

# **SPE/IADC International Drilling Conference and Exhibition 2023**

**Stravanger, Norway, USA  
7 - 9 March 2023**

**Volume 1 of 3**

**ISBN: 978-1-7138-7113-2**

**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© (2023) by Society of Petroleum Engineers  
All rights reserved.

Printed with permission by Curran Associates, Inc. (2023)

For permission requests, please contact 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: 845-758-2633  
Email: [curran@proceedings.com](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

# TABLE OF CONTENTS

## VOLUME 1

### DRILLING MECHANICS I - TORSIONAL DYNAMICS

Mitigation of Drilling Dysfunction: Data Analysis and Physical Modelling Shine a New Light on HFTO.....	1
<i>Ashley Johnson, Muhammad Sarfraz Balka, Sameer Bhoite, Paul Crerar, Aaron Simon, John Quinones</i>	
Testing and Characterization of High-Frequency Torsional Oscillations in a Research Lab to Develop New HFTO Suppressing Solutions .....	16
<i>Everhard Eli, Kueck Armin, Huang Xu, Lam Sui-Long, Heinisch Dennis, Reckmann Hanno, Bomidi John</i>	
Experimental Verification of Vibration Mitigation Through a Viscous Damping System Along the Drill String.....	40
<i>Andrew Holsaeter, Adrian Amrus, Eric Cayeux, Rodica Mihai, Sonja Moi</i>	
2nd Mode Shape Torsional Vibration - Observation, Identification, Mitigation .....	60
<i>Sahet Keshiyev, Tarje Naterstad, Ross Murray</i>	

### DOWNHOLE TOOLS I

4D Radar Imaging of Wellbore Geometry While Drilling.....	85
<i>Lars Øy, Inge Bye, Magne Lauritzen, Mike Herbert, Kamil Grunwald, Anne Mette Rød, Danny Kane</i>	
Detailed Dynamics Modeling Helps to Assess the Effect of Stabilizer Design on Drill String Vibrations .....	100
<i>Khac-Long Nguyen, Mohamed Mahjoub, Ngoc-Ha Dao, Stéphane Menand</i>	
Stringer Detection and Drilling System Significantly Reduces the Invisible Lost Time (ILT) Caused by Reaming.....	114
<i>Andreas Hohl, Glen Houghton, Danial MacFarlane</i>	

### INNOVATIVE USE OF LOGGING DATA AND ITS ENVIRONMENTAL IMPACT

Time-Lapse Evaluation from Ultrasonic Pulse-Echo and Pitch-Catch Configuration and Sonic Logging Data for Potential Formation Creep and General Annulus Solids Segregation.....	129
<i>Guillermo Andres Obando Palacio, Amit Govil, Gaurav Agrawal, Shilpi Gupta, Laurent Delabroy, Tron Golder Kristiansen</i>	
Annuli Material Pseudo-Density Estimation from Standard Integrity Logging Data.....	169
<i>Ioan - Alexandru Merciu</i>	

## **DRILLING MECHANICS II**

A Control-Oriented Lumped Parameter Drillstring Dynamic Model for Real-Time Vibration Mitigation and Drilling Optimization .....	186
<i>Yifan Zhang, Pradeepkumar Ashok, Dongmei Chen, Eric van Oort</i>	
Modeling of Axial Rotary Drilling Dynamics as a Step Towards Drilling Automation .....	202
<i>Zackary Whitlow, Mohamed Mahjoub, Sonny Auld</i>	
Qualifying Bit Influence on High-Frequency Torsional Oscillations Based on Full-Scale Laboratory Experiments.....	212
<i>Kueck Armin, Everhard Eliah, Huang Xu, Valbuena Franklin, Reckmann Hanno, Bomidi John</i>	

