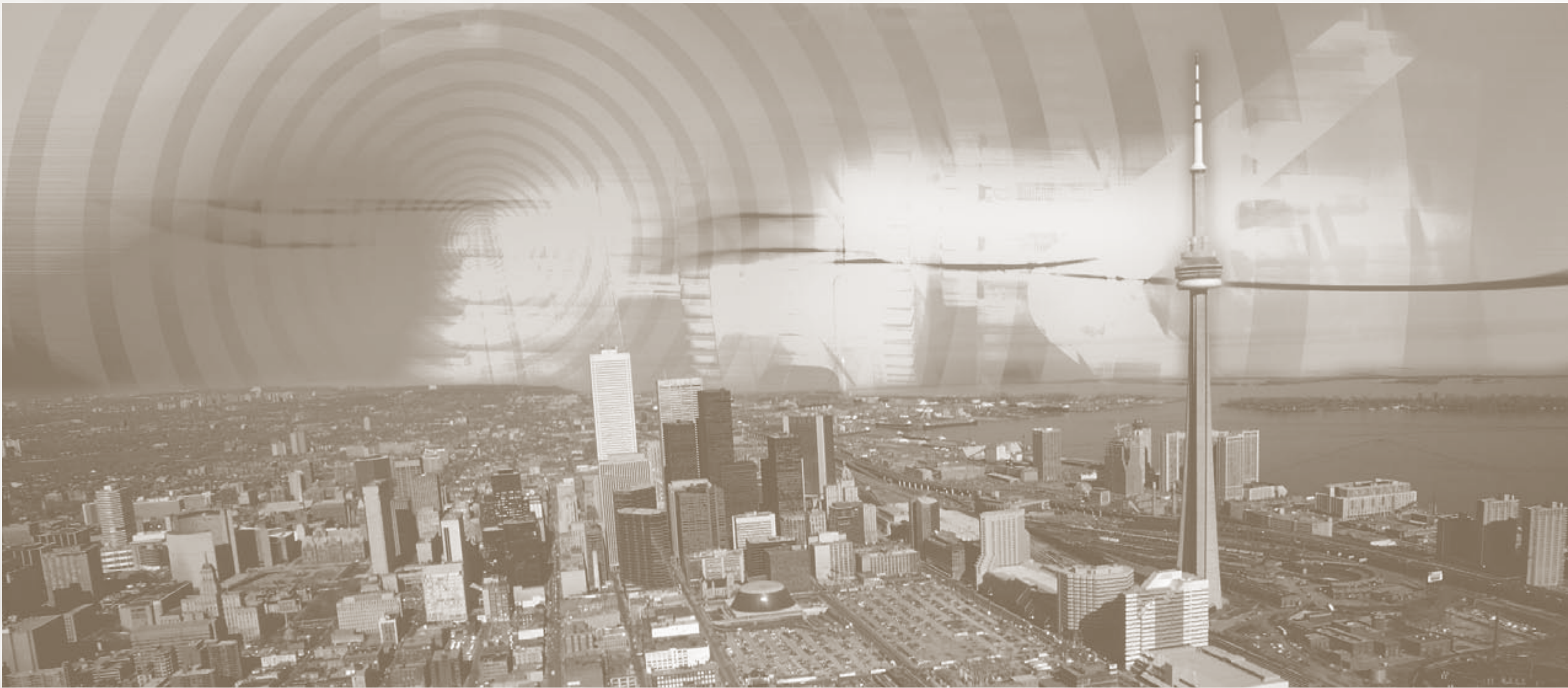
Sponsored by SMTA Surface Mount Technology Association

International Conference on Soldering and Reliability

In conjunction with SMTA Toronto Academy and Tabletop Exhibition



APRIL 17-19, 2007 | Park Plaza Hotel | Toronto, Ontario, Canada

Introduction:

The drive for smaller, more functional consumer electronics along with the need for highly reliable electronics for industrial, bio-medical, aerospace and automotive applications have kept the material, process and quality engineers busy planning for the future. The European Union's directive on lead-free electronics which became a reality on July 1, 2006 complicates that with the variety of alloy choices, component compatibility and mixed-solder concerns. Soldering and reliability engineers and designers need to come together to share their knowledge and their vision. Plan to attend the 2007 International Conference on Soldering and Reliability to hear experts share their knowledge and ideas for these current industry issues.

