Shale Oil & Shale Gas Seminar

Talk	Time	Name	Talk Title	Affiliation	Silde package
	09:00 - 09:20	**Registration**			
	09:20-09:30	Rob Leveridge	Welcome	LPS	
1	09:30-10:00	Andrew Foulds	Shale gas and Shale Oil fundamentals	Petrafiz	
2	10:00-10:30	Richard Arnold	Shale Gas & Shale Oil Petrophysics	Gaffney, Cline & Associates	
3	10:30-11:00	Andrew Gunning	Portfolio Management in Shale Gas Investment Decisions	Halliburton	
	11:00-11:30	**BREAK**			
4	11:30-12:00	Neal Morgan	Multi-Mineral Integrated Shale Gas Analysis	BG Group	
5	12:00-12:30	Doug Bentley	Reservoir Quality and Completion Quality Drivers	Schlumberger	
	12:30-13:30	**LUNCH**			
6	13:30-14:00	Quentin Fisher	Measuring Permeability in Gas Shales	Leeds University	
7	14:00-14:30	Ade Elegbede	The Challenges in exploiting a great Opportunity	SASOL	
8	14:30-15:00	Patrick Hogarty & Monica Ghioca	The Estimation and Measurement of Total Organic Carbon and Other Issues	TGS	
	15:00-15:30	**BREAK**			
9	15:30-16:00	Mark Bacciarelli	Wellsite Shale Resource Analysis from Advanced Surface Logging Technology	Weatherford	
10	16:00-16:30	Oberon Houston	Modelling, design and optimisation of a multi-stage fracture stimulation job in horizontal tight gas wells	JKX	
11	16:30-17:00	Mike Kendall	Micro Seismic processing, present and future techniques	Bristol University	
17:00 onwards		Discussion and Closing Remarks			
Wine & Savories					

Key

All slides available post conference

Some limited slides available post conference

No Slides available post conference

Fundamentals of Shale Gas/Oil

Andrew Foulds, Petrafiz Limited

LPS, Shale Oil and Shale Gas Seminar 14th June 2012

Abstract:

The phenomena that is Shale gas and its sister exploration target, shale oil, is taking the world by storm. The fairly recent technology change that has allowed multi-stage hydraulic frac stages to be performed in horizontal wells has transformed the gas market, and is starting to impact the oil market initially in North America, but is now beginning to spread around the world. However, it is a phenomenon that has been with us for a number of years both from a resource base and a technology knowledge base.

It also a subject that attracts a great deal of debate not only from the environmentalist, but also a economics viewpoint; both of which provide interesting and often vitriolic debate amongst proponents and distractors. It seems that everyone has an opinion on shale gas/oil – it seems to have attracted the attention of many people from all walks of life, both professional and layman.

Exploration and exploitation of the resource is firmly based on formation evaluation characterisation of the resource using conventional and non –conventional petrophysical techniques. Petrophysicists need to learn new techniques as well as adjust existing knowledge and understanding to better evaluate these often strange rock/fluid systems. The need for shale specific core data to drive the analysis of the wireline data is paramount in understanding the resource base and is often unavailable until specific shale gas targeted wells are planned and drilled. The use of analogues and compiled shale gas specific databases become critical in initial assessment. Additional knowledge of formally regarded specialised petrophysical techniques like Geomechanics, together with those than are not normally associated with Petrophysicists, like Organic and Inorganic Geochemistry, are regarded is required to assist in understanding shale gas, both from a resource base and a producibilty perspective.

No new paradigms in the evaluation techniques are suggested. The understanding of the rock/fluid system by conventional core to log integration techniques is paramount. New analyses and methods are required by the Petrophysicists to better understand the rock system but conventional principles are still required. However, Shale or Source Rock Petrophysics, for want of a better term, is in the nascent period and there is so much scope to apply better analytical techniques to fully unlock the potential of this important resource base.

Biography:

Andrew is presently working in the UK as a Consultant Petrophysicist within his own company Petrafiz Limited, serving the nascent unconventional exploration program in Europe as well as conventional reservoir evaluation. Andrew previously worked for ExxonMobil/Mobil for over 14 years in a number staff positions around the world, as well as a consultant in the London office. Previous to this he ran his own petrophysical consultancy for a number of years, as well as staff positions at a number of UK based independent oil companies, along with a number of service companies. He holds a BSc in Geology from Hull University. Andrew is an active member of SPWLA, LPS, SPE, PESGB and the Geological Society of London, and has previously held positions on the committee of the LPS including Treasurer and Editor of the society's magazine, DiaLog. He lives down in Cornwall on what one UK based Eploration Director recently called a 'hobby farm' - a slightly derogatory comment relating to anti oil and gas exploration landowners.

