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FRONTIERS OF TECHNOLOGY

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Reservoir Simulation-Beyond Tomorrow

10-15 May 2010 • Phuket, Thailand

SPE Forum Description

Technical Discipline: Reservoir Description and Dynamics; Management and Information

Reservoir simulation has become an integral part of the oil and gas business over the last 50 years. A large segment of reservoir engineers now specialise in the use of reservoir simulation to help make large capital decisions, estimate reserves, and to diagnose and improve the performance of producing reservoirs. This penetration into the industry has been enabled by the advances in computing hardware, software design, and improved numerical algorithms and formulations.

This forum will discuss the development of new technologies and work processes to make a step-change in the application of reservoir simulators.

Potential themes include:

- Integration with G&G: Model Construction, Scale-up, and Feedback Loops
- Development Planning and Optimization – Primary, Secondary and Tertiary Recovery
- Uncertainty Assessment and Risk Identification
- History Matching: Quality Assessment, Assist Tools, Multiple Solutions
- Real-time Production Optimization, Support for Drilling, Stimulation and Measurement
- EOR Physics and Fluid Characterization
- Discretization, Formulations and Linear Solvers
- Geomechanics and Fractured Reservoir Model Formulations
- Wellbore Formulations and Representations
- Integration Surface Networks, Facilities and Optimizers
- Unconventional Applications: Physics and Formulations

To Whom Forum Will Appeal To

This forum will appeal to reservoir engineers, geoscientist, software developers, users from exploration and production companies, service providers, government institutions and universities.

Attendees Will

- Discuss common interests informally with colleagues from around the world.
- Share knowledge and experience in an off-the-record format.
- Gain new insight and perspective through conversations with others from international companies, service companies, contracting companies, research institutes, and universities.
- Enjoy a relaxed atmosphere of learning through one-on-one interaction.

Please come prepared to be a participant, not a spectator.

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Forum Session Topics and Descriptions

Session Title	Chairpersons
Why Next Generation Simulators/Emerging Simulators	Rosalind Archer, Cosan Ayan, Larry Fung
Problems with Scales – Time and Space	Hamdi Tchelepi, Michael King, William Kasischke
Managing Uncertainty in the Future	Michael King, Akhil Datta-Gupta, Kurt Thomas
Enhanced Reservoir Simulations	Halilu Uba, Stephen Lyons
Solving Unconventional Problems with Simulation I	Christopher Clarkson, Shige Miyazaki
Solving Unconventional Problems with Simulation II	Birol Demiral, William Kasischke,
Integrated Sub-Surface and Surface Network Modelling	Larry Fung, Stan Cullick
Impact of Future Simulation Technology on Recovery	Stan Cullick, Stephen Lyons,

Why Next Generation Simulators/Emerging Simulators

Reservoir simulators have long become a primary reservoir engineering tool for recovery analyses and performance evaluation in the oil and gas industry. Multi-scale multi-domain data, geological and geophysical models are becoming more integrated with increasing resolution and complexity over time. Thus, the quest for faster, more efficient, and more comprehensive simulation engines is ongoing. In this session, we will discuss emerging simulation technology covering advances in programming paradigms and languages, new formulation ansd methods, gridding and discretization, linear and nonlinear solvers, parallel computing and HPC related advances.

Problems with Scales – Time and Space

Reservoir simulation data involves a multitude of scales and resolution. Core measurement are in the order of inches, log measurement are in the order of feet, well tests measures distances in the order of tens to hundreds of feet, current seismic resolution is of the order of tens of feet. These data are typically integrated into the reservoir model through the geological modeling step. Today, reservoir models are frequently in the sub-million cell range. They use grid cell sizes which are in the order of a hundred feet by a hundred feet. Number of layers varies from tens of layers to a hundred layers. Thus, a homogenization step known as upscaling is frequently done to coarsen the finer geological realizations into the final reservoir simulation models. In this upscaling step, fine details are discarded such that field-scale simulation studies can be carried out expeditiously. Recent advances in reservoir simulation method such as multi-scale method holds some promise in addressing this issue. In this session, we will look at the recent advances on the issue of scales in reservoir simulation.

