

SPE Hydraulic Fracturing Technology Conference and Exhibition 2020

The Woodlands, Texas, USA
4 – 6 February 2020

Volume 1 of 2

ISBN: 978-1-7138-0730-8

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: CASE HISTORIES I

CASE HISTORY OF DRAINAGE MAPPING AND EFFECTIVE FRACTURE LENGTH IN THE BAKKEN.....	1
<i>C. Cipolla, M. Litvak, R. Prasad, M. McClure</i>	
OPERATIONAL CHALLENGES AND REWARD OF LINER REFRACTS IN THE EAGLE FORD	44
<i>J. Bennett, S. Baker, B. Williams, M. Pitman</i>	
ENHANCEMENT OF PRODUCTION AND ECONOMICS THROUGH DESIGN OPTIMIZATION IN THE STACK	56
<i>J. Huchton, C. Mallory, J. Calvin, M. Alberts, S. Rogers, G. Romines, T. Markowski, J. Boyer</i>	
MITIGATION FOR FRACTURE DRIVEN INTERACTION: A MIDLAND BASIN CASE STUDY.....	77
<i>R. Scherz, Y. Pradhan, M. Rainbolt</i>	
A DATA ANALYTICS FRAMEWORK FOR CORED FRACTURE IMAGING AND NOVEL CHARACTERIZATION WORKFLOW - APPLICATION ON SAMPLES FROM HYDRAULIC FRACTURING TEST SITE HFTS IN THE MIDLAND BASIN	84
<i>D. Maity, J. Ciezobka</i>	
IMPROVING COMPLETIONS IMMEDIATELY: AN APPLIED METHODOLOGY FOR REAL-TIME OPTIMIZATION	96
<i>P. Stark, J. Tran, D. Mogck, G. Mask</i>	
SOUND COMPLETION ENGINEERING TECHNIQUES LEAD TO SUPERIOR PRODUCTION OF THE CODELL SANDSTONE IN LARAMIE COUNTY, WYOMING	108
<i>B. Kusters, K. Shaw, S. D'Souza, J. Clark, M. Besler, M. Barham</i>	

SESSION 2: DIAGNOSTICS I: PERFORATIONS AND CLUSTERS

A COST-EFFECTIVE EVALUATION OF PODS DIVERSION EFFECTIVENESS USING FIBER OPTICS DAS AND DTS	122
<i>G. Ugueto, P. Huckabee, A. Nguyen, T. Daredia, J. Chavarria, M. Wojtaszek, D. Nasse, A. Reynolds</i>	
PROPPANT DISTRIBUTION OBSERVATIONS FROM 20,000+ PERFORATION EROSION MEASUREMENTS	135
<i>G. Roberts, J. Whittaker, J. McDonald, T. Paxson</i>	
EVALUATING LIMITED ENTRY PERFORATING & DIVERTER COMPLETION TECHNIQUES WITH ULTRASONIC PERFORATION IMAGING & FIBER OPTIC DTS WARMBACKS.....	150
<i>C. Murphree, M. Kintzing, S. Robinson, J. Sepehri</i>	

A STRUCTURED APPROACH TO SOLVING COMPLETION CHALLENGES WITH DOWNHOLE FIBER OPTIC MONITORING.....	176
<i>M. Mast, B. Hoffman, C. Cox, D. Byrd</i>	

ACOUSTIC IMAGING OF PERFORATION EROSION IN HYDRAULICALLY FRACTURED WELLS FOR OPTIMIZING CLUSTER EFFICIENCY	197
<i>S. Robinson, T. Littleford, T. Luu, K. Wardynski, A. Evans, B. Horton, M. Oman</i>	

EXPERIMENTAL INVESTIGATION ON PARAMETERS AFFECTING THE COEFFICIENT OF DISCHARGE OF A PERFORATION HOLE IN HYDRAULIC FRACTURING TREATMENTS.....	248
<i>J. Loehken, D. Yosefnejad, B. Fricke</i>	

PERFORATING TRENDS, TECHNOLOGY AND EVALUATION IN NORTH AMERICA	277
<i>C. Squires, C. Ramos, M. Clay</i>	

SESSION 12: KNOWLEDGE SHARING EPOSTER II

DEEP LEARNING BASED HYDRAULIC FRACTURE EVENT RECOGNITION ENABLES REAL-TIME AUTOMATED STAGE-WISE ANALYSIS.....	296
<i>Y. Shen, D. Cao, K. Ruddy, L. Moraes</i>	

