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About The Oil DROP

The Oil DROP is an informal journal, produced twice a year by EPA's Oil Program Center. The goal of the Oil DROP is to attract a broad audience, including concerned citizens and environmental groups, on current developments in environmental news related to the Oil Spill Program. The Oil DROP covers oil spills in the United States and throughout the world, with an emphasis on the effects these spills have on wildlife and ecosystems. The Oil DROP is available on the Oil Program homepage at www.epa.gov/oilspill.

South African Oil Spill

The Panamanian bulk-ore carrier *Treasure* sank off the shores of Cape Town, South Africa on June 23, 2000, polluting the waters around Robben and Dassen Islands. The islands are home to approximately 64,000 endangered African penguins, and the spill triggered the largest marine bird rescue effort in history. Estimates of the total number of birds immersed in oil range from 14,000 to 18,000. The severity of the incident was compounded by the fact that the *Treasure* sank during breeding season, when 20-30 percent of the adult birds on Robben Island were sitting on eggs. The South African National Foundation for the Conservation of Coastal Birds (SANCCOB) is heading the rescue effort, with the help of approximately 300 volunteer workers and 100 members of the South African Navy. Three bird rescue centers were set up in the area to address the oiled penguins.

By June 27th, over 4,500 penguins had been transported to the mainland for cleaning, and by July 4th the number had leapt to 14,500 birds. Initially, the spill directly affected only Robben Island, but by June 28th, oil was sighted on the surf of Dassen Island also. Thus, the decision was made to evacuate all 50,000 penguins that inhabited Dassen Island. By July 4th, 11,000 unoiled penguins from Dassen Island had been transported around the tip of South Africa to Port Elizabeth, leaving the remaining penguins fenced in on the island to keep them from the sea. Homing instincts will bring the displaced penguins back to Dassen Island, but relief workers hope to have the oil spill cleaned up by the time these penguins return to their native habitat.

In addition to the ecological disaster, the sinking of *Treasure* created political controversy. The vessel is owned by Good Faith

Shipping Co. of Piraeus, Greece and was damaged by stormy weather while heading south along the West African coast. The South African Maritime Safety Authority (SAMSA) inspected the ship while it sat anchored off the coast of Robben Island in Table Bay and found a 170 meters squared hole in the ship's hull, ordering it to leave Table Bay or unload the fuel in Cape Town and begin repairs, or devise a plan to do so. Decision-makers for *Treasure* could reach no agreement on a plan of action, and SAMSA ordered the ship to leave, at which time the ship was already beginning to sink. Attempts were made to drop the anchors and keep the ship from drifting towards shore as it sank, but by 3:00 a.m. local time, the ship had settled 48 meters to the bottom of the bay and a 5.5 by 7.4 kilometer oil slick had formed on the water's surface. South African officials demanded to know why the ship had been allowed to remain in the bay as long as it had without pumping out its oil cargo. Other controversies surfaced concerning the ship's insured worth. SAMSA is preparing to investigate the ship's sinking.

Original cost estimates for the oil spill cleanup and penguin rehabilitation ranged between $444,700 and $587,600 but, by July 6th, had risen to $5.9 million. Cleaning an oiled penguin begins with rehydrating the bird and cleaning the oil from the intestines and eyes, followed by removing oil from the feathers. Finally, the penguin is rinsed under high-pressure hoses and dried using infrared lights. The entire rehabilitation process for one bird takes approximately three weeks.

Immediate efforts were made to address the quickly dispersing oil. The vessel was originally carrying 382,000 gallons of No. 5 oil and 26,460 gallons of gas oil. Divers closed off the leaks in the hull by 8:30 a.m. the morning *Treasure* sank. Preparations were then made to remove the oil from the ship using a hot tap system. Under this scenario, a hydraulic drill was used by divers to puncture the ship's fuel tanks. A control valve and hose was fitted to this hole, allowing the oil to rise through the hoses to a barge where the oil was contained. Meanwhile, efforts were in place to protect the shoreline. An oil skimming vessel was addressing the growing oil slick, and cleanup continued on Robben and Dassen Islands as well as on Cape Town's western beaches through early July.

