

# **Global Congress on Process Safety 2014**

**Topical Conference at the 2014 AIChE Spring Meeting and 10th Global Congress on Process Safety**

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

**ISBN: 978-1-63439-058-3**

**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>	1
<i>William Banholzer</i>	
<b>(46aa) How to Better Manage the Combined Effects of Barrier (IPL) Impairment and Ongoing Work Hazard Risks .....</b>	2
<i>Mike Neill</i>	
<b>(46ae) Comparative Consequence Analysis Between LNG Import and Export Terminals through the Use of PHAST and GIS .....</b>	3
<i>Guido Lamus, Bilkis Islam, Sonny Sachdeva, M. Sam Mannan</i>	
<b>(46ah) Challenges of Explosion Risk Management in Artic Environments .....</b>	4
<i>Derek M. Engel, Are Brattetrig, Tom Debold, Scott G. Davis</i>	
<b>(46b) Experimental Study On The Relationship Between The Charge Amount Of Polypropylene Granules and Electrostatic Discharges While Silo Loading .....</b>	5
<i>Kwangseok Choi</i>	
<b>(46e) Management of Change at Shell.....</b>	14
<i>Soy Tir</i>	
<b>(46f) Inherently Safer Design: Lessons Learned about the Principle of Simplification .....</b>	15
<i>Russell A. Ogle, Andrew R. Carpenter, Sean J. Dee, Brenton L. Cox</i>	
<b>(46g) On What Do You Base the Safety of Your Process .....</b>	23
<i>John Wincek</i>	
<b>(46i) The Need for a Unified Process Safety Map.....</b>	34
<i>Teddy Bucher, John T. Perez</i>	
<b>(46j) How Is Your Process Safety Vision? - Try Pursuing “Perfect Process Safety” .....</b>	35
<i>Steve Arendt</i>	
<b>(46k) Using Metrics to Improve Emergency Management.....</b>	36
<i>Rixio E. Medina</i>	
<b>(46l) Flame Propagation in Dust/Air Mixtures Under Reduced Pressure Conditions .....</b>	37
<i>Hannes Kern, Gerald J. Wieser, Harald Raupenstrauch</i>	
<b>(46n) Using Incident Risk Analysis to Learn from Near Misses .....</b>	47
<i>Sharon K. Tinker</i>	
<b>(46r) Use of Kpi's for Process Safety .....</b>	59
<i>Prasad Goteti</i>	
<b>(46s) Pssr: The Easiest and Sometimes Forgotten PSM Element .....</b>	60
<i>Brian D. Rains</i>	
<b>(46u) Kinetic Identification and Risk Assessment Based on Non-Linear Fitting of Calorimetric Data .....</b>	61
<i>Charles Guinand, Michal Dabros, Bertrand Roduit, Thierry Meyer, Francis Stoessel</i>	
<b>(46x) Integration of Learned Knowledge into the Technical Information System .....</b>	76
<i>Craig A. Richardson</i>	
<b>(46y) Control Systems Integrity Review - Selective Application of Controls Systems HAZOP (CHAZOP) Study .....</b>	77
<i>Steven T. Maher, David Bent, Whye Foong, Senem Weaver, Stephanie Smith</i>	
<b>(47f) Are We in Control of Our Safety Critical Equipment in Drilling Operations? .....</b>	78
<i>Claudio Castaneda, Luis Rincon</i>	
<b>(49b) Development of Low-Charring Nanocomposites to Aid in Fundamental Understanding of Nanocomposite Flame-Retardancy .....</b>	82
<i>Logan Hatanaka, Sonny Sachdeva, Agustin Diaz, Zhengdong Cheng, Qingsheng Wang, M Sam Mannan</i>	
<b>(43a) Best Practices in IPL Integrity Management - Case Study in Kuwait Oil Company .....</b>	91
<i>Chandra Seethepalli</i>	
<b>(47a) Multiple Perspectives on the Role of Safety Leadership in Major Hazard Organisations .....</b>	92
<i>Julie Bell, Waddah Ghanem, Chrysanthi Lekka</i>	
<b>(47ab) Using Explicit Finite Element Analysis to Simulate the Dynamic Response and Predict the Structural Damage Associated with a Real-Life Process Equipment Failure Due to an Internal Detonation .....</b>	93
<i>Phillip E. Pruetter</i>	
<b>(47ac) Analysis of the Potential Energy Sources of Risk of Tools in Presence of Hazardous Area in Segment of Oil and Gas .....</b>	107
<i>Leandro Erthal, Caetano Moraes, Denize D. Carvalho</i>	

