

NAVIGATING COMPLEXITY, UNLOCKING POTENTIAL



Maersk Oil ADIPEC 2012 Knowledge Series



MAERSK
OIL



Maersk Oil ADIPEC 2012 Knowledge Series Highlights...

LEADING INDUSTRY EXPERTS joined to discuss some of the biggest challenges and opportunities facing the energy industry at the Maersk Oil ADIPEC Knowledge Series, held in association with Gulf Intelligence, at the ADIPEC 2012 Conference and Exhibition, November 11th & 12th 2012.

The industry faces a unique set of challenges in the development and production of hydrocarbons as we enter the era of 'post easy oil'. There is a growing realisation that new recovery technologies and partnerships will be required to harvest previously inaccessible or commercially unviable hydrocarbons, as conventional energy resources dwindle and world demand increases.

The overwhelming takeaway from the Knowledge Series, was that this is exactly the right time to start working closer together, to collaborate more. It is only through trusting partnerships – with peers in the international energy industry and along with host governments – that we can go to new corners of the globe to explore previously impossible areas and develop the technology to access oil and gas thought to be inaccessible or non-commercial.

CONTENTS

02	MAXIMISE RECOVERY: FAST TRACK CO2 EOR TECHNOLOGY IMPLEMENTATION IN THE POST EASY-OIL ERA By Bob Alford, Senior Business Development Manager, Maersk Oil
06	PANEL DISCUSSION Maximise Recovery: Fast Track CO2 EOR Technology Implementation in the Post Easy-oil Era
<hr/>	
12	AN NOC-IOC 21ST CENTURY PARTNERSHIP - TRANSFORMING THE MARGINAL TO THE COMMERCIAL By Soren Frank, Director of Maersk Oil Research & Technology Centre
16	PANEL DISCUSSION An NOC-IOC 21st Century Partnership: Transforming the Marginal to Commercial
<hr/>	
22	GULF RESEARCH & DEVELOPMENT: ONE COMMON CHALLENGE, MANY SHARED SOLUTIONS? By Frans Van Buchem, Principal Geologist, Maersk Oil
26	PANEL DISCUSSION Gulf Research & Development: One Common Challenge, Many Shared Solutions?
<hr/>	
32	DEVELOPING LOCAL TALENT: BETTER PREPARED FOR THE ENERGY CHALLENGES AHEAD? By Nikolaj Svane, HR Director, Maersk Oil
36	PANEL DISCUSSION Developing Local Talent: Better Prepared for the Energy Challenges Ahead
<hr/>	





Maximise Recovery: Fast track CO2 EOR Technology Implementation in the Post Easy-Oil Era

**By Bob Alford, Senior Business
Development Manager, Maersk Oil**

The TriGen 'oxycombustion'

technology is derived from the space industry and involves burning gas together with pure oxygen to produce clean power, pure water and 'reservoir ready' carbon dioxide. The compact TriGen combustor fits in a box the size of a Maersk shipping container and combusts natural gas at high pressure and high temperature to provide optimal efficiency and complete combustion. The resulting high purity CO₂ is then fully captured – making the power generation emission-free – and pipelined to oil fields for Enhanced Oil Recovery (EOR).

The A.P. Moller-Maersk (APMM) Group of companies is active in deploying technologies that reduce the carbon footprint of its global operations for the benefit of all its stakeholders. The added benefit of TriGen for APMM's Maersk Oil subsidiary is that the resultant low cost carbon capture also makes EOR operations economic creating both an environmental benefit and an attractive investment opportunity. CO₂ is already a well proven EOR agent to produce oil that would otherwise not be recovered. The CO₂ is injected deep underground in reservoirs that have already stored hydrocarbons without leakage for millions of years which ensures the CO₂ storage integrity.

It was TriGen's potential to enable EOR that first caught the eye of Maersk Oil, which had already started to study whether it could use CO₂ to enhance recovery from its own mature oil fields and was seeking low cost sources of the gas. But the company soon realised that the technology's multi-stream output, including its ability to burn CO₂-contaminated gas as fuel without any pre-treatment, actually gave it access a number of global business opportunities and provided a new source of zero emission energy to meet the needs of growing worldwide demand in an environmentally responsible manner.

"We're currently exploring opportunities in the Middle East and South-East Asia that have different value chains and benefits, yet both can now be made commercial from the implementation of the TriGen technology," said Bob Alford, TriGen Project Manager.

In the Middle East, Maersk Oil is investigating how TriGen's low cost CO₂ can benefit EOR projects. Gulf countries in particular have increasingly focused on clean energy, while many of their oil reservoirs are suited for CO₂ / N₂ based EOR. Here, gas would be burned to produce clean power and water for households. Nitrogen,

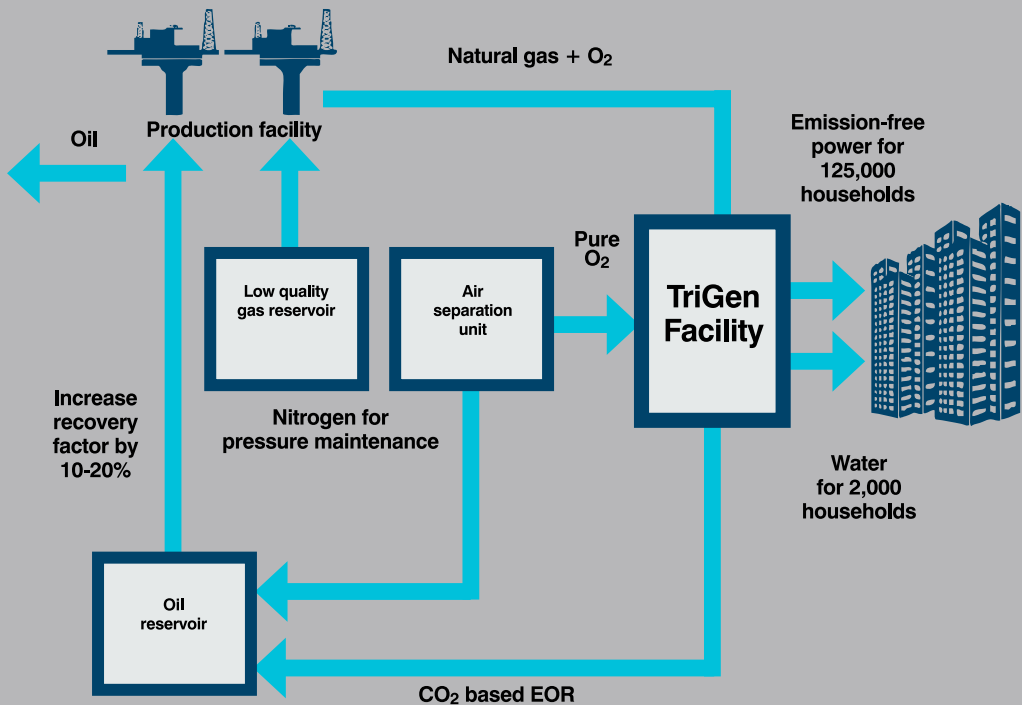


a by-product from the production of pure oxygen, and CO₂ would be supplied to oil fields – nitrogen to maintain the pressure in depleting reservoirs and CO₂ as the EOR agent coaxing out oil that would otherwise not be recovered.

Traditionally, CO₂-based EOR has only been feasible in areas with large sources of natural CO₂ – chiefly in the United States. But the ability to produce CO₂ as a by-product of a commercial power generation venture now makes CO₂-based EOR attractive in regions such as the Middle East, which has limited sources of natural CO₂. TriGen also provides resource owners a full life cycle development concept for EOR as its oxyfuel combustion process can accept the CO₂ in the associated gas coming back from a CO₂ EOR flood again without requiring any pre-treatment for CO₂ removal.

"The technology provides a compelling investment opportunity in the Gulf region as it offers both the benefit of clean power and low-cost CO₂ to increase recovery potential. The technology also complements Maersk Oil's current work and studies on CO₂-based

TriGen's Integrated Clean Energy Development



EOR in Denmark and Qatar, enabling us to offer integrated field development solutions in this area,” Alford said.

In South East Asia, the value chain starts at a different point – at world class gas fields that lie undeveloped because they are naturally contaminated by CO₂. Such stranded gas fields could now potentially be produced economically and with full carbon capture because the TriGen technology can burn gas contaminated with up to 90% of CO₂ without requiring any costly pre-treatment for CO₂ removal. TriGen also offers an efficiency advantage over conventional gas power generation processes with carbon capture - especially on power plants fed by CO₂ contaminated gas fields that would require both pre and post combustion CO₂ separation. Conventional gas turbine based power plants suffer flame-out when the level of non combustible gas (i.e. CO₂) reaches approximately 40% necessitating the addition of pre-combustion gas treatment processes. TriGen thus allows countries to use their

clean gas for export and their contaminated gas for domestic power to address the needs of the regions rapidly expanding economies.

“We would be unlocking enormous value to the states that have been sitting on these fields, unable to produce them commercially,” Alford said. “Although it is early days yet – there are technical and commercial challenges to overcome – these are just the kind of projects that affirm Maersk Oil’s pioneering approach to business.”

Maersk Oil launched the project in January 2011 when it acquired rights to the combustion technology, from U.S.-based Clean Energy Systems (CES). CES has proven the technology over the last 15 years, and now in collaboration with industry heavyweights Maersk Oil and Siemens, is deploying the technology at a commercial scale. *

More information on the innovative TriGen technology solution is available at: www.maerskoiltrigen.com.

