

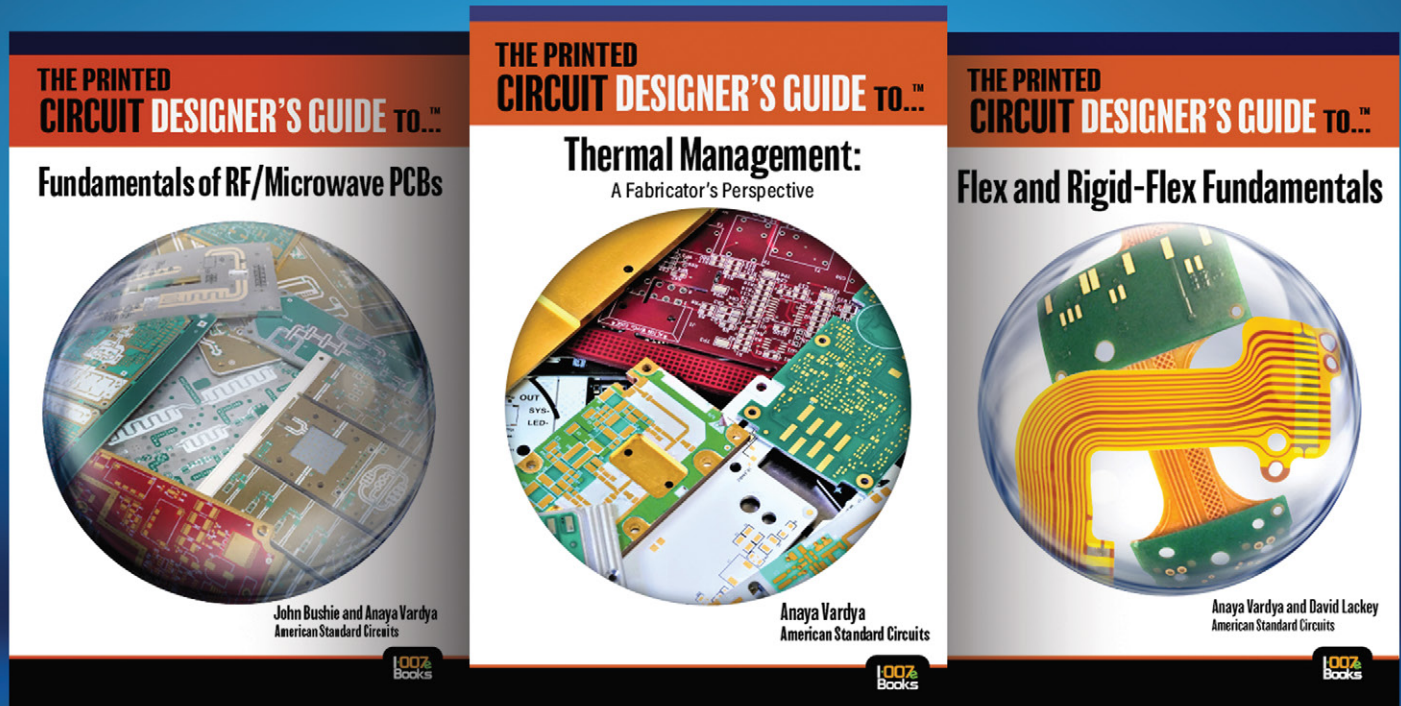
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MAGAZINE



A GNOME IS BORN
SEE PAGE 38

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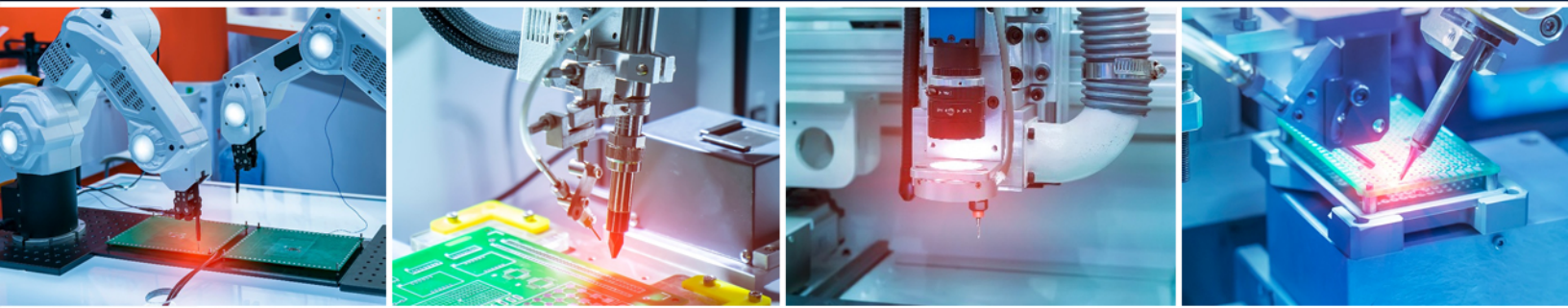
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Education Changes Us for the Better

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

“As CEO of IPC, I have a front-row seat to the advances in technology and electronics. It’s an exciting, wild ride. But without also embracing new methodologies and nontraditional sources for the human component and recruiting, we are stuck.” —John W. Mitchell, *Fire Your Hiring Habits*

When I set out to write my new book, *Fire Your Hiring Habits*, I was intrigued by news of the “great resignation,” a time when many people left their jobs in search of something more meaningful. Because I had spent so many years hiring, training, and retaining employees in the electronics industry, I saw this trend as something positive, innovative, and closely aligned with opportunity and growth. It was more of a “reprioritization” than a resignation. Why did I think this way?

Continues on page 9...



Hmm, what is recommended
**minimum distance for
copper to board edge?**



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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It's because education, especially the effort toward lifelong learning, changes us for the better. I've spent my career looking for these opportunities, being open to new possibilities, and embracing all that I can find. My formal education includes a doctorate in education, an MBA, and a bachelor's degree in electrical engineering. I am fundamentally curious, so by following that natural drive and staying open to learning new things, I have become a much stronger contributor and person.

Electronics manufacturing is a continually changing industry. When you take opportunities to learn about new technologies and how they can best be adapted to your company or your factory, you have a better chance of success. When you encourage your staff and offer them opportunities for education that helps them enhance their career opportunities and skills, you are embracing a lifelong learning culture. Lifelong learning is any form of education in our lives with a goal of improving our knowledge and skills, but also just for the pure joy of it. Few things make me more excited than finding a new way to do things, realizing that I will never learn all that I would like to, and that there are so many new opportunities available if we just open our minds to them.

IPC is dedicated to the lifelong education

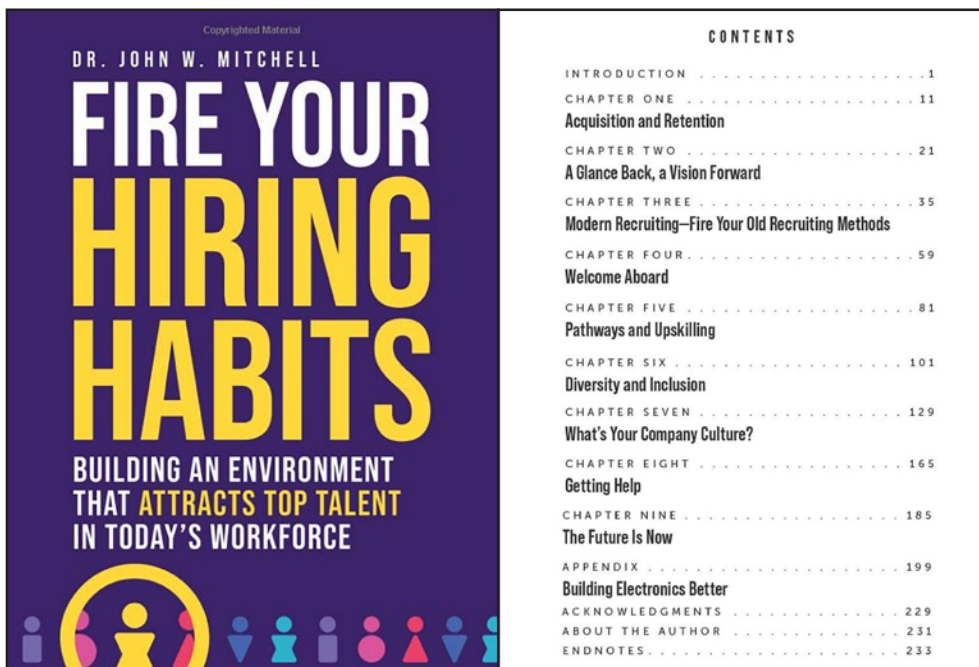


of members of the electronics manufacturing industry; our workforce training modules reflect that dedication. The IPC Education staff works closely with industry experts and learning specialists to build quality training programs for the industry. We listen closely to what our members tell us about what they need their employees to learn, and we build courses on the latest learning science to transmit and help individuals retain their input.

We're passionate about learning and educating at IPC. I thoroughly enjoy sharing my passion for education and creating a more enlightened, invigorated, and excited workforce. 

Fire Your Hiring Habits, by Dr. John W. Mitchell is available on [Amazon](https://www.amazon.com). Proceeds will benefit the IPC Education Foundation.

Supporting documents are available for download, including color versions of the diagrams included in this book at: johnwmitchell.com





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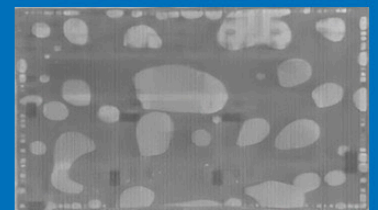
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The Ongoing Banking Crisis

By Shawn DuBravac, IPC Chief Economist

On May 1, First Republic Bank became the latest addition to the growing list of failed banks, making it the third major bank to collapse in recent months. Previously the 14th largest bank in the United States, First Republic Bank now holds the unenviable title of being the second largest bank failure in U.S. history. Silicon Valley Bank, which was the 16th largest bank in the country, and Signature Bank, the 29th largest bank

in the U.S., also collapsed recently. These two bank failures mark the third and fourth largest bank collapses in history. Since the 1970s, more than 90 banks with assets over \$1 billion have failed in the United States. Three of the four largest collapses have occurred in the past few months.

In light of recent U.S. bank failures and a significant surge in interest rates, depositors have hastened withdrawals from commercial

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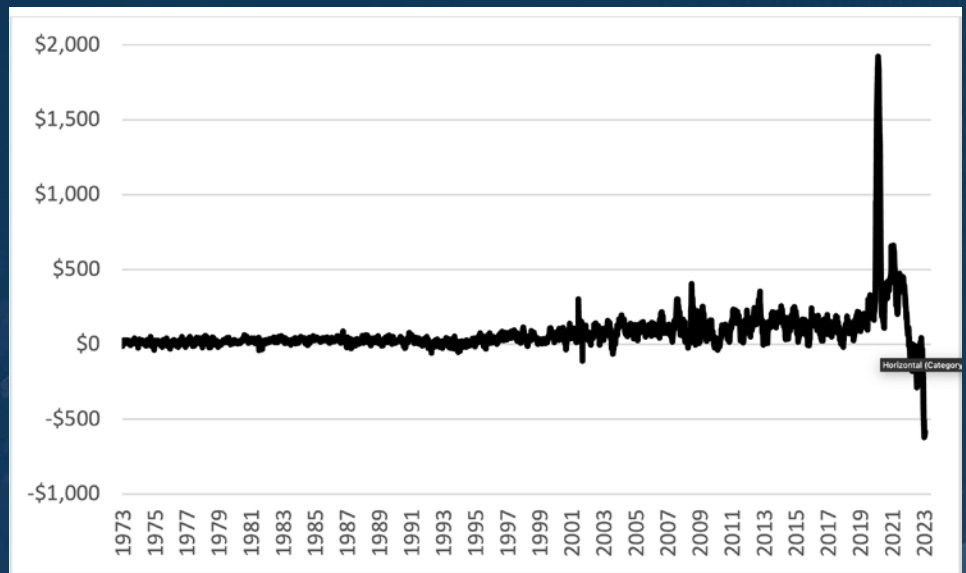
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banks. Bank deposits have fallen about 3.5%, or over \$600 billion, since the start of the year. Small banks have seen deposits decline roughly 4.4%, or nearly \$250 billion, since the beginning of the year.

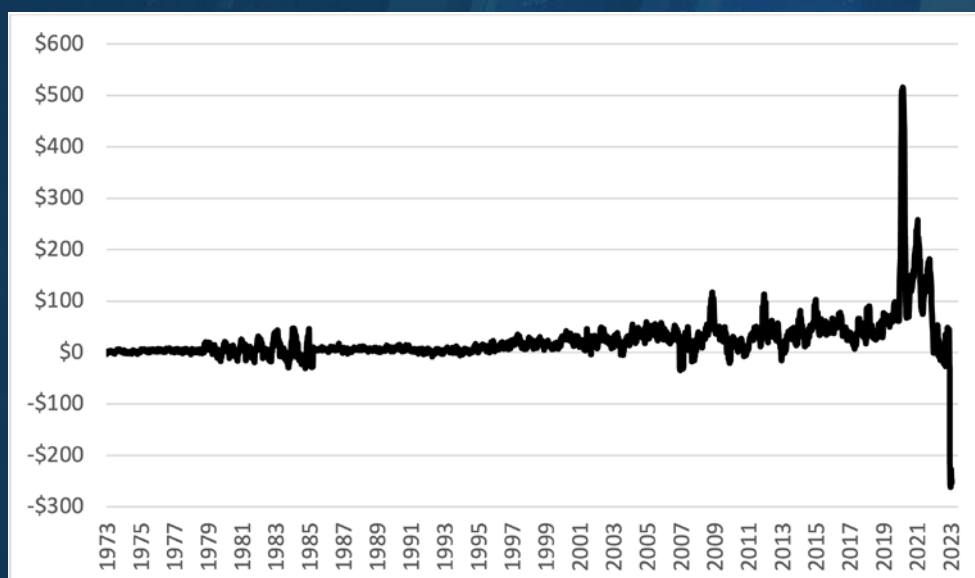
Depositors have been moving bank deposits from low-interest-bearing bank deposits to money market funds which offer higher yields. Money market holdings have risen over \$160 billion since the start of the year and are up nearly \$400 billion since the Federal Reserve began raising rates in early 2022. The effective Federal Funds rate has risen nearly 500 basis points since the Federal Reserve began raising rates in March 2022. Money market rates have risen sharply over this time while interest rates for savings accounts have remained muted. The spread between interest-bearing bank deposits and money market funds is likely to remain wide and, as a result, deposit outflows are unlikely to reverse.



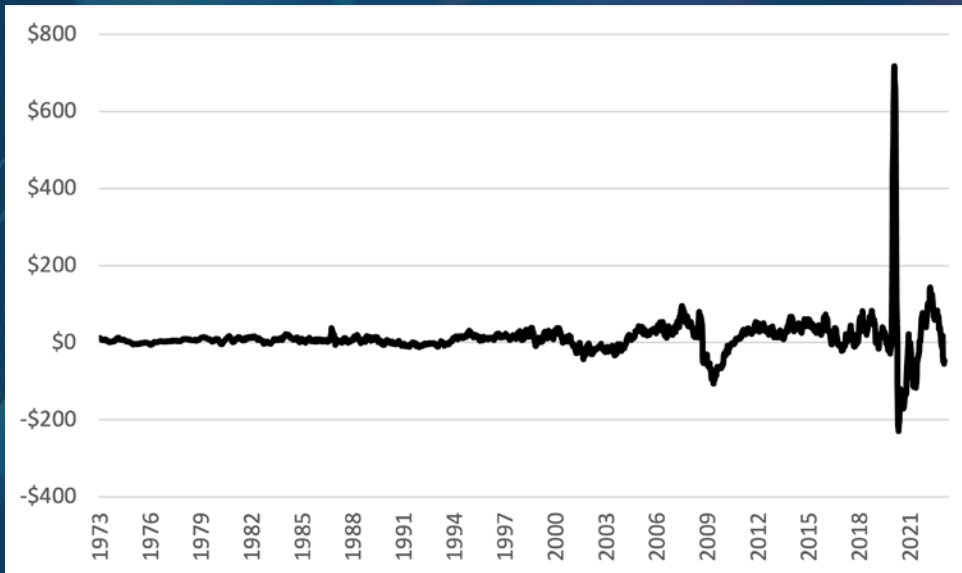
Deposits, all commercial banks, seasonally adjusted, 12wk change, \$B.

The outflow of deposits limits both the ability and willingness of banks to offer loans. Moreover, financial institutions are becoming more cautious given both the volatility in the banking system and the broader economic uncertainty. Banks are reporting tighter lending policies and this trend is likely to continue in the months ahead as their risk tolerance continues to diminish.

Since the start of the year, commercial and industrial (C&I) balances are down \$40 billion across all commercial banks and off over \$28 billion at small banks. While there is much focus on big banks, there are about 4,800 banks in the U.S. and small banks are especially important to watch when it comes to lending because of the impact they have in specific lending areas and geographic regions. Small- and mid-sized banks, defined as domestically chartered banks not among the 25 largest, represent about a



Deposits, small domestically chartered commercial banks, seasonally adjusted, 12wk change, \$B.



Commercial and industrial loans, all commercial banks, seasonally adjusted, 12wk change, \$B.

tion imposed on the banking sector. While this is intended to enhance stability and prevent future crises, it can inadvertently impact the electronics industry. Increased regulation often translates to higher compliance costs for banks, which can be passed on to borrowers in the form of higher lending costs and reduced lending capacity.

Furthermore, the potential consolidation of banks resulting from these regulatory changes can have far-reaching implications for the electronics industry.

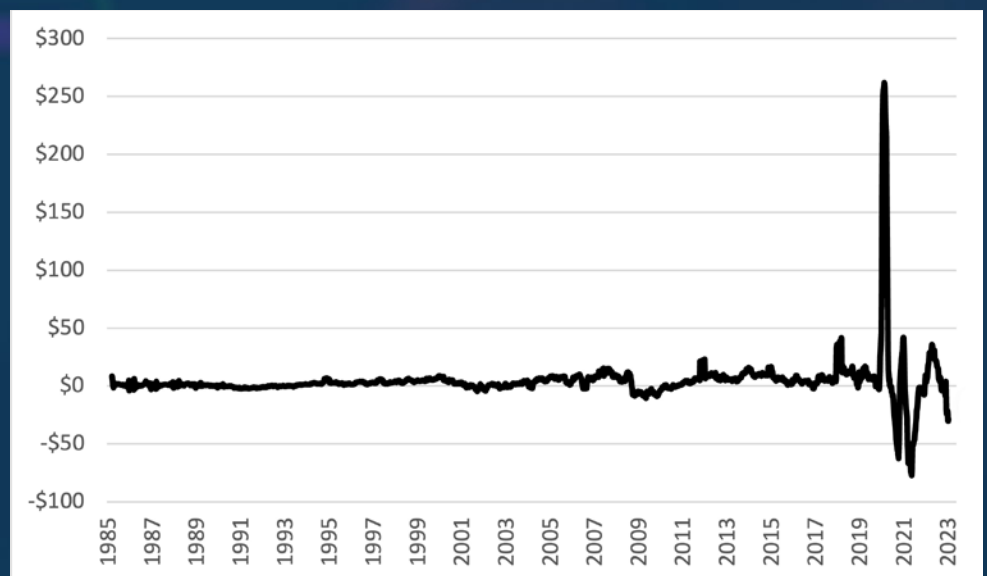
third of total bank credit. But small banks are 54% of all real estate loans, 67% of all commercial real estate loans, and 71% of construction and land development loans. Small banks are about 27% of all C&I loans.

The Impact on the Electronics Industry

The ongoing banking crisis will have both immediate and long-term consequences for the electronics industry. In the short term, lending costs will be higher and lending requirements more arduous. During credit crunches, banks raise lending standards, which not only makes it more difficult for businesses to get loans but can make it difficult for businesses to refinance loans that are coming due.

