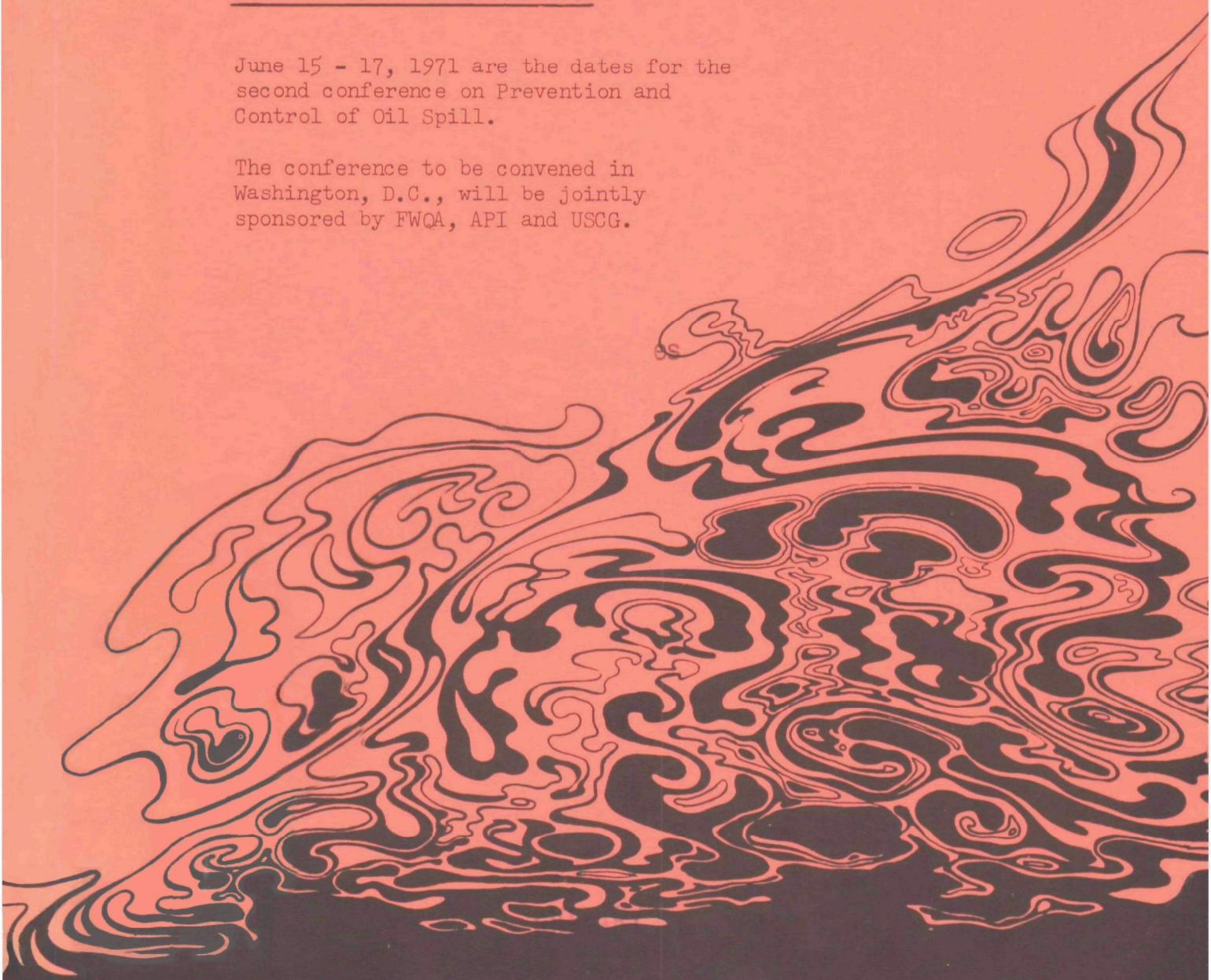
Edison Water Quality Laboratory CLEAN WATER December 1970 Vol. III

OIL & HAZARDOUS MATERIALS RESEARCH NEWSLETTER

MARK YOUR CALENDARS!

