

SPE REVIEW

LONDON



Solutions for an Uncertain World
Wealth of Data: valuable insights
Industry Opportunities and Events

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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 143,000 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.

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Opportunity

Welcome back! We hope you've had a good summer, and are now looking forward to a sometimes challenging, yet rewarding and interesting Autumn.

With that in mind, this September issue of SPE Review London is packed with fresh insights, new developments, exciting opportunities, and positive upcoming social events.

Dr. Chris Hopper believes the **industry needs to improve its success ratio on major projects**, with the key being to embrace uncertainty rather than fight it. Find his approach to project failure on *page 7*. This approach will be **presented and developed at the SPE London monthly meeting** on September 27, 2016.

And **don't miss the Esanda contest** (*also on page 7*) and the chance to win tickets to the September Dinner Meeting: Hydrocarbon Asset Valuation; Building Resilient Projects.

As **Bill Peters**, President OPC USA remarks, the benefits of pressure transient analysis (PTA) for production wells is widely recognised, however the **water injection wells can sometimes be overlooked by operators**. See his insights starting on *page 3*.

And there's a opportunity to **develop/update technical product skills** in support of career development, with complimentary training classes - more information on *page 8*.

SPE London actively encourages **member engagement and networking**. London SPE YP's certainly embraced that concept at their summer social (see *page 5*); on the same page you'll find news about the upcoming **Student Paper Contest** (deadline 18 September! so be quick), and the **Intro to Exploration & Production: 12th Annual Seminar** in November.

And there's more events and networking opportunities listed on *page 10*.

As always, this issue of SPE Review London offers the opportunity to be educated, entertained and informed.

We appreciate all your feedback!

SPE Review London is YOUR online magazine, so please send us your ideas, comments and suggestions for articles, interviews and/or topics you'd like to see in future issues.

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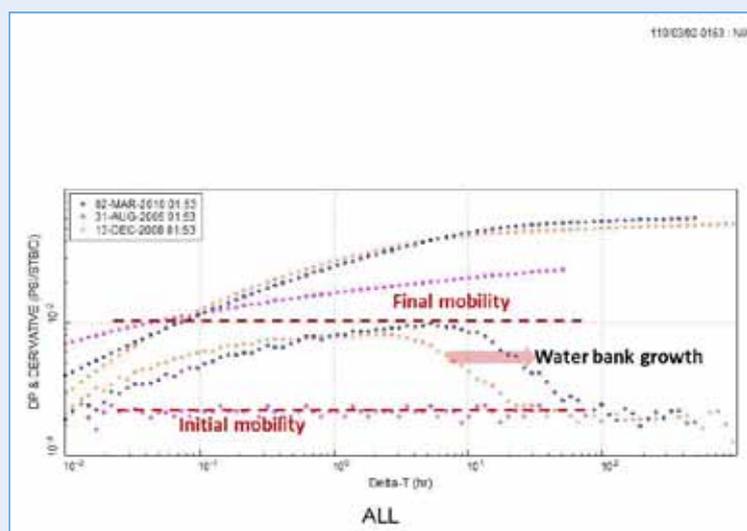
Wealth of Data

Bill Roberts, President, OPC USA shares insights on the valuable information obtainable through robust PTA surveillance analysis.

The benefits of pressure transient analysis (PTA) for production wells is widely recognised, however the water injection wells can sometimes be overlooked by operators. Since wellhead pressure and injection rate are very often measured continuously, there is a wealth of data that can be reaped from PTA interpretation of injection wells and shown as a variation with time such as:

- Mechanical Skin
- Injectivity Index
- Average reservoir pressure
- Fracture closing pressure
- Information about the flood front advance

With this information, remedial action can be taken such as stimulation, reperforation or even the recommendation of a production log to further understand the performance change. In the last decade the study of Injection wells has become one of the industry's hot topics. This has been a direct consequence of the increasing number of enhanced oil recovery projects (EOR). The market force for efficient reservoir management has always been in place, but now it must also take into account injection well performance, waterflooding strategies, water



disposal needs and injection facilities. Throughout the remainder of the article, some examples are shown which provide an insight to the kind of information that can be obtained by doing a robust PTA surveillance analysis.

