

# SESHA 2005

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**DoubleTree Paradise Valley**  
 Guest Phone: 480-947-5400  
 Guest Fax: 480-481-0209

### Registration Hours:

Monday, May 9 .....	3:00-6:00 PM
Tuesday, May 10 .....	8:00 AM-3:00 PM
Wednesday, May 11 .....	8:00 AM-2:00 PM
Thursday, May 12 .....	9:00 AM-11:00 AM

### Exhibit Hall Hours:

<b>Tuesday, May 10</b> .....	11 AM-7 PM
Exhibit Hall Opening Lunch .....	11:15 AM-1:15 PM
Soda Break .....	2:45-3:15 PM
Welcome Reception .....	5-7 PM
<b>Wednesday, May 11</b> .....	9 AM-3:30 PM
Poster Session & Coffee Break .....	9:30-10:30 AM
Cash & Carry Lunch and <i>Raffle</i> .....	Noon-1:30 PM
Soda & Ice Cream Break and <i>Raffle</i> .....	3-3:30 PM

# SESHA 2005

## Week at a Glance

### Monday, May 9

Student Scholarship Paper Presentations  
8:00 AM–4:30 PM *Bouchon*

Professional Development Courses  
8:00 AM–5:00 PM

Conference Registration  
3:00–6:00 PM *Forum*

Academic Committee Meeting  
4:00-7:00 PM *Executive Board Room*

### Tuesday, May 10

Morning Training Run  
6:30 AM *Meet in Lobby*

Student Breakfast  
7:00-8:00 AM *Bouchon*

Conference Registration  
8:00 AM–3:00 PM *Forum*

Continental Breakfast at the Keynote Forum  
8:15 AM *Center Ballroom*

Keynote Forum  
8:45 AM–4:45 PM *Center Ballroom*

Exhibitor Luncheon  
11:15 AM–1:15 PM *Forum*

Exhibit Hall Open  
11:00 AM–7:00 PM *Forum*

Soda Break  
2:45-3:15 PM *Forum*

Welcome Reception in the Exhibit Hall  
5:00-7:00 PM *Forum*

### Wednesday, May 11

Morning Training Run  
6:30 AM *Meet in Lobby*

Student Breakfast  
7:00-8:00 AM *Bouchon*

Fellows Forum  
7:30-8:15 AM *Executive Board Room*

Exhibitors Meeting  
8:15-9:00 AM *Forum*

Conference Registration  
8:00 AM–2:00 PM *Forum*

Sessions 1 & 2  
8:00 AM–5:00 PM *Rio Verde/Sonora*

Sessions 3, 4, 5 & 6  
8:00 AM–5:00 PM *Center Ballroom*

Exhibit Hall Open  
9:00 AM–3:30 PM *Forum*

Poster Session  
9:30-10:30 AM *Forum*

Soda Break  
9:30-10:30 AM *Forum*

Cash & Carry Lunch and Raffle Drawing  
Noon–1:30 PM *Forum*

Soda Break and Raffle Drawing  
3:00-3:30 PM *Forum*

### Thursday, May 12

5K Race  
6:30 AM *Meet in Lobby*

Region/Chapter Meeting  
7:00-8:30 AM *San Carlos*

SESHA Board of Directors Meeting  
8:30-11:30 AM *Executive Board Room*

Sessions 7, 8 & WEEE/RoHS Roundtable  
8:00 AM–4:15 PM *Rio Verde/Sonora*

Sessions 9, 10 & 11  
8:00 AM–4:15 PM *Center Ballroom*

Conference Registration  
9:00-11:00 AM *Ballroom Foyer*

Coffee Break  
9:30-10:00 AM *Ballroom Foyer*

General Closing Session  
4:15 PM *Center Ballroom*

### Friday, May 13

Golf Tournament  
8 AM-1 PM

# **SESHA 2005**

## **Details**

- Symposium Proceedings for SESH A '05 are available on-line at our website [www.seshaonline.org](http://www.seshaonline.org). The full proceedings can be downloaded or you can order a CD by contacting SESH A Headquarters.
- Conference attendees are eligible to receive certification maintenance points from both BCSP and ABIH. Certificates will be available at the Registration Desk.

## **SESHA 2005 Sponsors**

The SESH A Board of Directors extends a special thank you to the following companies for their support of this Annual Symposium.

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# SESHA 2005

## Professional Development Courses

All Professional Development Courses take place on Monday, May 9

8:00 AM-5:00 PM

- PDC 1 Media/Crisis Communications for EH&S Professionals. *K. Haseley, S. Sovari*
- PDC 2 Applied Industrial Ergonomics. *W. Rostykus, J. Mallon*
- PDC 3 EHS Design & Installation Considerations for Specialty Gas, Chemical Distribution & POU Delivery Systems. *V. Gopalakrishna, A. Zude, S. Creighton*
- PDC 4 Global Environmental Health and Safety Management. *K. Seabrook*
- PDC 5 RCRA Waste Identification and Generator Performance Standards.. *R. von Oppenfeld*

8:00 AM-Noon

- PDC 7 Cancelled
- PDC 9 WEEE/RoHS and Other EU Legislation and Their Likely Effects on the Semiconductor Industry. *A. Sweatman*

1:00-5:00 PM

- PDC 6 Performance-Based Auditing: A Different Approach to Enhancing Your EMS. *J. Yturri*
- PDC 8 Beyond CTDs...An Ergonomic Sprain/Strain Prevention Strategy. *M. O'Brien*

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Journal, Chapter updates and  
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# MST Ad

# SESHA 2005

## Symposium Planning Team

Co-Chairs : Cheryl Stadlman, *Intel* & Jennifer Chittick, *Axcelis*  
Mentor: Amanda Gonzalez, *AMD*

### Professional Development Courses:

Co-Chairs: Hilary Mathews, *Axcelis* & Dave Moyer, *APCI*

### Opening Session (Keynotes):

Chair: John Cox, *Advanced Technology Solutions*

### Closing Session:

Chair: Bernie Frist, *EORM*

### Exhibitors:

Co-Chairs: Karl Albrecht, *Fairchild* & Gary Williams, *Sipex*

### Student Papers:

Chair: Ron Scholtz, *Analog Devices Inc.*

### Golf Tournament:

Chair: Joe Richard, *Raytheon*

### Boot Camp:

Chair: Judi Barker, *Intel*

### Leadership Forum & EHS Management:

Chair: Pat Tierney, *EORM*

### Safety:

Chair: John Bucciarelli, *Freescale Semiconductor*

### Emerging EHS Technologies & Issues:

Chair: Tim Jones, *ON Semiconductor*

### Value-Added EHS:

Chair: Rick Row, *SEMI*

### Environmental:

Chair: Mike Sherer, *Sherer Consulting Services, Inc.*

### Regulatory/Code Developments & Round Table - ROHS/WEEE:

Chair: Brian Sherin, *ESHconnect*

### Industrial Hygiene:

Chair: Doug Thornton, *Fairchild Semiconductor*

### Occupational Health:

Chair: Molly Doddo, *Fairchild Semiconductor*

### Chemical & Product Stewardship:

Chair: Renee Bade, *RSB Technical Services*

### Poster Session:

Chair: Jennifer Chittick, *Axcelis*

# SESHA 2005

## Board of Directors

### Executive Committee

President - *John Cox; Advanced Technology Solutions*

President Elect - *Bernie Frist; EORM*

Treasurer - *Brian Sherin; ESH Connect*

Secretary - *Karl Albrecht; Fairchild Semiconductor*

Member-at-Large - *Steven Roberge; Axcelis*

Executive Director - *Brett Burk*

### Board of Directors

*Robert Bianconi; National Semiconductor*

*Aimee Bordeaux; SEMI*

*Mark Gordon; Analog Devices*

*Mike Sherer; Sherer Consulting Services*

*Gary Williams; Sipex*

# SESHA 2005

## Session Schedule

Tuesday, May 10

8:45 AM-4:45 PM

**Room: Center Ballroom**

*Moderator: John Cox*

### Keynote 1

9:30 **Semiconductor Industry Forecast and the Future of Nanotechnology**

*Feldhan, Jim*

*Semico Research Corp.*

Jim's Keynote will focus on his semiconductor forecast and emerging markets, plus the direction he foresees nanotechnology to take in the future and the challenges it will present.

### Keynote 2

10:30 **Retooling Yourself for the Next EH&S Wave**

*Tighe, David*

*Bovo-Tighe, Bellevue, WA*

EH&S professionals today are faced with a career perfect storm. Expectations are increasing that their projects show ROI and business contribution beyond regulatory compliance. Shrinking infrastructure and limited hiring have left EH&S professionals with little growth opportunity yet greater responsibility. These factors have created high stress and burnout rates. Many are leaving the industry. Now is the time to retool yourself and your team to not only weather the storm, but thrive in the new environment. In this session you will be offered a proven, systematic approach to set yourself and your team up for greater success. This approach is a fresh way, proven with numerous organizations, to get results beyond what anyone believed possible. You will discover 1) new ways to truly understand your talents and skill gaps (they are different than you think), 2) better ways to discern your future opportunities (you can do better, even in your

current job), and 3) how to prepare yourself for any eventuality (yes, any eventuality!). You owe it to yourself and your team to check out this new technology. It might be the best thing you can do this year to create gains in productivity, personal growth, and enthusiasm.

### Keynote 3

1:15 **The Semiconductor Industry Association Worker Health Project: An Update**

*Fischman, Michael, Fraust, Chuck*

*Intel Corporation and Semiconductor Industry Association*

Over the past year, the Semiconductor Industry Association (SIA) has made considerable progress on its Worker Health initiatives. We will share some key results from the completed initiatives, the Retrospective Cohort Scoping (Feasibility) Study, the Primary Prevention Initiative, and the Health Surveillance Initiative. However, the focus of the presentation will be on the progress toward initiation of the large retrospective cohort epidemiology study involving multiple SIA member companies. The emphasis of the study is on cancer risk, with planned evaluation of the cancer mortality and, if feasible, the cancer incidence of semiconductor fab workers. We will also discuss the critical role of various components of the study effort, including the Scientific Advisory Board and independent academic investigators, in fostering a credible, scientifically defensible and ultimately successful study.

### Keynote 4

2:00 **Exploring Opportunities to Further Eliminate Potential Equipment Related Exposures**

*McIntyre, Andrew*

*Environmental and Occupational Risk Management, (EORM, Inc.)*

In response to allegations of increased cancer risk for semiconductor industry fabrication workers, the Semiconductor Industry

## Tuesday, Keynote Forum

Association commissioned a Scientific Advisory Committee (SAC) whose primary objective was to conduct an independent, objective analysis of whether potential semiconductor “clean room” chemical exposures are likely to elevate cancer risk and, based on this analysis, make appropriate recommendations to SIA. The SAC concluded that there was no affirmative evidence of increased risk of cancer for the fab population and also reported that insufficient data exists to conclude whether exposure to chemicals or other hazardous materials has or has not increased cancer risk. As a result, the SAC provided recommendations to the SIA for further studies. The SIA outlined various follow-up actions known collectively as the Worker Health Project which included the identification of Primary Prevention Initiative (PPI) Tasks. These PPI Tasks had multiple objectives and focused on further strengthening of ongoing efforts to ensure a safe workplace, and were designed to provide member companies with a broader base of knowledge to help enhance their existing worker safety programs. One of the PPI projects identified as a priority was the need to study certain manufacturing process areas to:

- Identify opportunities for capital equipment suppliers to demonstrate further hazard mitigation through changes to normal operation, preventive and corrective maintenance procedures and tool design.
- Identify alternatives that might provide opportunities to reduce and/or eliminate the need for administrative controls as the primary means of preventing unsafe exposures. Areas chosen included Etch, Implant, Thin Films, CVD and Epitaxy. This paper focuses on a review of the Semiconductor Industry Association Worker Health Initiative (WHI) Primary Prevention Initiative (PPI) project conducted by Environmental & Occupational Risk Management (EORM) and important findings and conclusions as they pertain to

innovative controls and techniques being used to further minimize potential exposures during equipment maintenance.

