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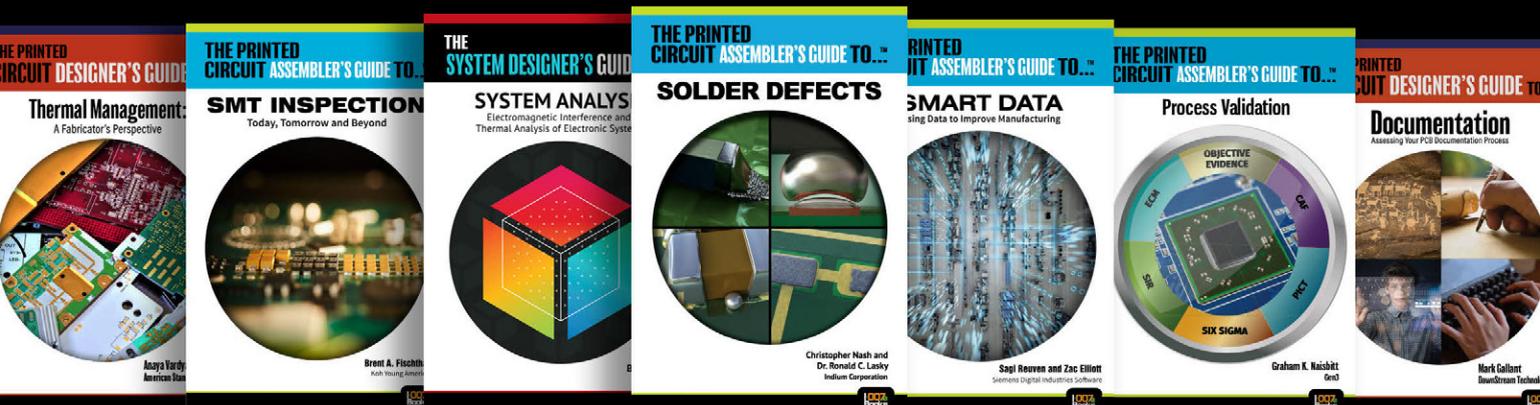
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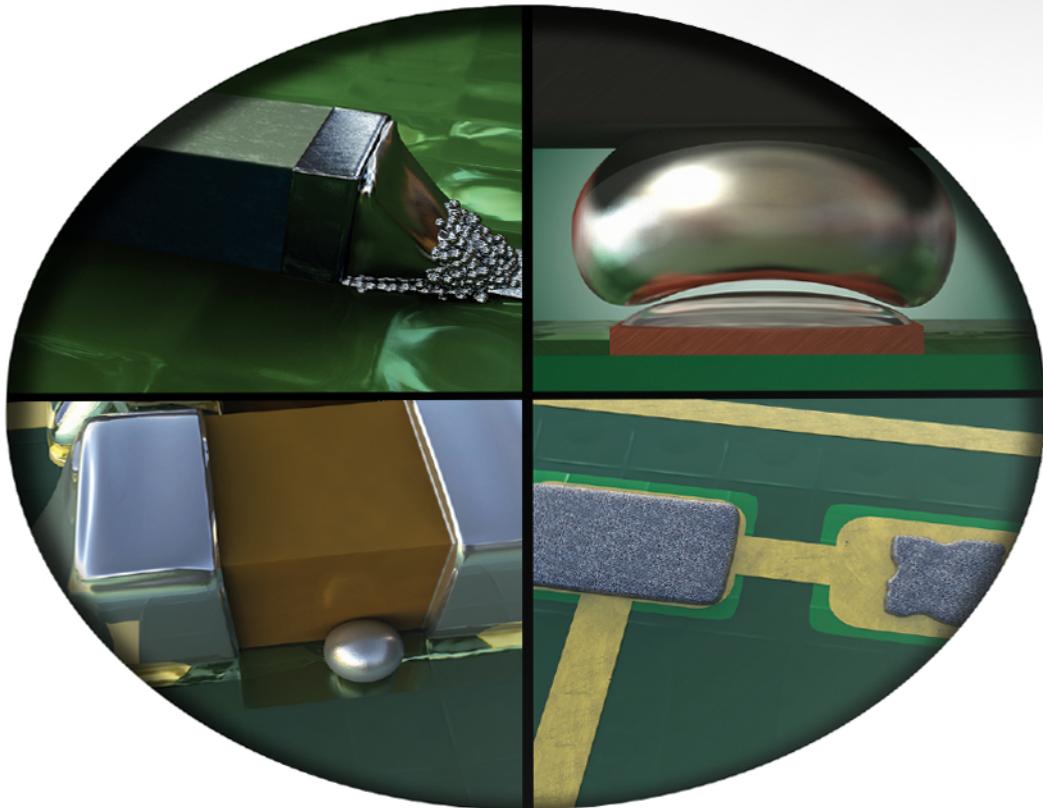


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IPC APEX EXPO 2022—Preview

It's the IPC APEX EXPO Preview issue! This month, we bring you show-related interviews with IPC leadership, how-to information, preshow details, and insight from industry experts. As you pack your bags, your briefcase full of standards documents, and your trade show booths, use this issue to help you plan a successful trip.

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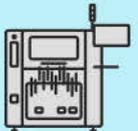
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Preparing for APEX: The 2022 Edition

Nolan's Notes

by Nolan Johnson, I-CONNECT007

As summer was waning, I found myself at the airport with my carry-on, headed to a technical conference for the first time in nearly 20 months. During a normal winter trade show season, I keep a “go bag” packed, ready to just grab on my way to the airport. But after more than a year and a half travel-free, my “go bag” had gone. It had long since been unpacked, the contents folded in with my normal household belongings. Repacking my bag was a treasure hunt; I had to remember all the things I’d found useful on the road (and the ones that seemed to be useful but weren’t). But once I’d brought all my gear together, and boarded the plane, I felt a familiarity settle over me; everything seemed to be back in place again.

I suspect that many of you will have a similar experience (both personally and professionally) as you prepare for IPC APEX EXPO in January 2022. Relax, breathe, and start gathering your stuff early. It will all be

fine. If you thought you were the only one who had a burning need to reconnect, please heed my words: You are not alone.

Our collective need for (re)connection is at a peak. In our pre-show interview with IPC President and CEO Dr. John Mitchell, he said, “It’s been a long time since most of us have been together face-to-face. While we’re going to have a lot of tremendous and compelling content, the thing I’m most excited about is for everybody in the industry actually being able to reengage.”

This sentiment runs throughout all the conversations in which the I-Connect007 editorial staff has been involved. IPC APEX EXPO 2022 is a time to come back together. As we return to in-person work, meeting new people as one can only do at an in-person event, those new remote work skills that we’ve learned (and likely mastered) should serve us well in maintaining those working relationships. In his interview,

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Mitchell captured that thinking quite well, “I hope people have that as one of their priorities, to meet different people. Of course, we want to say hello to all our old friends, but there’s going to be a lot of new people there too. And those connections can be super important.”

There is so much that is new, or different, than in previous years. Committees will function just a little differently this year; the EMS Leadership Summit has retooled in some exciting ways to meet changing needs; social events have morphed and evolved to bring freshness and relevance to the program; and a big highlight is how the technical tracks are thriving and growing.

That sense of renewal and evolution is why we chose this orbital star rise photo for our cover. To us, the image represents the industry moving toward the light of a new day, the dawn of the next phase in our history. In the wide expanse of the economy all around us, it may seem like we’re still stationary. But focus on the goal, the light ahead of us, and it becomes clear that we are rocketing forward, energy vibrating through all aspects of our businesses at this moment.

Of course, in this period of continued pandemic management, we cannot stress enough the need to be safe and to practice responsible social interactions as we come back together. To that end, here is the official statement on safety from IPC, as shared by Alicia Balonek, senior director of trade shows and events, “In accordance with the guidelines in California

and the San Diego Convention Center, we expect the requirement will be that people show either proof of vaccination or a negative COVID test within 72 hours. (Most people coming from overseas must do that anyway when they get on the plane.) Attendees will find a COVID Q+A on our website that explains our protocols more fully.” We’ve included IPC’s detailed COVID safety policies in this issue as well. All this is part of the packing and preparation necessary for getting back together.

So, as you pack your bags, your briefcase full of standards documents, and your trade show booths, we invite you to use this issue of *SMT007 Magazine* as a part of your planning process. In this issue, we bring you interviews with IPC leadership, how-to information, and insight from industry experts.

Be sure to stop by the I-Connect007 booth while you’re on the show floor. You can find us at Booth #1319, right on the main aisle. Say hello and tell us about your experiences since the last IPC APEX EXPO. You help us find the meaningful news and stories, the content worth sharing.

On behalf of IPC, and I-Connect007, we can’t wait to see you in San Diego! **SMT007**



Nolan Johnson is managing editor of *PCB007 Magazine*. Nolan brings 30 years of career experience focused almost entirely on electronics design and manufacturing. To contact Johnson, [click here](#).

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John Mitchell: Focus on the Future

Feature Interview by Barry Matties

I-CONNECT007

In a far-ranging interview, Dr. John Mitchell and Barry Matties discuss the upcoming IPC APEX EXPO, IPC programs, and the challenges (and opportunities) facing our industry. If you think Dr. Mitchell's assessment would be pessimistic, you'd be wrong.

Barry Matties: John, what are you most excited about for the upcoming IPC APEX EXPO?

Dr. John Mitchell: Getting together with the industry again. Unlike years past, it's been a long time since most of us have been together face-to-face. While we're going to have a lot of tremendous and compelling content, the thing I'm most excited about is for everybody in the industry being able to reengage.

We're an industry that enjoys and needs to work together, and we've been held at bay for too long. Throughout 2021, at every conference I've attended, people are really excited about seeing each other again. And since APEX EXPO is one of the premier events for the industry, that is the thing I'm happiest

about—getting people back together again, getting them excited.

In addition, I'm also excited that we're partnering with Altium, whose AltiumLive design conference will be co-located with APEX EXPO.

Matties: Tell me about that. How did that come about and what's the benefit?

Mitchell: IPC has been providing standards and education on the design front for decades. But there's a dearth of good, experienced, young engineers. We've been trying to encourage students to consider engineering and design as a great career path. Altium, similarly focused, makes a lot of their software freely available to students.

AltiumLive connects all aspects of the engineering design and development community, and we think that co-locating AltiumLive at APEX EXPO will benefit our attendees, too, since we have so many design programs to offer.

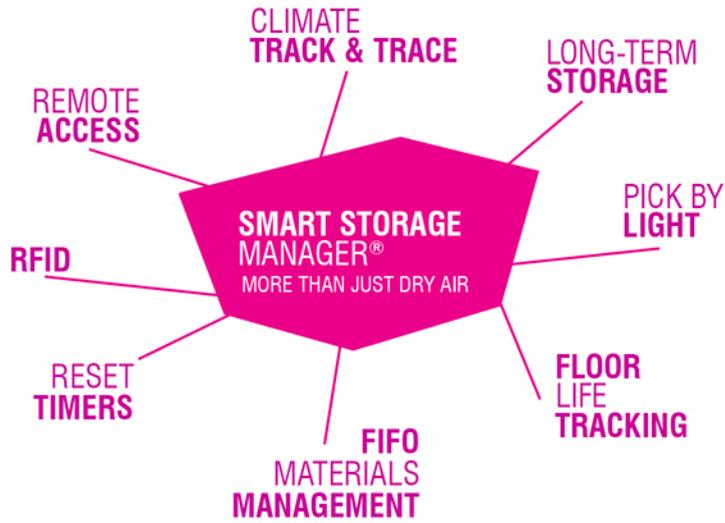




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Matties: This will really give the designers an opportunity to get there, perhaps a day early, and get out on the APEX EXPO exhibition floor and maybe spend some time in conferences.

Mitchell: Yeah, they can do APEX EXPO professional development courses beforehand, and then they can experience Altium Live as well. We're looking forward to that.

Matties: I think this next APEX EXPO will be, for many, the first event that they will have attended in-person since about two years ago. Has the last two years impacted the format for it?

Mitchell: The biggest impact really is about making sure everybody is safe at the event. In accordance with the guidelines in California and the San Diego Convention Center, we expect the requirement will be that people show either proof of vaccination or a negative COVID test within 72 hours. (Most people coming from overseas must do that anyway when they get on the plane.) Attendees will find a COVID Q&A on our website that explains our protocols more fully.

The biggest impact really is about making sure everybody is safe at the event.

Matties: Do you expect a lot of international participation?

Mitchell: We had some concerns about that a few months ago, but with the U.S. re-opening its borders to international tourists, we're encouraged. Our registrations show that we have people signing up from literally everywhere,

even from places where they're going to have to quarantine when they go back. We found that very gratifying and encouraging.

Matties: Speaking of registrations, how is that tracking? Are you seeing an increase over the last in-person event or is it an adjusted goal?

Mitchell: I think people are being more cautious right now because they just don't know what's going to happen. The whole Delta variant July caught everybody by surprise. We thought we were getting out of the COVID concerns, and everything was going to be rosy. Then Delta hit, and people thought, "Oh wait, whoa."

That was a few weeks before we opened registration, so I think there's some cautiousness. We have a lot of people saying, "Yeah, we're still planning to come," but they're not ready to commit. To be clear, I am speaking about individual registrations. Most of the exhibitors have signed up, so we are encouraged by that.

Matties: Now, on the exhibitor front, do you expect to see as much equipment on the floor?

Mitchell: We hope to. We've been instructing and coaching for people not to use Long Beach or some of the more crowded ports but to look for others or just truck it in if you are already in the States. Because, frankly, the port situation is a mess.

Matties: We know that there are really tough challenges—supply chain, labor, inflation—going on. How will participation for the attendees help them navigate the challenges?

Mitchell: I don't think we're going to solve all these challenges at APEX EXPO. Whether it's the labor shortage, parts shortage, transportation costs, or others, we are going to be finding ways to collaborate. To me, the best opportunity to work on the supply chain issues is when you're meeting face-to-face. One of the intangible values of APEX EXPO is the face-to-face

An important discussion on RF/Microwave



John Bushie



Anaya Vardya



David Lackey

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discussions that aren't necessarily scheduled or built into the program.

When you're talking to a friend of yours and you say, "Hey, we've got this business we're unable to fulfill," and they say, "Well, we've got these parts we'd love to get to you because we can't use them anymore. We need different parts," then magic happens. Collaboration occurs and problems that were intractable start moving down the solution path. These little microcosms of supply chain work will help some people solve some of their challenges. But it'll be more micro impacts than macro changes to these large issues.

Matties: Do you have any specific presentations or conferences that are geared toward addressing or navigating these issues?

Mitchell: In my keynote, I'll be talking about what we can do to navigate some of these challenges specifically. We'll talk about what the situation really is vs. what's being reported. And what, in different regions and different types of companies, we might do to overcome some of those challenges.

I hope that my keynote will spur people to find solutions on the other issues. Now, as far as other programmatic elements that are dealing with these issues specifically, the answer is yes. On the labor front, everybody is having difficulty trying to hire people. Finding talent or even warm bodies, frankly, is a challenge. IPC has amazing online skills development programs that can literally take somebody with no experience in the industry, say working at your local fast-food restaurant, and in two days they could be an operator on a line and effective.

You don't have to spend weeks trying to train the people anymore. We were fortunate that industry leaders came to us and said, "Here's what we need. These are the skills we need to teach. Here's the kind of training we would have you do." Our team of education specialists took that information, leveraged their ex-

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Wednesday Keynote Speaker: John W. Mitchell

President and CEO | IPC

Wednesday, January 26 | 8:00 am - 9:00 am

Session Description

State of the Industry: Electronics Manufacturing Embraces Digital

Drawing on insights gleaned from industry leaders and IPC research, Dr. Mitchell will assess the state of electronics manufacturing and identify the trends that will define the industry's financial growth and technological progress in 2022 and beyond. His keynote presentation will touch on the topics that are the focus of boards rooms and shop floors: factory modernization, supply chain resiliency, workforce demands, and environmental stewardship. Be sure to attend to learn more about how to navigate your organization to success in today's dynamic global marketplace.



perience about knowledge acquisition and retaining information, and built this into a program that meets the industry driven job-specific needs of workers across a broad range of industry roles and skill levels. So basically, very, very quickly you can onboard somebody and get them productive.

Then there are other programs as well, specifically geared toward engineers. We have new programs offered to those who might not know anything about an assembly operation. We can give them 30 to 40 hours of online content that helps them get grounded in how various parts of the electronics manufacturing process works. Often the industry just relies on shadowing to provide this kind of education which is not very consistent and sometimes doesn't happen at all. With this program, they learn and can also keep going back to that information for a refresher, if needed, when something new comes up. One of the programs, Electronics Assembly for Engineers (EAE), has been very well received. At APEX EXPO, we will share more information about EAE and other courses under development, and I am very excited about that.

Matties: When we start looking at inflation, when material input costs started to rise, a lot of the fabricators just compressed and did not

pass those on. But you can only do that so long and inflation is not transitory as it turns out. It's here, and it's going to be here.

Mitchell: Yes. If you're spending much more on hiring the individuals that are building your materials, then that cost must get accounted for somewhere.

Matties: Right. And it's not just the labor, as we know. It's the cost of raw materials and other input cost.

Mitchell: Exactly. Chips, parts, materials, transportation, everything. The costs have gone up just about everywhere.

Matties: Are there any strategies or programs to help the fabricators look at how to be more efficient, lowering their costs to help combat the inflation that's happening?



An important discussion on Flex and Rigid-Flex



Anaya Vardya



David Lackey

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Mitchell: I know one of the areas that we are really trying to help combat those costs is through our Factory of the Future initiatives. APEX EXPO will showcase the Factory of the Future pavilion on the show floor, hosting leading tech companies in the field. Those companies will provide information on solving real business challenges with technologies that modernize processes throughout factories.

Matties: When we look at Factory of the Future, obviously automation is a key part of it. AI comes into play.

Mitchell: That's part of it, but also, it's about managing that information in terms of knowing what to do with it. Now, in most companies we are collecting big data, but we don't have enough of our engineering staff that knows how to do proper data analytics to know what to do with all that data.

Matties: Well, the core problem is first identifying the critical data out of that. The other side of combating higher prices is to have better yields.

Mitchell: Yes. It's also looking at where you can—and this is obvious—use alternate sources. Right now, people have gotten very comfortable ... I shouldn't say right now. A year or two ago, people were very comfortable with their sources; now, people need to get comfortable with looking at many alternative sources if they want to combat some of these challenges.

Matties: But alternate sources, in some cases, are few and far between.

Mitchell: I think you're right. But I have seen creativity allowing people to reconsider sources they'd discounted before. Some companies have been helping their suppliers to "level-up" to get to the quality level that they need. This is where you have people looking beyond their own needs. You're saying, "If I really care for

Supplier X and can help them be successful, their business will get better, and, in turn, I've got a supplier that's going to value me and I'm going to have more access to the things I need."

Matties: I was reviewing the technical program for APEX EXPO, specifically looking at who is presenting, the type of businesses, and the company names. There's a very nice cross-section between industry suppliers, fabricators, and manufacturers. And you have a lot of OEMs—Intel, Bose, and John Deere, to name a few—all making presentations. To your point, this is an excellent opportunity for the industry to collaborate. Here, they can find information to bring efficiencies into their factories and find out what the challenges are that they need to be preparing for, as if they don't have enough.

Mitchell: You can learn from your neighbor. Fortunately, I have the opportunity to chat with, as you guys do, industry leaders all around the world. When we started hosting weekly calls for our executive forum at the beginning of the pandemic, with many people calling in, some had already lived through some of COVID in China. Industry leaders on the call were able to share those procedures here in North America very candidly, which was very helpful to everyone.

That's the same type of thing that can happen here at APEX EXPO when discussing challenges such as the supply chain issues. There are people who have found ways to figure this out, and by sharing their knowledge in professional development courses, attendees can walk away with such great knowledge from APEX EXPO that they can literally solve problems the next day.

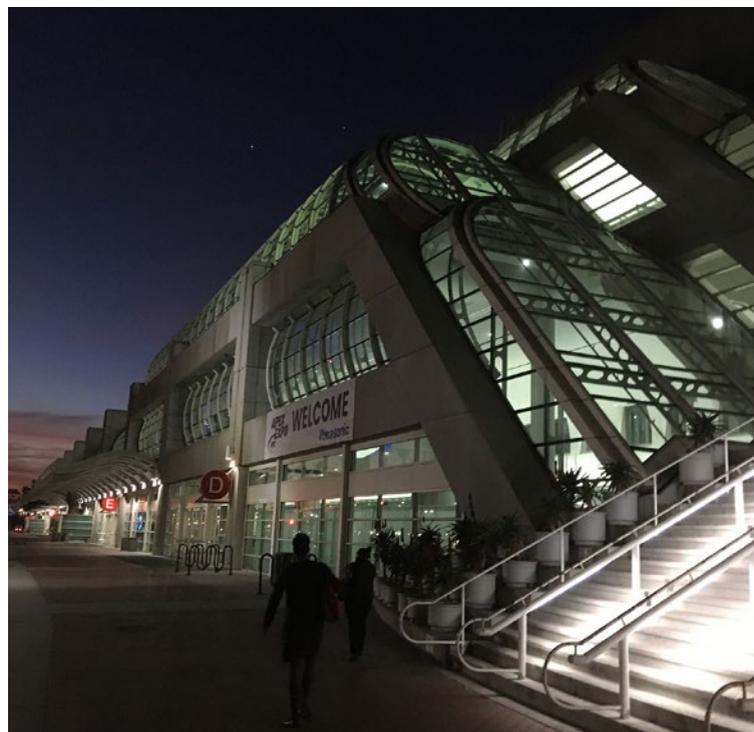
Matties: Over the last couple of years, we have developed a new way of doing business, whether we like it or not—the virtual, the Zoom meetings—and as we pointed out earlier in our conversation, this may be the first or one of the

first shows that people are attending since the pandemic began. Do you think the attendees are coming with a different goal or priority to this event?

Mitchell: Perhaps. I'm curious about this one myself, frankly. I think part of the priority will be to have that face-to-face conversation and to reconnect with different people. One of the hardest things to do virtually is to make new connections because you just don't have that trust that you've developed over the years.

It's easy for me to call you up and say, "Hey Barry, let's chat via Zoom." That's a super easy thing to do. It's not necessarily an easy thing for me to reach out to somebody I've never met before and have them say, "Yeah, let's have a Zoom chat." But if I've met them before and can make that connection, then I can easier maintain that connection easier.

While it may not always be true, I've found there are certain types of connections that just don't lend themselves to finding a new person you've never heard of in a virtual environment. But coming to a conference like this, where like-minded people—many that you've never met before—are showing up and sharing their



experiences, suddenly you can make a connection. Once you've got an additional connection, you gain a whole new branch of network connections that you could work with to help your business or that you can help. This is when you can leverage the virtual connections more easily.

I hope people have that as one of their priorities, to meet different people. Of course, we want to say hello to all our old friends, but there's going to be a lot of new people there, too. Those connections can be super important because people have gotten very comfortable, as you said, with the virtual way of doing things. Now if they've made a new acquaintance, they can maintain that very easily once they leave APEX EXPO.

Matties: What messaging are you providing for those who are not attending APEX EXPO but still want to be able to participate?

Mitchell: IPC APEX EXPO is really three events combined in one. You have your exhibition show floor, something that really needs to be experienced in person. Non-attendees could certainly find out who exhibited and how to contact them, but they could do that anyway, right?

Then we have professional development, giving attendees a chance to take a deep dive into a particular subject, and a robust technical education program that offers more than 100 papers in four strong educational tracks. In addition, we will have committee meetings going on essentially all the time.

The standards development committee meetings will be live, but people who aren't there will have the opportunity after the fact to raise comments, concerns and/or points, and share data after the fact, so if they can't make it, they can still impact the standards. On the professional development side, a few presentations' recordings, I believe, will be shared for those who aren't there. But as you said, you were able to peruse the entire agenda for

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Anaya Vardya



John Bushie

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it right now. And if there's interest in those, a specific speaker, there's always the opportunity to reach out. But mostly, we're trying to keep it pretty much a live event.

Matties: Good move, I think. Can you give us a preview of your keynote, the theme, what people can expect, and the takeaways?

Mitchell: Sure. We're working on it every day, and it will continue to evolve up to the last minute because we want it to be timely and relevant as things can change and shift. But, in general, I will be discussing some of the basic trends—economic, supply chain, or technological—as an opening salvo to setting the landscape for a discussion on how we navigate these choppy waters. How do we chart a path through these treacherous terrains and leverage them toward both immediate success and long-term success?

We'll be taking some of these items that we've talked about—supply chain, labor, transportation costs, parts being unavailable, and part shortages (which I look at as slightly different)—and discuss what organizations should be doing, best practices, etc. I hope those in attendance will be listening to understand: What are the little nuggets that we can take away to help soften the challenges we're facing today? It's an interesting time we're living in.

Most companies that I'm talking to are producing more than they have ever produced in their lives, and they *still* have back orders. Yes, there's a shortage, but at the same time, around 80% of the companies I'm talking to are having their best years ever.

Matties: We hear the same thing.

Mitchell: Despite that, there's more demand. I will be talking about how much of that is sustainable in the long term. Are we actually changing? Do we just need to produce more forever, or is this just a two- or three-year bump

for certain things? Will the needs change? It's a tough situation to navigate.

Matties: There's an ebb and flow to everything.

Mitchell: That's right. People are making stronger investments. That's another part of what you'll hear me talk about. Another reason for bringing all this up is to talk about how and why to strategically hire. There's very little scrutiny taking place on the people many organizations are trying to hire right now. A lot of people are just saying, "Get me a warm body! We'll train you up and figure it out." That's fine, but the challenge is understanding whether that person is a one-trick pony or are multifaceted. We need talent that can adapt to change.

Matties: I was talking to a fabricator who said that when they hire somebody they only expect them to stick around for a couple of years, maybe three at best. Their big challenge is how to train them up fast enough. Hearing about your training program will be very welcomed.

Mitchell: I've heard the same thing, which is fascinating.

Matties: It's an extremely competitive market and if you're just bringing in a line operator to run an etcher or something to that effect, hiring bonuses are being offered in many places that you are competing against.

Mitchell: Yes. The opportunity that I hope to bring home is that those companies that can offer the right incentives to bring in somebody who can stick around have a tremendous advantage of not having as much turnover.

Matties: Absolutely. I think that's exactly the right message. If they're not hiring for longevity, there's a problem. I know we're trying to rush bodies in to get jobs done, but there's a big cost for scrap and most scrap is human error.

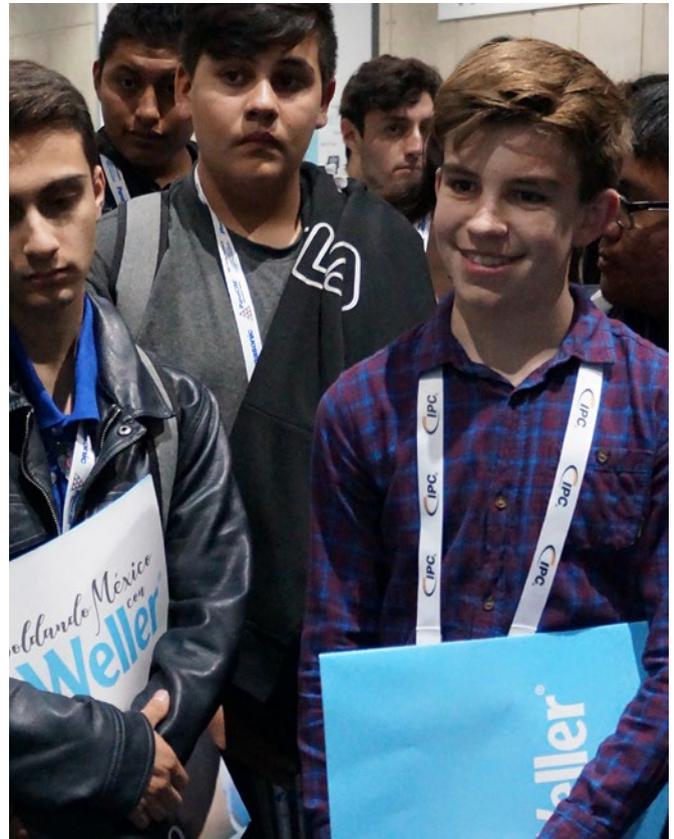
Mitchell: I agree with you. The training programs to help people come up to speed very quickly are critical. There's also some assessment we can do as to how capable an individual is. Don't just accept any warm body; do a little bit of assessment.

Matties: I don't think you should throw away your hiring standards just because you're in crisis. At the same time, we must develop the future workforce and that's part of IPC STEM and emerging engineer programs. We are a sponsor of the STEM program, so that's something close to our hearts as well.