June 15 - 17, 1971 are the dates for the second conference on Prevention and Control of Oil Spill.

The conference to be convened in Washington, D.C., will be jointly sponsored by FWQA, API and USCG.



U.S. ENVIRONMENTAL PROTECTION AGENCY ● FEDERAL WATER QUALITY ADMINISTRATION

EDISON BURNS!

In October 1970 the Oil and Hazardous Materials Research Section, as part of its in-house activities, conducted field tests using various types of commercially available burning and/or wicking agents with several different types of oils. A final report on this field test, as well as the results of laboratory investigations, is being prepared and should be available shortly. In the meantime, however, a summary of our findings is presented below:

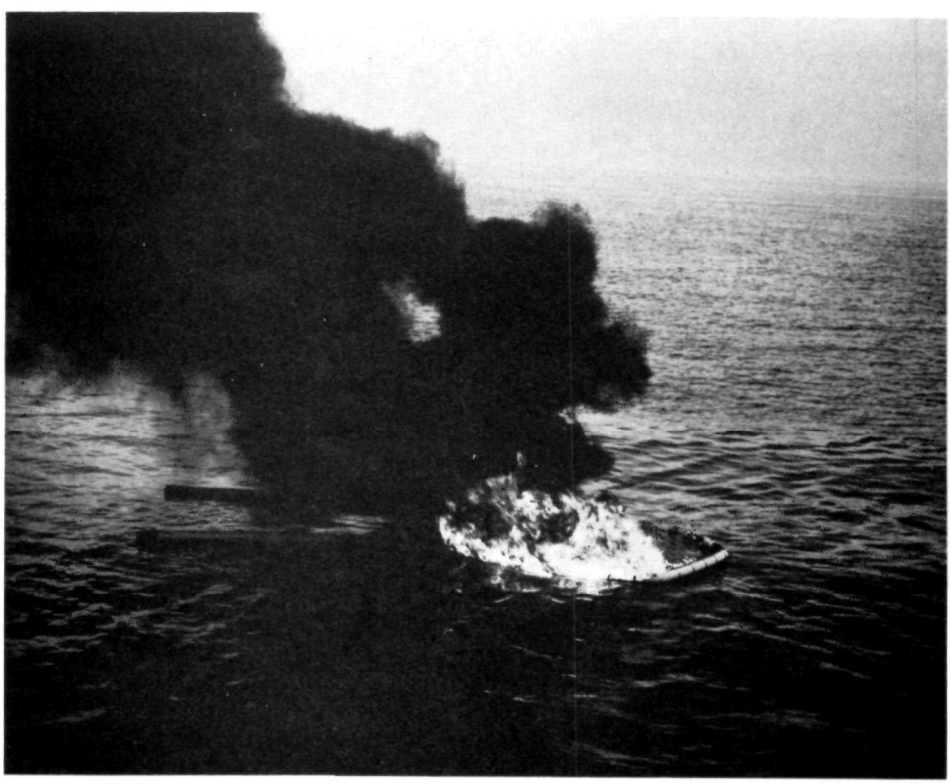
1. Burning of free floating or uncontained oil slicks is extremely difficult unless the thickness of oil is 2 mm or greater.

2. Adequate automated seeding methods for both the powder and nodule-type burning agents are lacking. Spreading of the burning agent on the oil slick had to be accomplished by hand. This conclusion was also reached by the Navy, which conducted burning experiments in May 1970.

3. Contained South Louisiana crude oil was successfully burned — 80% to 90% reduction — without the application of burning agents and/or "priming" fuels. Bunker C could not be ignited under these same conditions.

4. Bunker C was successfully burned — 80% to 90% reduction — when the slick was seeded with burning agents and an appropriate priming fuel. It was discovered the South Louisiana crude oil performed better as a priming agent than did gasoline or lighter fluid.