Water Bank Growth and pressure support around the wellbore

Characterization of water bank growth and pressure support around the wellbore relates to overall water flooding and displacement efficiency. From the cumulative injected water volumes a theoretical injected bank size can be obtained as long as the net injection thickness is known. The growth of the theoretical bank size is then compared to the apparent inner bank growth of the derivative.

For a water injection well injecting directly into the oil zone, this approach gives an immediate understanding of how the water bank is behaving in the reservoir. If discrepancies are observed between theoretical and apparent water bank sizes it must mean

that the water bank growth is not homogenous within the reservoir. This could be due to a strong relative permeability contrast, existing pressure gradient or simply due to the presence of heterogeneities and/or boundaries.

Understanding Changes in Temperature effects

Reservoir temperature affects viscosity which is directly related to the mobility. Since the temperature of injection water can change throughout the life time of a field (if produced water is added to the total injection yield), it is important to understand the impact that temperature changes will have in the injection performance and in the overall reservoir.

Continued on page 6



Bill Roberts is a reservoir engineer with more than 36 years' broad-based international experience in well testing, reservoir simulation, petrophysics, reserves estimation, prospect evaluation, field development and training. Since 2003 he has specialized in well testing and reservoir surveillance with permanent downhole gauges on producing fields, and since 2005 has taught well test analysis for the Master's program, Institut Français du Pétrole, Paris.



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- Heavy oil/oil sands
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- Unconventional gas (CBM, shale)
- Improved recovery/mature fields
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- Theoretical analysis
- Laboratory and field research
- Emerging concepts

Published in February, April, June, August, October, December



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- Portfolio/asset management
- Risk assessment
- Systems modeling/forecasting
- Benchmarking/performance indicators
- Strategic decision making
- Information/knowledge management

Published in January, April, July, October

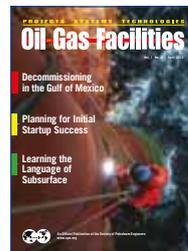
OTHER PERIODICALS



Journal of Petroleum Technology

is SPE's flagship magazine for members and anyone interested in petroleum technology. Each issue includes three to four technical topics featuring some of the best papers from SPE conferences over the prior year. These papers are selected by the Editorial Board, rather than through peer review.

Published monthly in print and online at JPTonline.org



Oil and Gas Facilities

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- peer-reviewed technical papers
- and more

Published in February, April, June, August, October, December



Industry Opportunities

SPE London's events programme offers varied and professionally rewarding opportunities, including contests, evening programmes and networking.

Student Paper Contest

Every year the SPE YP London organises the London leg of the Student Paper Contest, a competition where students studying an oil and gas related masters have the opportunity to showcase their research and innovation to industry professionals.

CONTEST AHEAD!
Deadline:
18 September, 2016

To enter, students are required to send in their **abstracts only** to the SPE YP committee. From that pool, finalists will be selected, who will have the opportunity to present their research to industry veterans during the presentation evening.

This year **the submission deadline for abstracts is midnight, Sunday 18 September.** If you are interested in taking part, please send your abstract to spe@gmail.com

The presentation evening will be hosted by London Southbank University on Friday, 23 September. The SPE YP Committee looks forward to seeing you there!

Intro to Exploration & Production:

12th Annual Seminar - November 17, 2016

The 'Introduction to E&P' provides an 'end-to-end' introduction to oil and gas field developments, led by leading experts.

In addition to covering the basics in exploration, projects, drilling, operations, reservoir management and commercial terms, speakers will bring out key issues faced by the industry.

Speakers include:

- Adam Borushek, RISC Advisory
- Miles Cudmore, Cudmore Oil & Gas Consulting
- Mick O'Hare
- Iain Hutchinson, Merlin ERDC
- Nigel Talintyre, LR Senegy
- Geof Boyd, Esanda Engineering
- Lame Verre, Monetgas
- Prabhat Garga, Upstream Advisors

Register via [Eventbrite](#).

