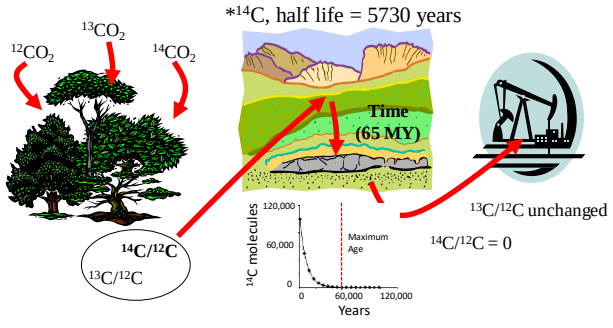
Managing Risks of Excessive Methanogenesis during *In Situ* Remedial Actions

Microbial consumption of organic carbon or electron donors (sugars, [emulsified] vegetable oils, lecithin, various hydrogen release compounds) used in bioremediation continually results in fermentation byproducts (*e.g.* volatile fatty acids) and end-products such as carbon dioxide, methane and water until all the carbon is consumed. The organic carbon source resulting in high levels of methane production is *not* the chlorinated contaminants, but rather the amendments used to induce anaerobic conditions required for reductive dechlorination reactions. If not controlled, elevated methane levels represent: i) inefficiency (as the hydrogen leaves the system), ii) induced vapor migration potential, and iii) potential health & safety issues such as explosion risk (here, confined accumulation is required high pressure is not required in the presence of an ignition source). Accordingly, excessive methanogenesis should be avoided and/or appropriately managed during remediation through: i) proper amendment selection / dosing, ii) continuous monitoring, iii) data confirmation, and/or iv) technical or engineering responses.

- ***Proper Amendment Selection / Dosing:*** Conventional remedial amendments (see above) often feed methanogens (Archaea) more than the desired microbes. Provect-CH4® Advanced represents our latest advancement in the science of applied antimethanogenic reagents (AMRs). It is a proprietary mixture of Plant Extract Oils/Saponins in combination with red yeast rice extract that when combined with other materials to prevent excessive methane production during remedial action by specifically controlling the growth and proliferation of Archaea.
- ***Continuous Monitoring:*** VaporSafe™ represents the industry's first automated real-time, web-based vapor monitoring (gasses, pressure, *etc*) and response platform. Continuous laboratory grade measurements from up to 16 locations are automatically delivered to the web, processed, visualized, and when thresholds are exceeded, alerts and controllers are immediately triggered.
- ***Data Confirmation:*** Stable carbon ($\delta^{13}C$) and naturally occurring radiocarbon ($\Delta^{14}C$) analyses provide conclusive identification of methane sources in soil gases, groundwater, vadose soils, and ambient/indoor air. Through natural radiocarbon isotope decay, during a time span of approximately 50,000 years carbon that was once modern and rich in ^{14}C no longer contains ^{14}C. Hence, petroleum-based molecules are devoid of ^{14}C which allows one to follow C cycling in modern environments. $\delta^{13}C$ allows additional data interpretation: as no change occurs in $\delta^{13}C$ in complex microbial driven ecosystems, these data provide: i) capability to fingerprint an organic contaminant source; ii) a second variable for assessment of CO_2 or methane source(s); and iii) diagnosis of microbial respiration or CH_4 oxidation and production. Specific examples of studies are available at https://strategic-carbonllc.com/.



- ***Technical or Engineering Responses:*** Upon request, these integrated technologies can be implemented as a turn-key service to help you and your clients most effectively address remedial efficacy, manage potential methane risks, and successfully meet the growing regulatory requirements regarding methanogenesis during ERD and ISCR applications, especially in industrial and residential settings.

For more information, contact us at: http://www.provectusenvironmental.com/the-methane-zone/
https://www.groundswelltech.com/VaporSafe.aspx

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