As the FDIC and the Federal Reserve reevaluate financial system oversight in response to the banking crisis, it is likely that there will be increased supervision and regula-

regulatory changes can have far-reaching implications for the electronics industry. Larger banks may prioritize lending to more established and financially secure companies, making it even more challenging for small- and medium-sized electronics businesses to access necessary funding. This could lead to a concentration of resources and power in the hands of a few major players, potentially stifling competition and limiting opportunities for smaller enterprises. 🇺🇸



Commercial and industrial loans, small domestically chartered commercial banks, seasonally adjusted, 12wk change, \$B.

From Father to Son

A story of generational volunteerism

By John Perry, Director, Printed Board Standards & Technology

As an IPC technical staff liaison to numerous IPC standards development committees, I'm sometimes asked to extoll the virtues of what it means to be a volunteer within one of them. The question mostly comes from someone interested in joining an IPC committee for the first time. The answer usually includes phrases not uncommon to other kinds of volunteer efforts in our lives:

"You get more out of participating than the effort you put into it."

"You become part of a network of subject matter experts, and in so doing, grow to become a subject matter expert yourself."

"You get to represent your company's interest in an IPC standard."

"It's very rewarding to contribute to the publication of a standard that benefits not only your company but the electronics industry as a whole."

If you've ever attended one of the IPC Award Luncheons at IPC APEX EXPO, then you've probably heard the same from volunteers themselves, including the recipients of awards such as the IPC President's Award or IPC's highest honor, the Raymond E. Pritchard

Hall of Fame Award. I really like that because you're getting such good feedback "straight from the horse's mouth," and not just from IPC staff (even though I tell myself, "Answering that is part of my job").

To share their story, I wanted to reach out to a long-term volunteer who has not only contributed to numerous IPC standards efforts

over the years but has served as a leader within some of those committees. Then it hit me:

I have a committee chair who has led and supported numerous IPC standards efforts for over 25 years, and now his son leads and supports IPC standards committees and other IPC initiatives of his own.

So, how did he cajole, (or maybe coax) his son into following in his footsteps as an IPC volunteer?

This is where I introduce Scott Bowles and his son Steven, both of Lockheed Martin Corporation. Scott works as an electronics PMP materials engineer for senior staff. Steven is an LM Associate Fellow.

Obviously, one doesn't need to be a parent of or a progeny of a standards committee volunteer or leader to get involved, though Scott and Steven are a great example of two generations in one family that see the value of getting out more than what they put in.

**Leadership
runs in the family:
Steven and Scott
Bowles (right)**





You don't have to be someone who likes to stand out in a crowd or aspire to committee leadership. Many of IPC's most influential committee supporters and leaders started by attending a few standards meetings, sitting quietly in the back, and taking it all in before they eventually became comfortable having a more vocal and active role. If my memory hasn't gone haywire yet, I seem to recall Scott quietly hanging out in the back of the meeting rooms many years ago. After 24 years as a member of IPC's Technical Department, most volunteers and leaders have told me it was worth making that jump into the water—for themselves, their company, and our industry.

Scott has contributed to over 35 IPC task groups and subcommittees since 1996, and currently co-chairs the task groups responsible for IPC-6012, *Qualification and Performance Specification for Rigid Printed Boards*; IPC-A-600, *Acceptability of Printed Boards*; IPC-2228, *Sectional Design Standard for RF/Microwave Printed Boards*; and the V-TSL-MVIA Microvia Reliability Subcommittee.

Steven has contributed to more than 30 IPC task groups and subcommittees since 2012, and currently serves as co-chair, vice chair, or chair of task groups and subcommittees responsible for IPC-2223, *Sectional Design*

Standard for Flexible/Rigid-Flexible Printed Boards; IPC-6011, *Generic Performance Specification for Printed Boards*; the IPC-420X series of flexible/rigid-flexible material standards; the Printed Board Base Materials General Committee; and as past chair of the committee responsible for IPC-T-50, *Terms and Definitions for Interconnecting and Packaging Electronic Circuits*. Steven also received the IPC President's Award at IPC APEX EXPO 2023.

I sat down with this father-son duo and asked them what it's like to support IPC's standards development efforts together.

How did you get involved in IPC standards development? Was there encouragement (or even discouragement) between the two of you?

Scott: I got involved decades ago while working as a PCB supplier when I saw what I believed to be ambiguity in the IPC performance specifications, and differences in interpretation between suppliers and end users. I learned that I could contribute by bringing clarity to requirements as I actively participated in IPC standards development.

I used to joke with Steven to not get involved in PCB fabrication because it's a very challenging industry. When he didn't listen to his dad's advice, I recommended that he get involved

with IPC standards development so he could have a better understanding of requirements and to help make things better.

Steven: I joined the IPC committees for IPC-T-50 and IPC-6012 in 2012 while working in printed board fabrication at another company. It was mostly based on the recommendations of my dad and his involvement, which by then had been more than 15 years.

What is the value in contributing to one or more IPC standards groups, either as a member or as a leader?

Scott: The value is being able to stay at the forefront of changes taking place in the industry from a technology perspective, sharing our company's interests and concerns regarding PCB design, fabrication, test and inspection, and helping shape IPC standards and performance specifications that will benefit the entire industry. Contributing to multiple standards groups, (e.g., design and fabrication), helps connect the dots and ensures one supports the other.

Steven: There's an incredible value, personally and professionally. Our involvement benefits the industry, the companies we work for, and our personal development. We are participating in advancing technology, defining requirements, and ensuring reliability for the greater good.

What's it like working on committees together as father and son?

Scott: I have found it very rewarding being able to share my knowledge and experiences, but more so seeing Steven grow with involvement in not only IPC standards development by taking on leadership roles, but also with other involvements like participating in the IPC Emerging Engineers program and ulti-

mately mentoring multiple individuals. Steven is an awesome note taker.

Steven: It's awesome—except when he constantly asks me to send him my meeting notes.

Did you think when you started that you would be involved in IPC committees this long?

Scott: I had no idea in the beginning that I would spend decades volunteering with IPC standards development. In the beginning I just wanted to get a more in-depth understanding of basic requirements and help fix the gap between suppliers and OEMs; however, the more I learned, the more I wanted to support IPC in its efforts.

Steven: Nope, no way. I initially thought it would be for a single revision of the IPC-T-50, not a 15-year commitment. I'm sure Scott will respond similarly but with a few more than 15 years.

“
**Don't
hesitate
to get
involved.**
”

What would you say to someone on the fence about joining an IPC standards development committee?

Scott: Don't hesitate to get involved. I have continued to learn throughout my career and a lot of that learning has taken place at the table of IPC standards devel-

opment committees by working hand-in-hand with peers from throughout the industry. Participating in IPC standards committees provides an opportunity to work side-by-side with the best and brightest and that provides learning you cannot get elsewhere.

Steven: Do it. Just jump in. That's exactly what I've told my Emerging Engineer mentees and those I've formally mentored at Lockheed Martin. There's an opportunity to learn and engage and at the very least, you'll likely pick up knowledge simply by osmosis. 🌈



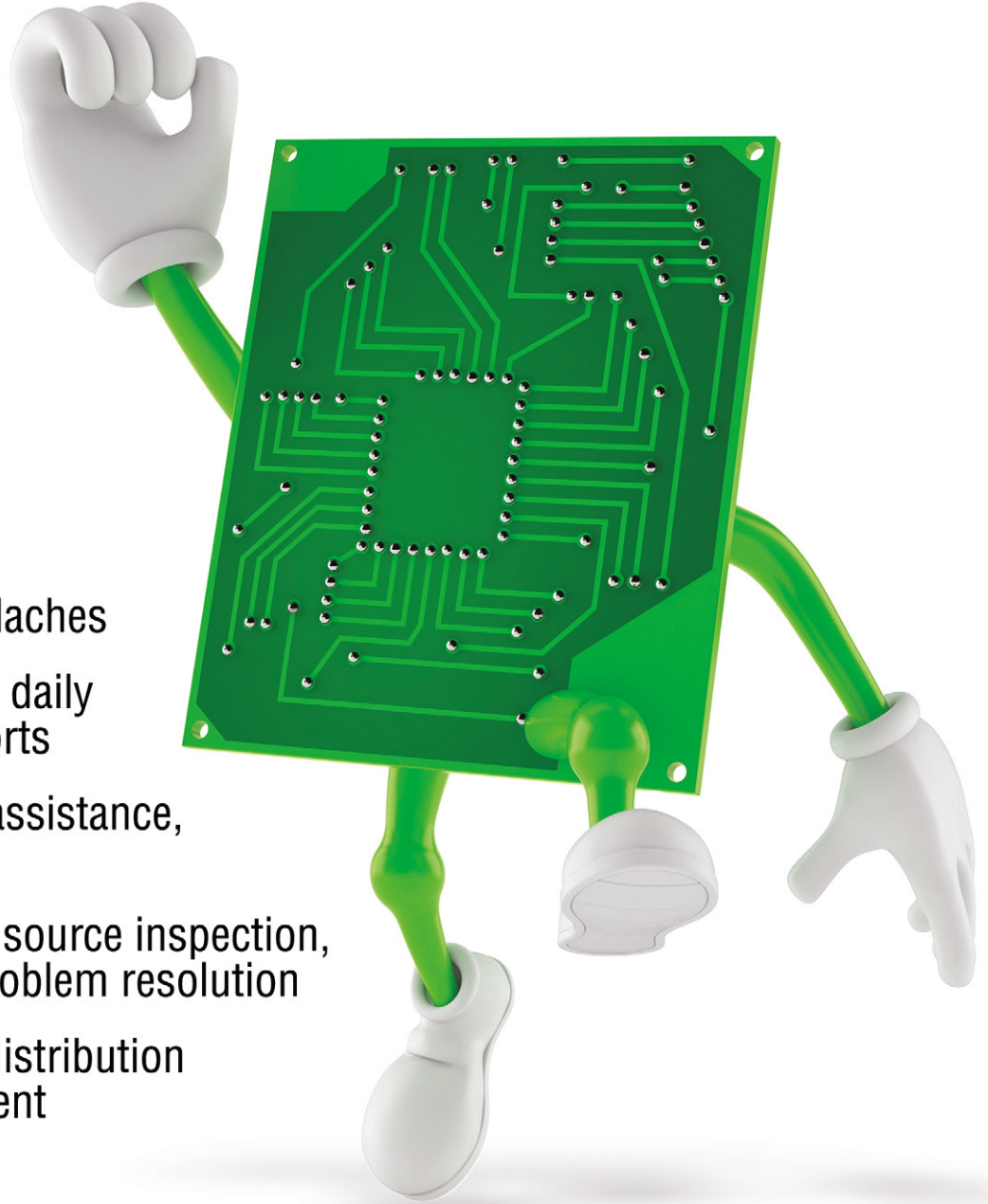
Supporting the New Workforce

Joe O'Neil leads the IPC Education Foundation Board

By Gentry Manning, Marketing Manager, IPC Education Foundation

IPC Community celebrates member success while sharing the important work done within IPC to better serve its members and the entire global electronics manufacturing community. But who will take us into the future? How do we prepare the next generation of industry professionals for the needs of today's consumer, industrial, and defense bases? Joe O'Neil, chair of the IPC Education Foundation (IPCEF), shares his vision for developing that pipeline of new talent entering the electronics industry.

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Joe, what are the top three concerns facing the electronics industry?

Risk mitigation in the global supply chain seems to be top of mind. The benefits of globalization were tested by the pandemic and further impacted by geopolitical challenges. Now, regionalization seems to be a focus for electronics manufacturing.

Domestically, the strength and resilience of the electronics industrial base is a major concern. The CHIPS Act and other efforts to accelerate domestic manufacturing capabilities and capacities, coupled with some reshoring and regionalization, may be the needed catalyst to reestablish a solid foundation across the entire value stream.

I'm also concerned about access to the talent pool from region to region. In some areas, there is an emerging demand for engineering and technician-level operators; reskilling, upskilling, and training are needed to bring those from other industries into the electronics sector. In Silicon Valley, there are thousands of highly skilled operators at every level, and the level of competition for that talent is incredible. Attracting, retaining, and developing career paths are major concerns.

Industry executives often say workforce development is a major concern. What do they mean and why is it a problem?

In the short term, there is a supply-and-demand gap. There are more jobs than qualified

candidates to fill the roles. This limits growth, hurts profitability (more overtime), and cuts into capital available for investment, and research and development.

While many challenges in the near term can be overcome, and impacts to the bottom line are manageable, they become untenable over the long term. If software, crypto, social media, and finance sectors are attracting the best and the brightest, then our industry will continue being both understaffed and under-talented. Yet this is a dynamic, fast-paced, challenging sector, and we need to attract the best and the brightest talent as well. We must showcase our exciting career options—advanced artificial intelligence, machine learning, automation-driven opportunities—which are transforming our industry at this very moment.

How is IPCEF addressing this issue? How do we develop a pipeline of new talent?

We are addressing the workforce development challenge in the electronics manufacturing industry by focusing on three pillars: awareness, access, and connection.

To increase awareness of the opportunities within the industry, the Foundation engages with schools, colleges, and universities to showcase career opportunities and highlight the importance of the industry. They also participate in industry events and conferences to reach a wider audience.

To provide access to resources, content, and knowledge to develop that talent, the Foundation offers a range of educational programs, including online courses, workshops, and training sessions. It also provides scholarships and support for individuals pursuing careers in the industry.

Finally, to connect the employee/employer and the talent with the opportunity, people, and companies, the Foundation facilitates networking events, career fairs, and mentorship programs. These initiatives bridge the gap between talent and the industry and



enable individuals to develop the skills and connections needed to succeed in the field.

By focusing on these three pillars, the Foundation is developing a pipeline of new talent and addressing our workforce development challenges.

One of those efforts is the Careers in Electronics website. Why was it created?

This website has curated more than 50 career profile videos that showcase the incredible options within the electronics industry. We've intended it as a central hub, which we believe will draw a large audience, build a talent pool, increase awareness of opportunities within the industry, and help get people into jobs that meet their career objectives.

What are your responsibilities as chair of the IPCEF?

IPCEF was founded to address the number one concern of IPC membership at large: developing a pipeline of new talent for the electronics industry. I work with the Foundation's board and senior management to set that mission and vision. We want to create awareness of electronics manufacturing careers. We do that by reaching out to high schools and technical colleges/universities where we promote our access to content and connections within the industry. My overarching responsibility as chair is to ensure that there is leadership in place, and that we have the resources to achieve our mission.

How does this work differ from your work as chair of the IPC Board of Directors?

I first engaged with IPC 20 years ago and watched it mature into a global association. When I became IPC board chair, there were several new initiatives in place, but the core, foundational business and value proposition



had been set on solid footing for decades. Thus, our role was to look forward 10 to 20 years and set a course that would maximize the benefit to our members. While there were several new initiatives within a dynamic industry association, the core, foundational business and value proposition to the industry had been set on solid footing for decades. As a board, we set a course maximizing the benefit to our members over that horizon.

IPCEF is a relatively new entity with major challenges ahead but limitless options for how best to achieve our objectives. Finding the right leadership was critical, and we are blessed to have Charlene Gunter du Plessis at the helm. She provides experienced, consistent direction coupled with boundless energy and passion for the mission. She absolutely loves working with youth and seeing them flourish in our industry. That energy is contagious and is a major reason for IPCEF's success.

How does IPCEF help educators prepare students for future careers?

I come from a family of educators. Both of my parents are teachers, and my sister is in the education field. My views are formed from decades of first- and second-hand experiences, and my perspective is that our educators are, for the most part, overworked,



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underpaid, underappreciated, and can use every bit of support we can give them.

IPCEF not only provides support but also offers carefully curated engagement opportunities which serve as life-changing moments. We hope to spark a fire in students who may want to pursue careers in engineering or manufacturing—or simply open their minds to the world of possibilities.

How does IPCEF reach out to underserved communities, particularly women and the African-American community, which are not broadly represented?

We are committed to providing equal opportunities for individuals interested in the electronics manufacturing industry and are taking steps to address this issue.

For example, at IPC APEX EXPO 2023, we invited more than 500 high school students to attend, and the mix of race and gender among those students more closely resembled today's society. This indicated to us that our efforts to attract a diverse range of participants are paying off.

Over the years, the electronics industry has become increasingly diverse, with more women and individuals from underrepresented communities taking on senior management roles, so we believe that providing students with real-world examples of successful leadership is key to attracting the underserved communities. We want to inspire the next generation of industry leaders by showcasing the accomplishments of individuals from diverse backgrounds.

However, there is still more work to be done, and IPCEF is committed to making the industry more inclusive. Ultimately, the industry requires the best and brightest talent to address the complex challenges it faces, and discrimination has no place in achieving that goal.

Joe, thank you for sharing some of your thoughts on this important work.

You're welcome. Educating the next generation is so dear to my heart, and I want to do everything I can to move the work forward. 🌈

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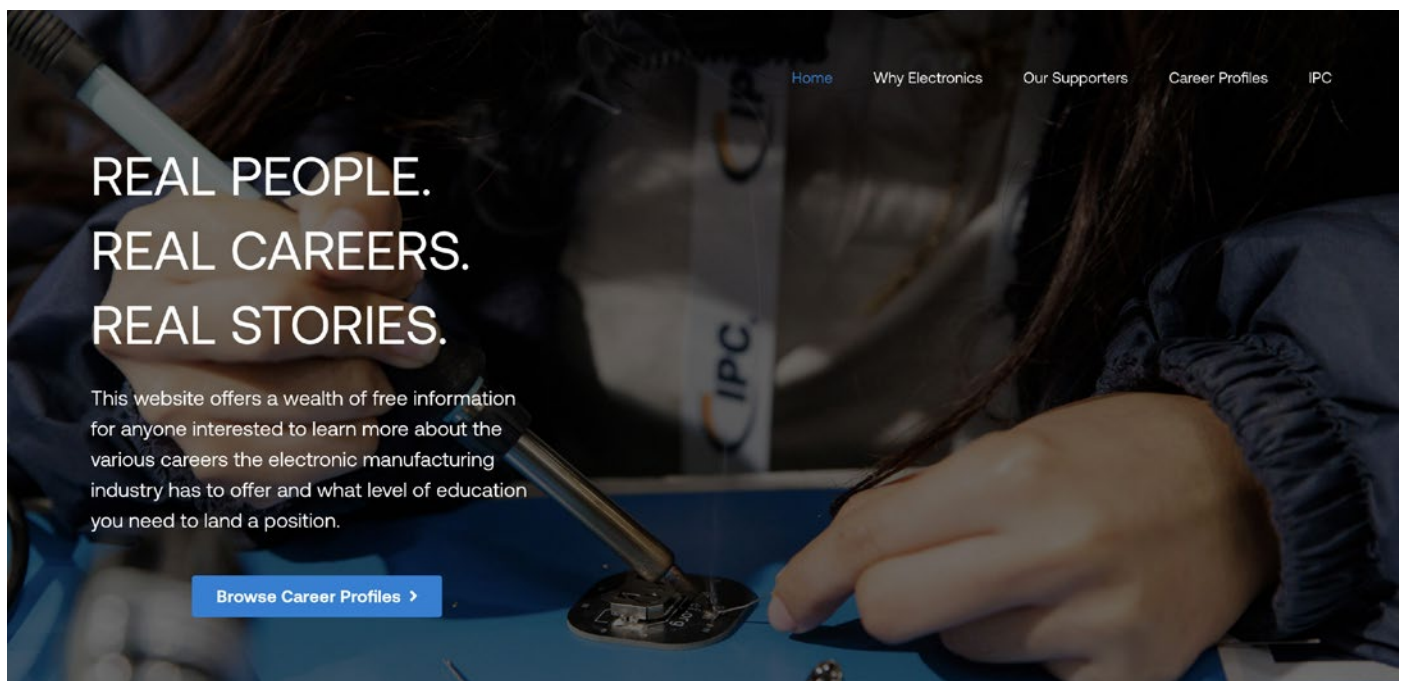
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Careers in Electronics

A new IPCEF website puts the world of electronics manufacturing at your fingertips



Workforce development, training, and availability of a career-ready workforce are among today's most pressing concerns. The IPCEF's new website, *Careers in Electronics*, provides access to crucial information and resources for career development, as well as an opportunity to connect students with industry professionals and companies through an upcoming job board.