Shale Petrophysics

Richard Arnold, Gaffney, Cline & Associates

LPS, Shale Oil and Shale Gas Seminar 14th June 2012

Abstract:

For decades, shales have merited only a cursory evaluation during the petrophysical interpretation process. With the drive towards shale gas and shale oil production, organic rich claystone reservoirs are now the subject of detailed petrophysical workflows to evaluate their reservoir potential, storage capacity and flow characteristics.

In addition to the traditional petrophysical parameters of porosity and permeability, shale evaluation must also address mineralogy; kerogen content; type and maturity; relative volumes of free gas and adsorbed gas. Geomechanical properties such as the stress regime and mechanical rock properties must also be considered in the evaluation.
The close integration of log and core data is key to the successful evaluation of the organic and inorganic properties of shale reservoir units. Organic rich shales can be effectively self sourcing, if thermally mature, and particular effort must be applied to the evaluation of the Total Organic Carbon (TOC) and maturity of kerogen. The kerogen itself contributes to the storage capacity of the shale reservoirs.

An insight into organic rich shale properties can be derived from alternative approaches to the interpretation of conventional logs suites, e.g. gamma ray, sonic, resistivity and density, which can yield useful information on TOC when calibrated to core and cuttings by rock pyrolysis techniques. Recent developments in Elemental Spectroscopy Logging and its interpretation can yield valuable independent information , enabling the identification and classification of the organic carbon. Magnetic resonance logs can also yield an insight to permeability which is enhanced by calibration to pressure pulse decay measurements on core.

Flow properties of shales are dominated by natural and induced fracture systems. These can be characterised by acoustic, density and image log analysis in conjunction with stress measurements on core samples. The challenge is to relate measurements at the log and core scale to the regional stress regimes to enable prediction of the potential behaviour of induced fractures.

Although currently termed “unconventional” reservoirs, the evaluation of shales is becoming a routine part of the modern petrophysicist’s work. Shales differ in physical and chemical properties from basin to basin and it is essential that the petrophysicist understands the specific geological nature of the shale as well as the appropriate log and core evaluation techniques.

Biography:

Richard is currently Petrophysics Team Leader at Gaffney, Cline & Associates, based at Westhill, Aberdeen.
Prior to joining GCA in 2010, Richard spent 9 years as a Technical Adviser in Business Development for Core Lab's Rock Properties group based in Aberdeen. Before that he held various technical and managerial posts with Core Lab and others in the UK, Europe, and South America. He has nearly 30

years experience in the planning and performance of core based formation evaluation projects from all over the world.
His current role includes advising various groups within GCA on all core related issues from the design of new core acquisition to the review and analysis of existing data sets for use in field evaluations.
Richard holds a BSc (Hons)degree in Geological Sciences from Aston University and a Post Graduate Diploma in Information Systems Engineering from Robert Gordon's University.
Richard is an active member of the AFES Committee and has served on organising committees for several DEVEX conferences and SPWLA 2008. He is currently involved in the SCA Annual Conference, to be held in Aberdeen at the end of August 2012.

Portfolio Management in Shale Gas Investment Decisions

Andrew Gunning and Larry Chorn, Halliburton

LPS, Shale Oil and Shale Gas Seminar 14th June 2012

Abstract:
The remarkable combination of U.S. property ownership laws, ready access to drilling capital, historically high commodity prices, technology breakthroughs and overstocked drilling portfolios has led to an oversupply of natural gas in the United States since 2009. An oversupply in a market economy invariably results in lower prices, beneficial for downstream industries and consumers, but a serious problem for the industry.

In this presentation we explore the question of whether low gas prices are inherent to the exploitation of resource plays or the consequence of un-coordinated portfolio decisions relating to a commodity which has limited storage capacity.

We compare this situation to Europe where most countries have regulatory systems in place to licence exploration and production activities and where gas prices are often controlled through long-term pricing mechanisms.

