The role and effects of dispersants in an oil spill

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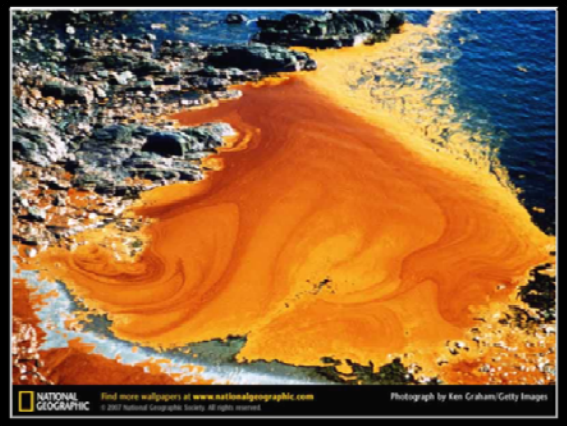
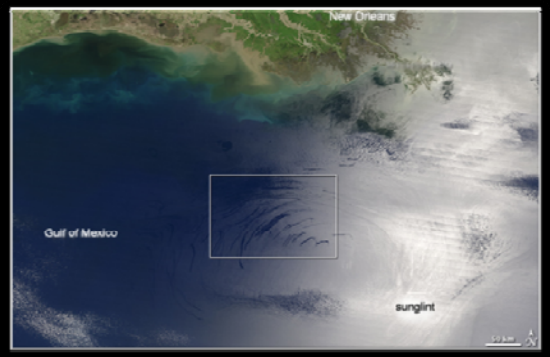
Clean up options

- Type of spill

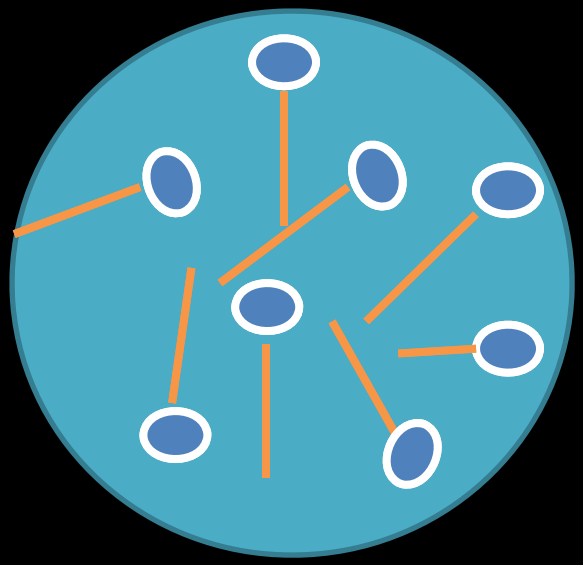


- Booms
- Skimmers
- Burned
- Hand collection
- Dispersants



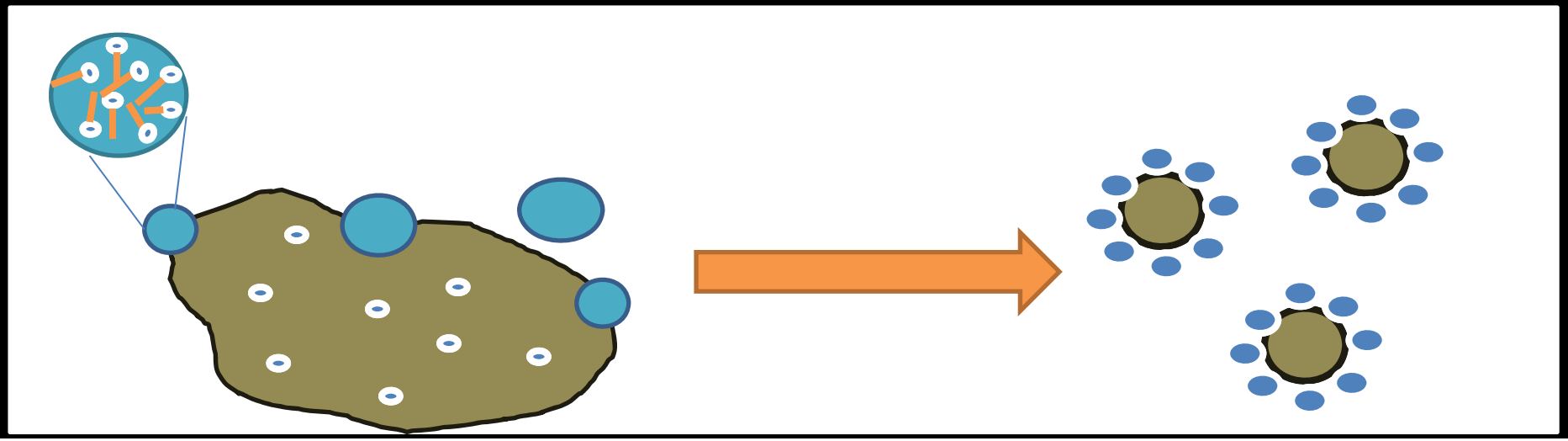
What is a dispersant:

