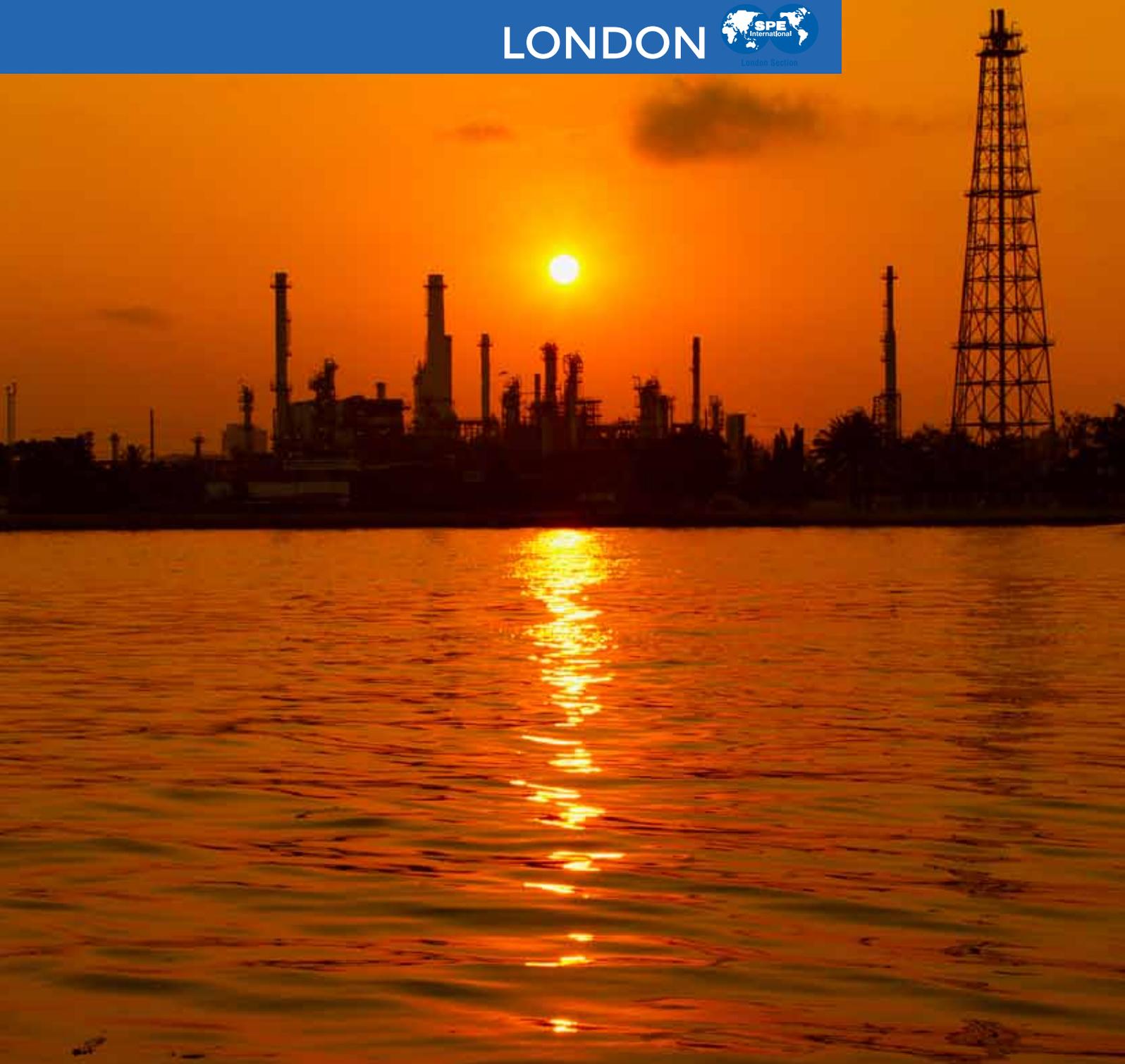


SPE REVIEW

LONDON



Professional excellence and achievement: Q&As with award recipients
Challenges, investment and study: Feasibility Study
SPE London's inspiring new chairperson: Pamela Tempone

Contents

NEWS

Challenges, investment and study ..4

Feasibility Study on Offshore Polymer Flooding, Forecasting Production Through Integrated Asset Modelling, A Technical and Economic Approach.

SPE London's inspiring new chairperson ..6

The Society of Petroleum Engineers (SPE) London Section has appointed Pamela Tempone as its new chairperson, taking over from Alejandro Primera after his successful term.

Inspiring the next generation..... ..11

The four days of the free-to-attend SPE Offshore Europe 2015 event on 8 - 11 September in Aberdeen will include 11 keynote sessions, 75 technical papers, and daily topical lunches and breakfast briefings.

FEATURE

Professional excellence and achievement, recognised through the 2015 SPE awards ..3

Allan Twynam and Dr John Campbell, recipients of 2015 awards, answer our questions about driving efficiency and performance, and major future challenges facing society and the industry.

ABOUT US

The Society of Petroleum Engineers (SPE) is a not-for-profit professional association whose members are engaged in energy resources development and production. SPE serves more than 110,000 members in 141 countries worldwide. SPE is a key resource for technical knowledge related to the oil and gas exploration and production industry and provides services through its publications, events, training courses and online resources at www.spe.org

The SPE provides services through its global events, publications and website at www.spe.org. SPE Review is published 10 times per year by the London sections of the Society of Petroleum Engineers. It is sent by e-mail to over 4,000 SPE members. If you have read this issue and would like to join the SPE and receive your own copy of SPE Review London, as well as many other benefits - or you know a friend or colleague who would like to join - please visit www.spe.org for an application form. The views expressed herein are not necessarily those of the SPE. Extracts may be reproduced subject to a clear acknowledgement of the source.