Mitchell: Yes, we're super excited about the STEM programs and we are doing a lot on that front. This is about building the pipeline for the industry. So, when we say there's a skills gap, Dave Hernandez, our VP of education, is quick to point out that there are four issues and IPC is working on all four. One is the pipeline. The second is onboarding. The third one is pathways, and the fourth is upskilling. Pipeline is where the foundation comes in, where we're working to help educate, inform, and engage students in high schools, universities, people changing jobs, about what this industry is, and what it has to offer.

Onboarding is the very quick turn, helping train people in a repeatable fashion that will get them what they need as fast as possible, which is employees that can be productive.

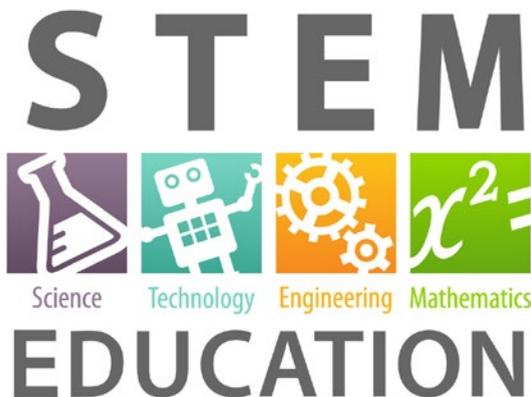
The pathways are about keeping the employees that you have. Is there a pathway for their



success? Our design programs provide pathways. We have this whole hierarchy that, say, if you're new to design, here's the information you need to build the basic skills. Once you have a little bit of experience in design, here are some of the courses. We have online live courses and certification programs that allow you to lift your skills. If you're an advanced designer, there's a whole slew of specializations that you can get training in. That's building a pathway. If you want a career in design, for example, what's your next step, and the next after that? We are providing education pathways along the way.

Upskilling is training workers on new methods, machines, and materials to succeed in an increasingly competitive global market. Our industry changes all the time, and we need to provide courses, information, and education to make sure that engineers have the latest skills available, giving them and their company a leading edge.

That whole suite of educational offerings helps someone as they evolve from those who



are new engineers, operators, or technicians to those who need to develop more advanced skills, getting them up to speed and engaged, as well as caring for them along their path in the electronics industry.

Matties: It's great seeing these young engineers and the STEM students, frankly, at the show. The enthusiasm in which they're participating is noticeable.

Mitchell: Let me share some insight on our volunteers. We see a lot of people reaching retirement age. What happens when they retire? What's left of the industry? What happens to standards committees? We've been doing the Emerging Engineer Program for a while and each year it continues to grow, which we find very gratifying. Not only because of the number of participants, but because you have cross-company mentors, where people are spending their time to help these newer folks get more experience in the industry.

Matties: That makes a big difference right there.

Mitchell: It does. Being concerned about having another 60+ years ahead of us, we surveyed how many years of experience each committee member has. I expected to see that 80% have more than 20 years of experience on these standards committees. I was wrong. It's balanced from an industry experience perspective. We thought, "We don't have a problem to solve here." We have people with a little bit of experience, mid-experience, mid-senior, and super senior. That's the perfect combination. We will continue to monitor it, but it was so good to see it wasn't a situation with 80% of the people retiring in the next five years. That's not the case.

Matties: That is good news. Now, as you look forward to 2022, what do you think the indus-



try should be mindful of? What should we really be paying attention to, aside from the obvious challenges?

Mitchell: If companies can leverage the success they're currently having, not just for 2022, but to set them up for the next decade, that is what I think industry should be thinking about.

What are the investments they can make now, while they're flush, that will pay dividends for the long term? That could be in terms of machinery, systems, talent, new customers, or new niches they want to explore. There are a lot of opportunities. Those companies that will have the brightest future through the ebbs and flows of the industry are the ones that are preparing right now.

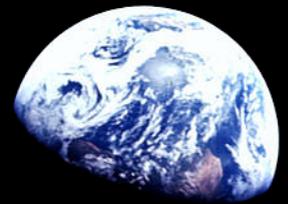
Matties: That's not typical thinking in U.S. business, though, when you talk about 10 or 20 years out; people typically look at quarter to quarter.

Mitchell: Yes. As we think about the Factory of the Future, there's such a different perspective

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when we talk to people in North America vs. Europe vs. Asia. North America thinks, “Why should I do this now? Show me how I’m going to get paid on this right now.” European companies tend to say, “Of course, we’re already doing this.”

Matties: The smaller the manufacturer, typically the more limited the resources. But oftentimes we’re talking to a fabricator here that’s low volume, quick turn. They say, “We don’t need automation. We just don’t need that.” Maybe they’re right. Maybe they know their business.

Mitchell: Maybe, but I also talked to low-volume, quick-turn places that, because of the parts shortage, can’t really be quick turn anymore. They’re having to shift their thought process to more mid-production. Instead of low-volume, it’s mid-volume because they’ve got to do other things with the parts that they have available. Maybe they were doing things for 12 and now they need to do 100 to 1,000 times that.

Matties: Exactly. It’s not about the quick turn.

Mitchell: It’s about, “The stuff needs to work, and I need it in these quantities.” Those are some of the things I think people need to be mindful of. Even the smaller companies you mentioned may not have the resources to go after this. But that’s where things like implementation of CFX will help. There are ways to retrofit existing machinery. You can send and utilize CFX messages and work with your larger suppliers and customers that are already using those systems without having to buy brand-new equipment everywhere all at once.

Matties: Part of the problem is that’s a job function—chief process improvement manager—that most companies don’t have a dedicated person for. A chief process improvement officer is worth their weight in gold. They can add more to your bottom line than you can imagine in most cases.

Mitchell: If you’re doing \$10 million worth of business and you get a chief process improve-

ment manager to go through and make you 10% more efficient, you just made a million dollars.

Matties: It's not just that the million dollars on the bottom line, it's the added capacity and opportunity that comes with that.

Mitchell: You also get employee benefits because they're happier doing things in a smarter way.

Matties: I referenced an interview I did with a company in Europe. Ventec hired a guy from the newspaper business who didn't know anything about laminates, but he was a logistics expert. And as you can read in the interview, the company was thinking, "We need to get another building. We're running out of space." He came in, looked at the logistics, reorganized the factory. Not only did they not need additional space, but they had extra space already within their existing walls.

Mitchell: That's our industry's example of the famous hospital Ferrari example. You're familiar with this story?

Matties: No.

Mitchell: There's a hospital in Europe where their emergency room process was losing patients. People were literally dying because it was just a very complex process going through the ER. The Ferrari race team came in and re-optimized how they did things. These were the guys that can do a pit stop in 4.3 seconds: they change all four tires, refuel, etc. So, the same team walked in, worked with the hospital, and understood what they needed to do. They re-designed the thing. They didn't lose a patient due to process error; basically, the fatality rate dropped by seven times. It was incredible. The crucial point you're making is to look outside the industry for expertise.



Matties: I know we can go on, but do you have any final thoughts you want to share?

Mitchell: First, I can't wait to see everybody again at APEX EXPO. It's going to be a great event. Second, we want to make sure everybody is being safe out there, so I encourage everybody to follow the best process to make sure that not only themselves, but everybody they're interacting with, is safe. Thank you all for your compliance with what may be challenging rules that we're subjected to. But if we can, let's look past the rules, follow them, and then enjoy the time together, because that's what these guidelines are enabling us to do.

I am grateful for my team members who are working with the industry to make sure this is a successful event. Our staff—whether it's the standards, education, events, or marketing team, all of them—they are all engaged in making sure that APEX EXPO is successful for the entire industry and every individual who attends. I want to express my gratitude for all the good work they do in working with the participants, whether they're exhibitors, presenters, or standards committee leads, to make sure this can be an event that they will long remember in such a positive fashion.

Matties: Thank you very much and I look forward to seeing you at the show.

Mitchell: All right, thanks for the time. SMT007

Keynotes Educate and Entertain

Each year, IPC APEX EXPO features industry's most dynamic, innovative minds to deliver keynote presentations that are both educational and entertaining. IPC APEX EXPO 2022 will feature New York Times columnist, Emmy-winning CBS Sunday Morning contributor, and NOVA host David Pogue. During his keynote on January 25, Pogue will present, "Disruptive Tech: How It Will Affect Your Business and What's Coming by 2026."

In his keynote, Pogue will cover several disruptive technologies from the "quantification of self" movement, augmented reality, wearables, autonomous cars, drones, the Internet of Things, and what he calls "World 2.0."

Drones and robotics, AI, self-driving cars, employee-less stores, flying taxis, wearable medical sensors, software, and components are accelerating the arrival of new consumer technologies—and with them, changes to society and culture. With 30 years of experience reporting technology trends—and the entertaining style that has earned him six Emmys for his CBS Sunday Morning stories—Pogue will take his audience on a wild ride through the cutting-edge science and technology that is powering a next wave of technological innovation. His funny, fast-paced snapshot will bring everyone up to date—with a heads-up on how to succeed in a world we've never seen before.

"With broad appeal to general, business, healthcare, and tech audiences alike, David will bring his expansive knowledge, engaging wit, and perhaps a song or two to the APEX EXPO keynote stage," said Alicia Balonek, IPC senior director of trade shows and events. "The audi-



David Pogue

ences will leave as informed as they are entertained, with an enlightened perspective of the state of technology today and how it's shaping everyone's tomorrow."

Pogue's keynote is free to all IPC APEX EXPO participants. In addition to Pogue's keynote, John Mitchell, IPC president and CEO, will deliver a keynote on Wednesday, January 26. Drawing on insights gleaned from industry leaders and IPC research, Mitchell will assess the state of electronics manufacturing and identify the trends that will define the industry's financial growth and technological progress in 2022 and beyond. His keynote presentation will touch on the topics that are the focus of boardrooms and shop floors: factory modernization, supply chain resiliency, workforce demands, and environmental stewardship. Be sure to attend to learn more about how to navigate your organization to success in today's dynamic global marketplace. **SMT007**

Meetings and courses will run January 22–27; the technical conference and exhibition will run January 25–27. For more information on schedule and registration options, visit www.IPCAPEXEXPO.org.

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Navigating the Supply Chain Storm with ICAPE

Interview by the Barry Matties

I-CONNECT007

Guillaume Chauvet of ICAPE Group, vice president of sales—Americas East, discusses managing the supply chain through transportation issues, raw material shortages, and longer production times. He also details how he helps customers manage different suppliers and divergent technologies.

Barry Matties: Guillaume, would you give us a better understanding of how your company operates?

Guillaume Chauvet: The company was created by Thierry Ballenghien. He had managed PCB shops in France, and in 1999 he saw the PCB business going to China, but it was complicated to go there. French people didn't have strong ties to Asia, so it was a really good spot for him to open a company, to buy PCBs directly from Taiwan and China with our own qualified supplier, and then sell them in France. That's how

we started: by qualifying a PCB shop in Asia and creating more business in France.

It was quite successful. At that time, everyone tried to go to China, but it's not easy when you don't know the business, how to qualify PCB shops, etc. PCBs are very technical. Now it's a bit different. It's easy to buy from Asia, people are used to it, the quality is quite good, and there are many PCB experts there.

In 2004, Thierry opened a new company called CIPEM, which was doing more or less the same as ICAPE but for custom parts like harnesses, coils, and metal parts. There are custom parts that were easier to buy in China and were sometimes a better price. The target is to sell more product to our customers. We were selling PCBs to some contract manufacturers, and we said, "You have trouble finding good suppliers for the harnesses, so let us provide them for you. We have solutions for you." It was really to upsell the existing customers.

As we've grown, we have opened a big office and lab in China to control the quality of our Asian suppliers. Now we also have inspec-



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tors in the factory who just check the quality of the product directly out of the lines. We send the product to the lab to validate the sample before the customer receives the boards.



Guillaume Chauvet

The target was a long-term strategy—to sell everywhere in the world. We are opening new offices all the time. We started in the United States in 2015, but we are increasing. We have representatives in most European countries, in Brazil, Mexico, and Canada, but also in Japan, Thailand, India, Malaysia, China, Hong Kong, and South Africa.

Matties: It looks like your revenue has grown substantially since that first five million euro. You have over 450 people and 20 business units, correct?

Chauvet: I think now we have more than 500 employees.

Matties: Fantastic. You been with ICAPE since April 2020, at the beginning of the pandemic; that's a tough time to start.

Chauvet: It was really tough. I'm French, but I was living in Estonia. I used to work for a contract manufacturer, and I knew some people, so we contacted each other, and they said that there was a really nice opportunity in the U.S. I was stuck in Europe, but I was able to travel and move to the U.S. in November. I worked remotely for quite a long time from Europe.

Matties: I'm certainly glad we're getting a chance to chat today. Let's start with the supply chain. Obviously, that's the big topic right now.

Chauvet: It's a big topic. For two years, we have had many supply chain issues. We had COVID,

but every year we have the Chinese New Year and that creates a big impact on PCB manufacturing. Most Taiwanese and Chinese partner factories closed for over a month, so we needed to be sure that the PCBs were shipped before Chinese New Year. It took a while to get it restarted, and when I started working for ICAPE Group, we had transportation issues. Air travel was just impossible during COVID. Even now, the customer doesn't really know when he will get the components, so they are pushing out or pulling in the components, and it creates big, complicated problems for our partner factories and takes more time for us to manage the inventory.

We have ships that are blocked, and the docks in the U.S. are full. It seems like we always have a new issue. It's so important to secure the supply chain and to put stock in Asia when the PCBs are built. The best plan for us is to stock the PCBs at our warehouse in Indianapolis, which we are expanding to allow for more storage. We have a shortage of raw material, so the lead time went from eight to 16 weeks on some part numbers.

My goals have been to form partnerships. We cannot put in stock unless we find solutions with the customers, so we discuss the options. We see how we can secure the visibility or not, and just propose different solutions. One solution is consignment. We pushed to get more vendor-managed inventory (VMI), which means they get a forecast, we have some contracts, and we try to keep a certain level of stock inside our warehouse.

Matties: Now the work that you do is made-to-order.

Chauvet: Right. We only do custom parts. Therefore it's more complicated for us and it's why the customer needs to secure this part—they cannot find it off the shelf. We try to store parts here in Indianapolis or secure the raw material so the shop can build the boards when they need to. Currently, there is a lot of alloca-



Bare board electrical test—
MicroCraft EMX6151 Flying Probe.



BGA repair station—
ERSA Kurtz IR PL 650.

tion in the raw materials, so some raw materials are extremely tough to get. Transportation and raw materials are complicated.

The shops don't know when they will get the raw material, so they are replanning their schedules all the time and creating a low efficiency for manufacturing.

Matties: How do you manage this? What advice are you giving your customers and how are you expediting their orders?

Chauvet: We tell them to anticipate as much time as possible. We discuss updated lead times. After we get the PO, and if it's a need that was not anticipated, we have some options. One is working on alternative raw materials. We have the lab here in Indianapolis, so we have expertise on raw materials, and we know the difference in raw materials, so we can propose alternative material to the customer that is available at the key time.

Matties: For clarification, when you're talking about raw material, are you talking about the base material, the laminates, and such?

Chauvet: Yes, the laminates. In the second step, when we get the PCBs, we can just compare the true material. We can do some tests on cross-sections of the raw material, then check

that quality both before and after is the same or equivalent.

Matties: Let's talk about your lab. To have a lab where you can analyze and test materials, both pre-production and post-production, must give you a huge advantage.

Chauvet: We have two labs. We also have one in China. This is more to check the quality of mass production, etc. The lab in the U.S. is huge. Some of our staff have 40 years of experience in the PCB industry.

Matties: I think that today's customers are more willing to look at alternate materials for the sake of timeline, where perhaps two years ago, maybe they were a little more resistant to that.

Chauvet: Correct. Sometimes, they have no choice. The main thing is to know the raw material, and to have the customer trust us with the experiences we have. If we just send the datasheet, sometimes the customer can't identify whether it's similar or better. We have different customers, but sometimes they are not an expert in PCBs and how to design the boards. They are used to using the same laminate or raw materials, but they have never used different raw materials.



Ionic contamination—
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The same applies to the stackup. If we are talking about raw material, the stackup is quite important, so we discuss it with the China office; we are saving so much time by knowing different stackups, discussing with the supplier, and finding the best stackup for the customer. We link in with the PCB designers.

Matties: What trends are you seeing in orders?

Chauvet: Overall, I don't know if it is increasing, but with more electronic everything, this should be the trend. We are clearly getting more orders.

Matties: That's good news, for sure. What advice are you giving customers who are searching for their boards right now?

Chauvet: Good question. My advice is to build a partnership with the supplier. In the past, it was more like a buyer's market, where the buyers had the power. When the supplier tried to increase their price, the buyer would just switch to another supplier. It is totally different now. In Asia, and especially in China, the market is stressed, and they are struggling to find the raw material. They are struggling with having electricity, so the factory will shut down one or two days a week. Just putting pressure

on the supplier doesn't really work, and sometimes it's doing the opposite. We have a long-term partnership with the factory so we can discuss with them about finding available raw material spots, and they will help us.

Matties: Are you seeing any shift in customers wanting to have boards built in other countries other than China where maybe it's regionally more advantageous to them?

Chauvet: Yes. They ask for a lot of quotations from suppliers in America, Korea, Taiwan, and Japan. Because of the 25% tariffs in China, customers are trying to find a better solution, but it really depends on the technology. Even with the tariff, it's not always easy to find a better solution outside of China.

Matties: Well, this is where your organization is strong; you have a network of over 500 people around the world, to help the customer shift to a different supplier.

Chauvet: Yes. We already help with that, and the lab is helping a lot. We like to say, "Just send us a current PCB. We will analyze it and check to be sure the specifications are built according to the new specification." We know that some products are five years old, specifica-

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tions have been changed, and there is a change during production or some stuff that has been approved by the customer but has not been updated in the specification of the customer. Just to be sure we are talking about the same thing, we'll check the current PCB and then we will try to source with another supplier.

Matties: You validate those labs to give you a huge advantage for a number of different reasons.

Chauvet: We see that sometimes the customer validates 150°C Tg, which is normal Tg, we will say. During the project they have some troubles, or they ask in the project to go to 170°C, but they never really update the specification. So, when they outsource the PCB, the new supplier is using the old lower value and they get the same issue that they already found during the project, but they just have some trouble validating an alternate supplier sometimes.

Matties: As you look forward, what do you expect for 2022 regarding the pandemic, the supply chain, and how you're taking care of your customers?

Chauvet: I think it will stay very complicated. We are hearing that the docks and transportation will continue to be complicated. For us, the main target is to get the boards before Chinese New Year. Even after that, I don't think that the situation will be like before. It will stay a selling market and there are still some difficulties in finding raw material for the PCBs. I don't think it will change totally. It might be a bit easier, but it will stay a complicated market. We can see that there are new markets, like EV, etc., that are pushing. Copper is a very big issue for us. While we have allocation in the raw material for PCBs, it's because they cannot get the copper. I don't think it will change in the next few months.

Matties: How much EV work have you seen, or what's the percentage or curve over the last year or two?

Chauvet: Currently, it's still small. We just get more and more RFQs. We do a few prototypes, etc., but nothing is really in mass production on our side. We can see that there is a big shift and with our location, we expect to get a lot of business from Michigan, Ohio, and Indiana. Therefore, we want to invest in that. It's a bit of a new technology, or it's old, but there are more people doing the boards in a different way. Now they try to put the power circuitry with the control circuitry in the same PCB, so it means one part of the PCB has heavy copper and one part has normal copper. They try to mix both in the same PCB, and this is really brand new on the market.

Doing that, it's because everything keeps getting smaller and they need to find space. They cannot use two boards, so they try to reduce the space and they must put everything in one PCB, but it's not easy at all. Therefore, we try to bring this technology to the EV manufactur-

ers or the tier one or tier two that are trying to develop that and bring this knowledge that we have on these two points to help them design the board.

Matties: I would think that the suppliers, the fabricators, are finding this to be a challenge, dealing with the mixed coppers.

Chauvet: Yes. It's challenging and, at the same time, for the designer it's a new way to see things. In the past they needed to dissipate the heat, so we already help them to dissipate the heat and to see the new rules, like about tolerances, etc. It's a bit challenging on both sides, just to be sure that the PCB is according to specifications.

Matties: Do you consider yourself a broker or how do you classify your organization?

Chauvet: We say that we are a PCB supplier. For us, we are not the trading company because we are embedded in the factory. We have the lab, we check the quality, we have an inspector directly in the factory. We are much more than the trading company. We are really an expert in PCBs.

Matties: Just to be clear, I'm hearing that your employees are working in the PCB fabrication facilities.

Chauvet: Yes. We have inspectors working full-time jobs in the factory to check the quality after manufacturing. We are already embedded in their process.

Matties: The inspection, the work that they're doing, is exclusively for your customers?

Chauvet: Yes. Correct.



X-ray inspection—Nordson Dage Quadra 3.

Matties: Oh, that's great. So, what's the advantage for an OEM to go through you vs. direct?

Chauvet: There are many reasons, but first it's the DFM. We check the file to be sure that everything is okay. We can help them with the specifications, finding alternatives, etc. This is one of the steps. Then we qualify the supplier for them.

The same if you have a quality issue. How will you go to the factory to understand the issue and fix the problems? They really cannot currently, so we have people who can go directly there, we'll do some Teams calls, and we can just explain. We have people who can control things in the factory. After, it's a security for them in the way that we are like an additional inspector for the boards, but we do lab inspection in U.S. or in Asia. We'll manage the transportation for them.

Matties: Good. Well, this has been really insightful and interesting.

Chauvet: Thank you, Barry. SMT007

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Digital Transcendence: Fear of the Unknown

Smart Factory Insights

Feature Column by Michael Ford, AEGIS SOFTWARE

The first three industrial revolutions have brought us automation of physical tasks through adoption of mechanical and electrical machines, the benefit of which has been quite easy to appreciate. Industry 4.0 automation, however, is driven almost exclusively from the digital realm, representing a whole new world of intangibility. With manufacturing being rather averse to unplanned change or risk, unless there are very compelling reasons, how do we get to fully trust digital technology needed for our businesses today, taking us toward manufacturing digital transcendence?

Wouldn't it be amazing to have god-like powers, to be able to look down across the completely automated factory that simply, efficiently, and perfectly, making whatever prod-

ucts are required, whenever needed, and without human dependencies? All actions and activities would be automated in the mix of mechanical and software automation, lights out. This is the extreme and potentially obtainable goal, but with quite a few challenging steps to be taken in getting us there.

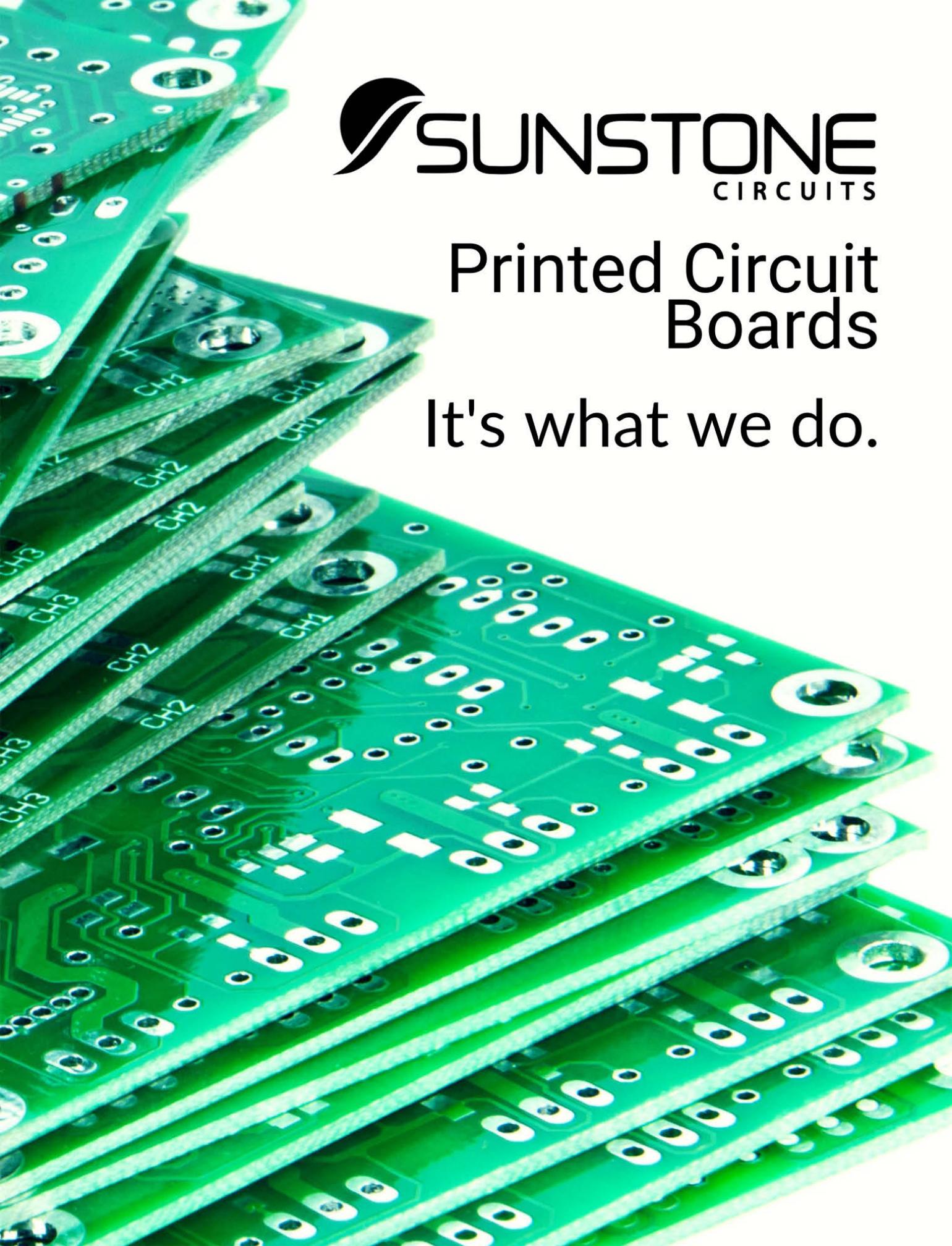
Several steps have already been taken. Data captured from machines and operations can be more instantly transmitted and contextualized for various uses today than ever before. We can remotely monitor machines and operations from the other side of the planet, if we so wish. Software has been evolving, not only to bring us, as humans, holistic factory information, with which we make operational decisions in a faster, smarter, and more reliable





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way, but has already started to make those decisions for us. We accept results, for example, from automated inspection and test machines that alert us to potential quality issues, instruction from Lean supply-chain tools that orchestrate material logistics based on production progress and planned future activities, and actionable information from dashboards that alerts us to trends.

Smart software technology is still evolving, with many challenges yet to fully overcome.

Hang on a minute. Do we trust all these decisions? Smart software technology is still evolving, with many challenges yet to fully overcome. It starts with the problem of data collection. Other than IPC-CFX, for which not every machine vendor has yet received IPC qualification, other data exchange technologies do not guarantee the integrity, content, or meaning of information, leaving gaps in the data that often go unobserved. Decisions are being made by software automation that are based on access to only a certain part of the true holistic picture. Proof of this is apparent as we see examples that include:

- Instances of work-orders being created and scheduled by ERP without the actual physical materials being available
- The failure of an in-circuit test operation resulting in a “no fault found”
- A dashboard indicating a ridiculous number for OEE at the start of a production run

These are all examples of where data and software are incomplete, that contextualization is being assumed or even guessed. How

many times do we turn off and on again our computers, phones, tablets, printers, televisions, etc.? Something went wrong, something quite unknown to us, but we know enough about what to do to fix it. This does not inspire confidence.

Today’s reality is that we will not transcend into the full digital world of Industry 4.0 until these kinds of problems have been solved and trust created. This is not an unexpected issue per se. We continue to use human operators for assembly tasks that automation, even after many years of evolution, has not yet found a way to competently and cost effectively replace. The same is, of course, happening in software, with “AI” algorithms evolving over time, with improved visibility and therefore decision-making, though we are much closer to the start of the journey with software than we are with hardware automation, a whole +1.0. We find ourselves therefore on a progressive journey.

The trust element is vital for ongoing adoption. Almost all of us are still driving our cars manually, even though more automated features are being added, such as LIDAR-driven emergency braking and automated steering following the lines on the road, are successfully being introduced. However, we don’t yet totally trust that the software can provide full autonomous driving in all conditions. Is it the software itself that we don’t trust or something else? Hardware failures are also possible, which are addressed, we expect, by a degree of redundancy and fail-safe design. Far more likely would be the problems with the vast variety of road conditions due to unexpected or unrecognized fixed and mobile hazards, weather events, and human nature. Some very clever people work on the development of automotive software, yet the most important people in the mix are those who implement and experience it, then provide feedback as it works in the real world.

The same is true in the evolution of artificial intelligence (AI) manufacturing software.

