

New Thinking Boosts Maturing UK Continental Shelf

John Sheehan, Contributing Editor

With the record oil prices of recent years, major operators in the UK North Sea have been holding onto assets and extracting as much value from them as they can. Companies such as BP, Shell, Total, and Chevron are applying new technologies to increase recovery rates and prolong the life of their existing assets.

This is a reversal of the trend of just a few years earlier when smaller independents came in to the region and snapped up producing assets that were deemed noncommercial by some of the indigenous oil companies. As a result, the UK North Sea is now being given a boost by both the established players and the independents, which are also applying innovative thinking and technology to tap the basin's existing reserves.

Malcolm Webb, Chief Executive of Oil & Gas UK, the leading representative body for the UK offshore oil and gas industry, has always been wary of tales of the bigger players turning their backs on the North Sea.

"I would say the stories of the majors leaving the North Sea were always slightly overdone," he said. "I think what we saw was a rebalancing of their portfolios. We saw some rather good asset deals for the basin going ahead and newcomers like Apache and Talisman coming in, picking up older assets, and bringing in new vitality and reworking them. Underneath all that we saw a continuing determination of the majors to go on working the basin generally and they have continued to invest. I think the view they were on a mass departure route was always overplayed.



Malcolm Webb, Chief Executive of Oil & Gas UK.

"I think there are very positive signs that they are continuing to invest. If we look at majors like Total, Chevron, and BP, it is very interesting that they are all involved in the West of Shetlands activity. Total is looking to take forward some significant investments out there and Chevron has made good discoveries there as well, so there is lots of activity going on. They are also active elsewhere in the central and northern North Sea."

Moves to Reverse Production Decline

The UK Continental Shelf (UKCS) has so far had approximately 38 billion bbl of oil produced and the consensus among geoscientists is that another 25 billion bbl are still in play. But there is an alarming 7% annual production rate decline on the UKCS, a rate that Webb says must be pegged back.

"The thing that concerns me is that I am not sure we are tracking down the right curve at the moment," he said. "The underlying decline rate of the offshore as a whole seems to be around the 7% mark, which is much higher than it should or need be. If that continues, we would be in a sorry position in 12 years' time and it would mean that we would probably only recover something like 10–12 billion of those 25 billion bbl. That would be a disaster for the UK economy and the UK industry and it cannot be allowed to happen so we really do need to address the issues of this basin and give it some special focus."

Jim Hannon, Managing Director of oil and gas consultancy Hannon Westwood, agrees. "We have the oil and gas resources in the North Sea to increase production; I am quite clear on that because of our results over the past 3 years. But what we do not have is the political will and financial will to push it through. I can still be optimistic about it. The reality is a 7% decline, but it is wrong to say the North Sea does not have the potential, it really does. There are thousands of prospects and hundreds of discoveries that only get partial treatment and do not get full attention the way they used to do back in the 1980s. Only now are we starting to recover the well count we used to have."

BP's Investment Drive

BP appears to be a leader in the drive to maximize value from the North Sea, with huge investments in technology and the opening of a new state-of-the-art headquarters in Aberdeen. According to Oonagh Werngren, the company's

DynaPump



Dinosaur



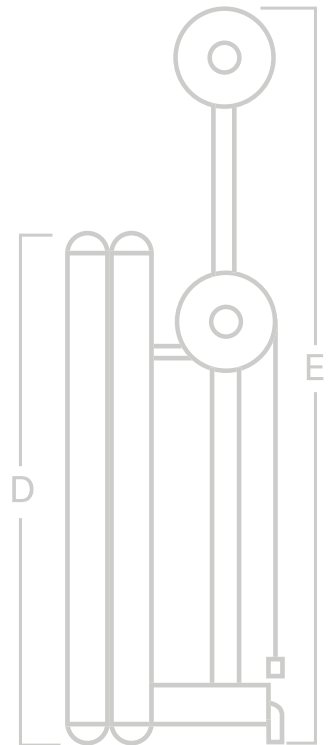
Evolve or become extinct

DynaPump offers significant advantages over other forms of artificial lift. For starters, a DynaPump unit generally costs up to 36% less than a comparably equipped new conventional unit and offers a longer stroke length than is available from competitors. The evolutionary advantages don't stop there. DynaPump features include:

- Adjustable automatic flow control
- Light, portable, and easier to install
- Lower unit, transportation, and installation costs
- Low installed power. Lower power consumption

DynaPump's lower upfront investment, advanced features and longer stroke — for optimized plunger movement downhole — translates to increased production rates, lower lifting cost per barrel, leading to a faster return on investment, **rendering conventional pumping units extinct.**

Contact a DynaPump representative today to find out more.



2441 High Timbers | The Woodlands, TX 77380, USA | Phone: 281-973-0050 | Fax: 281-220-6492

Inquiries: info@DynaPumpInc.com | www.DynaPumpInc.com

head of North Sea Technology, the company is focusing on three core areas of technology to garner value from its 45 North Sea fields.