How can you get involved in moving this important project to the next level? By visiting the site, becoming familiar with what it offers, and finding ways to share the information

with your employees and potential job candidates. The following Q&A from IPCEF will help you better understand why the website was created, and how you can help to ensure its success.

Who should use *Careers in Electronics*?

The answer is simple: Anyone who wants to learn more about careers in the electronics manufacturing industry. This information-driven, industry-focused career website will assist students in high school and college, as well as parents, educators, career counselors, and professionals. Each career pro-

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Electronic Assembler



Engineering Manager



Engineering Technician



Environmental Engineer



**Facility Maintenance
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**Field Applications
Engineer**



Front End Engineer



Hardware Engineer



Industrial Engineer



Instrument Technician



Lead Engineer

file includes a unique job description, a look inside the work environment, typical skills and requirements needed, estimated salary ranges, and videos of real people in their careers.

How can I get the most out of the Careers in Electronics website?

By signing up to be an “insider,” where you will get immediate access to exciting developments through our regular newsletters. You’ll also receive a free downloadable copy of the IPC Terminology Booklet, another valuable resource for anyone interested in electronics.

How can the website help my company hire employees?

The job board, which launches later this year, will promote internships, co-ops, and job openings to a talent pool of interested candidates. Our members can participate in this opportunity free of charge as a member benefit. If anyone is interested in connecting with more candidates, please complete [this form](#).

Why should industry support CIE?

There’s nothing else like it. We are the first to provide a comprehensive, information-driven resource that showcases all the careers available in electronics manufacturing, as well as the entry points to these careers.

We share profiles of employees’ career stories that will inspire the future workforce as well as promote what your company does. Together, we can help close the workforce skills gap.

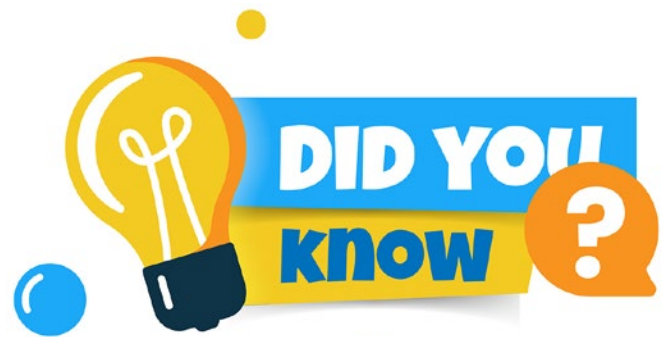
How can I contribute to the website?

Our core pillars are awareness, access, and connections. You can help us achieve these goals by sharing your career stories. This not only creates awareness of your career profile, but you give a voice to the industry and that specific career. To learn more about how to participate, [click here](#).

Our job board will increase the level of engagement by connecting future talent with potential employers. IPC member companies will have the option to participate in this initiative. To receive more information, please complete [this form](#).

How can I share the news about the Careers in Electronics website?

The easiest way to spread the word about this resource is by sharing [careersinelectronics.com](#) and following us on [Facebook](#), [Instagram](#), [Twitter](#), and [LinkedIn](#). We also have a flyer which can easily be shared. 



56

Number of job profiles

13

Number of website sponsors and

partners: CAES, TTM Technologies,

I-Connect007, Foxconn, Google,

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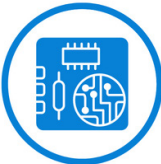
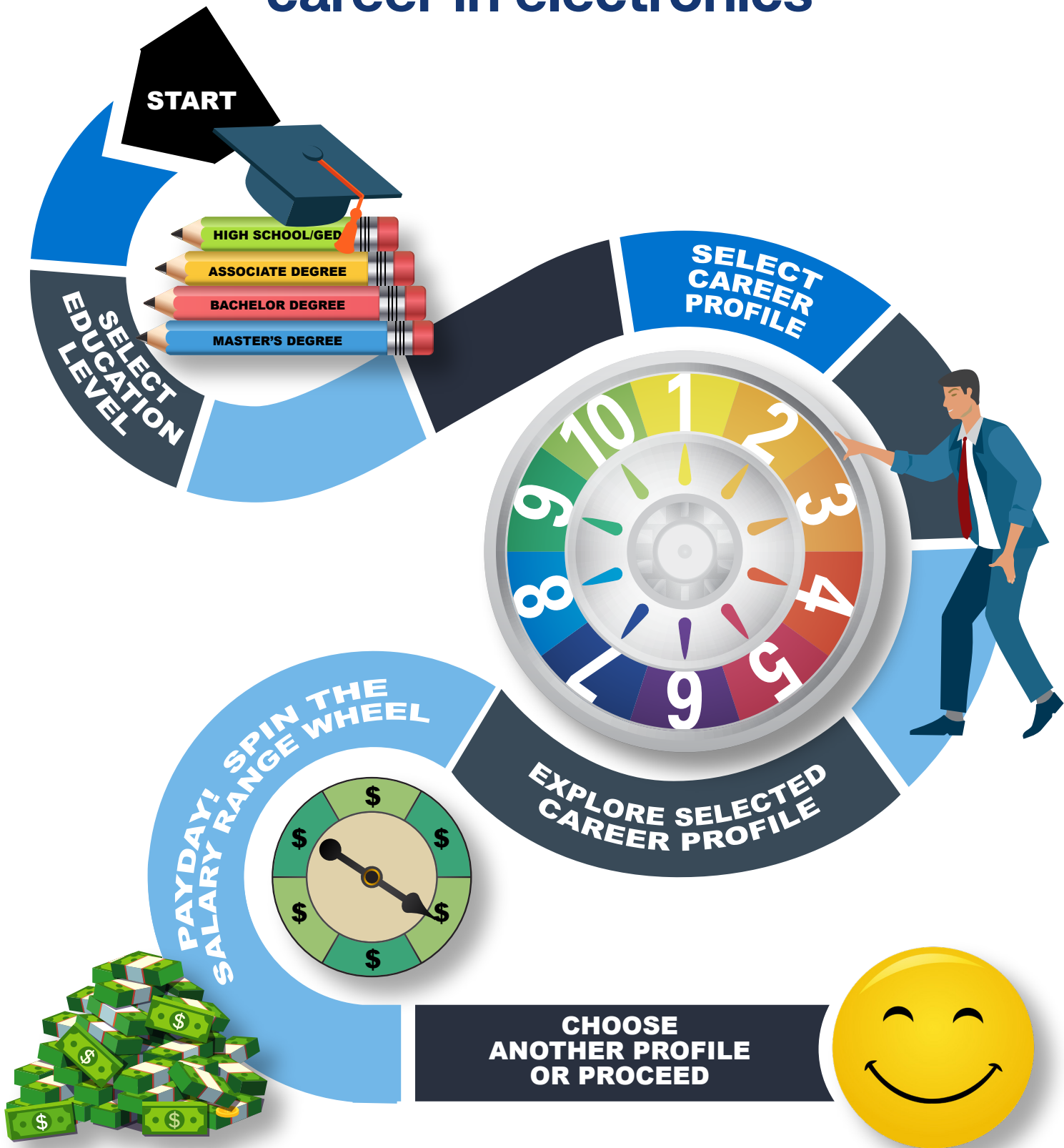
Mycronic, Circuit Assembly,

Calumet, STI Electronics,

Digi-Key, Eagle Circuits,

IPC Education Foundation, IPC

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careers in
ELECTRONICS

Meet the Team

The IPC Education Foundation

Charlene Gunter du Plessis

Senior Director

Charlene is responsible for implementing the strategic direction of IPCEF, and works with industry member partners, academic institutions, and career technical education instructors and teachers to develop and execute program initiatives for the Foundation.



Wendy Gaston

Business Development Manager

Wendy is a liaison between the student chapters and companies. She connects students interested in exploring opportunities in the electronics manufacturing industry with companies seeking to educate them about the many career paths the industry has to offer.



Gentry Manning

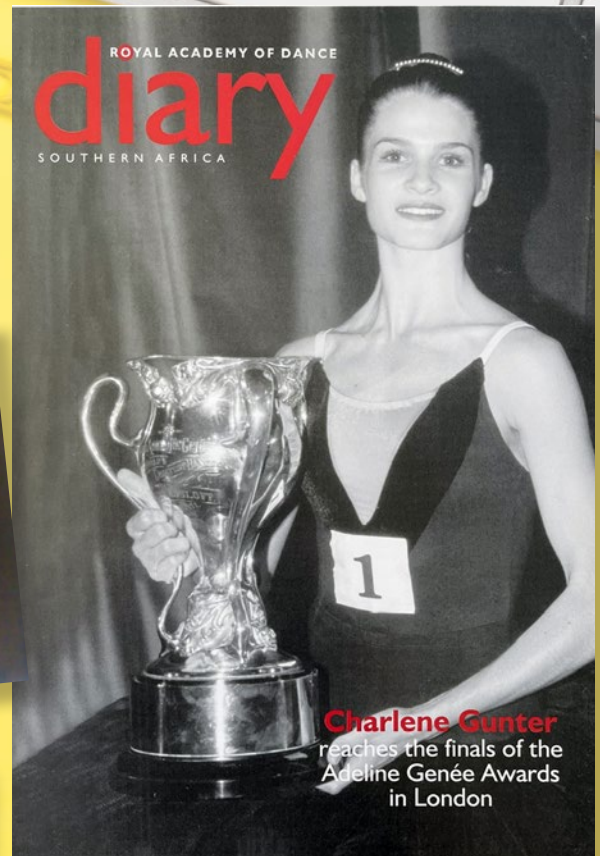
Marketing Manager

Gentry, a full-time project coordinator, built and manages the IPCEF website, marketing, and events for IPCEF. She also manages all platforms relating to the brand/image, and maintains the new Careers in Electronics website.



Team Fun Facts

Charlene is a classically trained ballet dancer who, at age 18, represented South Africa in the Adeline Genée Ballet International Competition in London.



Charlene Gunter reaches the finals of the Adeline Genée Awards in London



Wendy has two sets of twins—her 16-year-old sons and her twin rescue dogs, Ginger and Storm.

Gentry has hiked to Everest Base Camp in Nepal.





SummerCom 2023

By Teresa Rowe, IPC Senior Director, Assembly and Standards Technology

Energized. Engaged. Exhausted.

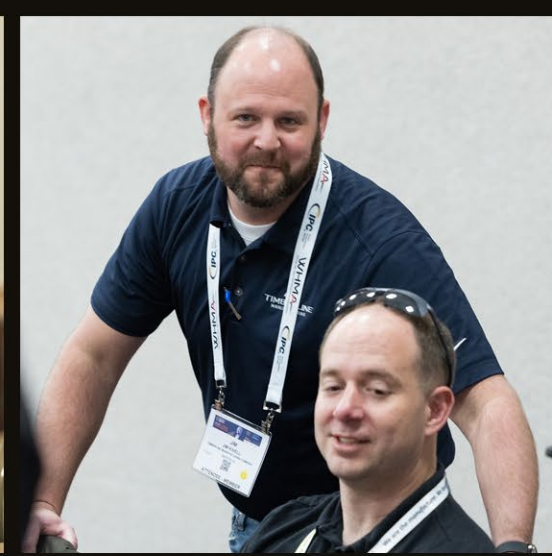
These are just a few of the words that come to mind when looking back on IPC SummerCom 2023 in May. We did a lot of work, had a little fun, and recognized the hard work and hours that go into standards development.

With seven days of standards development meetings—co-located with the Electrical Wire Processing Technology Expo (EWPTTE), a trade show for the electrical wire harness, wire and cable processing industries—there was, once again, confirmation that even with the ease of teleconferencing, bringing technical

experts together in person is an opportunity for groups to immerse themselves in development with minimal distractions.

Getting the Job Done

More than 90 task groups, A-Teams, training committees, and special project teams met during SummerCom in Milwaukee, Wisconsin. Discussions covered a broad range of topics that included reviewing cutting-edge technologies, resolving comments submitted by industry, and discussing current and future projects. Both long-time committee members and attendees new to standards development



brought different perspectives and ideas to the table. This is important because technology changes, tribal knowledge can be lost, and it's important to hear both sides when making decisions.

Several task groups met important milestones that will allow their proposed standards to move to Final Draft for Industry Review while others completed comment resolution and are headed to ballot. Leaders and staff work hard to reach those milestones. IPC's Status of Standardization provides the latest information on documents in the development cycle. Click [here](#) to see the updates.

And the Winner Is...

SummerCom was also the location for the Third Annual Golden Gnome Awards, an opportunity to celebrate the accomplishments of A-Teams and their volunteers who are working on specific topics or activities within standards and training program development. We had fun with our "Top Gun" theme, even down to a Golden Gnome statue with a volleyball and aviator sunglasses. We invited everyone who attended to dress in formal attire

and treat this event for what it's really about: Showing deep respect and appreciation for the hard work that goes on in standards development.

The evening was an opportunity to socialize with colleagues, experience a one-of-a-kind awards ceremony, and toast the winners. Dave Bergman, IPC vice president of standards and technology, was master of ceremonies and kicked it up a notch when he performed with Tin Whiskers, the cover band entertainment for the evening.

Winners in 17 categories took home Golden Gnome honors that recognized their contributions in categories such as A-Team Name of the Year, Designer-Top Contributor, Rookie of the Year, and A-Team Member of the Year.

A-Team members who attended the event voted for the winner of the new Gnomes Choice Award, and competition for the coveted gnome was fierce. Everyone received a swag bag with collectibles and crafts, made by the IPC technical staff, that will keep the fun going throughout the year. To conclude the event, Dave Bergman offered a toast to the winners. 🏆





2023 Golden Gnome Award Winners

Clumpy Category

A-TEAM NAME OF THE YEAR

5-22A-7-31B-AT

Looks Like a Hangover

IPC WORKS LEADERBOARD

Tiberiu Baranyi, *Flextronics Romania SRL*

WORKER BEES OF THE YEAR

D-75-AT1

The Terminators

HIGH-FIVE

- Michael Ford, *Aegis Software UK*
- Symon Franklin, *Custom Interconnect Ltd*
- Jan Pedersen, *NCAB Group AB*
- Ekaterina Stees, *Lockheed Martin Missiles & Fire Control*
- Debbie Wade, *Advanced Rework Technology*

GNOMETASTIC

Christina Rutherford,
Honeywell Aerospace

GNOME'S CHOICE

Randy Bremner,
Northrop Grumman

Klumpios Category

EDITOR OF THE YEAR

Scott Meyer, *Collins Aerospace*

EMERGING ENGINEER AWARD

Tyler Siebert, *Lockheed Martin Missiles & Fire Control*

GUARDIANOME

- Symon Franklin, *Custom Interconnect Ltd*
- Garry McGuire, *NASA Marshall Space Flight Center*

GLOBETROTTER AWARD

- Tiberiu Barnyi, *Flextronics Romania SRL*
- Michael Schleicher, *Semikron Elektronik GmbH Co. KG*

ROOKIE OF THE YEAR

Xu Lu, *Apple*

GNOME SPIRIT AWARD

- Joe Geiger, *Bally Ribbon Mills*
- Milea Kammer, *Honeywell International*

DESIGNER: TOP CONTRIBUTOR AWARD

D-31B-CREEPS-AT
The Creeps

GNOBLE GNOME AWARD

Jim Blanche, *NASA Marshall Space Flight Center*

BEST VISUAL EFFECTS ARTIST

Robert Cooke,
NASA Johnson Space Center

INNOVATOR GNOME

5-26a A-Team

OUTSTANDING A-TEAM MEMBER OF THE YEAR

Tim Pearson, *Collins Aerospace*





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A Gnome Is Born

Some ingenuity and a 3D printer bring the gnomes to life

By Patrick Crawford, Manager, IPC Design Process Standards

A-Teams play such a crucial role in helping standards committees accomplish their goals that IPC established the Golden Gnome Awards Ceremony in 2021 to recognize their contributions. As part of the event, IPC wanted to provide a tangible and meaningful keepsake for award winners to take home.

IPC invested in 3D printers and leveraged their capabilities to create unique and personalized gnome trophies. When a winning A-Team member walks away from the Golden Gnome Awards Ceremony carrying their statue, they're holding a "project" that's equal parts science and design, a symbol of modern technology combined with old-school creativity.

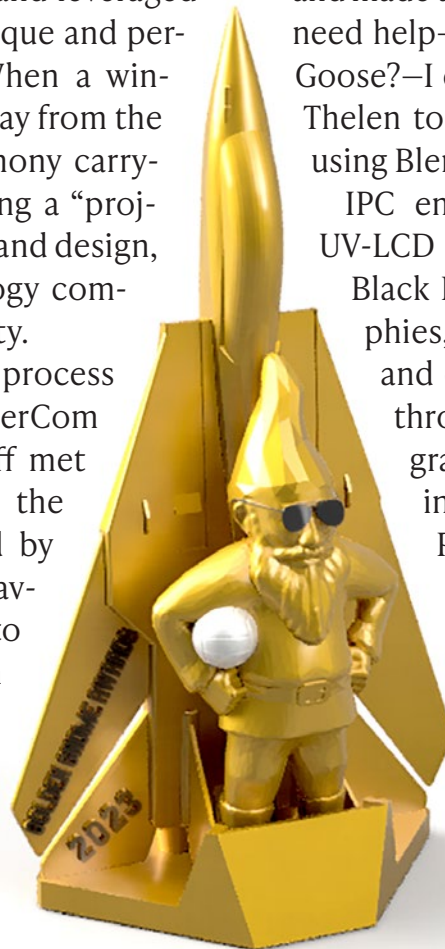
This year's statue design process began shortly after SummerCom 2022 when IPC technical staff met to determine the theme of the 2023 event. Partially inspired by the release of "Top Gun: Maverick," the tech staff chose to fashion this year's celebration after the original Tom Cruise classic. My "top secret clearance" design requirements: the eponymous gnome must have aviator sunglasses, a fighter jet, and a volleyball.

I started with a few preliminary sketches, ruling out the too-

silly, too-complex, and too-time-consuming. Then I used Fusion 360 to build a few CAD models for the tech team's review. To maintain a thread of tradition, I incorporated the same gnome body as the two previous years' designs, but with a different headgear and pedestal. The tech team reviewed my designs and made their final decision. Knowing I would need help—where would Maverick be without Goose?—I enlisted technical team intern Nick Thelen to repair and refine the model mesh using Blender, a 3D modeling tool.

IPC employs three Elegoo Mars 2 Pro UV-LCD printers—Kraken, Nostromo, and Black Pearl—to fabricate the various trophies, badges, challenge coins, key fobs, and other keepsakes gifted and earned throughout IPC departments and programs. Kraken and Nostromo reside in Crestwood, Illinois, while Black Pearl lives in Sant Pol de Mar, Barcelona, Spain, under the care of Fran Fourcade.

Although 3D printers come in many variants for commercial purposes, only two types are realistically available for home users: Fused Deposition Modeling (FDM) and photopolymer resin-based systems. Kraken, Nostromo, and Black Pearl are examples of photopolymer resin-based printers



A prototype.



Kraken and Nostromo were two of the 3D printers used for the gnome project.

that work by curing liquid photopolymer resin with 405-nm UV light, layer by layer.

Unlike FDM printers that build models by fusing material onto lower, previous layers, photopolymer resin systems usually create models by dipping the build-plate into a bath of resin. UV light shines through the bath and onto the build-plate, curing layers one at a time. The Mars 2 Pro is an LCD-based system, which uses a monochromatic LCD screen to create “masks” that permit UV light into the resin bath, following the image corresponding to a “slice” of the prescribed model.