Technical Committee:

Laura Turbini, Ph.D., – *Research in Motion, Program Chair*
Bev Christian, Ph.D., *Research in Motion*
Polina Snugovsky, Ph.D., *Celestica, Inc.*

Keynote Address:

Cindy Coutts – Director, End of Life Electronics for Noranda Recycling, will give the keynote address "From Policy to Practical: Putting an Electronics Recycling Program in Place." Cindy has been involved in waste/recycling issues from a commercial perspective and from a regulatory/policy perspective at both the international level (UN and OECD) and the domestic level. Most recently she has been involved in the start up of Canada's first 100% end of life electronics recycling facility, Noranda Recycling in Brampton, Ontario and the establishment of ESM guidelines for sound electronics recycling.

In co-operation with:

- International Electronics Manufacturing Initiative (iNEMI)
- SMTA Toronto Chapter

T1: The Reality of Reliability of Lead-Free

Craig Hillman, Ph.D., *DfR Solutions*

Tuesday, April 17, 2007
8:30a.m. - 5:00p.m.

What You Will Learn

Although July 2006 has passed, the potential reliability implications of switching to Pb-free materials and a Pb-free process will potentially be felt for years to come. Numerous American companies in industries exempt from RoHS have already decided to make the jump to Pb-free. These include automotive, appliance, telecommunications, and military. These applications demand long-life in potentially severe operating environments. Understanding how to predict and ensure quality (can I make Pb-free just as good as SnPb?) and long-term reliability (will it last just as long?) is critical to customer satisfaction and, eventually, the success of your company.

This presentation provides a focused but comprehensive discussion on all potential issues that can arise during the transition to Pb-free. All areas of potential risk are examined. For each reliability concern, a brief description is provided, followed by the current state of industry knowledge and an opportunity for risk mitigation based upon the product design, materials, complexity, volumes, and customer expectations of reliability. A final summary provides the attendees a roadmap for ensuring the reliability of Pb-free product.

Topics Covered

- Introduction
  - Review of RoHS Legislation
  - What has Changed?
- Components
  - Robustness
  - Popcorning (PEMs and capacitors)
- Tin Whiskering
  - Background
  - Matte vs. Bright
  - Mechanical Behavior
  - Mitigation (component-level)
  - Mitigation (OEM level)
  - Prediction
- Solderability Platings
  - ENIG Failure Mechanisms
  - Immersion Tin Failure Mechanisms
  - Immersion Silver Failure Mechanisms
  - OSP Failure Mechanisms
  - Lead-Free HASL
- Printed Board Robustness
  - Tg and Thermal Stability
  - PTH Barrel Cracking
  - Conductive Anodic Filaments
- Solder
  - Copper Dissolution
  - Mixed Solder
  - Mechanical Loading
  - Intermetallic Formation
  - Tin Pest
- Reliability
  - Temperature Cycling
  - Vibration
- Metallography of Pb-Free Solder

Who Should Attend

All personnel involved in the process of transitioning to Pb-free; including procurement, design engineers, reliability and quality personnel, failure analysts, and management involved in new product introduction (NPI) and program support.

T2: Lead-Free — China RoHS — The Implementation Continues

Ken Stanvick, *Design Chain Associates*

Tuesday, April 17, 2007
8:30 a.m. - 12:30p.m.

What You Will Learn

The Environmental Compliance Seminar will be presented in two parts. Part one will cover what you need to know and do to comply with the "China RoHS" regulation. Misinformation about China RoHS abounds on the Web, in print, and in Webcasts. Many of these sources contain inaccuracies and conjecture that, if depended on, could have serious consequences.

This program will cover the information you will need to know to successfully design and manufacture products that are compliant to the EU RoHS Directive. Driven by the EU requirements on the elimination of lead from electronic assemblies and products, we can now review what we've tried and what has worked and our reasons for this belief. To successfully manufacture products that are compatible to the EU RoHS Directive we now have more options than we had when the major emphasis was being applied two years ago.

Changes in materials, chemicals and laminates have been addressed as well as changes in manufacturing; this session will cover some of these changes and describe the thought process with the direction the industry has taken. This session will also attempt to forecast future needs as there are still some unanswered questions and information lacking to make this new process more robust, repeatable and reliable.

