

Society of Petroleum Engineers

SPE International Symposium on Oilfield Chemistry 2007

February 28 – March 2, 2007
Houston, Texas, USA

Printed from e-media with permission by:

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

ISBN: 978-1-60423-753-5

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

Copyright and Use Restrictions

Copyright 2007, 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 2007 SPE International Symposium on Oilfield Chemistry 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 International Symposium
on Oilfield Chemistry
2007

TABLE OF CONTENTS

Limiting Scale Risk at Production Wells by Management of PWRI Wells	1
<i>Eric J. Mackay, Heriot-Watt U.</i>	
Use of Silicate-Based Drilling Fluids To Mitigate Metal Corrosion	15
<i>M. McDonald, National Silicates, and K. Barr, S.R. Dubberley, SPE, and G. Wadsworth, Alliance Drilling Fluids</i>	
Salt Free: A Case History of a Chemical Application To Inhibit Salt Formation in a North African Field	19
<i>Steve Szymczak and Randy Perkins, BJ Chemical Services; Mark McBryde, Anadarko; and Mohamed El-Sedawy, BJ Services</i>	
Fracture Stimulation Utilizing a Viscoelastic-Surfactant-Based System in the Morrow Sands in Southeast New Mexico	27
<i>Vibhas J. Pandey and Tarik Itibrou, Schlumberger; Larry S. Adams, Chevron; and Tracy L. Cowan and Oscar A. Bustos, Schlumberger</i>	
Advanced Technology To Reduce Water Cut: Case Studies From the Pemex Southern Region	35
<i>Gustavo A. Farrera Romo, Héctor Hernández Leyva, Cinco Presidentes Asset Team, Pemex, and Raúl Bonifacio Aguilar, Carlos Caballero Campos, Larry Eoff, and Dwyann Dalrymple, Halliburton</i>	
Inhibition and Removal of Low-pH-Fluid-Induced Asphaltic Sludge Fouling of Formations in Oil and Gas Wells	41
<i>Kenneth M. Barker and Michael E. Newberry, Baker Petrolite</i>	
An Experimental Investigation of Interactions Between Supercritical CO₂, Asphaltic Crude Oil, and Reservoir Brine in Carbonate Cores	46
<i>Abdulrazag Y. Zekri, SPE, Shedid A. Shedid, SPE, and Reyadh A. Almehaideb, SPE, United Arab Emirates U.</i>	
A Case Study in the Removal of Deposited Wax From a Major Subsea Flowline System in the Gannet Field	55
<i>H.A. Craddock, K. Mutch, and K. Sowerby, Roemex Ltd., and S. McGregor, J. Cook, and C. Strachan, Shell U.K. Ltd.</i>	
The Application of Wax Dissolver in the Enhancement of Export Line Cleaning	61
<i>H.A. Craddock, E. Campbell, and K. Sowerby, Roemex Ltd.; M. Johnson, CNR Intl. Ltd.; and S. McGregor and G. McGee, Shell U.K. Ltd.</i>	
Well Modeling Incorporating Nonisothermal Effects and Asphaltene Precipitation	68
<i>W. Thanyamanta, T.E. Johansen, and K. Hawboldt, Memorial U. of Newfoundland</i>	
Water-Based Drilling Fluid for HP/HT Applications	83
<i>M.A. Tehrani and A. Popplestone, M-I Swaco, and A. Guarneri and S. Carminati, Eni E&P</i>	

