

A Gas Diffusion Subsurface Recirculation System for Enhanced Bioremediation and Abiotic Geochemical Fixation

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Platform Presentation

A new gas diffusion tool was designed for subsurface enhanced bioremediation as well as abiotic geochemical fixation of metals, and restoration of the oxidation-reduction potential of remediated aquifers. The inPro, a patented mass-transfer device designed for enhancement for above ground remedial systems as well as in-situ treatment of a variety of aqueous chemical contaminants, infuses significantly higher dissolved gas concentrations in groundwater, using specialized pressure valves. The system is powered by 115 V and does not require three connections: an oxygen or other gas supply, a pressurized water supply, and the discharge connection. Once connected, and the valves opened, the unique but simple inPro control system automatically operates the system according to the pressure and flow rate of both water and oxygen (or other gas), and the dissolved oxygen (or other gas) demand.

For above ground or in-situ treatment, the large volumes of high concentration dissolved oxygen can be used, with concentrations in the aquifers reaching 200 mg/L of dissolved oxygen. Many chlorinated solvents such as PCE and TCE, as well as other chemicals such as perchlorate, or the precipitation of certain metals (such as chromium or uranium) require anaerobic processes. These processes can occur with the introduction of dissolved hydrogen, methane, propane, or other gases. Other co-metabolic pathways remediation pathways are also available.

The subsurface application of the inPro uses two treatment wells. Based on computer modeling, the inPro shows five times the groundwater flow of a passive treatment system. The active 2-well inPro system has a radius of influence of about 30 feet. The flow through the in-situ, downhole pumping system is about 10 gallons per minute per well. Computer modeling of the inPro system groundwater flow and dissolved gas concentrations are described.

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