PFAS ACTION TEAM – THOUGHTS FOR CONSIDERATION

November 30, 2018

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PFCs

Perfluorooctanoic acid
(also known as PFOA)

Perfluorooctane sulfonic acid
(also known as PFOS)

- However, there are over 4,500 PFCs
- UCMR 3- Included 6 PFCs (PFOS, PFOA, PFNA, PFHxS, PFHpA & PFBS)

- Federal Health Advisory Level (70 total for PFOS/PFOA)
- Many sites identifying 15-20 PFCs and the PFOA/PFOS is less than 50% of total PFCs
PFCs- Good Properties

PFOS

- Surfactant or emulsifier; used in fire-fighting foam, circuit board etching acids, alkaline cleaners, floor polish, and as a pesticide active ingredient for insect bait traps; U.S. manufacture of PFOS phased out in 2002; however, PFOS still generated incidentally

PFOA

- Per fluorinated aliphatic carboxylic acid; used for its emulsifier and surfactant properties in or as fluoropolymers (such as Teflon), fire-fighting foams, cleaners, cosmetics, greases and lubricants, paints, polishes, adhesives and photographic films

PFNA, PFHxS, PFHpA & PFBS

- Manmade chemical; used in products to make them stain, grease, heat and water resistant
# Fire Fighting Foams AFFF vs FFF

<table>
<thead>
<tr>
<th>Category</th>
<th>Aqueous Fire Fighting Foam (AFFF)</th>
<th>Fluorine Free Foams (FFF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire Extinguishment</td>
<td>18 seconds</td>
<td>40 seconds</td>
</tr>
<tr>
<td>Timeframe</td>
<td></td>
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<tr>
<td>Effectiveness on Petroleum</td>
<td>Good on petroleum fires, which is the primary use</td>
<td>Inherently oleophilic (fuel attractive) &amp; can easily pick up fuel, degrades quickly and becomes flammable compromising the fire</td>
</tr>
<tr>
<td>Military and FAA Requirements</td>
<td>Meets both US military specification (milspec) and FAA requirements</td>
<td>Unable to pass the fire tests necessary to meet the requirements of the US military</td>
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<td>Toxicity</td>
<td>One European study showed AFFFs are much less toxic to fish in the short term than FFFs because of high BOD</td>
<td>The same one European study showed FFF much more toxic to fish in the short term due to high BOD; only 38-110 ppm levels caused fish kill</td>
</tr>
</tbody>
</table>
Carbon Facts

- Carbon is a filter media
- Carbon Affinity is affected by
  - Compound characteristics,
  - Compound concentration,
  - Carbon bed contact time, and
  - Other competing contaminants
- Carbon adsorption
  - Better for longer chain PFCs (example PFOS, PFOA)
  - Poor for shorter chain PFCs (PFBS, PFHxS, etc.)
- Water and Wastewater Treatment Plants
  - Report only PFOA/PFOS (HAL 70 ppt)
  - PFCs not treated and escape
Standards & Cleanup

- Standards
  - Complicated
  - Getting them accurate
  - Importance

- Cleanup
  - Not Detect – Not Realistic
  - Enforcement
  - Media
  - Technology Selection
Remedial Measures

• Investigating vs Interim Remedial Measures vs Final Remedy
• Protection of Receptors
• Public Participation
• Interim Remedial Measures
  – Source Control
  – Control, Minimize & Eliminate Releases
  – Control, Contain & Separate Stormwater Runoff
  – Control Groundwater Plume Migration
  – Control Infiltration through Impacted Soils
  – Control Leaching from Impacted Sediments
• Remedial Options
  – Alternative Clean Water Supplies
  – Carbon vs Resins
  – Interceptor and Containment Barriers
  – Thermal and Oxidation and Plasma Technologies
  – Phytoremediation
  – Institutional Controls