SILANE SAFETY SEMINAR 2007 SINGAPORE

A 1-1/2 day programme on 1-2 November at the Singapore Management University Conference Hall, Singapore

- By leading experts in the industry
- Includes discussion and workshop sessions

Who should attend?

- All users of silane
- Safety personnel
- Regulatory & ER personnel

Photo: Eugene Ngai, Air Products

Organised by: AIGA **Asia Industrial Gases Association**

In cooperation with: semi SESHA

For registration, contact: aigasec@singnet.com.sg **Or use registration form provided**

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Silane, an electronic specialty gas has been used in commercial quantities since the mid 1960's. It is a pyrophoric gas and there have been a number of incidents associated with its use over the last 40 years. Considerable study has also been conducted in the intervening years to better understand silane's properties and its behaviour when it is released during an incident.

To better control the hazards, standards have been developed based on these studies. These include CGA Pamphlet P-32, FM Global 7-7 and NFPA 318. To help educate the gas suppliers, users and the regulatory community on the studies and standards, a number of silane technical symposiums were conducted in Europe and the U.S since the 1990's.

Silane's use has increased significantly in recent years in Asia. AIGA recognizes the importance of a similar education programme for users of silane in Asia.
AIGA , together with the Taiwan High Pressure Gas Industry Associationorganized the first silane safety seminar in Asia in Hsinchu, Taiwan in 2006.

This seminar in Singapore is the second one organized by AIGA and is targeted for audience in the South East Asian region.

PROGRAMME

Nov-01	Day 1	08.30 - 16.30
8.30 - 9.00	Registration	
9.00 - 9.10	Introduction	
9.10 - 9.50	An overview of silane incidents & release behaviour	Eugene Ngai
9.50 - 10.30	CGA G-13 Storage and handling of silane and silane mixture	Ron Fuhrhop
10.30 - 10.50	**coffee break**	
10.50 -11.30	Silane cylinder valve safety issues	Jerrold Sameth
11.30 -12.10	Silane cylinders - safe transportation, handling and storage	Kazuya Inoue
12.10 - 13.30	**lunch break**	
13.30 - 14.10	Bulk silane system risk analysis and best practices	James VanOmmeren
14.10 - 14.50	Safety fundamentals for design of bulk silane containers & distribution system	John Borzio
14.50 - 15.10	**coffee break**	
15.10 - 15.50	Procedures, personnel training and certification for silane cylinders and bulk container changes	Alberto Luraschi
15.50 - 16.30	Silane delivery system design considerations	Dave Tolejko
Nov-02	**Day 2**	**08.30 - 12.45**
8.30 - 9.50	**Panel discussion** Standards and system risk assessments for bulk silane systems	Al Brown *(chairperson)* Vinnie DeGiorgio James Van Ommeren Chu Tiong Yong
9.50 - 10.10	**coffee break**	
10.10 - 11.30	**Panel discussion** Bulk silane system operations & issues	Jean-Paul Barbier *(chairperson)* Kevin Boal Kazuya Inoue David Tolejko
11.30 -12.30	**Workshop** Silane emergency response	Eugene Ngai *(chairperson)* Raymond Ang
12.30 -12.45	Summary & Closing	

ABSTRACTS

An overview of silane incidents & release behaviour - **Eugene Ngai, *Air Products***

A review of 20 years of silane incidents from small leaks to large, root cause of incidents, what causes releases to not ignite and then explode, confined and unconfined; actual silane testing with RFO's, DISS, Gas Cabinets

CGA G-13 : Storage and handling of silane and silane mixtures - **Ron Fuhrhop, *Praxair***

ANSI/CGA Publication G-13 - 2006 (second edition of P-32) is becoming the standard in the U.S. for silane storage and use. This presentation will review the background, bulk silane release testing, and highlight the key requirements of the standard. Under the international harmonization effort this will be reviewed for adoption by AIGA, EIGA and JIGA.

Silane cylinder valve safety issues - **Jerrold Sameth, *Matheson Tri-Gas (a Taiyo Nippon Sanso company)***

A review of the history and lessons learned with cylinder valves. This will include outlet connections, pressure relief devices. seat materials. A review of the Matheson Tri Gas silane fire in 1997 - Newark, CA which ties together fill density, pressure, compressibility, burst disc rating and extrusion of the fuse metal will also be included in the presentation.

