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This Month's Feature Articles

ASSOCIATIONS

Our final issue of 2015 is a view into various global associations that help our industry function and thrive. In their own words, top executives from around the world are on hand to provide an insider's perspective of the who, what, where, when and why of their organizations.

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The Associations Issue

by **Patty Goldman**

I-CONNECT007 TECHNICAL EDITOR

Well, it's the end of the year. How did that happen? It really is true that every year goes by a little faster. You young whippersnappers out there won't know what I'm talking about, but just you wait and see.

We changed it up for our December issues this year. Instead of doing a year-end review, we decided to devote this month to our associations and trade organizations—at least some, because when you start poking around, you will find there are scads of them.

I've been involved in IPC activities since '80 or '81; I'm not sure anymore. I have made a ton of friends in this crazy industry of ours, learned a tremendous amount, and put in a lot of hours on subcommittee meetings and document writing. I started out by volunteering to chair the Process Effects Task Group and we put out a pretty complete PCB Troubleshooting Guide within two years or so—amazing at the time. We went through a few revisions over the years, and then I moved on to chair the Glass Reinforcement Task Group and in the meantime,

served as TAEC chairman (explained later).

The key word here is “volunteer.” I know many or you can't quite make that connection between volunteering and “I have learned so much,” but that truly is a great way to learn—much better than a classroom (go ahead, ask any volunteer). Even if you are writing just a paragraph or two for a document, you will research the heck out of it to make sure you have the right information, but you'll also have this network of other volunteers to call upon for help.

The other connection to make is this: When you are working on a standard or specification you really can have input. The standards you use every day are not pulled out of thin air, nor are they written automatically by computers. They are written by people just like you. Tests are performed to verify data by member companies—just like yours—big or small. But they all have one thing in common—they are willing to put their money where their mouth is and buckle down and do the actual work of writ-



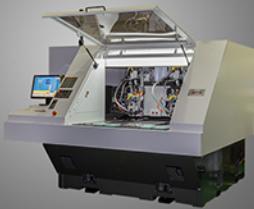
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THE ASSOCIATIONS ISSUE

ing and testing. There are no excuses not to participate in the writing and revising of standards that you use and that affect your business. You don't have to physically attend a meeting; travel is entirely optional in this day and age. You just need to be willing to put in a little time.

Uyemura's George Milad is one of those; we see each other once or twice a year, usually at an IPC meeting, and we catch up or reminisce or just find lots of things to talk about. Seems we have all changed jobs at least a few times—one time you are the customer, the next you are the supplier; this has happened to me multiple times with many different friends.

“There are no excuses not to participate in the writing and revising of standards that you use and that affect your business.”

For this issue, I thought maybe a little history would be interesting. I asked Dan Feinberg to give us a brief history of the founding of IPC Expo (now with APEX added in). I remember it all too well. There was much uncertainty on the part of nearly everyone as to how well it would succeed. Many were against it, but NEPCON was the 800-pound gorilla and stripping a lot of money out of our industry so...well, I'll let Dan tell you.

Following that, you'll hear from John Mitchell, president of IPC, certainly the largest and most prominent association in our industry. He fills us in on all that IPC is and stands for. Also on hand from IPC is Dave Bergman, IPC's VP of Standards and Technology, who brings us an international perspective.

As I mentioned, there are many organizations serving our industry and some necessary overlap. In fact, often there seems to be some competition between organizations going

on—something I believe should be avoided as much as possible. But while there is definitely competition for technical presentations and of course membership dollars, I've noticed that there does seem to be coordination to avoid actual overlap of meetings and shows. This is good, because we don't need our associations and organizations at odds with each other. To that point, Insulectro's Jason Marsh provides us with a real-time example of conflicting interests between organizations and members.

We got input from a number of regional organizations besides IPC for this PCB-focused issue, including the European Institute of Printed Circuits (EIPC), the China Printed Circuit Association (CPCA), the Hong Kong Printed Circuit Association (HKPCA) and the Indian Printed Circuit Association (IPCA). We used a standard set of questions to help with comparisons. An interview (conducted at productronica) with EIPC's Alun Morgan and Kirsten Smit-Westenberg is next in our line-up.

We also have three question/answer exchanges: one with the Secretary General of CPCA, Miss Jin Zhang, another with HKPCA, finally, with Secretary K.S. Babu of the IPCA.

Now back to learn some more about other arms of the IPC. In an interview with Fern Abrams, IPC's director of regulatory affairs and government relations, we get a great update on what's happening on that end. Next, Randy Cherry, IPC's Director of Validation Services, fills us in on that program as well as the latest program called Standards Gap Analysis.

To give you, dear reader, a more rounded picture of IPC (sorry, but they are the big one out there), we have input from three noted volunteers in that organization. First is a column by Doug Sober (a.k.a. Mr. Laminate) who explains some of the committee structure of the IPC and IEC (International Electrotechnical Commission). He also puts out a call, so to speak, to those interested in working on industry standards.

Next is an interview with Renee Michalkiewicz, of NTS, explaining the role of chairman of the TAEC. She also talks about a mentorship program that is just starting up. Getting involved writing specifications in a subcommittee is just one volunteer role. For those that are

committed, there are chairmanships available where one can contribute even more.

I also interviewed Milad, chairman of the Plating Processes subcommittee (IPC 4-14). He explains how his subcommittee has sped up document updates by 'meeting' in conference calls throughout the year.

Judy Warner of Zentech reports on a relatively new meet and greet that happened in Minnesota, Geek-A-Palooza. It's not quite an association, but any event that attracts ~350 people has got to be worthwhile! And good news for the West Coast: It's coming to California in spring 2016!

And now to the techy portion of the magazine! Todd Kolmodin of Gardien Services has put together a great wrap-up column on some of the highlight questions he has received over the past year, which of course have to do with electrical test.

And last but not least, our close friend and contributor Joe Fjelstad of Verdant Electronics writes about insulated metal-base circuits as an enabling technology for power electronics. Having worked way back when at Western Electric-

Kearney, where all the circuits were made of epoxy-coated steel and additively plated (for real), it's interesting to see that "what goes around comes around...!"

So, back to the main theme of associations. We only covered a few in this magazine—sorry to anyone who feels slighted. On our website you can find a rather complete list with links on our [resources page](#). Plus, you can learn the details of some industry associations like SMTA in this month's [SMT Magazine](#) and [The PCB Design Magazine](#).

See you in 2016! **PCB**



Patricia Goldman is a 30+ year veteran of the PCB industry, with experience in a variety of areas, including R&D of imaging technologies, wet process engineering, and sales and marketing of PWB chemistry. She has worked actively with IPC since 1981 and served as TAEC chairman, and is also the co-author of numerous technical papers. To contact Goldman, [click here](#).

Survey: Electronics Industry Associations and You

Our most recent reader survey on industry associations was by far the most popular, garnering more than twice the response as any other we have conducted in recent months.

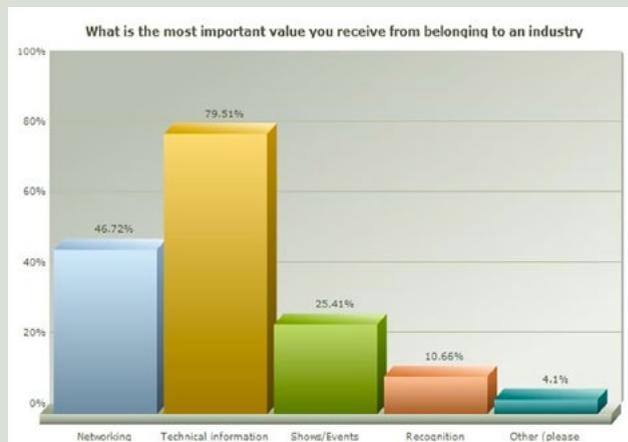
As expected, the bulk of company memberships were with IPC, SMTA and IEEE. We discovered quite a number of additional organizations, as enumerated in replies, in fact more than we listed, including IMAPS, SMCBA (Australian), HDPUG (a user's group), Svensk Elektronik and KPCA (Korean).

We also asked about the most important value received from membership. The overwhelming reply was technical information followed by networking. There were very few responses with "none" which speaks highly of our organizations.

More interesting was the open-ended question on recommendations for the organizations. A few people felt that copies of standards or specs should

be lower cost or free, though most should recognize the costs to create and publish a standard. Other comments included more local/regional meetings, lower cost booths, more bareboard presentations, better recognition of smaller companies, and improved communications. Let's hope our associations are listening and can respond.

If you missed participating in this survey, watch for our next one. [Subscribe to our newsletters here.](#)



A Brief History of the Inception of IPC Expo

by **Dan Feinberg**

FEIN-LINE ASSOCIATES INC.

In 1992 I had just taken on the position of president for Morton Electronic Materials (or Dynachem as most of the old-timers remember). Then IPC President Thom Dammrich called and asked me if I would be willing to head the new IPC Suppliers Council. But first, just a bit of history...

When IPC was first founded, and for more than 25 years, suppliers could not be full members. They could be associate members only and could not serve on the Board of Directors. As the years progressed, many of us who had become very involved in IPC transitioned from the fabricator side to the supplier group. In some cases a few had to relinquish committee positions, thus depriving the IPC of some valuable talent. Eventually it was decided that suppliers could

become full members, although it still took a number of years before a supplier could serve on the Board and even more years before one could become president/CEO of the IPC. In the late '80s and early '90s an attempt had been made to start an active suppliers group, but there were not any notable activities or accomplishments achieved, thus Thom's attempt to reset and reboot the group.

In any case, I agreed and we scheduled our first meeting at a spring IPC meeting in Florida in 1992. I was very much honored to have been asked to take the leadership role and even more so when Thom set the stage by inviting only managing directors, presidents and CEOs of the key suppliers at the time to join the initial group. The thinking was that the members of



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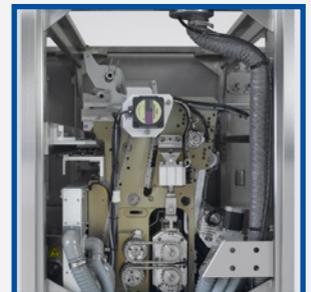
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A BRIEF HISTORY OF THE INCEPTION OF IPC EXPO

the Suppliers Council had to be able to speak for their companies. If a decision was made to take on a project, we did not want the committee members needing to go back to convince their boss; they had to be of a position to make decisions and commit their companies to the project right then and there.

With this new group there were some obvious potential conflicts and some legal concerns. After all, as president of Dynachem, I would be working closely with Dr. Jim Hickman, managing director of DuPont's Riston Division. Our two companies were fighting a decades' long market battle for imaging product dominance. The presidents of MacDermid and Shipley would also be working together, etc. So you can see the potential for conflict. However, there was none. The entire group met and agreed to work together for the good of the industry and the IPC. Competitive issues were never dis-

cussed and for the most part there was a great deal of mutual respect.

We set up a time and place to meet and we then spent a full day discussing ideas on projects that we could take on to meet our mission. Obviously, with that many talented and proven executives, there were many good ideas and there was much discussion. We decided that we could not take them all on at once to we then set about narrowing them down to just a few that we could start and complete before we took on more.

So what ended up being #1 on the list? What would this august group take on first? Before we identify it, here's a little more background.

In the late '70s and throughout the '80s the main trade show in the USA and one of the largest in the world was NEPCON West. The competition between suppliers was fierce, not only on the trade show floor, but also in the arena



Figure 1: Ribbon cutting at the first IPC Printed Circuits Expo, which opened to rousing reviews. Front row, from left to right: Jerry Siegmund, Siegmund & Assoc.; Peter Sarmanian, Printed Circuits Corp.; Sam Altschuler, Altron Incorporated; and Dan Feinberg, Morton Electronic Materials.

A BRIEF HISTORY OF THE INCEPTION OF IPC EXPO

of “the best hospitality suite.” By the late ‘80s, I recall thinking, after reviewing our NEPCON costs, that our hospitality suite had cost almost \$1000 per every five minutes. In addition, one year the show management had decided to lengthen the show from three days to four, with an approximate 25% increase in fees. When the longer show did not work out and the show was reduced back to three days, most of the higher fees stayed in place. In other words, that show was becoming a very large expense with almost no part of the expenditures going back into our industry.

The number one project as decided by the founding Suppliers Council was to organize and put on a trade show sponsored by the IPC. That way the costs could be greatly reduced, we would agree to stop the outrageous hospitality suites, and the actual show fees would go into the IPC coffers for the good of the industry.

The next step was convincing the IPC board, none of whom were suppliers at that time, to get into “show business.” There were those that felt it was a good idea and those that strongly felt that the IPC should have nothing to do with something as commercial as a trade show. There were fears that the openness and non-commercial atmosphere that was typical at an IPC meeting would be lost. To make a long story short, we convinced them by showing them that the show would not only save money for the suppliers, thus avoiding some perhaps necessary material price increases, but that we also could contribute many hundreds of thousands of dollars to the IPC coffers. This was money that could be used to invest in education, research, marketing, funding work on a roadmap, etc.

As I recall the vote was not unanimous but it was decided that we would proceed. The first show, which at that time was only PCB fabrication focused, was to be held the following year in Boston. In order to keep costs in control there would be no individual company hospitality suites. Instead there would be one big buffet and entertainment paid for by all suppliers equally and that would be open to all attendees. In fact, the first show included an outrageous buffet dinner and drinks, and it was followed by a private concert given by the Boston Pops Orchestra.

The first Printed Circuits Expo held in Boston in 1994 marked a major event in the history of the IPC. More than 1,700 people attended the Expo, which included 275 booths representing 158 companies. The first Expo was not simply a show, however; it included a major effort to provide technology exchange within the industry. It featured more than 60 technical papers, 17

“By the late ‘80s, I recall thinking, after reviewing our NEPCON costs, that our hospitality suite had cost almost \$1000 per every five minutes.”

workshops, and almost 100 committee meetings aimed at developing standards for the industry, as well as starting an effort to work with government for the good of the domestic industry.

The key tenet was that Expo should be fair, focused and cost effective, by and for the industry. Today we have the combined Printed Circuits Expo as well as the assembly-oriented APEX, both housed at the same location. This year it will be at the Las Vegas Convention Center. There have been a number of changes to the overall event, changes in the rules having to do with booth size, entertainment and even changes as to who makes up the governing committees, but the overall tenets put in place, the overall goals and objectives put in place over two decades ago still guide the exhibition today. **PCB**



Dan Feinberg is the owner and president of FeinLine Associates Inc.



A Conversation with IPC President and CEO John Mitchell

by Patty Goldman

I-CONNECT007

A few weeks ago I was able to sit down with John Mitchell, president and CEO of IPC, to discuss the organization and where we are going as an industry. We discussed IPC's four aspirational goals—standards, education, advocacy and solutions—as well as short-term goals. We also talked a bit about going virtual and becoming paperless.

Patty Goldman: *John, could you start by giving readers the background on IPC.*

John Mitchell: IPC serves the entire global electronics industry supply chain. And we represent all facets of the industry from design to materials, boards, assembly and test, and the suppliers along that chain. We're really trying to meet the needs of this whole industry value chain and the various segments as well, whether it's aerospace, defense, military, medical, automotive, consumer electronics, telecommunications, etc. Overall, we're trying to make sure our member

companies achieve success. We do that by focusing on four goals. It's easy to remember because the acronym spells SEAS: S-E-A-S.

The first "S" is for standards. IPC is known around the world for our standards. We continue to try to make our standards even better. Many people have this mistaken notion that IPC creates standards, but we don't. IPC manages the development process. It's really all of the industry that creates standards. To note however, annually, IPC publishes dozens of new and revised standards in areas from printed board design and intellectual property protection through box build. Our collection of industry guidelines and standards exceeds 300 active standards and our resource library contains more than a 1,000.

Goldman: *Not just the member companies, but any company?*

Mitchell: Right. Experts from all over come together and work on the standards. It's a collaborative effort to meet needs in the industry. Some of the things in that area we're doing a

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A CONVERSATION WITH IPC PRESIDENT AND CEO JOHN MITCHELL



little bit differently, because we've been asked by the industry to move faster. Electronics technology is an ever-evolving technology. It's constantly changing. With the most popular standards, our industry members have asked us to shorten the development time frame. We're looking to shorten the coming standards development process to about a three-year period so we can stay aggressive—any faster than that and you run into some issues.

Goldman: *On approvals and issues like that?*

Mitchell: Exactly. If you're building something and the revision changes before you can build the product, that's a problem. We're looking to get it down to about a three-year period. That's one of the changes we're looking to do.

The second goal, the "E" in IPC's aspirational goal acronym, stands for education. Right now, IPC training and certification allows industry to connect with expertise and knowledge and build valuable relationships in the process. We have a lot of partners around the world and do some of the training ourselves. The training takes the individual and matches them up with a standard and makes sure that they understand the standard themselves. To date, nearly 100 IPC-authorized training centers worldwide have trained and certified more than 250,000 individuals at thousands of companies across the globe.

On the education front, we try to make sure the individual understands the standard. We've taken that concept and about a year and a half ago we started our validation services program, which is actually then taking the next step and looking at the companies. Seeing that they not

only have the individuals who know the standards, but that they are actually capable of producing products in accordance with the standards. IPC QML (qualified manufacturer listing) certification helps a manufacturer improve supply chain management and this can lead to an elevated company profile within the industry. Those are a couple of examples of our education focus.

Goldman: *Much more falls under education, doesn't it?*

Mitchell: Yes, and you're going to see more from us in terms of online training. We're looking to support the need for skills-based training. We've partnered with some other associations, like the ESD association, to develop online training for ESD. Again, the idea behind everything that we're doing is to take the overall cost to the company, and if we can lower that for the industry by doing common things for the industry as a whole, that's what we want to get involved in. Anything to help the industry save money, be more efficient, be smarter, etc. You might see some online offerings coming out from IPC to help train, not necessarily certification to the standards, but other alternatives to help the technicians and operators on the line perform better at their jobs.

Goldman: *Is your video department still doing multimedia?*

Mitchell: Yes, our multimedia department is still very active. We'll be incorporating and utilizing some of what we have, and creating some new things as well into our multimedia and online video training products. So that's some of what's coming in the education space.

Our third aspirational goal, the "A," is advocacy. There are numerous government regulations that affect our industry in this country, in Europe, in Beijing, etc. Our government relations staff continually monitors proposed legislation, regulations and rules by governments and agencies around the world. They actively engage with regulatory agencies to protect the interest of our members and advocate for science-based regulations. We want to say, "Okay,

A CONVERSATION WITH IPC PRESIDENT AND CEO JOHN MITCHELL

you think this product is bad, or you think it should be eliminated. That's fine. We want a safer environment too. However, let's make sure that the science actually proves this out before we go and create a regulation that's going to cost the industry a billion dollars, and then have no effect."

We're very active in D.C. right now, and we're looking to expand our efforts in Europe. We're doing some things in Europe and actually looking to be much more active there. You'll see more activity from IPC in the coming months.

Goldman: *Is that in conjunction with EIPC?*

Mitchell: Not necessarily. EIPC is focused primarily on the PCB sector, and we're trying to cover the entire supply chain. We're in the process of establishing an IPC European Electronics Council that has OEMs, assemblers, and PCB manufacturers, etc., which are all a part of this council. The role of the council is to help identify critical issues and opportunities that will ultimately strengthen the competitive excellence of IPC members.

Goldman: *Is that incorporating EIPC then?*

Mitchell: You have to be an IPC member to be a part of it. Those members who are also IPC members could be a part of that as well.

The last "S" in our aspirational goals acronym stands for solutions. We're looking at solutions both big and small. Let me give you an example of each. On the topic of big solutions, back in 2013, IPC inherited a group called PERM, a lead-free high-reliability electronics industry consortium. A lot of people mistakenly think lead-free processes have already been implemented, but the aerospace, defense, military, and medical sectors, haven't yet made the lead-free conversion. There are some problems on the forefront. We really just haven't done the science behind it to figure out how to take lead-free into the higher reliability space. So IPC is becoming more active in trying to solve that big problem by raising funds, getting experiments done, etc. That's a big industry problem we're trying to solve.

On the smaller side, there are little things

like when we're working on a standard, there may be a table or something, or a certain spec in the standard where people are saying, "Why is it 12 microns instead of 11, or 15?" for example. Many companies have difficulty wanting to share their data because they feel it's proprietary. In that case, we might say there is a broad impact and we might actually go out to the industry and say, "Is this something you'd like have us get the actual data on?" Maybe we'll go pass the hat around and say, "Okay, we need each of these 100 companies to put in \$1,000 and we'll go run the experiment, and then it will be public data." Those are kind of smaller solutions, if you will.

That's really the four areas—standards, education, advocacy, and solutions—where IPC is trying to help the industry continue its growth path, to run more efficiently and more effectively as companies.

Goldman: *Allow me to digress for a moment. I'm a printed circuit board person, and the IPC was founded by PCB people.*

Mitchell: That's right. Fifty-seven years ago, IPC was founded to become the voice of the printed circuit board industry. Today, IPC still remains that voice as it guides the PCB industry through dramatic changes.

Goldman: *I often feel as though the assembly part of our industry is overshadowing the PCB in IPC. I have especially noticed that in the education and training area over the last dozen or*



A CONVERSATION WITH IPC PRESIDENT AND CEO JOHN MITCHELL

so years. I know that at the shows the guys with the big equipment are mostly for EMS, there are many EMS member companies, and that the larger share of the conference is devoted to assembly issues. So how can we make sure the PCB guys are taken care of with respect to training, education and just a general say in how IPC is operated?

Mitchell: More than half of IPC's PCB-market members are based in North America and IPC provides focused support and opportunities to collaborate on industry issues with PCB manufacturers. Several examples of this from the past year include: publishing PCB related market research reports based on statistical programs; developing a technical conference entirely dedicated to flex circuits and HDI, which was held in Minneapolis in October, where several independent PCB fabricators participated as speakers and attendees; recognizing the importance of helping the PCB members by tasking the IPC Ambassador Council to develop a management program for PCB/PCB supply chain executives; and finally, sponsoring an exclusive dinner at IPC APEX EXPO 2015 for PCB executives to discuss ideas for how the association can help them be more productive and profitable.

Additionally, efforts are ongoing in Washington, D.C. to represent the PCB industry on key issues such as tax reform, R&D tax credits, Toxic Substances Control Act (TSCA) reform and the final rule for Category XI for Military

Electronics of the United States Munitions List clarifying that PCBs "specially designed" for defense-related purposes will be controlled under USML Category XI.

Goldman: *I guess one of the places I see that falling down a little bit is in the training area. I used to be on the video steering committee, back when there was one, and we did a lot of video stuff for PCB. Then it started to shift away, and now it has pretty much shifted away entirely.*

Mitchell: So let me just ask you a question, what kind of training would you like to see for the PCB market?

Goldman: *We could start with some basics about the whole manufacturing process. I haven't seen new or updated training materials for the PCB folks in a very long time.*

Mitchell: So when I mentioned online training pieces, I think you'll see that kind of material coming out.

Goldman: *That's good to hear. That has always been my concern.*

Mitchell: IPC has a complete line of training videos on PCB fabrication with many translated into Chinese and Spanish. We're still supporting the design area as well. We're trying to address all supply chain training issues.

Goldman: *There are still 300+ companies in North America—they do the high-tech boards, they do a lot of the military and medical boards, so it's not an insignificant part.*

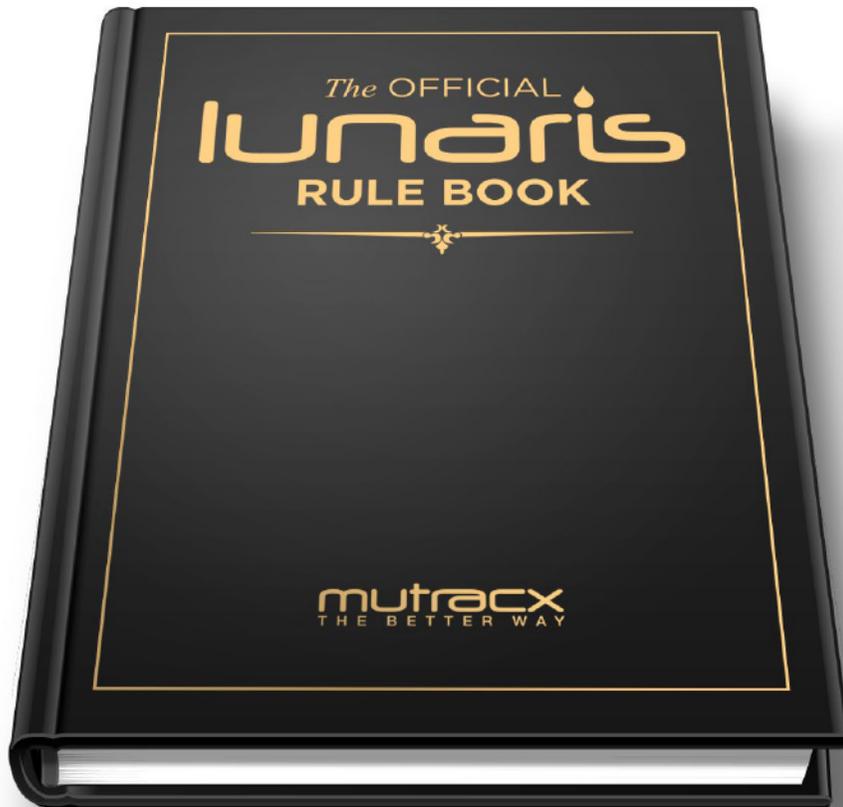
Mitchell: It's not; it's important. That's why we stay involved, because we're trying to serve the industry as a whole.