Oil Spills in Brazil

Environmental news in Brazil has been dominated by oil spills in the past year, many of which were caused by the oil company PETRÓLEO BRASILEIRO SA (Petrobrás). Brazil's worst oil spill in 25 years occurred on July 16, 2000, when a Petrobrás pipeline burst at President Getulio Vargas Refinery and spilled 1.06 million gallons of crude oil in southern Brazil. Clean-up activities for this spill were hampered by persistent rains. The most urgent spill response work included the construction of concrete dikes to prevent rains from washing spilled oil around the refinery area into the Barigue River. The Barigue River is a tributary of the Iguaçú River, located on the Brazilian border of Argentina and Paraguay. According to Petrobrás, more than 150,000 gallons of oil were contained within the refinery grounds. Even with the spill response effort, over one million gallons of crude oil escaped into the Barigue River and eventually into the Iguaçú River. Clean-up crews managed to remove all but 5,000 gallons of oil from the Iguaçú River.

About 100 oil-coated animals were found during the cleanup and taken to a veterinary hospital in nearby Curitiba. Half of the animals died. Environmental activists who flocked to Curitiba have accused Petrobrás of gross negligence in its second large accident in six months. A major concern was the 2.7 million liters believed to have soaked into the ground, which could be washed into rivers by strong rains.

Greenpeace International estimated the river will need years to recover, mostly because of the residue that will be left on the rocks and banks.

A spokesman for Petrobras said the accident was caused by a combination of human and technical errors. A worker forgot to let incoming oil flow in, and a pipe joint broke before the emergency valve was triggered. Brazil's environmental agency, IBAMA, fined the company $94 million (U.S. dollars) to be paid over 3 years for the spill and for the company's repeated damage to the environment. The Paraná state government has separately fined Petrobrás in the amount of $28 million (U.S. dollars).

More spills

The July 16th spill was Petrobrás' third oil spill this year, but not its last. In January 2000, a ruptured pipeline at a Petrobrás refinery in Rio de Janeiro released 340,000 gallons of oil into Guanabara Bay and a nearby protected mangrove swamp. Guanabara Bay was the site of Brazil's largest spill in 1974, when 1.6 million gallons were dumped by a tanker. IBAMA fined the company $28 million (U.S. dollars) for the January spill. A smaller spill that took place in June 2000 was traced to a Petrobrás barge that washed its tanks out, dumping approximately 98 gallons of crude oil into Guanabara Bay again. The company states that it has earmarked $62.3 million (U.S. dollars) for cleanup of the Bay, but environmentalists say that the actual costs are "ongoing and unlimited."

In late July 2000, a Petrobrás pipeline carrying methyl tertiary butyl ether ruptured, spilling 270 gallons of the fuel additive near the Town of Paracambi. Petrobrás was made aware of the leak when residents of the town began suffering from nausea and complaining of a strong chemical smell on July 29th. The company immediately shut down the pipeline that runs past Paracambi from the City of Volta Redonda to Japeri. The actual hole in the pipeline was discovered the next day, and company officials assured the public that the chances of groundwater contamination are "minimal."

Finally, on August 7, 2000, Petrobrás caused a small offshore spill off the coast of Ceara State, Brazil. The company confirmed that approximately 25 gallons of crude oil was spilled and that it was utilizing chemicals to clean the 1.3 square-mile slick.

These five spills caused by Petrobrás were not the only oil spills occurring in Brazil this year. Other spills with unidentified culprits have occurred this year, such as the July 25th spill of 100 gallons of diesel oil from an unknown source in Guanabara Bay. Residents of Brazil's tourist mecca fumed over this incident in light of all the previous spill incidents this year. A greasy film of about 100 gallons of diesel appeared at the entrance of the bay and washed up one day later on beaches in Niteroi, which lies across the bay from Rio. Rio's world-famous Copacabana and Ipanema beaches were spared. Officials had not determined the cause of the spill but said the diesel could have leaked out of a ship's fuel tank or cargo tanks. The oil also could have been washed into the water when a tanker flushed its bilges.