CONTACTS

Communications Committee: [Zelda Heath](mailto:Zelda.Heath@afren.com)
For queries please contact: [Kate McMillan](mailto:Kate.McMillan@afren.com), katespe@aol.com

CHANGE OF ADDRESS?

If you need to change any of your membership details, please visit the 'Update your profile' link at the foot of the homepage at <http://london.spe.org/home>

Future Basics

There are some basics that always hold true – in good times and not so good: technical contributions, professional excellence, career achievement, service to colleagues, industry leadership, and public service.

SPE London's new chairperson, Pamela Tempone holds those values very dear, and explains (**on page 6**) how she sees the Society's two-fold mission, and its key priorities.

Two men who also exemplify the Society's mission are **Allan Twynam** and **Dr. John Campbell**, recipients of two **SPE 2015 Awards**. We were given a rare opportunity to ask some probing questions, and get indepth insights from these top-level professionals. Read the full Q&A interviews, starting **on page 3**.

Elsewhere in this issue, you will read about **SPE Offshore Europe 2015** plans to inspire future generations (**page 11**), providing a global industry hotspot to refresh industry knowledge, discover new technology and connect with individuals and companies drawn from North and South America, Africa, Asia and Europe – all under one roof.

And, we have a new study: starting on **page 4** you'll find a comprehensive review of **offshore polymer flooding through Integrated Asset Modelling (IAM)**, from Arash Farhadi, London South Bank University and Primera Reservoir Ltd, Alejandro Primera, Jesus Aponte, Primera Reservoir Ltd, Maria Astrid Centeno, London South Bank University

In addition, read about the event that some young professionals travelled the breadth of the country to attend: **SPE YP's visit to Kappa's UK home** (see **page 6**).

As we continue to work together to ensure a strong, technically superior and community-aware industry, we welcome your feedback on the online SPE Review London. **It's our third issue now, and we'd really like to know what you like, what you don't like, and what additions you'd like to see in future issues.**

Drop us a line at Zelda.Heath@afren.com

*P.S.: We're still got some new volunteer opportunities – especially with the Conference and Continuing Education committees (see **page 9** for more details).*

<http://london.spe.org/home>



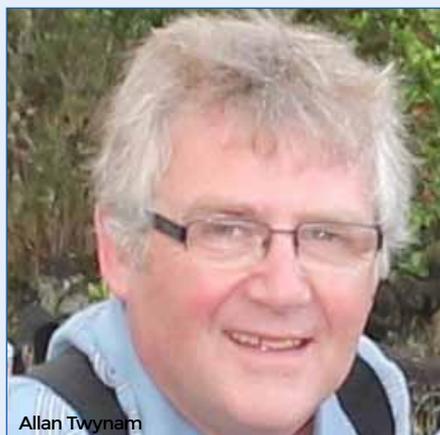
Professional excellence and achievement, recognised through the 2015 SPE awards

SPE Awards recognise members for their technical contributions, professional excellence, career achievement, service to colleagues, industry leadership, and public service. **Allan Twynam** and **Dr John Campbell**, each a recipient of a 2015 SPE Award, took time to answer our questions about driving efficiency and performance, and future challenges facing society and the industry.

Driving Efficiency and Performance

Allan Twynam, Senior Advisor - Formation Damage / Drilling Fluids Specialist at BP Exploration is the recipient of the **SPE 2015 North Sea award for Drilling Engineering**.

BP's businesses are organised to deliver the energy products and services people around the world need right now.



Allan Twynam

Its Upstream segment is responsible for activities in oil and natural gas exploration, field development and production. The Downstream segment is the product and service-led arm of BP, focused on fuels, lubricants and petrochemicals.

Allan works in the BP Global Wells Organisation (GWO) based in the BP International Centre for Business and Technology at Sunbury.

Allan spoke to SPE Review London about his career, industry challenges and why being part of one team approach to operations and a 'bridge' between functions is so important.

SPE Review London You've been with BP Exploration for almost twenty-five years. How did you start in the business?

Allan Twynam: I'm a geologist by degree and I started working offshore as a mudlogging engineer – which in the early 1980's was a highly important - but lowly paid role for a geologist. After a couple of years, I became interested in the drilling fluid business (which appeared to me to offer improved profile, pay and prospects too) and I was fortunate enough to get a job offshore with BW Mud, a small North Sea drilling fluid engineering company.

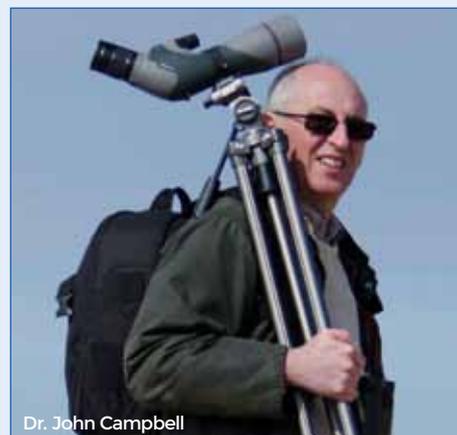
I was with BW Mud for eight years as mud engineer on various rigs onshore and offshore including Shell, BP, Amoco, British Gas, Chevron, Texaco and Mobil. I was then offered a job with BP Exploration in 1990 as a drilling fluids technical services specialist in their Sunbury facility supporting global operations. That job offer was unique, being a drilling fluids engineer specialist role in Sunbury, as opposed to Aberdeen or

Continued on page 7

Looking to the Future

Dr. John Campbell, Technical Director of the International Association of Oil & Gas Producers (IOGP) is the recipient of the **SPE 2015 award for North Sea Health, Safety, Security, Environment and Social Responsibility**.

IOGP serves industry as a global partner for improving safety, environmental and social performance. It also acts as a uniquely upstream forum in which its Members identify and share knowledge and good practices to achieve improvements in health, safety, the environment, security and social responsibility.



