

Society of Petroleum Engineers

SPE Gas Technology Symposium 2006

“Mature Fields to New Frontiers”

May 15-18, 2006
Calgary, Alberta, Canada

Printed from e-media with permission by:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571
www.proceedings.com

ISBN: 978-1-60423-557-9

Some format issues inherent in the e-media version may also appear in this print version.

Copyright and Use Restrictions

Copyright 2006, Society of Petroleum Engineers

Material included in this *Proceedings* is copyright protected. Electronic reproduction, distribution, or storage of any part of an SPE-copyrighted paper for commercial purposes without the written consent of the Society of Petroleum Engineers is prohibited. Permission to reproduce in print is restricted to an abstract of not more than 300 words; illustrations may not be copied. The abstract must contain conspicuous acknowledgment of where and by whom the paper was presented. For photocopying beyond the above permissions, libraries and other users dealing with the Copyright Clearance Center (CCC) Transactional Reporting Service must pay a base fee of \$3 per copyrighted article plus \$0.25 per page to CCC, 222 Rosewood Drive, Danvers, Massachusetts 01923 U.S.A. For other permissions, contact Librarian, SPE, 222 Palisades Creek Drive, Richardson, Texas 75080-2040 U.S.A.

Use of SPE member or author contact information included on this CD for commercial purposes or reproduction of that information in whole or in part, in any form or medium, is strictly prohibited and subject to legal action. Contact SPE to inquire about rental of mailing lists.

This CD of the 2006 SPE Gas Technology Symposium was produced by SPE. This product contains Adobe® Reader® Software. Permission to print and distribute content from this product must be obtained from SPE. Duplication of replication products is absolutely prohibited without written permission from SPE and Adobe. Adobe, the Adobe logo, and Reader are either registered trademarks or trademarks of Adobe Systems Incorporated in the United States and/or other countries.

Material on the CD was reproduced from original papers and/or electronic files provided by the authors. Some discrepancies are inevitable. Please advise SPE of errors so corrections can be made to the electronic versions of the article. Send corrections by e-mail to pdf@spe.org or mail to the SPE Americas Office, attention Technical Paper Administrator.

Society of Petroleum Engineers

SPE Gas Technology Symposium
2006

TABLE OF CONTENTS

- 1** SPE 99317 Improved Production in Low-Pressure Gas Wells by Installing Wellsite Compressors
N. Behl, K.E. Kiser, and J. Ryan, Schlumberger IPM
- 11** SPE 99338 Transforming Data Into Decisions to Optimize the Recovery of the Saih Rawl Field in Oman
G.C. Dozier, Schlumberger, and P. Giacon, Petroleum Development of Oman
- 23** SPE 99351 Case Studies: A Practical Approach to Gas-Production Analysis and Forecasting
C.L. Jordan, M.J. Fenniak, and C.R. Smith, Rapid Technology Corp.
- 38** SPE 99352 An Efficient Model for Gas-Rate Forecasting in Complex Reservoirs
C.L. Jordan, M.J. Fenniak, and C.R. Smith, Rapid Technology Corp.
- 56** SPE 99356 Prediction of Drillstring Fatigue Life Under Axial-Torsional-Combined Vibration
A. Chi, Daqing Petroleum Inst.; J. Zhang, Jilin Petroleum Co. Ltd.; W. Ge, Daqing Petroleum Inst.; and B. Guo, U. of Louisiana at Lafayette
- 61** SPE 99386 How Reliable Is Fluid Gradient in Gas/Condensate Reservoirs?
C.S. Kabir, Chevron ETC, and J.J. Pop, Schlumberger
- 76** SPE 99388 Field Application of Combined Kinetic Hydrate and Corrosion Inhibitors in the Southern North Sea: Case Studies
A.W.R. MacDonald, M. Petrie, J.J. Wylde, A.J. Chalmers, and M. Arjmandi, Clariant Oil Services
- 82** SPE 99445 Numerical Investigation on Hydraulic Fracture Cleanup and Its Impact on the Productivity of a Gas Well With a Non-Newtonian Fluid Model
T. Friedel, Schlumberger Data & Consulting Services
- 91** SPE 99520 Gas Storage and Operations in Single-Bedded Salt Caverns: Stability Analyses
G. Han, M.S. Bruno, K. Lao, and J. Young, Terralog Technologies USA Inc., and L. Dorfmann, Tufts U.
- 101** SPE 99522 3D Simulation of Rock Breakage With Air Hammers in Gas-Well Drilling
G. Han and M.S. Bruno, Terralog Technologies USA Inc., and M.B. Dusseault, U. of Waterloo
- 109** SPE 99580 Proppant Placement Using Reverse-Hybrid Fracs
Y. Liu, P.B. Gadde, and M.M. Sharma, U. of Texas at Austin
- 120** SPE 99647 Simulation of Experimental Gas-Recycling Experiments in Fractured Gas/Condensate Reservoirs
S.R. Shadizadeh, Petroleum U. of Technology, and D. Rashtchian and S. Moradi, Sharif U. of Technology
- 126** SPE 99700 The Effect of Sulfur Deposition on Gas Deliverability
H. Mei, M. Zhang, and X. Yang, Southwest Petroleum Inst.
- 136** SPE 99720 Oligocene Vicksburg Thin-Bed Production Optimization Derived From Oil-Based Mud Imaging: A Case Study
D.L. Fairhurst, B.W. Reynolds, S. Indriati, and M.D. Morris, Schlumberger, and E.G. Hanson, Abaco Operating LLC

