

Community

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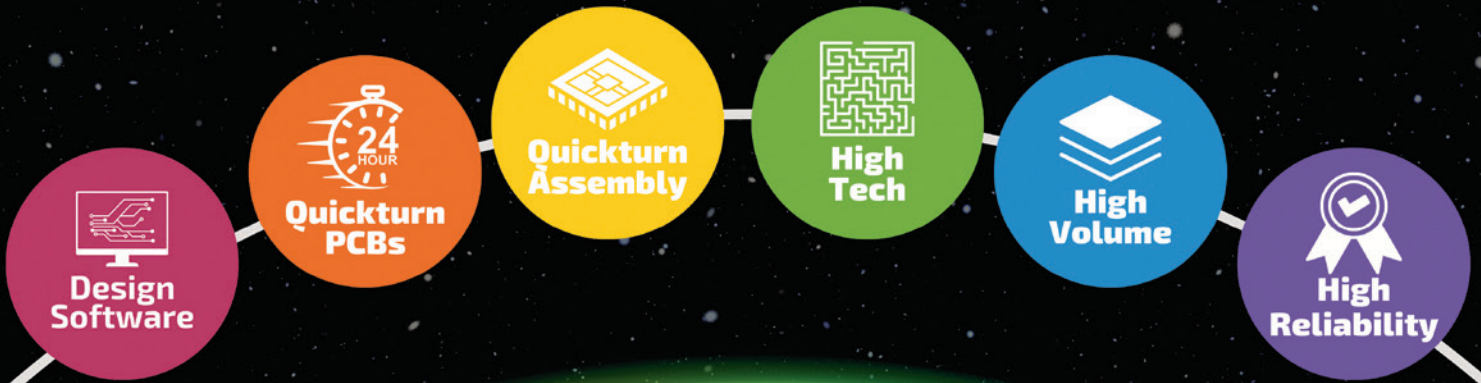


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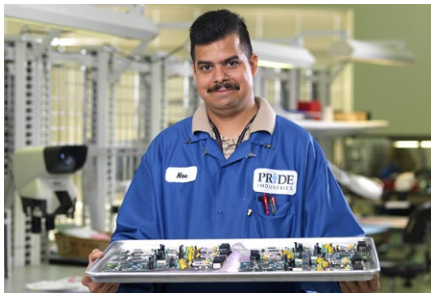
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Connecting With the Best and Brightest

By Dr. John W. Mitchell, IPC President and CEO

The show floor. Keynote speakers. Receptions. Awards ceremonies. The best and brightest minds in electronics manufacturing. IPC APEX EXPO is one of my favorite events of the year. I enjoy attending the many receptions, meeting young and upcoming engineers at the Newcomers Reception, visiting with our many global colleagues at the International Reception, and stopping by the Women in Electronics Reception to see many industry leaders, not to mention the exhibitors who showcase the newest equipment available to us.

IPC APEX EXPO offers many opportunities to learn from experts in the field and to discuss the subjects that are uppermost on our minds: sustainability, Factory of the Future, workforce, PCB fabrication and materials, advanced packaging, and design, to name just a few. This is the first time in 17 years that IPC APEX EXPO



takes place in Anaheim, California, and we are proud to host the international PCB symposium, the 16th Electronic Circuits World Convention (ECWC16), with an expanded, global technical symposium featuring more than 70 presentations over nine technical tracks.

The diversity of the industry makes us strong, and we see that in committee meetings that provide insight into how our important standards are being revised and developed to include the

rapid changes occurring in electronics manufacturing and design. Talking to our cohort of Emerging Engineers and their mentors allows us to see the passing of the torch from one generation to the next in real-time. The awards ceremonies celebrate those committee members and emerging engineers, as we acknowledge their valuable work to build electronics better.

Keynote addresses are an important part of IPC APEX EXPO, and an opening keynote from Paul Bailey, former principal concept technical director, Walt Disney Imagineering, will be fascinating. Paul developed the projection system used in Millennium Falcon: Smuggler's Run and directed the delivery of the attraction Star Wars: Rise of the Resistance. He was also responsible for bringing the Astromech droids to life, earning him the illustrious distinction of "R2-D2 expert."

In my luncheon keynote on Wednesday, I discuss the future of the human workforce and the role people will play in an increasingly AI-driven world. In his closing keynote on Thursday, Shawn DuBravac, IPC chief economist, provides insight into the next wave in electronics, and the trends reshaping the industry.

IPC APEX EXPO is a wonderful opportunity for our community to come together. We are growing and expanding while becoming more tightly knit as the years go by. It's an exciting time to be in electronics, a wonderful time to be in sunny California, and a valuable opportunity to connect with the larger global electronics community. I hope to see you there, and I hope you'll seek me out and say hello. 🌈

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GROWTH POTENTIAL

Electronics manufacturing is driving a massive surge in manufacturing investment

By Shawn DuBravac, IPC Chief Economist

In the early months of the pandemic, investment in manufacturing infrastructure, such as plants and production facilities, declined sharply. Real investment dropped over 11%, before finally recovering to pre-pandemic levels in the first half of 2022. Over the past two years, however, several factors have combined to drive manufacturing investment to record levels.

In 2023, manufacturing investment in plants and other production facilities in the United States rose nearly 63%, the biggest yearly gain since 1951. This surge in investment underscores an unparalleled confidence in the growth potential of the U.S. manufacturing sector that looks beyond any short-term variability.

Several factors are contributing to the

increase in manufacturing construction spending, including:

1. Government incentives: Three major legislative acts enacted in 2021 and 2022—the Infrastructure Investment and Jobs Act (IIJA), the CHIPS and Science Act, and the Inflation Reduction Act (IRA)—are propelling the increase in manufacturing construction spending by allocating hundreds of billions of dollars of incentives to the sector.

2. Technological advancements: The integration of new technologies into manufacturing processes, such as automation, robotics, and artificial intelligence, necessitates the construction of modern facilities equipped to handle these advancements.

3. Supply chain resilience: The pandemic highlighted vulnerabilities in global supply chains, prompting companies to invest in domestic manufacturing facilities to ensure more resilient and reliable supply chains.





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4. Sustainability and green manufacturing:

There's a growing emphasis on sustainable and environmentally friendly manufacturing practices, driving the construction of green facilities that adhere to these principles.

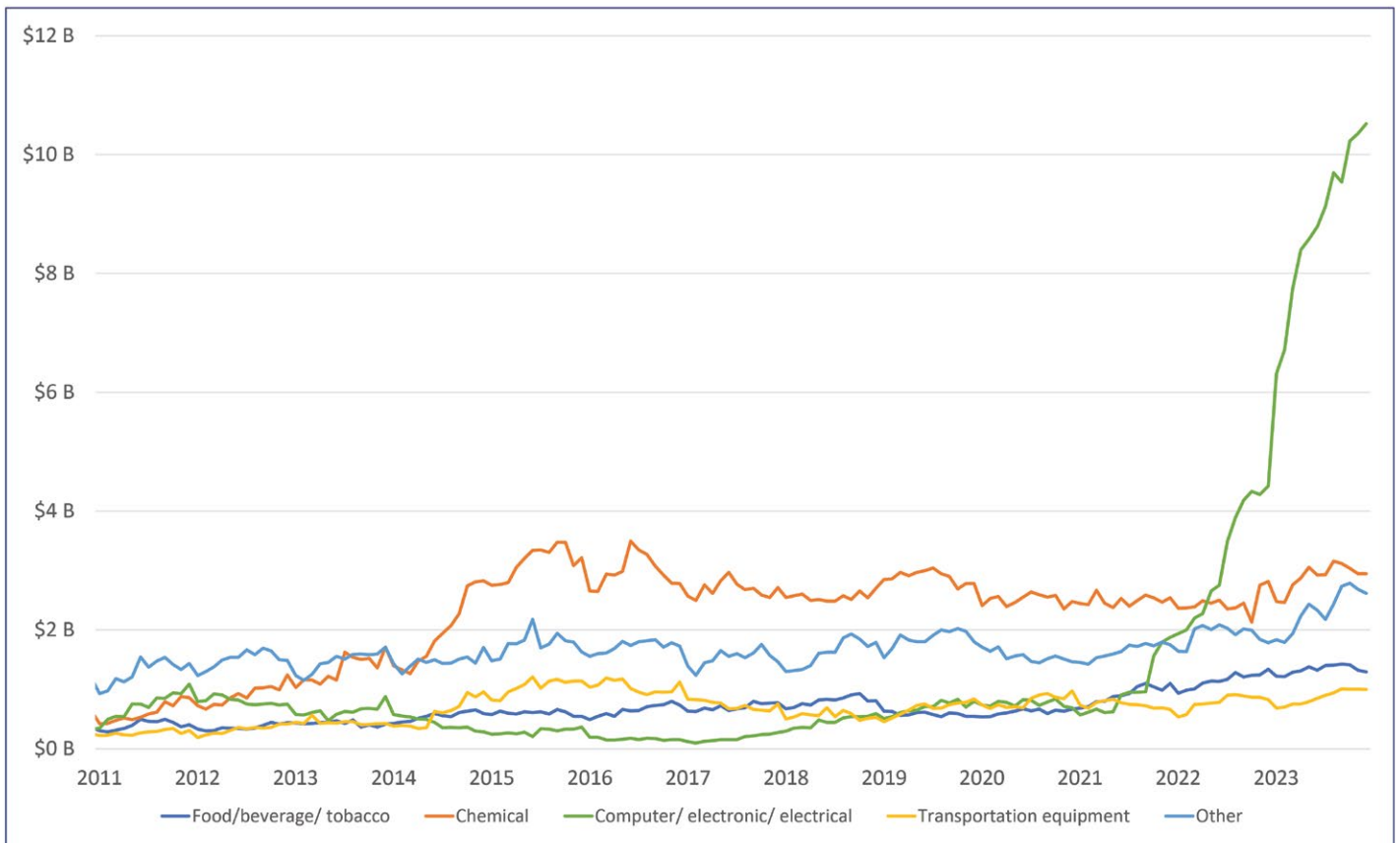
5. Green transition infrastructure needs: The push toward a green transition necessitates the manufacturing of essential components such as batteries and chargers, driving the construction of facilities dedicated to producing these key elements needed to fuel sustainable energy solutions.

6. Shift toward customization: The demand for customized products is leading to the need for more versatile manufacturing facilities that can quickly adapt to changing production requirements.

7. Pandemic-related investment catch-up: The postponement of investments during the pandemic is now being addressed, with companies undertaking previously delayed projects to upgrade and expand their manufacturing capabilities.

The electronics sector is playing a pivotal role in the surge of manufacturing investment in new U.S. plants and facilities. Last year, roughly \$1.54 trillion in total private construction was completed—a 4.7% increase from 2022. Over this same period, manufacturing construction soared. Manufacturing recorded \$195 billion in completed construction during the year, a 71% increase over 2022. Consequently, manufacturing rose from 7.8% of total private construction in 2022 to 12.7% in 2023, further highlighting the sector's expanding impact.

Driving this spike in manufacturing is an incredible rise in construction spending in the computer, electronics, and electrical manufacturing sectors. The computer and electronics sectors are responsible for producing computers, peripherals, communications devices, and related electronic items, along with their components. The electrical sector focuses on creating goods that produce, distribute, and utilize electrical energy. This includes compa-



Electronics manufacturing is fueling a surge in U.S. construction activity.

(Source: U.S. Census Bureau, Author's calculations)

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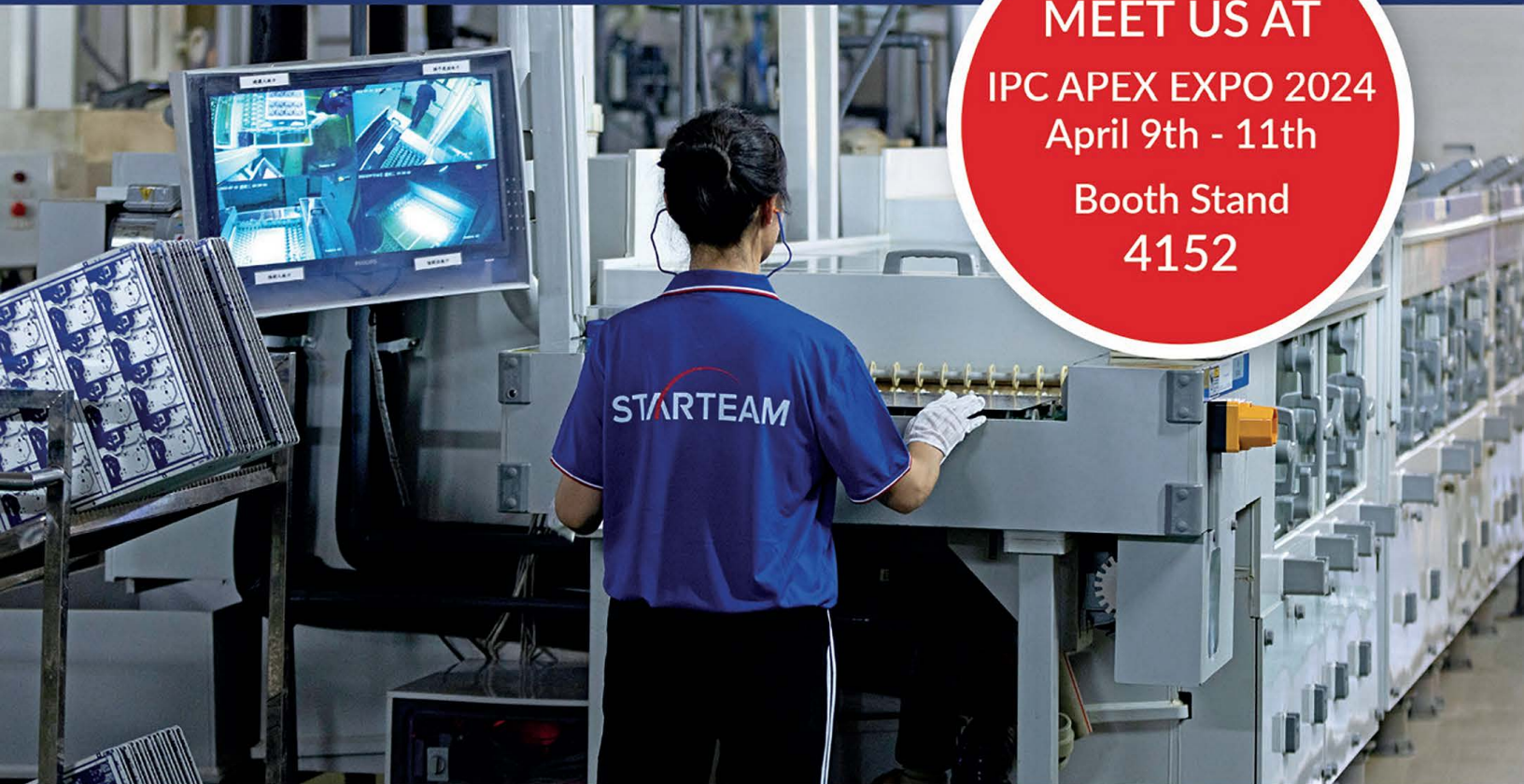
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nies that make electric lighting fixtures, household appliances, and various other electrical equipment and components, many of which are driving the green revolution.