Legal ramifications

The predominance of Petrobrás spills this year is a serious cause for concern and action. Environmental activists in Brazil are very concerned about Petrobrás' actions and lack of response to environmental, safety, and health con-

cerns. They cite Petrobrás' lack of preparedness, incompetence in taking preventative measures, and slow reaction time to spills as being particularly alarming. Financial analysts are applauding a "reduction in inefficiencies" in the mammoth company, while employees attribute it to an overemphasis on the bottom line and a drastic cut in qualified labor and proper training.

On July 27, the Association for the Environment of Araucaria (AMAR) filed suit against Petrobras asking for the "cancellation of the company's environmental license, elaboration of impact studies, and indemnity for material and moral damages." This comes in addition to hundreds of millions of dollars in fines that IBAMA has already assessed Petrobrás for its spills this year.

Alternative Countermeasures for Oil Spills

Oil spill cleanup involves a number of steps, beginning with an evaluation of the degree of cleanup needed. For example, it is often up to firefighters who are usually first on the scene of a tanker truck or automobile accident to decide the best and safest method of cleanup. The most common methods involve sorbents such as sand, plant materials, or synthetic materials in pad or boom form, which are placed on and around the spill to contain and remove it.

If the spill is too large for the first responders to handle, local authorities may turn to state or federal response agencies for help. These agencies send an on-scene coordinator (OSC), who assesses the situation and draws up a plan to start clean-up activities and control the downstream effects of the spill. The OSC may deem it necessary to use chemical or biological countermeasures often referred to as alternative or applied countermeasures.

Alternative countermeasures include bioremediation agents, dispersants, surface washing agents, and miscellaneous oil spill control agents. Bioremediation agents are microbiological cultures, enzyme additives, or nutrient additives that are introduced after the initial cleanup has taken place to increase oil's biodegradation rate. A surface washing agent is any product that removes oil from a solid, impervious surface that has been coated with oil, such as a rocky beach or a road, using a detergent mechanism. Surface washing agents do not involve dispersing or solubilizing the oil into the water column. Miscellaneous oil spill control agents are any other products that do not meet the strict definition of any other type, but can be used to clean up, remove, treat, or mitigate an oil spill. EPA determines into which category a product will fall. There are also alternative response options, such as in-situ burning of oil in which case the decision is made that burning the oil will be the most effective and efficient way to remove the oil and minimize the harm to the environment.

If the use of alternative countermeasures is proposed, the state or federal OSC must receive approval from the regional response team (RRT) and a representative of the state, unless a pre-approval plan exists. There are 13 RRTs, one for each of the 10 federal regions plus 1 for Alaska, 1 for the Carribean, and 1 for the Pacific Basin. Title 40, Part 300.910 of the Code of Federal Regulations requires RRTs and area committees to evaluate, in writing, the desirability of using alternative countermeasures during the first hectic hours of a spill, in part because chemical and biological agents may themselves have a deleterious effect on the environment. Typically, alternative countermeasures are considered only when mechanical clean-up methods are extremely difficult or impossible to use. Most are used in conjunction with mechanical measures and offer a faster way to prevent oil from causing harm to the environment. Bioremediation of spills into wetland areas prevents harm associated with many labor-intensive response options.

Chemical or biological agents are to be used in compliance with Subpart J of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). EPA lists these products on the NCP Product Schedule, which indicates that product data has been submitted and technically screened, as required by the NCP. Appearance on this list does not indicate that EPA approves, encourages, endorses, or authorizes a product. These data are intended to inform OSCs about the potential effects of these products on human health and safety and on the aquatic environment. Protocols are in place to monitor the effectiveness of most alternative countermeasures.

Manufacturer-supplied information on special handling and worker precautions for storage and field application must be followed, as must the product's recommended application procedures.

