

32nd Center for Chemical Process Safety International Conference 2017 (CCPS)

Topical Conference at the 2017 AIChE Spring Meeting and 13th
Global Congress on Process Safety

San Antonio, Texas, USA
26 - 30 March 2017

ISBN: 978-1-5108-4363-9

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© (2017) by AIChE
All rights reserved.

Printed by Curran Associates, Inc. (2017)

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) AGILE Award Keynote Address	1
<i>John Televantos</i>	
(8a) Reducing Process Safety Events - An Approach Proven By Sustainable Results	2
<i>Sheila F. Van Geffen, John W. Champion, Lynnette Borrousch</i>	
(8b) Building a Group Process Safety Management System for a Non-Chemical Industry	29
<i>Marc Massant</i>	
(8c) How Culture Effects the Implementation of Process Safety Program Elements	64
<i>Michael Hazzan</i>	
(22a) Ensuring Learning (Not Just Training) - Measuring the Impact of Learning on Business Performance	75
<i>Alfonsius Ariawan, Lawrence S. Short</i>	
(56l) Tridimensional Training Matrix to Improve Process Safety Performance	81
<i>Americo Alves Franca, Isadora Correa, Cristina Maretti Dias, Fabiano Fiscina, Paula Franco Brandao, Thaiane Duarte</i>	
(22c) Experiences in Development and Deployment of a Process Safety Curriculum in a North American Pipeline Company	91
<i>Ruth Uy, Eli Vilorio</i>	
(32a) A Proposal for Improving the Efficiency, Effectiveness, Quality, and Usefulness of PHA Identification of Controls	92
<i>Keith Lennon</i>	
(32b) Cost-Effective Human Factors Tools to Reduce Plant Costs and the Risk of Injuries	93
<i>Dennis Attwood</i>	
(32c) Selection of Cases for Atmospheric Dispersion Modeling	107
<i>Thuc Ngo, Zubin Kumana</i>	
(50a) Dow Laboratory Safety Academy: Improving Awareness of Reactive Chemicals Hazards and Preventing Incidents	108
<i>Marabeth Holsinger, Lori Seiler, Pankaj Gupta</i>	
(50c) Safety and Asset Integrity Excellence - Using Data and Analytics to Control Composite Risk and Add Operating Value	109
<i>Brian Dickerson, Coen Van Driel, Robert Kauer</i>	
(57a) What if PHAs Included an Analysis of Human Error?	125
<i>Jeanne Curcio</i>	
(57aa) Thermal Decomposition of Mono-Nitrated Toluene (MNT) with Additives	136
<i>Wen Zhu, Chad Mashuga</i>	
(57ab) Addressing Challenges of Controlling Change By Implementing Best MOC Practices	137
<i>Annant Srivastava, Laura Geerlings</i>	
(57ad) Process Change Impact on Relief System Design	138
<i>James Brigman, Shailesh Saraykar</i>	
(57ae) Identification and Local Impact Analysis of Projectile Hazard in the LNG Industry	139
<i>Prerna Jain, Wimberly Dick, David A. Rosenberg, Andrew Kohout</i>	
(57ag) Thermal Hazard Analysis and Chemical Incompatibility Tests with Custom High-Pressure Crucibles Made from Commonly Used Metals and Alloys	140
<i>Han Xia, Joan F. Brennecke</i>	
(57ah) Do Dust Hazards Analysis (DHA) Really Differ from a Process Hazards Analysis (PHA) or a Process Analysis (PA)?	141
<i>Michael E. Robertson</i>	
(57ai) A Leading Indicators Based Decision Support Tool to Predict Blowout Events	151
<i>Nafiz Tamim, Delphine Laboureur, A. Rashid Hasan, M. Sam Mannan</i>	
(57am) Consequence Modeling at the Eastman Kingsport Site	152
<i>Michael D. James, David Skelton</i>	
(57ao) Relief Systems Design: The Importance of Accounting for Static Head	179
<i>Nicholas N. Cristea, Zubin Kumana, Guomin Wang</i>	
(57aq) Study of Factors That Affect Dust Explosion Characteristics of Fibrous Dust Materials	187
<i>Bharatvaaj Ravi, Yan-Ru Lin, Chad Mashuga, M. Sam Mannan</i>	
(57ar) High Integrity Pressure Protection System (HIPPS) and Implementation Challenges	188
<i>Janardhanan Kallambettu</i>	
(57as) Managing Risk Associated w/ Electrical Energy Ignition Sources	213
<i>Jim Johnston</i>	
(57at) Review and Analysis of Recent Cyber Security Attacks	214
<i>Ursula Malczewski, Amy Theis</i>	
(57au) Resilience-Based Survival Analysis in the Event of a Process Upset: A Case Study of Utility Plant	215
<i>Prerna Jain, Efstratios N. Pistikopoulos, Sam Mannan</i>	
(57aw) Model-Based Pressure Relief Design for Reactive Systems	216
<i>Michelle Murphy</i>	
(57ax) Dynamic Modeling of Inbreathing Requirements for Low-Pressure Storage Tanks	217
<i>Dona Chakra, Georges Melhem, Ronald J. Willey</i>	