## Keynote 5

### 3:15 Semiconductor Industry PFC Emissions Estimating and Reduction: Status and Future Directions

*Worth, Walter, Beu, Laurie*

*International Sematech and Laurie Beu Consulting*

The Kyoto Protocol will come into force on February 16, 2005 following Russia's official ratification on November 18, 2004. The Protocol requires that Annex I signatories such as the European Union, Japan, and Canada reduce their emissions of carbon dioxide, methane, nitrous oxide, sulfur hexafluoride (SF<sub>6</sub>), hydrofluorocarbons (HFC) and perfluorocarbons. The Protocol also calls for the establishment of an emissions trading system and entities such as the United Kingdom (UK), Chicago Climate Exchange and European Union (EU) have proactively established greenhouse gas (GHG) trading systems. While the United States has chosen not to ratify the Protocol, the U.S. Environmental Protection Agency has initiated the Climate Leaders Partnership to encourage companies to develop long-term climate change strategies and to commit to reduce GHG emissions. Members of the semiconductor industry world-wide have committed to tracking and reducing absolute emissions of perfluorocompounds (PFC), HFC and SF<sub>6</sub> via Memoranda of Agreement (MOA) or Memoranda of Understanding (MOU) at the World Semiconductor Council. As part of the second MOU between the Semiconductor Industry Association (SIA) and the U.S. EPA, the MOU partners agreed to publish a report by December 15, 2005 detailing the progress that has been made toward achieving the Partnership Goal of reducing the absolute PFC emissions by 10% (on an MMTCE basis) below the 1995 baseline by 2010. In 2005, the semiconductor industry will develop a State-of-the-Technology report to summarize the status of the various technology options, changes in the PFC use and the progress, glob-

## Tuesday , *Keynote Forum*

ally, to meet the 2010 goal. This presentation will review the status of efforts requiring GHG emissions estimating and reporting, provide an overview of changes to the Intergovernmental Panel on Climate Change (IPCC) National Greenhouse Gas Inventory Guidance as it applies to the semiconductor and electronics industry, and provide a preliminary update of global semiconductor industry PFC activities and the commercial readiness of reduced emission technology options.

### **Keynote 6**

#### **4:00 Fire Codes 2005 - A Review of the Fire Codes and Standards Applicable to the Semiconductor Industry Today**

*Benson, Roger*

*Factory Mutual Global*

Fire Codes 2005 - A review of the Fire Codes and Standards applicable to the Semiconductor industry today. 1. The International Fire Code (IFC) today and changes proposed by the SIA-FABS group. 2. The NFPA 318 Standard for the Protection of Semiconductor Fabrication Facilities and the proposed changes for the 2005 edition. 3. A brief look at existing SEMI Standards and the ones being currently revised. 4. Where are we headed? The drive toward more performance based rather than prescriptive requirements, the widening use of Alternate Materials and Methods solutions to problems and the preference of proactive rather than reactive ways to process safety.

## **Don't Miss these Exhibit Hall Events!!**

### **Exhibit Hall Raffle:**

We will be holding a raffle with some very nice prizes in the Exhibit Hall on Wednesday. All registered attendees should have received a page of self-adhesive contact labels. On Wednesday you will be able to place one of your contact labels on a sign-up sheet at each exhibit booth in exchange for a raffle ticket. Remember, this is for Wednesday only. Write your name on the raffle tickets you receive and place them in the box at the entrance to the exhibit hall. Drawings will take place at the end of the lunch and afternoon breaks on Wednesday. You must be present to win.

### **Check your Email:**

Free Wireless Internet Access is provided in the exhibit hall courtesy of SEMI

### **Poster Session:**

Poster Session will be in the Exhibit Hall on Wednesday from 9:30 to 10:30 AM

### **Exhibit Hall Schedule and Activities:**

#### **Tuesday:**

- ◆ Exhibit Hall opens for the 11:15 to 1:15 lunch break. Lunch provided for everyone in the Exhibit Hall.
- ◆ Afternoon break in the Exhibit Hall from 2:45 to 3:15 PM
- ◆ Evening Welcome Reception in the Exhibit Hall from 5:00 to 7:00 PM

#### **Wednesday: RAFFLE BEGINS!**

- ◆ Poster Session and morning break in the Exhibit Hall from 9:30 to 10:30
- ◆ Cash and Carry Lunch in the Exhibit Hall from Noon to 1:30
- ◆ First Raffle drawing in the Exhibit Hall at end of lunch break
- ◆ Afternoon Ice Cream Break in Exhibit Hall from 3:00 to 3:30
- ◆ Final Raffle drawing in the Exhibit Hall at end of afternoon break

## Wednesday, May 11

8:00 AM-Noon

**Room: Rio Verde/Sonora**

### **Session 1: Boot Camp: Back to Basics**

*Moderator: Mark Gordon*

**8:00 An Overview of the Semiconductor Manufacturing Process**

*Benson, Roger  
Factory Mutual Global*

This overview presentation will cover the three basic process steps of: 1) Layering - Oxidation, CVD and PVD; 2) Patterning - Resist and develop application, exposure methods, and etching; 3) Doping - Diffusion and ion implant. We will also look briefly at wafer manufacturing, mask-making and back end processing. The hazards presented by the processes and chemicals used will be briefly discussed to set the stage for more detailed presentations on EHS consideration in the Boot Camp Session.

**9:30 Poster Session in Exhibit Hall**

**10:30 Ergonomic Assessment of Cumulative Trauma Risk**

*Kelso, Dan  
Earth Tech Inc.; San Jose, California*

Cumulative stress injuries have become a major contribution to the potential injuries occurring in the modern work setting. Working off criteria developed by the American National Standards Institute (ANSI), moderate to high-risk job tasks can be identified for modification, reducing the risk of injury. Starting with a thorough task analysis including information on joint angles, task duration, repetition and forces, work tasks can be evaluated for injury risk and specific job task elements targeted. This presentation will present the criteria and methods of interpreta-

tion and job analysis and redesign discussed.

**11:15 Industrial Hygiene Speak for the Non IH Applying Strategies and Methods**

*Visty, John  
Earth Tech Inc., Colorado Springs, CO*

Whether you are an in-house EHS professional or simply trying to insure your project is completed by a competent external industrial hygiene (IH) resource there are key points that can be applied to improve your likelihood for a successful IH project. Assessing some standard rationale for industrial hygiene will better organize your IH project, establish a straightforward project scope and improve the quality of the product or deliverable. A rationale will be presented on how to approach and successfully complete a sampling IH project. The rationale will include the key points to:

- ♦ Determine the core need for the IH exposure data
  - ♦ Identify the analytes and related OELs
  - ♦ Establish the IH methodology (OSHA / SEMI / NIOSH / ACGIH / IEEE)
  - ♦ Select the proper IH survey / sampling equipment
- Industry IH project examples will be highlighted to underscore the use of the rationale. The audience will also be given an opportunity to review or ask questions regarding upcoming IH project issues.

Noon Cash & Carry Lunch & Raffle in Exhibit Hall

1:30-5:00 PM

### **Room: Rio Verde/Sonora Session 2: Emerging EHS Technologies & Issues**

*Moderator: Andy McIntyre*

**1:30 The Brave New World of Nanotechnology**

*Moffitt, C. Michael  
Western Technologies Inc., Phoenix, AZ*

Nanotechnology promises to be the next great technology wave — transforming science, industry, and society in a way unseen since the Industrial Revolution. It has already spawned innovations at the nexus of biology, physics,

and chemistry. The global market for nanotech-related products is estimated by the National Science Foundation at \$1 trillion within 10 years. Nanoscale materials such as carbon nanotubes and titanium dioxide are being used in the microelectronics, medical, materials, and cosmetics industries. At first glance it would appear that nanotechnology could help create benign, lightweight, and energy-efficient replacements for materials that are now used in manufacturing, many of which are toxic. Furthermore, there are pollution control application and clean-energy production opportunities created by the new nanomaterials. However, there is a huge question mark looming over these rapidly developing technologies and products. We have little knowledge to predict how the new substances, with their unique physical and chemical properties, will affect the world's environment or the health of consumers and workers. Yet, the U.S. Department of Labor estimates that 2 million workers are already being exposed to nanoparticles on a regular basis. To keep pace, we must rapidly develop research programs to investigate the effects of nanomaterials on biological systems and disseminate this information to professionals and the general public. Although the topic is often sensationalized by the media, there is a firm scientific basis for the emerging concerns, and preliminary toxicity and worker safety studies are being conducted by industry, government, and academia. NIOSH, the National Nanotechnology Initiative, and the UK's Royal Society are taking lead roles in the assessment and discussions are underway regarding international regulatory options.

**2:15 Methods & Resources Used to Help Close ESH Data Gaps and New Tools to Screen Novel Semiconductor Chemicals**

*Speranza, Dawn, Kuntz, Matthew  
SEMATECH, Austin, TX*

In light of higher standards and the global harmonization of ESH regulations, novel semiconductor chemicals will need to be assessed and screened more thoroughly and effectively. The SEMATECH advanced ESH assessment

project has looked at over thirty novel chemistries over the past few years. SEMATECH has tried to obtain the ESH data on an ideal set of seventy-five ESH chemical properties by using various resources and models. This practical application of the data types has shown that the ESH information does not always exist for many of our novel chemicals. This presentation will discuss the ESH data gaps that currently exist and the compilation of models, lists, databases, and tools we use to screen novel semiconductor chemicals. We will also look at the current and future global approaches to obtaining ESH data and recommend potential solutions to close the ESH data gaps and prepare for tomorrow's standards.

**3:00 Break and Raffle in Exhibit Hall**

**3:30 Reducing PFC Emissions Through Advances in CVD and Etch Processing**

*Johnson, Andrew, Ridgeway, Robert, Maroulis, Peter*

*Air Products and Chemicals, Inc., Allentown, PA*

The semiconductor industry has voluntarily agreed to reduce emissions of perfluorocompound (PFC) gases due to their high global warming potentials and long atmospheric residence times. Significant progress has been made towards the goal of reducing PFC emissions to 90% of 1995 levels by the year 2010. PFC gases are used in both CVD and plasma etch processes. Two successful strategies for reducing PFC emissions are described: process optimization and alternative chemistries. We describe how advanced CVD and etch processes result in reduced PFC emissions while also enhancing process performance. For CVD chamber cleaning, optimization of the existing  $C_2F_6$ -based recipe can result in substantial reductions in both PFC emissions and gas usage. Process optimization involves identifying process conditions resulting in lower PFC emissions while also cleaning the chamber in the same amount of time. Examples will be presented for production CVD equipment. Even greater PFC reductions are possible by implementing  $NF_3$  based chamber cleans. We

describe a remote  $\text{NF}_3$  plasma process where PFC emissions are 90% lower than that for typical  $\text{C}_2\text{F}_6$  based chamber cleans. Advanced integrated circuits require ever more demanding plasma etch processes. Newer etch technologies have been developed that include changes in hardware design and etch chemistry. The advent of high density plasma based etch processes coupled with newer etch gases, such as  $\text{C}_4\text{F}_6$ , have led to a significant reduction in volumes of PFC gases used in and emitted from the process.

**4:15 Developing a Climate Change Action Plan**

*Higgs, Tim*

*Intel, Chandler, AZ*

In recent years, climate change has become recognized as a critical environmental issue. Companies that wish to establish or maintain their credentials as industry leaders on environmental matters are expected to have programs in place that mitigate their climate change impact. The semiconductor industry took a leadership position on PFCs a decade ago, and is now expanding its programs to include minimizing the climate change impact from energy use as well. This paper will look at the development of an overall company position on climate change, including: Key program elements that need to be included: ♦ How to develop an overall greenhouse gas inventory ♦ Useful technical resources available ♦ Steps for mitigating impact, in PFCs, energy use, alternate energy sources. The paper will also examine current information detailing where energy is used in the fab, and new developments in improving efficiency and minimizing total climate change impact.

**Room: Center Ballroom**

**Session 3: Leadership Forum**

*Moderator: Lonnie Schock*

**8:00 Thriving in an Era of Scarcity**

*Niekerk, Gary*

*Intel Corporation, Chandler, AZ*

The semiconductor industry has been operating over the last few years in a “paradigm of scarcity” where there are less resources, less funding, and less opportunities, for EHS professionals. This situation causes organizations and the people who work in those organizations to behave in a certain ways, and it’s important to recognize and adjust to these behaviors to be more successful as an EHS professional. This presentation will cover how to recognize when you, your colleagues or your organization are operating in a scarcity paradigm; and what actions you need to take to influence others and maximize your chances for success.

**8:45 Integration of an ESH Chapter into to the International Technology Roadmap for Semiconductors (ITRS)**

*Jewett, Jim*

*Intel Corporation, Chandler, AZ*

The International Technology Roadmap for Semiconductors (ITRS) is an assessment of the semiconductor technology requirements. The objective of the ITRS is to ensure advancements in the performance of integrated circuits. This assessment, called road mapping, is a cooperative effort of the global industry manufacturers and suppliers, government organizations, consortia, and universities. The ITRS identifies the technological challenges and needs facing the semiconductor industry over the next 15 years. It is sponsored by the European Semiconductor Industry Association (ESIA), the Japan Semiconductor Industry Association (JSIA), the Korean Semiconductor

## Wednesday, Session 4/Session 5

Industry Association (KSIA), the Semiconductor Industry Association (SIA), and Taiwan Semiconductor Industry Association (TSIA). This presentation will concentrate on the integration of an ESH Chapter in the ITRS, discussion of ESH difficult challenges, 2004 ITRS requirements, 2005 ITRS objectives for ESH, 2005 progress and current opportunities for engagement in the ITRS process.

