Ocean Is Expansive Oil Field

The quest for vast new oil supplies is bringing with it an arsenal of new technology to conquer the sea and drill beneath it—By Charles A. Betts

➤ THE SEARCH for "black gold" under the sea is developing into one of the largest international enterprises of the century, with modern science making the ocean floor a vast oil field staked out for exploration.

Operations are spreading worldwide to the Gulf of Mexico, the Persian Gulf, and the waters off Nigeria and Alaska. One of the newest operations is a plan to explore the turbulent North Sea off the coast of Norway. The Norweigan Oil Council has awarded an exploration license to subsidiaries of the Murphy Oil Company, El Dorado, Ark.; the Ocean Drilling and Exploration Company, New Orleans, La.; and the Phillips Petroleum Company, Bartlesville, Okla.

Like Housing Development

Initial drilling operations will soon begin in an 11-block area of ocean bottom, staked out like lots in a suburban housing development. However, each of these sea blocks covers about 250 square miles. Water depths in the area range from 200 to 350 feet.

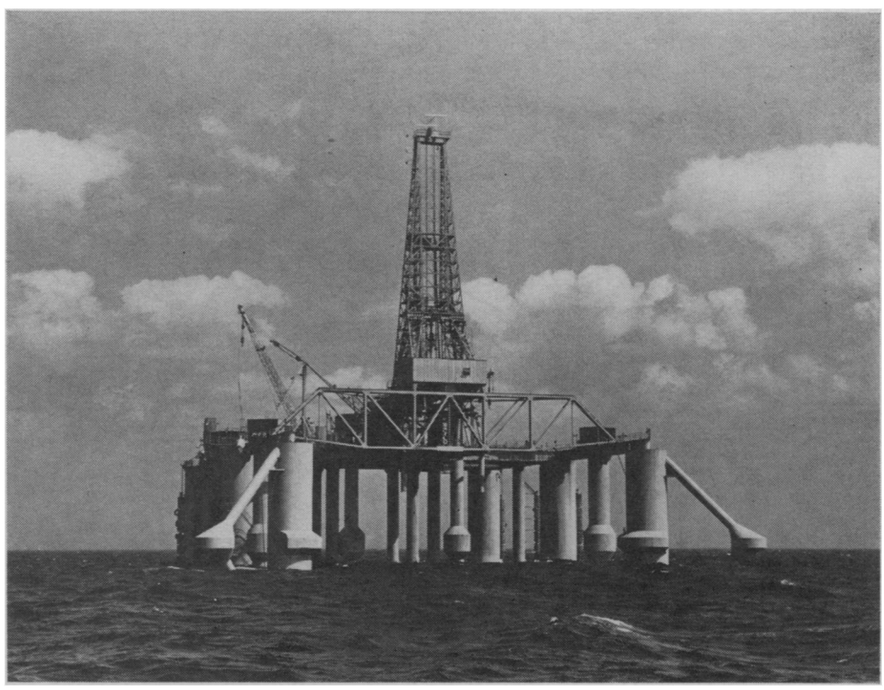
The key unit in undersea oil work is the semi-submersible, floating barge. The basic component of the unit is a series of huge torpedo-like cylinders on which a drilling platform is built. Rising from the cylinders are vertical support pilings for the platform which holds the derrick. New rigs, such as the Ocean Prince, which was recently launched in Great Britain for ODECO oil explorations, have 23,000 square feet of working deck area.

More than 6,000 tons of steelwork are used to make a barge 300 feet long, more than 200 feet wide and 150 feet high. Now under construction in Norway is a similar vessel for the North Sea drilling.

Mobility and stability are the key factors in the success of this type of rig for off-shore oil exploration. The rigs can be towed anywhere and operate either floating or resting on the ocean floor.

The new Ocean Prince, for example, is equipped to operate afloat in waters 600 feet deep or to rest on the sea bottom in 100 feet of water. The rig will be able to drill to depths of 20,000 feet, and, under favorable conditions, will be capable of drilling about 10 wells annually in the North Sea area. It has quarters for about 50 crewmen. This vessel is similar to the Ocean Queen, which was recently launched and put into service.

This handy "little" item costs more than $5.6 million to put together and equip for its mission.



Humble Oil and Refining Company

BLACK GOLD DIGGER—The Ocean Traveler, a floating semi-submersible drilling rig, will be used to search for oil in the North Sea waters off Norway this summer.

A self-elevating barge which basically is a flat bed to support the drill rig, with the unit held up by four legs is also in use. These legs are triangular, 17 feet to a side, and are almost 400 feet long. An example of this barge is the Constellation, constructed in Great Britian for the Offshore Company in Texas.

When the unit has been towed to its location, the legs are lowered to the sea bottom to find footing. Electro-hydraulic jacks then lift the barge hull out of the water and raise it into drilling position well above maximum wave height.

An interesting feature of this rig is a 140-foot multi-well derrick mounted on a mobile track. This makes it possible to drill three wells at each location without having to move the barge.

