

IADC/SPE International Drilling Conference and Exhibition 2020

Galveston, Texas, USA
3 – 5 March 2020

Volume 1 of 3

ISBN: 978-1-7138-0741-4

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© (2020) by Society of Petroleum Engineers
All rights reserved.

Printed with permission by Curran Associates, Inc. (2020)

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

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
Web: www.proceedings.com

TABLE OF CONTENTS

VOLUME 1

SESSION 1: CEMENTING AND ZONAL ISOLATION I: KEEPING IT TOGETHER

SIMPLIFYING WELL ABANDONMENTS USING SHALE AS A BARRIER	1
<i>E. Oort, M. Juenger, M. Aldin, A. Thombare, M. McDonald, A. Lucas, F. Ditlevesen</i>	
VALIDATING ULTRASONIC LOG RESPONSE AGAINST REFERENCE BARRIER CELLS SIMULATING DOWNHOLE WELL CONDITIONS ENCOUNTERED DURING WELL CONSTRUCTION AND ABANDONMENT OPERATIONS	20
<i>A. Govil, D. Gardner, G. Obando, K. Beltran-Jimenez, H. Skadsem</i>	
CHANGING THE GAME WITH REAL-TIME DOWNHOLE AND ALONG STRING DATA DURING MANAGED PRESSURE LINER RUNNING AND CEMENTING.....	41
<i>A. Hawthorn, D. Groves, T. Brian</i>	

SESSION 2: DIGITAL TRANSFORMATION I

VERIFICATION AND VALIDATION OF SENSORS AND SYSTEMS USING SYSTEMS ENGINEERING METHODS.....	45
<i>J. Wardt, P. Wood</i>	
TOWARD THE REDEFINITION OF DRILLING PLAN AND EXECUTION VIA A DIGITAL DRILLING ECOSYSTEM	62
<i>C. Caso, P. Bennett, J. Isaachsen, K. Ask, T. Stray, P. Andresen, C. Straumsheim</i>	
MEASUREMENT OF THE FLOWRATE OUT OF A WELL FOR CONVENTIONAL DRILLING OPERATIONS	68
<i>E. Cayeux</i>	

SESSION 3: DRILLING AUTOMATION I

LARGE-SCALE DEPLOYMENT OF A CLOSED-LOOP DRILLING OPTIMIZATION SYSTEM: IMPLEMENTATION AND FIELD RESULTS.....	80
<i>S. Lai, J. Ng, A. Eddy, S. Khromov, D. Paslawski, R. Beurden, L. Olesen, G. Payette, B. Spivey</i>	
INTELLIGENT PIPE-HANDLING: A CASE STUDY FOR AUTOMATION.....	99
<i>N. Morales, N. Ronquillo, D. Lisi, M. Lynch, C. Parker, J. Sutler, M. Machum</i>	
RESULTS FROM THE INTRODUCTION OF A WELL CONSTRUCTION SYSTEM	113
<i>J. Rowatt, A. Jourde, V. Pemmasani, B. Barbosa, J. Yopez, P. Thow</i>	

SESSION 4: UNDERSTANDING STICK SLIP AND TORSIONAL DYNAMICS

DRILLING DYNAMICS MODEL TO MITIGATE HIGH FREQUENCY TORSIONAL OSCILLATION.....	122
<i>Y. Shen, W. Chen, Z. Zhang, A. Bowler, B. Jeffryes, Z. Chen, M. Carrasquilla, D. Smith, G. Skoff, H. Panayirci, Y. Arevalo, P. Bolchover</i>	

THE NATURE OF THE INTERACTION BETWEEN STICK/SLIP AND HIGH-FREQUENCY TORSIONAL OSCILLATIONS	144
<i>A. Hohl, V. Kulke, A. Kueck, C. Herbig, H. Reckmann, G. Ostermeyer</i>	
ANALYSIS OF TORSIONAL STICK-SLIP SITUATIONS OBSERVED WITH DOWNHOLE HIGH-FREQUENCY MAGNETOMETER DATA	168
<i>E. Cayeux, A. Ambrus, A. Helleland, S. Brundtland, H. Nevoy</i>	
CAPTURING STICK-SLIP IN THE LAB USING HARDWARE-IN-THE-LOOP	197
<i>H. Panayirci, A. Robinson, D. Scott, G. Skoff</i>	
IDENTIFICATION OF OPTIMAL DRILLING PARAMETERS FOR REDUCTION OF HIGH-FREQUENCY TORSIONAL OSCILLATIONS BY COMBINED APPROACH WITH MODELING AND REAL-TIME ANALYSIS OF HIGH-FREQUENCY MEASUREMENTS.....	212
<i>P. Patil, O. Ochoa</i>	
IDENTIFICATION AND MITIGATION OF FRICTION- AND CUTTING ACTION-INDUCED STICK-SLIP VIBRATIONS WITH PDC BITS	224
<i>S. Chen, J. Wisinger, B. Dunbar, C. Propes</i>	