We also assess whethor Portfolio management is an investment optimization exercise that would benefit from “sweet spot” identification. In Europe identifying sweet-spots mayl make shale gas more acceptable to regulators as drilling effort is more focused and the technology more sophisticated i.e. fewer well-pads, less environmental impact etc.

Biographies:

Andrew P Gunning
Andrew joined the Halliburton Consulting and Project Management group in 2011 as Consulting Partner for Geology and Geophysics in the Europe and Sub-Saharan Africa Region. He leads a team carrying out consultancy projects in conventional oil and gas and in the unconventional sector where his focus has been on shale gas and coal bed methane projects in continental Europe, the UK and India. Andrew leads a team of experienced Halliburton geologists, geophysicists, petrophysicists, reservoir engineers and economists. Recent papers include: *K.Drop, A.Gunning, M.Kozlowski*: Analysis and evaluation of European Shale Gas plays: A Case Study. "GEOLOGIA" GEO-ECO-TECH May 2012 PIG-PIB, Warsaw.
Prior to taking up his current role in Halliburton Andrew worked in the unconventional gas sector for Centrica as a project manager from 2008 to 2011. This involved generating exploration programmes including establishing technical objectives and budgets, design of drilling and testing programmes, completion of planning applications and stakeholder engagement programmes. as well as the estimation of reserves, economic evaluation and outline design of surface engineering facilities.
His 25 year career as a geologist has covered upstream oil and gas, mineral exploration and water management and has included technical consultancy and strategic advisory roles. Andrew also has experience in business development and has been successful, as an Executive Director in two business start-ups and has developed multi-disciplinary teams and opened new offices through successfully winning large value projects.
Andrew is educated to MSc level in geology (Newcastle University), has a Diploma in Company Direction (Institute of Directors) and is a Chartered Engineer.

Larry G. Chorn

Larry joined Halliburton Consulting and Project Management group in December, 2011 as Director, Unconventional Resources.

His 30-plus year career in the upstream oil and gas business has ranged from pure technical to strategic roles with corporations ranging in size from Mobil Oil to Newfield Exploration. Following the completion of his PhD in Chemical Engineering from the University of Illinois-Urbana/Champaign, he joined Atlantic Richfield's research organization in Dallas, TX working on reservoir engineering issues in miscible gas flooding for Prudhoe Bay. Following the completion of his MBA in strategy and finance at Southern Methodist University, he moved to Mobil Research and Development Corporation where he rapidly progressed from research team lead to Global R&D Planning manager, Reserves Economics advisor, and finished his Mobil tenure as coordinator of the upstream strategic planning function. He departed Mobil at the merger with Exxon and formed a seven-person consulting firm specializing in international petroleum investment management. In 2003 he joined the faculty of Colorado School of Mines in Golden, CO as Associate Professor of Petroleum Engineering where he taught both graduate and undergraduate courses in petroleum finance, investment decision making, real options and project portfolio management. He continued to consult and also acted as an Advisor to Madison Capital Management on energy investment opportunities during this period.

In 2006, he joined McGraw-Hill Corporation's Platts information service as their Chief Energy Economist. As Chief Economist he was an on-air contributor on CNBC and Bloomberg business programs and often quoted in energy publications.

By 2008, he was anxious to return to the "front lines" of the energy business and he joined EnCana Oil and Gas Company as a strategic planner in their North American gas business function. In 2010 he moved to Newfield's Rocky Mountains organization in Denver as Manager of Business Development where he focused on their unconventional oil assets.

Multi mineral Integrated Shale Gas Analysis

Neal Morgan, BG Group

LPS, Shale Oil and Shale Gas Seminar 14th June 2012

Abstract:
Shale gas log interpretation is very different from conventional gas. The rock matrix has an intricate fabric and the gas is present in multiple states. The challenge in solving such a complex problem is to develop a simplified model that still represents the physics of what is happening. Traditionally, empirical correlations have been used. Such an approach is very simple but does not capture the physics of the problem and therefore is not reliable. Our shale gas interpretation model is based on the simultaneous inversion of well logs. Adsorbed gas is computed based on the kerogen volume. Free gas is computed from porosity and gas saturation, and is corrected based on the extra pore space taken by the adsorbed gas.
We have successfully used our method to analyse Marcellus and Haynesville wells. After model calibration to core data, the modelled minerals, porosity and saturations were very close to the measured data. Our results show that a multi mineral method does work and is efficient and fast in analysing shale gas.

