

## iSOC<sup>®</sup> Technology: A Brief Introduction

### Bioremediation:

- Since the mid-1990's pure oxygen to enhance natural attenuation has been growing as a remediation technology.
- Today there are a variety of technologies that can provide low to moderate concentrations (10-20 ppm) of DO.
- As these elevated DO levels mix with contaminated ground water, natural biodegradation occurs (due to existing in situ micro-organisms).
- Unfortunately, technologies such as sparging, chemical oxidation and powdered peroxide compounds are not effective in low permeability sites.

### inVentures Technologies Incorporated:

- iSOC<sup>®</sup> developed inVentures Technologies Incorporated.
- inVentures developed mass transfer technology, where they can transfer any gas into a liquid.
- Offices in Ontario and Fredericton, NB.
- Started by three Professional Engineers (Graduates of University Of Waterloo).

### iSOC<sup>®</sup> History:

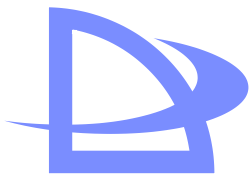
- Used at hundreds of sites in the US, Canada, Europe and Asia (Since 2001).
- iSOC<sup>®</sup> installations are occurring monthly.
- The European And Asian markets are beginning to use iSOC<sup>®</sup>.
- Many state regulators and national companies are actively using iSOC<sup>®</sup>.

### What is iSOC<sup>®</sup>?

- It is a gas delivery technology that will infuse any gas into a liquid.
- iSOC<sup>®</sup>, stands for "in situ submerged oxygen curtain".
- It is a low cost technology for enhancing natural attenuation.

### How does it work?

- iSOC<sup>®</sup> contains over 700 hydrophobic microporous hollow fibers that allow for the mass transfer of oxygen into the ground water.
- The technology supersaturates the ground water with low decay D.O. at concentrations ranging from 40 to 200 ppm depending on aquifer conditions and depth of injection.
- The oxygen transfer efficiency is nearly a 100%.
- The underlying scientific principle for the iSOC<sup>®</sup> is the equilibrium that exists between the dissolved concentration of a gas in a liquid and the partial pressure of the gas above the liquid. **Henry's Law states:** the weight of any gas that will dissolve in a given volume of liquid is directly proportional to the pressure that the gas exerts above the liquid.



## iSOC<sup>®</sup> Has Many Advantages

### Distinguishing Features:

- Will infuse any gas into a liquid.
- No moving parts and does not require electricity.
- Very low O & M.
- Easily moved to a new injection point or new site.
- Works in a 2-inch (51mm) monitoring well or larger.
- Powered by the pressure of the gas in the cylinder.
- Installation compound above ground or below ground.

### Construction:

- The iSOC<sup>®</sup> unit measures 1.62 inches by 12.5 inches. (41 mm X 318 mm)
- Made of stainless steel.

### Connecting Tube:

- 1/4" (6mm) inch polyurethane tube connects iSOC<sup>®</sup> and iSOC<sup>®</sup> Distribution Header.

### Site Compatibility:

- Primary remediation strategy to attack the source.
- Polish off low level contaminated sites.
- Curtain to stop off-site plume migration.
- Can be used on petroleum or chlorinated solvents.
- Not bothered by high levels of iron, BOD<sub>5</sub> or COD.

### Radius of Influence:

- Typically 10-15 feet (3-4.5m) – higher depending upon soil and groundwater flow
- Primarily depends on ground water velocity and the oxygen demands of the aquifer.
- Installs at any depth (deeper the water column the higher the DO level).
- Infuses 4 to 10 times more dissolved gas than any competitive technology.

### What Determines DO levels?

- Atmospheric Pressure Determines DO Levels.
- iSOC<sup>®</sup> will deliver about 41 PPM of dissolved oxygen per atmosphere of head pressure.
- Example: A 33-foot (10 m) column of water would equal about 2 atmospheres. (1 atm = 14.7 psi = 1 Bar; plus the water head pressure  $(2.306 \div 33) = 14.31$  total pressure (1 bar), or 29 psi, or about 2 atmospheres or 2 bar.  $2 \text{ atm} \times 41 \text{ PPM} = 82 \text{ PPM DO}$  in 33 foot (10 m) column).