Combined, these manufacturing industries increased construction spending from \$38.4 billion in 2022 to roughly \$106 billion in 2023. Electronics and electrical manufacturing accounted for 54% of total manufacturing construction spending in 2023. These investments are set to catalyze a long-term transformation in manufacturing, as they go beyond merely replacing current capacity. Instead, they are establishing new forms of capacity, laying the groundwork for innovative production methods and capabilities. This shift is not just an expansion; it's a redefinition of manufacturing's future landscape, embracing modern technologies and processes.

“...a pivotal moment for the U.S. manufacturing sector.”


International interest and investment are significantly supporting this transformative approach to enhancing manufacturing capabilities and building new types of capacity. Some of the growth in manufacturing construction is being fueled by foreign direct investment (FDI). In 2022, manufacturing attracted \$55.2 billion in new FDI, representing 31% of total new FDI in the United States. In 2022, investment outlays for greenfield projects—funds allocated for launching new U.S. ventures or enlarging foreign-owned businesses already operating in the U.S.—reached \$8.1 billion. Within this, the manufacturing sector accounted for the lion's share of greenfield investment, with \$5.3 billion directed toward it. The computer and electronic products category attracted \$1.8 billion of that total.

Although capital expenditure growth is expected to decelerate this year following the 63% surge last year, purchasing and supply executives anticipate a continued increase in capital

expenditures, with projections of an approximately 12% rise in 2024, according to the latest semiannual economic forecast from the Institute for Supply Management. Even with a slowdown in growth rates, the momentum in manufacturing investment activities is anticipated to persist, demonstrating confidence in long-run manufacturing dynamics. This optimism seemingly downplays any immediate risks associated with a decrease in demand.

Investment in manufacturing capacity is indicative of a broader trend toward reindustrialization and technological advancement in the United States. The strategic focus on sectors such as computer and electronic product manufacturing reflects a deliberate move toward enhancing the U.S.'s competitive edge in high-tech industries. Moreover, the continued commitment to expanding manufacturing capacity, despite potential short-term demand fluctuations, signals a strong belief in the fundamental strength and future potential of the American manufacturing landscape.

The remarkable surge in electronics manufacturing investment, coupled with the diverse factors fueling this growth, underscores a pivotal moment for the U.S. manufacturing sector. This robust influx of capital, both domestic and international, into modern, sustainable, and technologically advanced manufacturing facilities, signals a strategic shift toward reimagining the industry's future. With a clear focus on innovation, sustainability, and resilience, the sector is poised to not only meet the current demands but also shape future trends and opportunities. This forward-looking investment strategy demonstrates a collective commitment to ensuring the U.S. remains a global manufacturing leader, ready to navigate the complexities of the 21st century.

The continued evolution of the manufacturing landscape will undoubtedly play a critical role in driving economic growth, fostering technological innovation, and enhancing the nation's competitive edge on the global stage. 



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All-Inclusive

PRIDE Industries is helping employees with disabilities to succeed

By Sandy Gentry, Contributing Editor, IPC Community

PRIDE Industries is the leading employer of people with disabilities and those with other barriers to employment in the United States, including veterans and former foster youth. The company offers job training, placement, on-the-job coaching, and skills development for independent living. It has held IPC membership since 2000.

Darelyn Pazdel is vice president of workforce inclusion at PRIDE Industries and provides an overview of the company's breadth and depth

for employees with disabilities in its manufacturing services division.

What is the size of the PRIDE Industries staff?

Darelyn Pazdel: PRIDE Industries has nearly 4,500 employees. About 2,000 have a disability. We have a team of 425 people who assist individuals with disabilities in securing employment both within PRIDE Industries and in the community.

PRIDE Industries operates across several states. How many of these companies include electronics manufacturing facilities?

PRIDE Industries has 37 offices in 17 states throughout the United States. In some communities we operate as a true integrated model, meeting people in their communities. Our flagship electronics manufacturing facilities are in Roseville, California, where we are unique in the industry because we produce quality electronics supported by a disability-inclusive team.

How did PRIDE Industries create employment specific to electronics manufacturing for individuals with disabilities?

Individuals with disabilities are successful in many industries. Given our nearly 60 years of experience with our mission to create employment for people with disabilities, it's what we do naturally. Our team works with our employees to provide tools for accommodation. It is our experience that the learning curve may be a little steeper for individuals with disabilities; however, once they learn tasks and have the tools necessary, they deliver high-quality services and products. Electronics manufacturing for individuals with disabilities has been a natural fit for our organization.



Darelyn Pazdel

What support systems are in place for employees with disabilities, and how do you find employees?

Support systems for employees with disabilities can be both formal and informal. We strive to create an atmosphere where co-workers provide informal support, and we also have a team of trained job coaches. A job coach provides formal support to an individual who may need to learn a new task, or who may need support with communication or soft skills.

We find our employees through many avenues. One way is meeting with high schools in the area and finding transition-aged students interested in employment. We also work with individuals who may have been referred to our employment services through the state's vocational rehabilitation services. PRIDE Industries provides programs where we begin with the smallest of learning environments—for example, how to use public transportation—and we help them enhance their vocational skills from there. Employees have support throughout their employment journey, and they are given the opportunity to learn and develop skills, increasing their confidence and independence.

PRIDE Industries has placed nearly 300 individuals in other organizations, some of



whom were in other EMS companies. We do not necessarily count success in numbers; however, when one individual is successful in an industry, we see this as an opportunity to replicate the effort.

Do you recruit at local high schools or veterans' affairs organizations?

PRIDE Industries is active in all communities where we operate and serve individuals. We work directly with local high schools where we meet with transition students who have disabilities or significant barriers to employment. We provide pre-employment training and offer internships and employment assistance. We

have our very own veteran's liaison who actively performs outreach to veterans in the community and provides support, matching veterans to job opportunities at PRIDE Industries.

How does PRIDE Industries work with members of the foster community?

PRIDE Industries works with the foster community through the high schools as well as through our Career Hub in Citrus Heights, California. This is a walk-in career center where many foster youth are referred to us through the County of Sacramento, specifically for employment development.

Workforce Training at PRIDE Industries

Andrew Williams, director of product engagement, and George Hadley, production manager, talk about how IPC's workforce training programs have benefitted the company's efforts.

You recently purchased a workforce training subscription from IPC. How will this training benefit your employees?

Andrew Williams: When we evaluated the program, we listed the benefits that we required. We believe these will be greatly recognized over this first year in the following ways:

- Increasing the level of quality on the floor by improving operator knowledge
- Gaining IPC-level training courses for all electronics manufacturing staff
- Increasing the ability to recognize advanced operators to send for certification classes
- Strengthening our abilities for IPC-J-STD-001 (mil-aero)
- Providing for additional factors to be marketed to potential customers via a stronger workforce
- Assisting with maintaining a competitive edge without having to invest in a full-blown training/certification program that can be very costly and requires an internal training administrator to control.



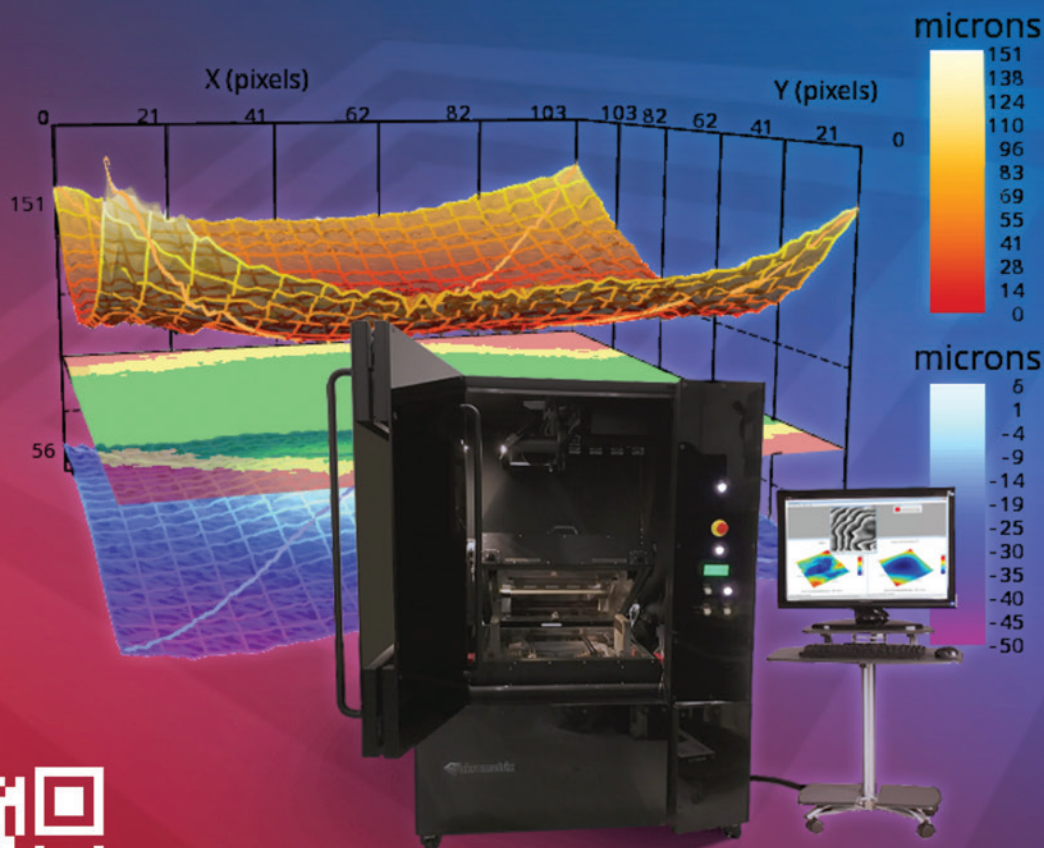
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This training package gives our employees with disabilities a stable platform to provide higher-level training that would otherwise be very difficult to establish without a dedicated training coordinator just for the electronics manufacturing services division. Being able to group employees for specific training classes enables us to schedule content review meetings to ensure that everyone has ample opportunity to get help with any areas they may have trouble with.

Why did you choose IPC's training subscription service?

Andrew: There are multiple reasons for selecting the IPC training subscription, including:

- All courses are online and self-paced, and students have access to content for 90 days.
- Several courses establish the baseline for determining candidates who can pursue operator certification for IPC-A-610, IPC-A-620 and IPC J-STD-001.
- Multiple lower-level courses have been released to assist with the onboarding of non-industry employees.

- Without a Certified IPC Trainer on staff, a robust training system for industry training was needed. We have a solid training system for ISO/general/HR items, but it does not include higher-level training for the electronics manufacturing industry.

The program has been in place for several weeks. What has been the feedback so far?

Andrew: That feedback has been very good with a decent range of positive comments related to the intensity and quality of the content. The training is driving discussion with production floor staff as they navigate the training in the same timelines.

How are participants responding to the IPC courses?

George Hadley: The feedback I have received has been very positive. The amount of detail in the courses is very good and relevant to what we do. The only fear expressed by the employees is not being able to pass the quiz by the third time. I tell them to take notes as they go through each section; hearing the content and writing it down will help with retention.

Three Employees Share Their Thoughts

Khai Xiong and John Xiong, wire harness assemblers, and Armand Ortillo, SMT machine operator lead, are currently enrolled in the IPC workforce training course. We asked them about their experiences.

Why did you choose to take the training course?

Khai: I chose this training course because I want to learn new skills and develop existing ones.

John: It was in my best interest to expand my knowledge and have a deeper understanding of electronics.

Armand: I wanted to learn more about electronics manufacturing.

Please explain how the course helps in your work at PRIDE Industries.

Khai: This course gave me more knowledge and helped me to minimize time working on electronics to produce more quantity with high quality at PRIDE Industries.

Armand: The course is connected to my everyday tasks. I have learned new skills and techniques to handle the product.

“ The training course has helped me strengthen my skill levels and achieve higher quality and quantity. ”

— John Xiong



Is the content of the course helpful? Do you have suggestions for improvement?

Khai: All the content of the course is very helpful. All the videos and pictures are excellent, helping me get a better understanding of the course. No suggestions for improvement.

John: Yes, the content was very helpful. No other suggestions.

Armand: One improvement could be giving us more time.

How is the self-paced online module helpful?

Khai: The self-paced online module gives me more time, and it's great that I can go back to the module when I need to review.

John: It's helpful to have flexibility to take the courses on my own time.

Armand: Yes, because I can do it on and off during working hours. 🇺🇸🇩🇪🇬🇪

Lauriane's Ambition

Seeing IPC WinterCom 2024 through the eyes of one ambitious student

Sanjay Huprikar, President, IPC Europe and South Asia Operations

Lauriane Testuz stands as a testament to the power of curiosity, perseverance, and the relentless pursuit of knowledge. Her story serves as a reminder that the path to success is often paved by an unwavering commitment to one's dreams.

Lauriane is a second-year student in electrical engineering at ENSEA, a specialized graduate school in France, who was invited to attend IPC WinterCom 2024 in Barcelona this past January. She has a passion for PCB design and assembly and found this event to be a fusion of learning, networking, and personal growth.

She was initially drawn to the world of artificial intelligence (AI), but her trajectory shifted when she discovered an affinity for PCB assembly during a university project. Guided by her school technician and armed with a newfound passion, Lauriane learned about IPC WinterCom. She decided to attend with a clear



mission to deepen her understanding of PCB design and secure an internship abroad.

IPC WinterCom is a new event organized by IPC to support standards development committees in face-to-face sessions. During the week-long series of meetings, the global electronics manufacturing industry met in Europe for the first time to develop and maintain the IPC standards they use to build electronics better.