<b>(47ad) Increase Hazard Discovery and Minimize Errors in Your Process Hazard Analyses, a Graph Theoretical Approach.....</b>	123
<i>Riffat Qadir</i>	
<b>(47af) Deflagration Incident Case Review .....</b>	141
<i>Amy Theis, Timothy Cullina, Zachary Hachmeister</i>	
<b>(47ag) Enhanced Lessons Learned Approach from the Bscat Investigation Approach.....</b>	142
<i>Robin Pitblado, Richard Green, Kate Ascher</i>	
<b>(47ah) Death of "Landlord" or Collapse of "Tomb", Which Matters More? - Some Perspectives of Engineering Ethics and Engineering Philosophy on Enterprise Global Risk Management.....</b>	143
<i>Long Zhang</i>	
<b>(47aj) New Tools to Aggregate Operational Risk Across an Enterprise of Assets and to Help Govern This Risk through Policy Which Can be Directly Linked to Front Line Decision Making .....</b>	144
<i>Mike Neill</i>	
<b>(47al) Inherently Safer Design Of Stirred Reactors and Visimix® Modeling Software .....</b>	145
<i>Yuri Nekhamkin, Leonid Braginsky, Yuri Kokotov</i>	
<b>(47am) An Easy and Accurate Design Of Safety Relief Valve Inlet Piping Systems For Gas/Vapor Relief.....</b>	158
<i>Guibing Zhao</i>	
<b>(47ao) Off-Gas Flammability Control for a High Level Nuclear Waste Glass Melter System Based on Process Modeling and Pilot Testing .....</b>	172
<i>Alexander S. Choi</i>	
<b>(47ap) Advancing Process Safety: Operating Risks and Solutions to SOP Compliance.....</b>	173
<i>Keith Lapeyrouse, Sam Solomon</i>	
<b>(47as) "Reducing the Frequency and Lowering the Severity of Human Error: Optimize Performance" .....</b>	192
<i>Tom Harvey</i>	
<b>(47au) Management of Process Safety Performance Indicators .....</b>	193
<i>Abdul Aldeeb, Vivek Sud</i>	
<b>(47av) Improving Process Safety Performance for Mature Asset By Implementing of the Process Safety Key Performance Indicator .....</b>	194
<i>Margaretha Thaliharjanti, Frik Febby</i>	
<b>(47aw) An Innovative Work Flow for Performing Overpressure Protection Analysis Incorporating Process Simulation, Pressure Relief Valve Sizing, and Flare System Analysis.....</b>	195
<i>Wilfried Mosor, Nick Brownrigg</i>	
<b>(47ax) Risk Based Inspection Applied at Aging Chemical Facilities .....</b>	196
<i>Jonas Duarte</i>	
<b>(47az) Identifying Early Indicators of Incidents through Near-Misses.....</b>	197
<i>Deborah L. Grubbe, Ankur Pariyani, Ulku Oktem</i>	
<b>(47b) A Methodology to Determine the Minimum Number of Pha's for Projects.....</b>	198
<i>Humbert Joseph Howard III</i>	
<b>(47ba) "People" Means Leadership, NOT Simply Mean People - 4 New Dimensions of Process Safety Competency.....</b>	207
<i>Long Zhang</i>	
<b>(47bc) Evaluating The Need For Depressuring Systems - A Methodology .....</b>	225
<i>Neil Prophet, Dave Gaydos, John Paschall</i>	
<b>(47bd) The Capability-Demand Gap In US Refining and Petrochemical Console Operations.....</b>	226
<i>George Dzyacky</i>	
<b>(47be) Process Safety Management (PSM) In Pilot Plants and Research Laboratories .....</b>	230
<i>Kabier Moideenkyty</i>	
<b>(47bf) Resolving Inherently Safer Design Conflicts with Decision Analysis .....</b>	231
<i>Russell A. Ogle, Sean J. Dee, Brenton L. Cox</i>	
<b>(47bj) Operating Safely through Integrated Process Safety Management .....</b>	232
<i>Alfonsius Ariawan</i>	
<b>(47bk) Improving PSM Performance through Workforce Culture Assessment .....</b>	237
<i>Carl Green</i>	
<b>(47bl) Tracking Instrumentation and Controls Reliability .....</b>	238
<i>Shane Pirtle, Brant Smith, Ad Arnold, Dr. Angela E. Summers</i>	
<b>(47bm) PSSR: The Easiest and Sometimes Forgotten PSM Element .....</b>	239
<i>Brian D. Rains</i>	
<b>(47bn) Guidelines for Pressure Relief and Effluent Handling Systems, 2nd Edition .....</b>	251
<i>Georges Melhem, Harold Fisher, Albert Ness</i>	
<b>(47bo) Journey to World Class through Capability Development.....</b>	252
<i>Lawrence S. Short</i>	

