Introducing a proven and patented Environmental Remediation Technology

Density-Driven Convection (DDC)

In-Well Aeration Technology

WASATCH ENVIRONMENTAL

Environmental Science and Engineering

Density-Driven Convection Groundwater Circulation Wells

- **What is DDC?**

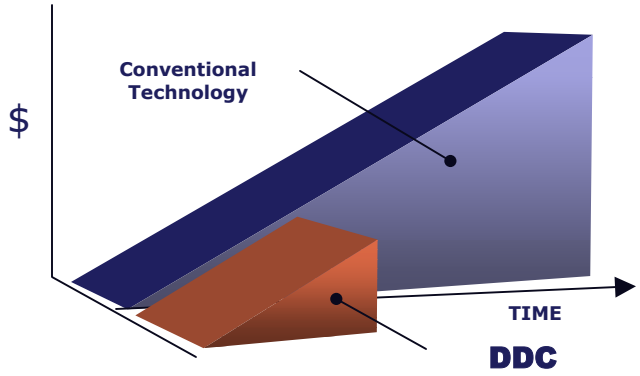
  Developed by Wasatch Environmental, Inc., the patented groundwater Density-Driven Convection (DDC) in-well aeration technology provides an effective in situ remediation solution. DDC systems are used within both confined and unconfined aquifers for the remediation of volatile and/or aerobically biodegradable organic contaminants including chlorinated solvents, MTBE, fuel hydrocarbons, and oil.

- **What are the benefits to DDC technology over other in-well aeration remediation methods?**

  High Performance in Varying Soil Types- DDC remediates petroleum hydrocarbons and chlorinated solvents in a wide range of soil conditions from sands and gravels to silts and clays.

  Installation Cost Savings - DDC utilizes a simplified design of off the shelf components, cutting remediation costs up to 50 percent over similar competing technologies or more conventional remedial techniques such as pump and treat.

Typical DDC well



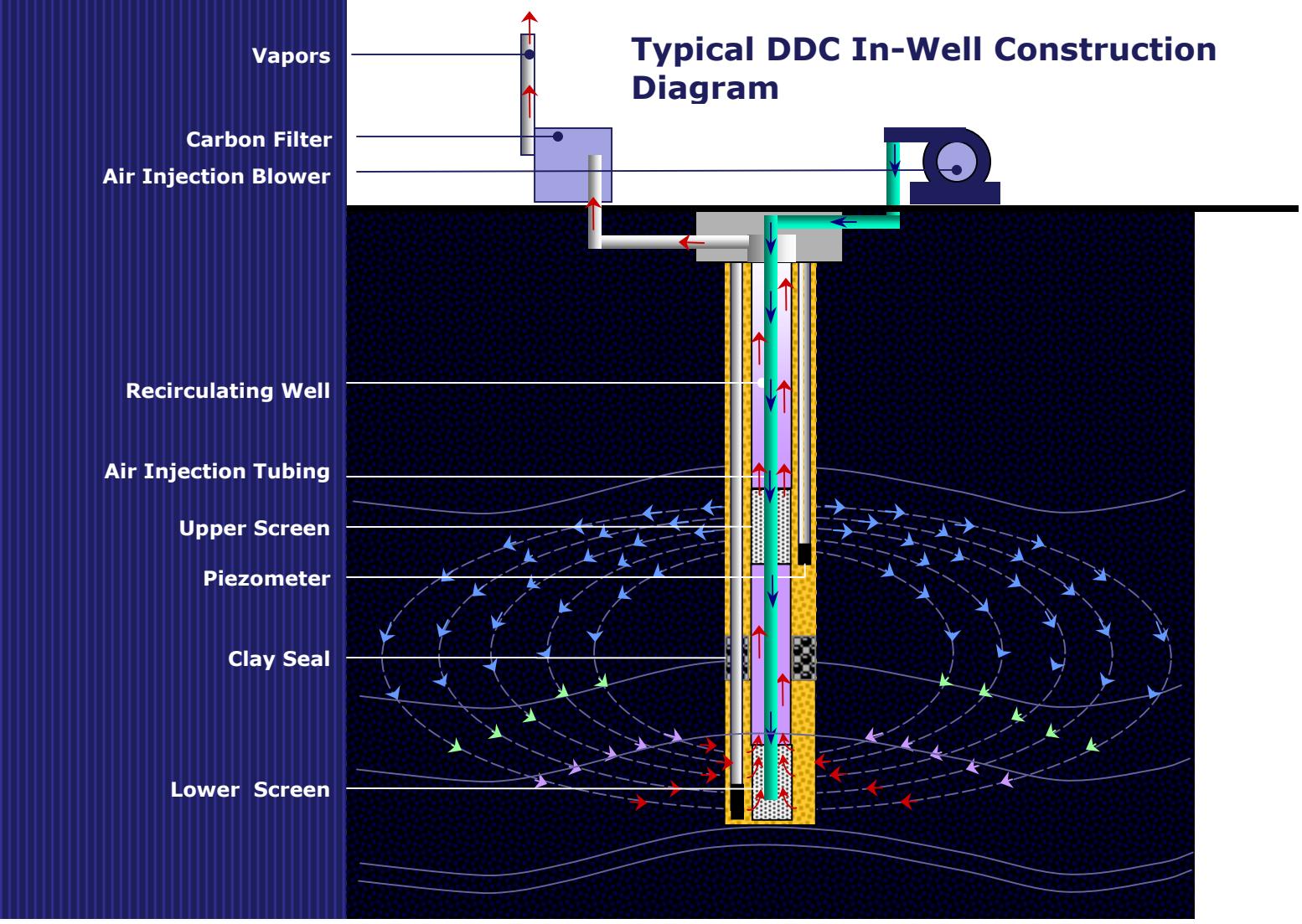
Proven Effective Technology - DDC has been proven to be effective in removing a broad range of petroleum products and volatile halogenated compounds in a wide range of soil types. More than 60 DDC systems involving over 1,200 DDC wells have been installed. Of these installations half have achieved cleanup targets for soil and groundwater.