9:30 Poster Session in Exhibit Hall

10:30 AM-Noon

### Room: Center Ballroom

### Session 4: EHS Management

*Moderator: Bob Bianconi*

10:30 Transitioning Your EMS from ISO 14001:1996 to ISO 14001:2004

*Wilk, Lisa, Esty, Paula*  
*Capaccio Environmental Engineering, Inc., Marlborough, MA*

The ISO 14001:2004 & ISO14004:2004 revisions were released for publication on November 15th, 2004. ISO (International Organization for Standardization) and the IAF (International Accreditation Forum) are allowing an 18-month transition from the publication of the revised standard. Beyond this period, certificates for ISO 14001:1996 version of the environmental management system (EMS) standard will be invalid, and the IAF will only recognize certificates for ISO 14001:2004 version of the EMS standard. Therefore, companies already registered to the ISO 14001:1996 version will need to upgrade their current systems to comply with the new requirements of the ISO 14001:2004 standard. Also, companies that have not yet registered to ISO 14001, should be using the ISO 14001:2004 standard for developing and implementing their EMS. This paper will review the requirements of the new standard, including changes from prior standard, as well as provide guidance on transitioning to the new standard and using this as

an opportunity for improving your EMS. Case study examples from the transition process of semiconductor manufacturers are included in the presentation.

11:15 Global Care is Smart Business!

*Row, Rick*  
*SEMI, San Jose, CA*

Communities, customers, investors, employees and other outside stakeholders of for-profit businesses are demanding ever better environmental, health and safety performance, beyond that set by current regulations. Many successful businesses today are learning to respond to these demands while simultaneously meeting their obligation to maximize value for their owners. Global Care, the semiconductor industry's voluntary EHS initiative, provides a broad framework for individual businesses and the industry as a whole to seek EHS improvements that are beneficial to the bottom line as well. This paper discusses ways of effectively integrating EHS management into general business management by companies of all size that are committed to the five Global Care principles.

Noon Cash & Carry Lunch & Raffle in Exhibit Hall

1:30-3:00 PM

### Room: Center Ballroom

### Session 5: Value-Added EHS

*Moderator: Mark Krauss*

1:30 Identifying and Communicating EHS Value

*MacLean, Richard*  
*Competitive Environment, Scottsdale, AZ*

EHS managers are keenly aware that their careers and longevity within their organizations are dependent upon their ability to demonstrate that they bring something of value to the table beyond just the donuts for a meeting. It's a subject in need of considerable attention, especially in today's tight economy. This presentation examines how to identify true EHS value to the business and even more important, how to communicate to business managers to

obtain the resources necessary to turn your ideas into reality.

**2:15 Using Business Metrics and Leading Indicators of EHS Performance—Translating EHS into Business Benefit**

*Rankin, Kristyn*

*ERM, Austin, Texas*

Leading a corporate environmental, health and safety (EHS) program is a unique opportunity. EHS leaders can play a major role in corporate governance, business performance, and aligning the corporation with society's expectations. This is often a daunting role. Corporate EHS leaders face some challenges shared by most corporate executives. Two of these challenges are driving continued performance improvement and proving the value of their organization to the overall business. Achieving these objectives from an EHS organization perspective is significantly facilitated by using certain non-EHS business metrics (accounting, human resources, facilities, production, etc.) that a company is already using to monitor the health of the business as leading indicators of EHS performance. Once these are identified, the EHS manager has a dash board of leading metrics to monitor EHS performance instead of relying on traditional lagging indicators. Linking EHS performance to traditional business metrics also clearly illustrates the impacts of EHS performance on the business. This paper will describe the process for identifying appropriate metrics for a given business and for efficiently using them to monitor EHS performance and to illustrate the value of EHS to the financial health of the business.

**3:00 Break and Raffle in Exhibit Hall**

3:30-5:00 PM

**Room: Center Ballroom**  
**Session 6: Chemical & Product Stewardship**

*Moderator: Jeanne Yturri*

**3:30 Around the World in 80 Days with a New Chemical Substance?**

*Majors, Mary*

*Air Products and Chemicals, Inc., Carlsbad, CA*

The semiconductor industry is known for its rapid pace of technology advancement. As the industry works to keep pace with Moore's Law, new and novel chemical substances are being evaluated for their utility in enhancing semiconductor performance. International chemical control regulations often apply to these new substances and can significantly impact the speed with which these new substances can be deployed in high volume production manufacturing environments. Because of this, international chemical control regulations must be taken into consideration when planning new process development. An overview of international chemical control regulations in semiconductor manufacturing regions will be provided. Regulations in the US, Europe, Japan, Korea and China will be explored, including estimated timelines and information requirements.

**4:15 Intel Corporation's Technology & Development EHS Chemical Approval Process**

*Brown, Steven*

*Intel, Hillsboro, OR*

The development and manufacture of advanced semiconductor products is resulting in the use of new production materials, including materials not previously used by the industry. In order to ensure these materials are used in a safe and environmentally responsible manner, Intel Corporation utilizes a comprehensive chemical use approval process. The chemical use approval process includes performing a hazard assessment of the new material, a review of the intended use of the material and a determi-

## Thursday, Session 7

nation of the EHS controls necessary to safely use the material. This presentation will describe the chemical use approval process employed at Intel's microprocessor research and development facilities. Specific topics to be covered include; Intel's Chemical Use Approval Process, toxicology assessment protocols, hazard classification system (i.e. carcinogenicity or reproductive hazard determination), TSCA compliance methodologies for R&D materials, intellectual property protection guidelines, environmental restriction screening, material use screening tools, S2 compliance for new chemical uses, waste treatment/disposal requirements, drain line compatibility testing, Process Hazard Analysis requirements and determination of EHS controls such as PPE and/or engineering controls. Included in the presentation will be a description of a chemical use review panel utilized at Intel to obtain input from content experts during the approval process.

### Thursday, May 12

8:00-11:30 AM

#### **Room: Rio Verde/Sonora** **Session 7: Environmental**

*Moderator: Mike Sherer*

**8:00 Common Yet Complex RCRA Issues Facing SESHAs Environmental Managers: A Discussion of Regulations, Policies and Pointers on Such Topics as Printed Circuit Board Recycling, Management of Contaminated**

*von Oppenfeld, Rolf*  
*TESTLaw Practice Group*

There are a number of common yet complex RCRA Issues that SESHAs environmental managers regularly face at their facilities that the presenter has worked with for various clients over the years. This presentation will provide a discussion of the regulations and guidance on such topics as printed circuit board recycling;

management of contaminated wipes; Aerosol Can Usage, Recycling and Disposal; F006 recycling and the proper management of satellite accumulation areas. Each topic will also include a few helpful practice pointers gleaned from experience over the 20 years of working with and teaching RCRA classes.

**8:45 Catalytic Decomposition of Ammonia from GaN Processes**

*Van Gompel, Joe*  
*BOC Edwards, Austin TX*

Gallium nitride deposition processes use high flows of both H<sub>2</sub> and NH<sub>3</sub>, sometimes approaching 100 slm each. NH<sub>3</sub> cannot be vented to the atmosphere, and rooftop abatement is inefficient, so point of use abatement is often required. Wet scrubbing is effective, but NH<sub>3</sub> (or ammonium ions) in the fab wastewater may trigger local regulatory issues. Combustion of NH<sub>3</sub> is expensive and can raise NO<sub>x</sub> emissions. Standard dry-bed abatement, where NH<sub>3</sub> is collected on an acidic medium, is economically impractical. However, dry-bed catalytic decomposition of NH<sub>3</sub> to N<sub>2</sub> and H<sub>2</sub> generates an exhaust stream that can be discharged to the atmosphere. The exhaust is free of particulate, moisture, and hazardous air pollutants (HAPs). Facilitization of wastewater and fuel gas to the POU scrubber is eliminated. Poisoning of the catalytic bed is resolved by a reactive inlet bed to decompose the organometallics, extending catalyst life to a year or more. Overall cost of ownership is very low compared to other abatement solutions. This methodology has been developed to decompose up to 100 slm NH<sub>3</sub> to > 99.9% conversion.

**9:30 Break**

**10:00 Removing Fluoride from Industrial Wastewater Using Hybrid-Membrane Technology**

*Peterson, Joel, Madole, Jim*  
*Geomatrix, Scottsdale, AZ and Nalco, Phoenix, AZ*

New fluoride [F] discharge limits are forcing many industrial sites to employ [F] treatment. Past [F] limits, when imposed, were lax but

now limits of 10-25 ppm are common with some set at drinking water levels, < 4 ppm. Many [F] removal systems are unable to achieve these limits. However, emerging membrane technology is proving capable of meeting these limits while improving efficiency and operating costs. The semiconductor industry proved an ideal place to test the treatment of small concentrated streams, such as HF baths/rinses, and the large dilute ones, such as combined process effluent. Pilot testing of a Vibratory Shear-Enhanced membrane Process, VSEP, has shown great success in both cases. VSEP technology was integrated into a chemical process to remove calcium fluoride solids in a single filtration step. Feed concentrations of 5K25K ppm [F] were used to simulate a range of waste streams and were filtered through a UF membrane (200K MWCO, ~ 0.1 um). Effluent [F] ranged from 8-17 ppm, resp., with lower levels achieved using co-precipitation reagents. The VSEPs high resistant to fouling is due to vibratory-induced shear forces imparted directly at the membrane surface. The hybrid VSEP concentrates solids 10X, creating a zone of reactive solids above the membrane surface. Contaminated water passes through this zone, where collision efficiency is elevated, and exits the membrane as high quality permeate at ~90% recovery. The VSEP can use most membrane materials, and pretreatment can be tailored to address various/multiple contaminants and problematic waste streams. The result is superior performance in terms of removal efficiency, chemical/waste reduction, treated water quality, reliability and operating costs.

**10:45 Chemical Vapor Deposition Process Emission Reduction Using Point-Of-Use Wet Scrubber Technology**

*Kempton, Curtis, Jain, Anita  
Rogers, Chandler, AZ*

A chemical vapor deposition process (using silicon tetrachloride and titanium tetrachloride) exhausted to a conventional end-of-pipe wet grid scrubber failed emissions testing for HCl removal efficiency (< 90%), as well as particulate emission requirements of Maricopa

County Air Pollution Control Regulation III, Rule 311. In addition, exhaust ducts were fouled quickly with deposited residues. A path to resolve the problem was being pursued with conventional end-of-pipe control technology. In this case a wet scrubber followed by a wet electrostatic precipitator had been recommended. Even with this technology, there was no guarantee of meeting the requirements. Additional research led to the evaluation and use of point-of-use (POU) wet scrubber technology followed by the existing end-of-pipe wet grid scrubber. Following pilot testing, POU wet scrubbers were added to the process and the follow-up system tests demonstrated HCl removal efficiency of 99.6% and compliance with particulate emission requirements of Maricopa County Rule 311. In addition, other benefits of implementing the POU wet scrubber technology were realized.

**11:30 Lunch on Own**

**1:00-2:30 PM**

**Room: Rio Verde/Sonora  
Session 8: Regulatory/Code  
Developments**

*Moderator: Aaron Zude*

**1:00 Assessing the Impact of Technology on the Regulatory Process**

*Gannod, Gerald, Koehnmann, Harry, Litchfield, Larry  
Arizona State University, Tempe, AZ, and City of Phoenix, AZ*

Regulatory agencies face many challenges. The volume of permit requests is increasing while those requesting permits expect a quicker response time to their submissions. Construction projects are reducing their timelines and require incremental, continuous permit review processes. To help resolve these problems, regulatory agencies are looking to technology solutions to help increase their performance by automating and managing por-

tions of the permitting process. By deploying technology solutions, agencies hope to provide permitting customers better service in a more timely manner as well as enable the staff to efficiently process increasing volumes of requests. In this paper, we outline a continuous permitting process and survey some technology investments that have been implemented by local municipal government agencies to improve current permitting processes. This analysis uses data collected over the past ten years including information on budgets, staff, and permitting performance and analyzes the impact of IT investments on observed productivity and performance gains. We conclude the paper with recommendations for other regulatory agencies looking to make technology investments

1:45 **Fire and Building Codes: One Code or Conflicting Codes?**

*Hynes, George  
ATS, LLC*

This slide presentation discusses the Fire and Building Codes. Several topics are covered. The interplay of the two major model code groups involved, the National Fire Protection Association (NFPA) and the International Code Council (ICC) are discussed. Which model codes are required by law is discussed, with examples of a few states' requirements. The need for one code set is emphasized. An overview of the latest editions of both the ICC Building Code and Fire Code is presented, with examples relevant to semiconductor facilities and operations. An analysis of current trends is also presented.