<b>(47bp) Incident Lessons Learned Portal .....</b>	253
<i>Marco Vela</i>	
<b>(47bq) A Functional System Approach to Criticality Analysis, FscA .....</b>	254
<i>Tacoma Zach</i>	
<b>(47br) Can Black Swans be Red Herrings? .....</b>	257
<i>Stephen Shaw</i>	
<b>(47bs) Emergency Response Plan: It's Above and Beyond Best Practices .....</b>	258
<i>Sarah Acton, Najmeh Vaez, Suresh Yelisetty, Dennis Butts</i>	
<b>(47bt) Process Safety Hazard Management Plan : Help You in Sustaining Production and Preventing Losses .....</b>	259
<i>Margaretha Thaliharjanti</i>	
<b>(47bw) Process Risk Assessment and "Safe Area" for a Petro-Chemical Plant in China .....</b>	260
<i>Jing Yu, S. Dharmavaram, Jiming Wang</i>	
<b>(47bx) Identifying and Quantifying MAJOR Hazard for Platforms Deck Raising Using Synchronous Hydraulic Jacking System .....</b>	261
<i>Akhmad Harmantoro, Margaretha Thaliharjanti</i>	
<b>(47by) A Creative &amp; Strategic Initiative (Champions Model) In Managing Process Hazard: Process Safety Culture .....</b>	275
<i>Sharad Rathore</i>	
<b>(47c) Defining Dust Hazard Areas .....</b>	276
<i>Michelle Murphy</i>	
<b>(47ca) Challenges and Achievements in Implementing Management of Change System at Binh Son Refinery (BSR), Vietnam .....</b>	277
<i>Bong Nguyen Thanh</i>	
<b>(47cd) Process Safety Culture Applied in Latin America Oil and Gas Industry: Experiences in Ecopetrol Colombia .....</b>	284
<i>Oscar Barajas</i>	
<b>(47cf) Ammonium Nitrate Condition-Dependent Thermal Decomposition .....</b>	285
<i>Zhe Han, Sonny Sachdeva, Maria Papadaki, M. Sam Mannan</i>	
<b>(47cg) CFD Modeling for Prediction and Prevention of Runaway Reaction .....</b>	286
<i>Edna Méndez, Yi Liu, M. Sam Mannan</i>	
<b>(47ch) Sensitivity Analysis of Variables Affecting the Runaway Decomposition of Dicumyl Peroxide .....</b>	287
<i>Olga Reyes-Valdes, Valeria Casson-Moreno, Luc Vechot</i>	
<b>(47ci) Beyond the Phi Factor: Correction of Experimental Data for Vaporization in Tempered Reactions, for Pressure-Relief System Design .....</b>	288
<i>Guibing Zhao</i>	
<b>(47cj) The Effect of Non-Uniform Distribution of Obstacles on Deflagration-to-Detonation Transition (DDT) .....</b>	302
<i>Camilo Rosas, Hao Chen, Eric L. Petersen, M. Sam Mannan</i>	
<b>(47ck) Dispersion Modeling of a Cloud Generated By Depressurization of a Flashing Multi-Component Liquid System .....</b>	303
<i>Laurent Nouailhetas, Ralph Mancik</i>	
<b>(47cl) Quantitative Analysis of Environmental and Societal Risk for Onshore FUEL Pipelines .....</b>	316
<i>Alexander Gutierrez, Lina Parra, Maria Camila Suárez, Felipe Muñoz</i>	
<b>(47cm) Characterization Of Vaporization Rates Of Liquid Nitrogen On Water and Ice .....</b>	318
<i>Nirupama Gopalaswami, Luc Vechot, Tomasz Olewski, M. Sam Mannan</i>	
<b>(47cn) Consequences Analysis Associated with the Failure of the Safety Interlock System of Methanator (I-351) of the Ammonia Plant of Fertilizantes Nitrogenados De Venezuela, C.E.C. (FertiNitro) .....</b>	331
<i>Ruben Garcilazo Sr., Juan Duarte Sr.</i>	
<b>(47cq) Building Siting Evaluation: A New Software Tool for the Determination of Blast Loads from Potential Vapour Cloud Explosions (VCEs) .....</b>	333
<i>Kehinde Shaba, Nic Cavanagh</i>	
<b>(47cr) Modelling of Time-Varying Dispersion from Ground-Level Liquid Pools or Vapour Area Sources .....</b>	334
<i>Henk W. M. Witlox, Mike Harper, Maria Fernandez</i>	
<b>(47cu) Nanotechnology on Removing Arsenic Using Modified Carbon NANO- Tubes (MCNTs) .....</b>	349
<i>Ahmed Ashiq</i>	
<b>(47cv) Possible Two Physical Hazard Scenarios for Polystyrene Foams, Based on Life Cycle Stages .....</b>	350
<i>Toyoaki Nakarai, Satoru Yoshino, Atsumi Miyake</i>	
<b>(47cw) Problems Encountered in the Development of a Process Safety Climate Tool .....</b>	364
<i>Julie Bell, Sarah Binch, Caroline Sugden</i>	

