Removal of Elevated Concentrations of PFAS and PFAS^{+} Compounds

Jurgen Buhl (buhl@cornelsen-umwelt.de)
(Cornelsen Umwelttechnologie GmbH, Essen, Germany)

Background/Objectives. Groundwater contaminations with PFAS (per- and polyfluorinated alkyl compounds) are often characterized by moderate concentrations of these compounds. Under certain conditions elevated concentrations of PFAS are being detected in water and in some cases, possible in groundwater. On an airport site 770 ppb of PFAS had been detected, on another site in North America, 3000 ppb had been present in the groundwater. But more of interest are two additional sources of elevated concentrations of PFAS. First, contaminated water with various PFAS concentrations as a result of the process of replacing previous AFF foams that contain PFAS. After removing the previous foam, cleaning works are required at tank and pipework of the fire-fighting truck. During this process, clean water is flushed several times through the pipework and the valves of such the truck which generates PFAS contaminated water. And secondly, elevated concentrations of PFAS in fire-fighting water can be detected. This water can be the result of the annual fire-fighting training events or of fire-fighting activities initiated by a larger fire on an industrial or petrochemical site.

Approach/Activities. Both scenarios generate water with various concentrations of PFAS. Based on our experience concentrations can range between 100 and 2500 ppb of PFAS. The telomer 6:2 FTS is often an important compound, but additional compounds can be present in the water as well. These compounds, for example surfactants and precursors, contain concentrations at much higher levels than the PFAS values. In our example the concentrations of surfactants had been about 228 mg/L (ppm) and additional fluoroorganic compounds at about 140 ppm. This water showed a more complex contamination, resulting from fire-fighting training, which made it look grey. The use of crude oil for starting the fire at training purposes had caused a DOC level of about 1700 ppm in the water. PerfluorAd was used for treating that water with the goal to prove that the solution could remove the PFAS and a certain percentage of the additional compounds by generating flocs that contain the contaminants.

Results/Lessons Learned. Different dosing rates of PerfluorAd were used followed by measurement of the corresponding results. Although the water was grey both colour and turbidity, this did not play a role in the treatment process. At the most ideal dosing rate it was possible to remove about 99.3% of the PFAS (list of 23 parameters) and a similar percentage of the anionic surfactants. More than 75% of the fluoroorganic compounds were removed. Interestingly, there was no influence observed on the DOC level, just 1% of the DOC was removed. A particle filter removed the flocs that carried all compounds out of the water. The water resulting from that filtration process was clean and transparent.