RAPID COMPLETION OPTIMIZATION USING PARTICULATE OIL-SOLUBLE TRACERS	315
<i>M. Jones, J. Larue</i>	

SESSION 3: FRACTURE MODELING

DEVELOPING UPSCALING APPROACH FOR SWARMING HYDRAULIC FRACTURES OBSERVED AT HYDRAULIC FRACTURING TEST SITE THROUGH MULTISCALE SIMULATIONS.....	321
<i>W. Fu, J. Morris, P. Fu, J. Huang, C. Sherman, R. Settgest, H. Wu, F. Ryerson</i>	

REAL-TIME COMPLETION COST OPTIMIZATION USING MODEL PREDICTIVE CONTROL.....	338
<i>Y. Ben, S. Sankaran, C. Harlin, M. Perrotte</i>	

UTILIZING DISCRETE FRACTURE MODELING AND MICROPROPPANT TO PREDICT AND SUSTAIN PRODUCTION IMPROVEMENTS IN NANO DARCY ROCK	350
<i>C. Montgomery, M. Smith, Z. An, H. Klein, W. Strobel, R. Myers</i>	

COMPREHENSIVE SIMULATION OF HYDRAULIC FRACTURING THROUGH MECHANICAL STRATIGRAPHY WITH EXPLICIT WIDTH CALCULATION AND LEAKOFF: FOUNDATIONS OF COMPLETION MODELING.....	374
<i>L. Ji, A. Settari, V. Sen, R. Sullivan, P. Puchyr</i>	

LABORATORY INVESTIGATION OF FRACTURE PROPAGATION IN MULTIPLE FRACTURING WITH COMPLEX WELL INTERFERENCE.....	394
<i>M. Lu, Y. Su, M. Gutierrez, W. Wang, Y. Gan, A. Almrabat</i>	

A NEW MECHANISM FOR THE FORMATION OF HYDRAULIC FRACTURE SWARMS	408
<i>R. Manchanda, K. Shrivastava, S. Zheng, M. Sharma</i>	

AN INTERESTING LOOK AT MULTIPLE FRACTURES: STRESS SHADOWING AND PROPAGATION.....	425
<i>R. Morales</i>	

NUANCES AND FREQUENTLY ASKED QUESTIONS IN FIELD-SCALE HYDRAULIC FRACTURE MODELING	437
<i>M. McClure, M. Picone, G. Fowler, D. Ratcliff, C. Kang, S. Medam, J. Frantz</i>	

SESSION 4: DIAGNOSTICS II: DAS, DTS AND OTHERS

MONITORING THE PULSE OF A WELL THROUGH SEALED WELLBORE PRESSURE MONITORING, A BREAKTHROUGH DIAGNOSTIC WITH A MULTI-BASIN CASE STUDY	456
<i>K. Haustveit, B. Elliott, J. Haffener, C. Ketter, J. O'Brien, M. Almasoodi, S. Moos, T. Klaassen, K. Dahlgren, T. Ingle, J. Roberts, E. Gerding, J. Borell, S. Sharma, W. Deeg</i>	

JOINT INTERPRETATION OF FIBER OPTICS AND DOWNHOLE GAUGE DATA FOR NEAR WELLBORE REGION CHARACTERIZATION	498
<i>S. Zhang, H. Tang, R. Hurt, V. Jayaram, J. Wagner</i>	

DISTRIBUTED ACOUSTIC AND TEMPERATURE SENSING APPLICATIONS FOR HYDRAULIC FRACTURE DIAGNOSTICS	513
<i>X. Li, J. Zhang, M. Grubert, C. Laing, S. Cole, Y. Oukaci</i>	

DIAGNOSING MULTISTAGE FRACTURE TREATMENTS WITH DISTRIBUTED FIBER-OPTIC SENSORS	530
<i>I. Pakhotina, S. Sakaida, D. Zhu, A. Hill</i>	

DELINEATING FAR FIELD PROPPED FRACTURE GEOMETRY USING ELECTROMAGNETIC GEOPHYSICS AND ITS POTENTIAL IMPACT ON WELL PLANNING AND RESERVOIR MODELING.....	549
<i>T. Palisch, S. Mukherjee, W. Al-Tailji</i>	

A RAPID INJECTION FLOW-BACK TEST RIFT TO ESTIMATE IN-SITU STRESS AND PORE PRESSURE IN A SINGLE TEST	564
<i>H. Wang, M. Sharma</i>	

