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A Trip Worth Taking

Michelle Te, Managing Editor, IPC Community



One of the things I love most about road trips across the American Pacific Northwest is the variety of topography one encounters. It's a traverse through elongated valleys and rocky mountain ranges, past rushing rivers and crystal lakes, and delight at charming small towns. Along the way, I'm also searching for the most reasonably priced gasoline.

My husband and I recently took our daughter to college, driving through the "belly" of Idaho, replete with mountains, farms, and ranches, engulfed by vast, low-lying expanses, curvy mountain passes, lava fields, potato fields, and even an "atomic city." Nothing ever felt too ordinary; each bend of the road brought a new and pleasant surprise.

Publishing *IPC Community* has been a little like that road trip through Idaho. With each brainstorming

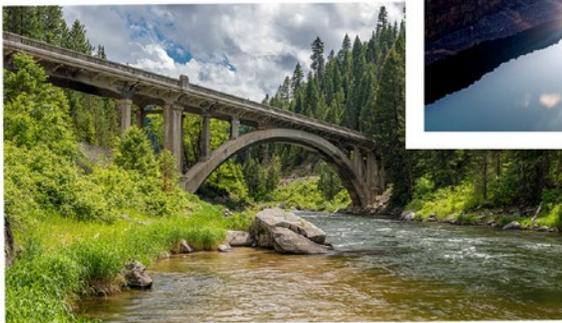
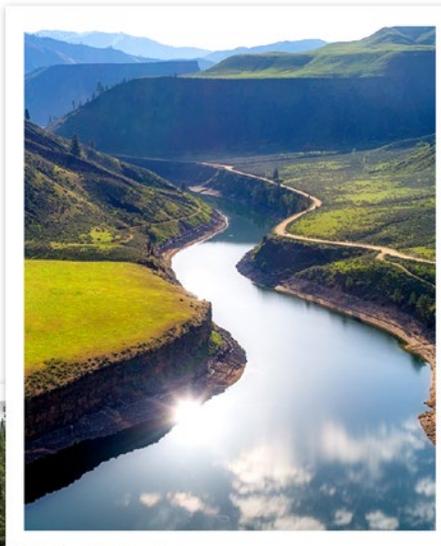
session, interview, and story, we discovered something that would catch our interest, pull us in, and make us want to learn more.

My most successful and memorable trips involve quite a bit of planning. Such is the case with *IPC Community*. The idea of celebrating the partnerships between IPC and its members requires careful thought and a constant focus on our mission to share those particular stories. Unlike my Idaho trip, which had very few stops as we drove toward our destination, we've "stopped" at stories within the IPC community everywhere we turn. IPC has an extensive network of programs meant to help you "build electronics better."

From our member profiles to updates on standards, explaining educational products, and how IPC effectively reaches the electronics industry around the world, I believe we've shown that we're all better off when we involve an association like IPC in our professional lives.

Whether you've been in the business for many years (read about Joe Russeau's standards work on page 20) or you're a newcomer (learn about two student chapter leaders at Auburn University on page 74), there's always something to be discovered about how IPC is working closely with industry to elevate your knowledge and improve your bottom line. Every page has something to look at and enjoy.

IPC circles the globe, making a world-wide industry feel like we're all next-door neighbors. It's been a fun, interesting journey, and we're just getting started. 🌈



A person in a yellow shirt is sitting on a suspension bridge that spans across a deep valley. The valley floor is covered in large, grey rocks. In the background, there are majestic, snow-capped mountains under a sky with soft, orange and blue hues, suggesting a sunset or sunrise. The bridge's cables and wooden planks are clearly visible.

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

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

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American Standard Circuits crew, West Chicago, Illinois.

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Recognizing the value of IPC market data

Michelle Te, Managing Editor, IPC Community

Anaya Vardya has more than 35 years of experience in electronics manufacturing in the U.S., Canada, and the Far East. He has been president and CEO of American Standard Circuits in West Chicago, Illinois, since 2007. ASC is a total solutions provider and manufactures quality



rigid (digital and RF/microwave), metal-backed, metal core, flex, and rigid-flex printed circuit boards on various types of substrates for a variety of applications. ASC recently acquired Oregon-based Sunstone Circuits. ASC-Sunstone has been a member of IPC since 1994.



Anaya, tell us a little about your company.

We have grown a great deal, especially in the past five years. This can be attributed to increasing our technology reach, including adding flex and rigid-flex, metal-backed PCBs, and lately, ultra HDI with lines and spaces down to 1 mil. When deciding which technology to invest in, we have found the market information provided by IPC tremendously helpful. We rely on IPC global and domestic surveys to help determine our company's strategic direction.

What are you most proud of about your company?

ASC-Sunstone provides our customers with a complete solution, from design to fabrication, and cutting-edge technology to global sourcing. We consider ourselves the industry's most diverse, flexible, and capable company to work with. We aim to provide our customers with the most complete and valuable PCB experience.

Why is your company an IPC member?

We joined IPC to be sure we are kept up to date on industry market data, technology developments, and market trends. And of course, we need the specs. We consider IPC the industry supporter—the one place where all the PCB fabricators can meet and work toward the greater good of our technology.

What does IPC membership mean to you?

I like having international standards that everyone must adhere to. Honestly, this is the most important service that IPC offers. The specs are guidelines that define our entire industry. If we didn't have this, then every country could independently follow its own standards. For a global technology like ours, that would not only be chaos but also unfair to those of us who strictly follow the global standards that IPC sets. In fact, we gladly take part when we are asked to give feedback to IPC.



Anaya Vardya (left) and Matt Stevenson (right) ASC Sunstone Circuits, Jered Stoehr, Screaming Circuits (center).

What value does IPC membership provide to your company?

We rely on industry reports and surveys. I consider IPC's industry reporting on growth, broken down by market segment and region, as unbelievably valuable background information for our marketing efforts. That is a direct way that IPC helps our company succeed.

What has been the biggest obstacle or challenge for your company?

Our biggest obstacle has been finding people. COVID-19 created a dilemma in the sense that it disrupted the workforce. We had to step up

our recruiting. People got used to working remotely, which does not work for many positions in a manufacturing facility, so we had to find new ways to attract and keep good people. One way has been through IPC's educational offerings.

How has the electronics industry changed over the years and how do you keep pace?

The technology has rapidly increased in the past few years. Companies and customers need fabricators that keep up and stay ahead of their needs. We strive to do this by investing in people, technology, and equipment. I believe it has worked out pretty well. 🌈





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Nearshoring

Mexico making pivotal move in supply chain dynamics

By Shawn DuBravac, IPC Chief Economist

Amidst the turbulence of international trade wars, pandemic-induced supply chain disruptions, and the escalating demands for rapid delivery cycles, businesses are increasingly looking to relocate manufacturing and production operations to countries geographically closer to their core consumer markets. Nearshoring's potential promise is not only to mitigate the vulnerabilities of extended supply lines but also to offer agility in responding to consumer needs, fostering a more adaptable and resilient business model.

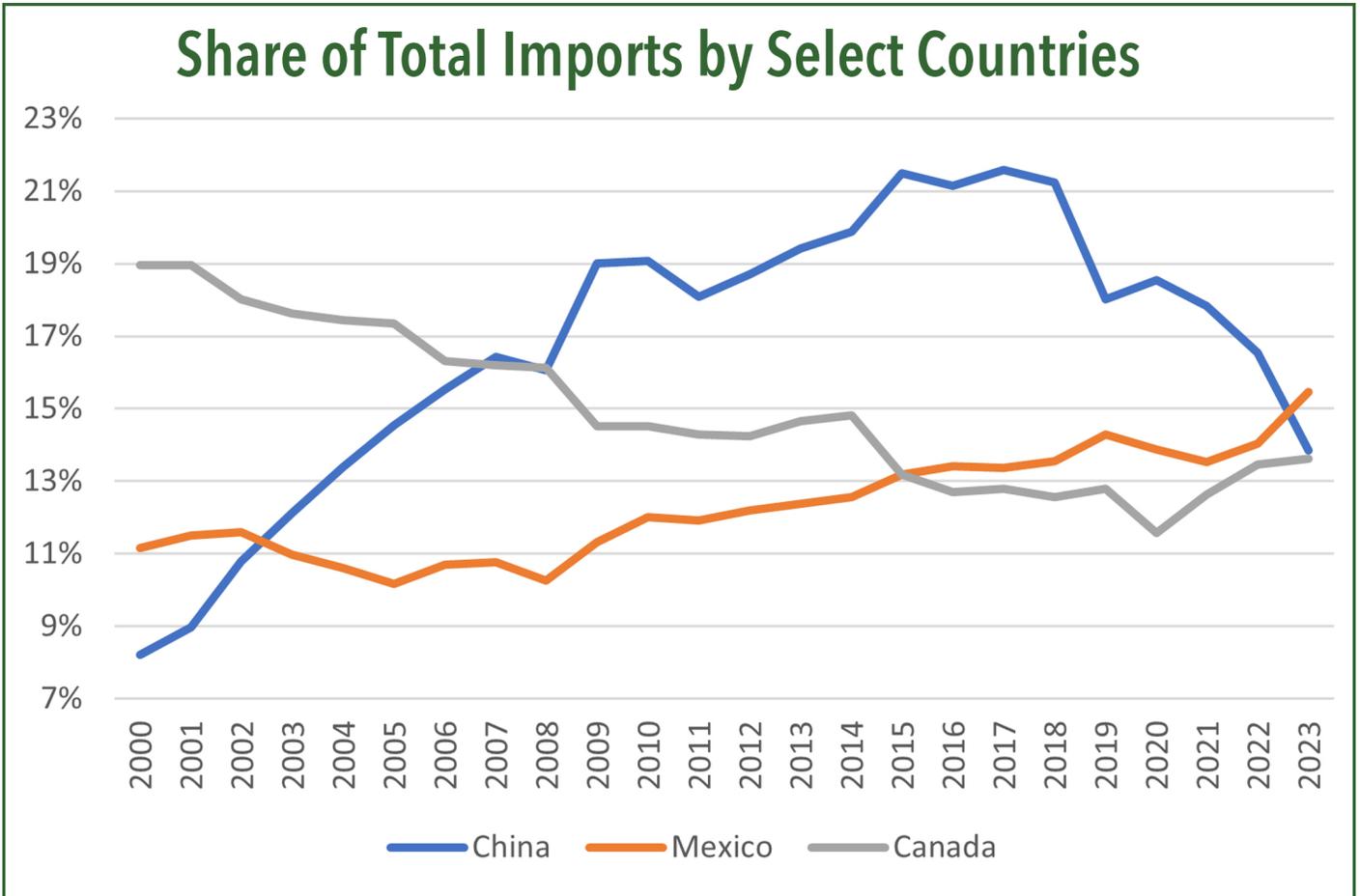
In the intricate web of North American commerce, Mexico has emerged as a pivotal node of manufacturing and production, harnessing a burgeoning tide of investments and business engagements from industries in the United States and Canada. This intensifying trend is underscored by the noticeable decline in China's dominance as the leading exporter to the U.S. market—a position it has seen erode from over 21% of U.S. imports in 2017 to a mere 13% this year. In stark contrast, Mexico's contribution to U.S. imports has experienced an upward trajectory, now accounting for more

than 15%, overtaking China for the first time in two decades. Mexico solidified its place as the United States' top trading partner in 2023, surpassing China and Canada in two-way trade.

