

29th Center for Chemical Process Safety International Conference 2014

(CCPS)

**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: 978-1-63439-159-7

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

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
Web: www.proceedings.com

TABLE OF CONTENTS

(1a) Possible vs. Practical: Engineers Must Lead the Development of Practical Technologies	1
<i>William Banholzer</i>	
(9a) Too Close For Comfort - Part 2	2
<i>Mike Broadribb</i>	
(9b) Root-Causes and Causal Factors: Effective Incident Investigation Closure	12
<i>Carlos A. Barrera and Abid Kemal</i>	
(9c) Performing Data Analysis Of a Company's Global Process Safety Events	21
<i>Kelly Keim</i>	
(22a) Application of Leading and Lagging Indicators to Improve Situation Awareness	37
<i>Tianxing Cai and Qiang Xu</i>	
(22b) Driving Performance Improvement Using Progressive Leading Indicators	52
<i>Mei-Li Lin and Joe Stough</i>	
(22c) Management Systems: Correcting for Wear and Tear	54
<i>Jatin N. Shah, Michael P. Broadribb</i>	
(41a) Assessing Thermal Stability - the Challenge of Powders	62
<i>Stephen Rowe and Swati Umbrajkar</i>	
(41b) Intrinsic Hazards Assessment: Chemical Reactivity Hazards Assessment for Nitration Processes and Nitrochemicals Handling	81
<i>S. Dharmavaram and R.W. Trebilcock</i>	
(41c) Safe Scale-up of Advanced Battery Materials	92
<i>Gregory K. Krumdick, Krzysztof Pupek and Trevor Dzwiniel</i>	
(46aa) How to Better Manage the Combined Effects of Barrier (IPL) Impairment and Ongoing Work Hazard Risks	93
<i>Mike Neill</i>	
(46ae) Comparative Consequence Analysis Between LNG Import and Export Terminals through the Use of PHAST and GIS	95
<i>Guido Lamus, Bilkis Islam, Sonny Sachdeva and M. Sam Mannan</i>	
(46ah) Challenges of Explosion Risk Management in Arctic Environments	97
<i>Derek M. Engel, Are Brattetrig, Tom DeBold and Scott G. Davis</i>	
(46b) Experimental Study On The Relationship Between The Charge Amount Of Polypropylene Granules and Electrostatic Discharges While Silo Loading	98
<i>Kwangseok Choi</i>	
(46e) Management of Change at Shell	107
<i>Soy Tir</i>	
(46f) Inherently Safer Design: Lessons Learned about the Principle of Simplification	108
<i>Russell A. Ogle, Andrew R. Carpenter, Sean J. Dee and Brenton L. Cox</i>	
(46g) On What Do You Base the Safety of Your Process	116
<i>John Wincek</i>	
(46i) The Need for a Unified Process Safety Map	127
<i>Teddy Bucher and John T. Perez</i>	
(46j) How Is Your Process Safety Vision? - Try Pursuing “Perfect Process Safety”	129
<i>Steve Arendt</i>	
(46k) Using Metrics to Improve Emergency Management	130
<i>Rixio E. Medina</i>	
(46l) Flame Propagation in Dust/Air Mixtures Under Reduced Pressure Conditions	132
<i>Hannes Kern, Gerald J. Wieser and Harald Raupenstrauch</i>	
(46n) Using Incident Risk Analysis to Learn from Near Misses	142
<i>Sharon K. Tinker</i>	
(46r) Use of Kpi's for Process Safety	154
<i>Prasad Goteti</i>	
(46s) Pssr: The Easiest and Sometimes Forgotten PSM Element	156
<i>Brian D. Rains</i>	
(46u) Kinetic Identification and Risk Assessment Based on Non-Linear Fitting of Calorimetric Data	157
<i>Charles Guinand, Michal Dabros, Bertrand Roduit, Thierry Meyer and Francis Stoessel</i>	
(46x) Integration of Learned Knowledge into the Technical Information System	172
<i>Craig A. Richardson</i>	