“Delivering a sustainable future in the North Sea where costs are rising and volumes are decreasing relies on evolution, on the ability to do business differently and more cleverly,” she said. “To increase recovery we concentrate on technologies in three main areas. The first is to improve our understanding of the location of remaining hydrocarbons and that is primarily through 4D seismic. Secondly, we are looking to improve the effectiveness of our well penetrations and interventions in pay zones, and that would be primarily through drilling and completion technologies. Thirdly, we are improving the quality and speed of our operating decisions by delivering subsurface and topside information to our onshore and offshore staff in a common environment. That specifically is in advanced collaboration environments (ACEs).”

There are now 11 ACEs at BP’s new headquarters, where real-time data including high-quality audiovisual is streamed in to allow onshore and offshore teams to collaborate.

Werngren says investment in technology is needed across many areas given the diverse nature of the fields and facilities under BP operatorship. “One of the most powerful is our ongoing development and integration of computer processing power and enhanced seismic technology, which together have enabled us to better image both reservoir structure and the movement of the mobile reservoir fluids within. This improvement in visualization has enabled BP staff to optimize new well placements and improve operating tactics for active wells.”

Advances in seismic techniques in the North Sea were also highlighted by David Liddle, Technology Manager, Production Wells and Subsea, of the Industry Technology



Apache's UK Forties field.



One of BP's advanced collaboration environments at its new facility in Aberdeen.

Facilitator (ITF), which is currently collaborating on 21 enhanced technology projects with BP.

"There are new developments in continuous source electromagnetics (CSEM). This was more of a technique that previously was only applicable in deep water because of the way the technology works," he said. "Previously it was applied in water depths of about 3000 m and now it is less than 100 m, which is more applicable to the North Sea.

"The advantage of CSEM is that it actually allows you to view fluids in the reservoirs instead of just the geology that you get from seismic, so the combination of the two has significant advantages. These techniques are coming into the North Sea and being adopted."

Field of the Future

Key to BP's strategy in the North Sea is its "field of the future" program, which has been rolled out across the majority of the company's producing assets. "The full scope of the field of the future program covers development and deployment of technology and business process solutions to most aspects of oil and gas field operations—from reservoir and wells to export, in both mature and new fields, onshore as well as offshore," said Bill Hill, BP's head of Production Engineering for the North Sea. "Technologies have been grouped under a single program to obtain maximum leverage from them by ensuring appropriate integration, by making strategic choices about where they are deployed, and by ensuring rapid propagation of early learnings."

Hill says the program is a key component of BP's North Sea technology strategy. "It is primarily focused on enabling high-quality, near-real-time operational decisions in day-to-day production and drilling operations, facilitated by our ACE facilities," he said.

To this end, BP's headquarters is now linked to all its operational fields in the central and northern North Sea, including Schiehallion, Magnus, Valhall, Clair, Andrew, Harding ETAP, and Bruce.

Werngren says, "We are conveying an increasing volume and variety of real-time data from the wellbore to wellside and shore-based engineers during drilling operations. We do this to mitigate drilling difficulties, to reduce nonproductive time and well costs. We see that as being fundamental to improving the commerciality of smaller oil pools, particularly as we look to the future."

As part of its field of the future program, BP has also implemented its proprietary Integrated Surveillance Information System (ISIS). "The technology accepts near-real-time sensor data from wells and allows its visualization and analysis," Werngren said. "The primary users of the system are office-based engineers. ISIS has been deployed on around 50% of our production in the North Sea and is helping us manage our wellstock and improve our production optimization capability.

"We're actively tracking the benefits of our field of the future program and ISIS is a core component of that. Our successes to date include early detection and mitigation of slugging events and improved new well startups. The technology also protects well integrity and provides early detection of sanding events, well backflows, and hydrate formation."

Chevron Looks to Captain

BP is not alone among the major operators in the North Sea looking to use innovative techniques to enhance oil recovery. Chevron has a long-term project under way to boost the lifespan of its Captain field, from where it hopes to achieve a recovery rate of 50% by the end of the field's life—with every 1% increase equivalent to 10 million more bbl of oil.

The company has already carried out studies into the viability of extended-reach drilling and the use of multilateral wells in the Captain reservoir with positive results so far. Now Chevron is going further with a project to recover even more oil with polymer-augmented enhanced oil recovery (EOR). The team, led by Stewart Mitchell, Project Manager, Asset Development for Chevron, is evaluating EOR using a phased approach employing polymer flood followed by potential application of alkali surfactant polymers to improve the sweep efficiency in the reservoir.

Chevron says that polymers in injection water essentially thicken it, pushing more oil ahead of it as it washes through the reservoir, while surfactant with alkalides acts like washing-up liquid on greasy dishes, separating and mobilizing more oil from the reservoir sand. Polymer flooding has been successfully applied in the industry previously, if mostly on small-scale applications.