Venue: Geological Society, Burlington House, Piccadilly, London, W1J 0BG

SPE YP Summer Social

On July 1, 2016, gathered on a boat on the Thames, the SPE YP summer social took place. Never deterred by the unseasonal, ever-changing weather of the past few months, young professionals congregated in their shared passion for sunshine and conversation. The turnout was high, rain would not stop the masses, beverages and food were enjoyed by all.

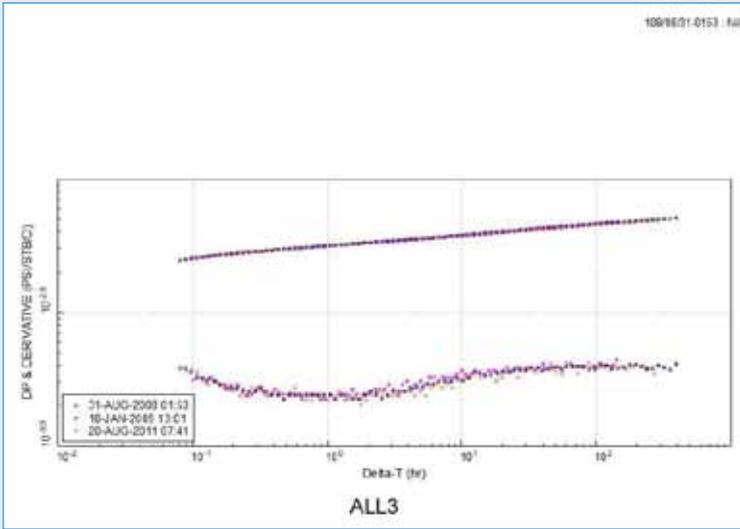
Being one week after the outcome of the referendum, for once the main topic of conversation was something other than the price of oil! But once the sun began to set conversations began to lighten up and work was pushed aside. While SPE London events bring members together for professional reasons, they also provide opportunities for professionals to meet friends. This was mostly the intended purpose of the social. Yes, it's great to have engaging networking sessions and formal gatherings, however all work and no play makes the engineer a dull boy or girl.

The SPE YP had a positive year, some great events were held so on behalf of the committee we will continue to do our best to keep up the good work and deliver worthy programmes to be appreciated by the YP members. Let's raise our glasses to the coming year.



Wealth of Data continued from page 3

An example is shown in the following plot, which illustrates the effect of fast warming up of injection water. The thinking would be that cold injected water would have a higher viscosity than reservoir water, and therefore a change in mobility might be seen.

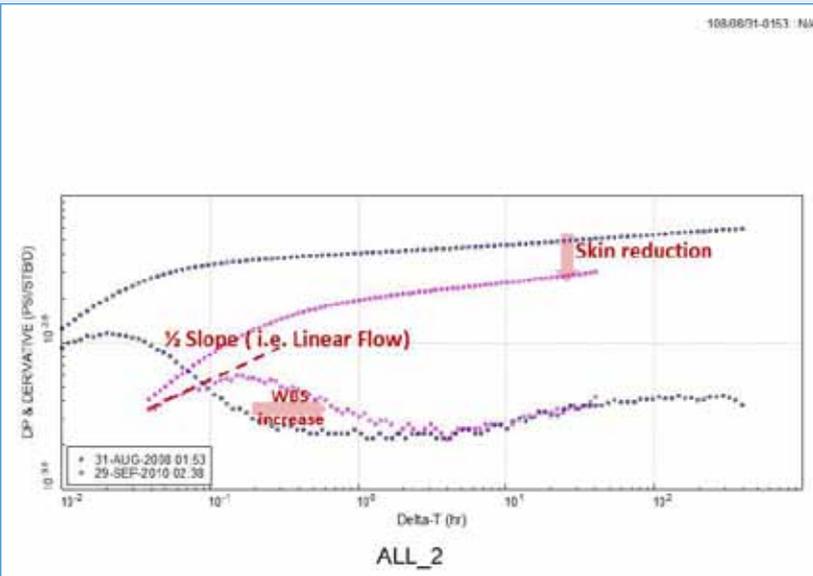


The reality shows a different picture. After several millions of injected cold water barrels, the change in the derivative response is negligible. How could this be if the inner water bank is supposed to have a different mobility via a viscosity change?