Squeeze Chemical for HT Applications—Have We Discarded Promising Products by Performing Unrepresentative Thermal Aging Tests?	93
<i>Rex Wat, Lars-Even Hauge, Kåre Solbakken, Kjell Erik Wennberg, Linda Merete Sivertsen, and Berit Gjersvold, Statoil ASA</i>	
Thermochemical Process To Remove Sludge From Storage Tanks	105
<i>Nelson O. Rocha, Carlos N. Khalil, Lúcia C.F. Leite, and Andre M. Goja, Petrobras</i>	
One Year Experience With The Injection of Nitrate To Control Souring in Bonga Deepwater Development Offshore Nigeria	113
<i>Cor Kuijvenhoven, Shell Intl. E&P B.V., and Jean Christophe Noirot, Paul Hubbard, and Lukman Oduola, Shell Nigeria E&P Co.</i>	
Anionic Surfactant Gel Treatment Fluid	122
<i>Thomas D. Welton, Jason Bryant, and Gary P. Funkhouser, Halliburton</i>	
Formation Damages Caused by Emulsions During Drilling With Emulsified	130
<i>Ingebret Fjelde, IRIS</i>	
Conformance and Mobility Control: Foams vs. Polymers	138
<i>Guoyin Zhang and R.S. Seright, New Mexico Petroleum Recovery Research Center</i>	
A Study of Polyacrylamide-Based Gels Crosslinked With Polyethyleneimine	148
<i>G.A. Al-Muntasheri, Delft U. of Technology and Saudi Aramco; H.A. Nasr-El-Din and K.R. Al-Noaimi, Saudi Aramco; and P.L.J. Zitha, Delft U. of Technology</i>	
Oxidation as a Rheology Modifier and a Potential Cause of Explosions in Oil and Synthetic-Based Drilling Fluids	157
<i>K. Shahbazi, S.A. Mehta, R.G. Moore, M.G. Ursebach, and K.C.V. Fraassen, U. of Calgary</i>	
Application of Viscoelastic Surfactants as Mobility-Control Agents in Low-Tension Surfactant Floods	166
<i>Istvan Lakatos, Janos Toth, Tibor Bodi, and Julianna Lakatos-Szabo, U. of Miskolc, and Paul D. Berger and Christie Lee, Oil Chem Technologies</i>	
Designing Cement Slurries for Preventing Formation Fluid Influx After Placement	180
<i>Ashok Santra, B.R. Reddy, and Mfon Antia, Halliburton</i>	
Design of a Novel Composite Agent for Improving the Toughness of Oilwell Cement Sheath	191
<i>X. Yao and S.D. Hua, Nanjing U. of Technology, China</i>	
Sensitivity Study on the Main Factors Affecting a Polymeric RPM Treatment in the Near-Wellbore Region of a Mature Oil-Producing Well	198
<i>O. Vazquez, M. Singleton, and K.S. Sorbie, Heriot-Watt U., and R. Weare, Baker Petrolite</i>	
Nanoemulsions: A New Vehicle for Chemical Additive Delivery	212
<i>Lucilla Del Gaudio, Eni E&P; Rossella Bortolo, Eni R&M; and Thomas P. Lockhart, Eni E&P</i>	
Using Microgels To Shut Off Water in a Gas Storage Well	221
<i>A. Zaitoun, R. Tabary, and D. Rousseau, Inst. Français du Pétrole; T. Pichery and S. Nouyoux, Gaz de France; and P. Mallo and O. Braun, Seppic</i>	
Engineering Rhamnolipid Biosurfactants as Agents for Microbial Enhanced Oil Recovery	229
<i>Xiangdong Fang, Qinhong Wang, Baojun Bai, Xi Cai Liu, Yongchun Tang, Patrick J Shuler, and William A. Goddard III, California Inst. of Technology</i>	
Laboratory Evaluation of an Innovative System for Fracture Stimulation of High-Temperature Carbonate Reservoirs	238
<i>H.A. Nasr-El-Din and A. Al-Zahrani, Saudi Aramco, and J. Still, T. Lesko, and S. Kelkar, Schlumberger</i>	

