

Industry 4.0 Topical Conference 2019

Topical Conference at the 2019 AIChE Spring Meeting
and 15th Global Congress on Process Safety

New Orleans, Louisiana, USA
31 March - 4 April 2019

ISBN: 978-1-5108-8681-0

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© (2019) by AIChE
All rights reserved.

Printed by Curran Associates, Inc. (2019)

For permission requests, please contact AIChE
at the address below.

AIChE
120 Wall Street, FL 23
New York, NY 10005-4020

Phone: (800) 242-4363
Fax: (203) 775-5177

www.aiche.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

INTELLIGENT PROCESSES: LEVERAGING THE DATA REVOLUTION FOR DECISION AND CONTROL	1
<i>Bhushan Gopaluni</i>	
(38A) THE DIGITAL PROCESS UNIT: REFINERY OPERATIONS MONITORING AND OPTIMIZATION USING REAL-TIME DATA COLLECTION AND ADVANCED MODELS	2
<i>Nevin Whalley, David De Gruyl, Matthew Hutchinson</i>	
(38B) NEXT GENERATION PROCESS MODELLING UTILIZING DIGITAL TWINS	12
<i>Corey Allen, Rasool Barouni</i>	
(38C) DATA CHARACTERIZATION, VISUALIZATION AND ANALYTICS FOR A SMART MANUFACTURING TESTBED	13
<i>Devarshi Shah, Jin Wang, Q. Peter He</i>	
(39A) VALUE OF INCREASING SAMPLE SIZE FOR ASSESSING DEFECT CONCENTRATION	14
<i>Brenda Colegrove, Swee-Teng Chin, Mark Webb, Casey McAlpin</i>	
(39B) DISTURBANCE TRACKING IN INDUSTRIAL MILK POWDER PROCESS SYSTEMS	15
<i>Irina Boiarkina, Arrian Prince-Pike, Nick Depree, Wei Yu, David Wilson, Brent R. Young</i>	
(39C) SOME CHALLENGES IN ANALYZING MANUFACTURING DATA FOR PROCESS OPTIMIZATION	16
<i>Wenyu Su, Tom Haynes</i>	
(57E) DESIGNING INDUSTRY 4.0 PROJECTS FOR PROCESS SAFETY	17
<i>Jim Petrusich</i>	
(57I) USING INDUSTRY 4.0 TO CREATE A PATHWAY TO OPERATIONAL EXCELLENCE	18
<i>Johnny Gipson</i>	
(57J) ACCELERATING PRODUCT INNOVATION AT DOW THROUGH MULTIVARIATE MODELING (POSTER)	19
<i>Brandon Corbett, Marlene Cardin, Kristin Wallace, Alix Schmidt, Haseeb Moten, Rebecca Beeson</i>	
(57K) REINFORCEMENT LEARNING (RL) BASED DATA-DRIVEN DECISION SUPPORT SYSTEM (POSTER)	20
<i>Pankaj Goel, Efstratios N. Pistikopoulos, M. Sam Mannan</i>	
(57L) A SEQUENCE TO SEQUENCE TIME SERIES FORECASTING MODEL FOR BATCH PROCESSES WITH SEASONALITY (POSTER)	21
<i>Shu Xu, Mark Nixon</i>	
(57M) TEXT MINING AND ANALYTICS (POSTER)	35
<i>James Cross</i>	
(57B) APPLYING OPTIMIZATION METHOD TO DELIVER PROACTIVE PRICING ON IMPROVING MARGIN BEYOND A COST PLUS STRATEGY	36
<i>Barnali Bhattacharjee, Ameya Dhaygude</i>	
(57C) AN HOLISTIC APPROACH FOR BATCH ANALYSIS AND MONITORING (POSTER)	37
<i>Chaojun Xu, Martin Hollender, Benedikt Schmidt, Liwei Huang</i>	
(57D) BEST BIG DATA ANALYTICS PLATFORM FOR MANUFACTURERS (POSTER)	38
<i>Ruqaiya Shipchandler, David Pope</i>	
(57F) MICROSOFT - EMPOWERING THE CHEMICAL INDUSTRY (POSTER)	39
<i>Jeff Leigh, Egbert Schroeer</i>	
(57G) BUSINESS VALUE, WORK PROCESS, ANALYTICS AND DATA IN THE CHEMICAL INDUSTRY (POSTER)	40
<i>Will Goetz, Maruti Dey</i>	
(57H) PROGNOSTIC AND HEALTH MANAGEMENT USING DIGITAL TWIN (POSTER)	41
<i>Jeff Washburn</i>	
(73A) USING BIG DATA TECHNIQUES TO TACKLE REFINING RELIABILITY AND OPTIMIZATION	42
<i>Johnny Gipson</i>	
(73B) TRANSFORMING ABUNDANT DATA INTO IMPROVED PROCESS RELIABILITY	43
<i>Tim Olsen</i>	
(73C) DIGITAL PLANT: THE CONVERGENCE OF PROCESS AND OPERATIONAL	44
<i>Tim Holtan</i>	
(77A) DIGITAL ETHYLENE PLANT: THE CONVERGENCE OF PROCESS AND OPERATIONAL	47
<i>Tim Holtan, Alessandro Bettini</i>	