MAXIMISE RECOVERY: *Fast track CO2 EOR Technology Implementation in the Post Easy-Oil Era*

PANEL HOST: Bob Alford, Senior Business Development Manager, Maersk Oil
Ali Vezvaei, Executive Vice President & General Manager Middle East, Siemens
Thomas Finkbeiner, PHD, Global Advisor Geomechanics GMI Geomechanics Services
Robin Mills, Analyst, Manaar Energy Consulting
MODERATOR: Sean Evers, Managing Partner, Gulf Intelligence

MODERATOR - SEAN EVERS (SE): Bob, if I could commence by asking you the central theme of this session -- What are the obstacles to maximizing recovery in the Gulf and how can we fast track CO2 Enhanced Oil Recovery technology implementation as one of the principal solutions in the post easy-oil era?

BOB ALFORD: I think in the region we've already crossed a few of the bridges towards CO2 enhanced oil recovery. There's general acceptance that we need to reduce carbon emissions in the region, and one way to do that economically is to maximize the recovery of our existing oil reservoirs. The reservoirs here have a strong affinity and fit to enhanced oil recovery, but what we've been missing so far is the source of low cost carbon dioxide. Now, with our TriGen Technology, we're seeing this as a way to link up the demand with the supply.

SE: Robin - what is the region's appetite for CO2 injection and carbon capture storage?

ROBIN MILLS: I've always felt that the Middle East was one of the key regions for CO2 capture and EOR globally. One key reason is you just have great geology here. You have giant fields, so you have great economies of scale. You have fields which are very suitable to injection and which have great scope for improving oil recovery with CO2. And unlike in Europe and the U.S., you don't have a lot of the public acceptability issues that you get there.

The key point in the Middle East is about

finding the sweet spots where CO2 injection can get started and proven so people get comfortable with it. For example, in Oman, which has a big EOR program, and in Abu Dhabi where there's a huge amount of natural gas injection, CO2 offers a great alternative to much needed natural gas. The environmental drivers are important, but the key drivers in the early days at least will be economics. It'll be about maximising oil recovery and maximizing economic returns.

SE: Ali, the economics -- What is Siemens view on the opportunities for Carbon Capture Storage and Co2 injection?

ALI VEZVAEI: For us, it's primarily about the price of the CO2 that you get out of the solution and how economically you can apply that to the field, especially for EOR. It is also important to make sure that the joint solution addresses the concerns of the resource owners and those who operate the data stream equipment around the asset.

SE: Thomas - what's your view on the opportunity for CO2 injection given that there are many competing opportunities under the surface?

THOMAS FINKBEINER: For me, the attraction is, first of all, it's a clean way of injecting gases into the reservoir.

And secondly, in this region it's very important that we maintain pressure in most

PANEL DISCUSSION

of the oil reservoirs in order to produce the oil. There are some challenges that we need to overcome, and one is to better understand the reservoir on which the EOR is going to be implemented.

SE: But surely isn't water injection doing just fine -- water has done very well as the solution of choice?

THOMAS FINKBEINER: Well, water has been injected in many of the fields for a long period of time. But I think we're beginning to see that water is not necessarily as efficient as we would like it to be. There's a lot of bypassed oil. I think with the gas, we have yet another way of trying to access that bypassed oil.

SE: Robin, let's step back a second. The title of this session is "Maximizing recovery in post easy-oil era" -- are we indeed a post easy-oil era in this region?

ROBIN MILLS: I think it depends where you look. There are mature countries like Oman and Egypt, which do need a lot of extra technology, including EOR. Then, you've got special cases like Abu Dhabi, particularly because it's injecting a lot of natural gas and the country is short of gas, and so gas is not really an ideal solution for managing reservoir pressure because you really want that gas for other uses. So clearly CO₂ has a role there.

If you look at Iraq, for example, it is still in the easy oil days and it's still about just drilling and water injection and fairly standard technologies. So I think it really depends where you look. And even within a single country, like Saudi Arabia, you have some fields which are very mature and which would benefit from CO₂ and you have some other fields which are still in the early stages of their life.

SE: What is the overall reception for CO₂ injection in the Gulf -- it doesn't appear to be overwhelming?

ROBIN MILLS: I think it is early days. One of the issues is simply the need to understand CO₂ because there's very little CO₂ injection here today -- there are only a couple of pilot projects. And the other part is that there hasn't been a source of low-cost CO₂ in the region. It is generally regarded as much more expensive than using natural gas, which is subsidized.



If you look at the U.S., it got started because there was natural CO₂ underground that was readily available and very cheap. Then the source of artificial CO₂ was created later. This region hasn't really done that yet. So it's really about finding the first few demonstrator projects that can access low cost CO₂ -- Perhaps TriGen Technology is one of them.

SE: Bob - economically viable, low cost—is that your pitch?

BOB ALFORD: You look at the United States, as Robin was saying, where this is really taking off, and people over there are seeing that above \$50 a barrel, we need to start

"In this region, because of the multi-product benefits of TriGen, we can actually deliver CO2 at less than \$50 per ton, so we're seeing very strong economic potential here for CO2 EOR."

BOB ALFORD

looking at EOR. It makes economic sense, and prices in the U.S. are already north of \$50 a ton for CO2. In this region, because of the multi-product benefits of TriGen, we can actually deliver CO2 at less than \$50 per ton, so we're seeing very strong economic potential here for CO2 EOR.

ROBIN MILLS: Yes, but if I have access to cheap natural gas, then \$50 is a lot of money...

BOB ALFORD: Yes, but you would still like to maximize recovery and do what's best for the reservoir, and the best thing for the reservoir is to maximize recovery over the long-term, and not by injecting methane, which is really limited on what it can achieve.

SE: So is CO2 a solution mainly for marginal fields, or is this a solution for other types of fields?

BOB ALFORD: CO2 can be used on tight reservoirs even at the start of a field's life, and it has huge benefits from an NPV perspective. Is it the best thing to spend a lot of money down the road, or shouldn't you just develop a field with it in mind from the outset...?

SE: Do you think that there is sufficient government support for lower carbon emissions and the environmental argument?

BOB ALFORD: We do. We see strong government support for clean energy and advanced technology in this region, which also has the financial strength to be able to tackle these issues. As an international oil company, we like to bring things that are not available in the region. And low cost CO2 and a clean power generation solution is something that we think can be beneficial here.

SE: Ali, I'd just like to bring you into that point. Siemens's brings in new technologies and is a very innovative company in that respect -- What are the hurdles faced by you and your colleagues as you advocate this technology or any other new solution?

ALIVEZVAEI: As a company who provides the technology, what we try to do is maximize the number of trials that we do before we even deploy the technology at the field. So what we have tried also is to get Maersk Oil to make sure we put pilot plans out there -- we call this 'Operational Excellence'-- to make sure that the solution, by the time it is deployed at the field, is from our standpoint, bullet proof.

NOCs in this region are looking to greener technology deployment in their oil and gas fields, and are open to exploring the benefits from the use of CO2. These two factors have led to at least the start of a dialogue.

SE: If one is looking to replace technologies -- i.e. replace water injection with CO2 - how efficiently can that be done in an existing project?

THOMAS FINKBEINER: I don't know if we really want to replace the water with CO2. CO2 is an additional factor in order to boost our recoveries. What's really important is that we inject intelligently in order to get the most out of the reservoirs and investigate the full features of the subsurface of the reservoirs better.

SE: The essence of your point is that currently we don't...?

THOMAS FINKBEINER: I think it could be done better. In a number of the fields we have seen that it's becoming more difficult to produce the oil and we are realizing how little we understand of the reservoirs.

BOB ALFORD: What we see is that water flooding takes you a certain distance in the recovery process, but you get tapped out at say 40%-45% recovery efficiency. CO2 injected into a tight carbonate reservoir can give you more oil. So the tight carbonate rocks that we find here in this region are really tailor-made for this solution.

SE: Bob, how important is the Masdar CO2 trial project that's currently underway in order to set a benchmark in the UAE?



BOB ALFORD: The project that Masdar is now working on in Rumaitha will supply enough CO₂ for a commercial scale CO₂ EOR operation. So everyone in the industry is excited to see how the benefits of CO₂ EOR are demonstrated in Abu Dhabi. The reservoirs here are analogous to where CO₂ EOR has been proven to be successful elsewhere in the globe. And the pilot tests here in the region have also been successful. So we're pretty confident that this will be proven to be beneficial here.

SE: Okay. Can we go to the floor for a question?

AUDIENCE MEMBER 1: My name is Waleed AbuKishk, Team Leader, Relations & Agreements, Planning, E&P Directorate, ADNOC.

We heard each of you talk about the fact that there is no more easy oil. Do you think the goal of getting to 70% recovery is realistic and doable given the cost benefit associated with such an initiative?

ROBIN MILLS: I think it very much depends on the field, but the question is cost benefit. Obviously, getting from 50% recovery up to 70% is going to cost a lot more than getting to the 50%. And you already have a couple of the mature fields in Abu Dhabi that are over 50%, so they're kind of getting towards that area. But I think for many fields this is really a

very long-term goal because most of the fields are not close to that recovery factor yet. It'll be a question in twenty, thirty years: what's the price of oil? What's the demand for oil? Is it worth going after that last few percent?