2:30 **Break**

2:45-4:15 PM

**Room: Rio Verde/Sonora**  
**Roundtable: Effect of WEEE & RoHS on the Global Electronics Industry Supply Chain**

*Chair: Brian Sherin*

- 2:45 **Opening Remarks. B. Sherin**  
**Semiconductor Equipment Manufacturing.**  
*Claes, B.  
Lam Research*  
**Semiconductor Device Manufacturing.**  
*Bolinger, N.  
IBM*  
**Consumer Electronics/Electronic OEMs.**  
*Author TBD*

8:00-9:30 AM

**Room: Center Ballroom**  
**Session 9: Industrial Hygiene**

*Chair: Judi Barker*

- 8:00 **Arsenic Regulated Areas—A Reality in the Clean Semiconductor Industry**  
*Rubin, James (Jamie)  
Agilent Technologies, Fort Collins, CO*  
The introduction of gallium arsenide (GaAs) wafer processing within Agilent Technologies, also introduced operations with significant employee exposures to inorganic arsenic and arsine gas. Employee monitoring confirmed the need to establish arsenic regulated areas per OSHA regulations. Inorganic arsenic exposures during maintenance operations cleaning a molecular beam epitaxial (MBE) reactor were more than fifteen times the OSHA acceptable limit. Arsine exposures exceeded our maximum detection limit of our direct reading instrumentation and were possibly at IDLH levels. Wastewater treatment processes from a GaAs wafer background opera-

## Thursday, Session 10/Session 11

tion also required the establishment of an arsenic regulated area. This presentation will show the numerous engineering designs that were implemented to isolate these exposures from the rest of fab operations and to minimize maintenance employee exposures; however, air supplied respirators are still a necessity for the MBE maintenance operations. Designing an airline respirator system that would support several employees for several hours resulted in some innovative solutions. Air purifying respirators for the GaAs backgrind wastewater treatment operation are still used. Complying with some paragraphs of the OSHA arsenic standard seemed unreasonable and successful negotiations with local OSHA office resulted in agreements that were acceptable to OSHA and Agilent Technologies.

### 8:45 Health and Nanotechnologies, from Benefits to Hazards

*Proust, Nicole*

*TRT-Fr, Orsay, France*

The nanoworld includes three different areas which are described as nanomaterials, nanoelectronics, nanobiology and nanomedicine. This paper will give the pros and cons in term of health. Nanotechnologies can be beneficial to the health and will be helpful to save human life. We will present some applications such as lab on chip, medical diagnosis, therapy, medicine transportation For some of them anoutubes, nanowires, fullerenes are required. On the other hand what are the hazards for workers dealing with the preparation of nanomaterials? What are the fears related to nanoparticles, nanotubes? What could be said and what is known in term of industrial toxicology in this field at the moment? We will try to answer these questions. We will also indicate what are the difficulties in term of industrial hygiene and occupational heath (collection of particles, evaluation of hazards) to protect health at work in such a case.

9:30 Break

10:00-11:30 AM

**Room: Center Ballroom**

## Session 10: Occupational Health

*Chair: Molly Doddo*

### 10:00 Managing Ergonomics as a Process

*Rostykus, Walt*

*Humantech*

During this presentation, participants will be provided a systematic approach to managing ergonomics as a business process and demonstrating value to their organization. Course agenda include; characteristics of successful ergonomics program, demonstrating business value from application of ergonomic principles, managing ergonomics as a process, strategic elements: management system to ensure integration and support, tactical elements: identifying and controlling risk factors in the workplace, integration with medical, quality and engineering. As a result of the presentation, attendees will be able to; identify strengths and opportunities for improvement in current ergonomics program and apply the ergonomics management process model to strengthen their program.

### 10:45 Personal Empowerment: An Unconventional Concept in Stress Management

*Jackson, Carol*

*Freescale Semiconductor, Tempe, AZ*

The concept of job stress as addressed by NIOSH and the CDC in 2002 places the major responsibility for managing workplace stress on the Company. Since that time major changes in the world and in the business sector have increased the potential for stress. As companies are shifting priorities to remain competitive in a global business environment, it is time to change our perception of job stress and how to manage it. Personal Empowerment is explored as an unconventional stress management strategy.

11:30 Lunch on Own

1:00-4:15 PM

**Room: Center Ballroom**

**Session 11: Safety**

*Chair: John Blades*

**1:00 Intel's EHS New Facilities Equipment Procurement Process (FEPP)**

*Yurconic, Mike*

*Ronler Acres, Hillsboro, OR*

Intel's Corporate Equipment Design for EHS Program (DFEHS) has consisted of the New Equipment Procurement Process (NEPP) for process tools going into the cleanroom. There was no similar process for evaluating supporting facility systems and equipment. There was some effort to apply SEMI S2/S8 to these systems. However, it became apparent that these documents were not appropriate for the more industrial-like facility systems. Consequently, these systems were being designed and installed with inadequate and inconsistent EHS evaluation. As facility systems, particularly waste systems, became more complex, Intel began experiencing a significant increase in the number and severity of incidents associated with them. Consequently, corporate EHS Engineering and Design was chartered by the Facility Technology Development organization (FTD) to develop an analogous process to NEPP but for facility systems. Subsequently, a small work group, led by EHS, was formed and developed the EHS Facility Equipment Procurement Process (FEPP). EHS presented FEPP to stakeholders for buy-in to the process. Once approval was gained, FEPP was integrated into Intel's procurement process and the FEPP deliverables were published as an Intel Master Construction Specification.

**1:45 Life Cycle Concerns for a Toxic Gas Monitoring System**

*Pugh, Jeffrey*

*Pugh Engineering*

This paper will take a Reverse Engineering approach to evaluating the life cycle concerns and strategic focus areas related to implementing a Toxic Gas Monitoring System. Starting with operation and maintenance and concluding with selecting/designing a new system, this paper will analyze key concerns through each phase of the system life cycle. This paper is intended to provide EHS personnel, system owners, operators, maintenance personnel, and designers with a full range of topics critical to a successful operating Toxic Gas Monitoring System. Operation and Maintenance will consider response philosophies, maintenance procedures, testing procedures, equipment reliability, cross-sensitivity, equipment location, and Code compliance. Equipment selection, installation and commissioning phases will consider identifying proven technology, owners acceptance, equipment calibration, system configuration, and system diagnostics. Discussion on how installation concerns are related to contracting strategy and equipment procurement. Finally, we will take a look at how these topics discussed above should be considered as an integral part of the initial system design to maximize performance and ensure reliability.

**2:30 Break**

**2:45 Arc Flash Safety Practices in the Semiconductor Industry**

*Clough, Jonathan*

*Square D/Schneider Electric, Spokane, WA*

This presentation addresses standards by NFPA 70E, NEC 2002 and OSHA for employee workplaces when working around exposed energized equipment. Each year, workplace deaths and injuries are caused by arc flash incidents in faulted, electrical equipment. Improved control of arc flash would lead to fewer injuries and a safer workplace. Estimates indicate that 10-15 serious arc-flash incidents (those that result in burn injuries requiring treatment in a burn center) occur each day in

the US, so it is not surprising that awareness of the hazards associated with arc-flash continues to grow. Present OSHA regulations do not specifically address arc flash hazards, but industry standards such as NFPA 70E-2004, Standard for Electrical Safety in the Workplace, provide information on safe work practices and required protective equipment for electrical workers exposed to arc flash hazards. OSHA has begun to write citations based on the NFPA 70E requirements. This paper will cover aspects of NFPA 70E, NEC, OSHA requirements, enforcement and what the Semiconductor industry is required to do to keep their workplace safe. Additionally, the steps of an Arc Flash study performed in a Semiconductor facility will be reviewed and examples of what Personal Protective Equipment (PPE), incident energy, and working clearances required when working around process electrical equipment will be discussed. He will also talk about design considerations and planning required meeting NFPA 70E, NEC and OSHA requirements.

**3:30 Fire Risk Mitigation for Integral IPA Dryers - Using Engineering Controls Versus Gaseous Fire Suppression**

*McDaid, Raymond, Wyman, Matt  
Applied Materials, Santa Clara, CA and Koetter  
Fire Protection, Dallas, TX*

IPA (Isopropyl Alcohol) liquid has been historically used to dry and clean wafers after vari-

ous processes in the fabrication of semiconductors. Because of the storage and distribution of this flammable liquid (flash point 45°F), regulatory and insurance requirements have historically required CO2 fire suppression within the process equipment in order to achieve acceptable risk in regards to fire mitigation. The development of new processing equipment with integral IPA dryers, has given rise to increased productivity and has allowed processing at smaller geometries, i.e. 65nm and below, however it has also introduced a new set of concerns that need to be addressed. In the design of the Applied Materials CMP tool, we have utilized the latest fire protection technology, and have incorporated the flexibility of new regulatory codes to effectively reduce the fire risk without using fire suppression agent, while still satisfying both AHJ and Insurance company requirements. This case study will demonstrate how Applied Materials has been successful in the design and integration, of an IPA dryer into a CMP tool by implementation of various engineering controls such as containment, restricted flow, exhaust ventilation, LEL and fire detection. Thereby reducing the fire risks to a mutually acceptable level for the equipment, personnel, and facility. We will also demonstrate the benefits associated with removal of the fire suppression system and agent, as well demonstrating the integration of the fire controls to meet NFPA and local jurisdiction requirements.

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# **SESHA 2005**

## **Poster Session**

**Authors will be at their Posters**

**Wednesday, 9:30-10:30 AM**

- P1** **Managing a Confined Space Program in a Semiconductor Manufacturing Facility**  
*Samaniego, David*  
*Advanced Micro Devices, Inc.*

Since OSHA's Permit-Required Confined Spaces Final Rule (29 CFR 1910.146) went into effect in April of 1993, employers now have over 10 years of experience in drafting, implementing, and managing an effective Confined Space Program in order to ensure the safety of its employees and contractors who work in confined spaces. This presentation takes a look at a confined space program and how it is managed in a semiconductor manufacturing facility. From conducting our initial site survey, conducting employee training, to working with local emergency responders, and establishing an on-site confined space rescue team, the objective of this presentation is to provide a basic outline of the elements of a good confined space program and how it is implemented on our site on a daily basis. In addition, lessons-learned will be discussed in order to illustrate examples of obstacles common both in and out of the semiconductor business. Attendees will have a good understanding of the resources required to establish and manage a confined space program for sites large or small.

- P2** **How Can New Technologies, Such as GIS or PDAs, be Utilized as Cost-Effective Tools to Manage a Broad Range of EHS Functions?**  
*Zimmerman, Michael, Shulenberger, Chris, Gladu, Nicole*  
*Clayton Group Services, Pleasanton, CA and Portland, Oregon*

The presentation will focus on how new technologies (i.e., GIS, PDAs and Web-based systems) can be utilized as cost-effective tools to manage a broad range of EHS functions. Employers manage large volumes of EHS data, some of which is related to the work environment. Examples of EHS data include locations of asbestos-containing materials; areas with elevated noise levels; Material

Safety Data Sheets (MSDSs); occupational exposure data (industrial hygiene sampling results); life safety equipment; schedules for medical evaluations and respirator fit testing; training records; and equipment calibration. Examples of other data managed by EHS professionals related to permits and regulatory compliance include locations of hazardous materials, quantities of hazardous materials (i.e., solvents) used for air permit compliance, locations of fire extinguishers and their inspection dates, and storm water sampling locations and analytical data. A geographic information system (GIS) can link these types of data (from a spreadsheet or a database) to a spatial representation of the work site. Using a graphical approach makes it much easier to visualize how the data relates to specific work areas or site locations. EHS professionals can use GIS to focus on specific workstations or query the system for a single facility or multiple sites.

- P3** **Business Process Outsourcing for Chemical Management**

*McCann, Russell*  
*Actio Corporation, Hampton, NH*

Today's Chemical Management System: In the past five years two chemical management models have surfaced: the first driven by chemical manufacturers and suppliers attempting to tighten their control of the supply chain, offering greater value to their customers. For the chemical company, such services allow for a reduction of the quantities of chemicals shipped in as much as the inventory, handling, waste processing and reporting mechanisms are now tightly integrated with the product's supply. For the manufacturer the reduction in supply is then offset by a charge for the management service. This model is used in several semiconductor firms. The net result is an overall reduction of chemicals consumed, and a small reduction in costs for the chemical consumer. The second approach is very similar with the exception that a third party, not the chemical manufacturer, administers it. The third party actually staffs on-site and manages the purchase, inventory and subsequent waste streams of chemicals being utilized in the manufacturing process.

This model is generally used in the automotive and aerospace industries. A New Approach: Business process outsourcing of CMS is a fresh new approach to chemical information management. Rather than outsourcing chemical management to a chemical manufacturer or independent third party, CMS services are delivered via the web enabling all the benefits of a complete chemical management system without committing to a single chemical supplier or third party manager. All stages of the chemical life cycle are managed from chemical requests to regulatory reporting. Implementation of business process outsourcing is fast and produces immediate efficiencies in chemical purchasing and inventory, as well as hard cost savings in managing environmental and regulatory information.