The answer is that the viscosity difference dissipates as soon as the injected water is warmed up. And the injected water is warmed up very quickly. Both the reservoir and the aquifer act as a massive heat exchanger that warms up the injected water to reservoir temperatures at a very fast rate (analogue to a geothermal energy system). Water injection into an aquifer does not present a significant contrast in relative permeability as long as water properties are not very dissimilar. It is concluded that wells that inject water into an aquifer will maintain almost identical derivatives until the moment the injected water front starts interacting with an oil leg with a contrasting mobility.

Diagnosing variations in Injectivity Index

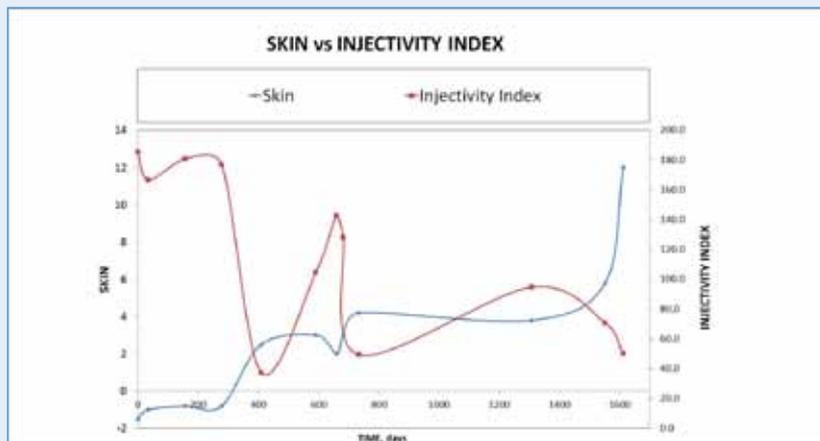
One of the issues that always crops up when doing Injection Surveillance PTA is the diagnostic of variations in the injectivity index (II). Is the injector performing as expected? Why or why not? The truth is that the majority of events that occur to injectors will affect their performance in one way or another.



For example, any kind of Skin increase or loss of injection reservoir interval will reduce the Injectivity Index; on the other hand the appearance of fractures will enhance it. All in all, injectivity index is one of the main parameters to monitor when doing PTA Surveillance of Injection wells. Some examples are illustrated.

The plot (left) shows two fall-offs (FO) carried out in the same well. The first FO (blue) was done soon after the well was put into injection. The pink FO was carried out two year afterwards after relatively continuous injection: The presence of a 1/2 slope in the early time of the latter FO stands out immediately as the appearance of a fracture.

This is reasonable taking into account the changing thermal rock properties around the well and the prolonged injection prior to it. As shown in the example (left) a fracture tends to increase wellbore storage duration (WBS) as per an increase of compressible volume during shut-in.



In addition, the development of a fracture creates an improvement in Skin (evidenced by the decrease in separation between pressure and derivative curves when comparing the final fall-off with the initial one). This reduction in Skin led to an improvement of the Injectivity Index of the well.

The plot (left) shows a clear example of how changing Skin over the life of a well influences the Injectivity Index.



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Solutions for an Uncertain World

Dr Chris Hopper, Managing Director, Moving Future, describes a different approach to project failure – in which uncertainty is built into the development plan up front to produce resilient projects that can accommodate change.

