R&D Needs for Dispersants

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ACS, AiCHE, Senate Science & Technology Caucus
“Chemistry in the Clean-Up: Oil Dispersants”
CAVEATS

• Today = Unique R&D Issues Deepwater Horizon (DWH)
• Extensive List of Dispersants R&D Needs Identified Before Deepwater Horizon Spill
  • National Research Council: Oil Spill Dispersants: Efficacy and Effects (May 2005)
  • Dispersants Working Group: Dispersed Oil Research Data (Present)
• R&D Coordination: Dispersants Working Group
DEEPWATER HORIZON SOURCES
(Today’s Presentation)

• Deepwater Horizon Dispersants Use Meeting Report
  • (May 2010)

• Deepwater Horizon Dispersants Data Webinar
  • (July 2010)
R&D ISSUES - DEEPWATER HORIZON

**LARGE VOLUME**

- Large Volume Applied: 1.84M Gallons Total
  - 1.07M gallons surface
  - 0.77M subsurface
- IXTOC = 2.5M gallons
- Continuous Application Over Many Days
  - Long-term exposure
R&D ISSUES - DEEPWATER HORIZON

SUBSURFACE INJECTION

• Deepwater Dispersant Use
  • Injection in turbulent plume
  • Cold water (~4°C) in deep GOM
  • Warm oil (~100°C) exiting well
  • Pressure high (2200 psi at 5000 ft, oil exiting under pressure too)
R&D ISSUES - DEEPWATER HORIZON

EFFICACY

- Dispersant: Oil Ratio
- Dispersant Types
- Oil Flow Rate Estimates
- Subsurface Mixing Energy
R&D ISSUES - DEEPWATER HORIZON

**EFFECTIVENESS**

- Droplet Size Distribution
- Monitoring Techniques:
  - Conventional = Visual + Fluorescence
  - Gas Chromatography / Mass Spectrometer
  - Acoustics
  - Particle Counter (LISST)
  - Ocean Observing Systems (e.g., gliders)
  - Molecular Techniques (DNA)
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FATE & BEHAVIOR

• Fate and Behavior: (Chemical Dispersants vs. Natural Dispersion)
  • 3D behavior from deepwater upward
    • Dispersion
    • Dissolution
    • Biodegradation
    • Sinking (?)
  • Dispersability of weathered oil
  • 3D models to predict where, when, how much
    • Offshore and onshore model links
R&D ISSUES - DEEPWATER HORIZON

BIOLOGICAL EFFECTS

- Air vs. Water Exposure
- Marine Biota (Surface & Deepwater) and Humans
- Food Web, Ecosystems, Bioaccumulation
- Acute vs. Chronic
- Cytotoxicity, Endocrine Disrupters
- Realistic Exposures
  - Time and Concentration
- Seafood Safety
  - Dispersants in Seafood
  - Dispersed oil
R&D ISSUES - DEEPWATER HORIZON

OTHER TOPICS

- Dispersant Discontinuance Criteria
  - Role of Consensus Ecological Risk Assessment
- Dispersant Database
  - Build on LUMCON (LA Universities Marine Consortium)
  - Biological Threshold Database
  - Links to Previous Studies
Coastal Response Research Center
Website

www.crrc.unh.edu