## **DOWNHOLE TOOLS II**

Rotary Steerable Drilling Dynamics and Associated BHA Changes to Improve Overall BHA Performance and Reliability .....	232
<i>Steve Jones, Junichi Sugiura, D. Wayne Johnson</i>	
Performance Analysis of a Downhole Regulator on Rate-Of-Penetration and Drilling Efficiency: An Autonomous Load Management at Bit .....	247
<i>Arviandy G. Aribowo, Ulf Jakob F. Aarsnes, Emmanuel Detournay, Nathan Van de Wouw, Nils Reimers</i>	
Mud Motor Digital Maintenance with an Industry-Unique PHM Solution.....	264
<i>Dmitry Belov, Sergio Rocchio, Zhengxin Zhang, Wei Chen, Samba Ba, Eimund Liland, Anton Kolyshkin, Yuelin Shen, Josh Scribbins, Henry Massie, Kent Phillips</i>	

## **MANAGED PRESSURE OPERATIONS - EXPERIMENTAL AND CASE STUDIES**

Gas Bullheading Study in an Instrumented Well .....	282
<i>Ganesh Arunkumar Samdani, Sai Sashankh Rao, Yashwant Moganaradjou, Mauricio A. Almeida, Mahendra K. Kunju, Otto Santos, Vishwas Paul Gupta</i>	
Design and Calculation of Process Parameters in Bullheading and Pressurized Mud Cap Drilling.....	301
<i>Yixin Liu, Eric R. Upchurch, Evren M. Ozbayoglu, Silvio Baldino, Junzhe Wang, Danzhu Zheng</i>	
Successful Deployment of Managed Pressure Cementing (MPC) System Across a Challenging Narrow Pressure Window Condition for a Critical Liner Cement Job: A Case Study From Saudi Arabia .....	317
<i>Wajid Ali, Ahmad Atef Hashmi, Faisal Abdullah Al-Turki, Athman Abbas</i>	
Gas Migration Model for Non-Newtonian Fluids Under Shut-In Well Conditions.....	334
<i>Yixin Liu, Eric R. Upchurch, Evren M. Ozbayoglu, Silvio Baldino, Danzhu Zheng, Junzhe Wang</i>	
Casing Design Implications of Managed Pressure Drilling and Cementing, and How to Consider Them in the Design of the Well and Operations .....	356
<i>Oscar R Gabaldon, P V Suryanarayana, Romar A Gonzalez Luis, Pedro Cavalcanti de Sousa</i>	

## **DRILLING SYSTEMS AUTOMATION**

Field Testing of an Automated 3D Cuttings and Cavings Measurement Sensor .....	364
<i>Sebastian Prez, Santiago Callero, Abraham Montes, Çinar Turhan, Pradeepkumar Ashok, Eric van Oort, Roger Pruitt, Taylor Thetford, Trey Peroyea, Michael Behounek</i>	
Drilling Systems Automation: Fault Detection, Isolation and Recovery Functions for Situational Awareness.....	377
<i>Eric Cayeux, John Macpherson, Moray Laing, Dimitrios Pirovolou, Fred Florence</i>	
Autonomous Directional Drilling Simulator Development for the Drillbotics 2021-2022 Virtual Competition.....	403
<i>Miguel Fernandez Berrocal, Alina Shashel, Muhammad Usama, Md Akber Hossain, Emre Baris Gocmen, Ali Tahir, Dan Sui, Fred Florence</i>	
Case Study of the World's First Offshore Implementation of a Drilling Automation Platform with Multiple Closed-Loop Applications .....	429
<i>Nahum Ronquillo, Kjartan Birgisson, Morten Ørevik, M Syahmi M Zurhan, M Syazwan A Murad, Khairul Amir Khazali-Rosli, M Ridzuan Abd Mokhtie, Jasrudin Jamal, Jason Bailey, Doug McEwan, Damien Ng</i>	
Drilling Parameter Optimization in Real-Time .....	441
<i>Anwesha Mal, Sven Inge Oedegaard, Stig Helgeland, Josef Navabi, Jan Ole Skogestad, Knut Steinar Bjoekvoll, Morten Lien, Tore Weltzin, Bjørn Rudshaug</i>	
Transient Modeling of Tripping Operations Enables Closed-Loop Limit Control of Tripping Processes to Reduce ILT While Maintaining Wellbore Safety .....	464
<i>Pedro Arevalo, Gerald Becker, Roland May, Matthew Forshaw, Sergiy Grymalyuk, Glen Houghton, Morten Lien, Sigve Hovda, Kim Evensen, Randi Reber</i>	