To whatever extent software is “smart” in today’s world, it takes an inspired and informed user to get the most benefit from the software’s functionality, and to understand the real opportunities and limitations. To be afraid of the software, to install it, and then, from a distance, expect to have it work without ongoing interaction and support is counterproductive. With mechanical automation, we have accepted the necessity to keep an eye on the performance and efficiency, as maintenance and repair will ultimately be needed. Software does not wear out, and there is no need for users to get into the bits and bytes levels of detail, but it is essential to understand how the software becomes progressively integrated as a member of the overall manufacturing resources team. As manufacturing practices develop and evolve toward digitalization, more software functions will be utilized, driving further benefits and new functional development, extending the reach of the software “AI,” creating further business opportunities.

For this whole scenario to be an acceptable part of manufacturing, there needs to be visibility, trust, and flexibility between customers and software vendors that reduces the risk of any adverse issue. What is most effective is selecting the right tools that enable low-risk, trustworthy functionality, and interoperability, and that progress at a rate at which manufacturing practices evolve. Bespoke software and middleware components should be avoided, as by their static nature, and bring limitations and barriers which eventually trigger step-changes in solution choices. Products from companies offering holistic, yet fully interoperable solutions, based around industry standards and thought leadership, represent a great start.

Customers of manufacturing operations today are expecting to see a plan. To not have a plan toward digitalization is increasingly being seen as a wasted opportunity, a risk that competitiveness, and hence customer val-

ue, is not being taken seriously. As with climate change, no one expects to create the fully autonomous digital factory overnight, but manufacturers should be putting into place the education, skills and strategy needed that take smart manufacturing toward its end goal. Each company will adopt different paths, as priorities and software selections differ. Having people in the organization with the right skills and expectation is essential. As holistic “AI” utilization within manufacturing is probably not on offer from most universities currently, human resource managers need to search for those candidates who are able to grasp the vision and methodology for manufacturing digitalization, to grow their experience and allow them to gain the trust within the organization.

Having people in the organization with the right skills and expectation is essential.

To achieve manufacturing digital transcendence, we need to know what we are transcending into, and trust those who are enabling that journey for us, in this case, driven by incremental creation of benefits, all of which align to medium- and long-term business goals. **SMT007**



Michael Ford is the senior director of emerging industry strategy for Aegis Software. To read past columns or contact Ford, [click here](#).

Technical Track Opportunities

Feature Interview by the I-Connect007 Editorial Team

Matt Kelly, IPC chief technologist, discusses the growth of the technical conference tracks in this year's IPC APEX EXPO program, as well as market dynamics that are influencing the topics presented at this year's event.

Nolan Johnson: Matt, thanks for taking the time to talk with us about what's coming up at IPC APEX EXPO 2022. The theme is the drive for digital transcendence. Can you walk us through your thinking on that theme?

Matt Kelly: Sure. When you look at the breadth of the technical topics embedded within Industry 4.0 or Factory of the Future, the number one topic that's long overdue and ready for operational execution is digital transformation. For example, it's amazing how many different processes within a factory are still moni-

tored and controlled using basic software functionality such as Microsoft Excel.

Let's break it into a couple of different areas. One area is the manufacturing floor where most people think to apply digital transformation. This is where products are built using statistical process control methods. There is tremendous opportunity to improve all process steps and to significantly improve key production metrics including productivity, efficiency, increased yields, reduction of scrap, and, most importantly, highest quality/reliability product assurance.

There's also logistical digitization, things like track and trace, so you can understand where things were built and when, so you can track when things go wrong. On the positive side, people are looking for demand forecasts: "I need to ship X number of pieces by these dates. Where are the parts in my line? How far are we into that job or build?" But on the opposite side, and this happens a lot,

(albeit not widely communicated), these cases are generally quiet, because this is where task forces get initiated. It's problem resolution and containment; an issue will be found, and the line may be stopped. "When was it built? How much of this problem affects what I already have now sitting at the end



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of line?” There is a lot happening. There is work in progress (WIP), in addition to what has already gone through the line. There’s containment and maverick lot containment. The value of digitization is that collected data can help engineers and operations management understand where things are and quality impacts of what’s happening.

Lastly, the supply chain management portion of this is coming to the forefront because of electronic component and mechanical part shortages. “Where are my components? What are my lead times? Who are my approved vendors? Has there been a natural disaster and I need to engage second source supply? Which suppliers have been qualified? Am I getting hit with tariffs? Should I consider switching to a regional or alternate geography source?”

Believe it or not, digitization at an industry level is still in its infancy. It needs to be utilized and applied in the factory, in the supply chain management, and most importantly, between companies. This is where things really start to gain value.

If you look at topics that encompass Industry 4.0, specifically things like digital twin, AI, and machine learning, they are wonderful enablers that will provide value. But they cannot—and will not—happen if you don’t have a proper data infrastructure. These are prerequisites. Industry 4.0 will take off when we can digitize and have the data collected. Digitization is the number one topic for Industry 4.0.

Johnson: Can we expect to see more research papers submitted on Factory of the Future type topics on digital transformation at the APEX EXPO Technical Conference?

Kelly: We are thrilled with the number of abstract submissions we have received. As of today, we have over 150 submissions, which may



Matt Kelly

be the highest number we’ve ever received. It shows the appetite and the interest people have to present and share their knowledge.

Last year was our first year for Factory of the Future, and it was offered in a virtual format. This year, we have a full track of 29 papers with contributions from IBM, Omron, MTC, Lockheed Martin, Continental, and ASM to name a few.

Johnson: Wow, 29 papers. How do you see these papers and what’s happening on the exhibition floor to tie this all together?

Kelly: This year we’re launching the first Factory of the Future Pavilion. We’re bridging the raw technical content in the conference with the companies and the suppliers that are working in this space. The difference is when you’re in a conference, we’re very technically focused. We have commercialization rules, trade names, with limited ability to promote your company. The pavilion is a place on the exhibition show floor where companies can talk tech and promote their commercial product and service offerings. This is the first pavilion that we’re offering and expect that to grow in future years.

Johnson: Based on what you’re hearing and what you know about what exhibitors are doing around Factory of the Future, can conference attendees anticipate getting some of that product-specific information on the show floor this year?

Kelly: Yes, absolutely. The pavilion is an open space for multiple segments of the industry to come together, such as MES software providers, artificial intelligence, and virtual reality. Also, on the show floor you will see IPC-2591 CFX qualified equipment suppliers of that protocol, and then just an increase in the capabilities of those suppliers.

Johnson: Great. I'm going to step back and ask a broader question. How does IPC choose the topics for the technical program?

Kelly: We've organized the technical program by nine different categories, spanning 1) Factory of the Future implementation; 2) enabling future technologies; 3) meeting extreme requirements; 4) PCB fabrication and materials; 5) circuit design and component technologies; 6) quality, reliability, test, and inspection; 7) assembly processes; 8) electronics materials; and 9) conscientious engineering. These nine categories are managed by our technical program committee, the TPC. This organization of volunteers are subject matter experts in the industry. We rebuilt the committee this year from the ground up.

Johnson: Great. From your perspective, how important is it to have these voices together in one event—suppliers, manufacturers, and OEMs?

Kelly: It's key. You need to have that voice from the original equipment manufacturer. They're the ones dreaming up and designing new products with requirements that flow down on how things are built, and the quality and reliability levels needed. On the other side, you have material suppliers, and equipment and tool suppliers. They are continually offering new equipment and capabilities so that these new products can be made.

Johnson: Matt, what are your recommendations for getting the most out of the program?

Kelly: It's always tricky. Everybody loves the amount of content, and then the feedback is that there's too much content and they can't attend it all. Come prepared and organized with your must-see agenda each day. In fact, we have mobile apps to help you with that. The program will pull you in many directions, so come with a map. For example, there are four

simultaneous tracks with the technical conference alone.

Johnson: How does the technical program merge with the professional development courses?

Kelly: We have a full slate of professional development (PD) courses. There's something for everyone. We've been careful that the PD course schedules do not overlap with the technical conference. Most PD courses are entry-level and general know-how, but the class can still get very deep into the topic due to the length of the classes. We find that many of the PD attendees are either new to the industry, may have a new job, or have a new assignment, for which they need some new base knowledge.

Barry Matties: What has you most excited about the technical program and the professional development program overall?

Kelly: In the technical conference, what really jumps out at me is the continued demand for these Factory of the Future topics. I'm excited about all the different topics we'll be bringing; I'll give you some examples. We have "transformational journey" style strategic topics, and then we get into more specifics. We have wonderful sessions on cybersecurity, supply chain, artificial intelligence, and machine learning. We have sessions on Factory of the Future and what that means for quality, and an entire area on flexible hybrid electronics as well.

The conventional technologies are also making significant advancements. I'm referring to our PCB Fab and Materials track. From what I can see, we likely have the strongest PCB fab track there has been.

There are, for example, 29 stellar papers on microvia design, HDI, and semi-additive processes. The semi-additive processes are new buildup technologies delivering much smaller line and spacing capabilities. We have two

different sessions on printed circuit structures and additive manufacturing electronics. I want to stress that these are new ways of producing PCBs. This is not just standard lamination and lithography techniques; these are brand new additive processes, not subtractive, and they are driving the new standards initiatives. We have brand new content coming out of the conferences that then goes straight into the standards committees.

We have brand new content coming out of the conferences that then goes straight into the standards committees.

Matties: Are you adding zero waste into your technical programs?

Kelly: Yes. If you look carefully at our Factory of the Future mission, it includes sustainable electronics. In the conference, we have a track dedicated to conscientious engineering, led by IPC's Kelly Scanlon.

Matties: Obviously, we're seeing an accelerated curve in terms of AI and automation, but what do you see the factory really looking like in five or 10 years?

Kelly: In the next five years, I expect a tremendous amount of improvement and focus on PCB fabrication techniques. We're seeing this in advanced packaging for IC substrates currently, as well as second-level board assembly and fabrication. There's a lot of emphasis on how PCBs are made. The driving force for that emphasis is miniaturization, speed, thermal, and multi-function. Partnering with fab technique improvements is the construct of Factory of the Future.

Matties: If I'm a board fabricator and I'm looking at a five-year window for my business, what should my plan be focused on?

Kelly: New materials, much tighter and tougher design points, plus expanding the technology offering and capability you have. If you're not looking at these new design points—HDI structures, SMT processes, printed circuits, and additive manufacturing—then, unfortunately, you'll be left behind.

Matties: I thought we would have seen additive in a stronger format a decade ago, but here we are today, and it seems to be accelerating nicely. Is that surprising to you at all?

Kelly: No, it's not surprising. Unfortunately, the printed circuit board fabrication industry, as well as EMS providers, have continued to be commoditized. When something is commoditized, it's deemed easy, as if anybody could do it. Yet we certainly know that's not true with printed circuit boards. I hope IPC can help the industry focus and promote these new technologies, whether that's in board fab, Factory of the Future, or advanced packaging. There is currently significant research and development on materials, processes, and advancements that must be overcome to make this advancement. Shaking off that commodity label is critical.

Matties: You mentioned some new standards that will evolve out of the changing landscape; what standards should we be aware of? And if you want to participate, obviously, there's an advantage to being on the early standards at the participation level.

Kelly: Yes. You're already seeing our new Factory of the Future digital standards portfolio grow. On the top of that list is the Connected Factory Exchange (CFX, IPC-2591). Then we have cybersecurity, a model-based design standard, and a digital twin standard that's forthcoming. That Factory of the Future portfolio

is growing as these technologies mature. The same trend is underway on the PCB fab side. Of course, then there are the tried and tested PCB standards. Those are being updated with new technology or we are in the process of creating new standards. The best area for that would be in this additive process space.

Matties: Let's talk markets for a moment. We all have cellphones, and we know that market is growing. What other markets should we be paying attention to?

Kelly: Automotive is huge. We're seeing the electrification of vehicles, not just from a drivetrain perspective, but from a cockpit perspective. Gaming and entertainment also; the commercial electronics market is what is driving technology advancements today, not aerospace or defense. They are not first movers, and that's by design. They want to make sure it works, it's good, it's strong, and it works for long as it needs to.

Matties: We haven't touched on cybersecurity, which must be an area of growing interest.

Kelly: Absolutely. There's the new IPC-1792 Standard for Cybersecurity in the Manufacturing Industry Supply Chain, and it tries to marry the data streams and end points within the manufacturing environment—the shop floor and the office. It's basically a combination of OT and IT cybersecurity.

Matties: The issue that many companies have, generally, is with the Factory of the Future: big data, implementations, cybersecurity. The smaller companies especially, they don't have the talent on their staff. How do the programs you're offering—technical, professional, or otherwise—help a fabricator navigate those challenges?

Kelly: We're very aware that there are some risks, and the migration is still just beginning.

Remember, we just started the Factory of the Future this year. We haven't even done our first full year yet, so we are now raising this awareness and this big picture strategy. We are working on this in a variety of ways. Take IPC EDGE and similar training programs as an example.

Remember, we just started the Factory of the Future this year.

Matties: It would be nice to see in 2023 some programs connected to navigating these challenges, because they're still going to exist. When you start looking at limited resources in an inflationary period, people are very cautious as to where they're spending their capital.

Kelly: We are definitely trying to build this into the content. Tim Burke from Arch Systems, for example, will be presenting the first F2P course on data analytics. We will pilot this program to determine the kind of draw we can expect. Course details can be found on the IPC APEX EXPO website.

Matties: Do you have any final thoughts, Matt, that you want to share regarding the technical program at IPC APEX EXPO?

Kelly: We are focused on delivering the industry's premier technical conference. I think that about 40–45% of these classes are being presented by an advanced-degree lead author. Nearly half the conference will be offered by PhDs.

Matties: That's great. Matt, thank you so much. Have a wonderful day.

Kelly: Thank you. SMT007

Revving Up Design

Feature Article by Patrick Crawford
IPC

During IPC APEX EXPO 2022, we are dedicating one portion of the show floor to PCB design. Inspired by the tenets of the IPC-2231A DFX Guidelines document—in short, good design takes all subsequent electronics manufacturing steps into account—we wanted to bring PCB design to the show floor, which is traditionally more focused on exhibiting fabrication and assembly technologies.

Yes, everything starts with design.

There will be an event in the Design@APEX booth every day of the exposition, starting on Tuesday, January 25 with our IPC Design Competition 2022 Finals. The competitors are currently working on their preliminary designs, and the finalists will be invited to compete in a layout competition at APEX. I'll be moderating the event a la a PGA Tour commentator (sports jacket and all) and we'll have some interactive Q&A with the competitors, as well as some special guest judges who will stop by to say hello.

Wednesday will be a Day of DFX with sessions dedicated to that cross-section of manufacturing and design. Starting in the early afternoon, we will host an Ask Me Anything (AMA) with some of IPC's top design committee volunteers, where we plan to spark a dialogue among attendees about how they can design and manufacture their products better



Patrick Crawford

by implementing DFX principles. The rest of the afternoon will feature 30-minute talks intended for passersby to drop in and learn more about IPC's involvement in the many facets of DFX—design for fabrication, manufacturing, test, environment, etc.

Both the AMA panel roster and a comprehensive schedule of talks will be published in the first week of January.

Finally, Thursday will be dedicated to STEM, specifically, how PCB design affects the entire electronics manufacturing industry and how students can get involved as they graduate from high school and move onward with their education. Our friends at Altium have put together a great group of individuals who are involved in their Upverter Education and Training departments who will be standing by in the Design@APEX booth to speak with students during their show floor tours. I'm personally very excited for this as I'm passionate about introducing more students to electronics and science in general. **SMT007**

Patrick Crawford is the manager of design programs and related industry programs at IPC, and an I-Connect007 columnist. To read past columns or contact him, [click here](#) or email PatrickCrawford@ipc.org.

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ein Electronics Industry News and Market Highlights



Samsung, IBM Announce Call for Code Challenge to Honor Everyday Heroes ▶

Samsung Electronics and IBM announced the Call for Code Honoring Everyday Heroes Challenge for enterprise developers to encourage the development of new technology solutions to help everyday heroes.

Cadence Extends Battery Life, Improves User Experience for Next-Generation Devices ▶

Cadence Design Systems, Inc. announced the Cadence® Tensilica® HiFi 1 DSP, which improves the user experience by delivering breakthrough audio/voice innovation for small battery devices such as TWS earbuds, hearing aids, Bluetooth headsets, smart watches, and other wearables.

Empower Semiconductor Signs Global Distribution Agreement with Mouser Electronics ▶

Empower Semiconductor, Inc. announces a new global distribution agreement with Mouser Electronics Inc., the authorized global distributor with the newest semiconductors and electronic components.

Apple Joins New imec's Sustainable Semiconductor Technologies and Systems (SSTS) Research Program ▶

Imec, a world-leading research and innovation hub in nanoelectronics and digital technologies, announces that Apple Inc. has joined imec's brand-new Sustainable Semiconductor Technologies and Systems (SSTS) research program.

Siemens Accelerates IP Validation by 1,000X at Arm using ML-powered Solido Variation Designer on AWS Graviton2 ▶

Siemens Digital Industries Software announced that Arm, a global leader in semiconductor intellectual property, used Siemens' machine learning-powered Solido™ Variation Designer software to improve IP validation runtime by 1,000X compared to traditional brute force statistical methods, while achieving greater accuracy and coverage.

IDC FutureScape: Top 10 Predictions for the Future of Digital Infrastructure ▶

International Data Corporation's (IDC) top 10 predictions for the Future of Digital Infrastructure point to a digital infrastructure strategy that addresses resiliency and trust; data-driven operational complexity; and business outcomes-driven sourcing and autonomous operations.

Energy Storage Ecosystem Offers Lowest-Cost Path to 100% Renewable Power ▶

As states reach toward 100% renewable operation, energy storage will be key to enabling a more variable power supply. But no single technology will be a silver bullet for all our energy storage needs.

JMA Wireless, Kyocera to Accelerate 5G Deployment Across Japan ▶

JMA Wireless (JMA) and Kyocera Corporation (Kyocera) announced an agreement to jointly develop a 5G millimeter-wave backhaul system. Leveraging Kyocera's wireless base station technology and JMA's X-RAN this system will accelerate 5G network deployment across Japan.

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STEM Program on the Grow

Feature Interview by Barry Matties

I-CONNECT007

In this interview we hear from Charlene Gunter du Plessis, senior director of the IPC Education Foundation, on the state of the STEM program started by IPC a few years ago. The program has been well received and continues to grow. IPC APEX EXPO 2022 will feature the live event with some exciting changes to reach even more students.

Barry Matties: The STEM program is an exciting and important component to IPC APEX EXPO. Of course, the 2021 event was virtual with nearly 1,000 participants, and some lessons were learned.

Charlene Gunter du Plessis: Yes, it made us realize we can do something else to provide the

necessary awareness of the industry and expand it virtually by hosting a career paths discussion in the form of a panel. We hosted another career panel on November 11 and reached more than 3,000 students. For IPC APEX EXPO 2022, in addition to the live program, we will be streaming and broadcasting live parts of the STEM event. We will use Instagram Live, YouTube, and the career panels that take place on Zoom. This will allow us to have more students learn about the industry because that's our goal; we want to continue with our efforts to create awareness and access of careers in the industry.

Matties: So, you will have students at the event and stream it as well?

Gunter du Plessis: Exactly. It will be a hybrid event. We will have about 200 students at the



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Charlene Gunter du Plessis

convention center, with six to eight recurring participating high schools involved. We will still do a hands-on soldering activity as a track, and students will tour the exhibit floor, but we are reworking the program to utilize the wonderful expertise and knowledge more fully in the industry by connecting students with real people. Therefore, we will collaborate with IPC's Emerging Engineers program as part of that.

They will do a roundtable discussion with the students, which will allow all students, including those not necessarily comfortable with speaking up, to be in a group and ask questions. It's a better way for them to engage, learn, and connect. That will be the focus. We will still do the career panel, and we are securing sponsors. TTM Technology will be the premier sponsor of the career panel luncheon track. We will have career panelists and representatives sharing information. Other tracks are supported by Mycronic, Google is a collaborating sponsor, and I-Connect007 is the official media sponsor.

We just want a great event that gets students and teachers involved and excited about the industry. Having it both live and streamed is another way for us to expand and reach more people. The IPC board wants us to impact as many students as possible, irrespective of where they are based, and this allows us to do that.

Matties: This program started about three or four years ago, right?

Gunter du Plessis: Yes. Alicia Balonek and her team did the first one in 2018, with about 50 students participating. When I came on board in 2019, we had 100 students, and doubled it to 200 students in 2020. In 2021, we did two virtual career panels instead of the event. And just yesterday, we had another one with 389 registered teachers who broadcasted it in their classrooms, so we definitely reached thousands of students. We had great panelists from IBM, Lockheed Martin, Digital Instruments, and General Dynamics. We had a great lineup of panelists. We are excited to host more panels in 2022.

Matties: For those viewing it online, can students sign up individually, or do they need to go through a classroom?

Gunter du Plessis: It doesn't need to be through a classroom. When we hosted a career panel this past February, we had more than 1,000 students who viewed it because their teachers had registered and broadcast it in the classroom. But we also had individual students from the Philippines, Germany, and more. Some students woke up bright and early in the morning hours, like 3 a.m., to join the discussion.

Matties: Your outreach is great. You've been doing this since 2018. How are you measuring the effectiveness? What impact are you having, and how is the industry feeling that?

Gunter du Plessis: After every event we conduct a survey, and we see a 99.9% satisfaction rate;

that's exciting! We have a near-100% success rate in helping a student who was not even familiar with our industry, or hadn't thought of pursuing this career, change their mind. We see them getting their thoughts together, increasing their grades, and getting on the right path to potentially get scholarships for four-year degrees, because some of them don't want to just get a job out of high school. They really want to go the academic route and get that four-year degree.

It opens their eyes to the potential for growth beyond operator level in the electronics manufacturing industry. They can get their employer (potentially an IPC member) to help them further their education, even putting money toward it, so they create a career path and don't just fill a job. We track teachers, asking them about the students who attended the event. Did they actually do what they said in the survey they would do? It's been really uplifting and positive.

We get those success stories from both our STEM events and from our Student Chapter Program as well. From the connections we're making for students, we can track where they end up, which is exciting for us. It's not thousands of people, but it's happening.

Matties: What about industry support? Obviously, this is an area that everybody benefits from. Right now, there's an incredible labor shortage, and it looks to continue for a while. Competing industries are putting out some nice incentives, which, perhaps, makes manufacturing not as glamorous as some of the others. How do the fabricators, EMS companies, and others help this effort?

Gunter du Plessis: Currently, we are asking the industry for collaboration. We would like them to be willing and open to host students at their facility for tours and an opportunity to talk with people in the industry. Maybe they could participate in a career panel or a formal presentation. COVID restrictions have made it diffi-

cult. Some facilities cannot necessarily house students, especially if they have DoD or specific regulations in terms of the equipment and what they're making. Therefore, we also have the opportunity for companies to sign up for a webinar and reach out to the IPC Education Foundation as a topic expert.

We've done a variety of webinars over the past two years with industry and IPC staff members. Kelly Scanlon did a webinar about conscientious engineering; Patrick Crawford did one; and we had one from Altium about schematic design. All these videos and webinars are recorded, and can be a spinoff for industry members to promote their internships, co-op programs, job shadowing opportunities, mentorships, or anything in terms of a talent pipeline or talent identification effort. We can brand it. We can do all the heavy lifting. We can promote it. The Education Foundation wants to be seen as the vehicle to create connections.

Through the IPC Student Chapter Program, companies can also be on campus, and can provide scholarships to IPC student members if they want to give and get involved. Companies can also host a college chapter. This is where a company within a group of universities or community colleges, that wants to target a specific group of students, can actually host those students. The cost is \$1,000 and they substitute the \$40 membership fee a student needs to pay to be part of the IPC Education Foundation Chapter Program. We have several companies that do this, such as Summit Technologies, Weller, and Calumet, at schools such as Michigan Tech and NC State. Hosting a college chapter allows for easier identification and relationships, and creates a bridge for these companies to the students.

Matties: Can you provide us with a list of all the student chapters?

Gunter du Plessis: Yes. We have exceeded 50 student chapters. One third are at community colleges, and two-thirds are at universities. We



have some big names, like Purdue University and University of California. Aaron Birney is doing an excellent job leading the chapter program and keeping the momentum alive. Students can take on leadership positions within their chapters as well and get recognized by receiving a chapter leadership scholarship at \$1,000.

We have been giving out five chapter leadership scholarships, with plans to increase that to six this year. It might be something students can put on their resumes, so when industry leaders know about the chapters and what the students are studying, it's an easy way to identify talent.

Wendy Gaston, who previously worked in sales for IPC, moved over to the foundation to help us with relationship building. Our vision is to have hubs, for example, in the Silicon Valley (San Francisco Bay area), because that is where most of our IPC industry members are based. If we can have most of the uni-

versities, community/technical colleges, and high schools involved there, it provides greater support for our local IPC member network. Then we will take that model and create hubs in different regions of the United States.

Nolan Johnson: Circling back to international expansion, where did those efforts begin?

Gunter du Plessis: That's a very interesting question because we don't necessarily know. In Europe, for example, all the regions are different; they have different academic contexts. We need to change the current chapter model. Each program needs to have a different look and feel to meet the needs of the students in those countries.

Mexico has great potential because IPC is there, and they are translating a lot of the education programs and products into Spanish. Canada is a natural fit, and we have been receiving some interest from African countries

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as well. We have a big presence in China, where they don't have the same program, but they do have opportunities for students. The IPC team had to tweak it because they have a specific relationship with specific industry members to support their internship programs, so it looks different. It's going to take some effort to modify it to be the same but also unique to their context.

Mexico has great potential because IPC is there, and they are translating a lot of the education programs and products into Spanish.

Matties: You might remember an email I sent to you describing a high school student named Drew who I met earlier this year. He wants to be an engineer, so I sent him a few questions to see how clear he is on what he wants to do.

What is the best way to connect him to the IPC? Many of us meet young people who we think would be good to bring into the industry. How do we help this person? What advice would you give to Drew, in this case?

Gunter du Plessis: On our YouTube channel, we have two webinars all about careers. Drew can reach out to those individuals on the panels. Everybody talks about networking and those panel members are very open to it. Drew could even attend one of our live events. If he's in the San Diego area, he can come out to the STEM event.

Matties: No, he's not in that area.

Gunter du Plessis: You see, that makes it difficult. We would like to do regional events in the future, similar to IPC APEX EXPO, but smaller. There might be career fairs housed

through companies and schools. High school students might have a robotics club at their school, and college students could have an IPC Student Chapter Program, where you can join your peers.

On the career panel yesterday, someone mentioned not just looking at the big companies, but go to your smaller manufacturing companies and ask them if you can get exposure. Be proactive. There are definitely resources available online from us and other companies, as well as internship opportunities for high school students; you don't need to be in college anymore to get an internship.

There are so many scholarships available for students and your chances are better if you are a well-rounded individual and showcase that you want to study, but you are proactive. Another suggestion is finding a YouTube video where you can be a hobbyist. Figure out a project and make something. You can add that to your resume. Everybody is saying that it's not necessarily even the certificate, the diploma, or the degree that potentially will get you the job. It is your experience. You might even talk about trying to build something and how you failed. "It didn't work, but I fixed it like this." That is what makes you stand out in an interview.

Matties: There's a wealth of information online, but what we're trying to do here is raise awareness about this industry. In Drew's case, would he be welcome to join the IPC APEX EXPO hybrids, the streaming version, as a high school student for the STEM portion?

Gunter du Plessis: Yes. And having a go-to person to guide you can give someone like Drew assurance that he's on the right path. Someone like that might just need a little nudge or guidance.

You need to steward someone like Drew. I know Aaron has been reaching out to individuals, too, because our chapter model is such that you must be part of a chapter to become a



member. We realize it's very difficult in COVID times to do that because you're not on campus. So, how is it possible? To grow a student club or organization, it's all about that connection: "Hey, you need to join this, it's like connecting with your peers." COVID made it so hard and distant. We have opened it up to have an individual member join so that it's not chapter-related, and we have seen an uptake on that.

This means that anyone currently at the tertiary side of education, post-high school, can join. Hopefully they'll be so inspired by the great things they can do once they are in and part of the network that they will eventually start a chapter at a school, if they joined without having a chapter.

Matties: This has been really good. Any final thoughts for the upcoming STEM event at IPC APEX EXPO?

Gunter du Plessis: On Thursday, January 27, anyone is welcome to pop in where we are hosting the event and find out about volunteering. Maybe someone would be interested to be part of the roundtable discussion, help

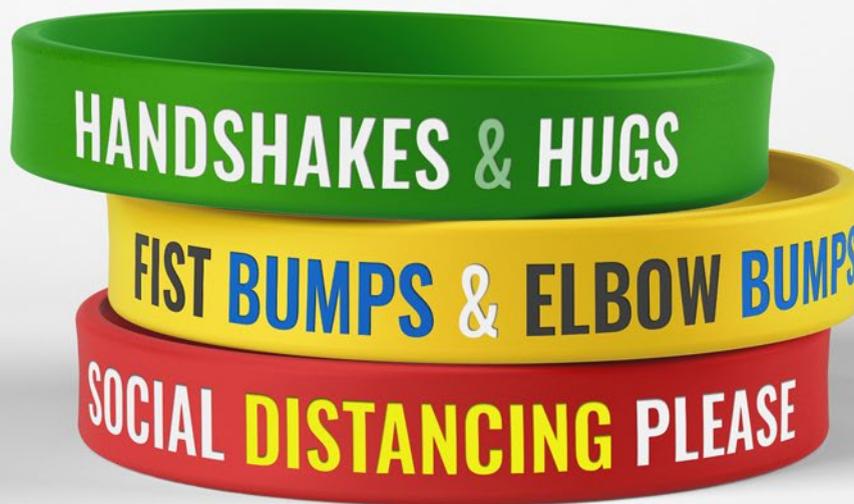
students to solder the pin; join in the fun. It's an open event. Hopefully we can do something on a smaller or a larger scale in some of our industry members' backyards, if that is something that they want to get involved in.

