

Ex-situ Thermal Treatment of Heavy Oils at Remote Oil Field in South Sudan

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Background/Objectives. More than 12.000 m³ of soil are contaminated with heavy oils coming from an oil field exploitation for more than 20 years in one of the different oil fields in South Sudan. Soil contamination in that area has a massive negative impact on nature and health of the neighboring residents due to potable water and fertile soil contamination. Consequently, the site is contaminated with C10-C40, mainly heavier fractions (C30-C40), with maximum average pollutant concentrations of up to 56.000 mg/kg d.m for C10-C40 and 25.000 on average.

Approach/Activities. In response to this environmental challenge, an English environmental remediation company, engaged Haemers Technologies to spearhead the decontamination efforts. In 2022, the first phase began with a small ex-situ thermal desorption pilot of 200m³.

Due to the remote nature of the site, several changes in design were necessary to enhance operations and increase performance of the contaminated soil ex-situ treatment. The primary change was linked to concrete being unavailable on site to cover the soil pile. The pilot phase tested different designs to optimize the treatment coupled with optimization for the challenges of the remote site. One additional pilot pile was performed to implement the design/operational changes with excellent results. The pilot treatment spanned a duration of 50 days and resulted in a remarkable pollutant mass reduction exceeding 99.9%.

A unique aspect of the remediation system implemented the use of a reburn technology, which consists of using the flame created to heat the soil and to burn (reburn) the contaminated hydrocarbon vapors released. This technology reduces the need for an additional vapor treatment system as part of the remediation system. Throughout the treatment process, rigorous monitoring was conducted on gas emissions and consumption, ground temperature, and pressure to maintain precise control over the installation.

Results/Lessons Learned. Numerous obstacles were faced while conducting operations in South Sudan. The rainy season rendered certain roads to the site impassable, resulting in delays of materials and/or equipment. Additionally, communication was challenging in this remote location, making it difficult to make quick decisions in response to issues. Consequently, there was a need for adaptability in both the design and schedule to effectively address the highly contaminated soils. The success of the initial pilot trials paved the way for the project's ongoing progress to full-scale application.

Engineering design and modifications, along with treatment results will be shared along with the lessons learned on operating in remote locations.