SESSION 5: RIG TECHNOLOGY AND MANAGEMENT

WILL THE 2020'S BE KNOWN AS THE 20K DECADE? THE 20K SUBSEA BOP IS HERE	243
<i>R. Cowan, J. Ellens, W. Hunter, A. Kulkarni, K. Scherm</i>	
IMPLEMENTATION OF RIG SIMULTANEOUS OPERATIONS OVER DRILL CENTERS TO IMPROVE DEEPWATER DRILLING PERFORMANCE	252
<i>A. Abuah, K. Okenyi, K. Erhunmwunsee, O. Onafeso, D. Abdallah</i>	
A STUDY OF THE REEVING EFFICIENCY AND INERTIA OF DRAWWORKS.....	268
<i>A. Kyllingstad</i>	
AUTOMATED BOP TESTING TECHNOLOGIES PROVIDE ECONOMIC BENEFITS ALONG WITH PERSONAL AND PROCESS SAFETY IMPROVEMENTS	283
<i>M. Anderson, J. Hilpert, M. Graziano, D. Zimpfer, S. Boegershausen, C. Kirker</i>	
GAS POWERED ENGINES WITH ENERGY STORAGE - A GAME CHANGER IN LAND DRILLING	292
<i>D. Hopkins, I. Fox, D. Molen</i>	
THE COMPANY MAN PROGRAMME	303
<i>T. Morton</i>	

SESSION 6: TUBULARS

DRILLSTRING FAILURE PREVENTION - A DATA DRIVEN APPROACH TO EARLY WASHOUT DETECTION.....	310
<i>A. Kuesters, C. Mason, P. Gomes, C. Cockburn, H. Lodhi</i>	
INVESTIGATION OF FRICTIONAL HEAT CHECK CASING FAILURES IN OFFSHORE DEEPWATER WELLS LEADS TO NEW MITIGATION STRATEGY	322
<i>M. Fitzsimmons, R. Reyes, K. Maskos, T. Thomas, S. Sutin</i>	
FATIGUE MODELING IN BHA CONNECTIONS: IS BSR HELPFUL?	334
<i>G. Pettit, K. Lee</i>	

FEA-BASED FATIGUE MODELING OF CUTS AND PITS SAVES MONEY AND REDUCES DRILL STRING RISK.....	340
<i>G. Pettit, K. Lee</i>	
APPLIED REAL-TIME DATA ANALYTICS IMPROVES DRILLSTRING LIFE AND DESIGN	345
<i>E. Martinez, A. Ardoin, C. Cheatham, R. Whitney</i>	
SPECIAL CONSIDERATIONS FOR WELL TUBULAR DESIGN AT ELEVATED TEMPERATURES.....	359
<i>G. Tao, C. Matthews, A. Adams</i>	
A PRACTICAL METHODOLOGY TO ASSESS CASING INTEGRITY AND SERVICE LIFE WITH SALT COLLAPSE LOADS IN UNCONVENTIONAL DEVELOPMENTS.....	392
<i>O. Coker, I. Kalil, A. McSpadden, S. Glover</i>	
IMPORTANCE OF THE PIN-END EFFECT ON LEAK ASSESSMENT IN THREADED CONNECTIONS.....	409
<i>M. Goodman, R. Mitchell, I. Kalil</i>	
CONNECTION FATIGUE MODELING WITH LARGE IDS: HOW LARGE OF AN ID CAN SUPPORT A SRG?	426
<i>G. Pettit, K. Lee</i>	

