

LSTE-10



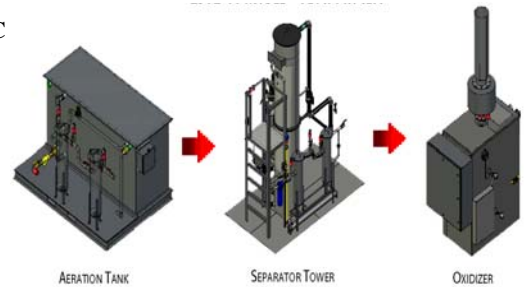
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Environmental remediation of groundwater and soil vapor is often plagued with noisy, inefficient and expensive technologies that are not easily modified to meet changing site-specific conditions. Once installed, typical remediation equipment remains static even though the contaminants being removed have been reduced in concentration. Thus, the equipment train that was efficient and cost effective when concentrations were high (typically the first few months), becomes over engineered (white elephant) and costly during the middle and rebound phases of the remediation when contaminant mass is only a fraction of the original design criteria. Additionally, it is frustrating and costly when the original design criteria is not realized due to decreased or increased flows from the extraction well field or changes in contaminant concentrations are different than the original design specifications.

The Liquid Separation Technologies and Equipment, LLC.'s patented and patent-pending Plug & Play platform utilizes a modular engineering concept to maximize and maintain removal efficiencies in the most cost effective manner possible for contaminated soil vapor and groundwater. It is no longer necessary to operate a treatment scheme designed and sized to remove high concentrations of contaminants when a much smaller or simpler treatment scheme is all that is necessary. When contaminants or their concentrations change and/or flow rates are reduced or increased etc., the LSTE-10 modules can be quickly and economically switched to maintain maximum removal at the lowest cost.

The LSTE-10 platform consists of an initial patent-pending aeration tank module where groundwater enters an air-tight low vacuum aeration chamber where eight SCFM of air is bubbled through the water efficiently transferring the contaminants to the vapor phase. The aeration tank module with its vacuum and low air flow requirements is very quiet, economical to operate and easier to maintain than a standard air stripper with its large blower and packed column. While utilizing just the aeration tank module, recent operation of the LSTE-10 was able to remove 99% of PCE, TCE, TCA, and BTEX respectively in a complex groundwater matrix to less than 1 part per billion. MTBE, notoriously hard to remove from groundwater, was removed with a 77% efficiency.

After aeration tank treatment the groundwater is then routed to the high-vacuum separator column. In this column, the groundwater is atomized under 27-inches of mercury vacuum (no packing is employed). Due to the low vacuum, the high contaminant removal efficiency of the column is achieved without the use of large noisy blowers that consume large amounts of electricity or tower packing that can become fouled due to hard water deposits. The high-vacuum separator tower achieved an additional 60%⁺ removal of MTBE, thereby yielding an overall MTBE removal efficiency of 92% using both modules.

The resultant low volume air stream from the aeration tank and high-vacuum separator column containing the removed hydrocarbons and chlorinated solvents are destroyed in a catalytic oxidizer with a destruction removal efficiency of greater than 99%.

The flexibility of the Plug & Play LSTE-10 platform allows for the use of the patent-pending aeration tank as a stand-alone unit without the high-vacuum separator tower if MTBE isn't present in the influent or falls below a concentration of concern. The need for the catalytic oxidizer is entirely dependent on the mass of contaminants to be destroyed. The higher the concentration of contaminants to be treated, the more efficient and economical the catalytic oxidizer is to operate.

In a typical project, contaminants in the groundwater become less concentrated with time. Therefore, as the remediation progresses, the cost to operate the catalytic oxidizer increases; however, typical systems continue to use this expensive technology due to space requirements or because it is impossible to remove it from the treatment equipment. With the Plug & Play LSTE-10, as the use of the catalytic oxidizer becomes less efficient or uneconomical, disposable activated carbon adsorbers easily replace the catalytic oxidizer. These adsorbers are much smaller than those required for standard air strippers due to the relatively low air flow to be treated. This reduces the volume of carbon required for proper treatment of the contaminated air stream, and maintains the small foot print requirements for the total treatment unit. Carbon adsorbers also require little to no maintenance, especially when compared to the catalytic oxidizer.

If the contaminant concentrations to be removed from groundwater are low, but treatment is still required to meet regulatory requirements (*i.e.*, MCLs), the Plug & Play LSTE-10 can be configured with just the vacuum aeration tank and carbon adsorbers. This extremely quiet configuration avoids the costs of operating and maintaining the catalytic oxidizer and requires a very small area for the equipment placement.

It is becoming common for both groundwater and soil vapor to require treatment. With the addition of a positive displacement rotary blower module to the LSTE-10, the catalytic oxidizer easily destroys 99% of the contaminants in the soil vapor. When remediating soil vapor, the concentration of contaminants in the air stream are reduced; often within a few weeks. When this occurs, the catalytic oxidizer is no longer economical and unless still required for the destruction of the air contaminants from the aeration tank, the catalytic oxidizer is replaced with carbon adsorbers, eliminating the costs associated with the catalytic oxidizer.

The LSTE-10 modular Plug & Play concept allows environmental remediation to be fine tuned to a specific project. The right equipment at the start of the project may quickly become a costly white elephant as the original equipment quickly becomes oversized and unnecessary for the job at hand. The Plug & Play modular concept allows the right equipment to be used as contaminant concentrations change during the course of the remediation. This flexibility maintains overall cost effectiveness and reduces project maintenance and operation costs.