Effect of Shear on Flow Properties During Placement and on Syneresis After Placement of a Polyacrylamide-Chromium Acetate Gelant	250
<i>Stan McCool, Xianping Li, and G. Paul Wilhite, U. of Kansas</i>	
Modeling the Impact of Capillary Pressure Reduction by Surfactants	266
<i>Rick Gdanski, Halliburton</i>	
Evaluation of a Renewable, Environmentally Benign Green Solvent for Wellbore and Formation Cleaning Applications	273
<i>Sandra L. Berry, Joel L. Boles, and Kay E. Cawiezel, BJ Services Co.</i>	
Experimental Investigation and Modeling of Naphthenate Soap Precipitation Kinetics in Petroleum Reservoirs	280
<i>S. Sarac and F. Civan, U. of Oklahoma</i>	
Biosurfactants Produced From Agriculture Process Waste Streams To Improve Oil Recovery in Fractured Carbonate Reservoirs	289
<i>S.J. Johnson, M. Salehi, K.E. Eisert, and J.-T. Liang, U. of Kansas, and G. Bala and S.L. Fox, Idaho National Laboratory</i>	
Effect of Temperature on Degradation of Polymer Drag Reduction and Heat Transfer in Non-Newtonian Fluid	295
<i>A.A. Hamouda and Omotayo.T. Moshood, U. of Stavanger, Norway</i>	
Remediation of Proppant Flowback—Laboratory and Field Studies	303
<i>Philip D. Nguyen, Jimmie D. Weaver, Richard D. Rickman, and Michael W. Sanders, Halliburton</i>	
Flexible Treatment Program for Controlling H₂S in FPSO Produced-Water Tanks	317
<i>E.D. Burger, EB Technologies; C.A. Andrade, Petrobras; and M. Rebelo and R. Ribeiro, Baker Petrolite</i>	
Zeta Potential Altering System for Increased Fluid Recovery, Production, and Fines Control	325
<i>Sarkis Kakadjian and Frank Zamora, Weatherford Intl. Inc., and Jim Venditto, Shell E&P Europe</i>	
Experimental Investigation of Emulsions Stability in GOSPs—Part I: Analyses of Separated Phases	335
<i>A.M. Al-Ghamdi, Saudi Aramco; C. Noik and C. Dalmazzone, IFP; and S. Kokal, Saudi Aramco</i>	
The Optimisation of a Scale Management and Monitoring Program for During the Production-Decline Phase of the Life Cycle	344
<i>Myles Jordan, Nalco; Ian Archibald, Chevron; Rod Farrell, Baker Petrolite; Clare Johnston, Nalco; and Alistair Strachan, Baker Petrolite</i>	
The Development of a Scale Management and Monitoring Program for a High-Temperature Oil Field During the Production-Decline Phase of the Life Cycle	361
<i>Myles Jordan, Nalco; Eyvind Sørhaug, Talisman; and Morag Elrick and David Marlow, Nalco</i>	
Advanced Nitrate-Based Technology for Sulfide Control and Improved Oil Recovery	378
<i>D.M. Dennis and D.O. Hitzman, The LATA Group Inc.</i>	
Kinetic Parameters for Dilute Epoxy Resins Measured by Nuclear Magnetic Resonance Spectroscopy	388
<i>Richard D. Rickman, J. Michael Wilson, and Jim D. Weaver, Halliburton</i>	
Accelerating Effect of Surfactants on Gas Hydrates Formation	394
<i>Marek Pakulski, BJ Chemical Services</i>	

