

# **SPE Production and Operations Symposium 2013**

**Oklahoma City, Oklahoma, USA  
23-26 March 2013**

**ISBN: 978-1-62748-167-0**

**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© (2013) by the Society of Petroleum Engineers  
All rights reserved.

Printed by Curran Associates, Inc. (2013)

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

<b>A Review of Total Job Times for Repair and Maintenance Jobs for Well Servicing Activities in the Permian Basin</b> .....	1
<i>Lynn W. Conine, Phil Burke</i>	
<b>Interactions of a Sandstone Acid System with Clays</b> .....	7
<i>Lijun Zhou, H. A. Nasr-El-Din, G. A. Al-Muntashri</i>	
<b>Enhanced Plunger Lift Performance Utilizing Reservoir Modeling</b> .....	28
<i>E. Parsa, E. Ozkan, B. Lowery, D. Cathcart, M. Lohmann</i>	
<b>Natural Gas Reciprocating Compressor Optimization</b> .....	38
<i>Jean Mino</i>	
<b>The Flow Behavior of Friction Reducer in Microchannels during Slickwater Fracturing</b> .....	52
<i>Yongpeng Sun, Qihua Wu; Baojun Bai, Yinfa Ma</i>	
<b>Pipe Diameter Effect on Liquid Loading in Vertical Gas Wells</b> .....	66
<i>A. Skopich, E. Pereyra, C. Sarica, M. Kelkar</i>	
<b>Solutions for Difficult Reservoirs Direct NMR Fluid Type and Permeability</b> .....	78
<i>Charles H. Smith, Sandeep Ramakrishna, Layne Hamilton</i>	
<b>Production Analysis in Multifrac Horizontal Wells Including the Effects of Adsorption, Mixed Wettability and Dual Porosity</b> .....	88
<i>S. Kalakkadu, A. D. Klinsky Alba, J. G. Callard, D. Devegowda</i>	
<b>Reactions of Simple Organic Acids and Chelating Agents with Dolomite</b> .....	98
<i>O. O. Adenuga, M. A. Sayed, H. A. Nasr-El-Din</i>	
<b>Analytical Determination of Interwell Connectivity Based on Flow Rate Fluctuations in Waterflood Reservoirs</b> .....	113
<i>Anh V. Dinh, Djebbar Tiab</i>	
<b>Inferring Interwell Connectivity in a Reservoir from Bottomhole Pressure Fluctuations in Hydraulically Fractured Vertical Wells, Horizontal Wells, and Mixed Wellbore Conditions</b> .....	133
<i>Anh V. Dinh, Djebbar Tiab</i>	
<b>A Critical Literature Review of Laboratory and Field Scale Determination of Residual Oil Saturation</b> .....	156
<i>Tadesse Weldu Teklu, Jeffrey S. Brown, Hossein Kazemi, Ramona M. Graves, Ali M. Alsumaiti</i>	
<b>Efficient and Accurate Monitoring of Rod Pump Well Performance Using Real Time Data Processing and Visualization</b> .....	172
<i>J. N. McCoy, Dieter Becker, Kay Capps, A. L. Podio, O. L. Rowlan</i>	
<b>Comparative Study Between Guar and Carboxymethylcellulose Used as Gelling Systems in Hydraulic Fracturing Application</b> .....	183
<i>Siwar Trabelsi, Sarkis Kakadjian</i>	
<b>Acid Treatments in High Temperature Dolomitic Carbonate Reservoirs Using Emulsified Acids: A Coreflood Study</b> .....	203
<i>M. A. Sayed, H. A. Nasr-El-Din</i>	
<b>Modeling and Analysis of Salt Cavern Natural Gas Storage</b> .....	216
<i>P. Barajas, F. Civan</i>	
<b>Matrix Stimulation: An Effective One-Step Sandstone Acid System</b> .....	232
<i>Ahmed M. Gomaa, Jennifer Cutler, Qi Qu, Joel Boles, Xiaolan Wang</i>	
<b>An Offshore Field Development Plan to Optimize the Production System from the Reservoir to the Tank</b> .....	245
<i>A. Karimi Vajargah, M. Usman, R. Brito, H. Karami Mirazizi, R. Etehad Osgouei</i>	
<b>Friction Reducers as Water Management Aids in Hydraulic Fracturing</b> .....	259
<i>Harsha Kolla, Philip Watson, Aditya Patel, Ronald Robinson, Logan Jackson, Mohan Nair</i>	
<b>Single Trip Drilling System with an Integral Deflector Allows Reliable Curve Building in Challenging Formation</b> .....	263
<i>J. Hildebrand, S. Swadi, P. Desai, D. Ervin, P. Gregurek</i>	
<b>Measured Plunger Fall Velocity Used to Calibrate New Fall Velocity Model</b> .....	270
<i>O. L. Rowlan, J. McCoy, J. Lea, R. Nadkrynechny, C. Cepuch</i>	
<b>Examination of Treatment Connectivity between Granite Wash Layers Using Microseismic, Tracer, and Treatment Data</b> .....	286
<i>Elsbeth M. Crawford, Bob Tehan, Bob Launhardt</i>	
<b>Real-Time Data and Expert System Combine to Develop Artificial Lift Predictive Diagnostics</b> .....	303
<i>Thibault Blanckaert, Yves Marie Subervie</i>	