Silane cylinders – Safe transportation, handling and storage - **Kazuya Inoue, *Linde Group***

Understanding of the basic properties and risks associated with silane cylinders during transportation, handling and storage at the users' premises

Bulk silane system risk analysis and best practices - **James Van Ommeren, *Air Products***

Silane Bulk Specialty Gas Systems (BSGS) are the best solution for customers who require larger silane flow rates and high reliability. However this inherently places more silane inventory at the customer's facility. Therefore, proper system design, siting, operation, maintenance and emergency preparation are key to ensuring a safe system for the life of the facility. This paper will compare computer modeling of bulk silane system gas dispersion, jet flame, and vapour cloud explosion hazards versus bulk silane testing results. Best practices for bulk silane system design, siting, and operation will also be presented.

Safety fundamentals for design of bulk silane and containers and distribution systems - **John Borzio, *Air Liquide***

This presentation will focus on specific improvement in container design for silane bulk supply. It also covers the Asia specific requirement for bulk installation systems illustrated by case studies.

Procedures, personnel training and certification for silane cylinders and bulk container changes - **Alberto Luraschi, *Air Liquide***

Based on worldwide on-site gas operations experience at customers, this presentation presents the best methods and practices for managing the containers change-out, equipment maintenance, procedures, personnel training, and so on.

Silane delivery system design considerations - **Dave Tolejko, *Praxair***

Silane delivery systems are recommended to be open air system; however, gas cabinets can be utilized. Design considerations for each must take into account flow rates. Joule-Thomson cooling, purge automation that helps to avoid simple human errors, and a host of other issues. This extends throughout the delivery system to valve boxes and the point of use. Safety related items in the design and operation of silane delivery systems will be covered.

Panel discussion 1- Standards and systems risk assessment for bulk silane systems

- **Al Brown, *Rushbrook Consultants*** – Risk based decisions in bulk system designs, how to assess other activities adjacent to the systems, what is an acceptable risk.
- **Vinnie DeGiorgio, *FM Global* -** FM-7-7 & NFPA 318 standards development – FM 7-7 was the first standard that mandated minimum system dilution based on RFO release rates
- **James VanOmmeren, *Air Products*** – Risk assessment and hazop review of systems
- **Chu Tiong Yong, *Air Liquide*** – One company's experience in implementing bulk silane supply for a customer

Panel discussion 2 - Bulk system operations & issues

- **Jean-Paul Barbier, *Air Liquide*** – Bulk silane delivery system safety for photovoltaic applications
- **Kevin Boal, *Air Products*** – Problem with Joule Thomson cooling system and operation
- **Kazuya Inoue, *Linde Group***
- **Dave Tolejko, *Praxair***

Workshop – Emergency Response

- **Eugene Ngai, *Air Products* -** A review with the audience will be made of a theoretical problem/incident to develop a preplan that can be used for a likely event with silane. This discussion will highlight actions that have not been effective.
- **Raymond Ang, *Air Liquide*** – How to form an ER team/how a company develops its ER plan

BIOGRAPHIES

Jean-Paul Barbier
Specialty Gas Director,
Air Liquide

Jean-Paul Barbier has a Master Degree in Chemical Engineering and a PhD in organo-metallic chemistry. He has worked for the last 28 years at Air Liquide and has held a variety of scientific and technical positions both in France and in the US, primarily in Electronic Specialty Gases. He is an Air Liquide Group Fellow and is acting in the field of Specialty Gases for photovoltaic and optoelectronic industries and for laboratories. He represents Air Liquide at the European Industrial Gas Association (EIGA) as Chairman of Working Groups for the writing of Codes of Practice for “Compressed oxidant-fuel gas mixtures manufacturing” and on “Fluorine”.

Al Brown
Managing Director,
Rushbrook Consultants.