Part One - China RoHS

Topics Covered

- Similarities to and differences from EU RoHS
- The scope of the regulation and its problems
- Phase One: Marking and Disclosure requirements
  - The two logo options – how to select
  - Disclosure – how to disclose
  - What is the environment-friendly use period?
  - Package marking
  - Date of Manufacture requirements
- The revised meaning of March 1, 2007
- Phase two: testing and certification
- OEM steps to compliance

Part Two – What Has Been Learnt By the Implementation of Lead-Free Material

Topics Covered

Review evaluations conducted and resultant actions on issues such as:

- Component Cracking issues
- Solder material alternatives
- Manufacturing changes
- Impacts to equipment and tools
- Rework and Repair cautions
- Re-training of work force to understand nuances of Lead-Free materials
- The changes in industrial standards related to the Lead-Free requirements
- Budget issues related to increase wear of equipment and cost of new materials

Who Should Attend

Electronics industry professionals involved in ensuring compliance at the supplier, contract manufacturing, distributor, or OEM level, including corporate management and engineering management; anyone who wants to better understand the critical nature of the March 1, 2007 deadline for the first phase of China RoHS. Also, quality engineers, purchasing, design engineers, manufacturing engineers, manufacturing operation staff, staff support engineers and plant managers.

T3: Lead-Free Soldering — Metallurgical Fundamentals, Failure Mode, Optimal Processes, and Reliability

Ning-Cheng Lee, Ph.D., *Indium Corporation of America*

Tuesday, April 17, 2007
1:30p.m. – 5:00p.m.

What You Will Learn

This course emphasizes on the technical knowledge required for implementing lead-free soldering. It covers the background, solders, surface finishes, components, substrates, assembly processes, rework, and reliability of lead-free soldering. Furthermore, it discusses the failure modes, challenges, and solutions for addressing those issues.

Topics Covered

- Lead-free legislation status
- Lead-free alloys
- Lead-free surface finishes
- Lead-free components and substrates
- Reflow processes of lead-free soldering
- Lead-free wave soldering
- Lead-free rework
- Lead-free soldering inspection
- Lead identification
- Transition stages of lead-free soldering
- Soldering area array packages
- Fragility of SAC solder joints
- Underfilling lead-free BGAs and CSPs
- Tin whisker formation mechanism and solutions
- Voiding mechanisms and control at lead-free reflow soldering
- Failure modes of lead-free solder joints
- Additional challenges of lead-free soldering

Who Should Attend

This course is intended for engineers, supervisors, managers, scientists, technologists, and technicians who are constantly plagued by the varieties of problems encountered in lead-free soldering of SMT industries.

T4: Soldering Reliability Issues for the 21st Century

Laura Turbini, Ph.D., *Research in Motion*

Tuesday, April 17, 2007
8:30a.m. - 12:30p.m.

What You Will Learn

This workshop will provide the user with an understanding of materials issues related to solder flux choice, manufacturing processes, cleaning requirements and end-use application. It will discuss how these are affected by the use of lead-free solder. It will review characterization tools used to evaluate fluxes both as received and after processing. It will cover surface insulation resistance (SIR), electrochemical migration (ECM) and other newly developed test methods for characterizing soldering fluxes. It will discuss accelerated test methods as distinguished from accelerated life tests and reliability assessment methods. It will also discuss common failure modes associated with processing chemicals.

Topics Covered

- Interacting Materials in Soldering Process
- Soldering Fluxes
- Cleaning Alternatives Past and Present
- Failure Modes Associated with Flux Residues
- Testing for Residues
- Electrochemical Migration
- Conductive Anodic Filament (CAF)
- SIR Testing of Low Solid Fluxes
- A Quantitative Corrosion Test Method
- Flux residues and RF

Who Should Attend

- Process engineers responsible for soldering flux/paste choice related to customer requirements
- Quality engineers responsible for reliability of the product
- Materials suppliers

Technical Conference Schedule | APRIL 18-19, 2007

WEDNESDAY, APRIL 18, 2007

7:30 am Registration, Continental Breakfast

8:30 am Opening Remarks
Keynote Address: From Policy to Practical: Putting an Electronics Recycling Program in Place
Cindy Coutts, *Noranda Recycling*

9:15 am Solder Joint Reliability in High Reliability Application for QFN Type Packages
Alex Chan, *Alcatel-Lucent*

9:40 am BGA Coplanarity Reduction During the Ball Attach Process
Rick Lathrop, *Heraeus*

10:05 am Coffee Break with Exhibitors

10:35 am Case Study on the Validation of SAC305 & SnCu Based Lead-free SMT, Wave and Hand-Soldering at the Contract Assembler Level
Peter Biocca, *Kester*

11:00 am Considerations in Selecting Fluxes for Lead-Free Wave Soldering
Chrys Shea, *ALPHA – A Cookson Electronics Company*

