

# **Environmental Division 2014**

**Core Programming Area at the 2014 AIChE Spring Meeting and  
10th Global Congress on Process Safety**

**New Orleans, Louisiana, USA  
30 March – 3 April 2014**

**ISBN: 978-1-63439-071-2**

**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© (2014) by AIChE  
All rights reserved.

Printed by Curran Associates, Inc. (2014)

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

AIChE  
3 Park Avenue  
New York, NY 10016-5991

Phone: (203) 702-7660  
Fax: (203) 775-5177

[www.aiche.org](http://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: 845-758-2634  
Email: [curran@proceedings.com](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

## TABLE OF CONTENTS

<b>(1a) Possible vs. Practical: Engineers Must Lead the Development of Practical Technologies .....</b>	<b>1</b>
<i>William Banholzer</i>	
<b>(5a) Hydrocarbons from Biogas Via Biogas Reforming, Syngas Cleaning and Catalytic Conversion .....</b>	<b>2</b>
<i>Qiangu Yan, Fei Yu, Jun Han</i>	
<b>(5b) Research for an Energy Future .....</b>	<b>4</b>
<i>Noah D. Meeks</i>	
<b>(5c) Environmental Impact of Bioenergy.....</b>	<b>5</b>
<i>Shijie Liu</i>	
<b>(27a) Air Permitting of a Major Capital Project at a Chemical Plant in Louisiana - .....</b>	<b>18</b>
<i>Peter,erson, Steve David</i>	
<b>(27b) Theoretical Screening of Mixed Solid Sorbents for CO<sub>2</sub> Capture Technology .....</b>	<b>20</b>
<i>Yuhua Duan</i>	
<b>(27c) Utilization of Carbonic Anhydrase-Displaying Escherichia Coli in the Foam Bioreactor to Capture and Sequester Carbon Dioxide .....</b>	<b>28</b>
<i>Eunsung Kan, Stuart Watson, Wei Wen Su, Zoey Malaluan</i>	
<b>(27d) Purification of Waste Carbon Dioxide from Ethylene Glycol Plants and its' Commercial Application .....</b>	<b>30</b>
<i>Abdul Wahab</i>	
<b>(27e) Fuel Based Approach for CO<sub>2</sub> Emission Factor Estimation .....</b>	<b>31</b>
<i>Mohammed S. Ba-Shammakh</i>	
<b>(27f) Adsorption of CO<sub>2</sub> and H<sub>2</sub>S from Natural Gas by Activated Fly Ash.....</b>	<b>32</b>
<i>Reyad Shawabkeh, Ibtelwaleed A. Hussein, Nadiir Al-Baghi, Hafiz Muhammad Zaheer Aslam</i>	
