On-Site Evaporative Desorption Technology Soil Treatment: A “Very” Low Temperature Ex Situ Thermal Remediation Alternative

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Background/Objectives. Advantages of on-site ex situ thermal soil remediation are well documented, but development of approaches that provided these advantages and complied with recent air emission regulations was limited. Historically, ex situ thermal remediation technologies have been based on the principal of dynamic (rotating) soil processing for thermal conduction to volatize the contaminants for incineration or adsorption onto activated carbon. The heating range for this type of thermal remediation is from 100ºC to 300ºC (considered “low” temperature) to 300ºC to 550ºC (considered “high’ temperature), and can often lead to unwanted byproducts from contaminant pyrolysis or combustion within the treatment chamber. In the wide spectrum of thermal remediation, the relatively new Evaporative Desorption Technology (or “EDT”), at the very low end of the thermal remediation soil heating range (50ºC to 100ºC), uses convective heating and high air flow volume to volatize contaminants from the soil mass. EDT is unique from other traditional thermal remediation alternatives because it is a static process using electrically heated air to evaporate contaminants from soil with no PM10, NOx and SOx emissions. The objectives of this presentation are to; 1) define the specific niche that this unique treatment method has within the ex situ thermal remediation field for the treatment of volatile organic compounds (VOCs) chlorinated VOCs and semi-VOCs, 2) describe how EDT bench scale testing is correlated to full-scale EDT processing, and 3) present the continued research to facilitate EDT processing for a broader range of contaminants generally considered recalcitrant to a low temperature evaporative desorption process.

Approach/Activities. First, an analysis of the EDT contaminant treatment capabilities will be provided by review of the range of thermally volatile contaminants, and their general chemical properties, that can be removed from soil using the EDT process. EDT permitting requirements, operating parameters and performance monitoring capabilities will be described to define EDT’s specific niche in the thermal remediation field. Second, empirical EDT bench-scale test process will be described, and empirical bench test data from select completed projects will be reviewed along with a correlation of those results to the actual full scale EDT soil processing. And finally, while EDT is a potentially effective treatment for persistent organic pollutants (POPs) including pesticides, PCB, PFOS and PFOA, processing equipment has not yet been constructed for production-ready EDT equipment to process them. The status of design work will be reviewed for these POP applications to describe the conceptual design of future generations of equipment.

Results/Lessons Learned. EDT bench testing plays a critical role in evaluating the viability of EDT as an effective remedial alternative and identifying potential impediments to a successful full scale implementation. Select projects completed to date are presented to show the types of site conditions including soil type, moisture content and organic content that can interfere with the EDT treatment processes and how these conditions were identified through bench testing of site specific soil and contaminants, and mitigated during full scale EDT treatment using process controls and equipment modifications. Finally, the potential limitations and advantages of EDT processing for POPs is explored.