

# Soil & Groundwater Remediation

## *Soil Venting, Bioventing, Dual Phase Extraction, and Air Injection*

**S**oil Venting is an innovative technology for removing organic contaminants to remediate polluted soil zones. The organic contaminants can be in the soil in three different zones: as free "product" in pools or residual globules, dissolved in the groundwater, or as vapors in the vadose zone. Soil venting directly deals with the free product and the organic vapors in the vadose zone by applying a vacuum through wells and extracting the air in the contaminated zone. Soil venting also deals indirectly with groundwater contamination, by removing the overlying free product and vapors, promoting transfer of the contaminants into the vadose zone, where they are removed through the extraction wells.

**Soil Vapor Extraction (SVE) the RSI way**  
RSI's patented systems use the vacuum from the engine's intake manifold to extract the soil vapors. Air flow rate is governed by the cubic inch displacement of the engine, rpm, system load, and site specific conditions. For large sites with multiple wells, positive displacement blowers driven by the ICE can provide extraction flow rates up to 2,300 SCFM. Blower capacity in terms of total flow and vacuum pressure can be sized to meet each specific remediation design. For sites requiring higher vacuum (greater than 18" Hg, liquid ring vacuum pumps can be driven by the ICE. The ability to deliver up to 156 brake horse power with the eight cylinder engine allows us to meet every customer need.



***Our Technology Meets EPA Demands***



U.S. Patent: 4,846,134; 4,979,886

Canadian Patent: 1,287,805

**Free Product Removal** Our innovative technology is more efficient than traditional methods for removing free product. Placing a vacuum on the well counteracts capillary forces allowing for flow of the free product into the extraction well during the SVE process. Second, the extracted vapors are consumed by the normal combustion process of the engine, therefore no need for costly storage or disposal. And last, depending on the BTU value of the contaminants, the use of alternate fuel source is significantly reduced.

**Bio-Slurping - Dual Phase Extraction (DPE)** The introduction of the DPE module to the Soil Venting Equipment (SVE) system allows us to perform dual-phase extraction, removing the petroleum hydrocarbons pooled above the groundwater, and hydrocarbon vapors and contaminated water at the water table, which considerably reduces total project costs.



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## Bio-Venting/Air Injection

RSI's system is also used for Bio-Venting, which involves the flow of fresh air through the vadose zone to increase oxygen content and accelerate bioremediation. In Air Injection mode, heated air from the blowers, or compressors, can be routed via reinjection wells.

The above modules can be combined with the spray aeration system, the ICE and/or catalytic oxidizers to completely remove and destroy all of the contaminants. The ICE provides power to all components and in the case of petroleum hydrocarbon contamination, the extracted contaminants are used as fuel by the ICE.

Natural gas or propane may be needed as supplemental fuel if the amount of fuel extracted is below the ICE requirements. RSI's system's diversity provides truly innovative environmental solutions to the most challenging site conditions.

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