

# **European Unconventional Resources Conference and Exhibition 2014**

## **Unlocking European Potential**

**Vienna, Austria  
25-27 February 2014**

**Volume 1 of 2**

**ISBN: 978-1-63266-081-7**

**Printed from e-media with permission by:**

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



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

Copyright© (2014) by the Society of Petroleum Engineers  
All rights reserved.

Printed by Curran Associates, Inc. (2014)

For permission requests, please contact the Society of Petroleum Engineers  
at the address below.

Society of Petroleum Engineers  
P. O. Box 833836  
Richardson, Texas 75083-3836

Phone: (800) 456-6863  
Fax: (972) 952-9435

[books@spe.org](mailto:books@spe.org)

**Additional copies of this publication are available from:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571 USA  
Phone: 845-758-0400  
Fax: 845-758-2634  
Email: [curran@proceedings.com](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

# TABLE OF CONTENTS

## Volume 1

<b>Research On Fractured Horizontal Wells Productivity And Productivity Influence In Shale Gas Reservoir .....</b>	1
<i>W. Xie, X. Li</i>	
<b>A New Geomechanical Model Explaining Source Mechanisms Of Events Induced By Hydraulic Fracturing In Shale .....</b>	10
<i>L. Eisner, F. Stanek</i>	
<b>Stakeholder Concerns Against Shale Gas Developments In Europe - The Relevance Of Water Management.....</b>	18
<i>W. Heinz, D. Hiller</i>	
<b>Application Of Support Vector Machine To Account For Hydraulic And Natural Fracture Interaction In Unconventional Naturally Fractured Reservoirs.....</b>	21
<i>R. Keshavarzi, R. Jahanbakhshi, M. Jafamezhad</i>	
<b>CBM Development Scenario Optimization For Production Sharing Contract, Case Study: Sumbagsel Field, Indonesia .....</b>	35
<i>F. Ferdian, A. Ilyas, V. Mediyanti</i>	
<b>The Impact Of Multiphase Flow On Well Testing Models In Gas Hydrate Reservoirs Without Crossflow .....</b>	41
<i>M. Kome, M. Amro</i>	
<b>Sweetspotting Of The First Appraisal Campaign Of Unconventional Resource Play In Kuwait .....</b>	64
<i>S. Narhari, S. Al-Ashwak, V. Kidambi, N. Al-Ajmi, N. Neog, J. Rao, M. Makki, A. Narayan, F. Erkan, Q. Dashti, C. Darous, S. Chakravorty, S. Miller</i>	
<b>Drainage Estimation And Proppant Placement Evaluation From Microseismic Data.....</b>	81
<i>C. Neuhaus, M. Ellison, C. Telker, K. Blair</i>	
<b>A Physics-Based Method For Production Data Analysis Of Tight And Shale Petroleum Reservoirs Using Succession Of Pseudo-Steady States .....</b>	89
<i>M. Shahamat, L. Mattar, R. Aguilera</i>	
<b>First Openhole Hydraulic Fracturing Treatment Using Diverter Technology In India .....</b>	105
<i>F. Adil, K. Pande, B. Raina</i>	
<b>Modeling Of Shale-Erosion Behavoir In Aqueous Drilling Fluids .....</b>	116
<i>S. Maghrabi, D. Kulkami, K. Teke, S. Kulkarni, D. Jamison</i>	
<b>Optimizing Lateral Lengths In Horizontal Wells For A Heterogeneous Shale Play .....</b>	124
<i>L. Chorn, N. Stegent, J. Yarus</i>	
<b>An Integrated Approach Towards A Holistic Sedimentological And Pore-Scale Characterisation Of Fine-Grained (Shale) Unconventional Reservoirs.....</b>	136
<i>K. Dasgupta, B. Kostic</i>	
<b>World's First Through-Tubing ESP Swap On Electric Line In Highly Deviated Wellbores .....</b>	140
<i>M. Kuck, J. Albright, C. Blount</i>	
<b>The Bowland Shale In The Roosecote Borehole Of The Lancaster Fells Sub-Basin, Craven Basin, UK: A Potential UK Shale Gas Play? .....</b>	148
<i>E. Hough, C. Vane, N. Smith, V. Moss-Hayes</i>	
<b>Modeling Transportation Logistics, Water Use, And Surface Footprint For Shale Gas Field Developments .....</b>	159
<i>M. Mitschanek, G. Thonhauser, M. Prohaska</i>	
<b>Imbibition And Water Blockage In Unconventional Resevoirs: Well Management Implications During Flowback And Early Production.....</b>	173
<i>A. Bertoncello, J. Wallace, C. Blyton, M. Honarpour, C. Kabir</i>	
<b>Use Of Near Bit Azimuthal Gamma Ray And Inclination Tool Improves Geosteering In CBM Wells, Airth Field, Scotland .....</b>	186
<i>N. Thwaites, A. Suh</i>	
<b>Well Design Evolution Towards The First Commercial Unconventional Gas Flowrate In Europe .....</b>	198
<i>N. Thwaites, L. James</i>	
<b>New Sponge Liner Coring System Records Step-Change Improvement In Core Acquisition And Accurate Fluid Recovery.....</b>	208
<i>L. Shale, S. Radford, T. Uhlenberg, J. Rylance, A. Kvinneland, C. Rengel</i>	