Matties: Great. And if somebody is interested in sponsoring, what should they do? What does a sponsorship entail?

Gunter du Plessis: Currently the sponsorship document can be downloaded from ipcef.org. We also take in-kind donations. If they're willing to sponsor a T-shirt that's branded with their logo, if they want to donate a water bottle or anything of some sort to support the students, just in general, to get their brand out, we are open to that. We have premier sponsorships at \$5,000 and then collaborating sponsorships that range between \$2,500 and \$1,000.

Matties: Thanks to you and your team for all the important work you are doing.

Gunter du Plessis: Thank you. SMT007



What to Expect Regarding **COVID** Restrictions

Feature Article by Alicia Balonek
IPC

As IPC is adhering to California Department of Public Health Guidelines, proof of COVID vaccination or a negative test will be required to attend IPC APEX EXPO 2022.

IPC has partnered with InHouse Physicians (iHP) for attendees to upload their proof of vaccine or negative COVID test results in advance of arrival at IPC APEX EXPO. Once information is uploaded via the iHP link, a trained medical professional will review the information within 24 hours and provide an email confirmation with a green check mark indicating they've been cleared for entry.

Upon arrival at IPC APEX EXPO, attendees will need to check in at the COVID clearance desk and provide a copy of the COVID clearance confirmation they received from iHP. Once cleared for entry, attendees will receive a plastic wristband and can then proceed to the registration counter to receive their badge. Attendees are asked to wear their COVID clear-

ance wristband for the duration of their stay at IPC APEX EXPO.

Although there are currently no social distancing requirements in the State of California, colored wristbands will be provided for exhibitors and attendees to indicate their comfort level for interaction while at the event:

- Green: Comfortable with handshakes and hugs
- Yellow: Prefer only fist bumps or elbow bumps
- Red: Interaction with social distancing

IPC will be following the State of California's guidelines; masks will be required for unvaccinated people and masks are recommended for those who have been vaccinated.

Masks, individual hand sanitizers, and hand sanitizer stations will be available for all exhibitors and attendees while at IPC APEX EXPO.

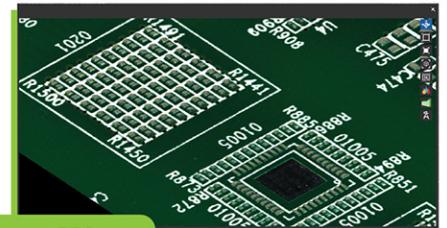
The San Diego Convention Center has enhanced its cleaning, disinfection, and infectious disease prevention protocols. IPC is working closely with the convention center to

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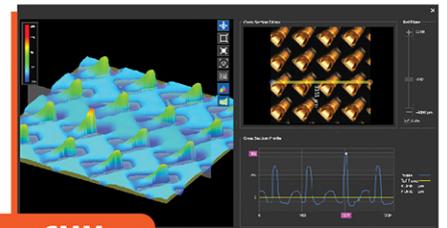
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Alicia Balonek

ensure high-touch items are cleaned and sanitized multiple times a day through the duration of IPC APEX EXPO 2022.

Additionally, the San Diego Convention Center became one of the first convention centers in the United States to achieve the prestigious GBAC STAR™ facility accreditation. Under the guidance of the Global Biorisk Advisory Council (GBAC), the convention center is implementing a program of stringent protocols for cleaning, disinfection, and infectious disease prevention.

Centerplate, the food and beverage provider for the San Diego Convention Center, was the first North American venue to achieve the Rise SAFE hygiene verification label for food and beverage services. To earn the label, Centerplate passed a site audit and protocol review covering 36 checkpoints in four core areas: process, people/training, facilities, and hygiene/cleaning. Centerplate demonstrated 100% compliance across all areas.

For the most current information regarding COVID-19 protocols for IPC APEX EXPO, visit [COVID-19 | IPC APEX EXPO 2022](#). SMT007

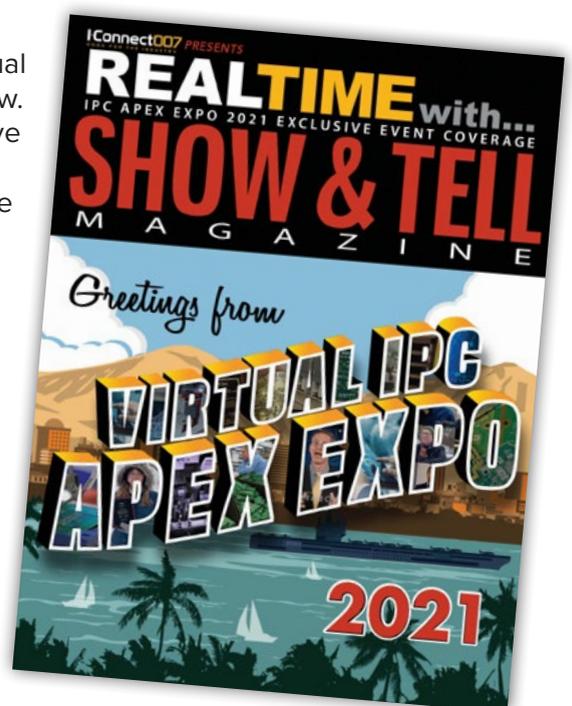
Alicia Balonek is the senior director of trade shows and events at IPC.

2021 Award Winners to Be Honored at IPC APEX EXPO 2022

The IPC APEX EXPO event of 2021 was an entirely virtual event. The following awards were presented during the show. Let's hear it for these men and women who continue to give back to the industry!

For more information about these award winners, visit the I-Connect007 2021 edition of *Show & Tell Magazine*.

- The IPC Raymond E. Pritchard Hall of Fame Award:
Karen McConnell, Northrop Grumman
- Best Technical Paper: Sarah Czaplewski, IBM
- Rising Star Award:
 - Radu Diaconescu, Swie.ie
 - Vlad Koncar, ENDSAIT, University of Lille
- Dieter Bergman IPC Fellowship Award:
 - Michael Ford, Aegis Software
 - Jan Pedersen, Elmatica
 - Hans-Peter Trantz, Continental Automotive GmbH



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EMS Leadership Summit Expands Its Reach

Feature Interview by Nolan Johnson

I-CONNECT007

Nolan Johnson talks with Tracy Riggan, senior director of solutions, and Mark Wolfe, executive EMS advisor, both at IPC. They discuss details for the EMS Leadership Summit planned for IPC APEX EXPO 2022, how the summit program has changed from years past, and who should attend. Hint: Directors and above, along with any “rising star” managers.

Nolan Johnson: Thanks for joining me to talk about the EMS Leadership Summit that’s coming up at IPC APEX EXPO. But first, Mark, let’s talk about you joining the staff.

Mark Wolfe: Thank you. I’ve worked with IPC for several decades as a customer, and as a leader in the EMS industry. There was a desire

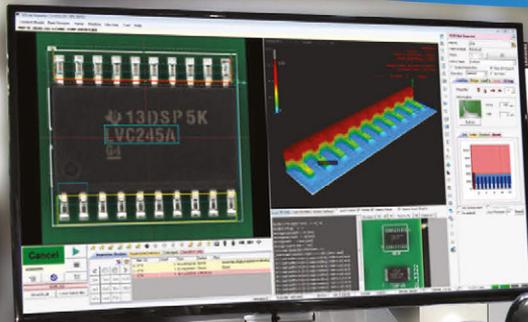
to bring more hands-on EMS industry leadership experience into IPC. The intent of my role is to work directly with other leaders across the EMS industry, better understand the needs that are out there, and determine what IPC is or is not fulfilling.

I’m looking for the opportunities to create new programs and capabilities that better serve the needs of the industry over the long term. This will include conversations with different tiers of executives, and lots of listening and understanding, so I can bring that back to the extended IPC staff and start talking about things we could do in the future.

Johnson: You’re a point of engagement?

Wolfe: That is certainly the intent. I’m representing both IPC and the EMS industry as an opportunity to connect those points together.

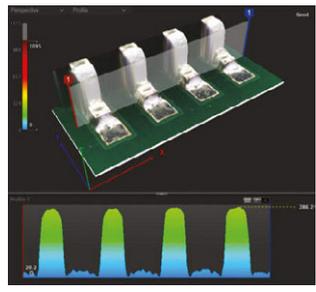
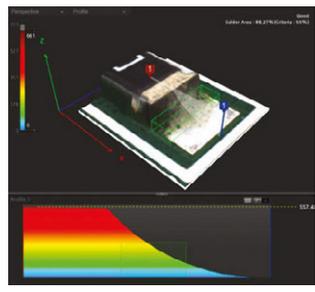




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Mark Wolfe

Johnson: Thanks for joining this conversation. Tracy, let's talk about the EMS Leadership Summit. How is it being structured this year?

Tracy Riggan: Leaders of small- to medium-size EMS companies in the IPC community have been coming together for years. As we're realizing that all levels of the organization have meaningful information to share, we decided to expand the invitation. We know there are up-and-coming leaders with new ideas and approaches to address some of the new challenges that we've experienced over the last few years.

The meeting is designed to bring in subject matter experts but also to bring in people from industry to highlight their experiences and give best practices and ideas about new ways to approach challenges. Additionally, we want to provide opportunities for leaders to work together to solve problems.

It's important in those discussions to have a wide breadth of ideas and learnings from different levels and roles of organizations. We're expanding that conversation by bringing in younger leaders, maybe those in management

positions staged to be the next presidents and vice presidents of their organizations. We want to hear how they're planning to approach these things to drive business growth and financial success.

Johnson: What motivated that change of scope?

Riggan: It was to bring in more voices and support EMS leaders of today and tomorrow to better help each other and the industry to prosper. That is what we aim to do this year. It is expanding that conversation to next generation leaders and assuring continuity of leadership, so that the conversation doesn't end with the meeting, but that it goes into practice.

Johnson: Right. It only just starts. I sense that the structure of this year's program is going to be a bit different than previous years.

Riggan: We're really focused on a conversation that's going to take place. We're bringing in younger leaders, so that's something new. We will have demonstrations of tools to provide more than theory, but a little bit more visibility on the practical applications. Rather than just bring in the experts on tools, for example, we're bringing in the users to show how tools are applied, and how they question and challenge them. Then, we will have discussions around that.

Johnson: Discussion on a practical level for part of the program?

Riggan: Yes.

Johnson: Let's run through the list of presenters.

Riggan: We have invited several users of quoting software. Right now, we have presenters from Zentech and Spartronics; we're identifying a couple more to talk about their user ex-

perience with the different types of quoting software so the audience can compare, then decide what they should be looking for in the software.

Calumet Electronics will provide a user perspective of CMMC (Cybersecurity Maturity Model Certification) and cybersecurity tools implementation. That's obviously a very difficult process and a lot of people are talking about how to do that because it's still in theory right now, very time consuming, and a very difficult thing to get one's head around. It will be a practical application that somebody can look to and ask questions about who to ask and steps for getting started.

Wolfe: Another topic of emphasis is the electronics supply chain. We have a panel that represents senior leaders from Avnet and the semiconductor side, TTI with the passive, electromechanical and connector side, as well as TTM at the circuit board level. This will allow a good exchange in conversation around what's going on in those industries. Are there ideas about practices that can help people to be more successful with all the constraints that are out there?

The overall intent of the EMS Leadership Summit is to give participants a chance to take home real-life actions to help their businesses; this is where some of the practical side comes in. For example, we will be talking about robotics as an alternative to labor challenges, and someone will bring in an actual robot to do some show and tell. Again, it's bringing in a hands-on piece.

Johnson: Who should be attending this session?

Riggan: Any director and above of an EMS company, as well as managers of EMS companies. We want the future leaders, the successors, those who are at the helm of designing those new business solutions and putting them in place right now.



Tracy Riggan

Johnson: This does seem to be a broader attendee scope than in previous years for the EMS professional development programs, is that correct?

Wolfe: Yes. One of the statements of past success is the repeat attendance, but we haven't necessarily been drawing new owners, new senior executives of new companies, at the rate we'd like. We feel like there's an opportunity here to attract and expose the next generation of leaders into this industry and to start treating this meeting as a mix of the senior level exchange of the most pressing issues that are going on, but also for the high potential individuals in their organizations to observe, participate, and grow themselves.

To support both ambitions, there have been some incentives put in place so that if more than one person attends, they earn incremental credits. It's an opportunity to make it more attractive to attend.

Riggan: We are promoting this as a place to receive education, not just to network amongst themselves. This is an opportunity

to spread education and encourage their entire team at all levels to be engaging with one another to benefit from the best practices of their peers.

In addition to bringing those up-and-coming leaders, we also put an incentive in place to encourage them to share training and learning opportunities with others at their organization—the operators back at home. Every attendee will get a \$200 voucher for IPC Edge with multiple training opportunities so they can choose what fits their current needs. If they bring a colleague, they will get \$600 for their company.

Every attendee will get a \$200 voucher for IPC Edge with multiple training opportunities so they can choose what fits their current needs.

Johnson: That's a nice spiff for attending.

Riggan: We definitely want to encourage them to reach out.

Johnson: You're encouraging the education portion, but will there be networking opportunities?

Wolfe: Yes. From a program perspective, one of the keys that ties us all together—and from which we get a tremendous amount of positive feedback—is the two-plus hours of roundtables planned around certain topics. It's not PowerPoint, it's not formal, but rather an opportunity for smaller groups to talk about specific issues and report out to the group.

One of the definite benefits of this meet-

ing has been the tremendous number of relationships and follow-up conversations. There are even some small regional groups that have formed because they come to this meeting each year and want to get together and collaborate more regularly. I'll say the relationship aspect of it is a very important part of this meeting, as well as the hands-on and the formal agenda.

That extends into a networking dinner that we have as part of it, in the evening, where we're, again, bringing people into a venue to continue the one-on-one conversations. Overall, there's a very substantial opportunity to network and build those relationships.

Johnson: Let's walk through the when, where, and how to register.

Riggan: The EMS Leadership Summit is going to take place on Monday, January 24th in San Diego at IPC APEX EXPO. The meeting takes place from 8 a.m. to 5 p.m. followed by a networking dinner. Register just like you're registering for IPC APEX EXPO at IPC Apex expo.org. When you register we encourage you to bring a colleague so you can take advantage of those IPC Edge credits.

Wolfe: There's also an opportunity for an early bird discount by December 17, which is an additional 20%. The meeting is practically free if you act soon.

Johnson: Bring a colleague, get those credits, and get the discount. You have a strong argument there. Thanks to both of you for taking the time to talk about the EMS Leadership Summit.

Wolfe: Our pleasure.

Riggan: Thank you. SMT007

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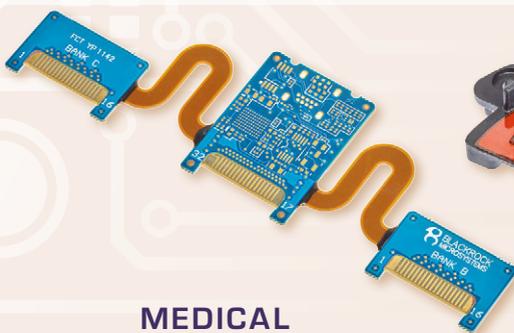
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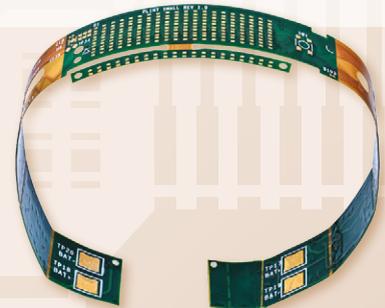
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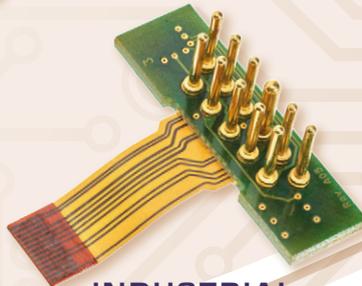
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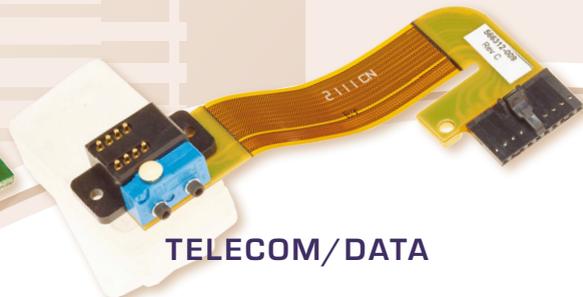
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Industry Market Drivers, Inflation, and the Supply Chain



Shawn DuBravac

Feature Interview by Barry Matties
I-CONNECT007

In this wide-ranging interview, Shawn DuBravac, chief economist for IPC, discusses a variety of market drivers and pressures that are affecting PCB manufacturing and assembly. He also shares his thoughts on the relationship between inflation, wages, and the current supply chain challenges—and what all this may mean to your bottom line in 2022.

Barry Matties: Shawn, as we look at the pressures the industry faces today—supply chain, inflation, labor and so on—how should our industry be viewing or reacting to these pressures?

Shawn DuBravac: These are forces that are impacting not just companies in the electronics manufacturing industry but also everyone who is upstream and downstream of them. These forces, for the most part, aren't likely to abate soon, and will likely stay with us well into 2022. These forces are causing companies

to really rethink the type of relationships they have with their supply chain. It's causing them to rethink pricing, their suppliers and supply chains, and what those relationships look like.

Matties: Looking at our end-markets, what do you see? I'm thinking of automotive, military, medical, and so on.

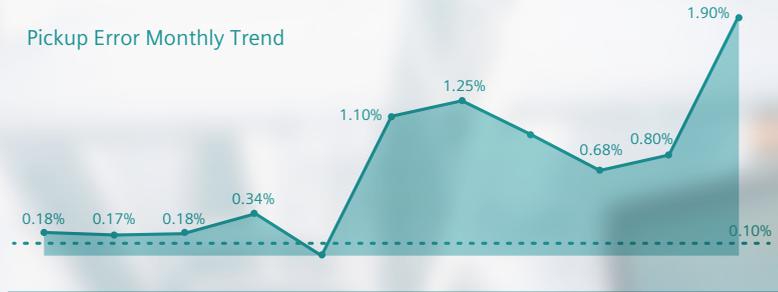
DuBravac: Speaking broadly, we definitely see pressure on the auto industry. We've obviously seen a significant extension of lead times. Many of those shortages are playing out in other industries.

When demand picks up and lead times lengthen, it causes an acceleration of orders because people say, "I wasn't going to place that order for three weeks when it was a three-week lead time, but now that it's an eight-week lead time, I need to place that order today." Ultimately, lengthening lead times pulls orders forward and exacerbates the problem.

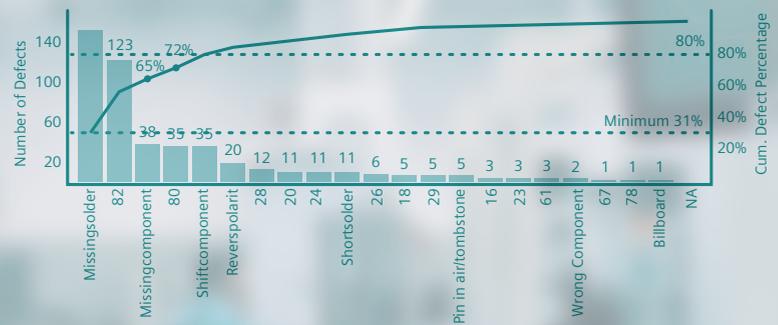
The supply chain is working to address the rapid rise in demand that we've seen over the last year. We're not seeing lead times extend



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significantly, but they remain very high. We've also seen a slowdown in demand which will help drive us to a more sustainable equilibrium. We saw, in the U.S. in particular, things slow in the third quarter. At the same time, inventory levels are low across the board. The backlog of orders continues to grow. It will take some time to work through all these dislocations and many of these pressures will be in place well into 2022.

Matties: Do you anticipate any surplus of inventory in 2022 which might result in a dip in our industry? Is there going to be a dip generally because of the slowdown?

DuBravac: Right now, we have the opposite dynamic. We've seen somewhat of a dip in certain industries because of the inability to get parts. We see a slowdown because of supply chain dislocations. For example, Apple said recently that the supply chain constraints cost them about \$6 billion in their fiscal Q4. They anticipate more than \$6 billion in lost sales because of the constraints in their fiscal Q1, which includes the holiday quarter and bleeds into the new year.

Some of the dip in the calendar Q3 in the U.S. was because of a rapid slowdown in consumer spending, which was still growing but at a much lower rate. I think some of the cutback in spending was a result of product availability. Recent research from Kelly Blue Book suggested new car buyers were holding off or exiting the car buying market because of lack of inventory and lack of product availability, coupled with stiffness of price.

Now to your question: Do we see a big overhang of inventory forming in 2022? I don't see that for several reasons. Have there been excess orders? Is there double booking? Possibly. But I'm seeing a lot of companies doing things to protect against that.

Distributors aren't taking on new customers in some instances as they're protecting their existing customers. I've heard of distribu-

tors who are allowing companies to only order some multiples of what they had ordered in the past. Maybe it's 10% or 20% more, not allowing them to try to double their orders over what they did in the past. Contract terms have stiffened somewhat, so the ability to cancel orders is not as relaxed as it might normally be or certainly has been in the past. They've done that as a mechanism to firm the orders.

I've heard of distributors who are allowing companies to only order some multiples of what they had ordered in the past.

When you look at semiconductors, you see a lot of companies using proprietary designs. Using Apple as another example, if Apple ends up with a bunch of extra M1 chips, that inventory is not going to go anywhere else. It will just sit with Apple and their supplier. In the past, you might have a glut of supply that materialized because you had extra orders across the board, which then gets dumped in the market at a lower price. That won't happen with proprietary chips and parts.

There are two other factors that are likely to protect against a large inventory overhang in 2022. One is that lead times are long, so that gives companies a relatively long time to adjust. If you're looking at a six- or 10-month lead time for some things, and suddenly we start to get supply of that, then people have a window in which to adjust. The other factor is that inventory levels are quite low so there will be residual demand to refill those orders to build the inventory back up.

Take the automotive sector, for an example. Typically, we have about two and a half months

of inventory relative to sales. In the current environment, we have a couple weeks of inventory relative to sales. You can have a little bit of an overhang to restock those inventory levels and get them back to more normal, arguably healthy, levels.

Matties: So, listening to everything you just said, you seem optimistic that 2022 will be a positive year for our industry.

DuBravac: I'm cautiously optimistic, but I think there are tailwinds. If you look at durable goods, which is where our industry fits, that's up from pre-pandemic levels by nearly 20% today. Spending on services hasn't really recovered to pre-pandemic levels yet. Some of that will presumably settle out in 2022. We will see a pickup in spending on services. We see some headwinds against spending on durable goods as a result.

Growth rates will be slower for the economy in 2022. We'll have presumably less stimulus than we have had since Spring 2020. Even considering the potential for the infrastructure bill, you're going to have less stimulus to drive spending. We'll be more reliant on wage increases and business investment to drive growth. Businesses are showing a bit of uncertainty, and consumers are showing less confidence than they were pre-Delta variant.

Here's an anecdotal example from a friend. His phone was dying, so he went to the carrier store to get a new one, but they weren't in stock. He got the battery replaced instead, and now the phone is charging fine, so he isn't going to upgrade. He said, "Well, now it's charging fine, so I'll just use this phone a little longer." That happens in a lot of categories where we extend the durability of the product. You see it in cars, especially, where there is a high degree of durability, and the life cycle can be long.

Going back to my example with Apple, by their estimate they've lost over \$12 billion in sales over the past six months. Some of that will materialize later in 2022. Maybe some of it is a missed opportunity, but some of it will re-materialize. As I said, there are some headwinds and tailwinds, but the overall environment looks pretty good.

Matties: The other impact, of course, is labor. Right now, there's obviously a shortage of labor. When you're looking at the market reports, how do you factor the labor into your thinking?

DuBravac: If you look at IPC's newly released indices, the ability to hire skilled labor remains a major constraint and companies—at least over the next six months—so I don't anticipate that to improve. In fact, most firms say that will deteriorate over the next six months. My rough estimate is that we have nearly 120,000 open jobs in our industry in the U.S.

Prices will go up for labor because they're going up in other places for labor. Manufacturers are competing against Amazon, Walmart, Starbucks, and everyone up the value chain, depending upon what type of job you're recruiting for.

Matties: Many of those major companies are offering hiring bonuses and other incentives.



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DuBravac: Exactly. Both Amazon and Walmart this year offered to pay higher education costs for some of their employees. Walmart announced a couple months ago they were going to give half of their associates, about 750,000 people, a smartphone to use while they're in the store but then also to use for their own personal use outside of the store. So, there are these fringe benefits together with real tangible benefits.

Matties: What advice do you give our industry about labor?

DuBravac: It's clearly a very competitive market. It will be very competitive in 2022. Prices will be going up and, as an economist, it looks to me like the reserve wage has gone up. We've never come anywhere close to having this many open jobs in the economy—as of the last count, almost 10 and a half million open jobs. We've never seen levels like this before. At the same time, we still have a fair amount of unemployment. Why haven't some of these individuals who are unemployed taken these jobs that are open?

Some of it looks like the reserve wage has gone up. They're not willing to work in certain jobs unless the total compensation package is improved. But beyond that, workers are also looking for a more holistic view of their work environment. For younger generations, like Gen Z, some want to be associated with a good cause. They want to believe in the mission of the organization.

For younger generations, like Gen Z, some want to be associated with a good cause. They want to believe in the mission of the organization.

For others, it's training opportunities. By my estimate, probably about a third of those who are unemployed are not getting a job because there's a skill mismatch—the skills gap. Sometimes it's the employer who thinks they're not qualified. Sometimes it's the worker who is maybe not applying to certain jobs because they feel they're not qualified. It goes both directions. Some companies are taking an inter-

esting innovative approach, what they call “returnships” as opposed to an internship, which might be targeting a young, first-time employee. Instead, returnships can offer training opportunities to those people who have been out of the workforce for some time.

Speaking of benefits that might be attractive, help with childcare is something that employees are struggling with. They can't go back to work because they don't have childcare. I think we've lost roughly 100,000 workers in childcare services from pre-pandemic levels. This is about 10% of the number of workers who had been employed in this sector. This has a ripple effect. Childcare providers have fewer employees so they're not able to accommodate as many children. And then suddenly that childcare center is booked up. As a result, parents can't find childcare so they can't go back to work.

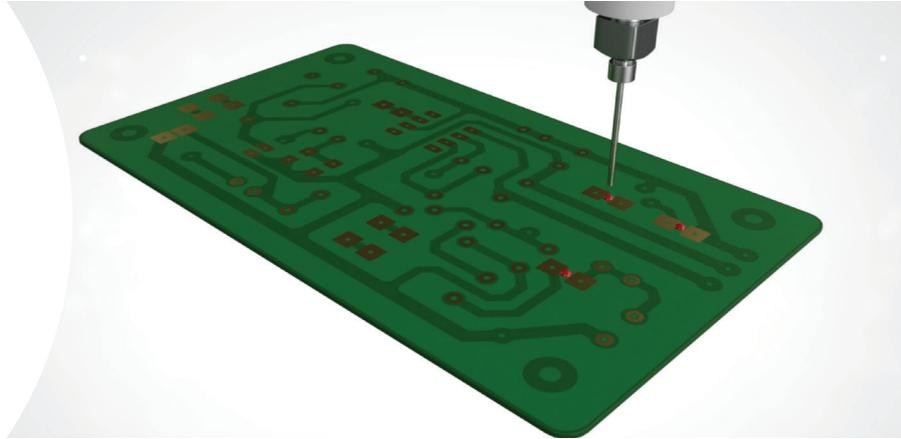
Maybe some of these employers offer in-house childcare, childcare credit, or something else to help facilitate that. There are some real tactical options that can help employees overcome some of these obstacles, and some of them will cost money. Companies will need to take that into account as well.

Matties: With this labor gap, it shifts the calculus for business owners regarding automation.

DuBravac: Right, a higher cost of labor changes the labor-capital equation. You have seen automation show up in lots of interesting places. There's been some automation in the Italian wine industry because they can't find labor to pick grapes and do other manual tasks. White Castle is using a robot called Flippy to cook french fries because they're struggling to find workers.