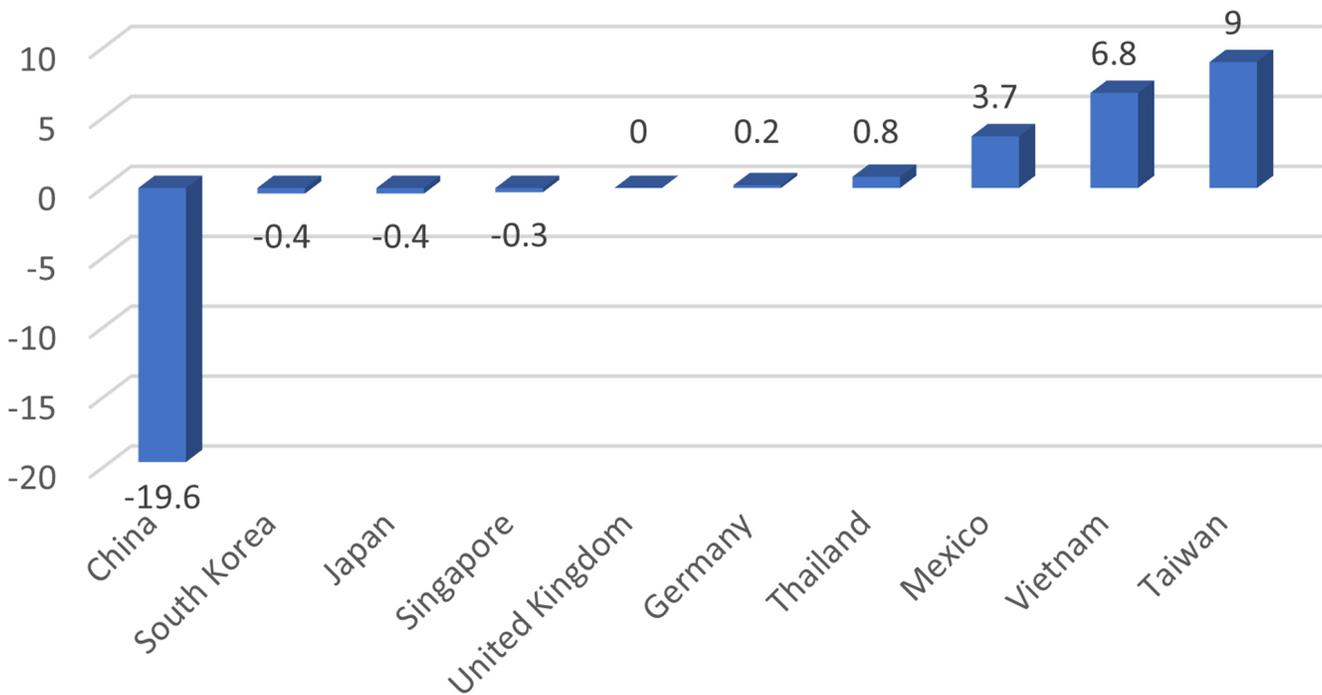
The upward trajectory of foreign direct investment (FDI) into Mexico is poised to maintain its momentum, reflecting a robust and growing interest in the country's economic landscape. Mexico attracted over \$106 billion in FDI announcements during the first nine months of 2023. More than 40% of these investments (\$42 billion) originated from U.S.-based companies opening facilities in Mexico¹. Chinese companies are also playing a big role in Mexico's growth. Of the 5.09 million square feet of space leased in Mexican industrial parks by foreign companies at the end of Q3 2022, approximately 80% were by Chinese-based companies, with U.S., Japanese, and Korean companies making significant investments².

China's FDI into Mexico has risen substantially over the past decade, increasing from \$38 million in 2011 to a peak of \$386 million in 2021, before a slight decrease to \$282 million in the following year. Despite representing just around 1% of Mexico's total FDI, China has become one of the fastest-growing sources of foreign investment in the country. A significant portion of this investment is flowing into computer equipment manufacturing. Approximately \$213 million was invested in 2021 and \$69 million in 2022 in this sector³.

The automotive sector is also a large driver of both investment in Mexico as well as the recent uptick in production. In the first half of 2023, the automotive sector accounted for 35% of all nearshoring demand in Mexico⁴. Mexico's automotive industry received a record-breaking \$5.024 billion in FDI for vehicle manufacturing in the first half of 2023. This is a 67.7% increase from the same period in 2022. The expansion of Mexico's automotive



Computer Equipment Imports



industry will bolster its role as a key supplier of auto parts to the United States.

Electronics imports from Mexico have seen a notable increase, while concurrently, there has been a sharp decline in imports from China. There have also been sharp rises in other markets in Asia. The share of computer equipment imports from China declined 19.6 percentage points from 2017 to 2023. At the same time, Mexico, Vietnam, and Taiwan all gained significant share.

A similar scenario has played out with audio and video equipment. China has seen its share of imports fall over 14 percentage points since 2017. Over this time, Vietnam has seen its share of imports rise 10.7 percentage points. Mexico's share has risen 0.6 percentage points.

Electronics components like PCBs have also witnessed significant shifts in imports. China's share of PCB imports has fallen 15.2 percentage points since 2017. Over this time, Taiwan gained 3.4 percentage points and Mexico

gained 2.4 percentage points. Several countries have seen their share of PCB imports rise over the past six years.

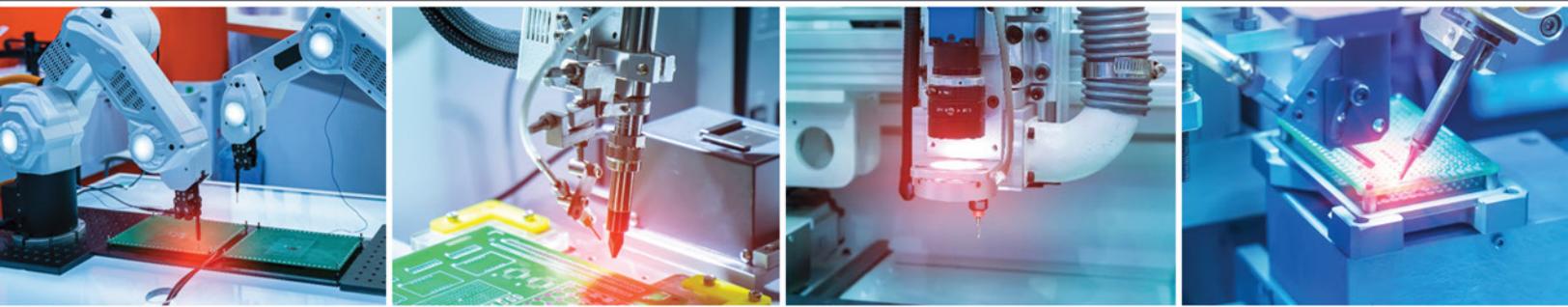
The momentum for nearshoring is not confined to North America. Across the Atlantic, European nations are reevaluating their supply chain strategies, turning to Eastern European countries with lower labor costs and robust infrastructures to shorten the production-to-market journey. This shift is catalyzed by the need for businesses to reduce their carbon footprint, align with sustainability goals, and adhere to the growing legislative pressures demanding ethical supply chain practices.

The demand for industrial space in key European markets is up 28%, driven in part by manufacturers nearshoring operations to improve supply chain flexibility and sustainability⁵. Manufacturers took up 9.6 million square meters (103 million square feet) of space in 2022, a significant increase from 7.5 million

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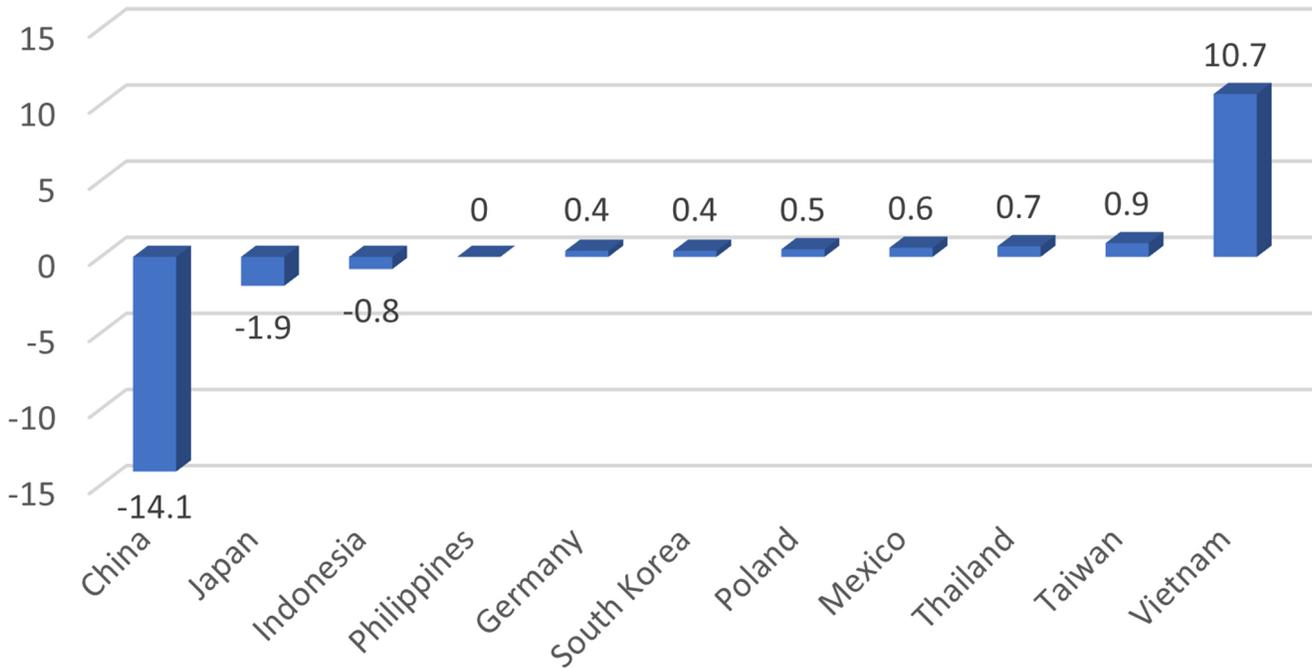
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Audio and Video Equipment Imports



square meters in 2021⁶. This surge in demand reflects a broader shift in production strategies as companies seek to balance efficiency with the resilience of their supply chains in a rapidly changing global market.

The reshaping of global supply chains toward nearshoring is not only a response to immediate logistical challenges but also a long-term strategic realignment that is playing out in every corner of the world. By reducing dependencies on distant markets and fostering regional economic synergies, nearshoring is paving the way for a more interconnected and robust global economy. While the nearshoring shifts have just begun, the full extent of changing trade remains to be seen. 🌍

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A FARMER AT HEART

IPC standards volunteer Joe Russeau straddles farm, laboratory life

By Linda Stepanich, Contributing Editor, IPC Community

“I’ve tried to leave the farm, but it’s part of who I am. There is something about that lifestyle, a joy I can’t express about how it makes me feel to see my cattle doing well.”

—Joe Russeau

Joe Russeau, president of Precision Analytical Laboratory, Inc. (PAL), has studied chemical residues on electronic assemblies for nearly 30 years. An IPC leader who chairs the 7-11

Test Methods Subcommittee and a member of the 5-32G Residue Task Group and J-STD-004 Task Group, Joe’s expertise lies in the analysis of manufacturing residues on the performance of electronic assemblies.

While Joe is an acknowledged leader in the field of chemical electronics and ion chromatography, what really makes his heart sing is his herd of Black Angus cattle and his deep love of cattle farming. He and his family—wife Andi, and children Rachel, Isaac, Claire, and Jacob—spend their



JOE AND ANDI RUSSEAU

free time preparing for 4-H competitions and local fairs in Indiana.

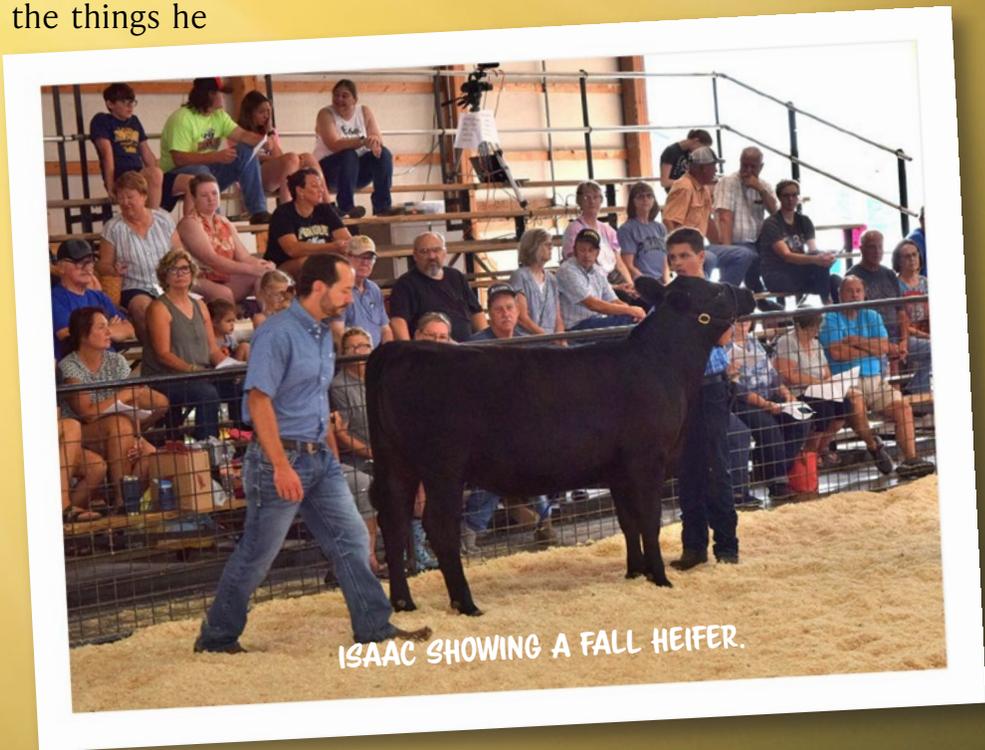
“I was raised on a farm, and truth be told,” Joe says, “if I had the lifestyle of my choice, that is what I’d be doing.”