<b>Shale And Tight Reservoirs: A Possible Geomechanical Control In The Success Of Producing Wells, Neuquén Basin, Argentina .....</b>	219
<i>M. Garcia, F. Sorenson, H. Stockman, C. Zavala</i>	
<b>Horizontal Well Development In Unconventional Resource Play Using Integrated Completion And Production Workflow: Delaware Basin Case Study .....</b>	229
<i>A. Sharma, M. Yates, T. Pope, K. Fischer, R. Brown, L. Honeyman, B. Bates</i>	
<b>How To Cope With Some Of The Challenges Associated With Laboratory Measurements On Gas Shale Core Samples .....</b>	237
<i>B. Lalanne, A. Le-Bihan, R. Poyol, L. Martinez</i>	
<b>The Uncertainty Of Future Commercial Shale Gas Availability.....</b>	254
<i>H. Rogner, R. Weijermars</i>	
<b>Numerical Simulation Of Low Permeability Unconventional Gas Reservoirs.....</b>	265
<i>D. Ding, Y. Wu, N. Farah, C. Wang, B. Bourbiaux</i>	
<b>Origins And Integrated Exploration Of Sweet Spots In Carbonate And Shale Oil-Gas Bearing Reservoirs Of The Timan-Pechora Basin.....</b>	295
<i>A. Petukhov, A. Kuklin, A. Petukhov, L. Cardenas, P. Roschin</i>	
<b>Water Loss Versus Soaking Time: Spontaneous Imbibition In Tight Rocks .....</b>	306
<i>Q. Lan, E. Ghanbari, H. Dehghampour, R. Hawkes</i>	
<b>Environmental Stewardship: Lessons For European Unconventional Gas From The United States And Australia .....</b>	318
<i>P. Wilkinson, P. Von Lany, A. Lane</i>	
<b>Stimulated Rock Information In Multistage Hydraulic Fracturing Treatment.....</b>	333
<i>A. Lin, J. Ma</i>	
<b>Shale Gas Boom In The USA Inspires Chinese Operators.....</b>	342
<i>S. Kang, C. Gao</i>	
<b>Effective Assessment Of Resource Plays: Handling Transition Zones.....</b>	355
<i>F. Stabell, G. Martinelli, C. Stabell</i>	
<b>Numerous Technological Improvements Slash Drilling Times In The Horn River Basin.....</b>	369
<i>H. Zafar, Y. Ji</i>	
<b>Logging Solutions For Completion Optimization In Unconventional Resource Plays .....</b>	381
<i>E. Wigger, A. Viswanathan, K. Fisher, R. Slocum, P. Kaufman, C. Chadwick</i>	
<b>Production Data Analysis Of Multi-Fractured Horizontal Wells Producing From Tight Oil Reservoirs - Bounded Stimulated Reservoir Volume .....</b>	398
<i>F. Qanbari, C. Clarkson</i>	
<b>Microseismic Waveforms And Velocity Heterogeneity: Towards Full-Waveform Location Algorithm.....</b>	408
<i>D. Angus, A. Aljaafari, P. Usher, J. Verdon</i>	
<b>A Novel Experiment Method Of Evaluating The Brittleness Of Rock.....</b>	415
<i>L. Song, Y. Li, Y. Wang</i>	
<b>Comprehensive Assessment Of Additive And Class G Cement Properties Affecting Rheology, Fluid Loss, Setting Time And Long Term Characteristics Of Elastic Cements .....</b>	419
<i>V. Kelessidis, M. Fraim, M. Fardis, E. Karakosta, N. Demokritos, G. Diamantopoulos, P. Arkoudeas, S. Elhardalo, L. Lagkaditi, G. Papavassiliou</i>	
<b>Comparison Of Empirical And Analytical Methods For Production Forecasting In Unconventional Reservoirs: Lessons From North America .....</b>	430
<i>R. Dutta, M. Meyet, C. Burns, F. Van Cauter</i>	
<b>Integrated Unconventional Gas Evaluation Workflow: From Anisotropic Geomechanical Modelling To Completion Design .....</b>	456
<i>V. De Gennaro, R. Amri, M. Brignoli, N. Kallel, E. Wielemaker, S. El Ayeb</i>	
<b>New Insights From Jurassic Shale Characterization: Strengthen Subsurface Data With Outcrop Analogues .....</b>	472
<i>M. Zijp, J. Veen, D. Ventra, R. Verreussel, L. Van Laerhoven, T. Boxem</i>	
<b>Mechanical Layering: Implications For Hydraulic Fracturing In An Unconventional Tight Carbonate Reservoir In Abu Dhabi, UAE .....</b>	480
<i>M. Sirat, X. Zhang, J. Simon, A. Vantala, M. Povstyanova</i>	
<b>Lower Paleozoic Basins Developed Above The East European Craton In Poland: New Insight From Regional High-Effort Seismic Reflection Data .....</b>	489
<i>P. Krzywiec, M. Malinowski, P. Lis, V. Buffenmyer, M. Lewandowski</i>	
<b>Investment Risks Inherent To Production Of Shale Gas In New Markets .....</b>	495
<i>R. Motta, J. Raulino</i>	
<b>Optimizing The Development Of Tight Oil Formations.....</b>	504
<i>A. Aladasani, S. Salehi, B. Bai, R. Nygaard</i>	

