

出國報告(出國類別：會議、參訪)

**赴美密西西比州 Jackson State University
演講、參訪及參加 11th Global Congress
on Process Safety 研討會**

服務機關：國立雲林科技大學

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出國期間：104 年 4 月 16 日~5 月 02 日

報告日期：104 年 06 月 22 日

摘要

本次旅程除應邀至密西西比州傑克森州立大學演講，內容為災害應變重要性、CSTI 應變之 12 原則、台灣危害性化學品管理概述及我國應變組織架構等議題，且參加醫院辦理之無線電培訓課程，順利通過結訓測驗，取得證照。也赴美國德州奧斯汀參加全球製程安全會議，於該會議發表論文並與製程安全領域學者專家進行學術與實務交流，行程包括參訪密西西比州國土安全卓越中心、密西西比州衛生部、德州農工大學訓練中心及德州大學 Mary Kay O'Connor 製程安全研究中心，了解美國於國家安全方面及製程安全之科學研究，包括如恐怖主義事件風險及經濟分析、食品保護及防護、動物及人傳染疾病防護、風險評估與製程安全等項目，此外，並針對災時大量傷患照護、住宅及人道服務等事項，相互進行實務執行上的經驗交流。

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一、目的

本次出國考察之目的：

1. 受袁保強教授邀請至密西西比州傑克森州立大學(Jackson State University)進行演講，使學員對於應變在化災事故上之重要性、東亞國家(台灣、日本、南韓及中國)在危害性物質上的相關管理、CSTI 應變 12 原則及妥善管理化學品等議題有基本之認知，更可以瞭解我國於化災應變領域之發展。
2. 拜訪密西西比州傑克森州立大學國土安全卓越中心(Homeland Security Center of Excellence)，考察該中心研究主題，並就政府與學術單位進行研究合作等相關經驗，進行意見交流。
3. 拜訪密西西比州國土安全辦公室及密西西比州衛生部，瞭解其權責及災時穩定民心之功效，並就如災前就大量傷患照護、住宅及人道服務等事項，進行整備及執行實務的經驗交流。
4. 參加第十一屆全球製程安全會議 GCPS (11th Global Congress on Process Safety)，藉此會議廣邀全球製程安全領域知名學者及實務專家演講或發表論文之契機，瞭解製程安全領域方面之新知，並於會議上口頭報告三氯矽甲烷製程火災事故及相關應變措施之研究成果，提升我校於國際製程安全領域之能見度
5. 參訪全球最大消防及核生化災害訓練場之一-德州農工大學訓練中心，參觀該訓練場緊急應變訓練 3 大主題(消防訓練場、緊急應變中心及城市災害情境)，瞭解其設置目的及預期訓練之成效，並與應變專家進行經驗交流。
6. 參觀於製程安全領域聞名國際的 Mary Kay O'Connor 製程安全中心，瞭解其研究主題，如液化天然氣安全性、化學品之易燃性及可燃性、化學品之反應性及風險評估等與製程安全相關等項目，並與中心研究人員針對製程安全及防災理念議題進行探討，藉此吸收歐美先進國家間於製程防災上之實務理念與作法。

二、過程

- 104.04.16 啟程，台灣桃園國際機場至美國洛杉磯國際機場
- 104.04.17 例假日停留 LA
- 104.04.18 例假日，停留 LA
- 104.04.19 前往密西西比州 Jackson 與袁保強教授會面
- 104.04.20 參訪 Homeland Security Center of Excellence 及 Collins Fire Department Training Center
- 104.04.21 參加由密西西比州醫院協會辦理之無線電培訓班
- 104.04.22 上午：密西西比州醫院協會辦理無線電培訓班及結訓測驗
下午：密西西比州傑克森州立大學大學演講
- 104.04.23 由密西西比州傑克森飛至德州 Houston 轉至德州農工大學拜訪密西西比州國土安全辦公室發言人及密西西比州衛生部負責人
- 104.04.24 參訪德州農工大學 TEEX 訓練中心
- 104.04.25 拜訪德州農工大學 Mary Kay O'Connor Process Safety Center
- 104.04.26-29 參加 CCPS 製程安全會議
- 104.04.30-05.02 德州經洛杉磯抵臺

表一 GCPS 製程安全會議議程表(範例，詳細議程如附件一)

SUNDAY, April 26	
8:00 AM – 5:00 PM	GCPS Short Courses
6:30 PM – 8:00 PM	2015 AIChE Spring Meeting and 11th GCPS Opening Reception Location: Conv. Ctr. Exhibit Hall 5
MONDAY, April 27	
7:00 AM	Complimentary Breakfast Location: Conv. Ctr. Ballroom D
8:00 AM	2015 AIChE Spring Meeting and 11th GCPS Opening Plenary Session: Cheryl Teich , AIChE President and June C. Wispelwey , AIChE Executive Director Location: Conv. Ctr. Exhibit Hall 5
8:30 AM	Keynote Address: Chemical Engineering – Is this the “Golden Age”? Presented by Marvin O. Schlanger , Chairman of the Supervisory Board of LyondellBasell (Ret.) Location: Conv. Ctr. Ballroom D
9:15 AM	Coffee Break Location: Conv. Ctr. Exhibit Hall 5
9:40 AM	11th GCPS Welcoming Plenary Session Location: Conv. Ctr. Ballroom D 11th GCPS Introduction and Welcome: Shakeel Kadri (Executive Director, CCPS) and Rainer Hoff (GCPS Chair) Symposia Introductions: Samantha Scruggs (CCPS Chair), Charles A. Soczek (LPS Chair), Karen Study (PPSS Chair), Lisa Long (PSM2 Chair), Jatin Shah (Spotlight Track Chair), Laura Turci (RPPS), and J. Wayne Chastain (DIERS) Presentation of William H. Doyle Award for LPS Best Paper Award and PPSS Best Paper Award

三、心得

本次行程首先是傑克森州立大學科技學院科技學院袁保強教授邀請並支付機票(無日支費)至傑克森州立大學參訪，並順道赴德州參與研討會。

(一) 密西西比州傑克森州立大學(Jackson State University)演講

本次受袁保強教授邀請至密西西比州傑克森州立大學科技學院(College of Science, Engineering and Technology)進行演講，主題是-為什麼化(危害物)災緊急應變是重要的？(Why is HAZMAT or Chemical Emergency Response important?)、關於東亞國家對危害物管理及事故應變之簡報(A Brief Review on Hazard Material Management and Incident Response for Eastern Asia Countries)、災害應變於中國及台灣的發展(Development of HAZMAT response in China and Taiwan)、美國加州緊急應變辦公室特別訓練中心(California Specialized Training Institute, CSTI)應變 12 原則及化學品如何進行適當管理？(How chemicals be managed properly?) 等項目，首先由各類型化災事故發生頻率、對人體及環境所造成之衝擊及災損金額等因素，使學員們了解化(危害物)災緊急應變之重要性。而後簡單說明東亞國家(台灣、日本、南韓及中國)對於危害物相關管理及權責單位，並介紹台灣及中國目前在事故應變上的發展，如台灣目前擁有環境事故專業諮詢中心及三區專業技術小組等應變組織。最後則藉由講解 CSTI 應變 12 原則和全球化學品管理相關組織權責及其功用兩項目，讓學員對於化學品災害及應變有基本程度上之認知。