5. Use of magnesium type flares and gasoline torches to ignite the burning-agent-treated slick proved unsuccessful. Success was achieved, however, using a blow torch once we learned how to manipulate the torch in such a manner that the torch gas pressure did not push aside the oil and seed material so as to expose the water surface.



WATER QUALITY IMPROVEMENT ACT OF 1970: CHEMICAL USE POLICY

Pursuant to the provisions of this Act, the President is authorized to prepare and publish a national oil and hazardous materials pollution contingency plan. This plan was published in the Federal Register, Vol. 35, No. 106 — Tuesday, June 2, 1970. Included was a schedule identifying dispersants and other chemicals that may be used in carrying out the plan. To summarize this schedule:

When Regional Response Team is activated:

Dispersants may be used in any place, at any time, and in quantities designated by the On-Scene Commander, when their use will:

1. In the judgment of the On-Scene Commander, prevent or substantially reduce hazard to human life or limb or substantial hazard of fire to property.
2. In the judgment of FWQA, in consultation with appropriate State agencies, prevent or reduce substantial hazard to a major segment of the population(s) of vulnerable species of waterfowl.
3. In the judgment of FWQA, in consultation with appropriate State agencies, result in the least overall environmental damage, or interference with designated uses.

When Regional Response Team is NOT activated:

Provisions of the preceding section shall apply. The use of dispersants in any other situation shall be subject to this schedule except in States where State laws, regulations or written policies are in effect.

Interim restrictions on use of dispersants and sinking agents for pollution control purposes:

Except as noted above, dispersants shall NOT be used:

1. On any distillate fuel
2. On any spill of oil less than 200 barrels in quantity.
3. On any shoreline.
4. In any waters less than 100 feet deep.
5. In any waters containing major population, or breeding or passage areas for species of fish or marine life which may be damaged or rendered commercially less marketable by exposure to dispersant or dispersed oil.
6. In any waters where winds and/or currents are of such velocity and direction that dispersed oil mixtures would likely, in the judgment of FWQA, be carried to shore areas within 24 hours.
7. In any waters where such use may affect surface water supplies.

Sinking agents:

Sinking agents may be used only in marine waters exceeding 100 meters in depth where currents are not predominately on-shore, and only if other control methods are judged by FWQA to be inadequate or not feasible.

'I THOUGHT OIL CALMED TROUBLED WATERS'

PULVERIZED LIMESTONE USED FOR BEACH CLEANING*

A method of cleaning oiled pebble beaches using waterproof limestone dust has been described by J.J.D. Greenwood, H.A.P. Ingram, J. McManus and D.J.A. Williams of Dundee University ('Public Cleansing' 60(4):178; 1970). The reported advantages of the powder are that it is cheap, non-toxic and precludes secondary pollution which may occur when dispersants are used.

The powder in question is a preparation of pulverized limestone rendered hydrophobic by treatment with stearic acid. It is not easily removed by high tides, and is very easily adsorbed to oil, forming a friable layer on rocks and pebbles which drops off and is washed away as sandsize pellets — a process greatly facilitated by abrasive wave action.

Greenwood et al. first tried out the powder at the beginning of March 1968 following a spill of topped Venezuelan crude oil into the Tay estuary, Scotland. In all, 15,400 lbs. of the dust obtained from a local limestone works were spread manually over 70,400 square feet of beach at a cost of about $142.80. Two years later the rocks and pebbles were free of oil and there were no gross signs of detrimental effect to living organisms. Regular checks had not, however, been made during the two years.