Luckily, Joe finds time to do the things he is best at: both raising cattle and evaluating and analyzing printed board and assembly cleanliness. His expertise in ion chromatography (IC), surface insulation resistance (SIR), and electrochemical migration (ECM) enables him to help clients find solutions to cleanliness questions that will mitigate risk to their products.

This knowledge about cleanliness led him to IPC at the suggestion of Doug Pauls, an IPC Hall of Famer and long-time volunteer. “I was a lab rat who used to work for Doug, and he suggested getting involved with IPC to help my business grow,” Joe says.

However, Joe gets more out of his IPC involvement than just helping grow his business. “The primary thing I get out of IPC is being able to contribute a voice to the direction the industry needs to take,” he says. “I meet folks I’d never have met from all over

the globe, and I now have new colleagues and friendships. I get to practice public speaking and have leadership roles—things I may not have had outside IPC.”



Joe has led the 7-11 committee since 2006 and says that, in many cases, test methods have not kept pace with circuit technology. “7-11 used to be an editorial body and now there are teeth in our process with the test method development packet required when submitting a method for approval. Fewer people send methods for review because validating them takes time and commitment to complete the work, and many don’t have the time to do what is necessary.”

He is experienced in all manner of cleanliness methods and is one of the few speaking out about taking these methods to the next level. “Many in the industry like to use the old ways, which are good frameworks,” he says. “But technology has changed so much, and we need to adjust. Circuit design is different: board real estate has shrunk, and our testing technology is not keeping pace. We need to do something to make changes so we can at least keep pace. These 50-year-old technologies we use for testing may come back to hurt us someday.”

He’s committed to seeing the industry adjust to the changes and has a novel idea for creating a space for discussion. “I would like IPC to host a debate on some of these topics,” he says. “The industry is hung up on certain aspects of certain tools they want to continue using, and we shouldn’t always just look for simplicity in a test. Sometimes we need a more extravagant test. We need tools that can give us more information about the residues manufacturers can find on their boards. Rather than do a presentation, bring up a topic, and

let’s debate it in front of our peers. It would be of great interest and allow others to make an informed decision. Hash it out; that’s how it used to be done. Roll up your sleeves and get dirty. That makes IPC what it is, and there are many successful standards to prove it.”

As dedicated as Joe is to ensuring that test methods keep pace with technological advances, he’s just as serious about his family farm. The Rousseau family owns a herd of female black Angus, and the children actively show the animals at 4-H competitions throughout the state. Their respect for the land and the work of farmers, like Joe’s father before him, informs the work they do.

“I am a steward and a caretaker,” Joe says. “I may own these cattle, but they do not belong to me. It’s a big responsibility, and I owe them the best I can provide. If we can help someone along the way—and we’ve donated to the local rescue mission to help feed the people who live there—that is all part of the lifestyle. We owe our cattle and community the best we can do.” 🌈





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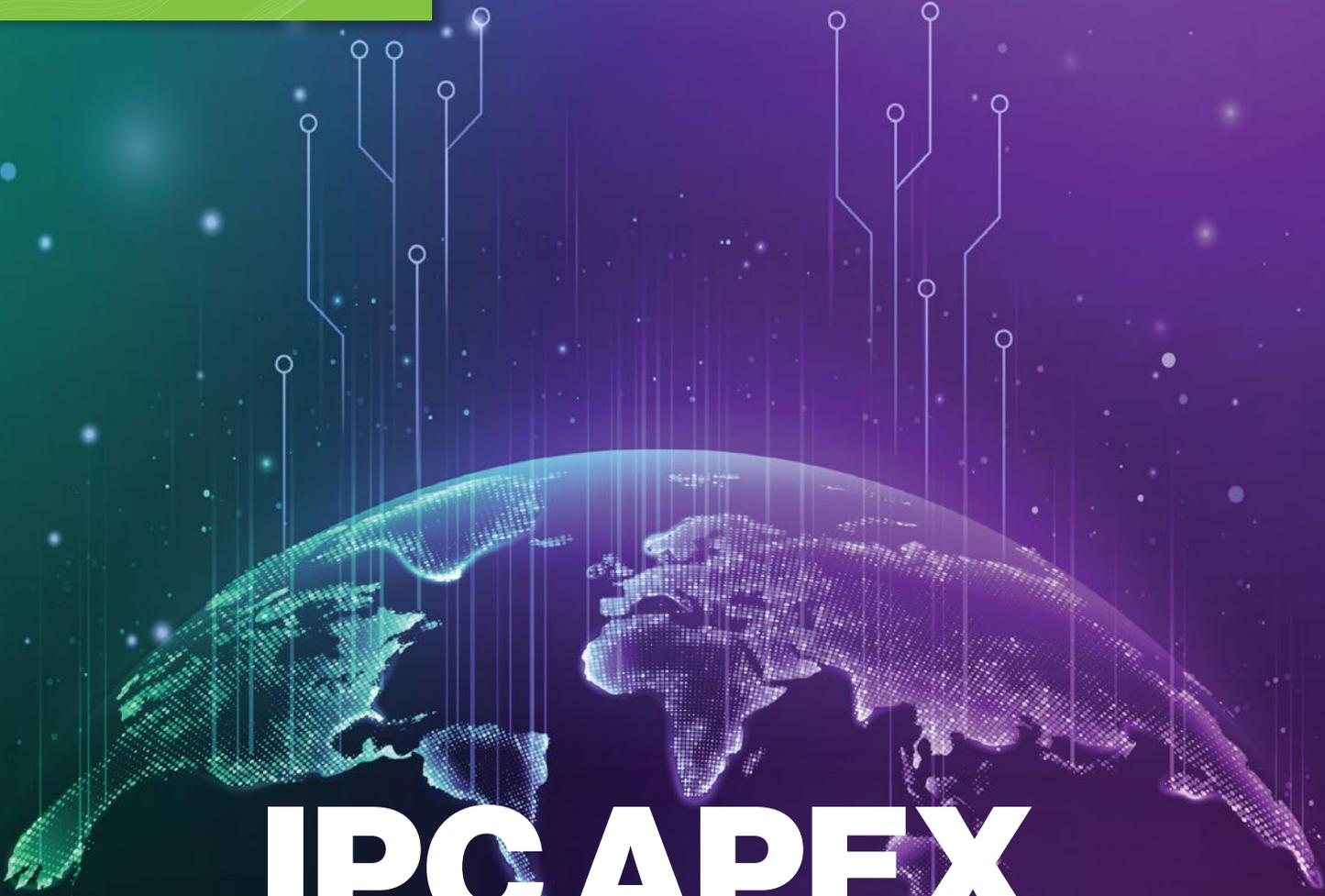
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Discover the newest innovations and hear from the best minds in the electronics manufacturing industry. **IPC APEX EXPO 2024** is our industry's largest event in North America, and this year's event will feature the largest gathering of leading manufacturers, suppliers, and product innovators, a technical conference with highest level of quality and technical merit through peer-reviewed technical paper presentations, professional development courses featuring knowledge you can leverage right away, non-stop networking opportunities and much, much more! Join us in Anaheim, California, April 6-11, 2024, as **IPC APEX EXPO** host the **Electronic Circuits World Convention 16** (ECWC16).

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IPC APEX EXPO 2024

What's next becomes now

By Alicia Balonek, Senior Director, IPC Trade Shows and Events

The IPC APEX EXPO planning team looks forward to welcoming attendees, exhibitors, and presenters to IPC APEX EXPO 2024. We will feature exhibitors, a technical conference, and professional development courses where you'll gain insights and learn about new ideas and innovations. Find new discoveries on topics from advanced packaging to e-mobility, design to Factory of the Future, and sustainability for electronics.

IPC APEX EXPO is the ideal place for electronics manufacturing industry members to

meet and collaborate with peers, leaders, and innovators from around the world during educational sessions, on the show floor, in standards development committees, and at various networking events and receptions.

We are proud to host the 16th Electronic Circuits World Convention (ECWC16) this year. This international PCB symposium encourages knowledge sharing about the latest information on global PCB demand and the PCB manufacturing process. ECWC16 promotes the domestic PCB industry in every country



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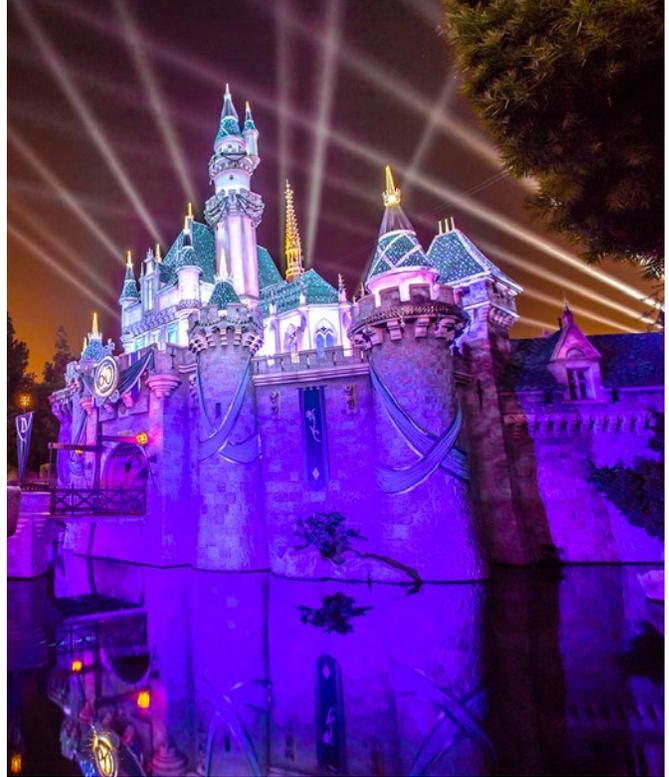
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and every region. To celebrate ECWC16, we will host an ECWC welcome reception and a world convention closing ceremony.

What's New This Year?

We welcome three keynote speakers to inform and enlighten us about current events in electronics manufacturing. Paul Bailey, former principal concept technical director for Walt Disney Imagineering, will present “The Art of the Impossible” during the Tuesday opening keynote and discuss the creation of the Star Wars land expansions at Disneyland and Disney’s Hollywood Studios at Walt Disney World. He’ll also talk about the Star Wars: Rise of the Resistance attraction and other “moonshot” projects while covering the “why” and deep purpose behind the decisions made and the human side of leading a team while attempting projects of such magnitude.

Our Wednesday luncheon keynote speaker is Dr. John W. Mitchell, IPC president and CEO, who will discuss the future of the human workforce and maximizing its potential in an automated world. Shawn DuBravac, IPC chief economist, will deliver the keynote at the ECWC closing ceremony and provide insight into the



next wave in electronics/trends reshaping our industry.

By signing up for educational sessions that are directly applicable to your work, you will meet manufacturing industry professionals from around the world, who are facing (and solving) challenges like yours, and learn techniques to overcome these challenges that can be implemented immediately.

Networking opportunities are plentiful at IPC APEX EXPO. In addition to the Women in Electronics Reception, and Monday’s Networking luncheon, new this year is the ECWC16 welcome reception. If this is your first visit to IPC APEX EXPO, be sure to attend the Newcomer’s Reception to learn how to make the most of your visit.

IPC APEX EXPO has not been in Anaheim since 2006, and we’re happy to be so close to Disneyland again—and to offer discounted Disneyland® Resort Theme Park tickets. IPC APEX EXPO attendees will receive a link to discounted Disneyland Resort Theme Park tickets in their registration confirmation, so bring your family along to Anaheim or consider adding a little vacation time to your trip to IPC APEX EXPO. 🎨



Paul Bailey



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TAEC

Demystifying the Technical Activities Executive Committee

By Linda Stepanich, Contributing Editor, IPC Community

You have an excellent idea for a new standard in the electronics manufacturing industry. How do you turn that idea into a reality? It's simple: You submit a PIN to the TAEC.

Now, what does that even mean?

To develop a new standard, you need the help of the IPC Technical Activities Executive Committee (TAEC) Global. Ideas for new IPC standards are submitted via a Project Identification Notification (PIN) to TAEC Global, which conducts an initial review. The PIN is then sent to the general TAEC standards development oversight committee for review and approval. How do they review it and who comprises the committee?

Karen McConnell, Northrop Grumman, IPC Hall of Famer, and long-time IPC volunteer, joins other TAEC members to provide clarity and insight into the critical role the TAEC plays in the standards developed by IPC members. She's currently serving her second term as TAEC chair and describes it as "the committee that cares about all the standards, not particular ones. Each



of the family of standards has a vote on the TAEC."