Wasatch provides full system design, construction, and installation services based on over a decade of real world testing and development experience.

Other Significant Advantages of DDC Over Other Technologies:

- Does not produce hydraulic fracturing or promote significant lateral contaminant spreading.
- Readily modeled and designed for field applications.
- Creates both vertical and horizontal groundwater flow allowing penetration of low permeability horizontal layers.
- Can be used to distribute inorganic nutrients for biodegradation.
- May eliminate the need for surface vapor treatment for aerobically biodegradable contaminants in permeable soils.
- Relatively inexpensive to implement particularly for shallow groundwater depths.
- Very low maintenance and operation costs due off the shelf components and few moving parts.

Typical DDC In-Well Construction Diagram



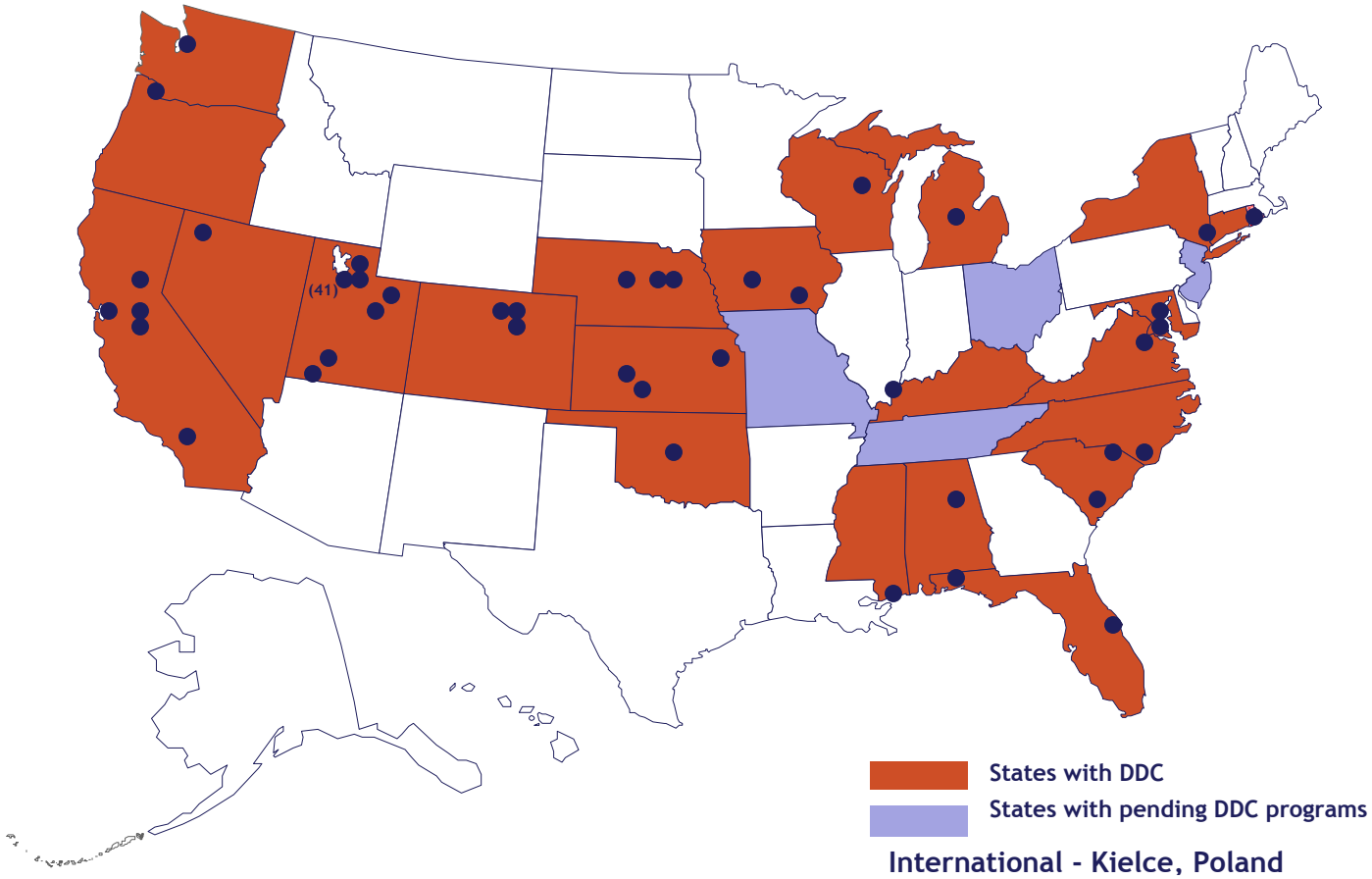
DDC systems are simple to install and operate and require very little maintenance (site personnel can be trained in system maintenance in less than one day). The system can be designed as a complete grid of wells to aggressively treat an entire plume area or as a line of wells across a plume to act as a barrier to plume migration by removing contaminants as they pass. The system has been applied to a wide range of subsurface hydrogeological environments.

