



## NEWSLETTER October 2009

### *Message from the LPS President:*

As autumn gets into full swing, the work of the LPS Committee concentrates on bringing the events of 2009 to a close and looking forward to 2010. University Open Days, One Day Seminars and the routine roster of evening talks all need to be planned and scheduled. Thinking of relevant subjects for seminars is always a challenge, if any members have an idea of what they would like in the way of seminar subjects please let us know. Likewise, before long we will be looking for oil company involvement with the Open Day. These have been very successful events in previous years and we hope that this will continue in 2010.

But on to the business at hand. Firstly, special thanks goes to both Roger Samworth of Weatherford and Graham Dean of Reach Coal Seam Gas for their September presentations on petrophysical and engineering aspects of Coal Bed Methane production. The meeting was well attended and the talk was thought provoking and led to a good standard of question and debate after the formal presentation.

The next LPS evening talk is scheduled for Monday 19<sup>th</sup> October. Dick Woodhouse will talk about "Very Low Water Saturations within the Sandstones of the Northern Barmer Basin, India"

Thereafter on 16<sup>th</sup> November we hold the Annual General Meeting. The society, through its elected committee, represents the wishes of its members. As such, any bonafide member is welcome to run for a post on the committee that will be put to vote by Patrick Crossouard. We may have one or two committee slots to fill as some current committee members stand down.

On another note, just a reminder that 14<sup>th</sup> December is sees our final one day seminar for 2008; **Basic FE: Capillary Pressure and Saturation Height Functions** at the Geolsoc that will concentrate on the basic physics and practical aspects of building and distributing fluid saturations away from the wellbore in 3D models. As previously this is an education seminar primarily focused at non-petrophysicists: to expose them to the basics of the subject. We therefore ask members to publicise the event in their organisation to ensure the widest possible exposure. Why not print the poster out and display it somewhere prominent in your office? You will see that there is a wide range of talks, both theoretical and practical, with some very relevant case studies, to hopefully attract a wide range of disciplines.

**Jonathan Lean LPS President**

### **Dates for Your Diary**

**Monday 19<sup>th</sup> October, LPS Monthly Evening Meeting, 6pm, Geological Society, London, Piccadilly.** - "Very Low Water Saturations within the Sandstones of the Northern Barmer Basin, India", Dick Woodhouse.

**Monday 16<sup>th</sup> November, LPS AGM, Geological Society, London, Piccadilly.**

**Monday 14<sup>th</sup> December, LPS One Day Seminar, Geological Society, London, Piccadilly** – "Basic Petrophysics Seminar – Fluids in the Reservoir: Understanding Capillary Pressure and Saturation Height Functions."



## **Very Low Water Saturations within the Sandstones of the Northern Barmer Basin, India**

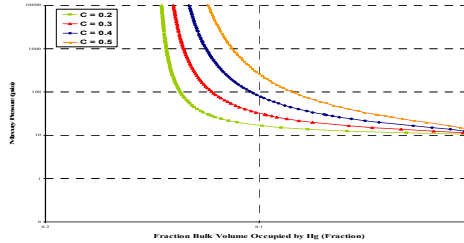
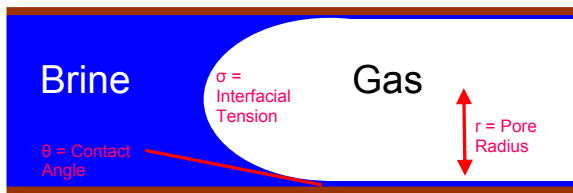
Dick Woodhouse B.Sc., Ph.D.

The Mangala, Bhagyam and Aishwariya Fields were discovered in early 2004 in the northern Barmer Basin of Rajasthan, in northwestern India. The data acquired in the field wells (including almost 2000m of core) enabled a precise estimation of field stock tank oil initially in place (STOIP). This paper summarizes the techniques that allowed the estimate of STOIP to be more precisely defined and to be revised upward by 12%, a substantial increase when dealing with a billion barrel field (Mangala Field). Initial evaluation of the log data indicated a sequence of clean, quartzose sandstones with porosity greater than 25%. High porosities together with resistivity in the oil column over 5,000 ohmm, suggested that water saturations ( $S_w$ ) were ~15% or even less. Based on the initial data and conventional techniques, the initial STOIP estimates were made for the three fields.

