SPE FORUM SERIES
FRONTIERS OF TECHNOLOGY

Thirty Years of Innovative Thought and Accelerated Results

16–21 August 2009

Kananaskis, Alberta, Canada

Application Deadline: 2 June 2009

The Future of Stimulation in Tight Gas and Gas Shale

Committee:

Larry Britt
Cochairperson
NSI Fracturing

Jorge Manrique
Cochairperson
Shell

Simon Chipperfield
Santos

John Bagzis
Chevron

V. Ray Ellis
OXY

Jack Jones
Retired

Randy F. LaFollette
BJ Services

Mark A. Layne
ALL Consulting

David Mack
Marathon Oil Company

Mukul Sharma
University of Texas at Austin

Norman Warpinski
Pinnacle

Over the past decade the contribution of unconventional gas resources, i.e., tight gas, gas from shale, and coalbed methane, as a percentage of total production in the US has seen significant growth, averaging 8.6 TCF/year at the end of 2006 (approximately 45%). This growth was driven by the drilling in 2005 and 2006 of over 34,000 tight gas and shale wells. While this tsunami of unconventional gas growth has carried its share of technological advances, the need for further game changing technologies is critical. This criticality is evident in the decreasing EUR/well recoveries being observed in more recent completions. These reduced recoveries combined with the dramatic increase in industry drilling and completion costs have short-circuited some unconventional developments as projects became unprofitable.

Economic rejuvenation will require efforts across a number of fronts, including the development of new technologies and approaches toward unconventional gas stimulation. In addition to allowing for continued development of known reservoirs, such technologies if identified and pursued, would enable development of additional resources throughout the world, including an estimated 10 TCF in the United States alone.

SPE Forums: Innovative Thought and Accelerated Results

SPE Forums offer an exclusive opportunity to discuss complex industry challenges with top technologists, innovators, and managers. The forums' limited size and intensive format maximize your opportunity to contribute. The objective is to stimulate thought, accelerate innovation, and inspire the development of new technology.

To create a cohesive group in which discussion is free flowing, only committee-selected applicants are invited to attend. Participants are encouraged to come prepared to contribute their experience and knowledge, not to be spectators or students.

If you have a role to play in meeting the challenges of tomorrow head-on, apply today. Participants will be selected based on their ability to contribute to the discussion and to represent their stakeholder group.

How Participation Benefits You—and Your Organization

- Learn in days what would usually takes months—even years—of research to learn.
- Effectively focus on a topic that directly relates to your work.
- Gain insight and perspective through conversations with peers who share your same interests.
- Meet with other experts from international companies, research institutes, and universities in an off-the-record format.
- Form professional relationships that will continue after the forum has ended.

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The Future of Stimulation in Tight Gas and Gas Shale

These exciting topics will be discussed in an open setting designed for optimal input from all participants.

Reservoir Characterization

Chairpersons: Randy LaFollette, BJ Services
Jorge Manrique, Shell

Reservoir Data and Information
- Required and desired information
- Information that is not needed

Reservoir Sampling and Analysis
- Rock and fluid samples; porosity and permeability measurement in very low permeability rocks
- Rock-pore system characterization for assessment of potential completion/stimulation problems and clay protection needs
- Rock analysis to assess proppant embedment and diagenesis issues

Reservoir Characterization Tools
- How can seismic attributes help the completion engineer?
- What wireline logs are most useful in tight gas sandstones and gas shales? What new logs do we need?
- Technologies and techniques for building log-to-core algorithms: Reservoir modeling for completion/stimulation design and post-job validation; production simulation; geomechanical simulation

Completion Strategy and Horizontal Well Architecture

Chairpersons: Ray Ellis, OXY
David Mack, Marathon Oil Company

Challenges of Stimulating Lenticular Formations
- Treatment design and staging

Controlled Hydraulic Fracture Placement
- Limited entry, solid diverting agents, focused stimulation, just-in-time perforating

Production Challenges
- Produced water handling; how to handle individual intervals; underperforming zones; secondary or tertiary recovery

Information to Maximize Success of Horizontal Wells
- Up-front diagnostics; pilot wells; log suites; reservoir modeling; cores; azimuth

Fracturing Fluids and Proppants

Chairpersons: John Bagzis, Chevron

Proppants
What will the next generations of proppants look like?
- We need them to be both lighter and stronger and "smart" for data transmission purposes.
- Can we create in-situ propping agents from chemical reactions?
- Will proppants be spherically shaped, rod-shaped, or other shapes?
- We need realistic prevention of proppant flowback using fibers, resin coatings, or other material.