(57az) Studying the Relationship Between Inherently Safer Design and Equipment Reliability	238
<i>Nilesh Ade, Guanlan Liu, Sam Mannan</i>	
(57b) Pressure Relief Analysis - It's About More Than Just Compliance	239
<i>Robert Siml, Alysson Ferreira</i>	
(57ba) How to Leverage Limited Design Data Along with Historical Incident Data to Assess Inherent Process Safety During Early Stage of Design?	240
<i>Fadwa T. Eljack, Monzure-Khoda Kazi, Ahmed AlNouss</i>	
(57bb) Inherently Safer Design From Overpressure Protection Viewpoint	241
<i>Nancy Faulk, Christopher Ng, Sachin Kanade</i>	
(57bc) Three Reasons Major Event Risk Management Fails on Capital Project	250
<i>Denise Chastain-Knight</i>	
(57bd) Safety Rating System Based on Current Situation of China Petrochemical Enterprises	263
<i>Linlin Wang</i>	
(57bf) The Difficulty and Prospect of the Development of Quantitative Assessment Technology in the Field of Chemical Safety in China	272
<i>Jiu Jiangbo</i>	
(57bg) Recipe for a Sizzling HAZOP Chair	273
<i>Angus Keddie</i>	
(57bi) Bridging the Divide - OHS and Process Safety	282
<i>Trish Kerin</i>	
(57bk) 20 Years of Personal Process Safety Lessons	283
<i>Steve Streblow</i>	
(57bl) Identifying Opportunities of Enhancing Safeguard Stewardship through IPL Rationalization	294
<i>SreeRaj Nair, Bernadette Thornton</i>	
(57bm) Process Safety Site Assessment Program (PSSAP) - 5 Years of Assessments	303
<i>Andrew Broadbent</i>	
(57bn) Alarm Management Meets SIS	312
<i>Darwin Logerot</i>	
(57bq) Enhancing Process Safety Management Integration to Improve Process Safety and Profitability in the Fuels and Petrochemicals Industry	313
<i>Thomas D. Watson, Harold Phillippi, Ronald Fuchs</i>	
(57br) Reactive Hazards Management: Lessons Learnt from Major Incidents	322
<i>Robert Weber, Sonny Sachdeva</i>	
(57bu) The Study of Safety Evaluation Technique for High Temperature Process	323
<i>Manabu Okuyama</i>	
(57bv) Handling Uncertainty in LOPA and SIF Design	324
<i>Arjan Abeynaik, Akshat Khirwal</i>	
(57bw) Fundamental Research at Purdue Process Safety Research Center	337
<i>Ray A. Mentzer</i>	
(57by) Bringing New Life to Process Safety	338
<i>Farshad Hendi, Steve Elliott</i>	
(57cb) Developing an Effective System for Action Item Resolution	339
<i>Zubin Kumana, Jason F. White</i>	
(57cc) Where Does Management of Change (MOC) Begin?	340
<i>Juliana Schmitz, Patti Jones, Gabriel Drummond</i>	
(57cd) Effectively Utilizing Calarp/RMP/PSM Contractors to Assist in Optimizing Process Safety Culture, Compliance with Standards, and Workforce Involvement	350
<i>Ivan Cheng, Timothy Lee, Steven T. Maher, Michael Saura</i>	
(57ce) A Streamlined Approach for Full Compliance with SIL Implementation Standards	351
<i>William Bridges, Art Dowell III</i>	
(57cg) The Art of the Audit: Being Audit Ready, Everyday	363
<i>Amanda Scalza, Brady Brown</i>	
(57ck) Economic Justification for Better Maintenance in a Safety System	364
<i>William M. Goble, Loren Stewart</i>	
(57cl) How Important Is Realistic Failure Rates for Safety Instrumented Functions?	365
<i>John Day, Loren Stewart</i>	
(57cn) Enabling Sustainable Relief System Management Programs through Independent Reviews	366
<i>Aniket Patankar, Norberto Pineda</i>	
(57f) The Jack Rabbit II: Experimental Large-Scale Chlorine Release Trials	367
<i>Shannon B. Fox, Thomas O. Spicer III, Leo Stockham, Mark Whitmire, Ronald Meris, Thomas Mazzola, Joseph Chang, Steven Hanna, Michael Sohn, Damon Nicholson, Andy Byrnes</i>	
(57g) Functional Safety - Pitfalls and Good Practices	374
<i>Crystal James, Marisa Pierce, Chris Parr</i>	
(57i) General Method for Uncertainty Evaluation of Safety Integrity Level (SIL) Calculations - Part 2 Analytical Methods	375
<i>Raymond "Randy" Freeman</i>	
(57j) Developing a Methodology for Process Selection in Pharmaceutical Industry Based on Inherent Safety Considerations: A Case Study on Batch Vs Continuous Process	425
<i>Shiqi Chen, Yogesh Koirala, M. Sam Mannan</i>	

