

## Quietly, HDPUG Gaining Members, Performing Research

Written by Mike Buetow

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Operating mostly under the radar -- although not necessarily by design -- the High Density Packaging Users Group is now well into its second decade of pushing electronics manufacturing technology forward.

Executive director Marshall Andrews is no stranger to consortia work: He spent about 12 years at MCC, the US-based computer consortium, and later was the founding CEO of ITRI, a consortium for promoting and enhancing printed circuit board fabricators and technology. He spoke with editor in chief Mike Buetow this week.

### **MB: What's the current membership count?**

**MA:** With the [addition of Indium](#), we now have 40 members.

### **MB: How stable is the membership?**

**MA:** HDP had 22 members 6 years ago and has grown steadily since. 2008 was the only year membership didn't grow.

There's different kinds of members. The core is mainly OEMs who have been members almost since Day 1. That includes Cisco and Juniper, Oracle; Celestica has also been with us a long time. Dell was in for a long time, left for a year or two, then picked back up again.

### **MB: Who drives the programming?**

**MA:** Our members drive the programming.

### **MB: How are you defining "packaging" these days? In other words, where does the scope of your work start and stop?**

**MA:** It's pretty loose, as you can imagine. Our projects generally deal with mounting of the package device through the final product to the customer. All the mechanical activities that occur through that flow. We deal with board manufacturing, assembly, and the materials that

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deal with those areas; design. We cover systems-level manufacturing; we built a laptop PC and put it through some tests. We have touched a few things in semi packaging, but not a whole lot. Some thermal electromigration projects concerning the attachment of the device to the board. The sweet spot is around the board and the assembly.

### **MB: You share many members with iNEMI. How do you coordinate with that organization?**

**MA:** We do have several members that are in both organizations. They are very adverse to duplication of efforts. If they see something that borders on what iNEMI is doing, they let us know and we talk to iNEMI to be sure there is no overlap.

For example, we did that with our halogen-free cables project. iNEMI had a [halogen-free project], but it was entirely different than ours. We have done that on several projects. When we are outlining a project, we go through a process where we define it, and we are very open about what we are planning. We try to hunt down duplications. We put a lot of emphasis on that. Our members also work with iNEMI, the Universal Consortium, Georgia Tech and others.

### **MB: Has anything you learned from your ITRI days informed what you are doing now?**

**MA:** I've used a lot of what I learned from ITRI to help HDP. The one thing I see that HDP is doing is the involvement and direction of the OEMs. That's a very important part of making this work. They are the ultimate customer. If they are participating and driving the programs, the supplier base is much more interested in the activity. In ITRI, we tried to take out the middle [i.e., focus on the fabricators], and without the direction of the OEMs, that was a real weakness. The OEM participation is a real incentive for the rest of the supply chain to jump on board.

### **MB: Tell me a bit about your current projects.**

**MA:** HDP has 22 active projects, eight of which are open to any companies – member or nonmember. Any initial project is open to all companies. When implementation starts is when we close it to members only, as we are getting into the results generation, which is what the members pay for. If a company is interested only in one project and does not wish to join but is willing to contribute resources that the project needs, with the approval and support of the HDP board, they are allowed to participate in the implementation stage.

### **MB: Could you give us an example of something HDP is currently working on?**

**MA:** One thing we've seen is the lead-free and halogen-free activities have driven a surge in new and improved PCB materials. There's been a great deal of change in the materials. We

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saw that, and our OEMs saw that several years ago and formed a group to look at the properties of these new materials for their suitability in lead-free assembly. In the first round, we built boards out of a number of different materials, put them through reflow, and tested them. Only one material, and it was an expensive one, met all the requirements. We fed that info back to the materials suppliers. Then we launched another round, and some of materials passed the requirements. We are now in the third round and more [materials] are meeting all the requirements. It has saved the project participants a great deal of money in evaluating these materials: If each had done this on their own, it would have cost them a great deal of money.

Now, I want to note that in setting all these requirements, we don't use pass/fail criteria. Some applications don't require all the strenuous performance attributes we put into these specifications. So doing it that way helps the member understand, "I don't need all this [performance]; I can go down a layer or two and save some money with some lower-cost materials." That was a strong payback.

It also gave very good direction to the materials suppliers, so they could improve their products. A number of suppliers participated. We evaluated 20 to 30 materials in each round. All were multilayer laminates, and we used six and 20 layers boards, because we focused mainly on high performance.

### **MB: Who sets the specifications for performance for this project?**

**MA:** It was a consensus of the participating companies, but driven by industry specifications. We didn't say, "We want to do 300C because it's fun." We stuck to temperatures that were supported by industry specifications. We ended up with six reflow cycles – side 1 assembly, side 2 assembly, removal and repair, etc. That gave us an opportunity to say: if this material passed three cycles, and that's all I need, that's fine. We were looking at the materials and how well they performed.

### **MB: Were the testing protocols based on industry standard or specific to the project?**

**MA:** We used industry standards for temperature cycling, DMA, thermal shock and so forth. We did use IST testing as part of it. In the process of going through that, we learned what it took for IST to correctly simulate thermal cycle, and redesigned the IST coupon so we no longer do thermal cycle at all. We do IST instead of thermal cycling. If you run it correctly, it's an excellent simulator of temperature cycling. Learning that was an unintended benefit. We used an Alcatel-Lucent test vehicle with CAF and other evaluations designed in.

**MB: Do you give feedback to the standards organizations?**

**MA:** We don't do standards; no need for it. Our work is to develop information for the standards developers. If there's some activity that we think will benefit the standards, we try to get them involved. We have a high-speed project, for example, that looks at high-speed test. We are bringing them along with the project and hope what we learn will become part of the standard.

**MB: How long does the typical project take?**

**MA:** We set our projects up so they have fixed start and finish dates. A typical project will last, from the beginning of idea to the finish, one to two years. Some have gone longer, some have gone less. For the lead-free project I mentioned, the first phase was a little over a year. Each successive round has been a year to 18 months. Most projects are aimed at issues members are facing right now.

**MB: In the course of your projects, how do you account for regional variances in the manufacturing environment? A facility in a high humidity locale might have different results than one elsewhere, for example.**

**MA:** The environment is a big, important part of what we do. Take the case of our Warpage Project, which is also an example of something that's complementary to iNEMI: iNEMI looking at long-term solutions in terms of how we design our boards and their material properties. Ours is more immediate: what can we do to live as best we can with the situation as it exists today? We're not going to change the package styles and designs, so what can we improve or adjust to improve yield with what we are seeing today? The build environment is a very big part of that: what can we do today. We are looking at solders and fluxes, and how they affect yields. Also, temperature ramps. We ask, "How can we improve those to reduce or better control warpage?"

**MB: HDP is quite a bit smaller than other trade groups. Does that affect your ability to get things done?**

**MA:** Usually the biggest issue and cost is the human capital and the run time: the floor resources. Companies will ask, "Is this a long-term, infrastructure type problem, where iNEMI is positioned to handle it, or is it an immediate need, where HDP can get involved in and help fix today?"