

15th Process Plant Safety Symposium 2013

(PPSS)

**Topical Conference at the 2013 AIChE Spring Meeting and 9th
Global Congress on Process Safety**

**San Antonio, Texas, USA
28 April - 2 May 2013**

ISBN: 978-1-62748-445-9

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© (2013) by AIChE
All rights reserved.

Printed by Curran Associates, Inc. (2013)

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

Business and Regulatory Aspects of Effective near-Miss Management Implementation	1
<i>Ulku Oktem, Iclal Atay</i>	
Process near Misses Identification, Investigation and Challenges	14
<i>Pawan Mittal, Parminder Sawhney</i>	
Near Misses - Private or Public Concern?	26
<i>Jay Brabson</i>	
Is Your Operation Prepared for Economic Recovery?	35
<i>John Herber</i>	
How to Create A Safety Culture	46
<i>Richard N Knowles</i>	
Process Safety: At the Heart of Operations	55
<i>Chung Nguyen</i>	
30, 60, 90 Day Plan for Operations Managers to Assess PSM and Prevent the Next Serious Incident	64
<i>Brian Wilson</i>	
Empowering Operating Managers with Decision Support System to Prevent Process Safety Incidents	77
<i>Deepak Phanse, Rohan Vardekar, Manasa Godavorthy, Prashanthi S. Bhupathi</i>	
Barrier Diagram (Bow Tie) Quality Issues for Operating Managers	90
<i>Robin Pitblado, Pieter Weijand</i>	
Learning From High Potential Near Misses in the Refining Sector	106
<i>V. M. Ramesh, R. Sakthivel</i>	
Felt Leadership: An Essential Ingredient in Successful PSM Implementations	107
<i>Brian D. Rains</i>	
Localization of Control Rooms Using a MINLP Approach, Based On Accidental Explosion Scenarios	119
<i>Lina M. Sierra, Sergio E. Rodríguez, Jaime E. Cadena, Manuel A. Ramos, Jorge Mario Gómez, Felipe Munoz</i>	
Risk Analysis for Overpressure From Pressure Vessel Burst	133
<i>Seungho Jung, Elizabeth Lutostansky, Joan M. Schork</i>	
Comparison of the Peak Relief Rate Estimated by Dynamic Simulators Compared to Traditional Methods for Several Distillation Columns	142
<i>John Wilkins, Dustin J. Smith</i>	
A Hybrid Model for Characterizing the Source of Hazardous Material Release	152
<i>Shahryar Khajehnajafi, Anjana Meel</i>	
Guidelines for Developing Site-Specific Human Error Rates and Human IPLs for LOPA Using a Safety Climate Approach	170
<i>Farheen Khan, Sunil D. Lakhiani, Delmar Morrison</i>	
Benchmarking – An Important Milestone in the Journey towards PSM Excellence	171
<i>Prerna Jain, Ravi Ramaswamy, Cindie Pridy, Robert Cravens</i>	
Process Safety Management - A Practical View	185
<i>German Luna-Mejias Sr.</i>	
Auditing the Process Hazard Analysis - Key Characteristics to Scrutinize in a Good-Quality HAZOP Study and Supporting Effective HAZOP Study Updates	197
<i>Steven T. Maher, Michael A. Nour, Kristin D. Norton</i>	
Vapor Cloud Explosion Test of Air-Inflated Fabric Structure	198
<i>Matthew Edel, Brad Horn</i>	
Revisiting the Conditions and Consequences of CO₂ Tank Explosions	213
<i>Yu Zhang, Joan M. Schork, Keith Ludwig</i>	
New Ignition Source "Exploding Wire" for the Determination of Explosion Characteristics of Combustible Dusts in the 20-L-Sphere	225
<i>Marc Scheid, Volkmar Schröder, Christian Kusche</i>	
Operational Discipline and Beyond: An Interdisciplinary Approach to Improving Process Safety Management Implementation Through Behavior and Cultural Change	237
<i>Charles A. Soczek</i>	
Risk Analysis for Pressure Relief Devices – Managing Plant Safety and Reliability	244
<i>Jose R. Aguilar-Otero Sr.</i>	
Enterprise Risk Management--Adopting Risk-Based Decision Making in a Chemical Enterprise From the Board Room On Down Through All Functions and All Levels	246
<i>Jerry L. Jones</i>	