(二) 美國密西西比州國土卓越中心

國土安全卓越中心(Homeland Security Center of Excellence)為美國國土安全部(United States Department of Homeland Security, DHS)與各大學合作所成立的研究中心，成員皆為相關領域之專家學者，成立目的是藉由科技解決任何可能對美國本土造成危害之因素及降低災害所帶來之損害，該中心研究主題範圍廣泛如下：

1. 恐怖主義事件風險及經濟分析：由南加州大學主導，該中心致力於通過建立先進之科學預測模式和軟體對恐怖主義的風險、成本和後果進行分析。
2. 國家食品保護及防護：由明尼蘇大學主導，主要著重於食品安全領域的「經濟利益驅動摻假」相關研究。
3. 國家恐怖主義研究及恐怖主義應變：由馬里蘭大學主導，其使命是加深對恐怖

分子激進化過程以及恐怖組織演進過程的瞭解，並加強美國公民對恐怖威脅的應變能力。

4. 國家外國動物及動物傳人疾病防護：由德州農工大學主導，研究人畜共患疾病之威脅，並致力於保護國家農業及公共衛生安全。
5. 進階細菌風險評估：由密西根州立大學主導，研究細菌所引起的健康風險及其危害程度，並據此發展防制措施。
6. 離散科學研究：由羅格斯大學、南加州大學、伊利諾大學香賓校區及匹茲堡大學共同主導，進行資訊分析的先進方法及研發計算方式，進而分析大量的信息來檢測可能存在之安全威脅。

國土安全卓越中心成立至今，陸續發表過許多對於國家安全有所助益之研究報告，其存在已成為美國政府捍衛國家安全重要環節之一。藉由此次參訪，除了瞭解美國目前於國土安全面向之科技成果外，也於政府機關與學術單位進行合作計畫的細節部分，與卓越中心主管進行意見交流。另也參觀科林斯消防局及周遭鄰近地區相關應變人員之訓練場，並與科林斯消防局局長- **John Pope**-會談，共同探討關於美國社區緊急應變隊、災害疏散避難策略執行及化學品危害預防等相關經驗。

(三) 密西西比州公衛權責部門(國土安全辦公室及衛生部)政策執行暨災前整備之實務經驗請益

密西西比州國土安全辦公室 (Mississippi Office of Homeland security) 為美國國土安全部(United States Department of Homeland Security, DHS)於各州所成立之地區辦公室，其主要功能為災時負責之緊急管理、城市搜救、公共安全、經濟穩定、社區復建及減災、緊急公共資訊和外部通訊、大量傷患照護、住宅及人道服務等事項，密西西比州衛生部(Mississippi State Department of Health)則致力於災時公共衛生和醫療服務等事項，另因氣候變遷之故，位於美國東南部的密西西比州遭受龍捲風襲擊之機率增加，故此兩部門所擔負之重任顯得格外重要；而考量到我國位處台灣位處季風氣候與颱風侵襲路徑，無可避免也必需面臨氣候變遷所帶來的衝擊，且由高雄氣爆事故受災之民眾後續救助及安置相關事宜，可感覺我國政府機關對於此部分整備較為不足，所以剛好藉此參訪良機與兩部門主管進行交流，並從中學習值得我方效法之處，待回國後提出相關建議供政府相關權責單位參考。

(四) 參加 Magnolia Radio Intertie 辦理之無線電培訓班認證課程及通訊實務應

用

參與 Magnolia Radio Intertie 在密西西比州醫院辦理之無線電培訓課程，課程內容主要如下所列：(1)無線電訊號及波段介紹(2)調頻(3)無線電設備基本介紹(4)無線電頻射電路(5)緊急通訊設施(6)國際法規(7)實際應用等章節，了解環境災害應變時運用無線通訊於災害，除了增進應變人員於災區之救災效率外，更為重要的是協助通知受災人員之人身安全等狀況。

(五) 德州農工大學 TEEX 訓練中心緊急應變訓練設施實體及模擬事故模組觀摩

德州農工大學訓練中心為德州政府選定之公共安全訓練機構，其相關訓練服務稱為德州工程推廣服務及事業(Texas Engineering Extension Service,簡稱 TEXX)，緊急應變訓練主要分為三部分：

1. 消防訓練場：

以工業消防訓練設施為主，除了可提供訓練場可提供國土安全訓練、公共安全訓練、安全衛生訓練、災害整備搜救及滅火搶救訓練等項目，另設有化學災害、船舶、飛機災害事故現場模擬訓練場，供受訓人員實際操作演練，以達到有效增進救災能量之目的；該訓練場擁有超過 140 個訓練項目，占地超過 36 萬 5 千坪，為全球綜合緊急事故最大訓練場之一。

2. 緊急應變訓練中心：

中心主要是結合電腦數據模擬、訓練方法標準化、災害事故模組等相關資料，提供富彈性且可延伸之仿真事故管理訓練之情境，該系統主要運用於大規模演習操作，能明顯提升應變人員之指揮能力。

3. 城市災害情境：

該場地以訓練搜救人員課程著名，以社區概念設計而成，可用來模擬各種級別的災害現場，如救難人員需爬入一截倒塌之火車車廂進行搜救、在建築物的瓦礫中尋找生還者或是進入倒塌的百貨電影院搶救民眾等訓練情境。

德州農工大學訓練中心開課時間為全年，培訓對象包含國家安全、醫療、消防、救難、及對應變感興趣之人員，課程採分級訓練方式，可供不同背景人員進修，聘請師資皆為從事相關領域工作之專家，並擁有國家級認證，除了傳授實際操作技巧，且更為藉由過往實際案例分享應變經驗。我國之緊急應變訓練機構，並未有定期開班授課機制，可供國內專業緊急應變人員進行訓練，建議政府訓練單位應整合有限資源，邀請國內災害防救領域專家學者等共同討論，網羅各式不同災

害類型訓練課程及規劃短、中、長期之訓練班與期程，供國人於緊急應變領域能有多元化專業技術訓練課程，建置完整之教材課程，完善我國應變專業訓練機構，進而提升我國應變人員之能力。

(六) 德州農工大學 Mary Kay O'Connor Process Safety Center 製程安全技術研究及未來發展方向

Mary Kay O'Connor 製程安全中心是美國德州農工於 1995 年設立，為了紀念不幸於 1989 年 Phillips 化學公司聚乙烯工廠爆炸身亡的 Mary Kay O'Connor 女士，中心名稱以其名命之，是國際製程安全領域上之重要研究機構，其研究之主要方向是關於製程安全方面，內容則包含：(1)液化天然氣安全性(2)彈性設計之系統(3)化學品之易燃性及可燃性 (4)化學品之反應性(5)實驗研究，如量熱數據的分析及預測(6)固有安全性之研究，如製程設計及優化的安全性整合(7)風險評估等與製程安全相關等項目；其整體研究目標是發展出：

1. 基於事故發生概率與事故後果所建立之系統鑑別與風險評估方法
2. 對於存在風險之最佳應對計畫
3. 對於最常見和最危險製程之安全處理方案
4. 基於科技方法之理念，發展出可落實製程安全目標之工程技術
5. 用於提高於化學操作、儲存及運輸之安全性的設備、系統或其他裝置
6. 對於預測危害性化學品及相關系統之行為分析方法的改善

而該中心除了於製程安全研究領域享有盛名外，在相關領域之專業人才培訓及養成也不餘遺力，如每年皆會不定時規劃舉辦相關研習課程，並邀請全球知名學者及實務專家進行授課及經驗分享。

