

- Demand for oil and gas has continued to grow, despite recent price rises.
- Increasing production to match demand must be a top priority if global economic growth is to be sustained.
- New technology is playing an increasingly important role in the retrieval of lower-quality hydrocarbons from complex reservoirs.

No let up in exploration and production

With global economic growth and demand for oil and gas showing no signs of slackening, hydrocarbon exploration and production is more important than ever, writes Andrew Gould, chairman and CEO of Schlumberger.

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DESPITE PERSISTENTLY HIGH COMMODITY PRICES, recent International Energy Agency (IEA) reports indicate that world demand growth for oil in 2006 remained broadly unchanged at 1.2mb/d or 1.4%. In 2007, this is forecast to increase to 1.9%. Both of these figures are consistent with long-term average growth forecasts of 1.6% per year.

Economies in the OECD countries are proving resilient in the face of high oil prices, as evidenced by US motorists accepting the reality of \$3 per gallon petrol. Rising oil and gas prices have not dampened demand or economic growth in rapidly industrialising countries, indeed growth in China accelerated to approximately 8% in the first half of 2006.

The world supply of oil has grown to match demand. The call on OPEC crude remains around 29mb/d, implying little change in effective physical spare capacity of approximately 2mb/d. The IEA has lowered its expectations for non-OPEC production growth, but this continues to see growth in 2007.

In the past 18 months supply has been affected by disruptions in the Gulf of Mexico and Nigeria, slowing production growth in Mexico and production closures in Alaska. There have also been growing signs of physical constraints on growth in upstream activity due to a shortage of equipment and skilled professionals.

Growth areas

Around the world, governments understand that re-investment in energy and energy infrastructure is urgent if we are to avoid energy shortages that could hamper economic growth. Saudi Arabia has begun massive investment in new production capacity for both oil and gas, while exploration is underway in North Africa, the US and Russian Arctic, Eastern Siberia, deepwater India and Malaysia, the Norwegian Arctic Ocean, and West and Central Africa.

As far as gas is concerned, the IEA has recently published data that indicate demand rising at a compound annual rate of 2.71% through to 2010. This same set of data indicates that only half the investment needed to grow supply to meet demand has been committed.

Russia remains the fastest-growing area for global oilfield and information services company Schlumberger. Drilling and measurements technologies have become the fastest growing services as the success of horizontal side tracking, as an alternative to the reservoir drainage technique, becomes more widely recognised. Integrated project management work is also growing.

Growth is strong in the Middle East, driven principally by the extraordinary increase in activity in Saudi Arabia, where the average rig count increased from 49 in 2004 to 70 in 2005 and 100 in 2006. This activity was aimed at increasing and maintaining Saudi Arabian oil production capacity. In Algeria, seismic activity is strong and there are high levels of exploration drilling. Overall, growth is running at more than 20%.

These areas promise sustained levels of new exploration and development. They have the reserves to sustain long-term activity, their activity levels are increasing and they are primarily land markets where the logistical difficulties of rapidly ramping up activity are minimal.

To service this growth, the service industry currently faces a number of important challenges. It is essential that the service industry's already stretched supply chain is able to deliver the new equipment and products required to meet the increase in activity. Meanwhile, the trend towards exploration will affect the technology used in the industry, as well as the overall uptake of technology, and the service industry must adapt to such trends.

The industry will continue to struggle with the lack of trained professionals. As a result, systems for the more effective use of the core of specialists that exist must become more prevalent. Demand for integrated project management services will increase.

Technology for non-conventional hydrocarbon recovery and production must be deployed. As the quality of hydrocarbon declines, the importance of this technology will increase. The service industry must accommodate this change.

Future development

As we enter a new exploration phase, infield exploration and the enhancement of recovery from existing reservoirs will remain a key

contributor to increasing production. At the same time, accumulations of new oil in most of the accessible exploration areas will be in smaller fields or will be more difficult to recover. As a result, improved characterisation of the reservoir will be more important than ever before, and this will require much better evaluation of uncertainty and the consequent mitigation of risk.

In this new exploration phase, I am very excited about several technologies that Schlumberger has introduced. Q seismic is a huge improvement over all previous systems in terms of quality of seismic definition. Q technology provides improved, low-noise, repeatable seismic measurements that reveal subtle and complex reservoir details. Unlike standard techniques, it acquires data from every sensor digitally, avoiding conventional seismic signal averaging, and yielding information of much higher fidelity. In addition, Q offers faster processing – enabling usable time-lapse surveys offshore and quasi real-time results on land.

But Q technology also reduces risk. The integration of advanced wireline and logging-while-drilling data, together with newer techniques such as controlled source electromagnetics, offers even greater potential for understanding reservoirs.

Scanner services take evaluation to the next level by providing customers with a 3D scan of a formation and thus a deeper understanding of reservoir rocks and fluids. The first three services to be introduced are the Rt Scanner multi-array tri-axial induction tool, the Sonic Scanner advanced acoustic platform and the MR Scanner nuclear magnetic resonance tool. Scanner technologies see deep into the formation at multiple depths simultaneously to reduce the uncertainties associated with reservoir characterisation.

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One critical area of reservoir characterisation that will benefit from such technology is geomechanics – the study of rock stresses and long-term formation integrity. This enables the quantification of the impact of the drilling process, for example.

The integration of measurements is vital in the reservoir characterisation field. To develop this market, Schlumberger has purchased TerraTek, the global leader in geomechanical measurement and analysis. This will allow the company to integrate advanced measurements to mitigate the risk associated with complex reservoirs and lower-quality hydrocarbons.

Digital oilfield

We have all heard a lot in the past few years about the digital oilfield. We have seen, and will continue to see, the digital enabling of the various data streams used in exploration and production operations, be they data streams for drilling, fracturing or production.

Schlumberger's operations centre in Aberdeen can monitor up to 28 concurrent drilling operations in the North Sea, and a similar centre exists in the Gulf of Mexico. While some customers with large operations may prefer to have their own centres, others will want to contract this function out to a service company centre.

The benefits of such technologies are many, but above all, it is by enabling complex projects – where centres of expertise can be directly linked to the well site in real time to allow interaction between geoscientists and drillers – that these technologies are rapidly becoming essential to success.

Well testing is another technology that is growing in importance as interest increases in exploration and the development of smaller or more complex hydrocarbon accumulations. Due to cost and environmental pressures, oil and gas companies have greatly reduced the number and duration of the flow tests they perform on exploration and delineation wells in recent years.

While wireline formation testing tools have rendered the need for many tests obsolete, there is a growing recognition that there is no substitute for flowing the reservoir to make a good estimation of long-term reservoir performance.

Schlumberger recently introduced the Scope series of measurement-while-drilling and logging-while-drilling services, which dramatically improve drilling performance and well placement. Scope represents one more step towards improving recovery from smaller and more complex reservoirs. Scope services set new standards for reliability and data quality, while quadrupling industry standard data transmission rates.

PeriScope is a directional, deep electromagnetic imaging-while-drilling service that is revolutionising well placement with its unsurpassed ability to view the reservoir as the well is being drilled. This technology enables formation and fluid boundaries up to 15ft away from the tool to be continuously monitored so that horizontal and extended-reach wells can be drilled entirely within the reservoir sweet spot. From the very first field test, PeriScope customers have been able to eliminate sidetracks, enhance production and increase recoverable reserves.

The timing of all these technology introductions is fortuitous, in that they coincide with a new exploration cycle and with a growing need for better reservoir characterisation. ●