- 147** SPE 99830 Performance Prediction of a Rich Gas/Condensate Reservoir Through Material Balance and PVT Behavior: A Case Study
M. Zeidouni, G.H. Movazi, and B. Pourghasem, Natl. Iranian Oil Co.
- 156** SPE 100313 Production Data Analysis of Single-Phase (Gas) CBM Wells
C.R. Clarkson, Burlington Resources Canada Ltd.; R.M. Bustin, U. of British Columbia; and J.P. Seidle, Sproule Assocs. Inc.
- 190** SPE 100321 Correcting Underestimation of Optimal Fracture Length by Modeling Proppant Conductivity Variations in Hydraulically Fractured Gas/Condensate Reservoirs
A.H. Akram and A. Samad, Schlumberger
- 200** SPE 100384 Diagnosis of Reservoir Behavior From Measured Pressure/Rate Data
C.S. Kabir, Chevron ETC, and B. Izgec, Texas A&M U.
- 213** SPE 100385 Review of Underground Gas Storage in the Bedded Salt Deposit in China
Y. Guangjie, R. Shen, Z. Tian, J. Yuan, Q. Wang, and M.S. Yang, PetroChina
- 220** SPE 100417 Field Case Studies: Damage Preventions Through Leakoff Control of Fracturing Fluids in Marginal/ Low-Pressure Gas Reservoirs
J. Paktinat, J.A. Pinkhouse, and C. Williams, Universal Well Services Inc.; G.A. Clark, Phillips Production; and G.S. Penny, CESI Chemical
- 231** SPE 100428 Three-Dimensional Permeability Utilizing a New Gas-Spot Permeameter
H.A. Belhaj, S.H. Mousavizadegan, F. Ma, and M.R. Islam, Dalhousie U.
- 244** SPE 100433 Case Study: Modeling of a Large-Scale Tight-Gas Gathering System
B.K. Stevenson, Consultant, and C.D. O'Shea, Fekete Assocs. Inc.
- 249** SPE 100434 Field Study of Completion Fluids To Enhance Gas Production in the Barnett Shale
G.S. Penny and J.T. Pursley, CESI Chemical, and T.D. Clawson, Antero Resources Corp.
- 259** SPE 100442 Selective Removal of Water From Supercritical Natural Gas
A. Karimi and M.A. Abdi, Memorial U. of Newfoundland
- 266** SPE 100451 Effect of Fracture Compressibility on Gas-in-Place Calculations of Stress-Sensitive Naturally Fractured Reservoirs
R. Aguilera, Servipetrol Ltd.
- 271** SPE 100460 Numerical Studies of Gas-Hydrates Formation and Decomposition in a Geological Reservoir
M. Uddin, Alberta Research Council Inc.; D.A. Coombe, Computer Modelling Group Ltd.; D.H. Law, Schlumberger Reservoir Fluids Center; and W.D. Gunter, Alberta Research Council Inc.
- 284** SPE 100467 Polymer Reduction Leads to Increased Success: A Comparative Study
N.H. Kostenuk, Trican Well Service Ltd., and P.J. Gagnon, Burlington Resources Canada Ltd.
- 289** SPE 100474 Corrosion Mitigation With Gas-Hydrate Inhibitors
R. Hoppe, R.L. Martin, M.K. Pakulski, and T.D. Schaffer, BJ Chemical Services
- 295** SPE 100497 Critical Evaluation of Existing Methods for Accounting for Multiphase Effects Around Producers in Depleting Gas/Condensate Reservoirs
C.A. Estrada and A. Settari, U. of Calgary