SESSION 21: STATION 1: KNOWLEDGE SHARING EPOSTERS

SIMULATION AND MEASUREMENT OF HIGH-FREQUENCY TORSIONAL OSCILLATION HFTO/HIGH-FREQUENCY AXIAL OSCILLATION HFAO AND DOWNHOLE HFTO MITIGATION: KNOWLEDGE GAINS CONTINUE BY USING EMBEDDED HIGH- FREQUENCY DRILLING DYNAMICS SENSORS.....	431
<i>J. Sugiura, S. Jones</i>	
DRILLING PERFORMANCE EVALUATION USING ADVANCED BHA MODELING AND FIELD VALIDATION.....	463
<i>J. Greenwood, J. Marck, V. Nair, J. Munguia</i>	
NONLINEAR DYNAMICS OF A DRILLSTRING IMMERSED IN A 3D CURVED WELL, SIMULATIONS AND EXPERIMENTS	483
<i>K. Nguyen, M. Mahjoub, Q. Tran, M. Andrianoely, L. Manin, R. Dufour, S. Menand</i>	
FLUID MIGRATION CHARACTERIZATION OF CEMENTED SECTIONS RETRIEVED FROM A NORTH SEA PRODUCTION WELL	497
<i>H. Skadsem, D. Gardner, K. Beltran-Jimenez, S. Kragset, L. Delabroy, F. Ruckert</i>	
A COMPREHENSIVE TEST PAD FOR BRADENHEAD PRESSURE MITIGATION IN THE DJ BASIN	514
<i>A. Belvin, B. Cocchiere, M. Jacobs, A. Ichim</i>	
AUTOMATING TUBULAR-RUNNING OPERATIONS TO INCREASE RIG EFFICIENCY	526
<i>F. Amezaga, T. Cummins, J. Hooker</i>	

SESSION 22: STATION 2: KNOWLEDGE SHARING EPOSTERS

A NEW LOOK AT ELASTIC COLLAPSE	539
<i>R. Mitchell</i>	

WELLHEAD MOVEMENT ANALYSIS WITH A FINITE-ELEMENT MODEL FOR WELL INTEGRITY ASSESSMENT OF COMPLEX CONFIGURATIONS	548
<i>A. McSpadden, R. Cooper, R. Trevisan</i>	

WELLHEAD AND CONDUCTOR MULTI-VARIATE FATIGUE ANALYSIS FOR OLD AND NEW SUBSEA WELLS	567
<i>N. Pilisi, D. Lewis</i>	

VOLUME 2

AN AUTOMATED WORKFLOW FOR REAL-TIME MONITORING AND BENCHMARKING OF CONNECTION TIME IN DRILLING OPERATIONS.....	596
<i>A. Vajargah, R. Banirazi, J. Mejia, P. Haffner</i>	

OPTIMIZING DRILLING WELLS AND INCREASING THE OPERATION EFFICIENCY USING DIGITAL TWIN TECHNOLOGY	613
<i>M. Mayani, T. Baybolov, R. Rommetveit, S. Odegaard, V. Koryabkin, S. Lakhtionov</i>	

HOW REALISTIC IS THE CALCULATED CEMENTING DISPLACEMENT EFFICIENCY?	623
<i>H. Foroushan, E. Ozbayoglu</i>	

SESSION 23: STATION 3: KNOWLEDGE SHARING EPOSTERS

PREDICTIVE ACTION PLANNING FOR HOLE CLEANING OPTIMIZATION AND STUCK PIPE PREVENTION USING DIGITAL TWINNING AND REINFORCEMENT LEARNING	640
<i>G. Saini, P. Ashok, E. Oort</i>	

THE DEVELOPMENT AND APPLICATION OF REAL-TIME DEEP LEARNING MODELS TO DRIVE DIRECTIONAL DRILLING EFFICIENCY	658
<i>D. Cao, D. Hender, S. Ariabod, C. James, Y. Ben, M. Lee</i>	

A PHYSICS MODEL EMBEDDED HYBRID DEEP NEURAL NETWORK FOR DRILLSTRING WASHOUT DETECTION.....	672
<i>C. Jeong, Y. Yu, D. Mansour, V. Vesslinov, R. Meehan</i>	

HIGH-FREQUENCY DRILLING DATA ANALYSIS TO CHARACTERIZE WATER-ICE ON THE MOON	681
<i>D. Joshi, A. Eustes, J. Rostami, J. Hanson, C. Dreyer</i>	