Dr. John Campbell

SPE Review London was fortunate to catch up with this busy man, and ask him about his career, how the industry has changed during his time in the business, and how he sees the future.

SPE Review London: You've been with the IOGP for almost twenty years. How did you start in the business?

Dr. John Campbell: I'm a chemist, who got involved in geochemistry and oceanography, and then into broader environmental issues, which is where I am now. June 1, 2015 marks my eighteenth year with IOGP. Previous to that time, I was with the UK government's Ministry of Agriculture, Fisheries and Food (MAFF), most latterly as head of the Fisheries Research laboratory at Burnham on Crouch. I joined IOGP when it was called the Oil Industry International Exploration and Production Forum (E&P Forum). At that time, the big debate in the North Sea was about decommissioning, and my advisory work in marine science brought me close to decommissioning and other industry issues. My primary responsibilities at IOGP are for environmental matters, although I also deal with legal matters.

SPE Review London: How has the industry changed?

Dr. John Campbell: Not only has the number of issues increased, they've also become more general. Back in the early part of the century, around the year 2000, most issues were

Continued on page 7

Challenges, Investment and Study

Feasibility Study on Offshore Polymer Flooding, Forecasting Production Through Integrated Asset Modelling, A Technical and Economic Approach

Arash Farhadi, London South Bank University and Primera Reservoir Ltd, Alejandro Primera, Jesus Aponte, Primera Reservoir Ltd, Maria Astrid Centeno, London South Bank University. (Winner of the UK Student Paper competition 2014, held at Imperial College London.)

Introduction

Substantial percentage of current world oil production derives from mature fields and the rate of replacement of the produced reserves by new discoveries has been declining in the previous years. In order to sustain such upsurge in the demand for economical energy throughout the world, the recoverable oil resources in known reservoirs can be produced economically by applying EOR techniques.

The following work is a comprehensive review of offshore polymer flooding through Integrated Asset Modelling (IAM). Polymer flooding has been one of the emerging EOR techniques in offshore environment in the recent decades. The pilot implementation of polymer flooding has proved to be challenging due to the difficulties associated with the operational facilities and the high Capital Expenditure (CAPEX) required to initiate the project.

Coupling the IAM technique to such project would provide valuable insight to the current and future field production levels and expected operating conditions.

IAM can add essential values in areas of field and well optimization, production forecasting, operational decision making and effect of extending field life on surface and subsurface facilities.

Objectives

The objective of this work was to determine the performance and feasibility of polymer flooding in an offshore environment. Areas under scope were those such as ideal polymers for such environments, typical range of polymer concentration and slug size, injection rates, rock integrity and fracture pressure, polymer adsorption, along with the perspective need for required surface facilities such as polymer mixing unit, storage tanks, dispersion units, desalinization unit etc. The surface facilities required for such projects, which require incremental investment on platform, have proved to be an obstacle faced by the field operators in the process of polymer flooding implementation.

The execution of such projects would normally require significant initial investments which would go towards refurbishing or building the surface facilities required. Once the facilities are in place and the flooding is implemented, it would then take an average of 10 to 15 years before any significant incremental oil is recovered. To this end, it was essential to determine whether this project would be identified as rewarding considering the current oil price and the waiting time before any major lucrative incremental oil recovery.

Finally, the role that UK government has played in the recent times through the sanctioning of legislations such as Brown Field

Allowance (BFA) and its corresponding effect on company's desire to tackle such projects was analysed.

Polymer Flooding

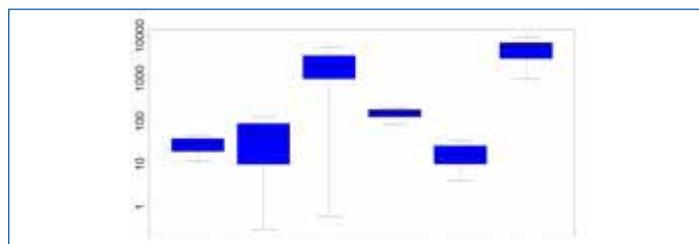
Polymer flooding is one of the chemical enhanced oil recovery mechanisms which has been used in the oil and gas industry since the late 1960s. It involves addition of water soluble polymers to injection water in order to increase injected fluid viscosity and enhance the oil displacement in the reservoir. The resulting increase in injected fluid along with the decrease in aqueous phase permeability would cause a reduction in mobility ratio, therefore increasing the volumetric sweep efficiency and lowering the swept zone oil saturation (Russell T, et al. 2014).

A typical polymer flooding consists of mixing and injecting polymer solution over an extended period of time until certain amount of reservoir pore volume has been injected. Subsequently, through long term waterflooding, the polymer slug and the oil bank will be driven towards the production wells.

Polymer Flooding Screening

In order to have an effective polymer flooding, the field under investigation needs to have the desired characteristics such as moderate reservoir temperature, permeability etc.

Figure 1, below, is an illustration of screening criteria for polymer flooding.



Polymer types and selectivity criteria

There are numerous types of polymers available in the market, however, choosing the right type of polymer out of those available is of paramount importance. In this work, Hydrolyzed polyacrylamide (HPAM) and Xanthan polymers were chosen as ideal polymers. The reason behind this decision was based on numerous factors such as their performance as a viscosifier, thermal stability, prices etc.

HPAM

More than 90% of polymer floodings around the world have been performed by HPAM. HPAM, which is a synthetic type

Continued on page 9

Energise a classroom!



Give a presentation to students.



Presented by **Society of Petroleum Engineers**

Make a difference in our industry while doing something good for your community. Simply visit your child's classroom or a school in your neighbourhood and talk about the importance of energy in our lives. SPE's energy4me® programme provides everything you need to prepare for your presentation quickly and easily.