White Castle recently announced that they cold-called, sent emails, made phone calls, and sent texts to 550,000 individuals who had applied to work at the restaurant in the last four years. I think they had about 30,000 who showed interest. So, you've got this company

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trying to find workers and then using technology—automation—to offset the difference.

It's one of the great conundrums when it comes to jobs: When you look at Capitol Hill it's usually the Democrats who want to raise the minimum wage and raise wages overall. At the same time, the offsetting feature of that is that it could drive automation and lead to fewer workers in some settings. So, you must find the right balance. In many instances, what I would call a starting wage has already risen above any minimum wage requirement.

Matties: Right. It's all related because as wages go up, so do the retail prices. It's a sliding scale. It might be a feel-good moment that the costs are passed on.

DuBravac: I think we're in that transition period right now. If you look at the research that IPC is publishing every month, companies report that orders are up, but at the same time costs are up and profit margins are down. So, they probably haven't raised prices as much as they should to offset higher costs.

In 2021, on average, about two thirds of our manufacturing companies said they had raised prices or were planning to raise prices and they were up about 14.5% on average.

In 2021, we saw a lot of triage in every industry. The manufacturers I've talked to across the board were saying, "Our costs have gone up, but we didn't raise our prices for any number of reasons. Short term, we're taking the hit in margin compression but longer term, we'll have to adjust prices."

In 2021, on average, about two thirds of our manufacturing companies said they had raised prices or were planning to raise prices and they were up about 14.5% on average. We also asked them what they anticipated raising prices in the first half and the second half of next year. On average, it was 7-8% increases.

Matties: On top of that?

DuBravac: Yes, on top of that. I don't think we've seen the end of price increases. Contracts needed to be rewritten. And companies needed to see if the cost increases they were facing were temporary or more permanent. Prices are up and companies will need to pass those forward. But I do think the rate of increase will slow. For example, energy prices and commodity prices, generally, are all up significantly. It's unlikely that they will double again on top of already high prices. Oil is hovering at \$80 a barrel, give or take. I don't anticipate seeing that going to \$160 a barrel, for example.

Matties: I think the rate of increase is slowing.

DuBravac: Yes, and that's ultimately what inflation is: a rate of increase. At the same time, in the consumer market, we had two compounding effects in 2020 and 2021. One was consumers stopped buying things, so savings naturally grew. Two, they had a tremendous influx of stimulus which drove up income in terms of checks from the government and any number of other mechanisms that were used to supplement unemployment benefits and spur spending. We saw household savings increase significantly—multitrillion dollars in increases. That cushions the consumer just a little bit in 2021 and in 2022 toward the higher prices.

Matties: But that buffer will run out.

DuBravac: And when it runs out, I think order growth will naturally slow. So, using the auto

industry as a simple example, people are willing to pay manufacturer's suggested retail price (MSRP) on a car right now because inventories are tight, and they've got the ability. In some cases, they're getting attractive financing options. Some are even paying over MSRP. But that is not a typical situation for the auto industry. Typically, buyers pay about 85% of the sticker price in a normal year. It's a great time to be an auto dealer, but that's not going to last; as inventories rise, it will be much harder to sell vehicles at the sticker price.

Matties: The same could be said for the real estate industry as well. It's a great time to be a realtor. We're starting to see price decreases in the real estate market.

DuBravac: Right. If you look at real estate, you're going to see some pressure on pricing. Some of what has happened is people rethinking the quality of life they want—where they want to live, needing a different-sized space, wanting to be in or out of the city. When that settles out, we get a new equilibrium. What makes it different than, say, 2009 is that we don't have a lot of excess and predatory lending.

So that piece of the dynamic has changed. I point this out just to say that we're not going to go into an environment where you see a free fall of housing prices. We are under inventory in housing because the last 10 years we've underbuilt housing. So, part of the reason prices have gone up is because there's a dearth of available homes for people. There are pressures that will keep prices from deteriorating significantly.

Matties: Sure. What emerging markets do you think the industries should be preparing for?

DuBravac: Just in the last two weeks, we've had major announcements around virtual digital environments. Facebook obviously renamed their whole umbrella company to Meta. Microsoft announced at Microsoft Ignite that they

were bringing Mesh to Microsoft Teams which will bring the mixed-reality capabilities to Teams. They talked a lot about the metaverse.

Whether we call it XR or the metaverse, I think there's a tremendous opportunity there. Had we been further along in that roadmap, I think that you would have seen a large uptake and an acceleration for mixed reality as we went into the COVID shutdown, but we just didn't have the hardware or the service infrastructure in place. The metaverse is definitely an emerging market to watch.



Another area to watch is the transition from digitization to datafication. Part of this transition involves bringing greater computation power to areas that only recently were digitized. One of the great examples of this datafication is the MBUX Hyperscreen curved display that Mercedes introduced earlier this year. It extends pillar-to-pillar across the dashboard of the car, with a multicore central processing unit (CPU). This screen uses artificial intelligence and has what is called a “Zero Layer” interface which uses voice and touch. So, now we're seeing the computerization of that dashboard. Google has announced some major initiatives to change the dashboard as well. This is just one example of what is happening in every industry.

The broad electrification of vehicles is another big trend and we have just barely seen the cusp of that. But all the auto manufacturers are pushing in that direction and inevitably that will come. This ties into a much broader narrative related to the environmental, social, and

corporate governance (ESG) movement that's happening globally among corporations. In the U.S., as we work to catch up with Europe and other regions that have been more progressive, we'll be seeing a lot of companies report more precise measures of their ESG impact. You've seen the Securities and Exchange Commission (SEC) come out and say, "A lot of companies are talking about ESG. We think that there needs to be some standardization in how this information is communicated." In SEC Chair Gary Gensler's speech a few months ago¹, he laid out what he saw as his outline for ESG disclosure, and he suggested it should be mandatory instead of voluntary.

In the U.S., as we work to catch up with Europe and other regions that have been more progressive, we'll be seeing a lot of companies report more precise measures of their ESG impact.

If the SEC has mandatory ESG disclosure requirements, how does that all factor back to us? Well, a piece of that is not only your own carbon footprint, but it's your supply chain and measuring your whole supply chain. Electronics manufacturers may not be as far down this path as others are who tend to be more consumer-facing, but they're going to have to be there because their buyers are going to require it.

Over the next decade, I think ESG will have a major impact on the industry. If a major OEM is required by the SEC to disclose certain things and to measure things in certain ways, then so will their supply chain. I think you'll see oth-

er requirements on the social and government piece for public companies, but the environmental piece is something that feeds into the supply chain.

Matties: Is there supply chain reshoring? How dramatic is it? Is it something we need to be aware of? And if so, what's the long-term effect?

DuBravac: Yes, my sense is that it's happening to some extent on the margin. There were already forces at work pre-pandemic, tariffs and other things which were causing companies to re-examine their supply chains. We had lengthened supply chains over numerous years, primarily to reduce cost within those supply chains and to avoid tariffs. The tariffs that were put in place under President Trump change those equations. Companies were thinking about it already, but the tariffs caused them to start looking at alternatives.

Initially they looked throughout Asia. We started to see Vietnam, Cambodia, Malaysia, Indonesia, and other places all become areas of exploration. The pandemic hit and that caused a lot of companies to look closer to home, in Mexico, and other places like that. It's happening on the margin. But this is a slow process. You build a factory, and it has multiple decades of usability. It takes some time for a major transition to take place.

Matties: Do you think the inflation is slowing the reshoring drive?

DuBravac: When companies are looking at reshoring decisions, I don't know that they're necessarily looking at it as, "Should we reshore or not?" I think they're looking at it in a holistic sense, asking, "Where should we manufacture?" They're looking much longer than near term inflation pressures; the next three, five or 10 years.

I think the jury is still out whether inflation pressures could be as severe in three years, five years. There's an argument that they won't

even be this severe in a year. There are some arguments against that as well. But I think that in much longer time horizons they don't consider some of those near-term pressures. The flip side is that, if you're looking at a capital deployment and factories of the future, arguably the cost is going to be comparable wherever you are in the world outside of some labor component tied to deploying that capital.

So, if I'm buying equipment, it will have a general global price and I'm going to pay the same wherever I buy it. Now, I'm going to have some other costs based on local implementation or regulation. Let's say Apple suddenly and unilaterally said, "We're going to produce 50% of what we sell in every market inside of that market." It's not a reshoring decision by itself but that they want to service the markets with production inside of those markets. Then you would see a big swing back because there is so much consumption in the U.S.

You've had a lot of companies say, "There's a lot of ambiguity happening right now in China, and we don't want to be in this market." At the same time, you have a lot of the Chinese companies which have lost a lot of value in the last year as there seems to be a tightening of the regime's direction. I think the tariffs in place are a factor, but there are a lot of forces that have diminished the view of China.

Matties: Shawn, you have given us a lot to consider today. Thank you and we look forward to seeing you at IPC APEX EXPO.

DuBravac: Thank you, Barry. SMT007

References

1. "Prepared Remarks Before the Principles for Responsible Investment 'Climate and Global Financial Markets' Webinar, July 28, 2021.

Lean Digital Thread

Why is Everyone Suddenly Interested in Supply Chain?

by Sagi Reuven

Prior to the global pandemic, most people didn't give the supply chain much thought. There was no reason to—consumers had become accustomed to a reality in which they could simply click on an item on a website, and it would magically arrive on their doorstep the next day. What difference did it make how it got there and where its components were produced as long as everything was running smoothly?

That reality has changed drastically in the past year and a half since the onset of the pandemic. Suddenly, it seems like there is a backlog of several months on every item, from cars to washing machines to books; the supply chain has become the headline news in leading publications. What happened? Are the changes tied solely to COVID-19? Will things return to normal as we recover from the pandemic?

The challenges facing electronics manufacturers are compounded by the fact that they are competing with manufacturers of products as diverse as



food, medicine, clothing, furniture, and cars for logistical resources that have become increasingly scarce in the past year and a half. And that doesn't even consider extreme situations like when one of the world's busiest shipping lanes was blocked for almost two weeks earlier this year. No industry is immune, not even electronics.

To read the rest of this column, [click here](#).



Supplier Highlights



Seeed's Open Parts Library (OPL) Adds SnapEDA Models for Faster Electronics Production ▶

Seeed, a leading global electronics manufacturer based in Shenzhen, is adding SnapEDA computer-aided design (CAD) models to the Seeed and Shenzhen Open Parts Libraries (OPLs), to help electronics designers move from idea to fabrication with ease.

Mycronic Releases Interim Report January–September 2021 ▶

Mycronic reported an 8% sales drop to SEK 986 (1,068) million for Q3 2021 while January–September sales increased 16% to SEK 3,341 (2,889) million.

Nepcon Shenzhen Delivers on Promises for Europlacer ▶

As one of the world's first trade shows in the electronics sector to return as an in-person event, Nepcon Shenzhen appears to have delivered on expectations.

Element Solutions Announces Q3 2021 Financial Results ▶

Element Solutions Inc., a global and diversified specialty chemicals company, announced its financial results for the three and nine months ended September 30, 2021.

Saki Partners with ASM Assembly Systems to Drive Smart Factory Realization ▶

Saki Corporation, an innovator in the field of automated optical and X-ray inspection equipment, proudly announces its partnership with the SMT Solutions Team ASMPT.

The Manifest: New Feeder Design for Eliminating Errors Prior to Placement ▶

As new technology and methods have emerged, companies in the electronics manufacturing field now have new options to consider for improving their best practices. These practices have helped influence the design of new equipment with ground-breaking capabilities. One recent industry advancement is the design of feeders with built-in OLED screens. This innovation helps create a pre-inspection stage that allows for operators to review components before they enter the machine.

Nano Dimension Acquires Essemtec ▶

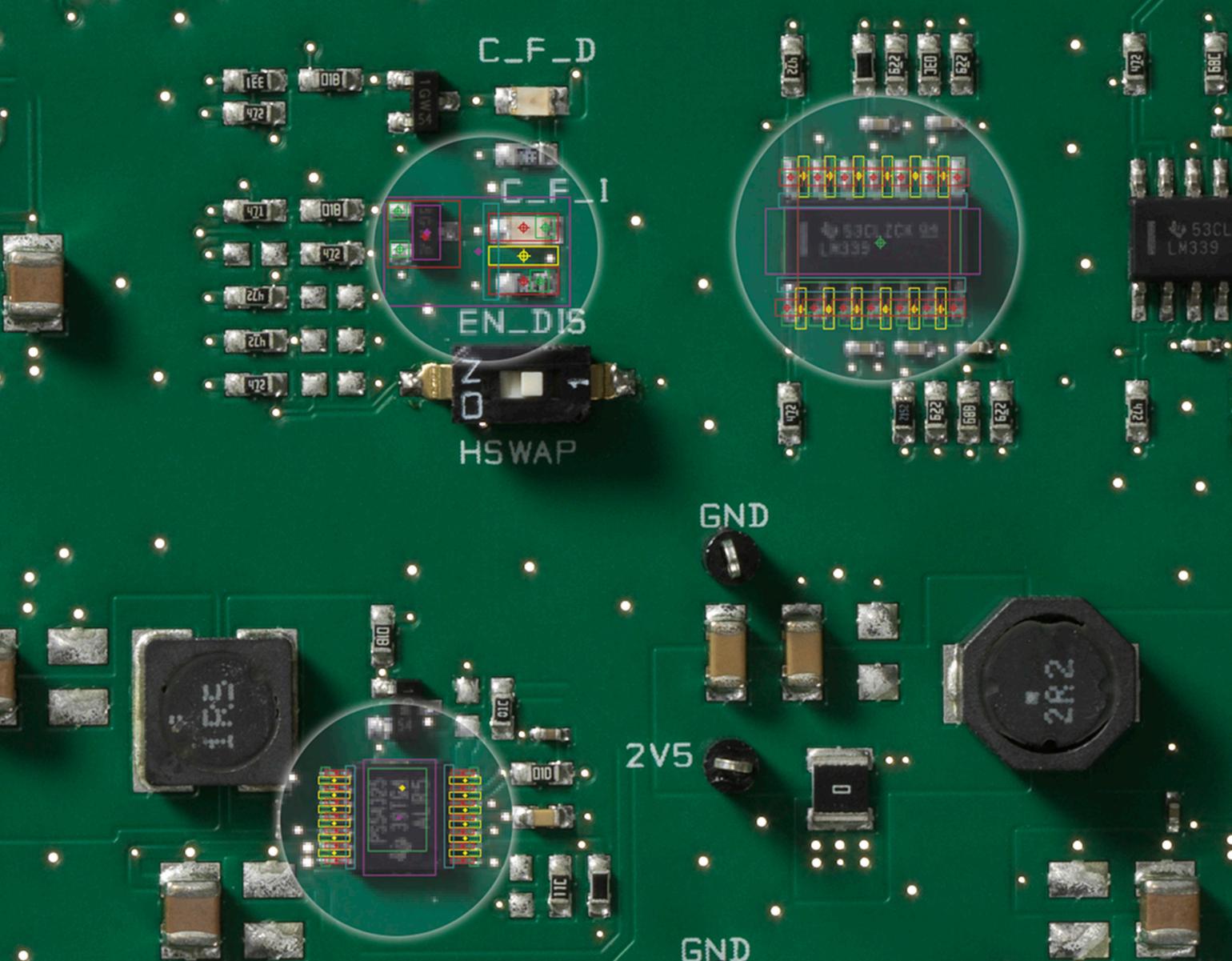
Nano Dimension Ltd., an industry leader in additively manufactured electronics (AME)/3D printed electronics (PE), and micro additive manufacturing (Micro-AM), has signed and closed a definitive agreement to acquire Essemtec AG based in Lucerne Canton, Switzerland.

Indium Expert Receives SMTA Award ▶

Indium Corporation's Ron Lasky, Ph.D., PE, senior technologist, was presented with the Surface Mount Technology Association's (SMTA) Member of Technical Distinction Award following a recognition dinner during SMTA International on Monday, Nov. 1 in Minneapolis, Minnesota.

Rehm Thermal Systems Takes a Holistic Approach to Environmental Management ▶

The topic of sustainability, energy efficiency, resource conservation is increasingly being discussed and is accordingly a major concern for Rehm Thermal Systems.



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IPC Standards Committees: Thoughts on a Changing Landscape

Feature Interview by the I-Connect007
Editorial Team

Teresa Rowe, senior director for assembly and standards technology at IPC, updates us on standards committee work: processes, key standards in process, teleconferencing, and international participation. All this work leads up to the standards committee sessions at IPC APEX EXPO in San Diego.

Nolan Johnson: Teresa, thanks for joining us to talk about IPC committee work. As we're coming out of change to processes and communication styles, thanks to the pandemic effect, what are you most excited about regarding committee work?

Teresa Rowe: Interesting question. Thank you. First and foremost, getting back together with people, being able to meet face-to-face is at the top of my list. We had an opportunity at SummerCom, but with travel restraints, we didn't have as many people as we typically would see. I'm also excited to get my dress shoes out again and use them while walking around APEX EXPO. It's quite the workout when you think

about all the things that happen and all the places you have to be.

Johnson: Yes. I think a lot of us have missed the human connection professionally and personally. I think you're right.

Rowe: Even turning your video on (on a good hair day) just isn't the same as having people in the same room, seeing their expressions and reactions, and seeing them all together at one time interacting. You don't see that on a phone call, so that will be fun.

Johnson: So, there's been a phrase attached to committee work: committee by Zoom. We're all experiencing that in our daily lives, of course. I'm curious to find out from you how that's affecting IPC committee work. How has that changed?

Rowe: The process itself hasn't changed, but we find that groups are meeting a lot more frequently and we're getting things done in a different cadence than we did before. I think back to some of the action items that get assigned; normally we would assign an action item, give





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somebody a deadline, collect the data, and then we would get back together at the next face-to-face meeting and review it. Now, we're assigning the action item, meeting to review where we are with the action items, and then meeting again for discussion when someone submits that work. The committees are working very well in this format, and we're seeing a lot of international participation with people who wouldn't typically even be able to travel to APEX EXPO. These are good changes.

Johnson: It sounds like part of the dynamic is shorter and quicker iterations through the steps of the process?

Rowe: It's shorter as in we see comments rolling in faster, but is the process itself shorter? We're still following all those required steps and we're still sticking to our timeframes that were established during our project identification and TAEC review of our new proposed projects. But we are seeing people reacting and moving at a different rate through that activity, rather than, "Let's focus on a face-to-face effort and then do my own thing and I'll see you again in six months." Now it's, "I have a meeting next month. What can I do by then to at least tell everybody I'm still engaged and focused on this project?"

Johnson: Do you see these changes in the process becoming a standard part of the committee work?

Rowe: I think it has become part of the standards committee work. People enjoy remaining active in standards development. It takes unique personalities sometimes to work these projects and people want to be involved, they want to be engaged and they want to stay with



Teresa Rowe

their group as they're working the projects. Yes, this has changed the process, but we will continue to use the face-to-face meetings because there's nothing to substitute for that human interaction.

Johnson: And yet now there's a whole new dimension of interaction. What are some of the key things that the standards committees are working on?

Rowe: Right now, we are working on new revisions of a few documents, including IPC/WH-MA-A-620, IPC-J-STD-001, IPC-A-610, and IPC-A-600620—those documents that people know, love, and use frequently—and that's an ongoing, continuing process. We are working on some new things in the environmental area; cleaning, coating, and materials continues to roll along as well as some of our design standards. We're not just focused on one thing, but we are working with all our committees on the projects that they are focused on, they want, and they expect for industry.

Johnson: Earlier, you mentioned increased international participation. I'm concluding that because the committees are using more teleconference interaction, that opens the opportunity for greater international participation. How is that changing what you see on committee work?

Rowe: In our case, many of our calls are on Teams. Those calls are attracting people who want to be involved in standards development, but who cannot participate because they can't travel for health reasons, company policies, or they can't be away from the office that long. Teams meetings have allowed us to have participation, especially new voices and new ideas in the task groups. That's a good thing and we welcome that.

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Johnson: What advice would you have for getting involved in committee work?

Rowe: Visit our website where we have a designated page for standards development, or send an email to answers@ipc.org and ask to join a committee.

We have our platform, IPC Works, where once you join a committee, you can access the files we're currently working on. Task group members can look ahead and see what we're working on, then participate as their time allows. Anyone can submit comments, but the task group members get to see the comments and the development of perhaps new content based on those comments. If you're interested, I encourage you to request to join a task group, and we'll get you started.

Johnson: For somebody just out of college or coming up in this industry, working on standards and committee work might seem a little intimidating. When these folks get involved, what can they expect?

Rowe: First, everybody is new the first time they come to a meeting, and this is not about putting someone on the spot in any committee meeting. Some people say very little during a committee meeting; they are there to listen, absorb, and learn, and that's okay, but I would encourage anyone even remotely interested to at least see how the process works to participate. We admit this is not for everyone. Standards development is a unique technical activity, but if you're feeling a little intimidated, I say just dive in and see what it's like.

You mentioned coming out of college and just getting in the industry. IPC offers the Emerging Engineer Program, a three-year program we started a few years ago. Someone is paired up with a mentor, and when they come to APEX EXPO, we get them involved, start introducing them to people, and their mentor takes them around. They have activities to do; we send them to the show floor, and have

fun things to do there as well. We introduce them to other emerging engineers so they can begin to build their own network. In the first year, they're just getting started; by second and third years, we're getting them engaged in standards development actions and activities as well. We've been finding that some of our second- and third-year emerging engineers are running A-teams, projects, and action items to learn the process and get involved on a much larger scale.

Johnson: Is that a planned part of the Emerging Engineers Program or is that something that happens organically?

Rowe: It's both. It happens because they're interested. Of course, we ask if they want to participate, and if they don't want to, we don't require it. They are all volunteers. But IPC staff talks to our chairs, our leaders of our committees, and we try to get our emerging engineers engaged and involved in these activities for several reasons. This is our upcoming generation joining standards development. We want them to embrace and learn the process and provide feedback on where the processes can be improved. This is a great opportunity for everyone.

Johnson: Excellent. Teresa, any closing thoughts?

Rowe: I'm excited to see everyone at APEX EXPO. I'm looking forward to it and keeping my fingers crossed that we don't have a major snowstorm in January that prevents people from getting to San Diego safe and sound. We haven't seen one of those weather issues for a long time. I don't want people stuck somewhere trying to get to San Diego. I want them to be able to be at APEX EXPO in person to experience all it has to offer.

Johnson: I couldn't agree more. Teresa, thank you very much. **SMT007**



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The Value of Training Committees

Feature Article by Zenaida Valianu
IPC

IPC certification programs, built around IPC standards, play a key role in bringing value to the electronics industry. Created and approved by industry, the programs are developed by training committees comprised of subject matter experts and trainers from around the world. Committee members volunteer their time and expertise to improve the existing standards-based certification programs and to develop new programs based on industry needs. These committees support the IPC Education Team in developing, updating, and maintaining the training program materials, and provide industry expertise to the development, evaluation, and revision of the certification program.

The TPAC Committee advises and supports the IPC Education Team on the development, maintenance, and implementation of the training programs. This committee also reviews proposals for new training programs and advises IPC on scope, feasibility, development, and implementation; advises and supports IPC in ensuring compliance of education programs to national and international standards; and complies with relevant accreditation requirements.



Zenaida Valianu

The training committees will meet at IPC APEX EXPO 2022 January 24–25 to discuss program updates and translation activities, and review the feedback received from the industry on the certification programs. These committees will also explore additional training tools, methods, and/or processes that will enhance the training and learner experience.

There are 45 volunteers who actively participated in the development of the 610H, 001H, 620D-S and 001H Space and Military Addendum certification programs, and 14 volunteers who translated the 610H and 001H programs in Italian and Spanish. These remarkable individuals will be presented with awards at the Wednesday, January 26 luncheon, in appreciation of their outstanding contribution toward the development of the certification programs.

Here are the meeting details:

**V-TPAC Training Programs Advisory Committee,
10 a.m. to noon Tuesday, January 25**

This committee is comprised of all training committee and subcommittee chairs. This closed meeting (by invitation only) will start

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by reviewing the training task group(s) successes and challenges for 2021 and continue with discussions on program updates, future strategies, and developments.

**7-31BT IPC-A-610 Training Committee,
8 to 10 a.m. Wednesday, January 26**

This committee provides recommendations for the IPC-A-610 training and certification program. This meeting will celebrate the release of revision H certification program and will review comments received from the industry on the newly released program.

**7-34T 7711/21 Training Committee,
3:15 to 5 p.m. Wednesday, January 26**

This committee is meeting to review the course content and to determine updates needed to be integrated into the next revision training and certification program, based on the changes from 7711/7721D standard working draft.

**7-31FT IPC/WHMA-A-620 Training Committee,
3:15 to 5 p.m. Tuesday, January 25**

This training group provides recommendations for the IPC/WHMA-A-620 training and certification program. This meeting will address comments received for both 620D and 620DS (Space and Military Addendum) certification programs and will establish objectives for the next revision training and certification program.

**7-31AT IPC-A-600 Training Committee,
10:15 to noon Monday, January 24**

This committee will address comments received for the IPC-A-600K training and certification program and explore opportunities for improvement for the next revision training program.

**D-33AT 6012 Training Committee,
1:30 to 3 p.m. Monday, January 24**

This committee will review submitted comments to the IPC-6012E training and certification program and will discuss the IPC-6012E Amendment 1 changes.

**5-22BT J-STD-001 Training Committee
10:15 a.m. to noon Wednesday, January 26**

This committee provides recommendations for the J-STD-001 training and certification program. This meeting will celebrate the newly released programs—J-STD-001H and J-STD-001H Space and Military Applications—and will review comments received from the industry on these programs.

If you are wondering how training and certification programs are developed, please consider joining one of our committees. Committee participation takes place in meetings, by teleconference, and/or by email. We welcome your expertise and participation. To learn more about joining a committee, please visit ipc.org. SMT007

Zenaida Valianu is IPC training manager.



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MilAero007 Highlights



Key Tronic Announces Results for Q1 Fiscal Year 2022 ▶

Key Tronic Corporation, a provider of electronic manufacturing services (EMS), announced its results for the quarter ended October 2, 2021.

Monitoring the High Seas at High Altitude ▶

Raytheon Intelligence & Space demonstrated the SeaVue MR and DAS-4 on the SeaGuardian for the United Kingdom, The Netherlands and 12 other NATO member and partner nations as part of the Joint Warrior demonstration in the fall of 2021.

The Government Circuit: How Can Government Help or Hurt You in 2022? ▶

The seasons may be changing, but IPC's commitment to advocating for the electronics manufacturing industry remains the same.

IPC Welcomes Language in Senate Defense Appropriations Bill Supporting R&D on Lead-Free Electronics ▶

The U.S. Senate Appropriations Committee released their fiscal year 2022 defense appropriations bill, which for the first time included language supporting further research and development into the issues surrounding lead-free electronics in mission-critical applications.

Honoring Those Who Served ▶

On this Veteran's Day holiday, the I-Connect007 staff takes a moment to honor those men and women who served over the years to protect and defend their country. Just on the

I-Connect007 staff, we have loved ones who served, ranging from World War I to present-day active-duty military. The holiday isn't intended to be a political statement, but rather a reflection on service, duty, and personal sacrifice. In some cases, the ultimate sacrifice. Our staff has submitted images of veterans who are near and dear to their hearts. Check them out!

Lockheed Martin, Verizon to Advance 5G Innovation for U.S. Department of Defense ▶

Verizon and Lockheed Martin have signed an agreement to collaborate on 5G.MIL™ technologies that will provide ultra-secure, reliable connections for U.S. Department of Defense systems, bringing together high-tech platforms into a cohesive network spanning air, land, sea, space and cyber domains.

Boeing Forecasts Africa's 20-year Commercial Aviation Market Opportunity ▶

Boeing forecasts that Africa's airlines will require 1,030 new airplanes by 2040 valued at \$160 billion and aftermarket services such as manufacturing and repair worth \$235 billion, enabling growth for air travel and economies across the continent.

Blue Canyon Delivers CubeSats to NASA for Starling Technology Demonstration ▶

Small satellite manufacturer and mission services provider Blue Canyon Technologies LLC, a wholly owned subsidiary of Raytheon Technologies, delivered the first of four 6U CubeSats to NASA's Ames Research Center in California's Silicon Valley.

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Francisco Fourcade: Meeting During a Pandemic

Feature Article by IPC Staff

How did IPC committee members fare during lockdown? We asked Francisco Fourcade, a master IPC trainer and member of the 5-22A and 7-31B standards development task groups revising two of IPC's biggest standards, IPC-J-STD-001 and IPC-A-610. Francisco lives in Barcelona, Spain, and experienced one of the toughest lockdowns in the world.

When travel restrictions eased, Francisco attended IPC SummerCom 2021, where the inaugural Golden Gnomes were held. As the first recipient of the Outstanding A-Team Member of the Year, Francisco was recognized for participating in several A-Teams, including J-STD-001 A-Team, IPC-A-610 A-Team, Shock and Awe A-Team, Team Kangaroo, Team Iron, Team Bones, and the IPC/WHMA-A-620 Training Committee. He was also an active participant on the J-STD-001/IPC-A-610 Automotive Addendum Working Group.