An extensive core analysis programme was begun in appraisal wells, with the objective of improved definition of the actual reservoir STOIP's. Two appraisal wells were cored with synthetic oil-based mud, and Dean-Stark  $S_w$  analyses were done. In addition to routine core analyses and the Dean-Stark  $S_w$  data, a sizeable set of other special core analyses is also available. This includes extensive capillary pressure data, laboratory NMR, and core electrical properties measurements.

The petrophysical dataset verifies the existence of  $S_w$ 's that are typically less than 5%PV, and often near 1%PV, in a very high-permeability and high-porosity reservoir containing little clay. The reservoir contains a medium gravity, highly paraffinic oil, and is moderately oil-wet. The various laboratory datasets challenged some of the traditional assumptions concerning the use of Archie constants in such reservoirs for  $S_w$  calculations. The upward revision of STOIP is significant, and can be principally attributed to the more accurate estimation of reservoir fluid saturations. As this work demonstrates that very low  $S_w$  values exist in the Barmer Basin, the Mangala, Bhagyam and Aishwariya fields can provide a model for the appropriate economic evaluation of similar reservoirs.

The laboratory results also challenge some of the traditional thinking about the petrophysical properties of reservoirs such as these. It is indeed possible, that high quality reservoirs can have initial water saturations lower than 5% of pore volume on average, and with some zones less than 1%. Conventional log tools and analysis methods will not reveal these low levels without integration with core data and appropriately designed core analysis programmes. Also, and perhaps more importantly, this work clearly demonstrates the economic worth of extensive laboratory measurements and analyses on high-volume, high-value reservoirs such as those of the Mangala, Bhagyam and Aishwariya Fields.



**London Petrophysical Society**  
**Basic Formation Evaluation One-day Seminar**  
**“Fluids in the Reservoir: Understanding**  
**Capillary Pressure and Saturation Height**  
**Functions”**

**Monday 14th December 2009 at the Geological Society, London**

**Ten Confirmed Talks**

**Capillary Pressure Theory:** Mike Lovell (Leicester University) - "Fluids in the Reservoir; How Capillary Pressure and Reservoir Properties Control Fluid Distribution."

**Lab Measurements of Capillary Pressure:** Carlos Grattoni (Leeds University) - "All Roads Lead to Rome: Water Saturation at Capillary Equilibrium in the Core"

**Saturation Height Function Models:** Steve Cuddy (Baker RDS) and Alan Johnson (Shell) - 'Established Saturation Height Function Models'

**Free Water Levels and Contact Location:** Jonathan Lean (Hess Services UK Ltd) - "Finding the Fluid Contact or Free Water Level - and what is the Difference?"

**Wettability:** Richard Arnold (Core Laboratories (U.K) Ltd) – “Wettability: Basic Concepts and Laboratory Determinations”

**Saturation Height Function Case Studies:**

Craig Lindsey (Baker RDS) - "Does My Transition Zone Look Big in This - Effective Integration of Core Data to Improve Your Saturation Height Model"

Richard Harris (Hess Services UK Ltd) - "Continuing Evolution of Saturation/Height Concepts in the North Sea Chalk"

Colin McPhee (Senergy) - “Saturation Height from Core: Back to the Future”

Joe Pumphrey (Logicom) - QSCAL Software

**Registration Cost:**  
**£150 for LPS/PESGB/AFES/SPE Members**  
**£175 for Non-members (LPS is not VAT registered)**

For further information visit: <http://www.lps.org.uk>  
 or e-mail [robert.webber@bg-group.com](mailto:robert.webber@bg-group.com)

**LPS Christmas Party After the Seminar**