我國雖然工業蓬勃發展，但相較於歐美先進國家對於製程安全之重視，除了法規規範不夠嚴格要求，多數業者也不甚重視，所以常常可見如涉及製程之事故，往往會造成極大的損害，為了有效防制，政府單位除了進行相關法規之修法外，也應徹底落實派員至工廠進行製程安全方面之檢核及輔導，加強業者對於此面向之重視；並定期舉辦講習課程，廣邀相關產學官界人員參加，藉此交流互動，以期增進我國於製程安全管理方面之成效。

(七) GCPS 製程安全會議相關議題研討及成果發表

全球製程安全會議 (Global process safety Conference) 由美國化學工程協會(American Institute of Chemical Engineers,AIChE)主辦，化學製程安全中心(Center

for Chemical Process Safety ,CCPS)承辦，該會議為全球製程安全相關會議規模最大者，且主題覆蓋面最廣及專業影響力最大之國際性會議，該會議目的為引領業者、政府機關、學術界和保險業重視製程安全領域，並提供及相互交流相關之應用技術，本屆會議共舉辦 4 天，約 2000 名相關領域人員參加，其會議主題可概分為 10 主題及 216 個分會議題；本人參加如火災與爆炸(Fires and Explosions)、液化天然氣和液化石油之製程安全(Process Safety in LNG and LPG)、中國近期製程安全之發展(Latest Developments in Process Safety in China)、設備選址之影響評估(Facility Siting Consequence Analysis)、原油輸送之過程安全(Process Safety in Crude Oil Transportation)、可燃性粉塵之危害 Combustible Dusts Hazards)、反應性化學品(Reactive Chemicals)及風險評估之應用(Application of Risk Analysis)等討論議題，皆是與我國工業或環境相關之議題，藉由本次會議與各國專家學者之交流討論，於工業製程相關領域獲益良多，另於 28 日口頭報告發表之論文『三氯矽甲烷製程火災事故及應變措施(A Case-Study of a Fire Incident of Trichlorosilane Process and Response Measures)』，並以海報方式發表綠色塑材使用示差掃描量熱儀所進行之放熱實驗 (Exothermal test for green plastics materials by DSC) 研究報告(相關摘要如附件 2 及附件 3 所示)。

四、建議事項：

- (一) 美國化工學會 CCPS 會議為製程安全領域重要之全球性會議，與會人員皆為相關領域學者及專家，所涉及學術內容對製程安全領域重要性及影響力，國內企業應也重視該會議，定期派員參加，對學術單位除了瞭解製程安全技術未來發展趨勢外，也能藉由經驗交流，有效提升我國學術研究於國際間之影響力及知名度。
- (二) 無線電收發為國際間通用之重要通訊技術，我國電信法也規定使用及持有設備需符合法規規定，如需通過考試取得證照及設置許可等，而考量無線電通訊應用於救大型災害應變上之優點，可提升救災及聯絡效率，本校環境事故應變諮詢中心也派員參加國際認證課程，此次乃了解國外資訊，未來將可與國內課程比較。
- (三) 美國國土安全卓越中心所進行之跨學科研究及技術應用，對於美國政府於捍衛國家安全方面有莫大之助益，如各種細菌風險評估技術應用，防爆手提式遠距偵測技術，廣泛地應用於運輸工具偵測(貨櫃、拖車、船舶、汽車及鐵路車廂等，

不僅可阻止恐怖分子欲利用運輸工具攻擊人口密集地區之計畫，另天然災害及救災管理等項目，可有效降低災害帶來之影響；建議政府單位應可如卓越中心般，由學術單位與政府機關合作所成立之研究機構之模式，作為未來國土安全政策發展方向，相信對於國家安全方面能有所助益。

(四)德州農工 **TEEX** 訓練中心對於各種災害緊急應變訓練，共分為消防訓練場、緊急應變中心運作及城市災害情境訓練三部分，本校環境事故應變諮詢中心也曾多次派員前往受訓，但多以參加以工業消防滅火訓練課程為主，但考量到災害應變的多元性時，指揮官各種應變行動皆應了然於心，故建議未來受訓人員應考慮參與其他訓練，如緊急應變中心針對大規模災害情境的模擬系統，應能提升受訓人員之指揮能力及各種應變系統之熟悉度。

五、附錄

附件一、照片

104年4月20日



參訪 Homeland Security Center of Excellence



參訪 Collins Fire Department Training Center



Collins Fire Department Training Center
設備展示

104年4月21.22日(無線電培訓班)



無線電培訓班受訓情形



無線電培訓班結訓證書

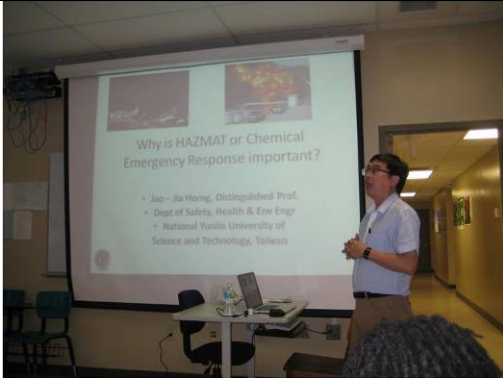
104年4月22日(密西西比州州立大學演講)



演講現況 1



演講現況 2



演講現況 3



演講現況 4

104 年 4 月 23 日 (參訪美國國土安全部相關單位)



拜訪國土安全辦公室發言人



拜訪衛生部負責人

104 年 4 月 24 日 (德州農工大學 TEEX 訓練中心)



經驗交流



環境簡介



設備展示



實場演示

104年4月25日 (德州農工大學 Mary Kay O'Connor Process Safety Center)



拜訪合影 1



拜訪合影 2

104年4月26-29日 (CCPS 製程安全會議)



會議現場



與會狀況



經驗分享討論



現場與會人員合影

附件二、會議議程表

SUNDAY, April 26	
8:00 AM – 5:00 PM	GCPS Short Courses
6:30 PM – 8:00 PM	2015 AIChE Spring Meeting and 11 th GCPS Opening Reception Location: Conv. Ctr. Exhibit Hall 5
MONDAY, April 27	
7:00 AM	Complimentary Breakfast Location: Conv. Ctr. Ballroom D
8:00 AM	2015 AIChE Spring Meeting and 11 th GCPS Opening Plenary Session: Cheryl Teich, AIChE President and June C. Wispelwey, AIChE Executive Director Location: Conv. Ctr. Exhibit Hall 5
8:30 AM	Keynote Address: Chemical Engineering – Is this the “Golden Age”? Presented by Marvin O. Schlanger , Chairman of the Supervisory Board of LyondellBasell (Ret.) Location: Conv. Ctr. Ballroom D
9:15 AM	Coffee Break Location: Conv. Ctr. Exhibit Hall 5
9:40 AM	11 th GCPS Welcoming Plenary Session Location: Conv. Ctr. Ballroom D 11th GCPS Introduction and Welcome: Shakeel Kadri (Executive Director, CCPS) and Rainer Hoff (GCPS Chair) Symposia Introductions: Samantha Scruggs (CCPS Chair), Charles A. Soczek (LPS Chair), Karen Study (PPSS Chair), Lisa Long (PSM ² Chair), Jatin Shah (Spotlight Track Chair), Laura Turci (RPPS), and J. Wayne Chastain (DIERS) Presentation of William H. Doyle Award for LPS Best Paper Award and PPSS Best Paper Award