For Lauriane, IPC WinterCom was more than a conference; it was a gateway to unparalleled opportunities. From engaging in committee meetings to forging connections with industry leaders, Lauriane's experience was a witness to the transformative power of immersive learning.

"For a long time, I thought my path lay in artificial intelligence," Lauriane says. "But during a university project focused on PCB assembly, I experienced a revelation. I found the process of creating PCBs extremely interesting, and from that moment on, I knew what my true passion was. One of the most enlightening aspects of IPC WinterCom was witnessing the intricate voting process during the IPC-J-STD-001 and IPC-A-610 joint task group meetings. It gave me insight into the process behind establishing standards that underpin the industry."

Yet, it wasn't just the technical aspects of the event that left an impression on her; IPC WinterCom offered a diversity of perspectives and an opportunity to explore deeper personal connections within the electronics manufacturing industry. Lauriane met industry leaders from different countries that spanned cultural boundaries, which left her inspired and with a professional confidence she hadn't felt before.

"Interacting with professionals from different backgrounds was incredibly enriching," Lauriane says. "It allowed me to broaden my horizons, gain valuable insights into the global landscape of electronics manufacturing, and see how it all comes together during the standards development committee meetings."

As she navigated meetings and networking sessions, Lauriane found herself gradually shift-

Lauriane's Advice to fellow students in similar situations:

"Be bold, don't hesitate to contact people even if you're scared, and be ambitious. I would encourage more students to take advantage of these event opportunities. I am immensely lucky to be the first student invited to such an event because I am not sure whether more events of a similar nature will take place in Europe any time soon. Some things cannot be taught at school, and you have to be there to see it yourself."



ing from a hesitant observer to an assured participant. She was eager to learn and seized every opportunity to engage with industry experts. This paid off in the form of new connections, LinkedIn exposure, stimulating conversations, and, ultimately, an entirely new outlook on her career goals.

"Initially, I was nervous about reaching out to professionals," Lauriane admitted. "But as I immersed myself in conversations and we



Part of the fun of IPC WinterCom is meeting the industry leaders who attend, like Golden Gnome recipients Debbie Wade and Tiberiu Baranyi, who received their awards in Barcelona because they were unable to attend Gnomeapalooza.

exchanged ideas, my confidence soared. IPC WinterCom provided the perfect platform to step out of my comfort zone and make meaningful connections. Who knows, I might not have come out of my shell at all until my very first professional experience,” she says, laughing.

Reflecting on her IPC WinterCom experience, Lauriane emphasized the importance of practical exposure to complement academic learning. She noted the disparity between theoretical knowledge and industry standards, underscoring the need for students to receive comprehensive education in electronics manufacturing.

“At school, we learn the basics of design, but there’s a gap when it comes to understanding industry standards,” Lauriane explains. “IPC WinterCom has been instrumental in bridging that gap and providing me with a deeper understanding of the industry landscape. It will be an

enormous advantage for me when I go back to my studies.”

Lauriane is grateful for the opportunity extended by IPC to attend this event. She emerged with a sense of purpose and direction, felt empowered by her interactions, and was inspired by the innovative spirit in the committee meetings. Now, she’s eager and confident to embark on the next phase of her journey.

“As I look ahead to my future endeavors, I feel incredibly grateful for the experiences and connections I’ve gained at IPC WinterCom,” Lauriane says. “It’s been a transformative journey, and I’m excited to apply what I’ve learned as I pursue my passion for PCB design and assembly, not to mention knowing I can reach out to all the great industry leaders I met. They have been so supportive of my goals, and I can’t wait to find out more about any open professional opportunities following my return to France.” 🇫🇷

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The Sky's the Limit!



A Day in the Life of PCB Designer Paul Brionez

Wisk EVTOL (electric vertical take-off and landing)
Source: Wisk Aero LLC

By Michelle Te, Managing Editor, IPC Community

Paul Brionez is a senior printed circuit board layout engineer for Wisk Aero LLC. He's responsible for the layout of PCBs and the management of library parts being created to use in PCB assemblies. He's also involved in the creation of processes and procedures to be used in the creation, management, and release/revision of PCBs and PCBAs used for Wisk Aero applications.

Paul has been a PCB designer for 31 years. He is CID and CID+, and has a bachelor of science degree in electrical engineering technology from Southern Illinois University. He's worked on boards for industrial, telecommunications, and aerospace needs. He also worked for seven years as an electronics technician in the U.S. Navy and had 18 years in the aerospace industry before his current role.

Paul, why did you want to work at Wisk?

Wisk is one of the leaders in the development of the EVTOL (electric vertical take-off and landing) market. When I learned from a special on "60 Minutes" about the growth of EVTOL and that

Wisk was part of that, I became interested in their program's future potential. Who wouldn't want to have an autonomous aircraft? It's the future of air travel. Wisk was looking to get this product to the FAA, and I have that experience. When this position opened, I applied, and here I am.

What is your typical day like?

I work from home and have done so since 2007—long before the pandemic. I usually start my day between 8 or 9 a.m. and end by 6 p.m. I'm off every other Friday. All my customers are internal, and I work with them daily. My projects are based on available information and the end date schedule. When we have a known ship-by date on the program, we prioritize those boards with the highest visibility. So, unless there's a rush, we structure our days as first in, first out.

Do you work independently or part of a team?

Our ECAD team works to support the needs of the individual product teams (IPT). We're cur-

rently working on the progression of bringing the first autonomous air taxi to commercial air services. This requires the ECAD team to begin the development of PCBs and their associated assemblies to meet the requirements of Class 3 IPC and FAA certification.

How do you work?

When I get deep into the routing of a PCB that has a high pin count, I tune out the rest of the world and focus on the task in front of me. It's like an artist who finds their muse: When you get tuned in, you lose track of the rest of the world.

How do you incorporate IPC standards in your work?

We use the IPC standards as a reference for all our drawing requirements. They are our go-to when there are questions on a particular process, whether it's an assembly standard or fabrication requirement. Also, I have worked on some of the standards, in parts. Last year, I worked with the training team from IPC EDGE on some revisions to the IPC J-STD-001 training. This year, I am working toward teaching some of the inherent knowledge I have learned.

What is your sweet spot as a designer?

It's the problem-solving when it comes to getting a board to completion and being able to see the solution when others may not. What I enjoy most about designing boards is the challenge of doing something that most people do not know about.

What's the craziest design you've worked on?

One of the craziest, most challenging designs I have worked on required a complex collaboration with my good friend Mike Kusman, a mechanical engineer, regarding a motor-controller mounted on the face of the helicop-

ter. The two-board assembly had to be placed at the same time. The blind assembly made the placement the most critical part of the assembly and required constant collaboration between us.

What's the most difficult thing about being a PCB designer?

There is a poor perception from engineers. The engineering community does not view designers as the same weight class as engineers. This is a myth, as many designers are degreed engineers. I became a degreed engineer only many years later in life. Having been in this role for many years, the degree was a personal goal. The knowledge and experience of a designer requires a lot of practical training and cannot all be learned from a book. This makes the designer a valuable asset. 🌈



You can find Paul at IPC APEX EXPO where he will be competing in the IPC Design Challenge. Paul also competed in the 2023 challenge, taking home third place.

Zooming in on Zentech

By Cory Blaylock,
Director, IPC Workforce Partnerships

Zentech among first to adopt IPC Apprenticeship National Program Standards

IPC achieved a landmark in 2023 by creating an apprenticeship program approved by the U.S. Department of Labor. With such a registered framework in place, industry can work through IPC to secure local, state, and federal dollars for workforce development in a way they've never been able to do before.

The response from industry has been enthusiastic. Zentech Manufacturing, headquartered in

Baltimore, Maryland, with production facilities in Bloomington, Illinois, and Richardson, Texas, is among the first employer partners to adopt IPC's national program. IPC is working with Zentech to secure grant funding that will help offset the costs incurred with training. Stephanie Austin, marketing director, helps explain Zentech's excitement for jumping on board so quickly.



“ It was important that we alter our approach to attract a new generation of workers. — Stephanie Austin ”

What motivated Zentech to become an early adopter?

Stephanie Austin: We recognize what has been talked about for years: Our workforce is aging, and many Millennials and Gen-Zers don't know the benefits of a career in manufacturing. We also know that these generations approach the market differently than their predecessors, so it was important that we alter our approach to attract a new generation of workers.

Raising awareness about careers in manufacturing has been a focus of our blog, "Manufacturing Careers on the Factory Floor," where Zentech employees tell their success stories and why they love their jobs in manufacturing. We also recently published an article on our blog and IPC's blog titled, "Manufacturing a Creative Workforce Development Strategy." It discusses our ideas for a different approach to finding talent.

Zentech is a leader in many areas. The apprenticeship program seemed like the next logical step for us in demonstrating what we believe: to be ambassadors of our company and the industry and lead by example.

How has IPC supported Zentech in ensuring the success of the apprenticeship standards?

IPC's support is likely the main reason it was so easy to move forward. The groundwork IPC laid in attaining a registered apprenticeship program through the U.S. Department of Labor and having someone on staff to help with the grant applications was a game changer for us. IPC has walked with us through every step of implementation. Without their help, this would have been a daunting task for any small business to achieve.

Were there any challenges in implementing the apprenticeship standards? If so, how is Zentech addressing them?

IPC considered the interests of all their members when they were drafting these standards, so everything was in line with Zentech's goals. I'm sure a lot of other companies would feel the same.



Stephanie Austin

How has the Zentech workforce responded to the introduction of the apprenticeship standards?

I have been conducting focus groups with our production management team for several months to determine the best approach for attracting new talent. As it turns out, many are passionate about attracting the future workforce, and their insights were invaluable to my research. Naturally, when I told others we were starting an apprenticeship program, they were ecstatic. The structure of the apprenticeship program with IPC training courses is a huge plus for them. Tracking their progress in Work Hands also helps everyone be on the same page.

Our apprentices expressed their appreciation that Zentech sees their potential for growth and is investing in their future. One of our mentors is retiring after 50 years in the industry and looks forward to imparting her knowledge to the next generation. It's a win-win for everyone.

How has Zentech integrated IPC standards with any existing training or development programs?

To be honest, this apprenticeship opportunity came at a perfect time. We are developing an employee engagement initiative with a more structured employee development and training program. The IPC apprenticeship program aligns with our goals and objectives.



What is the synergy between the apprenticeship standards and other workforce development initiatives?

We recently published an article on the IPC blog discussing creative ways to grow your workforce and engage with a new generation of workers using marketing principles. Some may ask what marketing has to do with workforce development. Everything! We operate in a competitive landscape; selling ourselves and our industry is key. Apprenticeship is a perfect selling point because it benefits everyone.

What advice does Zentech offer to other companies that might adopt IPC's electronics assembler apprenticeship standards?

It's not as scary as it looks. Since IPC has laid the groundwork and helps with implementation, all that's left is your enthusiasm to make it work. You need to hire people anyway. Since each state has financial incentive programs for hiring registered apprentices, why not recoup some of your costs and increase your chances of retaining long-term employees? It's a win-win situation.

Are there any lessons or best practices learned that you'd like to share?

- You don't have to know everything when you start. I found the key is just to start. I call it "nuggetizing." Break it down into smaller, more manageable, less overwhelming tasks. You'll gain confidence and knowledge as you go along.
- Start with your current employees first. This is an easy way to get your feet wet. They're already hired, and you need to train them anyway.
- Make the most of your IPC membership. There are many great resources, both in knowledgeable staff and helpful information, to get your apprenticeship program off the ground. IPC has a staff member who assists in applying for grants, so you don't have to navigate it alone. IPC has described it as a "plug-and-play" experience, which I can agree with. 🌈



Read "Real Progress Toward Solving U.S. Workforce Problems," an interview with Cory Blaylock by the I-Connect007 Editorial Team, in the February 2024 issue of *PCB007 Magazine*. In this interview, Cory defines and explains an apprenticeship model, how IPC achieved accreditation with the U.S. Department of Labor, and the incentive for companies to participate.



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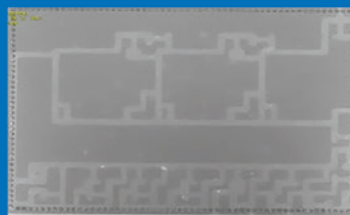
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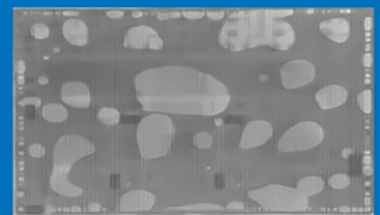
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Opening Doors for New Professionals

Cory Blaylock demonstrates leadership in workforce initiatives

As IPC's director of workforce partnerships, Cory Blaylock was hired to lead the IPC Apprenticeship National Program Standards. Last year, she received the 2023 IPC Excellence in Education Award, which is given to individuals who have made a significant contribution and demonstrated leadership in workforce development while building a culture of continuous learning within their organization and across the industry.



At the time of the award, Cory was working for Lockheed Martin. The following includes some excerpts from an interview with Cory after she received the IPC award. To read the full interview, click here or scan QR code.

Why is continuous self-improvement and learning so important to you personally?

Cory Blaylock: Because without it, people can miss out on great opportunities that could be life-changing, and I'm a perfect

example of that myself. I came to the electronics manufacturing industry by way of the scenic route. I spent the first 12 years of my career as an educator in the public school system. I left the classroom in 2015 to begin a new career at Lockheed Martin. I realized



While working at Lockheed, Cory attended the opening of the Lockheed Martin Training Lab, a partnership effort with Angelina College.

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The Lufkin/Angelina County Chamber of Commerce celebrated Lockheed's training lab.

that I had a lot to learn about electronics manufacturing at that point. Throughout my career at Lockheed Martin, I've gone from not knowing anything related to electronics manufacturing to becoming a certified trainer. I teach new operators, assemblers, technicians, and engineers about IPC standards and the applications that they will use in the production and manufacturing settings when they begin their careers.

Were you planning on getting into electronics or did that just surprise you?

Personally, I had an interest in STEM education; that was my passion. I got my Master of Science and Science Education from Montana State University. STEM was a big focus, so when I found that Lockheed Martin focuses on it and recruits people who are interested in STEM careers, it was a big draw for me.

What do you find most exciting in our industry now?