Al Brown is a leading specialist in fire and risk engineering and assessment, with particular expertise in the semiconductor and TFT-LCD industries, including assessment of manufacturing equipment and processes as well as semiconductor gas and chemical facilities. Before founding Rushbrook Consultants in 1999 he spent 14 years with FM Global where he was the Staff Engineering Semiconductor Industry Specialist and contributor to the development of FM 7-7 including the section on protection of Bulk Silane systems. He is regularly involved the development of risk mitigation strategies, as well as the design of fire protection systems for semiconductor wafer and LCD fabs in Europe and SE Asia. Al is a registered professional engineer in the UK, and member of the Institution of Fire Engineers, Society of Fire Protection Engineers and Institution of Mechanical Engineers. He is a member of the NFPA 318 Technical Committee, Co-chair of SEMI Europe EHS Committee and co-leader of the Fire Protection and Risk Assessment Task Forces.

Kevin Boal
Electronic’s Central Operations,
Global Gas Systems Manager, Air Products and Chemicals, Inc

Kevin Boal has 19 years experience within Air Products in a variety of areas, including the Process Systems Division, & the Speciality Gases Group, before joining Electronic Operations in 1997, where he worked on the Intel site in Ireland as the Operations/Gases Manager, as part of the on site “Megasys” operational support offering. In 2004 he moved into Electronic’s Central Operations, as the Global Gas Systems Manager, providing operational & technical support to the 850 “Megasys” personnel employed on customers sites globally. He is based in the UK and has a B.S. in Mechanical Engineering

Vinnie DeGiorgio
Principal Engineer FM Global Inc.

Vinnie DeGiorgio is the semiconductor Principal Engineer for FM Global and provides company-wide technical leadership. He has over 25 years of property loss control and business impact risk assessment experience associated with the semiconductor and related high technology industries. Vinnie has a BS Degree in Engineering and a MS Degree in Fire Protection Engineering. He maintains memberships in the NFPA, SFPE, SESHA and is the secretary of the NFPA 318 Technical Committee on Cleanrooms.

Kazuya Inoue
Asia Operations Manager,
Electronics Materials, BOC Edwards
Linde Group

Kazuya Inoue is currently based in Japan as Asia Operations Manager, Electronics Materials, BOC Edwards. Kazuya has worked extensively in the electronics specialty gases field in the areas of production, engineering, project management, commissioning, quality and safety management in the U.S, Europe and Asia. He graduated in Electronics Property from the Osaka Electronics Communication University in 1984 and joined Osaka Sanso Kogyo Ltd. (OSK). In 1993, he was involved in the design and construction of the Ina plant in Japan and managed the plant from 1994 -1999. In 2003 he transferred to BOC Edwards Japan from OSK.

Eugene Y. Ngai
Director of ER
and Disposal Technology,
Air Products
and Chemicals, Inc.

He has 35 years of Specialty Gas Experience in Production, Laboratory, R&D, Engineering, Safety positions. Was the Vice President of Technology for Solkatronic Chemicals for 10 years prior to the Air Products acquisition in 1999 with responsibility for EHS, Engineering, Information Technology, Research and Development, and Quality. Most recently he was Director of CS Technology in the Electronics Division and is now Director of ER and Disposal Technology in the Product Safety Group. He started the Emergency Response Equipment and Training group in 1990. He is the Course Director for a 3 day Specialty Gas Emergency Response course, which has trained over 4000 customers, government agencies and employees and over 750 Firefighters in Compressed Gas Safety and Emergency Response. He has 4 US patents for Gas Safety Devices and 2 pending for new Purification Technology.

Jerrold Sameth
Chief Technologist –
Director of Gas Packaging
Matheson Tri-Gas Inc.

Jerrold D. Sameth is the Chief Technologist and Director of Gas Packaging for Matheson Tri-Gas, a Taiyo Nippon Sanso Group Company. He joined the company in 1980 and is based in Basking Ridge, NJ. He is responsible for all facets of cylinder and valve engineering. He actively participates on CGA and ISO Cylinder and Valve Committees and has been a member of the AIGA Working Group on Electronic Specialty Gases since its inception in 2002. He is a 1971 Chemical Engineering Graduate of the City College of New York.