(46y) Control Systems Integrity Review - Selective Application of Controls Systems HAZOP (CHAZOP) Study	173
<i>Steven T. Maher, PE CSP, David Bent, Whye Foong, Senem Weaver and Stephanie Smith</i>	
(47bi) Process Safety Culture Best Practices	175
<i>Laurence Pearlman</i>	
(47f) Are We in Control of Our Safety Critical Equipment in Drilling Operations?	176
<i>Claudio Castaneda and Luis Rincon</i>	
(49b) Development of Low-Charring Nanocomposites to Aid in Fundamental Understanding of Nanocomposite Flame-Retardancy	180
<i>Logan Hatanaka, Sonny Sachdeva, Agustin Diaz, Zhengdong Cheng, Qingsheng Wang and M Sam Mannan</i>	
(43a) Best Practices in IPL Integrity Management - Case Study in Kuwait Oil Company	189
<i>Chandra Seethepalli</i>	
(47a) Multiple Perspectives on the Role of Safety Leadership in Major Hazard Organisations	191
<i>Julie Bell, Waddah Ghanem and Chrysanthi Lekka</i>	
(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	193
<i>Phillip E. Prueter</i>	
(47ac) Analysis of the Potential Energy Sources of Risk of Tools in Presence of Hazardous Area in Segment of OIL and Gas	207
<i>Leandro Erthal, Caetano Moraes and Denize D. Carvalho</i>	
(47ad) Increase Hazard Discovery and Minimize Errors in Your Process Hazard Analyses, a Graph Theoretical Approach	223
<i>Riffat Qadir</i>	
(47af) Deflagration Incident Case Review	241
<i>Amy Theis, Timothy Cullina and Zachary Hachmeister</i>	
(47ag) Enhanced Lessons Learned Approach from the Bscat Investigation Approach	242
<i>Robin Pitblado, Richard Green and Kate Ascher</i>	
(47ah) Death of "Landlord" or Collapse of "Tomb", Which Matters More? - Some Perspectives of Engineering Ethics and Engineering Philosophy on Enterprise Global Risk Management	244
<i>Long Zhang</i>	
(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	246
<i>Mike Neill</i>	
(47al) Inherently Safer Design Of Stirred Reactors and Visimix® Modeling Software	248
<i>Yuri Nekhamkin, Leonid Braginsky and Yuri Kokotov</i>	
(47am) An Easy and Accurate Design Of Safety Relief Valve Inlet Piping Systems For Gas/Vapor Relief	261
<i>Guibing Zhao</i>	
(47ao) Off-Gas Flammability Control for a High Level Nuclear Waste Glass Melter System Based on Process Modeling and Pilot Testing	275
<i>Alexander S. Choi</i>	
(47ap) Advancing Process Safety - Major Impact One Step at a Time	277
<i>Keith Lapeyrouse and Sam Solomon</i>	
(47as) "Reducing the Frequency and Lowering the Severity of Human Error: Optimize Performance"	296
<i>Tom Harvey</i>	
(47au) Management of Process Safety Performance Indicators	298
<i>Abdul Aldeeb and Vivek Sud</i>	
(47av) Improving Process Safety Performance for Mature Asset By Implementing of the Process Safety Key Performance Indicator	299
<i>Margaretha Thaliharjanti and Frik Febby</i>	
(47aw) An Innovative Work Flow for Performing Overpressure Protection Analysis Incorporating Process Simulation, Pressure Relief Valve Sizing, and Flare System Analysis	301
<i>Wilfried Mofor and Nick Brownrigg</i>	
(47ax) Risk Based Inspection Applied at Aging Chemical Facilities	303
<i>Jonas Duarte</i>	
(47az) Identifying Early Indicators of Incidents through Near-Misses	304
<i>Deborah L. Grubbe, Ankur Pariyani, PhD and Ulku Oktem, PhD</i>	
(47b) A Methodology to Determine the Minimum Number of Pha's for Projects	305
<i>Humbert Joseph Howard III</i>	