Emergency workers must use caution when applying chemical countermeasures in closed conduits, such as sanitary or storm sewers. They also must provide adequate ventilation and vapor suppression when using chemicals that increase a spilled fuel's tendency to vaporize. The EPA Environmental Response Team can provide expertise in this area. For more information on the proper authority and use of alternative countermeasures, please contact the EPA Oil Program Center at (703) 603-9918.

Pipeline - Deadly Reminder of Risk

Proponents of increased underground pipeline regulation are focusing on another pipeline disaster in hopes that it will bring public pressure and attention to their cause. This time, the explosion was a natural gas line in New Mexico that killed 11 people on August 19, 2000. Advocates of increased pipeline safety hope that this will push Congress to vote in favor of federal reforms in underground pipeline safety. Supporters of increased regulations, such as Representative Jay Inslee (D-Bainbridge) and Senator Patty Murray (D-Washington) cite insufficient safety standards, inadequately trained pipeline operators, and an uninformed public as reasons for the pressing need for increased federal regulation. Inslee proposes creating a searchable database of comprehensive pipeline information, including age and condition of the pipes, five-year internal inspections, federal certification for pipeline operators and drivers transporting hazardous materials; and higher fines for violations to at least match those under the Clean Water Act. Inslee states, "Our pipeline-safety legislation is like Swiss cheese, it's so full of holes." The goal of parties interested in this measure is to make the industry safer and more accountable for spills and accidents.

Attention to the need for increased federal regulation has been building in recent years from other pipeline disasters. The Bellingham Park explosion on June 10, 1999, killed three, and a high-pressure pipeline split open on March 9, 2000, spilling 500,000 gallons of gasoline and 50,000 gallons of the toxic additive MTBE in North Texas.

Representative Bob Franks (R-New Jersey) cited that underground pipelines are no longer buried in remote locations, but that instead "thousands of people live or work in immediate proximity to pipelines." For example, Kern County, California, which delivers energy to Los Angeles, has miles of pipeline carrying crude oil and natural gas under rural and urban areas. Industry officials and regulators state that, compared to other means of transporting hazardous liquids and gas such as rail and trucking, pipelines are safer and have fewer accidents. Additionally, energy companies recognize the increased danger with closer proximity to pipelines and, in some cases, work with city and county planners on developments near pipelines. However, pipeline safety champions such as Inslee, Murray, and others feel the need for federal regulation to create uniform safety regulations across the country.

The Senate Commerce Committee passed a pipeline safety bill in June 2000, but neither House nor Senate leaders have agreed to votes by the full chambers. Inslee hopes that public pressure from the recent New Mexico explosion will force Congress to vote.

Heinz Refuge Healing After Oil Spill

In February, a visitor to the John Heinz National Wildlife Refuge in Tinicum, Pennsylvania reported smelling petroleum. Initially, no one was alarmed by the report because the refuge is adjacent to the Philadelphia National Airport and a Sunoco refinery where petroleum smells are common. When workers found a pool of oil in an iced-over pond in the refuge, Sunoco launched a large-scale effort to stop the leak and repair the damage. Sunoco received an

Emergency Removal/Response Order issued pursuant to Section 311(c) on February 7, 2000, to perform immediate clean-up actions. Additionally, EPA issued a Unilateral Order for Abatement of Endangerment on February 29, 2000, requiring long-term cleanup. The action required by the order included the characterization and remediation of contaminated soil. In the weeks that followed discovery of the oil, Sunoco recovered 191,000 gallons of oil from the pond and replaced many of the joints in the pipes that traverse the refuge.

In the aftermath of the spill, community members and local officials are beginning to assess the longer-term effects on the refuge, some of which have already been identified. The soils along the access road that was built to reach the spill site were compacted so badly by the heavy equipment that nothing can grow there. The sediments within as well as outside the spill area are contaminated. The long-term effects of this contamination on wildlife may not be known for many years. The effects of clear-cutting along the pipeline right-of-way, done to improve access for inspectors, may be double-sided.