Biography:
Mr Neal Morgan has over 25 years experience in petrophysics and is currently employed as a petrophysicist in the Developments Technology team within BG Advance at Thames Valley Park in Reading. Since joining BG in 2006, Neal has been responsible for developing Petrophysics interpretation techniques for unconventional reservoirs including tight gas in Oman, coal seam gas in Australia and shale gas in basins around the world. Prior to BG, he was employed by a variety of oil industry service companies developing Petrophysics software and consultancy services. Neal holds a BA in Natural Sciences from Trinity College Cambridge (UK).

Reservoir Quality and Completion Quality Drivers

Doug Bentley, Schlumberger

LPS, Shale Oil and Shale Gas Seminar 14th June 2012

Abstract:
Shale Production is truly a complex issue, you need to understand and define many things to apply the proper completion to the shale that you may be evaluating. We will look at the process that Schlumberger has developed over the last 8 years “Reservoir Quality” and “Completion Quality” which looks at the total process. We look at both independently and then integrate to understand the complete evaluation and how to engineer the proper completion.

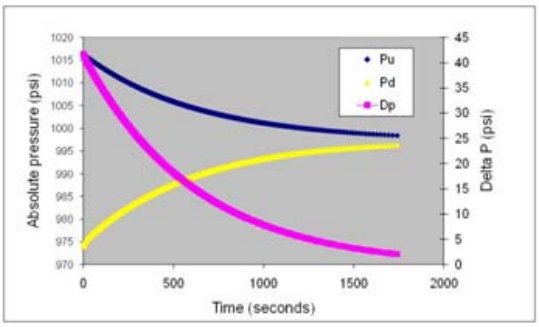
Biography:
Doug Bentley is Schlumberger’s European Unconventional Gas Manager based in Warsaw Poland. Doug has been with Schlumberger since 1982 and has worked in North & South America as well as several addition areas’ world wide including the North Sea and South East Asia. Since 2003, he has been involved in integrated solution projects that have mainly been involved in the “Unconventional Shale Gas” arena. His current areas of focus includes “Unconventional Shale Gas Evaluation”, “Shale Gas Stimulation & Completion Design”, “Microseismic Monitoring” and the integration of such data in various shale gas basins. Doug holds a B.S in Math & Physics from Mt. Allison University in New Brunswick Canada and a B.S in Mechanical Engineering from The Technical University of Nova Scotia now Dalhousie University in Nova Scotia Canada. .

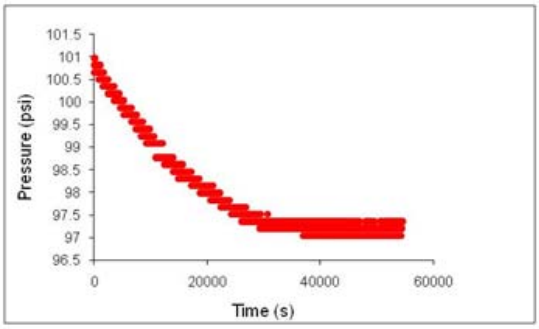
Laboratory analysis of shale permeability

Quentin Fisher, Frans Kets, Carlos Grattoni, Piroska Lorinczi,
Centre for Integrated Petroleum Engineering and Geoscience School of Earth and Environment, University of Leeds
e-mail: q.fisher@see.leeds.ac.uk

LPS, Shale Oil and Shale Gas Seminar 14th June 2012

Abstract:
Until recently very few data were available on the permeability of shale samples. Those available were mainly obtained by those interested in top seal capacity, overpressure retention or radioactive waste disposal. The shale gas revolution, which has taken place in the USA over the last decade, has meant that the amount of data available on shale permeability has increased by several orders of magnitude; although it is important to note that "shale" gas reservoirs tend to have far less clay than shale caprocks to petroleum reservoirs and overpressured compartments The experimental methods used by those involved in the shale gas industry differ significantly from those involved in seal analysis. In particular, the shale gas industry has tended to use the crushed shale technique in which an apparent permeability is estimated from the analysis of the transient decline in pressure when a know volume of helium gas is expanded into a pressure vessel containing a known volume of crushed shale fragments. The technique is particularly popular within the shale gas industry because the permeability measurements take around 10 minutes whereas days to weeks are needed for steady-state experiments on full core. Also, those who developed the crushed shale method argue the permeability obtained is that of the matrix and is unaffected by fractures within the sample. Indeed, steady-state and pulse decay measurements on full core that is confined in a core holder often yield higher permeability values than obtained either by the crushed shale method or by analysing the pressure transient when gas is expanded into a pressure vessel containing a full core that is unconfined (e.g. Figure 1).