Language in standards needs to be consistent, she says, so that someone trying to change jobs doesn't have to learn a new language when they go from fabrication to assembly or design to manufacturing. "The TAEC is the overseer of consistency," she says.

TAEC Global includes the chair, vice-chair, and two members each from Europe, India, and Asia. The TAEC meets yearly at IPC APEX EXPO and SummerCom, providing updates on leadership at IPC and new committee members.

"The TAEC needs global representation," Karen says. "TAEC Global reviews the PINs and ensures they are complete before sending them to the TAEC for a vote. The most important thing is to make sure that everyone gets to speak."

The TAEC is comprised of the chairs of the IPC General Committees. General refers to the oversight committees with subcommittees and task groups underneath them. For example, the 5-20 Assembly and Joining Committee has Subcommittees (e.g., 5-22) and Task Groups (e.g., 5-22A) underneath it. The chairs of the 5-20 Committee have representation on the TAEC.



Debbie Wade, Advanced Rework Technology, has a unique role as vice-chair.

“I’ve worked with IPC for over 20 years and have in-depth knowledge of the many aspects of standardization,” Debbie says. “There is

always so much you can learn from the many knowledgeable, diverse, and experienced individuals. It’s important to understand the TAEC is a collective where all input is listened to and discussed. This makes the role challenging but equally rewarding.”

The TAEC is important to standards development, she says, because it “allows all chairs and vice-chairs of IPC general committees to review questions and issues related to IPC Technical Programs. This allows members with massive technical and IPC experience to deal with some very difficult problems while building new and revision changes to IPC standards.”

After serving five years on the general TAEC committee, leaders become lifetime members of the TAEC. “We want to keep the history of what has happened,” Karen says. “It gives us a wealth of knowledge.”

TAEC members also keep an eye on up-and-coming committee members who show clear leadership skills and recommend them to be general committee chairs and serve on the TAEC.

“Many of us were mentors for emerging engineers and you can see who is good,” Karen says. “It would not surprise me in the least to see a former emerging engineer as the chair of the TAEC within a few years. Leadership gets stale, and committees need new blood to keep everything going.”

David Caputa, Lockheed Martin, is “new blood” for the TAEC. “Serving on the TAEC is



different than being a committee chair because TAEC members get the privilege of helping to steer all IPC committees, and help organize exciting, new industry developments,” he says. “TAEC members are then given an opportunity to vote to advance the PIN. It’s a true honor to be on the TAEC.”

He enjoys his new role because “serving on the TAEC allows me to be involved on a much broader scale and to be informed of all the efforts outside of the committees I typically support. Additionally, serving on the TAEC has been an incredible networking opportunity as I meet and collaborate with other top leadership at IPC.”

Jason Keeping, Celestica, says his TAEC membership differs from his committee chair role. “As a committee chair, you have a deep yet narrow sector of industry experts that can solve any project within their area of the industry,” he explains. “As a TAEC member, you have a broad perspective of industry. You are in a position to see which projects are similar and can support one another along with projects that may need more support to move the industry forward.”

He likes comparing the farmer of the field with the leader of an ant colony. Both are leaders in their own right, but one has a much broader view than the other and the other is much deeper in the trench on the day-to-day operations to move actions forward.

“As a member of the TAEC, I have the opportunity to work with other industry-leading subject matter experts and leaders that I would not otherwise work with as their focus is on different sectors of the industry,” Jason says. “This opportunity is a great avenue to





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explore and learn other areas of the business to support my sector of leadership that would not otherwise be available through a different lens of perspectives.”

The TAEC is important to standards development. “As the industry is composed of so many complex and ever-changing new developments, without a leadership body that can oversee these changes and bring groups together, as well as provide direction that may

not otherwise have been possible, we would be years (if not decades) behind where we are today without this leadership forum,” he says.

Karen hopes to focus on translating standards at the next TAEC Global meeting. “We tend to write the way we speak,” she says, “and that is not always translatable into other languages. This is big on my agenda since new engineers need to understand what we’re saying—in any language.” 🌈

A Personal Fulfillment

Karen McConnell has been active in IPC for many years, and is endlessly curious about our industry. “I am fascinated with the people I meet,” she says. “When we gather at committee meetings and feed and grow our brains to get to the proper solution, we can do things better together than any one of us could do individually. I call it the global or collective brain; we all work together. It’s fascinating to watch that happen.”



As TAEC chair, she spends a great deal of time learning about new committees and standards and meeting new committee members. “When I review the e-print and

wearables documents, for example, I know that if I can’t understand the first paragraph, no one else will. When it comes to PINs, I should know why they want me to read a section. With committee meetings, it’s great to see the new technology.”

She feels inspired to attend sessions on e-textiles or advanced packaging because it gives her a better understanding, and she enjoys meeting so many new people.

“I have the habit of at least once during **IPC APEX EXPO** finding a table where I don’t know anybody, but that’s getting harder lately,” Karen says. “It is a joy to sit down and listen to people who teach me new things.”

A turning point was at SummerCom 2023 when, for the first time, she had to stand in line to use the ladies’ room. “I have attended so many meetings when I was the only woman there,” she says. “That has changed now, and it’s thrilling to see the young female engineers put their voices forward.”

When she’s not at work or working on committees, Karen indulges in a personal interest: “I’m a Harry Potter nut,” she says. “I don’t know how often I have listened to audiobooks going home on my commute from Baltimore. Now I read the fan fiction; I love the ones written by younger people.”

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IPC Day Romania

First-time event exceeds expectations

By Peter Tranitz, Senior Director, Solutions, IPC Electronics Europe GmbH

In September, IPC Europe participated in the successful IPC Day Romania, “Build Electronics Better with Standards and Solutions,” featuring speakers from Flex, GE Healthcare, Indium, IPC, NASA, Nokia, Stellantis, TTM Technologies, Viscom, Vitesco Technologies, and the Polytechnic University of Timisoara (UPT).

Attendees learned about the latest advancements in electronics standards and solutions, reliability, e-mobility, medical electronics, and workforce training and education.

The event began with keynote presentations from John W. Mitchell, IPC president and CEO, and Paul Baldassari, president of Flex.

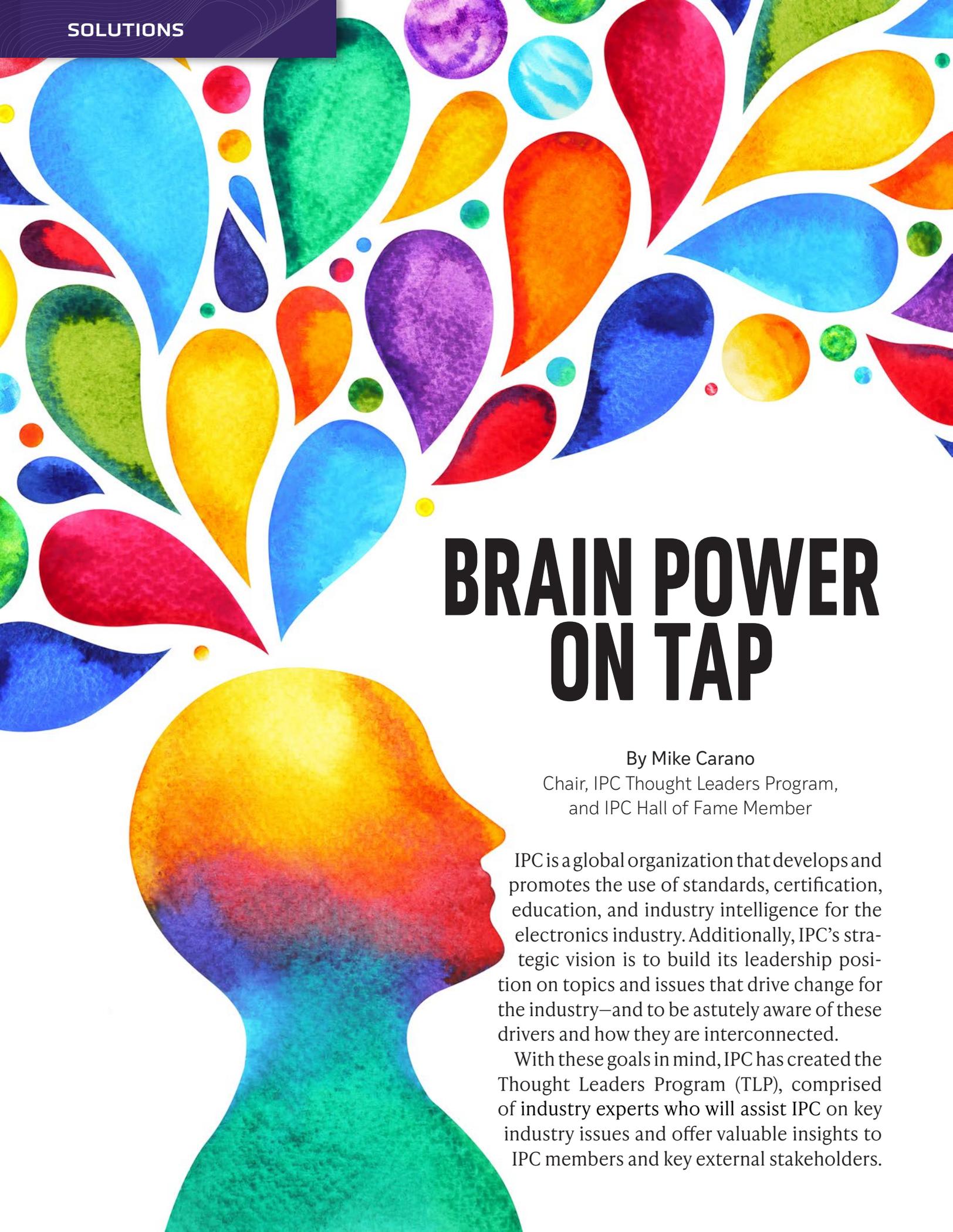
IPC Day Romania was sponsored by Flex, which did an outstanding job hosting the more than 230 attendees at the Polytechnic

University, and which provided the auditorium to welcome an event of this size.

On the day before the event, Flex opened its doors to IPC, where visitors toured their site. It was a very detailed and extraordinary factory tour. Attendees were invited to visit a Flex-sponsored SMT laboratory at UPT, followed by a cocktail event at ARChA for the Exhibition Atlas of Distances, an exhibit from “Timisoara 2023–European Capital of Culture,” featuring the design and architecture installations related to extraction climate and industrial cycles.

In addition to enjoying the cultural events in the city, participants networked with a community of peers and participated in vigorous discussions about the latest advancements in electronics manufacturing. 





BRAIN POWER ON TAP

By Mike Carano

Chair, IPC Thought Leaders Program,
and IPC Hall of Fame Member

IPC is a global organization that develops and promotes the use of standards, certification, education, and industry intelligence for the electronics industry. Additionally, IPC's strategic vision is to build its leadership position on topics and issues that drive change for the industry—and to be astutely aware of these drivers and how they are interconnected.

With these goals in mind, IPC has created the Thought Leaders Program (TLP), comprised of industry experts who will assist IPC on key industry issues and offer valuable insights to IPC members and key external stakeholders.

I'm thrilled and honored to coordinate the TLP and the work of this distinguished and diverse group of individuals. Our industry is on the cusp of exciting change, and the thought leaders IPC has assembled will help guide the industry to new heights.



This select group of experts is tasked with generating ideas and insights in five areas:

- Education and workforce
- Technology and innovation
- The economy
- Key markets
- Environment, health, and safety

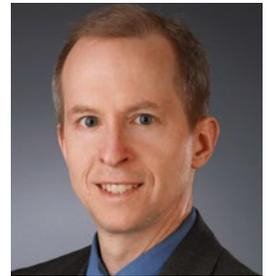
Using these five areas as a guide, IPC will push for changes in our industry, including more government interaction and widespread stakeholder involvement. Our thought leaders will be publishing white papers and presenting webinars on subjects ranging from the circular economy to working with materials and chemicals that may have adverse effects. In addition, they will generate new ideas on how to successfully compete in today's chal-

lenging environment. Other areas of critical thinking and thought leadership will focus on how to best draw individuals to our industry and further the development of those individuals in the workforce. There will be additional commentary on sustainability.

Finally, you can expect to see thought leadership on how the printed wiring board industry can compete on a larger scale, and how the industry can leverage the various consortia in practice to expand the industry further.

Our panel of experts and thought leaders are lending their insights into some of today's most critical subjects. Here is just a sampling of issues and what you can expect to see from our thought leaders.

Technical writing: Dr. Stanton Rak of SF Rak Company, an industry veteran and technologist, has called attention to the need for improved technical writing skills for engineers and



Why I joined the Thought Leaders Program:



Matt Holzmann,
CGI Americas

"I got involved with the TLP because, having had access to many of the largest Asian fabs over the years, there is much that we can learn in process and technology optimization. I want to not only learn but share what we've learned with our industry peers."