(47ba) "People" Means Leadership, NOT Simply Mean People - 4 New Dimensions of Process Safety Competency	314
<i>Long Zhang</i>	
(47bc) Evaluating The Need For Depressuring Systems - A Methodology	332
<i>Neil Prophet, Dave Gaydos and John Paschall</i>	
(47bd) The Capability-Demand Gap In US Refining and Petrochemical Console Operations	333
<i>George Dzyacky</i>	
(47be) Process Safety Management (PSM) In Pilot Plants and Research Laboratories	337
<i>Kabier Moideenkutty</i>	
(47bf) Resolving Inherently Safer Design Conflicts with Decision Analysis	339
<i>Russell A. Ogle, Sean J. Dee and Brenton L. Cox</i>	
(47bj) Operating Safely through Integrated Process Safety Management	340
<i>Alfonsius Ariawan</i>	
(47bk) Improving PSM Performance through Workforce Culture Assessment	345
<i>Carl Green</i>	
(47bl) Tracking Instrumentation and Controls Reliability	346
<i>Shane Pirtle, Brant Smith, AD Arnold and Dr. Angela E. Summers</i>	
(47bm) PSSR: The Easiest and Sometimes Forgotten PSM Element	347
<i>Brian D. Rains</i>	
(47bn) Guidelines for Pressure Relief and Effluent Handling Systems, 2nd Edition	359
<i>Georges Melhem, Harold Fisher and Albert Ness</i>	
(47bo) Journey to World Class through Capability Development	360
<i>Lawrence S. Short</i>	
(47bp) Incident Lessons Learned Portal	361
<i>Marco Vela</i>	
(47bq) A Functional System Approach to Criticality Analysis, Fscs	363
<i>Tacoma Zach</i>	
(47br) Can Black Swans be Red Herrings?	366
<i>Stephen Shaw</i>	
(47bs) Emergency Response Plan: It's Above and Beyond Best Practices	367
<i>Sarah Acton, Najmeh Vaez, Suresh Yelisetty and Dennis Butts</i>	
(47bt) Process Safety Hazard Management Plan : Help You in Sustaining Production and Preventing Losses	368
<i>Margaretha Thaliharjanti</i>	
(47bw) Process Risk Assessment and "Safe Area" for a Petro-Chemical Plant in China	370
<i>Jing Yu, S. Dharmavaram and Jiming Wang</i>	
(47bx) Identifying and Quantifying MAJOR Hazard for Platforms Deck Raising Using Synchronous Hydraulic Jacking System	372
<i>Akhmad Harmantoro and Margaretha Thaliharjanti</i>	
(47by) A Creative & Strategic Initiative (Champions Model) In Managing Process Hazard: Process Safety Culture	386
<i>Sharad Rathore</i>	
(47c) Defining Dust Hazard Areas	388
<i>Michelle Murphy</i>	
(47ca) Challenges and Achievements in Implementing Management of Change System at Binh Son Refinery (BSR), Vietnam	389
<i>Bong Nguyen Thanh</i>	
(47cd) Process Safety Culture Applied in Latin America Oil and Gas Industry: Experiences in Ecopetrol Colombia	396
<i>Oscar Barajas</i>	
(47cf) Ammonium Nitrate Condition-Dependent Thermal Decomposition	397
<i>Zhe Han, Sonny Sachdeva, Maria Papadaki and M. Sam Mannan</i>	
(47cg) CFD Modeling for Prediction and Prevention of Runaway Reaction	398
<i>Edna Méndez, Yi Liu and M. Sam Mannan</i>	
(47ch) Sensitivity Analysis of Variables Affecting the Runaway Decomposition of Dicumyl Peroxide	400
<i>Olga Reyes-Valdes, Valeria Casson-Moreno and Luc Vechot</i>	
(47ci) Beyond Phi Factor: Qualified Experimental Data for Emergency Relief Sizing	402
<i>Guibing Zhao</i>	
(47cj) The Effect of Non-Uniform Distribution of Obstacles on Deflagration-to-Detonation Transition (DDT)	416
<i>Camilo Rosas, Hao Chen, Eric L. Petersen and M. Sam Mannan</i>	