The Chemical Safety Board and the Prevention of Combustible Dust Hazards	248
<i>Manuel R. Gomez, Christina Morgan</i>	
Performing HAZOP of Startup/Shutdown Procedures	249
<i>Fareed Ebrahim, German A. Luna Sr.</i>	
Chasing the Protection of Intermediate Bulk Containers, Year 10	258
<i>John A. Leblanc</i>	
Process Safety Challenges in the Hazardous Waste Industry	259
<i>Hope Luebeck</i>	
A Novel Methodology for Maintaining Mechanical Integrity of High Pressure Relief Systems	269
<i>Sandipan Laskar</i>	
A Framework for Managing near-Miss Incidents.....	279
<i>Ghanshyam Shah</i>	
HAZOP Analysis and Debottleneck for Laboratory Operation in the Semiconductor Industry	287
<i>Tianxing Cai, Qiang Xu</i>	
Best Practice Management of Change & PSSR Process.....	302
<i>Mike Bearrow</i>	
Unifying Consequence Models for Natural Gas Pipelines in Petrobras Transpetro.....	316
<i>Ana Bahiense, Maria Caputo</i>	
Automation Strategies: Avoiding Accidents During the Process of Draining Water From LPG Spheres	324
<i>Carlos Andre Vaz Jr., Maurício Bezerra Souza Jr., Diego Da Silva Lione, João Márcio Almeida Villaça, Leonardo Salim Damian Aguiar</i>	
Complex BMS Made Simple	339
<i>Dave Sheppard, Nikki Bishop</i>	
Using ESD Valves As Safeguards, Myth or Reality?	340
<i>German A. Luna-Mejias Sr.</i>	
Contours When Pipelines Meets Facilities.....	351
<i>Karthick Deivasagayam</i>	
Ozone Flammability and Its Affect On the Lower Flammable Limit of Simple Hydrocarbons	352
<i>Paul Osterberg, Thomas Johnson, Thomas Frawley</i>	
Evaluate the Plant-Wide Safety of Your Interlock Systems.....	353
<i>Mohammed Naved Khan, James Brigman, Swapnil Pathak</i>	
Virtual Reality Applied to Training and Process Safety: A Semi-Industrial Boiler Case Study	367
<i>Carlos Andre Vaz Jr., Maurício Bezerra Souza Jr., Thiago Souza De Oliveira</i>	
Investigations On the Influence of Different Inert Gases On the Laminar Flame Propagation in Lycopodium/Air Mixtures	377
<i>Hannes Kern, Bruno Wimmer, Harald Raupenstrauch</i>	
Fire Protection and Life Safety Issues in Semiconductor and Related Facilities	386
<i>Jonathan Eisenberg</i>	
Lower Flammability Limits of Mixtures of Hydrogen and Methane At Atmospheric and Sub-Atmospheric Pressures.....	387
<i>Hai Le, Yi Liu, M Sam Mannan</i>	
Informatics Rich Integrated Chemical Safety Risk Assessment (ICSRA) Platform.....	396
<i>Muthukumarasamy Karthikeyan, Renu Vyas, H. V. Prasad</i>	
IV Enablement for Effective Implementation and Monitoring of Process Safety Management	400
<i>Pawan Mittal, Ajay Kumar</i>	
Sulphur Dust Explosions an Overview.....	404
<i>Karthick Deivasagayam</i>	
Simplified Uncertainty Analysis of LOPA Results.....	405
<i>Raymond Freeman</i>	
The Impact of Ozone On the Lower Flammable Limit of Hydrogen in Vessels Containing Savannah River Site High Level Waste	432
<i>Paul Osterberg, Carol Sherburne, Thomas Johnson, Thomas Frawley</i>	
Process Safety Considerations for New DOE Depleted Uranium Hexafluoride Conversion Plants	447
<i>Peter M. Burban</i>	
Minimum Ignition Energy Study of Flowing Heat Transfer Fluid Aerosols: Experimental and Theoretical Approach	454
<i>Szu-Ying Huang, Xinrui Li, M. Sam Mannan</i>	
Domino Effect Model Applied to the Hertfordshire Oil Storage Terminal (Buncefield Oil Depot)	455
<i>Esteban Bernechea, Xavier Seguí, Josep Arnaldos</i>	
Proven Approach to Investigating near Misses	465
<i>William Bridges, Gregory Smith, Gerald D. Burch</i>	