## **COMPLETIONS AND WELL INTERVENTION**

Safe, Robust and Efficient Through Tubing Abandonment.....	479
<i>Egbert Van Riet, Alex Lucas, Roel Roijmans, Wout Keultjes, Alistair Agnew, Mohamed Oukil Benmesbah, Simon Houghton-Evans, Caroline Evans-Guthrie, Robert Jan Potze, Jim Keenan, Meng Meng</i>	
Development of Guidepost Based Wellhead Load Relief System (GP-WLR).....	511
<i>Geir Gundersen Fuhr, Jone Stangeland, Lorents Reinås, Bjørn Birger Oppedal, Morten Sæther</i>	
Gas Tight Mechanical Casing Anulus Packer Enables Compliance with Well Design and Barrier Requirements for Re-Entry Multilateral Application in 20+ Year Old Well on Norwegian Continental Shelf.....	539
<i>Brett Hrabovsky, Ulrich Koberg, Keino Roxman, Jan Ove Fagna</i>	
System Integration Test (SIT) of Technology Enabling Through-Tubing Rig-Less Plug and Abandonment .....	546
<i>Johan Kverneland, Pierre-Marie Drevillon, Daniel Tomczak, Dave Gardner</i>	
Evaluation of Stress Distribution in Subsea Wellheads Installed in Caisson.....	565
<i>Lucas Cantinelli Sevillano, Sigmundur Sangesland, Tor Berge Gjersvik, Audun Faanes</i>	
A Short Summary of Retrofit Multilateral Technology Implementation .....	579
<i>Frode Berge, Marcus Fathi, Anne Mette Rød, Tomas Fjelde</i>	

## **DRILLING FLUID INNOVATIONS**

Investigation of Lightweight Drilling Fluids for Stability, Properties, and Performance at Downhole Conditions Through a Novel Pilot Facility.....	586
<i>Swanand Bhagwat, Angel Wileman, Luis Gutierrez, Sai Rao, V. Paul Gupta</i>	

## **VOLUME 2**

RecoRd-Breaking Reservoir Drilling and Openhole Gravel Packing With Cesium Formate Fluids in a High-Pressure, Marginal Mud Window Environment at Martin Linge .....	613
<i>Simen Jøsang Nilsen, Hanne Undheim Obrestad, Håvard Kaarigstad, Nadia Mansurova, Tom Are Solvoll, Johan Løchen, Siv Howard, Ben Abrahams, Christian Busengdal</i>	
Low Friction Drilling Fluid Additive Technology.....	631
<i>Nelson Akaighe, Sabine Zeilinger, Joshua Cutler, Dhaval Bhandari, Jeffrey Bunquin, Nidheesh Bharadwaj</i>	
Full-Scale Solids Control Testing of a Light Density Hollow Glass Beads Drilling Fluid.....	640
<i>Nikolay Kostov, Glenn Penny, James White, Nissan Shoykhet, Sabine Zeilinger, V. Paul Gupta</i>	
Real-Time Anomaly Detection Methodology for Drilling Fluids Properties .....	667
<i>Moacyr Nogueira Borges Filho, Thalles Pereira Mello, Cláudia Miriam Scheid, Luís Américo Calçada, Alex Tadeu Waldman, Gleber Teixeira, André Leibsohn Martins</i>	

## **DIGITAL TRANSFORMATION**

Automated Offsets for Drill Bit Performance Evaluation, Analysis, and Monitoring At-Scale .....	683
<i>Gregory Skoff, Dave Fink, Andrew Poor, Ole Gjertsen, Preston Wolfram, Roberta Santana, Robert Ford</i>	