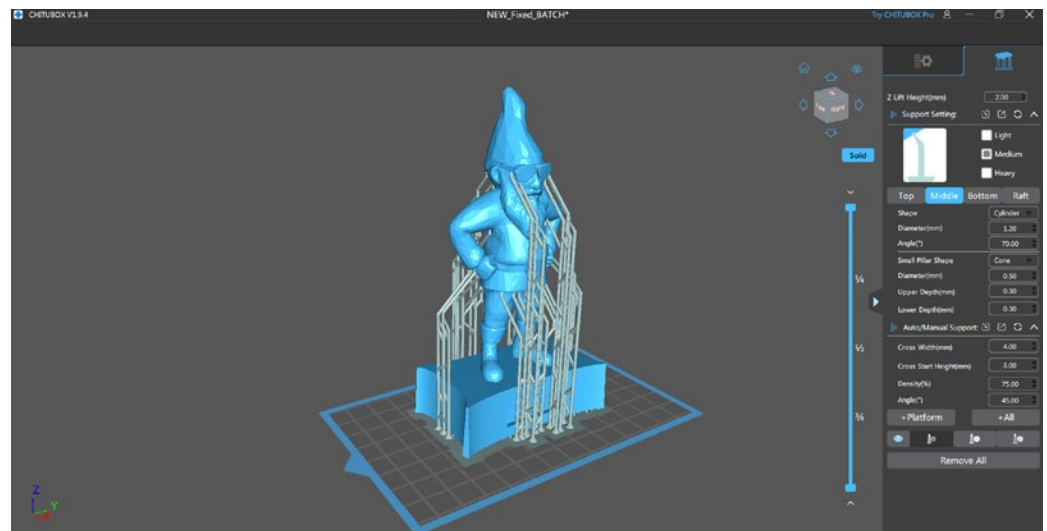
Once a model is created in a CAD tool, it needs to be converted into slice images, which is done through specialized slicing software. For the Mars 2 Pro printer, a proprietary slice format is created using Elegoo’s Chitu-Box software. Chitu-Box also generates

the support geometry required to reinforce complex models. However, sometimes I use an additional slicing tool called PrusaSlicer to pre-build supports before importing the model into ChituBox, but it depends on how detailed or specialized the supports need to be.

The Mars 2 Pro can produce layers between 0.01-mm and 0.05-mm thick, and the per-layer curing time is less than two seconds, making it an ideal method for fabricating models faster and cheaper than if we relied on a third-party service.

As any designer or engineer can attest, creating a finished product often requires a lot of trial and error. In early January, I began testing my new gnome design, knowing “there would be no points for second place.” Fortunately, I had plenty of time to spare, but I soon discovered that the supports needed for the trophy were too fragile and difficult to remove from the build-plate without damaging the entire model.

Like Maverick striking out with “Charlie,” I needed to re-think my strategy if I wanted to succeed. I attempted various removal techniques and printing parameters, finally concluding it would be better to revert to a simpler and easier-to-print trophy model. By removing the jet from the trophy, I reduced the number and thickness of supports needed. By doing



The ChituBox interface.

so, I also reduced the amount of resin used, and therefore the cost of material to print the trophy.

After yet another month of troubleshooting, I was ready to begin printing gnomes. The trophy would consist of three parts: the gnome body and pedestal, a name plaque, and a volleyball. Each print produced three gnomes, and with three printers working simultaneously, we built the required 38 gnomes in no time. To streamline the process, we printed the name plaques separately from the gnome bodies, which made it easier to mass produce the gnome bodies without needing recipient information.

Funny enough, those little gnomes are temperamental. The 3D printers must be kept between 68–78°F throughout the printing process because of the water-washable resin we use for printing. However, the weather in Chicago can be unpredictable, with wide fluctuations in temperature and humidity. To counteract this, I constructed an enclosure with a built-in heater to regulate the temperature. My efforts paid off.

We prefer water-washable resin for our application as it eliminates the need for large amounts of solvent to clean the prints. Ingenuity to the rescue: I used a storage bin, a pond circulation pump, and an old



The two separate pieces.



An enclosure built to regulate the temperature of the gnomes.



Water-washable resin is used for application.



The UV chamber allows for fast curing of prints.

dresser to build an effective rinse station for the prints.

Each print undergoes a final UV-curing cycle to complete the process. Elegoo offers a UV chamber that bathes the print in 405-nm light from all sides. Although the duration of the curing theoretically depends on the surface area of the model being cured, I found that a three-minute curing duration was sufficient for our trophies this year.

After post-processing, each golden gnome—as their name suggests—was treated to three coats of gold-metallic spray paint. To add interest, the gnomes’ aviator sunglasses and name-plate details received a coat of black paint via an alcohol-based paint pen, and the volleyballs were treated to a single coat of white spray paint, as the white resin made multiple coats unnecessary. The components were assembled using CA-glue.



The spray paint cabinet.


With the statues completed, each was cradled in copious amounts of bubble wrap and sent off to SummerCom 2023 in Milwaukee, Wisconsin, where deserving A-Team members would receive their special tribute.

While the process of printing gnome trophies may seem insignificant compared to the work of A-Teams, I believe it’s an important part of recognizing and celebrating their contributions. Golden gnome, you can be my wingman anytime. 🌈

IPC Instructor-led Training Schedule

IPC's instructor-led courses provide a personalized learning experience for highly technical material focused on PCB design and electronics manufacturing. Our instructors are active members of the industry community and have years of hands-on experience developing and manufacturing electronic products.

Since IPC introduced instructor-led courses, hundreds of engineers have benefited from in-depth discussions with our instructors and their colleagues also taking the course. Our instructors go above and beyond to ensure an understanding of the material by providing technical guides and meeting with students during office hours in addition to the virtual classes. Plus, all lectures are recorded for review.

Visit my.ipcedge.org to secure your spot and start learning in 2023. If you're interested in teaching a course, contact KellyAllen@ipc.org or tell us about your expertise at go.ipc.org/sme. 

Course Name	Dates	Days	Time GMT	# Weeks
July 2023				
An Introduction to PCB Design Engineering	July 10 – July 26	M/W	3 PM GMT	3
Top Lead-free Production Defects & Issues – Causes, Remedies & Prevention	July 11 – July 20	T/TH	3 PM GMT	2
High Density Interconnect (HDI) Enabling Technology for Advanced Packaging	July 11 – July 20	T/TH	10:30 PM GMT	2



Course Name	Dates	Days	Time GMT	# Weeks
Aug–Sept 2023				
PCB Design I	Aug 7 – Sep 14	M/W	4 PM GMT	6
PCB Design for Radio Frequency (RF) Boards	Aug 7 – Sep 14	M/W	11:30 PM GMT	6
PCB Design II	Aug 8 – Sep 28	T/TH	4 PM GMT	8
PCB Design for Rigid-flex Boards (F/RF)	Aug 8 – Sep 14	T/TH	11:30 PM GMT	6
PCB Design for Manufacturability	Sep 12 – Sep 28	T/TH	5 PM GMT	3
Advanced Troubleshooting & Defect Analysis	Sep 12 – Oct 5	T/TH	11:30 PM GMT	4
Certified Electronics Program Manager	Sep 26 – Nov 2	T/TH	10:30 PM GMT	6
Oct–Nov 2023				
PCB Design II	Oct 9 – Nov 29	M/W	4 PM GMT	8
PCB Advanced Design Concepts	Oct 9 – Nov 29	M/W	11:30 PM GMT	8
PCB Design I	Oct 10 – Nov 16	T/TH	4 PM GMT	6
PCB Design for Military, Aerospace & Other Extreme Applications	Oct 10 – Nov 16	T/TH	11:30 PM GMT	6
Advanced Troubleshooting & Defect Analysis (EUROPE)	Oct 24 – Nov 16	T/TH	5 PM GMT	4
Reliability of Electronics—Role of Intermetallic Compounds	Nov 7 – Nov 9	T/TH	4 PM GMT	1

I'M NOT HERE
TO BE
AVERAGE
I'M HERE
TO BE
AWESOME

o1E Benchmark



A Pilot Program Soars

By Michelle Te

With plants in Tijuana and Guadalajara, Mexico, that staff more than 3,000 employees, Benchmark has a continual need for training and certification to stay competitive. Through a unique partnership with IPC, the company was able to train nearly 100 operators and engineers through a pilot program that saved them money and elevated the knowledge base of their workforce.

In this interview, Elizabeth Magana, a regional human resources director for Benchmark, Lorena Villanueva, IPC director of Mexico, and Carlos Plaza, IPC senior director of education development, detail the pilot program and how it serves as an example of training success in electronics manufacturing.

Can you tell us about Benchmark's presence in Mexico?

Elizabeth Magana: Benchmark has been in Mexico for over 20 years. We manufacture or assemble high-reliability products for large-scale integration, system build to order, PCB assemblies, cable harnesses, and more. We serve key market sectors including complex industrial, defense, and commercial aerospace.

What does your typical onboarding effort look like? How are you getting new hires up to speed?

Elizabeth: We have a robust training program for each of our sites. We have a training team onsite that focuses not only on the production training, but also on company policies, procedures, values, etc.

You were introduced to IPC's training programs through Lisa Weeks, a former IPC board member and Benchmark executive. What intrigued you to pursue it further?

Elizabeth: In discussing this with our regional leader, we knew that we had some areas of opportunity when it came to knowing all that IPC has to offer, and we saw that there were two areas where IPC could be beneficial to us: the engineering group and direct labor, meaning those who assemble the products.

Often, we find there is confusion on even how to assemble the products to IPC specifications, and there are many conversations that take place between quality engineering and manufacturing, as well as with the assembly teams.

We determined that we would run 44 operators through Electronics Assembly for Operators (EAO), and 25 engineers through Electronics Assembly for Engineers (EAE). We let each site determine who those people would be. Because it's a pilot program, we didn't





The facility in Tijuana, Mexico.

focus on things like seniority or experience, but rather on who would most benefit from the IPC training. Both groups went through the same training no matter their level of experience.

Lorena, how were the courses designed and offered?

Lorena Villanueva: These courses were designed and approved by the industry. EAO is offered fully in Spanish, which was huge for Benchmark because it's very hard to find operators who are bilingual. The classes are self-paced and online. Benchmark provided the computers and gave the employees the opportunity to go through one or two modules at a time.

Did you find equally positive or negative feedback on the types of courses offered?

Elizabeth: We had almost 100% positive results from both groups. Even though some of the participants were more familiar with instructor-led types of instruction, they understood the value of the material they were learning.

Obviously it feels good to have such great feedback. In what other ways did you use those results?

Elizabeth: The training helped them look back at some of the mistakes they made with certain products; maybe it went to scrap because they

couldn't figure out how to do X, Y, or Z. Now, after taking the training, they went back to work and saw how they could fix things moving forward. The engineering group's feedback was that they learned a lot, and that the course would be useful to colleagues in management roles in the organization.

Sometimes management won't be as open to training because it takes staff off the shop floor, it can be expensive, and the results are hard to measure.

How did Benchmark approach this?

Elizabeth: We didn't have resistance, but when this was rolled out, we were still dealing with COVID and other global issues such as lack of materials, long lead times, and planning for headcount. So, when we asked managers to participate in the pilot, they had to consider their existing challenges when making a commitment.

Speaking of managers, who participated in the Certified Electronics Program Manager (CEPM) course?

Elizabeth: We only had one director of program management who took the CEPM training at one of our big sites in Tijuana. Program managers manage customers and projects. Once this director completed IPC's CEPM course, she expressed to Lorena that she wanted to take both the operator and engineering courses. She just wanted to learn as much as she could. She

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believes that not only should other program managers take the CEPM course, but other management and the general manager as well.

Like the others, she said the course helped her think back about how she could better solve customers' problems. She's already very experienced in what she does, so I think that's very powerful.

How do you feel about this IPC training program?

Lorena: We can't wait to replicate this with our member companies in Mexico. It surpassed all our expectations and only confirmed what we already knew—that our training programs help our customers succeed. We want to share this as much as we can and for other companies in Mexico to see the benefit of this type of training.

Elizabeth: Having Lorena to lead the effort made such an impact. She took the time to fly to the cities with our facilities and meet me there. We have the books and work instructions to show us how to do things, but when Lorena was there to get the program started, it made a big impact.



Carlos Plaza: IPC creates Spanish language training because we know it's needed in that market. One of the main reasons we were able to do this pilot program was because we had recognized the need for Spanish language training and developed our operator training courses in English and Spanish. IPC also offers 14 of our most popular standards in Spanish. We're committed to helping the industry in Mexico.

This matters because we see more companies from overseas, such as China and Europe, building operations in Mexico. This can make it even harder to find trained staff, so that's exactly what these courses are developed for. 🇺🇸🇪🇺



IPC WINTERCOM

STANDARDS DEVELOPMENT COMMITTEE MEETINGS

January 22–25, 2024

Barcelona, Spain

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The Fabric of Our Lives

IPC E-Textiles Committee A-Teams are bringing much-needed standards to this innovative technology space

By Chris Jorgensen, Director, IPC Technology Transfer

The e-textiles industry recognizes IPC as a leader in standards development for the greater electronics industry, and in 2017 asked IPC for assistance to develop global standards for materials, design, and manufacture of e-textiles. Volunteers quickly adapted to IPC's processes by integrating themselves into the fabric (pun intended) of IPC's global standardization efforts.

There are now eight task groups under the IPC E-Textiles Committee that are developing standards and many new IPC Test Methods for conductive yarns; woven, knitted, braided, and embroidered e-textiles; printed

electronics e-textiles; and even wearable e-textiles systems. The IPC E-Textiles Committee was among the first to embrace IPC's A-Teams approach, where dedicated groups of volunteers from an originating task group take on the lion's share of the work for their task group.

The first A-Team came together in 2018 and, from a list of topics identified by their subcommittee—IPC-8921, *Requirements for Woven and Knitted Electronic Textiles (E-Textiles) Integrated with Conductive Fibers, Conductive Yarns and/or Wires*—became IPC's first published e-textiles standard.



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Inspiring Innovation

That A-Team's efforts established IPC as a true leader for standards development in the e-textiles industry. As the results of their work became more well known, it attracted more volunteers to form new E-Textiles Committee task groups. These volunteers found IPC to be a fast path: A proposed standard topic could lead to a task group approval, an A-Team formation, and then to starting their projects.

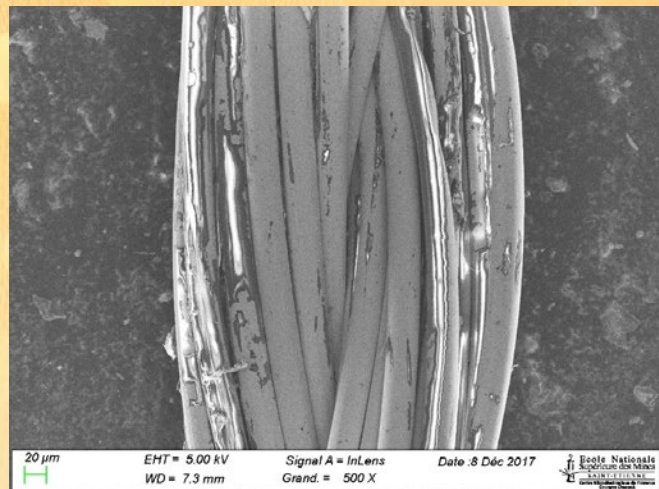
The IPC E-Textiles Committee now represents IPC's global footprint with eight A-Teams, all actively engaged in different standards projects. A-Team members hail from Belgium, Canada, France, Germany, Malaysia, Pakistan, Sri Lanka, Taiwan, the United Kingdom, and the United States. Each team has embraced IPC's challenge to come up with creative names for their teams. Let's meet the IPC E-Textiles Committee A-Teams and see what they're up to.

Hangin' By a Thread

This A-Team was formed in 2021 to develop the draft for IPC/JPCA-8911, *Requirements for Conductive Yarns for E-Textiles Applications*, a standard developed jointly with the Japan Electronics Packaging and Circuits Association (JPCA). This new standard will identify categories, and establish the classification system, qualification/quality conformance requirements, and test methods for conductive yarns used in e-textiles.

The goal for this standard will be to set a baseline for yarn suppliers to show the electrical, thermal, mechanical, and chemical exposure characteristics of their products so e-textiles integrators and end-product developers will have apples-to-apples comparisons of available yarns for selecting the one most suitable to their needs.

As the A-Team developed the content for the standard, the members realized there is a need for new IPC Test Methods for conductive yarns, so their initial project to develop one standard has been increased to include at least six new IPC Test Methods.



An example of conductive yarn.
(Source: IPC-WP-024, courtesy of ENSAIT)

The work of this A-Team is incredibly important because not only will they establish the first standard for conductive yarn, but other IPC standards being developed by A-Teams will have a best reference for specifying conductive yarns in their own standards.

This A-Team comprises both IPC and JPCA volunteers who have been utilizing IPC Works to develop this new standard. IPC Works is the intranet site all IPC working groups use for their standards development projects.

The team is led by Joe Geiger of Bally Ribbon



Showing the gnome spirit during
Gnomeapalooza 2022.
(Left to right) Joe Geiger, Big E. Gnome.

Mills (Bally, Pennsylvania), one of our many IPC A-Team members who capture the spirit and camaraderie of what it means to be on an IPC A-Team. He even took a selfie with “Big E. Gnome” during a meeting break at Gnomepalooza 2022 (our annual A-Team working meetings), and received his first award during the 2023 IPC Golden Gnome Awards.

The Fabricators

This A-Team formed around the same time as Hangin’ By a Thread to work on the revision of IPC-8921, IPC’s first published e-textiles standard. IPC-8921 establishes the classification system as well as qualification and quality conformance requirements affecting the electrical/electronic performance of woven, knitted, and braided e-textiles integrated with conductive yarns and/or wires. This revision will reference an additional 15 new IPC Test Methods for e-textiles durability and exposure, which are being developed by The Terminators as part of their work on IPC-8981 (more on that to follow).

The development of those new IPC Test Methods are critical to the advancement of IPC-8921A because it will reference many, if not all, of those new methods. A-Team leader Sahar Rostami of Myant (Toronto, AB, Canada) has been very active in developing many of those draft methods.



Sahar Rostami taking the charge for The Fabricators.

Smarties and The Terminators

Now, about those 15 new IPC Test Methods...

In 2020, Smarties A-Team was formed to undertake the development of IPC-8981, *Quality and Reliability of E-Textiles Wearables*, which will establish required testing and reliability expectations for e-textiles wearables products. This standard will set testing requirements for mechanical and exposure characteristics that would apply to e-textile wearables systems. These include exposure to acid, microbes, salt water, perspiration, and alkali; endurance to abrasion, stretch, torsion, and flexing; and washability.

For almost two years, Smarties volunteers developed content on each of the characteristics, including an explanation of each, a test procedure if no test standards existed (Guess how that went?), and proposed product performance expectations based on the IPC Classes. When that group completed its work in mid-2022, another A-Team called The Terminators was formed to “terminate” the remaining action items so the draft IPC-8981 and its 15 IPC Test Methods could be available for industry.

Thanks to the efforts of Smarties and The Terminators, which are led by Vladan Koncar



Examples of woven (top) and braided (bottom) e-textiles. (Courtesy of ENSAIT)



Electrodes for wearables systems.
(Source: ENSAIT)

of ENSAIT-University of Lille (Lille, France), and Sigrid Rotzler of the Fraunhofer Institute for Reliability and Microintegration IZM/ Technical University Berlin (Berlin, Germany), all 15 of those new IPC Test Methods and IPC-8981 can be submitted to E-Textiles Committee task groups. Their high level of volunteer activity moved this project along quickly.

As testimony to their work ethic, Smarties won the 2022 Golden Gnome Award for Worker Bees of the Year. Sigrid, Vladan, and



Smarties members with their 2022 Golden Gnome Award for Worker Bees of the Year.
(Left to right) Shahood uz Zaman, Vladan Koncar, and Sigrid Rotzler.