On one hand, the clearcutting has fragmented the woodlands, potentially reducing their value as habitat for migrating songbirds. On the other hand, it has increased the proportion of edge habitat in the refuge that supports butterflies and woodcocks. While it is clear that the spill and the response actions to address it have changed the refuge, the magnitude of that change will not be immediately revealed. Nonetheless, Dick Nugent, manager of the refuge believes that only time will reveal how the animals will acclimate. He believes that nature will adapt, and that "it will be interesting to see what happens next Spring."

Kentucky Buses Running on Grease

In July, the Cincinnati Metro and the Transit Authority of Northern Kentucky (TANK) began using a fuel mixture of 20 percent used cooking oil and grease and 80 percent diesel. This two-month project exploring the use of this "biodiesel fuel" is funded through a $50,000 grant for each of the organizations from the U.S. Department of Transportation.

According to a press release issued by Griffin Industries, the Kentucky-based supplier of the fuel, over 280 Metro and TANK buses ran on the fuel mixture in July and August. The company produces the fuel from recycled vegetable oil collected from local restaurants.

This use of biofuels is not the first for the Cincinnati Metro. The transit system used soybean-based diesel fuel in 1993 and 1994. However, the cost of the fuel has prevented it and other transit systems from using it more in the past decade. Currently, the system pays only $.51 per gallon for regular diesel fuel. The biodiesel fuel costs almost three times as much, at $1.49 per gallon.

Despite the increased cost of biofuels, the use of oils derived from plant and animal sources is gaining interest as an alternative to the use of petroleum-based products. Biofuels are a renewable resource, burn more cleanly than petroleum, and are similar enough chemically to diesel fuel to fit many of the same applications. Thus, biodiesel fuels, fuel mixtures of diesel fuel and fuel

derived from plant or animal origin, have been one of the first uses.

However, vegetable oils, animal fats, and other non-petroleum oils can still cause significant damage if released into the environment. These types of oils create slicks on the surface of water and can have negative environmental impacts on aquatic organisms and birds. Careful storage and transport of these products is critical to minimize spill potential. Edible oil spills have been associated with the deaths of thousands of waterfowl, fish, and crustaceans. Spilled non-petroleum oils have coated beaches and created problems for water treatment plants.

Study of Waterfowl Survival After Spill Finds Greater Long-Term Effects

Oil spills pose significant environmental risk to bird populations. Oil can damage bird feathers, making them lose their insulating properties and possibly causing death. Often, immediately after an oil spill has been discovered, several organizations may attempt to rehabilitate the oiled birds by cleaning the oil and other contaminants from the birds' feathers. Of course, one of the greatest concerns is how well these birds can survive after being oiled, rehabilitated, and released from captivity back into the environment.

Researchers at the University of California at Davis conducted an analysis of 37 rehabilitated American Coots, a marsh bird found in the western half of the United States and Canada, that were exposed to an 1,100 barrel crude oil spill in the San Gabriel River released from a broken pipeline on February 20, 1995. The coots were captured after exposure and cleaned. These coots were compared against a control group of coots that were not exposed to the oil.

The researchers published two articles from this study in the journal Environmental Pollution. One article examines the "lingering effects" of the oil exposure on the birds. Most significantly, the study points to higher mortality rates among the oiled, rehabilitated population over the control group. Additionally, the researchers noted that rehabilitated coots were more active, slept less, preened and bathed more, and fed and drank more than the control group. The second article reports that differences in blood-related factors between rehabilitated coots and the control coots suggest that the experience appeared to have caused some variations in the blood composition of the rehabilitated coots. However, the authors note that these effects could be due to the oil exposure, the rehabilitation, the captivity, or a combination of these aspects.