## **KNOWLEDGE SHARING EPOSTER PRESENTATIONS - STATION 1**

Intelligent Tracers for Fluid Invasion Tracking During Coring Operations .....	693
<i>Abdulaziz Al-Qasim, Atul Godbole, Deena Tayyib, Marie Wurtz, Sven Hartvig</i>	

## **KNOWLEDGE SHARING EPOSTER PRESENTATIONS - STATION 2**

New Approaches to Improve Rheological Characterization of KCl/Polymer Muds .....	708
<i>ismail Hakki Gucuyener, Samet Yanik, Onur Kazim Gürçay, Ahmet Ay</i>	

## **KNOWLEDGE SHARING EPOSTER PRESENTATIONS - STATION 3**

Proven Well Stabilization Technology for Trouble-Free Drilling and Cost Savings in Pressurized Permeable Formations .....	728
<i>Genaro Quiroz Broca, Guillermo Gomez, Octavio Blanco, Reinaldo Maldonado, Jené Rockwood</i>	

## **DRILLING MECHANICS III – NEXT STEPS TOWARDS PRACTICAL, EFFECTIVE AND SUSTAINABLE SOLUTIONS**

Drilling Dysfunction Demystified Using In-Bit Strain Sensors .....	738
<i>Ysabel Witt-Doerring, Paul Pastusek, Aaron Lacey, Pablo Barajas, Michael Bergeron, David Clayton, Steven Sowers</i>	
Facts, Fallacies and Pitfalls of Using Mechanical Specific Energy (MSE) – Part 1.....	762
<i>Robello Samuel, Graham Mensa-Wilmot</i>	
Fluid Circulation Effects on Torque and Drag Results, a New Take on an Old Subject.....	773
<i>Mohamed Mahjoub, Ngoc-Ha Dao, Matthew Summersgill, Stéphane Menand</i>	
Real-Time Digital Log Generation from Drilling Parameters of Offset Wells Using Physics Informed Machine Learning.....	788
<i>Prasham Sheth, Sai Shravani Sistla, Indranil Roychoudhury, Mengdi Gao, Crispin Chatar, Jose Celya, Priya Mishra</i>	
Drill-Off Tests for Drilling Optimization: Pitfalls and How to Avoid Them .....	805
<i>Khim Chhantyal, Åge Kyllingstad, Anders T. Hetland, Kjartan Thor Birgisson</i>	

## **EXTENDED REACH DRILLING**

Rock Mechanics Analysis of Observed Borehole Instabilities in an Ekofisk Field Extended-Reach Well .....	818
<i>Jairo Alexander Diaz Lopez, Edvard Omdal, James S. Rutherford, Hans Joakim Skadsem</i>	
Successful Field Implementation of an Integrity-Focused Digital Monitoring System for Tubular Running in a Challenging Thermal ERD Application .....	834
<i>Spencer Taubner, Marius Bordieanu, Dan Dall'Acqua</i>	
A Water-Base Drilling Fluid for Controlling Deep-Reservoir Extreme Conditions in an Abu Dhabi Gas Shale Play.....	852
<i>Gabe Manescu, Balazs Veer</i>	

## **PEOPLE AND PROCESSES**

Introducing Automated Advisory and Control Applications to a North Sea Jack-Up, Technology, Human-Centric Challenges and Resulting Performance Improvements at Scale .....	866
<i>Matthew Forshaw, Sigve Hovda, John Macpherson</i>	
Digital Transformation of the Rig Management System: A Systematic Approach to the Application of Software to Offshore Rigs.....	878
<i>Gabriella Thomas, Åsmund Hjulstad, Erlend Wersland, Sigmund Birkeland, André Ivarjord Røsbak, Son Minh Tran, Morten Lien, Jo Svenningsson Nordstrand, Joseph Oghenezino Ojero, Felix Odebrett</i>	

## **CASE STUDIES - DRILLING OPERATIONS**

Gas Migration in PMCD Operations: Instrumented Well Study Provides Fundamental Insights .....	887
<i>Ganesh Arunkumar Samdani, Sai Sashankh Rao, Yashwant Moganaradjou, Mauricio A. Almeida, Mahendra K. Kunju, Eric Upchurch, Vishwas Paul Gupta</i>	