<b>Integrated Well Construction Approach For Exploratory Shale Gas Horizontals</b>	517
<i>A. Yadav, A. Quereshi, S. Khan</i>	
<b>Interpretation Of The Silurian Basin Of Central And Eastern Europe As A Pro-Foreland Flexural Basin: Implications For Shale Gas Exploration</b>	526
<i>G. Tari, P. Poprawa, P. Krzywiec, I. Popadyuk, C. Krezsek</i>	
<b>Use Of Drilling With Casing Technology To Provide Operational Efficiency In The Vienna Basin</b>	534
<i>W. Sackmaier, M. Tan, M. McGrath, C. Montoya</i>	
<b>Unconventional Reservoirs: Proper Planning And New Theories Meet Challenges Of Horizontal Cementing</b>	548
<i>C. Pavlock, J. Bratcher, L. Leotaud, B. Tennison</i>	
<b>Direct And Inverse Methods For Determining Gas Flow Properties Of Shale</b>	561
<i>P. Lorinczi, A. Burns, D. Lesnic, Q. Fisher, A. Crook, C. Grattoni, K. Rybalchenko</i>	
<b>Adaptation Of Successful Tight-Oil Stimulation Technique In Unconventional Resource Play In Western Siberia</b>	587
<i>Z. Kaluder, M. Nikolaev, I. Davidenko, F. Leskin, M. Martynov, A. Platunov, K. Chong, A. Prokhorov, A. Shnitko, E. Fedorenko</i>	
<b>Assessing Mechanical And Petrographic Properties Of Fine-Grained Formations From Samples Collected In Deep Oil Wells</b>	605
<i>F. Descamps, J. Tshibangu, N. Da Silva, S. Regnard</i>	

