Thermal Desorption of Highly-impacted mercury soils in an Urban Area

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In-Situ and Ex-Situ Thermal Desorption (ISTD and ESTD) are a technology based on thermal conduction that can effectively treat organic contaminants, independently of large soil heterogeneity. One of its applications is for contaminated properties in urban areas and under existing buildings.

The main principle of the technology resides in installing a network of steel pipes that act as a air/soil heat exchanger to heat up the soil to temperature and pressure conditions at which the contamination is volatilized and recovered above-ground for further treatment.

Following this logic, ESTD is mainly used when small amounts of widely scattered contaminants can be more easily gathered to a single location for treatment rather than decontaminating separately with different ISTD batches. It can also be used when contaminated soil has already been excavated, gathered and stockpiled.

As part of a remediation project, a large volume of mercury-contaminated soil had been excavated by Biogénie below a building southeast of Paris, in Région Val-de-Marne due to a mercury contamination. The impacted soil lies below a building and is surrounded by residential buildings. After a decision-making process, it has been decided to send the maximum amount of impacted soil off site with the exception of highly-impacted soil and non-excavatable soils (by virtue of building stability).

Out of a total of 25 000 m^3 of impacted soil, 2500 m^3 were treated by thermal desorption on-site (In-Situ and Ex-Situ). The aim of this paper is to focus on ESTD part of the project, the highly-impacted mercury thermopile, corresponding to 260 m^3 of contaminated soil.

The soil had undergone a selective separation based on a visual test (presence of smalls mercury balls). The soil which contained visually small balls of mercury was stockpiled. Due to the excessive cost to eliminate these highly-impacted mercury contaminated soils, Ex-Situ Thermal Desorption was applied to reduce the mercury concentration below 50 mg/kg.

At the time of the thermopile construction, 4 samples have been analyzed and had an average concentration of total mercury of 11 700 mg/kg with a maximal concentration of 24 000 mg/kg. After 5 months of treatment time, 27 control samples were taken. The final samples had an average concentration of 48 mg/kg with a maximum concentration of 270 mg/kg. The mercury vapors from the thermopile were sent to a vapor treatment unit to be condensated and recovered in an unique tank.

The ESTD and the associated vapor treatment designed by HAEMERS Technologies © and implemented by Biogenie and HAEMERS Technologies to carry out the project is a worldwide premiere for complete and affordable treatment of heavily mercury-impacted soils. This case-study will address the details of said implementation and results.