P4 **Cancelled**

P5 **Assuring Cost -Effective WEEE/RoHS Compliance - A Case Study**

*Perrell, Susan, Hubert, Dave  
TechniData America, Wilmington, DE and  
Molex, Lisle, IL*

The focus of this paper is to show how Molex product content management information system provides cost-effective compliance assurance for the WEEE/RoHS and similar directives. WEEE/RoHS and similar global product compliance requirements impacted Molex supply chain in terms of business risks, costs, information gathering and reporting requirements, staffing, and workload. A business case was made for an information solution that would assure compliance while minimizing those impacts of the regulation. A solution was chosen based on specific decision criteria that focused on the Lowest Total Cost of Compliance. The resulting solution enabled and streamlined compliance from product engineering through delivery by means of business process and information integration, and through the use of a collaborative workspace for Molex and their suppliers and customers. The solution was configured and implemented using accelerated project methodologies. The solution is working, and next steps and improvements are planned as WEEE/RoHS requirements evolve further.

P6 **Technical, EH&S, and Economic Benefits of**

**Semiconductor OPC (Outsourced Parts Cleaning)**

*Leggett, G., Zuck, D., Macura, K.  
QuantumClean*

For the past three decades, semiconductor manufacturers have traditionally cleaned semiconductor tool parts “in-house.” Methods to clean parts — many still in use today— originated in the 70’s, when chemicals and labor were less expensive, when numerous water treatment/discharge and air quality standards did not exist, and when water was not considered a “precious” resource. Advances in tool part cleaning technology, did not keep pace with the stunning advances in semiconductor manufacturing technologies as “part cleaning” was considered a “non value-add” activity, receiving little to no R&D investment. Outsourcing chamber parts cleaning to a leading surface treatment provider alleviates fab management of associated safety, environmental, and health risks; thereby enabling production personnel to focus on core ship making competencies. In addition to cost and environmental benefits, these techniques are producing measurably “cleaner” parts required for shrinking device line widths and increasing wafer sizes into the nanotechnology realm. This poster will present evolutionary advances in part cleaning technologies (many patented or patent pending) and expertise that, compared with most cleaning alternatives: 1. Drastically reduce and/or eliminate chemical consumption; 2. Are safer to operate with less cleaning personnel exposure; 3. Have less impact on the environment. It will also provide examples of how these novel surface treatment technologies enable improved process tool performance, including: a. Faster chamber seasoning or pull-downs; (reduced MTTP); b. Extended process uptime (Increased MTBWC); c. Die yield improvement (as reported by many QC customers); d. Extended useful service-life of many common parts, including many that are commonly discarded. QuantumClean is a proven leader in advancing and applying innovative technologies within the semiconductor Outsourced Parts Cleaning (OPC) industry.

P7 **Eliminating the Need for Toxic Gas Calibrations for Semiconductor Life Safety Systems**

*Hogan, Patrick  
Zellweger Analytics Inc, Lincolnshire, IL*

Modern Fab facilities require over 1000 sepa-

rate points of gas detection to prevent death or injury to personnel, plant, processes and the environment from the release of extremely toxic, corrosive and pyrophoric gases used or generated in the manufacturing processes. Typically these gas detectors have required the routine application of equally toxic and environmentally damaging gases to check that the sensors are still viable and capable of registering adequate alarms in an actual emergency. The handling and procurement of these gases is considered by most facilities managers, complex to facilitate, potentially dangerous to store, use and dispose of and prone to introducing errors to the sensor calibrations if handled incorrectly or if decay of the gas has occurred. Zellweger Analytics will present data to confirm that new sensor and technology designs backed by laboratory and field generated data can demonstrate no / reduced requirement to provide routine gas calibrations in the field. This significantly improves the overall cost of ownership equation to the end user and greatly reduces their burden associated with acquiring and handling environmentally hazardous gases. Reliability to the life safety system is improved; instrument down time is reduced and staff are comforted by greater confidence in their gas detection protection.

**P8 Industrial Hygiene Analyzer for Semiconductor Fabrication Plants**

*Steven Plowman  
Midac Corporation*

This abstract describes an industrial hygiene Fourier transform infra-red (FTIR) spectrometer designed to test ambient air in a semiconductor fabrication plant for twenty five compounds which are considered to be hazardous to health. These compounds include Arsine, phosphine and diborane, with detection limits of 25ppb. These low detection limits are made possible by the long optical pathlength of the instrument (20m). The analyzer capable of testing up to 32 different test streams in series via a manifold, which is operated automatically by MIDAC AutoQuant Pro software. Each stream is sampled for approximately one minute before the software actuates a solenoid and switching to the next stream. In such a complex gas matrix, interferences in IR absorbance bands are inevitable. AutoQuant Pro copes with this issue by modeling the spectra acquired from

the sample screen using combinations of spectra contained within the method, which is specific to the particular matrix to be analyzed. Once a non linear least squares best fit is achieved between this combination of the calibration spectra and the sample, factors are delivered which give the concentration of the IR active components of the test stream. This application is proving to be highly effective in detecting hazardous compounds at very low concentration levels.

**P9 Novel Subatmospheric Pressure Gas Sources for Ion Implanters**

*Reinaldo Machado  
Air Products*

Subatmospheric gas supply technologies which serve the ion implant market are widely recognized as the preferred safe supply of hazardous feed gases (e.g. BF<sub>3</sub>, AsH<sub>3</sub> and PH<sub>3</sub>). The most common subatmospheric supply relies on cylinders filled with adsorbent to store dopant gases. Recently, at Air Products and Chemicals, Inc. we have developed two novel subatmospheric safe supply technologies which are both in beta-testing in commercial ion implant tools. The first technology, Low Pressure Delivery (LPD), developed for PH<sub>3</sub> and BF<sub>3</sub>, utilizes a novel, non-hazardous, non-volatile liquid that forms a reversible chemical complex with the dopant gases allowing them to be stored at high capacity while at subatmospheric pressure. A proprietary valve allows the canister to be used in vertical or horizontal ion implant gas boxes and utilizes the same manifold and mass flow system as other subatmospheric sources. The LPD system is a, safe, drop-in replacement for adsorbent based subatmospheric gas sources. The second technology, eGas™ arsine, is an electrochemical arsine generator that when shipped or stored before use contains no arsine. This unique characteristic reduces many barriers to shipping and storage. The eGas™ arsine generator utilizes electrochemical reduction at an arsenic cathode in a caustic electrolyte to generate a dopant gas containing 93-95% pure arsine (5-7% hydrogen) to the ion implanter at a constant subatmospheric pressure, currently set at 600 torr. Both technologies generate ion beams and commercial wafers that are comparable to those generated with other subatmospheric sources. This talk will focus on the performance and safety of these systems in real ion implant tools.

# SESHA 2005

## Speaker Biographies

### **Roger Benson**

Roger is a Senior Engineering Specialist with Factory Mutual Global. His responsibilities include design review of new I.C. Fab facilities, visiting existing Fabs to review operations and the training of other FM engineers in I.C. Fab operations. He has a BS in Civil Engineering from the University of Miami. He is a member of the NFPA 318 technical committee, co-chair of the SEMI Tool Fire Protection Task Force West group, a former member of the Board of Directors of SESH A and a frequent speaker at SESH A conferences and seminars.

### **Laurie Beu**

Laurie Beu is a consultant in the area of environmental policy, strategy and management. Ms Beu has extensive experience as an environmental professional including environmental construction management, program development and compliance management, integration of environmental solutions into manufacturing process development, and industry benchmarking. She has formulated company and industry environmental strategies, and has served as an industry representative in environmental policy negotiations with suppliers and government agencies. As chair of the Semiconductor Industry Association (SIA) Global Warming committee, Ms Beu drove the development of the second Semiconductor Industry PFC Emissions Reduction Partnership memorandum of understanding (MOU) with the Environmental Protection Agency (EPA) and establishment of an industry PFC emissions reduction goal. Ms Beu is a member of the United Nations Intergovernmental Panel on Climate Change industry experts group responsible for developing good practice guidance for estimating electronics industry greenhouse gas emissions. Ms. Beu is a Registered Professional Engineer in Texas.

### **Steven Brown**

Mr. Brown is a Certified Industrial Hygienist with a Masters Degree in Industrial Hygiene and is currently employed at Intel's Technology & Development facility located in Hillsboro, OR. He is heavily involved in the review and approval of all chemicals being investigated for future use including Component Research and Microprocessor process

development. He has been with Intel for over 9 years and been in the EHS field for over 24.

### **Jonathan Clough**

He received the BSEE degree from the University of NH in 1986. Other degrees include an AS degree in Industrial Electronics in 1984 and AS in Industrial Electricity in 1982. Prior to earning his degree, Jon served in the U.S. Coast Guard for 3 years as an electrician aboard CG Cutter Yacona in Oregon. Jon later moved to New Hampshire, where he worked for several contractors as a licensed electrician. While in New Hampshire, Jon joined General Electric as a test engineer in the Somersworth N.H. Meter Business Department, where he fabricated and tested electronic manufacturing equipment for the plant for 3 years. In 1987, Jon returned west as an Electrical Project Engineer for Port Townsend Paper in Washington State. In 1991, he was promoted to plant electrical superintendent and assumed responsibility for all electrical project engineering and maintenance for the 810 ton/day pulp and paper plant. In 1996, Jon joined Kaiser Aluminum as the Electrical Supervisor over the Can finishing plant in Spokane, WA. In 1999, Jon joined Schneider Electric as a Staff Engineer responsible for power system consulting services for the North American Services Division. In 2003 Jon assumed responsibilities as the Western Region Engineering Team Leader. He is responsible for Engineering Services in the Western States as a Senior Staff Engineer. Mr. Clough is an IEEE Power Engineering Society Member and a licensed Professional Engineer in Washington State.

### **Susan Creighton**

Sue Creighton has over 16 years EHS experience in High Technology R&D and Biotech industries. She has experience in EHS occupational Programs and training, semiconductor tool design safety review, accident investigation and Lab Operations EHS.

### **Paula M. Esty**

Paula is a Senior Systems Scientist at Capaccio Environmental Engineering, Inc. She holds a Master of Management degree from Cambridge College and has attended numerous quality and environmental, health & safety management seminars. Paula has over

15 years of experience in systems management in the semiconductor industry, including: developing and implementing ISO 14001 environmental management systems, OHSAS 18001 health and safety management systems, ISO 9000 quality management systems, and integrated EH&S management systems; assisting with development and implementation of systems to address European Union (EU) directives, performing systems audits and gap analysis assessments, developing EHS system performance metrics, and conducting training.

### **Jim Feldhan**

Jim Feldhan founded Semico Research in 1994. A 20-year veteran of the semiconductor industry, he brings his management, forecasting and modeling expertise to Semico. Jim designed and developed the research methodologies and report structures, which are the basis for Semico's Research and Portfolio Services. Jim develops Semico's overall economic outlook as well as conducting consulting and forecasting projects. With a focus on quality, Semico Research has grown to the largest semiconductor-focused consulting and research firm. Jim was formerly the Executive Vice-President and General Manager at In-Stat. As a member of the start-up team there, Feldhan was responsible for the design and methodologies of research that was the basis for the Semiconductor Services. Mr. Feldhan has held various management positions at GTE Microcircuits and Greyhound/Dial Corporation. Jim received a BS in Business with a minor in Chemistry from the University of Arizona and a MS in Marketing focusing on statistics and market research from the University of Arizona.

### **Michael Fischman**

Dr. Michael Fischman is an occupational medicine physician and toxicologist from the San Francisco Bay Area. He is an Associate Clinical Professor in and the Assistant Chief of the Division of Occupational & Environmental Medicine, Department of Medicine, at the University of California San Francisco. He received his medical degree at the University of Michigan and his masters degree in public health, in environmental health sciences, from the University of California, Berkeley. He did his residency training in internal medicine and in occupational medicine at the University of California, San Francisco. Dr. Fischman is co-author of a textbook, Chemical Hazards Of The

Workplace, and author of a number of book chapters, including *Semiconductor Manufacturing Hazards in Clinical Environmental Health and Toxic Exposures* and a chapter on occupational cancer in an occupational medicine textbook. He has been the Corporate Medical Director of Intel Corporation since 1986. He is the co-chair of the Project Management Committee for the Semiconductor Industry Association's Worker Health Projects. He is a fellow in the American College of Occupational and Environmental Medicine.