THOMAS FINKBEINER: I think it's possible. I think we have great technologies. I think we understand our reservoirs better, but I think we can improve on the philosophy of knowledge sharing of both our successes and failures.

AUDIENCE MEMBER 1 - WALEED ABUKISHK:

I think it's a great opportunity given the size of the fields that we have here. If you can just take 10% extra out of one of the big fields, you're talking billions of barrels. But I think it needs research and innovation and commitment from the NOCs as much as the private sector to make it happen.

My second question is: you talked about CO₂ injection - What are your views on using other gases, such as nitrogen injection?

BOB ALFORD: Well, TriGen also produces nitrogen so we're currently investigating the potential benefit of a combination of CO₂ and nitrogen injection. Typically, CO₂ is preferred over nitrogen because it mixes with the oil in the reservoir and increases the mobility of the oil, which enhances recovery. Nitrogen acts like a piston that sits on the top of your reservoir and pushes down to maintain its pressure. We



see CO2 as a superior injectant, but as you said, these oil fields are huge and there's room for many solutions.

ALI VEZVAEI: Nitrogen injection has been done successfully in Saudi Arabia and we have been part of providing the solution to that. My opinion is that it needs more analysis, and I think that's what Maersk Oil has been doing. And the results need to be shared. The point about commitment from end-users, from technology developers to solution providers, to move forward - is crucial. If that commitment is there, the answers to all these questions will be achieved much sooner.

AUDIENCE MEMBER 2: How do you convince IOCs to make investments today, for recovery in 10, 20, 30 years time -- Especially in easy oil fields for example like in Iraq?

BOB ALFORD: That is a good question. The governments need to try to incentivize operators to not just go after the easy barrels but to really maximize recovery--do what's best for the reservoir. And that's part of understanding the reservoir, but also trying to do what's best for the whole economy and for the country. The government makes a lot more than the operators on these oil fields, but they need to

understand that we need to be incentivized to go after those additional EOR barrels.

AUDIENCE MEMBER 3: These multiple processes offered in Tri-Generation seems like a very complex set-up - Is it really needed?

BOB ALFORD: The Maersk oil process is called TriGen. We're making three products -- water, electricity and CO2 simultaneously. The reason we're interested in polygeneration or trigeneration is that all of its products are valuable here in the region. We have desalination plants here. We have many power plants being built. And we're looking for sources of low cost CO2. If you set up separate processes to deliver each one of those product streams, the efficiency is reduced and the capital costs are significantly escalated.

So what we're saying is, start with those three products in mind. Instead of trying to capture CO2 after the fact, say, from your steel mill, let's set up a power plant with carbon capture already included. And consider that we'll already be desalinating water -- seawater -- for achieving pure water. This process delivers on these demands in one go which then provides low cost CO2, while also matching the countries aspirations to be a world leader in the production of clean energy. 📺

collaboration team
management performance
innovation

Partnership

business plan
consultant strategy
goal marketing
share finance investment



framework
performance
value
vision
strategy
mission
investment

An NOC-IOC 21st Century Partnership – Transforming the Marginal to the Commercial

**By Soren Frank, Director of Maersk Oil
Research & Technology Centre**

“History has shown that a healthy and balanced relationship between hydrocarbon resource-holders, represented by National Oil Companies, and International Oil Companies, provides the best possible framework for efficient oil and gas production,”

His Excellency Mohammed Dhaen Al-Hamli, the U.A.E. Minister of Energy, said earlier this year.

The energy industry faces a fundamental challenge – swim together or drown. Collaborating and forming trusting relationships is becoming vital as new oil and gas projects assume new technological as well as commercial challenges.

The industry may be witnessing the most disruptive shake-up since \$10 oil triggered a wave of takeovers in the late 1990s creating the super-majors such as TotalFinaElf and ExxonMobil. The good news is that the changes are largely positive, creating an industry that is better positioned to solve the world's great energy challenges.

But it wasn't the price of the barrel of oil which changed the inflection point, it was the consequence of that \$10 oil. In 1986 and 1992 and 1997 as the industry went through recession cycles in terms of the oil price -- what actually happened was there was a transfer of the knowledge capability from the place where it was originally developed and hoarded, which was in the major oil and gas companies, into the other parts of the industry, most notably in the energy service firms and independents, or indeed, in some cases, out of the industry.

At that point, the whole journey changed. A drilling engineer or a geoscientist who used to work for BP or Shell, and now works for Baker Hughes, Senergy or Maersk Oil, didn't change on a Monday morning from how he was on a Friday afternoon when he left that supermajor. Nor did his ambitions change to do the job he was trained to do. Today, what we're actually seeing is that those companies now have almost all of the capabilities that used to reside solely in the major oil and gas companies.

And that's where the genie got out of the bottle. And it is impossible to get that genie back in the bottle.

The neat, familiar defining lines separating different types of energy companies are becoming blurred. Twenty years ago those lines were crystal clear. National Oil Companies (NOCs) were the state-owned firms in charge of domestic assets, such

as Abu Dhabi National Oil Company or Petronas in Malaysia. They stayed at home.

Then you had International Oil Companies (IOCs) – private sector operators loosely grouped into major energy companies such as Exxon, and smaller independent production companies such as Maersk Oil. Service companies sold technical services and provided equipment such as drilling rigs, while trading companies bought and sold end products like crude oil and diesel.

Today many NOCs are increasingly acting like IOCs, expanding beyond their national boundaries and competing for assets overseas -- the arrival of Statoil, China National Petroleum Corporation and Korea National Oil Corporation into the Gulf's upstream energy sector are three good examples. For some NOCs the motive is commercial, while for others it's all about security of future supply for their home countries.

Aside from navigating geopolitical complexities, the energy industry now finds itself in an increasingly crowded market of a variety of national and international players. We all compete for a smaller number of opportunities to explore for oil and gas in more and more challenging areas. In partnership with NOCs and technology providers, we need to push the boundaries of what is operationally possible to access oil and gas previously thought to be inaccessible or non-commercial.

It can seem like a bleak picture, as if our options are all becoming more and more constrained, but the one graph that keeps going up is demand for hydrocarbons.

This is exactly the right time to start working closer together, to collaborate more. It is only through trusting partnerships with industry peers and with resource-owners that we can enter new corners of the globe, explore previously impossible areas and develop the technology to access oil and gas previously thought to be inaccessible.

The prize is significant, but no one company, or sector or country can solve the future challenges alone. Partnering is the key to future success - sharing knowledge, risks and technologies to innovate new business models and energy value chains.

Maersk Oil has always sought out partnerships in its 50-year quest to grow. The Danish firm began its life in 1962 as a very modest company with a very complicated task ahead – to unlock the oil and gas in the tight reservoirs of the Danish North Sea. It didn't do it alone. It worked with experienced



partners and learnt from them, and in time developed the technologies needed to solve its technical challenges, which also paved the way for the internationalization of the company.

In 1992 Maersk Oil took on the challenge of the Al Shaheen Field offshore Qatar. This was a field others had walked away from because of its complexity. It was deemed non-commercial, with very thin, low permeability carbonate reservoirs. But together with its partner Qatar Petroleum, Maersk Oil turned Al Shaheen into a great commercial success. This year, the Danish independent celebrated its 20th anniversary with Qatar Petroleum, a partnership that has produced more than 1 billion barrels from the Al Shaheen field.

The most sought-after contract that has emerged in the industry over the last few decades is one based on shared equity -- the opportunity for the international company to book reserves as part of an agreement with its

national oil company partner has been a crucial component for the industry. This has been less forthcoming in recent years, most notably in the recent Iraq contracts that some supermajors appear willing to now walk away from.

The national oil companies and their international partners have always had different points of view, and with knowledge and technology increasingly spread far and wide across many spaces there are more and more ways of aligning those points of view.

This new energy ecosystem is still evolving. NOCs, super majors, independents and service companies are increasingly entrepreneurial, adapting to the changing demands of the industry, but the core of any contract will always stand or fall on the timeless principal of trust -- If you're in a long-term relationship then you will transfer the knowledge because you will want to be successful together with your partner. ✨



AN NOC-IOC 21ST CENTURY PARTNERSHIP: *Transforming the Marginal to Commercial*

PANEL HOST: Soren Frank, Director of Maersk Oil Research & Technology Centre
Hans-Christian Freitag, VP Unconventional Resources Eastern Hemisphere, Baker Hughes
James McCallum, CEO, Senergy
Paul Navratil, Middle East Mining Utilities and Mining Leader, PWC
MODERATOR: Sean Evers, Managing Partner, Gulf Intelligence

MODERATOR SEAN EVERS (SE): Soren, how important is it that the NOC/IOC Partnership in the 21st Century is a balanced one?

SOREN FRANK: Collaboration between IOCs and NOCs has been critical for Maersk Oil. Back in the early 90's, the Al Shaheen field in Qatar was considered a prospect with no potential and economically unfeasible. Maersk Oil saw the potential and we partnered with Qatar Petroleum. This partnership has been the key to the realization of the current production from the Al Shaheen Field and to the success story we have achieved there.

Other partnerships have also been realized with service providers that have helped us push the limits and break world records in drilling at the Al Shaheen field, now Qatar's largest. And in my current position in the Maersk Oil Research Centre in Qatar, we are partnering up to look at new technologies. So our model of partnership and collaboration has definitely helped us to move forward over 50 years.