Stephen Sweeney, IBM

"I am excited to join the Thought Leaders Program and provide insight on critical issues, including full material disclosure (FMD) and/or sustainability in the electronics industry. I have served with IBM as the program manager for chemicals and materials management since January 2022 and hope to leverage this platform to address sustainability challenges within the industry."

scientists who desire to publish their works. Stanton considers technical writing an essential skill for engineers and scientists.

Supply chain: Matt Holzmann of CGI Americas, who has seen the electronics industry supply chain dynamics shift dramatically over the past 20 years, is passionate about onshoring to America. He suggests that with proper investment, the electronics industry, in terms of printed circuit board (PCB) and semiconductor fabrication, can thrive again in the United States. However, he realizes the current thinking must be changed. Matt will offer his valuable insights as to how this can be achieved. Matt will provide thought-provoking ideas and solutions to strengthen our critical technologies related to the country's security.

Full-material disclosure: There are more regulations governing various industries than ever before. Yet, there is a conundrum that materials and chemical suppliers face: FMD. Stephen Sweeney of IBM is tackling this issue and how it's affecting companies that must protect their intellectual property.

Workforce development: We would be remiss if we didn't address the hot topic of workforce development. Finding and employing competent personnel to operate equipment and other machinery in this high-technology environment is no easy task.

Peter Bigelow of FTG Circuits, business owner and an executive in a PCB fabrication company, is passionate about finding the right formula to attract and retain competent workers for the PCB and PCBA provider industries.



Cybersecurity: Hiroyuki Watanabe of NEC is concerned about cybersecurity in today's high-performance factories. His expertise suggests that management is more interested in recouping the cost of security measures inside individual companies than in what those measures should be. Hiroyuki will provide insights and suggestions for companies of all sizes operating in this highly digitized world to prevent cyber-attacks and preserve their mission-critical business operations.

I am excited to lead such a distinguished group of thought leaders. Through our partnership with IPC, and its strategic vision to provide global leadership, these topics and others will help your business grow and succeed. 🌈

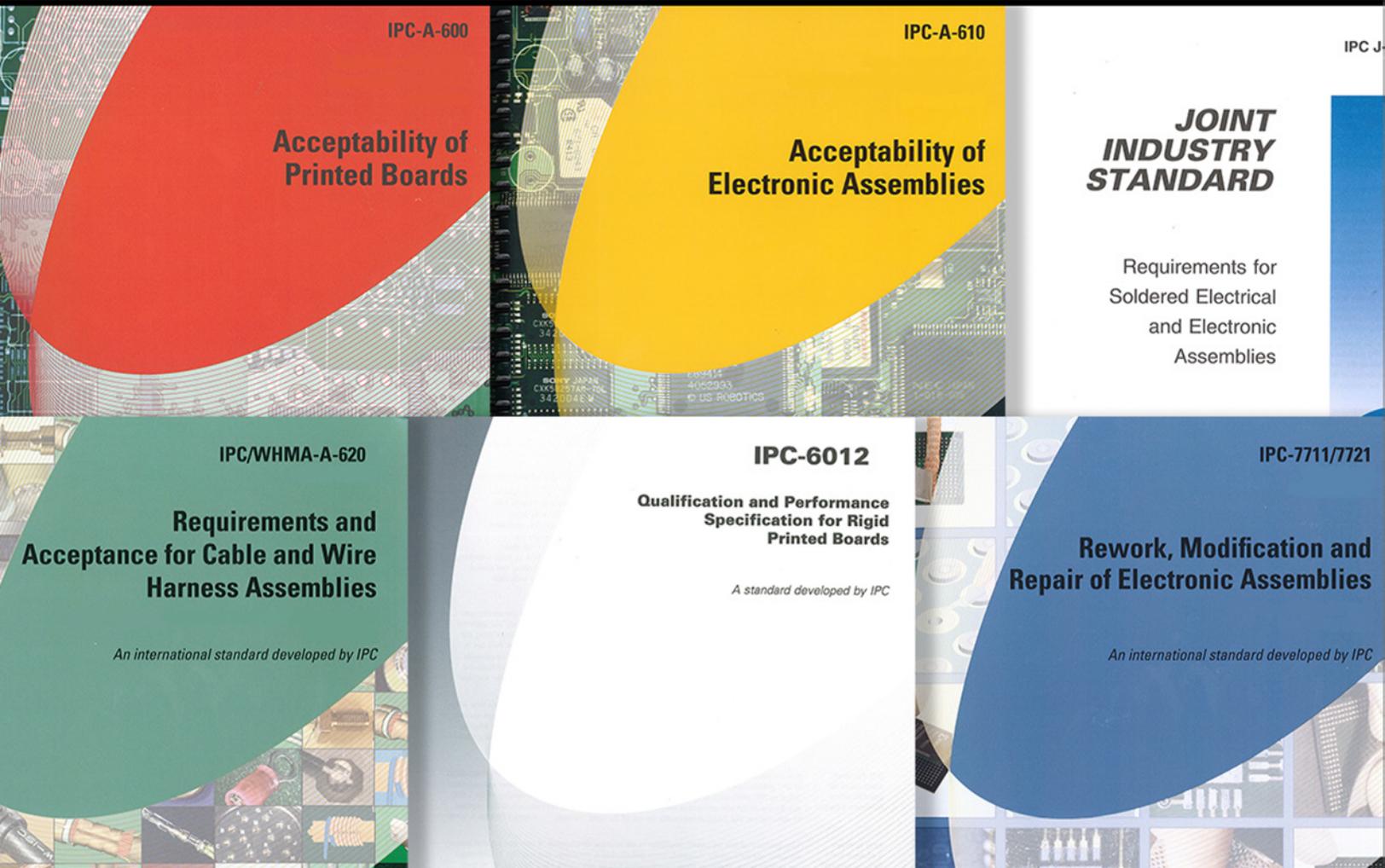


Want to learn more about IPC Thought Leaders Program?

MikeCarano@ipc.org



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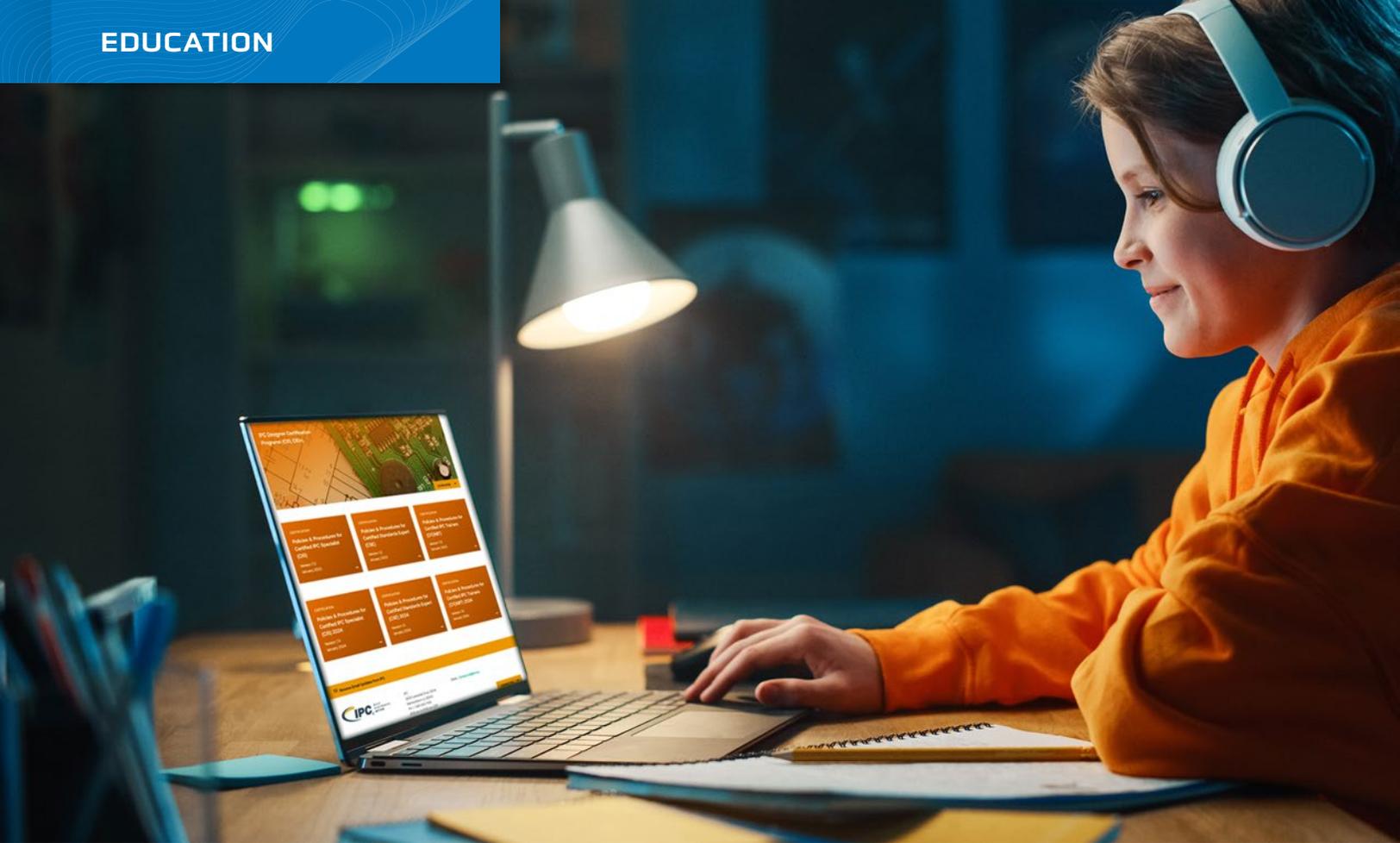
The CIS (Operator), CSE (Standard Expert), and CIT (Trainer) credential levels for IPC Certification can be taught online or in person at your facility or at one of our worldwide training centers.



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IPC Certification

Leading the way to ensuring quality in electronics

Michelle Te, Managing Editor, IPC Community

When high school students face an upcoming test, they may experience a mix of dread and excitement, depending on the source material and how well they've prepared. Similarly, professionals sitting for a certification exam to test their knowledge of IPC standards may feel a whirlwind of emotions. However, these aren't just any exams; they're meant for operators, engineers, and managers building the critical infrastructure of our world's most essential electronics systems.

Why is certification necessary? Simply put, standards certification provides a foundation

of proven knowledge for our most vital electronics manufacturing systems. The process to create the standards against which these systems are measured is both rigorous and meticulous. The examination process mirrors that depth, ensuring that individuals remain proficient in applying IPC standards even while the technology evolves.

Each IPC standard has a separate certification committee, and those committees are tasked with writing and developing new exam questions and answers. "Some of the standards are very broad, with more than 400 pages of technical guidelines and instructions," says Joe

Williams, IPC director of certification, “so obviously we can’t test on every detail, but we make sure to assess the most pertinent information.”

Certification committees work closely with IPC staff liaisons to provide guidelines about what the committee believes professionals in the field need to know, such as common elements in the workplace. We repeat this process for each standard, which amounts to hundreds of items under review.

A certification is valid for two years, and when IPC releases a new or revised standard, the certification staff begins reviewing their pool of questions to determine whether they are still relevant.

“That’s where a lengthy process comes into play,” Joe says. “Subject matter experts review every item through committees that discuss every question. The concept is simple, but the complexity adds up quickly when you realize it’s for hundreds of items.”

Levels of Credentials

Diploma Awarded by an academic institution after completing a series of courses. This includes instruction, assessments, and those predefined by government.

Certificates Awarded by academic institutions or third-party organizations after completing a course or a series of courses. This includes instruction and assessments; courses are usually shorter in time than a diploma, measure knowledge gained from the related course, and criteria are predetermined by the awarding institution.

Certification Awarded by third-party organizations after completing an assessment. It is job-based in nature; courses are optional and usually shorter in time than a diploma/certificate program, measure knowledge previously obtained and not from a specific course and are pre-determined by the awarding institution based on input from the industry. IPC offers certifications in three levels.

Licensure The main difference between certification and licensure is that government entities regulate licensure. It is mandatory to practice in a profession and measures knowledge previously obtained. Think doctors, lawyers, pharmacists, counselors, etc.



Choose the Right One for You

How do you choose the right IPC certification level for you and your company? IPC currently provides three levels of certification to the IPC standards for individuals in the electronics industry. Depending on your experience within the industry, you can become certified as:

1. Certified Standards Expert (CSE)
2. Certified IPC Trainer (CIT)
3. Certified IPC Specialist (CIS)

Choosing the right level of certification for you is important. To learn more about the three certification levels, visit [IPC Standard Certifications](#).

Additionally, standards and certification exams can be translated into 20 languages. IPC has representatives around the world who take on these responsibilities.