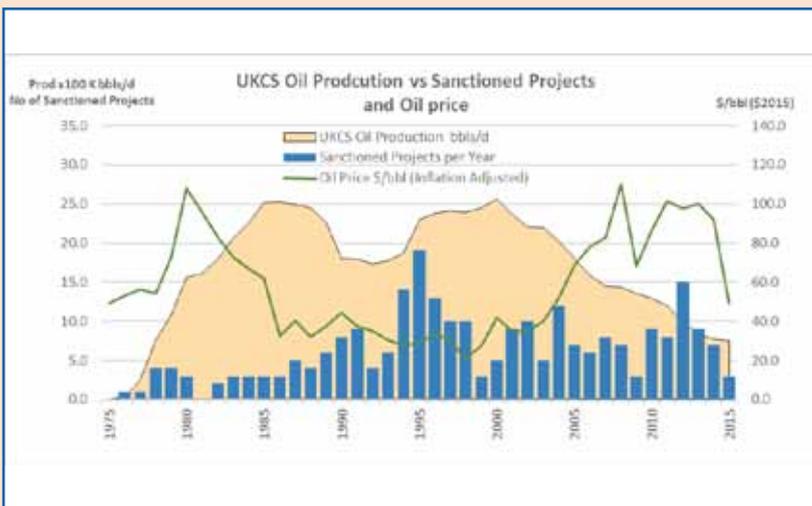
This approach will be presented and developed at the SPE London monthly meeting on September 27, 2016.

Since the oil price crash in late 2014, the industry has responded by cutting capex, cancelling projects and laying people off. After the initial shock wore off, there has been a lot of discussion about cost reduction, standardization and across the board cuts. While all these are important, they are not sufficient to make projects economic in a \$50 world. Something else needs to be done.

If we look back over the last ten years, the industry has routinely failed to deliver projects. 70% of projects failed to meet their objectives at an average cost overrun of 57%. This is commonly blamed on a hot market, but inflexible project plans were also a significant factor as they could not accommodate the change and uncertainty inevitable in any project.

“The industry needs to improve its success ratio on major projects and the key to achieving this is to embrace uncertainty rather than fight it.”

This has not always been the case and back in the 1990’s different business models were used to increase UKCS oil production to 2.6 mm bbls/d at an oil price of less than \$40, see Figure 1.



In other industries, similar levels of project failures have led to the adoption of different business processes such as Agile Project Management. The author has used similar methods to bring difficult and uncertain upstream projects to sanction by iterating to resilient solutions that embrace uncertainty. This contrasts with the linear waterfall approach commonly used by stage gate processes over the last ten years.

The industry needs to improve its success ratio on major projects and the key to achieving this is to embrace uncertainty rather than fight it. **Making these changes will require a change in mind set as much as a change in process, which will not be easy, but is inevitable.**

Figure 1. UKCS Oil Production vs Oil Price and Number of Sanctioned Projects

September London Section Evening Meeting

The September London Section evening meeting for lectures on hydrocarbon asset valuation, and on building resilient projects that can accommodate uncertainty.

Register via Eventbrite

Cost: £34 for SPE/PESGB/EI members, £44 non-members, £19 unemployed members.

Non-refundable £15 for students booking by Friday 23 September (£19 after). All costs have an eventbrite fee.

Venue: Department of Earth Science and Engineering, Imperial College London.

Agenda:

5.00 pm – 6.30 pm

Talk1: **Hydrocarbon Asset Valuation – Holistic or Bust**
Drew Powell, Director of Global Operations, Gaffney Cline & Associates

6.30 pm - 7.15 pm Drinks and networking buffet

7.15 pm – 8.45 pm

Talk2: **Producing resilient projects that can accommodate uncertainty**

Dr Chris Hopper, MD Moving Future

Esanda Competition!

Esanda, proud sponsors of the Society of Petroleum Engineers (SPE) London is offering the chance to win tickets to the September Dinner Meeting: Hydrocarbon Asset Valuation; Building Resilient Projects.

CLICK HERE for the Esanda website and full details on how to enter.

Good Luck!

Transition Training Adapting to Industry Challenges



Are you or any of your colleagues in a career transition?

IHS Markit is here to help you succeed. We recognise the current challenges within the industry, and want to assist you in preparing for your next career move. Whether you are a new graduate, between jobs or returning from overseas we are here to help.