SE: James – what are your views on the NOC-IOC partnership in the 21st Century, does it need to change, evolve?

JAMES MCCALLUM: We're entering an incredibly new entrepreneurial period for the industry. Historically, oil and gas was developed around the world from partnerships between some of the biggest names in the oil and gas company world -- the Exxons, the Conocos, and the Chevrons of this world. Today, for

the industry to be equipped to respond to continued growth and demand, we are seeing new names all the time, with collaboration and partnership between independents; with partnerships with service companies who have intellectual capability and technologies to bring to bear.

And the emergence of new consumers of energies seeking sustainability of supply has sought new partnerships to make that happen. My question for the other panelists would be: What will the oil and gas industry look like in terms of its partnerships 100 years from now?

SE: Chris, what does your crystal ball tell you - Do partnerships need to evolve?

HANS-CHRISTIAN FREITAG: It definitely will evolve. In the last century of oil field development we've seen changes in terms of how the IOCs and NOCs worked together. For example, in the 1950s and 60s, the IOCs brought knowledge and funding into the NOCs; now the NOCs have access to funding, and the service companies are providing the technology that is necessary to access the reserves. If you look at the recent development in North America with shale oil and gas, it was the small independents and the service companies who tried the unconventional approach to extracting those resources.

SE: Paul, do you see an existing form of contract that should be a boilerplate or a benchmark? In Iraq for example, the contracts that the

companies have gone back in with don't seem to be holding; we're seeing a supermajor there looking to pull out. Abu Dhabi's reviewing its concessions over the next few years. Does PWC see an ideal contract?

PAUL NAVRATIL: Well, contracts get in the way of most of the dialogue in relationships. And it's to do with the timeline issue.

If I'm an IOC with shareholders, they're looking at next quarter's results and at my ability to book reserves. If I'm looking at the contract as an NOC, I'm looking at how am I going to develop sustainable resources in my country and how am I going to develop my local talent. There are so many different types of contracts going on in the region right now that it's hard to say one contract is best for all.

JAMES MCCALLUM: Yes – for example, there is no such thing as a standard contract if you're a service company. Every client's interests, and therefore negotiations, differ. As we look forward to what is actually required by each party, the question is not as it used to be – where do I get that in the form of a single entity? Rather, it's where can I get that in the marketplace which gives me the best chance of yielding the greatest value from what I am about to do? Where am I going to access the knowledge or technology that I need? And how much am I going to have to pay?

SE: Soren, there has been a boilerplate contract more or less in the industry over the last 25 years and that's been equity: the ability to book reserves as part of a deal. That obviously has been a crucial component for the international energy companies. Does that remain a cornerstone?

SOREN FRANK: There are different ways of aligning the different points of view of IOCs and NOCs. In the Al Shaheen development, we ensured early on that we would have some cash flow to also realize the further projects that would happen, you can put in incentives, but it has to be in a collaborative way.

SE: Chris, we're seeing service companies now going into the upstream and taking on production challenges, for example, Vitol which is bidding for production opportunities in the Levant Basin; Schlumberger and Petrofac going into Mexico. How is that changing the shape of partnerships in the industry?

HANS-CHRISTIAN FREITAG: I would find

“The model we work from is partnering and collaborating and it has definitely helped us to move forward and we believe it will help us move forward in the future”

SOREN FRANK

it difficult to tell you what the future is going to look like, but I'm sure things are going to change. Every partner in the relationship should be able to focus on their core competencies to extract the most value. The other point is it needs to be a balanced relationship, and that is something that evolves over time. You need to make sure that everybody on the partnership is aligned and is pulling in the same direction. And that is the most difficult thing to establish.

JAMES MCCALLUM: In my view, there is no doubt whatsoever that we are witnessing the greatest inflection point for the industry that we've had since the 1970s. Over the next 10 to 20 years, we will see a wholesale change in the way that hydrocarbons are extracted and who does it and who partners with whom.

It's all about value realization. Who can I get to come along beside me, to provide me with access to knowledge or technology that enables me to deliver something that I couldn't yesterday?

SE: Paul, you mentioned that there is no ideal contract. What about equity and how it might differ in various contracts? Is that changing?

PAUL NAVRATIL: One of the interesting models that we're seeing come up, and I think is going to be taken up quite a bit more, is the type where you've got a high level of baseline production requirement, so there's no access to hydrocarbon reserves. And this is where bringing the know-how, the talent, the technology, the enhanced oil recovery, comes in. The more you produce, the more you exceed, the greater the take. That form of equity for a new entrant or new participant, could be in the form of a sovereign wealth fund-backed company who's looking for a portfolio of assets, not necessarily barrels in the ground.

SE: So sort of a private equity approach to



energy production. Chris, IOC's have reduced conducting extensive R&D in the last 20 years. What's the consequence of that as we look forward to these sorts of new partnerships that we're talking about?

HANS-CHRISTIAN FREITAG: Over the last 20 years we have seen service companies filling that technology void. We talked about equity. I think intellectual equity or intellectual property and sharing is something else to consider. The service companies are embarking on projects which are very focused towards particular applications with NOCs or with IOCs. And in many cases, the contractual framework is such that the technology then is restricted to be used by that NOC or IOC for a number of

years. And I question whether that's the best approach.

I don't think we will have a plethora of operating relationships where you have the service companies owning equity, but I think you'll see that we will provide expertise that previously used to be limited to the IOCs and the independents in terms of reservoir expertise. I think that is definitely evolving.

SE: Soren, does Maersk Oil find that your conversation with NOCs are changing -- How is that conversation evolving given the backdrop of what we're talking about here?

SOREN FRANK: I think in general, the contracts are changing; the model of bringing in technology and knowledge transfer is increasingly becoming a crucial element. The NOCs and IOCs are realizing that we need to collaborate to improve recovery factors and improve oil recovery. Collaboration is key and in Maersk Oil we live this model being a mid-sized oil company.

JAMES MCCALLUM: I think what we're witnessing at the moment is that there is a real vibrancy coming from new independents which hasn't been there before. In the area of marginal field development, for instance, over the last decade we've seen an incredible development in entrepreneurial activity from new independent oil companies, where very talented, experienced executives have stepped out of big oil and gas companies, and set themselves up in business. And those companies are looking to partner however they can.

In the 1980s, the set up for a large project would typically include one or two super majors with majority stakes, alongside maybe two or three small players with 4% or 5%. Today, that blend is changing. For example, Petrofac, the service company, recently committed to put \$500,000,000 into the Boweleven gas field developments in the Cameroon.

SE: Or Maersk Oil in Angola.

JAMES MCCALLUM: Like Maersk Oil drilling big, deepwater developments off the West Coast of Africa. The pace of this is moving so quickly, and I think that's what's really exciting.

SE: Paul, is this inflection point that James talks about due to \$100 oil -- is the sustained price at this level the trigger that's recreating this industry?

PAUL NAVRATIL: I think of \$100 oil from the perspective of what it means to the governments in the region, and what it means to the development of the oil and gas industry here, and how critical it is to maintaining and diversifying the economies of the region. What I see is very alarming, in that many projects are being budgeted at oil price levels that are too high, by both supermajors and by the new entrants that we're talking about. If we see anything come off the price of oil, then I fear that there may be a backlash.

HANS-CHRISTIAN FREITAG: It's not the current price of oil which has changed the inflection point. It's the consequence of that \$12 oil price; in 1986 and 1992 and 1997. As the industry went through recession cycles, there was a transfer of the knowledge capability from the place where it was originally developed, which was the major oil and gas companies, into the service sector, or indeed, in some cases, out of the industry. At that point the whole journey changed. A drilling engineer, or a petrophysicist, or a geoscientist, who used to work for BP or Shell, and now works for Baker Hughes or Schlumberger or Senergy, didn't change on a Monday morning from how he was on a Friday afternoon when he left that super major. Nor did his ambitions change to do the job he was trained to do. Today, what we're actually seeing is that those companies now have almost all of the same capabilities that used to reside solely in the big oil and gas companies. And that's where the genie got out of the bottle. And it is impossible to get that genie back in the bottle.

SE: James, there has been talk that because of technology and knowledge transfer needs, Abu Dhabi is looking at reconstructing its partnerships from consortiums to single operators so that the best technology can be deployed. If you were sitting on the NOC side and looking out on the horizon of this inflection point, what do you think are the things they need to be thinking about as they do consider such massive concession renewals?

JAMES MCCALLUM: The same as anywhere else in the world, which is how do I achieve the highest levels of excellence in what I actually do. Where is best practice and how do I get best practice into my marketplace here?

SE: Given the fluidity of the situation -- 25 years ago, 30 years ago, you could probably frame a contract with a certain level of predictability to the future. How do you make a long-term contract given the situation today where the level of uncertainty and volatility is much greater?

JAMES MCCALLUM: You look at an individual relationship with an individual entity on an individual project, and you take that forward and you run with that until there is clear demonstrable evidence that there is a better solution somewhere else. And I think the decisions which Abu Dhabi is making just now are the most important decisions to be made for the next 30 years of this country in which we all live. And so I don't think those decisions will not be taken lightly.

SE: Paul, how much a priority do you think the shape of these new contracts will give to ensure the deployment of best technology, knowledge transfer and such components?