“It’s a monumental feat to do that and it takes time to accomplish,” Joe says. “We want to ensure the exam is fair and equal in every language. We have representatives from all over the world, and we’re always looking to grow our certification committees with subject matter experts more consistently and regularly.”

When developing the exams, IPC staff pay careful attention to how questions are worded, how often they are repeated on exams, how often exam takers answer the questions correctly, and whether there is overexposure to specific questions.

“We don’t want people to prep for specific exam questions, but rather to study the standard broadly,” Joe says. “We want them to understand the material and not just focus on a handful of questions. The goal of certification is to demonstrate proficiency or minimum competency in an area of knowledge.”

Each respective endorsement serves a specific purpose in your organization, so you have to choose what’s right for your business. “IPC/WHMA-A-620 is about wire and cable harness assemblies, and if you’re not manufacturing wire and cable harness assemblies, you may

not need your staff to earn that endorsement,” he says. “However, IPC standards cover the most important parts of the electronics manufacturing processes.”

IPC utilizes more than 150 partner certification centers worldwide to prepare students for and administer the exams. These centers provide the necessary training for the workforce to be certified and earn the proper credentials. Visit [IPC Standards Certification Centers](#) and search for a certification center near you.

The number of certification exams administered has grown steadily over the past few years, with just a minor dip in 2020 due to the COVID-19 pandemic, but even then, IPC innovated an online proctoring system to allow participants to take their exams from home.

“All that progress comes from the work that our team has put in to improve these programs,” Joe says. “The training materials and exams are of high quality and serve as critical assets to the industry.”

These certifications continue to grow and evolve with an intentional focus on quality across all certifications. “Right now, for example, we’re reviewing the exam for IPC-7711/21, rework and repair,” he says. “There is a hands-on proficiency assessment correlated with the certification, and we are thoroughly examining it to improve that assessment.” 



What is **IPC EDGE**?

It's important for executives and staff to continue to build the electronics skills and knowledge necessary for success in the industry. IPC EDGE provides an opportunity to develop individually and scale learning in your organization.



Celebrating over **123,000** IPC certifications in 2023!



That translates to

10,263
per month

2,368
each week

337
every day

14
an hour

Source: IPC

Meet the Team

Certification

IPC Certification requires internal collaboration at IPC. David Hernandez provides the vision and C-suite perspectives while Joe Williams and Amy Wright manage different parts of the certification process. Joe's team creates and revises the exams that must be passed to earn a certification. This involves working closely with certification committees and subject matter experts. Amy's team works with certification centers and customers to facilitate exams, access credentials, and overcome technical hurdles.

Certification provides a critical service to electronics manufacturers and IPC supports certification centers and a company's internal training organizations to maintain the high level of expertise that IPC certification represents.

David Hernandez

Vice President of Education

David is responsible for certification, education, and professional development activities, including oversight of the IPC certification and workforce training programs, IPC Edge, and the development and distribution of a wide range of educational products and solutions.

Before joining IPC, David served for eight years as the director of education and systems for the American Welding Society,

where he oversaw a diverse team responsible for global education initiatives and programs. In his 20-year career, David has worked with businesses, schools, state and national government agencies, NGOs, and nonprofit organizations to increase the accessibility, quality, and efficiency of education and credentialing programs. He advocates for advancing career and technical education through technology and has spoken at over 100 conferences and events.



Joe Williams

Director of Certification

Joe oversees the examination development and operations of IPC certification programs globally.

Rebecca 'Becky' Nader

Psychometrician

Her focus relates to the development cycle of certification programs, from job analysis and standard setting to calibration, scoring, and data analyses.

Laura Budzinski

Certification Test Development Specialist

Laura is a liaison with various certification committees, consisting of SMEs throughout the electronics industry, to craft and review content for various IPC exams.

Debbie Goodhart

Item Quality Assurance Coordinator

Debbie assists with operational examination development activities related to psychometrics, examination building, and quality assurance of exams.

Zenaida Valianu

Training Manager

Zenny works with committee A-teams to update CIT and CIS training materials to reflect revisions made in IPC standards.

Amy Wright

Operations Director, Education

Amy manages IPC's education systems, processes, and support.

Dominique McBride

Operations Support level II

Dominique works as support staff to the education team and as an onboarding specialist.

Stephanie Stagg

Operations Support level II

Stephanie works as support staff to the education team and as an onboarding specialist.

Doug Bergman

Operations Support

Doug works as support staff in the certification department.

Judy Wells

Operations Support

Judy works as support staff for the certification department. 🇺🇸





BOSTONtec

A perspective on the evolving wire harness industry

By Brittany Martin, WHMA Marketing Coordinator

BOSTONtec® is a Michigan-based company established in 1993 that produces high-quality, height-adjustable modular workstations. It serves the assembly, fulfillment, medical, automotive, aerospace, and technology markets.

With 30 years of design and manufacturing experience, BOSTONtec is a leader in ergo-

nommic workstations and custom solutions that increase productivity, ROI, employee safety, and satisfaction. All BOSTONtec products are designed and fabricated in the United States and sold worldwide.

We visited with Rob Doucette, senior applications engineer, to learn more about the wire harness industry from his point of view.

What are the day-to-day operations like at your company? What are the main goals and objectives you set out to achieve daily?

Rob Doucette: At BOSTONtec, our teams collaborate seamlessly to fulfill our primary objective: meeting the unique requirements of our customers. With a steady stream of leads flowing through our website, phones, and channel partners, our regional sales managers engage with dealers and potential end users to gain deeper insights into their specific applications. Should the application be straightforward, our sales managers will use our configuration tool to develop a workstation design.

For projects that involve customization, our experienced applications engineers step in with concept drawings to help customers visualize their options. Once the concept receives approval and the purchase order is finalized, our engineers transform the concept into a detailed design, which is then handed over to our manufacturing team for production.

What's the biggest challenge facing the wire harness industry today? What will be the challenges in 10 years?

The cable and wiring harness industry plays a crucial role in various sectors, such as automotive, aerospace, medical, and telecommunications. These are all undergoing rapid and constant changes.

We think the industry's biggest challenge today is creating increasingly customized and complex solutions to meet the specific and ever-evolving needs of customers.

In 10 years, the cable and wiring harness industry will likely face new challenges from technological advancements and unpredictable market conditions. These challenges could bring both opportunities and threats. It will be crucial for everyone involved in the industry to adapt to changing customer expectations and requirements.

To remain relevant and competitive, we must invest more in research and development, automation, digitalization, and customer service.





Rob Doucette

What’s something about the wire harness industry that has surprised you?

Ergonomics is at the core of BOSTONtec as a company. We are passionate about it and have been working very hard to convince the

material handling industry of the value and benefits of ergonomic solutions. In collaboration with the Ergonomics Center of North Carolina State University¹, we conducted an ergonomic study to demonstrate the quantifiable differences from using workstations with ergonomic design features. Over the years, we encountered a lack of awareness and skepticism. However, lately, we are surprised in a positive way to notice that more companies in the industry have come around to embrace ergonomics. That makes our job a little easier.

What has been the most significant accomplishment for your team in the past year?

Our team has grown in response to the increasing interest in and demand for our products. We have achieved better brand recognition through superb customer service and a strong online presence. Over the years,

WHMA Hosts Annual Global Leadership Summit

Registration is open for WHMA’s Annual Global Leadership Summit, Feb. 13–15, in Myrtle Beach, South Carolina. Join us as we build relationships, make powerful connections through peer-to-peer discussions with current and potential business partners, and discover new approaches to industry issues.

[Click here](#) to register.

Speakers include:

- **Tyler Noesser**, technical director, alliantgroup
- **David Marquet**, retired U.S. Navy captain and author
- **Cara Silletto**, president and chief retention officer, Magnet Culture, a Crescendo Strategies Company
- **Brian Fretwell**, author and speaker
- **Shawn DuBravac**, IPC chief economist
- **Steve Baker**, vice president, The Great Game of Business, Inc.

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Global Leadership Summit

WHMA Wire Harness Manufacturers Association | IPC BUILD ELECTRONICS BETTER



we have accumulated knowledge and experience in ergonomics and workstation design, which we share with our existing and potential customers through multiple channels. It has helped customers choose the products that best fit their applications.

What motivates your team?

We are motivated by positively impacting the lives of workers everywhere. We take great pride in providing ergonomic workstation solutions that enhance productivity as well as the safety and well-being of workers. It is important for us that everyone leaves their workplace in the same shape as when they came in.

What is one initiative on your whiteboard that wasn't there 30 days ago?

We strive to exceed our customers' expectations by continuously improving our products and services. We understand that the mobile digital service trend is transforming how our

customers work and interact. In response, we are upgrading our highly popular Configurator tool to make it even more intuitive and user-friendly. Our goal is to provide 24/7 on-demand services to our customers wherever and whenever they need them.

What WHMA resources does your company take advantage of?

BOSTONtec values the abundant resources provided by WHMA/IPC. In particular, we appreciate the tremendous effort of WHMA/IPC in the comprehensive monthly report, "Current Sentiment of the Wire Harness and Cable Assembly Industry." We read these reports regularly because they help us stay on top of global industry trends and advancements. 

References

1. "Ergonomics Benefits by the Numbers," BOSTONtec.com.

Standards Update

Newly Published Standards and Revisions

IPC-1791D

Trusted Electronic Designer, Fabricator and Assembler Requirements

IPC-1791D provides minimum requirements, policies, and procedures for printed board design, fabrication, assembly, and cable and wire harness assembly organizations and/or companies to become trusted sources for markets requiring high levels of confidence in the integrity of delivered products.

IPC-6012F

Qualification and Performance Specification for Rigid Printed Boards

IPC-6012F covers qualification and performance of rigid printed boards, including single-sided, double-sided, with or without plated-through holes, multilayer with or without blind/buried vias, and metal core boards. It addresses final finish and surface plating coating requirements, conductors, holes/vias,



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Consumer Electronics



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frequency of acceptance testing and quality conformance, as well as electrical, mechanical, and environmental requirements.

IPC-1782B

Standard for Manufacturing and Supply Chain Traceability of Electronic Products

IPC-1782B establishes minimum requirements for manufacturing and supply chain traceability based on perceived risk. IPC-1782B applies to all products, processes, assemblies, parts, components, equipment used, and other items as defined by users and suppliers in the manufacture of printed board assemblies, as well as mechanical assembly and printed board fabrication.

IPC/WHMA-A-620E-S

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

IPC/WHMA-A-620E-S space addendum provides additional requirements to IPC/WHMA-A-620E standard to ensure the reliability of cable and wire harness assemblies that must survive the vibration and thermal excursions encountered getting to and operating in the military and space environments.

IPC-2591-V1.6

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. The standard applies to communication between all executable processes in the manufacture of printed board assemblies, automated, semi-automated, and manual, and is applicable to related mechanical assembly and transactional processes.

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 [ipc.org/status](https://www.ipc.org/status)

High Density Packaging User Group provides its members with outstanding value through member-driven projects...

HDP User Group is a project-oriented industry consortium addressing the integration of new electronics technologies into member company supply chains.

HDP has successfully brought electronics producers and suppliers together to solve component packaging and interconnect challenges for more than 30 years.

...and contributes to the IPC community.

Three HDP papers are being presented during IPC APEX/ECWC16:

- **Innerlayer Copper Balancing to Reduce PCB Surface Topography Under Large Form Factor BGAs.** Gary A. Brist, Intel Corporation & Neil Hubble, Akrometrix.
- **Managing Backdrill Stub Length Variations due to Innerlayer Core Deformation.** Gary A. Brist, Intel Corporation
- **HDP Users Group Thermal Analysis Methodology Assessment.** Tony Senese, Panasonic; Jason Furlong, PWB Interconnect; Sarah Czaplewski-Campbell, IBM & Jenny Inocencio, Isola.

JOIN HDP – Join industry leaders driving the evolution of PCB technology.



Collaborate. Create. **SOLVE.**



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.

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WHAT STUDENTS ARE SAYING

The live interaction facilitated asking questions that helped clarify the information

The material of this course was great!

The recorded lectures helped me to be able to review the training materials at a time most convenient to me.

I liked the approach the instructor took to get full participation from all of the students.

The instructor explained the course in detail, in a way that was understandable by everyone.