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Managing Uncertainty in the Future

You have finally completed your history matching, and run prediction cases. How accurate are the predictions? There was considerable uncertainty in the prior geologic models. The production data was of variable quality. If you could quantify the uncertainty in the prior models and production data, you could do a better job of judging the uncertainties in your history matched models and in your forecasts. The ideal assisted history matching tool would aid you in dealing with the data and model parameter uncertainty, help you identify which data was critical to improving the match, and guide you in developing an appropriate range of possible outcomes in your prediction runs. This session will address gaps in our ability to manage uncertainty from the start of a simulation project through to the final prediction runs.

Enhanced Reservoir Simulations

This session will examine the current and future challenges of modeling Fractured Reservoirs, Geomechanics, and Complex Wells. Although fractures can play a major role in hydrocarbon recovery, the complexity of the dual media approach to modeling is constantly debated among practitioners. Coupled with the problems of acquisition and use of both static and dynamic data to model flow in fractured reservoirs, questions arise as to how representative these models are and how reliable are their predictions. The role that geomechanics plays in stress-sensitive reservoirs, hydraulic fractures, and natural fracture properties during production can be significant and adds to the complication of modeling. Recognizing the difficulty in modeling and the uncertainty in reservoir description, complex multi-lateral and smart wells are employed to provide operational flexibility to minimize risks in reservoir management. Modeling these complex wells remains a challenge in full field reservoir simulation.

Solving Unconventional Problems with Simulation I & II

With the rapid development of unconventional resources in recent years, reservoir simulation technology is facing new challenges to provide key information used for long-term development decisions. Further, growing interest in geo-sequestration of green-house gases has necessitated new applications of simulation. The two sessions will explore novel concepts of reservoir simulation for not only the recovery of unconventional gas resources (tight gas, shale gas, coalbed methane and gas hydrate) and heavy oil but also the subsurface disposal of green-house gases. Delegates will discuss simulation model formulations to deal with unique physics and flow mechanism within unconventional gas reservoirs and devise more suitable simulation techniques to improve recovery. We will also investigate thermal simulation models applied to heavy oil reservoirs and long-term (>1000 years) simulation models applied to geo-sequestration. Recent advancement and future direction of special gridding technology, coupled geomechanical flow simulation and hydraulic fracture networks will be discussed.

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Integrated Sub-Surface and Surface Network Modelling

Historically, the simulation of the surface and the subsurface have been performed separately. The analyses might even be the domain of different departments in a major oil company, as each component involves complex numerical simulation. Increasingly however, assets are being developed as multi-reservoirs connected through complex gathering systems with multiple flow systems for production, water disposal/injection, and gas handling/injection. The modeling of gas and LNG deliverability is one such example. Planning and operating these assets require coupled surface and subsurface simulation. There has long been the quest for integrating the surface network simulator with the reservoir simulator to model a fully coupled complete system. Advances in the use of intelligent well technology and complex multi-lateral wells is another important aspect for a coupled system. In this session, we will discuss the state-of-the-art and the future technology for coupled simulation.

Impact of Future Simulation Technology on Recovery

Reservoir simulation focus is on oil and gas recovery prediction in order to make better decisions. With continuing volatility of oil prices and costs, evaluating the best decisions for optimizing recovery from mature and brown field assets will require simulators that have a lot of flexibility and scalability to enable engineers to evaluate many scenarios. The simulators will cover a range of physical processes for recovery, e.g. enhanced recovery through chemical, biological, thermal, electric, and other means. This session will focus on future techniques to optimize recovery from mature assets and the enabling simulation technology.

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Application Information

Participants at SPE Forums are selected by the SPE Forum Series Steering Committee on the basis of ability to contribute to the discussion of the topic. Attendance is limited to maximise each person's opportunity to contribute.