The changes that are happening in the workforce, especially with STEM education as a focus, are really exciting. Being able to implement that focus and seeing more industries create those partnerships is the most exciting thing because things are always evolving, and

we're going to need that qualified workforce. To make those changes in the future, we must prepare and upskill existing workers for those future opportunities.

What are you most enjoying about your work now at IPC?

I most enjoy getting to work with companies of various sizes, in different states and navigating the workforce system for them in their state, figuring out the intricacies because every state is different and every grant is different. I really enjoy establishing those relationships and helping the employer solve the problem they have.

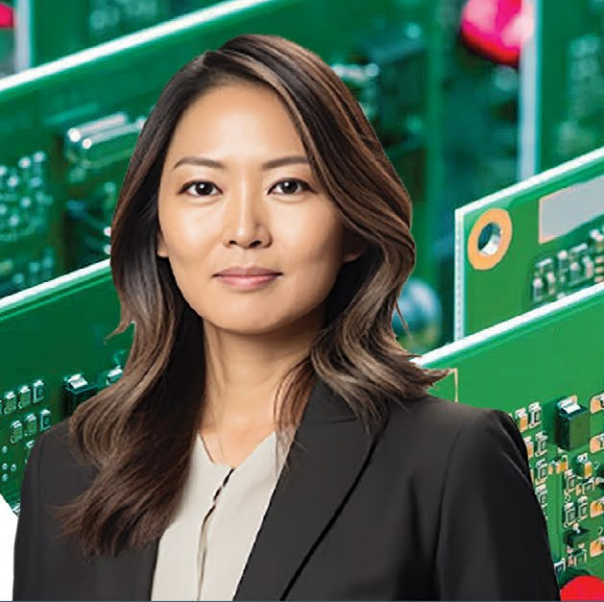
You're not one to rest on your laurels. What's next for you and your work with IPC?

We're gearing up to expand IPC's registered apprenticeship program into more community college curriculums, offering specialized micro-credential opportunities for universities, and deepening our involvement in high school CTE programs nationwide. By continually innovating and collaborating, we're ensuring a strong talent pipeline for the electronics industry's future. I'm excited to lead these initiatives and make a lasting impact on workforce development. 🌈



In her spare time, Cory loves being on the tractor, working on the property around her home.

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Traditional DFM: Is it Dead or Alive?	May 6	6:30 pm ET/3:30 pm PT	Monday and Wednesday	1 week
Gold-Aluminum Wire Bonding Chip Assembly Process, Quality and Reliability	May 7	11:00 am ET/8:00 am PT/5:00 pm CET	Tuesday and Thursday	2 weeks
Troubleshooting and Defect Analysis for Electronics Assembly	May 7	6:30 pm ET/3:30 pm PT	Tuesday and Thursday	2 weeks
Top Lead-free Production Defects & Issues – Causes, Remedies & Prevention	May 21	11:00 am ET/8:00 am PT/5:00 pm CET	Tuesday and Thursday	2 weeks
PCB Design for Rigid Flex Boards (F/RF)	June 3	6:30 pm ET/ 3:30 pm PT	Monday and Wednesday	6 weeks
Introduction to PCB Design I	June 4	2:00 pm ET/11:00 am PT	Tuesday and Thursday	6 weeks

WHAT STUDENTS ARE SAYING!

"The live interaction facilitated asking questions that helped clarify the information."

"The material of this course was great."

"The instructor explained the course in detail, in a way that can be understood by everyone."

"I liked the approach the instructor took for full participation of all students."

"The recorded lectures help me to review the training materials at my convenient time."

Get Ready for IEMI 2024

Electronics manufacturing event takes center stage in India and Malaysia

By Manvi Kapoor, Deputy Manager, Events and Communication, IPC India

The third annual Integrated Electronics Manufacturing and Interconnections (IEMI) event takes place July 24–25 in Penang, Malaysia, and July 29–30 in Bengaluru, India. It promises to be a landmark event in the electronics manufacturing ecosystem. Building on the success of its previous editions, IEMI 2024 brings together the brightest minds and the latest innovations in the industry by offering a unique platform to network, share knowledge, and showcase cutting-edge technologies.

“If you’ve never attended IEMI before, be prepared for two days filled with several activities, including presentations on technical topics and professional development,” says Gaurab Majumdar, executive director, IPC India. “But the best part is the exhibition and display of products. We will have about 50 companies there. It might not seem like a lot compared to other exhibitions, but India and Malaysia are poised to play an important role in electronics supplies and semiconductors.”

IEMI 2024 will attract a global audience of industry leaders, technology experts, policymakers, and academia, all converging to discuss the trends and challenges in electronics manufacturing. The event will feature a series of key-

note speeches, technical presentations, panel discussions, standards development meetings, and a hand-soldering competition.

“IEMI helps you meet the key players in the industry,” Gaurab says. “Fifty to 60% of the delegates are from production process and quality departments, which will elevate the level of technical conversations about products and services.”

IEMI will place a significant emphasis on defense and aerospace, exploring the latest trends, technologies, and challenges in these high-stakes industries. Both of these key

themes reflect the event’s dedication to highlighting cutting-edge developments and regional specializations in electronics manufacturing.

“It’s important for your business to attend IEMI because electronics manufacturing value chain providers are a main part of the event,” Gaurab says. “The delegates are both end-users and suppliers. Based on the profiles of our international delegates, we

customized our meetings so there is a higher chance of getting business leads.”

To see a list of activities happening within the IPC India region, visit ipc.org and search for “Journey Towards IEMI 2024.” 

“

**“IEMI helps
you meet the
key players in the
industry.”**

—Gaurab Majumdar

”

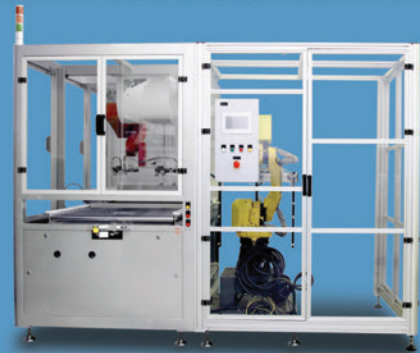
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IPC-7711/21

An IPC 'BLOCKBUSTER'

What's on the horizon for this popular guideline?

By **Teresa Rowe**, IPC Senior Director, Assembly and Standards Technology,
and Liaison to the 7-34 Committee

Dan Foster, Missile Defense Agency, has been instrumental in developing IPC-7711/21, *Rework, Modification and Repair of Electronics Assemblies*, over several revisions of this important guideline document. We talked to Dan and committee member Agnieszka Ozarowski, BAE Systems, about the most recent revision.

IPC-7711/21 is the replacement guideline for IPC-R-700C, a document last updated in 1989. In 1998, Dan led the first meeting for the creation of IPC 7711/21 and recalls why R-700 needed to be updated.

“We were using, like, two hair dryers to remove components by hot air at that time,” he says.

Technology had changed, and IPC-R-700 needed to be replaced. IPC-7711/21 is different from others in the IPC library. It is a guideline, not a standard, offering information on how to do rework and repair on boards and assemblies. IPC-7711/21D provides easier-to-follow guidelines, new visual aids, procedures, tools, methods, and materials for restoring electronic assemblies.

Each procedure has been reformatted to make it easier for the reader to understand, and the format is more in line with standards.

“The big thing about 7711/21 is that it has procedures, but they are flexible,” Dan says. “We wanted to give people core procedures to use, and those can be modified. People tend to treat it like a standard, and we need to remind them that it is not.”

The first thing he tells others is to read the front of the book. “Nobody wants to, but we changed procedures with a simple note up front, stating whether procedures will work for

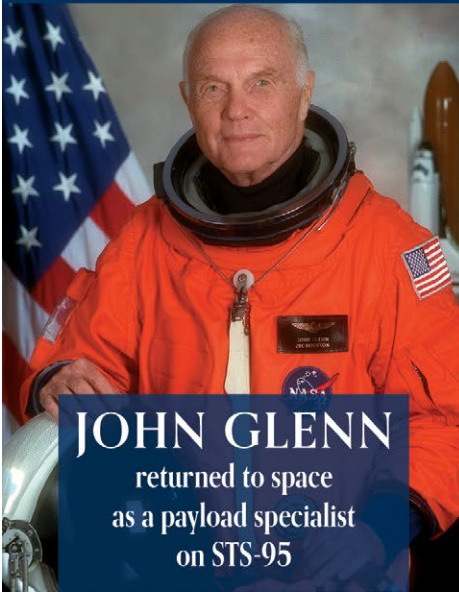
lead or lead-free,” Dan says. “But you need to understand the features—different fluxes and higher temps. We refer to all that in the front of the document. In revision D, you will see many changes to the General Information section of the document. Team Iron, the A-Team responsible for the content, worked to bring it up to date.”

Not only has the document changed to reflect new technology, but operators and technicians must build or update their skill set to perform the work. For Agnieszka, who trains to the guideline, this means anyone taking the course must first be carefully selected to determine whether they can perform the needed tasks. They must have IPC-J-STD-001 certification before they can become certified to IPC-7711/21.

“If the person does not solder well, their rework may damage assemblies even more,” Agnieszka says. “I advise managers that if the candidate has patience and diligence, they can be a great rework technician. When training for IPC-7711/21, I stress at the beginning of training: Do not rush, and think before and during each step. Our boards are very expensive. Is the moisture out? Did I remove the conformal coating correctly? Which procedure will be the best?”



IPC-7711/21 was released for the first time in April 1998 with Dan Foster as the chair. Here are some other exciting things that happened that same year.



Dan agrees on the need for an advanced skill set. “You are making changes on the fly, and just because you are good at soldering doesn’t mean you are a good rework technician,” he says. “You must understand how that board is put together. You cannot rush it. It takes patience to get it right.”

Agnieszka joined the committee revising IPC-7711/21 in 2012. “I had a lot of experience in reworking electronic assemblies and could provide practical tips to the procedures in IPC-7711,” she says. “I enjoyed committee meetings at IPCAPEX EXPO very much. The learning curve is amazing. Everybody has an opinion; everyone contributes their experiences, and I found it so helpful in my job.”

She knew that the changes were decided by a group of experts, not just one person. “Committee meetings, especially in person, are the best,” Agnieszka says. “It helps to know that new technologies are coming into the document, so I look forward to conducting training on the new revision.”

Because the skill set of the technician/operator is much more important now, the changes to IPC-7711/21 reflect that by listing the skill set necessary for each procedure.

“Pictorials are very popular,” Dan says. “We ensured that all the figures represented exactly what we were showing. That makes it so much easier for anyone reading the guidelines. So much has changed due to all the different materials. Lead-free is new, conformal coatings are new, and the technology is so different. This all requires a much higher skill set.”

Both Dan and Agnieszka have a favorite procedure in IPC-7711/21. “My favorite is the removal of components by using solder wrapped around the part, which minimizes heat application in the rework area,” Agnieszka says. “My goal is to advise students to choose an effective rework method that will not damage the assembly but save it and make it functional.”

Dan likes the machine procedures, such as those for a BGA. “If you have a time-temperature profile set up, the technician can follow all the precautions, push a button, and let it do its job,” he says.

The work of IPC standards development, revision, and editing prepares committee members and the global electronics manufacturing industry for what to expect from rapid changes in procedures and processes. 🇺🇸🇯🇵

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- **Managing Backdrill Stub Length Variations due to Innerlayer Core Deformation.** Gary A. Brist, Intel Corporation.
- **HDP Users Group Thermal Analysis Methodology Assessment.** Tony Senese, Panasonic; Jason Furlong, PWB Interconnect; Sarah Czaplewski-Campbell, IBM & Jenny Inocencio, Isola.

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Standards Recognition in South Korea

By Tina Choi,
IPC Korea
Representative

EOS brings IPC standards to local industry

We are well aware of the saying, “There are no borders in the world economy.”

To grow, a company must think about establishing a global customer base, no matter how small the product. So, the product must be manufactured according to a common global standard. In electronics manufacturing, one South Korean company learned that IPC standards should be applied immediately.

Electrical One-Stop Service (EOS) Ltd. is a specialized PCB manufacturer dedicated to providing high-quality PCBs quickly and to a diverse range of customers. Established in

2004, EOS focuses on building an all-in-one electronics platform that covers PCB design, manufacturing, and assembly.

With investments in innovation and digital systems, EOS has experienced rapid growth and established itself within the industry.

EOS works with more than 600 domestic and international companies, particularly as a trusted partner in the defense, aerospace, and satellite industries. Additionally, the company is meeting the needs of customers in fields such as communications and security. It particularly benefits from technological expertise in South

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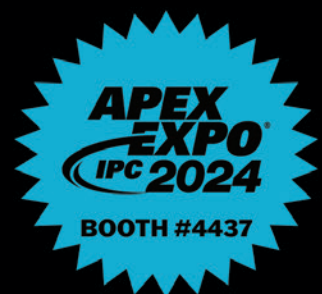


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Korea, but also retains customers in countries including Israel, the United States, Turkey, Singapore, and others.

With its decision to enter the defense and aerospace sectors, EOS recognized the necessity for standardizing quality specifications. In South Korea, PCB manufacturing had traditionally relied on individual company requirements as the basis for production. This resulted in varying quality standards for different products.

To address this issue, EOS identified four key international standards that formed the foundation of these quality criteria:


- Japan: JAXA-QTS-2030
- Europe: ESCC-ST-Q-70-10
- United States: MIL-PRF-55110/IPC-A-600
- Korea: KS C IEC 60326, “Printed circuit board (PCC)”

After examining various regulations, it became evident that everything referenced IPC standards. To succeed in its domestic defense, aerospace, and satellite industries, and to achieve longevity as a company, EOS needed to focus on international standards rather than relying on the domestic market. Company leadership

became convinced that the path to overseas expansion relied on mastering IPC specifications.

EOS quickly discovered a lack of awareness in South Korea about the standards. This expanded beyond PCB manufacturers to companies in the defense, aerospace, and satellite sectors, all oblivious to the existence and significance of IPC standards.

A pivotal moment occurred in August 2006 when EOS found an overseas company willing to provide IPC specification training. Despite the costs of travel and time away, EOS immediately sent engineers for training in IPC spec and quality management techniques. This decision marked a crucial turning point for EOS.

Over the past 15 years, equipped with IPC standards, EOS has evolved into a company that competes for contracts with major domestic and international defense, aerospace, and satellite companies. By recognizing that IPC standards help ensure quality, reliability, and consistency in electronics manufacturing, EOS has become a valued member of the nearly 3,000 industry professionals participating in the development of IPC standards. 



