

Fuels and Petrochemicals Division 2020

Held at the 2020 AIChE Spring Meeting and 16th Global
Congress on Process Safety

Online
17 - 21 August 2020

ISBN: 978-1-7138-2346-9

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 AIChE
All rights reserved.

Printed with permission by Curran Associates, Inc. (2021)

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

(1A) 2020 AICHE SPRING MEETING & 16TH GCPS AGILE AWARD KEYNOTE ADDRESS - BEYOND THE HORIZON: THE FACTORS AND FORCES AFFECTING THE GLOBAL PETROCHEMICAL INDUSTRY	1
<i>Bhavesh V. (Bob) Patel</i>	
(4B) DIGITAL TRANSFORMATION IN CHEMICAL INDUSTRY	2
<i>Lloyd Colegrove</i>	
(16A) SECURING ENTERPRISES VIA CYBERSECURITY UNDERSTANDING, RESILIENCY, AND EDUCATION	3
<i>Matt Loeb</i>	
(23B) MO DOPED NOVEL SOLID ACID CATALYSTS: A COMPARATIVE STUDY FOR METHANE AROMATIZATION	4
<i>Ashraf Abedin, Swarom Kanitkar, Srikar Bhattar, James J. Spivey</i>	
(24A) HAZARD IDENTIFICATION AND RISK ANALYSIS FOR RETROFITTING A BIOREFINERY	6
<i>Sean Dee, David C. Hietala, Taylor Sulmonetti</i>	
(45A) TECHNO-ECONOMIC ANALYSIS OF DIRECT METHANE AROMATIZATION FOR NATURAL GAS UPGRADING WITH MINI-PLANT CONSTRUCTION FOR REMOTE DEPLOYMENT	7
<i>Michael D. Sees, Lauren Ward, Sheima J. Khatib, Chau-Chyun Chen</i>	
(45C) COMBINED XPEEM AND STXM STUDY OF COKE FORMATION ON HIGH TEMPERATURE AL-CONTAINING ALLOY DURING STEAM CRACKING OF ETHANE	8
<i>Manjunath Patil, Jia Zhang, Brecht Laforce, Rachid Belkhou, Sufal Swaraj, Hilde Poelman, Vladimir Galvita, Laszlo Vincze, Guy B. Marin, Marie-Françoise Reyniers, Kevin Van Geem</i>	
(46C) DATA INFRASTRUCTURE AS FOUNDATION TO OPERATIONAL EXCELLENCE AND DIGITAL TRANSFORMATION.....	12
<i>Stephen Reynolds</i>	
(46A) HOW TO REALIZE YOUR DIGITAL TRANSFORMATION	13
<i>Jonas Norinder, Ilro Esko</i>	
(46B) PILOTING DIGITALIZATION AT DUPONT.....	14
<i>Donald Mack, James Simmons</i>	
(144A) ELECTRIFICATION, PROCESS INTENSIFICATION, AND ARTIFICIAL INTELLIGENCE FOR MODULAR AND IMPROVED CHEMICAL MANUFACTURING.....	15
<i>Montgomery Baker-Fales, Tai-Ying Chen, Dionisios G. Vlachos</i>	
(144B) ADVANCED INTEGRATED TECHNIQUES FOR QUANTIFYING KINETICS AND TRANSPORT PARAMETERS IN MULTIPHASE REACTORS	16
<i>Binbin Qi, Omar J. Farid, Sebastián Uribe, Humayun Shariff, Muthanna Al-Dahhan</i>	
(144C) PROCESS INTENSIFIED CONVERSION OF STRANDED ENERGY RESOURCES TO VALUE-ADDED LIQUID PRODUCTS FOR DISTRIBUTED PRODUCTION	17
<i>Jianli Hu, Dushyant Shekhawat, Christina Wildfire, Götz Vesper, Debangsu Bhattacharyya, Joseph B. Powell</i>	