PAUL NAVRATIL: Well, I think it has too! If we believe that the average recovery rates are in the 30s, low 40s, and the aim is to get to 70%, that's only going to happen through the adoption of best

technology, and I believe the winners will be those who share, and who help each other to incubate and innovate.

SE: Can we go to the floor for a question or a comment?

AUDIENCE MEMBER 1: My name is Wail Jubara, I work for Abu Dhabi's ZADCO (Zakum Development Company) in the contracts department.

I have a couple of questions on the partnership model that's changing with service companies, IOCs etc. -- IOCs, NOCs and service companies all have different agendas and objectives, so can these contracts be structured in a way to align all these incentives so that they can all work together?

And my second question is to do with the Schlumbergers, the Baker Hughes and Halliburtons getting involved in upstream production -- they may have the technology, but my concern would be can their corporate culture manage this new area of engagement? I've worked for a service company, an IOC and now I work for an NOC. The culture between IOCs and NOCs is very different from service companies.



SE: Paul - could you answer on that first question - aligning incentives for the operator, the service provider, the NOC?

PAUL NAVRATIL: I think it's possible. The first one that comes to mind is Shell-PDO in Oman. That's one where they understand each other. They've been very transparent with each other. They've done a lot to develop the national workforce, and I truly think they understand each other. The other one also is Maersk Oil Qatar. It also comes back to the point of how the government, or NOC, is positioning its national resources in that dialogue, or in that context, with potential partners.

SE: James, the second question – can service companies handle the big leagues of upstream?

JAMES MCCALLUM: We come from an industry which is very used to doing things in a certain way and following a certain style of contractual negotiation. But optimum performance comes from those parties who think differently, do something differently and make it their unique selling proposition.

In terms of the collaboration point that you sought, you'll never get that if you come out in a prescriptive way to the industry saying: here's what I think the answer looks like. It happens where you have collaborative discussion and debate around a flip chart and you debate what you want as the value proposition coming out the back-end. And that's the key word: value proposition. And is it possible to actually get all parties aligned? It is if you are all aligned to the same goal. *

X: 0001001
Y: 1103110
Z: 0101011

ПР 8503-3092

ЩС-3
 $P_y = 4,012 \text{ кВт}$
 $P_p = 3,6 \text{ кВт}$
 $I_p = 8,25 \text{ А}$

717 8503-3093

ЦАП-12

ЩСВ-НН-3,6-6,25-6-37,5¹⁴

NYM-5x10 L=6M

NYM-5x10 Y=0.1x5-WAN

ip=

AE2046,
Ip=40A

AE2046
Ip=100A

AE2046

AE2046
Ip=31.5A

ВВОД №2

$$P_{y2} = 71,754 \text{ кВт}$$

$I_{pAS} = 32.8 \text{ nA}$
 $I_{pAS} = 55.0 \text{ A}$

U3680 2T
5A
N2 Wf

T-0.66
260/5

ПНЗ 250
150



Gulf Research & Development: One Common Challenge, Many Solutions to Share?

By Frans Van Buchem, Principal Geologist, Maersk Oil



The challenge facing much of the Gulf is maximizing energy production with patented technology. This paradox of sharing technology and information across companies and country boundaries versus protecting information in order to retain competitive advantage needs to find a resolution as the recovery of hydrocarbons is an increasingly complex and costly challenge facing all producers in the region.

The wealth of the Arabian Gulf is tightly linked to the quantity of recoverable hydrocarbons. Accordingly, future research in the region certainly must focus on technologies that maximize oil and gas recovery. These include techniques for imaging subsurface structures and for extracting petroleum from reservoirs. The challenge is also global with the U.S. Geological Survey forecasting that the proportion of international heavy-oil supply that is recoverable using existing technology stands at 434 billion barrels as compared with almost 3,000 billion barrels which remain unrecoverable.

The good news is that the unique geological nature of the Arabian plate petroleum systems means that many of these technical challenges are, however, identical in different fields and countries. The information, methodology and technology, enabling shared research and development to cross borders would be for the benefit of all and should be explored – the bad news is that it isn't.

The major oil fields in the Gulf region, such as Burgan & Ghawar, two of the world's biggest, have pumped more than half their oil—the point at which production traditionally begins to decline. There is a moratorium on the region's biggest Gas field, and large amounts of much-needed natural gas supplies are re-injected into the oil fields to maintain pressure.

There are many similarities between these reservoirs, and operators over the producing history of these fields have already acquired vast amounts of information -- Saudi Aramco would have stores of core actionable data that it hasn't even looked at yet. The recognized challenge with attempting data sharing is the fact that all of this information is the result of huge amounts of investment from the operators and consequently there is a reluctance to offer it to one's peer or competitor for free – but indirect benefits will revert back to the data provider in an open source environment.

The opportunity to compare different fields to each other could provide untold value-added insight into what kind of analytical work



you might or should consider. You could use analogues from one country to work in another and that may actually save a lot of money. The prospect of comparing fields in different stages of their life cycle could provide valuable foresight into what has been done well or badly on one particular field that simply is a bit further down the line in its life cycle than your own field.

Over the past 50 years or so, the world's demand for energy has expanded dramatically; from just over 55 million barrels of oil equivalent a day in 1960 to around 233 million barrels of oil equivalent a day in 2010. This demand growth was met by a variety of energy sources, but the majority has come from fossil fuels. This expansion is set to continue, with OPEC projecting a figure of close to 360 million barrels of oil equivalent a day by 2035. It means that energy demand will increase by around 50% by 2035.

From the perspective of oil, this translates into demand increasing by close to 23 million barrels a day over the period 2010-to-2035.



It reaches almost 110 million barrels a day by 2035.

Technology and people continue to transform the oil industry, in terms of the way resources are identified, developed and produced. Technology is bringing out more resource from the tight grip of rocks. New technologies have also helped transform resources once thought unconventional into conventional ones. We should remember that only forty years ago, all offshore oil was considered unconventional. Today, this portion of total global oil supply accounts for 30%.

Over the years, the improved quantity and quality of information available about different geological structures has enhanced the likelihood of finding oil, and extended the reach of surveyors, geologists and explorers into more remote and harsher locations in the 'frontier areas'.

Petroleum science has evolved from basic geology to supercomputer-based calculations, reservoir simulators and 3D views of deep and complex horizons in the subsurface. In terms of

drilling, we have progressed from drilling tens of meters to many kilometers below the surface, both vertically and horizontally.

Still, given the low recovery of petroleum from most reservoirs, future cooperation will be required and shared research will need to focus on enhanced oil recovery as the Gulf States target double the global rate of recovery. Higher petroleum prices in triple digits will bring research involving EOR tools such as CO₂ injection and surfactant flooding to the forefront. Modification of reservoir rocks to improve flow characteristics will play a role in this research. Modeling will grow in importance as detailed understanding of reservoir flow characteristics provides opportunities to enhance production.

The Gulf States have already taken a paradigm leap with their participation in the International Energy Forum initiative, the Joint Organizations Data Initiative, which is a concrete outcome of the producer-consumer energy dialogue. The importance of exchanging supply and demand data as a means to enhance transparency of global energy commodity markets is recognized by Energy Ministers as being beneficial to energy security and in the interest of producers and consumers alike.

The initiative relies on the combined efforts of producing and consuming countries to build the timely, comprehensive, and sustainable energy data provision architecture which is a prerequisite for stable energy commodity markets. By helping to mitigate some of the uncertainties that may be detrimental to market functionality, JODI aims to moderate undue price volatility, thereby increasing investor confidence and contributing to greater stability in energy markets worldwide.

The commitment to JODI could present a template for Gulf energy producers to create a single body to facilitate the collection and exchange of subsurface data on the common characteristics of their reservoirs, some of which literally cross borders.

The value of transparency and an open-source mentality is being recognized globally as having more benefits than negatives for all involved. The Wellcome Trust, which spends more than £600m on scientific research a year and is the largest non-governmental funder of medical research after the Bill & Melinda Gates Foundation, said this week it planned to adopt a more robust approach with the scientists it funds, to ensure scientific results are freely available within six months of first publication. *

GULF RESEARCH & DEVELOPMENT: *One Common Challenge, Many Shared Solutions?*

PANEL HOST: Frans Van Buchem, Principal Geologist, Maersk Oil
Andrew Dennant, Oil & Gas Marketing Director, Emerson
Stuart Walley, Regional Manager Middle East & India, Senergy
Ryan McPherson, Managing Director MENA-Asia, IFT
MODERATOR: Sean Evers, Managing Partner, Gulf Intelligence

MODERATOR SEAN EVERS (SE): Why is it important for Gulf producers to consider sharing data – What is the common challenge?

FRANS VAN BUCHEM: I had the opportunity to work for about 20 years on Middle East carbonate reservoirs. And there's one thing that strikes you when you work in the region -- there are very intriguing geological patterns that are common in different countries. So what that means is that as a geologist you can actually be predictive with respect to the nature of these reservoirs.

Firstly, that means that you can compare different fields with each other. You can decide on what kind of analytical work you might, or should do. So you can use analogues. You can use analogues from one country to work in another. And that may actually save a lot of money. The other crucial benefit is the opportunity to compare fields in different stages of their life cycle.

What holds us back from taking advantage of these kinds of insights is that our industry is a bit fragmented -- we need to work more on productive partnerships and also make sure that we share data sets.