Goldman: *Any other things you see coming up down the road? Future plans? I know you must have a five- or ten-year plan.*

Mitchell: Some of the things we work on with the IPC Board, we tie to the IPC's four aspirational goals: standards, education, advocacy, and so-



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A CONVERSATION WITH IPC PRESIDENT AND CEO JOHN MITCHELL



lutions. We've written the four aspirational goals so that they're unachievable, meaning that we'll have annual goals that are achievable, and five-year goals that are achievable, but the way we phrased the aspirational goals, there will be new goals we can always set towards those. So we can always have an ever-expanding target.

Another thing we're looking at is trying to be more global, because our standards are globally accepted and are associated with nearly every stage of the global electronic product development cycle. I've often used this analogy when describing IPC's global impact. Patty, what kind of car do you drive?

Goldman: Toyota.

Mitchell: A Toyota. When you bought your Toyota, did you pay in yen?

Goldman: No, of course not; it was a U.S. distributor.

Mitchell: You bought it in the U.S.

Goldman: It was probably manufactured in the U.S.

Mitchell: At least parts of it were for sure. Similarly, with our standards, they're being used globally. We want to make sure that there is a local process to using a global standard. While you know a Toyota is a Japanese brand, you bought it as a global product. We're trying to make our impact feel the same. If you buy it in Brazil or if you utilize an IPC standard in Germany, or in Taiwan, wherever you happen to use an IPC product we want you to feel like you can have the normal, local experience to utiliz-

ing this global standard. Currently, IPC's standards are available in 19 languages.

That's a big vision we're trying to achieve and it will take some time because frankly we don't have the kinds of resources as the electronics industry. We don't sell billions worth of products like smartphones out there.

Goldman: Or big cars.

Mitchell: Or big cars, or anything like that. We'll try to do it in the most efficient way we can. We'll focus on the centers where most of the electronics manufacturing happens, but eventually we look to offer that type of global view. Many people have used the term "Global but Local." We're trying to do the same thing for our standards—provide a global product with a local experience.

The same goes for developing the standards. As I mentioned with the IPC Electronics European Council, just like we have the fall committee meetings and the spring committee meetings, we're looking to have similar types of events for standards development in Europe. We already have committee meetings in Asia. We're really trying to make sure there is a larger global impact.

Goldman: Somehow those all get pulled together so that we still have one global standard?

Mitchell: That's correct. There is a single standard, but we want to have input from all of the different segments regionally, as well as across the various market segments. When companies work from established IPC standards, they speak the same language with customers and suppliers—the language of the global electronics industry.

Goldman: Excellent. What else would you like to talk about? How's Chicago?

Mitchell: Chicago's great. From an office perspective, we've gone virtual. We're having people work from their home environment a significant portion of the time, which, again, improves your home life experience. You don't have to drive in Chicago traffic for 40 minutes each direction coming to the office every day.

A CONVERSATION WITH IPC PRESIDENT AND CEO JOHN MITCHELL

Goldman: *How is that working out? Is everyone able to interact OK?*

Mitchell: We come together twice a week, so we do some overlapping. It was interesting, we had about an average commute time of 40 minutes each direction for our employees here in the Chicago office. When we went virtual we said, “We want you to work from home three days per week.” By doing that, we basically gave staff five hours of their life back each week, which I thought was pretty important—saves them gas, pollution, all that good stuff, so we try to be green in that way as well.

You’ll find a lot of our talent now is not worried where they’re located. Last August, we hired Teresa Rowe as IPC’s director of assembly standards. Teresa lives in Pennsylvania, and that’s fine. We’re looking to hire the best people we can to enhance what we’re doing and we really don’t care where they’re located in the world. If we’ve got the best people, we should be able to utilize their talents to help make our industry better.

Goldman: *Considering how much people travel for IPC, I’m sure it matters even less. I work for a virtual company, as well. There are a lot of online tools that make it very easy to talk and work together.*

Mitchell: So you’re familiar with that. That’s some of what we’ve done internally. We’re also trying to go paperless. We’re looking to enhance our systems. In terms of our electronics support systems to the industry, we’re looking to enhance those to make the experience simpler, smarter, and work the way businesses are used to working. We’re bringing that proposal to the IPC Board. By the time this comes out, hopefully the Board will approve it. It will take us a couple of years to vet that whole new system and create it, etc., but we’re committed to making the investment.

The underlying message of IPC, or the overarching message of IPC, is that we’re looking at the industry and we’re trying to understand and meet the needs of our industry. We’re bringing in people to interact more often with our member companies so that we can hear what their challenges and issues are, and when we see a

correlating problem, we want to attack that and try to bring a solution to the industry. It’s really the industry that informs what we do, and we’re trying to make sure that everything that we do helps the industry—either by lowering costs, improving productivity, or improving reliability or quality. That’s what we’re here for.

Goldman: *How long have you been with IPC now?*

Mitchell: I’ve been with IPC now three and a half years.

Goldman: *And how is it going?*

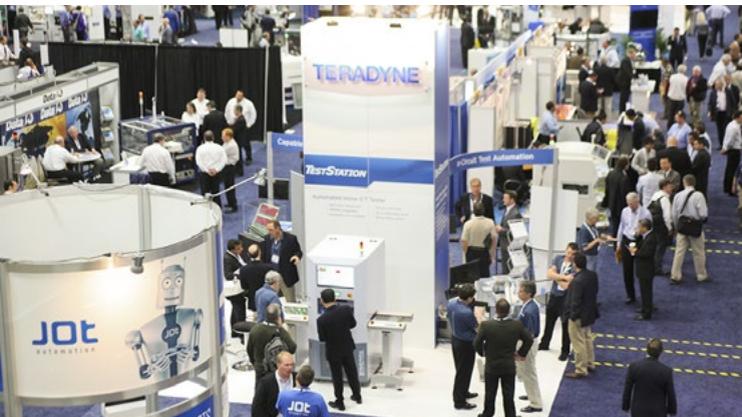
Mitchell: It’s rocking. I’m having a good time. There is so much to this industry. We have almost 3,800 IPC member companies, and though I’m giving it my best effort, I’ve barely scratched the surface as far as getting to know them all. That’s part of the reason for changing some of our systems as well, so we have a better way to reach everyone more regularly, to listen to what they need and be a better association.

Goldman: *How does it work with the membership? I don’t know anymore, having been far from it for some time. What levels of membership are there?*

Mitchell: That’s a good question. Right now, there are basically two types of membership: One is a classic membership package for a company that makes at least \$5 million a year. You need to be a member to be able to be able to take advantage of discounts on IPC standards and other member benefits. Without being a member, you don’t get those benefits. The other type of membership is if you’re below \$5 mil-



A CONVERSATION WITH IPC PRESIDENT AND CEO JOHN MITCHELL



lion, like an academic association; you would pay a lower membership fee than the classic membership package.

And we do offer some individual member packages. As one example, we have an ambassador's membership for people that have retired out of the industry. We don't want to lose that knowledge and expertise, so we found a low-cost way to keep them associated with IPC and their industry peers.

All of these are very important segments to IPC and we are willing to adapt or shift that model to whatever best suits the needs of the industry. We discuss new membership options with the Board once a year, or once every other year, to see if there are some adjustments that need to be made to the membership model. If you look at a lot of the associations out there, companies pay hundreds of thousands of dollars to be members of associations, and our price point is about \$1,200 for a company site membership.

Goldman: *That's basic membership and then they get discounts on everything beyond that?*

Mitchell: Exactly. When I first came to IPC, I looked at the membership pricing, and I was surprised at how low it was. Before this, I used to sell memberships to college students, and I sold those for a \$100 per person, and here, for an entire company, it was only ten times that. Comparatively, this pricing model is inexpensive, but we try to keep the entrance point low because we want to provide more value to our members.

Goldman: *You want to reach more people and more companies too, right?*

Mitchell: IPC is a member-driven organization, thus we exist to help our member companies innovate, compete and succeed in the marketplace. We're here to help our members create better quality products, enhance their skills and be ready to capitalize on what is next in store for them. We set our membership pricing very competitively. The stronger IPC is as an association, the stronger our industry is.

Goldman: *It's pretty much always been that way with IPC. The founding idea was if we all work together, we'll grow this whole industry and that benefits us all—create the standards, get more applications, etc.*

Mitchell: You'd be surprised how many times that gets brought up at our board meetings. We test everything that we're doing against that. If it's not helping the membership, we shouldn't be doing it.

Goldman: *It used to be that only PCB companies could be on the board, years and years ago. Suppliers and OEMs had an associate-type membership but could not have board representation. There was a fear that the other groups would overwhelm the PCB companies. I think the big turning point was when the decision was made to start IPC Expo and then that was expanded to IPC APEX EXPO and of course those companies needed representation.*

Mitchell: IPC members represent the entire electronics industry supply chain, thus our Board should also represent the entire supply chain.

Goldman: *So now you've got a broad spectrum.*

Mitchell: We're trying to make sure the IPC Board represents IPC membership. The Board provides overall policy, vision and strategic direction for IPC and thus needs to represent all of IPC membership.

Goldman: *That's great. John, it's been good to talk to you. Thanks so much for stopping by.*

Mitchell: Thank you. PCB



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Dave Bergman: IPC's Technology & International Reach

by Patty Goldman
I-CONNECT007

I met with the IPC's VP of Standards and Technology, Dave Bergman, while in Chicago recently. I've known Dave for almost 30 years, so we had quite a chat, covering a lot of ground, from the efforts of IPC China and IPC India, to the standards activities that are certainly the core activity of IPC.

Patty Goldman: *Dave, it is good to see you as always. How about we start with telling me a little bit about your job and what you are responsible for. I know everything morphs a little bit, as time goes by.*

Dave Bergman: I am currently vice president of standards and training at IPC. As part of my activities, I retain some international responsibilities, including leading IPC's India office, and European representatives in Sweden and Russia. I oversee all of our standardization efforts, our certification and training efforts, as well as validation services QML certification, the new SGA standards gap analysis program and multimedia training DVDs and online videos being developed for shop floor operators and technicians.

Goldman: *Tell me more about your international responsibilities.*

Bergman: From the international standpoint, I am responsible for the relationship between IPC and other global associations, many of which are in the World Electronics Circuits Council (WECC). These associations have a significant focus on the PCB industry in their regions and while this is still an important part of IPC activities, it is only a piece of the market we serve. WECC relations still help IPC in the area of market research, standards and government relations.

I was formerly responsible for the China office. I got involved in IPC China when we started the office in 2002. I took over the management in 2007. IPC China activities grew enough to the point where IPC's board said they wanted to have a full-time president responsible for China. When we hired a full-time president in 2012, I transitioned into other areas of responsibility and turned over the reins to Phil Carmichael.

I still support IPC China in their standards and certifications efforts and expect this to continue, as it is important that IPC's standards efforts be coordinated globally. In addition, I put considerable effort into the activities of IPC In-

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dia as well as actively working with our European and Russian representatives and our network of distributors throughout Europe.

Goldman: *As I mentioned to you, this month we focus on our trade associations and what they do, how they help their members, why people should be members, and so forth. Maybe you want to talk a little bit about the standardization programs: what they involve, and why we have standards and specifications.*

Bergman: I think you probably had an opportunity to talk to my boss, John Mitchell. I assume that he spoke to you about IPC's four aspirational goals, that is, standards, education, advocacy and solutions.

Goldman: *Yes, and he did indeed talk about the goals.*

Bergman: Standards are certainly the number one goal of the IPC organization and they are how people normally become aware of IPC for the first time. Faced with a callout of IPC standards on a purchase order they probably say, "What's this spec, and why is it required by my customer?" It becomes the first window of opportunity for somebody to experience IPC.



From the international perspective, we formed in the USA in the '50s, but we have had participation from companies outside of North America since the early '60s. As the industry became increasingly global, IPC has invited companies to get involved and participate in IPC standardization worldwide. We have had efforts in Europe for many years and continue to try to grow IPC committee working group activities there.

Our first IPC standard developed outside of North America came from Denmark. A group of companies informed IPC HQ that they wanted to work on a solder paste inspection standard. IPC encouraged this effort and this group of dedicated Danish companies supported by IPC's training center in Denmark, Hytek, found out indeed they could create a new IPC standard while not standing in the USA.

IPC started standards meetings in China around 2004. When you are dealing with English as a second language and you want a useful, effective standard, you need a technically accurate translation. It's not good enough to translate only the words. The meaning has to be communicated. You spend a lot of time saying, "What does this English mean?" so that somebody can transmit or communicate that in another language.

We now have about 30 committees that are active in China. It requires a lot of translation but once the committee members actively participate they realize that, they can see the value of what's in the standard and they recognize that their company should be participating in future. We also have standards revisions. After revision work is complete, the committee members realize that they are welcome to try to develop proposals for new standards as well. We receive requests from companies for new standards that are relevant for their market but might not have as strong an interest in North America. This is certainly encouraged by IPC's global perspective.

China is not the final stop on this journey. IPC took this model and we did the same thing in India as well as Korea, with a handful of key committees looking at IPC's most popular standards such as 610, 620 and 001.

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rational goal—education. Once people understand the standards they want to train their people to them. We have developed training programs that were demanded by our members and the industry. “Get us a training program for A-610 or we will find someone who can” was the clear message we got in the ‘90s from the assembly industry. This grew up in the U.S. but has spread to many other regions.

In new regions like India, for example, when companies realize that IPC services can help business, they start asking for more. One example was, “We’re not finding that what you make is exactly what we want; we need something more basic for this marketplace. Can you develop something for us, for new employees that are coming off the streets?” We said, “Okay, we can come up with a one-day preparatory class.”

.....

“The IPC standards lead into our next aspirational goal—education. Once people understand the standards they want to train their people to them.”

.....

This can help the workers be more productive earlier than previously seen. At the request of the membership, we did some unique things in India and China to try to help the work needs there.

When you are an industry association, you try to talk to the companies, listen to them, and explain the types of things that you do. We ask about their current challenges and learn what things we can do to help our industry. And while I am not actively involved in IPC’s next aspirational goal—advocacy and government relations—you never know when there will be an opportunity to help make a connection where IPC can provide the support.

One day got a call from Bill Beckenbaugh, who I had worked with when he was with Motorola for many years. I expected a technology

discussion but Bill suddenly said, “Hey, there is some legislation going on in China that’s really scaring us; can IPC look into this?” They wanted to get rid of cyanide gold plating, and I thought that sounded strange. After a few questions, I verified that indeed, what he was saying was accurate. IPC has sister organizations in many other countries and we were able to use these relationships to impact this questionable legislation. In this case, in China, we reached out to the China Printed Circuits Association (CPCA) as one avenue to effecting change in Beijing.

From North America, with the help of a coalition that came from associations as well as multinational OEMs, IPC was able to change legislation in China. It was rather astounding. We don’t have full-fledged active lobbyists in China, but because of the association connection and working together, we were able to halt this legislation. We are continually advocating on behalf of our members.

The fourth aspirational goal is industry solutions, which you’ve been involved in by way of round-robin programs over the years.

Goldman: *That’s correct.*

Bergman: Round-robin test programs provided significant impact to IPC specifications over the years and we wanted to re-energize this activity. Our committees have been doing some test programs on their own. The ‘solutions’ aspirational goal is intended to highlight that test programs and consortia type activity are important work to support industry standards. We are looking to involve the technical leaders in our membership to actively seek out and raise awareness of these opportunities. There may be opportunities for IPC to pursue government funding for certain research projects depending on the nature of the program and the industry’s active interest. IPC committee members will continue to play a key role in IPC’s ‘solutions’ aspirational goal.

Goldman: *It seems as though applications and such are practically exploding, like in automotive and in military and medical industries. A whole lot is going on.*

IPC STANDARDS AND TECHNOLOGY VP TALKS INTERNATIONAL REACH, TECHNOLOGY, AND MORE

Bergman: You know, not that long ago, people did not even have cellphones or anything like that, and now they putting that technology in watches. On the radio, on the way here, they were talking about sensors on the skin.

Goldman: Yes, and think about your automobile. They say there are now more electronics, lightweight, than steel or metal. In addition, of course, there's the whole medical industry with wearable devices and implants. I was talking with a PCB company about some of the things going on in the military; they've got little robots that can climb straight up concrete walls and they have one that will jump over walls.

There's a new robot, [BigDog](#), that's the size of a large dog. It can follow anything around, carry heavy loads, climb hills, etc., and never fall over.

It sounds like Star Wars machines are getting closer to reality.

Bergman: I don't think there is ever really any end because there is no limit to the imagination.

Goldman: Do you think that soon the chairs you sit in might transport us to the airport or something?

Bergman: I'm looking for my car to drive itself.

Goldman: Me too. Won't that be nice. Okay, thanks Dave.

Bergman: My pleasure. PCB

MacDermid, Enthone, Alpha, OMG Electronic Chemicals, and Compu-graphics Now Under One Roof

Platform Specialty Products Corporation, a global diversified specialty chemicals company, has closed on its acquisition of Alent plc. The closing of this transaction will prompt the launch of MacDermid Performance Solutions, a division of Platform that will combine the original MacDermid operations with businesses from Alent (Enthone and Alpha and their subsidiary company, Fernox), along with the recently acquired OM businesses.

The new entity will pool the experience and resources of each company and unify sales strategies in order to improve processes, drive innovation, and deliver best-in-class products and services at every stage of the supply chain. With combined resources, MacDermid Performance Solutions will have one of the largest technological and service-oriented forces in the industry, offering the highest level of support in conjunction with our best-in-class products across a diversified global footprint that cov-

ers Africa, Asia, Australia, Europe, North America, and South America.

"We are excited to welcome Alent to the Platform family," said Scot Benson, President of MacDermid Performance Solutions. "This transaction propels us into a new chapter for the business. Alent's talent and resources will enhance our flexibility and expertise to develop new and improved products and capabilities. This acquisition represents a great addition in our ability to support our customers through innovation and technical support."

"Customers, supply chain partners, employees and investors will all benefit as we unify sales strategies, improve processes throughout the company, expand global reach, and continue to deliver the high quality products and services that all of you have come to expect," said Frank Monteiro, COO of MacDermid Performance Solutions. "In the near-term, as we begin to build the best company possible from the combination of these businesses,

our customers' experience will not change. A comprehensive branding and integration effort will be deployed in the coming months, and in the interim we encourage you to reach out to your local company contacts with any questions about this announcement."



Multek CTO Excited About the Challenges of the Fast-Moving Wearables Market

Multek CTO Dr. Joan Vrtis sat down at IPC APEX EXPO to discuss the rapidly evolving wearables market, especially for medical, and the myriad questions that must be addressed. Other topics include Multek's contribution to the wearables industry and what it sees as the main challenges to putting their circuits into various applications.



Zentech's John Vaughan on the Mil/Aero Sector: "It's Headed Up"

I-Connect007 Publisher Barry Matties and Zentech's John Vaughan had a chance to discuss industry concerns within the mil/aero segment at IPC APEX EXPO 2015. The two also shared thoughts on the space industry.



Reliability and Harmonization of Global Standards at Forefront of EIPC Efforts



At IPC APEX EXPO 2015, I-Connect007 Technical Editor Pete Starkey caught up with EIPC's Michael Weinholt and Alun Morgan, who were happy to discuss both recent and ongoing focuses for EIPC, namely, reliability. Also touched on

was the importance of the alignment of global standardization processes, especially for Asia.

A Conversation (and Day) with Joe Fjelstad

I-Connect007 Publisher Barry Matties and industry veteran Joe Fjelstad, CEO and founder of Verdant Electronics, met recently to spend a day together enjoying their conversation that ebbed and flowed between a wide variety of topics including the "war against failure."



An Optical Update with TTM

This interview with Marika Immonen, manager of R&D optical interconnects at TTM Technologies, revolves around the optical project that she's been leading, as well as the future of optical technology in the PCB industry.



Bernie Kessler: Pioneering Spirit Then and Now

I-Connect007's Patty Goldman sat down with longtime friend and IPC Hall of Famer Bernie Kessler at IPC APEX EXPO 2015 in San Diego. Among other things, the two discussed the early days of IPC, and the beginnings of APEX EXPO.



DSG Invests in the Future



Mauro Dallora, COO of Dongguan Somacis Graphic PCB Co. Ltd (DSG), shares how they have increased revenue and share their plans to double it.

A Conversation with Andy Michniewicz



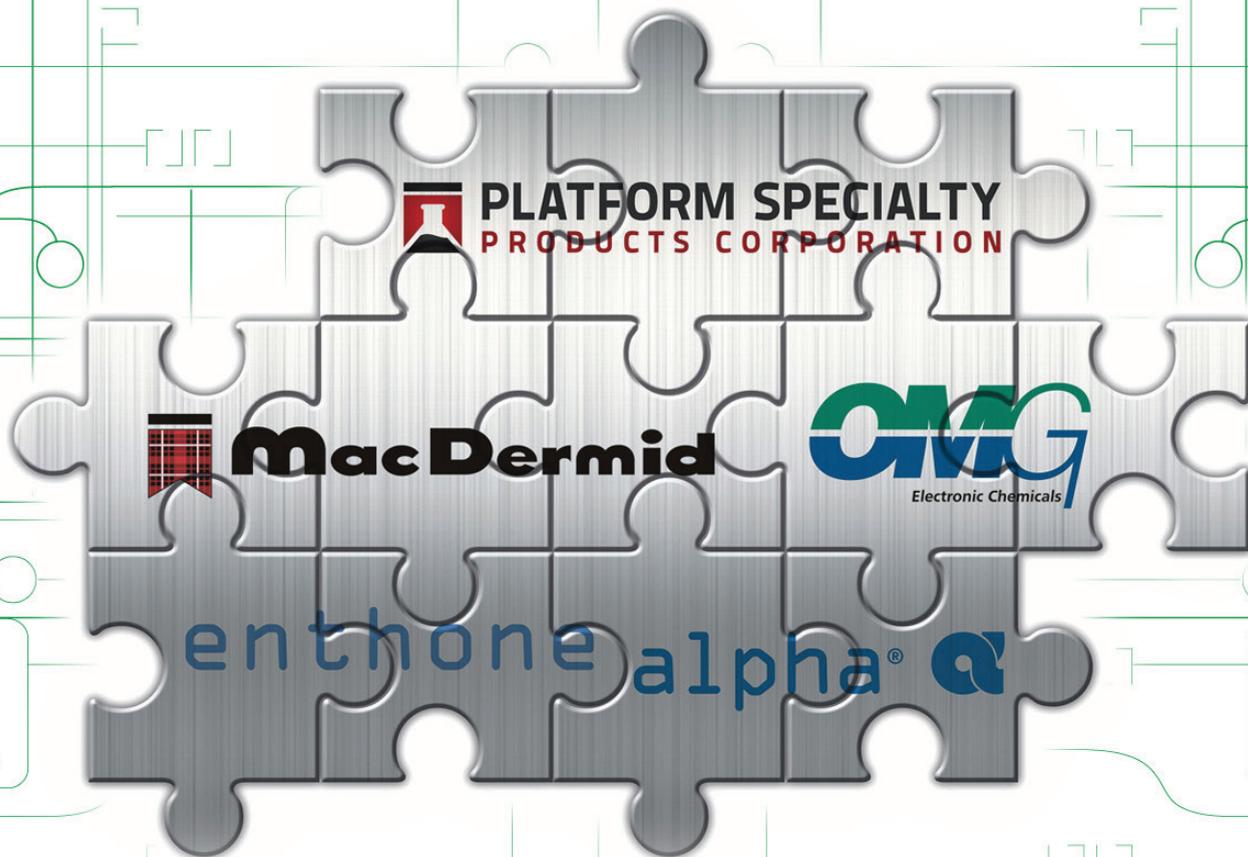
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Is IPC the Past or the Future of our Industry?

by Jason Marsh
INSULECTRO

In the electronics industry, there seems to be an infinite number of trade organizations, each with their own special niche and purpose. It can be challenging from the outside to understand why they each exist and how they fit together. First there is the alphabet soup of trade shows including IPC APEX EXPO, CPCA, HKPCA, JPCA, TPCA, DesignCon, productronica, IEEE Microwave, IMAPS, NEPCON, Meptec, Flex, Semicon West, CES, CEDIA, OE-A, MD&M, IDTechX and SMTA, to name a few. Then behind these trade shows there are the trade organizations that are the representatives of their respective technology niches such as IPC, CEA, NAMM, SMTA and IEEE. From a bare board fabricator and assembly perspective, the primary trade organization has historically been IPC. We look to IPC to take a lead in fostering our market, developing economically viable methods of standardization, and helping to bring suppliers and customers together. For those of us manufacturing PCBs, assembling electronics or supplying the bare

board industry, IPC is the steward of our industry and interests.