Fracturing Fluids
What will be the next big breakthrough in fracturing fluids?
- Is slickwater a panacea or a curse? Will the breakthrough come from crosslinked gels, linear gels, foam, micellar fluids, or some other fluid types?
- We need to reduce or eliminate polymer residue and imbibition problems, recycle larger percentages of our recovered fracturing fluids, environmentally friendly fracturing fluids and additives.
- Are surfactants and alcohols really necessary? What future government regulations are likely regarding fracturing fluids?

Application Information

Participants at SPE Forums are selected by a steering committee on the basis of ability to contribute to the discussion of the topic. You can apply via the web, mail, or fax. You must apply by **2 June 2009** to be considered.

Online: www.spe.org/events/09fcn1
Mail: SPE FORUM SERIES, PO Box 833836, Richardson, TX 75083-3836 USA
Fax: +1.972.952.9435

An electronic version of the printed application form is available for downloading and printing at www.spe.org/events/09fcn1. You may also contact SPE at +1.972.952.9393 or service@spe.org to receive a printed registration form via mail, fax, or email.

Please obtain appropriate approvals from your supervisor PRIOR to applying to the forum. Include enough information about your experience and knowledge to enable the steering committee to evaluate your potential contribution to the forum.

Damage Prevention and Flowback

Chairpersons: Mukul Sharma, University of Texas at Austin

- Gel induced damage in fractures
- Water blocking in low permeability formations
- Condensate blocking in gas shales and tight gas sands
- Fines induced damage in fractures: How important is it?
- Frac fluids to minimize damage
- Proppant flowback
- Flowback strategies (forced closure vs. gradual flowback)

Frac Design

Chairpersons: David Mack, Marathon
John Bagzis, Chevron

- What is an optimum fracture stimulation design and how does it differ from a conventional stimulation design?
- How do we recognize stimulation best practices?
- How do we recognize when the optimum stimulation design has been achieved?
- Do we have a coming crisis with hydraulic fracturing and fracturing materials? Can these issues be resolved?
- What are some fracture stimulation design and execution risks and risk mitigation strategies, now and in the future?
  - Vertical well applications
  - Multiple fractured horizontal well applications
  - Naturally fissured reservoir applications

Frac Mapping

Chairpersons: Larry Britt, NSI Technologies
Norm Warpinski, Pinnacle

Strategies

- Single-well vs. multi-well monitoring; positioning of receivers and numbers of receivers and size of the array; minimizing noise

Issues

- Velocity structure; uncertainty; data quality

Results

- Multi-zone vertical well stimulations in lenticular tight gas sands
  - Height growth, length, azimuth, zonal coverage, missed zones
- Horizontal well stimulations in gas shales
  - Complexity, stimulated volume, simulfracs and zipper fracs, effectiveness of staging strategies
- Engineering value and application
  - How is this information being used?
- Future improvements and needs in mapping
  - Receivers, processing, other

Post-Frac Appraisal and Fractured Well Performance

Chairpersons: Jack Jones, Retired
Simon Chipperfield, Santos

- DTS monitoring and real time BHP gauges—emphasizing the value of additional diagnostics data for completion quality
- Standard data collection possibilities
  - Can PTA/RTA methods be used to characterize effective bulk parameters for design improvements and/or prediction? What is the role of traditional production data and standard surveillance?
- The future of micro-seismic
- Emphasizing integration with geophysical data; How do we carry micro-seismic results into predictive models or is translating the identified fracture pattern necessary? Can we do okay by just honoring the stimulated volume idea?
- Pilot simulation modeling: How do we model complicated, fluvial, heterogeneous reservoirs?
  - How do we include the completion in this (vertical wells with multistages, horizontals with multiple fracs)?