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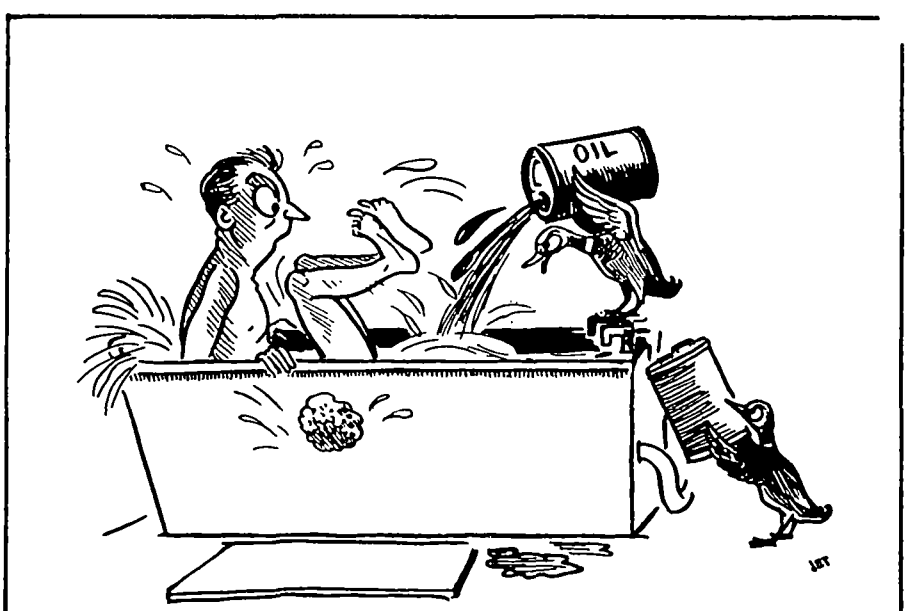
*Marine Pollution Bulletin, Volume 1 (NS), Number 6, June 1970, pg. 82.

Dr. J. McManus has been investigating the effect of the limestone dust on various types of rock contaminated with crude oil to determine the optimum conditions for its application. He has found that pebbles presoaked in water take up less oil than do dry pebbles, and the dust-oil coating is more easily removed. He has also found that fresh acid igneous rocks such as granite, quartzite, and flint are more readily cleansed than basic basalt ones such as limestone and dolerite, though why this should be is not immediately clear. It is however, understandable that porous, deeply weathered rocks that have been oiled are very difficult to clean.



From 1970 Spring Issue of Ducks Unlimited

A John Tickner cartoon, reprinted from *The WAGBI Magazine*— published by The Wildfowlers' Association of Great Britain & Ireland.

NEW FWQA OIL POLLUTION PROJECTS

Following is a list of grant and contract projects awarded by the Federal Water Quality Administration since May 1970:

Grantee or Contractor	Subject	Project Officer Expected Completion Date
Atlantic Research Corporation Missile Systems Division Costa Mesa, California 92626	Concept development studies on a self contained oil harvesting device employing a series of rotating disks.	S. T. Uyeda 10/70
Battelle Memorial Institute Pacific Northwest Laboratories P.O. Box 999 Richland, Washington 99352	Design fabrication and full-scale testing of an oil harvesting system employing water jet sweeps and floating, skimming and primary oil-water separation.	Paul C. Walkup 10/70
Consultec, Inc. 2351 Research Boulevard Rockville, Maryland 20850	Concept development studies on a device to harvest oil slicks based upon use of a water permeable - oil impermeable filter bag.	R. B. Dayton 11/70
JBF Scientific Corporation Alpha Industrial Park Chelmsford, Massachusetts 01824	Development and demonstration of a prototype scale mechanical harvesting device based upon a submerged hydrodynamic oil concentrator.	Ralph A. Bianchi 5/71
University of Miami School of Marine and Atmospheric Sciences 10 Rickenbacker Causeway Miami, Florida 33149	To measure comparative acute toxicity and effectiveness of four dispersants according to procedures supplied by FWQA.	Charles E. Lane 4/71