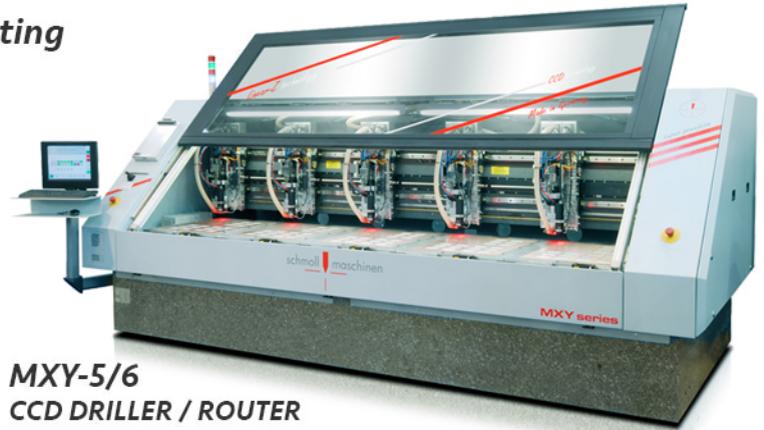
For those of us who have been around for long enough, there is a good chance you have at some point experienced frustration with IPC and its mission or effectiveness at supporting our industry. Over the past decade and a half, North American fabricators have watched significant volumes of work transition from the U.S. to China. At the same time, operating costs have increased, EPA controls have tightened, and fabricators have been saddled with costly compliance requirements like Dodd Frank Section 1502 around conflict minerals, all of which add cost to U.S. operations, while the protection from overseas competition continues to be eroded.

However, since IPC President and CEO John Mitchell took the helm in 2012 (Figure 1), the mission, vision, direction and focus of IPC has been quietly transforming behind the scenes with a focus on the future needs of its mem-



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IS IPC THE PAST OR THE FUTURE OF OUR INDUSTRY?



Figure 1: IPC President and CEO John Mitchell addressing the 2015 IPC APEX EXPO audience.

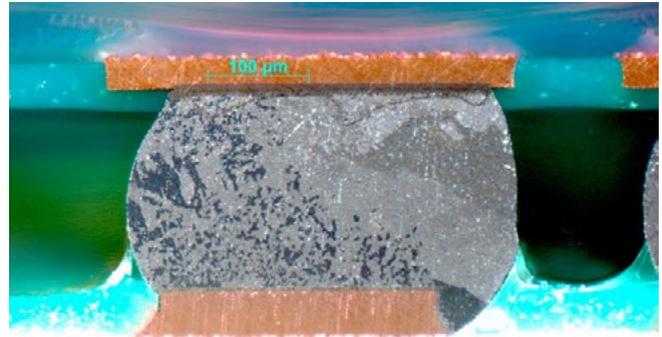


Figure 2: HDPUG—tin, silver, copper, colder aging characterization test cross section. (Source: HDPUG)

bers and our industry. One of the key changes that IPC has undergone is that they have made a concerted effort to grow its membership base of OEMs. In the past three and a half years IPC has added 153 OEM members as well as three seats on their board of directors for OEM resources with Peter Cleveland VP of Legal and Corporate Affairs/Global Public Policy for Intel joining in Q3 of 2015. IPC has also grown its membership and presence amongst the assembly companies. They continue to expand their reach into new markets with the addition in 2012 of the D61/62/63 standards committees which are defining standards for printed electronics (led by Chris Jorgensen and Scott Gordon), as well as beginning a push into the European market. The net result is that IPC is moving towards a more vertically integrated hardware position and setting the organization up as the go-to source for interconnect technology in the supply chain.

As one would expect, given the sheer number of trade organizations out there, many of them overlap and intersect in their missions and membership. In some cases, this opens the door for effective collaboration between different segments of the technology chain. Good examples of this include HDPUG and iNEMI which focus on both technical testing as well as roadmap programs. HDPUG has done a great deal of work to characterize the relationship between boards and packaging such as HDPUG-SAC aging studies (Figure 2) or the correlation between different signal integrity test vehicles

and test methods such as the example presented by Karl Sauter of Oracle at PCB West.

However, as often as you have good collaboration between IPC and complementary technical organizations, as you get closer to the topic, you learn that trade organizations can compete for membership, compete for trade show attendees, compete for control of technology initiatives and even be at odds with each other on policy decisions.

One example is the challenge that I have observed between the objectives of IPC, representing the bare-board PCB and assembly industries, many of whom are engaged in military and aerospace work in North America, and the Consumer Electronics Association (CEA), sponsor of the giant CES tradeshow each year in Las Vegas, representing some of the same OEMs but with a decidedly more commercial perspective on their directives.

IPC's member companies need controls like International Traffic in Arms Regulation (ITAR) and DoD oversight and backing to ensure that they can protect technology and intellectual property critical to national security. CEA, by contrast, seeks to minimize government oversight, reduce tariffs for overseas suppliers and allow the large OEMs to define much of what they need to minimize their global cost footprint without the logistical drawbacks of national boundaries. It is clear that these two organizations, that on paper appear aligned, are coming at topics from opposite ends of the table.

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A great example of this is shown by the issue of Unmanned Aerial Vehicle (UAV or drone) management. In July 2015, NASA held the Unmanned Aerial Systems (UAS) Traffic Management Convention at NASA Ames Research Center at Moffett Field, California to discuss drone regulation, which has until now been entirely unregulated. This conference came on the heels of at least five incidents where aircraft in Southern California fighting raging wildfires amidst an unprecedented drought were grounded due to interference from civilian piloted drones, resulting in blazes that grew unchecked (Figure 3).

The conference was attended by Jamie Boone and Doug Johnson, director of government affairs and VP of policy for CEA, respectively. As they explained, the consumer drone market was estimated at about \$600M in 2014. It is anticipated that this market could grow by many billions of dollars annually in the next half decade. On behalf of their member companies, "CEA is advocating collaborative and consumer driven policy and minimizing the default Airforce and FAA management of drones," explained Johnson. A task force, charged with recommending policy for drone tracking and registration for vehicles larger than nine ounces, has been launched on Oct 29, 2015 with representatives from the FAA, the U.S. Department of Transportation and NASA. It includes industry influencers such as Earl Lawrence, FAA director of Unmanned Aerial Systems, Sean Cassidy and Ben Gielow of Amazon, and Dave Vos of GoogleX, as well as representatives from Walmart, GoPro, Best Buy, CEA and others. An-

thony Fox, secretary of transportation, stated in early November that drone registrations would be in place by year end (a potentially optimistic timeline according to task force members).

The task force is comprised entirely of commercial interests, and consequently, much of CEA's constituency would prefer to minimize government oversight of UAV technology and the electronics which drive them, allowing policies on both the technology going into UAVs and regulation of their usage to be managed by the manufacturers and users. Of course, there is a significant difference when talking about drone management, responsibility and safety for a consumer envisioning a \$200 Costco purchase with a GoPro attachment (Figure 4) and the type of systems many IPC member companies build. IPC member companies who have worked on General Atomics programs are uniquely positioned to understand the magnitude of the national security risk if the technology were to fall into the wrong hands. It is a very sobering comparison to look down the nose of a fully weaponized MQ-9 Reaper drone that can carry a payload of 3800 pounds of laser guided bombs and hellfire missiles, climb to 50,000 feet and travel at speeds of 300 mph (Figure 5).

For these reasons, IPC has stepped up its work with government involvement and its influence on Washington. IPC's government relations committee (IPC GRC), currently chaired by Bhawmesh Mathur of Creation Technologies (Figure 6), has undergone a significant transformation in recent years. In 2014, IPC GRC was



Figure 3: CBS coverage of drone interference in Southern California fires in July 2015.



Figure 4: GoPro equipped hobby drone.

IS IPC THE PAST OR THE FUTURE OF OUR INDUSTRY?



Figure 5: Armed General Atomic MQ9 Reaper drone taxiing.

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successful in getting printed circuit boards listed in Category 11 for the current ITAR controlled materials catalogue. The GRC has driven initiatives such as the annual IMPACT event on Capitol Hill, which brings business leaders together in Washington to drive forward public and private sector collaboration like the National Network for Manufacturing Initiatives (NNMI), a consortium of government-funded innovation centers with initiatives that span everything from 3D printing to flexible electronics.

After meeting with Jason Miller, special assistant to the President and deputy director of the National Economic Council (NEC) to forward the NNMI agenda (Figure 7), IPC has since partnered in two of the initiatives, including the Digital Manufacturing and Design Innovation Institute in Chicago, Illinois, and the Flexible Hybrid Manufacturing Institute in San Jose, California. In August 2015, Secretary of Defense Ashton Carter announced the awarding of \$75M in federal funding to the Flex Tech Alliance, which will launch the NextFlex innovation center in 2016 focused on flexible hybrid electronics, and consist of 160 member companies, and for which IPC will manage the standards portion.

One of the keys to this transformation has been the addition of dedicated resources at IPC. Alongside IPC veteran Fern Abrams, who has helped to get IPC to the table to submit language for the Toxic Substances Control Act reform in 2015 (TSCA), Mitchell has added Ken Schramko with a background in appropriations, STEM education and R&D policy, and Jon Has-



Figure 6: Bhawmesh Mathur and John Mitchell with J.J. Raynor, special assistant to the President for Economic Policy, National Economic Council at The White House discussing the White House Supply Chain Innovation Initiative.



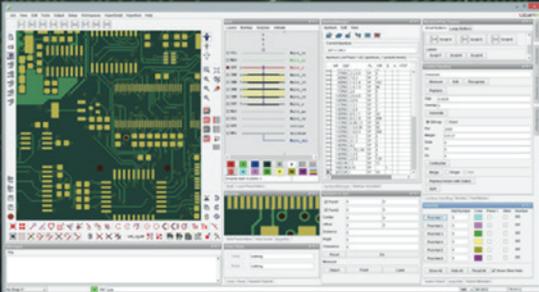
Figure 7: IPC GRC Meeting with Jason Miller, special assistant to the President and deputy director of the National Economic Council in the White House War Room.

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sleman with a background in IP protection, as full-time resources in Washington. Schramko explains that IPC has also “engaged the Prime Policy Group (a professional lobby association) on behalf of IPC to work the beltway channels on key initiatives.” This team was successful in getting talking points to Ohio congressman Bill Johnson who was able to articulate several IPC relevant issues in front of an EPA hearing in Washington earlier this year.

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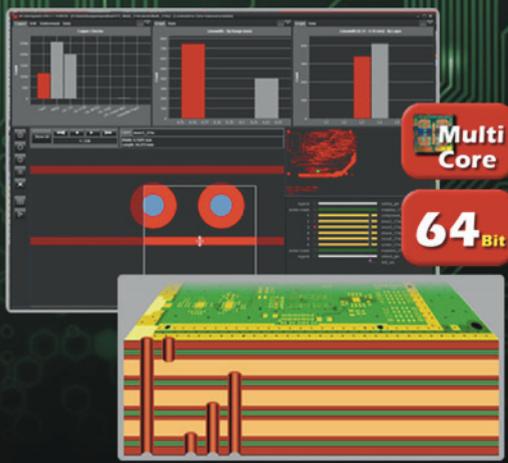


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Figure 8: Current Speaker of the House Paul Ryan addressing Creation Technologies staff in their Wisconsin factory in 2015.

Another key objective for IPC GRC is to organize site visits from congressman and their aides to IPC member companies' facilities. Dubbed "Meet the Policymakers," the project has completed more than 30 site visits since its inception in 2014 with several more scheduled by the end of the year. This is an opportunity to help IPC member companies' issues stick in their congressman's mind which improves our chances of success in Washington (Figure 8). In addition, a Political Action Committee was formed in 2014 that will help promote the candidates and initiatives that are important to North American fabricators and IPC member companies^[1].

Even with ITAR reform it is important to keep our North American fabrication base healthy through foresighted and science-based regulation and program awards based on merit and capability rather than solely on price. After

many years of market erosion, budget challenges in Congress and the dreaded sequestration of 2011 and beyond, the U.S. military is recognizing that its technology supply base is struggling to keep investing in next generation equipment and technologies. In order to get their arms around the problem, NAVSEA Crane (part of Department of the Navy—Naval Surface Warfare Center) who is the DoD's executive agent for PCB technology, has commissioned the Department of Commerce to undertake a study to profile the health of the U.S. PCB industry.

This exhaustive study will profile the entire domestic manufacturing base and will be spearheaded by Brad Botwin and Mark Crawford from the Office of Technology Evaluation, and is slated to be completed by September 2016. When asked how they intended to collect key information from private companies, Crawford replied humorlessly, "the Department of

IS IPC THE PAST OR THE FUTURE OF OUR INDUSTRY?

Commerce is the U.S. Government. Fabricators have two choices: to submit accurate data and records, or go to jail.” Botwin followed up the comment explaining, “It is for this reason they are highly confident in their data and findings.” The upside of this study as promised by the Department of Commerce and the Navy is that they will have the ability to influence policy or funding to help improve the health of the PCB fabricators, including import tariff reforms and program releases. It is a very intriguing turn of events and it will be interesting to see if it does manage to help our market and the fabricators in the U.S.

Regardless of the outcome from the Commerce Study, or the impasse between IPC and CEA, one thing that we all seem to agree upon regardless of which side of the aisle you sit, is that UL and its “for profit” structure, is an often expensive challenge where standards can be changed with little notice—which fabricators suspect is often in an effort to increase revenues. Kevin Ravo, director of business development on product safety for UL, has indicated that “UL is also looking into its strategies and how they serve the market and [they] are planning to make changes to address the ease of working with UL.” The positive impact of this effort will remain to be seen.

As the focus on government policy advocacy continues to gain momentum and produce tangible results for IPC members, the next challenge for IPC will be to further its mission on education for the next generation of talent in the industry. The North American PCB industry continues to see many of its long-time experts retire and with each retirement a tremendous amount of knowledge and experience leaves the industry. The key to a healthy industry is to bring new talent into the game early on and let them learn from industry veterans and experts who have spent their careers moving the technology needle through standards generation as well as testing and building thousands and thousands of printed circuit boards.

Talent, education and collaboration will be necessary to support critical market needs in the next generation data-rate systems for the Internet of Things and Big Data. In order to achieve this, each IPC member company and

electronics industry trade organization must set aside historical divisions and work toward an unprecedented era of teamwork. Bare-board fabricators and assembly houses will look to IPC to help usher in the next generation of technologies and facilitate a closer relationship with government entities.

If you still have concerns about whether IPC is fulfilling the needs of its members or your company, roll up your sleeves and help out. As

“If you still have concerns about whether IPC is fulfilling the needs of its members or your company, roll up your sleeves and help out.”

John Mitchell says, “Become involved so your voice can be heard. IPC is fostered by the individuals who participate and we want our members to become active participants in shaping the future of our industry.”

If you are a bare board fabricator or assembly house or materials supplier in North America, IPC is OUR trade organization. The industry isn’t so large that you can’t make an impact by getting involved with IPC. It is looking increasingly like IPC is the future of our industry and is positioning itself to help guide us into a new era of strength in the North American market—and you can be a part of that. **PCB**

References

1. For more information, go to www.ipc.org/PAC



Jason Marsh is vice president of product management at Insulectro.



EIPC: Furthering the Reach of Electronics Industries in Europe

by **Barry Matties**
I-CONNECT007

The European Institute of Printed Circuits (EIPC) might be based in Europe, but it very much helps its members on a global scale. Chairman Alun Morgan and Executive Director Kirsten Smit-Westenberg sat down with me at productronica recently, and explained how companies around the world have benefited from joining the EIPC. We also discussed current industry trends in Europe and the upcoming EIPC conferences and workshops being designed around them.

Barry Matties: *Why don't you start with a little bit about the EIPC and what it does?*

Kirsten Smit-Westenberg: What we try to do at the EIPC is bring together the European countries by organizing networking events. We organize a winter and a summer conference every year, and we specialize in workshops that we do 12–16 times a year. Events and workshops are our main focus and our strong points.

Matties: *How many members do you currently have?*

Smit-Westenberg: We have 108 currently. We're very proud to say we've gained 16 new mem-

bers this year. We've lost five, unfortunately, but we're very happy to have gained the new members, who are mostly European, but two are North American.

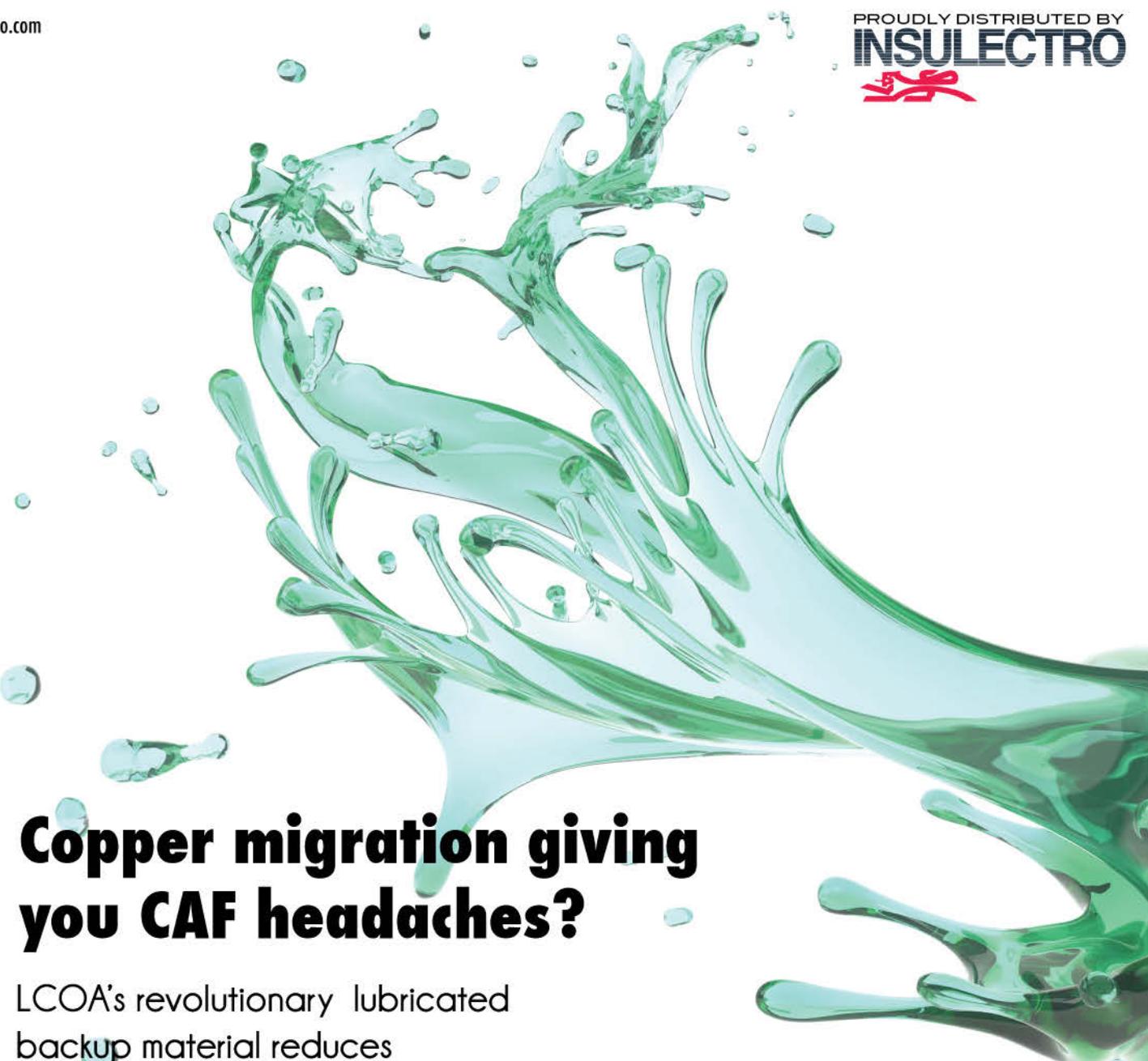
Matties: *Great to hear. Alun, what is your role as chairman of the EIPC?*

Alun Morgan: Well, I am the functional head of the organization, so it's very much a hands-on role. My job is to lead the organization. Kirsten is doing all the day-by-day work—all the real work, I have to say—and my job is to steer it and actually be responsible for what we do. What we try to do really is provide value to our members.

Matties: *What sort of value do you provide your members when they join the association?*

Smit-Westenberg: We try to find out what it is that they are looking for. Is it visibility? Are they looking to get connected to the European industry? Do they need to be informed about the European Union?

We can get them involved in European-funded projects and provide them market information. We can sell IPC standards to them, or get them connected to IEC standards, UL connections, etc. It depends on what they're looking for. I think our strongest point is to get



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Alun Morgan, Chairman, EIPC.

members connected. We bring together the users, the OEMs, the designers, the manufacturers, the suppliers, and that's our strongest point.

Morgan: We have to see the thing in context. European PCB revenues are now around 4.3% of the worldwide business, so around \$2.6 billion is done in Europe. There has been a decline in worldwide share here for many years. But the European market does specialize in certain areas. For example, we would call defense a very big activity for us in Europe, as well as medical and automotive. Even though sometimes the production might be offshore, the IP is still held in Europe, and we still have things that we can offer that are unique within Europe.

We can offer two things: First, we can offer access to our markets and technologies in Europe to people outside the area. For example, we have a few North American members now who joined the EIPC so they could contact and connect with European PCB companies.

Matties: Are those suppliers?

Morgan: Suppliers, yes. Test labs as well who wanted to access the market for test in Europe. That was one thing.

The second thing is we also help our members within Europe make contact with other parts of the world. I'll give you a good example: Many of the shops in Europe have small pro-

duction capabilities—they're very specialized—and they have a need to satisfy bigger requirements from their customers, but they no longer have the volume capability to do so. We can help them to find partners in other parts of the world who can satisfy that part of their business, so their customers in Europe can come to them as a one-stop shop. These people need partners now. You can't always do it on your own anymore. The days of somebody being able to do everything from single digit batch sizes to batch sizes in the thousands using different technologies are gone. Nobody can have that capability in-house anymore, especially in Europe.

You need to have partners that can complement your activity. Many of our members do exactly that. We are able to help them by finding partners. We are part of a worldwide organization, the World Electronic Circuits Council, so we have partners in China, Japan, Korea, India, North America, Taiwan, Hong Kong, etc. We have direct contact with the trade associations in Asia accounting for over 90% of worldwide PCB production and can make connections at a very high level.

Those are two very good examples of how we can bring things in and take things out.

Matties: How often do people actually take advantage of that, though?

Morgan: They are more and more. Michael Weinhold, our technical director, is attending the HKPCA & IPC show in December and taking one of our members with him to look for exactly that. He was there last year doing exactly that with another member company. We have a partner in Asia named David Ho, whose business is finding partners for our members.

Matties: Ivan's son.

Morgan: Ivan's son, yes. Ivan was doing it before, but sadly, we lost Ivan a few years ago, which is a great shame. David has taken over the role and it's critical, because you can find partners around the world. You can go on the Internet, you can search, and you can find partners. You just don't know whether they have a factory, whether they have an organization, or whether they're reliable.

EIPC: FURTHERING THE REACH OF ELECTRONICS INDUSTRIES IN EUROPE

This due diligence is critical so having a partner in Asia who's Chinese, speaks Chinese, and can actually establish this is really important.

More and more that is happening, and I think it's necessary. The companies in Europe have specialization and can do certain parts of the business, and they might still have a great business. But more and more their customers want a greater offering and don't want to have to go to five or six different companies. They want to go to one company and say, "I want to have this and this, and you take care of it."

But you have to have the partners for that. I see that's more and more important for survival. We could dig our heads in the sand and say, "Oh no, we don't want to work with off-shore shops. We want to make sure we stay in Europe and we want to make sure we do it ourselves." But this is pure fantasy. In certain areas that works, and there can be an influence and then some business does come about, there's no doubt about it. But the days of Europe being 15–20% of world production are gone. We can't invest that much anymore—you can't even buy that equipment any more in Europe. You have to accept that that boat has sailed, but there's certain parts of this that we can benefit from.

Networking would be the biggest benefit that comes to my mind. You can meet other people. There are many examples of people just meeting over a beer, over dinner or a coffee break, and finding another partner. By way of example, at the last conference a large German PCB manufacturer sat down and met a UK board supplier and they found a way of doing business together. They would not have met, I don't think, had they not come together at our event. The social side is certainly part of it, and the other part is technical.

Matties: *When are EIPC's conferences?*

Smit-Westenberg: We usually plan our winter conference for January/February, and then summer around June. Sometimes we skip to September, but I'm happy to announce that our winter conference will be in Dresden, January 21–22.

Matties: *How many days are the conferences usually? Two days?*



Kirsten Smit-Westenberg, Executive Director, EIPC.

Smit-Westenberg: It's one and a half days actually, with a social event that's always on the first evening or afternoon. We have a bonus program where we take the people to a facility, this time it's Volkswagen, and after that we take them to dinner. It's always a very good event. That's, again, one of the networking events where people do business in a very informal atmosphere.

We will go to the Volkswagen Phaeton factory, where they build the Phaeton model. It's a glass house factory with very high-end equipment. We will have a two-day technical program that will inform people about a various list of topics, but the focus is automotive.

Matties: *That's a big focus I would think here in Europe. That's what's driving the industry now, isn't it?*

Smit-Westenberg: Absolutely.