Over 500 students have experienced the personalized instruction of IPC's instructor-led courses. Start the year mastering mil/aero applications, radio frequency boards, or learning the fundamentals with Introduction to Design I & II. [Check out the complete annual schedule here.](#)

2024 COURSE SCHEDULE FOR JANUARY – APRIL

COURSE NAME	DATES	DAYS	TIME	# OF WEEKS
PCB Design for Military, Aerospace & Other Extreme Applications	Jan. 22–Feb. 28	M/W	8 am PT/11 am ET/5 pm CET	6
PCB Design for Radio Frequency Boards	Jan. 22–Feb. 28	M/W	3:30 pm PT/6:30 pm ET	6
PCB Design I section 1	Jan. 23–Feb. 29	T/TH	8 am PT/11 am ET/5 pm CET	6
PCB Design for Manufacturability	Feb. 20–Mar. 7	T/TH	9 am PT/12 pm ET/6 pm CET	3
Certified Electronics Program Manager	Feb. 27–Apr. 4	T/TH	2:30 pm PT/5:30 pm ET	6
PCB Design II section 1	Mar. 18–May 15	M/W	8 am PT/11 am ET/5 pm CET	8
PCB Advanced Design Concepts	Mar. 18–May 15	M/W	3:30 pm PT/6:30 pm ET	8
PCB Design II section 2	Mar. 19–May 16	T/TH	3:30 pm PT/6:30 pm ET	8
PCB Design I (Brazil)	Apr. 22–May 29	M/W	7 pm BST/ 6 pm ET	6
Top Lead-free Production Defects & Issues – Causes, Remedies	Apr. 23–May 2	T/TH	8 am PT/11 am ET/5 pm CET	2





Recycling PCBs

NCAB is navigating challenges and embracing opportunities

By Jan Pedersen, Director of Technology, NCAB Group

In a [recent article for Design007](#) about sustainable PCBs, my colleague Ramon Roche wrote about the various environmental regulatory requirements all of us have to meet every day. He emphasized that regulations are used as a starting point. He stated, “We also require our suppliers to comply with local social and environmental regulations and be ISO 9001 and ISO 14001 certified, where applicable.”

The ambition to create sustainable printed circuit boards (PCBs) is a continuous effort, and no single regulation makes a complete solution. However, applying all these standards together can help to create the most sustainable PCB possible.

Regulations are there to move the world in a direction, but in reality, the most significant effect is ensuring we efficiently use existing technologies and services. These regulations can be considered starting points instead of

endpoints. We see that the industry can aim for more: We want to see actual steps toward a fully recyclable PCB, whether that is achieved through closed-loop processes or environmentally friendly end-of-life disposal.

The escalating use of electronic products has led to a critical environmental issue known as electronic waste. Among the key contributors to this waste stream are PCBs. As a result, the concept of PCB recyclability has gained significant traction within NCAB, driven by technological advancements and a growing environmental consciousness.

We have a strong commitment to sustainability and want to help others consider advancing the concept of circularity in PCB production and amplifying its significance in creating more sustainable PCBs. This is not without challenges, which include recycling PCBs and the potential of reusing organic PCB residues for new products. We see promising



technologies that give us confidence that we can achieve fully recyclable PCBs and we highlight one of those projects in this article.

Understanding Circularity and the Challenge of PCB Recyclability

Circularity is the practice of reducing waste at the end of a product's life by integrating that product back into the production lifecycle. It means that when we send an electronic product containing PCBs for waste management, we can reuse the scrapped product as raw materials in the production of a similar product. However, achieving true circularity can only be done if we have a homogeneous product, meaning the product needs to be made from the same group of materials. This, however, is not the case with PCB-containing electronic products, as they contain a mix of materials.

The assembled PCB is a homogeneous integration of multiple products: the bare PCB, plus components soldered on the PCB, such as semiconductor packages, resistors, and

capacitors. For us to recycle PCBs effectively, we must first remove the electronic components so that we are left with the bare PCB, as that is the product that we want to recycle. To understand how that can be done, we must examine what a PCB is made of.

The Composition and Bonding of PCBs: Implications for Recycling

The surface of a PCB has solder mask and marking ink. Below that are copper conductors in several layers inside the PCB. Additionally, all PCBs have surface finishes, such as tin or gold contacts or connectors. Within the PCB, we have different epoxy or other resin versions that encapsulate fiberglass cloths. All these components are bonded together, which, quite frankly, makes separation a challenging task.

Currently, the only way to break down the PCB is by grinding the complete PCB, resulting in a blend of small particles of metals, fiberglass, and resins (epoxy). While there are techniques for separating the different metals

(such as copper and gold) for reuse and new PCBs, the resulting residue of resin and fiberglass particles is less useful and useless for PCB production.

Globally, much of this organic residue is managed as waste in landfills. However, in some countries, this residue becomes a source for generating heat and electricity. The ideal approach would be reusing these residues for new products, and several projects are investigating how that can be done. The goal is to separate glass fibers from the resin so they can be used as raw materials for new PCB base materials.

Promising Advances: Separating Fiberglass from Epoxy Resin

Shengyi, a major laminate factory in China, has developed an FR-4 fiberglass base material suitable for being separated into its constituent parts, allowing the fiberglass base material to be separated from the epoxy resin that makes up the laminate. So far, this has only been achieved in a lab and is not ready for an industrial scale.

So, when we talk about a recyclable PCB, we should refer to the separation of fiberglass from resin in the organic residue, and the extent to which we can reuse it to produce new PCBs.

Testing the New Material: Assessing Reliability and Characteristics

Let's look into this. How reliable is the new Shengyi base material compared to FR-4 base materials—the traditional and most common types—and what are the characteristics of this material?

While the published characteristics must also be qualified, it is worth noting that this material has very similar characteristics to a high-end low-halogen (FR-4.1) material. In spring 2023, NCAB ordered samples of this recyclable FR-4 type base material and conducted a series of common tests in our Stock-

holm lab. The results were surprisingly good.

- The samples were thermally stressed six times in a laboratory oven set to 260°C for 2.5 minutes each time (IPC-J-STD-003D Table 4-6)
- The samples were then dipped two times for 10 seconds in molten solder according to IPC-TM-650 2.6.8E Test Condition A 288°C ± 5°C
- A 10 mm x 20 mm microsection was taken and inspected for defects

Our tests indicated, “No deviation against IPC-A-600 could be seen, and no evidence of material degradation could be seen. The material's CTE properties seem good since there is no evidence of pad lifting. The material seems to be able to handle the heat well since there is no evidence of resin recession.”

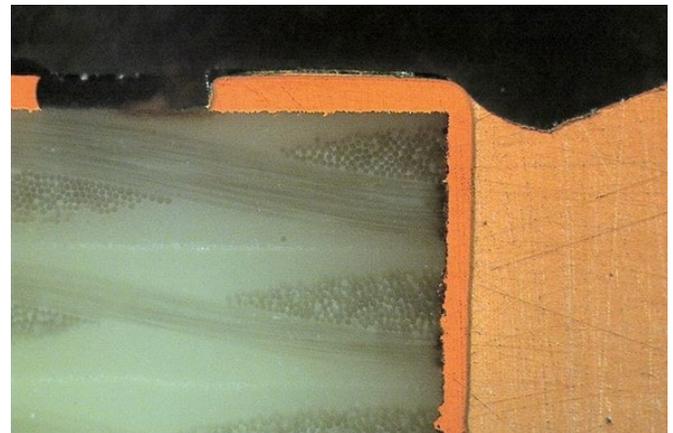


Image displaying the appearance of a thermally stressed hole wall. No resin recession, no pad lifting. We have seen no deterioration of reliability as a result of delamination. (Source: NCAB)

Moving Forward: Further Testing of Recyclable PCB Material

So, what's next? We have done tests but haven't yet sent any boards for assembly, which is our next step. We plan to assess the material's performance and reliability in real-life scenarios and to do long-term reliability tests. In conclusion, to confirm reliability, we need more data.

A Plant-based PCB Material: Jiva Soluboard

Another interesting development is the Jiva Soluboard, a PCB material made of jute, which means it is fully organic and, funny enough, can be dissolved in pure water of 90°C or above. This can be seen in [this YouTube video](#). Until recently, this material has been usable for single-sided PCBs only, but according to Jiva, the new Soluboard v2 shall withstand plating processes, which means it can be used for PCBs with plated through-holes. NCAB plans to test this material in parallel with the Shengyi material to see differences, understand properties, and how it can be used for real products.

Conclusion

Your question now might be, “When can we order PCBs made of this material, and when can we test the circularity?” Unfortunately, we don’t have a definite answer yet. As mentioned, we will order more boards, test them, and send them to customers willing to do field tests. For the recycling, we will follow the laminate factories very closely and share with our customers as we go.

Additionally, one factor that can speed up the concept of PCB recyclability is the interest among standardization organizations like IPC and UL, and papers presented in global conferences.

Overall, as the concept of PCB recyclability gains momentum, we need to explore the challenges of achieving true circularity due to the heterogeneous nature of electronic products. Testing and development of new materials show promising results, all of which contribute to the goal of recyclable PCBs. While uncertainties remain about the timeline for fully recyclable PCBs, continued research and collaboration can accelerate progress in the recycling and sustainable use of PCBs. 🌱

Member Milestones

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

IPC Anniversaries in Q4 2023

Draper

Cambridge, Massachusetts, USA

50
YEARS

Unimicron Technology Corp.

Taoyuan Hsien,
Taoyuan City, Taiwan

40
YEARS

Janco Electronics Inc.

Rollinsford,
New Hampshire, USA

Universal Instruments Corp.

Conklin, New York, USA

25
YEARS

ASMPT

Suwanee, Georgia, USA

Circuit-Tech Inc.

Markham, Ontario, Canada

Compeq Manufacturing Co. Ltd.

Taoyuan Hsien, Taiwan

GPD Global, Inc.

Grand Junction, Colorado, USA

ITM Consulting Inc.

Springfield, Tennessee, USA

Los Alamos National Laboratory

Los Alamos, New Mexico, USA

Lutron Electronics Co. Inc.

Coopersburg, Pennsylvania, USA

MicroCraft K.K.

Okayama, Japan

Plasma Ruggedized Solutions

San Jose, California, USA

RiverSide Integrated Solutions, Inc.

Lewiston, Minnesota, USA



productronica 2023

IPC supports the electronics industry at biennial event

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

The signature event for our industry in Europe in 2023 was productronica, and IPC was thrilled to exhibit at the Munich show and support our members across Europe. Our presence this year was threefold:

- Host the Hand Soldering Competition World Finals
- Showcase thought leaders and industry activities in the vital areas of connected factory exchange (CFX), sustainability, market research, wire harness technologies, design, and e-mobility
- Provide valuable meeting space for our sponsors and partners to conduct business

The show was a resounding success for the thousands of exhibitors who presented cutting-edge solutions in equipment, tools, components, and software across the four-day event. IPC was able to fulfill the goals aligned with our core mission to serve the industry across our main pillars of standards, education, advocacy, solutions, and industry intelligence.

The World Finals in Hand Soldering boasted record participation from 16 countries: Thailand, Vietnam, China, Japan, Sri Lanka, India, Malaysia, Taiwan, United Arab Emirates, South Africa, Germany, France, United Kingdom, Italy, Hungary, and Estonia. This illustrious group of regional winners represented the

best global talent in an important workforce skill. Given the task of manually populating a printed circuit board to create a functional assembly in under 60 minutes, the result was 12 PCBAs that were fully functioning. The judges declared the winners to be China and Japan, based on the quality of the solder joints, cleanliness, and speed.

Joe O’Neil, chair of the IPC Education Foundation, was impressed with the action at productronica, particularly at IPC’s booth. “The crowd trying to get a glimpse of the IPC Hand Soldering World Championship was six people deep, as everyone tried to catch a glimpse of the competitors in action,” he said. “Productronica was well attended, and there was a renewed sense of energy and a big buzz being generated from IPC’s space, including resources and presentations.”

Using a dynamic “video wall,” the IPC Forum debuted as a two-way communication vehicle for the industry to share and exchange critical information and know-how on important challenges impacting cost, quality, reliability, supply chain risk, and compliance. The speaker roster was a “who’s who” of industry thought leaders:

- **CFX:** Michael Ford, Aegis Software; Thomas Marktscheffel, ASMPT GmbH & Co. KG; Naim Kapadia, Grinsty Rail Ltd; Markus Scheid, Scheid IT; Sandro Ballurio, Canavisia; Jennifer Davis, Arch Systems; Gadi Meik, Arch Systems; Alexis Fouquet, Europlacer; Bertrand Leplay, Europlacer; Martin Kostadinov, SAKI Europe GmbH; Chris Jorgensen, IPC
- **Sustainability:** Didrik Bech, Altium; Golzar Alavi, Bosch; Benjamin Klingenberg, NCAB; Michael Ford
- **Market data:** Dieter Weiss, in4ma; Philippe Leonard, IPC
- **Wire harness:** David Bergman, IPC
- **Design:** Peter Tranitz, IPC
- **E-Mobility technology solutions:** Tracy Riggan, IPC

Michael Ford gave presentations on both IPC-CFX and sustainability. “The combination of productronica as the primary industry event for electronics assembly in Europe, and IPC being the focal point for industry standards and technologies, brought a lot of interest and excitement to the show,” he said.