Here is a snapshot of Francisco's committee experiences during the pandemic.

IPC: What was it like to work on these standards under lockdown? The committees could not meet in person, but was there anything else that struck you about working on IPC standards during a pandemic?



Francisco Fourcade

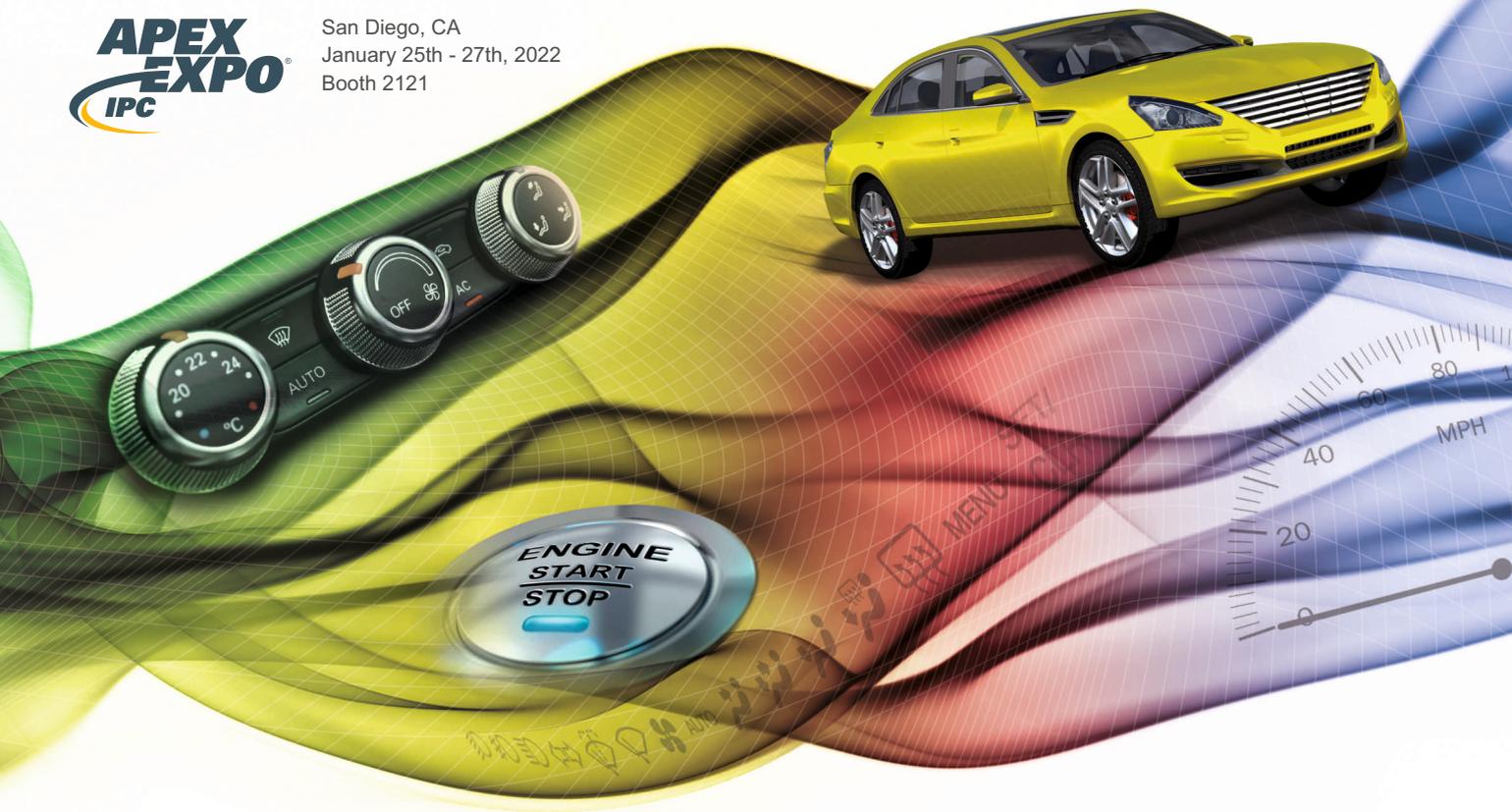
Francisco Fourcade: Under lockdown, between the unprecedented uncertainty and isolation that most of us experienced, staying actively connected was crucial. Working on IPC standards was certainly a good way to collaborate alongside colleagues that were experiencing some form of lockdown as well. We had a lot of participants join from all over the world sharing their knowledge and support in our virtual community.

IPC: What was your personal experience? Where were you locked down and for how long?

Fourcade: My lockdown took place in Barcelona, Spain. We had boots on the ground running checkpoints with police to enforce one of the toughest lockdowns in the world. Every time you'd leave your house you were required to have a self-signed certificate, dated, specifics with point A and B addresses, and a set of seven defined reasons why you were not home. It lasted 98 days; it was brutal. Fortunately, I live in a small town on the northern coast of Barcelona, so I could walk my dog for a one-kilometer radius, which meant walks on the beach. It was amazing how nature was flourishing everywhere during lockdown; we even got to see dolphins at sea!



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IPC: What are some of the significant changes in the standards?

Fourcade: Both documents went under some great changes and synergy between them. The most significant change in A-610H was removing target conditions entirely in line with A-620D. Also, some re-structuring of ESD into an appendix and the jumper wires criteria into a new section 13, in which I was personally involved with the Kangaroo team. J-STD-001H brings some critical industry consensus on cleaning, a new appendix for X-ray guidelines, and both documents incorporated new SMT termination criteria: wrapped terminals. The leaders and IPC liaisons did an outstanding job handling all these changes and getting it done.

IPC: Why are J-STD-001H and IPC-A-610H important to the industry?

Fourcade: These documents are called out when the industry needs reliable electronics.

Their importance is held by the industry itself demanding a standardized baseline to build electronics better.

IPC: Should these documents be used together?

Fourcade: Users are encouraged to use these documents together to best aid their inspection process. Interpretation leads sometimes to misconceptions of the intended use. As defined by the scope of each document, a user may apply J-STD-001 to their entire manufacturing process, whereas A-610 is applicable only during inspection, mainly for reference and training.

IPC: Thank you for all your work on the committees.

Fourcade: Thank you. SMT007

Watch & Learn!

I-Connect007 Launches New Video Series: 'Predicting Reliability in Electronics' Presented by the Experts at GEN3

In this engaging, 11-part micro webinar series, topic experts Graham Naisbitt and Chris Hunt examine the history of the influences of electrochemical migration (ECM) and the evolving use of Surface Insulation Resistance (SIR) testing that has been developed over the past 25 years by GEN3 and its association with the British National Physical Laboratory. GEN3 and NPL have created the standard that has now been in widespread use around the world since the turn of the millennium.

It was only in 2017 that, together with their customer Robert Bosch, they were able to demonstrate the insufficiency that has been the ROSE test accept/reject of 1.56 µg/cm² NaCl equivalence, which has remained unchanged since the mid-1970s.

Designed to complement GEN3's book, *The Printed Circuit Assembler's Guide to...Process*

The image is a promotional graphic for a webinar series. It features two men, Graham Naisbitt and Chris Hunt, in professional attire. The background is dark with a faint image of a circuit board. Text on the graphic includes: 'I-007e Micro Webinars', 'On Demand: Free 11-part Webinar Series', 'Predicting Reliability in Electronics', 'with experts Graham Naisbitt and Chris Hunt', a 'WATCH NOW' button, and the GEN3 logo with the tagline 'Precision as Standard'.

Validation, this entire webinar series can be viewed in about an hour and covers a comprehensive range of topics surrounding the four groundbreaking test standards published between 2019 and 2021 that set the scene for "Objective Evidence" and its widespread influence throughout the world of electronics, whether in the high reliability arena of space, medical, automotive or general industrial applications.

Visit **Predicting Reliability in Electronics** and start watching, free, today!



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Jackie Mattox

Keynotes Women in Electronics Reception



Jackie Mattox

Jackie Mattox, founder, president, and chief executive officer for Women in Electronics, headquartered in Southern California, will keynote the Women in Electronics Reception at IPC APEX EXPO 2022 from 6 to 7:30 p.m. Tuesday, January 25.

Named one of the Top 21 female influencers in 2021, Jackie started her career in the electronics industry during her college years at a small rep firm in Southern California, where she worked her way into the roles of sales and distribution manager and took a passionate interest in strategic key account management. Jackie graduated from California State University-Northridge with a Bachelor of Arts degree in communication/journalism. Jackie has always had a heart for people and especially for women's issues, along with a dedication to personal and professional leadership development. Jackie had a vision for women rising into leadership roles in the electronics industry and

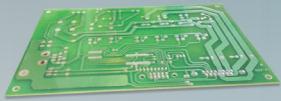
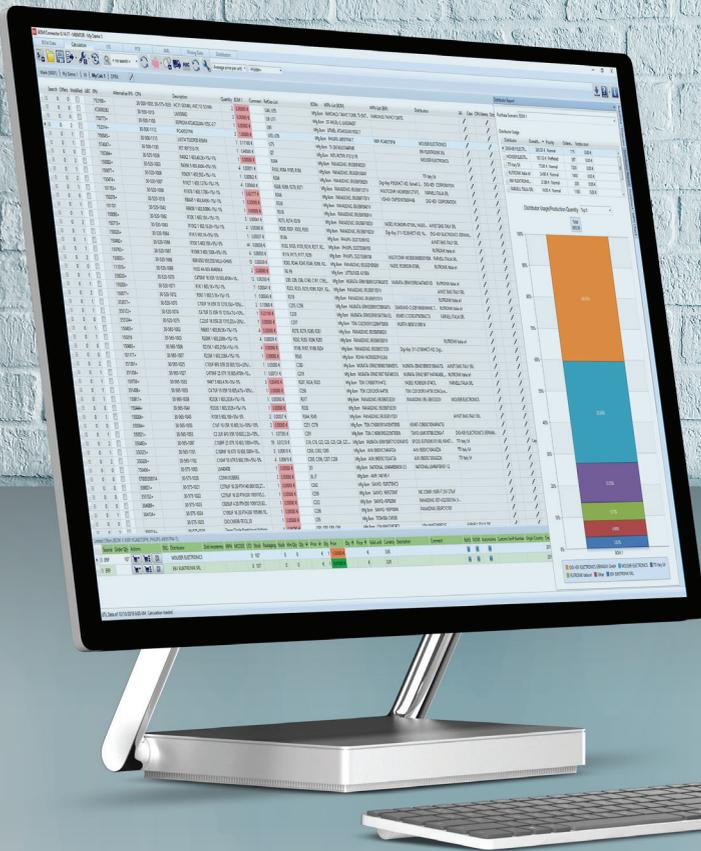
founded Women in Electronics in 2017, which is now a thriving global nonprofit 501(c)3 organization.

Having a very active role in her children's education, she also helped with the start-up of a charter school in Orange County, California. Jackie values time with her children and loved ones, the experience that travel brings, and being home in the city of beautiful Laguna Niguel, California, with her family, life-long friends, and her two dogs, Cocoa and Rubie.

We're looking forward to hearing Jackie's insights on how she's able to manage a family, a business, and a thriving career.

Attendance to the Women in Electronics Reception at IPC APEX EXPO is included in all registration packages, including the exhibit hall only/event essentials package. **SMT007**

Submitted by Alicia Balonek, senior director of trade shows and events.



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Lee Tyson

Hey, Mr. DJ:

Trivia Networking Night

IPC's Trivia Networking event has been reimagined for IPC APEX EXPO 2022 and will feature a special guest, "Hey Mister DJ, Lee Tyson."

DJ Lee's career started 15 years ago in his hometown of Minneapolis, Minnesota. Influenced by the diverse and funky grooves of what later became known as the "Minneapolis Sound," Lee began looking for a way to express his own creativity and passion for music and found his way to a pair of turntables. He is now one of the most sought-after DJs in Los Angeles, Miami, and Las Vegas. Lee also serves as the official DJ for Mercedes-Benz Fashion Week.

Lee's chameleon-like ability, along with his intuitive capabilities to read a room, escalated into expanding spinning records into en-

gaging crowds through games and trivia. So, if you like Jeopardy, Family Feud or are looking to find usefulness for all your useless knowledge—this is a must attend event.

DJ Lee is the host extraordinaire and in no time, you will be fully engaged and making connections with new people while competing for prizes in this high energy and hilariously entertaining event.

Trivia Networking Night will take place from 6 to 7:30 p.m. Wednesday, January 26. Registration is \$40 which includes a supreme nacho station and two complimentary drink tickets. **SMT007**

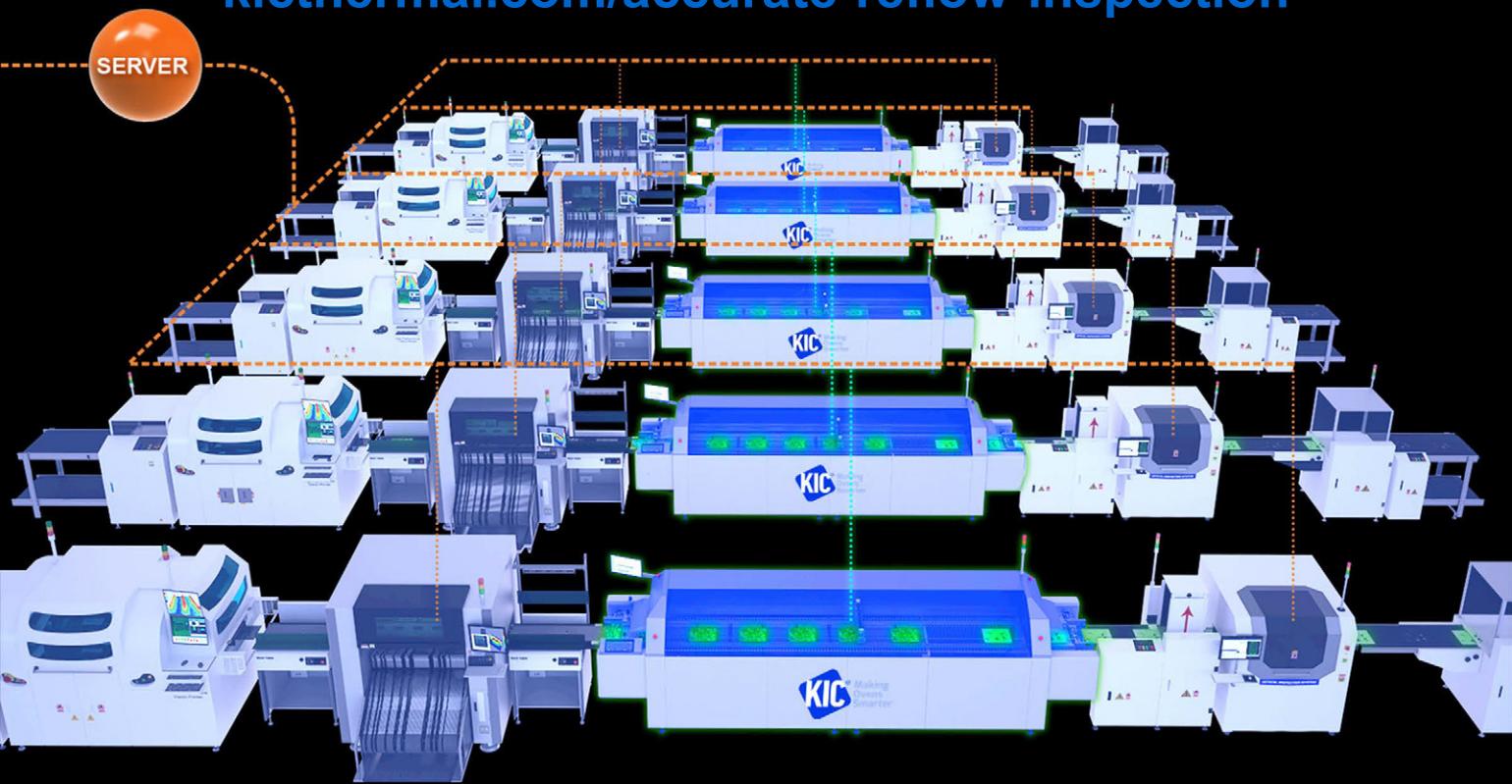
Submitted by Alicia Balonek, senior director of trade shows and events at IPC.

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The Power of Pareto

Maggie Benson's Journey

by Ronald C. Lasky, INDIUM CORPORATION

Editor's note: Indium Corporation's Ron Lasky continues this series of columns about Maggie Benson, a fictional character, to demonstrate continuous improvement and education in SMT assembly.

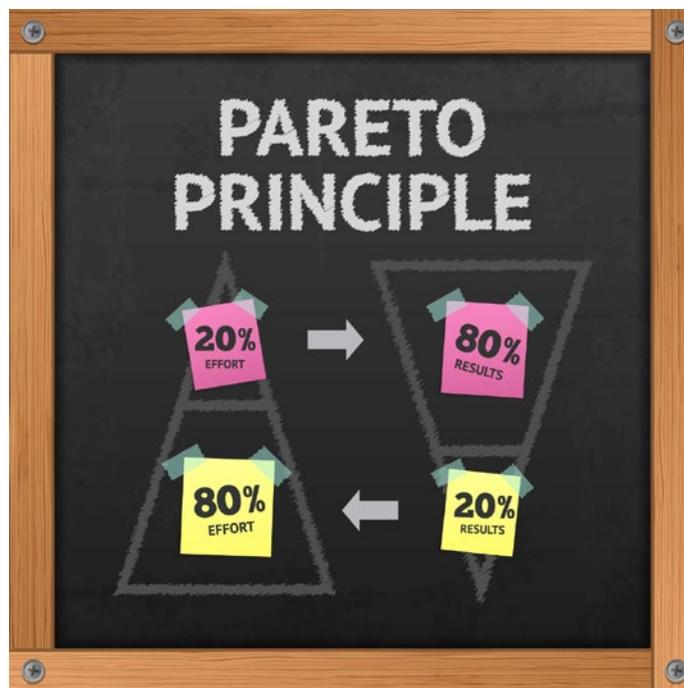
Why was Patty scowling?

Patty had just received a phone call from Mike Madigan, CEO of ACME Electronics and her former employer.

She still consulted with them. Madigan had previously expressed to Patty that he suspected a vendor was averaging Cpk from two partial lots to get a higher overall Cpk. It seemed to be happening again. Mike remembered that the scheme looked like this:

The vendor had many components that did not meet the required Cpk, for example, 1.0. The vendor would sort some components and form a partial lot that had a resulting Cpk of 1.5 and the remaining parts in the original lot might have a Cpk of 0.8. The vendor would

then recombine the components and claim the Cpk was 1.15 $[(0.8+1.5)/2 = 1.15]$. Mike remembered that this approach was wrong, but couldn't remember why. Patty had written a report¹ on this type of dishonest scheme and was now looking it up on her computer to send to Mike. Bottom line: you can't average Cpk's. Doing so is meaningless.



Two weeks later...

Patty was waiting expectantly in her spacious office to meet with the Benson Electronics (BE) team. She knew they were working hard on improving productivity and first pass yields, and she was anxious to see the results. Maggie, John, Chuck Tower, and Frank Emory entered the office.

"Pro-," Maggie started, then said,

enthusiastically, "Patty, I mean, it's so good to see you."

"I've been on pins and needles waiting to hear how you made out with all of your improvement plans," Patty said to the group.



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“Let Chuck explain,” John said.

“Well, the improved uptime continued at a little over 45%,” Chuck began, “and nearly everyone is involved. Not only is uptime high, but the morale and camaraderie are remarkable.”

“Profitability has skyrocketed even though we have been the low bidder on several contracts. Maggie and John are even considering a late mid-year bonus in addition to the Christmas bonus,” Frank chimed in.

“I understand that you have been working on first pass yields too,” Patty mentioned.

“Let me take that one on,” John said. “For years, we repaired the boards coming off the line before tallying first pass yields. Because of this, we never developed continuous improvement² action plans to improve yields. In the past six weeks or so, we have collected the failure modes before repairing the boards. The Pareto chart shows the yield fallout by failure mode type,” he continued.

“Many people don’t recognize how powerful using a Pareto chart can be in understanding the data. It shows where to focus,” Patty commented.

“Once we saw what the failure modes were, we developed action plans to improve the yields. First pass yield was 95% and now is up to 98%,” Maggie added.

“We were all surprised at how many head-in-pillow defects there were. After chatting with our solder paste vendor, they suggested a different paste that was developed to reduce this defect. The new solder paste virtually eliminated the head-in-pillow defects,” Chuck pointed out.

“In addition, a solder defects book³ created by Indium Corporation really helped us to reduce the defects. It’s free and can be obtained at I-Connect007. Indium Corporation developed webinars on some of the topics, and even offered to come onsite for in-person workshops, if requested,” John said.

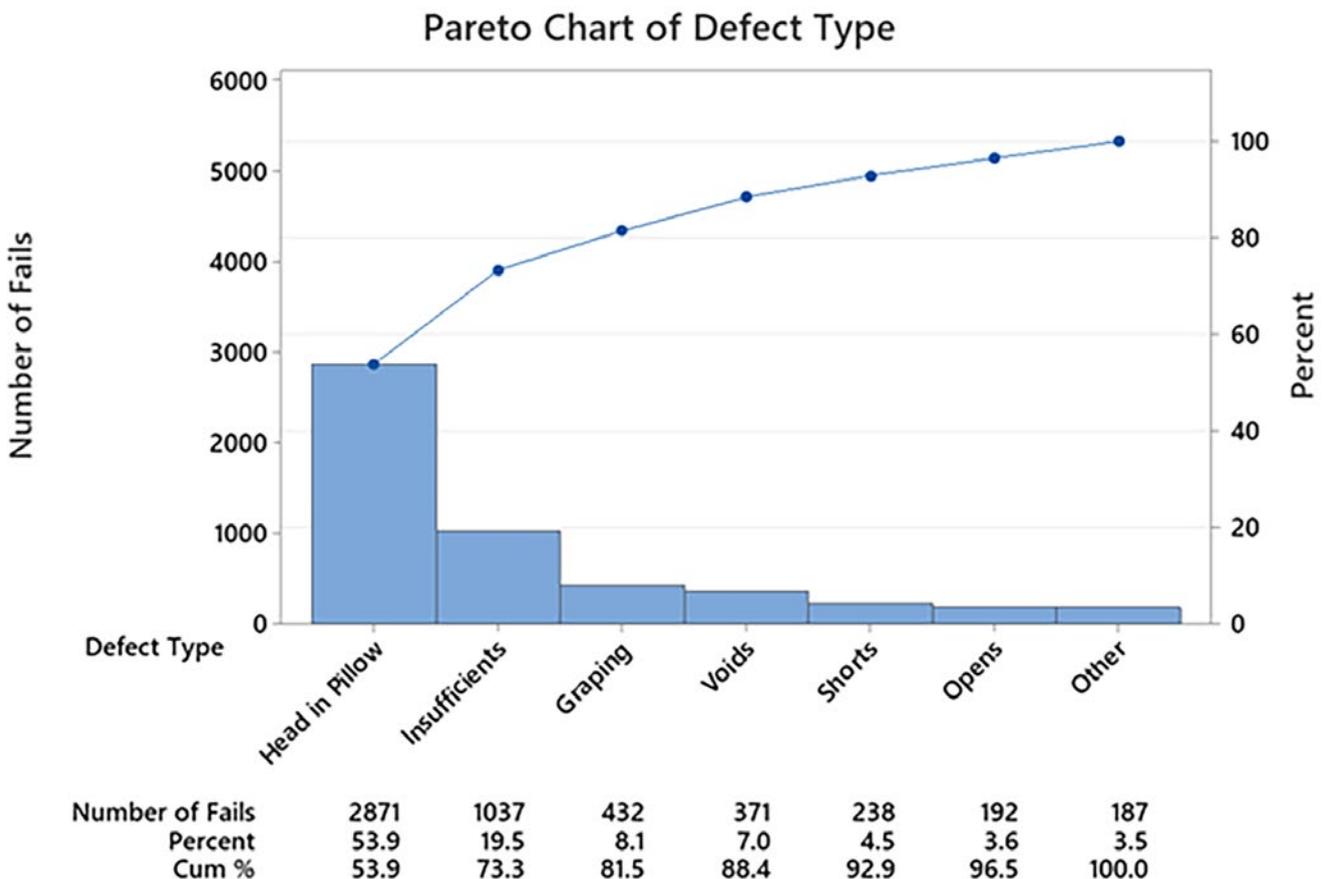


Figure 1: A Pareto chart of first pass yield failures by type.

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2/3 of electronic industry companies have difficulty finding production workers.¹

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¹IPC. (2017). Findings on the Skills Gap in U.S. Electronics Manufacturing.

“We also found the solder defects book’s advice on reducing “insufficients” to be helpful,” Maggie said. “I’m a little embarrassed to say that many of our stencils had BGA area ratios⁴ of less than 0.66. Apparently, in the past, BE used stencils that were quite thick, and didn’t decrease the thickness on some as lead spacings became closer,” Maggie said.

There was a lull and it appeared as though discussions were wrapping up, until Frank chuckled.

“As an MBA candidate, I was embarrassed to find out that I was the only one of us that didn’t know that the 80/20 rule came from Pareto and his charts,” he said, jokingly.

“As soon as I understood “the rule,” I ran to the sales department and asked Charlie Becker (head of sales, the editor) if it applied to BE sales,” Frank said. “Charlie said that almost exactly 80% of BE’s cash sales come from 20% of BE’s customers. A perfect example.”

Chuck was feeling more comfortable with the executive team of BE. So, out of character, he said, “You know, Frank, I just have a two-year tech degree, you are almost an MBA, and even I knew the 80/20 rule.”

Everyone burst into laughter. John even tapped Chuck’s shoulder as a sign of acceptance.

With this moment of levity, it appeared the meeting was over. But then Maggie added, “One more thing. We are planning on buying a competitor, and we would like any suggestions

you might offer, Patty.” Maggie was feeling quite proud that she had finally remembered to call her former professor by her first name.

“As long as it is not Ivy Electronics, you should be OK,” Patty replied.

“But it is Ivy Electronics,” John said dejectedly.

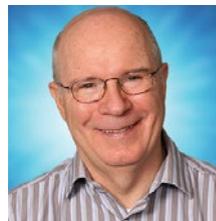
Why is Patty down on Ivy Electronics?

Should Maggie and John not buy it?

And what does a Pareto Chart of your first pass yields show? What is your resulting continuous improvement action plan? SMT007

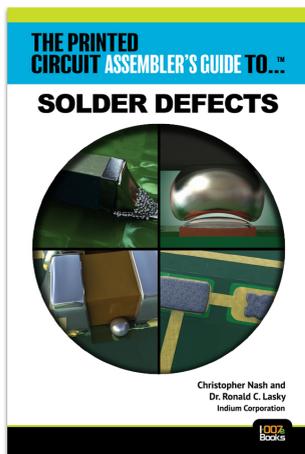
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1. “It’s Wrong to Average or Add Cp and Cpk,” by Ronald C. Lasky, Dec. 10, 2010.
2. “Continual improvement process,” Wikipedia.com.
3. *The Printed Circuit Assembler’s Guide to... Solder Defects*, by Christopher Nash and Ronald C. Lasky.
4. “Process Guidelines to Ensure Optimal SMT Electronics Assembly,” by Ed Briggs and Ronald C. Lasky, Indium Corporation.



Ronald C. Lasky is an instructional professor of engineering for the Thayer School of Engineering at Dartmouth College, and senior technologist at Indium Corporation.

To read past columns, or contact Lasky, [click here](#).



Learn How to Avoid Solder Defects With New Book by Indium Corporation

The Printed Circuit Assembler’s Guide to... Solder Defects—the latest title in the I-007eBook library—is specifically dedicated to educating the printed circuit board assembly sector and serves as a valuable resource for people seeking the most relevant information available.

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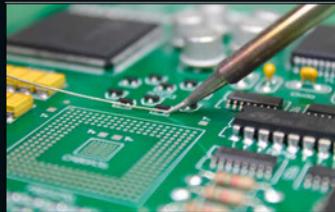
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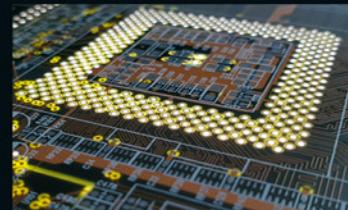
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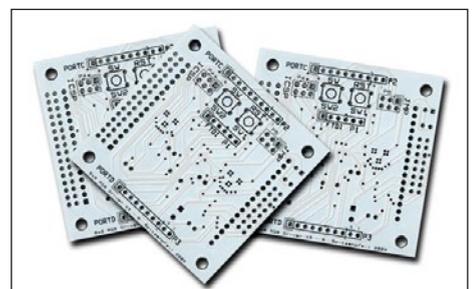
The Top Five Things You Need to Know About

SOLDER MASKS

by Taiyo America

The main function of solder mask is to insulate and prevent the copper surface from oxidizing/corroding and prevent solder bridging. While these are the main objectives for solder mask, in the electronics industry there is a misconception that all solder masks are alike.