Grantee or Contractor	Subject	Project Officer Expected Completion Date
Microwave Sensor Systems 8050 E. Florence Avenue Downey, California 90240	To demonstrate the application of microwave radiometry to the detection and measurement of thickness of oil slicks.	J. C. Aukland 6/71
New England Aquarium Central Wharf Boston, Massachusetts 02110	To measure comparative acute toxicity and effectiveness of four dispersants according to procedures supplied by FWQA.	S. Fai Cheuk 4/71
New Mexico State University Physical Science Laboratory Box 3548 Las Cruces, New Mexico 88001	Develop and demonstrate at scale a mechanical oil recovery device which employs a combination of the principles, gravity weir, perferential wetting on a rotating belt and vacuum suction.	J. R. Gleyre 5/71
Fire Department, City of New York Municipal Building New York, New York 10007	Demonstrate a comprehensive oil spill control program for New York harbor and immediate waters.	Joseph F. Connor 6/30/71
Pacific Engineering Laboratory 657 Howard Street San Francisco, California 94105	To measure comparative acute toxicity and effectiveness of four dispersants according to procedures supplied by FWQA.	Robert A. Ryder 4/71
Rex Chainbelt, Inc. 4701 West Greenfield Avenue West Milwaukee, Wisconsin 53214	Develop fundamental design criteria for a belt-type oil harvesting device; build and test a prototype device.	John Pernusch 12/70

Grantee or Contractor	Subject	Project Officer Expected Completion Date
Sonics International, Inc. 7101 Carpenter Freeway Dallas, Texas 75247	To demonstrate and evaluate the use, effectiveness, and cost of a device utilizing the ultrasonic energy concept to clean oil contaminated beach sands.	Byron Dunn 9/7/70
Syracuse University Research Corporation Life Sciences Division Syracuse, New York 13210	To measure comparative acute toxicity and effectiveness of four dispersants according to procedures supplied by FWQA.	Richard B. Moore 4/71

For further information on individual projects, please contact the Oil and Hazardous Materials Research Section, Edison Water Quality Laboratory, Federal Water Quality Administration, Edison, New Jersey 08817

"I say if the good Lord wanted us to fly, He wouldn't have invented oil slick."

OIL POLLUTION: ESTIMATED AMOUNTS AND SOURCES

Used oil from vehicles may be the largest single source of oil pollution, including oil pollution of the oceans. This is one of the tentative conclusions reached by a Massachusetts Institute of Technology sponsored study group.

A summary of their major findings, including an estimate of the quantities and types of oil discharged to the world's waters is as follows:

a. "It is likely that up to 1.5 million tons of oil are introduced into the oceans every year through ocean shipping, offshore drilling, and accidents. In addition, as much as two to three times this amount could eventually be introduced into waterways and eventually the oceans as a result of emission and wasteful practices on land.

b. Very little is known about the effects of oil in the oceans on marine life. Present results are conflicting. The effects of one oil spill which have been carefully observed indicate severe damage to marine organisms. Observations of other spills have not shown such a marked degree of damage. Different kinds of damage have been observed for different spills.

c. Potential effects include: direct kill of organisms through coating, asphyxiation, or contact poisoning; direct kill through exposure to the water soluble toxic components of oil; destruction of the food sources of organisms; incorporation of sub-lethal amounts of oil and oil products into organisms, resulting in reduced resistance to infection and other stresses, or in reproductive successes."

ESTIMATES OF OIL INTRODUCED INTO WORLD'S WATERS AND POTENTIAL LOSSES TO WATERS, 1969

Metric Tons Per Year

				% of Total
1.	Tankers (normal operations)			
	Using control measures (80%)	30,000		
	Not using control measures (20%)	500,000		
			530,000	10.7
2.	Other ships (bilges, etc.)		500,000	10.1
3.	Offshore production (normal operations)		100,000	2.0
4.	Accidental spills			
	Ships		100,000	2.0
	Nonships		100,000	2.0
5.	Refineries and petrochemical		300,000	6.0
	SUBTOTAL			1,630,000
6.	Potential losses to water from industrial and automotive (not fuel):			
	Highway vehicle spent oils		1,800,000	36.6
	Industrial plus all other vehicles		1,500,000	30.6
	SUBTOTAL			3,300,000
	TOTAL			4,930,000

NOTE: Oil from pleasure craft and natural seeps not included.