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Standards Update

Newly Published Standards and Revisions

IPC-7711/21D

Rework, Modification and Repair of Electronic Assemblies

IPC-7711/21D provides guidance on procedures for rework, repair, and modification of printed board and cable or wire harness assemblies. IPC-7711/21D provides the requirements, tools, and materials to be used in the rework, repair, and modification of electronic products and for cable or wire harness assemblies.

IPC-2221C

Generic Standard on Printed Board Design

IPC-2221C establishes the generic requirements for the design of organic printed boards and other forms of component mounting or interconnecting structures, including PC card form factors. The organic materials may be homogeneous, reinforced, or used in combination with organic materials; the interconnections may be single, double, or multilayered.

IPC-1791D

Trusted Electronic Designer, Fabricator, and Assembler Requirements

IPC-1791D provides minimum requirements, policies and procedures for printed board design, fabrication, assembly, and cable and wire harness assembly organizations and/or companies to become trusted sources for markets requiring high levels of confidence in the integrity of delivered products. These trusted sources shall ensure quality, supply chain risk management (SCRM), security, and chain of custody (ChOC).

IPC-1782B

Standard for Manufacturing and Supply Chain Traceability of Electronic Products

The traceability information detailed in IPC-1782B is intended to improve operational efficiency, and productivity, quality, and reliability, as well as to enable activities such as predictive maintenance in the manufacturing environment, but not necessarily to be distributed outside of the organization. This standard can help organizations more easily ensure end users/consumers will receive products and services that meet or exceed their expectations in the timeliest and most economically viable method.

IPC/WHMA-A-620E-S

Space and Military Applications Electronic Hardware Addendum to IPC/WHMA-A-620E

This Addendum provides modified and additional requirements over those published in IPC/WHMA-A-620E to ensure the performance of cable and wire harness assemblies that must survive the vibration and thermal excursions encountered getting to and operating in the military and space environments.

IPC-6012F

Qualification and Performance Specification for Rigid Printed Boards

IPC-6012F covers qualification and performance of rigid printed boards, including single-sided, double-sided, with or without plate through-holes, multilayer with or without blind/buried vias, and metal core boards. It addresses final finish and surface plating coating requirements, conductors, holes/vias, frequency of acceptance testing, and quality conformance, as well as electrical, mechanical, and environmental requirements.

The New Objective Evidence Website is Now LIVE

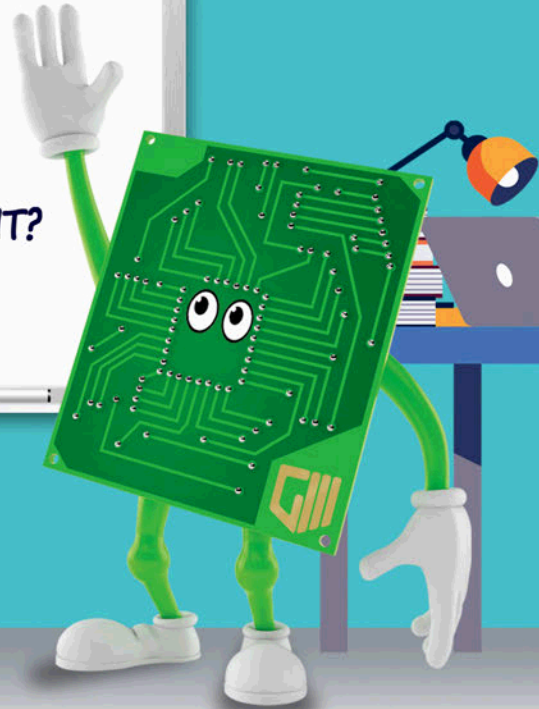


AS REQUIRED BY IPC-J-STD-001

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See GEN3 at APEX 2024
Stand 3934

The Need for a Holistic Global Sustainability Standard

By Michael Ford, Aegis Software

No one can deny that the resources of our fragile planet are finite. The environment seems like a third party, subject to constant degradation. We're acutely aware of the effects of pollution on our climate, and despite our "throw-away" culture, recycling and recovery of materials has remained relatively expensive, even as we use more energy just to survive.

As individuals, we feel helpless; anything we do carries little meaning. How can we all get on the same page? I've seen some local groups (from different industries with different goals) finding inroads to overcome these challenges. Some examples include using renewable energy, recycling key materials, economies in consumption, and advances in materials.

How do we reduce the amount of raw materials and energy being

consumed and motivate companies to recycle? Not many companies want additional costs to their bottom line.

Governments and some forward-thinking companies either offer incentives or impose penalties, a "carrot and stick" approach to measure results and drive toward a more sustainable future. However, this can expose a company's sensitive intellectual property, including product design, manufacturing performance, and supply network information. Thus, their default response to these incentives and penalties is a solid "no."

As an industry, we are very creative. In cases where information must be shared, we can consistently and accurately measure, calculate, and derive that information. In their own way, individual companies will devise their own methods and results. There is, after all, little specific guidance as to how to measure, declare, and communicate the required information. The only specific mandate is that it must be authorized. We need standards.

Volunteers on the 2-12D Digital Sustainability Credentials Standard Task Group are developing a new IPC standard, IPC-2553, *Global Standard for Digital Sustainability Credentials*. They have already started addressing these challenges and have created a working draft for a standard that addresses the key requirements and challenges discussed. The first revision of this standard aims to address two significant areas:



This article was written in December 2023 when Michael Ford was co-chair of the 2-12D Task Group. He passed away in January 2024.

- **Exchange of information:**

The requirements that define a mechanism for the creation and exchange of Credentials. Based on data collected during manufacture, Credentials are constructed that provide the necessary facts needed to be exchanged: initially, the amount of Scope 1, 2, and 3 carbon dioxide emissions caused by energy usage. Rather than sharing raw data, which would include product design, manufacturing and material sourcing information, the Credential provides the needed result, calculated and derived from internal sensitive information, which itself remains inside existing solutions and databases within the manufacturing organization. Credentials, based on W3C Verifiable Credential technology, are digitally signed to provide authenticity, accuracy, responsibility, and security. Such credentials are exchanged throughout the supply network as a hierarchical flow, from the earliest of raw materials, through to the end product.

The use of existing technologies, such as IPC-2591, Connected Factory Exchange (CFX), IIoT message standard, are utilized to provide automated safe exchange of credentials. The defined Credential exchange mechanism can also be utilized for the exchange of Credentials related to, for example, existing supply-network trust information, as defined in the IPC-175x material declaration and data exchange family of standards, as well as cybersecurity business process digital certificates defined by the IPC-1792 cybersecurity standard.


- **Creation of information:** The standard defines requirements behind measurement methods, including allowable assumptions, data acquisition and calculation methods,



field content, and formatting. This utilizes the existing capabilities of CFX to automate the collection of required data and follows the principles behind CFX to create a single language and coding definition. Credentials from any manufacturing or logistics operations can then be combined to create the necessary end-product information.

The benefits of any solutions developed around IPC-2553, are significant for the electronics manufacturing supply chain and beyond. This standard will underpin the requirements in many industries and sectors.

- Automated data collection can substantially reduce costs and help identify opportunities for energy reduction.
- The amount of data exchanged through Credentials is a mere fraction of the exchange of raw traceability data. This can reduce networking and storage costs.
- With everyone following the same measurement and declaration criteria, there is no need for translation or conversion of data. This will save what could be extreme costs in customization and middleware in a complex supply network.
- An audit mechanism is built into the standard.
- Security of intellectual property and privacy are preserved, as no sensitive data is accessible or shared between parties, turning the default “no” into a “yes” from the business perspective.

For this to be successful and meet your specific needs, you should get involved. Be a part of the team that can significantly contribute to solving the environmental challenges we all face together. 

“I like finding the limits and testing stuff to destruction, and I guess I was doing the same thing to myself in trying to find my limits.”



Laced Up and Moving On

Engineers break things on purpose. They like the challenge of putting things back together and making them stronger and more resilient. The skills engineers use to build products can also be used to rebuild their lives after a personal loss, something Phil Kinner learned when he laced up his running shoes after many years of a sedentary lifestyle.

As an IPC standards development committee member, Phil finds community, connection, and challenges in his work and his hobby of long-distance running. As head of research and development at MacDermid Alpha Polymer Protection and Re-enforcement, Phil oversees polymer product development and R&D to make electronics more reliable.

Meeting Professional Challenges

Phil attended his first IPC APEX EXPO in 1999, sent by his boss for the networking opportuni-

ties it offered. He quickly learned that participating in standards development committees allowed him to “be at the forefront of standards and technology development, trying to push things forward, and make things better from a technical point of view,” he says.

Phil appreciates the broad network he’s built as an IPC member. “I wouldn’t have met half the people I’ve met, and my network would not have been anywhere near as good if I hadn’t gotten involved in IPC,” he says. “It’s like the ‘phone a friend’ concept on television quizzes—when you need help with electronics questions, you can always find someone in your network to reach out to.”

He believes involvement in IPC standards development committees creates significant input for global standards. “If you don’t have any involvement, you can’t complain about the outcomes,” Phil says.

With expertise in polymer protection and an extensive background in conformal coating, Phil tests electronics to failure so that he can find the limits of products and raise those limits.

“Maybe what we’ve done for 30 years is not what we will do for the next 30 years, and I find that exciting,” he says. “I really like a challenge.”

Meeting Personal Challenges

Phil faced a significant challenge when he experienced a personal loss. How he faced this loss led to an entirely new community, one built over 15,000 miles.

“There was a time in my life where I was seriously unhappy, and I had an unhealthy lifestyle,” he says. “I was very overweight—we’re talking 300+ pounds. Then my oldest brother died of cancer. That made me revisit my life choices and wonder what meaning can be made of that sort of loss.”

When he was younger, he was very “sporty,” and really enjoyed running. “But running at 300 pounds was never going to be fun,” Phil says. “I could barely run from one lamppost to another, but I set off anyway. I used to run in the dark because I was so embarrassed, but with time I got better, eventually discovering parkrun and



running a 5K, then a 10K. Then I started running marathons, eventually wondering how far I could go. It’s like in my engineering life, where I like breaking stuff. I like finding the limits and testing stuff to destruction, and I guess I was doing the same thing to myself in trying to find my limits.”

Phil ran quite a bit during the COVID lockdown, training for a 24-hour race—the first time he’d run that long. Because the UK COVID rules allowed six people to run together, Phil ran with a large group of people from his running club over the 24-hour period, allowing for “a couple of hours where life was somewhat back to normal,” he recalls. “Running with others was therapeutic and became a community thing. I don’t know that I could have done it by myself. It’s a lot harder to give up when others are relying on you.”

Not only were Phil’s new running friends relying on him, but charitable organizations needed extra help, and Phil found a way to honor his late brother by raising funds for MacMillan Cancer Support, a UK charity. “MacMillan is a support network that was very helpful to my brother. By raising money for MacMillan, I had an opportunity to do something in his memory.”



Since that initial charity run for MacMillan, Phil has raised \$12,000 for various British charities. Most of the money has gone to cancer research, with other funds going to mental health charities and Britain's National Health Service (NHS). Although Phil found it increasingly difficult to ask people to sponsor him, "you must do things a long way outside your comfort zone to be worthy of sponsorship," he says. "If I'm going to run a hundred miles, it seems worthy of asking people to sponsor a cause for that. If I'm just running a marathon, meh." Phil expects future charitable runs to support Alzheimer's research and prevention in honor of his father, who recently died of the disease.

Phil is a leader in his local running club, Swad Joggers, and leads six of their seven-mile runs on the two club nights a week in the local neighborhood. On weekends, he'll often travel to where it is reasonably hilly, so he gets more elevation. "I love being in the mountains—the scenery, the challenge, and the solitude is really refreshing," he says. In the past six years, Phil has logged approximately 15,000 miles, with no sign of stopping. 🏃‍♂️



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A Skill and a Passion

Dan White leads the IPC Student Chapter at Valparaiso University

By Charlene Gunter, Senior Director, IPC Education Foundation

Dan White is an associate professor of electrical and computer engineering who serves as the faculty advisor for the IPC Student Chapter at Valparaiso University. He received the Michael V. Carano Teacher Excellence Award in 2023. The annual, student-nominated award comes with a \$1,000 prize and a one-year membership to IPC EDGE, the institution's online learning platform.

“Student learning development by any means possible is at the core of my teaching strategy,” Dan says, “IPC helps provide extra opportunities for learning about and engaging with the elec-

tronics industry, and I'm happy to help bring that experience to my students as the chapter advisor.”

I talked with Dan about his impact on his students as they pursue their interests in electronics manufacturing, his contributions to the field, and why a student talent network is crucial for the industry.

Let's start with an overview of your own career journey.

Dan White: I always wanted to be an engineer and work for NASA. I attended the University



Dan (black shirt) with his first cohort of students who worked on the international SatNOGS project. They also helped run the project's booth at Hamvention, one of the largest amateur radio conventions.



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principles. This means there are few opportunities to build electronic devices, especially as a larger system. Without building larger projects—dealing with physical dimensions, soldering processes, heat management, or other manufacturing processes—students never actually see what happens between finishing a PCB design and an assembled product.

What would help them overcome this obstacle?

Our IPC chapter will be making some site visits to member facilities in our area. Seeing the industry from behind the scenes goes a long way toward students being able to see themselves in those roles. It is ultimately about creating physical things that are truly hands-on.

What has been personally rewarding for you as a professor?

Most significant to me is when former students contact me after graduation with significant news in their lives and they tell me how some aspect of our relationship was key to that. Student success can be a cliché, but as mentors and teachers, those are the times we work for. 🍷

of Nebraska-Lincoln with a dual major in mechanical engineering and French horn performance. That extra time as an undergrad gave me the opportunity to complete a master's in science in three semesters.

I had no plans to be a professor, but my master's work led to earning a PhD in ultra-low power analog chip design. That was my first contact with IPC standards as I made hardware prototypes to test my chips. As a teaching assistant, I realized that teaching technical topics and working with students was a skill and a passion.

What is the value of joining an IPC Student Chapter?

When students make contact with peers in their chapter, they get real experience in how to work with others. The ability to reach out and develop contacts is key to how much work gets done in industry, and much of life in general. These interactions are hard to emulate without a network.

