BP in Rumaila

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Mr Chairman, Ladies and Gentlemen.

I'd like to thank the organisers here at the Energy institute for this kind invitation to BP to talk about our recent move into Iraq.

In 1953 the Iraq Petroleum Company (IPC), of which BP was a key partner, discovered oil in the Rumaila prospect of Southern Iraq. In 2009, BP signed a Producing Field Technical Service Contract to grow production and recovery from the field that it helped discover more than 50 years ago.

In this talk, I will share with you BP's perspective on Rumaila, its context, reservoirs and resources, the nature of the BP relationship with Iraq and outline a little of what the future looks like.

Context

Firstly, it is worth considering the geology and tectonic make-up of the whole Middle Eastern oil and gas province, and how Rumaila fits into it. The image shows the high Zagros Mountains passing southwards into the foothills of Kurdistan in Iraq, and Khuzestan in Iran. The foothills give way southwards to the subdued landscape of the Zagros foreland basin that is partly submerged beneath the present day Gulf.

The Zagros foothills and foreland basin hold the greatest concentration of oil in the world. It was in the Zagros foothills that Middle Eastern oil was first discovered in the fold structure of Masjid y Suleiman in Persia in 1908; natural oil seepages and surface structures were the clues that led to the discovery. Subsequent exploration focussed on similar fold structures trending north-west/south-east in the Zagros foothills.

It was fully 55 years later, with the help of seismic data, that Rumaila was discovered, in the Zagros foreland. The structures in the foreland have a north/south trend, at a high angle to the Zagros. These are old structures that date back to at least the Late Cretaceous. Because they are largely buried with little to no surface expression, these structures were found many years after the first oil in the Middle East as seismic data was required for their discovery.

The secret to the oil and gas wealth of the Middle East is the multitude of petroleum sources and reservoirs the province contains. In general terms the lower Gulf is characterised by carbonate or limestone reservoirs. However, in the Upper Gulf, Early Cretaceous delta systems were developed over the Arabian margin and deposited a series of stacked sandstones interbedded with the carbonates.

The Rumaila/W Qurna oil field is one of these old structures with both sandstone and carbonate reservoirs. Looked at as a single structure, it ranks second in the Middle East in terms of oil originally in place after the great Ghawar Field of Saudi Arabia.

Rumaila stratigraphy and field area

Geologically the Rumaila area has experienced a very special history. The Upper Gulf area is the locus of two Lower Cretaceous deltaic sequences (Burgan and Zubair) which have interrupted a long history of carbonate deposition along the northern margin of the Arabian plate.

The cartoon shows the multiple petroleum systems of southern Iraq. In Rumaila oil is reservoired roughly equally between clastic sandstone and carbonate reservoirs. It is the clastic reservoirs that have given Rumaila its prolific past and that will initially drive the future production from the field.

In Rumaila, this clastic reservoir is known as the 'Main Pay' (geologically, it is the Zubair Formation of Hautervian & Barremian age). The Zubair Formation extends over the southern and central regions in Iraq. A similar but slightly younger clastic sequence known as the Nahr Umr Formation is the main reservoir of the giant Burgan Field of Kuwait, to the south of Rumaila.

Rumaila/West Qurna – surface and sub-surface

The structural map of the Rumaila/West Qurna structure shows it to be a continuous, single, anticline; a single structure comprising a series of three subtle domal structures.

However, on the surface there is a very different story. The satellite image shows the great variation and changing operating environment. This has proved significant in the development of the Rumaila / West Qurna structure.

The southern half of the structure – the area known as Rumaila – is largely open, uninhabited stony desert. The only thing existing there is the oil field and its infrastructure. This is a relatively easy operating environment with few issues of land ownership and access.

When Rumaila was discovered it was believed to be a single domal structure confined to the south of extensive marshland to the north. This area later became South Rumaila as prospecting moved northwards and discovered the North Rumaila continuation in 1961. Later still in 1964 seismic prospecting led to the definition of the third dome of West Qurna.