### **Charles L. (Chuck) Fraust**

Charles L. (Chuck) Fraust is Director, Environment, Health and Safety for the Semiconductor Industry Association a position he has held since 1999. Up until the time he joined SIA, he was a Senior Staff Engineer for Lucent Technologies, Microelectronics Group, serving in the capacity of Corporate Consultant and lead Microelectronics Environmental Health Engineer. He received his B.S. in Civil Engineering from the Cooper Union and his M.S. and Ph.D in Environmental Health Engineering from Northwestern University. He is a Registered Professional Engineer in Pennsylvania and a Certified Industrial Hygienist. Dr. Fraust's professional career started with Western Electric in 1968 at their semiconductor manufacturing facility in Allentown, Pennsylvania working on issues related to product contamination. He was subsequently tasked with developing EHS programs for the Allentown Works. Chuck stayed with the Allentown facility through its transition to AT&T Technologies, AT&T Microelectronics, and the Lucent Technologies Microelectronics Group. He left Lucent Technologies shortly before Agere Systems was spun off. Dr. Fraust represented Lucent Technologies on the Semiconductor Industry Association's Environment, Safety and Health Committees and chaired numerous industry committees in this capacity. He was the Lucent Technologies ES&H representative to SEMATECH and International SEMATECH and is a former ES&H Council Chair. Additionally, he serves as a representative, and former chair, of the SIA contingent to the World Semiconductor Council ESH Taskforce. He currently is chair of the WSC ESH Taskforce PFC Working Group. Additionally, Dr. Fraust is a member of the Domestic Technical Working Group for the International Technology Roadmap for Semiconductors. He is also a member of the Industrial

Advisory Board for the NSF/SRC Engineering Research Center for Environmentally Benign Semiconductor Manufacturing. In 1994, Dr. Fraust was named the Lehigh Valley Professional Engineer of the Year and, subsequently, the Pennsylvania Professional Engineer of the Year in 1995.

### **Bernie Frist**

Mr. Frist has over fifteen years of experience supporting the design, manufacturing, and EH&S sectors of process intensive industries. His experience includes five years of site EH&S management for a semiconductor manufacturing facility and ten years of technical and EHS management consulting. Mr. Frist is a Managing Principal with Environmental and Occupational Risk Management and SESH A President-Elect.

### **Varun Gopalakrishna**

Mr. Gopalakrishna has over 8 years of experience providing strategic and tactical EHS consulting to a variety of high-technology industrial applications. Varun's experience includes Process Hazard Analysis for semiconductor and biotechnology equipment, facilities and abatement technology, semiconductor equipment design review and sign-off, facility design review, hazardous materials management, incident investigation and design for safety and environment training. He is one of the EORM professionals qualified to train equipment designers and engineers on key aspects of DFESH and industry EHS guidelines. Varun specializes in providing strategic support to EHS management in an R&D environment at semiconductor equipment manufacturers, including budget planning, resource management and oversight of EHS program implementation.

### **Tim Higgs**

Tim Higgs is an environmental engineer with the worldwide environmental, health and safety department at Intel Corp. He received his B.S. degree in chemical engineering from Michigan State University in 1983 and is a registered professional engineer in the State of Arizona. Tim has been with Intel for 21 years in a variety of positions at the site and worldwide levels. He has worked with state and local regulatory agencies across the U.S. on air programs, and has frequently consulted with U.S. EPA on air program matters of importance to the semiconductor industry.

### **Patrick Hogan**

Dr Patrick Hogan is Zellweger Analytics' Business Development Director with responsibility for new products and services to the Semiconductor industry. Dr Hogan has worked with research, marketing and new product development with several Zellweger Analytics' division including the MDA Scientific and Sieger ranges of toxic and flammable gas detection systems with technologies involving catalytic, infra red, electrochemical and colorimetric Chemcassette technologies. After being awarded with his PhD in Organic Chemistry and Magnetic Resonance Imaging (MRI) at the University of Cambridge, England in 1987, Patrick Hogan has worked in areas associated with bio-sensors, FT IR, field bus control systems and chemical analyzers. As Vice President for the British Gas Technology group he led research and consulting teams in diverse areas associated with gas exploration, handling, transportation and utilization projects around the world. Hogan has presented at other SESH A and semiconductor events.

### **George Hynes**

Mr. Hynes has over 32 years experience in the environmental health and safety field. He is a safety and industrial hygiene professional with expertise in the semiconductor industry. He was the primary safety engineer during the design and construction of Digital Equipment Corporation's last two state-of-the-art semiconductor manufacturing facilities. These facilities received critical acclaim for their outstanding safety and manufacturing features. On more than one occasion, Mr. Hynes' building code expertise saved hundreds of thousands of dollars through cost-saving code interpretations.. Mr. Hynes is a Certified Industrial Hygienist (CIH), and a Certified Safety Professional (CSP). At Advanced Technology Solutions, LLC, Mr. Hynes specializes in product/process/equipment safety reviews including the development of cost-effective in-house programs, safety and industrial hygiene training programs, building and fire code reviews, indoor air quality, air sampling and noise studies/engineering noise controls.

### **Carol Jackson**

Carol Jackson received her BSN from Brigham Young University and has national certification for Occupational Health Nurses (COHN-S) and a Workers' Compensation Claims Professional (WCCP)

designation. She has worked in the semiconductor industry for 17 years and has been a sought out speaker for local, regional and national programs.

### **Jim Jewett**

Jim Jewett is a Principle Engineer and manager of Strategic Environmental Programs for Corporate Materials at Intel, where he has served in several EHS related management and technical positions since 1984. Before joining Intel, he was Corporate Environmental Affairs Manager for Medtronic, Inc. Jim chairs the international technology working group responsible for ESH in the International Technology Roadmap for Semiconductors (ITRS). He also is an SIA representative to the World Semiconductor Council's ESH Committee, chairs the WSC's Chemical Management Working Group and is Intel's member of the Industrial Advisory Board to the SRC's Engineering Research Center for Environmentally Benign Semiconductor Mfg. Jim's presentation will discuss current efforts for integration of ESH needs into the ITRS.

### **Andrew D. Johnson**

Andrew D. Johnson, Ph.D., is Lead Research Chemist at Air Products and Chemicals, Inc, providing applications support for electronic specialty gases (e.g.,  $\text{NF}_3$ ,  $\text{C}_2\text{F}_6$ ,  $\text{HBr}$ ,  $\text{HCl}$ ). Working with semiconductor customers, he has developed CVD chamber clean processes having reduced emissions of PFC gases, faster clean times and lower cost. Other research programs include in situ and process effluent monitoring. Andrew received his Ph.D. from Massachusetts Institute of Technology.

### **Dan Kelso**

Mr. Kelso is an ergonomist with 14 years of experience related to ergonomics and human factors engineering. He has consulted on design and conducted Semi<sup>®</sup>S8 Ergonomic Evaluations on a variety of types of wafer processing equipment. Mr. Kelso has developed and facilitated ergonomic training for a variety of applications and audiences. Participation in the development of the Semi<sup>®</sup>S8 and Sematech standards has assisted him in developing strong guideline interpretation skills. His experience in ergonomic analysis and design has involved settings ranging from semiconductor manufacturing to office workstation environments, and involves both engineering and administrative

redesign. Mr. Kelso has served as an EH&S campus manager for a large local computer manufacturer. Academic training included musculoskeletal injury cause and prevention, and has conducted training in ergonomics and biomechanical safety. This includes expertise in the use of static strength prediction software. He has developed ergonomic safety programs for a number of large corporations and served as a consultant to leading ergonomic furniture and equipment manufacturers.

### **Curtis Kempton**

Curtis Kempton is a Senior Manufacturing Engineer at Rogers Corporation - Durel Division in Chandler, Arizona, a manufacturer of electroluminescent lighting technology. Curtis is a process engineering project manager, as well as having the role of environmental coordinator for the division. Curtis holds a Bachelor of Science degree in Chemical Engineering from Brigham Young University and has twenty years experience in process engineering.

### **Matthew B. Kuntz**

Matthew B. Kuntz is a SEMATECH intern in the ISMI Environmental, Safety, and Health Technology Program. He is a third year student at The University of Texas at Austin working towards a B.S. degree in chemical engineering with an emphasis in environmental product design.

### **Ray Machado**

Reinaldo (Ray) Machado joined Air Products and Chemicals, Inc. in 1986. Currently he is serving as the technical project leader of the eGas arsine generator team. He is a senior consultant within the company specializing in applied electrochemical and chemical reaction engineering. Ray has broad technical experience in the scale-up of chemical reaction processes, mass transfer, heat transfer, applied reaction calorimetry, hydrogenation, and electrochemical engineering. Ray received a Ph.D. in chemical engineering with a concentration in chemistry from the University of Wisconsin, Madison, and a B.A. in chemistry and mathematics from Frostburg State College. He has served as a part-time instructor of a short course, "Fundamentals of scale-up," at Lehigh University and currently teaches industrial courses on scale-up. He holds 15 patents, has collaborated on 14 publications, and is a member of the American Institute of Chemical Engineers and the American Chemical Society.

## **Richard MacLean**

Richard MacLean is President of Competitive Environment Inc., a management consulting firm established in 1995 in Scottsdale, Ariz.; a Principal at Independent Perspectives, a virtual consulting network supporting business management; and the Executive Director of the Center for Environmental Innovation (CEI), a university-based nonprofit environmental research organization. He is also an Adjunct Professor at Arizona State University, College of Business. Richard has held health, safety and environmental [EHS] positions (including engineering, department, group, and officer level) in several Fortune 500 corporations including General Electric and Arizona Public Service. A chemical engineer by training, he specializes in EHS strategic planning, management systems, organizational re-structuring, corporate reporting, benchmarking, sustainable development metrics and corporate governance. He has published extensively on EHS management subjects and has a monthly column in Environmental Protection magazine (Manager's Notebook).

## **Jim Madole**

Jim Madole is a water reuse specialist with Nalco Company for North America, and holds a Bachelor's Degree in Chemical Engineering from the University of Utah.

## **Mary Majors**

Mary Majors is a Principal EH&S Specialist for the Product Safety department of Air Products and Chemicals, Inc. Mary has presented at various semiconductor industry conferences on product stewardship topics and has been published in Solid State Technology. She has over ten years of experience in the chemical industry in both commercial and EH&S functions. Mary is a member of the Society for Chemical Hazard Communication and the Semiconductor Environmental Safety and Health Association. Mary received a B.S. in Medical Technology from Fitchburg State College.

## **James Mallon**

James Mallon, Managing Consultant and Ergonomics Engineer for Humantech, has experience in the automotive, aerospace, plastics, technology, and food industries, performing ergonomic risk assessments and engineering reviews, and implementing ergonomics programs. In addition, James delivers ergonomics

training for audiences of varied backgrounds from executives to operators. His work has included direct contact with clients such as General Electric, DuPont, Nestle USA, and Agilent Technologies. Prior to joining Humantech, he served as Manager of Ergonomics Services at Office Interiors, Inc. in Halifax, Nova Scotia, Canada.

James received his Bachelor of Science degree in Kinesiology and Master of Science degree from Dalhousie University in Halifax. James' research activities include the effects of extreme temperature on human cognitive performance as well as the relationship between Six Sigma and ergonomics.

James is a member of the Human Factors and Ergonomics Society, the Association of Canadian Ergonomists, and the Atlantic Canadian Kinesiology Association. He has also achieved recognition as a Board Certified Professional Ergonomist.

## **Russell F. McCann, Jr.**

Russ brings more than 22 years of high technology marketing and executive management experience to Actio Corporation. He is currently serving on the Board of Trustees of the Bigelow Laboratory for the Ocean Sciences a non-profit research foundation and based in Boothbay, Maine. Prior to founding Actio in 1996, Russ was CEO and co-founder of Ares Software Corporation, which invented a patented parametric font technology. Ares also produced and marketed a wide range of award winning Microsoft Windows and Apple Macintosh shrink-wrap software products before being acquired by Adobe Systems Incorporated in early 1996. Russ's association with Adobe Systems began in early 1990 having joined the Application Products Division of Adobe Systems, as Director of Accessory Products after their acquisition of Emerald City Software, in March of 1990. Russ served as Vice President of marketing and sales for Emerald City Software whose early success resulted from innovative Postscript Development tools on both the Apple Macintosh and NeXT operating systems. As Marketing Manager, International Marketing Manager and Manager of Product Marketing for Esselte Letraset Graphic Design Software U.S., Russ expanded the Company's traditional graphic arts product line, having joined the Letraset organization upon the acquisition of Boston Software Publishers, of which he was President and Co-founder. Boston Software Publishers

produced the first commercially shipped product for the Apple Macintosh, which helped define the desktop publishing revolution. He has a BS and MBA from Northeastern University and specialized marketing studies from the Sloan School of Management at MIT. Often quoted, Russ is frequently called upon to speak at industry forums addressing wide ranging issues from technology trends to marketing strategies for privately held companies.

### **Raymond McDaid**

Raymond is a Senior Product Safety Engineer at Applied Materials, working for the CMP division for the last 5 years, initially, and for the last 3 years as the division product safety engineer. Raymond's 4+ years of experience includes working on Fab design to ensuring S2 and regulatory conformance for the CMP tools at Applied. Raymond is a member of the Semi S3 and S6 Task force and previously spoke at SSA 2000 as a student presenter.

