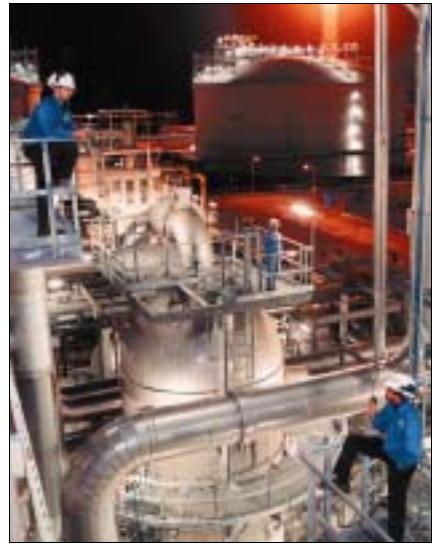




# Integration

## the key to meeting energy challenges



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Malcolm Brinded is Executive Director Exploration and Production of Royal Dutch Shell plc. He is also responsible for the Middle East, Russia, North Africa and Nigeria. He was a Managing Director of The “Shell” Transport and Trading Company, p.l.c. from 2002 until the unification with Royal Dutch in July 2005.

He was born in the UK in 1953 and joined Shell after graduating in Engineering from Cambridge University. He has worked for Shell companies in Brunei, the Netherlands, Oman and the UK. In 1998 he became Managing Director of Shell UK Exploration and Production – responsible for a fifth of the country’s offshore oil and gas business – and in 2001 the Director for Strategic Planning, Sustainable Development and External Affairs in Shell International. From 1999 until 2002 he was Shell Country Chairman in the United Kingdom.

He is a Fellow of the Institution of Civil Engineers and of the Royal Academy of Engineering and an honorary fellow of the Institution of Mechanical Engineers. He was appointed CBE in 2002 for services to the UK oil and gas industry.

He is a member of the Russian Foreign Investment Advisory Council and also of the Shanghai Mayoral International Business Advisory Council.

The first International Petroleum Technology Conference – organised by four leading professional societies and under the patronage of His Highness Sheikh Hamad bin Khalifa Al-Thani, Emir of the State of Qatar – is a major step. Tackling the world’s energy challenges will depend on the industry’s ability to develop new technologies and deploy them – in an integrated way – effectively. The Middle East – with over half the proved oil and gas reserves, and significant potential for further discoveries – will be at the heart of this.

It is hard to overestimate the importance of this multi-disciplinary conference. The world is beginning to comprehend the real challenge of meeting expanding energy demand, while tackling its impact on our climate. Both depend on our ability to develop new technologies and deploy them together effectively. And the Middle East is at the heart of meeting this challenge.

We are honoured to be under the patronage of His Highness Sheikh Hamad bin Khalifa Al-Thani, Emir of the State of Qatar, and hosted by Qatar Petroleum. Qatar’s commitment to innovation and technology development, including in the Science and Technology Park, is well known. So it is fitting that this first ever combined technology conference – organised by four of the industry’s leading professional societies – should be here in Qatar.

#### *Facing up to new challenges*

Global energy demand could increase by more than half in 25 years, although there’s scope to reduce this by greater efficiency.

We will still rely on fossil energy, with oil and gas expected to meet 60% of demand in 2030. And the world will increasingly depend on the Middle East, with over half the proved oil and gas reserves, and significant potential for further discoveries.

This region’s own energy demand is projected to double by 2030, with gas overtaking oil to become the major fuel. This reflects industrial development and economic integration, with the likely development of a major new regional gas supply infrastructure.

According to the IEA, oil exports from the Middle East could rise by almost 75% and gas exports by 350% by 2030, although countries will decide for themselves how to manage their resources.

The region is characterised by prolific giant fields with few wells. In most countries there has not been the need for such intensive exploration and application of advanced production technologies as elsewhere, which gives real scope for the future.

But the challenges are many:

- increasing recovery from existing fields,
- developing more difficult resources,
- finding new resources in different settings,
- delivering gas to distant markets,
- and reducing environmental impacts, including carbon dioxide.

The IEA’s reference case would require investing over a thousand billion dollars in oil and gas in the Middle East by 2030, over \$40 billion a year. For oil – which accounts for 60% expenditure – this would be twice what it was over the last decade.

I don’t doubt the industry’s ability to meet the challenges, here in the Middle East and around the world. In particular I believe we will be able to continue driving up recovery factors:

- applying new technologies to better understand and monitor the subsurface,
- drilling faster and more productive wells,
- using ‘smart’ tools to manage reservoirs more efficiently,
- and realising the potential of Enhanced Oil Recovery.

Raising average conventional oil recovery from 35 to 45 percent could add some 20 years of current production.

The key is to integrate:

- to integrate knowledge, tools and data,
- to integrate appraisal, development and operations,

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- and to integrate over field life cycles, where early decisions affect long term potential,
- to combine new skills with practical experience,
- and to integrate along the value chain from reservoir to customer.

The world depends on the industry's ability to sustain high levels of investment as the search for energy leads us to increasingly challenging and technically demanding environments.

The global economy coped relatively well with prices in the \$40 or so a barrel range during 2004. But at \$60 a barrel and above there is clearly increasing risk that oil and gas demand will be hit by economic downturn and by costly substitution measures driven by both consuming government policy changes and consumer choice. We already see this beginning to occur, as happened after 1979 when oil consumption fell sharply and took a decade to recover.

