Applications and Trends in Oil and Gas Technologies to Maximize Resource Production

Johnnie Burton, Director, Minerals Management Service

Sixth U.S.-China Oil & Gas Industry Forum
June 28-29, 2005 — New Orleans, Louisiana

Thank you, for inviting me to participate in this sixth U.S.-China Oil & Gas Industry Forum. The Minerals Management Service participated in the first of these meetings in 1998 and sees these meetings as valuable opportunities to facilitate a cooperative bilateral effort that explores solutions to the challenges of developing offshore resources.

The MMS, part of the U.S. Department of the Interior, oversees 1.76 billion acres of the Outer Continental Shelf, managing offshore energy and minerals while protecting the human, marine, and coastal environments through advanced science and technology research. The OCS provides 30 percent of oil and 21 percent of natural gas produced domestically. MMS collects, accounts for, and disburses mineral revenues from Federal and American Indian lands, with Fiscal Year 2004 disbursements of approximately $8 billion and more than $143 billion since 1982.

As the United States' regulator of the offshore petroleum industry we have had a front row view of the dramatic changes in both the types of technology used in offshore oil and gas development, and the accelerated pace of technological change over the last decade as the industry has steadily marched further offshore and into deeper waters. The current world water depth record for exploratory drilling — 10,011 feet and offshore production — 7,509 feet are in Gulf of Mexico waters just a little more than 200 miles from where we sit today.

The technologies to achieve these remarkable industrial feats begin with the acquisition of pre-exploratory 3-D depth migration and 4-D and 4-C multi-component seismic and gravity and magnetic data that provide improved imaging of complex structures and the identification of hydrocarbon reservoirs at great depths. Using this data at the desktop and in data analysis centers with improved coherence/variance cube and amplitude versus offset (AVO) technology has resulted in enhanced visualization techniques that allow scientists to image complex structures and identify subtle stratigraphic relationships within sediments.

Once scientists have identified a prospective target the development of advanced materials in areas such as:

- Improved drill b**it** technology results in tougher and more abrasion resistant materials and the ability to drill for longer periods of time without changing bits;
- New cementing additives allow high temperature cementing and reduced incidences of lost circulation to high pressure; and
- Solid expandable tubulars (SET) technology results in casing you can fit through a small diameter, then pressure up to expand to a larger size.

Use of these advanced materials are combined with computer assisted and automated drilling systems that help monitor well activities and allow for quicker response time for a shut-in or other well control procedures. In addition, automation can allow for hands off operation with continuous feed off to provide best possible borehole quality at optimized drilling speeds with the result that you employ fewer personnel and save time and cut down on injuries.

Then there are drilling techniques such as directional drilling — the intentional deviation of a well bore from the vertical that allows the driller to target smaller pay zones and to orient the well bore to enable the best possible reservoir production

OR

Horizontal or extended reach drilling technology that allows development of smaller satellite reservoirs from a common hub.

In addition, micro-drill projects can now drill wells 4 ¾ inches in diameter (about the size of a small coffee can) and smaller using coiled tubing drilling techniques that cut the cost and time of exploratory drilling.

Data collection has also advanced. The latest in measurement tools are designed to withstand the extreme heat and pressure that comes with drilling to great depths, so that data collection is continuous while drilling, and information is transmitted to the control room during drilling operations providing real-time access to information about the formation during the drilling process.

After the exploratory process these same drilling techniques and materials are employed in the development and production phase.

The drilling of multilateral wells will enable operators to produce from multiple pay zones and the use of subsea developments that allow subsea tiebacks allow multiple well production to a common hub.

The development of floating production systems such as tension leg platforms and truss spars that use polyester mooring lines that have lower payload capacity giving additional reserve buoyancy-increase combined with anchoring suction piles that result in less environmental intrusion with increased stability.

These are just a few of the numerous advances in offshore drilling technology that have been developed or used more widely in the last decade. Without these technological advancements the offshore industry would not have been able to capitalize on the deepwater promise of the Gulf of Mexico — which has led to almost a doubling of OCS oil production since 1995.

Although a lot of these technological advancements have been employed in the Gulf of Mexico they certainly can be used in many other parts of the world. In addition, a decade worth of experience has resulted in many financial and project management lessons that lead to reduced times to bring offshore projects online.

I am sure that many of the industry representatives attending this forum are ready and willing to share these management "best practices."

I hope that the discussions today and tomorrow will provide China with many avenues for collaboration and cooperative development in the future, and that at the next forum held in the United States we will hear from you about your offshore successes.