Learnings from Successful Drilling in Heavily Depleted HPHT Reservoir with Up to 460 Bar Depletion .....	906
<i>Trond Heggheim, Jamie Andrews</i>	
Improving the Accuracy of a Kick-detection System by Reducing Effects of Rig Operational Practices .....	923
<i>Deep R. Joshi, Sai Sharan Yalamarty, Curtis A. Cheatham, Mohammadreza Kamyab, Kelly Winklmann, Trish Ross, Patrick McCormack</i>	
Becoming an HPHT World Class Project, the Valemon experience 2012-2017.....	935
<i>Steven Leonardus Paulus, Hendry Shen, Hany Ahmed Beeh</i>	

## **REAL TIME SIGNAL INTERPRETATION**

A General Framework to Describe Drilling Process States .....	959
<i>Eric Cayeux, John Macpherson, Dimitrios Pirovolou, Moray Laing, Fred Florence</i>	
Interoperability of Real-Time Drilling Signals at the Rig Site: An Example Based on Mechanical Specific Energy .....	987
<i>Eric Cayeux, Benoît Daireaux, John Macpherson, Fred Florence, Espen Solbu</i>	
Towards the Correct Interpretation of Real-Time Signals on the Well-Site .....	1026
<i>Benoit Daireaux, Hans-Uwe Brackel, Robert Ewald, Petter Markussen, Maria Johansen, Mahdi Parak, Ghanshyam Yadav, Anar Ismayilov</i>	
Automatic Determination of Drill-string Geometry for Numerical Drilling Models .....	1044
<i>Benoît Daireaux, Liv Carlsen, Erik Dyvergsnes, Maria Johansen, Mohsen Balov</i>	
Cloud-Based Real-Time Well Engineering: Coupling Torque-And-Drag and Uncertainty Modeling .....	1058
<i>Yuandao Chi, Vanessa Kemajou, Anil Rajan, Robello Samuel</i>	
Field Deployment of a LSTM Neural Network Tool for the Rock Formation Consolidation Inference of Brazilian Sandstone Reservoirs.....	1070
<i>Fabio Rodrigues Gonçalves da Silva, Victor Hugo Ribeiro Carriço, Alexandre Zacarias Ignácio Pereira, André Leibsohn Martins</i>	

## **TUBULARS**

Damping Identification from Subsea Logger Axial Riser Response Data.....	1080
<i>HyeongUk "Harry" Lim, Scot McNeill, Daniel Kluk, Matthew Stahl, Konstantin Puskarskij, Kristian Hansen</i>	
Designing and Qualifying Equipment for a Potential World-Record Deepwater Casing Landing Operation.....	1096
<i>Thomas Chase, Aaron Garcia, Kellon Marchman, Manuel Mendoza, Chris von Eberstein, Jacob Tritz, Noah Tritz, Chris Jordan, Logan Smith</i>	
Engineers' Trilemma: Use and Limitation of Torque and Drag Models.....	1108
<i>Robello Samuel</i>	

## **DRILLING MECHANICS IV - APPLIED DATA ANALYSIS FOR DRILLING DYNAMICS**

Deployment of a Hybrid Machine Learning and Physics Based Drilling Advisory System at the Rig Site for ROP Optimization.....	1118
<i>Michael Behounek, Kirt McKenna, Taylor Thetford, Trey Peroyea, Michael Roberts, Julie Pearce, Gary Hickin, Pradeepkumar Ashok, Michael Yi, Dawson Ramos</i>	
Applying a Downhole Drilling Mechanics Tool to Improve Operational Procedures and Rig Operating Systems in Horizontal Wells.....	1132
<i>Isaac S Fonseca, Matthew Isbell, Austin Groover</i>	
Field Test Results for Real-time ROP Optimization Using Machine Learning and Downhole Vibration Monitoring - A Case Study .....	1154
<i>Ryan Robertson, Aidan Deans, Kriti Singh, Daniel Braga, Mohammedreza Kamyab, Curtis Cheatham, Tatiana Borges</i>	
Drill String Failure Prediction Methodology Using Data Analytics for Real Time Well Engineering .....	1169
<i>Bharat Thakur, Vishruth Chokshi, Kushan Patel, Robello Samuel</i>	