SE: Stuart, how do you maximize production when most of the best technology is patented and held by individual companies?

STUART WALLEY: There are many challenges and many similarities between the reservoirs in the region, and operators have acquired vast amounts of information over the decades. The challenge with

collaborating and sharing data is that all of this information has resulted from a huge amount of investment from the operators, and naturally there is reluctance within the E&P community to share that proprietary data with your peers and competitors.

SE: Ryan, your firm - Industry Technology Facilitator - is rather unique and neutral with a singular mission statement to get industry to cooperate on finding solutions to shared problems...does that resonate in this market?

RYAN MCPHERSON: ITF has thirty member companies, a mixture of IOCs, a number of NOCs and some service companies. So we have a good cross section of the industry. ITF was very much created out of the necessity for things like sharing data and fast-tracking new technology into the industry.

SE: What are the obstacles to data, knowledge sharing?

ANDREW DENNANT: Well, forty-nine times out of fifty, when we send teams of engineers in to help model, they have to be within the premises of the end-user client. So the capability to get that cross-border knowledge sharing is zero. Occasionally we will work on a memorandum of understanding but what we find is that if you model better, if you question your assumptions better, if you look for the differences from what you expected in one place based on the similarities with another place, you make better decisions, you improve recoverability.

Gulf Research & Development: One Common Challenge, Many Shared Solutions? 11:30

Frans Van Buchart, Principal Geologist, L. Mearns Oil
Andrew Diamond, Oil & Gas Marketing Director, Envision
Stuart Welby, Regional Manager Middle East & India, Sonergy
Ryan McPherson, Managing Director MENA Asia, ITF
Sean Evans, Managing Partner, Gulf Intelligence



PANEL DISCUSSION

So we're all for finding a solution to the common challenge.

SE: How much of the regional challenge, Frans, is created by the fact that there isn't enough research done here FOR here?

FRANS VAN BUCHEM: We've seen over the last 10 years the creation of a number of regional research centers, such as the QSTP in Qatar which Maersk Oil is part of, and here in Abu Dhabi, you have the Petroleum Institute. In Saudi Arabia, Schlumberger has set up a research center. So yes the need has been recognized. What I do not see is how they cooperate. Should the GCC play a role in bringing together these institutions and providing joint access to data sets -- If you don't have data you cannot do good research.

SE: Ryan, have you identified any regional bodies that advocate and support cooperation, or could do so if compelled to do so, across the GCC?

RYAN MCPHERSON: I think there are a number of organizations and in fact, a lot of the oil companies will do it themselves to a certain degree. We are seeing the thirst for this collaborative nature is here.

What we have found, however, is a lack of understanding, and we're trying to assist in this area to answer some questions -- Who has the research capability to do what? Where?

SE: Stuart, do you think there should be a single R&D hub in the region, a center, like the Qatar Science Technology Park for example, as opposed to several centers, which is currently the case?

STUART WALLEY: I think for the development of ideas and for breakthroughs, often having a level of collaboration is the catalyst. One of the challenges here is that you have large companies that are often quite selective about the information they share; and they have their own R&D budgets which are very extensive.

By comparison in the UK you have one governing authority in the Department of Energy, Conservation, Climate --DECC-- which oversees all of the operators, and it provides an umbrella for collaboration. The challenge that we have here is the fact that you have many competing interests within the region. Ultimately, producers here have their own end-clients buying their product,



and it's in their interest to maximize their own production and to maximize their own recovery.

SE: Andrew, what do companies have to lose by sharing data?

ANDREW DENNANT: There's certainly the point that the detailed knowledge of what's in the reservoir is jealously guarded. But across borders, different countries are doing different studies that yield better results for better recoverability. Maybe Aramco could share knowledge on making enhanced oil recovery more effective, whilst there are certain specialized modeling techniques that some of their neighbors could help with.

“We actually would need to work more on productive partnerships and also make sure that we can share data sets”

FRANS VAN BUCHEM

SE: Should the international industry, the services industry, the independents, take a lead in highlighting the reasons why data sharing makes sense? Or does it have to be NOC-led, given they are the gatekeepers of the reservoir?

ANDREW DENNANT: The NOCs need to lead and say “take this data that we’ve locked you in a room for twelve months to gain and analyze, share it with our competitors” -- no one in the service industry can make this case convincingly. So it has to come from the NOC.

STUART WALLEY: We’re talking here about a complete cultural shift in thinking within these organizations.

A decision can be made at the top but as that permeates down, the message can change. It’s a very big hurdle to overcome because even within organizations, you find groups not sharing information.

RYAN MCPHERSON: I agree. There are a number of unique challenges here, and the culture of sharing by different countries with different government regulators is one of those, as well as internal relationships.

SE: Have you found that they’re willing to come together and share a research project about something as innocuous as admin process i.e. how to better recruit?

RYAN MCPHERSON: The rhetoric and the willingness are absolutely here.

One area that they’ve hung their hat on here is ‘produced water’. And that’s the one that they’ve tasked ITF with immediately; go out globally, these are the issues that we are experiencing here within the Gulf; who have we got that can develop solutions? The preference may be a localized solution, but as long as we can get a solution, it will illustrate to the wider community that we’re willing to collaborate together.

The water project will potentially have four different NOCs collaborating on it and the financial aspect isn’t the big driver here; it’s the sharing of the knowledge and illustrating they can work together. The NOCs will provide information in a non attributable manner: not necessarily the data, but the challenges that they’ve been experiencing. And in some cases, they may also offer regulatory information. And that in itself is a significant step forward to get this round the table.

SE: Stuart, in an environment where there are patented technologies and this certain lack of willingness to share, what are the consequences of this?

STUART WALLEY: Like any commercial enterprise, you leverage your expertise and technology to have a commercial edge. One of the challenges that are being experienced in this part of the world is the fact that you may have many interests in a particular operating company, and many of those interests may have proprietary knowledge, but that’s often not shared because that’s the technical advantage that they could leverage to their own benefit in the future.

SE: How do you surmount that paradox if you’re given the situation where you have multiple joint ventures and consortiums?

STUART WALLEY: That is often a question that’s raised by large NOCs that would be a majority shareholder: why is the best technology not being leveraged in these particular assets? If you have a number of competing interests all privy to that technology, it’s different to have access to the raw data.

What you make of the raw data in the way of developing new technology and intellectual property is your lever. The challenge comes when commercial interests have to be considered - that you’ve gone and invested as a company in developing technology and therefore you don’t want to freely share that, because you want to monetize the value of that particular technology.

SE: What about an organization like the International Energy Forum, which is tasked with bringing together producers and consumers globally, and which has set up data streams for supply and demand data that is contributed to—it’s called JODI. Is there an



opportunity for an independent international agency like that, or an OPEC, for example, to take a role? Would that be the best conduit to get the creation of sub-surface data streams out into the common area?

STUART WALLEY: The challenge comes when you start to share more confidential information around the assets themselves, because that's very much guarded. I was having a conversation recently about iFields with a senior figure, and I was told that a study had been done between an organization and this company in which they started to use the actual production information to predict the future forecast of that reservoir.

Now, what companies are starting to say is we've got this wealth of information from these wells; let's start to use that information through advance neural networking to predict what will happen in the future. And it's a perfect example of where a company here may be reinventing the wheel, when it's been done elsewhere very effectively already.

SE: Andrew, what's the consequence today of not sharing this information, the absence of this data stream?

ANDREW DENNANT: I'd love to build a business case that specific. But for sure, you might have one operator who is modeling fractures, for instance, and another operator who is seeing water break through. If they'd spoken earlier, they could've both done the fracture modeling and been able to predict better to improve production and safeguard the hydrocarbon. I think that's the real risk, though, isn't it? That nobody wants anyone to know, as well as they do the hydrocarbons in the ground.

And we've all alluded to the fact that if you share enough geological detail, people can start making pretty informed estimates of what else is down there, and that it's got to be kept inside the firewall is very much the opinion of the operators here, I feel.

SE: Stuart, what about the quality and



quantity of data that is provided to operators when they take on a project -- what in that process could be improved in order to facilitate the work being done better?

STUART WALLEY: One of the things that could be better is more freely available analogues. Whenever you do any piece of work, the first thing that you need to go and find out is -- are there other similar reservoirs in the world where this type of pilot has been conducted? Service companies and operators will always go to parts of the world where that information is more available. So having more access to analogues, I think, would enhance the process.

SE: Ryan, what needs to be achieved to get data streams shared in this region?

RYAN MCPHERSON: I think the big thing is getting the right people in the room to talk about the right topics. We've got the cultural shift starting to happen. I don't know how long it's going to take, but I know the rhetoric is there, the willingness is there. So I think that's one.

And then you almost have to have—and this is where we are trying to really have a significant impact in the region—a proven project, a pilot that illustrates the value of doing x or y, with all of the NOCs and IOCs participating; and also the service providers, need to see it as a win. I think we're now at the stage where that decision is in the process of being made, but it won't happen on its own. It will need a few of them to stand up. Not necessarily one in a leadership role, but all collectively come together and at least try this.

SE: Frans - Is there a trigger do you think to achieve this?