Not all underwater technology, however, has been concentrated on units to support the drills, although this field has received the most attention. Much special equipment for locating potential fields, drilling, pumping and mapping has been developed.

In a report to the Institute of Petroleum, A. Bryce Cameron of the Burmah Oil Exploration Company Ltd., highlighted some significant progress in the field.

One item capturing the imagination of scientists and laymen alike is an underwater robot, developed by the Shell Oil Company to probe the depths and do man's work at depths man cannot yet reach.

The name of this robot is Unumo, which is short for Universal Underwater Mobot. Unumo can move around all by himself. He can work his arms and comes equipped with a television camera, underwater lights and sonar.

Deeper Than Sealab

Unumo has already worked at depths exceeding 800 feet—600 feet deeper than the depth tests of Sealab II last summer. While under the sea, Unumo performed a variety of jobs, such as attaching wire line to pipe, inserting and removing shackle pins and picking up samples of the ocean floor.

Unumo's masters now have counter-

parts ready to rent to industries interested in working under the sea. The robot costs $40,000 a month, which probably makes him the highest paid diver in the world.

Human divers, however, remain indispensable to industry and great improvements have been made in their techniques. The use of oxyhelium equipment now enables them to remain as deep as 525 feet for up to 30 minutes. Research with Sealab may lead to far greater descents for considerably longer periods of time. Depths of 2,000 feet or even more are seen possible in the near future.

Other significant equipment includes new well-head designs that make it possible to complete and control wells at sea bottom at considerable depths.

One of the big problems of these oil rigs, Mr. Cameron reports, is the need for improving the means for holding floating drilling equipment in position in deep water, so as not to entangle the drilling lines or move away from the site.

In relatively shallow water various anchoring systems have been successfully used. In the deep water conditions where the industry is now working, however, floating rigs need to employ a dynamic positioning system.

One method, developed by Shell, utilizes constant, varying thrusts to hold a vessel in a fixed position against the forces of wind, wave and current. The automatic position equipment uses two propellers, each of which can apply a variable thrust to and from any direction. By changing the power and direction of thrusts from these units, drilling vessels can be held in exact position in relation to the well location on the bottom.

Another important development for drilling rigs is the system of microwave transmission from drilling platforms to shore headquarters of the electric log of a well while it is actually being dug.

Submersible Oil Barge

One more new innovation by the Murphy Corporation's ODECO firm is a new submersible oil storage barge with a capacity of 24,000 barrels. Such a vessel can be used as an undersea collecting station, storing oil pumped from wells under the bottom of the ocean.

The submersible oil storage barge —nicknamed S.O.B. No. 1—is more than 90 feet long with an 80-foot beam. Its lower hull will consist of four tubular tanks, each 16 feet in diameter, forming a square with an open center from which concrete ballast will be suspended.

Extending upward from each corner of the lower hull will be hollow columns, each with a diameter of 20 feet. These four columns will support the main deck some 93 feet above the bottom of the lower hull.

Mounted on the main deck will be the power plant, processing machinery and living quarters for 22 hands. The barge will also be equipped with a heliport and boat-landing facilities to provide easy access.

The tubular tanks that form the lower hull will provide approximately one-third of the total storage area.

Mohole, the project to drill in some 3,000 fathoms of water at a position where the earth's crust is thinnest through about 20,000 feet of rock is expected to provide even more new concepts in design and development of drilling equipment.

Innovations so far include:

A completely automated pipe handling system to store 38,000 feet of drill pipe and 18,000 feet of riser casing.

Changes in the steels of drill pipe to give added strength, and a possibility of using a titanium alloy because of its light weight and greater resistance to corrosion.

All these things, and the unknown wonders yet to come, will ultimately push the search for black gold to the deepest parts of the sea. Undersea oil exploration already has moved out from the tidewater areas. There seems little doubt that the search will turn increasingly to exploration of further offshore regions of the world.

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OCEANOGRAPHY

Arms Reach to Sea With Research Subs

➤ A LONG THIN metallic claw will be picking objects as delicate as a sea urchin or as heavy as a 150-pound treasure chest, off the sea floor.

This mechanical arm, with a 14-inch, long reach, is one of the longest undersea arms in existence. It can pick up flat, round or irregularly shaped objects, and can be fitted with a variety of attachments such as a cable cutter or a power nut-driver.

The mechanical claw is a feature of the modern research submarine, Star III, which, with its companion sub, Star II, has been launched by the Electric Boat division of General Dynamics at the U.S. Navy's Underwater Sound Laboratory, New London, Conn.

Star III, one of the more sophisticated undersea research vehicles yet built, is 25 feet long and designed to carry a ton of scientific equipment for operation at depths as low as 2,000 feet. The two-man crew can maneuver it in all directions, and let it hover in water much like a helicopter hovers in air. Driven by a 7.5 horsepower motor, it can travel at a speed of six knots.

The second submarine, Star II, is nearly 18 feet long and operates at depths of 1,200 feet. It can stay submerged for eight hours.

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