- Similar to a grease fighting dish soap
- Surfactants and solvent compound
- Surfactant
  - Common in food, cosmetic, and pharmaceutical products
  - Oil-loving portion
  - Water-loving portion



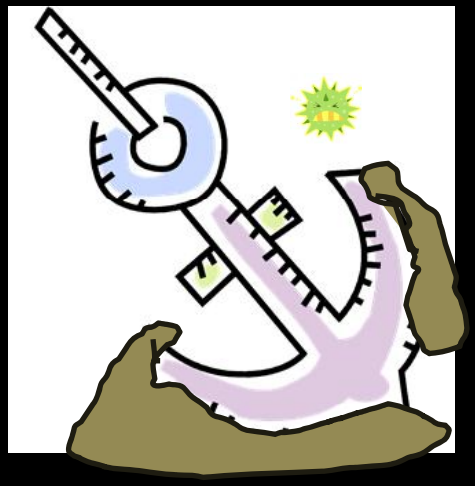
How does it work?

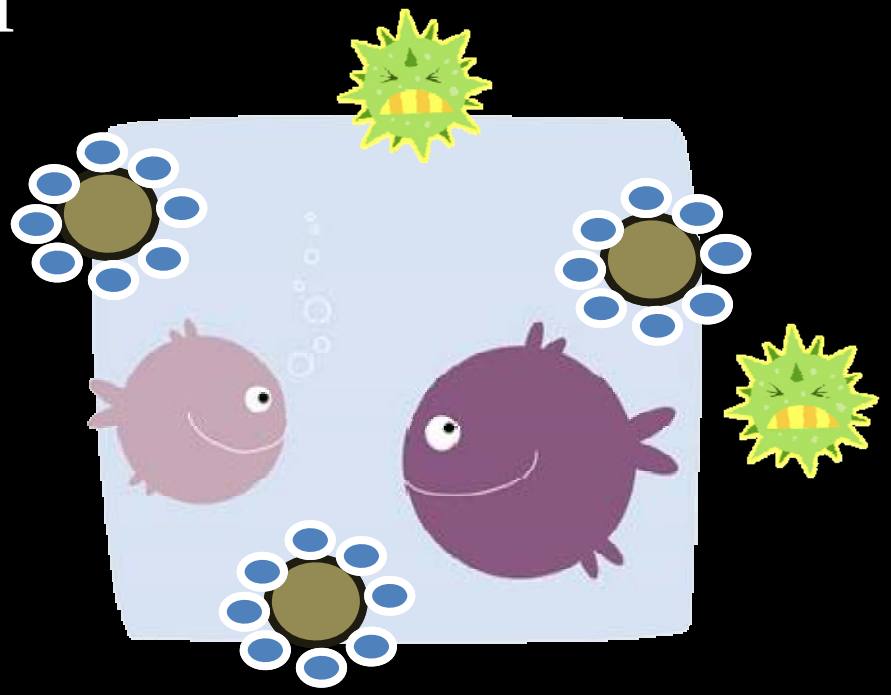
- Surfactant breaks up the oil
- Smaller discrete droplets form
- Surfactant forms a layer around preventing reformation
- Individual droplets move into the upper water column.



