Helpless birds, helpless technology

Giant oil spill coats beaches; both prevention, cure unknown

Photos: UPI

A log boom corrals the oil leaking from an offshore well at Santa Barbara.

Once again seabirds struggled to get out of their deadly jackets. Once again sticky, petroleum tides smeared white beaches. Once again the ocean surface turned to smelly, black grease.

The place this time was the resort town of Santa Barbara, 75 miles up the California coast from Los Angeles. For 12 days, starting on Jan. 28, a Union Oil Company well six miles offshore spewed 235,000 gallons of oil over more than 800 square miles, an area almost the size of Rhode Island, before it was finally plugged.

Investigators are not positive about what caused the blowout, but one theory has it that the 3,500-foot shaft drilled to the oil pool below caused the well to operate like a huge soda pop bottle. The decreased pressure, and possibly some natural gas, shot the oil up the shaftway where normally it would have been capped. However, this time on the way up, the oil encountered a fault, or fracture, running up through the oil sands to the ocean floor. Taking this detour, the oil broke through the ocean floor and rose to the surface.

The disaster might not have occurred if state requirements for a drill-pipe casing at least 1,200 feet under the ocean floor had been met. The casing extended down only 239 feet, which met Federal standards.

For 12 days, workers tried to plug the well while fighting the spread of the oil with chemical and mechanical means. They finally stopped the leak Feb. 8 after pouring 500,000 pounds of cement and 10 million pounds of drilling mud down the well.

While oil men were struggling to get out from under the disaster, scientists at the University of California's Santa Barbara campus were hoping to turn the offshore oil field and the blackened beaches into a giant laboratory to help prevent future spills and alleviate their most serious effects.

An application will be made to the National Science Foundation for a grant of $730,500 to finance a two-year project looking into all aspects of oil spillages.

The University of California team, if the project is funded, will be coordinated by Dr. Robert W. Holmes, associate professor of marine biology.

One of his assistants will be Dr. Michael Neushul, one of the rare botanists who have had an opportunity to study the ecology of a harbor before and after a big spill. He was studying flora and fauna in a remote bay in Baja California, Mexico, the summer before a tanker was wrecked and spilled thousands of gallons of diesel fuel into the sea. After a seven-year study of the results, Dr. Neushul came up with pessimistic results:

"Before the wreck, the bay had a balanced population of sea plants and animals which fed on them. But the diesel fuel killed almost all the animals. . . . With nothing to eat the plants and keep them in check they began growing all over each other."

Although diesel oil is more poisonous than ordinary oil, the outlook is not good for the fauna off Santa Barbara.

One fact emerges from the Santa Barbara experience, as it did from the earlier Torrey Canyon disaster: There is no truly effective technology to handle massive oil spills. At Santa Barbara, the methods and equipment employed were those for fighting local spills.

There are four ways to fight spilled oil: burn it, disperse it, contain it and collect it or sink it. Burning was out of the question because of the gas in the area and the fact that the platform which was being used for sealing operations would have to have been abandoned. In addition, there were other offshore drilling platforms in the area worth millions of dollars that could have been in danger. More important, burning alone is ineffective, as the British Royal Air Force found out with the Torrey Canyon after futilely dumping thousands of gallons of aviation fuel and napalm and bombing the ship.

Oil-coated bird plucked from the sea.

The second method, dispersion, represents a possible solution, but it too has drawbacks. Dispersants are chemicals that reduce the surface tension of the oil, thereby breaking it up into small droplets which can then be biodegraded by marine microorganisms that feed on them. One problem with dispersants is that to be effective against huge spills, enormous quantities must be used, and this can upset the marine ecology even if the dispersants are nontoxic. Furthermore, by breaking up

the oil into countless droplets, dispersants promote oxygen depletion of the seawater since the marine microorganisms must use the dissolved oxygen to biodegrade the oil droplets.

Two dispersants were used at Santa Barbara: Corexit and Polycomplex A-11. It was the continual discharge of oil that prevented the chemicals from dispersing the oil. Hal Shawlee, manager of civic affairs of the Union Oil Company, points out, "The slick would have been larger if the dispersants weren't used to contain it, even though the oil continued to flow."

Under containment and collection, one of the commonest devices employed is a boom, which is nothing more than a barrier floating in the water. Booms can contain the oil and prevent it from spreading. A drawback, however, is that in rough weather, oil can slosh over or slip under. To prevent oil from escaping underneath, plastic booms come equipped with skirts that extend down into the water. At Santa Barbara's harbor entrance, a plastic boom was used, while a double log boom was constructed south of the offshore well. The oil washed over the plastic boom and got through to the harbor.

