



Marine Oil Spill Control Technology

Poseidon Sciences develops new oil response technology

Chemicals and dispersants may damage the aquatic ecosystems in the effort to mitigate oil spill in the Gulf of Mexico. It is time to return to using natural products in offshore oil spills.

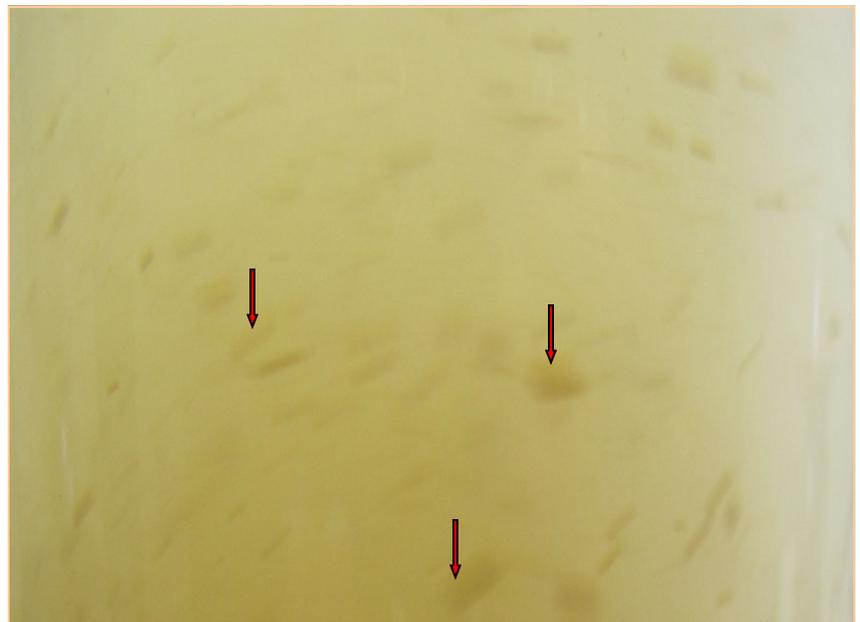
The continuing discharge of oil from the blowout damaged drill pipe of the Deep Horizon oil rig in the Gulf of Mexico has stimulated Poseidon scientists to quickly re-evaluate its existing portfolio of technologies that may be of use in protecting the environment from this unfolding man-made disaster. Besides the ecological damage from the spilled oil, the widespread use of dispersants with their unknown open ocean environmental effects required re-thinking of how mitigation should be approached. The primary consideration is the development of inert substances that can sequester, encapsulate, and disperse buoyant micro droplets of oil within the upper layer of the water column to disperse the oil while increasing its biodegradation by marine bacteria in the warmer surface waters. Thus, the Nereus Project was initiated.

NEREUS PROJECT: new materials for oil spill mitigation, **Nereid 640**(US patent pending)

The latest result of the Nereus Project is the development of its first generation micronized powder technology, called **Nereid 640**[®] (U.S. patent pending), which comprises a blend of inert, naturally occurring porous lipophilic minerals that specially addresses the issues required for dispersion and bioremediation. See the demonstration video: http://www.youtube.com/watch?v=K1VE3b_KH14



Oil complex after slow mixing. The Nereid-oil complex is suspended and should remain suspended by wave action.



Following mixing (to simulate wind and wave action) the oil is sequestered and encapsulated by Nereid[®] 640, forming buoyant micro oil droplets that are dispersed and suspended in the water column.

What is Nereid 640®?

- It is a proprietary blend of inert natural minerals that forms microstructures that adsorb lipophilic (oils) to its inner and outer surfaces.
- It is a US FDA designated GRAS material (Generally Recognized As Safe) as a food item. <http://www.accessdata.fda.gov/scripts/fcn/fcnNavigation.cfm?rpt=grasListing>
- Toxicity tests (48hr, EC₅₀) with marine larval organisms indicate that it is nontoxic to marine life.
- It is micronized with particle size in the range of 10 microns.