(57k) Risk Based Decision Making Methods for Evaluating Complex Technologies, a Comparative Analysis on Pipelines and Railroad for Crude Oil Transport	449
<i>Pranav Kannan, M. Sam Mannan, Martin A. Wortman</i>	
(57m) Key Modeling Parameters and Process Safety Information for Effective Atmospheric Dispersion Modeling	450
<i>Srihari K Maganti</i>	
(57n) Implementation of Hazard Mitigation Solutions: Consequence Vs. Risk-Based Building Specifications	451
<i>Travis Holland, Joshua Bruce-Black</i>	
(57o) Generalization of Modeling Along-Wind Dispersion	452
<i>Jessica M. Morris, Thomas O. Spicer III</i>	
(57p) Review and Analyze the Effects of Parameters for H₂S Gas Mixture Dispersion Models: Degadis and CFD Models	466
<i>Jiayong Zhu, Delphine Laboureur, M. Sam Mannan</i>	
(57s) Considerations When Justifying the Purchase of an Operator Training Simulator	467
<i>Ian Willetts</i>	
(57u) Consequence Analysis of Gas Explosion in Underground Common Utility Tunnels	468
<i>Mirae Yoo, Yuri Jang, Seungho Jung</i>	
(57v) Air Cooler Explosion Analysis Using CFD	469
<i>Greg R. Knight</i>	
(57w) Revisions to the QMEFS Vapor Cloud Explosion Model	470
<i>Jeffrey D. Marx, Benjamin Ishii</i>	
(57x) Do We Need a Quantitative Risk Assessment (QRA) If My Consequence Analysis Facility Siting Presents a Problem?	485
<i>Vinicius Simoes</i>	
(57y) Proposed Method for Investigating the Reactivity of Chlorine with Environmental Materials Under Relevant, Controlled Conditions	486
<i>Audrey Feuvrier, Thomas O. Spicer III</i>	
(57z) Fire Proofing Cost Reduction Measures for LNG Plant	496
<i>Raminaidu Girada, Jegan Babu Arumugakan Thuraishwamy, Antonino Nicotra</i>	
(79a) Simplistic Yet Insightful Way to Present Operational Risks in Order to Facilitate Risk Discussions	507
<i>Alfonsius Ariawan, Donald Byrne</i>	
(79b) Uncertain About Uncertainty	513
<i>John Joseph Crump</i>	
(79c) A Look into Cumulative Risk Assessment: Past, Present and Future	543
<i>Syeda Zohra Halim, Yogesh Koirala, M. Sam Mannan</i>	
(94a) Sustaining Process Safety During Difficult Economic Times	555
<i>John Herber</i>	
(94b) And Now for Something Completely Different	569