Shahood uz Zaman (from Smarties) accepted the award on behalf of their A-Team. Not to be outdone, The Terminators took home the same award during the 2023 Golden Gnome Awards.

Wearablist

In 2021, about a year into the Smarties' initial work on IPC-8981, the team began to realize that much of the draft content on the various characteristics would be too much information for the requirements standard. They did not want to lose the knowledge being provided by team members, so Wearablist was formed to take the overflow content from IPC-8981 and use it as a starting point for a potential guideline on e-textiles wearables. If Wearablist could curate enough content for a guideline, in addition to the overflow content, then Vladan Koncar, the D-70 Committee chair, would approve moving forward with a Project Initiative (PIN) form to get official approval from TAEC for this new standard.

In less than a year, Wearablist had a 72-page working draft; the PIN was submitted, and the project approved for IPC-8961, *Guideline on E-Textiles Wearables*. Led by Paula Veske of Ghent University/imec (Ghent, Belgium), and thanks to the strong contributions from other Wearablists, this draft document is now more than 100 pages and continues to grow.

When Wearablist completes its work (planned for January 2025), IPC-8961 will be a valuable standalone resource for anyone interested in the design and manufacture of e-textiles wearables as well as a document to provide guidance and additional information on the characteristics and testing of IPC-8981.

Traceblazers and Inkpendables

In late 2022, the second and third IPC e-textiles standards and the first IPC Test Method for e-textiles were published for the industry. IPC-8952, *Design Standard for Printed Electronics on Coated or Treated Textiles and*

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Paula Veske is leading Wearablist to early successes.

E-Textiles, establishes the requirements for the design of printed electronics and their forms of component mounting on coated or treated textile substrates. IPC-8952 references the other new e-textiles standard, IPC-8971, *Requirements for Electrical Testing of Printed Electronics on Textiles*, as well as a new *IPC Test Method, Conductor Temperature Rise Due to Current Changes in Conductors for Printed Conductor Materials on Textiles*.

These two standards are excellent examples of how A-Teams—even those from other committees—can spur standards development. Unlike the preceding A-Teams we’ve mentioned, Traceblazers was able to use the work of the Inkpendables A-Team from the D-60 Printed Electronics Committee, which developed and managed IPC-2292 and IPC-9257, the design and electrical testing standards for printed electronics on flexible substrates. Traceblazers, led by Pratyush Rai of Regeneron (Tarrytown, New York), used those two standards as starting points to revise requirements for printing on flexible substrates to be suitable for textile substrates, enabling them to focus their time and energy on developing entirely new requirements specific only



Traceblazer in a tweed blazer: Pratyush Rai.

to textile substrates (e.g., printing over seams and stitching).

Additionally, since Inkpendables was working on Revision A of IPC-2292 at the same time Traceblazers was working on IPC-8952, both teams fed information on their content changes and additions to one another. This led to improvements in both standards.

Pratyush is now leading a new project to develop a standard for quality and reliability of printed electronics on coated and treated textiles and e-textiles, so we expect a new A-Team to form.

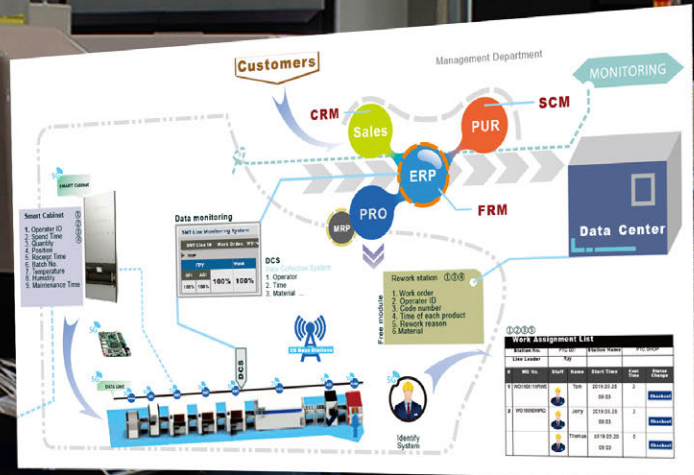
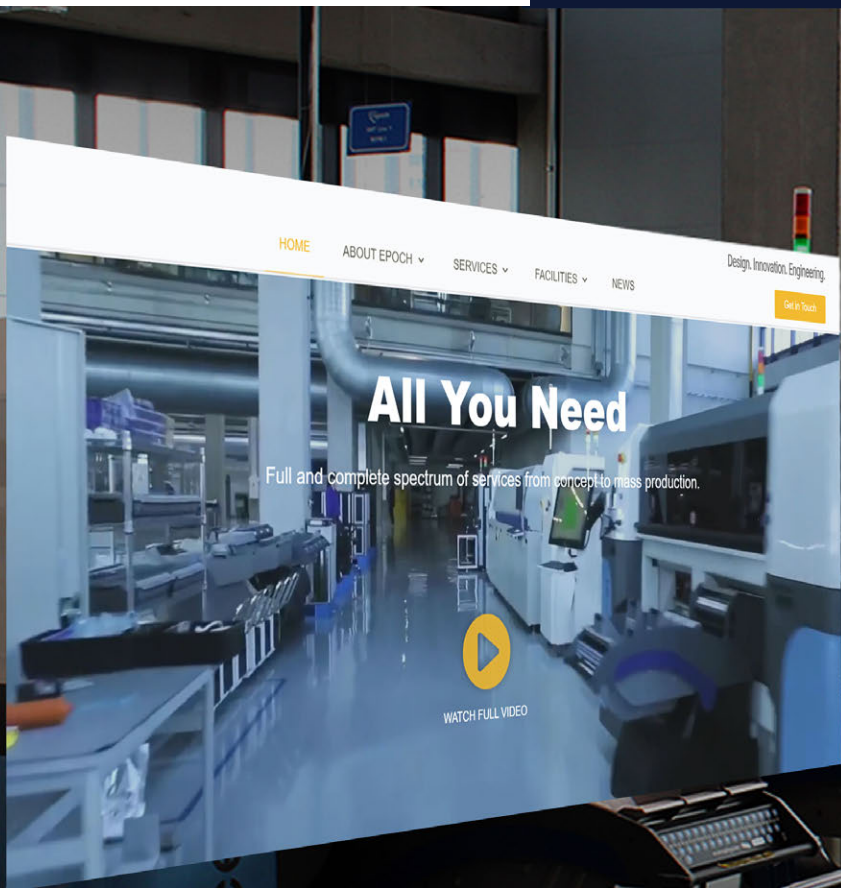


Printed electronics e-textile.
(Source: IPC-WP-025, courtesy of Loomia)



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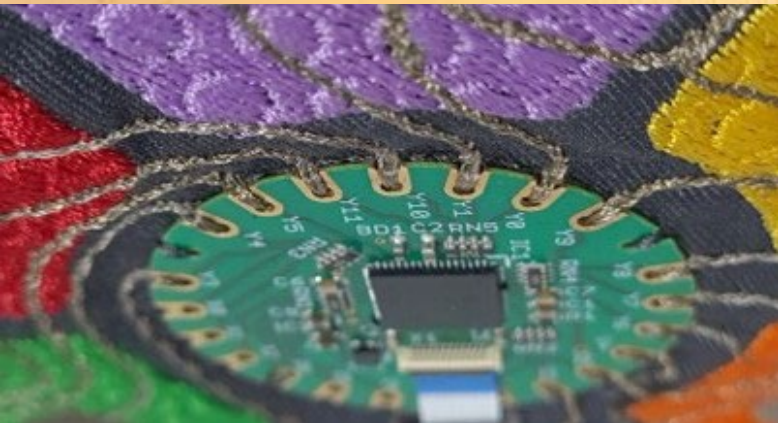
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Printed board assembly embroidered into e-textile system. (Source: ZSK Technical Embroidery Systems)



Ready to lead the EmbrEos: Melanie Hoerr.

EmbrEos

This provides the perfect segue to the newest A-Team in the committee, the EmbrEos, a name which signifies both embroidery of electronic (or conductive) yarn and being the newbie A-Team on the committee.

Last year, when an interest group was formed under the D-70 Committee to debate standards for embroidered e-textiles, they considered many potential standards topics but landed on a design standard. They chose the design standard because, after reviewing IPC-8952, they were able to make many connections between design requirements for

printed electronics and embroidery, as they are both additive manufacturing processes.

As a result of their work, the TAEC earlier this year approved the formation of a new task group to begin work on IPC-8953, *Design Standard for Embroidered E-Textiles*. Similar to IPC-8952, this standard will establish design requirements for embroidered e-textiles.

Soon after the approval of the project, the task group chair, Melanie Hoerr of ZSK Technical Embroidery Systems (Krefeld, Germany), formed EmbrEos to begin the development of this new draft standard. 🌈

How You Can Get Involved

From just one A-Team, so many IPC e-textiles standards projects have popped up, and the committee expects additional projects ahead. We need volunteers to form new groups and A-Teams on topics that include high-voltage applications, automotive, and load measurements for athletics, among others.

If your company is involved with e-textiles technologies, consider joining one of these A-Teams. If you have an overall interest in the technology, consider joining the task groups for these A-Teams. Those task groups are always looking for perspectives from others in the greater electronics industry, and you will have the opportunity to weigh in on the draft standards through IPC's commenting process.

Visit the IPC E-Textiles Initiative Website

Many of our A-Team members and their colleagues have created brief educational videos about e-textiles materials, manufacture, and reliability, available on demand.

A-Teams are supported by dozens of volunteers from around the world. Click on "A-Team Member You Should Know," where we periodically post member profiles.

If you have interest in joining these efforts or learning more about how IPC is working with the E-Textiles Committee to build electronics better, contact ChrisJorgensen@ipc.org.

Access the IPC E-Textiles website here.

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Standards Update

Newly Published Standards/Revisions

IPC-9797A

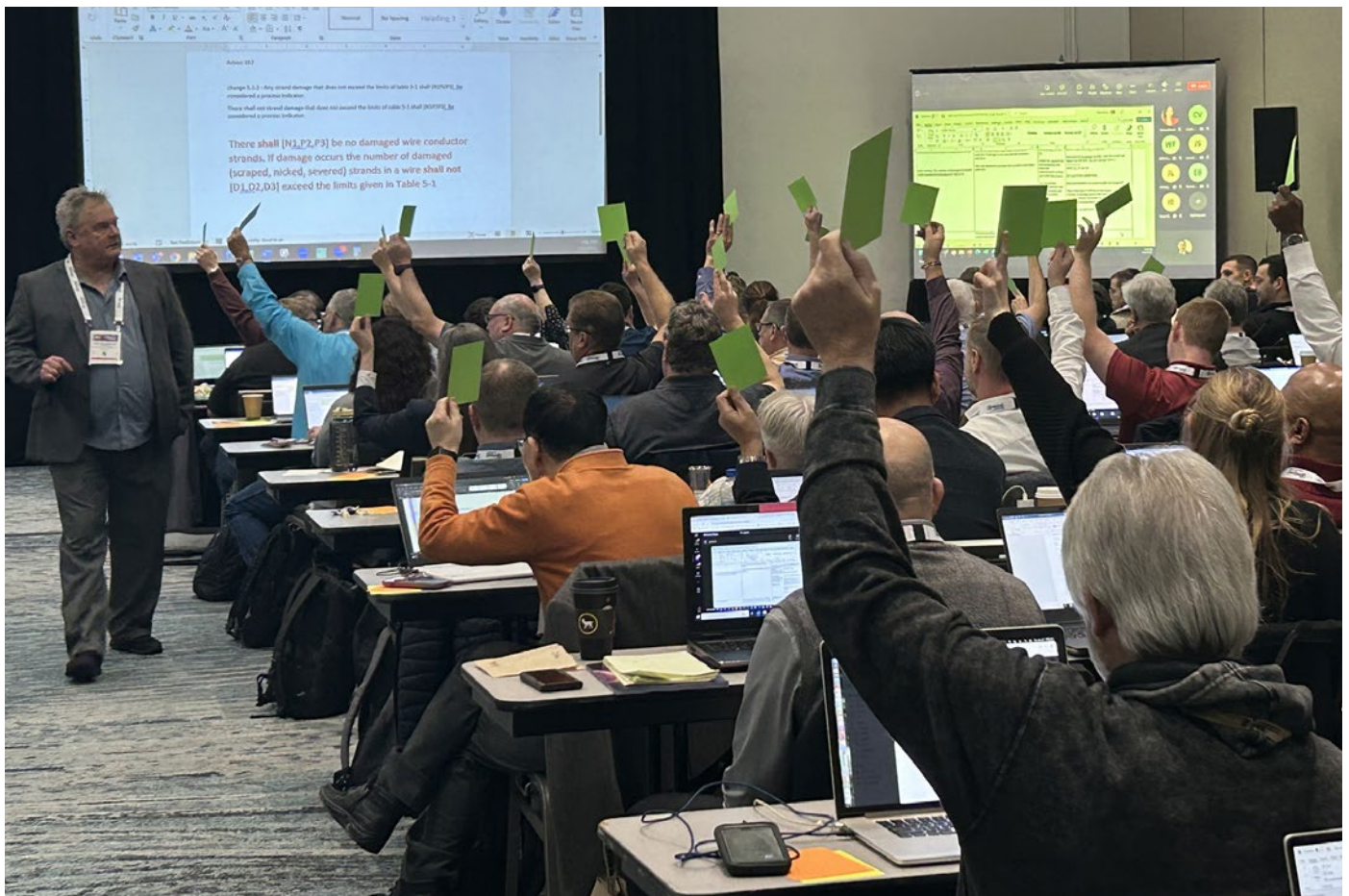
Press-fit Standard for Automotive Requirements and other High-Reliability Applications

IPC-9797A is the only industry-consensus standard for requirements and acceptance of press-fit pins. IPC-9797 describes materials, methods, tests, and acceptance criteria for solderless press-fit pin connections.

IPC-1791C

Trusted Electronics Designer, Fabricator and Assembler Requirements

IPC-1791C 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.



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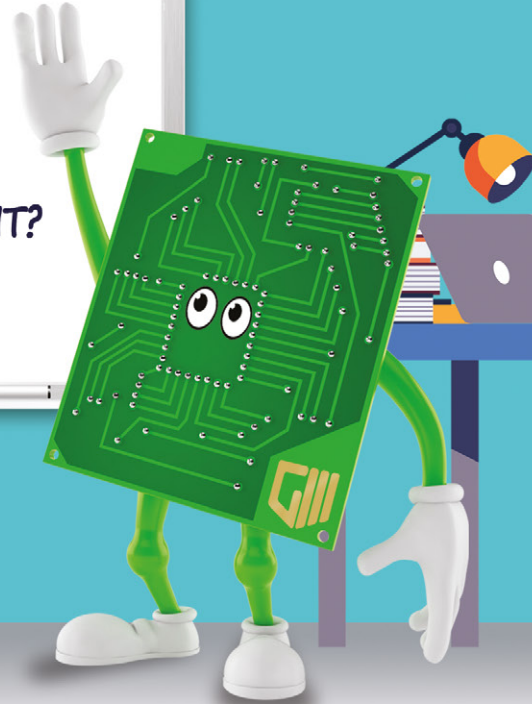
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IPC-1792

Standard for the Management and Mitigation of Cybersecurity Incidents in the Manufacturing Industry Supply Chain

IPC-1792 establishes requirements for companies to provide assurance that their products have been manufactured in cybersecure environments, ensuring that there has been no risk of impact to the product due to any cybersecurity incident. IPC-1792 requirements specify actions that need to be taken if a cybersecurity incident is detected, identifying all possibly affected products.

IPC-2591

Version 1.6, Connected Factory Exchange (CFX)

IPC-2591, Version 1.6 establishes the requirements for the omnidirectional exchange of information between manufacturing processes and associated host systems for assembly manufacturing. IPC-2591 Version 1.6 applies to communication between all executable processes in the manufacture of printed board assemblies, automated, semiautomated and manual, and is applicable to related mechanical assembly and transactional processes.

IPC/WHMA-A-620E

Requirements and Acceptance for Cable and Wire Harness Assemblies

IPC/WHMA-A-620E is the only industry-consensus standard for requirements and acceptance of cable and wire harness assemblies. IPC/WHMA-A-620E describes materials, methods, tests, and acceptance criteria for producing crimped, mechanically secured and soldered interconnections and the related assembly activities associated with cable and harness assemblies.

IPC-9203A

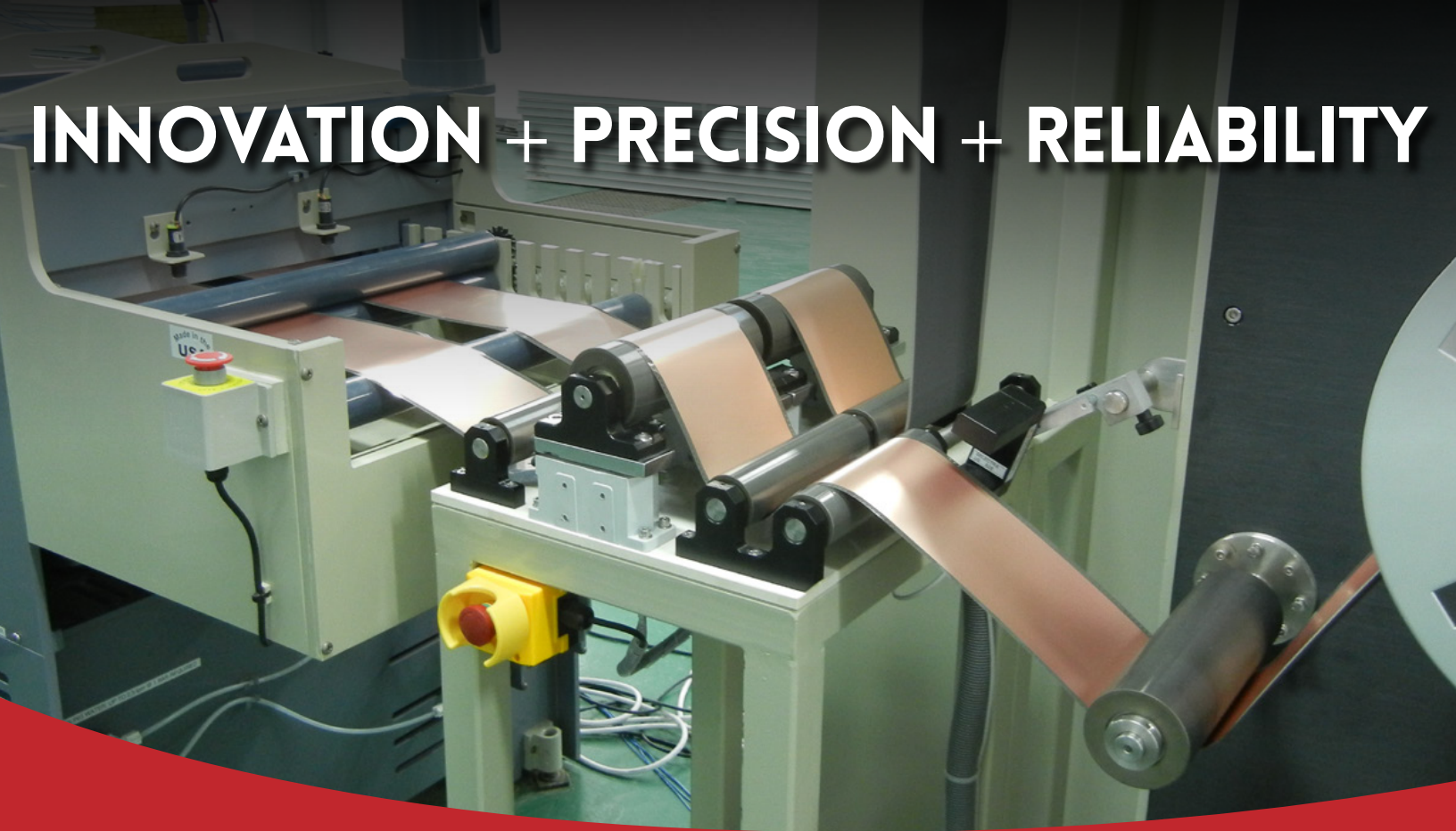
Users Guide to IPC-9202 and the IPC-B-52 Standard Test Vehicle

While there are a variety of industry test vehicles for the examination of material compatibility, the IPC-B-52 test board was created to meet the needs for testing both ion chromatograph and surface insulation resistance (SIR), which would be more representative of the manufacturing materials and processes. IPC-9203A standard addresses the IPC-B-52 test vehicle, which can be used to evaluate a manufacturing process, or to provide objective evidence that a chosen manufacturing material set and process are compatible, from a cleanliness standpoint.