(77B) HARNESSING ETHYLENE PLANT MANUFACTURING OPERATIONS RELIABILITY USING DATA DRIVEN ANALYTICS	48
<i>Pratap Nair, Kaushal Sampat</i>	
(77C) ENABLING TRANSFER LINE EXCHANGER UTILIZATION OPTIMIZATION BASED ON ADVANCES DATA ANALYTICS	64
<i>Joerg Weidenfeller</i>	
(77D) EFFECTIVE APPLICATION OF DATA ANALYTICS FOR ETHYLENE FURNACES.....	74
<i>James Brigman</i>	
(82A) USING MACHINE LEARNING TO DEVELOP DEEPER UNDERSTANDING OF AGITATED FILTER DRYER	75
<i>Prashant Kumar</i>	
(82B) EFFICIENT USE OF COMPUTATIONAL MODEL DATA VIA "ZONAL" MODELING	76
<i>Mothivel Mummudi, Gopal Kasat, Murtja Khan</i>	
(82C) SOLUBILITY IN THE AGE OF A DATA LAKE.....	77
<i>Michael Lovette</i>	
(108A) POWERFUL AND NOVEL NONLINEAR MODELING AND MULTIVARIATE STATISTICAL APPROACHES IN BIG DATA SETS IN CHEMICAL PROCESSES AND IN DATA MINING WITH APPLICATIONS TO BIO-, MEDICAL-, AND MATERIAL-INFORMATICS.....	78
<i>Derrick Rollins</i>	
(108B) FROM DATA TO KNOWLEGE: AI APPLICATIONS TO CHEMICAL ENGINEERING	79
<i>Jose Romagnoli</i>	
(126A) BUSINESS VALUE, WORK PROCESS, ANALYTICS AND DATA IN THE CHEMICAL INDUSTRY	80
<i>Will Goetz, Noel Bell</i>	
(126B) PROGNOSTIC AND HEALTH MANAGEMENT USING DIGITAL TWIN	81
<i>Jeff Washburn</i>	
(126C) MICROSOFT - EMPOWERING THE CHEMICAL INDUSTRY	82
<i>Sam Istephan, Jeff Leigh, Egbert Schroeer</i>	
(130A) TEXT MINING AND ANALYTICS	83
<i>James Cross</i>	
(130B) TEXT ANALYTICS APPLICATIONS FOR MATERIAL MANUFACTURING.....	84
<i>Michael Dessauer</i>	
(130C) OPPORTUNITIES FOR TEXT MINING IN SERVICE OF CHEMICAL ENGINEERING	85
<i>Carolyn Rose, Sreecharan Sankaranarayanan, Bo Shuang, Scott J. Bury</i>	
(144A) SAFE AND OPTIMISED OPERATIONS THROUGH SMART ANALYTICS & BIG DATA	86
<i>Karl McManus, Jason Payne, Ronan O'Malley</i>	
(144B) DON'T WORRY!! LABORATORY SAFETY IS FUN DO, LET'S PLAY A MOBILE GAME	95
<i>Nishaben Desai Dholakiya, Milos Ferjencik, Josef Brozek, Zdenek Jalovy, Jan Kubik</i>	
(144C) LEVERAGING ADVANCED DATA ANALYTICS TO IMPROVE PROCESS AND PLANT SAFETY	105
<i>Charles Fialkowski</i>	
(145A) DATA-ASSISTED OPTIMIZATION	106
<i>Fani Boukouvala, Jianyuan Zhai, Sun Hye Kim, William Bradley</i>	
(145B) PREDICTIVE MODELING FOR PRODUCT QUALITY IN POLYMERIZATION PROCESS.....	107
<i>Andrea Cavalier, Yanling Wu, Sanjay Sharma, Charles Neal</i>	
(145C) SOFT SENSOR DEVELOPMENT FOR INDUSTRIAL MILK POWDER PROCESS SYSTEMS	108
<i>Irina Boiarkina, Arrian Prince-Pike, Nick Depree, Wei Yu, David Wilson, Brent R. Young</i>	
(146A) PERSISTENT HOMOLOGY TO VISUALIZE BATCH DATA SETS IN CHEMICAL PROCESSES.....	109
<i>Marcus Webb, Ivan Castillo, Leo H. Chiang</i>	
(146B) MANUFACTURING SMART IDEAS -- NEW IDEAS ON MOVING R&D INNOVATIONS TO MANUFACTURING FASTER AND AT HIGHER VALUE	110
<i>Darrell Velegol</i>	
(146C) MACHINE LEARNING TECHNIQUES APPLIED TO CLASSICAL PRODUCT PROPERTIES.....	111
<i>Suryakant Suryakant, Benoit Celse, Denis Guillaume, Victor Lameiras Franco Da Costa</i>	
(162A) ALARM MANAGEMENT USING DATA-DRIVEN METHODS	112
<i>Pankaj Goel, Efstratios N. Pistikopoulos, M. Sam Mannan, Aniruddha Datta</i>	
(162B) FINDING UNKNOWN ANOMALIES BEFORE THEY RISK PROCESS SAFETY	113
<i>Tim Holtan</i>	

