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MARKETPLACE

Wells Take Voyage to Bottom of the Sea

Smaller Oil and Gas Fields, Lower Costs Lead to a Boom In Pumps on the Ocean Floor

By Russell Gold
And Ana Campoy
Gulf of Mexico

Standing on the deck of **Anadarko Petroleum** Corp.'s Independence Hub platform, crew chief Darwin Nichols can't hide his enthusiasm. "You can see everything from here," he marvels.

His view: a computer screen with a spider web of wells, pipes and flow lines used to extract natural gas, all of which are invisible from the platform because the wellheads, pumps, separators and meters distinguishing most petroleum platforms sit on the ocean floor.

As the wells start up over the next few weeks, Mr. Nichols will use his computer to monitor the status of all of them, checking how much gas is flowing out of each. With a couple of taps on the screen, he could shut off a well or choke its flow.

Painted traffic-light yellow, the Independence Hub floats in the deepest water of any offshore platform. (The ocean floor is two miles below the surface.) Plans call for the hub to suck up to one billion cubic feet of natural gas from the earth every day. By itself, the platform is expected to produce enough gas to heat about 4.8 million U.S. homes.

Giant offshore platforms remain the Hollywood stars of the petroleum industry, appearing on covers of countless glossy annual reports. But the industry is finding fewer fields large enough to justify building a massive structure loaded with drilling derricks and well controls atop the reservoir. This has opened the door for a distinctly less photogenic alternative: the subsea well.

Ten different gas fields are feeding into the Independence Hub, which is basically a

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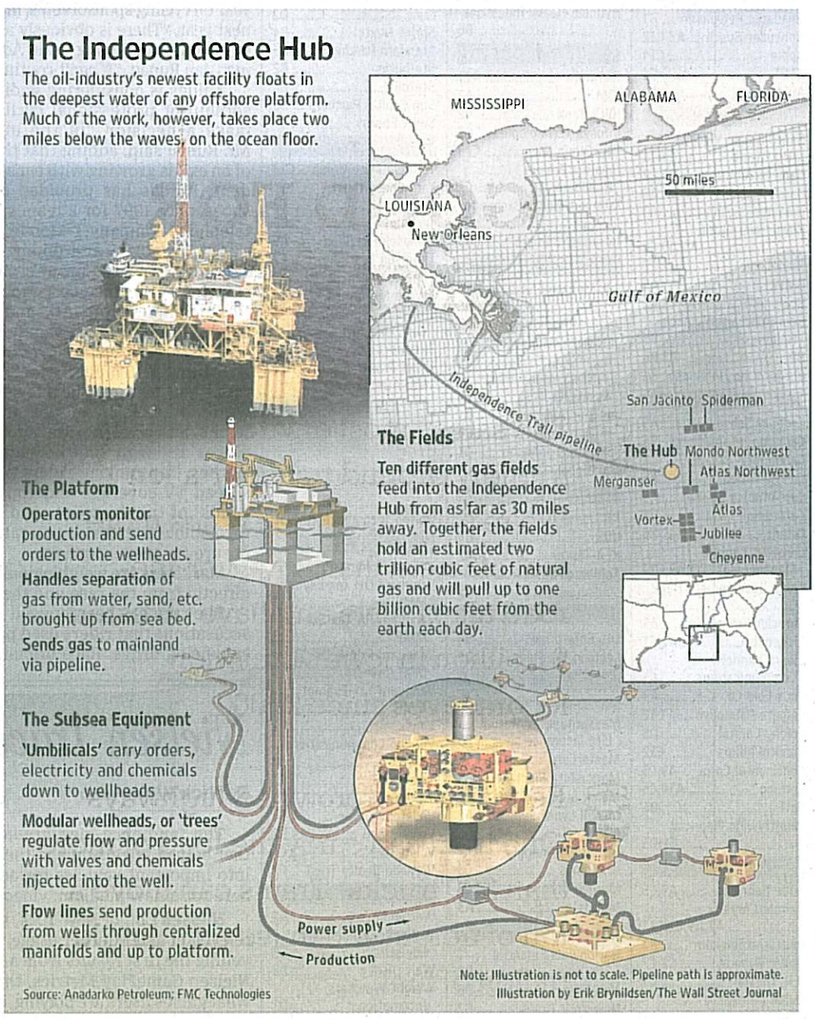

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Gas Drilling With a Difference

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floating pipeline hub, with an assortment of gas compressors. The remotest field, Cheyenne, is 30 miles south of the hub. Together, the fields hold an estimated two trillion cubic feet of discovered natural-gas reserves. If it were a single field, it would be one of the largest in the prolific gulf.