### **Andrew McIntyre**

Andy McIntyre has been an environmental, health and safety professional for more than 22 years and is a co-founder of EORM. He previously worked for Hewlett Packard's Component Group and the Electronics Division of Xerox Corporation. At EORM's founding, Mr. McIntyre served as vice president and managing principal. He was instrumental in the formation of the semiconductor industry's first joint venture consulting company, Global Semiconductor Safety Services, LLC (GS3), a collaboration between EORM and Intertek Testing Services (ITS). Mr. McIntyre served as president of GS3 until the sale of EORM's interest to ITS in January 1999. He then rejoined EORM as executive vice president and chief operating officer and has since worked with the executive management team to develop EORM into a national management and technical EHS consulting firm. Mr. McIntyre is a board certified industrial hygienist and is the second recipient of Peninsula Industry Business Association (PIBA) Health and Safety Professional of the Year Award (1999). He is an active member of the Semiconductor Environmental Safety and Health Association (SESHA) where he was elected a Fellow in 2001. Prior to that, he served as SESHAs president ('96-'97) and as a member of its Board of Directors ('89-'96).

### **C. Michael Moffitt**

Dr. Moffitt is an Adjunct Professor with The University of Arizona and is Vice President of Environmental Services for Western Technologies Inc. in Phoenix, AZ. He has a Ph.D. in Toxicology and Environmental Science from The University of Texas, and an undergraduate degree from the University of California. Dr. Moffitt has 25 years of experience providing environmental health and toxicology consulting services including laboratory and field assessments, health risk assessments, and regulatory compliance. He specializes in identifying and providing science-based solutions to environmental health issues associated with high-tech manufacturing, construction, and energy operations, and in the emerging nanotechnology fields. Dr. Moffitt acts as consultant to global nanotech commercial and venture capital firms, and to academic research groups. He is a member of the American Industrial Hygiene Association and Society of Environmental Toxicology and Chemistry, and is Vice Chair of Valley Forward Association (Arizona's largest environmental business organization). He is also Co-Chair of Operations for Intel's 2005 International Science and Engineering Fair taking place in Phoenix, Arizona May 8-13, 2005.

### **Gary Niekerk**

Gary Niekerk has spent almost 20 years in the field of environmental health and safety. He has a BS in occupational safety and health and a MS in industrial hygiene. Gary has worked for Hewlett-Packard, Apple Computer and most recently Intel Corporation where he has worked for the past ten years. While at Intel, Gary has held a variety of EHS leadership positions, such as site and regional EHS manager, and he has lived and worked in both the US and Europe. Gary's current position is the Manager of External Affairs where he serves as the link between Intel's internal programs and the external world of customers, stakeholders, shareholders and the community.

### **Michael O'Brien**

Mike is a certified professional ergonomist (CPE), with an M.S. degree in Ergonomics from Texas A&M University and has been working at Intel since 1996. He has been an ergonomist for Intel's Arizona and Colorado sites, with primary responsibility for driving office and industrial ergonomics programs, including training, risk assessment, and medical case manage-

ment. He has also provided leadership for ergonomics programs at international sites, including Malaysia, Ireland, and Costa Rica. His work has covered technology development and high-volume manufacturing for a variety of environments, including semiconductor fab and assembly/test facilities

### **Steven Plowman**

Steven has a BS degree in applied chemistry from De Montfort University in Leicester, England. Worked as a gas phase FTIR spectroscopist at the National Physical Laboratory in London. Then worked both as a consultant and a direct employee employing FTIR in solid state analysis for pharmaceutical companies in England and Italy. Currently engaged as an applications scientist working on gas phase FTIR solutions for MIDAC in the USA.

### **Susan Perrell**

Susan Perrell graduated from the Colorado School of Mines and has over 20 years of industry experience in science, engineering and environmental health and safety management. Susan managed environmental, health and safety at ARCO and led environmental public affairs, legislative and regulatory initiatives in Washington, DC for ARCO, the American Petroleum Institute, the National Association of Manufacturers, and The Business Round Table. She has been involved with EH&S management information systems solutions for the past 9 years, as a Vice President of the world's largest environmental engineering firm, and now as an Account Executive for TechniData America.

### **Joel Peterson**

Joel Peterson is a Senior Environmental Engineer with Geomatrix Consultants in Scottsdale, Arizona. Mr. Peterson is a registered professional engineer (environmental), holds a Master's Degree in Civil Engineering from Arizona State University, and has been engaged in water and wastewater treatment in the semiconductor industry for over 20 years..

### **Nicole Proust**

Nicole Proust is a research engineer who has been mainly involved in material growth and technology processes for electronic devices in private research at THALES Research and Technology (TRT) France for a long period of time. She is in charge of the Clean Technology Laboratory at

TRT and she had a position in public research as Associated Research Director at CNRS (Centre National de la Recherche Scientifique) in the chemical risk prevention field. She does research on clean and green technologies (studies supported by the European Community). The activity key words are technology and environment, health at work, waste, metrology of toxic species. She is graduated from Ecole Polytechnique Féminine, and she has studied industrial toxicology in Paris. She teaches toxicology in France or abroad to process engineers and technicians, to safety engineers and occupational health officers. She is member of various associations dealing with toxicology and environment in Europe .

### **Jeffrey A. Pugh**

Mr. Pugh received Bachelor of Science Degrees in Electrical Engineering and Computer Engineering from University of Missouri-Columbia in 1990 and a Master's in Business Administration from the University of Phoenix in 1998. Mr. Pugh has worked in the field of Electrical Engineering, Instrumentation and Controls, and Life Safety Systems for over 14 years. Mr. Pugh's professional experience covers diverse industries from mining, refining, petroleum distribution, semiconductor, biopharmaceutical, and wastewater treatment. Jeff is a registered Electrical Engineering in Arizona, California, Colorado, Texas, and Utah. Mr. Pugh's Toxic Gas Monitoring experience includes engineering, operation, and maintenance responsibilities for Freescale Semiconductor's (formally Motorola Semiconductor Products Sector) MOS12 facility located in Chandler, AZ. Mr. Pugh has also provided Toxic Gas Monitoring consulting and engineering services for clients in Arizona, California, Colorado, and Utah.

### **Kristyn Rankin**

Kristyn Malina Rankin is a Senior Consultant with Environmental Resources Management. Ms. Rankin has over fifteen years of environmental, health and safety (EHS) consulting experience, with an emphasis on strategic EHS and business risk management. She has worked with a broad range of companies in the semiconductor, consumer electronics, pharmaceutical, petrochemical, oil and gas, and ore refining sectors as well as the US Departments of Defense and Energy in developing, implementing and evaluating key EHS programs. Her experience includes project

work throughout the United States, Greenland, the United Kingdom, France, Japan, and Singapore. She now uses her broad-based experience to help companies to determine and optimize the role of EHS within their organization. Ms. Rankin can be reached by telephone in Austin, Texas, USA at +1 512 459 4700 or by e-mail at kristyn.rankin@erm.com.

### **Walt Rostykus**

Walt Rostykus, Vice President and ergonomics engineer for Humantech, has provided technical and program management services, conducted program assessments, and carried out compliance reviews and process evaluations for corporate ergonomics programs in the electronics and health care industries, among others. Walt has worked directly with clients such as Federal-Mogul, Quebecor World, and Quaker Oats. Prior to joining Humantech, Walt established and managed the Environment, Health, and Safety (EHS) program for sales and service operations worldwide at Agilent Technologies, providing guidance and direction for management ownership of EHS programs and processes. He also served as Ergonomics Program Manager at Hewlett Packard, managing communication and process review/evaluation, and representing Hewlett Packard in occupational safety and ergonomics rulemaking development at State and Federal levels. At Compaq Computer Corporation, Walt managed EHS programs at manufacturing facilities. His background also includes managing occupational health and safety programs in the environmental and biotechnology industries, and 18 years training experience in a wide variety of topics ranging from ergonomics awareness to industrial hygiene sampling. Walt received his Bachelor of Science degree from Washington State University and his Master of Science degree in Public Health (MSPH), Industrial Hygiene and Safety/Environmental Health and Sanitation, from the University of Washington. Walt has received recognition as a Board Certified Professional Ergonomist, Certified Safety Professional, and Certified Industrial Hygienist, and has served as Environmental Management System Lead Auditor (EMS-LA) for ISO 14001. Walt is a member of the American Industrial Hygiene Association, American Society of Safety Engineers, Semiconductor Environmental, Safety & Health Association.

### **Rick Row**

Rick Row coordinates the Global Care initiative and manages other EHS activities in the EHS Division at SEMI. Formerly he managed environmental R&D projects at EPRI (Electric Power Research Institute) for the electric utility industry, and has also been a financial analyst in the mining industry. He holds an MBA from Golden Gate University and an undergraduate degree in chemical engineering from the University of Queensland. He is a registered professional chemical engineer in California.

### **James (Jamie) Rubin**

James (Jamie) Rubin has been an EHS specialist in the semiconductor industry for 20 years with Agilent Technologies, Hewlett-Packard and Honeywell. Prior to working in private industry, he worked as an OSHA Compliance Officer and Supervisor in Montana and Colorado respectively. Jamie served as Hewlett-Packard's representative on SEMATECH's ESH council and has represented both Hewlett Packard and Agilent Technologies interests in the PFC Reduction/Climate Partnership with the Environmental Protection Agency.

### **David Samaniego**

David Samaniego, ASP, is a 21-year employee of Advanced Micro Devices, Inc., a semiconductor manufacturer and is a senior member of the EHS staff. He has an Associates of Science degree in Biology from Austin Community College. He is currently completing his Bachelor of Science degree in Biology at Texas State University. David's primary responsibility is EHS operations support for a 200mm wafer fabrication facility. Other areas of responsibility include toxic gas monitoring, equipment safety, compressed gas safety, and confined space safety. He was responsible for establishing the first confined space rescue team for the Austin facility. He has completed his Safety Fundamentals examination and is an Associate Safety Professional.

### **Kathy A. Seabrook**

Seabrook is president of Global Solutions, Inc.(GSI) and Global Solutions International (UK) Limited (GSIL). She is currently leading GSI's international expansion into the UK, bringing UK - US expertise to new and existing multinational clients. She has over 20 years of diverse safety and health man-

agement experience in both the domestic and international sectors, is an US Certified Safety Professional (CSP) and UK Registered Safety Practitioner (RSP), with a BS in Chemistry. She is a keynote speaker and presenter of leadership workshops, site implementation training and seminars on safety and health management systems, risk assessment and UK/EU health and safety regulations. Her US and international speaking experience includes annual conferences of NSC, ASSE, Canadian Society of Safety Engineering, Society of Human Resource Managers, RIMS, American Society of Mechanical Engineers/ IMechE, UK, World Congress on Safety and Health (Brazil) and the British Institution of Occupational Safety and Health. She's a member of ASSE's national faculty, serves on the ANSI ASC Z10 Occupational Safety and Health Systems (Management) standard committee and contributed authored the global safety & health management sections for Essentials of Safety and Health Management and Ted Ferry's Safety and Health Management Planning.

### **Dawn E. Speranza**

Dawn E. Speranza is an Intel employee assigned as a project manager at SEMATECH's Environmental, Safety, and Health Technology division located in Austin, Texas. She has been employed with Intel since 1998 in the fields of Industrial Hygiene, Occupational Safety, and Construction Safety. Prior to Intel she was employed with Digital Equipment Corporation in the ESH field. She has a B.S. degree from Tulane University and a M.S. degree from the University of Massachusetts at Amherst. Dawn is a certified Industrial Hygienist and a Certified Safety Professional.

### **Andrew Sweatman**

Andrew has over 13 years of experience providing strategic consulting services to companies in Europe, Australia and the U.S. to help reduce the environmental impact of their products and production processes. Andrew is a co-author of a key text on environmentally oriented product development titled "Design + Environment" published in the UK and distributed globally with translations in Chinese and Italian.

This unique area of expertise is enhanced by his information technology skills that allow such consulting solutions to be delivered to global clients via the Internet in the form of web-based regulatory tracking

and e-Learning solutions. Mr. Sweatman's achievements include the development of regulatory tracking systems for the peak U.S. electronics trade body-the Electronics Industry Alliance (EIA). He has also developed successful on-line regulatory tracking systems for Nike and Apple. Mr. Sweatman is a certified Associate Environmental Auditor with a degree in Industrial Design from RMIT University, Australia and a Master's degree in Environmental Management from Brunel University London, UK

### **Dave Tighe**

David partners with innovative organizations ranging from startups to the Fortune 100 that want to rapidly add value to their customer offerings. David holds a degree in Chemical Engineering, a technical background which uniquely qualifies him to develop approaches that create lasting change within technically-based organizations. David specializes in designing culture-changing approaches that motivate and leverage the strengths of employees, often drawing together unique teams of people to achieve powerful results. Dave's clients include numerous industry leaders such as Hewlett-Packard, Chevron, AT&T, Agilent, and Genentech. David also works with many smaller entrepreneurial organizations and industry consortia. Has experiences as a national award-winning sales person and territory manager for a multinational specialty chemical company add real-life customer connection success to his development work with organizations intent on creating even higher levels of individual and organizational performance.