Morgan: After the conference in January, the next one will be in Edinburgh in the UK, probably next June. These will attract probably 60–100 people. We present a varied and detailed program. More and more we've had an academic thread in the last years as well, to show research and how things can move forward, and research is still very strong in Europe.

We have a strong academic link through Martin Goosey, our VP of Technology, where we

EIPC: FURTHERING THE REACH OF ELECTRONICS INDUSTRIES IN EUROPE

do have programs on microelectronics or electronics where we have made a contribution, for example at Sheffield University and others.

Also on the other side there are some practical examples with new equipment being developed, where we can actually showcase these companies to the EIPC members. We also have a strong training program and workshop program as well. We have two workshops coming up in December, one in Switzerland and the other in Germany.

Matties: *How well attended are the workshops?*

Morgan: We've got 40 or so signed up for December.

Smit-Westenberg: Yeah, we've already sold out at the Swiss workshop with 50 total registrants.

Matties: *Is that limited only to the members to participate?*

Morgan: No, members and non-members. Members get preferential rates. Non-members have to pay more money, but they can still go. We gain many members from these events. They go along and they like what they see. We do this in English and in German. We wanted Italian, but we didn't get a big traction for that. We are an international organization, so we primarily work in English. We shouldn't forget though that German-speaking Europe probably accounts for two-thirds of all of the PCBs made in Europe, if not slightly more. We have to be clear that we work with those as well.

We have an alignment now with FED, which, as you see, share the stand with us. They're a professional association for PCB and electronic design based in Germany. They have, I think, over 600 members. They're much bigger than we are, but they are a great fit for us. They wanted to have some leverage outside of German-speaking areas and markets, and we wanted to have more penetration within the German-speaking markets, so actually we found a great alliance, and we work very well together. This is our first workshop together, and we've already sold out with still about three weeks to go. I'm very happy about that.

Matties: *Fantastic. From the technical side, how do you populate your program?*

Morgan: We think of a theme, first of all. We think of what theme we'd like to address, and that comes from the members, largely—things that they're interested in—and then we have a call for papers. We're looking now at automotive reliability and technology development, which is strong in Europe, so we thought that was a good theme to start with.

We put down a basic agenda and basic topics that we like, and we ask them to supply papers on that basis. Then we put them together in different clusters and groups. We always have a strong reliability section. That's something Europe specializes in. Reliability is a key part of what we do in Europe, and always has been. Automotive requires reliability, so we fit very strongly in that. We can't have vehicles or ABS systems failing whilst you're in the middle of a stop or your steering wheel doesn't work. You don't want your engine failing either so you're stranded out in the middle of who knows where.

If you think about it, in the last 15–20 years, automobiles have become so reliable. The service intervals are going way out, and this is a huge area of progress. We want to learn from that and hear what these people have to say. We have some very strong contacts within the automotive sector and Tier 1 suppliers from automotive here. Of course, there are new technologies as well in automotive, like collision avoidance systems, radar systems, and fly-by-wire, which is now state of the art. Cars have become more and more electronic as time has gone on. In days gone by, the mechanical content would be the biggest value, and now it's the electronic content. Vehicles contain dozens of control units for many different reasons, whether it be the air bag, the ABS, traction control, transmission, etc.

That always features, to some degree, and we have many producers in Europe who supply into that industry—either in small volume for prototyping or for bigger volume. The big volume tends to go offshore these days for these industries, but there's always a phase, a beginning of life and end of life, where we have a strong

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The InfinityLine is the combination and innovative optimization of the SCHMID CombiLine and PremiumLine. In addition to the proven SCHMID quality and performance, it offers several new highlights which are to the benefit of our customers.

“NEO”: New etching solutions made by SCHMID

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EIPC: FURTHERING THE REACH OF ELECTRONICS INDUSTRIES IN EUROPE

contribution to make. That's another big area. That'll be the next conference on that, I think.

Next summer's conference will probably be on defense. Defense is again, a very strong sector for Europe, and of course, North America, looking across the ocean. We have quite a few North American members now who want to have access to our markets, and perhaps be able to participate in our technology to some degree. I'm trying to get a visit to a defense establishment up in Scotland. I haven't got it agreed to yet, but I'm working on that because many of our members supply to that sector.

And also IP is critical for these things. Some of these businesses really don't go too far offshore. There are certain protected areas where you don't want the IP to leave your shores. Defense is one of those areas, and defense is very strong in the UK and Europe in general. France has a very strong defense industry as well.

Matties: *It's a global desire, defense.*

Morgan: Right, and of course in Israel. Israel is maybe on the edge of Europe, but we still class it as part of our group. We've had members from Israel for many years, and that again is a very critical defense-oriented market.

Here at productronica this year we'll have our general assembly, so we have the chance to listen to what our members have to say and they'll steer us. We hope we do the right things, and we hope we give something of value to them. We're not expensive to join and we have lower fees. As Kirsten said, we've gained 16 member companies this year, which is very nice indeed. We imagine that if we gain that many new members, we are doing something they value.

We are member driven. We will do what the members want, and what they think has value. Of course, we make our proposals from the board. We have a board of 15 member companies, which is quite a large board and a very diverse board, as well as a very innovative board. They make a great contribution to our organization.



Matties: *I think one of the takeaways that we want to share with our readers is that the EIPC really is a global organization. It may be European centric, but it has global impact.*

Morgan: We have global partners through the World

Electronics Circuit Council. I think that's very important, and together we organize the world conventions every three years. The next one is in Korea 2017, and then beyond that we're back in Asia again.

Matties: *What month is that taking place in Korea?*

Morgan: April 2017, and then three years later we'll be back in Asia again.

I think the message is probably that we just can't work on islands anymore. We have to make sure we are connected globally, and that's a crucial part of success for us all.

Matties: *I think that's an important message to get out. Just because you belong to a global organization like the IPC, being a part of the EIPC is important because your perspectives and efforts, though aligned with the IPC, are still regionalized to the area that people are trying to do business in.*

Morgan: We have global reach. We have global suppliers and we have global markets. Let's not forget that has been a trend in the last 15 to 20 years for all industries. The world has become smaller—it's a cliché, but it's true.

Matties: *It's true. Once you've been around it once you know how small it is.*

Morgan: Yeah, so that's really where we are: We're trying to further the reach of electronic industries in Europe.

Matties: *Great, thanks so much for joining me today. PCB*

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In Their Words:

The China Printed Circuit Association (CPCA)

I-Connect007 recently asked a number of printed circuit associations around the world to tell us about their organizations via a questionnaire. Here are the responses from CPCA Secretary General, Miss Jin Zhang.

I-Connect007: *What is CPCA's basic mission?*

CPCA: The basic mission of the CPCA is to:

1. Play a role as a link between government departments and enterprises
2. Carry out industry research
3. Strengthen industry self-regulation
4. Perform good service to the industry and companies by gathering industry statistics; analyzing developments in domestic and international trade; collecting and publishing industry information; publishing newspapers and setting up websites; establishing technical and economic management, marketing and other advisory services; and organizing talent, technology, management, regulatory and other training work
5. Help companies develop new markets
6. Organize new product identification, evaluation research, industry standard-setting and quality supervision work

I-Connect007: *What are your membership stats—industry segments, job descriptions, regions of the world, total membership, etc.?*

CPCA: CPCA member companies are nationwide, though mainly concentrated in the Pearl River

Delta, Yangtze River Delta and the inland central regions. These include world-renowned U.S.-funded enterprises include Meadville Electronics, Taiwan-funded companies like Unimicron, and European and Japanese companies. Domestic national brands such as Shennan Circuits and Shantou Chaosheng, and local public companies like Sheng Hong Technology, Zheng Ye, Chao Hua Electronics, WUS, Chukyo Electronics, Jinan Guo Ji, etc., are members of the CPCA.

China is the biggest PCB manufacturing base in the world. The CPCA has more than 800 members; we have good relationships with local trade associations and government. We have offices and branches in different cities.

I-Connect007: *Does CPCA host any events?*

CPCA: We have held the CPCA Show for 24 years now. The exhibition has become an important global show for our printed circuit industry. The CPCA show has clear positioning and distinctive features of a comprehensive exhibition and is held every year in March in Shanghai.

CPCA SHOW 2016 will be held at Shanghai New International Expo Centre March 2016 15–17. Exhibitions include: printed circuit board manufacturing, equipment, raw materials and chemicals; electronic assembly equipment, raw materials, electronic manufacturing services and contract manufacturing; water treatment technology and equipment; clean room technology and equipment. Well known industry enterprises such as Shennan Circuits, Hingsen Technology, AT&S, ZhanHua Electronics, Unimicron and others have already registered for the exhibition.



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IN THEIR WORDS: THE CHINA PRINTED CIRCUIT ASSOCIATION (CPCA)



CPCA Secretary General Jin Zhang.

In addition, CPCA has held the Electronics Industry Summit annually since 2005. In 2015, the summit held China's printed circuit industry Top 100 certification ceremony at the same time, which brought this event to the next level. This will be an important annual benchmark for the industry.

CPCA has a sub organization, the Technical Committee of Science and Technology, which is a professional industrial technology organization. The CPCA Technology Technical Committee holds a PCB Technology/Information Forum in spring and autumn every year.

To ensure effective communication links between enterprises and associations, in-depth understanding of the actual situation of the enterprise, to help companies cope with the difficulties, solve problems, and steady development, the Association continued to visit outstanding national enterprises and entrepreneurs. In 2015, the Association visited Hirotoshi Electronics, Shennan Wuxi, Wuxi-Fast Print, Jiang Su Guangxin, Sheng Wang Technology, San De Guan, Xusen Precision Circuit, Jingming Machinery, Ke Ludi, East Space Light, Hang Sheng circuit, Galaxia Electronics, Honesty and electronics, Huangshi WUS, Kun-Shan dong wei, Guangde Boya, Guangde Baoda, Guangde Ju Kang, Guangde Longtai, Guangde Sansheng, Huangshi Shangda, Shanghai Jindu and some other large enterprises.

I-Connect007: Please list the two or three biggest advantages and benefits that CPCA provides to members?

CPCA: The biggest advantages are:

1. Providing an exhibition platform (CPCA SHOW) and opportunity for the members.
2. Providing personnel training for the industry by qualifying domestic colleges, promoting research with the institutions and enterprises, and establishing printed circuit professional courses for the electronics industry.
3. Providing members the chance to exchange information during visits and other learning opportunities with international companies and the association. In 2015 CPCA delegations visited the United States, South Korea, Japan, India, and the Taiwan exhibition. We organized nearly 200 people. For the members who can take the opportunity to learn foreign PCB market development, this was a great info exchange.

I-Connect007: How much does membership cost?

CPCA: Membership cost is based on a company's annual sales income, as follows:

- 5 million CNY enterprises contribute 1,000 CNY/year
- 5–50 million CNY enterprises contribute 3,000 CNY/year
- Above 50 million CNY enterprises contribute 5,000 CNY/year
- Council members: 6,000 CNY/year
- Executive director members: 15,000 CNY/year
- Vice Chairman members: 25,000 CNY/year
- Chairman members: 50,000 CNY/year

I-Connect007: Many of our readers feel standards should be free to members. What is your response to that?

CPCA: This problem cannot be generalized. On one hand are the commanding heights of technology standards: to ensure that standards are kept up to date by encouraging the preparation units and personnel, we have differential member and non-member pricing. On the other

IN THEIR WORDS: THE CHINA PRINTED CIRCUIT ASSOCIATION (CPCA)

hand, in order to encourage a green economy, protect the earth's resources, and promote sustainable economic development, standards such as "social responsibility standards" can be free.

I-Connect007: *What resources (book stores, etc.) are most important to your members?*

CPCA: The most important resources are the annual economic information, economy statistics for our industry and other industries, Top 100 analysis reports, and macroeconomic policy.

I-Connect007: *How do you satisfy CPCA members' need for technical information, and in what format?*

CPCA: First, our association holds a technical forum in the spring and autumn of every year, where best papers are released. Secondly, we can provide technical advisory services for enterprises. Third, we offer identification of new technologies and issue expert reports.

I-Connect007: *Please highlight some of your success stories in the industry.*

CPCA: There are too many to name. We are the connection between our industry and the government. We have done great work for our members and industry. The government listens to our voice when they are building regulations. Currently, after our hard work, the government announced that PCB manufacturers don't need to apply for a "printing business license" anymore.

I-Connect007: *What technologies do you consider the most important in the future?*

CPCA: China is advocating intelligent manufacturing, as are most countries. Germany is also advocating industry 4.0, and India keeps promoting "Made in India." All countries have attached great importance to industrial development. Industrial development is the cornerstone of development in each country. With regard to the future of PCB manufacturing, smart manufacturing is the most important one. I think the sustainable development of energy-saving tech-

nology, environmental protection, and low-carbon emissions must be the future trend.

I-Connect007: *How do you cooperate with other associations?*

CPCA: We learn from each other and share information.

I-Connect007: *What upcoming standards/certifications should people be aware of?*

CPCA: "Electronics industry emission standards", this standard will complete separation of printed circuit industry with electroplating industry; it is a milestone in our industry.

I-Connect007: *How do you assist your members in dealing with government agencies?*

CPCA: We help the government see things from companies' points of view.

I-Connect007: *What are your most successful programs and why?*

CPCA: The CPCA Show is an industry benchmark with great international influence.

I-Connect007: *Why should someone join your association?*

CPCA: It is an excellent platform on which to find business and make friends and contacts.

I-Connect007: *What regions do you best serve and what are your missions in each region that you serve?*

CPCA: We are wherever PCBs are being made in China. We provide information, events, technical seminars, and other activities in developed areas. In developing areas, we offer industry development plans for the local government, to provide professional advice to corporate investment expansion.

I-Connect007 would like to thank CPCA for taking the time to respond to our questionnaire. PCB



In Their Words:

Hong Kong Printed Circuit Association (HKPCA)

Recently, we sent a questionnaire to a number of printed circuit associations around the world, asking them to tell us a little about their organizations. With the annual HKPCA & IPC show having just ended, this information provided by HKPCA is especially interesting.

I-Connect007: What is HKPCA's basic mission?

HKPCA: Our mission and objectives are:

1. To promote and protect the rights and interests of the printed circuit industry
2. To represent the industry and present its views to the government and/or other parties
3. To develop and strengthen internal and external communication, with a view to enhancing cooperation and business opportunities, by means of the following:
 - Organizing technical/business seminars and recreational functions
 - Gathering and distributing relevant information to members
 - Establishing links with overseas counterparts, such as CPCA, JPCA, TPCA, IPC, KPCA, IPCA and EIPC

4. To establish and manage funds for charity purposes.

I-Connect007: What are your membership stats—industry segments, job descriptions, regions of the world, total membership, etc.?

HKPCA: HKPCA has more than 470 members coming from Hong Kong, China and overseas enterprises with total production values reaching around \$9.4 billion, occupying 16% of the PCB industry in the world. Member categories include PCB manufacturers, PCB equipment suppliers, suppliers of chemicals and raw materials, and other trade and environment protection service companies. The HKPCA member base will be broadened by recruiting more and more qualified members and with all our efforts to promote China PCB industry to a more prosperous future.

I-Connect007: Does HKPCA host any events?

HKPCA: WECC Tradeshows: The 2015 International Printed Circuit & APEX South China Fair (2015 HKPCA & IPC Show) is the world's largest and most influential exhibition for PCB and electronics assembly sector, and the ideal source-

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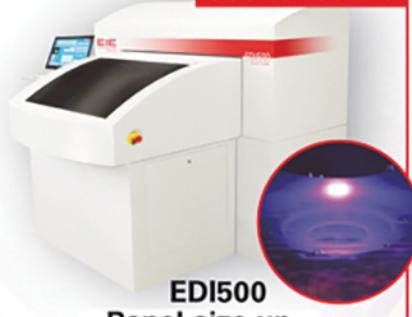


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IN THEIR WORDS: HONG KONG PRINTED CIRCUIT ASSOCIATION (HKPCA)



ing platform for industry professionals and electronics manufacturers. This year's edition was presented December 2–4 at the Shenzhen Convention and Exhibition Center in Shenzhen, China. This annual spectacle boasted over 50,000 square meters of show floor area, offering more than 2,500 booths of exciting innovations and cutting-edge products.

HKPCA also organizes:

- a regular training course every month, from March through November annually, and then finally at the international conference in December
- Technical sessions serving as an industry standard seminar and technical forum
- Recreation activities and programmes such as: badminton, bowling, hiking, golfing, trips or other entertainment (including a Mah-Jongg tournament)!

I-Connect007: *What are the top two or three benefits that HKPCA brings to your membership?*

HKPCA: Our members enjoy the member rate for participating at our exhibition, HKPCA training courses and other activities. Members also receive a yearly PCB market survey report free of charge.

I-Connect007: *How much does membership cost?*

HKPCA: There is an entrance fee and then an annual Membership Fee as follows:

The corporate member entrance fee is HK\$3,000, and the annual corporate membership fee is HK\$2,500. An annual corporate membership runs 12 months from the enrollment date.

The associate membership fee is HK\$500, and runs from January 1 to December 31 of each calendar year.

I-Connect007: *Please explain how membership is worth the cost.*

HKPCA: Our members receive many benefits, including:

- No charge for HKPCA Quarterly Journal
- No charge for yearly PCB market survey report
- No charge for posting website job recruitment ads
- No charge for linking HKPCA website to member company's website
- No charge for weekly email of market news
- Member rate for HKPCA training course
- Member rate for participating in our exhibition
- Member rate for placing ads on our website or in our journal
- Member rate for joining our recreation activities
- Member rate of group buy under monthly leaflet



IN THEIR WORDS: HONG KONG PRINTED CIRCUIT ASSOCIATION (HKPCA)

I-Connect007: Why should someone join HKPCA?

HKPCA: Our many benefits and professional services for our members include:

- A quarterly journal that contains market outlook, technical articles, news and activities, and members' information
- The HKPCA website, where members can find timely updates on market news, training programs, recruitment notices, recent activities, technical papers, executive committee details, etc.
- Recreational activities (as mentioned earlier)
- Monthly training course to equip PCB engineers with the latest technologies to enhance the advancement of the industry
- Market news related to the global PCB industry and an annual market survey

- Distributions of related policies of China and HKSAR governments
- The annual HKPCA Show and participation in WECC members' meetings and exhibitions
- Collection of information on environmental issues from members and representation of the industry to present its view to related government departments
- Participation in IPC's Asia standards development activities and review technical papers

For more information, visit the [HKPCA website](#).

I-Connect007 would like to thank the HKPCA for taking the time to respond to our questionnaire.

PCB

Show Review

HKPCA and IPC Take PCB Industry Exhibition to a New Level

By Stephen Las Marias

I-CONNECT007

The International Printed Circuit & APEX South China Fair 2015 (HKPCA & IPC Show 2015) lived up to its theme "Global Event. Global Vision." Featuring more than 500 global and local exhibitors showcasing an impressive number of PCB equipment and supplies, the show—which expanded to three halls to provide a total of more than 50,000sqm floor space to house more than 2,500 booths—was said to be the largest ever in the event's history, and so far the biggest in the world for the PCB and electronics assembly industries in terms of square footage.

Held at the Shenzhen Convention & Exhibition Center from December 2 to December 4, this year's show featured new highlights, including the PCB Giga Conference, the Smart Automation Pavilion, the PCB Smart Automation Development Showcase, and the Green Pavilion.

The PCB Giga Conference saw global industry experts and leaders sharing their knowledge and insights on key developments and trends shaping the PCB industry, including automation, energy consumption, and environmental protection. The Smart Automation Pavilion and the PCB Smart Automation Development Showcase, meanwhile, presented the industry with the Industry 4.0 developments, and how automated equipment can improve production efficiency and reduce labor costs. The Green Pavilion offered the industry green solutions from waste management to environmental protection and energy saving.

"I was absolutely surprised at the energy, the interest and agenda," industry veteran Gene Weiner, president at Weiner & Associates Inc., comments. "This is the most energetic, active trade show in the industry that I've been to in the past three years. There's innovation in the chemical processing, innovation in robotics and automation; I think this industry will grow

HKPCA AND IPC TAKE PCB INDUSTRY EXHIBITION TO A NEW LEVEL

much more than anywhere else in the world.”

Despite the global economic challenges and slowdown, the HKPCA & IPC Show—based on the foot traffic and amount of technology innovations being showcased—seems to be oblivious of it. “The numbers were up on the show, we have one extra hall this year compared to last year, and we got good traffic,” says Philip Carmichael, president of IPC Asia. “I’d say the show is doing very well. And this industry is typically doing better than the general GDP.”

Carmichael notes that the show exceeded his expectations. “I was surprised that we got very good turnout in some of the panel discussions and technical topics. To have 60 or 70 people sit in and listen to a technical presentation in the middle of the show is a good thing,”

.....

“To have 60 or 70 people sit in and listen to a technical presentation in the middle of the show is a good thing.”

.....

he says. “It shows that we got good content. It’s one thing to go around and look at equipment; it’s another thing to hear about the trends in the industry. So I think people are getting a lot out of the show.”

Hamed El-Abd, executive director of WKK and president of WKK Distribution Ltd, says, “To be quite honest, I was expecting less than what we have here because of the state of the economy; and I was pleasantly surprised. It’s not so much that people are here buying or wanting to buy, but they are looking and seriously considering different technologies.”

The last three days have been a very good show, according to El-Abd. “It’s been well attended; I don’t have any complaints about the attendance. There are a lot of good people here; we have presidents of corporations here looking at technology, looking at equipment. It certainly met my expectations. The show is physically bigger, and there’s more exhibitor here than in the past,” he says.

Technology Showcase

The show featured interesting PCB equipment technologies and innovations, including imaging equipment, drilling, and testing. “The exhibits were really great. I saw new machines coming out, and what I didn’t see at the CPCA Show, I saw here,” says Soichiro Fujita, section chief of the overseas operation department at MicroCraft. “There were a lot of exciting things to see here.”

Apart from the machines being showcased, what’s more interesting is the amount of software that’s being brought along with them. In terms of control and new applications, the software level at the show was very high in terms of sophistication.

“We have some visitors who came from Japan and South Korea, and they very impressed at the level of sophistication that they are seeing in software applications,” says IPC’s Carmichael. “I think that’s very positive.”

For his part, WKK’s El-Abd highlights the amount of automation that can be seen in almost all equipment being exhibited at the show. “What we’ve said all along for the past many years is that it’s all about automation. And for sure, if you look around all of these equipment, there’s a lot of automation—even on our own equipment. We now have customers saying to us, ‘If the machine is not automated, I don’t want it in my factory.’ That message is loud and clear; and it verifies everything we have been talking about over the past few years.”

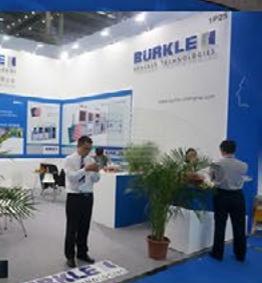
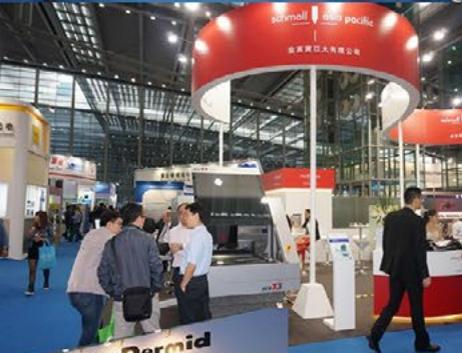
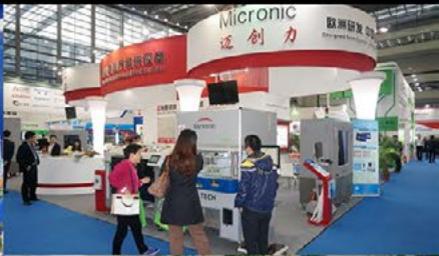
The Future

“It’s always our hope that the show will grow every year,” says Carmichael. “So I hope that it’s even bigger next year. One of the challenges we have as we have more halls is how to get people to go to the back one. So we have to start thinking about it like some kind of a retailer, put something special on the back to drag visitors to the back. We are going to work on that. I think it’s been a great show.”

The HKPCA and IPC Show will be back again next year, from December 7–9, at the Shenzhen Convention & Exhibition Center.

Be sure to visit our [Real Time with...HKPCA & IPC Show](#) site for video and photo coverage.

PCB



EIPC Summer Conference, Berlin

The 2015 EIPC Summer Conference, which attracted delegates to Berlin from sixteen countries to experience 21 technical presentations over two days. Also included was a visit to the Berlin laboratories of Fraunhofer Institute, Europe's largest application-oriented research organization.



HDPUG Demonstrates Benefits of Cooperative R&D

The High Density Packaging User Group (HDPUG) is a member-driven, non-profit, project-oriented industry consortium that addresses the integration of new electronics component packaging and interconnection technologies into the supply chains of its member companies.

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The electronics manufacturing industry is an important sector in the global economy, and John Hasselmann, VP of Government Relations at IPC, is an advocate for policies that will help our industry as well as the prosperity and welfare of billions of people.

Characterization of PCB Material & Manufacturing Technology for High-Frequency

Concepts like Industry 4.0, Internet of things, M2M communication, smart homes and communication in, or to cars are maturing. All these applications are based on the same demanding requirement—a considerable amount of data and increased data transfer rate. The aim of this paper is to develop a concept to use materials in combination with optimized PCB manufacturing processes, which allows a significant reduction of losses and increased signal quality.