11:25 am Impact of Inert Atmosphere Quality on Wettability of Printed Wiring Board(PWB) Finishes for Surface Mount Soldering Applications
Dave Hillman, *Rockwell Collins*

11:50 am BGA Component Thermal Warpage and Implication on Interconnect Reliability
Hua Lu, *Ryerson University*

12:15 pm Lunch with Exhibitors

1:30 pm Have High CU Dissolution Rates of SAC305/405 Alloys Forced a Change in the Lead-Free Alloy Used During PTH Processes?
Craig Hamilton, *Celestica, Inc.*

1:55 pm A Unique Process that Eliminates Solder Dross
Keith Howell, *P. Kay Metal Inc.*

2:20 pm Lead Free – Impact on Interconnect Reliability
Paul Reid, *PWB Interconnect Solutions Inc.*

2:45 pm A Unique Tin Whisker Growth Study of Nine Lead Free Alloys
Karl Seelig, *AIM*

3:10 pm Coffee Break with Exhibitors

3:40 pm Lead and Brittle Fracture of Solder Joints
Vladimir Igoshev, *Research in Motion*

4:05 pm Thermal Cycling for Lead-free Solder-Dwells and Ramps
Milos Dusek, *NPL Management Ltd.*

4:30 pm Impact of Primary Creep on the Simulation of Thermal Fatigue of SnPb and SnAgCu Solder Joints
Dwayne Shirley, *University of Toronto*

4:55 pm Enhancing Mechanical Performance of CSP and WLCSP Solder Joints
Brian Toleno, *Henkel Loctite*

5:20 pm Bend Strain Induced BGA Interconnect Failures During Printed Circuit Assembly
Jason Bragg, *Celestica Inc.*

5:45 pm Wrap Up

6:00 pm-8:00 pm Exhibitor Reception

THURSDAY, APRIL 19, 2007

8:00 am Registration, Continental Breakfast

8:30 am A Comparison of SAC and Non-SAC Lead Free Solders
Howard Stevens, *Metallic Resources, Inc.*

8:55 am Optimizing the Tin-Copper Eutectic as a Lead-Free Solder
Keith Sweatman, *Nihon Superior*

9:20 am The Interaction of Sn-Zn-Al Solder with Copper and ENIG Substrates
Doug Perovic, *University of Toronto*

9:45 am Various Phases Formation and Reliability of a Sn-8Zn-3Bi Joint
Jae Pil Jung, *University of Seoul*

10:10 am Coffee Break with Exhibitors

10:40 am The Great SAC Debate: Comparing the Reliability of SAC305 and SAC405 Solders in a Variety of Applications
Heather McCormick, *Celestica Inc.*

11:05 am Failure Mechanism of SAC 305 and SAC 405 in Harsh Environments and Influence of Board Defects Including Black Pad
Polina Snugovsky, *Celestica Inc.*

11:30 am Ultrasonic Soldering of Si-wafer for Flip Chip with Sn-3.5Ag
Jung-Mo Kim, *University of Waterloo*

11:55 am Lunch with Exhibitors

1:25 pm A Review of Electromigration Under Time Varying Current Stressing
Kevin Enser, *University at Buffalo*

1:50 pm BGA and Fine Pitch Gullwing Defect Identification with Transmission X-Ray
Zhen (Jane) Feng, *Flextronics*

2:15 pm Compliance Screening Using a Small Spot Hand-held XRF Analyzer
David Mercuro, *Thermo Fisher Scientific Corporation, NITON Analyzers*

2:40 pm Use of Portable X-Ray Fluorescence in Materials Identification and Regulatory Compliance
Ken Smith, *Innov-X Systems*

3:05 pm Coffee Break with Exhibitors

3:35 pm Modular Approach to SMT Pick and Place Equipment
Michael Wagner, *Assembléon America, Inc.*

4:00 pm Will You and SMDs Really be Ready for Pb-Free with J-STD-033B and 020C/D? What about Passives?
Steven R. Martell, *Sonoscan, Inc.*

4:25 pm Effect of Thermo-migration on Lead-Free Solder Alloy Mechanical Properties
Mohammad Abdulhamid, *University at Buffalo*

4:50 pm FEM Modeling of Thermo-migration
Shidong Li, *University at Buffalo*

5:15 pm Wrap Up

SMT Process Certification | TUESDAY-THURSDAY, APRIL 17-19, 2007 | 8:30 AM - 5:00 PM

THE SMTA IS ALSO PLEASED TO BE BRINGING OUR CERTIFICATION PROGRAM BACK TO TORONTO. The SMTA's comprehensive program will provide the knowledge, skills, study materials and examination that will allow you to be recognized as an SMTA Certified Process Engineer.