## Volume 2

<b>Understanding Shale Gas Production Mechanisms Through Reservoir Simulation</b>	615
<i>H. Sun, A. Chawathe, H. Hoteit, X. Shi, L. Li</i>	
<b>New Insights Into Shale Fracturing Treatment Design</b>	658
<i>A. Gomaa, Q. Qu, S. Nelson, R. Maharidge</i>	
<b>Successful Alternating Sequential Hydraulic Multifrac In Two Parallel Horizontal Wells In A Low-Permeability Turbidite Oil Reservoir</b>	673
<i>G. Gutierrez, G. Perazzo, E. Medina, J. Sierra, C. Henriquez, J. Salguero</i>	
<b>Unconventional Well Completion Generates Significant Production Increase In Lateral Wells In Chicantepec Formation</b>	686
<i>G. Gutierrez, E. Medina, G. Perazzo, J. Sierra, C. Henriquez, J. Salguero</i>	
<b>Stimulation Of Unconventional Naturally Fractured Reservoirs By Graded Proppant Injection: Experimental Study And Mathematical Model</b>	698
<i>A. Keshavarz, A. Badalyan, T. Carageorgos, R. Johnson, P. Bedrikovetsky</i>	
<b>Mathematical Model For Stimulation Of CBM Reservoirs During Graded Proppant Injection</b>	710
<i>A. Keshavarz, A. Khanna, T. Hughes, M. Boncioli, A. Cooper, P. Bedrikovetsky</i>	
<b>Rigless Operation To Restore Wellbore Integrity Using Synthetic-Based Resin Sealants</b>	723
<i>P. Jones, J. Karcher, A. Ruch, A. Beamer, P. Smit, S. Hines, M. Olson, D. Day</i>	
<b>Sweet Spots: What Are They, Where Are They, How Are They Created And Are They Important Anyway?</b>	732
<i>M. Giles, S. Tenant</i>	
<b>Fractured Reservoir Modeling: Effects Of Hydraulic Fracture Geometries In Tight Oil Reservoirs</b>	738
<i>M. Lin, S. Chen, Z. Chen, J. Xu</i>	
<b>Influence Of Effective Pressure On Mudstone Matrix Permeability: Implications For Shale Gas Production</b>	748
<i>R. McKerman, E. Rutter, J. Mecklenburgh, K. Taylor, S. Covey-Crump</i>	
<b>The Application Of Well Test Deconvolution To Wireline Formation Tester Pressure Buildup And Falloff Data To Improve Coalbed Methane Reservoir Characterization</b>	761
<i>M. Osman, N. Thwaites</i>	
<b>Automatic Processing Of Microseismic Data: Determination Of Hypocenter Position And Estimation Of Focal Mechanism</b>	769
<i>J. Vicek, T. Fischer, J. Vilhelm</i>	
<b>Integrated Assessment Of Pilot Performance Of Surface To In-Seam Wells To De-Risk And Quantify Subsurface Uncertainty For A Coalbed Methane Project: An Example From The Bowen Basin In Australia</b>	775
<i>C. Zhao, Z. Xia, K. Zheng, L. Duan, L. Liu, M. Zhang, Y. Yang, H. Lau, V. Sharma, X. Liu</i>	
<b>Wellbore Stability Estimation Model Of Horizontal Well In Cleat-Featured Coal Seam</b>	787
<i>C. Ai, C. Hu, Y. Zhang, L. Yu, Y. Li, F. Wang</i>	
<b>Probabilistic Assessment Of World Recoverable Shale Gas Resources</b>	796
<i>Z. Dong, S. Holditch, D. McVay, W. Ayers, W. Lee, E. Morales</i>	

