

Case Study

Site Description – Heavy Fuel Oil Contamination from Freighter

Site Location: Cape Town, South Africa.

Site Description: On 20 June 1994, the Apollo Sea suffered a catastrophic loss and sank between Dassen and Robben islands. The APOLLO SEA, was lost in open seawaters approximately 20 miles north of Cape Town in a Cape Storm immediately after refueling with 2400 tons of heavy fuel oil. The fuel was released onto the open water from a depth of 180 meters off the West Cape of South Africa. The accident was not immediately reported to the authorities and seven days later the oil started coming ashore. During this time the heavy oil was carried to the shore and deposited high above the shoreline.



Oil came ashore on Dassen Island at West Bay and House Bay, and later also on Robben Island. It floated ashore at Robbins Islands and then passed around the Port to the south where the heavy cold oil washed on the beaches and rocks from Sea Point to Llandudno. During the aftermath of the strong storm the shoreline east of the Cape was heavily coated because of the wave action.



Photo - The oil slick has reached the shore and continues to approach the shore. At the top of the photo you can see the rocky shoreline.

Ten days after the spill came ashore, Dr Carl Oppenheimer, working with the Sea Fisheries Institute and the Dept of Environmental Affairs of South Africa was authorized to treat a 600 square meter section of Rockland Bay beach. Oppenheimer Biotechnology was granted permission to The Oppenheimer Formula I. The product was added to a seawater emulsion and applied at the proper density per square meter, with a high pressure sprayer.

The test area was high above the tidal zone. Because the degradation of the hydrocarbon produces an equivalent fatty acid little physical removal of the oil from the rocks would be noticed until either a rain or tide event would wash this fatty acid by-product into the water, to be used as a food for the fish.



Contaminant: Heavy fuel oil

Additional Site Notes

After the initial accident, a storm carried much of the beached oil high above the high tide line. A second impact was observed along the occasional sandy beach where the shifting sands (due to wave and tidal action) covered the oil previously deposited on the beach. This covered oil would most likely come to the surface during later sand movement.

This oil had weathered in a month to dark varnish coatings on the rocks and jetties. Oil was also found on the driftwood and plastics that are brought ashore by storms and deposited high on the beach in the rocks or sand. One area was highly impacted with both old dark tar-like weathered oil from the initial spill, and light brown platter-like tar patties from newly released oil.

In addition to the new oil, the older oil from the initial spill had filled in between rocks and breakwaters. This oil was in large blobs floating in the water as the tide changed and wave action impacted the area. At time of high tides or heavy winds these blobs floated free and joined the new oil covering the shoreline on rocks and beaches.

Weather Conditions: The weather along the coast was highly variable. The weather, during the project consisted of heavy seas and calm seas, rain, sleet, and sun. This affected the water level along the rocks and beaches. This change in energy along sand beaches would erode the sand during high waves and then

return the sand during calm weather. This impact could account for the observed burying of oil on the sand beaches.



Recommended Treatment Application Method (in-situ) : The mechanism of bioremediation involves not only the microbes but the type of oil, the age of the oil, the type of deposition, the thickness of the oil, and the oil's position relative to the tidal height and to wave action. The microbes will only work at the oil water interface. Therefore, blobs of oil above the high tide zone will take a long time to decompose relative to the availability of moisture. The oil on rocks and sand within the tidal range will degrade at a faster rate. Conditions along an open beach will directly affect the time necessary for bioremediation.

Goal: The goal of the program is to cleanup the beaches to allow the local community to be able to fish and conduct business as usual prior to the spill. Duration of the treatment time to bioremediate the area was approximately 180 days (6 months).

Outcome: Our first effort was to show the absorptive property of BioZorb®. An oil covered rock was treated with the powder and the resultant oil-powder was washed into sea water, leaving a clean rock surface. The crude oil on people's hands was cleaned by the same process. These observations of oil reduction and cleansing were followed by a general application of BioZorb® in the area.

Reversal of oil toxicity on attached algae when an emulsion of products was applied to the oil. The oil was then removed as a blob. Additional applications removed residual oil and 24 hours later the algae were alive. Rocks covered with oil were cleaned by BioZorb®. The resultant powder-oil was washed into the sea where it continued to biodegrade. High pressure removed tar from concrete above the tide zone. The oil was pretreated with BioZorb®. The combined removed oil and product washed into the shore water discolored the water. In 12 hours the water was clear. No harmful effects to the marine life were detected during the following weeks. Oil blobs, treated with an emulsion of product were then peeled off the rock surface.

To view a newspaper article published shortly after the spill -
<http://www.obio.com/docs/rsanewsarticle.pdf>