LSTE's New Patented Plug & Play Platform Treats Soil Vapor and Groundwater While Allowing Cost Effective, Continuous Improvement of Remediation Equipment

LSTE-10

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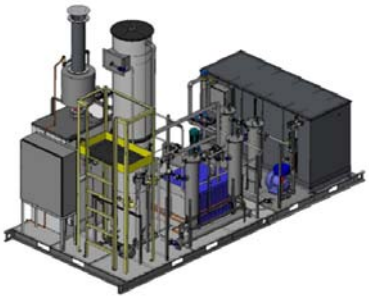

The Liquid Separation Technology and Equipment LLC.'s patented and patent-pending "Plug & Play" platform utilizes a modular engineering concept to maximize and maintain removal efficiencies in the most cost effective manner possible for contaminated soil vapor and groundwater. It is no longer necessary 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 for soil vapor and groundwater remediation can be quickly and economically switched to maintain maximum removal at the lowest cost.

Soil Vapor

A LSTE-10 module utilizes a 250 SCFM blower and catalytic oxidizer to effectively remove and destroy contaminated soil vapor with a $99\%^{+}$ destruction efficiency.

In a typical project, contaminants in the soil vapor become less concentrated with time. Therefore, as the remediation progresses, the costs to operate the catalytic oxidizer increase; 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. Due to the unique Plug & Play modular treatment platform, as the concentration of the contaminates in the soil vapor diminish with time, the catalytic oxidizer can be easily replaced with carbon adsorbers. This allows the soil vapor treatment to continue in the most economical manner while maintaining the desired treatment efficiency. Maintenance requirements are also reduced due to the simplicity of the carbon adsorbers.

Groundwater

The LSTE-10 platform for groundwater treatment consists of an initial patent-pending vacuum aeration tank ("VAT") 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 VAT module with its low vacuum and low airflow 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 VAT 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 an $77\%^{+}$ efficiency.

If additional MTBE removal is necessary, the VAT treated groundwater is then routed to the high vacuum separator column. In this column, the groundwater is atomized under approximately 27 inches of mercury vacuum (no packing is employed.). Due to the high 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 VAT and high vacuum separator column containing the removed hydrocarbons and chlorinated solvents are destroyed in the catalytic oxidizer used to treat the soil vapor with the same destruction removal efficiency of greater than 99%. This occurs simultaneously with the treatment of soil vapor.

As with the soil vapor treatment, if the concentration of contaminates in the air streams from the VAT, with or without the high vacuum separation tower, along with the concentration of contaminates in the soil vapor reduce in concentration to the point where the costs to operate and maintain the catalytic oxidizer exceed those for carbon adsorbers, the Plug & Play platform allows for the easy replacement of the catalytic oxidizer with carbon adsorbers. This maintains the desired removal efficiency while minimizing operating costs.

In summary, 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 flow criteria are not realized or changes in contaminant concentrations are different than the original design specifications. The LSTE-10 Plug & Play modular concept allows the right equipment to be used for soil vapor and groundwater remediation as contaminant concentrations change. This flexibility maintains overall cost effectiveness and reduces project maintenance and operation costs.