A separate study published in Comparative Haematology International considers the role of petroleum ingestion in causing anaemia in marine birds. The researchers considered 40 rhinoceros auklets that were given varying amounts of Prudhoe Bay Crude Oil and then examined to determine whether the oil had caused anaemia, a condition believed to be caused by petroleum ingestion. The researchers found that birds in the study developed the condition regardless of whether they had ingested oil. Researchers suggest that the development of anaemia in marine birds exposed to oil may be dependent on the age of the bird or may be caused by the stress of captivity.

These studies on oiled wildlife provide a greater understanding of the detrimental effects of oil spills. They also point the rehabilitation community to techniques that will increase the likelihood of survival among cleaned wildlife released back into their natural habitats.

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South Florida Oil Spill

The worst oil spill that South Florida has seen in a decade

blackened 15 to 20 miles of coastline on August 8, 2000. The spill covered the coastline from Pompano Beach to Golden Beach. Emergency workers were responsible for gathering swimmers out of the water and hurrying to rescue thousands of sea turtle hatchlings from the huge globules of oil. The last of the swimming bans immediately went into effect and were not lifted until August 10, 2000. The bans were lifted in exchange for yellow caution flags informing swimmers that conditions could still be grimy. There have been oil slicks that have appeared on the Southern Florida beaches before, but none have involved a swim ban of this size.

The spill appeared overnight in clumps, globules, puddles, and knots of seaweed. The slick was initially spotted at 9:00 a.m. The U.S. Coast Guard investigated in an attempt to find the source of the spill. The oil could have been intentionally dumped or simply leaked from a cargo tank of a ship carrying petroleum products. Samples of the gooey mess were sent to labs, and the results revealed that toxic substances are not present.

The immediate threat was to sea turtles because the spill arrived at the peak of their hatching season. If the slick does not subside before the hatchlings head for the water, their already low odds for survival will be reduced even more. Some swimmers were immediately affected by the slick because they were unaware of any danger of being in the water until lifeguards communicated the hazardous conditions. No wildlife was injured as a result of the spill. Scientists say the long-term effects are harder to predict. If the slick is driven out to sea, the environmental effects should be minor near the coast. If the oil remains along the coast, it will begin to break down, volatile chemicals will evaporate into the air, and the crude oil will clump into tar. Even after the oil is no longer visually apparent, it still remains in the environment.

The cleanup was conducted in a low-tech, labor intensive manner, focusing on the shore and coast line. Workers used shovels and rakes to scoop up tar balls and place them into plastic bags. Twenty tons of oil-soaked debris were collected by August 9, 2000, and more is expected to be collected in the future. The cleanup is financed with money from the federal government fund for oil spills. Dozens of ships have been boarded, and investigators have collected oil samples in an effort to find a match to the oil that was spilled.

Pipeline Oil Spill Threatens Canadian Town's Water Supply

A pipeline in northeastern British Columbia, Canada ruptured on August 1, 2000, spilling about 6,300 barrels (449,400 gallons) of crude oil into the Pine River, which supplies the region's water. The cause of the rupture is undetermined. The spill created an oil slick reported to be 13 miles long, says Rich Girard, pollution prevention manager with the provincial Environment Ministry. "This is pretty big in that it has spilled into a river to start with (and) secondly a pretty sensitive river," Girard said. The pipeline, operated by Federated Pipe Lines Ltd., was shut down shortly after the early morning incident.

The rupture occurred about 60 miles from Chetwynd, a community of about 3,000 people approximately 435 miles northeast of Vancouver. Pembina Pipeline is taking the lead in containment and recovery of the oil. About 80 percent of the oil that reached booms along the river was contained, but a thin sheen got past the third and last set of barriers. Girard stated that the sheen would dissipate, but some oil was certain to reach the intake.

Town officials filled the municipal reservoir with untainted water from the river, and a monitoring station was established about three miles upstream from the intake. The mayor and local officials encouraged citizens to conserve water during the cleanup.

The long-term environmental consequences could be severe. Wayne Landis, a professor of environmental toxicology at Western Washington University in Bellingham, Washington said the Pine River ecosystem will never return to its previous state. The British Columbia Oil and Gas Commission and the Environment Ministry will conduct a full investigation of the incident.

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