<b>(47d) Upper Explosible Limits for Combustible Dusts.....</b>	365
<i>Richard Prugh</i>	
<b>(47e) Agglomeration Effect on Combustion and Explosion Properties of Nanoparticles .....</b>	366
<i>Jiaqi Zhang, Yi Liu, Hao Chen, M. Sam Mannan</i>	
<b>(47g) Shock Interaction with Dust Layers for Different Mach Numbers and Dust Layer Depths.....</b>	379
<i>Amira Yousif Chowdhury, Brandon Marks, H. Greg Johnston, Eric L. Petersen, Sam M. Mannan</i>	
<b>(47h) Numerical Simulation of Cryogenic Boiling .....</b>	380
<i>Monir Ahammad, Yi Liu, Samina Rahmani, Luc Vechot, Sam Mannan</i>	
<b>(47i) Homogenous-Gaseous and Particle-Gas-Air Combustion in Turbulent Environment: Analytical Formulation and Experimental Validation .....</b>	381
<i>V'Yacheslav Akkerman, Ali S. Rangwala</i>	
<b>(47j) Application of Leading and Lagging Indicators to Improve Laboratory Operation Safety.....</b>	382
<i>Tianxing Cai, Qiang Xu</i>	
<b>(47q) Graphic Visualization of IPL Status Enables Better Judgement of Inspection, Maintenance and Repair Priorities and Helps Day to Day Assessment of Operational Risk and Work Management Decisions .....</b>	383
<i>Mike Neill</i>	
<b>(47r) 2. Successes in Implementing PHA/HAZOP/LOPA in Major Capital Projects in a Steel Company .....</b>	384
<i>William Bridges</i>	
<b>(47s) Liquid Fuels Release Rate Calculation in Transport Pipelines with Complex Topographical Conditions .....</b>	385
<i>Carlos A. Manjarres, Jaime E. Cadena, Felipe Munoz</i>	
<b>(47t) Decision Tree to Optimize NFPA 30 Criteria in Fire Protection Systems Applied in Oil and Gas Industry .....</b>	386
<i>Oscar Barajas</i>	
<b>(47u) Sil Determination of High Integrity Pressure Protection System (HIPPS) .....</b>	387
<i>Frik Febby, Margaretha Thaliharjanti</i>	
<b>(47w) Comparison of Different Methods to Determine the Activation Energy of Flammable Dusts Mixed with Inert and Inhibitory Materials .....</b>	388
<i>Christoph Wanke</i>	
<b>(47x) Economical Approach Quantification of Impacts in Major Accidents.....</b>	389
<i>Alexander Gutierrez, Carlos A. Manjarres, Felipe Muñoz</i>	
<b>(47z) Application of Consequence Analysis in the Development of Emergency Response Plans for Accidental Events in Liquid Fuels Transport Pipelines .....</b>	390
<i>Carlos A. Manjarres, Alexander Gutierrez, Felipe Munoz</i>	
<b>(52a) Shale Oil and Gas -Wellhead to Fuel.....</b>	391
<i>Lawrence Kremer</i>	
<b>Author Index</b>	