(162C) DIGITALIZATION IN PROCESS SAFETY: FIRE RISK PREDICTION ANALYTICS	114
<i>Sulo Belawan</i>	
(163A) BIG DATA, IIOT, & DIGITALIZATION: THAT'S THE ANSWER, WHAT'S THE QUESTION	115
<i>Mike Brooks</i>	
(163B) DATA ANALYTICS GIVES MANUFACTURING PLANTS INSIGHTS FOR CONTINUOUS IMPROVEMENT	116
<i>John Scheible</i>	
(163C) READY FOR DIGITALIZATION - DON'T MISS THE TRAIN	117
<i>Jonas Norinder</i>	
(164A) BEST BIG DATA ANALYTICS PLATFORM FOR MANUFACTURERS	118
<i>David Pope, Ruqaiya Shipchandler</i>	
(164B) AN HOLISTIC APPROACH FOR BATCH ANALYSIS AND MONITORING	119
<i>Chaojun Xu, Martin Hollender, Benedikt Schmidt, Liwei Huang</i>	
(164C) PREDICTIVE MAINTENANCE WITH MACHINE LEARNING	120
<i>Samvith Rao</i>	
(166A) HEAT EXCHANGER FOULING AND CLEANING ANALYSIS FOR COMPLEX NETWORK	121
<i>Yanling Wu, Paul Bonner</i>	
(166B) PERFORMANCE EVALUATION OF ALTERNATIVE TECHNOLOGIES FOR FOULING MITIGATION IN REFINERY PRE-HEAT TRAINS	122
<i>Francesco Coletti, Emilio Diaz-Bejarano</i>	
(166C) CRUDE UNIT FOULING: CONSEQUENCES AND COSTS	123
<i>Andrew W. Sloley</i>	
(178A) ACCELERATING PRODUCT INNOVATION AT DOW THROUGH MULTIVARIATE MODELING	138
<i>Brandon Corbett, Marlene Cardin, Kristin Wallace, Alix Schmidt, Haseeb Moten, Rebecca Beeson</i>	
(178B) MECHANICAL RELIABILITY IN THE CHEMICAL INDUSTRY: CHALLENGES AND SUCCESSES IN PREDICTIVE MAINTENANCE MODELING	139
<i>Kaytlin Henderson, Michael Dessauer, Birgit Braun, Mary Beth Seasholtz</i>	
(178C) DEEP LEARNING-BASED SENSOR FOR CRYSTAL SIZE AND CONTOUR CHARACTERIZATION	140
<i>Vidhyadhar Manee, Wenbo Zhu, Jose Romagnoli</i>	
(179A) REINFORCEMENT LEARNING (RL) BASED DATA-DRIVEN DECISION SUPPORT SYSTEM	141
<i>Pankaj Goel, Efstratios N. Pistikopoulos, M. Sam Mannan, Aniruddha Datta</i>	
(179B) A SEQUENCE TO SEQUENCE TIME SERIES FORECASTING MODEL FOR BATCH PROCESSES WITH SEASONALITY	142
<i>Shu Xu, Mark Nixon</i>	
(179C) PROGRESS TOWARD MACHINE LEARNING METHOD FOR CORROSION SURVEILLANCE OF NUCLEAR MATERIALS STORAGE CONTAINERS	155
<i>Bruce Hardy, Taylor Clingenpeel, Jason Bakos, Anna Dentremont, Michael Martinez-Rodriguez, Brenda Garcia-Diaz, Lindsay Roy</i>	
(191A) VISUALIZING CHEMICAL PROCESS DATA VIA DIMENSIONALITY REDUCTION	165
<i>Mark Joswiak, Ivan Castillo, Leo H. Chiang</i>	
(191B) MINIMIZING BATCH CYCLE TIME USING EVOLUTIONARY DESIGN OF DYNAMIC EXPERIMENTS	166
<i>Christos Georgakis, Swee-Teng Chin, Zhenyu Wang, Philippe Hayot, John M. Wassick, Leo H. Chiang, Ivan Castillo</i>	
Author Index	