- Presentation templates
- Hands-on activities
- Career information

Materials available in:

• العربية	• Français
• 中文	• Italiano
• English	• Русский
• Español	

Learn more at energy4me.org.

Pamela Tempone: SPE London Chair 2015/16

“I strongly identify with SPE London’s mission – and it is a privilege to be in a position where I can influence its ongoing development.”



Pamela Tempone,
SPE London Chair 2015/2016

The Society of Petroleum Engineers (SPE) London Section has appointed Pamela Tempone as its new chairperson, taking over from Alejandro Primera after his successful term.

Following a PhD in Applied Geophysics from the Norwegian University of Science and Technology (2010), and an MSc in Environmental Engineering from the University of Bologna (2006), Pamela has worked as a geomechanics specialist for BP since 2010. Her technical interests are in reservoir geomechanics and drilling geomechanics. Pamela is actively involved in SPE London, serving in various roles, including: Communication Chair in 2013-2015; Editorial Member for SPE Review in 2013-2015; and Annual Conference Committee member in 2010-2012. She received the 2014 SPE London Section Outstanding Service Award.

Prior to 2010, Pamela led the SEG Student Chapter in Trondheim, Norway (2007-2008).

Speaking about her new role as SPE London chairperson, Pamela says: “I strongly identify with SPE London’s mission – and it is a privilege to be in a position where I can influence its ongoing development.

As Pamela explains, SPE London mission’s is two fold:

1. To collect, disseminate, and exchange technical knowledge around the safe exploration, development and production of oil and gas for the benefit of the London-based public; and,
2. To provide opportunities for London-based professionals to enhance their technical and professional competence without needing to travel far from their offices.

She adds: “To enable the London-based oil and gas industry to share its technical knowledge in an effective and efficient way, I believe we should continue to focus on the following priorities:

- **Boost capability development to support the industry in managing the big crew change.**

SPE London arranges workshops / conferences / seminars to enable individuals at all stages of their career to master new areas of expertise, equip themselves for new responsibilities, and keep their technical knowledge current.

- **Maintain and enhance technical quality within SPE programs, despite challenges created by the sudden dive of the oil price.**

Questions have been raised, in the current challenging business climate, about SPE London’s capability to maintain the same quality of knowledge delivery to members, diversity of content, and other program elements. By ensuring the continued health and robustness of section finances, we are confident that programmes will continue to be of the highest quality, and remain an essential component in SPE London’s ongoing success.

- **Maintain and enhance member engagement and volunteerism.**

To ensure continuance of its quality programmes (especially during the current industry downturn), SPE London relies on member engagement (especially technical expertise), and on its invaluable member volunteers. We recognise and respect the enormous contribution provided by our volunteer members, and are reliably informed that volunteers derive great satisfaction from their involvement with the Society, on both personal and professional levels. Indeed, as the industry struggles to find more career opportunities in the current challenging environment, SPE London provides its members and volunteers with a platform for networking within the wider industry, together with unique opportunities to demonstrate technical expertise and gain soft skills.”

In accepting her nomination as the 2015/2016 Chairperson for SPE London, Pamela asserts that she will do her utmost to serve the Society to the best of her abilities, and uphold SPE London’s excellent standards. ■

SPE YP pays a visit to Kappa’s UK home

On Wednesday 29 April the SPE YP London section co-organised an event with Kappa Engineering to give a crash course on one of Kappa’s most used and popular Saphir well testing software.

In attendance were 18 of the industry’s sharpest and brightest who were eager to expand their professional skills. Among the 18 who came along a handful were students who had travelled the length of the country to attend one of the SPE YP London section’s events mainly due to the section’s reputation for delivering exceptional technical events.

The day started with a 9 am coffee meet and greet where there was 30 mins to engage with fellow Kappa enthusiasts before the prompt start at 9.30 when the real meaty classroom session took place. The participants were guided through the suite of Kappa’s jewels, Ecrin (French for jewel box) and shown where Saphir fits

amongst the other packages that are available within Ecrin. As with most software tutorials, it is wise to start from basics at the beginning, therefore the tutorial began with data loading QA QC processes and an introduction to Analytical Models. This took the session up to lunch where once again the young professionals were able to talk, share experiences and get to know new members. After lunch, the session proceeded with Numerical Modelling and the need for Non Linear.

The day was a success, with a full house and informative knowledgeable tutors; the attendees seemed happy with the delivery. The dialog flowed easily between the YP’s and the session leaders, interesting questions were returned with well-informed answers.

We would like to express our thanks to Kappa for being such gracious hosts and putting together a great technical event of which the SPE YP’s would love to have more in the future. ■

Professional excellence: the 2015 SPE awards

(continued from page 6)

Gt Yarmouth. Sunbury is just outside London – where I grew up. I've been with BP ever since.

In my early BP career, I managed BP's global fluids contracts, design and implementation of fluids programmes and trouble-shooting of drilling fluid systems in interesting locations, such as Vietnam, Papua New Guinea, South America, Kuwait, Middle East and Indonesia. Since the BP Amoco merger in 1999, I have focused on quality assurance in laboratory design and field implementation of non-damaging reservoir drilling and completion fluids.

SPE Review London: How has the industry changed?

Allan Twynam: I see a big change in many areas, but particularly in safety, process and performance. The industry has always been safety conscious of course, but it is now so much more systematic and controlled, which is a good thing. Everything we do in the industry is risk assessed and vastly more consideration is given to personal and operational safety.

For BP, the process changes are around standardisation, simplification and being systematic in what we do to make the right decisions. The industry has benefitted enormously from technology advances in communication and automated systems offshore; for example, in my field of drilling fluids we can monitor and maintain fluid systems real-time offshore, observe real-time wellbore engineering challenges, and communicate with onshore teams much more effectively, which improves overall performance.