(47ck) Dispersion Modeling of a Cloud Generated By Depressurization of a Flashing Multi-Component Liquid System	418
<i>Laurent Nouailhetas and Ralph Mancik</i>	
(47cl) Quantitative Analysis of Environmental and Societal Risk for Onshore FUEL Pipelines	431
<i>Alexander Gutierrez, Lina Parra, Maria Camila Suárez and Felipe Muñoz</i>	
(47cm) Characterization Of Vaporization Rates Of Liquid Nitrogen On Water and Ice	433
<i>Nirupama Gopaldaswami, Luc Vechot, Tomasz Olewski and M. Sam Mannan</i>	
(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)	446
<i>Ruben Garcilazo Sr. and Juan Duarte Sr.</i>	
(47cq) Building Siting Evaluation: A New Software Tool for the Determination of Blast Loads from Potential Vapour Cloud Explosions (VCEs)	448
<i>Kehinde Shaba and Nic Cavanagh</i>	
(47cr) Modelling of Time-Varying Dispersion from Ground-Level Liquid Pools or Vapour Area Sources	450
<i>Henk W.M. Witlox, Mike Harper and Maria Fernandez</i>	
(47cu) Nanotechnology on Removing Arsenic Using Modified Carbon NANO- Tubes (MCNTs)	465
<i>Ahmed Ashiq</i>	
(47cv) Possible Two Physical Hazard Scenarios for Polystyrene Foams, Based on Life Cycle Stages	466
<i>Toyoaki Nakarai, Satoru Yoshino and Atsumi Miyake</i>	
(47cw) Problems Encountered in the Development of a Process Safety Climate Tool	480
<i>Julie Bell, Sarah Binch and Caroline Sugden</i>	
(47d) Upper Explosible Limits for Combustible Dusts	481
<i>Richard Prugh</i>	
(47e) Agglomeration Effect on Combustion and Explosion Properties of Nanoparticles	482
<i>Jiaqi Zhang, Yi Liu, Hao Chen and M. Sam Mannan</i>	
(47g) Shock Interaction with Dust Layers for Different Mach Numbers and Dust Layer Depths	495
<i>Amira Yousuf Chowdhury, Brandon Marks, H. Greg Johnston, Eric L. Petersen and Dr. Sam M. Mannan</i>	
(47h) Numerical Simulation of Cryogenic Boiling	496
<i>Monir Ahammad, Yi Liu, Samina Rahmani, Luc Vechot and Sam Mannan</i>	
(47i) Homogenous-Gaseous and Particle-Gas-Air Combustion in Turbulent Environment: Analytical Formulation and Experimental Validation	498
<i>Vyacheslav Akkerman and Ali S. Rangwala</i>	
(47j) Application of Leading and Lagging Indicators to Improve Laboratory Operation Safety	499
<i>Tianxing Cai and Qiang Xu</i>	
(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	500
<i>Mike Neill</i>	
(47r) 2. Successes in Implementing PHA/HAZOP/LOPA in Major Capital Projects in a Steel Company	502
<i>William Bridges</i>	
(47s) Liquid Fuels Release Rate Calculation in Transport Pipelines with Complex Topographical Conditions	503
<i>Carlos A. Manjarres, Jaime E. Cadena and Felipe Munoz</i>	
(47t) Decision Tree to Optimize NFPA 30 Criteria in Fire Protection Systems Applied in Oil and Gas Industry	505
<i>Oscar Barajas</i>	
(47u) Sil Determination of High Integrity Pressure Protection System (HIPPS)	506
<i>Frik Febby and Margaretha Thaliharjanti</i>	
(47w) Comparison of Different Methods to Determine the Activation Energy of Flammable Dusts Mixed with Inert and Inhibitory Materials	508
<i>Christoph Wanke</i>	
(47x) Economical Approach Quantification of Impacts in Major Accidents	510
<i>Alexander Gutierrez, Carlos A. Manjarres and Felipe Muñoz</i>	
(47z) Application of Consequence Analysis in the Development of Emergency Response Plans for Accidental Events in Liquid Fuels Transport Pipelines	512
<i>Carlos A. Manjarres, Alexander Gutierrez and Felipe Munoz</i>	
(50a) The Illusion of Attention: Are There Gorillas in Your Plant?	514
<i>Elliot Wolf and Robert F. Wasileski III</i>	