On the surface, West Qurna was originally entirely covered by marsh land. Today, it has been split into two phases West Qurna I and West Qurna II. West Qurna I comprises drained marshland developed as farmland. Further north, the Euphrates River crosses the structure from east to west and has a number of significant sized towns on it. The Euphrates separates the developed part of West Qurna I to the south from the undeveloped West Qurna II to the north.

The Rumaila/W.Qurna structure holds the order of 110 billion barrels of oil originally in place. The oil is split between the main formations – primarily the Main Pay clastic reservoir, the shallower Mishrif carbonate formation and the deeper Yamama formation. There is also further, deeper potential. In the Main Pay and Mishrif reservoirs, the volunes are well-described, but the other reservoirs still require significant definition before a definitive volume can be determined. Suffice to say the volume is large.

The sands of the Main Pay are restricted to approximately the southern half of the Rumaila/West Qurna structure; their presence basically defines the Rumaila Oil Field.

These Main Pay sands of the Zubair Formation have an average porosity of 20%, and high permeability. The oil is sweet and about 34°API. Oil recovery from individual wells has topped 200 million barrels, with initial rates commonly of 60,000 barrels a day achieved in large completion wells during the expansion program of South Rumaila in the mid-1970s.

The reservoir experiences a strong aquifer drive from the South West and there is evidence that the oil water contact is slightly tilted as a result of this. These conditions lead BP to be optimistic of achieving a very high recovery factor for the Rumaila Main Pay sands of the order of 65% to 70%.

In contrast to the Main Pay which only exists in the south of the formation, the carbonates of the Mishrif formation and the Yamama Formation are developed throughout the structure, although their quality as reservoir varies somewhat. The shallower Mishrif limestones have good porosity but much lower permeability. Streaks of high permeability rock also complicate recovery from the formation, yet there is a large amount of oil in place and modern downhole technology will help push recovery way beyond today's target.

Rumaila resources, reservoirs and production

Since its discovery, Rumaila has been well-developed. The current infrastructure in place on the field consists of over 800 wells – over 550 producers and more than 150 injection wells – feeding 10 gathering and degassing centres. Just over half of the producing wells are flowing today; but it is the wells that are not flowing where the short term oil opportunity lies.

In addition, water currently produced from the Main Pay is disposed of in shallow water disposal wells. This presents a major opportunity for the longer term, as the water can be processed and re-injected back into the reservoir, reducing the need to source new water.

Rumaila is clearly a brownfield development with a huge amount of kit in the ground and on the surface. This fact has important implications for our confidence in our ability to reach the initial production target, which I will touch on later.

The infrastructure, such as the degassing stations, has been well maintained. This is quite impressive considering the turbulent history of the region. This turbulence is reflected in the production history of these great reservoirs.

Rumaila production

It is clear that Rumaila has had an interesting life. After achieving a peak production of about 1.6 million barrels a day in 1980, Rumaila's production has experienced a turbulent history, with major falls reflecting the major conflicts of the past 30 years.

Despite this, throughout this time the South Oil Company (SOC) has done a remarkable job in sustaining the production capacity of Rumaila, including a substantial period under sanctions, and with minimal investment and modern technology.

The job BP has now taken on is to work with the SOC and our partners to renew investment in the field and to bring new and innovative technology with the singular intent to grow production beyond the previous peak; sustain it for several years; and in doing so increase the expected recovery factor of Rumaila.

So what does the contract look like?

Technical service contract

The Iraq Producing Field Technical Service Contract (PFTSC) comprises a simple service fee, paid on incremental production above an agreed base production decline curve, together with cost recovery. Cost recovery is drawn from a pot comprising 50% of the incremental oil revenues.

The contract incentivises the contractor to deliver rapid production growth, firstly to trigger cost recovery by exceeding the initial improved production target (IPT) and later to achieve the plateau production target (PPT) as early as possible. It also encourages sustaining that plateau for seven years.