If this happens, we could see significant downward pressure on prices emerge, just as the world needs increasing investment to meet the expanding demand for energy. And, as we saw after 1998, even when such an economic downturn is short-lived, the impact on investor confidence and future upstream investments can be prolonged.

The point here is that a downturn of the global economy caused by very high prices is clearly not in anyone's interests. Great volatility in oil and gas prices would inhibit the growth of the new supplies necessary to underpin global economic development.

In any case this industry faces great challenges. And the world depends on our ability to meet them.

The quality of the contributions to this conference demonstrates the strengths brought to this task from all around the world, and not least from here in the Middle East. Among authors from 35 countries a third come from this region. The Middle East is also very well represented in the competition for the 'Excellence in Project Integration' award this evening.

### *Integration is the key*

Let me touch on some examples of integration.

As existing basins mature we need to explore elsewhere: over large areas, in harsher conditions, with deeper, more complex geology. This means applying a range of technologies beyond conventional seismic, including:

- satellite imaging,
- airborne sniffing,
- electromagnetic methods – with seabed logging here in the shallow waters of the Gulf soon,
- and enhanced seismic imaging.

We need new tools to integrate diverse data quickly. And we also need people with wide geological and geophysical understanding, able to apply global knowledge locally.

We have an important session on the future of exploration on Wednesday and a range of valuable exploration papers, including one on the challenge of exploring in Saudi Arabia's Rub al Khali desert.\*

Subsurface integration is the essential enabler for all our efforts to improve recovery. It doesn't happen just by telling people to talk to each other.

A 3D All the Way™ approach we use in Shell integrates work in parallel, rather than sequentially. Seismic, geological, petrophysical and production information is integrated to produce a dynamic 3D model from the outset, adding more understanding at each phase. This enables early business decisions and provides feedback to influence the study, discarding unrealistic options and focusing on key uncertainties.

For example, this was used in planning redevelopment of a carbonate reservoir in Malaysia. Karst features – elusive on seismic – were identified as a key drilling risk. Rough properties from multi-attribute seismic interpretation were refined against production history to screen proposed wells.\*\*

Enhanced Oil Recovery is increas-

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\*Exploring the “Empty Quarter” -- early experience and lessons of a new upstream venture in Saudi Arabia P. Allman-Ward & W. Voggenreiter IPTC 10231 (2005)

ingly important. But complex projects depend on integration. Two projects in Oman illustrate the challenges.

PDO is undertaking its first full-scale EOR project in the Harweel Cluster in southern Oman. Injecting miscible gas aims to raise recovery from the Pre-Cambrian heterogeneous carbonate reservoir from just 10% to at least 44%. But the sour gas must be injected in exactly the right place – at the right molecular weight, composition and pressure to suit varying and fierce reservoir conditions. So it is vital that subsurface information is properly integrated into the project design.\*\*\*

In Qarn Alam in Central Oman, PDO plans to use thermally assisted gas-oil gravity drainage in a highly fractured carbonate reservoir, to increase recovery of the viscous oil from less than 5% to 35% eventually. A range of subsurface information has to be integrated to model the fracture network used to both distribute the steam and recover the heated oil.\*\*\*\*

How such challenges are being tackled – by PDO and other companies – will be discussed in papers and poster sessions over the next three days. I know they will offer valuable learning opportunities for us all.

On Gas to Liquids ... I will have the privilege this afternoon of going for a drive in the first car powered by GTL Fuel in the Middle East with His Excellency Abdullah Bin Hamad Al-Attiyah, whose strategic vision has put Qatar at the heart of developing this important and commercially attractive technology.

With its cleanliness and efficiency,

GTL Fuel can play an important role in cutting vehicle emissions – in existing vehicles and in the more efficient dedicated engines now being developed. By 2015 there could be 10 million tonnes of GTL Fuel marketed a year.

But that requires a sustained effort to develop markets:

- working with vehicle manufacturers, transport companies and regulators,
- undertaking trials,
- and marketing GTL fuels and lubricants.

#### *Harnessing capabilities*

We face great challenges as an industry and need to harness all our capabilities to succeed.

This starts, with those working in this industry across the Middle East, as well as the young people studying to join them. The contributions to this conference demonstrate the professionalism that exists. Building on those capabilities is a priority.

The national companies of this region understand what is required to develop their national resources – and can call on the capital, technologies, wide experience and capacity to integrate of global operators, as well as the specific skills of service companies.

Much is made of competition between international operators and service companies. I think this is overstated. We have different roles and strengths. We need to integrate all our capabilities.

We also need to develop those capabilities: as individual companies seeking competitive advantage – the driving force for innovation and improvement – and together within this industry.

I believe that the IPTC offer a remarkable learning opportunity to help us all go forward. It has taken a great deal of effort from all concerned, particularly our hosts here in Doha. It is a great pleasure to welcome you to the first International Petroleum Technology Conference.

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*“Enhanced Oil Recovery is increasingly important. But complex projects depend on integration.”*

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\*\*3D-All-The-Way™ and F6 further development  
L. Alessio et al SPE-87014 (2004)

\*\*\*How to incorporate emerging subsurface information in a front end design: a green field miscible gas flood example from the southern part of Oman H. Soek IPTC-10460 (2005)

\*\*\*\*Accelerated understanding and modelling of a complex fractured heavy oil reservoir, Oman, using a new 3D fracture modelling tool K. Rawsley et al IPTC-10095 (2005) & Steam injection in fractured carbonate reservoirs: starting a new trend in EOR R. Penney et al IPTC-10727 (2005)

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