<i>Mike Broadribb</i>	
(94c) Supervisors and Mid-Managers at the Center of Safety	581
<i>Renato Prestes, TJ Larkin</i>	
(116a) Managing Risk Through Integrity Operating Windows	582
<i>F. Russ Davis</i>	
(116b) Human Reliability Analysis for Evaluation of Conduct of Operations and Training	590
<i>Erin Collins, Bijan Najafi</i>	
(116c) Process Safety in Operations - What's Missing?	601
<i>Mike Neill</i>	
(138a) Using PS Incident Warning Signs to Increase Hazard Awareness and Sense of Vulnerability	614
<i>Brian Kelly, John Herber, Jerry L. Jones</i>	
(152a) Systematic Approach to Improve Learning from Incidents	627
<i>Juliana Guarguati Ariza, Noor Quddus, M. Sam Mannan</i>	
Leading and Lagging Indicators	644
<i>Robert Weber, Sonny Sachdeva</i>	
(152c) Ten Years of Living Risk Based Process Safety	676
<i>Steve Arendt</i>	
(158a) Are Your Safeguards Fast Enough to Be Effective?	687
<i>Eloise Roche, Angela E. Summers</i>	
(158b) Temporary Management of Change: A Problem or a Necessary Part of Managing Process Safety	699
<i>Jody Olsen</i>	
(158c) Don't Do What We Did - Stupidity, Luck, and Making Good Choices	726
<i>Mike Moosemiller, Kathleen A. Kas</i>	
(167a) Inherently Safer Automation	748
<i>Angela E. Summers</i>	
(167b) CCPS Project 246 - 2nd Edition Guidelines for Siting and Layout of Facilities	762
<i>Bruce K. Vaughen, Martin Timm, Donald J. Connolley, Charles Ian Cowley</i>	
(167c) CCPS Vision 20/20: What and How Are WE Doing?	789
<i>Cheryl Grounds, Jack McCavit, Rukyah Hennessey</i>	
(182a) Waste Solvents to Trash Haulers: Lessons Learned from Hazardous Waste Accidents	799
<i>Delmar "Trey" Morrison, Michael Stern, Carmen Osorio-Amado</i>	
(182b) ExxonMobil Torrance Refinery FCC ESP Explosion	827
<i>Mark Wingard</i>	

(182c) Overfill to Overpressure - Investigation Findings and Contributing Events to the Capeco Explosion	828
<i>Scott Davis, Tom DeBold</i>	
(182d) Produced Water Tank Explosion Case Study	849
<i>J. Kelly Thomas</i>	
(182e) Milestone Company Incidents and Their Impact on Air Products Process Safety Journey	864
<i>Brian E Farrell</i>	
(182f) Plymouth Incident	865
<i>Von Studer</i>	
Author Index	