New dispersed molecules

- Less likely to adhere to fish, birds, or boats
- More surface area for bacteria to naturally break down the oil



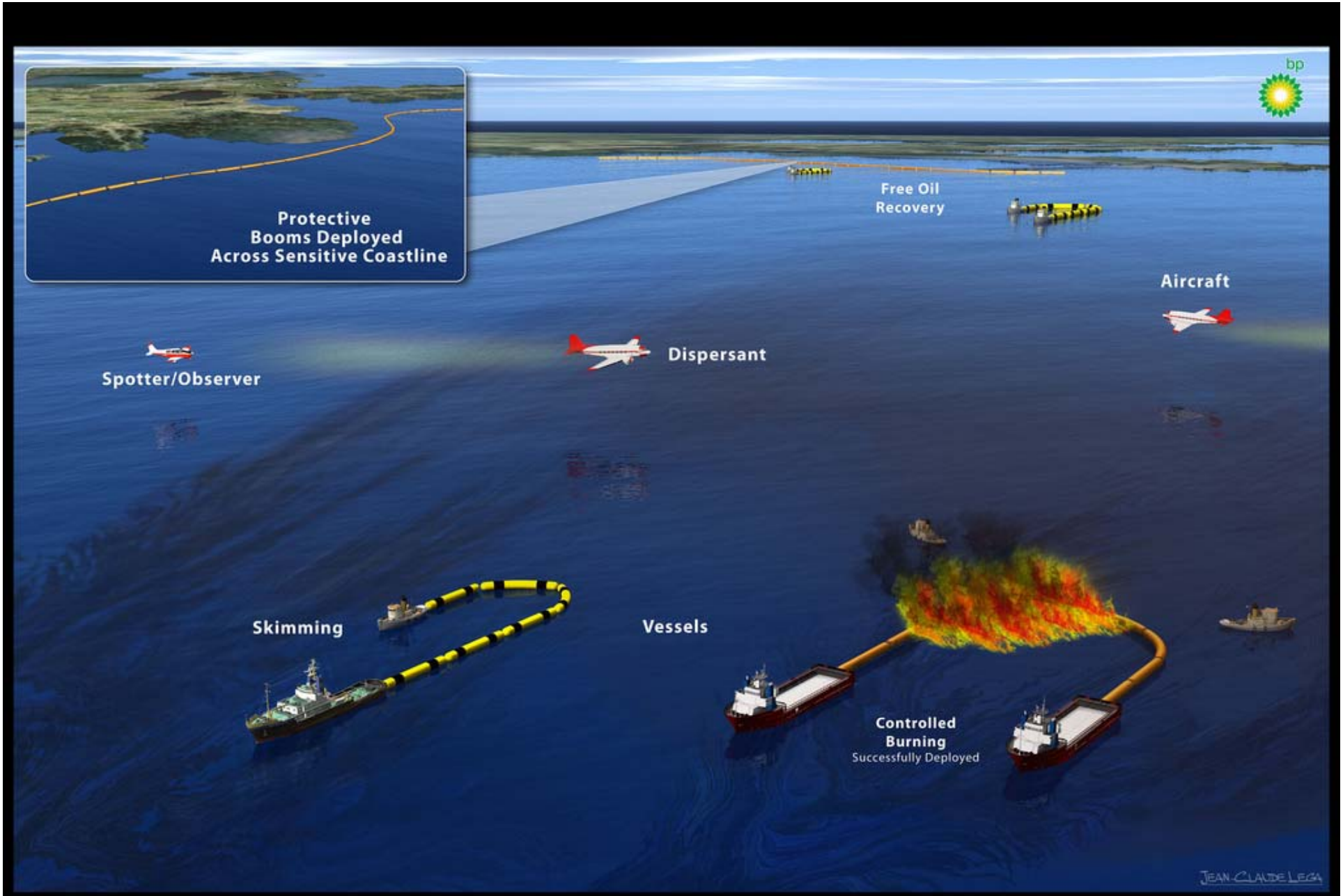


The BP spill

- " To minimize the impact of the oil on the environment"- EPA, Coast Guard, BP, & Nalco
- Prevent the oil from reaching the shorelines
  - Natural
  - Economic
- Aerial and subsea application
- 1.84 million gallons total
  - 771,000 gallons subsea
- ~50 miles offshore

