



iNEMI

International Electronics Manufacturing Initiative

Concluding Remarks

Bob Pfahl
iNEMI
APEX 2008

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Next Steps on Pb-Free at iNEMI

- **Driven by the needs of the High Reliability Community**
- **New Projects and Initiatives**
 - iNEMI Pb-free Alloy Alternatives
 - iNEMI Pb-free Early Failures During Accelerated Temperature Cycling
 - Pb-Free Component & Board Finish Reliability



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Pb-free Alloy Alternatives

**Project Leaders:
Greg Henshall (HP)
Steve Tisdale (Intel)**

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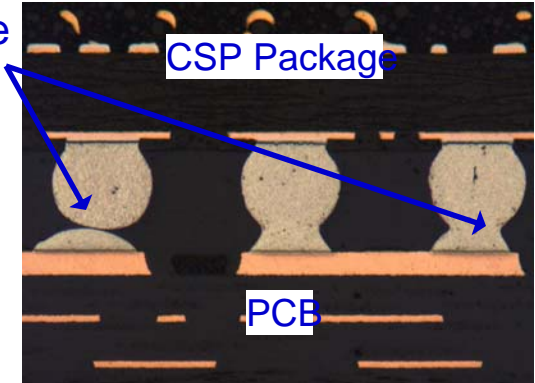
Pb-Free Alloy Alternatives Project

Goal: Provide guidance for industry on management of Pb-free alloy proliferation

Strategy:

- Address proliferation of Pb-free alloy alternatives through management of the situation, not (at least initially) through technical investigations.
- Project Leaders: Greg Henshall (HP), Steve Tisdale (Intel)

Unacceptable low Ag SAC solder joints reflowed at 230°C.



Tactics

- Phase 1: Determine existing knowledge & critical gaps. Raise awareness through publication of findings. Use to drive further investigation.
- Phase 2: TBD. A number of potential objectives & tasks have been identified and prioritized.
- Perform tasks in parallel to the extent that we can. Some activities are low effort, though perhaps long term (e.g. engaging standards bodies).

Milestones & Issues

- Phase 1: Virtual “workshop” 1 Feb '08. Complete. Face-to-face meeting 2 Apr '08. Complete. SMTA presentation May '08. On track. SMTAI paper, etc. Aug '08. On track.
- Phase 2: TBD. Planning begins April/May timeframe Influencing of standards begun.
- ISSUES: Need to wrap up literature review and begin planning Phase 2
- Need to write paper for SMTAI (due 2 June)
- Drive updates to key standards

Pb-Free Alloy Alternatives Project

The project is now officially under way with the following founding members:

- Agilent
- Alcatel-Lucent
- Celestica
- Cisco
- Cookson Electronics
- Delphi
- HP
- Huawei
- Indium
- Intel
- Jabil
- Nihon Superior
- Plexus
- Sanmina-SCI
- Senju Comtek
- Vitronics Soltec



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Pb-Free Early Failures during Accelerated Temperature Cycling

Project Leader:
Joe Smetana
(Alcatel-Lucent)

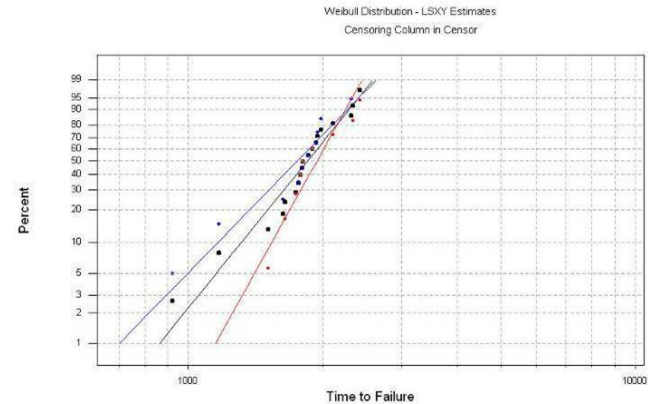
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Pb-Free Early Failures Project

Goal: Determine if a large sample size exposes early solder failures in accelerated thermal fatigue testing of Pb free solder joints.