MONDAY, April 27							
	Process Safety Spotlights	4 th Process Safety Management Mentoring (PSM ²)	30 th Center for Chemical Process Safety International Conference (CCPS)	17 th Process Plant Safety Symposium (PPSS)	49 th Annual Loss Prevention Symposium (LPS)	Perspectives on Process Safety from Around the World	Design Institute for Emergency Relief Systems (DIERS)
	<i>Executive Panel: Opportunity Crudes in a Changing Market and Process Safety Considerations</i>	<i>Guidelines for Effective Implementation of PSM I</i>	<i>Committed Culture I</i>	<i>Technological Advances and Their Impact on Process Safety</i>	<i>Fires and Explosions I</i>	<i>Challenges of Japan's Process Safety</i>	<i>Effective Scenario Identification for Pressure Relief and Effluent Handling Systems</i>
	Location: Conv. Ctr. Ballroom E	Location: Conv. Ctr. Ballroom G	Location: Conv. Ctr. Room 18B&C	Location: Conv. Ctr. Room 17A&B	Location: Conv. Ctr. Room 19A&B	Location: Conv. Ctr. Room 18D	Location: Conv. Ctr. Ballroom F
	Co-Chairs: Tim Olsen Jatin Shah	Co-Chairs: Ravi Ramasamy Bruce K. Vaughen	Co-Chairs: Jim Klein Stacey Moore	Co-Chairs: Sanjeev Saraf Vic Edwards	Co-Chairs: Jerome Taveau Derek Miller	Co-Chairs: Masaki Nakagawa Neil Concibido	Co-Chairs: Peter Howell, Wayne Chastain
10:30 AM	Panelists Include: Steve Arendt, ABSG Consulting, Inc. Carl Weaver, Baker Hughes Michael E. Webber, Webber Energy Group Terry Higgins, HART Energy	Development and Implementation of Process Safety and Integrity Management (PSIM) <i>Frik Febby</i>	OK so our culture sucks! What Do We Do Now? <i>Mike Broadribb,</i>	Eli Lilly PSM Implementation Case Study <i>Robert Stankovich</i>	Suppression of Overpressure during a Vapor Cloud Explosion <i>Chris Buchwald</i>	Development and Research Activities of Advanced System Safety Laboratory for Safety Education/Culture <i>Atsuko Fumoto</i>	Overpressure Protection of a Pressure Vessel By System Design through the Application of ASME VIII Ug-140 in Lieu of a Relief Device By an Appropriate Choice of Mawp and/or By Safety Instrumented System <i>Dilip K. Das</i>
11:00 AM		PSM Implementation at Binh Son Refining & Petrochemical Ltd. - Challenges and Strategies <i>Vo Hoang Vu</i>	Leading Indicators – The Corner Stone of a Committed Process Safety Culture <i>Anne O'Neal</i>	Autonomous Remote Gas Detection Using Optical Imaging Technology <i>Jonathan Morris</i>	Deflagration Load Generator: Repeatability and Application to Test Article Blast Loading <i>Brad Horn</i>	Development of Quantitative Hazard Analysis Method for Inherently Safer Chemical Processes <i>Yuto Mizuta</i>	Understanding Gas Blowby Scenario Calculations <i>Nancy Faulk</i>
11:30 AM		Capital Projects: Process Safety from Conception through Retirement <i>Robert Wasileski</i>	Essential Practices for Developing, Strengthening, and Implementing Process Safety Culture <i>David Moore</i>	An Optimal Cost-Effective Approach to Sensor Siting for Industrial Facilities <i>Azar Shahraz</i>	Safety Critical Items Siting Based on CFD Deterministic Fire Simulations <i>Rafael Storch</i>	Development of Best Practices of Process Safety in Japan <i>Masatoshi Kumamoto</i>	Can I Use My Cooling Water Header As a Relief Device? <i>Rahul Raman</i>
12:00 PM	Luncheon with Speaker: Wesley E. Lohec – “Challenges in sustaining effective process safety” Location: Hilton, Sixth Floor, Salon F, G and H						

MONDAY, April 27							
	Process Safety Spotlights	4 th Process Safety Management Mentoring (PSM ²)	30 th Center for Chemical Process Safety International Conference (CCPS)	17 th Process Plant Safety Symposium (PPSS)	49 th Annual Loss Prevention Symposium (LPS)	Perspectives on Process Safety from Around the World	Design Institute for Emergency Relief Systems (DIERS)
	<i>Process Safety in LNG and LPG I</i>	<i>Guidelines for Effective Implementation of PSM II</i>	<i>Committed Culture II</i>	<i>What You Need to Know about Process Safety for Capital Projects</i>	<i>Fires and Explosions II</i>	<i>Indicadores De Seguridad De Procesos</i>	<i>Relief Considerations for Low Pressure Storage Tanks</i>
	Location: Conv. Ctr. Ballroom E	Location: Conv. Ctr. Ballroom G	Location: Conv. Ctr. Room 18B&C	Location: Conv. Ctr. Room 17A&B	Location: Conv. Ctr. Room 19A&B	Location: Conv. Ctr. Room 18D	Location: Conv. Ctr. Ballroom F
	Co-Chairs: Trey Morrison, Kathy Pearson, Victor Edwards	Co-Chairs: Ravi Ramasamy, Bruce Vaughn	Co-Chairs: Jim Klein, Stacey Moore	Co-Chairs: Bob Wasileski, Katherine Prem	Co-Chairs: Jerome Taveau, Derek Miller	Co-Chairs: Marcela Recaman	Co-Chairs: Casey Houston, Georges Melhem
1:30 PM	CFD Modeling of Large Scale LNG Pool Fires <i>Fillipo Gavelli</i>	Implementing PSM: Perspective from a Process Engineer Turned PSM Attorney <i>D.A. Duggar</i>	Creating a Culture of Chronic Unease <i>Laurence Pearlman</i>	Real World Challenges in Meeting Risk Criteria for Brownfield Projects <i>Anne Branson</i>	Hydrogen Jet Vapor Cloud Explosion: Test Data and Comparison with Predictions <i>J. Kelly Thomas</i>	Indicadores De Seguridad De Procesos y Observaciones Planificadas De Seguridad <i>Ricardo Ceskiavikus</i>	Influence of Overpressure in Pressure Vacuum Safety Valves on Emission Reduction and Explosion Risk Minimization of Atmospheric Storage Tanks <i>Davide Moncalvo</i>
2:00 PM	CFD Modeling of LNG Spreading and Atmospheric Dispersion <i>Anh Bui</i>	Improving Risk-Based Decision Making By Connecting PSM Systems to Day-to-Day Plant Operations <i>Mike Neill</i>	Guidelines for Creating a Process Safety Culture Assessment Tool <i>Farheen Khan</i>	Pre-Developing an Asset Integrity Program during the Capital Project <i>F. Russ Davis</i>	Prediction of the Mass Flow of Heavy Gas Released from Standard Gas Bottles <i>Christian Rauchegger</i>	Choosing Inspections Using Composite Indicators – a New Safety's Regulator Approach in the Brazilian Continental Shelf <i>Alex Almeida Sr.</i>	A Comprehensive Guide to Accurately Size Pressure and Vacuum Relief Devices for Atmospheric and Low Pressure Storage Tanks <i>Steve Streblov</i>
2:30 PM	Mitigation Effect of High Expansion Foam on LNG Vapor Hazard <i>Bin Zhang</i>	Implementation of Process Safety at SABIC-Sinopec Tianjin, China <i>Homoud Al-Maynoui</i>	Cracking the Code of Process Safety Culture with Organizational Network Analysis <i>Elliot Wolf</i>	Prevention or Mitigation of Major Accident Hazards through Early Identification of Safety Critical Elements <i>Raminaidu Girada</i>	Engineered Floating Beads: New Method for Vapor Suppression and Fire Prevention for Flammable Liquids <i>Joe Riordan</i>	El Uso De Metricas De PSM y Su Impacto En La Cultura De Seguridad <i>Alberto E. Vignale</i>	Overfilling Protection for Weak Tanks <i>Rahul Raman</i>
3:00 PM	Coffee and Networking Break Location: Conv. Ctr. Exhibit Hall 5						