(108A) KEYNOTE: INDUSTRIAL CLEANING: TOWARDS CONDITION-BASED CLEANING.....	19
<i>Hans Borgt</i>	
(108C) CONDITION-BASED CLEANING MODELS FOR INDUSTRIAL HEAT EXCHANGERS	20
<i>Emilio Diaz-Bejarano, Hans Borgt, Robert Mol, Guus Euwen, Dick Euwen, Francesco Coletti</i>	
(131A) MONITORING-BASED FOULING MITIGATION IN CRUDE UNIT PREHEAT TRAINS USING LAB AND FIELD FOULING UNITS.....	21
<i>C. B. Panchal, Francesco Coletti, Emilio Diaz-Bejarano</i>	
(137A) ADVANCED PROCESS CONTROL OPTIMUM MAINTENANCE	22
<i>Stephen Mayo, Sundararajan V. Madihally, R. Russell Rhinehart</i>	
(74B) BENEFITS OF DEPLOYING PACE, A NEW APC TECHNOLOGY	23
<i>Fady Kantara</i>	
(74C) BATCH APC: ADDRESSING A LONG-STANDING PROBLEM IN THE PROCESS INDUSTRY	24
<i>Lucas Reis, Jacky Lao, Alex Kalafatis</i>	
(171A) PROCESS INTENSIFICATION OF TERNARY DISTILLATION USING DYNAMIC OPTIMIZATION METHOD AND DATA-DRIVEN APPROACH	25
<i>Lingqing Yan, Tewodros L. Deneke, Keijo Heljanko, Ilro Harjunkoski, Paul Witt, Thomas F. Edgar, Michael Baldea</i>	
(171B) PROCESS INTENSIFICATION OF CO ₂ ABSORPTION USING AN ADDITIVELY MANUFACTURED INTENSIFIED PACKING DEVICE	27
<i>Costas Tsouris, Eduardo Miramontes, Ella Jiang, Lonnie Love, Xin Sun, Canhai Lai</i>	
(171D) AN EFFICIENT AND RELIABLE NUMERICAL METHOD FOR COMPUTING COUPLED MULTICOMPONENT FLUXES FOR COMPLEX MIXTURES ACROSS ASYMMETRIC MEMBRANES	28
<i>Dylan Weber</i>	
(171E) ETHYLENE PRODUCTION USING OXIDATIVE DEHYDROGENATION: EFFECTS OF ALTERNATIVE SEPARATION TECHNOLOGIES ON PROCESS SAFETY & ECONOMICS	30
<i>Anne M. Gaffney, Natalie V. Duprez, Kelsey J. Louthan, Kenneth L. Roberts</i>	
(171G) ENERGY EFFICIENT SEPARATIONS OF OLEFINS AND PARAFFINS THROUGH A MEMBRANE II	31
<i>William Charlton, Hannah Murnen, Sudip Majumdar</i>	
(179A) WHEN DISASTERS HAPPEN: A COLLABORATIVE APPROACH TOWARDS THE COMMUNITY'S RECOVERY PROCESS	32
<i>Thomas Munoz</i>	
(87A) PLANT OF THE FUTURE	33
<i>Douglas C. White, Jack Chosnek, Francesco Coletti</i>	
(115A) UNTAPPED ADVANCED CONTROL CAPABILITIES IN MODERN DISTRIBUTED CONTROL SYSTEMS	34
<i>Michael Taube</i>	