To view a complete list of newly published standards and standards revisions, translations, proposed standards for ballot, final drafts for industry review, working drafts, and project approvals, visit www.ipc.org/status.

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Silicon-to-Systems in Europe

IPC hosts inaugural meeting in Brussels

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



Mrs. Eva Maydell

Innovation. Digital and Green Transition. Supply Chain Resiliency. Advanced Packaging. Security. Sustainability. Robust Electronics Ecosystem.

These vital themes were explored on April 13 at a meeting in Brussels organized by IPC for electronics industry leaders and European government officials. The primary impetus for the gathering was to celebrate the imminent passing of the European Chips Act, legislation designed to manufacture semiconductors in Europe to secure supply for Europe's industries. However, there was also an active and vibrant discussion on partnering with the government to strengthen Europe's overall electronics manufacturing ecosystem by enhancing the region's capabilities and capacities through a "silicon-to-systems" approach.

Fifty influential individuals representing 31 companies and three important Directorate-Generals of the European Commission

were treated to forward-looking keynote addresses by Mrs. Eva Maydell, member of the European Parliament, and Dr. Francisco Ibanez, microelectronics subject matter expert at the European Commission. There were two industry panel discussions, one focused on technology and the other focused on the market.

Matt Kelly, IPC chief technology officer and VP of technical solutions, moderated a discussion, titled "Building Leadership in Semiconductor Packaging," with key technologists Jose Silva from Amkor, Hannes Voraberger from AT&S, Chris Scanlan from Besi, and Rolf Aschenbrenner from Fraunhofer. Some of the key points expressed were:

- Splitting the system-on-chip into multiple, smaller chiplets, and then connecting them within the package utilizing advanced chip-to-wafer die attach, is an optimal solution to counter the slowing of Moore's law.
- Scaling capabilities and high-speed interconnection can be achieved with advanced IC substrates and packaging.
- OSATs can serve as cost-effective building blocks for back-end semiconductor packaging and test.
- Trends show that the gap between the wafer fab and system level is narrowing.
- There is strong commitment to having a Pan-European pilot line facility to support advanced heterogeneous system integration (AHSI).



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I moderated a discussion titled, “State of the PCB and EMS Industries,” with key executives Thomas Michels from ILFA, Dirk Stans from Eurocircuits, Marc Achhammer from Katek Group, and Xaver Feiner from Zollner. Some of the key points expressed were:

- Industry and the government should work together more closely to re-align policies, and to address vulnerabilities in critical technologies like printed circuit board and printed circuit board assembly, by identifying measures that ensure greater resilience.
- Having a continuous pipeline of competent and trained workers remains one of the electronics industry’s biggest challenges.
- Europe is falling behind on incentivizing R&D and capital in back-end segments.

One of the truly unique features of this meeting was the incredible attendance and enthusiastic participation across the entire

value chain. Different phases were well represented by prominent organizations:

- **OEMs:** Siemens, Continental
- **Semiconductors:** Intel, NXP
- **OSATs:** Amkor, ASE
- **Equipment:** ASML, Besi, Viscom
- **Research:** Fraunhofer, IMEC, CEA-LETI
- **EMS:** Zollner, Katek, C-Mac
- **PCB/substrate:** AT&S, Samsung Electro-Mechanics, Unimicron GmbH, Somacis, Elvia, Dyconex, ILFA, Eurocircuits, Polytron-Print, Cistelaier, Elco, ACB
- **Electronics materials:** CCI Eurolam
- **Advanced packaging:** Novapack Technologies
- **National nonprofit:** Estonian Electronics Industries Association
- **Intergovernmental organization:** European Space Agency
- **European Commission Directorate-Generals:** GROW, DEFIS, CNECT

IPC was instrumental in ensuring that the adoption language of the European Chips Act reflects the strategic role of advanced packaging in driving innovation and the transition to digital and green. We applaud the dedicated work of the European institutions on the Chips Act and the upcoming discussions on broader initiatives and funding opportunities to ensure a more competitive, resilient, and sustainable electronics industry in Europe. Our meeting was an important step in IPC’s strategy to expand a European electronics community around a silicon-to-systems approach. 🌈

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Photo credit: U.S. Marine Corps
LCpl Bridgette Rodriguez, 07-07-23

Good News for U.S. National Security

By Chris Mitchell, Vice President, IPC Global Government Relations

In case you missed it, President Joe Biden recently issued a presidential determination that prioritizes the domestic development of printed circuit boards (PCBs) under the Defense Production Act (DPA).

Translation: It is now a tenet of U.S. policy that manufacturing more of the building blocks of modern electronics in the United States is essential to America's economic and national security.

Most people take our modern electronic wonders—from smartphones to medical monitors to air traffic control—for granted. We don't think about where these products come from, or what goes into making them.

But the supply chain crisis spawned by the COVID pandemic was a wake-up call. Suddenly, leaders of business and government realized we didn't have enough domestic capacity to supply all the semiconductor chips needed to power our economy.

That is why Congress last year enacted, and President Biden signed, the CHIPS and Science Act, which authorized the funding to implement the CHIPS Act of 2021 and expand U.S. output of semiconductor chips.

Now, leaders of business and government are beginning to realize that merely producing more chips is not enough. Semiconductors are

modern wonders, but they are useless without PCBs and the rest of the electronics package. No one buys just chips; they buy components and systems that contain chips. Unfortunately, the United States is even more dependent on overseas suppliers for these components than they are for semiconductor chips.

Luckily, the Biden administration seems to get it, and there are signs of hope in Congress as well.

For example, in launching the first round of funding under the CHIPS for America program, Commerce Secretary Gina Raimondo announced that the U.S. will develop multiple high-volume “advanced packaging” facilities and become a global leader in chip packaging technologies.

The week before that, Raimondo confirmed that some of the CHIPS Act funding will go to “smaller firms,” including “circuit board companies.”

Several weeks earlier, the administration’s year-long assessment of the ICT supply chain highlighted the importance of PCB fabrication and assembly and recommended that the DPA be used to bolster the strength of U.S. PCB manufacturers.

Most recently, Reps. Blake Moore (R-UT) and Anna Eshoo (D-CA) reintroduced the Protecting Circuit Boards and Substrates Act, which would incentivize purchases of domestically produced PCBs and spur industry investments in factories, equipment, workforce training, and research and development.

Thus, the U.S. government appears to be on the right track on this issue, although now we need leaders in Congress and the Executive Branch to ensure the follow-through.

For long-term sustainable change that boosts the United States’ economic and national security, a significant chunk of CHIPS Act funding should be earmarked for the advanced packaging and PCB segments of the electronics supply chain.

The funding and leadership for a “silicon-to-systems” approach must not fall victim to partisan political battles in Washington. 🇺🇸

Member Milestones

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

IPC Anniversaries in Q2 2023

Compunetics Inc.
Monroeville,
Pennsylvania

35
YEARS

Foresite
Kokomo, Indiana

Technic Inc.
Cranston, Rhode Island

WestOak Industries Inc.
Erick, Oklahoma

30
YEARS

ACME Training & Consulting
Rapid City, South Dakota

BEST Incorporated
Rolling Meadows, Illinois

KelTech Incorporated
Roanoke, Virginia

Utah State University
North Logan, Utah

25
YEARS

QML: Vital to Business

By Sydney Xiao, President, IPC Asia Operations

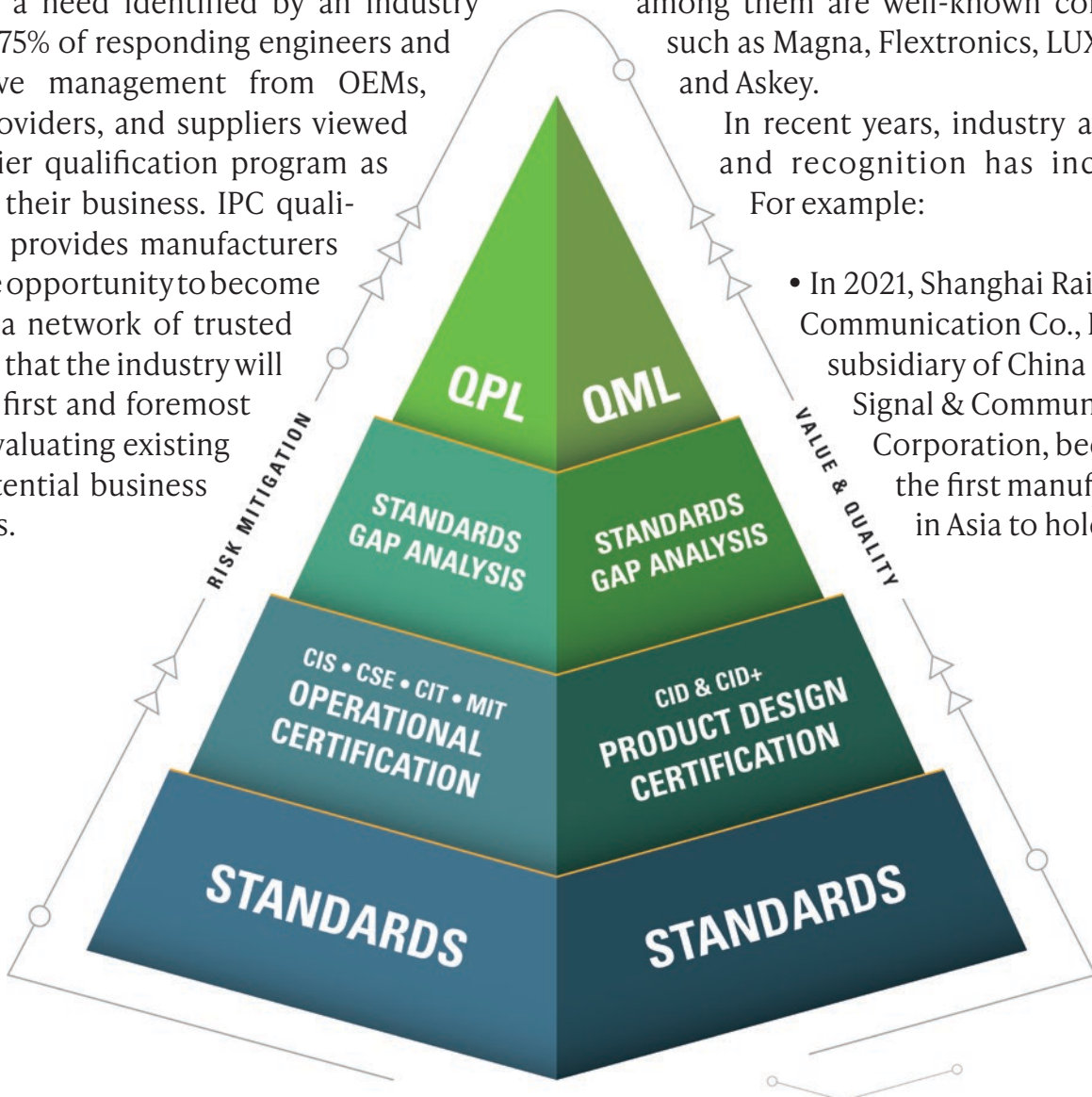
IPC Qualified Manufacturers List (QML) and Qualified Products List (QPL) were created to address a need identified by an industry survey: 75% of responding engineers and executive management from OEMs, EMS providers, and suppliers viewed a supplier qualification program as vital to their business. IPC qualification provides manufacturers with the opportunity to become part of a network of trusted sources that the industry will look to first and foremost when evaluating existing and potential business partners.

Since 2015, more than 30 manufacturers in China have taken part in the IPC QML program; among them are well-known companies such as Magna, Flextronics, LUXSHARE, and Askey.

In recent years, industry adoption and recognition has increased.

For example:

- In 2021, Shanghai Railway Communication Co., Ltd, a subsidiary of China Railway Signal & Communication Corporation, became the first manufacturer in Asia to hold



The IPC standards implementation pyramid.

certificates for both IPC-A-610/IPC-J-STD-001 QML and IPC/WHMA-A-620 QML.

- In 2022, Haier COSMOPlat applied for QML in its five factories. Through IPC's QML services, Haier COSMOPlat could better understand the current situation and how to optimize opportunities in its factories, improving the quality and service level of its products. Wen Guiqin, quality director of Haier COSMOPlat, expressed her appreciation for the IPC QML audit process. "It is an honor that the five interconnected factories of Haier COSMOPlat have been awarded IPC QML certificates," she said. "We will work hard to live up to our customers' trust, providing better products and services to them worldwide."
- In March 2023, KO-M TECH became the first company in South Korea to get an IPC QML certificate. In addition to China, audits are scheduled this summer for new manufacturers in Thailand and Vietnam.

To meet the growing demand for IPC QML service, IPC Asia auditors traveled in April to Suzhou, China, right after China lifted its international travel control measures, for a

week-long auditor training program. Our auditors from China, Japan, South Korea, Thailand, and Vietnam were honored to be hosted by a long-term IPC member Askey Technology (Jiangsu) Ltd.

It's not an easy task to host a multinational group, but Askey's careful planning ensured that the training proceeded smoothly on their manufacturing floor. For example, each auditor had a companion who would respond quickly to questions; to help the auditors feel at home, Askey prepared different meals from their respective countries. The IPC Asia team is very grateful for Askey's hospitality.

Askey is one of the earliest manufacturers to receive IPC QML qualification in China.



Haier COSMOPlat is awarded IPC QML certificates.



KO-M TECH QML audit.

Huang Jianhua, factory director, was deeply touched by the experience: “IPC QML has become an important threshold for customers to measure vehicle-related products. We can proudly tell our customers that our factory manufactures products according to IPC Class 3 standards. We regard IPC standards as the best standards and tools, and we strictly implement them as part of our company’s culture. In terms of market development, more wins come from the factory, so we regard the Askey factory as our sales card, and IPC QML is a great advantage for our business.”

As electronics manufacturers increasingly value product quality and reliability, the IPC QML program becomes a great solution for them. These companies can improve their manufacturing processes and product reliability, and reduce duplicate audit costs, as well as stand out in global competition, which fundamentally enhances their competitiveness and profitability. 🇺🇸🇯🇵🇰🇷



For more information, please contact Sydney Xiao, president of IPC Asia operations, at sydneyxiao@ipc.org.



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Getting Wired and Inspired

EWPTE 2023 draws more than 3,000 attendees

By Sandy Gentry

This year, the cable and wire harness manufacturing industry came “wired” to the Electrical Wire Processing Technology Expo (EWPTTE), May 16-18, and left inspired with access to new technologies, solutions to challenging issues through training and education, and a network of leading-edge companies, industry leaders and subject matter experts. Produced by the Wiring Harness Manufacturer’s Association (WHMA), IPC, and the Wisconsin Center, the event drew in 3,049 attendees, an 18% increase over 2022.

“This year’s event surpassed our expectations,” said Joe DeMan, WHMA Board chair. “The energy on the show floor was amazing and spoke volumes on the touch points and relationships that were created. I am certain that the collaborations formed have already begun to forge a host of innovative real-world solutions, technical advancements, and business opportunities. I continue to believe that WHMA/IPC’s mission to ‘lead, educate and connect’ will continue to play an ever-increasing role in this process. As our industry grows





to play a significant part in the most vital areas of our lives, so too will the pivotal role of WHMA/IPC.”

Highlights included seven professional development courses and 19 technical conference sessions that provided new information and data, skills, and techniques and trends related to the cable and wire harness industry, a keynote from Dr. Kenneth Harris on building the future, and ample networking opportunities.

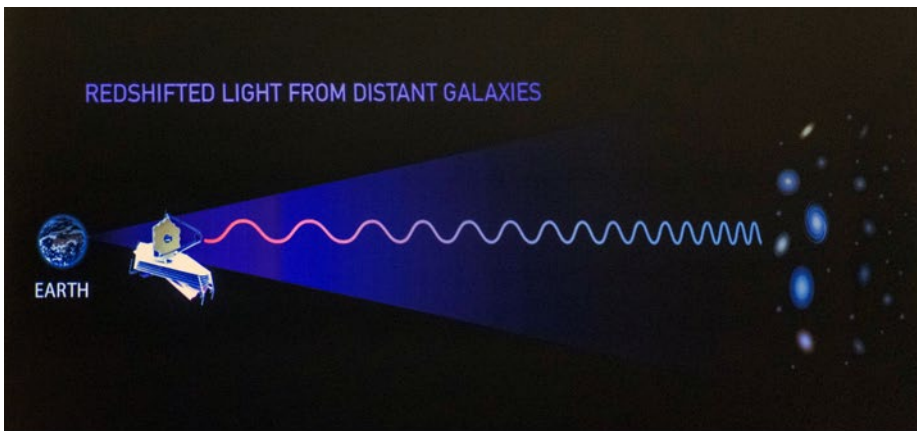
From survey responses, attendees clearly achieved their business objectives while at the event. “I really enjoyed attending my first EWPTTE and getting to see new technology and equipment that could potentially increase our company’s productivity,” said Jessica Murphree, associate quality engineer, Syncro Corporation. “Every booth, supplier, and vendor actually took time to demonstrate equipment and answer questions. Everyone was very helpful in pointing us in the right direction of needs based on our company’s products. Our goal was to find some cost savings in products and increase employee efficiency. I feel con-