To apply, complete and return the application form in the brochure by **10 March 2010**. Include enough information about your experience and knowledge to enable the SPE Forum Series Steering Committee to evaluate your potential contribution to the forum. Upon acceptance, you will receive registration materials in April 2010, including detailed information on housing, transportation, and fees. After notification of acceptance, your registration form with full payment must be returned to SPE by **10 April 2010** to ensure your place in the forum. All accepted participants must register and pay the full fixed fee in advance.

Forum Registration Fee

USD 2,500 per person on/before 10 April 2010
USD 2,600 per person after 10 April 2010

Includes the following for the forum participant:

- Registration to attend all the forum sessions
- Five nights' hotel accommodation based on single occupancy
- Welcome reception and dinner with entertainment on Monday
- Breakfast and lunch Tuesday through Saturday
- Dinner on Tuesday, Wednesday, and Friday
- Daily coffee breaks

Please note: **Attendees are expected to attend the full forum.** The full fixed registration fee is charged regardless of the length of time a registrant attends the forum. The base registration fee does not include accompanying persons. Details of accommodation and rates for spouses and family members will be sent with the registration packet that will be mailed to each delegate upon acceptance.

The Forum Series Format

The SPE Forum Series provides morning, afternoon, and evening sessions of short, scheduled and unscheduled presentations, with maximum time available for informal discussions and exchange of experience.

To encourage the free interchange of information and ideas, SPE Forums are conducted off the record. 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 specifically requested to omit reference to forum proceedings in any subsequent published work or oral presentation.

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 steering committee, and with appropriate SPE approval.

To encourage maximum discussion, lengthy, formal presentations are discouraged. Presentations are usually limited to three or four slides or transparencies. Breakout sessions for discussions in smaller groups are common. Participants are encouraged to come prepared to contribute their experience and knowledge, NOT to be spectators or students.

To create a cohesive group in which discussion is free flowing, attendance at forums is limited, and only registrants are allowed to attend sessions. To ensure opportunities for formal and informal discussions, all attendees are expected to attend every forum session.

APPLICATION DEADLINE: 10 March 2010

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This application is due by
10 March 2010
Do NOT send payment with this form.

Please print or type:

Name (First) (Middle) (Last)

SPE Member Number ☐ Check here if you are not an SPE member

Job Title and Discipline

Company Name

Complete Mailing Address

Telephone Number Facsimile Number

Email Address

IMPORTANT: List experience that qualifies you to attend this Forum and specify your expectations of this Forum. Use additional paper if required.

Please identify your primary discipline from the six categories below.

- ☐ Drilling and Completions
- ☐ Production and Operations
- ☐ Management and Information Technology
- ☐ Health, Safety, Security, Environment and Social Responsibility
- ☐ Projects, Facilities and Construction
- ☐ Reservoir Description and Dynamics

Do you wish to make a presentation about evolving and future technologies, issues or challenges? Presentations are 5 to 10 minutes long with only 3 or 4 slides. No professionally prepared visual aid may be used. Attach additional paper if required.

Do you wish to present a poster? If so, please specify topic and provide brief description.

The Poster Chairperson will notify you by telephone or email if your poster is accepted.

Note: Recording of any portion of the SPE Forum Series in any form (photographic, electronic, etc.) is strictly prohibited. Extensive note taking is forbidden. Printed reference to any SPE Forum discussion is not permitted without the consent of the parties involved. All participants are specifically requested to omit public reference to Forum proceedings in any published work or oral presentation. Registrants agree to attend ALL Forum sessions, and discuss and share with forum participants their experiences and knowledge in the subject area, specifically in those areas of advanced technology in a given subject.

Each participant agrees to the above regulations when application is submitted.

Signature **Date**

Submit this completed application by mail, fax, online or by email. Do not send payment with this form.

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Email: spekl@spe.org

Website: www.spe.org

Applications are reviewed by the SPE Forum Steering Committee. Accepted applicants will receive their registration form and other materials in March 2010 AFTER acceptance by the committee. Accepted applicants must return their registration form with payment by **10 April 2010**