CLEANING OILED SEABIRDS WITH LARODAN*

Kare Larsson, Institute of Medical Biochemistry, and Goran Odham, Institute of Plant Physiology, University of Goteborg, Gotegor, Sweden, have successfully used Larodan for cleaning oiled seabirds. Reportedly, with this cleaning agent, waxing takes place during cleaning (a method similar to that sometimes used in car cleaning) of the oiled bird.

When detergents are used for washing oiled seabirds the natural feather wax is often removed because the solubility and emulsifying properties of the feather wax and the contaminating oil are almost identical. Because of the importance of wax in maintaining water repellancy and heat insulation, no seabird can be returned to its natural environment until the wax has been replaced in one way or another.

The preen gland produces about 50 mg of wax per day which helps to compensate for the loss of natural wax, and the plumage usually contains a few grams of preen gland secretion, but it takes a long time for the bird to replace all the wax. For both practical and economic reasons, however, rehabilitation must be as short as possible, and so they investigated the possibility of adding

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*Marine Pollution Bulletin, Volume 1 (NS), Number 8, August 1970, pg. 123 - 124.

wax after cleaning. Initially, about 150 oiled common swans in Goteborg were cleaned with Tremalon B, and wax subsequently sprayed on the plumage. In practice, the spraying technique was not very satisfactory; overdoses were often given resulting in plumage with the same properties as the original oiled plumage.

To overcome this problem Larodan 127 was used. The preparation consisted of a dispersion of hydrophilic lipid crystals in water, with a commercially available synethetic wax 'pur-cellin liquid' (composition similar to that of natural feather wax) included in the hydrophobic regions of the lipid crystal matrix. The hydrophilic lipid is the 1-monoglyceride of dodecanoic acid (chain length 12), and the synthetic wax contains a methyl-branched C_7-acid linked to n-octadecanyl -1. The wax is a common component of cosmetic preparations. (Larodan 127 refers to these chain lengths.) The proportions of the three components, monoglyceride, wax and water, were adjusted on the basis of practical tests so that the final product consisted of 20 per cent monoglyceride and 2 per cent wax in water. Larodan thus consists of two lipid components of the same type as those occurring naturally in seabirds. The crystalline monoglyceride dispersions in water have been extensively tested externally in man, and both internally and externally in test animals.

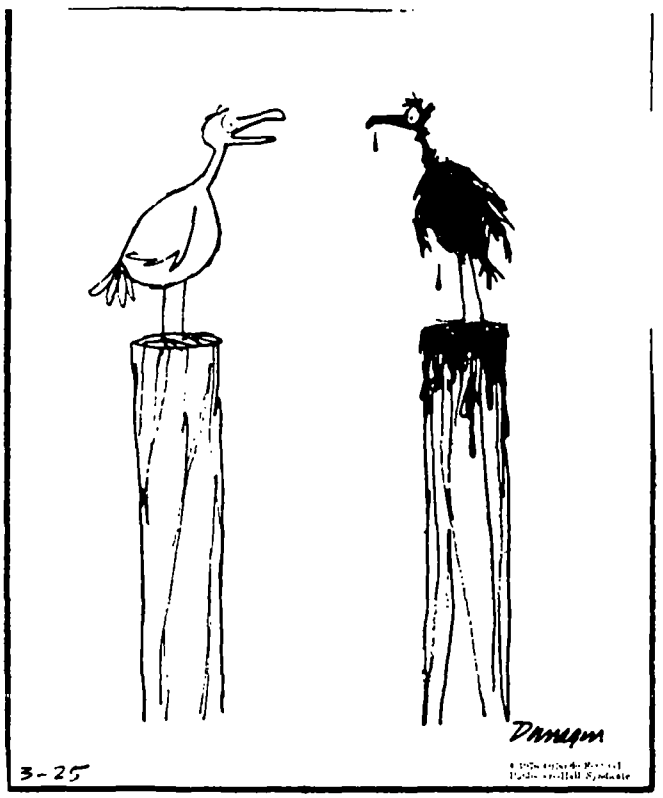
Larodan 127 has been tested on about ten Peiping ducks contaminated with Shell talpa oil 30 to which carbon powder had been added. About 100 g of contaminant was used on each bird, and after 3 days