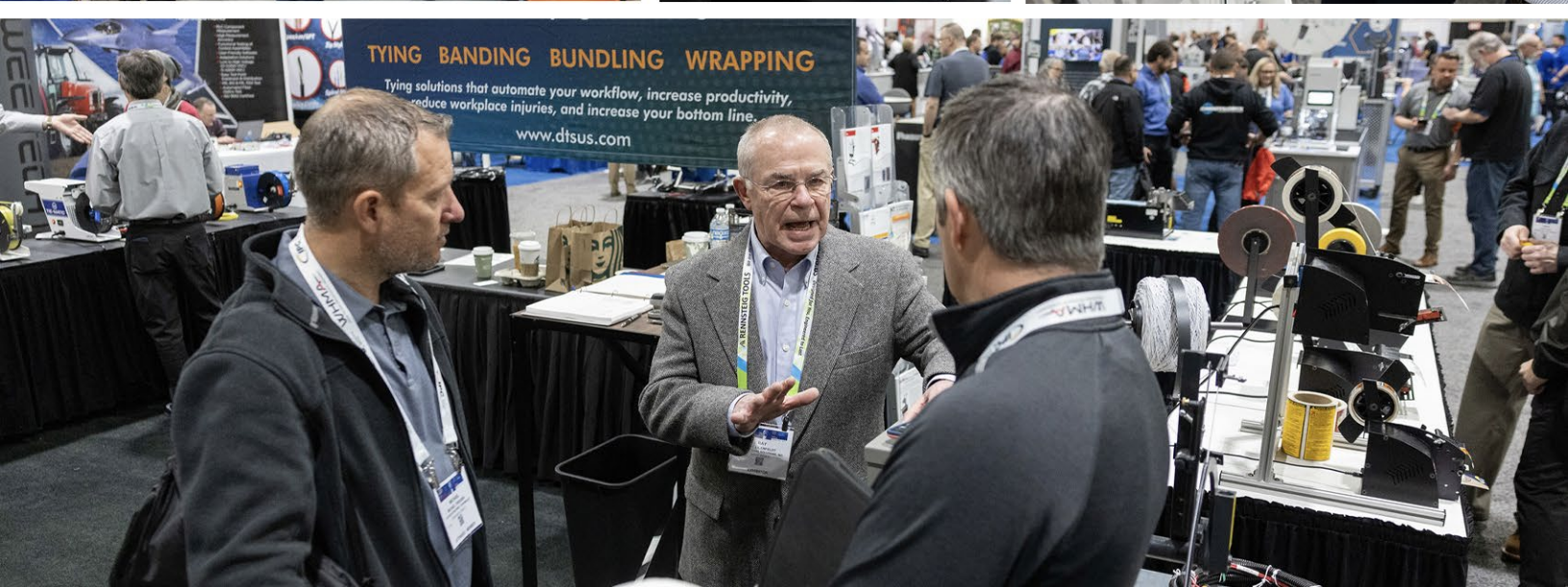
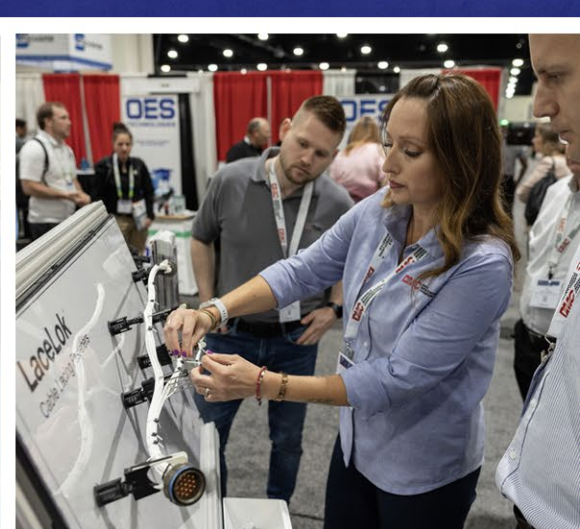
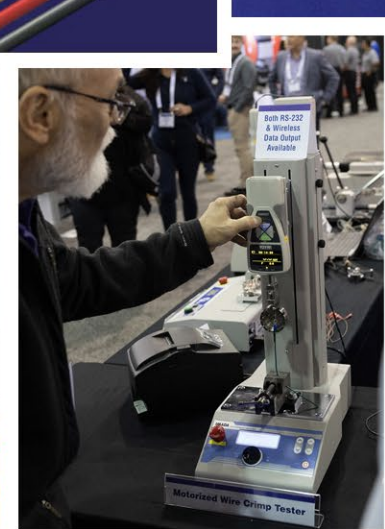
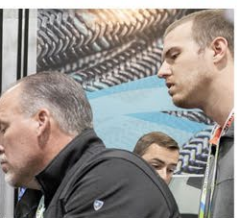
fidant that we have found everything that we needed at EWPTTE 2023. This was my first trip to Milwaukee and this particular expo, and I hope to attend more in the future.”

The EWPTTE 2023 experience was equally positive for the 185 exhibitors (up 19% from 2022) who showcased their products and services spanning 43,400 net square feet of show floor space (up 17% from 2022) and generated a total of 12,063 leads according to the lead data count, a 35% increase over leads in 2022.

“We have exhibited at EWPTTE for many years, and this has always been a great show to attend and meet new potential customers while re-uniting and exchanging new ideas with our existing customer base,” said Brian Betti, president, LPMS-USA. “This year was exceptional. We had the two busiest show days in our years of exhibiting that generated a higher amount of quality leads from potential customers than we have previously.”

In 2024, EWPTTE will return to the Baird Center, May 14-16. For more information, visit www.electricalwireshow.com. 🇺🇸







Team Players

A new industry leadership council provides solutions to sustainability challenges

By Kelly Scanlon, IPC Lead Sustainability Strategist

The work on sustainability in electronics at IPC continues and a new leadership council is one result of those efforts.

In March 2023, IPC convened a Sustainability for Electronics Leadership Council to offer peer review and direction to IPC. The council is a response to the industry's requests for more attention on environmental, social, and corporate sustainability in IPC's industry standards, education, and advocacy.

The council includes industry leaders in sustainability, bringing together more than 160 years of professional experience in sustainability for electronics. It is a rich and credible resource to propose global industry efforts, led by IPC, to assist in moving sustainable electronics design, development, and production forward to build electronics better.

The companies that comprise the Leadership Council represent multiple supply chain segments and geographic regions. Members of the council are senior leaders in their companies who head technology programs for sustainable solutions, environment/social/governance (ESG) programs and foundations, and environmental health and safety programs.

These companies aim to be leaders in sustainability for electronics by:

- Developing their own frameworks for identifying and prioritizing sustainability priorities
- Being known for their strong disclosure and reporting practices
- Paying attention to top priorities (e.g., chemical, energy, and water use)
- Taking responsibility for their sustainability obligations
- Having top-down leadership
- Broadcasting their values (e.g., leadership, teamwork, perspective, and judgment) to enable shared solutions

The Leadership Council has an ambitious goal: Finalize their recommendations by the end of this year for an industry-backed, sustainability strategic plan that will serve as a roadmap for industry standards, education, and advocacy. IPC's sustainability initiative is supported by expert sustainability consultants from Anthesis.

To get started, the members of the Leadership Council have been meeting biweekly and have identified their most relevant and urgent priorities. They are gathering experts from across the electronics manufacturing value

chain to establish smaller action teams. These teams will address those priorities, including supply chain communications, sustainability terminology and definitions, and greenhouse gas data and reporting obligations.

These companies have specific reports, mission statements, priorities, and targets regarding their sustainability efforts.

Altium

AT&S

BAE SYSTEMS

 **BOSCH**

flex

intel

JABIL

**NORTHROP
GRUMMAN**

SIEMENS

TTM Technologies

ZOLLNER

Note: Each company logo is linked to its sustainability information.

I enjoy working with the Leadership Council and the budding sustainability action teams because of their shared sense of responsibility and determination to do something better and different. They have a drive to urgently identify sustainability for electronics.

Council members describe sustainability for electronics as being layered, imperative, and a journey. They say it is challenging work, particularly when facing complex topics like “circularity for electronics” and “comprehensive impact assessments” innate to lifecycle assessment.

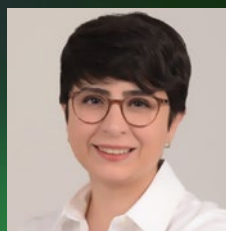
These council members also must be devoted to the cause of sustainability in their work. To be effective sustainability leaders in their companies and valuable contributors to the Leadership Council, they must:

- Stay smart about sustainability through their networks of professional colleagues
- Be in tune with news and policy developments on sustainability topics
- Engage with other associations and agencies with resources useful to the industry
- Read sustainability reports within the industry

IPC knows that industry support is key to shaping a strategy for addressing sustainability for electronics. The Leadership Council and the sustainability actions teams provide the voice of the industry and a forum for the industry. We are building a richer community of sustainability for electronics professionals, and we are off to a good start. 🌈

Company representatives that participate in the Sustainability for Electronics Leadership Council:

- Golzar Alavi, Robert Bosch GmbH (OEM)
- Barjouth Aguilar, Flex (EMS)
- Didrik Bech, Altium (PCB design)
- Thomas Cetta, Jabil (EMS)
- Colin Cupitt, BAE Systems (OEM)
- Marina Hornasek-Metzl, AT&S (PCB)
- Martin Franke, Siemens (OEM)
- Julian Lageard, Intel (OEM)
- Stanley Merritt, Northrop Grumman Corp. (OEM)
- Charles Nehrig, TTM Technologies (PCB)
- Markus Otrin, Zollner (EMS)



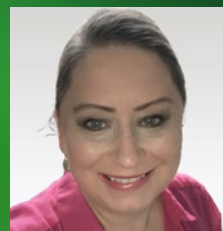
Golzar



Didrik



Thomas



Marina



Martin



Julian



Charles

And now a word from...

Barjouth Aguilar

Flex (EMS company)

Why is your company's sustainability mission so important?

Our vision at Flex is to be the most trusted global technology, supply chain, and manufacturing solutions partner to improve the world. We believe that sustainability, including environmental, social, and corporate governance (ESG), is essential to bringing that vision to life.

Through our 2030 sustainability strategy, we're focused on minimizing our environmental impact; investing in our communities; advancing a safe, inclusive, and respectful work environment for all; partnering with our customers and suppliers to help mitigate value chain emissions; and driving ethical and ESG-focused practices with strong transparency. As a diversified, global manufacturer, we recognize the importance of taking a comprehensive approach to sustainability and doing our part to help address broader environmental and social challenges as we pursue our purpose—make great products for our customers that create value and improve people's lives.

What's on the agenda for initial leadership council projects for the rest of this year?


The materiality exercise is on the agenda, which analyzes members' materiality assessments and areas of focus. The aim is to create an assessment that is reflective of common industry and stakeholder priorities, so we can align to and work toward addressing shared sustainability ambitions. We're also taking advantage of sub-groups within the council, such as supply chain and



scope 3 emissions, where we can invite company subject matter experts to share knowledge and explore ways for further collaboration.

What led you to joining IPC's leadership council?

The IPC Leadership Council is an opportunity to discuss industry-specific sustainability challenges and, more importantly, identify scalable solutions. I look forward to sharing best practices and collaborating alongside other leaders to better promote sustainability across our respective companies and the industry.



The aim is to create an assessment that is reflective of common industry and stakeholder priorities...



Stanley Merritt

Northrop Grumman Corporation (OEM):

Why is your company's sustainability mission so important?

To best address the needs of our customers, Northrop Grumman took a major step in furthering our sustainability mission in 2022 when we introduced our next generation of environmental sustainability goals. These cover three areas: The footprint goals address the fundamental needs driving environmental sustainability by minimizing the footprint of our operations. The handprint goals enhance sustainability within the aerospace and de-

fense industry by supporting customer needs and supply chain objectives. The blueprint goals affirm our leadership in sustainability through collaboration to protect ecosystems and define environmental opportunities in our communities.

What's on the agenda for initial leadership council projects for the rest of this year?

The first part of the effort has been the formation of the Council, the identification of sustainability topic priorities, their ranking by relevance and urgency, and communication to the IPC Board about status of the broader Sustainability Initiative. The next phase will be generating an industry-level Materiality Assessment and other work products to finalize a recommendation (for the IPC Board) for an industry-backed sustainability strategic plan.

What led you to joining IPC's leadership council?

Being a global leader in the printed circuit board industry and sustainability arena, we felt it imperative to actively participate in strategy and IPC's action to build electronics better. Our place as an aerospace and defense industry leader also provides us with a unique perspective to bring to IPC, especially when it comes to supply chain best practices. For

example, we know the role of supply chain in helping us achieve our sustainability goals and to ensure that proprietary data security is maintained as it is communicated through the supply chain.

IPC INDUSTRY INTELLIGENCE

To download this white paper, visit:
go.ipc.org/sustainabilitywhitepaper

A White Paper from IPC's Chief Technologist Council



Markus Otrin

Zollner (EMS company)

Why is your company's sustainability mission so important?

Sustainability, CO₂ footprint and emission reduction are important to Zollner and influence our company's strategy. Sustainability is a major topic; we are an EMS company with headquarters in the EU and regulations like the Corporate Sustainability Reporting Directive (CSRD), customer requirements, and corporate social responsibility are the main drivers for us.

What led you to joining IPC's leadership council?

The opportunity to interact with representatives of the entire electronics supply chain was a major factor in my decision to join the Council. Sustainability today considers the entire lifecycle (downstream, upstream, direct). Suppliers have approximately 10-15% influence of the sustainability of a product. OEMs have the greatest influence on suppliers and sub-suppliers. It's all about effectively working with the supply chain.



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SIEMENS



Colin Cupitt

BAE Systems (OEM):

Why is your company's sustainability mission so important?

Our sustainability agenda directly supports our purpose “to serve, supply and protect those who serve and protect us.” Our products and services enable governments to defend their lives and freedoms of people around the world, support international stability, and keep people safe. At the same time, our business supports the prosperity of nations with high-quality, well-paid sustainable jobs and by being a valued member of our local communities.

Many of our programs are complex, pushing the boundaries of current technology. The products we design and build now will remain in service for decades to come, which emphasizes the need to develop long-term sustainable solutions. This is why we are supporting governments' national decarbonization programs, working closely with our customers and partners in developing sustainable solution, as well as setting a target of achieving net-zero greenhouse gas emissions across our own operations (Scope 1 and 2) by 2030.

What led you to joining IPC's leadership council?

BAE Systems recognizes the important work that IPC does in the field of electronics and is happy to support them. The particular focus of the Sustainability Leadership Council is to prepare the electronics industry to be better equipped to address the changing scope of sustainability and to ensure that upcoming legislation can be addressed in an effective way. This will minimize risk to our business, our supply chain, and our customers.

What's on the agenda for initial leadership council projects for the rest of this year?

The Sustainability for Electronics Leadership team has identified critical issues in sustainability and determined those that need to be addressed first. Initially this is focussed on standardization of terminology and tools to enable us to talk the same language and allow clarity to measures. A-Teams have been created to tackle supply chain communications, terminology for “sustainability for electronics” and GHG education and awareness. In the fall we are expecting an assessment from Anthesis on Materiality, with a goal to identify priority sustainability themes, topics, and trends relevant to the electronics manufacturing value chain. This will better define “sustainability for electronics” by identifying/prioritizing relevant stakeholder groups for engagement, benchmarking industry practices based on desktop research, conducting interviews with stakeholders and developing a “network map” to allow assessment of impacts caused and impacts incurred by the industry. 🌈

Compiled by Sandy Gentry.

Click to learn more about IPC resources for Sustainability for Electronics.

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sustainability podcast



From logistics, manufacturing, and personnel, to cloud-based applications, there are many aspects of sustainability that should be considered. I-Connect007 brings to our listeners a six-part series on Sustainability. Siemens topic experts explore how each of these areas are impacted by the effort to go green.



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An Industry-ready Workforce in India

By Gaurab Majumdar, Executive Director of IPC India

Higher education in many parts of the world still lacks a practical training approach and awareness of the latest technologies. For example, new college graduates joining the electronics manufacturing industry in India find themselves regularly making critical decisions that could have an impact on the end product. However, challenges confronted on the shop floor are not necessarily part of the

theoretical curriculum of the university or technical institute where they received their education.

When young technicians and engineers join a company, they need time to thoroughly understand the production and quality processes. IPC is dedicated to making it easier for new employees to learn these needed skills. An office was set up in India in 2010 and has

been instrumental in providing more than 13,000 certifications while connecting with more than 500 electronics manufacturing companies there. This has led to an initiative to train college students through IPC's workforce development courses.

A Unique Training Opportunity

An important Memorandum of Understanding (MoU) was signed on Aug. 4, 2022, between IPC India and the Vidya Vikas Institute of Engineering and Technology (VVIET), in Mysuru, Karnataka. IPC India Executive Director Gaurab Majumdar and VVIET Secretary Kaveesh Gowda signed the MoU in the presence of students; Dr. John W. Mitchell, IPC president and CEO; Sanjay Huprikar, IPC president of Europe and South Asia operations; and David Bergman, IPC vice president, standards and technology. The signing ceremony took place at the Integrated Electronics Manufacturing and Interconnection (IEMI) event, organized by IPC India, in Bengaluru, Karnataka.

Last fall, 11 final-year students in VVIET's Electronics Diploma course were selected to take the IPC Electronics Assembly for Operator (EAO) course. The project's short-term internship focused on practical training, regular student interaction and evaluation, and industry exposure. To ensure that students didn't miss their regular classes, IPC conducted sessions on Fridays and Saturdays over a three-month period. The students' dedication and enthusiasm helped them successfully complete the program.

This initiative was supported by IPC member companies in Mysuru—Kaynes, Vinyas, and Cyient—where the staff contributed significantly by providing practical training for the students. They endorse the EAO course syllabus as important for technicians and operators who are new to the industry. It meets the needs of students interested in joining EMS companies.

Experienced trainers—Mr. CS Nagaraj, Master IPC Trainer (MIT), based in Bengaluru, and Ms. Padmavathy, Certified IPC Trainer (CIT), based in Mysuru—administered EAO training to students. They not only trained the students but instilled the importance of contract manufacturing and assembly in the overall growth of the electronics sector. The students saw that operators are valuable to the production process and each one makes an important contribution in developing high-quality and reliable products. Such orientation helps new technicians understand the industry and their job role and solidifies their interest in staying longer at the company.

The 11 students who successfully completed the EAO course received certificates, soon received job offers, and were successfully placed in electronics manufacturing companies with the basic knowledge of how to do the job because of their IPC training.





provides knowledge and gives ideas to the students about what industries are looking for exactly. Once they are placed, they see and understand easily. This makes it easier for the industry and helps us to hire the right candidates who have already been exposed to this terminology.”

“Talent shortages remain one of the most difficult challenges for the electronics manufacturing service (EMS) sector and could even threaten to stall reshoring to geographies like Asia and India,” said John Mitchell. “I am excited about current manufacturing opportunities in India. IPC skill development programs in India will benefit employers as well as employee retention and upskilling.”


“It is a matter of great pride for our association with IPC as an institutional member,” said Amulya Mohapatra, director of skill development at VVIET. “We are proud and privileged that this unique training program supported our students in electronics assembly skills and with employment opportunities. Industry companies told us they appreciated that our students are truly ready to work. It gives us immense satisfaction that all the students are placed in appropriate job roles in different EMS industries.”

Thejas K, a student who completed the program, said, “The course was very effective, with six days of internship followed by practical experience. The course taught us to understand best practices, reached our expectations, and helped to build our career while increasing our confidence level.”

Members of the industry speak highly of the program. Sharath Kumar Bhat, senior vice president at Kaynes Technology, said, “This kind of workforce training

provides knowledge and gives ideas to the students about what industries are looking for exactly. Once they are placed, they see and understand easily. This makes it easier for the industry and helps us to hire the right candidates who have already been exposed to this terminology.”

“Talent shortages remain one of the most difficult challenges for the electronics manufacturing service (EMS) sector and could even threaten to stall reshoring to geographies like Asia and India,” said John Mitchell. “I am excited about current manufacturing opportunities in India. IPC skill development programs in India will benefit employers as well as employee retention and upskilling.”

Electronics manufacturing has been growing quite significantly in India, and IPC supports the industry and government there by providing resources that will help electronics manufacturers to build electronics better through a better trained workforce. 



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Solving Problems in Defense Electronics

Nathan Edwards Takes Helm at USPAE

By Chris Mitchell, IPC Vice President, Global Government Relations

The U.S. Partnership for Assured Electronics (USPAE) is a nonprofit organization dedicated to ensuring the U.S. government has access to resilient and trusted electronics supply chains. USPAE members include companies, academic institutions, and nonprofit organizations from the U.S. and its allies, representing the entire electronics ecosystem from research to design, manufacturing, assembly,

and test. I spoke with Nathan Edwards, the USPAE executive director, about his new role.

Nathan, congratulations on your new role as director of USPAE. Can you tell us about your role?

Thank you, Chris. I am attempting to fill some very large shoes created by former executive director Chris Peters. The role of exec-

utive director includes a lot of connectivity with our industry members and with the government, but one element that really stands out is setting forth our strategic direction on where we need to go as an organization, with our industry members, and with the government. USPAE is a trusted third party and as I take the leadership helm, I will be able to identify emerging needs or technologies across these organizations, both in government and industry, while working to solve the large problems in the defense electronics sector.

Share with me a little bit about your background.