## **RIG OPERATIONS AND EQUIPMENT**

Improved Drilling Line Fatigue Model Reveals a Need for Revising Slip and Cut Procedures .....	1178
<i>Åge Kyllingstad, Rolf Hørsdal, Ivan Rajic</i>	
Flywheel and Battery Solution Working Together to Lower Drilling Rig Emissions by Taking Generator Sets Offline.....	1199
<i>Borsholm Thomas, Verhoef Richard</i>	
Improving Performance – Electrification of Well Control Equipment .....	1213
<i>Samantha Beim, Matthew Givens, Bruce Boulanger, Matthew Olson</i>	

## **VOLUME 3**

Pressure On-Demand - Hybrid Electric BOP Control Systems.....	1223
<i>Matthew Givens, Matthew Olson, Joseph Hope, Samantha Beim</i>	
Validation of CO <sub>2</sub> Emission Reductions from Advanced Vessel Management Solutions by Leveraging the Big Data from Offshore Drilling Operations .....	1231
<i>Massimiliano Russo, Krishna Kumar Nagalingam, Rune Haakonsen, Rune Loftager, Konstantin Puskarskij</i>	

## **DIGITAL TRANSFORMATION**

Field Validation of Scalable Condition-Based Maintenance (CBM) of Mud Pumps .....	1254
<i>Dongyoung Yoon, Pradeepkumar Ashok, Eric van Oort, Pradeep Annaiyappa, Shungo Abe</i>	
Automatic Drill Bit Dull Grading Report Generation to Address the Revised IADC Dull Grading Schema .....	1280
<i>Jian Chu, Pradeepkumar Ashok, Dongmei Chen, Eric van Oort</i>	

Automatic Classification of PDC Cutter Damage Using a Single Deep Learning Neural Network Model .....	1296
<i>Abdulbaset Ali, Harnoor Singh, Daniel Kelly, Donald Hender, Alan Clarke, Mohammad Mahdi Ghiasi, Ronald Haynes, Lesley James</i>	

## **KNOWLEDGE SHARING EPOSTER PRESENTATIONS - STATION 1**

Problems to Solve to Achieve Cost Efficient CO <sub>2</sub> Injection Wells .....	1316
<i>Henrik Manum, Line Kristin Borgerud, Ragnar Stokke</i>	

## **KNOWLEDGE SHARING EPOSTER PRESENTATIONS - STATION 2**

Environmentally Compliant Flexible Cement System Achieves Customer Zonal Isolation Objectives: A Case History from the Norwegian Continental Shelf.....	1322
<i>Talgat Akhmetov, Jose Barreiro, Carl Johnson, John Knowles</i>	

## **EYES ON THE PRIZE**

Scenario Based Training in Drilling Rig Simulator Improves Drillers Core Competency .....	1335
<i>Malini Manocha, Somesh Soni, Michale Beck, Xavier Ramirez</i>	
Cuttings Return Analysis by Visual Imaging: Novel Technology to Support Drilling Automation .....	1351
<i>Caroline D Grossi, Yuri H Hummels, Luiz Augusto da Cruz Meleiros, Claudia Miriam Scheid, Luís Américo Calçada, Alex Tadeu Almeida Waldmann, Carlos De Sa, André Leibsohn Martins</i>	
Extended Reality and Gamification for Drilling.....	1362
<i>Crispin Chatar, Rajat Lokesh, Vineet Kamboj, Danny Saetern</i>	