The SMTA Certification program is a three-day workshop consisting of refresher topics in SMT processes. This will include both open and closed book examinations. The workshop, as well as the exam, assumes that the participant has at least one year of SMT experience and has an educational background equivalent to two years or more of college in a technical discipline. This is not an entry level program. Basic algebra and geometry will be used in the workshop and examination. The examination is "competitive" in that it requires written answers and some calculations. The intent of this procedure is to enable the students to establish competitive credentials as "Certified" by the SMTA in SMT Assembly Processes or SMT Systems.

Full details on Certification can be found at www.smta.org, click on Certification in the left browse bar.

Academy/Technical Conference Registration | REGISTER BEFORE MARCH 30 AND SAVE!

1. Registration Information

❒ Dr. ❒ Mr. ❒ Ms. SMTA Member #: ____________________

Name ____________________ Job Title ____________________

Company ____________________ MS ____________________

Address ____________________

City ____________________ State/Province __________ Zip __________ Country __________

Phone ____________________ Fax ____________________ E-Mail ____________________

Tabletop Exhibition Information

Tabletop exhibit space will be available for suppliers to display their products and profile their company during the conference. Contact Melissa Serres at 952-920-7682 or melissa@smta.org for more information.

2. How to Register

Register Online!
www.smta.org

By fax with
credit card
952-926-1819

By phone with
credit card
952-920-7682

By mail with
payment to SMTA
5200 Willson Road, Suite 215
Edina, MN 55424-1316

3. Registration Fee (US$$)

Register before March 30 and save 10%

Academy Courses

Tuesday, April 17

Full Day Course	Member	Non-Member
❒ T1	$450	$525

Half Day Courses	Member	Non-Member
❒ T2	$250	$325
❒ T3	$250	$325
❒ T4	$250	$325

Technical Conference

Wednesday, April 18 – Thursday, April 19

	Before 3/30	After 3/30
❒ SMTA Member	$450	$550
❒ Non-member	$550	$650
❒ Speaker	$250	$250

4. Payment Options

Academy Cost __________ Conference Cost __________

Total Amount Due ____________________

❒ Check enclosed (US$$) ❒ Purchase order # __________

❒ MC ❒ VISA ❒ AMEX

Credit Card # ____________________

Expiration Date ____________________

Cardholder's Name ____________________

5. Registration

Registration

Pre-Registration is strongly recommended. There will be no guarantee of space or materials for on-site registrants.

Four Registrations for the Price of Three

If four employees from the SAME company each register for the technical conference OR a course, the fourth registrant is free!

Registration Fee

Your registration fee for the technical conference includes proceedings, coffee breaks, lunch, and entrance to the exhibitor reception.

The registration fee for the Academy courses includes course materials and coffee breaks.

Cancellation

Registration fees will be refunded (less a $50 processing fee), if written notice is postmarked two weeks prior to program date.

No Shows

Registration fee will not be refunded in order to cover expenses incurred.

Hotel Information

Park Plaza Hotel
33 Carlson Court, Toronto, Ontario
416-675-1234

A block of rooms has been reserved at the Park Plaza Hotel for the rate of $109.00 CDN/night. The room block cut-off is April 2, 2007. Please call the hotel to book a room and reference the SMTA to ensure receipt of the discount rate.

5200 Wilson Road, Ste 215
Edina, MN 55424-1316

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SMTA Toronto Academy Program, April 17th

- **T1:** The Reality of Reliability of Lead-Free
- **T2:** Lead Free – China RoHS – The Implementation Continues
- **T3:** Lead-Free Soldering – Metallurgical Fundamentals, Failure Mode, Optimal Processes, and Reliability
- **T4:** Soldering Reliability Issues for the 21st Century

SMT Processes Certification, April 17-19

Don't miss your chance to become recognized as SMTA certified in SMT Processes.

Conference, April 18-19

- Keynote presentation from Cindy Coutts of Noranda Recycling
- Technical presentations from Celestica, Heraeus, University of Toronto, Kester, Assembléon, and many more…

Tabletop Exhibition, April 18-19

Two days of displays from industry suppliers with an exhibitor showcase reception on April 18.