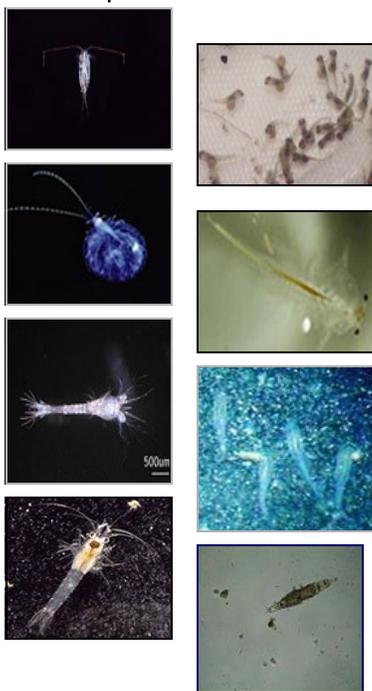


Inventory Reserve: How much material can be available if needed? The US inventory of Nereid 640® is approximately 1 million tons. Today, hundreds of tons can be mobilized in reasonable time to respond to oil spill mitigation testing. More material can be processed to support thousands of tons required to respond to an oil spill.

Next steps towards commercial deployment

Because the *Nereus Project* has been developed in a fast paced research environment to solve an immediate crisis, there are still many questions that can only be answered through controlled in-situ field tests.

- What particle sizes of Nereid 640® will form the most buoyant oil complexes?
- How much Nereid 640® is needed to mitigate oil-water emulsion of a surface open ocean slick (thousand pounds per length and width of surface slick)?
- What is the best application method (air spray drop or air spray over water from a boat)?
- How toxic will the formed Nereid 640-oil micro droplets be to various open ocean marine organisms?
- What are the biodegrading rates for formed Nereid 640-oil micro droplets in the warmer photic surface water column of the ocean?



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In Greek Mythology, Nereus was the son of the Titans—Pontus (the Sea) and Gaia (the Earth). Always known as the “Old Man of the Sea” for his truthfulness and virtue, Nereus fathered the Nereids or sea nymphs, known for their friendly help to mariners in stormy seas. Hence, the name Nereus Project was chosen for this R&D program.

48 Hour Toxicity Test

Test Facility: Athena Bioventures, Inc. <i>a Poseidon Sciences company</i>	Technology Officer: Araceli Q. Adrias
Test completed: May 24, 2010	Name of toxicant: Nereid 640, very light pink color, powder

Procedure:

See general procedures as outlined in attached draft technical paper. The study follows procedure from American Society of Testing & Materials ASTM E729-96 (re-approved 2002). Marine larvae were acclimatized for 3 hours to filtered seawater prior to each test. Seawater temperature was at 29 °C. Nereid 640 powder was added to the filtered saltwater from the same source where the larvae was acclimatized. It was stirred and allowed to settle for 30 minutes before the marine larvae were added. Mortality was counted every 2 hours for the first 24 hours.

Test Organism: Prawn (*Penaeus monodon*)

Stage: PL 9 (post-larvae at 9 days from date of hatching)

Source: Hatchery ; 20 per test, in triplicate; N=60 per group

Test Concentration	% Mortality					
	After 24 hours			After 48 hours		
Control	0	0	0	0	0	0
0.1 g/ml	0	0	0	0	0	0
1.0 g/ml	0	0	0	0	0	0

Test Organism: Milkfish (*Chanos chanos*)

Stage: fish larvae

Source: Wild, collected by seining from shoreline; 20 per test, in triplicates; N=60 per group

Test Concentration	% Mortality					
	After 24 hours			After 48 hours		
Control	0	0	0	0	0	0
0.1 g/ml	0	0	0	0	0	0
1.0 g/ml	0	0	0	0	0	0

Conclusion

Nereid 640 is not toxic to prawn and milkfish larvae at the 48-hr acute toxicology test.