Another change for BP from my early days is that we originally had drilling operations in numerous places across the globe – from Canada to China. We've now streamlined operations to key areas: the North Sea, Angola, Azerbaijan, Trinidad, Egypt and Gulf of Mexico.

What has not changed is the constant, but rewarding challenge faced at all times of exploring and developing new wells in challenging environments from Alaskan tundra to desert, from onshore to deep sea.

SPE Review London: Can you give an example?

Allan Twynam: More than 60% of BP's production is coming from soft sand and unconsolidated reservoirs and that offers its own technical challenges.

BP is an industry leader in working with our contractors in the development of soft sand reservoirs, including design and implementation of non-damaging reservoir drilling and completion fluids, completion design strategy and execution of drilling, and completion engineering practices for unconsolidated reservoirs. Twelve years ago, we weren't doing any of that, as we concentrated mainly on development of cased and perforated wells with competent rock reservoir targets.

That's one of the reasons that ongoing research and development (R&D) is so critical – and that's part of my work with the BP operational teams to ensure the best fluids technology and engineering systems are applied to our current and forthcoming development projects.

SPE Review London: So, how has your specific role become a 'bridge'?

Allan Twynam: Basically, I'm a former drilling fluids engineer from the drilling function who now works in the completions

single-topic, focused issues; and we produced guidelines on those topics.

Now, things are much broader. For instance, the 'environment' is one of these 'catch-all' terms, which runs through everything from climate change down to individual chemicals that are used in the E & P business processes. So, I spend a good deal of my time on these subjects with the international regulatory communities that deal with 'the environment', or the 'marine environment', and that's a very broad mandate.

SPE Review London: Can you give an example?

Dr. John Campbell: We used to do a lot of work on production water: the quality of produced water, technologies for improving the quality, and the impacts that produced water discharges might have on the environment.

However, it's now more about 'eco-system based management', which looks more widely at the environment in which we're operating – so it's not just the case of produced water coming out of a pipe, rather it's how that interacts with all sorts of other activities going on, not all of which are oil and gas activities. So, it's a very broad and rather 'hard to define' area of 'cumulative effects' in the environment.

Now, 'cumulative effects' is a very good area for environmental non-governmental organizations, simply because there's no answer. Thus, such organisations can continue to be critical because we simply do not have 'the answer'. And, in an industry that is essentially engineering based – where engineers seek to find the 'answer' to each problem – it's difficult to handle people's different perceptions on the environment and the effect which you are or perhaps are not, having.

SPE Review London: So, how has your specific role changed?

Dr. John Campbell: My role had moved away from very technical things into much looser subjects – and in an industry driven by facts and information.

Sometimes, it seems the external agencies that are critical of the industry appear not to have to rely on the same level of information and rigour that is applied to the oil and gas industry. So, they tend to build their case on the lack of information – and because of the lack of information, you cannot prove that there's absolutely no risk to the environment and therefore you shouldn't do it... whereas in industry, our tendency is to say: this is the information we have, and this tells us the following, and we assess the risk of that, and, based on that risk, we have a discussion to find the point at which this risk is acceptable.

So, yes, it is different, and the challenge has become bigger. There are subjects now being more extensively discussed, such as marine sound, (and the consequent impact the industry may generate on the environment), and marine biodiversity. Of course, 'biodiversity' gained political acceptability in 1992, and an entire 'industry' has built up around the term. It's another one of those areas that's extremely broad. And there is a lack of information to be absolutely definitive; you have to work on the basis of risk assessment. Industry critics tend to be generally less tolerant of risk.

But that's not saying we're cavalier in any way – far from it: industry does huge amounts of work, and employs talented scientists and engineers who really understand and can get to grips with diverse subjects. And they have a frustration in that they're

Continued on page 8

Continued on page 8

Professional excellence: the 2015 SPE awards

(continued from page 7)

function – and I think that’s a rare career transition in the industry. So, I feel privileged to be a ‘bridge’ between drilling teams and completion teams – I have a foot in both camps and like to encourage and motivate communications and information exchange between them.

Both teams ideally should work well together as one team to ensure we deliver safe, reliable, compliant and competitive wells: that means clear communication and integration of their duties, responsibilities and actions. It’s in BP’s interest to maximise well performance – that’s where I come in.

In general, drilling teams are focused on drilling activities – constructing the well is their number one priority. The completion team is focused on optimizing well productivity. In the interest of BP, we need to make sure that whatever the drillers do in the reservoir section does not have an impact on completion efficiency, and conversely, that the demands of the completion design does not negatively impact the drilling programme.

I believe that communication drives such efficiency and performance.

SPE Review London: How is your role affected by the current low cost oil?

Allan Twynam: My laboratory support team and I are busier than ever! Of course, in the current price environment, BP is continuing to strive to improve our competitiveness and therefore look for opportunities to remove unnecessary complexity and increase efficiency. My team and I play a key part in this by working to ensure we maximize value out of every well. This will allow us to make the business more competitive while maintaining safe and reliable operations.

SPE Review London: What are the greatest industry needs, looking at the future?

Allan Twynam: Our industry has a recognised forthcoming challenge in skills replacement, reflecting the impact of the ‘great crew change’ which is occurring. The recent drop in oil price and knock on effect of industry redundancies may add to this challenge.

While graduate opportunities are currently limited, BP has sensibly recognised the importance of recruitment of new talent, and the continuation of our graduate-based three-year Challenge Programme and BP’s eXcellence framework reflects this. Our young engineers get exposure to all the diverse parts of the business, not just drilling and completions. In light of the recent oil price reduction and uncertainties of recovery, I am certain that drilling and completion technology developments to allow lower cost field development will be an important industry requirement.

SPE Review London: Any final thoughts?

Allan Twynam: I’m very honoured to have been given this award from SPE.