Key Strategies for Implementing a Corporate Fatigue Risk Management System	479
<i>David E. Cummings</i>	
Consequences Calculation for Boilover and Storage Tank Fires	490
<i>Juan C. Díaz, Jaime E. Cadena, Felipe Munoz Giraldo, Alejandra Cano, Alexis Vignes</i>	
A Practical View of Risk Reduction Management of Hardware and Software Design for Safety Critical Applications	504
<i>Luis Duran Mike Krywonos</i>	
Metodologías Para Reducir Las Fallas De Causa Común	N/A
<i>Luis Manuel Duran</i>	
Establishing a 3 Credit Course in PSM for Undergraduate Engineers	517
<i>Deborah L Grubbe</i>	
Investigations On the Self Heating Potential of Garage Waste As Basis for the Hazard Evaluation of Bulk Storage Facilities	518
<i>Hannes Kern, Christoph Spijker, Harald Raupenstrauch</i>	
Estimate Vibration Risk for Relief and Process Piping	528
<i>Georges Melhem</i>	
Performance Metrics Development Management and Reporting Reaching Sustainability by Design	555
<i>Robert C. Smith</i>	
Alarm Management - the Human Factors Challenge	556
<i>Robert C. Smith</i>	
Dust Flame Propagation in Industrial Scale Piping - Part 2: CFD Study of a Conveying Vessel-Pipeline System	557
<i>Jim Vingerhoets, Thomas Farrell, Jef Snoeys</i>	
The Use of CFD to Evaluate the Interactions Between Multiple-Leak Sources and to Assess Effectiveness of Integral Modeling Techniques in a Multiple-Leak Scenario	579
<i>Joshua Richardson, Ha Nguyen, M. Sam Mannan</i>	
Understanding, Managing, and Communicating High Consequence Risk	581
<i>Charles A. Soczek</i>	
Frequencies of Accidents As Functions of Design Variables	582
<i>Esteban Bernechea, Josep Arnaldos, Cristian Massaguer</i>	
Routes Optimization for Hazardous Materials Transportation in Bogotá, Colombia	594
<i>Jorge Victoria, Nubia Velasco, Eliecer Gutierrez, Felipe Munoz</i>	
Mejores Prácticas En Los Procesos De Gestión Del Cambio Para Seguridad De Procesos y La Evaluación De Seguridad Previa Al Inicio (PSSR)	595
<i>J. Luis Aguirre</i>	
Lesha – Multi-Layer Progressive Stress & Impact Assessment On Health & Behavior	596
<i>Salvador Ávila Filho</i>	
Building Design for Resilience Beyond Design Basis Blast Loads	598
<i>Michael A. Polcyn, Raymond H. Bennett</i>	
Reliability Analysis of Man-Machine Response to an Emergency Situation Based On a Detailed-Action Plan	607
<i>Najmeh Vaez, Farshad Nourai, Yaneira Saud, Suresh Yelisetty</i>	
Hazards of Gasoline Contamination – Case Study of a Tanker Truck Explosion Resulting From Switch Loading	608
<i>Scott G. Davis, Kees Van Wingerden</i>	
Is Your MOC Process Doing All That It Should Be?	609
<i>William Fink, Carolina Herrera</i>	
Beyond DSC, Improved Thermal Hazards Screening Methodology	610
<i>Peter J. Ralbovsky Iv</i>	
Using Explicit Finite Element Analysis to Simulate the Effects of External Chemical Explosions On Single and Double-Walled Storage Tanks	612
<i>Phillip E. Prueter, David J. Dewees</i>	
The Hidden Risks of Deposits, by-Products, and Residues On Exhaust and Waste Streams	629
<i>Carlos A. Barrera, Abid Kemal</i>	
Explosion Characteristics of Carbon Nano-Fibers	630
<i>Jiaqi Zhang, Yi Liu, M Sam Mannan</i>	
High-Fidelity Combined Dynamic Modeling of Depressurizing Vessels and Flare Networks: Accurately Assess the Effects of Process Changes On Mechanical Integrity and System Capacity	631
<i>James Marriott</i>	
An Engineering Method to Mitigate the Impact of Regulatory Focus On Relief System Installations by Prioritizing Risk	632
<i>Dustin J. Smith</i>	