<b>Design Optimization Of Horizontal Wells With Multiple Hydraulic Fractures In The Bakken Shale</b>	817
<i>L. Saputelli, C. Lopez, A. Chacon, M. Soliman</i>	
<b>Getting Back To Basics: Using Routing Drilling Mud Logging Data For Reservoir Characterization</b>	834
<i>S. Hayton, G. Tischler</i>	
<b>Case Study-Investigating Probable Root Causes Behind Consistent Higher Water Cut In A Mother CBM Well Than Its Deviated Wells: Well Spacing, Well Stimulation, And Overlying Strata Viewpoints And Recommendations</b>	842
<i>S. Chandra, F. Adil</i>	
<b>Benefits Of Novel Preformed Gel Fluid System In Proppant Placement For Unconventional Reservoirs</b>	888
<i>J. Zhou, H. Sun, Q. Qu, M. Guerin, L. Li</i>	
<b>Water-Based Environmentally Preferred Friction Reducer In Ultrahigh-TDS Produced Water For Slickwater Fracturing In Shale Reservoirs</b>	895
<i>J. Zhou, M. Baltazar, H. Sun, Q. Qu</i>	
<b>Unlocking The Resource Potential Of The Bowland Basin, NW England</b>	908
<i>H. Clarke, P. Turner, R. Bustin</i>	
<b>Estimation Of Stimulated Reservoir Volume Using The Concept Of Shale Capacity And Its Validation With Microseismic And Well Performance</b>	919
<i>A. Ouenes, A. Bachir, D. Boukhef</i>	
<b>Distribution Of Well Performances In Shale Reservoirs And Their Predictions Using The Concept Of Shale Capacity</b>	933
<i>A. Ouenes</i>	
<b>Integrated Thermal Gas Production From Methane Hydrate Formation</b>	948
<i>K. Sasaki, Y. Sugai, T. Yamakawa</i>	
<b>An Overview Of The Completion Challenges In A Tight-Gas Formation In Saudi Arabia</b>	957
<i>J. Leal, J. Duarte, S. Aramco, E. Soriano, A. Lopez, D. Falkhutdinov</i>	
<b>Microresistivity Image Driven Inversion Of Nuclear Logs For The Evaluation Of Unconventional Reservoirs</b>	967
<i>J. Whetton, P. Elkington</i>	
<b>How Much Does The Borehole Fluid Affect The Cement Impedance Measurement In Ultrasonic Scanner Tools?</b>	976
<i>L. Tello, D. Azuaje, E. Roberts</i>	
<b>A Review Of The Fundamentals Of Shale Gas Evaluations: The Dangers Of Effective Porosity And Clay Excess Conductivity Corrections</b>	985
<i>J. Glorioso, A. Rattia, R. Lolley</i>	
<b>Effect Of Salt Concentration On Base-Gel Viscosity Of Different Polymers Used In Stimulation Fluid Systems</b>	994
<i>P. Das, S. Konale, R. Kothamasu</i>	
<b>Impact Of Formation Softening And Rock Mechanical Properties On Selection Of Shale Stimulation Fluid: Laboratory Evaluation</b>	1003
<i>P. Das, M. Achalpurkar, O. Pal</i>	
<b>Liquid-Rich Shale Versus Conventional Depletion Performance</b>	1013
<i>G. Lei, N. Cheng, C. Whitson</i>	
<b>New Models For Reserve Estimation And Non-Darcy Gas Flow In Shale Gas Reservoirs</b>	1038
<i>B. Haghshenas, C. Clarkson, S. Chen</i>	
<b>New Before Closure Analysis Model For Unconventional Reservoirs</b>	1054
<i>C. Lamei, M. Soliman</i>	
<b>Is It Possible To Do Unlimited Multi-Stage Fracturing Economically?</b>	1070
<i>F. Yuan, E. Blanton, C. Palmer, C. Andersen, A. Grogan</i>	
<b>Application Of Integrated PTA And PDA Approach In A Tight Gas Reservoir In China</b>	1080
<i>T. Zhang, W. Pang, J. Du, J. Mao, Y. He, Q. Wu, X. Feng, P. Jiang, D. Di</i>	
<b>Reservoir Heterogeneity In Upper Carboniferous Tight Gas Sandstones: Lessons Learned From An Analog Study</b>	1086
<i>P. Wuestefeld, C. Hilgers, B. Koehler, M. Hoehne, P. Steindorf, K. Schurk, S. Becker, P. Bertier</i>	
<b>De-Risking Shale Plays And Assessing By-Passed Pay Potential In The Netherlands</b>	1096
<i>J. Lutgert, R. Greiss, C. Hughes</i>	
<b>A Conceptual Shale Gas Field Development Plan For The Lower Jurassic Posidonia Shale In The Netherlands</b>	1109
<i>R. Godderij, B. Brouwer, M. Harings, B. Scheffers, M. Broelsma, S. Bouw</i>	
<b>Water Dumping Improved Recovery For Bounded Thin Oil Reservoir Of East China Offshore</b>	1123
<i>G. Zhang, Y. Li, F. Xu, J. Jia</i>	

<b>Unlocking Future Heavy Oil Development In The North Sea: A Well Testing Success In The Kraken Field</b>	1133
<i>D. Beck, Y. Shumakov, G. Hetherington, V. Ovchinnikov</i>	
<b>An Optimal Approach To Shale Gas And Oil Exploration Beyond North America</b>	1151
<i>H. Madhoo, A. Acevedo, M. Koley, I. Bryant, R. Laver</i>	
<b>Welltest And Rate Transient Analysis For SRV Characterization In Shale Oil And Shale Gas Reservoirs: Field Examples From Eagle Ford Shale</b>	1163
<i>N. Bahrami, D. Pena, I. Lusted</i>	
<b>Modeling Multiple Hydraulic Fractures Interacting With Natural Fractures Using The Material Point Method</b>	1176
<i>Y. Aimene, J. Nairn</i>	
<b>Influence Factors Of Fracability In Nonmarine Shale</b>	1196
<i>C. Fang, M. Amro</i>	
<b>New Dynamic Rock Test System To Assist In Planning And Creating Multidirectional Fractures</b>	1203
<i>J. Surjaatmadja, D. Looper K. Coffman, D. Meadows</i>	
<b>Development Of An Optimized Completion Strategy In The Vaca Muerta Shale With An Anisotropic Geomechanical Model</b>	1218
<i>E. Ejofodomi, R. Varela, G. Cavazzoli, E. Velez, J. Peano</i>	
<b>Experimental Investigation Of Decalin And Metal Nanoparticles-Assisted Bitumen Upgrading During Catalytic Aquathermolysis</b>	1235
<i>L. Hendraningrat, Y. Souraki, O. Torsaeter</i>	
<b>Unconventional Gas Water Management: What Can Be Applied From Decades Of Experience With Conventional Oil Produced Water Management?</b>	1246
<i>R. Evans</i>	
<b>Author Index</b>	