### **Joe Van Gompel**

Dr. Joe Van Gompel is a Senior Product Specialist for Exhaust Management Systems at BOC Edwards. He is based in Austin, Texas, and has done customer and sales support for the Point-of-Use Exhaust Management devices for 9 years. Joe earned his Ph.D. in organic chemistry from the University of Illinois in 1988. Joe is very active with SEMI and SESA events, as well as related semiconductor and compound semiconductor safety issues. Van Gompel can be reached at 800-848-9800, ext. 6111, or [joe.vangompel@bocedwards.com](mailto:joe.vangompel@bocedwards.com).

### **John Visty**

Mr. Visty is a project manager and department manager for the Colorado Springs project office. He

has over 22 years of field experience, including 12 years employment working directly for companies in the high-tech industry. As a consultant with Earth Tech, Mr. Visty has performed several SEMI®S2 evaluations on equipment designed and produced by some of the largest manufacturers in the world. Mr. Visty has also served as a project manager on a variety of environmental health and safety assignments. Since Mr. Visty has also managed environmental health and safety departments at both small and large semiconductor facilities, he is very knowledgeable in assessing what information is needed and the appropriate methods to organize a program or plan to be effective according to the site operations and systems maturity.

### **Rolf R. von Oppenfeld**

Rolf R. von Oppenfeld (e-mail [rvo@testlaw.com](mailto:rvo@testlaw.com)) is an environmental attorney with the Team for Environmental Science and Technology Law (TESTLaw) Practice Group, Rolf R. von Oppenfeld, P.C., in Phoenix, AZ. Mr. von Oppenfeld received his B.S. in Chemistry and Biology and worked as a chemist and in the enforcement and Superfund offices at EPA headquarters. He received his J.D. (summa cum laude) in 1982 from George Washington University. Articles published include Defeating Environmental Civil Penalty Claims through the Use of the Federal Statute of Limitations Defense, 36 Chem. Waste Litigation Reporter 989 (1998); A Primer on New Source Review and Strategies for Success, 32 Env't. L. Rptr. 11091 (2002); Strategies for Limiting Engineers' Potential Liability for Indoor Air Quality Problems, 48 J. Air & Waste Manage. Assn. 995 (1998); The Common Law Impetus for Advanced Control of Air Toxics, 29 Env't. L. Rptr. 10001 (1999); Legal Requirements for Proving the Fugitive VOCs Emissions Defense to an Alleged PSD Permit Violation, 29 BNA Env't. Rptr. 1612 (1998); South Carolina Release Prevention, Reporting and Liability: A Primer on the Legal Requirements Imposed to Avoid And, If Necessary, To Respond To "Environmental Accidents," 11 Southeastern Env't. L. J. 223 (2003); The Federal Title V Air Quality Permit Program for Operating A Major Source of Air Pollution: A Primer on the Substantive and Procedural Requirements Imposed on Industrial Facilities by the 1990 Clean Air Act Amendments, Applicable Regulations, and Key EPA Guidance Documents, 33 Env't. L. Rptr. 10815 (2003); Through the Looking Glass: Regional Haze and Visibility Considerations for Industry, 31 Env't. L. Rptr. 10957 (2001), and Multimedia Exposure Modeling in the Courtroom, 29 Env't. L. Rptr.

10185 (1999).

### **Patrick J. Webb**

Mr. Webb is an Environmental Specialist in Texas Instruments Incorporated's World Wide Environmental, Safety and Health Services organization. Mr. Webb has a B.S. in Mechanical Engineering from Clarkson University and a M.S. in Hazardous and Waste Materials Management from Southern Methodist University. His responsibilities include the management of TI environmental liabilities including facility decommissioning, remediation, and due diligence programs. Mr. Webb was elected to TI's Technical Staff in 2002. He has been with TI since 1987 and in the ESH organization since 1995.

### **Lisa F. Wilk**

Lisa Wilk is currently the President of Capaccio Environmental Engineering, Inc. She is a Registered Professional Engineer (PE) and holds a B.S. in Chemistry from Bates College and a B.S. in Civil/Environmental Engineering from Northeastern University. Lisa has over 23 years of experience, including: developing & implementing ISO 14001, OHSAS 18001, and other EH&S management systems (including the first U.S.-based semiconductor company registered to ISO14001); compliance management; industrial pollution prevention and abatement systems design. She has recently directed the development of interactive computer-based training programs and electronic compliance management tools. Her extensive practical experience has helped numerous clients in the electronics industry including semiconductor and printed circuit manufacturers. Lisa is a published author of several technical articles and books, and a frequent speaker at industry seminars and conferences. Lisa was selected as the Massachusetts Society of Professional Engineers "Young Engineer of the Year-1994."

### **Walter Worth**

Walter F. Worth is a SEMATECH Fellow and member of SEMATECH's Environment, Safety and Health Technology Development Group. He has been employed by SEMATECH since 1993. Prior experience has been with Exxon Research & Engineering, Bechtel and Brown & Root in the chemical and petrochemical industries. He has earned a B.S. degree from the University of Toronto, and M.S. and Ph.D. degrees

from MIT, all in chemical engineering. He is a registered Professional Engineer in the State of Texas and a member of AICHE, The Electrochemical Society and SESHA.

### **Jeanne Yturri**

Ms. Jeanne Yturri is a founding partner and principal of Zephyr Environmental Corporation, a company based in Austin, Texas that provides consulting, training and data systems. Her 24 years of experience in the fields of environmental compliance and safety program management include ten years in industry. Prior to becoming a consultant in 1991, Jeanne served as the Environmental Affairs Manager for SEMATECH during its startup. Her technical expertise includes industrial waste management, storm water and wastewater permitting, emergency preparedness and response programs, workplace exposure assessments, environmental and safety management systems, and employee training. Due to her broad background and operational expertise, Jeanne has significant experience conducting multimedia environmental and safety compliance audits.

Under Jeanne's leadership, Zephyr has provided environmental management system (EMS) implementation and certification support to over 26 different clients since 1996. Jeanne co-authored a book in 1998 with two EMS experts from IBM. The name of the book, which was published by McGraw-Hill, is ISO 14001 Implementation Manual. Jeanne is a certified ISO 14001 Lead Auditor and is currently serving as the co-chair of the Environmental Performance Partnership, the Texas Commission of Environmental Quality (TCEQ) advisory group on TCEQ's EMS Rule and the Clean Texas, Cleaner World program.

Jeanne is a past-president of SESHA and served on the Board of Directors from 1995 to 2001.

### **Mike Yurconic**

Mike Yurconic, Intel Corporation, Hillsboro Oregon. Mike Yurconic is a Sr Safety Engineer in Intel's Technology Development EHS Group. His responsibilities include; 1) establishing systems and methodologies to fully integrate environmental, health and safety (EHS) requirements into Fab process tool/facility systems selection, design and installation, 2) supplier management and development, 3) Fab/office facilities' base build design. He also provides technical EHS support to Components Research (CR),

Portland Technology Development (PTD) and California Technology Manufacturing (CTM) groups for process development and next generation Path Finding collaborations. Additional responsibilities include EHS support to the Gas Systems engineering group, Intel's Cross-Site Code Team and coordination of equipment safety support for development of abatement/ treatment technologies. Mike is a member of the NFPA 318 Cleanrooms Committee and the SIA Fabs West EHS work group.

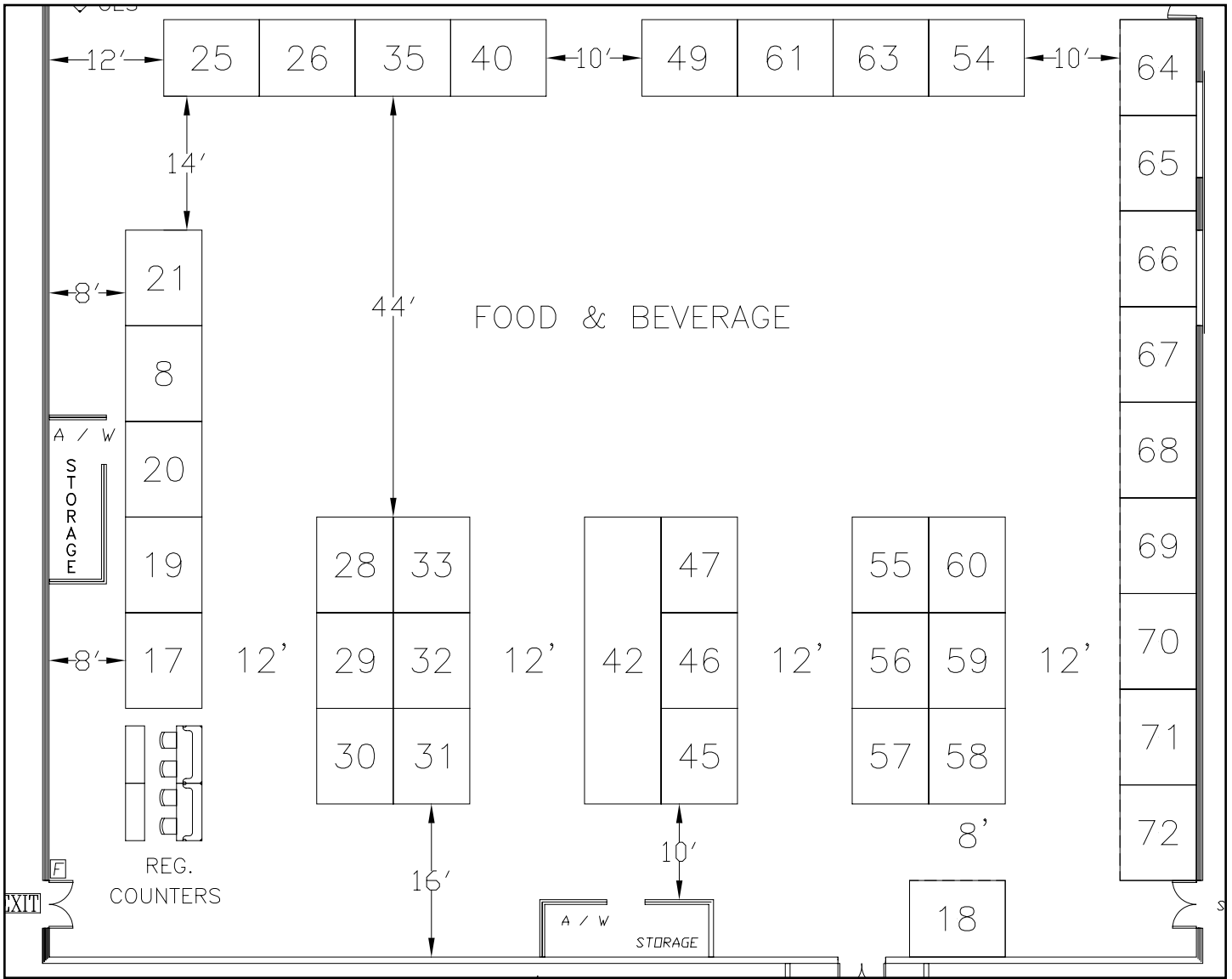
### **Michael J. Zimmerman**

Michael is a Senior Project Manager in the San Francisco Regional Office of Clayton Group Services. He has over 17 years of experience in the field of environmental safety and health and is considered an expert in environmental compliance, auditing, and permitting for air, water, and waste issues. He performs air dispersion modeling, manages risk assessments, provides third-party assessments, designs remediation systems, and manages multi-disciplinary projects for private and public clients. On a daily basis, Mr. Zimmerman solves clients' problems in complying with California regulations for air, water, and waste. He is also experienced with applicable federal regulations and those for many other states. For more information regarding this article, please contact Mr. Michael Zimmerman at 925.426.2681 or by e-mail [mzimmerman@claytongrp.com](mailto:mzimmerman@claytongrp.com).

### **Aaron Zude**

Aaron Zude has over 16 years experience in assessing and implementing safety, fire, and equipment installation codes and practices in the semiconductor and high technology industries. Most recently, he has supported the development and implementation of criteria and processes for semiconductor tool and equipment installation design review, permitting and commissioning for application within domestic tool manufacturing R&D operations. Prior to starting his facilities and safety consulting business 3 years ago, Aaron worked in EHS and facilities management positions at Asyst Technologies, Cirrus Logic, National Semiconductor and Varian Associates. He served 6 years (1996 to 2002) on the Board of Directors for the Semiconductor Environmental, Safety & Health Association (SESHA), served 4 years (1991 to 1995) on the SEMATECH ESH Focus Technical Advisory Board (FTAB), and served 12 years (1990 to 2002) on the SIA EHS and Fabs committees.

# SESHA 2005



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