## **GEOTHERMAL**

Building a System to Solve the Challenges of Drilling Hot Hard Rock for Geothermal and Oil and Gas.....	1379
<i>Anthony Pink, Adam Patterson, Karl Erik Thoresen</i>	
Strategies for Prevention of Downhole Tool Failure Caused by High Bottomhole Temperature in Geothermal and HPHT Oil and Gas Wells .....	1393
<i>Mohamed Shafik Khaled, Ningyu Wang, Pradeepkumar Ashok, Dongmei Chen, Eric van Oort</i>	
Geothermal Drilling – Collaborative and Holistic Applications Specific Solutions Drive Consistent Improvements in Drilling Efficiency and Operational Costs.....	1417
<i>Graham Mensa-Wilmot, Rufino Cotanda, Dexter Pazziuagan</i>	

## **MACHINE LEARNING ENABLED PROCESSES**

While-Drilling Pore Pressure Surveillance Using Machine Learning .....	1447
<i>Rahul Raman, Benjamin Spivey, Richard Fink, Stephen Karner</i>	
Improve Well Integrity Using an Annular Barrier AI tool .....	1460
<i>Eirik Time, Eirik Berg, Siddharth Mishra</i>	

Apples to Apples: Impartial Assessment of Drilling Technologies through Big Data and Machine Learning .....	1472
<i>Daria Khvostichenko, Greg Skoff, Yezid Arevalo, Sergey Makarychev-Mikhailov</i>	
Machine Learning-Based Drilling System Recommender: Towards Optimal BHA and Fluid Technology Selection .....	1488
<i>Gregory Skoff, Fatma Mahfoudh, Cheolkyun Jeong, Sergey Makarychev-Mikhailov, Oleh Petryshak, Velizar Vesselinov, Crispin Chatar, Vijay Bondale, Manju Devadas</i>	
Automated Detection of Rig Events from Real-Time Surface Data Using Spectral Analysis and Machine Learning.....	1504
<i>Timothy S. Robinson, Olav Revheim</i>	

## **DIRECTIONAL DRILLING**

New One BHA Solution for High Dogleg Severity Curve and Lateral Drilling .....	1514
<i>Anan Noel, David Mendoza, Denis Li, Freddy Perez, Greg Andreasen, Kien Hoe Tang, Oscar Buitrago, Ryan Sardjono, Sola Oluwadare</i>	
How a Bayesian Approach Can Overcome Noisy Data and Interpretation Ambiguity in Automated Geosteering.....	1522
<i>Alexander Mitkus, Timothy Gee, Tannor Ziehm, Andrew Paré, Kenneth McCarthy, Paul Reynerson, Marc Willerth</i>	
Combining Best-in-Class Surveying Measurements to Provide the Most Accurate Wellbore Position .....	1533
<i>Mahmoud ElGizawy, Ross Lowdon, Darren Aklestad, Paul Strain, Fraser Boyce</i>	
A Field-Proven Approach to Decreasing Survey Times During Connections While Drilling .....	1542
<i>Markus Hempel, Nils Helle, Ibrahim Asghar Shah, Martin Fuhrwerk, Anh Vu Quach</i>	

## **CLOSED LOOP DIRECTIONAL DRILLING**

Real-Time Directional Guidance Through Cloud-Based Well Path Optimization .....	1553
<i>Deep R. Joshi, Mohammadreza Kamyab, Daniel Cardoso Braga, Curtis Alan Cheatham</i>	
Downhole Trajectory Automation of RSS Tools: Autonomous Drilling Becomes Reality .....	1564
<i>Maja Ignova, Katharine Mantle, Katerina Brovko, Vincent Abe, Andrey Gorodnov, Ling Li</i>	

## **HOW MODERN DATA COLLECTION IS INFLUENCING DRILL BITS**

IADC Dull Code Upgrade: Photometric Classification and Quantification of the New Dull Codes.....	1575
<i>Ole Gjertsen, Ryan Mushinski, Preston Wolfram, Jeffrey Leisey, Mani Bandi, Roberta Santana, Gregory Andreasen, Paul Pastusek, Dustin Daechsel</i>	
Software-Based Three-Dimensional Scan of a Drill Bit; Advances in Technology and Applications.....	1591
<i>Crispin Chatar, Kishore Mulchandani</i>	
Utilizing Electronic Data Captured, at the Bit, in Combination with Automated Bit Dull Grading, to Improve Bit Design Features, Dull Condition, and Ultimately, Drilling Performance.....	1603
<i>Carlos Galarraga, Gabe Gusey, Derek Wade, Andrew Allen</i>	
Real-Time Prediction and Detection of Drilling Bit Issues Based on Along-String Measurements (ASM) Along Wired Pipes - A Case Study.....	1615
<i>Mostafa Gomar, Behzad Elahifar</i>	