I'm a mixed bag of tricks. As you go through your career and life, you continue to discover things about yourself. Years ago, I spent a few years in college studying mechanical engineering. But then the opportunity to serve my community presented itself, and I left school to work as a firefighter and paramedic for nine years. When I returned to school I focused on computer and electrical engineering as I realized that electronic controls were paramount to all other fields. That led to several opportunities in electronics research where I frequently studied questions like, "How are you

going to build these things?" It increased my interest in assembly and supply chain issues. Ultimately, one graduate thesis and five patents later, I moved to work in secure technologies of the energy and defense sectors, where I started to understand the broad needs for government.

My technical background in circuit assembly and failure analysis along with a broad knowledge of electronics applications and the defense sector led me to work for USPAE. I bring a broad perspective to the table that I believe will help USPAE members engage in government, understand their needs, and shape technical solution development. It's been a tremendous adventure from where I started 17 years ago.

What were you doing at USPAE prior to this new role?

In August 2022, I was hired as the director of government development to cross-connect industry and government, develop new projects and programs, and to identify what electronics industry members could execute. One of the key questions for the government is, "What kind of emerging technologies work best to reduce risk?" Some of our member



organizations help answer that, and many engagement opportunities have evolved through those conversations. My goal was to establish USPAE as a trusted third party at the program level, and some of those conversations continue in my new role.

Tell us about the mission of USPAE.

The mission of USPAE is a simple statement with a great deal of complexity behind it—strengthen the global competitiveness of the electronics industry and to partner with the U.S. government, primarily in the defense sector. Most of our lives are enabled by electronics, and there are so many geopolitical and supply chain needs and challenges. With all that is happening in policy and the global industry, how do we maintain and grow competitiveness? The defense sector has driven a lot of this need. We want to partner across the defense sector and electronics industry to meet the needs of the U.S. government while remaining strong and competitive.

What are USPAE’s top priorities?

To strengthen our relationships and connections and be positioned to support rapid needs for our country. We need to focus on information sharing, helping to shape the technical approaches from what our industry has already created, and to use technolo-

gies and manufacturing processes to increase competitiveness. Sometimes, offices in the Department of Defense (DoD) don’t know how to spec out the best requirements that capture advanced electronics technology, or how to determine an emerging issue that includes our industry ecosystems—and we can help with that.

We also help the government reduce administrative roadblocks and create partnerships with new industry members to ultimately capture the broad electronics ecosystem and keep growing in electronics assembly, circuit boards, semiconductor, and packaging opportunities. Can we recreate and do interesting things to meet emerging needs? Partnerships with others are critical to growing into other electronics areas such as additive manufacturing or advanced materials.

USPAE is a trusted advisor to DoD, shown by DoD’s establishment of the new Defense Electronics Consortium. Would you talk about USPAE’s work with the Consortium?

Sure. It’s an Other Transaction Agreement (a government contract vehicle), and it is exclusively focused on electronics, giving it a very limited scope, and allowing DoD to do things very quickly. Programs flowing through the Consortium can be completed in months rather than years.



What are some of the benefits of USPAE membership?

The primary benefit of joining USPAE is our direct connection between government and industry. Many of our members are small- or medium-sized companies and may not fully understand the dynamics and complexi-

For more information, visit uspae.org, or contact USPAE at info@uspae.org.

ties of the DoD. We help them make connections that can lead to better opportunities for their companies. USPAE also helps prioritize issues and topics that support a robust electronics manufacturing system.

When looking at the last 30 years, the trajectory of the industry is a bit discouraging from a manufacturing perspective. Companies in the U.S. have led in the design of new technologies, but we can't necessarily manufacture the designs. I'm sensing a recent sea change in mindset, an opportunity to rebuild capabilities driven by a greater understanding of the industry and the realization that manufacturing matters. Are you sensing a new mindset?

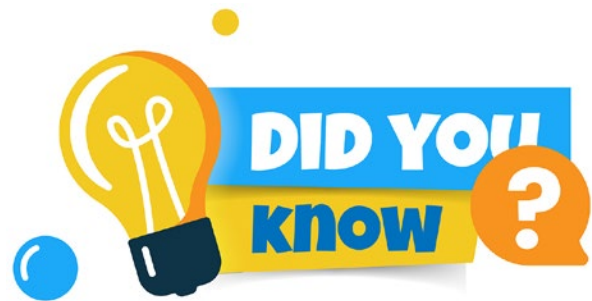
I agree with you, Chris. Here's a quick anecdote. During the pandemic, our country struggled because we could not produce enough masks since most had been produced overseas. Similar to that is a pinch point we see in electronics manufacturing. The movement toward bringing things back is a reality, but the tough thing is that a lot of small- and medium-sized companies don't have staff to participate in these top-level perspectives. As a membership organization, we can pull everyone together to move in a direction that shifts technology areas away from overseas and back to the United States. So many of our needs in the U.S. are dependent on electronics, and if we get cut off from foreign sources or manufacturing, we are cut off from production of critical electronic items that affect all of us. It's a self-sustaining perspective from the U.S. and similar in other allied countries as well—we all want to take care of our own. It's an exciting time because we are not just bringing old technology back to the U.S. We are creating new technology as well.

The reality is that rebuilding won't happen overnight, but the U.S. should act with urgency. That is what makes membership in

USPAE so important. It's an organization that encourages bringing issues up directly and driving action and implementation of worthwhile products.

Nathan, thank you for speaking with me about your new role. We are glad to have you here as part of the broader IPC team.

You're welcome. I'm looking forward to all that we can accomplish. 🇺🇸



The Navigation Technology Satellite-3 is staged inside The Benefield Anechoic Facility at Edwards Air Force Base, California, April 18, 2023. NTS-3 will be the Defense Department's first experimental, integrated navigation satellite system in nearly 50 years and is expected to pave the way for a more robust, resilient and responsive architecture for satellite technology. (U.S. Air Force photo by Adam Bowles)

IPC Day Comes to **Romania**

By Peter Trantz, Senior Director, Technology Solutions, IPC Electronics Europe

When IPC staff wanted to showcase the latest industry developments to a European audience, they made an obvious choice: Timișoara, Romania.

The dramatic economic expansion here over the past 30 years has resulted in a large concentration of manufacturing and technology businesses. Long-term planning by authorities positioned the city as a business-friendly and diverse cultural hub on the western border, providing easy access to Central Europe.

Timișoara has now become one of the country's main economic centres, and in 2023 was named as the European Capital of Culture.

Today the vast manufacturing infrastructure and skilled workforce here act as a magnet for nearshoring or regionalization investment, where goods are produced close to their end market. According to a Reuters report, “A generational shift in sourcing strategy,” 8.5% of European manufacturers and retailers point to Romania as their future manufacturing location¹.

The Flex Factor

IPC has had a long-standing relationship with Flex, a U.S.-headquartered multinational and diversified manufacturing company with a significant presence in Timișoara.





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Between these partners, there was recognition that future growth in Romania and the wider region would not be dependent on the economic model that got them there, or a variation of it, but on the ideas and innovation developed within the region by a sizeable skilled workforce.

Investments in people through partnerships among industry, representative bodies, and educational institutions like the Universitatea Politehnica in Timișoara, are key to advancing investment in research and development to deliver a self-sustaining model of regional growth.

Electronics Manufacturing Showcase

On Sept. 27–28, IPC and Flex will host an event at Universitatea Politehnica in Timișoara called “Build Electronics Better with Standards and Solutions, Powered by Flex.”

The event will provide a unique opportunity to learn about the latest advancements in electronics manufacturing, participate in industry discussions, and network with a community of professionals dedicated to building better electronics.

Who is the Event For?

Presentation and panel discussions will feature industry experts from NASA, Stellantis, Bosch, Flex, Indium, IPC, Universitatea Politehnica, and Vitesco.

The range of topics are sure to appeal to Timișoara’s electronics community and include electronics reliability, e-mobility, medical meets 5G, education and training, and IPC leadership.

If you are in manufacturing or quality, work as a design engineer, or might be studying engineering toward a degree, this event offers a unique opportunity to hear about the latest trends, needs, standards, education options, production line, and product development solutions.

For more information, [click here](#). 🇷🇴

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IPC Around the World



North America

By Brian Knier

Vice President, Marketing, Member Success, and Sales

IPC and TEEMA Sign MoU to Support Digital Transformation

On May 16, IPC's HQ office in Bannockburn, Illinois, hosted a delegation from the Taiwan Electrical and Electronic Manufacturers' Association (TEEMA) for an office tour and half-day series of meetings as a precursor to a Memorandum of Understanding (MoU) signing the next day. On May 17, at EWPTe in Milwaukee, Wisconsin, leadership from TEEMA and IPC were on hand to sign an MoU. The MoU aims

to promote the adoption and use of IPC-2591, Connected Factory Exchange, the plug-and-play industry standard for factory communication which sets the baseline for companies to achieve Industry 4.0.

IPC and ITI Convene to Examine Critical Environmental Requirements

On June 6, IPC partnered with the Information Technology Industry Council (ITI) to offer an educational conference for the electronics sector on critical environmental requirements. In total, the event played host to 70 attendees, nine speakers, and four sponsors from 22 U.S. states and 13 countries, who learned about sustainability and eco-design policies in the U.S. and EU; PFAS regulations;

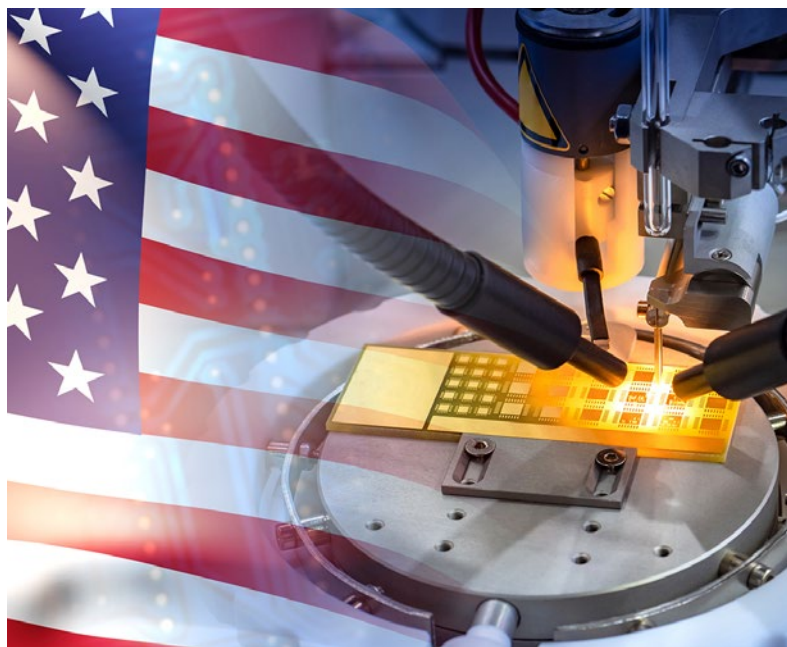
EU Restriction of Hazardous Substances in Electrical and Electronic Equipment (RoHS) General Review and changes to exemptions and new substances; and the importance of industry data and participation in studies during regulatory consultation periods. Key takeaways included policy themes that reflect our daily work to engage with industry and government colleagues on critical environmental requirements for electronics.

While it is the responsibility of every company to understand the environmental requirements that apply to them, IPC will continue being your educational resource and advocate. To learn more about IPC's policy and research work in environment, health, and sustainability, please email Suhani Chitalia, IPC's environmental regulatory affairs manager, at SuhaniChitalia@ipc.org.

IPC and IMAPS Host Onshoring Advanced Packaging and Assembly Workshop

IPC and the International Microelectronics Assembly and Packaging Society (IMAPS) hosted an "On-Shoring Advanced Packaging and Assembly" workshop July 10-12, 2023, in Washington, D.C. Bringing together government agencies, the Defense Industrial Base (DIB), and advanced packaging and assembly providers, the workshop focused on efforts to onshore advanced packaging and identify newly created programs to address U.S. government and defense requirements critical to microelectronics assembly and packaging supply chain.

Keynotes included: "CHIPS," by Eric Lin, U.S. Department of Commerce; "DPA/Title III and ICAM/IBAS Activity," by Anthony Di Stasio, Office of the Under Secretary of Defense (A&S); "Next Generation Microelectronics Manufacturing (NGMM)," by Carl McCants, Ph.D., DARPA; and "DoD ME Commons," by Dev Shenoy, Ph.D., Office of the Undersecretary of Defense and Director of the Defense Microelectronics Cross Functional Team.



Our message to policymakers is that building a more robust, domestic ecosystem for advanced electronics will require a few key policy decisions: investment in advanced packaging capacity and research and development, supply chain partnership promotion, and strategic decisions on what we are building and for whom. This workshop brought the important players to the table—policymakers, the DIB, and commercial suppliers—who have a goal to improve on advanced packaging and assembly onshoring strategies.

IPC High Reliability Forum Back and Better Than Ever

If you manufacture, design, or test Class 3 electronics for mil-aero, automotive, and long-life applications subjected to harsh use environments, you won't want to miss the IPC High Reliability Forum, Oct. 17-19, 2023, at the Hilton Baltimore BWI Airport Linthicum (Baltimore), Maryland. Registration is now open. The IPC High Reliability Forum offers a unique opportunity to learn about the latest advancements in electronics, participate in industry discussions, and network with this respected community of professionals focused on electronics with high reliability requirements. For more information, [click here](#).



Asia

By Sydney Xiao

President of IPC Asia Operations

The IPC Asia team organized a delegation for Taiwan Electrical and Electronic Manufacturers' Association (TEEMA), May 17-20, to the EWPTTE Expo in Milwaukee, Wisconsin. During this event, IPC and TEEMA signed an MoU to solidify our commitment to collaborate on the digital transformation of the electronics manufacturing industry.

In Korea, a new milestone: IPC established its first regional standard task force. This group will provide input on the IPC-A-610 standard, a move that further globalizes IPC's standards platform.

Looking ahead to Q3, we anticipate a vibrant period with several key events. IPC China will host the highly-anticipated 2023 IPC China Electronics Assembly Masters, July 11-14, in Shanghai. This event includes a hand-soldering competition, wire harness and cable assembly competition, and a newly created competition for BGA repair. We look forward to seeing the excellent skills of the contestants who will demonstrate the spirit of craftsmanship shared in our industry.

We continue to dedicate support for the rapid development of the automotive industry in Asia. There will be two seminars on automotive electronics in September in Shenzhen, China, and Nagoya, Japan. These are forums for industry professionals to exchange insights, share best practices, and foster synergy that drives continuous innovation in this sector.

As we move forward, the IPC Asia team remains steadfast in our commitment to fostering collaboration, nurturing talent, and staying at the forefront of advancements in the industry.

Europe

By Sanjay Huprikar

President of IPC Europe and

South Asia Operations

The second quarter of 2023 was the busiest period in history for the IPC Electronics Europe GmbH team. From April 13 to June 15, we had the wonderful honor and privilege of meeting our members and many other companies from the European electronics community at seven Pan-European events: PCB Industry Executive Roundtable (Belgium),



Italian hand soldering 2023 champion, Alessandro Manicone, Elettronica GF, with a score of 546 compared to max possible of 558, produced in 60min.



Sixty experts representing 45 Czech EMS companies gathered May 25–26, 2023, to network, exchange and learn at IPC Day Czech Republic, Kuneticka Hora, Dirtec.

Silicon to Systems (Belgium), IPC Day (France), SMTconnect (Germany), Focus on PCB (Italy), IPC Day (Czechia), and EMS Executives Summit (UK). These meetings and exhibitions gave us the opportunity to engage European subject matter experts on many of our forward-looking initiatives, including workforce development, advanced packaging, sustainability, and design. It is anticipated that many of these technical experts will become future participants in IPC's standards development activities to support the industry's needs in these vital areas.

The meeting with PCB executives was a critical step for IPC's Government Relations and Solutions teams to understand the unique needs of the industry. Executives from 12 of the largest PCB manufacturers headquartered in Europe provided candid feedback on areas that they believe require government support, ranging from expanding R&D competencies to managing regulatory burdens and modernizing equipment.

Looking ahead, the industry will be focused on productronica, the signature European trade show, Nov. 14–17, 2023, in Munich. IPC plans to host the Hand Soldering Competition World Final there as well as several CFX information sessions.

India

By Gaurab Majumdar

Executive Director of IPC India

IPC India organized its first regional India and Sri Lanka Standard Development Team, comprised of 22 members from 20 EMS providers in a single platform. During the meeting, the proposed changes for new revisions of IPC-A-610 and J-STD-001 in FDIR were discussed and recommended.

We also organized a standards regional team for IPC-A-620, *Requirements for Acceptance for Cable and Wire Harness Assemblies* on April 25. This involved 20 experts from 16 prominent organizations in India and Sri Lanka.

There were four hand-soldering competitions in April and May. On April 27, there was a competition and technical workshop in Kolkata for the first time. In addition to demonstrating their soldering skills, participants gained insight into industry best practices. The other competitions took place May 9 at Prebin Distribution CC, Johannesburg; May 16 at VVIET College in Mysuru; and May 25 at EDB in Sri Lanka. A wire harness competition took place May 11–12 at Ray-q technologies in Bengaluru.



We have several events planned for Q3. First, we have scheduled two IPC hand soldering competitions. These are platforms for showcasing skills and sharing knowledge. We also have two IEMI 2023 conferences, which are valuable opportunities for networking, knowledge sharing, and staying current on industry trends.

The IPC Hand Soldering Competitions will take place in Dubai, UAE (July 6, Neuro Technologies), and Penang, Malaysia (July 12-14, EMAX Expo), and are organized by IPC's International Electronics Manufacturing Initiative. These are highly anticipated events that bring together skilled soldering professionals from around the globe. They will demonstrate their skills under the watchful eyes of industry experts and serve as a platform for recognizing and celebrating excellence in manual soldering techniques.

The Integrated Electronics Manufacturing Interconnections (IEMI) conference is a

prominent event in the electronics manufacturing industry. IEMI 2023 will be held in two major cities in India. The first conference will take place on Aug. 1, in Chennai, Tamil Nadu, followed by an IEMI 2023 event in Pune, Maharashtra, on Aug. 3.

Please use these links to learn more and to register for these events:

- [IPC Hand Soldering Competition in Dubai, UAE](#)
- [IEMI 2023 in Chennai, Tamil Nadu](#)
- [IEMI 2023 in Pune, Maharashtra](#)

Attendees can expect to gain valuable insights from industry leaders, participate in interactive sessions, and explore the latest products and services showcased by exhibitors along with the B2B meetings. 🌈

Member Benefits: **Free IPC Standard**

One of IPC's most valuable benefits, the free new standard, provides member companies with one single-user digital download of each new or revised standard after it is released. The number of free standards provided to each company is determined by company revenue. Free documents are released in the original language in which they were developed. IPC releases approximately 20 new standards each year. At an average cost of \$140 per standard, the free standard benefit is a significant cost saver for members.

IPC standards are available for download to a single device, designated by the primary contact at a member company. The contact receives an email notification when the latest IPC documents are available for

download. Documents are digital rights management (DRM) protected and need to be opened via the FileOpen plugin for Adobe. Instructions on this process will be provided to the company contact via email.

First-time IPC member companies receive a gift of one electronic single-device license IPC standard of their choice. This is a separate benefit from the Free PC Standard Benefit.

Explore all the members-only resources on [IPC's website](#).



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2023 Programs Q3

Stay connected with IPC through some of these regional events in August, and September. Visit our [online calendar of events](#) for more information.

AUGUST

August 1

IEMI 2023: Integrated Electronics Manufacturing Interconnections
Chennai, Tamil Nadu, India

August 3

IEMI 2023: Integrated Electronics Manufacturing Interconnections
Pune, Maharashtra, India

SEPTEMBER

September 13–15

IPC Hand Soldering and Rework Competition at NEPCON Vietnam
Hanoi, Vietnam

September 14

IPC Automotive Seminar
Nagoya, Japan

September 27

IPC Day: Build Electronics Better with Standards and Solutions, Conference Powered by FLEX
Timișoara, Romania



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CONFERENCE & EXHIBITION

APRIL 9-11

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