"Lessons learned on polymer flooding, particularly from projects that have been less than entirely successful, are helping the project team refine its approach," Mitchell said. "Incomplete reservoir intelligence and management, poor ability to model process mechanisms at field scale, dependence on unscaled laboratory experiments, and unavailability of appropriate polymers or surfactants in the quantities required are all factors that have emerged as barriers to success."

A major challenge for Chevron will be to manage the logistical complexities of a large-scale application in a

major asset offshore which, if successful, will be a North Sea first, he said.

Independents In On Technology Game

Not to be outdone, the recently arrived independents are also tapping new technological advances to drive their projects forward. Oilexco's work to develop the Brenda field is a prime example, where the Canadian operator has used directional deep electromagnetic logging-while-drilling (LWD) technology to produce the field's reserves.

Oilexco had to consider where to place production wells on the field to give them the best possible production rate, and drain as much of the reserves as possible while not producing water. The Brenda field wells had to be placed high in the reservoir, which would not have been possible with conventional LWD and geosteering techniques.

This new technology allows reservoir contacts to be mapped from up to 15 ft away, allowing wells to be drilled relative to reservoir contacts. The horizontal production wells on Brenda were drilled with this technology. Venture Production, meanwhile, is the first operator in the UK North Sea to tap a field with one of Sevan Marine's innovative cylindrical rigs.

Apache, which came into the North Sea with its purchase of the Forties field from BP, continues to breathe new life into the 38-year-old asset. The company has just asked AMEC to carry out work on two, multimillion-pound contracts that will extend the life of the field. AMEC will carry out a front-end engineering design review and detailed design for the Forties Charlie deep gas lift compression project. The project includes the addition of a new high-pressure gas lift compressor package into an existing module on Forties Charlie, together with a new produced water treatment package and vessel internals.

The second contract award covers the design, construction, and commissioning of Phase 1 of the Forties field switchboard upgrade project. Apache says the project will enable expansion opportunities as well as improve operations reliability for the Forties field. The project is expected to take 3 years to complete and is technically challenging because it will be carried out with minimal impact to existing operations and with no major outages.

The work on Forties is part of a number of key facility projects, including new power generation and multiplatform gas and power distribution systems, export pumping, produced water handling and injection systems, and drilling rig package upgrades.

Jim House, Regional Vice President and Managing Director, Apache North Sea, said, "Over the last 5 years, Apache North Sea has transformed the Forties field into one of the UKCS region's more notable oil producing assets. This has been achieved through a sustained program of significant investments in projects to renovate a mature operation, critical long-term and fabric maintenance as well as an active drilling operation. These two new projects awarded to AMEC are part of our long-term development plan, and together with a range of others,

will help deliver sustainable production growth as well as achieve our integrity and safety objectives."

Subsea Is the Key

Oil & Gas UK's Webb also highlights the importance of subsea technologies for the continuing development of the UKCS. "If I was going to focus particularly on one area of technology that is important for the maturing UKCS as we go into smaller fields and smaller accumulations that we need to tie back into existing infrastructure, it has to be subsea technology," he said. "About 40% of the technology from the UK offshore is coming through subsea equipment and technology and that is hugely important for the basin. It is something we lead the world in. Companies of all sizes have been playing their part in that.

"I think what we are able to do on tiebacks and extended tiebacks is important. These can be done in deep water as well and this will be important for the West of Shetlands region. The majors are doing great things in subsea and Total's Jura field development is a fantastic example of the application of really stunning subsea technology. The sheer scale and magnitude of that and the speed with which it was brought through in under a year and a half from discovery to production was impressive."

Liddle, of ITF, highlighted the exportability of the UK's subsea technology. "Subsea technology has got applications globally and the UK is one of the leaders in the field of subsea technology and has got a lot to offer. A lot of what is being done around the world was initiated in the North Sea. Tiebacks are a big issue and subsea processing is a goal we are moving toward. The Norwegians are very advanced in that. The ultimate goal is getting it back to the beach but we are some decades away from that yet."

The Future

As the majors and the independents drive forward with their optimization plans, recent events in world financial markets are certain to have a bearing on what will go on in the UK North Sea. Hannon believes the next year belongs to the intermediate companies, which have the cash flow to move to swallow up smaller companies.

"The next 12 months belong to companies like Dana, Cairn, Venture, Oilexco, and perhaps Canadian companies that are big enough to have funds to buy up production that goes on sale," he said. "The smaller new entrant, meanwhile, has got a different problem altogether, in that it would still like to get into the UK but we have about 100 companies working here on top of the original 50 or so who have no production and are trying to gain admission through drilling. They are in deep trouble because with the credit squeeze, a lot of them now have no financial base on which to proceed.

"I have not seen any dilution in appetite to get into the North Sea by smaller companies, but the financial ingredients are now wrong for them. I think the reason we will see them leave the North Sea is not that they do not want to be here but because they will not get the funds to stay here and will not get the funds for the 2 or 3 years that they need while they are drilling wells." **JPT**