## **KEEP A LID ON IT**

Quantifying the Sealing Performance of Plug and Abandonment (P&A) Cement Systems under Downhole Conditions.....	1632
<i>Roel FH Roijmans, Timotheus KT Wolterbeek, Erik K Cornelissen, Wout JG Keultjes</i>	
Continuous or Stacked Cement Bond Logs – Does It Matter? .....	1653
<i>Hans Petter Lohne, Øystein Arild</i>	
Abandonment Barrier Placement with Novel Analysis Spells Success in Deepwater.....	1664
<i>Donnie Kehlenbeck II, Jim McNicol</i>	
Continuous Improvement for Offshore Plug and Abandonment, a Case Study from Egypt Offshore .....	1677
<i>Mohamed El Nadoury, Ola Balbaa, James Vincent, Todd Eberhardt, Mohamed Moussa, Alaa Galal, Sherif ElKholy, Joseph Younan, Mohamed Sabra, Martijn Bogaerts</i>	
Sealing Ability of Barrier Materials for P&A Application: Investigation of Casing-Barrier Interface.....	1684
<i>Paulo Moreira, Mahmoud Khalifeh, Amit Govil</i>	

## **ALTERNATIVE MATERIALS**

A Unified Model for Shale Barriers .....	1700
<i>Bernt S. Aadnøy, Tron G. Kristiansen, Mesfin A. Belayneh</i>	
A Full Laboratory Study on the Physical and Mechanical Properties of a Bismuth Plug.....	1722
<i>Lewaa Hmadeh, Behzad Elahifar, Sigbjørn Sangesland, Andreas Elmer Abrahamsen</i>	
Potential Utilization of Rock-Based Geopolymers for Oil Well Cementing at Cold Areas.....	1740
<i>Mahmoud Khalifeh, Laurent Delabroy, Johan Kverneland</i>	
Expandable Geopolymers for Improved Zonal Isolation and Plugging .....	1749
<i>Foster Dodzi Gomado, Mahmoud Khalifeh, Jan Aage Aasen</i>	
Experimental Investigation of Geopolymers for Application in High-Temperature and Geothermal Well Cementing .....	1761
<i>Veerabhadra S Denduluri, George Ulerio II, Moneeb Genedy, Maria Juenger, Eric van Oort</i>	

## **WELL PLACEMENT**

Definitive Survey Methodology – Update to an Old Concept for Higher Reliability .....	1774
<i>André Naschenveng, Lucas Isaac, Fernando Laroca, Cláudio Franceschi, Alex Neves, Fábio Canté, Adrián Ledroz, Abel Carrasquilla</i>	
Drilling Three-Mile Laterals Tighter and Safer with a New Magnetic Reference Technique .....	1795
<i>Andrew Pare, Nico Cosca, Alec Berarducci, Glenna Crookston, Ryan Paynter</i>	
A Comparison of High-Resolution Trajectory Methods and Their Impact on Drilling Data Analysis .....	1803
<i>Marc Willerth, Levi Heintzelman, Joe Bauman, Ahmed Mansour, Timothy Gee, Kenneth McCarthy, Alexander Mitkus, Paul Reynerson, Tannor Ziehm</i>	

## **KNOWLEDGE SHARING EPOSTER PRESENTATIONS - STATION 3**

An Innovative Workflow for Real-Time Torque and Drag Monitoring..... 1814  
*Kewen Sun, Chao Mu, Tao Yu, Graeme Paterson*

### **Author Index**