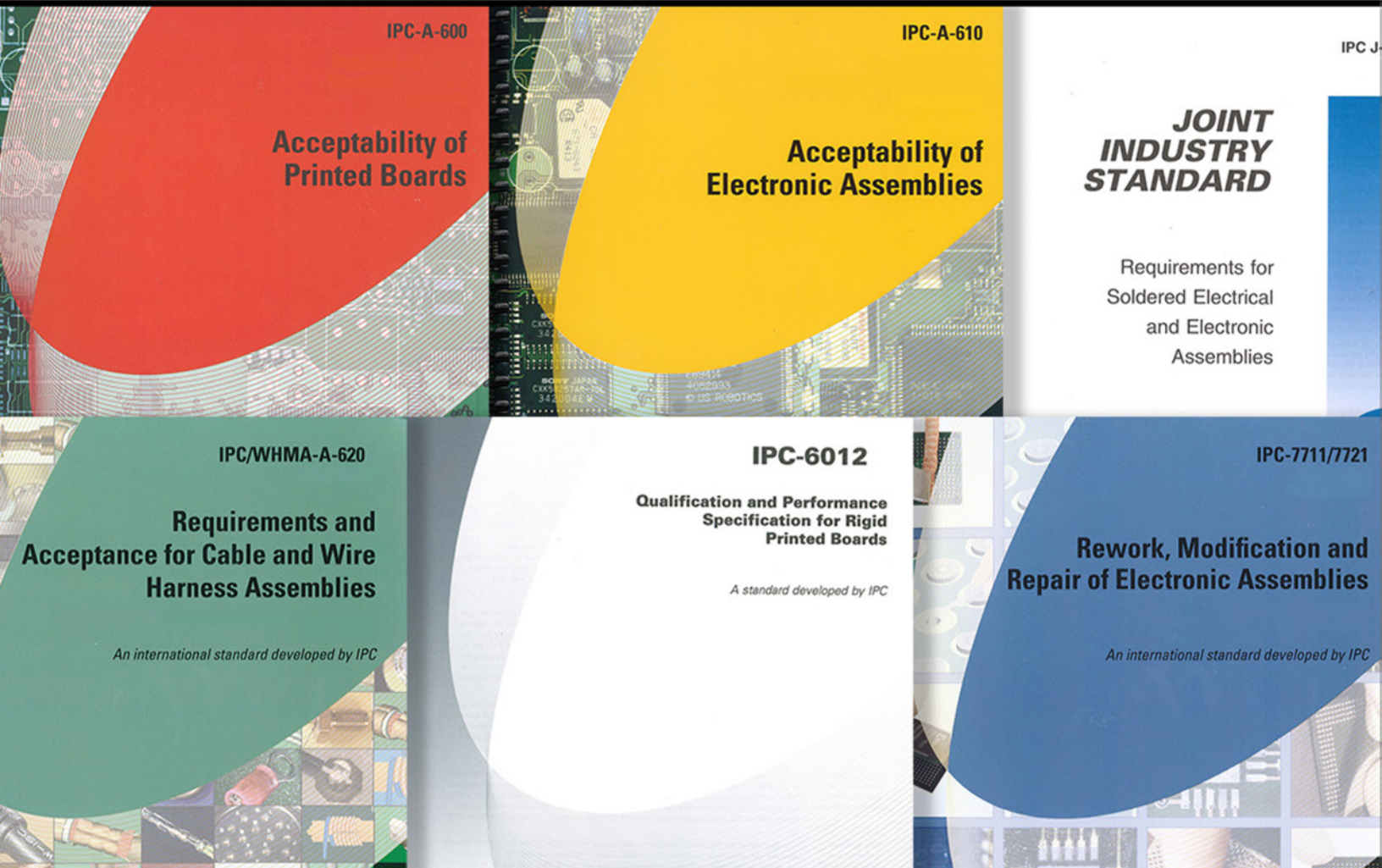
What is most challenging for students as they learn about electronics manufacturing?

Much of a degree's coursework involves examining the underlying theory and prin-





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An AI Revolution in the Wire Harness Industry

Arik Vrobel leads Cableteque with Predictive Interconnect Analytics

By Brittany Martin, IPC/WHMA Marketing Coordinator

In the wire harness industry, a narrative unfolds that is as intricate and interconnected as its products. Arik Vrobel's journey from El-Com Systems to the founding of Cableteque is one of enduring innova-

tion, strategic adaptation, and a deep understanding of the industry's evolving needs. His development of an AI application for the wire harness industry may be a game-changer for manufacturers.

Since its inception in 1961, El-Com Systems has specialized in the design and manufacture of wire harnesses and cable assemblies. The Vrobel family acquired El-Com Systems (then known as El-Com/cabletek) in 1988, when Elie Vrobel (Arik's father), an unemployed engineer, was seeking to fulfill his "American Dream" by becoming an entrepreneur. However, it was a difficult transition as Elie was unfamiliar with the business and El-Com was in a challenging industry. Arik worked alongside his father to understand the company and the industry. His involvement was characterized by a commitment to the values and vision established by his father.

When Arik took over the leadership of El-Com, he established a forward-thinking approach that significantly transformed the company. He says his vision for El-Com Systems "involved continuing its tradition of excellence and driving it toward new technological frontiers and market expansions."

He assumed leadership of the company in the early 2000s, with strategic decisions that expanded El-Com's capabilities and market reach, particularly in sectors demanding high reliability, like aerospace, defense, and medical. "I was known for seeking simplified, yet effective solutions to technical challenges," he says of that time, and his leadership was characterized by a drive to increase the company's capacity and scale.

"El-Com amplified its production capacity while emphasizing innovation in its manufacturing processes," Arik says. "This focus on manufacturing led to the development of sophisticated products that would meet the stringent quality and performance standards required by our diverse clientele, including some

of the most prestigious names in the aerospace and defense sectors."

The Genesis and Impact of an AI Tool

Arik formed Cableteque to address the key challenges in wire harness design by integrating AI into wire harness manufacturing. "Cableteque, with its flagship PIA system, represents the forefront of technological innovation in the industry," he says. "Our focus on AI-driven solutions aligns with the industry's growing trend toward digital transformation, setting a new standard for what is possible in wire harness design and manufacturing."

The conceptualization of Predictive Interconnect Analytics (PIA) marked a significant milestone. "I had recognized the need for a tool that could address the prevalent inefficiencies in wire harness design and manufacturing," Arik says. PIA has been in development since early 2022, after Arik exited El-Com following its sale to Winchester/Aptiv. He formed a global team of unique domain and software experts who were just as passionate about addressing the challenges in proper wire harness designs. His team has been working diligently for the past two years to develop the PIA tool, with plans for wide-market release in April 2024.

PIA's advanced AI algorithms automate the design validation process, significantly reducing the risk of errors that can be costly and





sible, and scalable, and caters to the diverse needs of manufacturers and OEMs alike,” Arik says.

Partnership with WHMA: Elevating Industry Standards

The alignment of both El-Com Systems and Cableteque with the Wire Harness Manufacturer’s Association

time-consuming to rectify. “The PIA application exemplifies a shift from conventional, labor-intensive methods to a more streamlined, efficient, and accurate approach,” Arik says. “PIA’s ability to conduct exhaustive design rule checks and offer predictive analytics ensures that designs are both compliant with technical specifications and optimized for manufacturing efficiency.”

The PIA software-as-a-service (SaaS) is more than just a tool for error detection. “PIA is a cloud-based platform that is powerful, acces-

(WHMA) underscores their commitment to excellence and innovation in the wire harness industry. “The industry adoption of WHMA/IPC-A-620 workmanship standards provides a practical and common framework that defines the manufacturing practices of electrical wire harnesses,” Arik says. “Cableteque leverages the WHMA/IPC-A-620 standard to help customers maintain optimal quality by identifying potential design gaps that don’t meet IPC requirements.” This partnership is central to Cableteque’s efforts to shape and adhere to industry

A Closer Look at PIA

Wire harness manufacturing is a sector marked by complexity. It is an intricate web of wires and connectors that must be precisely engineered to function in unison. Historically, the process of designing and validating these systems has been fraught with challenges, from undetected design errors to inefficient validation processes. Cableteque’s PIA application addresses these challenges head-on.

Traditional design validation methods in wire harness manufacturing involve time-consuming manual checks prone to error. Predictive Interconnect Analysis (PIA) uses AI algorithms that conduct comprehensive and automated design checks to reduce human error and increase efficiency.

Design Rule Check (DRC)

At the heart of PIA is its advanced DRC capability, which verifies that each component in a design meets

specific criteria for compatibility and functionality. The AI algorithms enhance DRC by analyzing designs for potential errors in real time, flagging incompatibilities and suggesting optimal alternatives.

Component Library and Real-time Market Data

Another significant aspect is PIA’s extensive component library, integrated with real-time market data. This feature enables manufacturers to access up-to-date information on component availability, pricing, and obsolescence. The AI system can recommend the best components based on current market conditions, leading to more informed and cost-effective decisions.

Enhanced Communication and Collaboration

A key challenge in wire harness manufacturing is effective communication between manufacturers

standards and reflects the dedication to quality and advancement of manufacturing practices.

The Future Vision: An AI-driven Manufacturing Landscape

Cableteque desires to play a pivotal role in the wire harness industry, especially as it embraces further AI integration and digital transformation. The company's commitment to innovation, as exemplified by the PIA system, sets a precedent, and paves the way for more efficient, reliable, and advanced manufacturing processes.

Arik knows that the true challenges lie in keeping up with evolving technology and getting PIA into the hands of as many manufacturers as possible. To overcome these challenges, he attended WHMA's Annual Global Leadership Summit in February, and plans to attend the Electrical



Wire Processing Technology Expo (EWPTE) in May. He sees both as opportunities to learn about new technology from industry experts and conduct educational sessions on the benefits and uses of PIA. 🌈

and OEMs. By providing detailed reports and insights, the application allows manufacturers to discuss potential design improvements with OEMs more effectively.

The Impact of PIA

The implementation of PIA has shown remarkable results. Manufacturers using the application report significant reductions in production errors and costs. The AI-driven design validation process reduces the time required for manual checks, leading to a more streamlined manufacturing process. Moreover, the enhanced communication capabilities have led to stronger collaborations between manufacturers and OEMs.

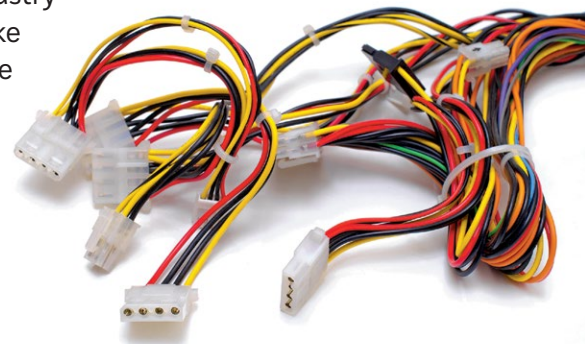
Future-ready Manufacturing With Generative Design

Cableteque aims to incorporate generative design into PIA. Generative design, powered by AI, is a method where the AI proposes design options based

on set parameters and constraints. This innovation could further revolutionize wire harness manufacturing by enabling the creation of more efficient, lightweight, and cost-effective designs.

Challenges and Opportunities

Despite its success, integrating AI into traditional manufacturing processes is not without challenges. There is a learning curve associated with adopting new technologies, and some manufacturers may be hesitant to rely heavily on AI-driven solutions. However, as the industry evolves, tools like PIA may become indispensable for manufacturers looking to stay competitive.



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Annual Global Leadership Summit 2024

Wire harness professionals find value in technical sessions and networking

By Brittany Martin, IPC/WHMA Marketing Coordinator

WHMA's Annual Global Leadership Summit in February at Myrtle Beach, South Carolina, proved to be a resounding success, drawing in nearly 200 professionals from the wire harness and electronics industries to engage in workshops, networking sessions, and keynote presentations.

The summit kicked off Tuesday, Feb. 13, with Tyler Noesser of alliantgroup conducting “Strategic Practices for Success,” a technical education workshop that focused on strategies for employee retention, a hot topic in today’s competitive business landscape. Attendees packed the room, eager to gain insight into strategies for keeping valuable team members engaged and committed.

“The program committee selected speakers who could provide tools that attendees could implement quickly to help their businesses,” said Doug Chowning, American Syscomp-tel, program committee chair. “Attendees of WHMA’s Global Leadership Summit agreed that this goal was achieved.”

The highlight of the first evening was the Welcome Reception and the opening of the Exhibit Hall. Against the backdrop of 30+ exhibitors, attendees enjoyed drinks and appetizers while fostering professional connections and exploring new opportunities for collaboration.

George Jacob, CEO of E-TRON Systems, remarked on how useful the summit was from a business perspective, and underscored the benefit of networking. “When we speak with executives of other companies in the industry at the summit, we find that we are all facing the same challenges, so we talk about possible solutions,” he said.

During the opening remarks on Wednesday, Feb. 14, Joe DeMan of Interconnect Dynamics—an Amphenol Global Solutions Provider passed the board chair title to Parker Garrett of EMSCO, a former member of the U.S. Navy, who introduced the day’s first keynote.

Retired Navy Capt. David Marquet titled his keynote, “Turn the Ship Around!” Drawing from his experience as a Navy submarine captain, he shared powerful insights on leadership, emphasizing the importance of teamwork and trust. “Giving orders became the last resort,



Parker Garrett is the new WHMA Board Chair.

not the first resort,” Marquet told his audience, as he urged leaders to empower their teams to make decisions and foster a culture of collaboration.

Later that day, Cara Silletto of Magnet Culture presented “The Case for Change: Critical Workforce Insights for Leaders,” which focused on building loyal workers. She provided valuable perspectives on workforce dynamics by challenging traditional notions of loyalty, highlighting the importance of communication and understanding in today’s evolving workplace.

The afternoon’s keynote was delivered by Brian Fretwell, whose session, “Building Cul-



tures of Connection,” delivered ideas on overcoming negativity bias and fostering a culture of appreciation. He offered practical strategies for promoting positivity and recognition in the workplace.

On Thursday, Feb. 15, the final day of the summit, IPC Chief Economist Shawn DuBravac shared insights into the future of the electronics industry in a keynote titled, “From Now to Next: The Emerging Trends Reshaping the Electronics Industry.” After his prescient presentation, it was all fun and games with author and speaker Steve Baker’s keynote and workshop, “Get in the Game: How to Create Rapid Financial Results and Lasting Cultural Change.” Attendees learned how to “gamify” the workplace to increase employee engagement.