A comparatively new device is a bubble barrier. Submerged, perforated tubes release compressed air to produce a rising curtain of bubbles and an upswelling of water that creates a current to drive back the oil. Another plan, still in the experimental stage, is high molecular weight alcohols that repel oil. Placed around the perimeter of a spill, they push it back for collection in barges, provided wind and tide are favorable and the oil deposit isn't too large.

The fourth method, sinking the oil, is unreliable because the material used to sink the oil often separates from it in the water and the oil reappears.

The Torrey Canyon incident of 1967 sparked the drive for new chemicals and methods to fight oil slicks. The British, for example, developed a self-propelled pontooned-shaped vessel designed to scoop up oil leaked during transfer from ship to shore (SN: 8/31, p. 208). The oil collection apparatus works by a system of belts to which floating oil adheres and is then carried into the vessel.

More recently a West German firm put oil-absorbing chemicals into plastic sacks to prevent wind dispersal when sprayed from a plane. In the U.S., the Cabot Corporation, of Boston, last month successfully tested a silicon dioxide compound that acts like millions of tiny nonflammable wicks, permitting the burning of thick oil slicks (SN: 2/8, p. 143). But none of these techniques has, as yet, handled a big spill.

NUCLEAR WEAPONS

Missiles and bombers

For a decade and a half, a basic schism among U.S. military policy planners has been the issue of whether manned bombers or long-range missiles would be the country's key weapon system.

The Air Force and other bomber boosters have argued that planes can be scrambled on short notice, making them less vulnerable than sitting-duck missile sites to an enemy first strike. Their opponents argue that the range and speed of missiles make them much more difficult than aircraft to defend against.

In the late 1950's, the airplane team, temporarily in the lead, came up with the idea for the giant B-70 as the super-bomber which would settle the matter once and for all. By the time of the plane's first flight in 1964, policymakers led by Defense Secretary Robert McNamara decided that it was both too expensive—the research and development plus the two prototype aircraft cost more than $1.5 billion, and a fleet would have included at least 200 planes—and too vulnerable to new anti-aircraft weapons. The prototype B-70's became XB-70's and were put out to pasture for experimental research.

Since then the missile team has held sway, and built up a substantial head of Defense Department steam for second and third generation strategic missiles and an Anti-Ballistic Missile (ABM) system that would blanket the U.S.

In recent weeks, however, the controversy has opened anew, with signs indicating that the bomber boosters are far from out of the picture.

A key item in the Defense Department's fiscal 1970 budget request is $77 million for AMSA, an Advanced Manned Strategic Aircraft. By itself, AMSA could be (and is) subject to many of the same arguments that flashed back and forth during the B-70's planning days. A new weapon, however, strategically leaked by Pentagon sources, may give the plane a fighting chance.

The weapon is a Subsonic Cruise Armed Decoy, SCAD, an unmanned, nuclear-tipped drone bomber which would be carried by the dozens by manned aircraft. Equipped with devices to make them look like full-sized planes to enemy radar defenses, the SCAD missiles might have a range as great as 1,000 miles. And because of their warheads, they could not be ignored by defenders even if radar penetrated their electronic disguise.

The SCAD has reportedly already made itself felt by contributing to the twin decisions to cut back on procurement of the FB-111, bomber version of the F-111, which could carry only a few of the drones, and to move ahead with AMSA. Even the current B-52 is believed capable of carrying 20 to 30 SCAD weapons, and the new bomber would carry even more.

NASA

XB-70: an old controversy revived.

Proposed commitment to a new weapons system, as in the case with the growing conflict over ABM, complicates a pending decision on the nuclear non-proliferation treaty, signed by 87 countries but so far ratified by only nine; the non-nuclear powers are waiting while they evaluate the intentions of the U.S. and the Soviet Union.

On Feb. 5, President Nixon formally asked the Senate to ratify the treaty, which would bar the sale or gift of nuclear weapons to non-nuclear countries. U.S. ratification was held off last year by the Soviet invasion of Czechoslovakia and the Presidential campaign. Hearings were to begin early this week, and Senate Minority Leader Everett Dirksen predicted ratification after about a week of floor debate.

To go into effect, the treaty must be ratified by the U.S., the Soviet Union and Great Britain (which has already done so), plus 40 other countries. Russia is expected to ratify the treaty shortly after U.S. action, but it is less certain that 32 non-nuclear powers will be similarly ready to follow suit.

It is as a concession to the non-nuclear powers, in fact, that the treaty will have to be re-ratified after five years in order to remain in effect. The nuclear powers, under the treaty, would be bound "to pursue negotiations in good faith on effective measures relating to the cessation of the arms race at an early date, and to nuclear disarmament. . . ." The intent of this provision is to assure the non-nuclear powers that the treaty is a peace-seeking move, and not just a dog-in-the-manger power grab. "There's a lot of persuad-