	<i>Process Safety in LNG and LPG II</i>	<i>Careers in PSM – Invited Panel</i>	<i>Vibrant Management Systems</i>	<i>LOPA and the Process Safety Lifecycle</i>	<i>Fires and Explosions III</i>	<i>Historia De Casos y Lecciones Aprendidas</i>	<i>Effectively Deal with Evolving Codes, Standards, and RAGAGEP for Pressure Relief Systems</i>
	Location: Conv. Ctr. Ballroom E	Location: Conv. Ctr. Ballroom G	Location: Conv. Ctr. Room 18B&C	Location: Conv. Ctr. Room 17A&B	Location: Conv. Ctr. Room 19A&B	Location: Conv. Ctr. Room 18D	Location: Conv. Ctr. Ballroom F
	Co-Chairs: Trey Morrison Kathy Pearson Victor Edwards	Co-Chairs: Jeff Fox Dow Corning	Co-Chairs: Russ Ogle Bernard Groce	Co-Chairs: Christy Blanchard Kimberly Mullins	Co-Chairs: Jerome Taveau Derek Miller	Co-Chairs: Nestor Sposito Luisa Lopez	Co-Chairs: Warren Greenfield Wayne Chastain
3:30 PM	The Human Factors behind Inherently Safer Design of LNG Liquefaction Terminals <i>David Weimer</i>	Invited Panel	Recent Process Safety Developments at BASF Ludwigshafen, the World's Biggest Chemical Site <i>Hans Volkmar Schwarz</i>	Impacts of Process Safety Time on Layer of Protection Analysis <i>Geoffrey Barnard</i>	Risk Ranking Criteria for Catastrophic Vessel Failures Due to Fire Exposure. Vessel Wall Dynamics & Consequence Analysis <i>Jordi Dunjó</i>	Un Caso Real En Ocotlan, México: Aplicación De análisis De Causa Raíz y Acciones En Base a Pareto <i>Hugo Hernandez</i>	Changes Between API STD 521 6th Ed and 5th Ed Cataloged <i>Dustin J. Smith</i>
4:00 PM	The Hazard We Know: Comparing Transportation Risk of LPG and LNG <i>Ryan J. Hart</i>		Next Generation Root Cause Investigation and Analysis - Elimination of Repetitive Incidents through Strengthening Management Systems <i>Kenan Stevick</i>	Demonstrating Separation and Independence of Automated Systems <i>Angela. E. Summers</i>	Observations and Modeling of Off-Site Damage from Large Vapor Cloud Explosion (VCE) Events <i>Raymond H. Bennett</i>	Alineación De Causalidad De Accidentalidad Con El Modelo De Gestión ASP <i>Clara Ines Arbelaez</i>	Changes Between API STD 520 Part II 6th Ed and 5th Ed Cataloged <i>John Burgess</i>
4:30 PM	Experimental Study on Propane Jet Fire Hazards: Thermal Radiation <i>Bin Zhang</i>		Internal Auditing of Process Safety - a False Sense of Security? <i>Lee Allford</i>	LOPA - More Observations from the Originators <i>William Bridges & Art Dowell</i>	Risk Assessment for a Gas and Liquid Hydrogen Fueling Station <i>Jo Nakayama</i>	Incidentes Ocurridos En La Industria Del Gnl <i>Juan G. Haitzaguerre</i>	Evolution of Relief Sizing at an Operating Company <i>Michael J. Maness</i>
5:00 PM	GCPS Electronic and Paper Poster Session and Cocktail Reception, Co-Chairs: Peter Lodal, Jennifer Mize, Revonda Tew, Jack Chosnek Location: Conv. Ctr. Exhibit Hall 5						

TUESDAY, APRIL 28							
	Process Safety Spotlights	4 th Process Safety Management Mentoring (PSM ²)	30 th Center for Chemical Process Safety International Conference (CCPS)	17 th Process Plant Safety Symposium (PPSS)	49 th Annual Loss Prevention Symposium (LPS)	Perspectives on Process Safety from Around the World	Design Institute for Emergency Relief Systems (DIERS)
	<i>Human Factors I</i>	<i>The Day PSM Hit Home I</i>	<i>Responsible Collaboration</i>	<i>Process Safety Management Audits</i>	<i>Combustible Dusts Hazards</i>	Latest Developments in Process Safety in China I	<i>Initial Design and Managing Ongoing Operation of Pressure Relief Systems</i>
	Location: Conv. Ctr. Ballroom E	Location: Conv. Ctr. Ballroom G	Location: Conv. Ctr. Room 18B&C	Location: Conv. Ctr. Room 17A&B	Location: Conv. Ctr. Room 19A&B	Location: Conv. Ctr. Room 18D	Location: Conv. Ctr. Ballroom F
	Co-Chairs: Tim Murphy Amanda Chapman	Co-Chairs: Michael Morris Scott Haney	Co-Chairs: Jerry Forest John Wincek	Co-Chairs: Jim Thompson Donnie Carter	Co-Chairs: Michael Moosemiller Henry L. Febo	Co-Chairs: Dongfeng Zhao Yi Liu Meng Yi-fei	Co-Chairs: Daniel Nguyen Wayne Chastain
8:00 AM	The Psychology of Decision Making in Process Hazard Analysis <i>Paul Baybutt</i>	We Learn and Share but We Don't Get Better! Time for Huaa <i>Mike Bearrow</i>	The Evolution of Process Safety Standards and Legislation Following Landmark Events - What Have We Learnt? <i>Trish Kerin</i>	API Process Safety Site Assessment Program - Promoting a Culture of Process Safety <i>Andrew Broadbent</i>	A Theoretical-Based and Generalized Method for Dust and Gaseous Deflagration Vent Sizing <i>Hans K. Fauske</i>	Safety Management of Petrochemical Tank Farms <i>Dongfeng Zhao</i>	Overlooked Factors in Pressure Relief Systems Design <i>Steve Streblov</i>
8:30 AM	Advanced Procedure Research Study - Applying Human Factor Principles to Procedure Presentation and Design <i>Elliott Lander</i>	Young, Inexperienced, and Learning: How Process Safety Hit Home While Attending a Conference <i>Ashley M. Weckwerth</i>	Industrial Partnerships and PSM Standards in Canada <i>Adrian Pierorazio</i>	Process Safety Auditing: Thinking Beyond Compliance <i>Stephen Gill</i>	Combustion and Explosion Related Properties of Carbon Nanofibers <i>Jiaqi Zhang</i>	Study on Separation Distance Determination of LNG Filling Station on Water <i>Gujun Wan</i>	Will It Really Make That Much of a Difference? Broad Effects of Operational Changes on Relief System Design <i>Marie Baker & Teddy Bucher</i>
9:00 AM	Examination of Events That Occur during an Alarm Flood - Their Impact on Safety and Proper Corrective Action <i>Darwin Logerot</i>	The Road Between Reality and Philosophy (aka HSE Success within an Engineering Organization) <i>Rao Akula</i>	AICHe/CCPS White Paper: Recommendations for Establishing Process Safety Investigation Boards <i>Scott Berger</i>	Ignorance Is No Defense... Audit Management Best Practices <i>Mike Bearrow</i>	Unconfined Deflagration Testing for the Assessment of Combustible Dust Flash Fire Hazards <i>Michael C. Stern</i>	A Case-Study of a Fire Incident of Trichlorosilane Process and Response Measures <i>Jao-Jia Horng</i>	Auditing Relief Systems Design Basis - Best Practices <i>Neil Prophet</i>
9:30 AM	Coffee and Networking Break Location: Conv. Ctr. Exhibit Hall 5						