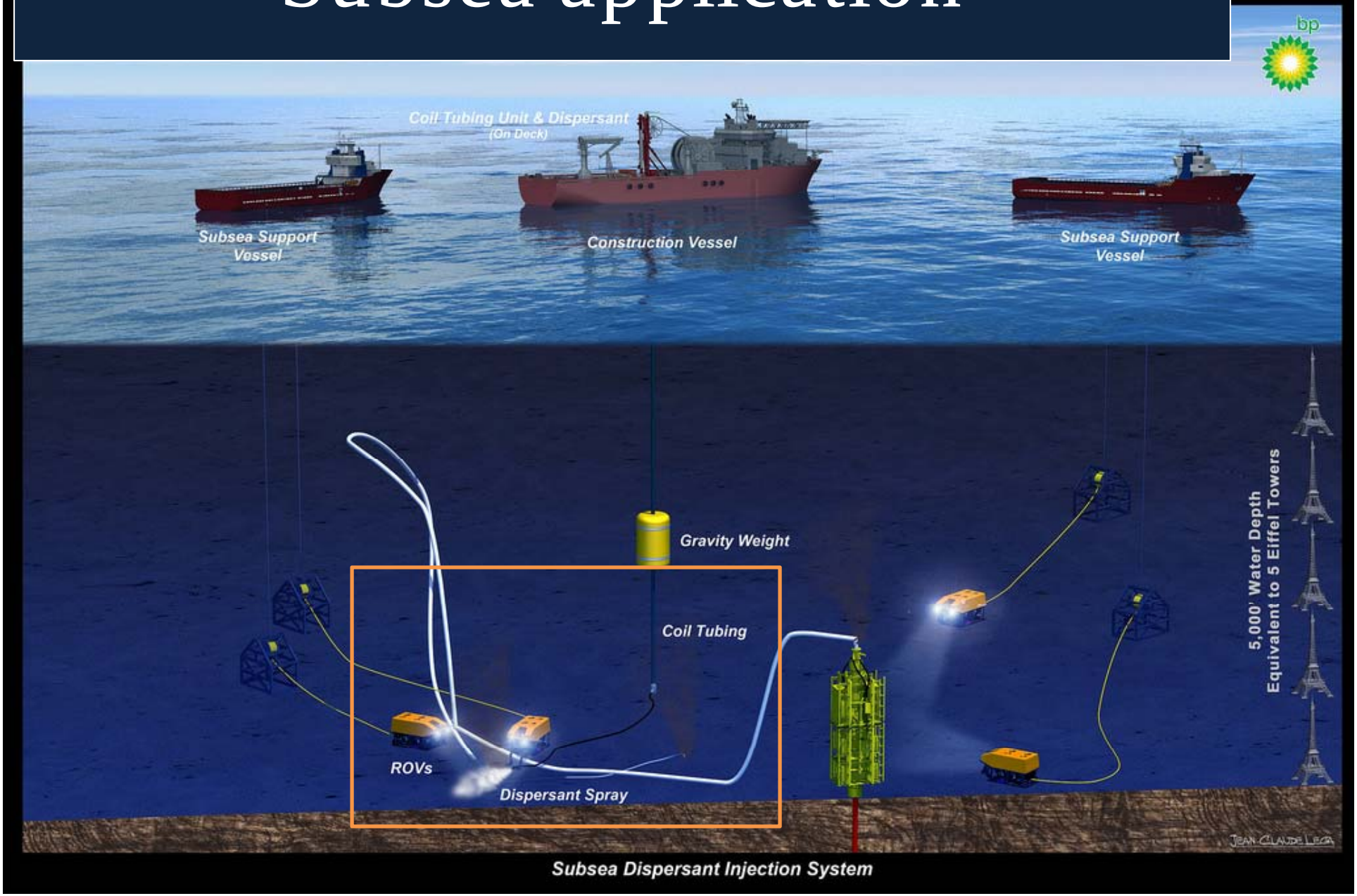
BP continued

- 30 parts per billion when dispersed across the area of the oil slick
  - 1/10th of 1 percent EPA standard testing
  - Far lower level than drinking water standards
- Novel for the sheer magnitude and for subsea application
- Depth of leak (~5,000 feet)