- 1 Selecting the Right Solder Mask**
- 2 Solder Mask Applications Evolve**
- 3 Advances in Solder Mask Imaging**
- 4 To Flex or Not to Flex**
- 5 Solder Masks Are Not Only Green**



1 Selecting the Right Solder Mask

In the world of electronics there are multiple industries each with their own requirements when it comes to solder mask. For the automotive sector, solder masks are required to withstand harsh environments. In the aerospace industry, solder masks must meet out-gassing requirements. Over the years, white solder masks have been developed that provide a high degree of reflectivity for the LED market.

2 Solder Mask Applications Evolve

Solder mask and the methods by which they were applied have evolved over the years. When non-photoimageable solder resists were introduced to the printed circuit board (PCB) industry, silk screen printing was the common method of application. As the demand for real estate on PCB designs increased, photoimageable solder masks were developed. The popularity of photoimageable solder masks introduced new application systems such as double-sided screen printing, curtain coating and spray systems. These methods of application have been around for many years and are still being used today. In the past five years, several other application processes have been reintroduced to the market including ink jet and photoimageable dry film.

3 Advances in Solder Mask Imaging

As technologies advance and offer more functions, PCBs have become more populated with the miniaturization of key components. The advancements have pushed the boundaries on image registration using conventional exposing units. Over the years, direct imaging (DI) systems were introduced to the PCB industry to help alleviate the challenge. The DI systems provide different wavelengths in comparison to conventional exposing units. Solder mask manufacturers, working side-by-side with equipment manufacturers, developed DI solder masks that are better suited for these types of imaging systems.

4 To Flex or Not to Flex

Solder masks have some degree of pliability. Thinner PCBs that are not categorized as a flex build can sometimes encounter a degree of bending due to handling or manufacturing processes. Depending on the amount the substrates are bent, they can exhibit a degree of fracturing. Fracturing of the solder mask is not the same as corner cracking caused by exposure to harsh environments. In cases such as this, PCB manufacturers and contract electronics manufacturers (CEM) should consider the use of a flexible solder mask.

5 Solder Masks Are Not Only Green

Solder masks have evolved from green to several other colors over the years. The most common colors besides green are black, blue, red, white, and yellow—all of which fall in the family of primary colors. Colors were developed and brought to market at the request of original equipment manufacturers (OEMs). Colored solder mask can be used for identifying prototypes, revision changes, manufacturing facilities, or for cosmetic reasons. Colored solder masks can also be combined in measured amounts to create a vast number of other colors such as orange, purple and brown. Solder masks can also have various surface finishes such as matte, glossy, or somewhere in between, depending on customers' requirements.



Established 30 years ago, Taiyo America Inc. is a subsidiary of Taiyo Holdings Co. Ltd., the world's leading manufacturer of specialty inks and solder masks for printed circuit boards. Taiyo offers conductive inks for manufacturing printed electronics. Visit us online at: Taiyo-america.com.

The Top Five Things You Need to Know About **MANUFACTURING TRAINING**

by **Blackfox Training**

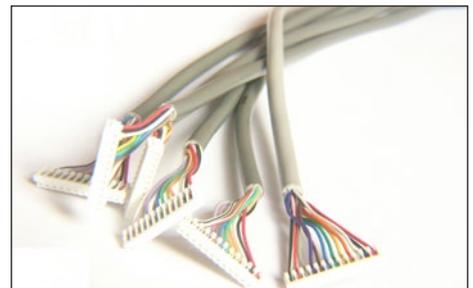
Electronics manufacturing companies need skilled and certified workers to perform the intricate and important tasks required to build modern electronic equipment. Here, we explain five ways to gain these workers:

1 Train and Certify Manufacturing Employees and Support Staff to the IPC Standards



2 Fill Training Gaps with Customized Courses that Focus on Basic Knowledge and Skills

3 Access Tools and Resources to Assess Your Workforce and Maintain Skill Levels



4 Offer Self-Paced Learning for Soft and Technical Skills (Available 24/7)

5 Hire U.S. Military Veterans Who Have Already Completed Immense Training



1 Train and certify manufacturing employees and support staff to the IPC standards

IPC certification is an internationally recognized credential that proves an employee's knowledge and skill level. IPC training and certification is industry developed and covers electronic manufacturing quality concerns, including PCB assembly and soldering, rework and repair, wire and cable harness production, and bare PCB fabrication. Having an IPC-certified workforce demonstrates an attention to detail and commitment to quality.

2 Fill training gaps with customized courses that focus on basic knowledge and skills

IPC training and other standardized courses don't cover every aspect of electronics manufacturing. Therefore, it is important to have customized courses that fill those missed gaps. Basic soldering, ESD, and electronic component identification are just a few examples of the many courses that complement IPC certification and ensure that your workforce is prepared for any challenges that may come their way.

3 Access tools and resources to assess your workforce and maintain skill levels

Assessing your workforce before and after training is an essential part of a proper manufacturing training program. The effectiveness

of training and the retention of knowledge gained can be gauged through assessments that are computer-based, interview-based, or audit-based. In addition to assessments, both students and trainers need to have complete access to resource documents and training materials after training has been completed.

4 Offer self-paced learning for soft and technical skills available anytime

Self-paced learning that is delivered in consistent, small snippets will have a higher retention level than content delivered through other methods. When employees can convert non-productive time into learning time, that employee becomes more valuable to the company, and in turn, the company benefits. Self-paced learning for your workforce will increase engagement, productivity, and positive morale.

5 Hire U.S. military veterans who have already completed immense training

Now more than ever, highly skilled and efficient employees are needed in manufacturing. The U.S. military invests an enormous amount of training in our soldiers. They are equipped with a framework of skills and attributes such as loyalty, integrity, leadership, and excellent work ethic. They know how to learn new skills quickly and adapt to changing environments, which are highly desirable qualities for manufacturing.



Blackfox is the worldwide leader in providing IPC certification and custom training systems to the manufacturing industry's top companies. Blackfox provides solutions for the manufacturing industry and for veterans seeking employment.

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The Top Five Things You Need to Know About DIRECT IMAGING

by Burkle North America

Digital direct imaging (DI) was first introduced in the early 1980s and is now an industry-accepted technology for fine line circuit boards. Here are five things to consider when selecting a direct imaging system.

- 1 Resolution/Capacity Trade-off**
- 2 Choosing a New DI Machine?
Test It on Your Work First!**
- 3 Will More Light Engines Increase
Productivity?**
- 4 Floor Space and System Platform**
- 5 Environment, Data Collection
and Support**



1 Resolution/Capacity Trade-off

The machines of today are capable of fine line resolutions that were unfathomable just a few years ago. But it's important to understand the trade-off between fine line capability and high production. A direct imaging machine with two types of light engines—a “hybrid” machine—can offer the best of both worlds.

2 Choosing a New DI Machine? Test It On Your Work First!

Every design is different. Dry films and solder masks are different. And claims made by equipment manufacturers vary wildly. Don't just look at a spec sheet and assume you'll get the same results. Test your work on the machine before you commit. Be aware that production processes greatly influence the outcome and could even potentially limit the capabilities of a new DI machine.

3 Will More Light Engines Increase Productivity?

A common myth about laser direct imaging is that more light engines increase productivity proportionately. It is important to understand that the exposed area (or image field) needs to be distributed well over the width of your panel size to give optimum exposure speed. When

adding further light engines on a multiple head system, it should be considered that these still cover the area of your panel, as you wouldn't see any gain in capacity if one light engine exposes in the “empty” areas.

4 Floor Space and System Platform

Cleanrooms may allow only a limited amount of space for the integration of new DI equipment. Ideally, it should replace older contact exposure units or LDI equipment from the previous generation. However, it is unlikely that the old equipment will be removed before installation of the new; therefore, a space-saving machine design which still offers all capabilities is a good choice as it won't require high infrastructure costs on your side.

5 Environment, Data Collection and Support

Controlling the environment in your direct imaging area is key to optimum machine performance. Since this digital technology provides the ability to log all relevant machine and production data, it makes direct support and preventive maintenance easier and plannable. Don't just look for a good equipment manufacturer; look for a partner that can guarantee good, long-term support for the equipment while supporting the progress of your process capabilities.



Celebrating 30 years in business, Bürkle North America distributes and services Bürkle GmbH and Schmolz Maschinen equipment which includes IMPEX and LHMT. BNA distributes equipment lines for multilayer lamination, drilling, cutting, routing, imaging, registration, automation and measuring. Visit [Burkle North America](#) online.

The Top Five Things You Need to Know About

MOISTURE MANAGEMENT

by Super Dry Totech EU

Moisture and surface mount components do not mix. This includes PCBs. The risks fall into two categories: solderability and encapsulant damage. How best to meet this continuously growing challenge? Here are five suggestions:

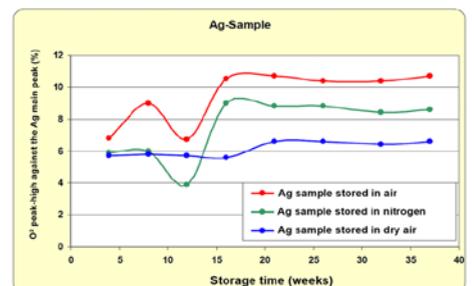
1 When Component Moisture Levels Become Critical, Encapsulant Damage Can Occur During Reflow

2 Components are Rated With a Moisture Sensitivity Level (MSL) Which Dictates Available Floor Life

3 Oxidation Will Occur When Components Are Improperly Stored, Compromising Solderability

4 If the Floor Life is Exceeded, it is Possible to Restore it Under Carefully Controlled Conditions

5 Dry Air Atmospheres Stop Oxidation Better Than Nitrogen



1 When component moisture levels become critical, encapsulant damage can occur during reflow.

Plastic/epoxy resin packaging material is permeable to moisture (as are PCBs). Components should be delivered in properly prepared moisture barrier bags. Once the bag is opened, components absorb moisture from the atmosphere. If moisture levels become critical (0.1% water weight), damage occurs during reflow as the moisture attempts to escape too quickly, exceeding the elastic limit of the encapsulant.

2 Components are rated with a moisture sensitivity level (MSL) which dictates available floor life.

The moisture sensitivity level (MSL) of components is identified by the manufacturer in one of six levels as defined in J-STD-020, displayed in J-STD-033D. This identifies the available safe floor life of components (time out of MBB). For instance, MSL 3 components have a floor life of 168 hours. Tracking the exposure time is critical to preventing defects.

3 Oxidation will occur when components are improperly stored, compromising solderability.

Oxidation will also occur on components stored in ambient RH. This negatively affects solderability. The same safe storage conditions

(<5%RH) that will stop moisture absorption by encapsulants will also stop oxidation. A level of <5% RH provides unlimited safe storage time, thus “stopping the clock” on the MSL floor life. This is particularly significant for low-volume high-mix operations.

4 If the floor life is exceeded, it is possible to restore it under carefully controlled conditions.

Expired floor life can be restored by reducing absorbed moisture to safe levels. Traditional high temperature (125°C) baking reduces moisture but induces oxidation and intermetallic growth, increases wetting times, and compromises solderability. Lower baking temperatures (40-60°C) combined with ultra-low RH (1%) will rapidly restore floor life without reducing solderability, and unlike high temperature, this process can be safely repeated.

5 Dry air atmospheres stop oxidation better than nitrogen.

Nitrogen was a traditional method for safe storage. However, dry air is much less expensive and provides lower RH%. X-ray data of numerous alloys proves low %RH air stops oxidation better than N₂. This is because water is the more aggressive bearer of oxygen than tightly bonded O₂ molecules. Removing the moisture removes the catalyst and prevents the corrosion process.



Super Dry Totech EU® www.superdry-totech.com is a moisture management specialist, providing hardware and process control software for safe storage, floor life reset and automated tracking of moisture sensitive components and materials.

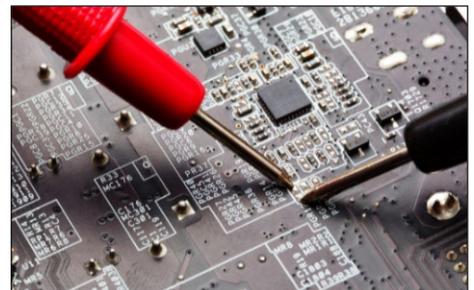
The Top Five Things You Need to Know About

EMS QUOTING

by **CalcuQuote**

EMS companies: You can now provide complete, instant, online quoting for your customers through your website. PortCQ is the future of EMS quoting.

- 1** Allows Customers to go From RFQ to Orders in Minutes
- 2** Includes BOM Costing, Labor and Overhead Estimation, and Configurable Margin Rules
- 3** Turns Your Website into a Lead Generating Digital Asset
- 4** Allows Your Team to Focus on Real, Valuable Business Opportunities
- 5** Ties into QuoteCQ for a Seamless Transition



1 Allows Customers to go From RFQ to Ordered in Minutes

Sometimes winning a quote is about showing how responsive you can be. With PortCQ, you can be always available and instantly responsive to your customers. Your customers will love the digital e-commerce experience that lets them check out with an order so they can iterate product revisions and go to market faster than ever before.

2 Includes BOM Costing, Labor and Overhead Estimation, and Configurable Margin Rules

CalcuQuote is the original all-in-one RFQ Management System for EMS. The same comprehensive quoting engine that has worked for 200+ EMS companies can be available through an intuitive web experience for your customers. They can submit their own RFQs, price their BOMs and get a complete quote entirely on their own. And you stay in control of who has access to it and how much information to share.

3 Turns Your Website into a Lead Generating Digital Asset

“Contact Us” forms are for the 1990s. The modern customer wants a value-added web

experience. Instead of having people just submit their info and wait for a sales call, it is better to engage them when you already have their interest. PortCQ allows you to automatically capture that interest and convert it to lead generating action.

4 Allows Your Team to Focus on Real, Valuable Business Opportunities

Keeping your quote team busy doing quotes is not value-added until those quotes turn into orders. A high performing quote team prioritizes winnable RFQs. By having interested leads and customers manage their own RFQs, you reduce the amount of time you spend on non-value-added activities. PortCQ reduces “distraction quoting” so that you can focus on real business opportunities.

5 Ties into QuoteCQ for a Seamless Transition

You have full control over who accesses your online quoting portal, and a parallel view is available for you inside of QuoteCQ. You can use your quote team’s expertise to improve the self-service quotes that your customers do, pick up where they left off or simply have them send you the RFQ details and BOM through your site.

CalcuQuote

elisa company

CalcuQuote provides quoting and supply chain software for the EMS industry by optimizing operations and implementing sustainable digital solutions. CalcuQuote serves 200+ EMS companies.

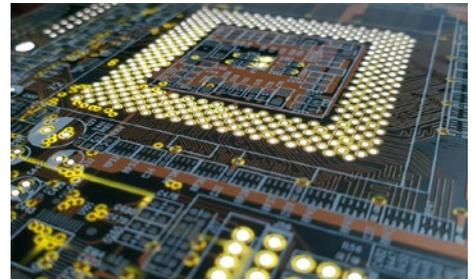
The Top Five Things You Need to Know About

HDI TECHNOLOGY

by ICAPE

HDI stands for high density interconnect. Surprising as it may seem, there is no precise definition for this class of PCBs. It really is a variety of technologies that can be combined in unique configurations. The general distinction is that an HDI structure has a higher density of interconnect characteristics than a conventional PCB.

1 Common Characteristics and Elements to HDI PCBs



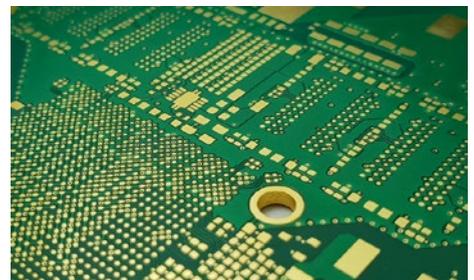
2 Make Space a Priority

3 Many Different HDI Via Types



4 A Wide Panel of Applications and Industries

5 Advantages: Flexibility and Density—Signal Integrity and Reliability



1 Common Characteristics and Elements to HDI PCBs

Some of the common elements to HDI PCBs are the following: combinations of via types such as buried, blind and through-hole; fine traces and spaces; shorter interconnecting traces; tightly spaced passives (or even embedded passives or passive substrates), as well as coreless constructions (very new concept); and multiple level constructions (not a single thickness).

2 Make Space a Priority

Considering space when designing HDI PCBs means more than inserting as many components as the board can possibly fit. Determining the amount of space between specific components and optimizing for additional room is a technique that allows you to minimize thermal stress and EMI. Via diameter, pad diameter, and track width should all be considered at the beginning. Not making space a priority might lead you to completely redesign your HDI PCBs.

3 Many Different HDI Via Types

We erroneously think of blind micro vias as being the definition of HDI. While these tiny vias (<150 micron) are always present in HDI designs, they are only one of the processes that could

be used in an HDI design. In practice, an HDI design has many of the possible via structures such as through-hole, buried, blind and micro-via, as well as stacked and multi-level.

4 A Wide Panel of Applications and Industries

HDI technology is often used in critical system industries such as aerospace, medical devices, automotive or the military, or for high performance like the Internet of Things (IoT). The areas and use of the HDI PCB are not limited to these industries. Instead, the circuit board can be used for many things and on many standard products such as digital cameras, mobile phones, laptop computers, network communications, or touch-screen devices.

5 Advantages: Flexibility and Density—Signal Integrity and Reliability

The flexibility of the HDI components allows unique approaches to satisfy the demands. For example, “layered” structure,” where different functions could be on segments of the PCB and the technology of each segment could be very different. The reduction in overall size is also an obvious benefit of HDI, allowing more ergonomic and creative designs. HDI technology delivers enhanced signal integrity and is highly reliable.



ICAPE Group has grown to become one of the largest providers of printed circuit boards and custom-made technical parts in the world. Contact us at sales@icapeusa.com or visit us at www.icape-group.com.



Learn How to Avoid Solder Defects With New Book Authored by Indium Corporation

The Printed Circuit Assembler's Guide to... Solder Defects—the latest title in the I-007eBook library—is specifically dedicated to educating the printed circuit board assembly sector and serves as a valuable resource for people seeking the most relevant information available.



Key Tronic Announces Results for Q1 Fiscal Year 2022

Key Tronic Corporation, a provider of electronic manufacturing services (EMS), announced its results for the quarter ended October 2, 2021.

HANZA Expands in Germany; Acquires Electronics Manufacturer

HANZA Holding AB has acquired Helmut Beyers GmbH, an electronics manufacturer in Mönchengladbach, Germany, with approximately 150 employees.



Real Time With... SMTA: Anaya Vardya of American Standard Circuits

Anaya Vardya, president and CEO at American Standard Circuits, speaks with Nolan Johnson ahead of the SMTA International exposition. Vardya outlines the topics ASC will be presenting on the show floor.

SMT Solver: Flux and Cleaning—How Clean Is Clean? Part 2



The selection of flux and cleaning process determines, to a large extent, the manufacturing yield and product reliability of electronic assemblies. In this column, columnist Ray

Prasad discusses cleanliness requirements to know whether the boards have been cleaned enough to meet their functional requirements for their intended applications.

X-Rayted Files: Was CS Model 101 Built on Industry 4.0?

While smart devices like sleep trackers that monitor the quality of our ZZs are exciting to some, for others it induces the fear of becoming subject to robot overlords. Regardless, the age of IoT is upon us, and as manufacturers, IoT is just one facet of the broader Industry 4.0.



Bill Cardoso

Test Strategies and Pain Points

Bert Horner of The Test Connection, Inc., a test engineering service provider, shares his insights on the trends and challenges for test and inspection. In this discussion centered around common challenges in the industry and the importance of setting up your test and inspection strategy, Bert states, “The biggest challenge is giving access to the key points and understanding a test strategy prior to the assembly being built.”



EPTAC Studying Low-Melt Alloys as In-Person Classes Resume

Managing Editor Andy Shaughnessy recently spoke with Leo Lambert, vice president of technology for EPTAC, about some research the company is doing into low-melt alloys. They also discussed EPTAC’s continuous growth, as well as some of the lessons learned during the pandemic and their plans moving forward.

Real Time With... SMTAI Interview: Dan Hart of MacDermid Alpha Electronics Solutions

Nolan talks to Dan Hart, application development manager, about the paper his team presented at SMTAI, the work that went into the research, and why his team took on this research.



Koh Young America Promotes Joel Scutchfield to General Manager

Koh Young Technology, the industry leader in True3D™ measurement-based inspection solutions, announces its executive committee has appointed Joel Scutchfield as general manager and head of SMT sales at Koh Young America.



Joel Scutchfield

For the latest news and information, visit [SMT007.com](https://www.smt007.com)

Career Opportunities



Is your team growing?

Find industry-experienced candidates at I-Connect007.

For just \$750, your 200-word, full-column ad will appear in the Career Opportunities section of all three of our monthly magazines, reaching circuit board designers, fabricators, assemblers, OEMs, suppliers and the academic community.

In addition, your ad will:

- be featured in at least one of our newsletters
- appear on our jobConnect007.com board, which is promoted in every newsletter
- appear in our monthly [Careers Guide](#), emailed to 26,000 potential candidates

Potential candidates can click on your ad and submit a resume directly to the email address you provide, or be directed to the URL of your choice.

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GOOD FOR THE INDUSTRY



Career Opportunities



Service Engineer Schmoll Laser and Direct Imaging

Reports to: Field Service Manager
Location: North America

SUMMARY:

Provide expert-level service on multiple laser drilling and direct imaging product lines. Maintain high customer satisfaction, timeliness, accuracy, efficiency, cost effectiveness, and safety.

DUTIES AND RESPONSIBILITIES:

- Install, commission, and maintain Schmoll products at customer sites. Perform modifications and retrofits as needed.
- Troubleshoot, diagnose, and calibrate products via telephone or at customer sites.
- Handle a wide variety of problems, issues, and inquiries.
- Provide training for customers and others in the effective operation, calibration, and maintenance of all products.
- Lead the project management team for retrofit/upgrade requests and recommendations for Schmoll equipment until the end of commissioning and final payment.
- Assist customers with potential optimization of their machine operations and work with clients on application improvements.

QUALIFICATIONS:

- Must possess a valid driver's license, clean driving record, major credit card (for business travel), and passport.
- Ability to read and interpret technical documentation, compile reports, and compose routine correspondence, define problems, collect data, and draw a valid solution.
- Must be able to travel extensively, partly international, to support customer needs. While Burkle makes every attempt to avoid Sunday and Friday evening travel, sometimes it is required.

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Technical Marketing Specialist Waterbury, CT

JOB DESCRIPTION:

Responsible for providing technical knowledge and support to marketing communications professionals. Cross training and acting as liaison between the Innovation and the Marketing Communications teams for both Circuitry Solutions and Semiconductor Solutions.

Chemist 1 Waterbury, CT

JOB DESCRIPTION:

Perform analysis—both chemical and mechanical—of customer-supplied samples. These include both structural and chemical testing using various instruments such as SEM, Instron, ICP, and titration methods. Perform various failure analysis functions, including, but not limited to, chemical analysis, SEM analysis of customer parts, and cross-section evaluation.

Applications Manager Waterbury, CT/New England Region

JOB DESCRIPTION:

Applications Manager in the Electronics Specialties/Circuitry Solutions group to provide applications process knowledge, training and technical support of new products leading to sales revenue growth. Requires working through the existing sales and technical service organizations to leverage this knowledge globally. Experience in multilayer bonding along with dry film and solder mask adhesion processes a plus.

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Career Opportunities



Sales Manager

New Business Development (m/w/d) – Sales Territory: Germany

CML Group is a global leader in the Printed Circuit Board industry, specialized in PCB manufacturing and sustainable PCB supply solutions. Our products are made to the highest quality and reliability standards, including automotive requirements.

For the expansion of our target markets, we need you to generate new business, drive new projects from RFQ stage and manage the customer relationship.

Your responsibilities:

- Develop new customers and build long-term customer relationships
- Understand the customer requirements and acquire new contract enquiries from all market sectors
- Proactive market and customer research
- Identify new potential electronic industry sectors
- Result-oriented sales management including support and consulting on new projects
- Independent management and organization of your accounts
- Price and contract negotiations with customers and contractual partners

Your profile:

- Several years of professional experience in sales and key account management
- Knowledge of printed circuit board production/industry would be an advantage
- Fluent in Business English and willingness to travel internationally
- Flexible and an open-minded mentality
- Strong communication skills, team player
- Self-motivated, well-organized, professional
- Your home base is in Germany

Interested? Looking forward to your application!
Please send your application to hr@cmit.support.

For more information visit
www.cml-globalsolutions.com

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Customer Service Representative, UK

We are looking to expand our UK Customer Service/Internal Sales team. As Customer Service Representative you will provide great sales and customer service support and respond to the needs of clients from industries including Aerospace, Defence, Automotive and Pharmaceutical. Duties include:

- Maintain & develop relationships with new and existing customers
- Make rapid, accurate cost calculations and provide quotations
- Accurately input customer orders through bespoke MRP System
- Liaise with colleagues at Chinese HQ and other Overseas Business Units to manage domestic and international requirements
- Assist sales team with reporting, sales analysis and other items at their request

Skills and abilities required for the role:

The ideal candidate is a proactive self-starter with a strong customer service background. Friendly, approachable, and confident, you should have a good phone mannerism and be computer literate.

- Previous experience in a Customer Service background, ideally management or supervisor role
- Experience with MRP Systems
- Good working knowledge of Microsoft Office Tools such as Outlook, Excel etc.

What's on Offer:

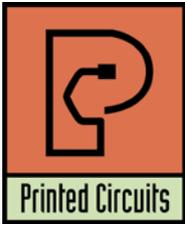
- Excellent salary & benefits commensurate with experience

This is a fantastic opportunity to become part of a successful brand and leading team with excellent benefits.

Please forward your resume to HR@ventec-europe.com

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Career Opportunities



Printed Circuits, a fast-growing printed circuit board fabricator, offers:

- Excellent opportunities for advancement and growth
- Dynamic manufacturing environment
- Excellent health, dental and other benefits
- Annual profit-sharing plan
- Signing bonus
- Additional incentives at the leadership level
- Clean facility with state-of-the-art manufacturing equipment
- Highly collaborative corporate and manufacturing culture that values employee contributions

Laminator Technician

Nature of Duties/Responsibilities

- Layup cover lay
- Layup rigid flex
- Layup multilayer/CU core boards
- Oxide treat/cobra treatment of all layers/CU cores
- Shear flex layer edges
- Rout of machine panel edges and buff
- Remove oxide/cobra treatment (strip panels)
- Serialize panels
- Pre-tac Kapton windows on flex layers (bikini process)
- Layup Kapton bonds
- Prep materials: B-stage, Kapton, release sheet
- Breakdown: flex layers, and caps
- Power scrub: boards, layers, and caps
- Laminate insulators, stiffeners, and heatsinks
- Plasma cleans and dry flex layers B-stage (Dry)
- Booking layers and materials, ready for lamination process
- Other duties as deemed necessary by supervisor

Education/Experience

- High school diploma or GED
- Must be a team player
- Must demonstrate the ability to read and write English and complete simple mathematical equations
- Must be able to follow strict policy and OSHA guidelines
- Must be able to lift 50 lbs
- Must have attention to detail

Wet Process/Plating Technician

Position is 3rd shift (11:00PM to 7:30AM, Sunday through Friday)

Purpose

To carry out departmental activities which result in producing quality product that conforms to customer requirements. To operate and maintain a safe working environment.

Nature of Duties/Responsibilities

- Load and unload electroplating equipment
- Fasten circuit boards to racks and cathode bars
- Immerse work pieces in series of cleaning, plating and rinsing tanks, following timed cycles manually or using hoists
- Carry work pieces between departments through electroplating processes
- Set temperature and maintains proper liquid levels in the plating tanks
- Remove work pieces from racks, and examine work pieces for plating defects, such as nodules, thin plating or burned plating
- Place work pieces on racks to be moved to next operation

- Check completed boards
- Drain solutions from and clean and refill tanks; fill anode baskets as needed
- Remove buildup of plating metal from racks using chemical bath

Education and Experience

- High school diploma or GED required
- Good organizational skills and the ability to follow instructions
- Ability to maintain a regular and reliable attendance record
- Must be able to work independently and learn quickly
- Organized, self-motivated, and action-oriented, with the ability to adapt quickly to new challenges/opportunities
- Prior plating experience a plus

Production Scheduler

Main Responsibilities

- Development and deployment of a level-loaded production plan
- Establish manufacturing plan which results in "best possible" use of resources to maximize asset utilization
- Analyze production capacity of manufacturing processes, equipment and human resource requirements needed to produce required products
- Plan operation manufacturing sequences in weekly time segments utilizing production labor standards
- Maintain, align, and communicate regularly with internal suppliers/customers and customer service on key order metrics as per their requirements
- Frequently compare current and anticipated orders with available inventory and creates replenishment plan
- Maintain master distribution schedule for the assigned facility, revise as needed and alert appropriate staff of schedule changes or delays
- Participate in periodic forecasting meetings
- Lead or participate in planning and status meetings with production, shipping, purchasing, customer service and/or other related departments
- Follow all good manufacturing practices (GMPs)
- Answer company communications, fax, copy and file paperwork

Education and Experience

- High school diploma or GED
- Experience in manufacturing preferred/3 years in scheduling
- Resourceful and good problem-solving skills
- Ability to make high pressure decisions
- Excellent written and verbal communication skills
- Strong computer skills including ERP, Excel, Word, MS Office
- Detailed and meticulous with good organizational skills
- Must be articulate, tactful and professional at all times
- Self-motivated

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Career Opportunities



Fuji America Corporation is a rapidly growing electronics assembly equipment distributor. We support the factories of the future and smart factories globally. We offer an exciting and challenging career for a software support engineer and an applications engineer who want to join our growing company.