	<i>Human Factors II</i>	<i>The Day PSM Hit Home II</i>	<i>Disciplined Adherence to and Harmonization of Standards</i>	<i>Best Practices in Process Safety and Risk Management I</i>	<i>Facility Siting Consequence Analysis I</i>	<i>Latest Developments in Process Safety in China II</i>	<i>Development of Engineering Analysis Methods and Tools for Pressure Relief Valve Stability and Relief Pipe Reaction Forces</i>
	Location: Conv. Ctr. Ballroom E	Location: Conv. Ctr. Ballroom G	Location: Conv. Ctr. Room 18B&C	Location: Conv. Ctr. Room 17A&B	Location: Conv. Ctr. Room 19A&B	Location: Conv. Ctr. Room 18D	Location: Conv. Ctr. Ballroom F
	Co-Chairs: Tim Murphy Amanda Chapman	Co-Chairs: Alan C. Brackey Brenton L. Cox	Co-Chairs: Marty Timm John Herber	Co-Chairs: Sandipan Laskar Mervyn Carneiro	Co-Chairs: Ronald J. Willey Jean-Paul Lacoursiere	Co-Chairs: Dongfeng Zhao Yi Liu Meng Yi Fei	Co-Chairs: Marc Levin, Georges Melhem
10:15 AM	Procedural Safeguard Reliability <i>Sean J. Dee</i>	2007 Valero McKee Refinery Fire <i>Shannon Gillespie</i>	How Does "Deviation" Become "Normal"? <i>Jennifer Mize</i>	Using PHA As a Framework for Effectively Addressing Evolving PSM/RMP Guidelines, Such As Damage Mechanism Hazard Reviews <i>Steven T. Maher</i>	Modelling Liquid Fuel Cascades with Open Foam <i>Jennifer X. Wen</i>	Case Analysis of Oil and gas Pipeline Deflagration Accidents <i>Shi Li</i>	Dynamics of Direct Spring Operated Prv's with Inlet Piping in Gas Service <i>Kenneth Paul & Alan Champneys & Csaba Hos</i>
10:45 AM	Changing Demographics: Preserving Safety and Increasing Performance <i>Denise Brooks</i>	1987 Celanese Pampa Butane Vapor Cloud Explosion <i>Jack Mc Cavit</i>	The Changing Tide of US Process Safety/Risk Management Regulations - How CCPS Risk Based Process Safety and Vision 20/20 Concepts Can Harmonize Future Requirements <i>Steve Hawkins</i>	A Case Study to Show How Bow-Tie Analysis Can be Used As an Effective Communication Tool in Risk Assessments <i>Varsha Pedhireddy</i>	Consequence Modeling of Dynamic Source Terms <i>Michael D. James</i>	Research of Process Safety Management Platform Architecture Based on Internet of Things <i>Guoliang Yang</i>	Effect of Body Bowl Choking on Pressure Relief Valve Stability <i>Hisao Izuchi</i>
11:15 AM	Human and Organizational Factors Assessment and Their Use As Potential Safety Barriers <i>Mehmood Ahmad</i>	"Let Me Tell You....." The impact of Eastman's Aniline Plant Explosion on Process Safety Awareness <i>Pete Lodal</i>	PSM/RMP Modernization Programs in California - Current Initiatives and What's on the Horizon <i>Steven Maher</i>	The Lifecycle of a Process Safety Recommendation <i>Benjamin Poblete</i>	Toxicity-Hazard Index and the "Infinite Point" <i>Richard Prugh</i>	Application and Optimization of Quantitative RBI on Equipment of Station Yard <i>Shuang Liang</i>	Modeling and Computation of Reaction Forces on Relief Piping during Depressurization <i>Jens Conzen & Gabe Wood</i>
11:45 AM	Luncheon with Speaker: Shakeel Kadri – Process Safety Culture – an organizational view Location: Hilton, Sixth Floor, Salon F, G and H						

Tuesday, April 28							
	Process Safety Spotlights	4 th Process Safety Management Mentoring (PSM ²)	30 th Center for Chemical Process Safety International Conference (CCPS)	17 th Process Plant Safety Symposium (PPSS)	49 th Annual Loss Prevention Symposium (LPS)	Perspectives on Process Safety from Around the World	Design Institute for Emergency Relief Systems (DIERS)
	<i>Process Safety in Upstream Operations I</i>	<i>PSM Mastery I - Specific examples of the four pillars of risk based process safety</i>	<i>Enhanced Application of Lessons Learned</i>	<i>Best Practices in Process Safety and Risk Management II</i>	<i>Facility Siting Consequence Analysis II</i>	A Importância Da Segurança De Processos Para o Crescimento e Perpetuidade Da Indústria Química No Brasil	<i>How to Measure the Right Data for Reaction Systems</i>
	Location: Conv. Ctr. Ballroom E	Location: Conv. Ctr. Ballroom G	Location: Conv. Ctr. Room 18B&C	Location: Conv. Ctr. Room 17A&B	Location: Conv. Ctr. Room 19A&B	Location: Conv. Ctr. Room 18D	Location: Conv. Ctr. Ballroom F
	Co-Chairs: Cheryl Grounds Robert Benedetti	Co-Chairs: Brian Dickson Ruifeng "Ray" Qi	Co-Chairs: Andrew Goddard Swati Umbrajkar	Co-Chairs: Sandipan Laskar Mervyn Carneiro	Co-Chairs: Ronald J. Willey Jean-Paul Lacoursiere	Co-Chairs: Americo Diniz Carvalho Neto,	Co-Chairs: Peter Ralbovsky Wayne Chastain
1:30 PM	Safety Case VS SEMS: Are They Really All That Different? an Operator's Perspective <i>Brent Dunagan</i>	Sherlock Holmes, Why Trees, Bow Ties, and Investigating Process Incidents, <i>James Klein</i>	Dow Learnings & Actions from the Deepwater Horizon Accident <i>John Champion</i>	Problems with HAZOPs and How to Correct Them <i>Howard Duhon</i>	Discharge and Dispersion for Large-Diameter CO ₂ Releases: Experimental Data and Data Review <i>Jock Brown</i>	Panel Session "Disciplina Operacional: Indicador De Cumprimento Das Rotinas" <i>Maria C. Saraiva,</i>	Phi Correction for Exothermic Gas Generation Rate <i>Guibing Zhao</i>
2:00 PM	A Modern Well HAZOP Approach <i>Yaneira Saud</i>	Ten Commandments of Risk Based Process Safety <i>Robert Rosen</i>	Three Decades after Bhopal: What We Have Learned about Effectively Managing Process Safety Risks <i>Bruce Vaughen</i>	Improving Process Safety Performance <i>James Klein</i>	Quantitative Collision Risk Analysis for Offshore Installations <i>Susan Y. Guo</i>		Calorimetric Study of the Exothermic Decomposition of Dimethyl Sulfoxide <i>B. Todd Brandes</i>
2:30 PM	To Safely Go Where No Man Has Gone before: Exploring and Producing with Process Safety <i>Mike Broadribb</i>	Developing Credible Scenarios for a PHA, <i>Nestor Paroliticci</i>	HUAA... When Local Learning and Casual Sharing Is Not Enough <i>Mike Bearrow</i>	Good till the Last Drop – How Much Is Too Much Valve Leakage? <i>Timothy J. Wagner</i>	Calculating Facility Siting Study Leak Sizes - Applications of the Maximum Design Leak (MDL) Approach <i>Gary A. Fitzgerald</i>		Relief System Sizing for Runaway Chemical Reactions - a Simple Comprehensive Approach <i>Charles Kozlowski</i>
3:00 PM	Coffee and Networking Break Location: Conv. Ctr. Exhibit Hall 5						