Water Management Relative to Hydraulic Fracturing and Hydraulic Fracturing Issues Involving NGO's, Regulatory Bodies, and the Public

Chairpersons: Mark Layne, ALL Consulting
Jack Jones, Retired

- Produced Water Management Strategies for disposal and reuse relevant to current tight gas plays
- Strategies relevant to addressing environmental groups, NGO's, and water boards about concerns when using hydraulic fracturing
  - How do we combat misconceptions?
- Current industry outreach efforts to public and regulatory bodies to address water access needs and produced water concerns
- Efforts to create new NGO's to address concerns being pushed by current environmental NGO's
  - Regulation and requirements relevant to fracturing fluid reporting
  - Fracture stage reporting: What may be required?
  - How to keep proprietary fluid makeup private
  - Environmental concerns
  - What disposal options are available for produced water?
  - AOR/UIC requirements to create injection wells using HF

If the committee accepts your application, you will receive registration materials, including more detailed information on housing, transportation, and fees. If your application is placed on a waiting list, you will receive notification of that fact. After notification of acceptance, your registration form with payment must be returned by **2 July 2009** to ensure your place in the forum.

The forum fee is USD 2995 and includes

- Registration to attend all nine forum sessions
- Five nights of hotel accommodation based on single occupancy
- Monday evening reception and dinner
- Daily breakfast buffet
- Thursday farewell reception and dinner
- AM and PM coffee breaks throughout the duration of the forum

Please note: The base registration fee does not include accompanying persons. The registration fee is not transferable. Gratuity for exceptional services is discretionary. The full fixed fee is charged regardless of the length of time a registrant attends the forum. Attendees are expected to attend the entire forum.

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The Forum Series Format

The SPE Forum Series provides nine alternate morning, afternoon, and evening sessions of scheduled and unscheduled presentations with maximum time available for informal discussions and exchange of experience. Presentations are generally limited to three or four slides. Breakout sessions for discussions are common. A short, written summary of major issues and consensus arising from the forum may be prepared and distributed to attendees after the forum at the discretion of the program committee and with appropriate SPE approval.

Forum Guidelines

- Participants are expected to attend every session.
- Lengthy, formal presentations are discouraged to promote maximum discussion.
- SPE Forums are conducted off the record to support the free interchange of information and ideas.
- Written papers are prohibited, and extensive note taking is not allowed.
- Mechanical recording of any portion of the forum in any form (photographic, electronic, etc.) is prohibited.
- Information disclosed at a forum may not be used publicly without the originator's permission.
- Participants are requested to omit reference to forum proceedings in any subsequent published work or oral presentation.

The 2009 SPE Forum Series Program

19–24 April
Overcoming Barriers to Deliver ERD Wells Beyond 15 km
Kota Kinabalu, Sabah, Malaysia

17–22 May
The Heavy Oil Challenge: Completion Design and Production Management
Tunisia, Africa

31 May–5 June
Artificial Intelligence in the E&P Industry: Future Opportunities for Better Decision Making
Colorado Springs, Colorado, USA

31 May–5 June
Maximizing Oil Recovery in the 21st Century
Colorado Springs, Colorado, USA

16–21 August
The Future of Stimulation in Tight Gas and Gas Shale
Kananaskis, Alberta, Canada

13–18 September
CO_2 Capture and Storage: Can the Oil and Gas Industry Support its Development and Deployment?
Cadiz, Spain

20–25 September
The Battle to Reduce Drilling NPT: Technology, Processes, and People
Cadiz, Spain

11–16 October
Getting to Robust Production Forecasts
Cadiz, Spain

25–30 October
Operational and Technical Innovation for Field Rejuvenation
Dorado Del Mar, Puerto Rico

SPE International

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