FRANS VAN BUCHEM: I believe that we are now in a situation where we see that all these research centers in the region have been created and have had five to ten years of existence. You always need a phase of establishing yourself and looking to see what you're going to focus on. So it might be a very elegant way for the institutions that have been established so far, to try and coordinate a limited number of regional projects, to demonstrate regional cooperation can work and produce useful results for all involved.

ANDREW DENNANT: I think that it's clearly aspirational. We want it to happen. And as we have said, the local players have to make it happen. Sharing local analogues and sharing best practice for where to do the additional research to ensure the model is as accurate as possible would be a start. And as a technology company, make sure that we measure to confirm our assumptions, not to find what works with the assumption, but to find what doesn't work, so that we know where to look next to make the model better.

STUART WALLEY: Until there is a real need on the part of the NOCs to collaborate, then you will not see whole-scale collaboration. I think you will see specific collaboration on certain challenges that they may have in common, but in general it will take a number of decades before we get there. 📌





‘Developing Local Talent: Better Prepared for the Energy Challenges Ahead ?’

Nikolaj Svane, HR Director, Maersk Oil

Developing local talent in countries rich in energy resources such as the Middle East is one of the ways in which the global industry can help to mitigate the pending talent shortage.

The oil industry has experienced a number of “boom and bust” cycles since the 1970s and each oil price crash has led to massive cuts to keep operating costs low. Unfortunately the first cuts almost always hit training and travel budgets, and the 10\$ oil in the late 90’s once again predictably led to a freeze on hiring new graduates into the industry and massive cuts in training and development. In the early 1990’s there were thousands of graduates in Petroleum Engineering worldwide; by 2005 there were only a handful. This trend was exacerbated by the rise in demand for graduates in the dotcom businesses of IT and telecommunication.

In the ten years since it first became apparent that there was a looming “cliff”, with many baby boomers expecting to retire with good IOC pensions, many factors have combined to push this reality a little further into the future – the financial and banking crisis and the pensions sell offs persuaded many expatriates to work a little longer. But even baby boomers don’t live forever and most of the talent which developed the North Sea fields is now either retired or getting ready for the golf course which will lead to severe shortages in the marketplace -- a radical change in strategy is required to ensure that energy projects continue at a pace to meet global demand.

Qatarization, Emiratization and other national programs that provide career development paths for Gulf nationals to enter their country’s respective energy industry are an absolutely essential necessity given the global backdrop to ensure that resource holders have the competent skills in-country to manage and develop their vast hydrocarbon wealth through the 21st century.

These initiatives, now about a decade old, should be increasingly enhanced with such features as mentoring programmes that have legally binding obligations and KPIs, and by encouraging young Gulf Arab petroleum engineers and geoscientists to be transferred abroad to garner vital experience. Otherwise we will not drive forward the kind of indigenous technological development and skills that we need to see emerge in the Middle East to manage the third generation of resource extraction in what many refer to as post-easy oil.

In Qatar, the nationalization programme is, by decree, targeted to increase to 50 per cent

the Qatari proportion of the energy-sector workforce. This presents a great challenge, given the increasing career options that are open to young nationals in a diversified economy that is seeing consistent double-digit growth, and given the limited number of appropriately qualified graduates leaving the region’s academic institutions.

You can guarantee big salaries but more money is not a replacement for experience in an industry full of operational challenges. The increasing cost of failure, in monetary and environmental terms, cannot be ignored – competency is a must.

Technology is also not a panacea. It is part of the story, but it has to be employed in collaboration with the mitigation of the general risks that are associated with its application, and that starts with answering these questions: Where are we going to get people? And where are they going to get access to the appropriate experience?

IOC’s have for years relied on expatriates from their base country to fill the most senior positions in their overseas ventures, and training programmes were (in the most part) designed to fulfill these objectives; local manpower was mostly restricted to oil field service work. The countries of the Gulf, along with other oil producing regions, demand more and place a high priority on the development of local talent.

Thoughtful IOCs recognize that the key to securing acreage for the future (a key determinant in the share price) relies on delivering on the promise of meaningful local talent development. A key differentiator therefore becomes IOC Talent, and most importantly the willingness and the implementation of skill transfer.

Particularly in the Gulf region where NOCs now hold the majority of the producing assets and IOCs are competing to maintain their positions, delivering on the promise of transferring skill becomes a key competitive advantage. NOCs are no longer interested in IOC capital -- the Sovereign wealth funds of most Gulf countries far outweigh the capital budgets of any IOC.

But the challenges of delivering an increasing number of mega projects and the aspirations of the NOCs have not changed. In fact the NOCs, especially from Asia, are now increasingly competing with the IOCs outside their own countries, which increases the need for Talent.

The New Silk Road and particularly China, which is a consumer of energy more than it is a producer of energy, has an important role to



play in plugging the global energy talent gap as it remains a part of the world where education is a fundamental gateway to the prosperity of the future. That is a resource that the international energy industry, which is desperate for new talent to counter the potentially catastrophic combination of an ageing workforce and the drastically reduced numbers of energy related graduates emerging from northern and western universities, has not yet tapped into.

Traditionally international oil companies and energy services firms didn't look to China for reservoir engineers, geo-scientists or environmental engineers because the Chinese education system didn't encourage students into such areas as the indigenous industry was not that mature — but that has all changed in recent years and forecasts now indicate two-thirds of all reservoir engineers and subsea specialists will, in seven to ten years, depending on the numbers, be coming out of Chinese universities.

International energy companies need to

adapt and develop their own revised version of internationalizing that befits the energy era we are now moving into — in time it should be near to impossible to say that X energy company is from Y country. Everything about a global player should be global, with its brand supported by adopting best global practices and the best global talent wherever it originates.

That goes for the Chinese as well as the Western firms.

In the 20th Century growth story the world looked to the West (Europe) and the North (US). As a result most global firms had a strong associated position in these regions because this is where the economic opportunity stood. But what we are now clearly witnessing is the emergence of a new trade route from the South to the East with a conveyor belt moving in both directions, which goes all the way from Brazil through Africa into the Middle East and on to the emerging regions of Asia. *

Developing Local Talent: Better Prepared for the Energy Challenges Ahead 14:30

Nikolaj Svane Head of Human Resources, Maersk Oil
Alex Schindelar Middle East Bureau Chief, Energy Intelligence
Regy Loknes HR Strategy & Planning, ADMA OPEC
Adam Lomas Managing Partner, Crestor & Partners
Sean Evers Managing Partner, Gulf Intelligence



MAERSK
OIL



BLECKMANN UK

95



DEVELOPING LOCAL TALENT: *Better Prepared for the Energy Challenges Ahead*

PANEL HOST: Nikolaj Svane, HR Director, Maersk Oil
 Alex Schindelar, Middle East Bureau Chief, Energy Intelligence
 Regy Loknes, HR Strategy & Planning at ADMA OPCO
 Adam Lomas, Managing Partner, Castor & Partners
MODERATOR: Sean Evers

MODERATOR SEAN EVERS (SE): Why is it important to develop local talent to be better prepared for the energy challenges ahead?

NIKOLAJ SVANE: I'd like to start by saying that there are several massive exploration and production projects lined up in the industry across the world but that the talent resource availability is very scarce. As an industry we need to understand how to expand our supply base of talent, how to tap into the talent in the Gulf region and how to attract that talent into our industry.

We are operating in areas outside of the North Sea, outside of the U.S., outside of areas where we have a long history of developing E&P specialists. In order to survive we need to make sure that we tap into the local workforce and drive localization strategies effectively and make sure that we have the right people in the right jobs.

SE: Adam - getting talent is a challenge, but to develop that talent, to give it a posture for leadership, compounds the global and regional challenge, does it not?

ADAM LOMAS: Having stepped out of a major international oil company after more than 30 years and now working much more closely with people who are on the ground, it makes me think about this in a more personal dimension. We should be attracting young nationals into these national oil companies, who have every right to expect that they will be in senior management positions as quickly as possible. But there's a need to make sure they have the talent, the expertise and the knowledge to be able to do that. The nationals

need to be clear about their responsibilities in this effort and the expatriates need to think about what will make them good at the business of coaching and mentoring. It requires a true partnership.

SE: Regy, does what Adam said resonate with the challenges you face at ADMA OPCO?

REGY LOKNES: Yes, but before you can start developing these people, you need to get hold of them. And the supply and demand is a big issue in the UAE. The demand for local talent is increasing tremendously, and the base for recruiting people is getting smaller. So the industry needs to plan ahead and work with agencies, with government, with academia, in order to get programs in place at a very early stage to get hold of these people.

SE: Adam, from a global perspective, is production being held back due to the lack of talent available? A recent report cited that the Scottish energy industry will need to attract 125,000 new technicians over the next five years just to replenish the industry. What can be done on a global level that hasn't been done up till now to tackle this challenge?

ADAM LOMAS: We haven't been very clever about keeping even the young people that we were getting into our industry. We need to work more one-on-one with people to help to convince them that the oil industry is an interesting technologically and challenging place to be.

SE: Nikolaj, is it equally as challenging to secure talent in other parts of the world -- it's

ironic that with unemployment rates of 15% in parts of Europe, here's an industry begging for talent.

NIKOLAJ SVANE: Yes, government and industry need to be better at attracting youth into technical disciplines at universities and engineering schools. It's about branding our industry and understanding that the generation that we are trying to attract is very different. And what we are also very cognizant of in Maersk Oil is developing an understanding on how can we also tap into emerging markets talent where the science is stronger and where the supply base of petroleum talent is actually already there.

