heating element into the target treatment zone. A short duration input of energy is then applied to heat the NAPL adjacent to the heating element to the target ignition temperature. Once this temperature is attained (typically between 200 °C and 400 °C), air is injected to ignite the NAPL. The NAPL combusts, releasing heat energy which is retained by the porous medium to pre-heat NAPL farther away from the ignition point. The heating element can then be turned off, and as long as sufficient air is supplied, the combustion process will continue, propagating away from the air injection point.

STAR can be used for both ex situ and in situ applications, including fully saturated conditions.
CASE STUDY
Former Cresol Manufacturing Facility in New Jersey

A Proof of Concept (POC) pilot test to evaluate the efficacy of the STAR technology to treat coal tar impacted soils was conducted at a former cresol manufacturing facility in Newark, New Jersey (the Site). The objectives of the test were to assess the ignition protocol, assess the system requirements for sustaining the smoldering combustion reaction, and evaluate the rate of smoldering front propagation.

This first phase of pilot testing successfully demonstrated the STAR technology: namely self-sustaining smoldering combustion (i.e., without external energy input beyond the initial ignition pre-heating) was achieved below ground surface and beneath the water table for approximately 9 days. Approximately 200 kg of coal tar was destroyed by the smoldering combustion process during this time.

A second phase of pilot testing explored the ignition protocol and demonstrated a “significant burn” - approximately 5 tons of coal tar was destroyed during this test with destruction rates as high as 800 kg/day.

Please visit our website at www.siremlab.com/STAR or contact us at star@siremlab.com for more information.