Factors Determining the Reverse Osmosis Performance of Zeolite Membranes on Produced Water Purification	399
<i>Ning Liu, Jun Lu, Liangxiong Li, SPE, and Robert Lee, SPE, New Mexico Petroleum Recovery Research Center</i>	
Nitrate-Based Souring Mitigation of Produced Water—Side Effects and Challenges From the Draugen Produced-Water Reinjection Pilot	406
<i>E.A. Vik, A.O. Janbu, F. Garshol, L.B. Henninge, and S. Engebretsen, Aquateam A/S; C. Kuijvenhoven, Shell Intl. E&P; and D. Oliphant and W.P. Hendriks, A/S Norske Shell</i>	
A Study on Catalytic Aquathermolysis of Heavy Crude Oil During Steam Stimulation	417
<i>Shoubin Wen, Yujian Zhao, Yongjian Liu, and Shaobin Hu, Daqing Petroleum Inst.</i>	
Understanding Formic Acid Decomposition as a Corrosion Inhibitor Intensifier in Strong Acid Environments	422
<i>Juanita M. Cassidy, Halliburton; Robert I. McNeil, Shell E&P Technology Co.; and Chad E. Kiser, Halliburton</i>	
On-Site Freshwater Production for Offshore Facilities	431
<i>J.P. Osegovic, J.W. Hill, S.R. Tatro, and M.D. Max, MDS Research</i>	
Gas Drying Using a Pass-Through Hydrate Crystallizer	434
<i>S.R. Tatro, K.M. Sheps, L.A. Brazel, J.P. Osegovic, and M.D. Max, MDS Research</i>	
Effects of Polymers on the Structure and Deposition Behavior of Waxy Oils	439
<i>Jack F. Tinsley, Robert K. Prud'homme, Xuhong Guo, Douglas H. Adamson, Susan Shao, Devang Amin, Scott Callahan, Princeton U.; Heather D. Dettman, National Centre for Upgrading Technology; and Robert Kriegel and Rajesh Saini, Halliburton Energy Service</i>	
Effects of Flow Conditions and Surfactant Availability on Adsorption	450
<i>Reid B. Grigg and Alexander A. Mikhailin, New Mexico Petroleum Recovery Research Center</i>	
Design and Evaluation of an Elastomeric Sealant for Use in Primary Cementing	457
<i>J.S. Phipps, H.K.J. Ladva, B. Craster, J.-P. Caritey, and B. Dargaud, Schlumberger</i>	
Characterization of the Chemical Properties of Crude Oils To Explain Observed Asphaltene Inhibitor Specificity	464
<i>Michael Squicciarini and Andrew Yen, Baker Petrolite; Donald F. Smith, Ryan P. Rodgers, and Alan G. Marshall, Florida State U.; and Geoffrey C. Klein, Christopher Newport U.</i>	
Internal Breakers for Viscoelastic-Surfactant Fracturing Fluids	470
<i>James B. Crews and Tianping Huang, Baker Oil Tools</i>	
Fluid-Loss Control Improves Performance of Viscoelastic-Surfactant Fluids	478
<i>Tianping Huang, SPE, and James B. Crews, SPE, Baker Oil Tools</i>	
Use of Nitrate or Nitrite for the Management of the Sulfur Cycle in Oil and Gas Fields	485
<i>G. Voordouw, B. Buziak, S. Lin, A. Grigoryan, and Krista M. Kaster, U. of Calgary; G. E. Jenneman, ConocoPhillips Co.; and J.J. Arensdorf, Baker Petrolite Corp.</i>	
Sandstone Matrix Stimulation Can Improve Brownfield Oil Production When the Chemistry and Procedures Are Correct	492
<i>Yin-Chong Yong and Karim Saaikh, Brunei Shell Petroleum; Joao Queiros, Yan Song, and Surasak Srisa-ard, Well Services Brunei; and Keng Seng Chan and Mathew Samuel, Schlumberger MEA Technology HUB</i>	
Asphaltene Gravitational Gradient in a Deepwater Reservoir as Determined by Downhole Fluid Analysis	502
<i>Oliver C. Mullins and Soraya S. Betancourt, Schlumberger-Doll Research; Myrt E. Cribbs and Jefferson L. Creek, Chevron Energy Technology Corp.; and Francois X. Dubost, A. Ballard Andrews, and Lalitha Venkataramanan, Schlumberger-Doll Research</i>	