These were followed by Best Practice roundtables, where attendees gained technical knowledge from industry experts. The summit ended with the Wine and Cheese Reception, which gave everyone a final chance to network and chat with their peers in the industry. Mitch Elbers of Dakota Fluid Power emphasized the significance of networking in addressing common industry challenges such as employee retention and supply chain issues. “At the summit,” he said, “we can bounce ideas off other companies in the industry. We find solutions just by talking to each other and sharing our experiences.”

Also part of the event was the annual golf outing. Despite the wind and cold, several attendees vied for prizes including longest drive, longest putt, best scoring team, and closest to the pin off the drive. 🏌️‍♂️



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Tuesday, February 13

5:30 pm-7:00 pm Welcome Reception Sponsored by IEWC

Wednesday, February 14

7:00 am-8:30 am Networking Breakfast Sponsored by Wesco

10:15 am-10:45am Refreshment Break Sponsored by Telsonic Solutions LLC

12:00 pm-1:30 pm Networking Lunch Sponsored by Komax Corporation

3:00 pm-3:30pm Refreshment Break Sponsored by Telsonic Solutions LLC

Thursday, February 15

7:00 am - 8:30 am Networking Breakfast Sponsored by LoneStar Industrial

10:15am-10:45am Refreshment Break Sponsored by JobFlow

12:00 pm - 1:30 pm Networking Lunch





TEAM SPIRIT

IPC's global advocacy team acting on your behalf

By Kate Koger, IPC Public Affairs Coordinator

The once seemingly apolitical world of printed circuits and soldering irons has evolved into the politically engaged electronics manufacturing industry that we know today. This landscape of technology is quickly evolving by intersecting innovation, economics, and politics. It has created a world where circuit boards and microchips meet lobbying efforts and legislative policymaking, and the decisions made in government chambers can profoundly impact the technologies that shape our lives. In this ever-changing environment, IPC has been at the forefront of advancing the collective voice of the industry.

We recognized the growing need for a more robust advocacy team to help navigate this new era of political engagement, both in the United States and Europe. We already feel a difference in establishing relationships with key legislators, bringing awareness to today's technology trends through forums in Washington, D.C., on advanced

packaging and high reliability; partnering with member companies on letters being sent to Congress; and through efforts to bring together OEM, PCB, and EMS supplier

C-suite executives to discuss trends and challenges. Adding key members to our advocacy team has made many of these efforts possible.

Our growing team is actively creating a louder voice for the industry in governments across the globe. "IPC remains at the forefront of this new age of electronics manufacturing, acting as a collective voice for the industry," says **Chris Mitchell**, IPC vice president of government relations. "Though the effort to expand and enhance our

advocacy team has proven to be beneficial in many areas, the need for political engagement across all areas of IPC and the industry as a whole is still a priority."

Richard Cappetto recently joined IPC's advocacy team as the senior director of North American government relations to spearhead efforts in Washington on behalf of the industry.



“In recent years, there has been a growing recognition of risks associated with the electronics supply chain, and policymakers are engaging with the industry to address the needs of our national security,” Rich says. “With the power to influence everything from healthcare to transportation, the importance of IPC member companies establishing a presence on Capitol Hill cannot be overstated. The decisions by the U.S. government are increasingly shaping the trajectory of our industry.”

Rich brings his experience as an administrator in federal and state legislative bodies to IPC. He says that by being on the Hill, our member companies can directly influence the policies and regulations that affect them and lend their invaluable expertise to crafting legislation.

“You become the voices that policymakers turn to for insights, solutions, and guidance, ensuring that the laws and regulations passed align with the best interests of the industry,” he says. “IPC’s commitment to facilitating the engagement of our member companies on Capitol Hill is a testament to our dedication to advocacy and the pivotal role each company plays in shaping the future of electronics manufacturing.”

One of Rich’s roles has been to reinstate the member-led North American Government Relations Committee. Comprised of executives from many of IPC’s most prominent members, this committee is poised to tackle its ambitious agenda. Committee members meet monthly to discuss critical topics, such as workforce education, new resources, environmental practices, and strategic policy endeavors. These deliberations consistently create a series of productive discussions, indicative of the com-



mittee’s renewed energy and commitment.

IPC’s advocacy team has expanded to Europe to face industry issues and stay involved. IPC recognizes the pivotal role that government relations play in ensuring the resiliency of our European members. **Alison James**, senior director of IPC’s European government relations, has been active in navigating the complexities of European policymaking.

“IPC is steadfast in its commitment to advocating for the unique needs and interests of our European stakeholders,” Alison says. “With the electronics manufacturing industry playing an increasingly central role in the European landscape, our government relations efforts in the region are paramount.”

Through dialogue, cooperation, and a dedicated focus on the diverse needs of our European members, IPC is actively shaping the political landscape to create an environment conducive to sustainable growth in the electronics manufacturing sector within the European Union.

As the industry embraces this newfound political relevance, the call for strategic and sustained political engagement becomes increasingly important in multiple sectors, especially government funding and grants. **Nyron Rouse** was hired as director of government grants and strategic funding to address these ever-growing needs.

“With the support of robust funding initiatives, we can empower our member companies to lead the charge, invest in research and development, and ensure that the electronics manufacturing industry remains at the forefront of technological advancement,” Nyron says. “These programs are essential for

mobilizing efforts and advocating for policies that promote innovation and growth, and for navigating the complex web of regulations and standards that govern our field more prominently than ever before.”

Nyron has made outstanding strides on the advocacy team. His efforts played a pivotal role during National Apprenticeship Week in Washington, as IPC’s first apprenticeship program was signed by the Department of Labor. This event marked a significant achievement for IPC, as well as participating member companies across the United States.

Sustainability also remains at the forefront of our advocacy efforts, recognizing that sustainability and environmental responsibility are integral to our industry’s future. The advocacy activities are led by **Dr. Kelly Scanlon**, IPC lead sustainability strategist.

“As we advocate for policies that promote innovation and economic growth, we also advocate for environmentally responsible practices, ensuring that the electronics manufacturing industry remains a leader in technology




and sustainability,” Kelly says. “IPC strives to catalyze innovation, advocate for supportive policies, and establish strategic partnerships that accelerate the global transition toward a sustainable economy through advocacy and stakeholder engagement.”

Understanding how to tell the electronics manufacturing industry story is essential as IPC grows its government relations capabilities. **Michelle Leff Mermelstein** recently joined as senior director of media engagement, bringing her experience leading communications for large tech and telecom companies to IPC.

“Now more than ever, IPC is uniquely positioned to build and grow relationships with reporters and influencers on behalf of the industry,” Michelle says. “We have an opportunity to gain visibility for the vital work our members do and grow global awareness for the electronics ecosystem.”

We understand that being an advocate for the electronics manufacturing industry is becoming an increasingly important role. Every member needs their voices heard, and IPC understands how to achieve that. 🌈

 **Let your voice be heard in government.
Reach out to our advocacy team here.**

A person is sitting on a suspension bridge that spans across a deep valley. The valley floor is covered with large, grey rocks. In the background, there are snow-capped mountains under a sky with soft, orange and blue hues, suggesting a sunset or sunrise. The bridge is made of wooden planks and is supported by cables. The person is wearing a yellow shirt and dark pants. There are three small orange circles of varying sizes above the person, leading to a large orange speech bubble containing text.

Hmm... If I have a **conductor width and isolation distance of 40 μm (1.5 mils)**, does that mean my **PCB is considered Ultra HDI?**

PCBs are complex products which demand a significant amount of time, knowledge and effort to become reliable. As it should be, because they are used in products that we all rely on in our daily life. And we expect them to work. But how do they become reliable? And what determines reliability? Is it the copper thickness, or the IPC Class that decides?

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The Makings of a Great Show!

While IPC events staff are hard at work managing all the pieces of a show like IPC APEX EXPO, they’re actually taking direction from the Trade Show Committee, comprised of representatives from a dozen or so member companies, whose goal is to “set policies and examine rules designed to ensure the event is cost-effective, focused and fair,” says Brent Fischthal, Koh Young, committee co-chair.

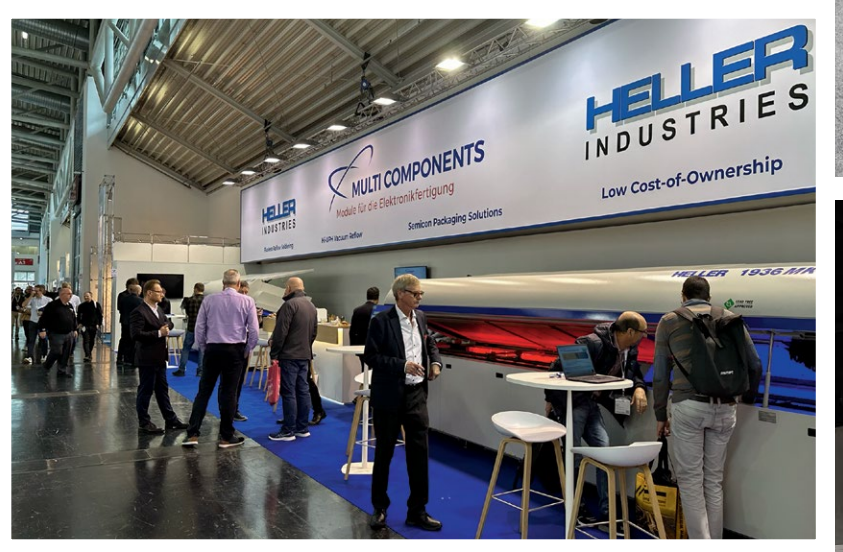
“It’s member-driven, not profit-driven,” says Marc Peo, Heller Industries, committee member. “All decisions made by the show committee

prioritize enhancing the members’ experience—both as exhibitors and visitors.”

“My goal is quite simple,” says Mark Odgen, ASMPT Solutions, committee member. “We continue to ensure that APEX EXPO remains the premier trade show for electronics assembly in the Americas.”

The outcomes from APEX EXPO can mean the difference between a good year and a great year,” says Brent. “It’s a strategic initiative that propels us toward a year of significant achievements and growth.” 🌈







MORE ABOUT ME...

“Running the family business, which was established in 1979 by my father (who has always been active in electronics manufacturing), keeps me really busy. But I also enjoy traveling and visiting with my family, which spans the American Midwest and West Coast, and Bavaria, Germany. I also enjoy hiking in the U.S. National Parks and European Alps or knocking around a tennis ball with friends whenever possible.” —Stan

Ideas and Insights

Elevating the IPC Thought Leaders Program

By Stanton Rak, Principal, SF Rak Company

As a member of the IPC Thought Leaders Program (TLP), I am responsible for identifying knowledge-sharing opportunities that can generate ideas and insights that strengthen the IPC community as well as create a sustainable and lasting future for its members. I am delighted to highlight some of my recent contributions as a member of the TLP.

Webinar: Improving Technical Writing

In a September 2023 workshop on workforce development, I delivered a webinar titled “Technical Paper Writing: Industry Best Practices for Conference Manuscripts.” The webinar was prompted by my observations as chair/co-chair of the IPC APEX EXPO Technical Program Committee (TPC) for 2022 and 2023, as well as preparations for ECWC16. TPC members believe there is a need to communicate and document information in a formal and permanent record for the advancement of science and technology. Technical papers add to the credibility of our work so others can truly understand the benefits and advance the field themselves. It is also important that any work presented at IPC APEX EXPO is described in a manner that can be reproduced by others.

Additionally, many members of the IPC community are involved with standards task groups and know that high-quality technical papers are often leveraged to help create new and stronger industry standards.

In my leadership role on the TPC, I observed that technical manuscript writing was more prevalent in scientific and academic communities and less so in engineering and industrial environments (where most IPC members reside). I also noted that technical paper writing is in danger of becoming a lost art. In today’s fast-paced world, information is often

communicated digitally in brief formats like text messages, posts, and video clips. PowerPoint presentations are useful for conveying information in most professional settings. All these forms of communication serve a valuable purpose: the timely and illustrative dissemination of information. But the quality and breadth of the information can have its limitations.

The IPC APEX EXPO Technical Conference was used as a model for the Technical Paper Writing webinar. The principles I covered can be applied to writing a manuscript for most any technical conference. Julia Gumminger, manager of IPC professional development and events, along with the TPC, created an Author Guidebook which is issued to



Stan received the IPC President's Award in 2023



“ I always find value in attending the Technical Conference at IPC APEX EXPO. ”

all IPC APEX EXPO authors who have abstracts accepted to the conference. I reviewed the individual sections of the Author Guidebook during my webinar, described the benefits of presenting at a conference, and talked about how to avoid commercialism and other common pitfalls.

Webinar: EV Technology and Innovation

In October and December 2023, I worked with IPC to organize and moderate two webinars intended to bring awareness and understanding to EV technology and innovation. The “Road to Reliability” webinar series (sponsored by Indium Corporation) was aimed at bringing together industry leaders to discuss the hurdles in achieving reliability for new e-mobility technology. We leveraged the platform to bring visibility to two important high-growth technology areas impacting automotive electrification.

Most of my professional work is concentrated around EV electronic materials and manufacturing. Both webinars were coordinated with Tracy Riggan, senior director of IPC business development and solutions, whose work centers on e-mobility.

October’s Webinar: Thermal Management Materials

For the October webinar, we highlighted the growing need for thermal management materials in EV applications. Industry research¹ shows rapid growth of the thermal management materials in electronic applications between now and 2031. Leading thermal management material growth are EV applications which will far exceed usage by the computer industry. Emerging demands are projected to reach 870,000 tons per year. This is giving rise to a \$10 billion a year industry.

Three industry experts in the areas of power electronics, battery packaging, and advanced driver-assistance systems (ADAS) were invited to join a panel and help explain the specific application needs behind the growth of thermal management materials for EVs. Milos Lazic of Indium Corporation presented, “Metal Thermal Interface Materials for EV Power Device and Semiconductor Applications.” Elizabeth Knazs of H.B. Fuller described, “Principals of Thermal Management to Improve Li-ion Battery Safety and Performance.” Dr. Kevin White of Henkel concluded with a presentation on “Thermal Management Material Needs for ADAS Applica-

tions.” The presentations were very professional and each did a wonderful job highlighting the applications where EVs are dependent on thermal management material technologies.