(115C) TOWARDS TAILOR-MADE AUTOMATICALLY CONTROLLED COMPOSITIONAL GRADIENT COPOLYMERS	35
<i>Julia Siqueira, Aide Wu, Fabio Herbst Florenzano, Shuchen Li, Wayne F. Reed</i>	
(74A) ADVANCED PROCESS CONTROL CAPITAL INVESTMENT	36
<i>Stephen Mayo, R. Russell Rhinehart, Sundararajan V. Madihally</i>	
(60A) PROCESS AND ADSORBENT FOR SEPARATING ETHANOL AND ASSOCIATED OXYGENATES FROM A BIOFERMENTATION SYSTEM.....	37
<i>Deepak Sharma</i>	
(60B) PUMP SAFETY, THE UNDISCUSSED TOPIC IN CHEMICAL INDUSTRY LEADING TO SEVERAL FATAL INCIDENTS	38
<i>Deepak Sharma</i>	
(60F) NEW KIND OF LINEAR NANOCOMPOSITE APPLIED IN IMPROVING RHEOLOGICAL BEHAVIOR OF CRUDE OIL AND ITS MECHANISM STUDIED THROUGH MOLECULAR SIMULATION METHOD	39
<i>Zheng Peng, Wei Wang, Weijie Yu, Huirong Huang, Jing Gong</i>	
(60G) SOLAR ENERGY CONVERSION AND NOISE CHARACTERIZATION SENSING IN BUILDING INTEGRATED SOLAR PHOTOVOLTAIC DEVICES WITH VENTILATION	40
<i>Himanshu Dehra</i>	
(60H) STRUCTURAL CHARACTERIZATION AND MODEL REPRESENTATION OF VITRINITE-RICH INDIA COAL BY USING ADVANCED ANALYTICAL TECHNIQUES	41
<i>Yash Jaiswal, Sunderlal Pal</i>	
(60K) LIFE MANAGEMENT OF HIGH ENERGY PIPING WITH HIGHLIGHTS FROM ASME B31.1	42
<i>Ben Ruchte, Wendy Weiss</i>	
(60O) OPTIMIZATION OF C3MR LNG LIQUEFACTION PROCESS USING A PARALLELIZED SIMULATOR	43
<i>Trevor Rice, Yoshitsugi Kikkawa, Mingder Lu</i>	
(60P) MODIFYING FISCHER-TROPSCH REACTION SEQUENCE WITH ADDITION OF ZEOLITE TO IRON-BASED ACTIVATED-CARBON SUPPORTED CATALYST	44
<i>Avinashkumar Karre</i>	
(60T) LATERAL RETENTION FORCE REQUIRED FOR SLIDING SALINE DROPLETS OVER SILANIZED SILICON SURFACE	45
<i>Yagna Valkya Reddy Bhimavarapu, Appu Vinod, Akash Jena, Rafael Tadmor</i>	
(60U) STUDY OF DROPLET MOTION ACROSS POLYMERIC SUBSTRATES BY CENTRIFUGAL ADHESION BALANCE (CAB)	46
<i>Akash Jena, Yagna Valkya Reddy Bhimavarapu, Appu Vinod, Sirui Tang, Rafael Tadmor</i>	
(60W) POPULATION BALANCE MODELING AND SPATIALLY-ORIENTED CONTROL FOR CRYSTAL SIZE AND SHAPE IN CRYSTALLIZATION PROCESSES	47
<i>Marcellus G. F. De Moraes, Martha A. Grover, Argimiro Resende Secchi, Maurício B. De Souza Jr., Paulo L. C. Lage</i>	
(60AE) AUDITING THE PROCESS HAZARD ANALYSIS - KEY CHARACTERISTICS TO SCRUTINIZE IN A GOOD-QUALITY HAZOP STUDY AND SUPPORTING EFFECTIVE HAZOP STUDY UPDATES	49
<i>Steven T. Maher</i>	