Coated Ultra-Thin Copper on Printed Circuit Laminate

Nano copper-based electronic ink and associated processing have been developed to create ultra-thin copper on flexible PCB substrates, allowing for much finer etch resolution and increased circuit density. The process is rapid and sufficiently low-temperature to allow deposition onto temperature-sensitive substrates such as polyimide, plastic and paper.



David Ciuffo

IMPACT 2015: An In-Depth Look



IMPACT 2015 Award (detail)

IPC understands that presenting a unified voice for the electronics industry is essential for advancing policies that affect the industry's long-term future and strengthens the U.S. and global economy. That is why 22 IPC member-company executives descended on the nation's capital for IMPACT 2015: IPC on Capitol Hill, IPC's annual advocacy event.

A Cautionary Tale: Counterfeit Materials

John Ling of EIPC writes, "Risk from counterfeits wears many hats. There is reputational risk, which can be damaging; there is inherent safety risk, which could be fatal; and there is financial risk to the OEM, the PCB manufacturer, and the PCB broker. One way of minimizing risk is by dealing direct."



Institute of Circuit Technology 41st Annual Symposium

ICT Technical Director Bill Wilkie has always excelled in locating interesting and unusual venues for the Institute of Circuit Technology Annual Symposium, and this year was no exception. For the 2015 event, the 41st, he chose the Black Country Living Museum, an open-air museum of rebuilt historic buildings in the home of the original Industrial Revolution.



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In Their Words:

The IPCA—India Printed Circuit Association

To better understand the many associations serving the global electronics industry, I-Connect007 conducted many interviews for this month's issue, as well as distributed several questionnaires, one of which was to IPCA (India Printed Circuit Association). The IPCA is not part of IPC, though the two associations do collaborate. Secretary K. S. Babu responded on behalf of IPCA President Viral Bhulani.

I-Connect007: *What is IPCA's basic mission?*

IPCA: Our mission is to promote state-of-the-art PCB technology and business in India by the mutual exchange of ideas and technical interactions arranged through periodic seminars, conferences, etc.

I-Connect007: *What are your membership stats—industry segments, job descriptions, regions of the world, total membership, etc.?*

IPCA: Our members are mainly manufacturers of printed circuit boards. Total membership is more than 200, and we serve India only. [Editor's note: According to the website, IPCA Membership is open to PCB designers, PCB manufac-

turers, EMS companies, other users, suppliers of equipment and raw materials and their authorized representatives.]

I-Connect007: *Does IPCA host events?*

IPCA: We conduct a trade show annually, along with a conference and technical seminar under the banner "IPCA Electronics Show." The next show will likely be in August 2016.

I-Connect007: *What are the top two or three benefits you bring to your membership?*

IPCA: IPCA coordinates communication with Government regarding industry requirements in matters of policy. We also conduct seminars and exhibitions to bring new technologies to members, and hold buyer-seller meets. IPCA also organizes training programmes for our industry and takes delegations to various shows worldwide.

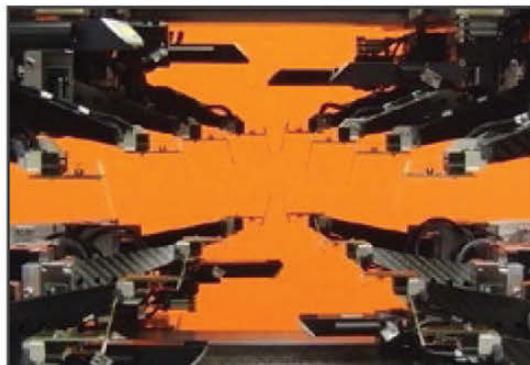
I-Connect007: *How much does membership cost?*

IPCA: US\$100 for small companies and up to US\$500 for a large company.

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Max. measurements / minute:	Up to 15000 measurements /min. *
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IN THEIR WORDS: THE IPCA—INDIA PRINTED CIRCUIT ASSOCIATION

I-Connect007: *Many of our readers feel standards should be free to members. What is your response to that?*

IPCA: That would be an ideal situation, but not practical, as the standards need to be updated.

I-Connect007: *What resources are most important to your members?*

IPCA: Industry standards.

I-Connect007: *How do you satisfy members' need for technical information, and in what format?*

IPCA: We do that through industry standards for quality benchmarks, and also through our annual conference, technical seminars, and training programmes.

I-Connect007: *Highlight some of your success stories in the industry.*

IPCA: Our government is giving a lot of incentives to the electronic Industry in general and the printed circuit board industry in particular.

I-Connect007: *What technologies do you consider to be the most important for the future?*

IPCA: We see HDI technology as the most important technology for the immediate future in India.

I-Connect007: *What types of committees/teams are currently active within IPCA?*



IPCA: We have a Technical Committee, Training Committee and Exhibition Committee.

I-Connect007: *How does IPCA cooperate with other associations?*

IPCA: By participating in each other's programmes that support the industry.

I-Connect007: *What upcoming standard/certifications do you feel people should be aware of?*

IPCA: IPC, JPCA and BIS standards.

I-Connect007: *How do you assist your members in dealing with government agencies?*

IPCA: By close coordination with the Department of Electronics and attending their meetings.

I-Connect007: *What are your most successful programs and why?*

IPCA: There are three:

1. Coordination with government—as per the requirement of the industry
2. Expo and seminars—for upgrading technical knowledge and the buyer-seller meetings
3. Training—by imparting skills in the workforce

For more information on IPCA, [click here](#).

I-Connect007 would like to thank the IPCA for taking the time to respond to our questionnaire. PCB



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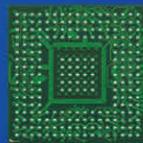
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IPC's Fern Abrams: Keeping up with Regulatory Matters

by **Patty Goldman**

I-CONNECT007

Recently, I met with IPC's Director of Regulatory Affairs and Government Relations, Fern Abrams. In the course of our conversation, we delved into everything from what her role entails and recent regulatory matters, to some of the group's successes and why companies need to get involved (it matters to your representatives in Congress or Parliament).

Patty Goldman: Fern, tell me about your position at IPC, and what you do.

Fern Abrams: Regarding my title, I am currently the director of regulatory affairs and government relations. Our vice president for government relations, John Hasselmann, wanted to emphasize the regulatory aspects of our work, hence, the reason for the title change.

Goldman: And what have you been doing lately?

Abrams: This week I've been here at SMTA, where we're holding our IPC fall meetings. On Monday we recognized the 2-18h Conflict Mineral Due Diligence Committee, for which I am

the staff liaison, for publishing a conflict minerals due diligence guide that was a long time in the making, and I think they're pretty pleased. It's a celebration well-earned. Then I gave a presentation to the EMS Executive Council. They had a meeting in conjunction with the fall meetings, and I delivered an update on some of the issues that I've been working on. The rest of the week I've been working as a staff liaison during committee meetings that are pertinent to the work I do.

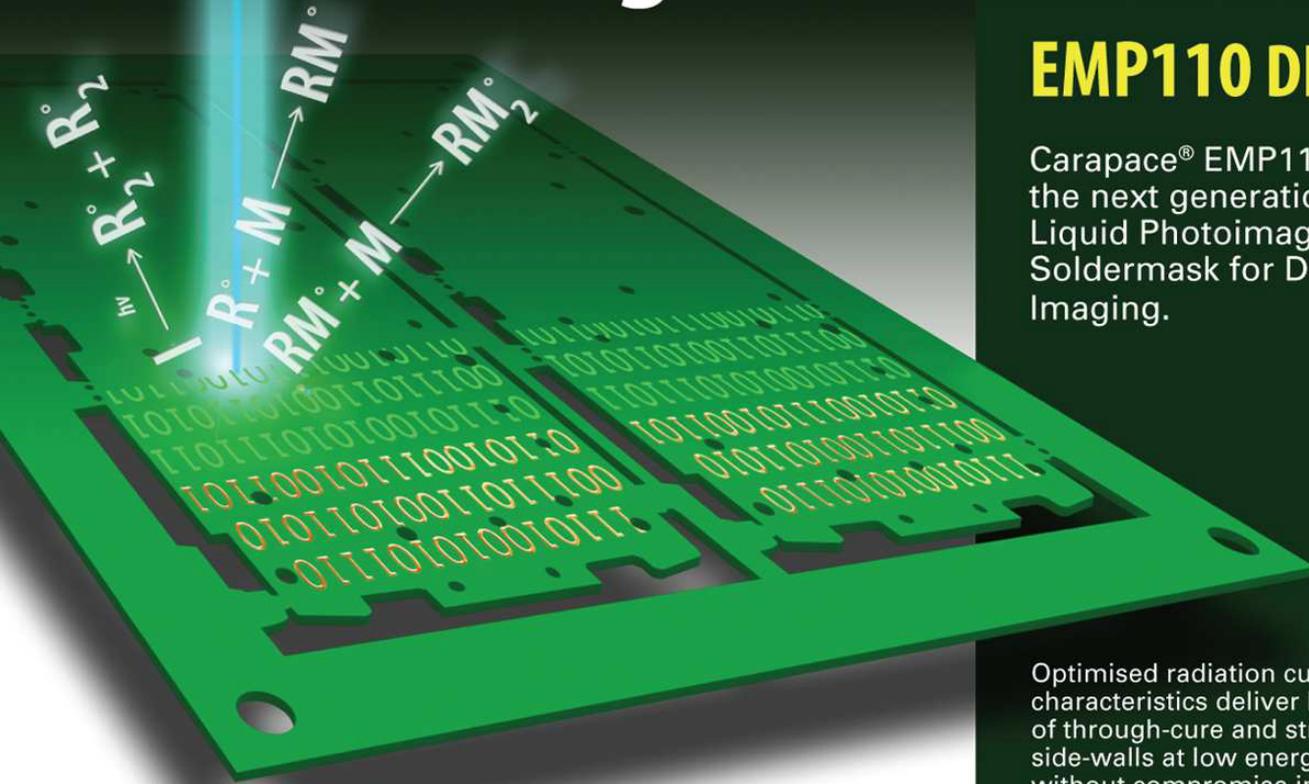
In addition to the due diligence committee, we have a number of standards committees, mostly in the areas of what we call data exchange standards, and they help companies define the information that they pass up and down through the supply chain. So many regulations, especially international, such as REACH and RoHS, and now conflict minerals, require companies to be responsible for not just what they make, but all through their supply chain. That data has to move up and down the supply chain, and that's what those data exchange standards facilitate.

Goldman: Our December issues are going to focus on trade associations. Perhaps you can expand a little bit more on your portion of IPC, the regu-



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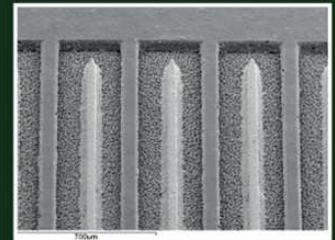
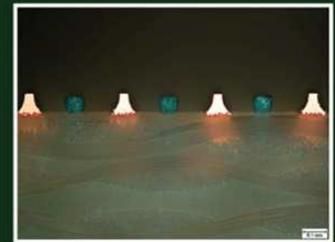


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IPC'S FERN ABRAMS: KEEPING UP WITH REGULATORY MATTERS



Fern Abrams, Director of Regulatory Affairs and Government Relations, IPC.

latory and government relations, and what your group does.

Abrams: I usually like to give people a picture of government relations as a giant funnel with two different ends. We collect information from our members, from the industry, and we use that to influence policymakers so that regulations accomplish their goals and are realistic.

Certainly we understand the importance of regulations in a functioning, modern society, but we want them to be effective and we want them to be as cost-efficient as possible, so that they accomplish their ultimate goals with the least amount of impact on the business that businesses are in, if you will.

Goldman: *That's science-based, then?*

Abrams: Certainly in the environmental area, that's science-based. We worked this summer with a coalition on proposed U.S. Department of Labor regulations. Sometimes we get into economics. I don't think of that as a science, but there are certainly people who do. I would certainly say we want our environmental regulations to be science-based, and we want the

rest to be based on factual evidence or our best knowledge.

There's a second side to that funnel. We collect information from government and we share that with our members. We do that in a number of ways, by the presentations we give to groups, like the one I mentioned that I gave on Monday. Next month I'm scheduled to address our PERM Council, made up of leading aerospace and defense contractors, on regulations affecting their products.

We get information out that way. Of course we get information out through publications, such as I-Connect007, print magazines, or web magazines. We post to our website and IPC blog. We're really in the information business when it comes to government relations.

Goldman: *Now, you've been doing this for quite a while, right?*

Abrams: I just celebrated my 15th anniversary with IPC this spring, so that was exciting. I can look back and see how things have evolved and changed both for the association and for the work I do.

Goldman: *What are some of the more important things you think you were able to accomplish, despite the membership, or with the membership? I'm thinking of the fact that everybody always says, "Can't we just ignore government?" But of course, you can't.*

Abrams: One of the big shifts that I've observed, and that my predecessor, Holly Evans, who is now at Microsoft, has noted when we compare notes is that when I started with IPC, and working just on environmental health and safety, for the first six years we were pretty much a U.S.-based organization. Most members' environmental concerns had to do with their facility—what happened at the perimeter, what went up in the air, what went out in the water. It was EPA and it was OSHA.

I contrast that with today. While we still monitor the EPA and there are still a lot of issues, we're a global organization, and many of the regulations that have the largest impact on our members are not here in the U.S.

IPC'S FERN ABRAMS: KEEPING UP WITH REGULATORY MATTERS

Goldman: *You are referring to the European ones?*

Abrams: Yes. They've been very active on regulations. The RoHS directive, the REACH regulation, those were monumental adjustments for the industry, not just getting away from lead, but from a compliance standpoint, because it shifted from what's at your facility to what's in your product. At that point, even if you're manufacturing in the U.S., you're manufacturing a global product. You now have to be cognizant of regulations on your product all across the world. It forced companies, even if they were only domestic, to have a much more global focus.

It focused the supply chain on working together in a way they never had. For the end product manufacturers, that was something their suppliers worried about. The OEMs didn't have a plant. They didn't need to worry about it. Now it's about what's in the product, and they are the ones that are ultimately responsible. The family of data exchange standards started with the implementation of the RoHS directive and industry realizing it needed a way to deal with this.

Goldman: *That is a huge difference.*

Abrams: To go back to your question, certainly the data exchange standards are a big accomplishment. IEC now has a data exchange standard, and there were meetings just this weekend between IPC and IEC to work on further aligning the data exchange standards. But IPC is still viewed by many as the leader in this aspect.

A lot of the wins that I can point out are where we made something a little less burdensome. Conflict minerals is an example. We lobbied on that for three years. It was inserted into Dodd-Frank literally at 11 o'clock at night by the staff for the senator in question. People asked, "Why is the SEC regulating conflict minerals?" Well, it was because they were moving a finance bill, and that's where the senator had jurisdiction, and so that's where he stuck it. There's no logical reason. I definitely wouldn't put that in the win category, but after the law was passed, we worked with the SEC a lot, and as onerous as

it is today, I think it would be much worse if we hadn't been involved.

We're right now rolling up our sleeves in Europe and seeing if we can continue some sensible response. The EU Commission, which we worked really closely with for over two years on conflict minerals, I think really heard our message about how devastating Dodd-Frank had been on industry, and how it had failed to accomplish its goals. So they proposed a voluntary system, but the parliament was led on, I think, by sound bites and NGO lobbies and politics, of course, for mandatory regulations. Those debates are ongoing right now. We just held a conference on government regulation

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“ We have had several big wins in my 15 years. One was in 2002. The EPA had proposed regulations in 2001 on effluent from wastewater treatment, mainly affecting our printed circuit board members. ”

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in Essen, Germany, where we discussed conflict minerals, along with RoHS exemptions, some of which are expiring, and the recent EU Court of Justice ruling on REACH "Once an Article, Always an Article."

We have had several big wins in my 15 years. One was in 2002. The EPA had proposed regulations in 2001 on effluent from wastewater treatment, mainly affecting our printed circuit board members. They make sure the wastewater has to be treated before it's discharged, and EPA sets limits for what needs to be in that wastewater.

The regulations they proposed were based on sloppy data and math management. It wasn't even science. They were supposed to be based on technically achievable things, except

IPC'S FERN ABRAMS: KEEPING UP WITH REGULATORY MATTERS

that they actually violated known laws of science and solubility. Anyway, we calculated that it would cost each facility a quarter of a million dollars a year to implement these regulations. We hired an economist to assess the stress that would pose on the industry, and they came up with a percentage of companies that would be forced out of business.

Goldman: *It was probably significant.*

Abrams: The EPA had calculated seven, and the numbers that our experts came up with was in the couple hundreds. The EPA had made some really flawed assumptions that the cost of compliance could just be completely passed on to the customers.

In the end, after two years of hard work by our EHS steering committee members and board members, with members testifying and hearings across the country, the EPA completely walked away from the regulations and proposed no changes.

Goldman: *That's a huge win, because you don't usually win against the EPA.*

Abrams: It is a huge win because no, you don't get it very often. Two years ago, we were completely successful—another big win—on export controls. The Obama administration had



proposed a complete reexamination of export controls in the country, and the idea that a lot of the aerospace industry had been advocating was every little pump and screw and hose is regulated under ITAR if it goes into a defense item. The system is completely broken, truly.

The goal of the administration was to put higher walls and better controls on a smaller number of items, to truly determine what needed to be protected and what did not. From a PCB perspective, we saw this as an opportunity to clarify what we saw as broad misunderstandings about the nature of PCBs throughout electronics, and particularly in the defense industry.

I sat down with a major defense OEM, the head of their ITAR compliance, and this person said to me, "We know they're commodity items; they could go in our system, or they could go in a toaster."

Goldman: *Because, of course, we all know that every circuit board is pretty much unique.*

Abrams: Yes, each is designed for a specific item. What I realized was the problem with the way export controls were written and the way that our supply chain works, even if it's in the same company doing their own manufacturing, the engineers that know that a PCB is individually designed and the lawyers who understand ITAR are in completely separate parts of the company.

And if you have suppliers who are building your boards and their word is filtering up, you've got even more misinformation. IPC took this as an opportunity to do outreach to the industry. We launched an educational campaign. We also hired one of the top lawyers in export controls, and as a result of all this, when the State Department issued a revised U.S. Munitions List for electronics, they made very clear exactly what we sought to explain: The classification of the circuit board should match the item for which it's manufactured.

You could have a classified plane, and it might have a radio system that's the same as a radio system in a Boeing passenger jet. Just because it's on a classified plane, that circuit board doesn't need to be restricted under ITAR. But if that circuit board is being designed for an ITAR-restricted item, then that circuit board

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also needs to be controlled under ITAR, because it contains vital information about the function of the item for which it's designed.

This took a lot of education with the State Department, because it's very different from the way most ITAR controls are written. Most of them are based on some intrinsic physical value. It's faster, it's stronger, it's a particular shape, etc. This was a big educational project for us and it took multiple years. We could not have done it without our member involvement. We had lead technology heads from Viasystems and TTM, who came with us and went to these meetings with State repeatedly and explained it, who went to meetings on the Hill and met with the House Armed Service Committee and explained it.

I think that's really one of the strengths of IPC when it comes to government relations. One of the things we bring that's different from many of the other associations and organiza-

tions in the same space, is when we lobby we have strong technical arguments to back it up. Not only do we want science-based laws and regulations, when we advocate for something, it's because there's science and technology behind it.

Goldman: Also, you don't just go to Washington. Your members go there beside you. Your members are there as support and they testify also.

Abrams: Not as support, as lead. We're there to support them.

Goldman: And I'm sure their voices speak much more loudly.

Abrams: Exactly. I can't emphasize that enough, I'm so glad you brought up that point. I can't emphasize enough how much a difference that makes when a member comes and takes

IPC'S FERN ABRAMS: KEEPING UP WITH REGULATORY MATTERS

the time to leave their business and to travel to Washington, and they can say, "I work for this company. We employ X-number of people in this city. This is the problem I have in my plant," it makes a huge impact. Whenever we can, we encourage members to come. Whenever we have a big meeting on a policy issue, we have members there.

Then, annually, we have an event called [IM-PACT](#)—it was in April this year—where we do what I call proactive work. We're not necessarily lobbying on a specific issue; we might tell Congress about our policy framework and the issues that we're working on, but we're really there to build relationships, to let people meet and talk with their representatives so when we do need to call on them, that relationship is already there.

Goldman: *Those are some really big wins. That was great.*

Abrams: That's two that come to mind in a 15-year career.

Goldman: *Does that get discouraging?*

Abrams: No, it's part of the job. I could maybe come up with more, if we went into the medium-sized, but those are the big ones. Maybe another would be persuading the European Union (EU) not to list additional substances under RoHS.

Goldman: *And how is it looking for that?*

Abrams: When the EU revised RoHS in 2011, it was only a partial victory, because they delegated that to the EU Commission, and so we get to work with the bureaucrats, and it gets to be a quasi-science-based process, as opposed to a fully political one. The EU did restrict four additional substances this year, and there will be more to come. That's why I'd put that in the medium victory category.

Goldman: *Okay, thanks so much for filling all of us in and talking with me. This is really good information. I don't think we can emphasize enough to our members how important they are in government relations.*



Abrams: I agree.

Goldman: *You're a lobbyist, more or less. I don't know if you call yourself that, or you think of yourself as such.*

Abrams: I am a registered lobbyist.

Goldman: *Of course, but our members are not. They represent companies and people employed, and that makes a huge difference to the people in Washington.*

Abrams: In Washington, in Brussels, or in Beijing. I didn't talk about our work in China at all, because we have really great on-site people there, and their system is completely different from ours. You would never say "lobbying" in China, it's all about relationship-building. Europe's system is a little closer to ours, so I do work in Europe sometimes because those regulations affect our members. It's not just about Washington.

Goldman: *Thank you so much.*

Abrams: Thank you, Patty. **PCB**

The Value of IPC's Validation Services

by **Patty Goldman**
I-CONNECT007

I recently spent a little time with IPC Director of Validation Services Randy Cherry, learning more about this relatively new program and how it was evolving. I also wanted to make sure that it was something that the industry wanted and felt a need for. Randy is on top of just about everything, it turns out, and provided great detail on the various aspects of this arm of IPC, including the newest program, Standards Gap Analysis.

Patty Goldman: *Randy, tell me a little about yourself and what you are doing at IPC, and then we'll get into the nitty-gritty about your goals and some new offerings from IPC.*

Randy Cherry: Thank you very much for this opportunity, Patty. I've been with IPC a little more than two years now and I have about 30 years of experience in the OEM industry. I spent the last 21 years working for Tellabs in Naperville, Illinois, as a process engineer.

Goldman: *What can you tell us about Validation Services?*



Cherry: Validation Services is basically a series of audit certification programs built around the IPC standards, mainly the more popular ones like J-STD-001, IPC A-610 and others that are used throughout the entire industry—pretty much everywhere.



Randy Cherry.

Basically, we certify companies to those IPC standards. Prior to Validation Services, IPC had certification programs for individual employees of companies. You could go to one of the recognized IPC training centers, take the class and exam, and you could either become a Certified IPC Specialist (CIS), or a Certified IPC Trainer (CIT). That's all focused on the individuals of various companies.

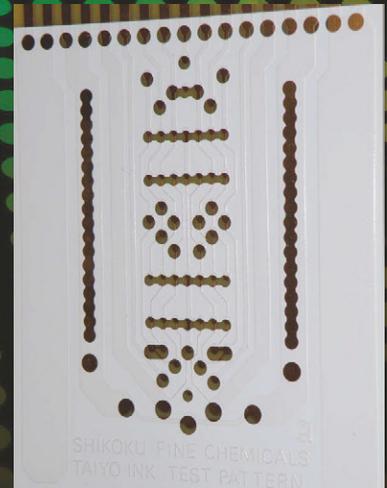
Goldman: *It was only for certain standards, right?*

Cherry: That is correct. IPC Validation Services takes it to the next level and certifies the facility or the actual site, the company site, to the same IPC standards.

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Goldman: If they say, "We build everything to A-610," then you go in and certify that they do indeed do that. As opposed to just saying so, they actually have some certification behind it.

Cherry: That is correct. Once the company site passes and meets the criteria of the program, then that company is listed on a Qualified Manufacturer's Listing (QML), that's up on the IPC Validation Services website. That's currently an open site; anyone can view it.

Goldman: How many different standards are you certifying to now?

Cherry: We have several current programs. On the QML side, we have a program, as I said, for J-STD-001 and A-610. I also have the space addendum program for 001. You have to pass Class III first, and then the next step would be to go for the space addendum.

I also have a QML program for the IPC/WHMA-A-620 Standard, that's the wire-harness and cable assembly standard. We even have an intellectual property program standard built around IPC 1071-A. Those are our current programs that we have in place today.

Goldman: How is the program going?

Cherry: It's going really well. We have completed about 20 audits so far for the J-STD-001/A-610

program. We kicked off the A-620 program around the time of APEX this year, and we've got a handful of companies we're working with there. The intellectual property program hasn't really taken off yet. We're also working on another standard, the IPC-1072, which is intellectual property for companies who do print circuit board assembly, like EMS companies. We're hoping that once we get the second one out, the two standards together will generate a buzz.