PDP = 0.004mD

Full core gas invasion = 32 nD

Figure 1. Results from: Left) a pulse-decay permeability test on a whole core confined in a core holder, Right) a pressure decline test in which gas is expanded into a pressure chamber containing the same, but unconfined, core.

A key problem with the crushed shale method is that companies offering this service have different ways of both conducting the experiment and analysing the results and this leads to several orders of magnitude difference in the permeability results when the same samples are sent to different laboratories. Taking into account the different gas flow mechanisms (Darcy flow, gas slippage, Knusden diffusion) explains why such different values can easily be obtained. For example, Figure 2, shows the results of various simulations of a crushed shale test. The result shows that a model in

which the shale has a permeability of 0.003 nD in which on Darcy flow is considered produces the same results as a sample with 0.1 nD permeability but in which gas slippage is also taken into account.

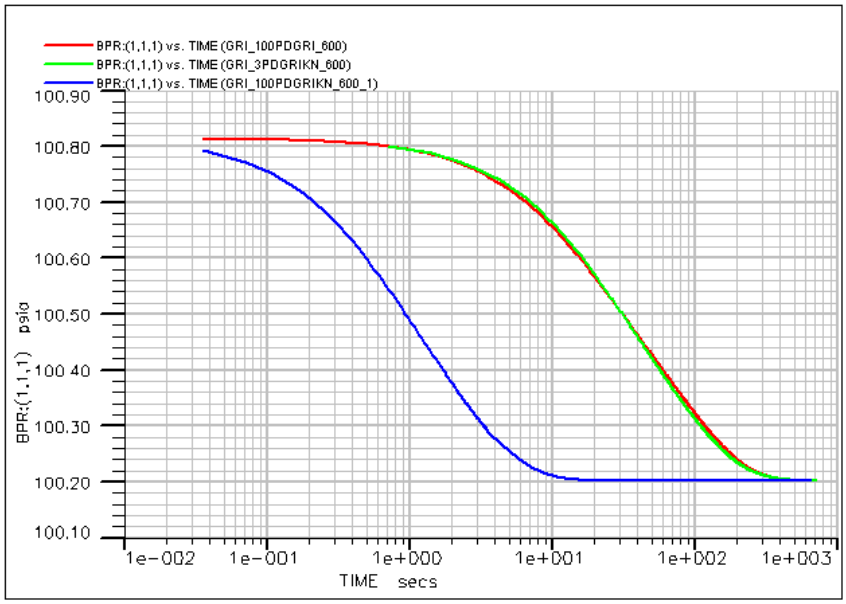


Figure 2. Results from the simulation of a crushed shale *test. The green simulation if for a sample with a permeability of 0.1nD taking into account gas slippage effects. The blue and green lines simulate samples with 0.1 and 0.003nD respectively without taking into account gas slippage effects.*

A pulse-decay test in which pressure continues to be monitored once the upstream and downstream chambers have reached equilibrium provides a useful method to assess the flow properties of both the fracture and matrix of within shale samples. Analysis of the initial pressure transient provides data on the fracture permeability whereas analysis of the late time behaviour provides information on the matrix porosity and permeability (Figure 3). The experiment may also be conducted at a range of stress and pore-pressure conditions to derived information on the stress dependence of fracture and matrix permeability, gas flow mechanisms as well as effective stress parameters.

