



Monitoring of Volatile Fatty Acids

Demonstrating Microbial Activity

Microseeps developed a new method for analyzing volatile fatty acids

With the proliferation of enhanced biodegradation as a remediation technology, Microseeps recognized the need to provide analytical support to clients using organic substrates to stimulate anaerobic degradation.

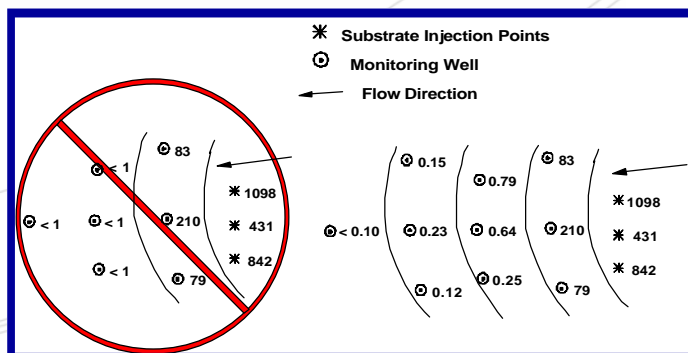
Some of these substrates are just lactic acid which is subsequently fermented by the in-situ microbial consortium into pyruvic, butyric, propionic and acetic acids. Thus, the presence of this suite of acids after addition of only lactic acid is evidence of the activity of the microbial process. This rather unique suite of so called volatile fatty acids is also a convenient tracer to monitor where the treated water flows.

The older method for determination of these acids was a gas chromatographic (GC) method with a detection level of about 15 mg/l for lactic acid, 5 mg/l for pyruvic, and about 1 mg/l for the rest. Given these detection levels, the suite of acids could not be traced down the groundwater flowpath very far before the concentration was below the detection level. It became important to be able to look at very low concentrations of volatile fatty acids so that the migration of the acids could be used as a tracer.

Microseeps developed a new methodology for analysis of the volatile fatty acids which uses ion chromatography (IC) instead of gas chromatography (GC). This method has achieved significantly lower detection levels in the range of a few tens of ug/l.

In addition, we have extended the method to the 5 and 6 carbon acids to accommodate clients who are using vegetable oils and other organic substrates instead of lactic acid.

In general when hydrocarbons are oxidized, we write the reactions as if they are oxidized directly to carbon dioxide, when in fact there are almost always organic acid intermediates. In the past, these naturally occurring levels of organic acids in contaminant plumes could not be observed because their concentrations were far below the detection levels of the developed analytical methodologies.



The analytical detection capabilities of Microseeps' new IC method is approaching the range of concentrations where natural levels of organic acids in biodegrading contaminated plumes will be able to be determined. In some cases we believe that we can already see these natural levels.

Compound Name	Acetic Acid	Propionic Acid	Butyric Acid	Pyruvic Acid	Lactic Acid	n-Pentanoic Acid	i-Pentanoic Acid	n-Hexanoic Acid	i-Hexanoic Acid
Low Level PQL (ppm)	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.10	0.10