(60AF) DEVELOPMENT OF HIGH PERFORMANCE ORGANIC-BASED CATHODES	50
<i>Sarwan S. Sandhu, Joseph P. Fellner</i>	
(60AK) ELECTROCHEMICAL KINETICS OF DEGRADATION OF GRAPHITE ANODES IN LITHIUM ION BATTERIES.....	51
<i>Supratim Das, Martin Z. Bazant</i>	
(60AU) MODEL DEVELOPMENT OF SOLID OXIDE FUEL CELL THERMAL PERFORMANCE USING ARTIFICIAL NEURAL NETWORK	53
<i>Mohammad Biswas, Kamwana Mwaru</i>	
(60AW) IMPACT OF SPACER NATURE ON RHEOLOGICAL PROPERTIES OF CATIONIC GEMINI SURFACTANT	54
<i>Shams Kalam, Muhammad Shahzad Kamal, Shirish Patil, S. M. Shakil Hussain</i>	
(60AX) REAL TIME ENERGY MANAGEMENT SYSTEMS IMPLEMENTATION FOR CONTINUALLY OPTIMIZED PERFORMANCE.....	55
<i>Pablo Montagna</i>	
(60AN) ANALYSIS OF FUEL CELL SYSTEM THROUGH PROJECT BASED LEARNING FOR APPLICATION OF CLASSICAL THERMAL FLUID CONCEPTS IN MECHANICAL ENGINEERING LABORATORY COURSE	56
<i>Mohammad Biswas</i>	
(60BD) MEASURED VERSUS CALCULATED SOUR GAS PROPERTIES	57
<i>Nasrin Nasimi</i>	
(60BL) THE STUDY OF A S-CO ₂ OXY-FUEL COMBUSTION POWER PLANT FOR LOW GRADE COALS	58
<i>Hyung Woo Kim, Su Been Seo, Seo Young Kang, Eun Sol Go, See Hoon Lee</i>	
(60BM) CHARACTERIZATION AND PERFORMANCE ASSESSMENT OF OIL ENTRAPMENT BY COMMERCIALY AVAILABLE SURFACTANTS.....	59
<i>Julia Siqueira, Lauren Ritz, Shuchen Li, Curtis W. Jarand, Wayne F. Reed</i>	
(60BN) DESIGNING A NATIVE MODEL FOR ASSESSMENT OF THE EFFECTIVENESS OF ADVERTISING	60
<i>Sorush Niknamian</i>	
(60BO) STUDY OF NATURAL ANTIOXIDANT INHIBITORS FOR CORROSION PROTECTION OF MILD STEEL IN ACIDIC MEDIUM.....	96
<i>Ibtihal Albahrani</i>	
(60BP) VERIFICATION OF FIREFIGHTERS' HEURISTICS AND PREDICTIVE MODEL DEVELOPMENT THROUGH BIG DATA ANALYSIS.....	105
<i>Sohyeon Park, Eunji Shin, Dongil Peter Shin, Jeonghoon Park</i>	
(60BT) CONVERTING SHELTER-IN-PLACE LOCATIONS TO ZERO VULNERABILITY SAFE HAVENS	106
<i>James Rau, Ashlee Young, Meghan McDermott</i>	
(60BW) HOW THE FIELD OF HUMAN FACTORS HELPS SOLVE THE RIDDLE OF SERIOUS INJURIES AND FATALITIES	120
<i>Chason Coelho, Sunil Lakhiani, Delmar Trey Morrison</i>	