- 315** SPE 100509 Estimating Layer Properties for Wells in Multilayer Low-Permeability Gas Reservoirs by Automatic History-Matching Production and Production Log Data
J.P. Spivey, Phoenix Reservoir Software LLC
- 329** SPE 100524 Novel CO₂-Emulsified Viscoelastic Surfactant Fracturing Fluid System Enables Commercial Production From Bypassed Pay in the Olmos Formation of South Texas
M.E. Semmelbeck, W.E. Deupree, and J.K. von Plonski, Escondido Resource, and F.A. Mueller, Y. Chen, J.W. Lewis, L.K. Keto, D.L. Fairhurst, and T.L. Pope, Schlumberger
- 337** SPE 100526 Static and Dynamic Uncertainty Management for Probabilistic Production Forecast in Chuchupa Field, Colombia
N. Rivera, N.S. Meza, J.S. Kim, P.A. Clark, R. Garber, and A. Fajardo, Chevron, and V. Peña, Ecopetrol
- 344** SPE 100529 Improving the Gas and Condensate Relative Permeability Using Chemical Treatments
V. Kumar, G.A. Pope, and M.M. Sharma, U. of Texas at Austin
- 353** SPE 100540 Semianalytical Model for Reservoirs With Forchheimer's Non-Darcy Flow
F. Zeng and G. Zhao, U. of Regina
- 369** SPE 100541 Simulation Study on Injection of CO₂-Microemulsion for Methane Recovery From Gas-Hydrate Reservoirs
H.A. Phale and T. Zhu, U. of Alaska Fairbanks, and M.D. White and B.P. McGrail, Pacific Northwest Natl. Laboratory
- 381** SPE 100543 Optimization of Fracture Length in Gas/Condensate Reservoirs
J. Mohan, M.M. Sharma, and G.A. Pope, U. of Texas at Austin
- 395** SPE 100556 Evaluation of the Proppant-Pack Permeability in Fiber-Assisted Hydraulic Fracturing Treatments for Low-Permeability Formations
M.N. Bulova, A.N. Cheremisin Jr., K.E. Nosova, J.T. Lassek, and D. Willberg, Schlumberger
- 400** SPE 100562 An Integrated Technique for Production Data Analysis With Application to Mature Fields
R. Gaskari, S.D. Mohaghegh, and J. Jalali, West Virginia U.
- 409** SPE 100563 New, Rigorous Material Balance Equation for Gas Flow in a Compressible Formation With Residual Fluid Saturation
N.M.A. Rahman, D.M. Anderson, and L. Mattar, Fekete Assocs. Inc.
- 421** SPE 100570 Decoupling Damage Mechanisms in Acid-Fractured Gas/Condensate Reservoirs
R.C. Bachman, Taurus Reservoir Solutions Ltd.; A. Settari, U. of Calgary; D.A. Walters, Taurus Reservoir Solutions Ltd.; and Z. Rahim and M.S. Ahmed, Saudi Aramco
- 433** SPE 100572 A Study of Fracture Initiation Pressures in Cemented Cased-Hole Wells Without Perforations
G.L. Rytlewski and J.M. Cook, Schlumberger
- 443** SPE 100573 Analysis of Gas-Well Reservoir Performance Data Using B-Spline Deconvolution
D. Ilk, Texas A&M U.; D.M. Anderson, Fekete Assocs. Inc.; and P.P. Valko and T.A. Blasingame, Texas A&M U.
- 453** SPE 100574 Using Reservoir Modeling To Evaluate Stimulation Effectiveness in Multilayered "Tight" Gas Reservoirs: A Case History in the Pinedale Anticline Area
S.K. Schubarth, Schubarth Inc.; J.P. Spivey, Phoenix Reservoir Software LLC; and P.T. Huckabee, Shell E&P Co.