<b>(31a) Energy Systems Model: Development of a Discrete-Event Simulation Tool to Facilitate Operating Decisions.....</b>	<b>33</b>
<i>Intan Hamdan, Scott J. Bury, Rene Diaz</i>	
<b>(31b) Oxygenated Compounds as Reducing Agent for NO<sub>x</sub> Removal in a Selective Non-Catalytic Reduction (SNCR) System .....</b>	<b>35</b>
<i>Maoqi Feng, Reggie Zhan</i>	
<b>(31c) Flare Emission and Greenhouse Gas Reduction Study during an Ethylene Plant Startup on Recycle through Dynamic Simulation and Process Optimization .....</b>	<b>47</b>
<i>Ha Dinh, Shujing Zhang, Qiang Xu, Fadwa T. Eljack, Serveh Kamrava, Mahmoud El-Halwagi</i>	
<b>(31d) Chemical Plant Startup Simulations for Flare Emission Reduction.....</b>	<b>49</b>
<i>Jian Zhang, Ziyuan Wang, Qiang Xu, Thomas C. Ho</i>	
<b>(31e) Dynamic Simulation for Flare Minimization Strategy in an Ethylene Plant Shutdown.....</b>	<b>51</b>
<i>Ziyuan Wang, Qiang Xu, Thomas C. Ho</i>	
<b>(31f) Assessing the Use of Ceramic Membrane Bioreactor for Anaerobic Treatment of High-Load Food Wastewater at Bench Scale and Pilot Scale.....</b>	<b>53</b>
<i>Carlos M Negro, Luis Cortijo, Helen Barndok, Patricio Lopez, Daphne Hermosilla, Elena Meabe, José R. Santiago, Frank Rogalla</i>	
<b>(48a) Change Your Board Operator to a Process Manager with State-Based Control .....</b>	<b>56</b>
<i>Tom Nolan, Dustin Beebe</i>	
<b>(48aa) Huaa – When Learning Is Not Enough .....</b>	<b>71</b>
<i>Mike Bearrow</i>	
<b>(48ac) Autocad - Smart Grid – Agriculture - Architecture and the United States Government.....</b>	<b>75</b>
<i>Ethenia Scott</i>	
<b>(48ad) Production, Characterization and Catalytic Studies of Biobased Carbon Materials.....</b>	<b>76</b>
<i>Qiangu Yan, Jilei Zhang, Zhiyong Cai</i>	
<b>(48ag) Uncertainty in Sour Gas Viscosities Estimation, What Is the Effect on Your Reservoir Inflow and Tubing Performance .....</b>	<b>77</b>
<i>Adel Elsharkawy</i>	
<b>(48ah) Chromonic Nanocarriers for Chemotherapeutics: Size Distribution and Control Release Studies.....</b>	<b>78</b>
<i>Rahul Misra, Sanat Mohanty</i>	
<b>(48ai) Double Containment Piping Solutions for Safety and Environmental Concerns .....</b>	<b>79</b>
<i>Patrick Fedor, Darin Johnson</i>	