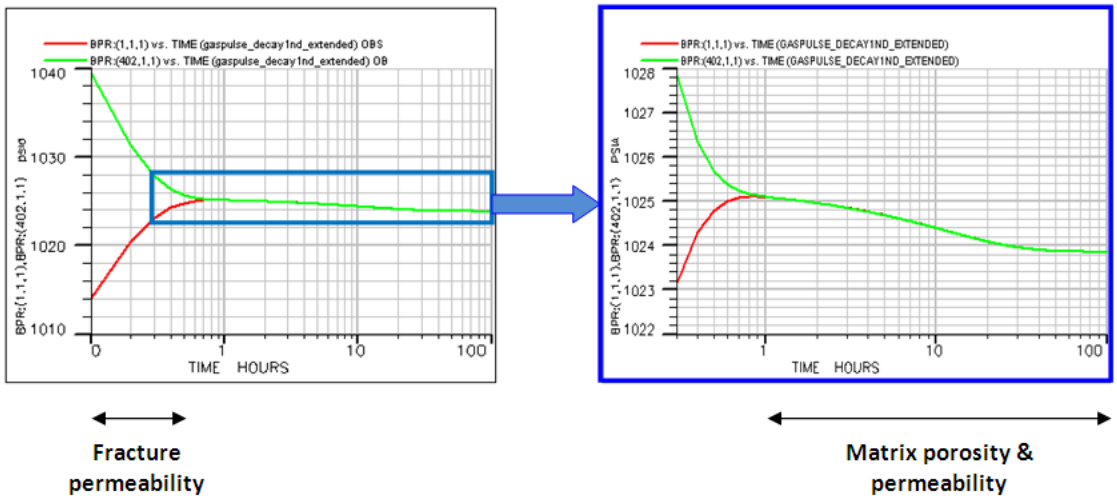


Figure 3. Simulation of an extended pulse-decay permeametry showing fracture and matrix response.

Gas permeability values lower than 0.001 nD (<$10^{-24}m^2$) are routinely reported from such tests. Those involved with seal analysis often use steady or unsteady state permeability analysis on core plugs using brine as the permeant. Published values obtained by such tests usually report

permeability values of >1nD (>$10^{-21}m^2$) many orders of magnitude higher than is frequently reported from GRI-type measurements. Pressure dependency is noted, and taking care of this pressure dependency is considered important.
This paper describes the issues with the different approaches. We combine laboratory data on shale permeability analysis with numerical modelling to explain some of the observations presented above. The paper then discusses in how far the measurements can be used for top seal analysis and overpressure retention in petroleum-bearing strata.

References

Bock, H., Dehandschutter, B., Martin, C. D., Mazurek, M., De Haller, A., Skoczylas, F. & Davy, C. (2010) Self-sealing of Fractures in Argillaceous Formations in the Context of Geological Disposal of Radioactive Waste. NEA No. 6184.
Lin, W., (1978) Measuring the permeability of Eleana argillite from area 17, Nevada Test Site, using the transient method, Rep. UCRL- 52604, 11 pp., Lawrence Livermore Lab., Livermore, Calif.,.
Schlömer, S. and Krooss, B.M. (1997) Experimental characterisation of the hydrocarbon sealing efficiency of cap rocks. Marine and Petroleum Geology, 14, 565-580.
Yang, Y., & Aplin, A.C. (2007) Permeability and petrophysical properties of 30 natural mudstones. J. Geophys. Res., 112, B03206, 1-14.

Biography:

Quentin Fisher

Quentin Fisher is Professor of Petroleum Geoengineering at the University of Leeds. He was awarded a PhD in low temperature geochemistry from the University of Leeds in 1993. He was worked for 18 years as a consultant conducting fault seal analysis for the petroleum industry. In 2007, he moved to the University of Leeds where is established the Wolfson Multiphase Flow laboratory. His research focuses on integrating the various upstream petroleum geoscience and engineering disciplines (e.g. petroleum geology, petrophysics, geophysics, geomechanics and petroleum engineering). In recent years, he's concentrated on unconventional reservoirs and is undertaking several large JIP's including PETGAS (petrophysics of tight gas sandstones), SHAPE (shale permeability analysis); FRACGAS (hydraulic fracturing of shales), and GESER (geomechanics of tight gas sandstone reservoirs).

The Challenges in exploiting a great Opportunity

Ade Elegbede, SASOL

LPS, Shale Oil and Shale Gas Seminar 14th June 2012

Abstract:
This presentation seeks to clarify some mis-conceptions about Shale Gas by reviewing some basic facts and science. Five steps that the Petrophysicist must take to help transform the Shale Gas opportunity in to value were also suggested.

Biography:
Ade holds a doctorate degree and has been a Physicist for 27 years. He researched and lectured in the Universities for 7- years before joining Shell Petroleum in 1992. In the last 20 - years, he has worked for many companies as Petrophysicist in support of Acquisition, Exploration and Exploitation of Hydrocarbon resources in Africa, Australasia, Europe, North and South America. In recent years, he has been involved with the assessment of value of more than 15 unconventional resources. He is currently the Senior Petrophysicist for SASOL - with responsibilities for Clastics and Carbonates fields, as well as Un-conventional (Shale Gas and CBM) resources.