David C. Tolejko
Global Process Gases
Safety Engineer,
Praxair, Inc.

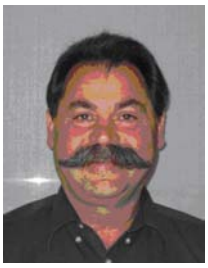
David Tolejko is the Process Safety Engineer for the Electronics Group of Praxair, Inc., and is responsible for the safe design and handling of high hazard materials for the electronics industry on a global basis. Since joining Praxair in 1974, Dave has held various positions including engineer and supervisor in Control Systems Engineering and Environmental Systems Field Project Manager. Since 1986, he has worked in the Safety Engineering group, performing some of the first process hazard analysis using hazops and FMEA. In 1994, Dave joined the Electronics group and worked with local building and fire code officials on projects around the world on design and installation of hazardous gas delivery systems at semiconductor fabs. He was also part of the Praxair team on the CGA Task Force to develop the Silane standard P-32/G-13. He presented a seminar on silane at the Taiwan Industrial Technology Research Institute in April 2005. As part of his ongoing safety commitment, Dave is the past fire Chief of the Grand Island Fire Co. and past commander and present Safety Officer for the Erie County Hazardous Material Response Team.

James VanOmmeren
Process Safety Engineering Associate, Air Products and Chemicals, Inc.

James VanOmmeren joined Air Products and Chemicals, Inc. in 1981 and has held various technical assignments within the corporation, including Development and Process Engineering. In 1993, he joined Process Safety Engineering supporting high-purity hazardous materials and equipment for Electronics use. He is an Engineering Associate and is the Global Process Safety Lead for Air Products' Electronics Division. Jim is responsible for Process Safety involving Electronics equipment manufacturing, gases and chemicals manufacturing, transportable containers and operational services provided to customers. He specializes in various qualitative risk review and quantitative risk calculation methodologies, and provides safety training globally to employees, customers, local authorites and emergency responders. Jim received his BSChE from University of Delaware in 1981 and is currently a member of several CGA Subcommittees. He has authored several papers, given presentations at global symposiums and holds eight patents dealing with gas and cryogenic processing.

Albeto Luraschi
Corporate Industrial Manager, Electronic Materials Services, Air Liquide

Alberto Luraschi is a 1990 Engineering Graduate in Management and Industrial Technologies from Politecnico di Milano.
He is currently based in Paris as Corporate Industrial Manager, Electronic Materials Services for Air Liquide Electronics. Before taking up his current position, he worked 7 years at customer Fabs in both Singapore and Italy as site operations manager within Air Liquide Total Gas and Chemical Management (TGCM) activity.
Appointed Air Liquide Group Expert, he is responsible for the development of Air Liquide Group Technical Standards for TGCM operations in electronics. He started the Air Liquide TGCM on-line Community of Practice, that involves 800+ operatives and managers from more than 55 TGCM sites worldwide.



John Borzio
Group Sr. Expert Air Liquide Electronics U.S. LP

John Borzio holds a Bachelor of Science degree from Rutgers University obtained in 1973. Since that time, he has devoted his entire working career to the Specialty Gases industry, holding various positions in the areas of gas analysis, purification technology, production operations, plant and process design, packaging technology and safety.
Currently, he is an Air Liquide Group Sr. Expert in Electronic Specialty Gases Technologies and manages the Electronic Specialty Gases facilities in the US. He also participates in several CGA technical committees and is an Emergency Response Coordinator.

Ron Fuhrhop
Sr. Process Engineer Process Gas Engineering Praxair Electronics

Ron Fuhrhop, a Senior Process Engineer for Praxair Electronics; in his 33 years with the company, he has developed a broad background of expertise in electronics and specialty gas systems. Ron has been actively involved in electronic and specialty gas fill system technology, plant design, installation, operations, silane transfill and BSGS systems. He provides technical support in Electronic process gases to Praxair operations globally. He has been active in the CGA specialty gas committee and was a primary member of the Task Force that developed the Silane standard G-13. He has an MS in Engineering Management, a BS in Mechanical Engineering, is a Registered Professional Engineer in NY State, and is a Six Sigma Green Belt.