- 461** SPE 100575 Quantifying Uncertainty in Original-Gas-in-Place Estimates With Bayesian Integration of Volumetric and Material Balance Analyses
A.W. Aprilia, Z. Li, D.A. McVay, and W.J. Lee, Texas A&M U.
- 473** SPE 100576 Well Testing of Tight Gas Reservoirs
J.P. Garcia, M. Pooladi-Darvish, F. Brunner, M. Santo, and L. Mattar, Fekete Assocs. Inc.
- 486** SPE 100578 Application of a New Fracture-Injection/Falloff Model Accounting for Propagating, Dilated, and Closing Hydraulic Fractures
D.P. Craig, Halliburton, and T.A. Blasingame, Texas A&M U.
- 503** SPE 100583 Simulation-Based Technology for Rapid Assessment of Redevelopment Potential in Stripper-Gas- Well Fields—Technology Advances and Validation in the Garden Plains Field, Western Canada Sedimentary Basin
Y. Cheng, D.A. McVay, J. Wang, and W.B. Ayers, Texas A&M U.
- 515** SPE 100584 Evaluation of the Technical and Economic Feasibility of CO₂ Sequestration and Enhanced Coalbed-Methane Recovery in Texas Low-Rank Coals
G.A. Hernandez, R.O. Bello, D.A. McVay, and W.B. Ayers, Texas A&M U.; J.A. Rushing, S.K. Ruhl, and M.F. Hoffmann, Anadarko Petroleum Corp.; and R.I. Ramazanov, Texas A&M U.
- 531** SPE 100586 Constant-Rate Drawdown Solutions Derived for Multiple Arbitrarily Oriented Uniform-Flux, Infinite- Conductivity, or Finite-Conductivity Fractures in an Infinite-Slab Reservoir
D.P. Craig, Halliburton, and T.A. Blasingame, Texas A&M U.
- 542** SPE 100588 Hybrid Fracture Stimulation in Underpressured Coals
M. Ramurthy, Halliburton; B. Lyons, Lance Oil & Gas Co. Inc.; and D.P. Magill, Halliburton
- 555** SPE 100589 BHA and Drillstring Modeling Maximizes Drilling Performance in Lateral Wells of Barnett Shale Gas Field of N. Texas
S.S. Janwadkar, Baker Hughes Inteq; D.G. Fortenberry, G.K. Roberts, and M. Kramer, Devon Energy Corp; D.K. Trichel, T. Rogers, S.A. Privott, and B. Welch, Baker Hughes Inteq; and M.R. Isbell, Hughes Christensen Co.
- 576** SPE 100590 The Tools, Techniques, and Advantages Involved in Combining Compression and Plunger Lift in Low-Rate Gas Wells
R.A. Schmitz and G.D. Steele, VaporTech Energy Services Inc.
- 591** SPE 100615 Prediction of Slug-to-Annular Flow Pattern Transition (SAT) for Reducing the Risk of Gas Lift Instabilities and Effective Gas/Liquid Transport From Low-Pressure Reservoirs
P. Toma, P.R Toma Consulting Ltd., and E. Vargas and E. Kuru, U. of Alberta
- 601** SPE 100650 Automated Liquid Unloading in Low-Pressure Gas Wells Using Intermittent and Distributed Heating of Wellbore Fluid
G. Alipour-Kivi, A. Bugacov, B. Khoshnevis, and I. Ershaghi, U. of Southern California