they were washed with Larodan. Only one washing was required to remove the oil, and after 8 - 10 days the birds could swim. Comparisons of Larodan with other agents showed that with the latter the washing procedure was longer, and the birds took longer to float.

Larodan has been used on a large scale in Scandinavia; for example in Gavle, Sweden, where about seventy-five birds belonging to the family Anatidae were successfully cleaned and returned to their natural environment within two weeks.

-The Post & Times-Star Cincinnati, Wed., March 25, 1970

TELL IT LIKE IT IS BY DUNAGIN



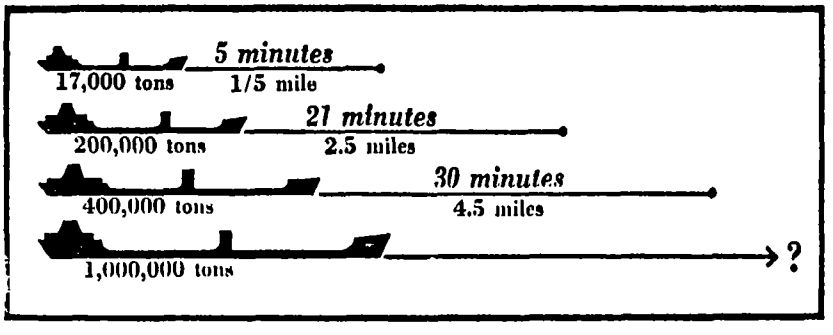
"WHY DON'T YOU SWITCH TO A DETERGENT OIL?"

NEW R&D NEED: POWER BRAKES FOR TANKERS!

The stopping ability of tankers, even under crash stop conditions -- vessel in full reverse -- is causing concern in naval circles. Causing the worry is a fleet of 326,000 ton, Universe class tankers built in Japan and under charter to a major U.S. oil company. These tankers are almost three times the capacity of the ill-fated Torrey Canyon.

In the September issue of the U.S. Naval Institute Proceedings Capt. Edward F. Oliver, USCG, ret., reported that:

> "The most important factor in connection with collision and stranding — the two most dreaded casualties — is the 'crash stop' ability. Unfortunately, the ability of the tankers to come to a 'Crash stop' has decreased as their size has increased.
>
> For the 400,000 tonner, the straight-line stopping distance for a 'crash stop' would be four to five miles and would take approximately 30 minutes. During this period of backing full, the ship's master is unable to steer her or regulate the speed.
>
> If the engines are not put 'full astern' but on 'stop' it takes up to one hour for the Universe Ireland to come to a stop."



OIL POLLUTION TRAINING COURSE

A three day training course on oil pollution control technology will be presented at the Edison Water Quality Laboratory during the week of February 1, 1971. Topics to be discussed at this course will include, but are not necessarily limited to, oil slick characteristics, sampling, analysis, environmental effects, booms, skimmers, contingency planning, and practical problem solutions. Course will entail not only classroom work, but actual "get the hands dirty" laboratory participation.

Course registration will be limited, therefore, for reservations or information contact Mr. J. McKenna, Training Officer, Edison Water Quality Laboratory, FWQA, Edison, New Jersey 08817. (FTS No. 201 846-4647, Commercial No. 201 548-3347).

WASHINGTON-EDISON PERSONNEL CHANGES

Since the last issue of the Newsletter, several personnel changes have taken place, both at Edison and at Headquarters. In Washington, RALPH RHODES, former Chief, Oil Pollution Research Section, has transferred to the FWQA's Charlottesville, Virginia o office. KURT JAKOBSON, previously with the Division of Technical Support, Washington, D.C., is now handling Ralph's responsibilities.