Making Relief Load Estimates Match Reality	640
<i>Nicholas N. Cristea, Dustin J. Smith</i>	
Explosion Accident Simulation for Petrochemical Plant	651
<i>Xiangdi Zhao, Jiwu Yuan, Chunming Jiang, Zheng Wang</i>	
Using Reliability Centered Maintenance (RCM) to Reduce Fire Risk in High Temperature Oil Handling	659
<i>Marc W. Yarlott, Ryan Johnson, Steven Waters</i>	
Characterization of the Emissive Power of Hybrid Methane-Air-Dust Flames	674
<i>Brian Elias, Ali S. Rangwala</i>	
Are You in Control of Process Safety? Basis of Safety Assurance Can Provide the Answer	675
<i>Ellis Graeme</i>	
Ragagep 101	683
<i>James Lay, Lisa Long, Mike Marshall, Jeffrey Wanko</i>	
Summary of Expert Forum On the Use of Performance-Based Regulatory Models in the U.S. Oil and Gas Industry, Offshore and Onshore	698
<i>M. Sam Mannan, Xiaodan Gao</i>	
A Guide to the Legal Framework of the PSM Standard for Engineers	719
<i>Christopher Cunio, Georges Melhem</i>	
New CCPS Guideline Book: Guidelines for Conditional Modifiers and Enabling Conditions	727
<i>J. Wayne Chastain, Stanley A. Urbanik, Robert W. Johnson, John F. Murphy</i>	
Implementing LOPA Recommendations Into Design of Instrumented Protective Systems	739
<i>Rajeev Limaye</i>	
Safety Controls, Alarms, and Interlocks As IPLs	757
<i>Angela E. Summers</i>	
Journey to Process Safety Excellence	771
<i>Shanahan Mondal, Brian McPherson</i>	
Management of Safety Critical Elements As a Base for Risk Management of Major Accident Hazards	783
<i>Mariana Bahadian Bardy, Paula Silveira, Flavio Luiz Barros Diniz</i>	
Promoting Commitment to Process Safety	793
<i>Russell A. Ogle, Andrew R. Carpenter, Sean J. Dee</i>	
Operational Discipline: Panacea for Performance?	801
<i>James A. Klein, Brian D. Rains</i>	
Process Safety Information Management - It Is More Than You Probably Think	814
<i>Mason Martin, Patrick Nonhof</i>	
Connecting the Dots – Managing the Little Things That Lead to Big Accidents	815
<i>Dave Jones, Anne O'Neal</i>	
Practical Implementation of Safety Management Systems at Unregulated Upstream Oil & Gas Facilities	830
<i>Kristin D. Norton, Michael B. Saura</i>	
Overcoming PSM Challenges for Small Chemical Companies: Observations, Insights and Guidance From the Trenches	842
<i>Philip M. Myers</i>	
Small Site MOC: Big Company Challenges without Big Company Resources	862
<i>Rainer Hoff, Gordon C. Blake</i>	
Novel Development of Asset Integrity Management for Refinery Equipment: Theory, Application and Effect of Setting Critical Operational Tan and Sulfur Level for Distillation Units	877
<i>Dingrong Qu, Shanjun Mu, Xiaohui Liu, Xiu Jiang, Yanyuan Li</i>	
Large Eddy Simulation - Based Mixing Tee Analysis and Comparison with in-Service Failure Data	888
<i>Seetha Ramudu Kummari, Michael F. P. Bifano, David J. Dewees</i>	
Improving Reliability & Safety Performance of Solenoid Valves by Stroke Testing	902
<i>Loren Stewart, Julia V. Bukowski, William M. Goble</i>	
Lessons Learned From Fire in Air Supply Ducts	921
<i>Alvin Waller</i>	
Hydrogen Sulfide Exposure From Molten Sulfur- A Forgotten Hazard?	929
<i>Mark J. Viz, Russell A. Ogle, Sean J. Dee, Brenton L. Cox</i>	
Calcium Stearate Deflagrations – A Series of Unfortunate Events	940
<i>Konanur Manjunath, Albert I. Ness</i>	
Effectiveness of Improvised Gas Absorption Techniques for Emergency Responders At Releases of Toxic Gases	949
<i>Hannes Kern, Matthias Taferner, Harald Raupenstrauch</i>	
Case Studies in Process Safety: Lessons Learned From Software-Related Accidents	956
<i>Terry Hardy</i>	

Technical Report on Chevron 2012 Pipe Rupture and Fire	971
<i>Steve Cutchen, Lauren Grim, Roger Evans, Don Holmstrom, Amanda Johnson, Dan Tillema, Kelly Wilson, Mark Wingard</i>	
Author Index	