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For further information, please contact the IHS Markit Education Training team: engineering.training@ihsmarkit.com

Please note: complimentary training is only available in London for RTA fundamentals and RTA Getting Started.

Examples of available resources:

IHS Markit Engineering Training

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This one-day training has been designed to maximise the value of your production data for conventional wells. You will be able to characterise your reservoirs and forecast your production combining the use of several powerful techniques.

This course provides a comprehensive methodology that combines theory and key concepts of production data analysis with practical diagnostics and workflows for analysing your own wells. Previous experience with the software is not required for this training.

This training has been carefully designed for Engineers and Technologists involved in any of the following areas: exploitation, reserves, production/operations and well testing for conventional wells. This course will benefit oil and gas professionals interested in getting additional mileage out of their production and flowing pressure data.

This training will help you:

Identify reservoir and well flow regimes, determine reserves, OGIP/OOIP and drainage area, identify reservoir parameters such as permeability and skin, perform production data history match using advanced analytical and numerical history match models, assess well performance and identify optimization candidates, and evaluate data quality and quantify analysis uncertainty (with the use of two case examples).

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The 'Getting Started' series consists of three 1.5 hour classes in which students learn:

How to add data to projects, edit attributes, query, view data plots, export data, conduct simplified DeclinePlus and RTA workflows to Conventional wells and create custom templates and workflows to streamline their work (theory and applied knowledge is beyond the scope of these classes).

Seats are limited; please register your interest now to reserve a place.



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EVENTS: Upcoming events 2016

13 - 14 September (London)

Individual Project Presentations

Individual Project Presentations given by the students currently supervising on the MSc in Petroleum Engineering. Each student will give a 15-minute presentation on the project done over the last three and a half months. Opportunity to meet with students, staff and researchers at the Centre for Petroleum Studies. Presentations followed by lunch and poster session. **RSVP:** Thomas Dray (MSc Postgraduate Administrator): t.dray@imperial.ac.uk
More information and details of presentations: <http://bit.ly/2c5XHZZ>

18 September 2016 (London)

SPE YPs - UK Student Paper Contest

The 4th Annual UK Student Paper Contest is a unique event, and first of its kind in the UK. The Competition is open to all students studying an oil and gas Masters in the UK.

To take part, interested students need to send an abstract of their paper or dissertation to the SPE YP committee.

Please send abstract to spe@gmail.com by midnight on Sunday 18th September 2016.

27 September 2016 (London)

September London Section evening meeting

Lectures on hydrocarbon asset valuation, and on building resilient projects that can accommodate uncertainty.

This event will be held at Imperial College; Royal School of Mines, Prince Consort Road, London, SW7 2BP.

For more information, and to register: <http://bit.ly/2bXRkGA>

27 September, 2016 (Dubai)

Imperial College Alumni Reception

Professor Martin Blunt would like to welcome all Imperial College Alumni and SPE London Section members to an Imperial College Alumni Reception at: The Vault Bar on the 71st and 72nd floor of the JW Marriott Marquis Hotel (Sheikh Zayed Road, Business Bay, Dubai 121000) from 6pm.

For more information, please contact c.baugh@imperial.ac.uk

16 October 2016 (London)

October London Section evening meeting

Energy Policy: Is it Effective? Is it Fair?

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

17 November 2016 (London)

12th Annual Seminar

The "Introduction to E&P" provides an "end to end" introduction to oil and gas field developments led by leading experts. In addition to covering "the basics" in exploration, projects, drilling, operations, reservoir management and commercial terms, speakers will bring out key issues faced by the industry.

For more information, and to register: <http://bit.ly/2c5Aarj>

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Consultant Listings

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Oleum Khaos Ltd: First quartile Petrophysics, 30+ years' experience, field studies, well planning, peer assist / review, project management.
 +44 (0)1252 416396 info@oleumkhaos.com www.oleumkhaos.com

Alan Taylor: Reservoir engineering, simulation, well modelling for oil & gas field development planning. Southern Reservoir Engineering Ltd.
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