December’s Webinar: Lithium-ion Battery Technology

In December, the second webinar brought awareness on lithium-ion (Li-ion) battery technologies for EVs and other forms of e-mobility. We invited Dr. Frank Richtert, CEO of Greenectra, which provides coaching and consulting within the Li-ion battery industry, to lead a discussion on “Li-ion Battery Technologies and Test Methods: EV Applications.” Richtert introduced different Li-ion battery technologies and package types and highlighted the e-mobility applications where they are being used. He defined the general parameters of the battery cells monitored by the battery management system (BMS). He described the importance and challenges of

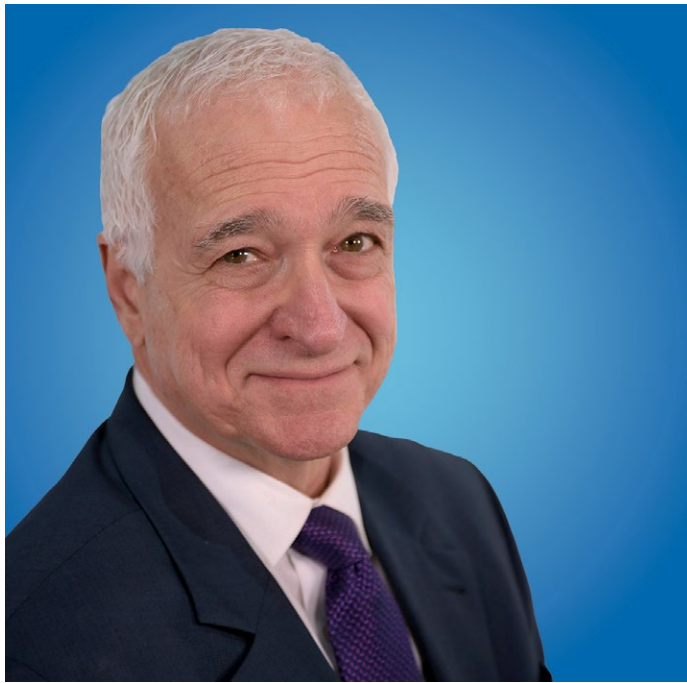
managing the thermal environment of the batteries and how temperature can impact reliability and performance. Finally, Richtert outlined how battery tests are performed individually and in the battery pack and vehicle. The information gave a better understanding and appreciation of the Li-ion battery construction, its operation, and why they are the batteries of choice for EV and other e-mobility applications. Richtert also instructed a Li-ion battery Professional Development Course at ECWC16 hosted by IPC APEX EXPO 2024 in April.

These TLP activities are intended to generate awareness and insights for the IPC community in the areas of workforce development with technical paper writing, and in technology and innovation with EV thermal management materials and Li-ion batteries know-how. 🌈

Reference

1. “Thermal Interface Materials 2021-2031: Technologies, Markets and Opportunities, IDTechEx.





Thank you, Michael!

Michael Carano is currently chair of the IPC Thought Leaders Program. He has served on 16 IPC committees and is a recipient of the IPC Hall of Fame Award.

In 2019, the IPC Education Foundation established the Michael V. Carano Teacher Excellence Award to support the professional development of secondary and postsecondary teachers, instructors, and educators pursuing training related to the electronics industry.

Scan this QR code or visit ipcef.org to learn more about other scholarships and awards distributed through the IPC Education Foundation.



Member Milestones

Congratulations to members who celebrated milestone (25-year+) anniversaries in the last quarter. Thank you for your continued support and contributions!

IPC Anniversaries in Q1 2024

**Canon Production Printing
Netherlands B.V.**
Venlo, Netherlands

Electronic Systems Inc.
Sioux Falls,
South Dakota, USA

Plexus Corp.
Neenah,
Wisconsin, USA

**Brookhaven National
Laboratory**
Upton, New York, USA

Flexible Circuits Inc.
Warrington,
Pennsylvania, USA

Advance Circuit Technology Inc.
Rochester,
New York, USA

AIM Solder
Cranston,
Rhode Island, USA

CTI Systems
Goldston,
North Carolina, USA

KIC Thermal
San Diego,
California, USA

Practical Components Inc.
Los Alamitos,
California, USA

Process Sciences Inc.
Leander, Texas, USA

Seika Machinery Inc.
Torrance,
California, USA

35
YEARS

30
YEARS

25
YEARS

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IPC Around the World

North America

By **Brian Knier**, Vice President, Marketing, Member Success and Sales

All That and a Bag of CHIPS Act: IPC Attends White House Signing Ceremony

“For the CHIPS for America program to succeed, America will need hundreds of thousands more skilled workers in this decade, not just in chips but in related sectors as well,” said John W. Mitchell, IPC president and CEO, who delivered a strong workforce message when he participated in a CHIPS R&D Roundtable at the White House focused on growing U.S. technology and talent. Mitchell was at the White House for the Department of Commerce’s formal launch of the National Semiconductor Technology Center (NSTC) Consortium and joined other industry stakeholders to discuss the necessity of a silicon-to-systems approach and electronics-related workforce programs.

From Emerging Engineer to Keynote Speaker

We are looking forward to welcoming Christina Rutherford, advanced materials and process engineer, Honeywell Aerospace Technologies, to center stage at the Electrical Wire Processing Technology Expo (EWPTE) on May 15, at the Baird Center in Milwaukee, Wisconsin. Her keynote, “Process Controls and their Impact on Supply Chains,” will provide a deep dive into the

critical role of process controls in shaping and enhancing supply chain dynamics, with a focus on the development and successful implementation of these controls. Rutherford is a key IPC/WHMA-A-620 content development contributor and recipient of the IPC Rising Star and Hillman-Lambert awards.

Regional Roundtables Reap Rewards

IPC initiated five regional roundtables over the past six months to host owners and senior executives of EMS companies in specific geographical areas. Roundtables have been held in the Pacific Northwest, the Midwest, the Great Lakes, Southern California, and the California Bay area. Encouraging EMS leaders in each region to share industry pain points and solutions, the free events were held at companies or public venues and provided attendees the opportunity to interact with peers to discuss various self-selected topics. To date, approximately 40 executives have attended.

Feedback from each group was positive, with executives suggesting that meetings occur twice each year. Attendees found value in the information they received on membership, subscriptions, and Standards Gap Analysis. Future regional gatherings are planned for locations in Texas, Florida, and the Northeast coast of the United States. We expect to increase the number of attendees and host regions by the end of 2024.

Problems solved!



IConnect007
GOOD FOR THE INDUSTRY



Europe

By **Sanjay Huprikar**, President, IPC Europe and South Asia Operations

The IPC Europe team will be actively engaging the electronics manufacturing industry during the second quarter of 2024 across five major events.

Soldering aficionados will have the opportunity to show off their skills during the Hand Soldering Competitions at two industry trade shows:

- Innoelectro 2024, organized by the National Electronics Society of Hungary in Budapest, Hungary, April 23–25
- FocusonPCB, organized by Nürnberg Messe in Vicenza, Italy, May 15–16

The winners from these regional events will compete with a dozen regional winners from around the globe at the HSC World Finals at electronica 2024, organized by Messe München in Munich, Germany, Nov. 14–15.

Our team members will be at these shows to answer questions related to IPC’s important “forward-looking” initiatives: workforce development, sustainability, advanced packaging, design, and factory of the future.

IPC has been developing new communities across the European value chain over the past four years, and we are thrilled to host three of them in June at important industry meetings:

- European PCB executives will meet in Brussels on June 11 to discuss topics related to resiliency, security, and R&D investment with the European Commission.
- Influential leaders from OEM, semiconductor, OSAT, packaging, EMS, PCB, substrates, and materials companies will meet with the European Commission in Brussels on June 11 to discuss the innovation and competitiveness required to implement a “silicon to systems” approach to manufacturing electronics in Europe.
- UK EMS executives will meet in London on June 13 for the third annual networking event featuring speakers from Make UK Defence, in4ma, MP Corporate Finance, and Leonardo.

Asia

By **Sydney Xiao**, President, IPC Asia Pacific

As the electronics industry supply chain shifts, manufacturers are ramping up investment and production in Southeast Asia, resulting in significant talent shortages, especially in technical positions. The IPC Asia team is addressing these gaps by actively localizing additional standards and certification programs, making them more accessible to local companies. Simultaneously, we aim to partner with governments and educational institutions to implement tailored workforce training initiatives.



Standards are pivotal in ensuring industry efficiency, and IPC Asia is committed to spearheading their development and adoption. Our key areas of focus encompass advanced packaging, factory of the future, and sustainability for electronics. Anticipated standards will address IC substrates, system in package (SIP), and wire bonding, scheduled for release by late 2024. We actively promote the adoption of crucial standards like Connected Factory Exchange (CFX) and Model Based Definition (MBD). Additionally, we plan to offer training and audits in line with the IPC-1401 *Supply Chain Social Responsibility Management System Guideline*.

IPC's presence in critical markets like China, Japan, and South Korea is steadily expanding. We strive to bolster this influence by enhancing member communications and services, fostering collaborations with local entities and governments, and organizing industry events such as CEMAC in China, K-Fest in South Korea, and advanced packaging symposiums in Japan. These efforts are geared toward fostering greater international cooperation within the electronics industry.

We anticipate attending IPC APEX EXPO 2024, featuring a record number of Asian exhibitors. Come visit our IPC Asia booth, #4352, to connect with our team.

India

By **Manvi Kapoor**, Deputy Manager, Events and Communication, IPC India

Q1 was a busy time for the IPC India team. It started with a technical session on hand soldering in Kolkata on Jan. 6. The IPC Skills Development Program successfully showcased its commitment to enhancing the skills and knowledge of professionals in the electronics manufacturing and electronics assembly industry. It was more than just a learning experience, as IPC continues to fuse education with collaboration, empowering professionals in the electron-



ics field with essential knowledge and valuable connections.

On Jan. 30, the IPC Standards Development Committee for the India region convened in Bengaluru. During this session, there were in-depth discussions on IPC-2232, *Guideline for Printed Board Design and Manufacturing of IoT Products*, and IPC-9911, *Guideline for Automotive Electronics Printed Board Thermal Management & Electronic Components*. These discussions were facilitated by electronics design companies, alongside electronics manufacturing services (EMS) and wire harness members from India, Malaysia, UAE, South Africa, and Sri Lanka. A total of 22 participants joined both physically and virtually to deliberate on IPC-A-610, IPC J-STD-001, and IPC-A-620.

IPC planned the Integrated Electronics Manufacturing & Interconnections (IEMI 2024) roadshow in Penang, Malaysia, on Feb. 6, engaging major stakeholders in the region and discussing its initiatives on advanced packaging of semiconductors. This global industry networking event is scheduled to take place in Penang on July 24-25.

In Q2, IPC India is preparing for hand soldering competitions in Delhi, Pune, Bengaluru, and Chennai, April through June. Anticipation is high within the industry, with expectations for significant interest and participation. 🇮🇳

2024 Programs Q2



Stay connected with IPC through some of these regional events in April, May, and June. Visit our online calendar of events for more information.

APRIL

April 6–11

IPC APEX EXPO 2024
Anaheim, California, USA

April 19

**Importance of IPC
Validation Services
for Australian Companies**
Online

April 23–25

**IPC Hand Soldering
Competition 2024 Regional
Qualification—Hungary**
Budapest, Hungary

MAY

May 14–16

**IPC Hand Soldering
Competition**
Pune, Maharashtra, India

May 14-16

**Electrical Wire Processing
Technology Expo (EWPTE)**
Milwaukee, Wisconsin, USA

May 14–16

**IPC Hand Soldering
Competition 2024
Regional Qualification—Italy**
Vicenza, Italy

May 26

**IPC Hand Soldering
Competition**
Jeddah, Saudi Arabia

May 29

**Hand Soldering Technical
Session**
Abu Dhabi, UAE



JUNE

June 1

**Advanced Technology
Symposium**
(sponsored by Keidanren)
Tokyo, Japan

June 1

**Hand Soldering Technical
Session**
Dubai, UAE

June 4–5

**IPC Hand Soldering
Competition**
Bengaluru, Karnataka, India

June 11

IPC Day
Brussels, Belgium

June 12

**Hand Soldering Technical
Session**
Vizag, Andhra Pradesh, India

June 13

**IPC Day and EMS Executive
Council UK**
London, England

June 19–20

**Hand Soldering Competition
& Technical Session:
Digitalization of Electronics
Manufacturing**
Sydney, Australia

June 19–22

**IPC Hand Soldering
Competition Thailand 2024**
Bangkok, Thailand

June 25–28

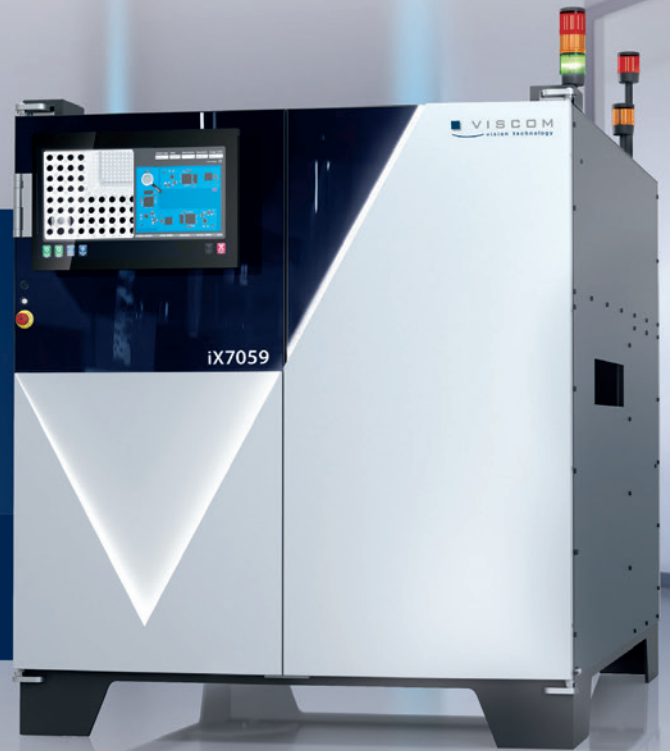
IPC Masters 2024
Shanghai, China

June 26

IPC Japan Symposium
Tokyo, Japan

June 26

**Hand Soldering Technical
Session**
Thiruvananthapuram,
Kerala, India



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Community

MAGAZINE

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Cover image: **ADOBE STOCK © GSTUDIO & Shelly Stein**

IPC Publishing Group Inc., 3000 Lakeside Drive,
Suite 105N, Bannockburn, IL 60015

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Spring 2024, Volume 2, Number 2
IPC Community is published quarterly.



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