If you look at some research studies, two-thirds of all reservoir engineers and subsea specialists will, in seven to ten years, be coming out of Chinese universities.

REGY LOKNES: I think we also need to look at the leadership in organizations. If we want to keep these young people, we need to also change our leadership development. We need to change the value of how we coach and how we develop these people on their terms. If not, they will just go.

SE: Adam, how should governments and the energy industry globally work together to promote the industry and find solutions to this pending talent crisis?

ADAM LOMAS: Making the oil industry "sexier" is certainly very helpful and politicians can do that. But I think education can play an important role. There was a very frightening statistic about how few petroleum engineers came out of American universities either in 1994 or 1995, where ONE petroleum engineer came out of an American university. And we currently need 250,000 of them.

ALEX SCHINDELAR: People are not choosing that path because it's not attractive; it just means there have been other better options. But maybe now, post-recession, people will come back to the industry which has a stable pay off in the long run.

SE: Bringing the subject down to the ground so to speak, in Qatar, Nikolaj, are you also competing with these same global trends, or are there abundant young Qataris looking to knock on your door?

"In order to survive, we need to make sure that we tap into the local workforce and drive localisation strategies effectively, and make sure that we have the right people in the right jobs"

NIKOLAJ SVANE

NIKOLAJ SVANE: I think in Qatar, the appetite for growth is great, and I think the ambition among the Qatari youth is definitely there. One of our big challenges is to attract them into technical disciplines, and that's where we have a big obligation as an industry to go in and ensure that we make it attractive and appealing to youngsters to go into technical universities. The challenge in Qatar is that the supply base is extremely limited. It's not only E&P companies competing with each other, but it's also banks and the public sector.

SE: Regy, how are the global challenges coming to the ground here in the UAE, at ADMA OPCO?

REGY LOKNES: The challenges are exactly the same. And it's not just at ADMA, it's at all the OPCOs -- we all are competing against each other for a small supply.

SE: One of the supply solutions that seem to be coming through on the local level is a significant amount of women coming into the energy opportunity -- 75% of new engineering students in the UAE are women.

ADAM LOMAS: Yes, if you take a broad picture, they are much more determined to succeed. They're much more determined to stay on the job. Having said that, girls in the oil industry, even in the West, is still a challenge.

NIKOLAJ SVANE: Yes, I think it's fantastic that we are capable of attracting so many women into the technical disciplines, and that women have such a great appetite for education and growth. And we know that we have so much unlocked potential. There



are cultural issues and boundaries that are difficult to break down, but there is also an opportunity and obligation on us, as an industry, to then look at our structures to say, "Okay, what can we do differently?"

ADAM LOMAS: One thing that should be done is to make sure that a young graduate who comes into an organization is very quickly given a meaningful job which challenges him or her to the very limits of their capability.

SE: Regy, what's your view on that - is that a challenge for you?

REGY LOKNES: Not really because the ADNOC group of companies has had a competence assurance management system

for 10 years, which was based on the best input from Shell, BP, Total, and the other shareholders. By getting that in place we managed to actually put the competence issue and system in place with assessment. And the key driver for it is doing real tasks and getting feedback. We have a competence based system.

NIKOLAJSVANE: I agree with that. Development of people is key. We are committed to the national vision of Qatar and employing nationals, but I'm more committed to all people, and making sure that they get real challenges and real opportunities and real support in developing and going through the ranks of the organization.

SE: The issue of competence is not only a challenge for the nationalization program; it's a challenge for the industry. As we rush to find a solution to the talent gap, we end up with maybe a lot of people with degrees, but not necessarily with the competence to execute complicated tasks?

ADAM LOMAS: Of course we want people to be employed, but there's not much point in employing people when you have to employ somebody else to get the job done as well. So it's important to make it clear within companies that talented, expatriate people who come to this region, have a responsibility to transfer their talent to the local population.

SE: Is the incentive for the commitment to transfer of knowledge in the work place, a mentor programme if you like, driven by the requirement to expand the global talent pool, or is it to tick the box of the local employment obligation?

ADAM LOMAS: It's both. They are separate, but they are both important.

REGY LOKNES: And it's actually a business need. You need these people. It takes time to develop them, so you need the expatriates there to train and develop them.

SE: Do you envision a future where the industry here will have too, essentially whether by design or by requirement, run by itself on indigenous talent?

REGY LOKNES: Definitely in the future, they will be able to do that by themselves. But that would not be ideal, as there's new technology, new challenges that will always

need to be taught especially when you're in an international business like oil and gas.

NIKOLAJ SVANE: I think we as organizations can benefit a lot if we focus on developing people, not from the perspective of social responsibility, but actually focusing on -- do we have a need to have these people in real jobs? Because otherwise we cannot do our business. Social responsibility is part of the equation, but it cannot be the driver.

SE: Adam, in terms of the competence issue, is it getting enough focus in the industry?

ADAM LOMAS: No, it can't be. Otherwise we would have solved this problem. It's being thought about but is it top of the agenda? Absolutely not! Should it be? Probably, because the number of projects which a major international oil company, or even an NOC, in the future will be able to take on is going to be limited, not by technology, not by dollars, it's going to be limited by the number of talented people which are required and available for these mega projects.

SE: Can I go to the floor for a comment or a question please? I'd be particularly interested to get the voice of the head of Qatarization from Maersk Oil, as we have been talking a lot about your space.

AUDIENCE MEMBER, FAWZI ALI AL-AJJI, HEAD OF QATARIZATION, MAERSK OIL:

Adam has summed up part of the biggest problem we have in the whole Gulf area, which is that we have international companies that have lasted over 60 to 80 years in the region and yet have not developed even the first tier leaders of nationals within their companies. They have to remember that they came to give the knowledge to the locals. It's only when we realize that we really have a serious problem that we find a solution for it.

A lot of things have happened in the oil and gas industry that have made many of the locals shy away from it -- issues like safety, the offshore environment and all of that, so we need to introduce it to them as the backbone of their country and that they should be part of that development.

In Qatar, the Nationalization programs initially were that you have to target a certain percentage, and you didn't have the people to deliver the certain percentage. But even if you put all the Qataris who are ready to work in all the companies, we will not get that

50%. So there is a shift now in Qatar itself, in the leadership, which says rather than put a percentage to it, we want every Qatari to have a very meaningful job. So to me, it should be an obligation on foreign companies to go to the grass roots and develop people, and then I'm sure the nationalization program will work. But if you try to force things with numbers, I don't think it will work.

ADAM LOMAS: Although it has been a kind of a well-understood fact that expatriates don't just come here to do a job, but to transfer talent, it has never been enforced. So, that's why we need to change the contracts so that there really is both a carrot and a stick and that this is assessed and measured.

SE: Regy, succession planning is something we didn't touch on. It's a bit like transferring skills. You've got to have succession plan for all roles?

REGY LOKNES: Yes, I'm looking after succession planning in ADMA. We have for many years had plans in place which have been more or less, replacement plans. We turned that around about three years ago, and turned them into development plans by identifying candidates during their assessment. At the assessment, its either yes, you can do the job, or no, you need a development program for a couple of months to get the skills in place.

What we are changing it to now is also on the technical side, because we need more UAE nationals in those kinds of positions for operational reasons. So, the whole thing is driven by specific critical business targeted positions and where the business needs succession planning.

And thereafter, you need to do assessments of the performance of the person in the job over time. If you don't have that assessment, you don't measure progress.

SE: And probably you should also add, Adam -- that if you are transferring your skill or your job to a national, then a part of that job offer should be what your next job is. Otherwise are you not putting yourself out of a job?

ADAM LOMAS: Well, it does. But if you're good at talent development, if you're really good at transferring your skills, the world's your oyster. That generation may not be able to go out anymore and grab hold of a piece of casing and throw it around a drill floor, but they certainly



can walk into an office and enthuse and mentor and coach somebody who needs the talent which has been gained over 35 years. And that is the role we should be using the 50 and the 60 year olds for now whilst they're still available. That is the best job for them today.

NIKOLA J SVANE: And it is being recognized and it is happening in organizations. And I think the demographics and the recent change in the economy where people are working longer, you need to use and tap into the senior population and utilize them in a different way than you used to in the past.

REGY LOKNES: There are a lot of other aspects as well about processes and procedures that have been placed in these companies. For instance, if you look at the strategic planning of the workforce, it's easy to put in place a recruitment plan for

expatriates. So before we actually go out and say we need to recruit an expatriate, have you looked at your own organization to see if you have any internal resources?

We've increased the use of internal resources at ADMA by 100% over the last two years, because they are there, they have been identified and we know about them from succession planning. Previously, they were also there, but it's so much easier just to put the vacancy into the HR recruitment plan and say go out and get some expatriates.

ALEX SCHINDELAR: Well, there's no shortage of ideas, but I have my doubts that all of this is going to be so easy. The pace of progress is not that fast. So if we want real results in employment numbers, then a quantum leap is needed or else I think we're going to have a lot of problems down the road -- I'm the skeptical on-looker in this situation. *



MAERSK
OIL

Maersk Oil Middle East A/S
Level 4, Building B
Al Mamoura, 15th St. Muroor District,
P.O. Box 46400, Abu Dhabi, UAE
tel: +971 2 659 4076 fax: +971 2 659 4045