<b>Impacts of Reservoir Boundaries and Fractures dimensions on Pressure Behaviors and Flow Regimes of Hydraulically Fractured Formations.....</b>	<b>318</b>
<i>Salam Al Rbeawi, D. Tiab</i>	
<b>Partially Penetrating Hydraulic Fractures: Pressure Responses and Flow Dynamics .....</b>	<b>333</b>
<i>Salam Al Rbeawi, D. Tiab</i>	
<b>Rigorous Simulation of Production from Commingled Multilayer Reservoirs under Various Crossflow and Boundary Conditions .....</b>	<b>361</b>
<i>Bielenis Villanueva-Triana, Faruk Civan</i>	
<b>More Accurate Method to Estimate the Original Gas in Place and Recoverable Gas in Overpressure Gas Reservoir .....</b>	<b>382</b>
<i>Kegang Ling, Xingru Wu, He Zhang, Jun He</i>	
<b>Tactics and Pitfalls in Production Decline Curve Analysis .....</b>	<b>398</b>
<i>Kegang Ling, Xingru Wu, He Zhang, Jun He</i>	
<b>New Generation of “Green” Defoamers for Challenging Drilling and Cementing Applications .....</b>	<b>414</b>
<i>Luciana Bava, Amir Mahmoudkhani, Robert Wilson, Leanne Levy</i>	
<b>Proppant Crush Test: A New Approach.....</b>	<b>426</b>
<i>Herve Simo, Maysam Pournik, Carl. H. Sondergeld</i>	
<b>Evaluation of Near-Wellbore Formation Treatment by Gel Particles Using Dimensional Analysis .....</b>	<b>438</b>
<i>Adnan Al-Ibad, Faruk Civan</i>	
<b>Successful Application of Innovative Reaming and Completion Technology in Williston Basin Wells .....</b>	<b>467</b>
<i>G. Scott, L. M. Smith</i>	
<b>Optimization of Multiple Hydraulically Fractured Horizontal Wells in Unconventional Gas Reservoirs.....</b>	<b>476</b>
<i>Wei Yu, Kamy Sepehrmoori</i>	
<b>Evaluation and Performance of Packer-Type Downhole Gas Separators .....</b>	<b>492</b>
<i>J. N. McCoy, A. L. Podio, O. L. Rowlan, D. Becker</i>	
<b>Field and Lab Experience with a Successful Preformed Particle Gel Conformance Control Technology .....</b>	<b>506</b>
<i>Baojun Bai, Mingzhen Wei, Yuzhang Liu</i>	
<b>Tool for Troubleshooting Emulsion Problems in Producing Oilfields .....</b>	<b>523</b>
<i>Adekunle Opawale, Samuel Osisanya</i>	
<b>Cement Evaluation Challenges in Horizontal Wells - Guidelines for Providing Meaningful Data .....</b>	<b>544</b>
<i>Gary W. Batcheller</i>	
<b>An Evaluation of Well Deployment Aspects Affecting Well Flow Performance on Horizontal Production Log Results .....</b>	<b>559</b>
<i>Duncan Heddleston</i>	
<b>Formation Damage Caused by Pipe Dope and Its Remediation .....</b>	<b>568</b>
<i>Julie Mathis, Emiliano Actis Goretta, Martin Lopez Saubidet, Tomas Castiñeiras, Alejandro Funes, Fernando Figini, Xiuli Wang, Michael J. Economides</i>	
<b>An Experimental Study on Liquid Loading of Vertical and Deviated Gas Wells .....</b>	<b>581</b>
<i>G. Yuan, E. Pereyra, C. Sarica, Robert P. Sutton</i>	
<b>3-D Simulation of Carbonate Acidization with HCl: Comparison with Experiments .....</b>	<b>597</b>
<i>P. Maheshwari, V. Balakotaiah</i>	
<b>The Effect of Management Involvement on Vehicle Safety Improvement.....</b>	<b>614</b>
<i>Corey Catten, Casey Johnson</i>	
<b>Production and Injection Monitoring and Surveillance .....</b>	<b>623</b>
<i>O. Agudelo, M. Amaya, G. Nunez, Casabe Alliance, M. Volante, C. Escalona</i>	
<b>Application of Mass Balance and Transient Flow Modeling for Leak Detection in Liquid Pipelines .....</b>	<b>635</b>
<i>Karent V Balda Rivas, Faruk Civan</i>	
<b>Effect of Stress Anisotropy on Well Productivity in Unconventional Gas Reservoirs .....</b>	<b>649</b>
<i>Hassan Bahrami, Reza Rezaee, M. Mofazzal Hossain, M. Sadegh Asadi, Vida Minaein, Ahmad Jamili</i>	
<b>Author Index</b>	