(60BX) INITIAL CONDITIONS USED IN ATMOSPHERIC DISPERSION MODELS:ISSUES WITH COMMONLY USED ASSUMPTIONS FOR GAS JETS AND PLUMES	121
<i>Thomas O. Spicer III, Chad T. Smith</i>	
(60BZ) FAULT TREE UNCERTAINTY ANALYSIS.....	122
<i>Raymond Randy Freeman</i>	
(60CD) MAKING THE MOST OF YOUR PHA	152
<i>Steven T. Maher, Morgan McVey</i>	
(60CN) THEORETICAL ANALYSIS OF THE VIABILITY OF ISOPROPANOL-CYCLOHEXANE SOLVENT SYSTEMS FOR BIOMATTER LIPID EXTRACTION.....	153
<i>Kyle Zappi</i>	
(60CO) TECHNO-ECONOMIC ANALYSIS OF THE CONVERSION OF CH ₄ AND CO ₂ INTO ACETIC ACID USING MICROWAVE PLASMA	154
<i>Abdulrahman S. Alsuhaibani, Marco Avendano, Mahmoud El-Halwagi</i>	
(60CQ) MODEL PREDICTIVE CONTROL DESIGN FOR THE ALLAM POWER PLANT INTEGRATED WITH AN AIR SEPARATION UNIT.....	155
<i>Dan Fernandes, Md Emdadul Haque, Song Wang, Daniel Chen, Srinivas Palanki</i>	
(60CR) EXPLORE THE FUNCTION OF ION-EXCHANGE MEMBRANE (IEM) IN MEMBRANE CAPACITIVE DEIONIZATION (MCDI) CELL, AN ALTERNATIVE TECHNIQUE IN BRACKISH WATER DESALINATION FIELD	156
<i>Xin Zhang, Danny Reible</i>	
(60CT) AN INTEGRATED PROCESS FOR THE PRODUCTION OF PROPYLENE GLYCOL FROM SHALE GAS	157
<i>Md Emdadul Haque, Namit Tripathi, Qiang Xu, Srinivas Palanki</i>	
(60DC) MONITORING METHODS FOR FAULT DETECTION AND DIAGNOSIS: ALGORITHMS AND APPLICATIONS	158
<i>M. Ziyen Sheriff</i>	
(60DE) SELECTIVE SEPARATION OF INDUSTRIAL RELEVANT METAL IONS FROM HIGH TDS WATER USING WAFER-ENHANCED ELECTRODEIONIZATION (WE-EDI)	159
<i>Humeyra B. Ulusoy Erol</i>	
(60DF) INFLUENCE OF PARTICLES ON AMINE LOSSES DURING CO ₂ CAPTURE: A PROCESS SIMULATION COUPLED AEROSOL DYNAMICS MODEL _	160
<i>David Dhanraj</i>	
(137D) ADVANCED PROCESS CONTROL CONTINUOUS IMPROVEMENT	162
<i>Stephen Mayo, R. Russell Rhinehart, Sundararajan V. Madihally</i>	
(137C) MISSED OPPORTUNITIES IN PROCESS CONTROL	163
<i>Gregory McMillan</i>	
(74D) FLARE CONTROL OPTIONS UNDER THE NEW FLARE REGULATIONS.....	164
<i>Herman Holm, Troy Boley</i>	
(145B) MILD THERMAL CRACKING OF OIL SANDS BITUMEN.....	165
<i>Yi Zhang</i>	
(145C) K-SAAT, A BREAK-THROUGH SOLID ACID ALKYLATION TECHNOLOGY.....	166
<i>Megha Shukla, Brian Heasley</i>	

(155B) A PRACTICAL APPLICATION OF DETECTION-BASED MULTICLASS CLASSIFICATION OF FAULTS: TENNESSEE EASTMAN PROCESS	167
<i>Nour Basha, M. Ziyen Sheriff, Costas Kravaris, Hazem Nounou, Mohamed Nounou</i>	
(155C) PRACTICAL MACHINE LEARNING FOR PROCESS CONTROL, MONITORING AND DIAGNOSTICS	169
<i>Ashwin N. Venkat</i>	
(156B) FIRED HEATER CONVECTION SECTION STEAM GENERATION TUBE FAILURE (UNDERSTANDING THE IMPACT OF FLOW REGIME AND HIGH PEAK HEAT FLUX PROFILES)	170
<i>Bijal Gangar</i>	
(156C) A SIMULATION WORKFLOW FOR FLOW, THERMAL, AND VIBRATION ANALYSIS OF HVU TRANSFER LINE	171
<i>Minkyu Han, Krishnadas S. Kshetrimayum, Yongjae Jang, Min-Sung Chae, Jaeyeol Park, Wonhee Cho</i>	
(245A) SPONSORED TECHNOLOGY WORKSHOP - CAPITAL ASSET LIFECYCLE MANAGEMENT - SIEMENS	172
<i>Ed Leggott, Bill Hahn</i>	
(177B) A PRACTICAL APPLICATION OF MODEL-BASED TECHNIQUES TO TRACK EQUIPMENT DEGRADATION AND PROCESS DRIFTS: MONITORING OF FOULING IN HEAT EXCHANGERS	173
<i>M. Ziyen Sheriff, Hazem Nounou, Costas Kravaris, Nazmul Karim, Mohamed Nounou</i>	

Author Index