New Subsea Technology Aims To Cut Well-Intervention Costs

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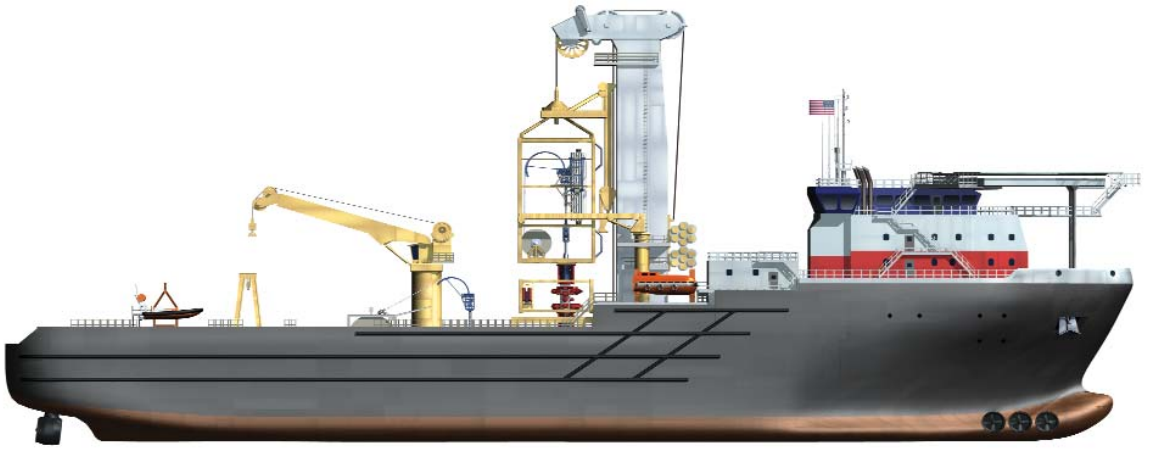

Fig. 1—The SIM system consists of the vessel and the tool, which includes the CT module, BOP module, one-way fluid-transfer lines, and ROV with power and control umbilical.

Deepwater subsea well intervention must be done with mobile offshore drilling units (MODUs), which can be very expensive. The cost per intervention using the standard MODU averages up to U.S. $10 million, in addition to the lost or deferred production. With deepwater production poised to play an even greater role in meeting global hydrocarbons demand, those costs will become increasingly burdensome.

A new technology unveiled by ExxonMobil promises to mitigate this costly expense and significantly reduce the cost and time of downhole logging, acidizing, and other interventions in deepwater oil and gas wells. The subsea-intervention-module (SIM) technology offers a riserless way to deploy a seafloor coiled-tubing (CT) unit from a specially designed support vessel. ExxonMobil says the new technology, which it has been working on for the past 4 years, is advanced well beyond concept stage and has undergone significant high-risk engineering and component testing. The technology is now entering the detailed design and construction phase, and it will undergo further development to complete its design and its integration with subsea facilities.

The SIM system—compromising a subsea CT system and a purpose-built monohull vessel that provides deployment, control, and support—is designed for use in 2,000 to 6,500 ft of water and can be used in even deeper subsea production interventions. It will be able to accommodate well depth of up to 13,000 ft below the seafloor. The system can be used for intervention on any subsea well constructed with 36-in. structural casing and completed with a horizontal tree.

First use of the technology will be offshore west Africa in 2008. To commercialize the technology, ExxonMobil has licensed the SIM system to a joint venture between BJ Services Co. and Otto Candies LLC. The venture will operate the SIM system following the completion of design and construction.

SIM Support Vessel

The SIM system consists of the vessel—consisting of a dynamically positioned vessel, compensated deployment system, and controls—and the tool, which includes the CT module, blowout-preventer (BOP) module, one-way fluid-transfer lines, and remotely operated vehicle (ROV) with power and control umbilical. The SIM support vessel is a monohull vessel with double skin, a large working moonpool, and diesel/electric propulsion with a dynamic-positioning system. The vessel is the mother ship for the subsea CT unit.

The self-supporting vessel carries stores and supplies for a 30-day period to support multiple well-intervention missions and can be replenished at sea if needed. The vessel also contains a helicopter deck and mooring facilities on both sides for a supply vessel. The vessel is 372 ft long and 79 ft wide, with an 18-ft draft **(Fig. 1).** It can accommodate up to 97 people and operate in up to 6,500 ft of water depth. The moonpool is 43×36 ft and located in the middle of the vessel, with a 750-ton, single-wire Huisman deployment system above. The vessel also includes deployment capability of two ROVs. A state-of-the-art control room includes the SIM control station, two ROV control stations, and a system to control and monitor CT operations and deployment.

SIM Tool

The SIM tool comprises a remotely operated subsea CT unit and an accompanying BOP module, ROV with power and control umbilical, and one-way fluid-transfer lines **(Fig. 2).** The technology can perform the same types of through-tubing well-intervention work normally carried out by a MODU. The combined upper CT unit and lower BOP module weigh approximately 500,000 lbm and measure 80×23×20 ft. The CT unit can handle up to 6,000 psi of wellhead pressure, while the BOP system is rated at 10,000 psi.