<b>(48b) DTP R Process: On-purpose Propylene Production Technology</b>	86
<i>Kazunori Honda, Atsushi Okita, Jumpei Takahashi, Koji Oyama, Nobuyasu Chikamatsu, Mitsuo Morita, Shuji Obayashi</i>	
<b>(48d) Self-Cleaning "Bernoulli" Type Filters Used in Onshore and Offshore Applications</b>	91
<i>Artur W. Krueger</i>	
<b>(48f) Effects of Support on Sulfur Tolerance and Regeneration of Pt Catalysts Measured By Ethylene Hydrogenation and EXAFS</b>	92
<i>Jorge Pazmino, Chuansheng Bai, Jeffrey T. Miller, Fabio H. Ribeiro, W.N. Delgass</i>	
<b>(48h) Improved Operational Efficiency and Reliability through Insulation Materials Selection</b>	93
<i>Steven Coppella</i>	
<b>(48j) Compliance with EPA Boiler MACT standards: Mercury-In-Fuel Gas</b>	94
<i>Patrick Laine</i>	
<b>(48k) Young Professional Simulation Tutorial</b>	95
<i>Naomi Hua, Mike Donahue</i>	
<b>(48m) Development Of Polymeric Sulfonic Acid Composite Membranes For Fuel Cell Applications</b>	99
<i>Jimoh Adewole, Abdullah S. Sultan, Amir Al-Ahmed, S. M. Jayid Zaidi</i>	
<b>(48o) Facility Siting for Major Projects – Implementation of Consequence Analysis/Quantitative Risk Analysis, a Project Development Lifecycle Framework</b>	107
<i>Mohammad Faruq Haider</i>	
<b>(48p) Global Energy and Transportation and Mobil Oil</b>	120
<i>Ethenia Scott</i>	
<b>(48r) Characterization of Iron Phthalocyanine As the Active Material for Lithium Batteries</b>	121
<i>Sarwan S. Sandhu, Joseph P. Fellner, David Anneken</i>	
<b>(48s) Design of a Free-Fall Reactor for Fast Pyrolysis of Waste Plastics</b>	122
<i>Pravin Kannan, Ahmed AlShoabi</i>	
<b>(48t) Biosorptive Dehydration of Ethanol/Water Azeotropes Using Compound Starch-Based Adsorbent</b>	123
<i>Wenping Wang, Jinsheng Sun, Xijia Cao, Guangxin Liu</i>	
<b>(48u) Purification of 2-Amino-1-Phenylethanol Enantiomers By a New Technique Combining Distillation and Crystallization</b>	125
<i>Lie-Ding Shiau, Hou-Guo Teng</i>	
<b>(48w) Fabrication of Low Cost Insulating Material from Kaolin Clay for Construction Purposes</b>	126
<i>Naim Faqir, M. A. Al-Harthi, Hamad AbdulWahhab, Mazen Alshaaeer, Reyad Shawabkeh</i>	
<b>(48x) Thermodynamic Study of Binary PAH (Anthracene + Phenanthrene) Solid Mixtures</b>	127
<i>James W. Rice, Jinxia Fu, Emma Sandström, Eric M. Suuberg</i>	
<b>(48y) How Confident Are You That Your Major Accident Risks Are Under Control?</b>	128
<i>Ellis Graeme, Robert Smith</i>	
<b>(48z) Sil Determination: Shortcomings with the Use of LOPA</b>	129
<i>Alan King</i>	
<b>(83a) A Recipe to Excel: Beyond Technical Competency</b>	131
<i>Syamal K. Poddar</i>	
<b>(83b) Managing Careers in Consulting and Engineering</b>	132
<i>R. Benson Pair</i>	
<b>(83c) Management Careers in an Industrial Setting</b>	139
<i>Frank van Lier</i>	
<b>(83d) Managing Through Extreme Change</b>	140
<i>T. Bond Calloway</i>	
<b>(83e) You Can Have it All, But Not at the Same Time</b>	141
<i>Rosemarie D. Wesson</i>	
<b>(83f) Managing Volunteers is a Little Like Herding Cats</b>	142
<i>Joseph Cramer</i>	
<b>(83g) Panel of Careers in Management Participants</b>	147
<i>Joseph Cramer, Frank van Lier, Syamal K. Poddar</i>	
<b>(91i) Oil-Water Separation System</b>	148
<i>William Moore</i>	
<b>(91b) What do a Trash Disposal Site and a Refinery Share in Common</b>	166
<i>Peter Nick</i>	
<b>(91c) Design Considerations for Boron Removal from Treated Industrial Wastewater, with Source Water from Desalination</b>	178
<i>William Celenza</i>	
<b>(91d) CO<sub>2</sub> BACT Preparation and Analysis</b>	189
<i>Joseph W Guida, Bruce A. Broberg</i>	