The Estimation and Measurement of Total Organic Carbon and Possible Pitfalls

Patrick Hogarty, Monica Ghioca and Paul Helps, TGS

LPS, Shale Oil and Shale Gas Seminar 14th June 2012

Abstract:
Total Organic Carbon (TOC) is a major focus for the evaluation of source rocks for conventional and unconventional oil and gas shale plays. Organic carbon content can be estimated from logs and measured in the laboratory. This paper will illustrate some of these techniques and their possible pitfalls.
Types of carbon will be presented in their geological/depositional context. Measurement estimation by logs and oil/gas shale characteristics for logs will be briefly discussed. Laboratory analysis of TOC will be presented and some discussion will follow on why XRF/XRD does not give results for light elements. The combination of TOC and bulk geochemistry, the calibration of measurement and some examples will be shown. LOM estimation from logs and calibrated TOC will be mentioned. A typical source rock interpretation workflow will be shown and some potential pitfalls highlighted. An optimised methodology will be suggested for improved core to log calibration.

Patrick HOGARTY (Biography), June 2012
Patrick graduated from The University of Dublin with an honours degree in Geology in 1976. After spending a number of years in the mineral exploration industry entered the oil industry in 1984 as a mud logging geologist. He has spent over a decade working for major logging contractors (Gearhart, Halliburton and Baker Atlas). A similar period has been spent with oil companies in the UK, Oman and Norway. His expertise extends from large Field studies (including India, Libya and Oman), Complex and Stochastic log analysis, Thin Bed analysis and has recently completed a major study on source rocks. Patrick is currently Lead Petrophysicist for TGS in Surbiton developing and mentoring a group of young geologists and petrophysicists. He is a Baby Boomer, but as yet has no intention of retiring any time soon.

Monica GHIOCA (biography), June 2012
Monica graduated in Physics from the University of Bucharest in 1994. She also holds an MSc and a PhD in Physics. After several years as a hydrologist and then senior researcher in hydrology, she joined Schlumberger as a Petrophysicist in 2006. Her expertise covers sonic data interpretation (including anisotropy analysis, fracture detection, mechanical properties of fractures), the monitoring of LWD and Wireline operations, and Petrophysical interpretation for wells in Europe, Africa and Asia. Monica joined TGS in 2011 as a Petrophysicist for Geological Products and Services, where she has recently completed a major study on source rocks.

Paul HELPS (Biography), June 2012

Paul graduated from Oxford Brookes University with a First Class Honours degree in Geological Sciences. He obtained his doctorate in 2010 from Kingston University, London, for work investigating the scale, nature, and origin of petrological, geochemical and isotope heterogeneities in igneous rocks. In his first industry post, Paul joined TGS in 2010 and, initially, worked in the Software Development team before moving to the Petrophysics Department, in order to build upon a range of rock analysis skills developed during his academic career. Paul's present role is as a Junior Petrophysicist, where his responsibilities include producing high quality log data sets. He is currently enjoying the learning and developing of petrophysical skills, through industry courses, in-house

training and practical experience. His other fields of interest include reservoir analysis, basin modelling and the geology and development of shale gas plays.

Well-site Shale Resource Analysis from Advanced Surface Logging Technology

Mark Bacciarelli, Weatherford

LPS, Shale Oil and Shale Gas Seminar 14th June 2012

Abstract:
Advanced surface logging analytical techniques based on mud gas and drill cuttings measurements can provide valuable information for shale resource evaluation. Because the data is collected in real time the information from such techniques can be used to make geosteering decisions, utilized in horizontal completion and stimulation program designs, predict fluid type or be integrated with late time data such as core and wireline to provide a better understanding of the resource.

The techniques discussed are a membrane gas system, GC-Tracer for gas analysis, Source Rock Analyser, SRA, for cuttings organic data and well-site XRF, XRD for cuttings inorganic data. A review of the technology employed is followed by interpretation techniques and examples on how this data can be used in the various aspects of shale evaluation. The importance of integrating these well-site data sources with core and conventional log data is sound science in unconventional shale reservoirs, where disagreement still exists on the preferred evaluation practices.