THE EFFECTIVE CLUSTER SPACING PLAYS THE VITAL ROLE IN UNCONVENTIONAL RESERVOIR DEVELOPMENT – PERMIAN BASIN CASE STUDIES	587
<i>H. Xiong</i>	

VOLUME 2

SESSION 5: INFILL WELLS AND FRACTURE HITS

LEVERAGING CLOUD-BASED ANALYTICS IN ACTIVE WELL DEFENSE PROJECTS AND AUTOMATED PRESSURE RESPONSE ANALYSES	614
<i>P. Bommer, J. Iriarte, M. Bayne, C. Cline, A. Ramirez, M. Domelen</i>	

PARENTING STRATEGIES FOR UNDERPERFORMING CHILDREN	633
<i>C. Senters</i>	

MULTI-WELL POROELASTIC PRESSURE INTERFERENCE ANALYSIS: TOWARDS REAL-TIME FRACTURE DIAGNOSTICS	652
<i>R. Manchanda, B. Elliott, P. Seth, M. Sharma</i>	

EFFECT OF PARENT WELL PRODUCTION ON CHILD WELL STIMULATION AND PRODUCTIVITY	671
<i>A. Kumar, K. Shrivastava, B. Elliott, M. Sharma</i>	

INTRA-WELL FRAC-DRIVEN INTERACTIONS FDIS: TYPES, CAUSES, CONSEQUENCES AND DIAGNOSTIC VALUE LEARNT FROM ACTUAL BH DATA	687
<i>A. Daneshy</i>	

OFFSET FRACTURE EVENTS MADE SIMPLE: AN OPERATOR'S COLLABORATIVE APPROACH TO OBSERVE PARENT CHILD INTERACTIONS, MEASURE FRAC HIT SEVERITY AND TEST MITIGATION STRATEGIES	704
<i>D. Johnson, B. Yeager, C. Roberts, B. Fowler</i>	

SESSION 6: FRACTURED WELL PERFORMANCE

SHALE FRAC DESIGNS MOVE TO JUST-GOOD-ENOUGH PROPPANT ECONOMICS	728
<i>H. Melcher, M. Mayerhofer, K. Agarwal, E. Lolon, O. Oduba, J. Murphy, R. Ellis, K. Fiscus, R. Shelley, L. Weijers</i>	

MORE BANG FOR THE BUCK – OPTIMIZED PERFORATING DESIGN FOR UNCONVENTIONAL RESERVOIRS.....	755
<i>C. Wehunt, S. Naik, A. Singh</i>	

CONVENTIONAL AND ECO-FRIENDLY HYDRAULIC FRACTURING FLUID ADDITIVES: A REVIEW.....	787
<i>A. Al-Hameedi, H. Alkinani, S. Dunn-Norman, H. Trevino, M. Al-Alwani</i>	

USING AUTOMATION WHILE PUMPING TO IMPROVE STIMULATION UNIFORMITY AND CONSISTENCY: A SERIES OF CASE STUDIES	805
<i>E. Holley, V. Martysevich, K. Cook, S. Gale</i>	

PULSED POWER PLASMA TO ENHANCE NEAR WELLBORE PERMEABILITY AND IMPROVE WELL PERFORMANCE.....	818
<i>A. Rezaei, F. Siddiqui, N. Callen, P. Gordon, W. House, M. Soliman</i>	

FRACTURE SEQUENCING IN MULTI-WELL PADS: IMPACT OF STAGGERING AND LAGGING STAGES IN ZIPPER FRACTURING ON WELL PRODUCTIVITY	832
<i>R. Manchanda, S. Zheng, M. Sharma</i>	

SESSION 13: KNOWLEDGE SHARING EPOSTER III

PROPPANT FLOWBACK: CAN WE MITIGATE THE RISK?.....	852
<i>D. Chuprakov, L. Belyakova, A. Iuldasheva, A. Alekseev, D. Syresin, M. Chertov, P. Spesivtsev, F. Suarez, I. Velikanov, L. Semin, D. Bannikov</i>	

SESSION 14: KNOWLEDGE SHARING EPOSTER IV

USE OF RESERVOIR SIMULATION TO FORECAST FIELD EOR RESPONSE - AN EAGLE FORD GAS INJECTION HUFF-N-PUFF APPLICATION	879
<i>E. Kerr, K. Venepalli, K. Patel, R. Ambrose, J. Erdle</i>	