I want to acknowledge that this award is the result of my working with highly talented BP engineers in both the drilling and the completions teams.

As a bridge between them, I am honoured to have access, insight, influence and impact in both functions and I share this award with my esteemed network of BP Global Wells engineers!

Thank you. ■

being held to a much higher standard than the industry’s critics. The entry to the Kirkaldy Testing Museum on Southwark Street in London bears a pediment proclaiming ‘Facts, not Opinions’. I like to keep that in mind.

SPE Review London: How do you see the changing roles of engineers and industry?

Dr. John Campbell: I think engineers may have to think more broadly – just as my horizons have grown over the past 18 years. While the theory of finding and getting hydrocarbons out of the ground and into the market can all be written in engineering terms, in practice it also involves people – and people who possibly don’t share your opinions. So, you have to become adept at looking at information and finding out how you can present a credible story. Engineers coming into the industry will learn skills they didn’t know they would have to learn, and those skills are critical to gaining acceptability.

Influencing public perception is always a challenge. It is a slow process. However, it can be advanced through industry being open about the information it generates, about the impact it believes it is or is not having on the environment, and as it is prepared to discuss with interest groups.

And you can never win over all of the people; but you may win over one or two. And certainly a number of companies have worked very successfully with environmental groups on strategic areas and on individual projects. They haven’t necessarily convinced the NGOs that what they’re doing is OK, but at least the NGOs get an understanding and an insight into the types of information we are required to have, and the way we’re expected to package it. So continuing to build on that relationship and trust is very important.

Obviously there are some things that happen in the industry, in the business, that have to be [commercially] protected.

But there are also some things that are a common currency, and that’s one of the values of international trade associations like IOGP, and the national associations in hydrocarbon producing countries.

They provide a place where companies can come together and share non-competitive information, and build a better picture of the industry.

SPE Review London: Where are opportunities for young people?

Dr. John Campbell: The oil & gas industry is not going away anytime soon. Many companies now view themselves on a broader remit, as energy companies; energy is critical. Society faces major challenges in acquiring the energy it needs to sustain its current and developing lifestyle. There are exciting career and business opportunities for young people coming in; and the industry needs young people with different perceptions that can challenge the previous ‘norms’, and from whom the industry can continue to learn, develop and improve. The industry continues to recognise young talent, so our young people have a real future in the developing oil and gas industry.

SPE Review London: Any final thoughts?

Dr. John Campbell: It’s a pleasure to work in this business, and I’m very honoured to have been given this award from SPE. Over the years, I’ve met incredibly talented people, and people prepared to listen to others’ expertise and be enriched by it. And, it’s that community on whom I rely to help me through my day-to-day work with whom the credit for this award has to be shared. Thank you. ■

Challenges, Investment and Study

(continued from page 4)

of polymer, is relatively cheap compared to other types of polymers. It has high molecular weight ranging between 2 – 20 million Dalton. HPAM solution can reach high viscosity levels at low concentration. It is, however, known to be sensitive to temperature, salinity and hardness (Russell T, et al. 2014).

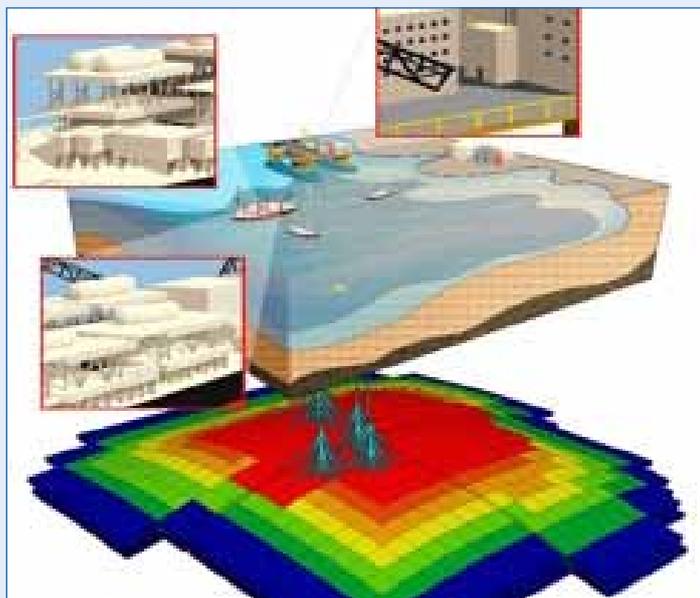
Xanthan

Xanthan is from the category of biopolymers which has an even higher molecular weight ranging between 2 – 50 Million Dalton. Compared to HPAM it comes at a higher price, however, due to its molecular structure, it has higher tolerance to temperature, hardness and salinity conditions. It is, however, known to be sensitive to bacterial degradation (Russell T, et al. 2014).

	HPAM	XANTHAM
Industrial Availability	550 Tons/year	32 tons/year
Performance as Viscosifier	Low salinity tolerance	High salinity tolerance
Thermal Stability	Threshold of 110 °F	Threshold of 150 °F
Gel issues	May require filters	No experience
Prices	3 to 5 \$/kg	8 to 10 \$/kg
Industrial Scheme	Successfully implemented	Successfully implemented
Timing	Available	Slightly less availability

Surface facilities on FPSO/Platform

The minimum required surface facilities in a typical polymer flood comprises of water treatment and mixing facilities, piping, valves, injection pumps and metering equipment. In most cases, the mixing process is operated at low pressure since there is no need of high pressure to be effective. Some of the aforementioned facilities could be the actual source of mechanical degradation of polymer. In some cases, special separation equipment is required at the surface due to the emulsion created by the produced



polymer (Russell T, et al. 2014).

Figure 2 (bottom of previous column) is an illustration of the surface facilities such as mixing unit, storage tanks, desalinization unit etc, on FPSO/Platform.