DDC wells are constructed of 4" to 12" diameter PVC or stainless steel casings screened near the top and bottom of the aquifer section to be treated. Air is injected into the casing via a drop tube installed inside the well casing. The air forms bubbles which flow upwards displacing water and reducing the density of the water column within the casing.

The effect of the density reduction is to create an upward vertical gradient within the casing, drawing groundwater in through the lower screen and pushing aerated groundwater out through the upper screen. This process creates a groundwater circulation cell within the aquifer surrounding the DDC well. Contaminant removal is effected by air-stripping the water in the casing. Stripping efficiencies of up to 98 percent have been achieved in full scale systems. Air emitted from the DDC wells may be exhausted to the atmosphere, collected at the well head for treatment, or, for biodegradable contaminants, exhausted via the upper screened interval to the unsaturated zone above the water table. Aerobic bioremediation is stimulated by supplying oxygen to the groundwater through the circulation cells, and to the unsaturated zone by exhausting to the zone above the water table.

Clients List (Partial List)

Alma Refinery
AMCOR
American Can
AMOCO
ATC
Brown & Caldwell
Crysen Refining
Conestoga-Rovers
ENSR
IT Corporation
Jacobs Engineering Group
Law Engineering
National Bank
Parsons
Project Performance Corporation
Sinclair Oil Company
URS
US Air Force /AFCEE
Utah Division of Response & Remediation
Wells Fargo
Williams Pipe Line Company, LLC.
Wind River Petroleum
RTI



National & International DDC Locations

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