<b>(91e) Optimization of Water Network Design and Dynamic Operation for Agile Batch Manufacturing</b>	200
<i>Guanlong Li, Tianxing Cai, Qiang Xu</i>	
<b>(91f) Ross Technology: Field Demonstration Report</b>	210
<i>Bob Bradley</i>	
<b>(91g) Sustainable Treatment Processes of 1,4-Dioxane in Water</b>	213
<i>Julie Bliss, John Bergendahl</i>	
<b>(108a) Monetising Gas Hydrates: New Mode for Natural Gas Storage and Transportation Against LNG Storage and Transportation</b>	214
<i>Aman Dhanani, Ishan Shah</i>	
<b>(108b) Towards the Development of a Control-Relevant Model of the Hydraulic Fracturing Process to Investigate Various Control Strategies</b>	215
<i>Karlene A. Hoo, Qiuying Gu</i>	
<b>(108c) Shale Gas as a Potential Source of Unconventional Reserve for Crude Oil</b>	217
<i>Sagar Gaikwad, Utkarsh Maheshwari</i>	
<b>(120a) Achieving Environmental Compliance through Proper Destruction Efficiency of Multi-Tip Low-Profile (MTLP) Flare Systems</b>	218
<i>Joseph Smith, Scot Smith</i>	
<b>(120b) A Multi-Period Process Integration to the Management of Process Flares with Consideration of Fuel Substitution and Cogeneration Systems</b>	235
<i>Serveh Kamrava, Fadwa T. Eljack, Kerron Gabriel, Mahmoud El-Halwagi</i>	
<b>(120c) Real Time Remote Monitoring of Flare Combustion Efficiency</b>	236
<i>Youzheng Zeng, Jonathan Morris</i>	
<b>(120d) Flameless Thermal Oxidation</b>	247
<i>Gene Irrgang, Goutam Shahani</i>	
<b>(120e) Modeling of the Dynamic Interaction in an LDPE Closed System Purge Bins-Regenerative Thermal Oxidizer (RTO) for Ethylene Emission Mitigation</b>	248
<i>Teresa Leung, Kamal K. Botros, rea Stojcevski</i>	
<b>(120f) Air Quality Impact of the Startup of a Single Olefin Plant</b>	250
<i>Jian Zhang, Ziyuan Wang, Qiang Xu, Thomas C. Ho</i>	
<b>(126a) Hydraulic Fracturing - Water Reuse Challenges and Solutions</b>	252
<i>Andrew Collier, G. Todd Langford</i>	
<b>(126b) An Integrated Approach to Water Treatment and Recycle in Oil and Gas Production and Processing Via Thermal Membrane Distillation</b>	263
<i>Nesreen Elsayed, Maria Barrufet, Mahmoud El-Halwagi</i>	
<b>(126c) Simulation and Technological Analysis of Thermal Evaporation Methods for Produced Water Desalination</b>	264
<i>Liwen Chen, Helen Lou, Lili Xu, Danny Reible</i>	
<b>(126d) Marine Desalination by Solar Radiation</b>	282
<i>Gabriel Camargo, Filipe Sastoque</i>	
<b>(137a) Solid Fuel to Natural Gas Conversions for Existing Boiler Applications</b>	304
<i>Bill Gurski, John Guarco, Nando Nunziante</i>	
<b>(137b) Vapor Intrusion - Models and Their Value</b>	318
<i>Eric M. Suuberg, Rui Shen, Yijun Yao, Kelly Pennell, Niklas Novoa</i>	
<b>(137c) Synthesis, Fine Structural Characterization, and CO<sub>2</sub> Adsorption Capacity of Cobalt and Nickel-Based Metal Organic Framework-74</b>	320
<i>Abhijit Krishna Adhikari, Kuen-Song Lin</i>	
<b>(137d) Treatment of Flowback Water from Hydraulic Fracturing with Biochar</b>	324
<i>Maoqi Feng, Steven Cooks, Zhigang Feng</i>	
<b>(137e) Hazards Management for Building Locations through Air Dispersion Modeling</b>	337
<i>Morgan Reed, Tony Liu, Eric Peterson</i>	
<b>(137f) H2S Removal from Biogas Using an Ionic Liquid as Physical Absorbent</b>	338
<i>Ricardo Macias-Salinas, Isabel Luna</i>	
<b>(144a) The Growth of Idea Ownership: Patent Infringement and Risk Management within the Chemical Process Industries</b>	339
<i>Paul LaVanway</i>	
<b>(144b) Chemical Engineering &amp; the Law --Case Examples in Industrial Litigation</b>	354
<i>Satish Almala</i>	
<b>(144e) Determining the Liability of a Fire Starting Product</b>	361
<i>Carl Abraham</i>	
<b>(151a) Increasing Reliability and Functionality of Molecular Sieve Dehydrators</b>	398
<i>Benjamin A. Schmitt, Mikael Ekholm, Gene Eberhardt</i>	

<b>(151b) Zeolite Adsorption Studies for Conditioning of High-Pressure Natural Gas Fluids .....</b>	412
<i>Behnaz Hojjati, Rob Marriott</i>	
<b>(151c) Design of Units for Mercury Removal from Hydrocarbon Gas Streams.....</b>	423
<i>Robert W. Soffel, John Markovs</i>	
<b>(151d) Estimation of Calorific Value and Grindability of Colombian Caribbean Coals by Multiple Regression and Artificial Neural Networks.....</b>	425
<i>Yamid Alí Gómez Rueda, M. Ricardo Angulo Mercado</i>	
<b>Author Index</b>	