Bakken Crude Awareness

Greg Powell
Unit Train
Oil in water inside containment boom in Armstrong Creek
Oil on Ice
OHMSETT Testing
Release of Bakken Crude

Air Monitoring
- Area Rae’s
- Ultra Rae 3000 / Benzene Tubes
- TVA 1000
- Tedlar Bag GCMS Analysis
- Carbon Tubes (Eight Hour Exposure Evaluation)
- TAGA Continuous
Bakken Crude Specifics

- Flash Point = 95 degrees plus
- LEL = 0.8%
- UEL = 8.0%
- API Gravity = 45
- Specific Gravity = 0.82
- Benzene Concentration = 1700 – 1900 ppm
Volatile Compound Reduction With Weathering

- Significant Levels of Light Hydrocarbons in Unweathered sample
- After 24 Hours a Significant Loss of Light Hydrocarbons Up to Nonane and BTEX Compounds
- After Seven Days a Complete Loss of Benzene and Toluene. Significant loss of Xylenes
Initial Concentration

1 Day Weathering

7 Day Weathering
Benzene Air Issues

- OSHA action level = 0.5 ppm
- TWA (8 hrs.) = 1 ppm
- STEL = 15 ppm 15 minutes
Release and TAGA Monitoring
ASTM Skimmer Testing
Additional Skimmer Testing

- Weathered Oil Recovery Rate
  - 20 gpm

- Fresh Oil Recovery Rate
  - 5 gpm
Air Monitoring
OPEN CUP FLASH POINT

- Fresh Oil - Too volatile and was lost prior to determination
- Oil Weathered One Day - 132.0 Degrees Fahrenheit
- Oil Weathered Seven Days - 165 Degrees Fahrenheit
PHASE II Warm Weather Testing
Somerset, New Jersey
Testing Area Layout
Quiescent Pool Prior To Release

Location of Water Sampling Ports
AreaRae Setup
Water Sampling Collection Configuration

Siphon Flow
Bakken Oil Release
Flash Point Data

- Time Zero  \( \leq 23^\circ F \)
- Time 25:30 Still Pool 168\(^\circ\) F
- Time 21:28 Agitated Pool 161\(^\circ\) F
- After 24 hours most of the C4 thru C10 hydrocarbons had volatilized.
Initial Release Air Monitoring

AreaRaes, PID/FID, UltraRae 3000, Tedlar bags for GC/MS Analysis, and Continuous TAGA Monitoring
Significant Effervescence
Total Coverage of Off Gas Foaming
### Comparison Data

**Table 2**  
Comparison of Benzene Air Monitoring and Air Sampling Results from 14 June 2016  
Bakken Crude Oil: Worker Health and Safety Pilot Scale Study  
Somerset Fire Training Academy, Hillsborough, NJ  
September 2016

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Location</th>
<th>Description</th>
<th>Start Time</th>
<th>Tedlar Bag GC/MS Benzene Concentration (ppmv)</th>
<th>UltraRAE 3000 Benzene Concentration (ppmv)</th>
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<tr>
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<td>Background</td>
<td>9:41</td>
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**GC/MS** = gas chromatography/mass spectrometry
TAGA Monitoring
Water Sample Collection
Oil Characteristics

Initial Release

After Off Gasing
Rudimentary Oil Thickness Gauging