Software Support Engineer

As a software support engineer for Fuji America Corporation, you will be a customer-facing technical advisor with the opportunity to solve technically complex problems for our proprietary software. As a trusted advisor to our customers, you will have influence over a broad range of solutions that create business value. As a valued member on our team, the software support engineer will use advanced troubleshooting methods and tools to solve technically complex problems. These highly complex, escalated problems require broad and in-depth product knowledge, as well as exceptional troubleshooting skills.

- Field installation of proprietary software/ automation equipment throughout North America
- Field troubleshoot, repair, training, and process support of proprietary software
- Provide remote and on-site technical support
- Troubleshoot Windows 10/Windows server installing, configuration, and support
- Networking experience—setting up and supporting networks.
- Exposure and/or experience with Oracle or Microsoft SQL server databases
- Strong verbal communication skills with both customer and other technical depts.
- Flexibility to travel and perform job assignments on short notice
- Strong aptitude with current computing applications and networking processes

Experience

- Bachelor of Science in computer science or related field preferred

Applications Engineer

As an applications engineer, you will be responsible for doing cycle time and studies in preparation to make recommendations of Fuji products for customers' applications. Support implementation of activities within the technical center such as customer visits, demonstrations, evaluations, testing, inspection of Fuji products, including peripheral equipment from other vendors.

- Assist sales representatives in technical aspects relating to machine and software functions and utilization.
- Assist sales representatives and customers with providing CTA (Cycle Time Analysis) to them for recommending Fuji products to customers' specific applications. This includes the sFAB machine as well as all other SMT machines.
- Schedule and perform product demonstrations on all available types of equipment and software to potential and existing customers.
- Test and evaluate existing as well as new technologies on equipment and software performance and reliability.
- Assist in the coordination of any new FAC projects by utilizing your full potential.
- Responsible for the setup of the equipment and its demonstration for various trade shows.
- Assist FAC staff in any technical issues which may require attention.
- Assist in the coordination of design and manufacture of customs tooling for placement equipment.
- Perform inventory checks every six months according to the schedule and manner regulated by the company, if applicable.

Experience

- Minimum five years programming/computer experience
- Bachelor's degree preferred

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Career Opportunities



PCB Field Engineer— North America Operations

ICAPE Group is a European leader for printed circuits boards and custom-made electro-mechanical parts. Headquartered in Paris, France, we have over 500 employees located in more than 70 countries serving our +2500 customers.

To support our growth in the American market, we are looking for a PCB Field Engineer.

You will work in our North America technical center, including our U.S. technical laboratory, and will be responsible for providing technical and quality support to our American sales team.

You will have direct customer contact during all phases of the sales process and provide follow-on support as required.

RESPONSIBILITIES INCLUDE

- Feasibility recommendations
- Fabricator questions and liaison
- Quality resolutions
- Technical explanation (for the customer) of proposals, laboratory analysis or technology challenges

REQUIREMENTS

- Engineering degree or equivalent industry experience
- 5 years' experience with PCB manufacturing (including CAM)
- Excellent technical understanding of PCBs
- Experience with quality tools (FAI, PPAP and 8-D)
- Good communication skills (written and oral)

Communication skills are essential to assist the customer with navigation of the complex process of matching the PCB to the application.

SALARY

Competitive, based on profile and experience. Position is full time in Indianapolis, Ind.

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Prototron Circuits

Sales Representatives

Prototron Circuits, a market-leading, quick-turn PCB shop, is looking for sales representatives for all territories.

Reasons you should work with Prototron:

- Serving the PCB industry for over 30 years
- Solid reputation for on-time delivery (99% on-time)
- Excellent quality
- Production quality quick-turn services in as little as 24 hours
- AS9100
- MIL-PRF- 31032
- ITAR
- Global sourcing
- Engineering consultation
- Completely customer focused team

Interested? Let's have a talk.

Call Dan Beaulieu at

207-649-0879

or email to

danbbeaulieu@aol.com

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Career Opportunities



Rewarding Careers

Take advantage of the opportunities we are offering for careers with a growing test engineering firm. We currently have several openings at every stage of our operation.

The Test Connection, Inc. is a test engineering firm. We are family owned and operated with solid growth goals and strategies. We have an established workforce with seasoned professionals who are committed to meeting the demands of high-quality, low-cost and fast delivery.

TTCI is an Equal Opportunity Employer. We offer careers that include skills-based compensation. We are always looking for talented, experienced test engineers, test technicians, quote technicians, electronics interns, and front office staff to further our customer-oriented mission.

Associate Electronics Technician/Engineer (ATE-MD)

TTCI is adding electronics technician/engineer to our team for production test support.

- Candidates would operate the test systems and inspect circuit card assemblies (CCA) and will work under the direction of engineering staff, following established procedures to accomplish assigned tasks.
- Test, troubleshoot, repair, and modify developmental and production electronics.
- Working knowledge of theories of electronics, electrical circuitry, engineering mathematics, electronic and electrical testing desired.
- Advancement opportunities available.
- Must be a US citizen or resident.

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Test Engineer (TE-MD)

In this role, you will specialize in the development of in-circuit test (ICT) sets for Keysight 3070 (formerly HP) and/or Teradyne (formerly GenRad) TestStation/228X test systems.

- Candidates must have at least three years of experience with in-circuit test equipment. A candidate would develop and debug our test systems and install in-circuit test sets remotely online or at customer's manufacturing

locations nationwide.

- Candidates would also help support production testing and implement Engineering Change Orders and program enhancements, library model generation, perform testing and failure analysis of assembled boards, and other related tasks.
- Some travel required and these positions are available in the Hunt Valley, Md., office.

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Sr. Test Engineer (STE-MD)

- Candidate would specialize in the development of in-circuit test (ICT) sets for Keysight 3070 (formerly Agilent & HP), Teradyne/GenRad, and Flying Probe test systems.
- Strong candidates will have more than five years of experience with in-circuit test equipment. Some experience with flying probe test equipment is preferred. A candidate would develop, and debug on our test systems and install in-circuit test sets remotely online or at customer's manufacturing locations nationwide.
- Proficient working knowledge of Flash/ISP programming, MAC Address and Boundary Scan required. The candidate would also help support production testing implementing Engineering Change Orders and program enhancements, library model generation, perform testing and failure analysis of assembled boards, and other related tasks. An understanding of stand-alone boundary scan and flying probe desired.
- Some travel required. Positions are available in the Hunt Valley, Md., office.

Contact us today to learn about the rewarding careers we are offering. Please email resumes with a short message describing your relevant experience and any questions to careers@ttci.com. Please, no phone calls.

We proudly serve customers nationwide and around the world.

TTCI is an ITAR registered and JCP DD2345 certified company that is NIST 800-171 compliant.

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Career Opportunities



MANUFACTURERS OF QUALITY PRINTED CIRCUIT BOARDS

Maintenance Technician

Inspects work-related conditions to determine compliance with prescribed operating and safety standards. Operates power-driven machinery and uses equipment and tools commonly used to maintain facilities and equipment. Replace filters, belts, and additional parts for repairs and preventive maintenance. Moves objects weighing up to 150 lbs. using a hand truck or pulley. Cleans work area and equipment. Works with cleaning fluids, agents, chemicals, and paints using protective gear. Works at elevations greater than ten feet, climbing ladders, while repairing or maintaining building structures and equipment. Assists skilled maintenance technicians/workers in more complex tasks and possible after-hours emergency repairs. Must meet scheduling and attendance requirements.

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Plating Operator

Plating operator for printed circuit boards. No experience necessary, will train. Must be able to work with chemicals, lift up to 50 pounds, and have good math skills. Minimum high school/GED or equivalent. All shifts (1st, 2nd, 3rd), 8 hours per day minimum, Monday thru Friday. Saturday and Sunday work is common allowing for steady overtime pay.

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MANUFACTURERS OF QUALITY PRINTED CIRCUIT BOARDS

Water Treatment Operator

Responsible for operating waste treatment plant, our operation that converts wastewater in drains and sewers into a form that's metal free to release into the environment.

Control equipment and monitor processes that remove metals from wastewater. Run tests to make sure that the processes are working correctly. Keep records of water quality and pH. Operate and maintain the pumps and motors that move water and wastewater through filtration systems. Read meters and gauges to make sure plant equipment is working properly. Take samples and run tests to determine the quality of the water being produced. Adjust the amount of chemicals being added to the water and keep records that document compliance.

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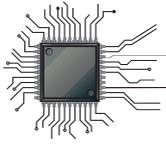
Drilling Operator

Drilling operator for printed circuit boards. Minimum 2 years of experience. Minimum high school/GED or equivalent.

All Shifts (1st, 2nd, 3rd), 8 hours per day minimum, Monday thru Friday. Saturday and Sunday work is common allowing for overtime pay.

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Career Opportunities



MivaTek

Global

Product Manager

MivaTek Global is preparing for a major market and product offering expansion. Miva's new NG3 and DART technologies have been released to expand the capabilities of Miva's industry-leading LED DMD direct write systems in PCB and Microelectronics. MivaTek Global is looking for a technology leader that can be involved guiding this major development.

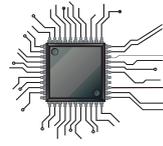
The product manager role will serve as liaison between the external market and the internal design team. Leadership level involvement in the direction of new and existing products will require a diverse skill set. Key role functions include:

- **Sales Support:** Recommend customer solutions through adaptations to Miva products
- **Design:** Be the voice of the customer for new product development
- **Quality:** Verify and standardize product performance testing and implementation
- **Training:** Conduct virtual and on-site training
- **Travel:** Product testing at customer and factory locations

Use your 8 plus years of experience in either the PCB or Microelectronic industry to make a difference with the leader in LED DMD direct imaging technology. Direct imaging, CAM, AOI, or drilling experience is a plus but not required.

For consideration, send your resume to N.Hogan@MivaTek.Global. For more information on the company see www.MivaTek.Global or www.Mivatec.com.

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MivaTek

Global

Field Service Technician

MivaTek Global is focused on providing a quality customer service experience to our current and future customers in the printed circuit board and microelectronic industries. We are looking for bright and talented people who share that mindset and are energized by hard work who are looking to be part of our continued growth.

Do you enjoy diagnosing machines and processes to determine how to solve our customers' challenges? Your 5 years working with direct imaging machinery, capital equipment, or PCBs will be leveraged as you support our customers in the field and from your home office. Each day is different, you may be:

- Installing a direct imaging machine
- Diagnosing customer issues from both your home office and customer site
- Upgrading a used machine
- Performing preventive maintenance
- Providing virtual and on-site training
- Updating documentation

Do you have 3 years' experience working with direct imaging or capital equipment? Enjoy travel? Want to make a difference to our customers? Send your resume to N.Hogan@MivaTek.Global for consideration.

More About Us

MivaTek Global is a distributor of Miva Technologies' imaging systems. We currently have 55 installations in the Americas and have machine installations in China, Singapore, Korea, and India.

apply now

Career Opportunities



Arlon EMD, located in Rancho Cucamonga, California, is currently interviewing candidates for open positions in:

- **Engineering**
- **Quality**
- **Various Manufacturing**

All interested candidates should contact Arlon's HR department at 909-987-9533 or email resumes to careers.ranch@arlonemd.com.

Arlon is a major manufacturer of specialty high-performance laminate and prepreg materials for use in a wide variety of printed circuit board applications. Arlon specializes in thermoset resin technology, including polyimide, high Tg multifunctional epoxy, and low loss thermoset laminate and prepreg systems. These resin systems are available on a variety of substrates, including woven glass and non-woven aramid. Typical applications for these materials include advanced commercial and military electronics such as avionics, semiconductor testing, heat sink bonding, High Density Interconnect (HDI) and microvia PCBs (i.e. in mobile communication products).

Our facility employs state of the art production equipment engineered to provide cost-effective and flexible manufacturing capacity allowing us to respond quickly to customer requirements while meeting the most stringent quality and tolerance demands. Our manufacturing site is ISO 9001: 2015 registered, and through rigorous quality control practices and commitment to continual improvement, we are dedicated to meeting and exceeding our customers' requirements.

For additional information please visit our website at www.arlonemd.com

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Logistics Assistant

Koh Young America is looking for a Logistics Assistant to assist and oversee our supply chain operations. Working alongside a Logistics Specialist, you will coordinate processes to ensure smooth operations using a variety of channels to maximize efficiency. You must be an excellent communicator and negotiator well-versed in supply chain management principles and practices. Also, you should be meticulous with a focus on customer satisfaction. These attributes are ideally complemented by a Bachelor's in Supply Chain Management or equivalent professional experience in the manufacturing industry.

This position is in our Duluth, Georgia, headquarters, where we serve our customers within North and South America. We offer health, dental, vision, and life Insurance with no employee premiums, including dependent coverage. Additionally, we provide a 401K retirement plan with company matching, plus a generous PTO policy with paid holidays.

Koh Young Technology, founded in 2002 in Seoul, South Korea, is the world leader in 3D measurement and inspection technology used in the production of micro-electronics assemblies. Using patented 3D technology, Koh Young provides best-in-class products in Solder Paste Inspection (SPI) and Automated Optical Inspection (AOI) for electronics manufacturers worldwide.

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Career Opportunities



SMT Operator Hatboro, PA

Manncorp, a leader in the electronics assembly industry, is looking for a **surface-mount technology (SMT) operator** to join their growing team in Hatboro, PA!

The **SMT operator** will be part of a collaborative team and operate the latest Manncorp equipment in our brand-new demonstration center.

Duties and Responsibilities:

- Set up and operate automated SMT assembly equipment
- Prepare component kits for manufacturing
- Perform visual inspection of SMT assembly
- Participate in directing the expansion and further development of our SMT capabilities
- Some mechanical assembly of lighting fixtures
- Assist Manncorp sales with customer demos

Requirements and Qualifications:

- Prior experience with SMT equipment or equivalent technical degree preferred; will consider recent graduates or those new to the industry
- Windows computer knowledge required
- Strong mechanical and electrical troubleshooting skills
- Experience programming machinery or demonstrated willingness to learn
- Positive self-starter attitude with a good work ethic
- Ability to work with minimal supervision
- Ability to lift up to 50 lbs. repetitively

We Offer:

- Competitive pay
- Medical and dental insurance
- Retirement fund matching
- Continued training as the industry develops

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SMT Field Technician Hatboro, PA

Manncorp, a leader in the electronics assembly industry, is looking for an additional SMT Field Technician to join our existing East Coast team and install and support our wide array of SMT equipment.

Duties and Responsibilities:

- Manage on-site equipment installation and customer training
- Provide post-installation service and support, including troubleshooting and diagnosing technical problems by phone, email, or on-site visit
- Assist with demonstrations of equipment to potential customers
- Build and maintain positive relationships with customers
- Participate in the ongoing development and improvement of both our machines and the customer experience we offer

Requirements and Qualifications:

- Prior experience with SMT equipment, or equivalent technical degree
- Proven strong mechanical and electrical troubleshooting skills
- Proficiency in reading and verifying electrical, pneumatic, and mechanical schematics/drawings
- Travel and overnight stays
- Ability to arrange and schedule service trips

We Offer:

- Health and dental insurance
- Retirement fund matching
- Continuing training as the industry develops

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Career Opportunities

SIEMENS

Siemens EDA Sr. Applications Engineer

Support consultative sales efforts at world's leading semiconductor and electronic equipment manufacturers. You will be responsible for securing EM Analysis & Simulation technical wins with the industry-leading HyperLynx Analysis product family as part of the Xpedition Enterprise design flow.

Will deliver technical presentations, conduct product demonstrations and benchmarks, and participate in the development of account sales strategies leading to market share gains.

- PCB design competency required
- BEE, MSEE preferred
- Prior experience with Signal Integrity, Power Integrity, EM & SPICE circuit analysis tools
- Experience with HyperLynx, Ansys, Keysight and/or Sigrity
- A minimum of 5 years' hands-on experience with EM Analysis & Simulation, printed circuit board design, engineering technology or similar field
- Moderate domestic travel required
- Possess passion to learn and perform at the cutting edge of technology
- Desire to broaden exposure to the business aspects of the technical design world
- Possess a demonstrated ability to build strong rapport and credibility with customer organizations while maintaining an internal network of contacts
- Enjoy contributing to the success of a phenomenal team

***Qualified applicants will not require employer-sponsored work authorization now or in the future for employment in the United States. Qualified Applicants must be legally authorized for employment in the United States.*

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U.S. CIRCUIT

Plating Supervisor

Escondido, California-based PCB fabricator U.S. Circuit is now hiring for the position of plating supervisor. Candidate must have a minimum of five years' experience working in a wet process environment. Must have good communication skills, bilingual is a plus. Must have working knowledge of a plating lab and hands-on experience running an electrolytic plating line. Responsibilities include, but are not limited to, scheduling work, enforcing safety rules, scheduling/maintaining equipment and maintenance of records.

Competitive benefits package. Pay will be commensurate with experience.

Mail to:
mfariba@uscircuit.com

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Career Opportunities



BLACKFOX

Premier Training & Certification

IPC Instructor

Longmont, CO; Phoenix, AZ;
U.S.-based remote

*Independent contractor,
possible full-time employment*

Job Description

This position is responsible for delivering effective electronics manufacturing training, including IPC Certification, to students from the electronics manufacturing industry. IPC instructors primarily train and certify operators, inspectors, engineers, and other trainers to one of six IPC Certification Programs: IPC-A-600, IPC-A-610, IPC/WHMA-A-620, IPC J-STD-001, IPC 7711/7721, and IPC-6012.

IPC instructors will conduct training at one of our public training centers or will travel directly to the customer's facility. A candidate's close proximity to Longmont, CO, or Phoenix, AZ, is a plus. Several IPC Certification Courses can be taught remotely and require no travel.

Qualifications

Candidates must have a minimum of five years of electronics manufacturing experience. This experience can include printed circuit board fabrication, circuit board assembly, and/or wire and cable harness assembly. Soldering experience of through-hole and/or surface-mount components is highly preferred.

Candidate must have IPC training experience, either currently or in the past. A current and valid certified IPC trainer certificate holder is highly preferred.

Applicants must have the ability to work with little to no supervision and make appropriate and professional decisions.

Send resumes to Sharon Montana-Beard at
sharonm@blackfox.com.

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American Standard Circuits

Creative Innovations In Flex, Digital & Microwave Circuits

CAD/CAM Engineer

Summary of Functions

The CAD/CAM engineer is responsible for reviewing customer supplied data and drawings, performing design rule checks and creating manufacturing data, programs, and tools required for the manufacture of PCB.

Essential Duties and Responsibilities

- Import customer data into various CAM systems.
- Perform design rule checks and edit data to comply with manufacturing guidelines.
- Create array configurations, route, and test programs, penalization and output data for production use.
- Work with process engineers to evaluate and provide strategy for advanced processing as needed.
- Itemize and correspond to design issues with customers.
- Other duties as assigned.

Organizational Relationship

Reports to the engineering manager. Coordinates activities with all departments, especially manufacturing.

Qualifications

- A college degree or 5 years' experience is required. Good communication skills and the ability to work well with people is essential.
- Printed circuit board manufacturing knowledge.
- Experience using CAM tooling software, Orbotech GenFlex®.

Physical Demands

Ability to communicate verbally with management and co-workers is crucial. Regular use of the telephone and e-mail for communication is essential. Sitting for extended periods is common. Hearing and vision within normal ranges is helpful for normal conversations, to receive ordinary information and to prepare documents.

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Career Opportunities

Now Hiring

Director of Process Engineering

A successful and growing printed circuit board manufacturer in Orange County, CA, has an opening for a director of process engineering.

Job Summary:

The director of process engineering leads all engineering activities to produce quality products and meet cost objectives. Responsible for the overall management, direction, and coordination of the engineering processes within the plant.

Duties and Responsibilities:

- Ensures that process engineering meets the business needs of the company as they relate to capabilities, processes, technologies, and capacity.
- Stays current with related manufacturing trends. Develops and enforces a culture of strong engineering discipline, including robust process definition, testing prior to production implementation, change management processes, clear manufacturing instructions, statistical process monitoring and control, proactive error proofing, etc.
- Provides guidance to process engineers in the development of process control plans and the application of advanced quality tools.
- Ensures metrics are in place to monitor performance against the goals and takes appropriate corrective actions as required. Ensures that structured problem-solving techniques are used and that adequate validation is performed for any issues being address or changes being made. Develops and validates new processes prior to incorporating them into the manufacturing operations.
- Strong communication skills to establish priorities, work schedules, allocate resources, complete required information to customers, support quality system, enforce company policies and procedures, and utilize resources to provide the greatest efficiency to meet production objectives.

Education and Experience:

- Master's degree in chemical engineering or engineering is preferred.
- 10+ years process engineering experience in an electronics manufacturing environment, including 5 years in the PCB or similar manufacturing environment.
- 7+ years of process engineering management experience, including 5 years of experience with direct responsibility for meeting production throughput and quality goals.

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Now Hiring

Process Engineering Manager

A successful and growing printed circuit board manufacturer in Orange County, CA, has an opening for a process engineering manager.

Job Summary:

The process engineering manager coordinates all engineering activities to produce quality products and meet cost objectives. Responsible for the overall management, direction, and coordination of the engineering team and leading this team to meet product requirements in support of the production plan.

Duties and Responsibilities:

- Ensures that process engineering meets the business needs of the company as they relate to capabilities, processes, technologies, and capacity.
- Stays current with related manufacturing trends. Develops and enforces a culture of strong engineering discipline, including robust process definition, testing prior to production implementation, change management processes, clear manufacturing instructions, statistical process monitoring and control, proactive error proofing, etc.
- Ensures metrics are in place to monitor performance against the goals and takes appropriate corrective actions as required. Ensures that structured problem-solving techniques are used and that adequate validation is performed for any issues being address or changes being made. Develops and validates new processes prior to incorporating into the manufacturing operations

Education and Experience:

- Bachelor's degree in chemical engineering or engineering is preferred.
- 7+ years process engineering experience in an electronics manufacturing environment, including 3 years in the PCB or similar manufacturing environment.
- 5+ years of process engineering management experience, including 3 years of experience with direct responsibility for meeting production throughput and quality goals.

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Career Opportunities

INSULECTRO



Are You Our Next Superstar?!

Insulectro, the largest national distributor of printed circuit board materials, is looking to add superstars to our dynamic technical and sales teams. We are always looking for good talent to enhance our service level to our customers and drive our purpose to enable our customers build better boards faster. Our nationwide network provides many opportunities for a rewarding career within our company.

We are looking for talent with solid background in the PCB or PE industry and proven sales experience with a drive and attitude that match our company culture. This is a great opportunity to join an industry leader in the PCB and PE world and work with a terrific team driven to be vital in the design and manufacture of future circuits.

View our opportunities at
Insulectro Careers ([jobvite.com](https://www.jobvite.com))

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eptac

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Become a Certified IPC Master Instructor

Opportunities are available in Canada, New England, California, and Chicago. If you love teaching people, choosing the classes and times you want to work, and basically being your own boss, this may be the career for you. EPTAC Corporation is the leading provider of electronics training and IPC certification and we are looking for instructors that have a passion for working with people to develop their skills and knowledge. If you have a background in electronics manufacturing and enthusiasm for education, drop us a line or send us your resume. We would love to chat with you. Ability to travel required. IPC-7711/7721 or IPC-A-620 CIT certification a big plus.

Qualifications and skills

- A love of teaching and enthusiasm to help others learn
- Background in electronics manufacturing
- Soldering and/or electronics/cable assembly experience
- IPC certification a plus, but will certify the right candidate

Benefits

- Ability to operate from home. No required in-office schedule
- Flexible schedule. Control your own schedule
- IRA retirement matching contributions after one year of service
- Training and certifications provided and maintained by EPTAC

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Career Opportunities



APCT, Printed Circuit Board Solutions: Opportunities Await

APCT, a leading manufacturer of printed circuit boards, has experienced rapid growth over the past year and has multiple opportunities for highly skilled individuals looking to join a progressive and growing company. APCT is always eager to speak with professionals who understand the value of hard work, quality craftsmanship, and being part of a culture that not only serves the customer but one another.

APCT currently has opportunities in Santa Clara, CA; Orange County, CA; Anaheim, CA; Wallingford, CT; and Austin, TX. Positions available range from manufacturing to quality control, sales, and finance.

We invite you to read about APCT at APCT.com and encourage you to understand our core values of passion, commitment, and trust. If you can embrace these principles and what they entail, then you may be a great match to join our team! Peruse the opportunities by clicking the link below.

Thank you, and we look forward to hearing from you soon.

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MANUFACTURERS OF QUALITY PRINTED CIRCUIT BOARDS

Pre-CAM Engineer

Illinois-based PCB fabricator Eagle Electronics is seeking a pre-CAM engineer specific to the printed circuit board manufacturing industry. The pre-CAM Engineer will facilitate creation of the job shop travelers used in the manufacturing process. Candidate will have a minimum of two years of pre-CAM experience and have a minimum education level of an associate degree. This is a first-shift position at our Schaumburg, Illinois, facility. This is not a remote or offsite position.

If interested, please submit your resume to HR@eagle-elec.com indicating 'Pre-CAM Engineer' in the subject line.

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Process Engineer

We are also seeking a process engineer with experience specific to the printed circuit board manufacturing industry. The process engineer will be assigned to specific processes within the manufacturing plant and be given ownership of those processes. The expectation is to make improvements, track and quantify process data, and add new capabilities where applicable. The right candidate will have a minimum of two years of process engineering experience, and a minimum education of bachelor's degree in an engineering field (chemical engineering preferred but not required). This is a first shift position at our Schaumburg, Illinois, facility. This is not a remote or offsite position.

If interested, please submit your resume to HR@eagle-elec.com indicating 'Process Engineer' in the subject line.

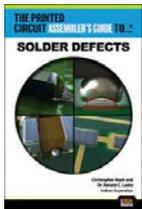
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Watch and Learn!

Our latest micro webinar series examines 3D inspection, AI, CFX, connectivity and smart factory success in 12 easy-to-digest segments. Designed to complement Koh Young's I-007eBook, *The Printed Circuit Assembler's Guide to...SMT Inspection, Today, Tomorrow and Beyond*, the presenters share highly focused educational information on the use of data gathered during the inspection process.



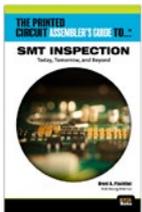
The Printed Circuit Assembler's Guide to...



Solder Defects

by Christopher Nash and Dr. Ronald C. Lasky, Indium Corporation

This book is specifically dedicated to educating the printed circuit board assembly sector and serves as a valuable resource for people seeking the most relevant information available.



SMT Inspection: Today, Tomorrow, and Beyond

by Brent Fischthal, Koh Young America

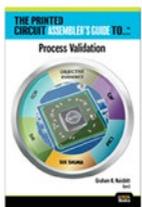
An in-depth insight into new and exciting true 3D inspection technology is provided in this book, along with a look into the future of leveraging big data management and autonomous manufacturing for a smarter factory.



Smart Data: Using Data to Improve Manufacturing

by Sagi Reuven and Zac Elliott, Siemens Digital Industries Software

Manufacturers need to ensure their factory operations work properly, but analyzing data is simply not enough. Companies must take efficiency and waste-reduction efforts to the next phase using big data and advanced analytics to diagnose and correct process flaws.



Process Validation

by Graham K. Naisbitt, Gen3

This book explores how establishing acceptable electrochemical reliability can be achieved by using both CAF and SIR testing. This is a must-read for those in the industry who are concerned about ECM and want to adopt a better and more rigorous approach to ensuring electrochemical reliability.



Advanced Manufacturing in the Digital Age

by Oren Manor, Siemens Digital Industries Software

A must-read for anyone looking for a holistic, systematic approach to leverage new and emerging technologies. The benefits are clear: fewer machine failures, reduced scrap and downtime issues, and improved throughput and productivity.

Our library is open 24/7/365. Visit us at: I-007eBooks.com

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SMT007

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