

The Formation of Vinyl Chloride Using HRC

It has been asked whether the use of HRC on chlorinated ethene compounds will lead to the formation of vinyl chloride (VC). The answer is yes, but, but only temporarily since the dechlorination process will continue to its final product: ethene. In all HRC applications to date, not a single site has accumulated VC in concentrations that persisted or moved off-site.

VC is Produced Naturally

VC formation is a natural, necessary process in the degradation of chlorinated ethene compounds; even with natural attenuation of chlorinated ethenes, through all chemical processes, both biotic and abiotic (i.e. reduction by metals), VC will form. With the addition of organic substrates to the aquifer (a sensible and cost-effective strategy), the dechlorination process is accelerated, though VC will still be formed from DCE as the degradation proceeds to ethene. This is true for all organic substrates, not just HRC; however, if HRC is used, the rate of VC formation will be minimized due to the consistent, low-concentration generation of hydrogen. This allows the rate of VC generation to more closely match the rate of VC degradation to ethene, preventing VC buildup.

VC Degrades Rapidly with Oxygen

As mentioned above, HRC has never caused a significant or permanent buildup of VC onsite. However, in cases in which site conditions do not allow the VC adequate residence time near HRC (i.e. quickly moving groundwater), it is conceivable that the VC could move offsite before it is fully converted to ethene. In this instance, REGENESIS would recommend the installation of a down-gradient passive ORC oxygen barrier which would cause the rapid and complete mineralization of any VC attempting to cross the barrier zone. The use of ORC to rapidly degrade VC is well documented and is summarized in TB 2.2.2.3.