SESSION 7: CEMENTING AND ZONAL ISOLATION II: IN THE ZONE

SELF SEALING CEMENT SYSTEM ENABLES PREVENTION OF WATER INTRUSION AND LONG TERM ZONAL ISOLATION IN UM GUDAIR FIELD: A CASE STUDY IN WEST KUWAIT.....	693
<i>A. Jaffar, J. Mohammed, M. Khaja, H. Haddad, S. Raturi, D. Albohamad, E. Lateef, R. Aldakheel</i>	

AN EVALUATION OF THE CEMENT SHEATH QUALITY OF CASING SECTIONS RECOVERED DURING A WELL ABANDONMENT OPERATION	701
<i>G. Palacio, D. Gardner, L. Delabroy, A. Govil</i>	

IMPROVED CHANNELING AND GAS MIGRATION ISSUES USING FOAM CEMENT: CASE HISTORY, MONTNEY FORMATION	721
<i>A. Ahmady, S. Turton, S. Lewis, M. Grant, B. Murphy</i>	

ACCURATE DETERMINATION OF ANNULAR CONTENT BEHIND CASING AND PREVENTION OF REMEDIAL ACTION DURING WELL CONSTRUCTION	735
<i>A. Govil, R. Kalyanraman, K. Constable</i>	

SESSION 8: INNOVATION TECHNOLOGY - CHALLENGING PERFORMANCE LIMITS

PRESCRIPTIVE DATA ANALYTICS TO OPTIMIZE CASING EXITS	744
<i>T. Popp, M. Shirangi, O. Nipen, A. Berggreen</i>	
WORLD'S FIRST HYBRID DRILLING RIG.....	757
<i>M. Bilgin, J. Donen, V. Scaini, M. Snijder</i>	
QUALIFICATION & TESTING OF A POWERED WIRED DRILL PIPE SOLUTION.....	776
<i>I. Silvester, T. Hogset, S. Torvund, S. Saxena</i>	
HOLE CLEANING IN HORIZONTAL WELLS USING VISCOELASTIC FLUIDS-AN EXPERIMENTAL STUDY OF DRILLING FLUID PROPERTIES ON THE BED EROSION DYNAMICS.....	793
<i>M. Hirpa, E. Kuru</i>	
A VOICE INTERFACE FOR DRILLING SYSTEMS.....	816
<i>C. Chatar, Z. Huang, P. Hadrovic</i>	

SESSION 9: GEOMECHANICS

AUTOMATED EVALUATION OF ROCKS PHYSICAL PROPERTIES TO ENHANCE DRILLING EFFICIENCY AND REDUCE NON-PRODUCTIVE TIME.....	827
<i>M. Al-Rubaii, M. Mahmoud, R. Gajbhiye, A. Al-Yami, M. Al-Awami, S. Alafnna</i>	
THERMAL EFFECT ON FRACTURE WIDTH FOR WELLBORE STRENGTHENING APPLICATIONS.....	837
<i>Z. Yao, M. Alberty</i>	
BOREHOLE STABILITY IN SHALE: BEYOND MUD WEIGHT.....	852
<i>E. Araujo, D. Kisinger, D. Vidal, B. Cresap</i>	
LOW-DENSITY INVERT EMULSION DRILLING FLUID ENABLES RECOVERY OF OIL RESERVES IN EXTREMELY DEPLETED RESERVOIRS: A CASE HISTORY FROM VALHALL, NORWAY	868
<i>A. Asko, E. Alsvik, T. Danielsen, M. Haga</i>	

SESSION 10: DIRECTIONAL DRILLING AND WELLBORE PLACEMENT

VALIDATION OF ERROR MODELS – A KEY COMPONENT OF RISK MITIGATION IN WELLBORE COLLISION CHALLENGES	880
<i>T. Ali, A. Ledroz, J. Weston, W. Allen</i>	
THEORETICAL VS. ACTUAL MUD MOTOR PERFORMANCE IN UNCONVENTIONAL FORMATIONS AND STRATEGIES TO EXTEND MOTOR LIFE.....	888
<i>I. El-Sayed, Z. Hopkins, F. Dupriest, S. Noynaert</i>	
GYRO WELLBORE PLACEMENT USING ADVANCED SOLID-STATE SENSOR TECHNOLOGY	908
<i>A. Ledroz, J. Weston, J. Moisan</i>	