The fields are all stitched together by 125 miles of "umbilicals"—thick flexible tubes that send electricity, orders and chemicals to the wells. It is so cold 9,000 feet below the waves that droplets of water in the gas can freeze and gum up the flow. To fight this, antifreeze stored in tanks over 40 feet tall is pumped down the umbilicals to the wells.

Anadarko Petroleum

A machine pumps antifreeze to ocean floor aboard the **Independence Hub**.

Subsea technology is quickly gaining favor in the oil-and-gas industry and has become a $6.4 billion market, according to Wachovia Securities. This industry niche has grown at a 23% compound annual rate for the past three years and is expected to keep growing at that rate for the next few years.

Lower costs and the ability to tap smaller reservoirs are major advantages, but not the only ones. The industry can squeeze more oil out of aging fields by adding pumps on the seabed, closer to the oil. Another plus: Going underwater puts the hardware out of the way of hurricanes, cyclones, icebergs and other destructive natural events, not to mention terrorist gangs in places such as Nigeria.

Statoil ASA, the Norwegian state oil company and a subsea pioneer, is constructing a subsea network to produce gas 1,000 feet below the icy Barents Sea and ship it 90 miles to shore. The project, known as Snohvit, will have no platform at all. This was done to satisfy demands from the local fishing industry, which didn't want to share the waves with man-made structures. The equipment is encased in a steel structure designed to prevent cod-fishing nets from getting entangled in the wells.

Another Statoil project, Tordis, will be the first to separate oil, water and sand on the seabed. As it ages, the reservoir is producing more and more water, but the nearby platform couldn't accommodate additional equipment to get rid of the water. A new platform would cost $800 million; installing the subsea separator on the floor will cost half as much. "It will make a hell of difference in economics," says Statoil executive Oivind Reinertsen.

The system was recently tested onshore at Fusa, Norway. The test required nearly 300 truckloads of sand, leaving the town, contentedly, with a new beach. The Tordis equipment is due to be installed this month and start pumping gas later this year.

Going underwater protects the hardware from storms, terrorists.

The growing subsea market means booming business for **FMC Technologies** Inc. The Houston-based company built the underwater equipment used at most of the wells feeding the Independence Hub, as well as Tordis. Other companies in this growing niche include **Cameron International** Corp., also of Houston; Norway's **Aker Kvaerner** ASA; and Switzerland's **ABB** Ltd. The growth of the subsea market could mean less business for companies that design and build the big platforms, such as France's **Technip** SA and **KBR** Inc., as well as Asian shipyard owners such as **Hyundai Heavy Industries** Co.

This shift can be seen in the economics of Anadarko's Independence Hub. The cost of building and installing the floating platform was $446 million, less than one-quarter of the total cost of the project, according to the companies involved. This ratio is fairly typical of the current crop of deep-water platforms, but a far cry from the past, when much more of a projects budget was spent above the wave line. "As you move into deep water, relatively more of the budget goes to drilling and subsea work," says **BP** PLC spokesman Ronnie Chappell.

Of course, putting equipment below the waves has disadvantages, also. Getting it into place is akin to landing a ship on Mars but with more extreme temperatures and pressures, says Peter MacInnes, FMC's marketing-development manager. In fact, Cameron International, which is currently working on more than 15 major subsea projects, uses motors and other equipment made by an aerospace-industry contractor.

The subsea equipment is designed to last for the lifetime of the project because sending down a Maytag repairman requires an unmanned submarine. "Is it high-tech," asks Cameron's chief executive, Sheldon Erickson. "You bet your sweet bippy it is."