Strategy:

- Use large sample size for greater statistical significance.
- Develop unique, simple test vehicle to minimize variables and keep cost/ schedule reasonable.
- Test design to encourage Early Failures & Late Failures.
- “Real Time” analysis so that results are better understood: 1) At regular intervals & 2) At failure event.
- Project Leader: Joe Smetana, Alcatel-Lucent



Tactics

- Phase 1: Complete Project Plan
- Phase 2: Procure components and design boards
- Phase 3: Fabricate bare board and assemble boards with test components
- Phase 4: Conduct thermal cycle testing
- Phase 5: Conduct failure analysis (FA)- start as failures occur
- Phase 6: Issue Final Report

Milestones & Issues

- Phase 1:.....03/15/08
- Phase 2:.....06/12/08
- Phase 3.....07/31/08
- Phase 4.....11/28/08
- Phase 5.....01/30/09
- Phase 6.....APEX2009
- ISSUES
- Team Members will share costs for Phase 2 & 3
- FA could be shorter if samples fail early

Pb-Free Early Failures Project

Project Members (preliminary)



Alcatel-Lucent



Agilent Technologies



Celestica™



DELPHI



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Pb-free Early Failures Project

The project is now open for sign-up by iNEMI members.

- **Project Leader: Alcatel-Lucent**
- **Board Design: Cisco**
- **Component/Board Procurement: Team (iNEMI coordinate)**
- **PCB Assembly: Celestica**
- **Wiring List: Cisco and Agilent**
- **Thermal Cycling: Agilent**
- **Weibull Analysis: Various (Alcatel-Lucent)**
- **Failure Analysis: HP, ALU, Celestica, Delphi, Cisco Others???**
- **Final Report: Team**
- **Other team members? TBD**





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iNEMI Halogen-Free PCB Project

**Project Leader
Stephen Tisdale - Intel**

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iNEMI Halogen-Free PCB Project

Phase 2 & 3

Phase 2 Start:
07-12-2007

Goal: Promote standards development for halogen-free printed wiring boards by establishing materials, manufacturing, assembly, and test guidelines

Strategy:

- Extend results of the Halogen Free PCB Phase I Project
- Create a proactive stance in the electronics industry for other non-regulated halogenated organic substances

Project Lead : Chair: Stephen Tisdale, Intel



Tactics

- **Phase 1: Design (Complete)**
 - Measure Material Properties to set baseline
 - Measure broadband frequency dependent dielectric constant and loss tangent (10KHz - 20GHz)
- **Phase 2: Test**
Determine compatibility of candidate laminate materials with higher temperature assembly
 - Electrical & Mechanical Performance
 - Test Parameter Evaluation (CAF, IST etc)
- **Phase 3: Results**
 - Compile results, assess significance, make recommendations, and publish report

Milestones & Issues

- Project start Feb '06
- Phase 1 Nov '06
- Phase 2 May '08
- Phase 3 Jun '08

Current Status

- The project is measuring the broadband frequency-dependent dielectric constant and loss tangent of candidate halogen-free laminate materials (10KHz-20GHz).
 - This activity has been completed and data is being tabulated
- Determine the compatibility of candidate laminate materials with higher-temperature assembly process reflow environments (mixed solder: 245°C; Pb-free: 260°C)
 - This activity has been completed and data is being tabulated
- Perform Critical Test Parameter Evaluation (CAF, IST, flex, etc.)
 - These evaluations are underway

Halogen-Free Next Steps Meeting

Islander B

Wednesday, April 2

1:00-3:30 p.m.

- This iNEMI meeting is open to industry and will discuss, evaluate, and prioritize plans for future halogen-free project activities.



Next Steps

- **iNEMI Board of Directors has called for a Sustainability Workshop to evaluate opportunities for industry collaboration**
- **Invite Industry and Academic Speakers to speak**
- **Establish Breakout Groups to brainstorm options and priorities**
- **Establish Action Groups on selected topics based on outcome of meeting**
- **All are welcome to participate in this event**
- **Watch the iNEMI web site for details (www.inemi.org)**





www.inemi.org

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