AUTOMATED SLIDING: EFFICIENCIES ACHIEVED IN THE NEXT STAGE OF DRILLING AUTOMATION	916
<i>A. Hausher, S. Kern, W. Chmela, J. Cantwell, K. Mims</i>	
BARITE SAG MEASUREMENTS	923
<i>T. Ofei, B. Lund, S. Sangesland, H. Linga, K. Gyland, M. Kawaji</i>	
REDUCE DOWNHOLE DRILLING MOTOR BIT-TO-BEND AND INCREASE DRILLING PERFORMANCE THROUGH NOVEL BEARING LUBRICATION CONFIGURATION.....	944
<i>J. Hankins, P. Thompson, N. Marchand, R. Smith, J. Wong</i>	
PRECISE INTER-LATERAL SPACING FOR OPTIMAL STIMULATION AND ENHANCED PRODUCTION IN NORTH AMERICAN SHALE	949
<i>G. Rassadkin, D. Ridgway, J. Dorey, C. Healy, C. Moss</i>	

SESSION 11: DIGITAL TRANSFORMATION II

DYNAMIC RT MODELLING AND 3D VISUALIZATION OF CRITICAL SAFETY PARAMETERS ON DRILLFLOOR DURING DRILLING, RUNNING LINERS & SCREENS AND CEMENTING OF CHALLENGING OFFSHORE WELLS.....	956
<i>R. Rommetveit, J. Navavi, S. Odegard, M. Mayani, S. Syltoy, M. Lauve, O. Jordal, T. Kolltveit</i>	
DATA-DRIVEN OPTIMIZATION OF DRILLING PARAMETERS	972
<i>R. Shishavan, D. Adam, R. Banirazi</i>	
VALIDATION OF TRANSIENT ANNULAR PRESSURE BUILD-UP APB MODEL PREDICTIONS WITH FIELD MEASUREMENTS IN AN OFFSHORE WELL AND CHARACTERIZATION OF UNCERTAINTY BOUNDS	986
<i>R. Pai, A. Gupta, U. Sathuvalli, P. Suryanarayana, S. Affes, J. Okoroafar, N. Nwamara</i>	
MEASURING MICROINVISIBLE LOSS MILT TIME IN DRILLING OPERATIONS	999
<i>M. Mittal, V. Lakhanpal, R. Samuel</i>	

SESSION 12: DRILLING DYNAMICS I

MAXIMIZING DRILLING PERFORMANCE THROUGH THE DELAWARE BASIN BRUSHY CANYON AND INTERBEDDED FORMATIONS.....	1009
<i>F. Dupriest, S. Noynaert, T. Cunningham, M. Rendon</i>	
BHA LATERAL VIBRATION CHATTER IMPEDES APPLICATION OF WEIGHT TO BIT	1028
<i>J. Bailey, M. Tenny, G. Payette, L. Wang</i>	
DYNAMICS VIBRATION PREDICTION AND COMPARISON WITH DOWNHOLE DATA MEASUREMENTS IN UNCONVENTIONAL WELLS	1059
<i>M. Mahjoub, K. Nguyen, S. Menand, Q. Tran, M. Andrianoely, L. Manin, R. Dufour, M. Isbell</i>	

SESSION 13: DRILLING AUTOMATION II

DIRECTIONAL DRILLING AUTOMATION USING A LAB-SCALE DRILLING RIG: SPE UNIVERSITY COMPETITION	1071
<i>E. Akita, F. Dyer, S. Drummond, M. Elkins, P. Duggan, R. Ahmed, F. Florence</i>	
AN APPROACH TO AUTONOMOUS DRILLING.....	1085
<i>E. Cayeux, R. Mihai, L. Carlsen, S. Stokka</i>	