Oilfield Surfactants Improve Recovery by Imbibition	508
<i>W.W. Weiss and X. Xie, Correlations Co.</i>	
Use of Microbial DNA Probes as a Potential New Tool in Oil Exploration and Characterization	521
<i>Hans Kristian Kotlar, Statoil ASA, and Odd Gunnar Brakstad and Sidsel Markussen, SINTEF Applied Chemistry</i>	
Wax Control by Biocatalytic Degradation in High-Paraffinic Crude Oils	533
<i>Hans Kristian Kotlar, Statoil ASA; Alexander Wentzel, NTNU; Mimmi Throne-Holst, SINTEF; Sergey Zotchev, NTNU; and Trond Ellingensen, SINTEF</i>	
Enhanced Oil Recovery by COMB-Flow: Polymer Floods Revitalized	540
<i>Hans Kristian Kotlar, and Olav Selle, Statoil ASA, and Ole Torsaeter, NTNU</i>	
Modelling of Nonaqueous and Aqueous Scale-Inhibitor Squeeze Treatments.....	546
<i>O. Vazquez, E.J. Mackay, and K.S. Sorbie, Heriot-Watt U.</i>	
Development and Field Application of a New Hydrogen Sulfide Scavenger for Acidizing Sour-Water Injectors.....	556
<i>H.A. Nasr-El-Din and M. Zabih, Saudi Aramco, and S.K. Kelkar and M. Samuel, Schlumberger</i>	
A Study of Acid Cement Reactions Using the Rotating Disk Apparatus	566
<i>H.A. Nasr-El-Din, A. Al-Yami, and A. Al-Aamri, Saudi Aramco, and Y. El-Marsafawi, Schlumberger</i>	
Chemical Diversion Techniques Used for Carbonate Matrix Acidizing: An Overview and Case Histories	574
<i>Frank F. Chang and Xiangdong Qiu, Schlumberger, and Hisham A. Nasr-El-Din, Saudi Aramco</i>	
Evaluating Chemical-Injection Packages for Downhole Continual Injection in High-Rate HP/HT Gas Production Systems	580
<i>Britt Marie Hustad and Rex Wat, Statoil ASA, and Ian Littlehales and Gordon M. Graham, Scaled Solutions Ltd.</i>	
¹⁹F NMR Study of Ovalbumin Diffusion in Guar Filter Cake.....	590
<i>Lin Fu, Brian Pethica, Robert Prud'homme, and Carlos Pacheco, Princeton U.</i>	
The Importance of Fluid Chemistry in High-Temperature Hydraulic Fracture Stimulation.....	595
<i>Bob Shelley and Phillip C. Harris, Halliburton</i>	
Advances in Microbial Ecology Relevant to the Application of Nitrate To Control Reservoir Souring	603
<i>S. Maxwell, Commercial Microbiology Ltd.</i>	
Advances in Inhibitive Water-Based Drilling Fluids—Can They Replace Oil-Based Muds?	614
<i>Arvind Patel, Emanuel Stamatakis, Steve Young, and Jim Friedheim, M-I Swaco</i>	
Assessment of Barite Scaling Potentials, Sulfate Removal Options, and Chemical Treating Strategies for the Tombua-Landana Development	622
<i>Huey J. Chen and Charlie J. Hinrichsen, Chevron ETC; Christopher A. Burnside, Chevron CIEP; and Mark Widener, Chevron ETC</i>	
Alteration of Sand Wettability by Corrosion Inhibitors and Its Effect on Formation of Sand Deposits.....	635
<i>E. Gulbrandsen and A. Pedersen, Institute for Energy Technology</i>	
Maximising Chemical Placement in Complex Wells	641
<i>Robert Stalker, Kristen Butler, Gordon Michael Graham, and Fazrie Wahid, Scaled Solutions Ltd.</i>	

**Understanding the Factors Influencing the Formation and Control of Calcium
Naphthenate Solids and Stabilised Emulsions Using a Novel Laboratory Flow Rig.....** 649
Helen Williams, Sarah Dyer, and Gordon Graham, Scaled Solutions Ltd.

**Biodegradable Surfactants Aid the Development of Environmentally Acceptable
Drilling-Fluid Additives.....** 657
Jeffrey Miller, Halliburton

Author Index