Tuesday, April 28

	Process Safety Spotlights	4 th Process Safety Management Mentoring (PSM ²)	30 th Center for Chemical Process Safety International Conference (CCPS)	17 th Process Plant Safety Symposium (PPSS)	49 th Annual Loss Prevention Symposium (LPS)	Design Institute for Emergency Relief Systems (DIERS)
	<i>Process Safety in Crude Oil Transportation</i>	<i>PSM Mastery II - Specific examples of the four pillars of risk based process safety</i>	<i>Intentional Competency Development</i>	<i>Getting the Most from Your Process Safety Near Misses I</i>	<i>Facility Siting and Consequence Analysis III</i>	<i>Practical Methods for Two Phase Flow Estimates</i>
	Location: Conv. Ctr. Ballroom E	Location: Conv. Ctr. Ballroom G	Location: Conv. Ctr. Room 18B&C	Location: Conv. Ctr. Room 17A&B	Location: Conv. Ctr. Room 19A&B	Location: Conv. Ctr. Ballroom F
	Co-Chairs: Dan Miller Bernard Groce	Co-Chairs: Nicholas N. Cristea, Faraz Khan, Siemens	Co-Chairs: Lizbeth Cisneros Don Connolley	Co-Chairs: John Champion Colin (Chip) Howat III	Co-Chairs: Ronald J. Willey Jean-Paul Lacoursiere	Co-Chairs: Davide Moncalvo Georges Melhem
3:30 PM	Human Factors Considerations: Midstream Process Safety Integration <i>Denise Brooks</i>	The Three Main Causes of Major Process Safety Accidents <i>William Bridges</i>	Know Your Target Audience - Building Leader Competency in Process Safety <i>Joan Bruney</i>	Are We Really Learning from Incidents? a Discussion of Best Practices and Common Mistakes <i>Laurence Pearlman</i>	Development of Quantitative Financial Risk Tolerance Criteria <i>Elliot Wolf</i>	Choked and Near-Choked Real Gas and Two-Phase Flow Analysis of Discharge Piping <i>Leonid Korelshteyn</i>
4:00 PM	Overcoming the Process Safety Challenges in Midstream Pipeline Operations <i>Juan E. Contreras</i>	Efficiency and Quality Improvements for Better PHAs <i>John Alderman</i>	Bridging Hazard Recognition Knowledge and Competency for Process and Occupational Safety <i>Michael Fleming</i>	Praxair's Process Safety Metric Program and Use if Large Data <i>Dan Rathgeber</i>	Blast Resistant Design and Retrofit of Buildings at Petrochemical Facilities <i>Paul Summers</i>	Models for Multi-Phase & Single-Phase Flow in Pressure Relieving System Using Bernoulli Integration <i>Freeman Self</i>
4:30 PM	Invited papers	Surviving an OSHA PSM National Emphasis Program Audit <i>James Johnstone</i>	Making Sense of Reason: A Review of the Message James Reason Put Forward for a Re-Think of Safety Management Principles <i>Brian Dickson</i>	Systematic Approach to the Root Cause of Process Safety Events at Equion Energia Ltd <i>Ignacio Alonso</i>	Thermal Radiation Analysis from Large Pool Fires in an Existing Atmospheric Storage TANK Farm to Estimate the Maximum FIRE Water Demand <i>Marco-Antonio Medrano</i>	How to Size a Rupture Disk Vent Line for Two-Phase Gas/Liquid Flow Based on Current Engineering Practices <i>Juergen Schmidt</i>

Wednesday, April 29

Wednesday, April 29					
	Process Safety Spotlights	30 th Center for Chemical Process Safety International Conference (CCPS)	17 th Process Plant Safety Symposium (PPSS)	49 th Annual Loss Prevention Symposium (LPS)	Design Institute for Emergency Relief Systems (DIERS)
	<i>Big Data Analytics Panel I</i>	<i>Enhanced Stakeholder Knowledge</i>	<i>Application of Risk Analysis I</i>	<i>Process Safety in Upstream Operations II</i>	<i>New Developments in Fire Exposure and Depressuring Systems Design and Evaluation</i>
	Location: Conv. Ctr. Ballroom E	Location: Conv. Ctr. Room 18B&C	Location: Conv. Ctr. Room 17A&B	Location: Conv. Ctr. Room 19A&B	Location: Conv. Ctr. Ballroom F
	Co-Chairs: Jatin Shah Eric Peterson Leo Chiang	Co-Chairs: Brad Newman Ryan Hart	Co-Chairs: Phil M. Myers Mike Broadribb	Co-Chairs: Cheryl Grounds Robert Benedetti	Co-Chairs: Michael Maness, Georges Melhem
8:00 AM	Panelists Include: Ted Wasserman, Tableau Software Lyold F. Colegrove, The Dow Chemical Company Deborah Grubbe, Operations and Safety Solutions, LLC Michael Firstenberg, Waterfall Security Solutions	Enhanced Stakeholder Knowledge through the Mary Kay O'Connor Process Safety Center <i>Sam Mannan</i>	Dependent, Independent and Pseudo-Independent Protection Layers in Risk Analysis <i>Hui Jin</i>	CFD Analysis and Field Tests of Gaseous Leaks with 80% CO ₂ on Offshore Facilities <i>Jianxin Lu</i>	Modification of the Diers Fire Exposure Test Methodology <i>Peter J. Ralbovsky IV</i>
8:30 AM		Advancing the Imperative for Process Safety Education in Engineering Curricula <i>Gord Winkel</i>	The Societal Risk of Process Industry Based on Integrated Assessment of Quantitative Risk Analysis (QRA) and Risk-Based Inspection (RBI) Methodologies <i>Vincius Esteves</i>	Case Study: Laser-Based Gas Detection Technology and Dispersion Modeling Used to Eliminate False Alarms and Improve Safety Performance on Terra Nova FPSO <i>Rajat Barua</i>	Guidance for Sizing Relief Devices That Are Installed below Liquid Level in an External Fire <i>Rahul Raman</i>
9:00 AM		Dow Laboratory Safety Academy Promotes Safety Mindset in Future Chemical Workforce <i>Marabeth Holsinger</i>	Addressing Issues in the Design and Use of Risk Matrices in Process Safety <i>Paul Baybutt</i>	Escape Routes Selection for Offshore Units Based on Quantitative Risk Assessment Results <i>Mariana B. Baray</i>	Mechanical Integrity Considerations in LNG Depressurization <i>Daniel Nguyen</i>
9:30 AM	Coffee and Networking Break Location: Conv. Ctr. Exhibit Hall 5				