AUTOMATING ANTI-COLLISION CALCULATIONS FOR AUTONOMOUS DRILLING SYSTEMS.....	1110
<i>M. Willerth, A. McGregor, S. Bhaduri, J. Eaton</i>	
DIGITALIZATION OF DETAILED DRILLING OPERATION PLANS AND VERIFICATION OF AUTOMATIC PROGRESS TRACKING WITH AN ONLINE DRILLING SIMULATOR ENVIRONMENT.....	1126
<i>P. Farmanbar, O. Revheim, A. Uberg, A. Chekushev, E. Cayeux, J. Gravdal, E. Hauge</i>	
AUTOMATED PROCEDURAL COMPLIANCE DRIVES REAL TIME DRILLING OPTIMIZATION	1142
<i>M. Kamyab, S. Yalamarty, C. Cheatham</i>	
ADVISORY SYSTEM FOR DRILLING: AUTOMATIC PROCEDURES ACTING ON REAL-TIME DATA	1153
<i>D. Dashevskiy, J. Macpherson, R. Mieting, I. Wassermann</i>	

VOLUME 3

SESSION 21: STATION 1: KNOWLEDGE SHARING EPOSTERS

REAL-TIME DRILLING ADVISORY ROADMAP SYSTEM DELIVERS SUPERIOR PERFORMANCE WHEN USED IN CONJUNCTION WITH DOWNHOLE EMBEDDED DRILLING DYNAMICS SENSORS	1164
<i>S. Jones, J. Sugiura</i>	
FOOTHILLS DRILLING PERFORMANCE IMPROVEMENT – A NEW TRANSVERSAL APPROACH.....	1177
<i>C. Rojas-Mendizabal, S. Menand, M. Farrag, L. Vennier, P. Leclerc</i>	
REVISITING THE CLASSICAL PROBLEM OF TRANSIENT TEMPERATURE PREDICTION IN COMPLEX DEEPWATER WELLBORES WITH A NEW SEMI-ANALYTICAL APPROACH.....	1194
<i>S. Chandrasekhar</i>	
WORLD'S FIRST CEMENT REPLACEMENT WITH METAL EXPANDABLE ANNULAR SEALING ON A HIGHLY LAMINATED, DEEP WATER INJECTOR IN WEST AFRICA	1221
<i>M. Hallaire, J. Bagal, P. Hazel, R. Vasques, B. Prasad, G. Onadeko</i>	
A NOVEL INTERVENTION TOOL TO OPERATE SUBSURFACE BARRIER VALVES	1234
<i>G. Balasubramanian</i>	
LARGE-SCALE DRILL CUTTINGS THERMAL TREATMENT AND SLOP SYSTEM RETROFITTED TO DRILLSHIPS DURING ZERO-DISCHARGE DRILLING OPERATIONS OFFSHORE ANGOLA.....	1244
<i>V. Sharma, D. Jepson, E. Sousa, M. Dompelo, J. Zghal, R. Bermudez, M. Lonca, J. Diogo, C. Szokolczai, P. Rennie, N. Donaldson</i>	

SESSION 22: STATION 2: KNOWLEDGE SHARING EPOSTERS

USING MODEL-BASED DESIGN FOR DIGITAL TWINS TO PREDICT THE REAL-TIME PERFORMANCE OF SURFACE EQUIPMENT.....	1253
<i>W. Johnson, S. Rao</i>	

STEP CHANGING SAFETY AND EFFICIENCY GAINS BY FAST RIG MOVES, AUTOMATED SEQUENCES AND DATA PROCESSING	1260
<i>A. Mul, D. Hooft, S. Ziatdinov</i>	

CLOUD-BASED COHERENT WELLBORE STABILITY, IMPROVING TRAJECTORY DESIGN FOR UNCONVENTIONAL WELL CONSTRUCTION PLANNING.....	1269
<i>A. Reyes, J. Huang, Z. Yuan, P. Temple, Q. Liang, J. Morana, Y. Hashemian</i>	

ENGINEERED WELLBORE STRENGTHENING SOLUTION ENABLES DRILLING OF DEPLETED RESERVOIRS BY EXPANDING THE DRILLING WINDOW	1281
<i>T. Saba, S. Adilin, R. Dey, A. Kadir</i>	

WELLBORE INTEGRITY DURING BLOWOUTS: BROACHING PREVENTION AND CONTROL	1288
<i>A. Michael, I. Gupta</i>	

SESSION 14: ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

RECURRENT AUTO ENCODERS FOR AUTOMATIC SENSOR VALIDATION; TOMORROWS DATA WITH YESTERDAY'S SENSORS.....	1310
<i>S. Gupta, C. Chatar, J. Celaya</i>	

