

Pneumatic Fracturing Innovative Technology Demonstration



Background

Tinker Air Force Base's North Tanks Area (NTA) was constructed in 1943 as a storage center for boiler fuel and a fleet service station site. The NTA site housed five underground storage tanks (USTs) between 1943 and present, ranging in size from 800 to 235,000 gallons. Investigations have revealed that at least two tanks have had chronic releases over the years. The NTA was established as an operable unit to Tinker's National Priorities List site, and the Record of Decision (ROD) directed interim actions for the site that included tank abandonment, free product recovery, and soil vapor extraction. After two years of recovery operations, only 2,200 gallons of product had been recovered. This was due to low permeabilities in the formation and product viscosities. A method was therefore needed to enhance product recovery before dispersal and smearing of the product occurred due to recovery of groundwater near the Building 3001 NPL site recovery well system located adjacent to the NTA.

Description

Pneumatic fracturing technology was selected for demonstration at the NTA to improve permeability in fine grained formations. Fracturing is ideal in situations where soils are compacted and tight, which hinders the flow of water and product underground.

The technology works by pumping high pressure air into the soil formation to expand the bubbles and produce cracks, thereby allowing liquid to flow more easily for cleanup purposes. Fracturing was demonstrated at the site in unconsolidated material in both the vadose (partially saturated and dry) zone and saturated zones. At the NTA, a single fracture interval between 26 and 28 feet below ground surface was initiated in the product saturated zone. The fracturing technology used at the site required a dual packer assembly installed above and below the zone of fracture. The initiation pressure required to

establish the formation fracture was 300 pounds per square inch (psi), and a sustained air flow rate of 1,500 standard cubic feet per second was maintained for 20 seconds, which propagated the fractures in excess of 60 feet horizontally from the injection point.

Benefits

Within two months after the fracture, more than 1,700 gallons of product had been recovered, compared to the 2,200 gallons recovered over the first two years.. Prior to the fracture, the well adjacent to the fracture point maintained a daily recovery rate of 2.2 gallons per day and a product level of three feet. After the fracture, recovery rose to 22 gallons per day and product level was 20 feet. In the 17 months since the fracturing project, daily recovery from this well remains at 3.8 gallons per day.



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