Challenges associated with polymer flooding implementation and post-production surface facilities

The design, construction and operation of surface facilities for offshore polymer flooding has always been a challenging task for operators. In addition, considering the potential emulsion occurrence at production level as a result of produced polymer demands emulsion treatment facilities, oil/water separation and water disposal facilities (Binayak K, et al., 2011)

Considering the large quantity of polymer being injected on daily basis, the logistical challenges in terms of transportation, handling and storage of polymer throughout the entire supply chain, from manufactures site to floating facilities, cannot be ignored.

In some cases, where the existing facilities have been in operation for years, the integrity of the assets become a factor. Some facilities will be approaching their end of design life. The facilities would need to be upgraded considering the potential rejuvenation and the respective extension life of the field facilities (Binayak K, et al., 2011).



Figure 3 (above): Challenges associated with implementation and post-production facilities required (Alvarado,V et al., 2013)

Through experimental design, sensitivity cases were generated in order to envisage the factors driving the value of the project. The sensitivity parameters were categorized as technical and economic.

Results

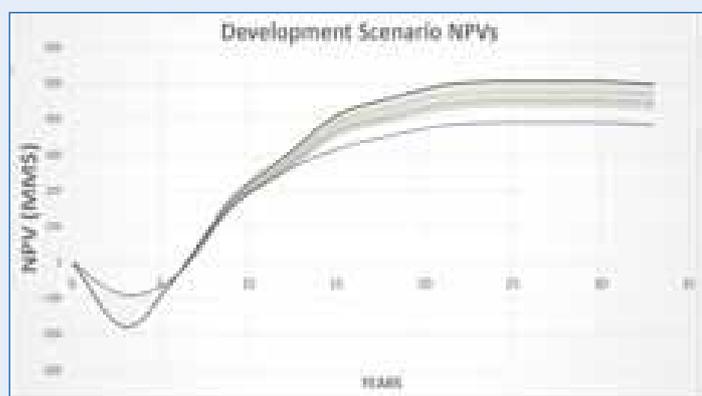
The sensitivity cases generated were then applied in simulation. The results generated indicated significant incremental recovery through Xanthan flooding. However it was not yet clear as to yet which case would be the most economically viable.

Continued on page 10

Challenges, Investment and Study

(continued from page 9)

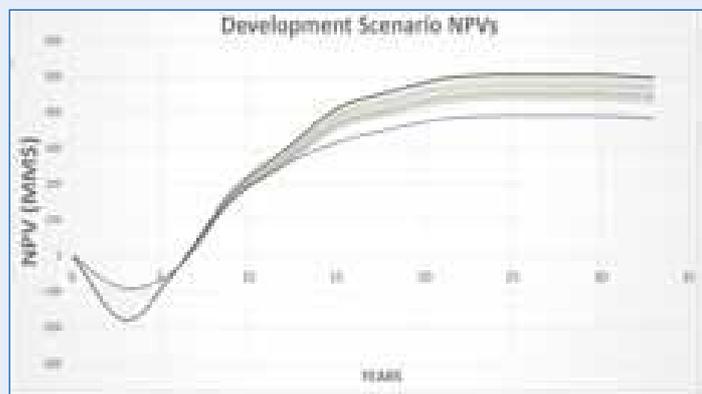
Graph 1: Summary of recovery factors obtained for polymer cases



Economic Analysis

Subsequently polymer and Waterflooding NPV cases were generated and compared.

Graph 2: Summary of NPVs obtained for polymer flooding and waterflooding cases



- From the sensitivity analysis it was determined that the most sensitive parameter was the incremental CAPEX associated with the surface facilities required for polymer flooding. Small swings in CAPEX could make or destroy the value of project.
- IAM is a robust approach to incorporating the physics of facilities and fluids in the wellbore.
- During the simulation runs, it was noted that the polymer concentration, adsorption and slug size have significant effects in the effectiveness and the productivity of the flooding. The lower the polymer adsorption, the more effective sweep of residual oil in the swept zones were noted. As the polymer concentration and therefore the slug size were increased, the adsorption levels also increased. However, yet higher incremental oil was recovered with the increasing slug size. This did not indicate a linear relationship between concentration level and the incremental recovery, along with higher the polymer concentration levels, high injection rates are required. In this case the rock integrity and the corresponding fraction pressure needs to be taken into account. A reasonable polymer concentration should be used along with a sufficient rate of injection.