BUILDING A GENERAL AND SUSTAINABLE MACHINE LEARNING SOLUTION IN A REAL-TIME DRILLING SYSTEM	1320
<i>Y. Ben, W. Han, C. James, D. Cao</i>	

AUTO-SUGGESTIVE REAL-TIME CLASSIFICATION OF DRILLER MEMOS INTO ACTIVITY CODES USING NATURAL LANGUAGE PROCESSING.....	1329
<i>J. Ucherek, T. Lawal, M. Prinz, L. Li, P. Ashok, E. Oort, T. Gobert, J. Mejia</i>	

SESSION 15: DIGITAL TRANSFORMATION III

NEW VERSION OF IADC DAILY DRILLING REPORT SIGNIFICANTLY INCREASES GRANULARITY, PROVIDES OPPORTUNITY TO COLLABORATE USING A COMMON DIGITAL FORMAT	1342
<i>D. Shackleton, R. Kuilenburg, N. Morales, R. Macmillan, J. Wardt, L. Hsieh</i>	

DIGITAL TRANSFORMATION STRATEGY ENABLES AUTOMATED REAL-TIME TORQUE-AND-DRAW MODELING	1356
<i>D. Cao, D. Hender, S. Ariabod, K. Ruddy, C. James</i>	

EARLY IDENTIFICATION OF DRILLING COLLISION RISK USING MWD SURVEY QUALITY DATA	1367
<i>N. Cosca, M. Willerth</i>	

SESSION 16: DRILLING DYNAMICS II

INVESTIGATION OF GEOMETRY AND LOADING EFFECTS ON PDC CUTTER STRUCTURAL INTEGRITY IN HARD ROCKS.....	1376
<i>R. Rahmani, P. Pastusek, G. Yun, T. Roberts</i>	

HOLE OPENING CHALLENGES AND EFFICIENCIES – INTERPRETATION AND IMPLICATIONS OF BIT AND REAMER DULL CONDITIONS	1398
<i>G. Mensa-Wilmot, G. Woldtvedt, M. Cardoso, W. Diwaku</i>	

ROLLING DEPTH-OF-CUT CONTROL IMPROVES TOOL-FACE CONTROL AND OVERALL ROP DURING STEERABLE MOTOR APPLICATIONS	1424
<i>S. Hawkins, V. Brackin, M. Ameri</i>	

SESSION 17: AUTOMATION OF THE DIRECTIONAL DRILLING PROCESS

DIRECTIONAL DRILLING AUTOMATION: HUMAN FACTORS AND AUTOMATED DECISION-MAKING.....	1434
<i>B. Chmela, S. Kern, T. Quarles, S. Bhaduri, R. Goll, C. Van</i>	
ACHIEVING AUTOMATED DIRECTIONAL DRILLING ACROSS US ONSHORE BASINS	1442
<i>S. Coffey, A. Groover</i>	
GUIDANCE FOR CALIBRATION OF A DIRECTIONAL DRILLING WELLBORE PROPAGATION MODEL USING FIELD DATA	1461
<i>J. D'Angelo, C. Pehlivanurk, P. Ashok, E. Oort, M. Shahri, A. Vasicek, M. Behounek</i>	
DOWNHOLE ATTITUDE-HOLD CONTROLLER LEADS TO AUTOMATIC STEERING OF DIRECTIONAL WELLS WITH IMPROVED ACCURACY AND REDUCED TORTUOSITY.....	1474
<i>U. Zalluhgolu, J. Tilley, W. Zhang, J. Grable</i>	
AUTOMATED TRAJECTORY DRILLING FOR ROTARY STEERABLE SYSTEMS	1482
<i>C. Hansen, M. Stokes, R. Mieting, F. Quattrone, V. Klemme, K. Rao, I. Wassermann, R. Zaeper</i>	
AUTOMATED GEOSTEERING WITH FAULT DETECTION AND MULTI-SOLUTION TRACKING	1491
<i>S. Maus, T. Gee, A. Mitkus, K. McCarthy, E. Charney, A. Ferro, Q. Liu, J. Lightfoot, P. Reynerson, D. Velozzi, R. Mottahedeh</i>	

SESSION 18: WELL CONTROL: CAN YOU HANDLE THE PRESSURE?