Goldman: They would work together because you would audit both standards at one time?

Cherry: That is correct. I should be clear—the 1072 is for EMS companies, the IPC-1071-A is for PCB fabricators.

Goldman: Is everything in North America? And do you personally conduct the audits?

Cherry: It's a global program and I design and create the programs. I do the initial beta site audits and just get the bugs out of the program, to where I feel it's ready to go. Then I do have other auditors that I train. I have another auditor here in the U.S., two out of our IPC China facility, and then I have an auditor in IPC India.

Goldman: So you aren't running all over the world.

Cherry: No, but I do travel to China to make sure all is going well.

Goldman: How many of the companies that you've certified are in China?

Cherry: Currently on the 001-610 program we've certified three EMS companies.

Goldman: Are you working on a program for PCB manufacturers using IPC-A-600 and IPC-6012?

Cherry: That's one of my new programs that we're going to be introducing soon. I gave a presentation in September to the IPC-6012/A-600 technical committee here at Rosemont, and the presentation I gave was about the new QML program built around those two standards. We had more than 30 people in attendance and

THE VALUE OF IPC'S VALIDATION SERVICES

it was very well received. The audience members were circuit board fabricators and OEMs who obviously have a strong interest in that industry.

Goldman: *It's important that the OEMs are really interested in the program, because that gets the board shops more interested in qualifying.*

Cherry: That's absolutely correct.

Goldman: *Again, just because they have the spec on-site, they may be using it, but certifying is one step further. It's like a guarantee. Not just saying so, but the action behind it.*

Cherry: The IPC-6012/A-600 program is much different than the others. For example, the J-STD-001/A-610 program is more of an inspection-based program, where your IPC-6012/A-600 has several IPC test methods involved. Since IPC doesn't have a test lab, I had to partner with two other companies to get this program off the ground. The companies I partnered with were Conductor Analysis Technology, otherwise known as CAT Inc., based in Albuquerque, New Mexico, and Robison Laboratories based in Indianapolis, Indiana. The three of us are going to work together to kick the program off.

As you alluded to earlier, at IPC I'll be doing the early audits, keeping the audit portion of the program in check, and then we'll be building some test coupons. These test coupons come from IPC 2221 Appendix A, we're using the AB/R and the D coupon to start with. Our focus is on rigid boards Class II and Class III. Once again, these can run in parallel; while the board shop is fabricating the test coupons, I can be doing the audit or vice-versa—it doesn't matter.

Goldman: *Your audits are on-site, obviously. At the same time they've got to build these coupons and have them tested as part of the audit? That's very impressive.*

Cherry: Like I said, we plan to kick this program off very soon. Speaking to the IPC-6012/A-600 Committee was invaluable because I got very

good feedback right away and I challenged the committee members to give us some help on future roadmaps. This is just the introductory phase. We want to add rigid-flex, flex circuits, and there are other IPC standards we want to bring into this program. But instead of IPC setting the direction, I want the committee members to take ownership of this program and give us feedback and we'll use that to steer the program for future revisions.

Goldman: *I'm guessing a lot of companies in the U.S. and North America are very familiar with the standards and have been using them and living to them for a long time.*

Cherry: That's correct.

Goldman: *Outside of this country, say in Asia, they haven't been working with them nearly as long and perhaps don't give them the credence and weight that they might deserve. I presume eventually you're going to delve more into that part of the world.*

Cherry: We'll keep the program in the U.S. for a few months, once again, to build up a database. As we get more test coupons' submissions completed, they're all going into a database where we'll set up a subscription for the OEMs to view all this test data from these various board shops. But because we have IPC China and we already have auditors there that are IPC employees, I would then go over to China and start training them on this program. Probably shadow those auditors at a couple of audits like I did with prior programs. Then, like I said, they'll go off and start doing them on their own.

Goldman: *Are these audits very expensive? How does that work?*

Cherry: The pricing is really a variety of pricing, and it's all based on how many hours you're going to be on-site, also the type of testing that we're doing. The testing for IPC-6012 we're using Table 4-3, and there's roughly 30 different tests that you're doing there.

Goldman: *That's significant.*

THE VALUE OF IPC'S VALIDATION SERVICES

Cherry: I'm very aware of the costs only because I know the PCB fabricators feel they're already getting audited to death, and they already do a lot of testing for their customers. I did a lot of research and talked to many board shops well in advance of designing this program. I used that feedback and plugged that into the model to try to keep the cost low.

Goldman: *Are you hoping that this replaces some of those other customer audits?*

Cherry: I don't want to say "replace" or "eliminate." I want to use terms like "reduce the frequency" of the audits.

Goldman: *It's an augment, I suppose.*

Cherry: Right. Another term I've been using instead of customer audits, they turn into customer business meetings. Where your financial people, your supply chain, your procurement people get involved and the focus is more just on price and delivery and the emphasis pulls back from the technical side of it, because they'll be looking at IPC for that.

Let me explain further. When I used to work for Tellabs, I was the process engineer and the auditor for the circuit board shops. When I



would go over to China to do audits, it'd be myself on the technical side and a quality engineer with me, as well as a commodity manager. The commodity manager's only job is price, delivery and lead time. That's all they care about. I'm focused on the technical part, and the quality guy looks at the ISO-type things, documentation, things like that. As you can imagine, it's very expensive for my former company to fly three people overseas.

And a lot of OEMs audit every year. Think about that: three people, every year.

Goldman: *Three people visit one facility?*

Cherry: To one facility or to a host of facilities when you visit China. If the OEMs get in line and support this program, then they don't need to send that technical person or that quality person over to China every year. Maybe it's every two years or every three years. The commodity person, that person would still go, but now you're flying over one person instead of three.

So there's a huge savings there to the OEM, and like I said, if we can reduce the frequency of the OEM audits, the board shops would be very satisfied with that. It's kind of the chicken and the egg, but it's a situation where the OEMs are looking to see if the board shops are going to participate, and the board shops are looking at whether OEMs are going to put this in their requirement documents; the board shop has to be IPC certified to the standard.

Goldman: *It's a matter of getting a little critical mass going here. Then do you expect it may snowball in both directions?*

Cherry: Yes, that would be perfect. If we could get that type of momentum.

I also have another program that I'd like to talk about, Patty. This is a program in which I'm kind of targeting small companies and companies that are not familiar with IPC's offerings or IPC standards. We came up with a new program called the Standards Gap Analysis program, known as SGA.

Once again, I can go into an OEM that does in-house manufacturing or a small EMS company, for example, that doesn't fully know all

THE VALUE OF IPC'S VALIDATION SERVICES

of the benefits that IPC offers. There I can come in, visit for a day, take a walk through their factory, look for gaps, and make recommendations on how they can improve their process, or yet again, how they can bring it up to the IPC standard level, so to speak. I've talked to companies already, and they're all very interested in this program. Obviously the costs are much lower; it's a flat hourly rate based on how many hours I'm there, and it's real easy. There are no IP issues or anything like that that you have to deal with. We just come in and walk through the facility.

Goldman: *You're not really certifying them, just advising.*

Cherry: Just advising, yes. I'm trying to help these companies have a better understanding of what IPC is trying to offer. Now this may, 12 months down the road, turn into an audit for a possible QML, but there's no pressure. Nothing like that.

Goldman: *Is that geared towards assembly, or PCB, or both?*

Cherry: It's directed at both. I'd even do it for wire and cable companies. Anyone who's more interested in learning about who IPC is would be ideal for this program. I say smaller compa-

nies, Patty, and let me expand on that. A lot of the smaller companies work on very tight budgets. They don't have a lot of money to invest in an audit program, but they also don't have a lot of money to invest in process engineering.

They don't have a Randy Cherry, for example. That's where I can come in and really help these companies out. EMS companies referred to it as the Tier Three, Four and Five companies and things like that. Once again, we just started rolling this program out here in September. We've had a couple of successes already and during this show here in Rosemont, I've had three or four companies come up and ask me about the SGA program, wanting to know more about that versus our QML programs for the audit certification. I also provide a report showing the gap analysis.

Goldman: *So you actually come back with a final analysis?*

Cherry: Yes, exactly.

Goldman: *Thanks again, Randy, for your time.*

Cherry: Thank you.

To contact Randy Cherry, or to learn more about IPC's SGA program, [click here](#). PCB

Photon Energy Loss Minimized with New Plastic Solar Cell

As the world increasingly looks to alternative sources of energy, inexpensive and environmentally friendly polymer-based solar cells have attracted significant attention, but they still do not match the power harvest of their more expensive silicon-based counterparts.

Now, researchers at the RIKEN Center for Emergent Matter Science and Kyoto University's Department of Polymer Chemistry have shown that a newly developed polymer can minimize energy loss as well as silicon-based solar cells when converting photon energy from sunlight to electricity.

Solar cells work because photons from the sun strike electrons and move them into a position where they can create an electric current. Photon energy loss was greater in polymer-based solar cells than in silicon-based ones.

"In polymer-based plastic solar cells, larger photon energy loss causes lower voltage. This has been one of the largest limiting factors for efficiency," explains Hideo Ohkita, one of the authors of the study, published in *Nature Communications*.

The group began working with the new polymer, where oxygen rather than sulfur atoms are located at key positions, and found that the new material was able to overcome some of the key obstacles to extracting and utilizing greater energy from sunlight.

Infinion Acquires 9.4% Stake in Schweizer Electronic

By investing into Schweizer, Infineon emphasizes its intention to jointly develop technologies for the integration of power semiconductors into PCBs and to tap the chip embedding market for high-power automotive and industrial applications.

Lenthor Achieves ISO 9001:2008 Re-certification

Lenthor Engineering, Inc. has successfully completed its corporate ISO 9001:2008 re-certification. The re-certification audit was performed at Lenthor's new 55k sq/ft corporate facilities in Milpitas, CA.

Complete Coverage of IPC APEX EXPO 2015

For those of you who weren't able to visit this year's IPC APEX EXPO, tune in to RealTime with... IPC to watch I-Connect007 interview many of the industry's movers and shakers.



Isola Unveils New Technical Education Series

Isola Group S.à r.l., a market leader in copper-clad laminates and dielectric prepreg materials used to fabricate advanced multilayer Printed Circuit Boards (PCBs), today announced the launch of a new Technical Education Series (TES) to address the increasingly important role of laminate materials in the overall process of system-level design.

N.A. PCB Book-to-Bill Ratio Strengthens

"Although North American PCB sales continued slightly below last year's levels in February, bookings strengthened," said Sharon Starr, IPC's director of market research, "This increased the book-to-bill ratio," she added. "The ratio has been in positive territory for the past five months, which is a positive indicator for sales growth in the first half of 2015."

Invotec Acquisition Strengthens Amphenol's Global Capabilities

The acquisition of Invotec, one of the global leaders in flex and flex-rigid PCB manufacturing, strengthens Amphenol's global capabilities and product offering in the defense, industrial and aerospace industries.

Sparton Acquires Hunter Technology Corporation

Sparton Corporation announced that its wholly owned subsidiary, Sparton Hunter Corporation, completed a merger with Hunter Technology Corporation in a \$55 million all-cash transaction. The merger is subject to certain and conditional post-closing adjustments.



Key PCB Makers Strategize to Meet Industry Demands

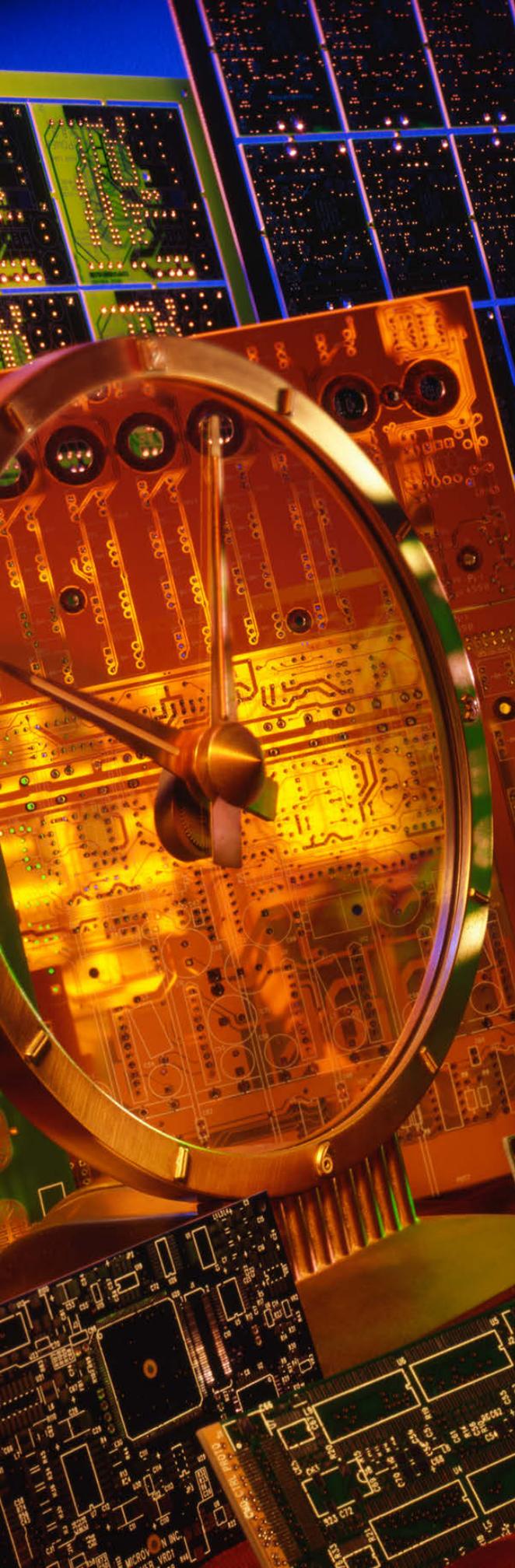
The computer/peripheral application is expected to witness the highest growth followed by the communication applications. Top industry players are going for partnership and strategic alliances to deliver unique solutions and to meet the constantly changing industry demands of customers.

Isola's New Laminate Mitigates Skew in High Speed Designs

Isola Group today announced the introduction of Chronon™, the company's latest ultra-low loss, high-speed laminate and prepreg materials engineered to mitigate skew issues in high-speed designs that have differential pairs.

IPC Honors Volunteers for Contributions to the Industry

IPC presented Committee Leadership, Distinguished Committee Service, and Special Recognition Awards at IPC APEX EXPO at Mandalay Bay Convention Center in Las Vegas, Nevada. The awards were presented to individuals who made significant contributions to IPC and the industry by lending their time and expertise through IPC committee service.



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.....

Dieter is Gone and I Don't Feel so Good Myself!

by **Doug Sober**

ESSEX TECHNOLOGIES

With apologies to Lewis Grizzard, who has a book title of similar ilk, the pioneers of electronics standardization are dying. IPC and IEC, the two principle purveyors of standards for base materials, boards and electronic assemblies, are losing their technical experts. Neither organization is losing its influence over the industry, however, experts that wrote the technical standards for the past 30 years are leaving the industry. Some are working new jobs in other industries, some are retiring, and yes, even some are still arguing the difference between base materials and interconnecting structures in the heavens. We need some new blood within the organizations, but first—a little about the trade associations themselves.

IPC

When National Electrical Manufacturers Association (NEMA) lost its influence over the copper-clad laminate standardization process, IPC was there to pick up the ball. IPC is a

USA-based organization with members and offices worldwide. Members of IPC pay dues for each company site registered. A large company may have a number of registered sites while a consultant may only have their home address on file.

IPC is organized into General Committees based on which part of the supply chain is being addressed. It begins with the Base Materials General Committee, the Printed Board General Committee, the Assembly General Committee and several support committees. The General Committees are then subdivided into subcommittees and again finally divided into task groups (TGs). Serving as the chairman of the Base Materials General Committee since 1996, I have two sub-committees and eight working groups (Figure 1). Please note that many of the positions are open or are inactive due to a lack of leadership. The Base Materials Chairmen and Vice Chairman shown do not have “one foot in the grave” but we all know where the cem-





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etry is. These positions need to be filled with young, talented and aggressive experts from the industry.

Standards are developed using a four-step process. First the concept or idea is presented to the Technical Activities Executive Committee (TAEC), which is comprised of both past and present General Committee chairmen and staff liaisons. Once approved, the appropriate task group develops the document as the second step. There are a series of comment periods as the document is refined and more reflective of the wishes of the membership. Once the document has been completed, the third step is a circulation resulting in a vote of either yes or no. Each IPC member company gets one vote if they have volunteered to be part of the voting process. The final step is the comment resolution, where "no" votes are resolved as appropriate. Documents at IPC can be published over any "no" votes provided

there have been ample attempts to resolve the conflicting points. This process typically takes 15–30 months to complete.

IEC

The International Electrotechnical Commission (IEC), based in Geneva, Switzerland, has a membership made up of countries not companies. Each country pays their dues from the "National Committee" to IEC in order to be a voting member. In the U.S., the actual voting organization or our National Committee is ANSI, based out of Washington DC. Our USA industry experts pay an annual fee of a little less than \$300 for the privilege of working on the IEC standards. A veritable bargain you might say. Our experts come from a number of USA trade associations including IPC, JEDEC, iNEMI, IEEE, and the like.

The IEC is made up of a number of technical committees or TCs. TC91, which develops most

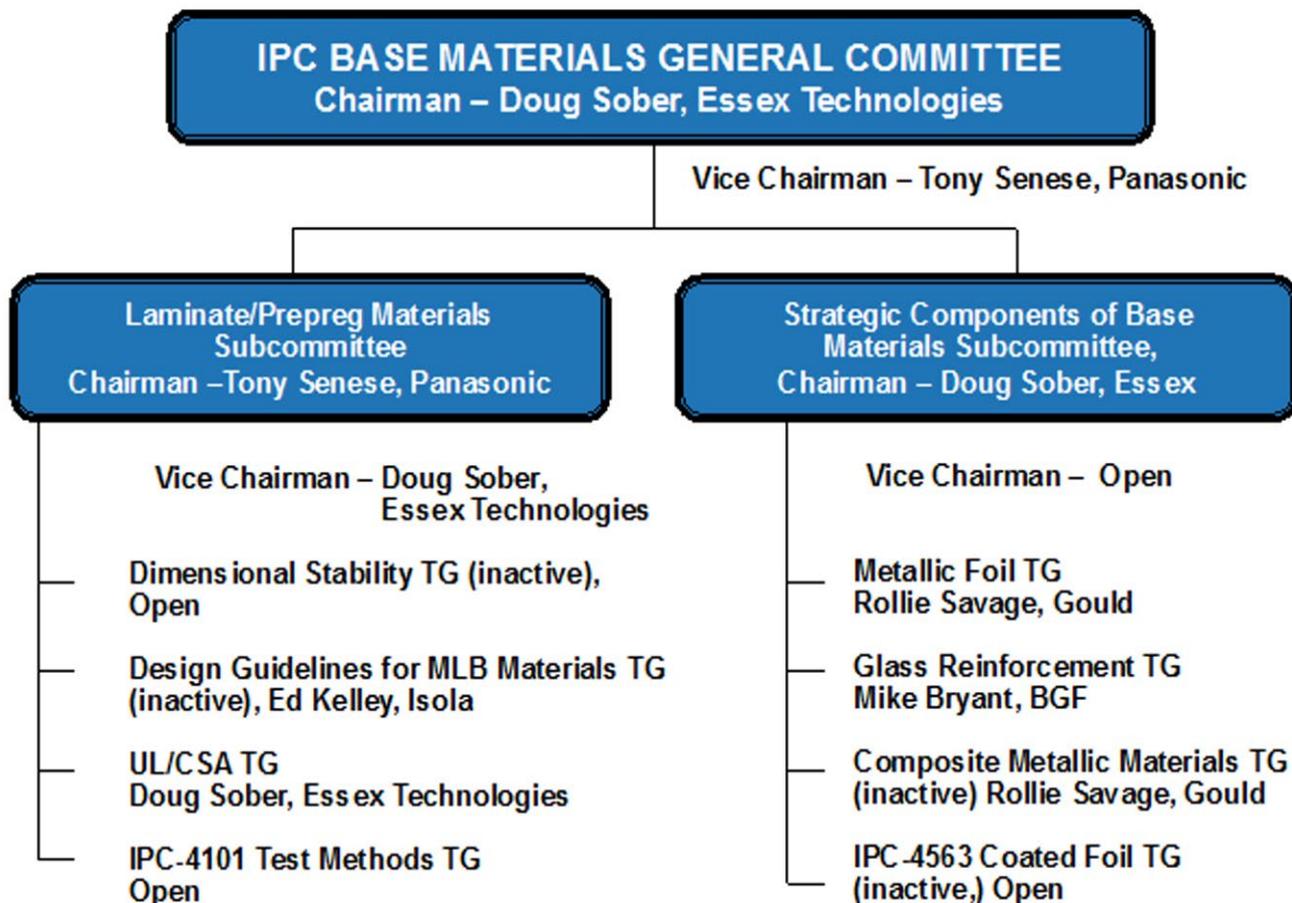


Figure 1: Organization of the IPC Base Materials Committee.

DIETER IS GONE AND I DON'T FEEL SO GOOD MYSELF!

of the standards for this industry, is Electronics Assembly Technology committee, and it has a number of Working Groups:

- WG1 Requirements for Boards
- WG2 Requirements for Assemblies
- WG3 Test Methods for Assemblies
- WG4 Base Materials and Printed Boards
- WG5 Terms and Definitions
- WG6 Embedded Substrates
- WG10 Test Methods for Boards and Materials
- WG11 Printed Board Data Description & Transfer
- WG12 Design of Printed Boards & Assemblies
- WG13 Design Automation, Components, Circuits & Systems
- WG14 Design Automation, Library of Reusable Parts
- WG15 Design Automation, Testing

I am the conveyor of Working Group 4 on Base Materials and Boards. There are 19 member countries that vote on the documents that are developed. The process for standards development entails a country proposing a New Work Item Proposal (NWIP). The countries then vote and propose an industry expert from their country to work on the document. The first circulation of a proposal is called a Committee Draft (CD). Comments are resolved resulting in a second circulation called a Committee Draft Voting (CDV) where countries make comments but in addition vote “Aye” or “Nay.” The comments are then resolved and this ends the ability to make technical revisions. The near-standard is then circulated once more for a final country vote in a step called Final Draft International Standard (FDIS). The document is then ready to be published. Just kidding. For some inexplicable reason, the standard must then be translated into French, a process requiring about six months. It must be due the large number of CCL/prepreg suppliers, PWB shops and assembly houses located there. Thus the total time for developing an IEC standard is 30–36 months.

What do both of these standards' organizations have in common? There are a very limited

number of people that actually put pen to paper, or in today's terms, fingertips to keyboard to create the first strawman documents and working drafts. These working experts, as opposed to reviewing experts, are slowly disappearing for reasons outlined elsewhere. There is no one left to do the heavy lifting. Perhaps it was easier for these people to write effective documents since they had grown up in the business and all of the historical perspective was at their fingertips.

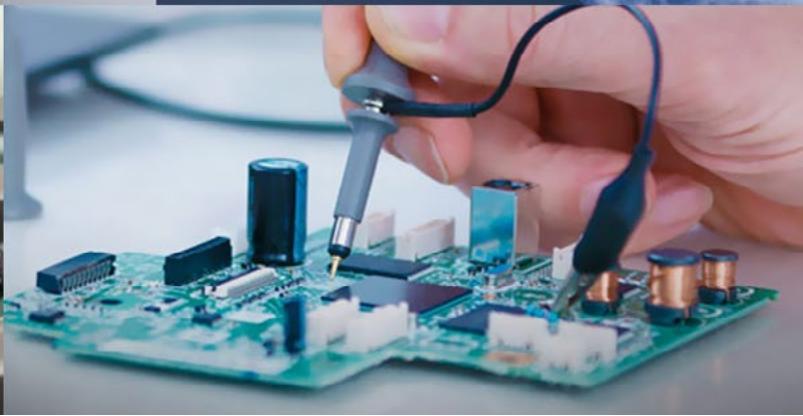
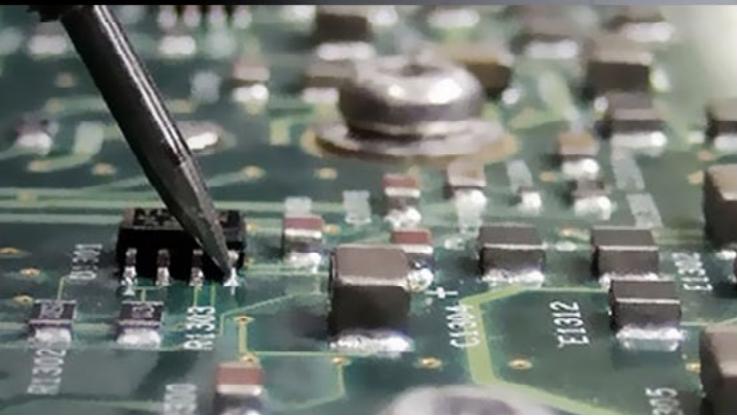
“These working experts, as opposed to reviewing experts, are slowly disappearing for reasons outlined elsewhere.”