Biography
Mark Bacciarelli is a Principal Geoscientist in Weatherford's Geoscience Development group and is based in East Leake in the East Midlands. After graduating in Petroleum Geology from Imperial College, London in 1979 he began his career as a geophysicist before moving to the oilfield. Since, he has accumulated close to 30 years global experience, both field and technical, in the varied fields of Surface Logging, Logging While Drilling, Directional Drilling, Software Applications Support, Wireline and Petrophysics.

Modelling, design and optimisation of a multi-stage fracture stimulation job in horizontal tight gas wells

Oberon Houston, JKX

LPS, Shale Oil and Shale Gas Seminar 14th June 2012

Abstract:
JKX Oil & Gas operate a number of producing fields onshore in the FSU. One Ukrainian license comprises a tight gas sandstone reservoir which has had mixed development success to date using fracture stimulation of vertical wells. JKX therefore turned to advanced stimulation technologies to develop the reserves in this area, recognising the wider implications for the future development of such resources across onshore Europe.

This study and design involved the:

- Successful drilling of a long horizontal well accompanied with an intensive data gathering program
- Completion of many studies of the acquired dataset (logs, SCAL, Core, etc.)
- Integration of this into the construction of 3D geological and mechanical models
- Construction of a reservoir simulation model designed to accept frac models
- History-match and inclusion of the frac design model into the simulation model
- Prediction modelling, fracture design optimisation and economic analysis of results

This work resulted in an optimised design of a 9-Stage fracture stimulation job utilising some total 2.7million lbs. of propant being planned. The use of a 'ball-drop shifting sleeve' system vs the more traditional 'plug & perf' technique was also heavily investigated. The selection of the preferred execution methodology will also be discussed. Job execution is currently in the detailed planning stage, with materials ordered and equipment being readied for mobilisation in-country.

Biography:
Oberon is a veteran of a number of international operators including BP, Talisman and Hess. During his 17 year career in the oil industry he has worked as a predominantly as a Reservoir Engineer and leading multi-discipline subsurface teams on operated assets. He currently provides group leadership for subsurface development activities at JKX Oil & Gas, based in Central London. JKX specialise in the Former Soviet Union (FSU) Region, and have operated assets in multiple FSU countries.

Micro Seismic processing, present and future techniques

Professor Michael Kendall

LPS, Shale Oil and Shale Gas Seminar 14th June 2012

Abstract

The successful exploitation of tight-gas reservoirs requires fracture networks, sometimes naturally occurring, often hydraulically stimulated. Borehole microseismic data acquired in such environments hold great promise for characterising such fractures or sweet spots. The loci of seismic events delineate active faults and reveal fracture development in response to stimulation. However, a great deal more can be extracted from these microseismic data. For example, inversions of shear-wave splitting data provide a robust means of mapping fracture densities and preferred orientations, useful information for drilling programs. They can also be used to track temporal variations in fracture compliances, which are indicative of fluid flow and enhanced permeability in response to stimulation. Furthermore, the frequency-dependent nature of shear-wave splitting is very sensitive to size of fractures and their fluid-fill composition. Here we demonstrate the feasibility of using such analysis of shear-wave splitting measurements on data acquired during hydraulic stimulation of a tight-gas sandstone in the Cotton Valley field in Carthage, West Texas.

Biography

Mike is Professor of Seismology and Head of the School of Earth Sciences at the University of Bristol. He has a PhD in Geophysics from Queen's University in Canada and he was a NSERC postdoctoral fellow at the Scripps Institution of Oceanography in the USA. He has had faculty positions at the University of Toronto and the University of Leeds, and he worked briefly for Chevron Canada Resources in Calgary. He is currently president of the British Geophysical Association and vice-president (Geophysics) of the Royal Astronomical Society.

Mike's research interests cover pure and applied seismology, with connections to mineral physics, geodynamics and engineering. Current research in global geophysics concentrates on the nature of the core-mantle boundary, continental cratons, continental rifting, mid-ocean ridges, and subduction zones. He has led seismic field experiments in a range of geologic settings.

Techniques developed to study wave propagation in the deep Earth have also been applied to his research in exploration seismology. His interests lie in microseismicity and passive seismic monitoring, rock-fracture characterization, and linked geophysics, geomechanics and fluid-flow modelling. He has managed a number of large industry-funded consortia.