RELIEF WELL CHALLENGES AND SOLUTIONS FOR SUBSEA BIG-BORE FIELD DEVELOPMENTS	1503
<i>E. Upchurch, R. Oskarsen, P. Chantose, M. Emilsen, B. Morry</i>	
USING MPD AND CONVENTIONAL METHODS TO ADDRESS A WELL CONTROL EVENT IN A DEEPWATER EXPLORATION WELL	1520
<i>S. Moghazy, R. Noort, A. Kozlov, I. Haq, T. Silva, C. Hester, O. Gabaldon</i>	
ADDRESSING SUBSEA BLOWOUT EFFECTS USING NASA METHODOLOGY	1533
<i>A. Cuthbert</i>	
PLUME ANALYSIS ESTABLISHES SAFE WORK ZONE AND CONFIRMS WELL-ACCESS FOR SUBSEA CAPPING EQUIPMENT INSTALLATION	1552
<i>U. Godse, A. Gill</i>	
NOVEL ANALYSES AND DESIGN OF RELIEF WELL CONSIDERING 3-D VECTOR EFFECT OF KILL FLUID.....	1561
<i>L. Zhou, P. Gomes, J. Knight, S. Nanda</i>	

SESSION 19: DRILLING FLUIDS

HELICAL PIPE VISCOMETER SYSTEM FOR AUTOMATED MUD RHEOLOGY MEASUREMENTS	1572
<i>S. Gul, O. Erge, E. Oort</i>	
TIME, PRESSURE AND TEMPERATURE DEPENDENT RHEOLOGICAL PROPERTIES OF DRILLING FLUIDS AND THEIR AUTOMATIC MEASUREMENTS.....	1590
<i>E. Cayeux</i>	
DIGITAL TWINS FOR DRILLING FLUIDS: ADVANCES AND OPPORTUNITIES	1618
<i>M. Shirangi, R. Ettehad, R. Aragall, E. Furlong, R. May, T. Dahl, M. Samnejad, C. Thompson</i>	
MODELING CUTTINGS TRANSPORT AND ANNULAR PACK-OFF USING LOCAL FLUID VELOCITIES WITH THE EFFECTS OF DRILLSTRING ROTATION AND ECCENTRICITY	1633
<i>O. Erge, E. Oort</i>	
ROBUST PROCEDURE FOR MEASURING PARTICLE SIZE DISTRIBUTION OF NON-AQUEOUS DRILLING FLUIDS USING LASER DIFFRACTION	1651
<i>H. Yuan, S. Klasner, F. Growcock, G. Perez</i>	

SESSION 21: STATION 1: KNOWLEDGE SHARING EPOSTERS

ACCOUNTING FOR HYDRAULICS AND VIBRATION IN MSE CALCULATIONS TO ESTIMATE FORMATION PROPERTIES	1670
<i>A. Trivedi, C. Clarkson, R. Shor</i>	
SIMULATING DRILLSTRING POSTBUCKLING STATE AND WEIGHT TRANSFER WITH ADVANCED TRANSIENT DYNAMICS MODEL	1683
<i>W. Chen, Y. Shen, R. Chen, Z. Zhang, S. Rawlins</i>	
MANAGING LOST CIRCULATION IN HIGHLY FRACTURED, VUGULAR FORMATIONS: ENGINEERED USAGE OF HIGH FLUID LOSS SQUEEZE AND RETICULATED FOAM LOST CIRCULATION MATERIALS	1697
<i>S. Savari, J. Butcher, M. Al-Hulail</i>	

SESSION 22: STATION 2: KNOWLEDGE SHARING EPOSTERS

FULLY AUTOMATED MANAGED PRESSURE DRILLING DELIVERS PRECISE CONTROL THROUGH HIGH PRESSURES IN A NARROW DRILLING WINDOW	1708
<i>J. Muhammad, C. Sugiarto, A. Moussa, C. Iturrios</i>	
THERMODYNAMIC BASIS FOR BRINE DENSITY AS A FUNCTION OF PRESSURE, TEMPERATURE AND CHEMICAL COMPOSITION IN DEEPWATER AND XHPHT ENVIRONMENTS	1721
<i>S. Rahman, U. Sathuvalli, P. Suryanarayana</i>	

Author Index