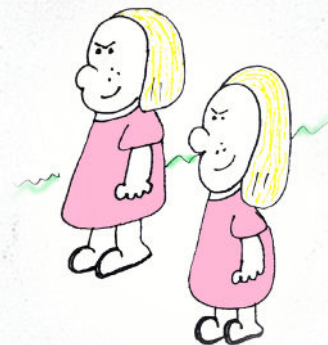


SURPRISING DAUGHTERS!



A surprising event adds an extra dimension to what we assume for our day, month, or life. Some unexpected events are fun, like a surprise party; others are life-changing, like the birth of twins. When it comes to chlorinated solvent remediation, the surprise arrival of the twin daughters cis-1,2-dichloroethylene (DCE) and vinyl chloride (VC) adds an extra dimension that can be scope-altering.



The interesting question regarding daughter products is – “who’s surprised?” Some remedies, typically enhanced reductive dichlorination, are almost guaranteed to produce the nightmare of persistent daughter products.

Biodegradation, enhanced or not, is a stepwise process. As reactions proceed from the parent compound to the non-toxic endpoint, intermediate reaction products are lost to the environment. A critical substrate such as hydrogen (H_2) may also be exhausted. A crucial vitamin such as B-12 can be depleted. A key microbe absent. These are just some of the deficiencies that lead to unwanted daughter products.

Daughter products are commonly detected in PCE, TCE contaminated groundwater before treatment. So, you may seek to avoid daughters by using ZVI-based remedies that degrade through β -elimination and, in theory, should not produce daughters. Yet, you often see significant daughter generation - likely through side biological reactions.

At RPI, we approach chlorinated solvent remediation differently. Our CAT 100 manages daughter generation through a marriage of biological degradation, metallic iron, and adsorption. This combination is unique because metallic iron is bound to the carbon throughout the micropores. The manufacturing process and the resulting BOS 100® are patented and not comparable to anything else on the market. BOS 100 is the base of CAT 100. Upon BOS 100 we build a biological treatment mechanism. The whole that arises in CAT 100 is a technology beyond the sum of its parts. Dual mechanisms with daughter product control – CAT 100. See Figure 1 as an example.

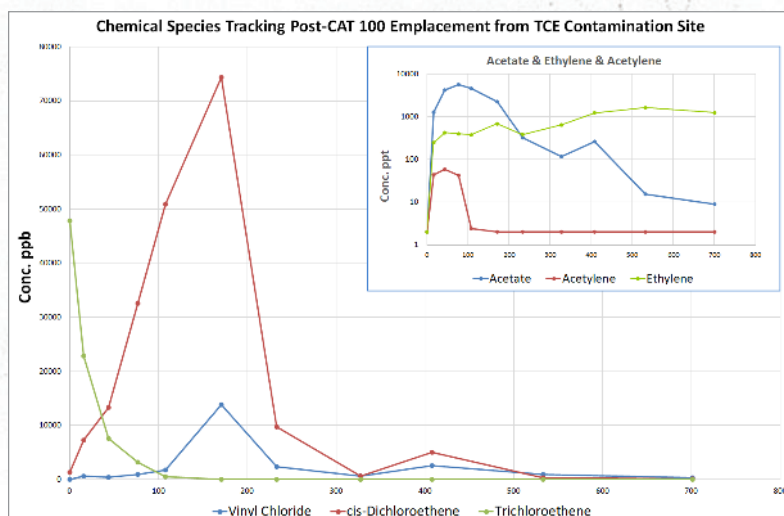


Figure 1

CAT 100 injection occurred at time zero. Before CAT 100 subsurface injection, the TCE concentration is greater than 4500 ug/L. Adsorption to the activated carbon base of CAT 100, and abiotic degradation start immediately and dominate the first 100 days post-emplacment. In the inset graph, note the initial acetylene “bump,” a marker of abiotic degradation. Biological degradation also occurs, as indicated by cis-dichloroethylene and vinyl chloride production. In the inset graph, notice the acetate peak. Acetate supports the biological degradation of halogenated solvents and is a marker of “CAT 100”. Next, look at the ethylene generation. Ethylene is a final product in the degradation and detoxification of TCE. The ethylene generation is intense and persistent. Finally, the daughter products of DCE and VC are restrained. Dual mechanisms with daughter product control – CAT 100.