SMART ASSISTANT GUIDED FLOWBACK DATA ANALYSIS.....	895
<i>E. Miertschin, F. Rasdi, S. Gupta, S. Anderson, B. Jeyachandra</i>	

SESSION 15: KNOWLEDGE SHARING EPOSTER V

DEVELOPING METHODOLOGY FOR DFIT DESIGN AND PRESSURE INTERPRETATION BY COUPLED RESERVOIR GEOMECHANICS FLOW SIMULATION.....	904
<i>M. Mohamed, T. Thaker, M. Ibrahim, E. Ozkan</i>	
A DATA DRIVEN APPROACH IN SCREENOUT DETECTION FOR HORIZONTAL WELLS.....	930
<i>X. Yu, W. Trainor-Guitton, J. Miskimins</i>	
DFIT ANALYSIS AND INTERPRETATION IN LAYERED ROCKS	943
<i>S. Zheng, R. Manchanda, H. Wang, M. Sharma</i>	

SESSION 7: CASE HISTORIES II

INVESTIGATING NEAR-WELLS DIVERSION METHODS FOR REFRACTURING HORIZONTAL WELLS	965
<i>J. Zhang, M. White, J. McEwen, S. Schroeder, D. Cramer</i>	
THE UNCONVENTIONAL UNCONVENTIONALS: TECTONICALLY INFLUENCED REGIONS, STRESS STATES AND CASING FAILURES.....	988
<i>A. Casero, M. Rylance</i>	
THE EFFECTS OF DOWN-SPACING IN THE DELAWARE BASIN WOLFCAMP PLAY: A CASE HISTORY	1041
<i>P. Bommer, M. Bayne</i>	
UNDERSTANDING THE ROLE OF WELL SEQUENCING IN MANAGING RESERVOIR STRESS RESPONSE IN THE PERMIAN: IMPLICATIONS FOR CHILD-WELL COMPLETIONS USING HIGH-RESOLUTION MICROSEISMIC ANALYSIS.....	1061
<i>H. Chittenden, D. Cannon, K. Jeziorski, S. Bowman-Young, L. Smith-Boughner</i>	
MAKING REAL-TIME DECISIONS TO IMPROVE COMPLETION PERFORMANCE IN DELAWARE BASIN: PROTECT PARENT WELLS AND INCREASE CLUSTER EFFICIENCY	1077
<i>Q. Ji, A. Garcia, L. Green, L. Valle, E. Coenen</i>	
LOST IN THE SHADOWS: SURVIVING FRACTURING HAZARDS WITH FLUID TRACKING	1097
<i>E. Scott, S. Young, J. Ely, D. Jones, O. Vasquez</i>	
HIGH VISCOSITY FRICTION REDUCERS - POTENTIAL FOR FRACTURE DAMAGE AND IMPACT OF BRINES ON PROPPANT TRANSPORT CAPABILITY	1106
<i>B. Hlidek, R. Duenckel</i>	
FIELD-SCALE COMPUTATIONAL FLUID DYNAMICS CFD MODELING OF PROPPANT TRANSPORT AND DISTRIBUTION WITHIN A HORIZONTAL HYDRAULIC FRACTURING STAGE.....	1132
<i>A. Almulhim, B. Kebert, J. Miskimins, W. Hunter, G. Soehner</i>	
REAL-TIME HYDRAULIC FRACTURING PRESSURE PREDICTION WITH MACHINE LEARNING.....	1154
<i>Y. Ben, M. Perrotte, M. Ezzatabadipour, I. Ali, S. Sankaran, C. Harlin, D. Cao</i>	

FIGHTING THE FEAR: OVERCOMING PRECONCEIVED NOTIONS OF LOW POLYMER
CROSS-LINKED GELS AND HIGH VISCOSITY POLYACRYLAMIDES IN
UNCONVENTIONAL FRACTURING 1168

B. Poppel

DETERMINATION OF STIMULATED RESERVOIR VOLUME SRV DURING
FRACTURING: A DATA-DRIVEN APPROACH TO IMPROVE FIELD OPERATIONS 1182

M. Rahman, S. Sankaran, D. Molinari, Y. Ben

HIGH FREQUENCY PRESSURE MONITORING AND DATA ANALYTICS FOR
STIMULATION EFFICIENCY DETERMINATION: NEW PERSPECTIVES OR POTENTIAL
LIMITS..... 1199

R. Korkin, S. Parkhonyuk, A. Fedorov, D. Badazhkov, A. Kabannik

Author Index