At Edison, both DR. THOMAS MURPHY, Chief, Oil and Hazardous Materials Research Section and PATRICK TOBIN, Sanitary Engineer, have been promoted to "greener pastures" in Washington. Dr. Murphy is now a staff assistant to Dr. David Stephan, Assistant Commissioner, Research and Development. Pat is still involved in research activities, however, in our sister division of Process Research and Development.

New additions at Edison include J. STEPHEN DORRLER, formerly in charge of the Navy's oil pollution program at Norfolk, Virginia, who will be takning on many of Tom Murphy's old responsibilities. DR. JOSEPH LAFORNARA, a recent graduate of the University of Florida, is devoting all of his time to develop new methods and procedures for analyzing oil spill samples. IRA WILDER, previously with the Navy's Applied Science Research Laboratory is handling the hazardous materials program. ARNOLD FRIEBERGER, also formerly with the Naval Applied Science Research Laboratory, is involved in grant and contract management, as well as in-house activities.

CLEANING OIL CONTAMINATED BEACHES

Dr. A. Y. McClean, a member of "Project Oil", the Canadian Government's response team for the Tanker ARROW disaster which occurred in Chedabucto Bay, Nova Scotia on February 4, 1970, reports that a chemical dispersant was successfully used, without any adverse biological effects, to remove Bunker C oil from rocky shorelines.

The test results indicated that an application of 0.1 gal/ft^2 would be effective in cleansing the Bunker C oil from the rocky shoreline. Based on a price of $2.97 per gallon, the cost for cleaning the rocky beach would be $0.30 per square foot. This cost would vary considerably depending on the nature of the shore and degree of oiling. In these tests, as the shore was rocky, and the oiling quite heavy, the product cost was probably above average. The cost of cleaning bedrock, for instance, would be less.

Dr. McClean concluded that the use of BP 1100 B, or a similar dispersant, is a convenient and effective way of cleaning rocky shorelines contaminated with Bunker C oil, although 100% removal of the oil is not possible in instances where the oil has flowed underneath rocky surfaces.

In addition, he indicated that undesirable biological side effects can probably be reduced to negligible proportions provided:

(a) The dispersant-treated oil is hosed off into the sea with large quantities of water.

(b) The cleaning operation is carried out during a rising tide, and wind and current conditions are such that the emulsified material is quickly diluted and dispersed, and

(c) The cleaning operation is not carried out on such a large scale that extremely large quantities of emulsified oil are dumped into the sea in a short period of time.

DISPERSANT USE RESULTS IN $500 FINE

As a result of expert testimony provided by the Edison Water Quality Laboratory in U.S. District Court, Southern District of New York, a New York City oil storage firm was fined $500 for an oil spill and an additional $500 for using dispersant. Testimony was directed to the toxicity and potential harmful effects to the marine environment that could result from the dispersant use.

The incident involved a spill of 50 - 150 gallons of #4 heating oil into Westchester Creeks as a result of the failure of an automatic control alarm on a storage tank. Sixty gallons of dispersant were used without notification of or approval by FWQA.

The case, prosecuted under the Refuse Act, U.S. Code Title 33, Section 407, was precedent setting in that this was the first time a violator was successfully prosecuted under the Refuse Act for using dispersant.

UPDATING OF TECHNICAL R&D MANUALS

The Newsletter will be used as the mechanism for updating Edison's R&D manuals on "Oil Skimming Devices" and "Oil Containment Systems". When appropriate, other past and future reports will also be brought up to date in this manner. For your convenience, the pages have not been bound into the Newsletter, but rather "T-slotted" so that they can be easily removed and inserted into the appropriate R&D report.

Included with this issue of the Newsletter is a new addition to the report on "Oil Skimming Devices":

Reynold's Medusa Skimmers

It is important to emphasize that mention of trade names or commercial products does not constitute FWQA endoresement or recommendations for use.