	Process Safety Spotlights	17 th Process Plant Safety Symposium (PPSS) <i>Track II</i>	30 th Center for Chemical Process Safety International Conference (CCPS)	17 th Process Plant Safety Symposium (PPSS)	49 th Annual Loss Prevention Symposium (LPS)	Design Institute for Emergency Relief Systems (DIERS)
	<i>Big Data Analytics Panel II</i>	<i>Getting the Most from Your Process Safety Near Misses II</i>	<i>CCPS Featured Projects – Vision 20/20</i>	<i>Application of Risk Analysis II</i>	<i>Reactive Chemicals</i>	<i>Unique Aspects of Pressure Relief Systems Design and Evaluation for Reaction and Flare Systems</i>
	Location: Conv. Ctr. Ballroom E	Location: Conv. Ctr. Ballroom G	Location: Conv. Ctr. Room 18B&C	Location: Conv. Ctr. Room 17A&B	Location: Conv. Ctr. Room 19A&B	Location: Conv. Ctr. Ballroom F
	Co-Chairs: Jatin Shah Eric Peterson Leo Chiang	Co-Chairs: John Champion Colin (Chip) Howat III	Co-Chairs: Jeff Fox Eric Freiburger	Co-Chairs: Phil M. Myers Mike Broadribb	Co-Chairs: Kathleen A. Kas John F. Murphy	Co-Chairs: Ken Kurko Wayne Chastain
10:15 AM	Panelists Include: Ted Wasserman, Tableau Software Lyold F. Colegrove, The Dow Chemical Company Deborah Grubbe, Operations and Safety Solutions, LLC Michael Firstenberg, Waterfall Security Solutions	Process Safety Opportunities for the Refining and Petrochemical Industries <i>Jerry J. Forest</i>	Vision 20/20 Panel Facilitators: Jack McCavit & Cheryl A. Ground	New Building Siting Using Risk-Based Approach <i>John N. Dyer</i>	Chemical Incompatibility Matrices <i>Michelle Murphy</i>	Statistical Review of Runaway Reaction Kinetics <i>Enio Kumpinsky</i>
10:45 AM		A Miss, Amiss, a Near Miss <i>John Wincek</i>		Holistic Approach to Barrier Integrity <i>San Burnett</i>	Understanding the Effect of Fill-Ratio on Thermo-Kinetic Data <i>Swati Umbrajkar</i>	Emergency Relief System Design for Reactive System Using Direct Scale-up Method <i>Surendra Singh</i>
11:15 AM		Lesson Learnt and Process Safety of Ammonia Urea Plant <i>Muhammad Haider</i>		Identifying and Quantifying Major Hazard of Construction Lifting Activities <i>Akhmad Harmantoro</i>	Lending Industrial Experience through Reactive Hazard Examples in University Safety Instruction <i>Henry T. Kohlbrand</i>	Engineering Safe Pressure Relief for Existing Flare Systems <i>Jay Riha & Steve Streblov</i>
11:45 AM	Spring and GCPS Joint Luncheon with Speaker: Al Sacco – You think you have safety concerns!! The flight of STS-73 Location: Hilton, Sixth Floor, Salon F, G, H, J and K					

Case Histories and Lessons Learned – GCPS Joint Session Location: Conv. Ctr. Ballroom D Co-Chairs: Fred Henselwood, Kathy Shell and Kendall Werts	
1:30 PM	Fire from the Cascading Failure of an Oxygen Supply System <i>Delmar Morrison & Vijay Kumar</i>
2:00 PM	Lessons Learned from an Incident at a Cryogenic Gas Processing Facility <i>Adrian Pierorazio</i>
2:30 PM	The Normalization of Deviation Leads to a Significant Process Safety Incident <i>Steven Barre</i>
3:00 PM	Break
3:15 PM	U.S. Chemical Safety Board's Final Investigation Report on the Chevron Richmond Refinery Rupture and Fire <i>Lauren Grim & Mark Wingard</i>
4:00 PM	Bhopal 30 Years Later <i>Ronald J. Willey & Dan Crowl</i>
4:45 PM	GCPS Concluding Remarks



A Case-Study of a Fire Incident of Trichlorosilane Process and Response Measures

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Keywords: Trichlorosilane, fire extinguisher, liquid nitrogen

Abstract

There was a fire occurring of a overheating Trichlorosilane (TCS) reactor in a solar panel manufacture plant in 2011. Although no injury happened, the leak-out TCS caught fire and produced acid plume creating great concerns for responding governmental agencies, nearby general public and news media. Since TCS is an important raw material for petrochemical, semi-conductor, and solar panel manufactures, its hazardous properties of low flash point, easy combustible, water-reactive, and acid-producing have created many difficulties in response as its leaking out.

All incidents of chlorosilanes (CS) materials would produce large acid plume as large amount of leaking lead to burning. The fires could not be controlled by water due to their water-reactive properties. When other distinguishers such as foams were applied, the uses of water jetty were essential to cover the burning surface and to reduce the acid plume. The best practice was to continuously put foams on top until it burn out. However, this action would prolong the response and could not control the damages well. Therefore, the prevention of acid plume and the correct use of foams were essential for fire response to CS and TCS.

Upon our field tests, we found that no fire distinguishing was observed for powder, carbon dioxide, water and halon on small-scale fire (3 kg) of TCS. All continuously produced acid plume and some even reacted to form harmful byproducts. The fires would be distinguished as the application of foams and liquid nitrogen. The effective practices were that 6% mixed middle-expansion foams with 15 cm of covering height and liquid nitrogen with volume (ml) of $177+0.287*(TCS \text{ volume})$. However, two methods adopted totally different principles for fire extinguishing.

Our study indicated that when using liquid nitrogen to effectively distinguish the TCS fire was due to it adsorbed reaction heat of burning and stop the reaction. We further prove that no property change of TCS after our application. This application was safe and was different from applying foams that water actually reacted with TCS and producing dangerous hydrogen gas. This finding might be used in future development for cooling agency for CS fire application.

Exothermal test for green plastics materials by DSC

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Abstract

Food containers made of plastics release harmful gases and nanoparticles due to thermal decomposition, which can pose health risks during use of the containers. Differential scanning calorimetry (DSC) was applied to evaluate the thermal kinetic and basic characteristics of plastic containers, such as polyethylene terephthalate (PET), low density polyethylene (LDPE), polypropylene (PP), polystyrene (PS), and poly lactic acid (PLA). Results indicated that PET, PS, and PLA had the lower decomposition temperature, even less than 100 °C compared to other plastics. It is expected that the obtained test results can provide useful safety information for these commonly used plastic containers.

Keywords: containers, plastic, differential scanning calorimetry (DSC), thermal kinetic, safety information

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