So, to be successful a company needs to believe that the IPT can be achieved rapidly, preferably before major capital investment has been made. Also that sufficient incremental production can be achieved fast enough after major capital investment, so that the full remuneration fee and cost recovery can be paid and financial exposure limited.

With Rumaila we felt confident about these issues.

The development plan

BP has been working with Iraq on Rumaila since April 2005 when we signed a Services Agreement with the Ministry of Oil for an “Integrated Rumaila Oil Field Study.” This comprised building a modern database for Rumaila and doing an initial, integrated reservoir analysis. The work allowed us to build on our historic knowledge and gain confidence in both the performance potential of the Rumaila reservoirs and their ultimate recovery. We have done this work hand in hand with the SOC and Ministry of Oil and so feel it is grounded in the deep local knowledge and capability that exists in Iraq.

The development plan starts with a focus on securing the base production from both the Main Pay and the Mishrif reservoirs. This will be done by executing a rehabilitation phase over the first three years. A full field surveillance programme will be established on the existing Rumaila well stock. From our earlier work we have more than a year’s work of well workovers already identified, largely involving the addition of electric submersible pumps (ESPs) to improve well deliverability and workovers of the old wells. Rig count will ramp-up during this phase in a drive to bring on new dry oil and grow towards the IPT and the later PPT.

Longer term we will enter the enhanced redevelopment phase, which will grow the well stock through a major drilling campaign, eventually deploying 20-25 drilling rigs and a number of workover rigs. This early work will focus on the Main Pay reservoir and also start the full field development of the Mishrif. The Main Pay will be the main story in the early years; the Mishrif peak will follow and sustain the field. This will be accompanied by a field-wide waterflood campaign to maintain field pressure.

As the work progresses we also plan to evaluate the deeper reservoirs of the Lower Cretaceous and Jurassic and their potential for development to help sustain the plateau beyond the planned seven years.

BP will bring a number of proprietary technologies to this programme, including Bright WaterTM injection, POWERliftTM ESPs, Field of the FutureTM remote monitoring and Production Technical LimitTM.

The Bright Water polymer will address the permeability heterogeneity of the Mishrif reservoir, blocking off the high permeability streaks and so improving the efficiency of water flooding. The Powerlift ESP is a more robust pump, designed for 3-phase flow and downhole repair and replacement. Field of the

Future will help manage the field in real time as the data from wells becomes transparent and available. These have a proven track record of improving the recovery from our other fields.

Organization

Our confidence that we will achieve the targets also comes from the partnership of complementary expertise we have assembled: BP, CNPC and SOMO working with Southern Oil Company (SOC).

SOC are the people who have nurtured Rumaila this far. They have the deep local knowledge and capability to make things happen. They hold all the keys to this part of the world and its reservoirs.

In addition, we have CNPC who have their own deep expertise in improved oil recovery on many of the great Chinese fields and also have access to a very competitive supply chain.

BP's experience of taking on brownfield developments has been deepened considerably through our TNK-BP venture. There we have transformed the production potential of the Russian supergiant Samatlor field, which has many similarities to the Rumaila Main Pay reservoir. We hope to be equally successful in Iraq. I have already highlighted the proprietary technology BP brings.

So what are the challenges for achieving the IPT and sufficient incremental production?

Opportunities and challenges

Of course there are a number of challenges that will need to be addressed to meet our targets, and those of the other TSCs Iraq has signed. Regionally several large development issues remain such as access to sufficient water for large water flood projects, gas capture and utilisation and sufficient export ullage for the oil production growth.

These issues are well known and are being addressed by the SOC, BP and others in the region to ensure a timely solution.

A number of logistical issues could also impact the pace of development. There will now be 10 developments competing for resources; skilled people, oil field services etc.

I hope I have given you a sense of the great scale and quality of the Rumaila oil field. The field has a remarkable history and I hope you will see that its future can be even more remarkable with the right investment technology and people involved.

Thank you.