



Brief Description of BOS 100®

BOS 100®

BOS 100® is a specialized catalyst manufactured by Remediation Products Inc and designed for rapid degradation of chlorinated solvents. The product consists of activated carbon that has been impregnated with metallic iron. The manufacturing process results in an extremely large (metallic iron) surface area that is highly active. Typically, the product is mixed with water and the resulting slurry is then injected using high pressure pumps although it has also been placed into excavations to address residual solvent impacts. Hydraulic fracturing is normally employed to enhance its distribution and place the material throughout the impacted formation. Since the product is granular, in clay/silt formations its installation results in seams of material that form preferential pathways throughout the formation. This enhances contact and provides a long-term mechanism for “effective contact” and this mechanism remains active for an indefinite period of time. In sands or sandy soils, fairly uniform distributions are possible.

First, contaminants are “trapped” by the activated carbon and then degraded by reaction with the metallic iron. As manufactured, the product contains roughly 6.5% (wt) metallic iron. Reaction byproducts include low levels of dissolved iron, chloride, and a series of non-toxic and generally unregulated hydrocarbon gases such as ethylene, and methane. A summary of performance characteristics is provided in the following items.

1. It is not necessary to wait for extended periods of time to know if the desired effect will take place. When properly installed, groundwater concentrations of site contaminants will be significantly reduced within a matter of days.
2. The product does not depend on any bacterial action to support its activity. The process is entirely based on chemical reaction.
3. Unlike bacterial mechanisms, the product is not sensitive to local geochemistry and will work just as well when oxidation-reduction potential is negative as when it is positive. For bacterial reductive dechlorination to function well, this parameter (ORP) must have a fairly large negative value.
4. BOS 100® is able to effect rapid reduction of contaminants in groundwater due to the fact it contains a substantial amount of activated carbon. This is the “trap” portion of the products activity. Activated carbon has a tremendous affinity for organic compounds and rapidly adsorbs contaminants from groundwater or from unsaturated soils.
5. The product is granular and when injected acts as a propanant, that establishes permanent seams within clay soils that become preferential pathways for

- groundwater seep. This is tremendously advantageous in clays as contamination will migrate into these pathways and come into immediate contact with treatment.
6. The product possesses an extremely high reactivity toward chlorinated solvents. This reactivity is due to a highly active and large available surface of metallic iron (roughly $250 \text{ m}^2/\text{gm-iron}$). The available surface area is at least ten times as large as that available from any other source of iron, including the most active forms of “nano-scale” iron suspensions.
 7. Rates of dechlorination are strong functions of both the surface area per gram iron but also on the local concentration of contaminants. The higher the concentration the higher the rate of degradation. With conventional iron powders or products such as HRC[®], this concentration is simply that observed in the groundwater. With BOS 100[®], the concentration of interest is that inside the activated carbon and this will be 50 to 100 times what existed in the groundwater.
 8. Rates of contaminant degradation are easily 100 times as fast as those achievable by other technologies. This results in clean-up cycles of weeks to months instead of years.
 9. Toxic daughter products such as vinyl chloride are not a problem since these compounds remain locked up within the carbon and are subsequently degraded. Since groundwater can be cleaned to targeted standards within very short periods of time and is maintained at this level throughout the clean-up lifetime, closure monitoring can commence within a short time after installation.
 10. Construction activities associated with property redevelopment can be performed without concern as groundwater is clean and there has been no contribution of carcinogenic byproducts to the soil vapor.
 11. The product is not water soluble so no dilution or movement of the product takes place after installation. Consequently, no long term contingency for re-treatment is required. Any re-treatment that might be needed can be accomplished within the first few months during active remediation.
 12. In barrier applications, the BOS 100[®] performs very much like an in situ carbon bed on steroids. This is because it not only absorbs the contaminants, it also rapidly destroys them so the expected lifetime of the carbon bed is substantially extended over that of carbon alone.