(50b) Guidelines for Integrating Management Systems and Metrics to Improve Process Safety Performance	527
<i>Bruce K. Vaughan, Anthony Downes, Jeff Fox and David Belonger</i>	
(50c) A Call to Action Next Steps for Vision 20/20	544
<i>Jack McCavit and Dan Sliva</i>	
(68a) Using Quantitative Risk Assessment to Make Billion Dollar Decisions	559
<i>Jim Salter</i>	
(68b) Facility Siting Rule Set for the TNO Multi-Energy Model for Congested Volumes (PES) and Severity Levels	560
<i>J. Kelly Thomas, Robin Pitblado, John Alderman and Donald Connolley</i>	
(68c) Examining the Use of Blast Resistant Modules (BRMs) within API 753 Zones 1 and 2	583
<i>David Skelton</i>	
(76a) Integrating Corporate Safety Culture and Process Safety after Merger – a Personal Perspective	594
<i>Sabine Knedlik</i>	
(76b) Managing Operational Risk in an Enterprise Risk Management Framework	603
<i>Jean Bruney and Jim Salter</i>	
(76c) One Company’s Approach on Relative Ranking of Portfolio of Process Safety Risk	615
<i>Shakeel Kadri, Derek Miller, Martin Dennehy, Glen Peters and James VanOmmeren</i>	
(104a) A Prudent Approach to Revalidating Process Hazard Analysis	625
<i>Sandipan Laskar</i>	
(104b) Risk Assessment Challenges to 20:20 Vision	645
<i>Dr. Angela E. Summers</i>	
(104c) Understand the Main Scenarios and Hazards and How Its Controls Are Being Managed	658
<i>Americo Diniz Carvalho Neto</i>	
(112a) Update: EPA Actions - Chemical Safety and Security Executive Order	674
<i>Craig Matthiessen and Kim Jennings</i>	
(112b) Risk Adverse or Risk Ad Nauseam	680
<i>John F. Kill and Kumar (CHRIS) Israni</i>	
(112c) For Want of a Nail, the Kingdom Was Lost: Process Safety Management of Gaskets and Flanged Connections	692
<i>Jeremy Nelson, Ha Nguyen, Jin Kim, Yi Liu and M. Sam Mannan</i>	
(131a) Becoming a Great Process Safety Leader	709
<i>Greg Robinson</i>	
(131b) What Should Leaders be Held Accountable for When It Comes to PSM Performance?	720
<i>Brian D. Rains</i>	
(131c) A Leader's Tactical Approach to Influence Changes in Process Safety Culture	731
<i>Laura Ankrom, Greg Oliver and Kathy Shell</i>	
(135a) Executive Order Panel	743
<i>Lisa Long, Scott Breor and Kim Jennings</i>	
(135b) What Have We Really Learned? (25 Years After Piper Alpha)	744
<i>Mike Broadribb</i>	
(135c) Lac Mégantic Accident: What We Learned	761
<i>Jean-Paul Lacoursiere</i>	
(135d) Case Study of the Domino Effect in a Catastrophic Solid Oxidizer Fire	789
<i>Russell A. Ogle</i>	
(135e) Complex Explosion Development in Mines: Case Study - 2010 Upper Big Branch Mine Explosion	800
<i>Derek M. Engel, Scott G. Davis and Kees van Wingerden</i>	
Author Index	