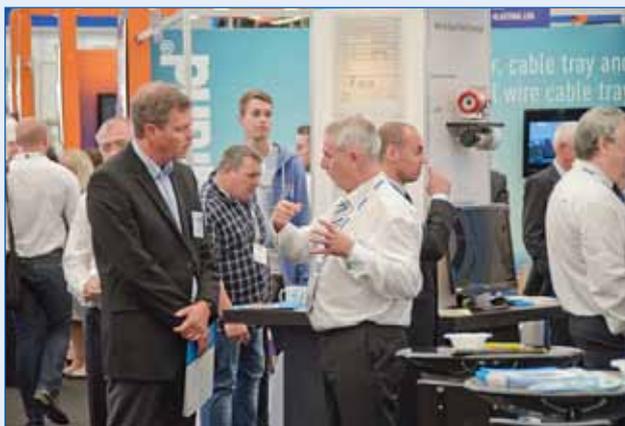
Conclusion

- Considering the current decline in the oil production rates in offshore fields in the North Sea, in order to preserve the present production levels, the polymer EOR infrastructure, facilities and technologies are considered as good areas of investment.
- The move of Polymer EOR to offshore environment to meet world's growing requirements for crude oil is becoming more appealing to operators, however considering the current volatility oil prices, more in-depth study needs to be carried out around the area.
- Such projects are expensive and require significant incremental CAPEX. Considering the late recovery in incremental oil and the subsequent impact on company bottom line, some operators may be more cautious to invest in such projects at this stage. To this end, companies should consider the ultimate recovery over immediate recovery when evaluating such projects.
- Governments can play significant roles when it comes to such investments on brown fields. Tax incentives for brown fields are appealing methods of promotion for the implementation of offshore polymer flooding. To this end, in September 2012 the UK government introduced a tax relief known as Brown Field Allowance (BFA) for producing fields in the North Sea with the intention of encouraging investments in mature assets therefore delaying the decommissioning. However, the sanctioning of the BFA in the recent budget proposal in the UK parliament could prove to be a step in the wrong direction in terms of encouraging companies to invest in offshore CEOR projects.
- Challenges associated with implementation of such projects in offshore environments are:
 - Platform space and weight limitations.
 - In case of remote locations it may be difficult to transport the polymers through pipeline from shore.
 - The high shear degradation of polymers are the limiting factors.
 - Sea water can influence the performance of the polymer due to its high salinity levels. To avoid this, there would be a need for water treatment facilities on the platform (Alvarado, V et al., 2013).
- High injection rates may result in an acceleration in production, however, other limiting factors such as the rock integrity in terms of formation pressure need to be taken into account. Also, along with higher injection rates there will be higher degradation rate of polymers.

References

- Alvarado, V., E, Manrique, *Engineering Design Challenges and Opportunities beyond Waterflooding in Offshore Reservoirs* (OTC-24105). Offshore Technology Conference, Houston, Texas, USA, May 2013.
- Larry W. Lake, Russel T. Johns, William R. Rossen, and Gary A. Pope (2014). *Fundamentals of Enhanced Oil Recovery*. 2nd ed. Texas: Society of Petroleum Engineers. 279-306.
- Kui-Fu Du, Binayak. Agarwal, Sho-Wei Lo, Simon Ritom, Wichaya Mekarapiruk, Gary Adamson and Chon Fui Chai, Sarawak SHELL Berhad; Azmi Bin Din and Norlia Azizan PETRONAS Carigali Sdn. Bhd and Nur Atiqah, Zakaria, Maisarah. Jamaludin, PETRONAS, *Evaluating Chemical EOR Potential of St. Joseph Field, Offshore Malaysia*, (SPE-144655). Kuala Lumpur, Malaysia, July 2011. ■

Inter-Society News: SPE Offshore Europe 2015



Inspiring the Next Generation

SPE Offshore Europe 2015's choice of theme, inspiring the next generation, empowers the industry to address both the technical and people challenges facing the oil and gas business today. Despite the current tough market conditions, oil and gas will remain indispensable to the world for securing heat, light, mobility and prosperity for many decades to come.

Over the four days of this free-to-attend event, which runs from 8-11 September in Aberdeen, SPE Offshore Europe 2015 will include 11 keynote sessions, 75 technical papers, and daily topical lunches and breakfast briefings.

Alongside the conference, visitors will have the opportunity to view the latest technology, product and service exhibits from the global industry, including the dedicated Deepwater Zone. Around 1500 organisations are expected this year, including at least 280 companies exhibiting for the first time at the show. Another new initiative includes a series of workshops and meetings to connect entrepreneurs and investors.



In these times of constrained travel and training budgets, attendance at large events such as SPE Offshore Europe becomes even more important. It provides a global industry hotspot where it is possible to refresh your industry knowledge, discover new technology and connect with individuals and companies drawn from North and South America, Africa, Asia and Europe – all under one roof.

www.offshore-europe.co.uk for information / register.

Events

London upcoming events – 2015

5 June 2015

SPE-YP spring/summer party and 2nd year bowling competition

Bloomsbury lanes, London, UK

9-10 June 2015

SPEi/London Section Conference

One Great George Street, Westminster, London, UK

For more information, or to book any of these events, visit: www.spe-uk.org or www.katemcmillan.co.uk

Inter-society upcoming events

25 June 2015

LPS One-Day Seminar

Permeability - from Reservoir Quality to the Simulator!

www.lps.org.uk/seminar.asp



Consultant Listing

Ross McCartney: Expert evaluation of formation water and produced water analyses for scale, well, and reservoir management.
www.oilfieldwaterservices.co.uk | ross@oilfieldwaterservices.co.uk

Can you help?

We need your industry experience...

Volunteers with SPE London tell us they get great personal satisfaction from using their professional abilities and business acumen to 'give something back'.



We're looking for a few key new volunteers in 2015!

While volunteers are very welcome on all our committees, we are especially looking for skills for the 'Conference', and the 'Continuing Education' committees.

The SPE London section 'Conference' committee organises regular, established events, along with single occasions created especially to answer industry demand.

Each event is the responsibility of the committee chairman and his or her team.

The Continuing Education (CE) committee is particularly seeking volunteers with technical or event-organising experience and skills.

Please **contact Kate McMillan** for more details of how you can volunteer your experience and skills to benefit all our members: katespe@aol.com

SPE LONDON SPONSORS 2015:

Anadarko Petroleum Corporation, BP, Challenge Energy, Dong Energy, LGO Energy, OPC, Rock Flow Dynamics (RFD).



Register Today!

Topics include:

- Mature Asset Acquisitions: Challenges and Opportunities
- Managing Rising Costs on the UK Continental Shelf
- Extracting Value from UK Shale Plays
- Mega Developments in a Capital-Efficient World
- The Attraction and Challenges of West Africa
- From Small-Cap to Mid-Cap— Financing Growth

Register today. Registration closes 1 June.
www.spe.org/events/lond/2015

SPE LONDON ANNUAL CONFERENCE 2015 MAXIMISING VALUE IN UPSTREAM OIL & GAS

9-10 June 2015 | One Great George Street
London, UK | www.spe.org/events/lond



Organised by Society of Petroleum Engineers
in association with the SPE London Section