Design highlights of the tool include:

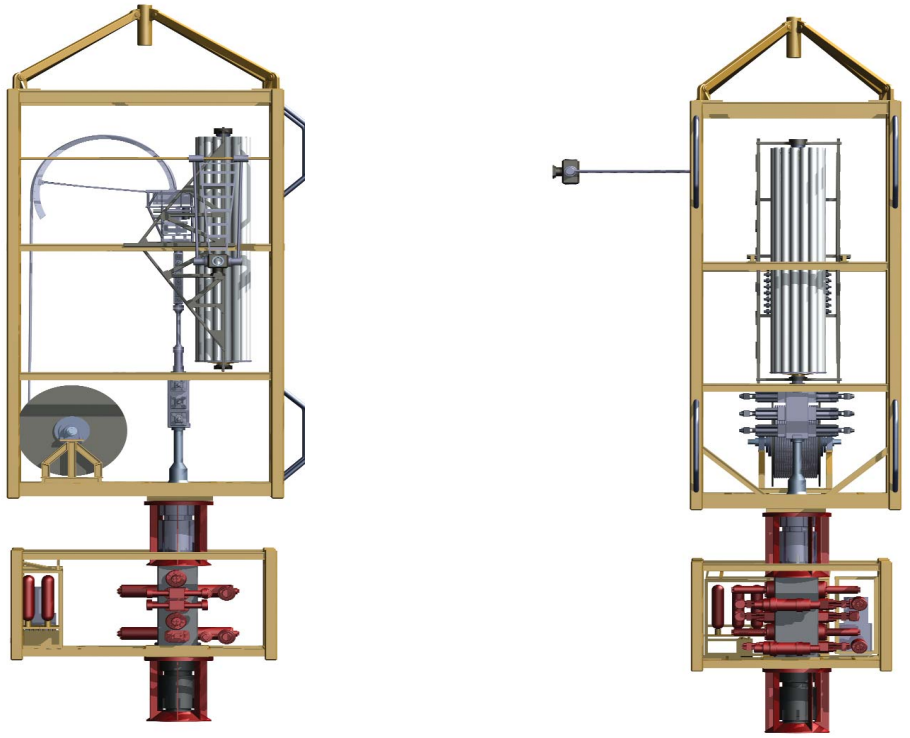

Fig. 2—The SIM tool contains the upper CT unit and the lower BOP module.

- Two independent modules: a full subsea BOP system with backups and the CT unit, which includes 2-in. CT with internal wireline.
- Capability of logging, pumping, acidizing, scale treatment, and tool deployment.
- Capability of separate retrieval of the CT module for repair.
- The BOP module can support MODU BOP and riser.

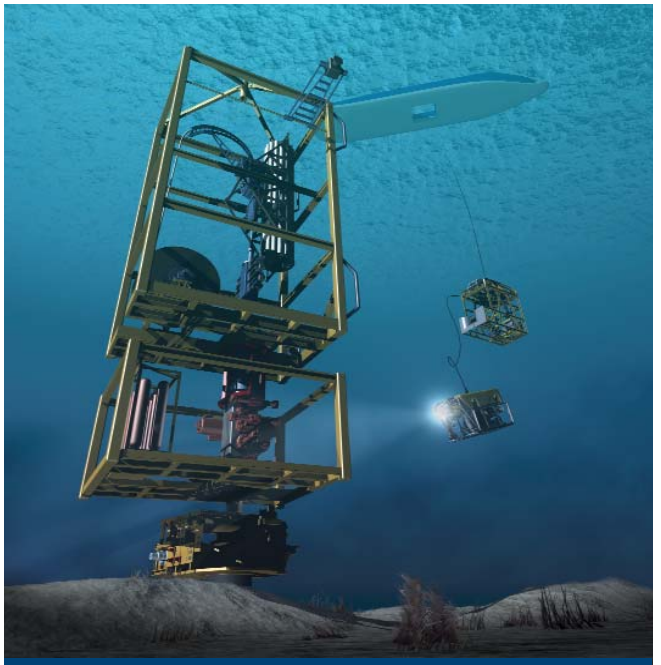

Fig. 3—Image of the complete SIM system.

- Internal backup systems exist for key components of the system.
- The concentric CT one-way fluid-transfer line provides two fluid paths from the vessel, with no well-intervention fluids returned back to the vessel.
- Control signals are conveyed through the ROV umbilical and a flying J-box.
- Pumps on board the vessel provide pressure for well-stimulation fluids and nitrogen.
- The SIM system is also capable of electric-line logging.

Projected Uses, Benefits

The SIM system was designed with a capability of lowering deepwater intervention costs by up to 85%. It is targeted to perform downhole logging, acidizing, and other interventions up to three times faster than a MODU **(Fig. 3).** Intervention cost could be up to half the expense of using a traditional MODU, in addition to the benefits of improved production rates and faster reserves recovery. One of the key features of the system is the elimination of fluid return to the vessel, which has been a hurdle in the design of deepwater intervention vessels. Under this system, the fluid goes to the reservoir or production facilities, but there are no returns back to the vessel.

One limitation with the system is that it must be used with horizontal subsea trees with 36-in. structural casing. Most of ExxonMobil's current deepwater developments already support that, and all future developments will. By licensing the SIM system to the BJ Services/Otto Candies joint venture, the technology will be available to all deepwater operators when fully commercialized. Input from other operators may affect the final design.

Dave Dunlap, BJ Services Vice President and President, Intl. Div., said the new technology should encourage new deepwater development and bring down operators' costs significantly. Construction is set to begin next year. JPT