Oil Spill Response Operation

Subsea application



Corexit 9500, 9500A, & 9527

- Different formulations
- Nalco
  - Dispersants very small portion of the company
- 9527 had limited usage due to available stock
  - 2-butoxy ethanol
- 9500/A primary dispersant
  - Only dispersant given by Nalco to Coast Guard for use

Ingredients

- Surfactant- DOSS- Dioctylsulfosuccinate, sodium salt

Name	Common Day-to-Day Use Examples
Sorbitan, mono-(9Z)-9-octadecenoate	Skin cream, body shampoo, emulsifier in juice
Sorbitan, mono-(9Z)-9-octadecenoate, poly(oxy-1,2-ethanediyl) derivs.	Baby bath, mouth wash, face lotion, emulsifier in food
Sorbitan, tri-(9Z)-9-octadecenoate, poly(oxy-1,2-ethanediyl) derivs	Body/Face lotion, tanning lotions
* Butanedioic acid, 2-sulfo-, 1,4-bis(2-ethylhexyl) ester, sodium salt (1:1)	Wetting agent in cosmetic products, gelatin, beverages
Propanol, 1-(2-butoxy-1-methylethoxy)	Household cleaning products
Distillates (petroleum), hydrotreated light	Air freshener, cleaner
** Ethanol, 2-butoxy	Cleaners

Dispersant research

- EPA required more testing
- Terms:
  - Toxicity testing
  - LD50/ LC50:
    - Dose or concentration resulting in median or 50% death in given time period
    - Ex. 100 mg/l in 48 hours
- Time:
  - Testing is not instantaneous
  - 2 week set up
  - 1 week run
  - Several weeks to verify
- Funding/ Supplies

EPA

- Data collection and monitoring
  - Air, water, and sediment
  - Benchmarks: DOSS and same compounds on ingredient list
  - All results are online
- Toxicity testing
  - Mysid shrimp
  - Inland silverside
  - Dispersants alone less toxic than oil alone or oil and dispersant mix

Universities & Private Entities

- Additional toxicity testing with relevant marsh, estuary and open water species
- Dispersant alone
  - Blue crab juveniles and larvae: extremely low death in very high concentrations
- Dispersant and Oil
- Sublethal

Limiting factors lab & field

- Laboratory tests cannot replicate real world
- We cannot set up true field tests: research of opportunity
- Other real world variables:
  - Freshwater diversions for spill
  - Drought
  - Freshwater diversions for floods
  - Unusually cold winter
  - Unusually hot summer

Pros and cons of use

- Pros
  - Kept the majority of the oil out of the marshes
  - Reduced surface oil
  - Breaks it up to perhaps make it degrade faster

- Cons
  - Open marine environment
  - Deep sea
  - Not fully researched impacts on individuals, communities, and the food chain

Future use of dispersants

- Every spill is different
- Hard to anticipate direct needs
  - Oil Spill Commission Report felt that an adequate response for a spill of this magnitude was not planned
- EPA is requiring additional toxicity testing prior to a dispersant being approved
- Tracer compound

Myths and Misconceptions

- Shorelines and communities were sprayed with aerial dispersant
  - Fact: Application was always 3+ miles offshore
- Dispersant makes the oil vanish
  - Fact: It breaks the oil up, but dispersed oil can still be detected
- Most Gulf workers are sick from 2-butoxyethanol
  - Fact: It's not in 9500
  - Fact: 20% detected, 0.8 ppm highest, 5.0 ppm is recommended limit
  - Fact: Ingredient in cleaners

Myths and Misconceptions cont.

- This dispersant is banned in Europe/ UK/ etc.
  - Fact : Banned from rocky intertidal
  - Fact : Not approved use by manufacture- 3+ miles out
  - Fact : Approved in UK for 3+ miles offshore use

- Corexit is highly toxic
  - Fact : All ingredients are found in common household products including food and cosmetics
  - Fact : Allowable toxicity levels
  - Fact : Used as directed
  - Fact: Water can be toxic at excessive quantities

Acknowledgments and Sources

- Louisiana Sea Grant
- LSU AgCenter
- Nalco.com
- Deepwater Horizon Spill Response
- EPA BP Spill Website


Questions