I am sure that there are technical people out there that have the talent, experience and ambition to get involved with the industry standards organizations and write the new documents. But in looking around the room at the standards meetings, all I see is the old guard. Why no new blood? Some of the problem may be that their employers seem to feel that there is no value in standards development. Others just do not want to take the time. Company travel and living expenses to attend meetings may also be an issue. However, these groups are always the first to cry wolf when a standard does not reflect the products of their company.

Help me fill in the blanks of my Base Materials Organization Chart. I would like to pass the baton—but to whom? **PCB**



Doug Sober is the president of Essex Technologies Group and may be reached by [clicking here](#).



Working for the Industry: NTS' Renee Michalkiewicz

by **Patty Goldman**
I-CONNECT007

I spent some time with my friend and former colleague Renee Michalkiewicz, vice president and general manager at NTS Baltimore, formerly Trace Laboratories. I was interested in Renee's views on IPC and the Technical Activities Executive Council, of which she is currently the chairman, a position I held some years ago.

Patty Goldman: *Hi Renee. It's good to see you again. Please fill me in on you and your company.*

Renee Michalkiewicz: William McGinley, one of the founders of our previous parent company, Methode Electronics, was one of the original IPC founding members more than 50 years ago and was the first recipient of the IPC Hall of Fame award. When he started Trace Laboratories in 1980, there was no question that we would continue this IPC involvement. George Smith, another Hall of Famer, became president of Trace and was part of the small group that wrote the original IPC-TM-650 [test methods] document.

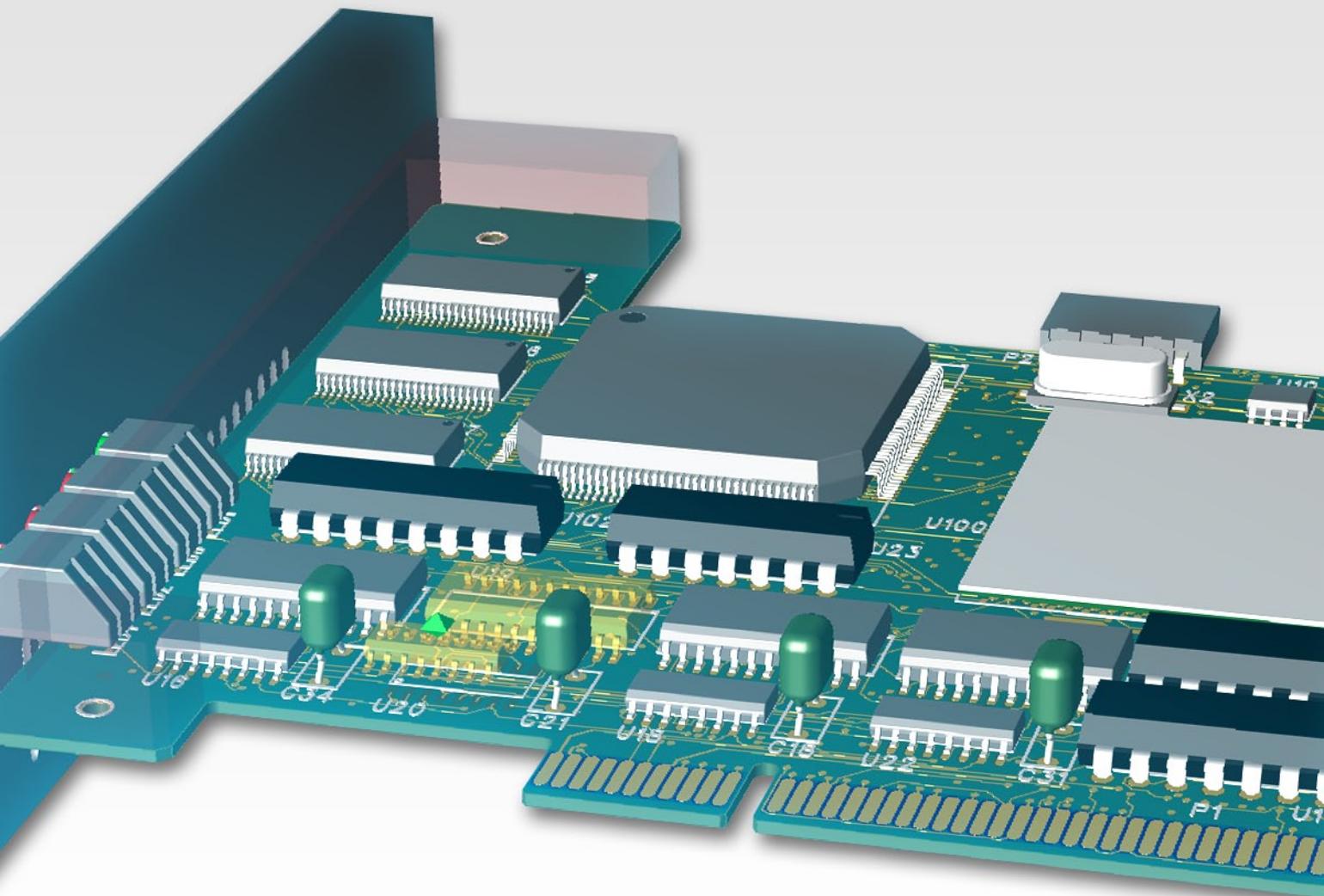
In February of this year we joined National Technical Systems and are now part of the largest test lab in the United States. Our Baltimore lab specializes in root cause failure analysis and electronics and materials testing. NTS as a whole is the leading independent provider of environmental simulation testing, inspection, and certification in the United States. It was really nice to join a lab that's so large with such expansive capabilities. We've really enjoyed the acquisition; it's been a great learning experience so far.



Renee Michalkiewicz

Goldman: *Great, and now you're chairman of IPC's Technical Activities Executive Council.*

Michalkiewicz: Yes, I'm chairman of the TAEC, and I've actually been a member of IPC for 20 years this year acting as an active member of many different standards development com-



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mittees. I started as a vice chair, did some task group work, then moved to general chair and became part of the TAEC a number of years ago and I am currently a lifetime member. Approximately a year and a half ago I was nominated to be the chairman of the TAEC; it is a great honor to be selected by my peers to lead that group for two years.

Goldman: *Why don't you tell us a little about what TAEC is—a lot of people might not know about it.*

Michalkiewicz: That is definitely true. The TAEC is made up of all the general committee chairs and vice chairs—and there are many standards committees. For example, there's Cleaning and Coating (5-30), Testing (7-10), Fabrication (PCB) Processes (4-10), PCB Base Materials (3-10), Assembly & Joining (5-20) and many others. Each has a general chair and vice chair, and usually several subcommittees reporting to it. There are many different groups represented.

I'm actually the chair of the Testing committee (7-10). All the general chairs get together in the TAEC meetings. We are responsible for the management function related to standardization within the IPC. We make decisions about committee work within the IPC, standards and specification development, and the standardization of these policies and procedures. All new standards-related projects that are initiated must be approved by the TAEC, and we have come up with a good process to vet these new

ideas. This is the higher-level work of the general chairmen.

Goldman: *How has it been during your tenure? I know your term is for two years.*

Michalkiewicz: That's right, two years. I have one more meeting, but I have about another six months or so. I've really enjoyed it. One of the things that we've initiated while I've been the chairman is to shorten our specification/publication cycle to three years, which is quite a task when you're reviewing a whole specification. The push for the shortened cycle is to make sure that our standards keep up with technology advancement.

Goldman: *How is that working with travel cut down? There used to be interim meetings every January, but I would guess most people couldn't justify attending.*

Michalkiewicz: Standards writing and reviewing does take time, but we're doing more and more via teleconference and that can be an hour long. It's not like you have to spend a whole eight-hour session here to get something accomplished. It could be once a month doing a conference call and things get accomplished.

Goldman: *That's a big time and money saver. That has to make the process much more efficient. What else is going on?*

Michalkiewicz: Another thing we are just beginning is a mentorship program. We're going to work with younger or less experienced engineers or new people coming into the field, and we're going to partner them with a mentor or a subject matter expert. They will be paired with a veteran IPC leader to work together and to help that person grow.

Goldman: *How is that going?*

Michalkiewicz: It's just getting started. It has just been announced, and we already have some people interested. The person being mentored will be able to attend sessions (being somewhat financially supported by the IPC). They will



Renee with IPC's Dave Bergman, conducting a TAEC meeting.

WORKING FOR THE INDUSTRY: NTS' RENEE MICHALKIEWICZ

present papers and attend the specification-writing subcommittees as well. The program will take advantage of all the different aspects of IPC, and SMTA too for that matter, because they'll do everything from working with industry experts to visiting exhibitors on the show floor. They'll go to conference sessions and present in some way, so it will be a very well-rounded experience.

Goldman: *There must be an application process. How does that work?*

Michalkiewicz: Right, they have to apply and there is a list of requirements that they need to meet. These requirements are undergoing final revision based upon some feedback. The idea was initially rolled out to the Committee Chairman Council, the CCC of IPC [consisting of all committee, subcommittee and task group chairmen], and that group had some feedback. We were originally going to work with an engineer who was one to three years out of school but I think we're going to allow more experience, because more experienced engineers will be more likely to be permitted to travel.

We'll probably extend that and it could even be somebody new to the field who has just come into electronics. I think we're going to expand the requirements so eligible individuals have at least a few years' experience and a commitment to attend IPC for three years.

Goldman: *Were there requirements as far as the type of company these "mentees" are from?*

Michalkiewicz: Not really, as long as they're from a member company, interested in the IPC, and willing to make a commitment for three years to help them grow.

Goldman: *I've been involved in IPC and TAEC and so forth for many years, as you know; we've been kind of sisters in that. Do you have any other input, or thoughts on IPC and what it's been for you, besides TAEC?*

Michalkiewicz: I actually don't come from an engineering background; I was in more of a management background when I stepped into



IPC's Jack Crawford presents Renee Michalkiewicz and Microtek's Debora Obitz with an award for updating the IPC-A-600 training program.

the electronics industry. I initially became involved when I started my position in quality at Trace. I right away began attending IPC and SMTA meetings, and that is actually where I got my experience. This is where I learned most of what I know.

Goldman: *You can learn so much.*

Michalkiewicz: You can learn so much just by attending these IPC and SMTA meetings. You can attend the paper sessions, go to training, etc. When you participate in the standards committees, you're working on the standards that are going to be used in the electronics industry. All that I know, I have learned from my colleagues and through these committee memberships.

Some of our newer engineers at our company are attending IPC and SMTA and learning so much by getting involved writing technical papers and contributing to the standards writing. There's no better way to learn.

Goldman: *One of the big things with IPC is the networking, as we know, and people think it's just about finding a job, but it's not. It's about knowing people, becoming friends with them and being able to talk with them and learn from them. If you're back at your job and you have a*

WORKING FOR THE INDUSTRY: NTS' RENEE MICHALKIEWICZ

question, you've got a whole list of people that you can call and talk to, and they'll talk with you and help you figure out your problem. I have made a lot of very good friends through IPC.

Michalkiewicz: And it doesn't matter whether they're a competitor or not, it really can be anybody. We all work together. You kind of drop the competition when you're in a room working on something and you all have the same goal in mind. It's just better for the industry.

Goldman: *Everybody's goal is to better the industry.*

Michalkiewicz: Like you said, once you've been coming to these meetings for 20 years, you have a very solid network and you can get the answer to just about any question you might have. You always know someone you can ask and if they can't help, they're going to point you to someone who can. It's just an endless network as far as information. It could be customers, colleagues, or it could be a position—let's say you lose your job or you're switching careers, you've got plenty of contacts. There really aren't any negatives.

Goldman: *Yes, definitely. Anything else you would like to add?*

Michalkiewicz: We're really trying to push to make sure that we have new talent coming up into the chairman positions. We're really trying to strive to make sure that we're getting people who've been involved in IPC or SMTA to come to the meetings, and we'll start to develop people into the chairs who really want to be a part of that.

Goldman: *Most likely people who are committee members and "doers" already.*

Michalkiewicz: Yes, and we want to help them get up to the point that they will become, after five years, a lifetime member of TAEC. We're working with some people trying to target some of our key talent and help them move up into those positions. We want to work with

anybody young coming in to get them more involved.

Goldman: *When I became a chairman, which was a long time ago, one of the big things I learned was how to manage people and meetings; because you're managing volunteers and it's like herding cats. You learn how to motivate volunteers and keep everyone working towards the same goal. People have differences, different opinions as to how something should read or how strict a spec should be. So you learn how to bring them together.*

Michalkiewicz: You do. When I first started as a new chair, I had some good mentors who worked with me in the chairmanship, and right now we're actually putting together a more formal training program for the chairs. We had our first session this Sunday where we had a group of chairmen in the room and we talked about some of those techniques that you can use to make your meetings run more smoothly. Now, we're going to have a meeting, or a training session each time before the standards meetings start.

Goldman: *And it's not just running a meeting but it is how to get people enthused and moving in the same direction.*

Michalkiewicz: Right. I mean honestly you can have conflict where people don't agree. You need to get your group to make those decisions based on data, rather than just on input.

Goldman: *I imagine that carries back to your own job.*

Michalkiewicz: It definitely does. It makes you a well-rounded leader who can lead meetings at work and gain that experience.

Goldman: *Thanks so much for your time, Renee. It has been so nice to chat with you about what we both know and love.*

Michalkiewicz: Yes, it has been nice. Thanks.

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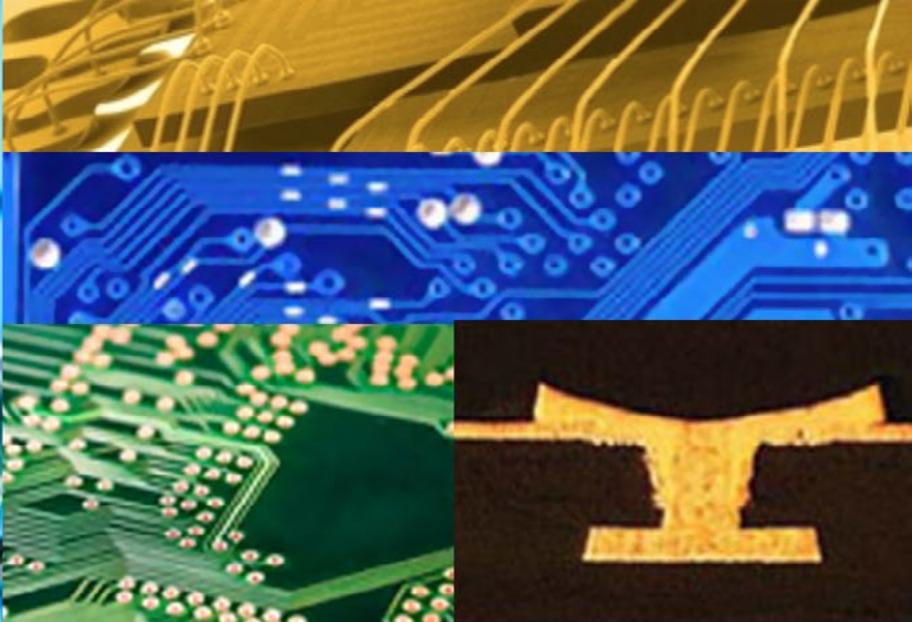
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Uyemura USA's George Milad on Updating Final Finish Specs

by **Patty Goldman**
I-CONNECT007

Throughout the years, I've met many people in the PCB industry and made good friends. George is one of those; we see each other once or twice a year, usually at an IPC meeting, and we catch up or reminisce. This time, after filling me in on his company, George wanted to talk about his subcommittee and what they have accomplished in a relatively short period of time. Their modus operandi of conference calls on a biweekly basis may be of interest to other committees and subcommittees that want to improve their turnaround time and get something done quickly.

Patty Goldman: *Hi George, it's good to see you, as always. Let's start with you telling me a little about Uyemura, and then we'll talk about your subcommittee work.*

George Milad: As you know, Uyemura is a Japanese company, and I work for Uyemura USA, which is a separate profit/loss center. We don't get any credit for any activity going into China, Taiwan, Korea or Japan, so we are strictly U.S.-focused. Our customers are ours and we like to serve our customers ourselves. We do not rely on outside people for service or for sales—we

are direct. I would dare say that we are one of the few companies that are totally focused on the U.S. market. For our big competitors, the U.S. market for them is a very tiny part—most of their profit/loss comes from the Far East, so we differ in that way. We have 75 people who work in R&D and that is where everybody starts at Uyemura.

Goldman: *Where is the R&D centered?*

Milad: The R&D is in Hirakata, Japan, at our central research labs. Everybody who gets into Uyemura spends their first years in R&D. If they are good at talking they go into sales. If they are good at tech service they go to tech service, but they all go through R&D. They put out a ton of products. We are always inundated with new products. I have six immersion golds, five different electroless nickels, and so on. They keep putting out products and it's difficult for us to go in and tell the customers, "We have a new product. Stop using this product and use the new one." [laughs]

It actually does not work like that. We always support our original product. If you are using a product that we sold you ten years ago and you want to continue to use it, we will continue to support you. Our big strength is in electroplating and surface finishing. We are working very

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UYEMURA USA'S GEORGE MILAD ON UPDATING FINAL FINISH SPECS



George Milad

heavily with ENEPIG, electro palladium, nickel palladium gold, etc. We are into via fill and the electrolytic copper side. In the United States I think we have the biggest market share of via filling and the biggest market share of surface finish using ENIG and ENEPIG. And then we also have other products that we sell, like MEC products and the micro-roughening products in competition with black oxide.

Goldman: *Are these considered companions to your plating products?*

Milad: Well, they are in a way, as a replacement for black oxide and brown oxide in a conveyORIZED system. That is from a Japanese company called MEC, and we represent them. We also represent Umicore, which is the old Degussa from Europe.

The Degussa products that we carry are mostly used in general metal finishing, so we service that market as well. We have a lot of new and exciting stuff, and we are making a lot of headway in the U.S. market.

Goldman: *And you've been with Uyemura for how long?*

Milad: It's hard to believe but I've been with Uyemura for 13 years. Before that I worked for Rohm & Haas and before that with Atotech. Before Atotech, I was a manager with Automata (which became DDi) in Virginia.

Goldman: *Yes, back in the old days. That's where I first met you.*

Milad: Yeah, and you were with Enthone at the time and you were there to help out with some problems that we had.

Goldman: *Ah, the old days...So, you're here at SMTAI to talk about your IPC subcommittee's meeting results, I believe?*

Milad: Yes, I was presenting an update on what the subcommittee is doing, what they have completed, what they are working on and what they are looking to finish. The subcommittee is called Plating Processes, IPC 4-14. It is a subcommittee under the Fabrication Processes general committee.

We've been very active since 2001 with Gerard O'Brien and myself as the co-chairmen. We've been there for 14 years. We've put out a number of specs—on ENIG, immersion silver, immersion tin, and we've put out ENEPIG.

Goldman: *You've been writing specs for the various processes for surface finishes?*

Milad: Yes, we've been writing the specs. And then we're finding as time goes by that we have to go back and revise them and add amendments and so on because things are constantly changing. When we wrote ENIG initially in 2002, there was no lead-free on the horizon at all. So, now we have lead-free and we are revising the ENIG specification. We are putting new lower and upper specs that put limits on the gold.

Goldman: *ENIG stands for electroless nickel/immersion gold?*

Milad: Yes, and the Rev A will have a few new things in it. One thing it is going to have is a lower limit and an upper limit on gold thickness. Before we did not have an upper limit at all. So it's 1.6 to 4.0 microinches for the gold.

Plus we are adding a corrosion chart. You know about nickel corrosion or "black pad." We are saying, "Here is a chart. If you see this, this is acceptable corrosion. If you see this, it is unacceptable corrosion." So the first spike of

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corrosion you see does not mean that this is a bad product. This is something new that we thought the industry needed.

We also wrote a test method for TM650 on the measurement of phosphorous and nickel in a nondestructive test method. It is based on XRF fluorescence. We submitted it to the 7-11 Test Methods Subcommittee yesterday and they were flabbergasted. They've never seen any committee do so much work to verify that a test method works and is reproducible. They were very impressed. Then they said we cannot publish this method without having it referenced somewhere in a specification that says "This is what you do."

We aren't just going to put out this method for nothing. We have to go back and revise the ENIG specs to make sure that during the setup you meet your supplier/vendor specification in phosphorous. We are not going to say accept a number based on the supplier/vendor spec.

Goldman: *You also mentioned ENEPIG finish, which I believe stands for electroless nickel/electroless palladium/immersion gold.*

Milad: With the ENEPIG we needed something very quickly. We put out ENEPIG in 2013 and this year we have issued an amendment of EN-EPIG. The initial ENEPIG said minimum 1.2 microinches for the gold and that is where it stopped. Now we have put an upper limit also. We said a minimum of 1.2 to 2.8 microinches. That is very important because a lot of designers were designing saying we want five, or eight microinches of gold, and the process is not capable of doing that.

Goldman: *Immersion of gold can never be very thick.*

Milad: They were messing up the nickel and the palladium. So we thought that it was very important to do this and finalize it completely. The draft was written and it was peer reviewed and everything. It's already in print right now. The important thing for people to realize also is that when you are calling out to spec, you have to call out the latest revision of the spec and don't just call out 4556—you have to call out 4556 rev-a.

Goldman: *Or, it would be nice if they could call out the spec and it would automatically go to the latest revision. So that all of those earlier revisions could just disappear.*

Milad: That would be a good way of doing it. That is a very good suggestion. I should talk to the IPC and see if they would just keep the latest.

Goldman: *And then you have to get that through to the customers, who sometimes want to stick with what they have.*

Milad: Our customers are not the users of the specification. We deal with the PCB manufacturers. The users of the specifications are the OEMs and the designers.

Goldman: *So the manufacturers have to deal with them?*

.....

“ Our customers are not the users of the specification... The users ... are the OEMS and the designers. ”

.....

Milad: Yes, and so we have to make sure that we close the loop.

Goldman: *In your subcommittee do you have a lot of representation beyond chemical suppliers? Do you have some of the PCB companies and also some of the EMS companies?*

Milad: We have everybody. We have something like 50–60 people on the committee. We operate very differently than most. We operate by a one-hour biweekly conference call. So every two weeks we discuss and update and make decisions about how we are going to be running tests, who is going to do what, who is going to

UYEMURA USA'S GEORGE MILAD ON UPDATING FINAL FINISH SPECS

volunteer, and we just keep it going continuously. It's a non-stop operation.

Goldman: *That has to be very effective.*

Milad: It is, and we accomplish a lot. When we come to a meeting like the one held here, people who walk into the committee meeting where I was giving an update talk about what we've accomplished, what we are doing and what we hope to accomplish in the future, but we do not have what you would call a working session like other committees do.

Goldman: *Because you got all of your work done during the calls.*

Milad: Exactly. I mean we meet 26 hours a year. We meet every other week and have one full hour meeting. It's very different.

Goldman: *You may be the only committee that does that.*

Milad: I think we are. We started it, and it's worked very well for us and people are accustomed to calling. And now we use GoToMeeting, so if we have a document we can share the document also. It is very effective.

Goldman: *Switching gears a bit, I know that you want to talk about copper via fill. Tell me about that.*

Milad: Uyemura has a very unique via fill system. I believe we are the number one supplier in the U.S. for via fill. We also can fill through-holes if they are very small. Not by plating it with copper, but filling it. It's got to be very small holes and a very thin board like an inner-layer of 10 mils or less. And we know how to set up a via fill tank. We learned that over time. It is very important how you set up the tank, where you place the anodes, the cathodes, and how you move the solution.

Goldman: *This is an electroplating process?*

Milad: It's electroplating, yes. The logic that you use in copper electroplating is not what you are



going to use here. You are going to use a different kind of logic, because you have components in the tank that prevent the hole from dog-boning and closing. You keep the hole open so the bottom can fill up first.

If you don't suppress the corners then they will grow and they will close and you will have a cavity in the middle. We have customers do their own thing most of the time. We have people plating at three hours and we have people plating at five hours, but the last installation we had we completed the work in two hours.

Initially, we said that we could do it in two hours, but most of our customers have extended the time. Recently, in the San Francisco Bay Area, we had a customer who just installed a via fill, and he filled different types of vias in two hours, and it was phenomenal. They kind of did it on their own. We set up the tank and we had the design and everything, but when they put the chemistry in, their plating engineer—they have a phenomenal plater—decided how it was going to plate. He brought it home. The first set of panels came out filled. The customer was convinced that we had the best chemistry in the world. For us, the plater Rodriguez was the man. He was the man. But it's a very good process with very good potential. So these are the exciting things. We also have various types of acid coppers for high aspect ratio plating and so on.

Goldman: *George, thank you so much for sharing this with us.*

Milad: Thank you. I really appreciate you taking the time to talk to me. **PCB**

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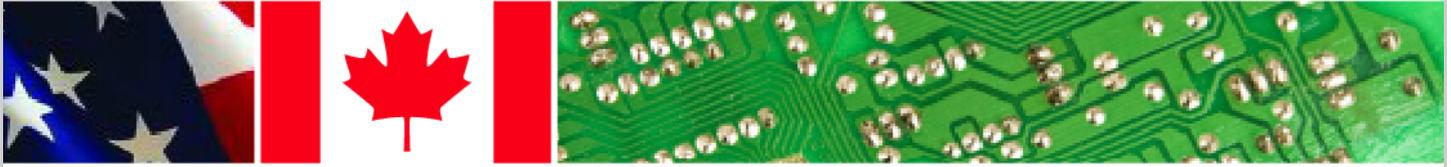


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Are Local Industry Events the New Social Media?

by **Judy Warner**

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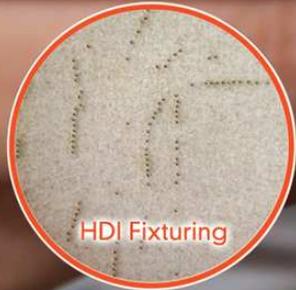
I love social media marketing. I discovered, quite by accident, that I am actually pretty good at it, too. It all started about five years ago, when marketing was unexpectedly thrust upon me in order to support my sales efforts, while working for a small PCB manufacturer in Southern California. Until then, I had no experience with social media platforms apart from posting the occasional family photo on Facebook. So I dug in, learned how to use the tools, and worked hard at turning some much needed attention our way. Surprisingly, it worked! (I call myself the “accidental marketer”).

Over time, my skills grew; I read books, attended webinars and learned from the pros until I tamed the mysterious creature that is social media. I have continued to manage Zentech Manufacturing’s social media efforts, since joining the Baltimore base CM just over a year ago, and it remains a fun and challenging part of my professional life. However, just as electronics technology is never static—social media, and the way we interact with it, is always evolving.

Over the past several years, I’ve watched our collective attention span shrink from around 10 minutes to mere milliseconds due to the incessant deluge of information that comes crashing our way through electronic devices daily. We’re flooded and fatigued. Worse than that, I’ve noticed a rise in workplace isolation as we have become enslaved to our screens 24/7. Even when surrounded by people, we hunch helplessly over our smartphones all day to retrieve urgent emails or texts—but only when we’re not anchored to a desk and a computer.

In light of these observations, I was delighted to experience a lively, social and relaxed face-to-face event called [Geek-A-Palooza](#). Held in the Minneapolis area every September, this event was founded by Tara Dunn of Omni PCB, and Tanya Martin, who is now preparing to take the helm at SMTA on January 1. Tara and Tanya noticed that the old-school regional electronics networking events of yesteryear had all but gone extinct. Yet, they both spotted a trend that indicated that many colleagues, engineers and customers





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ARE LOCAL INDUSTRY EVENTS THE NEW SOCIAL MEDIA?



Judy Warner (left) and Tara Dunn (right) share business ideas via a “Wine-n-Whine” weekly call.

were more eager than ever to meet in person, in an informal setting, that did not impose on their valuable time and strained budgets. So this dynamic pair of women decided to find a way to address this unmet need in a way that didn't include far-away conferences, tradeshows, or PowerPoint slides. So just three years ago, Geek-A-Palooza was born. Tara didn't create a self-serving event that promoted her own sales rep firm, but rather worked with Tanya to create a resource-packed, fun venue for the area's electronics industry—which included OEMs, customers, principals and even her competitors. Tanya was professionally compelled to direct her full energies on SMTA this year, but she continues to be supportive as Tara carries the “Geek” torch forward.

The annual event is held at a local country club overlooking a breathtaking golf course—far removed from windowless convention centers and stuffy ballrooms. The event lasts from about 4–8 p.m., and costs a mere \$10.00 to attend. In this way, the event offers a minimal time and cost investment while delivering a very high value to its participants and sponsors. Gourmet finger-foods are served throughout the evening and a bar is open for refreshments. There is music, raffles, a ring-toss (to win bottles of adult beverages) and the non-stop buzz of friendly conversation that magically makes smart phones disappear—at least for a while! A couple of dozen electronics companies sponsor table-top displays to help cover the cost of the event. There, casual inquires and information gathering can be made in a relaxed, conversational environ-

ment without the aggressive sales approach so often characteristic of a tradeshow. New features added to this year's event included participation by a local University's robotics department, a STEM table and a drone/videographer. It really had the feel of an industry celebrating itself—which is a real breath of fresh air in a world dominated by texts and e-mails. (Since a two-minute video is worth a thousand words—click [here](#) to see a video of this year's event).

Attendance at Geek-A-Palooza has steadily grown over the past three years. The head count has risen from about 200 participants in 2013, to more than 350 in 2015. These are fairly remarkable numbers given the relatively small electronics marketplace that exists in the Twin Cities area. Each year I've met engineers from large Minnesota-based OEMs, designers, distributors, IPC representatives, chemical and substrate reps, and countless others representing the full gamut of the electronics industry and supply chain. Geek-A-Palooza offers a relevant and fresh twist on what networking events ought to be in this brave new world we inhabit. Demanding schedules and our heavy use of electronic devices has ironically led us to be both hyper-connected (electronically), yet often under-connected (in-person). While we all may be helping enable the development of robots, we are still human beings that work best in the context of relationships and collaboration (and not the kind that come in 140 characters or less!).

A perfect illustration is the friendship Tara and I have developed since I began attending

ARE LOCAL INDUSTRY EVENTS THE NEW SOCIAL MEDIA?

Geek-A-Palooza two years ago. Before meeting in person at her event, we became acquainted through a few phone calls—followed by series of emails. After my first “Geek” event, we met up again at IPC APEX 2015, and quickly bonded as we realized all we had in common. Most notably, we are both part of very small number of sales professionals in our industry who are women—which comes with a unique set of obstacles and opportunities. Furthermore, we share a passion for online marketing and building business through relationships. Since then, we have established regular phone calls made from our home offices (pictured left). We typically squeeze them in around the close of business on Fridays. We share sales and marketing strategies, we talk about how to be innovative in our field, we celebrate our successes, and whine about our challenges—and we always do this over a glass of wine! It’s like our own virtual happy hour that helps us to decompress from our stressful jobs, while sharing business ideas, and connecting personally. We affectionately call it our “Wine-n-Whine” call, and laugh at the idea that we’ve become the Kathie Lee and Hoda of the electronics industry!

I love social media marketing and I know it is here to stay, but Tara and Geek-A-Palooza

have inspired me to renew my efforts to attend and support face-to-face local industry events. So much so, that Tara and I recently decided to partner up to launch Geek-A-Palooza West here in my Southern California area in spring of 2016. (If you are based in SoCal, mark your calendars for April 28, 2016.)

Meanwhile, I encourage you to carve out some time for industry events in your area, like IPC Designers Council, or an SMTA chapter meeting. The time and cost investment are minimal, and the benefits are high. It’s even better if you have a little time to volunteer. I find that I reap the most benefit when I volunteer—or at least attend with a willingness to openly contribute my abilities and efforts.

While valuable, an online network will never compare to the power and value of real relationships, built face-to-face over time. Now go forth and...get connected! **PCB**



Judy Warner is director of business development, Western Region and RF/MW markets. To reach Warner, [click here](#).

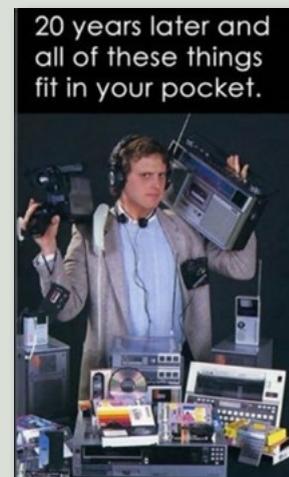
The Custer Outlook: What’s to come in 2016?

What’s going to be the next boom in the electronics industry? Is it self-driving cars, the Internet of Things, drones, or something else that’s still completely off the radar? At productronica recently, I-Connect007’s Barry Matties sat down with Walt Custer, who took a look ahead to 2016 to give our readers his forecast. Included in their discussion were his view of China’s current impact on the market, as well as some keen insight on a few key players and important sectors in the electronics industry.

After telling how and why he started Custer Consulting, Walt goes on to explain what he expects for 2016. Spoiler alert: There is no “next big thing” that close to volume. While it seems

like things such as wearables, medical applications and automotive electronics are growing by leaps and bounds, the actual volume or square footage of PCBs may actually be shrinking, as illustrated in one of the slides that Walt included in his presentation at productronica. In a humorous way, it conveyed how all the electronics we used to own and depended on to do various things have basically been replaced by a smartphone.

Read the entire interview [here](#) and learn a few things about how Custer determines his predictions—and how you can get a copy of Walt’s entire presentation.



2015: It's a Wrap!

by **Todd Kolmodin**

GARDIEN SERVICES

With Thanksgiving in the U.S. a recent memory and many of us not on speaking terms with our bathroom scale, we now look forward to Christmas and the continuance and closure of the Holiday Season. With that comes the closure of 2015 and the new challenges of 2016. With my last column of the year I thought I would publish some of the highlight questions I received over the past year:

Q: *My print says "Test to IPC-6012 Class 3/A." What is the difference between Class 3 and Class 3/A?*

A: IPC Class 3 is standard commercial/military/medical/communication product where high reliability is demanded. Continuity thresholds are 10 ohms or less and isolation thresholds are 10M ohms or greater. A mandatory test voltage is not specified other than IPC-9252A requirements of

either the test voltage specified on the print or procurement document, the rated voltage of the PCB as a minimum if stated on the print or 40 volts minimum if no other direction is given.

IPC Class 3/A is the IPC-6012 *Exception for Aerospace and Military Avionics*. When this requirement is specified the test voltage shall be 250 V minimum, the isolation resistance *shall be* 100 M ohms minimum and the continuity resistance shall be 10 ohms or less.

Q: *What is adjacency testing?*

A: Flying probe machines use what is called "adjacency testing" when performing isolation (shorts) testing. Unlike a fixture tester that tests all nets to one another during the test, the flying probes test only nets that are adjacent (next to each other). In most applications, the flying probe performs line-of-sight or horizontal adja-



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2015: IT'S A WRAP!

gency. This means that it is limited to the surface of the same layer. A single net is tested to all adjacent nets within the predetermined window. Industry standard for this window is .050" (1.27 mm.) The primary net is tested to all nets within that window. Nets outside that window to the primary net are disregarded.

The other type of adjacency is Z-axis, or vertical adjacency. In this method, not only are the line-of-sight nets checked to the adjacency window but also nets on the adjacent layers within the predefined Z-axis window. More fabrication information is required for programming Z-axis adjacency. The stack-up of the PCB must be calculated. Specific thicknesses of dielectrics and core materials are used to define the appropriate adjacency window. If not calculated correctly the window may be created too large and accidentally pick up a layer too far away and cause excess test time, or be calculated too small and not test as required.

Another hybrid feature in adjacency testing is the ability to create multiple adjacency windows on the same layer. This can be helpful if the PCB has a mix of tight trace/space coupled with other areas with larger spacing than the standard .050" window. One can define the .050" window for the areas of the product where the finer pitch/spacing indicates and then define a larger window for areas of the product outside the standard window but are at risk for possible discontinuity.

Q: My print says a dielectric withstanding test is required. It says to test to IPC-TM-650 Condition B. What is that?

A: In IPC-TM-650 (Test Methods) section 5.2.1 outlines the test conditions. There are two: Condition A and Condition B.

- Condition A: 500+15/-0 volts DC
- Condition B: 1000+25/-0 volts DC

In either case, there are two other variables considered, ramp and dwell.

Ramp = time in seconds from test start to reach full test voltage

Dwell = time in seconds to hold the test at test voltage.

Standards are 100V/sec ramp and 30 seconds dwell unless otherwise specified. (Note: If no condition is specified for the test, Condition A is the default.)

Q: We are testing a board that requires Class 3 electrical performance but we keep getting a few opens that will not pass at these parameters. What are my options?

A: This has become a rather common question. Class 3 product does require all nets to be 10 ohms or less. However you cannot bend the rules of mathematics. In most cases even large designs will pass under Class 3 parameters, however once a single net becomes too long with regard to length of the run from end point to end point, the math just doesn't work. That is why in Table 4-1 of IPC-9252A there is a note to compensate for this. For refereeing purposes the value of 0.5 ohms per .25 mm (.984") of circuit length shall apply. So if the circuit length is known, a calculation can be made for acceptance of that net even though it does not pass at the 10 ohm stated continuity requirement.

If a pass tag or pass requirement on the machine is mandatory, another solution is to program the net(s) as embedded components. The calculated resistance of the long nets can be programmed in the netlist to allow the rest of the board to be tested at 10 ohms. In the end you will receive your pass tag or green light from the machine.

Thank you all for reading this past year. Also, many thanks to Editors Lisa Lucke, Patty Goldman, and all the folks at PCB007 for being a great team to work with! Keep the questions and comments coming! Hope you all have a great rest of the Holiday Season and see you next year! **PCB**



Todd Kolmodin is the vice president of quality for Gardien Services USA, and an expert in electrical test and reliability issues. To read past columns, or to contact the author, [click here](#).

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Insulated Metal Base Circuits— an Enabling Technology for Power Electronics

by Joe Fjelstad

VERDANT ELECTRONICS

The use of structural metal in the manufacture of electronic circuits has been a part of the electronics' industry technology toolkit for many decades. For example, metal chassis structures were required and used in the early days of the electronics industry to both support the weight and handle the heat generated by the vacuum tube components that were the transistors of their day. Vacuum tubes are still used to this day in many applications, but most notably in large-scale sound amplifiers such as those seen at outdoor events and rock concerts (Figure 1).

Such assemblies typically employed sockets to receive the pins of the vacuum tube and discrete wires were soldered to the pins of the socket to make interconnections between various components and distribute power and ground. Many early printed circuits also had to deal with significant heat flux and ceramic refractory materials were commonly called upon to address the challenge. Well, ceramic materials are quite capable of dealing with the heat one of the problems they have is that they are brittle. As a result, they require more attention than traditional resin glass composites, which



Figure 1: Present day audio amplifier employing vacuum tube technology.

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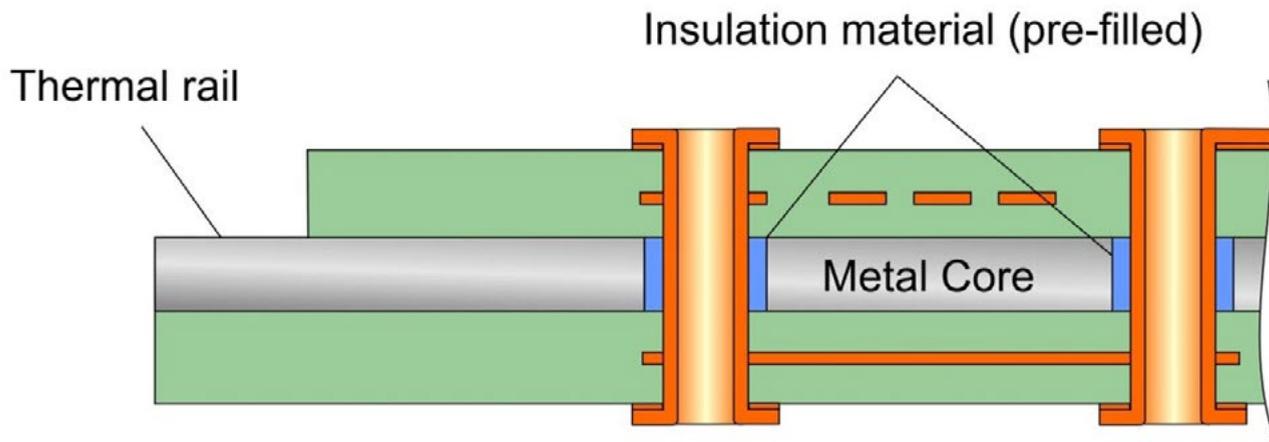


Figure 2: Multilayer circuit board with a metal core for either thermal management, dimensional control or a combination of the two.

tend to be tougher and more robust, but can sag and distort when the density climbs above the glass transition temperature of the resin. With this recognition in the 1970s, there was a rise in interest in the use of metal more specifically steel as a substrate for the manufacture of circuits which were subject to high thermal loads including hybrid circuits. Early steel circuits were commonly coated with porcelain enamel and then printed with conductive inks, which were fired in place creating a permanent bond between circuits and the porcelain enamel coating.

The practice of using porcelain enamel to coat kitchen cookware had been in use for many decades, so the inspiration may well have come at the dinner tables of more than one researcher of the time. While the first metal circuits were limited to one or two sides of the substrate, increases in integration at the level of the IC and increase use of multilayer circuits to interconnect them led some researchers to conclude that the marriage of multilayer circuits and metal sheets could produce real benefit. Early, simple solutions often involved the bonding metal sheet to the side opposite the components in a post-assembly operation, however interest soon turned to the idea of placing metal at the center of the structure and adding layers of circuitry to both sides and interconnecting them by plated through holes (Figure 2).

The circuits of the day were commonly referred to as metal core boards (MCB). (Note:

other terms are also presently used, including: IMS—insulated metallic substrate; MCPCB—metal core printed circuit board; and MiB—metal in board.

Metal core boards were of interest to the aerospace industry as a means of extracting heat from the electronic assembly through the board and into the racks, to which the circuit assemblies were mounted. One of the major challenges of assembling a metal core board is overcoming the risk of forming cold solder joints owing to the fact that a substantial thermal spreader lies just beneath the components and proximate to the plated through holes in the assembly. Given that, special processing considerations are a requirement, including substantial preheating before soldering.

Metal cores in printed circuits have not been limited just to heat management however. In the early days of surface mount technology, copper clad Invar was called upon to provide a CTE matching base for mounting ceramic components owing to the industry's experiencing failures with ceramic components mounted directly to unrestrained resin-glass laminates such as FR4. Metal core technology held sway in many applications until surface mount technology using compliant lead frame constructions (e.g., PQFP, TSOP, etc.) which could ameliorate the CTE mismatch problem were adopted.

While metal core boards have generally been relegated to niche status within the elec-

INSULATED METAL BASE CIRCUITS—AN ENABLING TECHNOLOGY FOR POWER ELECTRONICS

tronics industry, the need for such technology is on the rise. A 2013 report from BPA Consulting Ltd.^[1], offered up a comprehensive review of opportunities for PCBs, which serve thermal management and/or power management needs in high power applications. It additionally provides an analysis of the different types of MIB structures identified relative to market opportunities for both board fabricators and material suppliers. In the report the authors identify a number of different markets where metal base substrates are likely to see expanded use. Those markets include: automotive subsystems, solid-state lighting, digital control of electrical power, distributed energy harvesting, TV and display backlighting, domestic appliances and RF power.

In summary, the employment of metal sheet in the manufacture of printed circuits has a long history and the technology is faithfully served a number of applications over the last few decades and there is every reason to believe that the basic concept will see growth in the future. One scenario which should eventually prove compelling is one where metal actually becomes the board rather than just part of it especially when the Occam process and/or SAFE (solderless assembly for electronics) methods

are employed. For such structures the metal of highest interest is aluminum which is the third most abundant element on the planet and comprises 8.3% of the earth's crust. Aluminum as many attractive properties including: lightness, low-cost (\$0.72 per pound), close match in CTE to copper (22 versus 18 ppm per degree C), easy conversion of its surfaces to alumina by anodizing, environmental friendliness/sustainability, and of course, thermal conductivity.

A future article will examine this subject matter in more detail. **PCB**

References

1. BPA Consulting, [Metal in the Board](#).



Verdant Electronics Founder and President **Joseph (Joe) Fjelstad** is a four-decade veteran of the electronics industry and an international authority and innovator in the field of electronic interconnection and packaging technologies. Fjelstad has more than 250 U.S. and international patents issued or pending and is the author of *Flexible Circuit Technology*.

High-performance LEDs and Solar Cells See New Limits

Hybrid optoelectronic devices based on blends of hard and soft semiconductors combine the properties of the two material types, opening the possibility for devices with novel functionality and properties, such as cheap and scalable solution-based processing methods. However, the efficiency of such devices is limited by the relatively slow electronic communication between the material components that relies on charge transfer.

A phenomenon called Förster resonant energy transfer (FRET) was recently predicted and experimentally observed in hybrid structures combining an inorganic quantum well with soft semiconductor film. FRET is a radiationless transmission of

energy occurring on the nanometer scale from a donor to an acceptor molecule, which promotes energy rather than charge transfer.

Researchers from the University of Cyprus and Cyprus University of Technology, along with colleagues from the University of Crete, Greece, have conducted a comprehensive investigation on how various structural and electronic parameters affect FRET in structures of nitride quantum wells with light-emitting polymers. Based on their studies, the researchers discuss the process to optimize the energy transfer process and identify the limitations and implications of the Förster mechanism in practical devices. The work demonstrates the importance of understanding FRET in hybrid structures that could pave the way for developing novel devices such as high-efficiency LEDs and solar cells.



Pete Starkey
I-Connect007
Technical Editor

Pete's TOP TEN PCB Articles for 2015

1 Barry Matties and Bryan Bernas: Whelen Engineering Reduces Cycle Time by Building a New Automated PCB Factory

The future of American manufacturing might be found in the small community of Charlestown, New Hampshire, at Whelen Engineering. A company founded and headquartered in Connecticut in the 1950s, Whelen is a leading manufacturer of all things relating to emergency lights and sirens for the automobile and aviation industries.



2 Alun Morgan: Fire Retardancy: What, Why and How

Flame retardants are compounds, which when added to materials during or after manufacture, inhibit or suppress the combustion process.



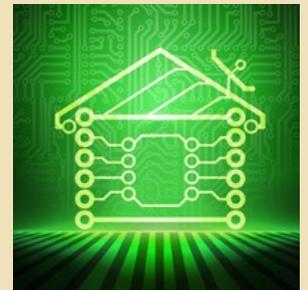
3 Tarja Rapala-Virtanen, et al: Next-Generation Ultra-Thin HDI PCB Manufacturing Challenges

High-density interconnection (HDI) PCB technology is advancing to enable increased miniaturization and functionality of products such as smartphones, tablet computers and wearable devices.



4 Dr. Jon Harrop: Opportunities for 3D Printed Structural Electronics

Today's 3D printers have many limitations, but the boundaries are being pushed and exciting developments are continuously being made. One of the most promising recent developments in the world of 3D printing is multimaterial printing...



5 Michael Carano: OSP and Selective Electroless Nickel for Mixed-Metal Finish PWBs and BGA Substrates

Pressure to eliminate lead in electronics assemblies is forcing fabricators and OEMs to reevaluate their surface finish and joint attachment procedures.



6 M.Cauwe, et al: Flexible and Stretchable Circuit Technologies for Space Applications

Flexible and stretchable circuit technologies offer reduced volume and weight, increased electrical performance, larger design freedom and improved interconnect reliability. All of these advantages are appealing for space applications.



7 George Milad: ENEPIG—The Plating Process

Electroless nickel/electroless palladium/immersion gold (ENEPIG) is sometimes referred to as the universal finish, because of the versatility of its applications. It is a multifunctional surface finish, applicable to soldering and wire bonding (gold, aluminum, copper and palladium clad copper).



8 Mark Goodwin: A Well-Designed Laminate Supply Chain has to Own It!

Designing a supply chain for the provision of laminates and prepregs to the PCB fabricator shouldn't be that complicated, should it? The laminate is simply manufactured and then shipped...what could possibly go wrong?



9 Dan Feinberg: Automotive Technology—the Next Driving Force in Electronic Manufacturing

We started with AM and then FM radios, then full stereo systems complete with tape, then disk, then SSD storage; we added speed control then GPS, and then mapping. The higher-end vehicles now have collision and obstruction warning, back-up cameras, driver fatigue warning... and some have self-parking... But in the automotive segment, as the man once said, "You ain't seen nothing yet."



10 Todd Kolmodin: Splitting Hairs—The Manufacture of HDI and Substrate Test Fixtures

Testing of higher-density product has become ever more challenging with the advancement of chip technology. BGAs, CCDs and other active components have decreased in size so much that historical industry accepted test methodology can no longer effectively test these newer substrates incorporating this higher technology.



2016 Events

EIPC Winter Conference

January 21–22, 2016
Dresden, Germany



FlexTech Alliance

February 29–March 3, 2016
Monterey, California USA
Building the innovation cosystem for flexible electronics



ICT-UK Evening Seminar

March 1, 2016
Institute of Circuit Technology
Tewksbury, England

IPC Apex Expo 2016

March 13–17, 2016
Las Vegas, Nevada USA
Show, conference and standards meetings



CPCA Show 2016

March 15–17, 2016
Shanghai, China
25th China International PCB & Assembly Show 2016



ICT Course

April 11–14, 2016
Loughborough, England 2016 Annual
Foundation Course

JPCA Show

June 1–3, 2016
Tokoyo, Japan
The total solution exhibition
for electronic equipment



Thailand PCB Expo 2016

April 19–22, 2016
Bangkok, Thailand

IPCA Show

August 2016
India



SMTA International

September 25–29, 2016
Rosemont, Illinois USA
International 2016 Conference and Exhibition



IPC Fall Meetings

September 24–30, 2016
Rosemont, Illinois USA
Co-located with SMTAi



electronicAsia

October 13–16, 2016
Hong Kong Convention Center
Hong Kong
A World of Electronic Components & Technologies



Electronica

November 8–11, 2016
Muchen, Germany
International Trade Fair for Electronic
Components, Systems and Applications



HKPCA and IPC Show

December 7–9, 2016
Shenzhen, China
International Printed Circuit &
APEX South China Fair



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January: Medical Electronics: Getting the Vitals

February: What's New in PCB Fabrication

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