“CFX is becoming well established throughout the industry, with attendees to the presentations eager to learn more about the potential value CFX data availability provides, including advanced analyses, live decision-automation, machine learning and closed-loop operations, CO₂ emission sustainability credential creation, as well as practical advice from an SME perspective showing how CFX eliminates barriers and wasted cost that otherwise would be incurred.”

Ford was enthusiastic about the videos of the presentations. “Videos enabled others to share in the program content, to inspire and prepare all of us to face opportunities and

challenges in the industry, today and in the future,” he said.

The post-presentation discussions among the audience members and facilitators validated the notion that transparent dialogue on these key topics across all phases of the value chain is necessary to develop optimal solutions.

Looking Ahead

As the industry works together to build electronics better, it serves as a reminder that the “C” in IPC continues to stand for collaboration and community. 🌈

Overheard at productronica 2023

Dieter Weiss, in4ma, asked, “Do we really need PCB manufacturing in Europe?” It raised some eyebrows, but he said Europe must have growth in PCB manufacturing for national security and supply chain resiliency purposes.

Benjamin Klingenberg of NCAB shared the parameters for developing a sustainability rating: circularity, waste, water consumption, power consumption, and toxicity.

“PCB is the second largest contributor to CO₂ emissions in the Electronic Control Unit.”
—**Golzar Alavi, Bosch**

“Design is a very important yet still under-appreciated aspect of addressing sustainability.”
—**Didrik Bech, Altium**

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A Glimpse Into Tomorrow

IEMI to showcase innovations in electronics manufacturing

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

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

IEMI 2024 is anticipated to attract a global audience, including industry leaders, technology experts, policymakers, and academia, all converging to discuss the trends and challenges in electronics manufacturing. The event will feature a series of keynote speeches, technical presentations, panel discussions, standards

development meetings, and a hand soldering competition, all focused on the latest advancements and future directions in the field.

IEMI 2024 will comprehensively address various topics pivotal to electronics manufacturing. This edition will notably focus on the advanced packaging of semiconductors at IEMI Malaysia, showcasing the latest advancements and innovations in this critical sector. Concurrently, IEMI India will place a significant emphasis on defense and aerospace by exploring the latest trends, technologies, and challenges in these high-stakes industries. These key themes reflect the event's dedication to highlighting cutting-edge developments and regional specializations in electronics manufacturing.

Click below to register for the location you would like to participate in.



3rd Edition

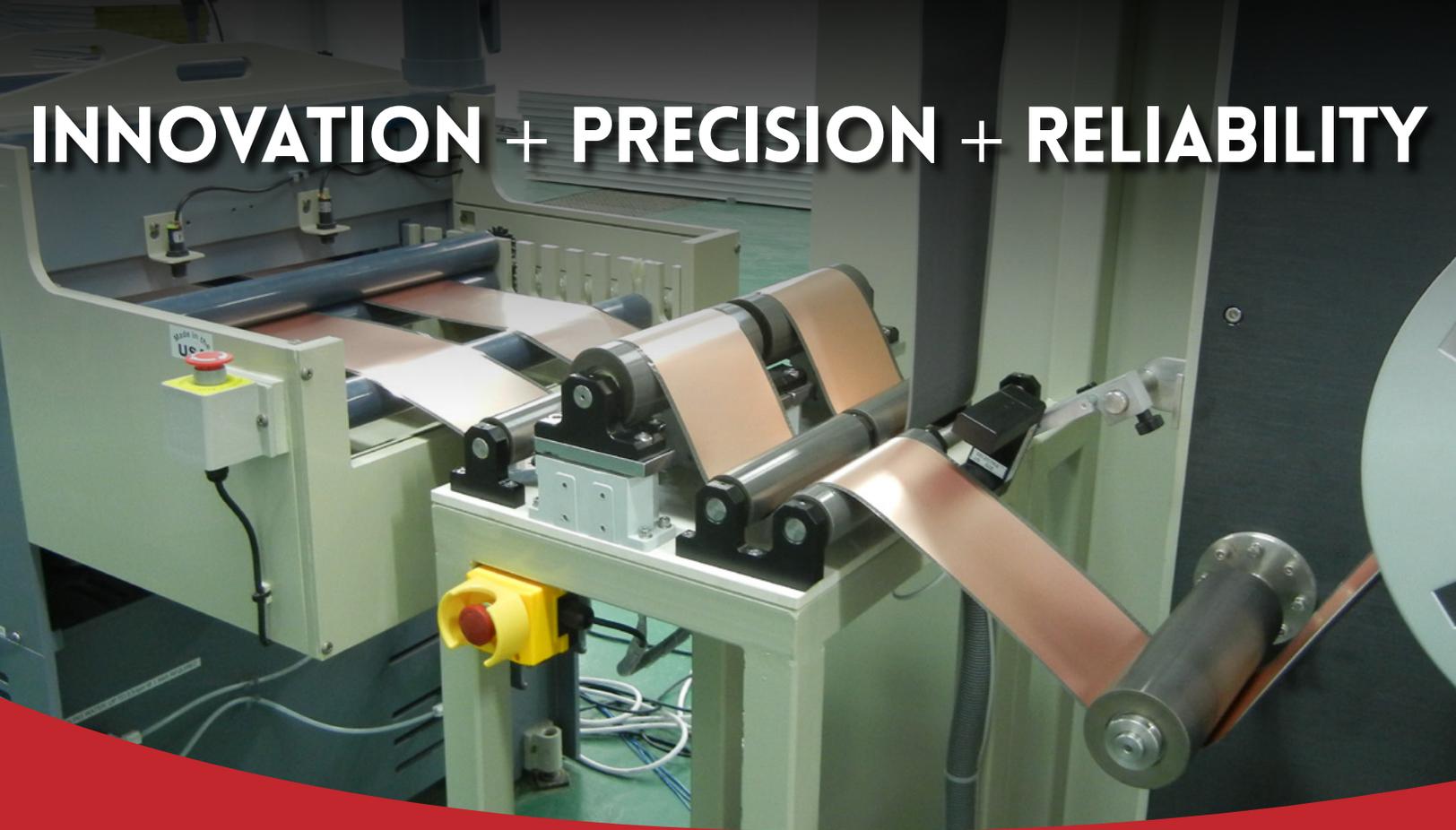
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IPC K-FEST 2023

IPC Korea hosts Festival of Electronics Standards and Technology

By Glenn Gong, Marketing Director, IPC Asia

IPC K-FEST, our annual premier event in Korea, successfully convened on Nov. 9 in Suwon, South Korea, with nearly 80 representatives from more than 40 companies spanning diverse sectors.

K-FEST stands for Korea Festival of Electronics Standards and Technology and is organized by IPC Asia and the IPC Korea Advisory Committee. “IPC K-FEST 2023 is where innovation meets inspiration, where standards meet technology, and where the future of electronics comes alive,” says Sydney Xiao, president, IPC Asia Pacific.

The event kicked off with welcome remarks from Dr. John W. Mitchell, IPC president and CEO, and Jongwon Kwon, general project director, De-facto Standard Forum. Sydney addressed the topic of “IPC Standards Trends.”

During the technical seminar session, industry experts presented insights into quality issues and countermeasures of electroless

tin plating, evaluation of basic properties of soldering materials, verification processes of SMT manufacturing based on IPC standards, and correlation between IPC QML and PCBA capability.





Other activities during the event included appointing members to the second IPC Korea Advisory Committee, a meeting with the IPC-A-610 Regional Task Group, and the annual IPC Member Appreciation and RTG Awards.

“We have seen the growing scale of IPC Korea’s activities, especially through this K-FEST event,” said Jaesang Min of LG Electronics, a member of the second IPC Korea Advisory Committee. “We are looking forward to the future role of IPC in leading relevant

standards in the electronics and automotive electronics industries.”

“IPC K-FEST is the fantastic result of a team effort between IPC and the IPC Korea Advisory Committee, bringing together the best minds in the global electronics industry,” Sydney said. “We shall make IPC K-FEST the go-to annual event in Korea, where we can all come together to cheer on the amazing strides in electronics standards and technology. Let’s celebrate the future at IPC K-FEST.” 🇳🇵





Advancing Innovation

IPC CEMAC 2023 fosters cooperation

By Glenn Gong, Marketing Director, IPC Asia

In October, IPC China hosted IPC CEMAC, the annual landmark event focusing on the most critical topics in the electronics manufacturing industry.

“It serves as a prominent platform to facilitate communication and promote cooperative opportunities within the electronics

industry,” says Sydney Xiao, president, IPC Asia Pacific. “We earnestly invite more people to participate because it inspires industry innovation and fosters collaboration.”

More than 300 representatives from 200 prominent companies gathered in Shanghai for the event with the theme, “Building an

Appreciation & Awards Dinner



Intelligent Future: Innovation and Cooperation in the Electronics Industry.” The event had IPC standards at its core and was dedicated to creating a high-value platform for mutual exchange and learning among professionals in the electronics industry.

IPC President and CEO John W. Mitchell, and Hongliang He, vice secretary-general of the China Electronics Industry Standardization

Technology Association, delivered keynotes. The event also featured six forums, covering the topics of automotive electronics, talent training and development, innovative products and solutions, advanced packaging, Factory of the Future, and ESG sustainability.

In addition, the conference played host to IPC Asia committee meetings, standards technical group meetings, and the annual IPC



Member Appreciation and Awards Dinner. An exhibition showcased innovative products and solutions from local electronics manufacturing companies.

“Participants had in-depth discussions on industry trends, technological innovations, market challenges, and opportunities,” Sydney says.

Zhicheng Yang of Shennan Circuits Co., Ltd., received the IPC Asia Excellence in Leadership Award. “Standards are the technical foundation for economic activities and social development,” he says. “As the authoritative organization in the electronics industry, IPC has been consistently developing industry standards. Shennan Circuits has been collaborating with IPC for more than 15 years. I firmly believe that, under IPC’s guidance and through our ongoing collaboration, we will continue making

valuable contributions to global standards that move the entire industry forward.”

IPC Asia officials say the successful organization of this most recent IPC CEMAC has played a pivotal role in spurring innovation, development, and collaboration in the industry.

“It provided an arena for passionate discussions on industry trends, technological advancements, and the wealth of opportunities presented by the market,” Sydney says. “These offer invaluable insights and inspiration for the future of the electronics industry.”

IPC CEMAC 2024, scheduled for Oct. 24 in Shanghai, will continue this mission. “We want to further expand our horizon and provide an even broader platform for professionals within the global electronics industry,” Sydney says. “We want to engage in enriching dialogue.” 🌈



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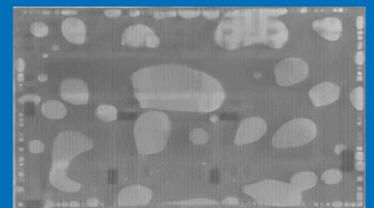
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No vacuum

A photograph of the Auburn University campus. In the background, a large, multi-story red brick building with a prominent clock tower and a weather vane on top. The building is surrounded by lush green trees. In the foreground, there is a well-maintained green lawn. A row of vibrant purple and red flowers runs across the bottom of the image, partially obscuring the text. The sky is clear and blue.

Driven by a Mission

Student members excel at Auburn University

By Charlene Gunter du Plessis, Senior Director, IPC Education Foundation

The IPC Student Chapter Program officially launched in early 2019 with 10 universities and community colleges, including Auburn University in Alabama, where students have remained active and involved. They have truly been a beacon of hope, particularly during the difficult pandemic years, and have risen even stronger since. This is due to inspiring student ambassadors and leaders who are shaping the way for every new member.

The IPC Student Chapter Program provides student members various opportunities, including scholarships and awards, access to industry-relevant content and knowledge, engagement with industry representatives, and leadership roles. The program offers insights into career opportunities in the electronics manufacturing industry through on- and off-campus events, webinars, speaking engagements, and industry conferences. The



IPC Education Foundation oversees this program and has carefully reviewed the structure this past year to ensure it continues impacting students at community and technical colleges and universities across North America.

The mission of the IPC Education Foundation is to support building a talent pipeline for the industry. Students are at the forefront of the talent pool our industry desperately needs. Therefore, it is essential to showcase the continued commitment and dedication of Auburn University's IPC Student Chapter student leadership, their IPC involvement, and how they've managed to keep their fellow members engaged to such an extent that it has resulted in membership growth and increased student involvement.

Since 2019, 36 students associated with the Auburn IPC Student Chapter have received an IPC Student Member and/or Leadership Scholarship. Three students have participated in the IPC Emerging Engineer Program—resulting in an additional \$10,000 investment—and IPC has ensured students are attending IPC APEX EXPO.

When seeking to understand the intricacies of student societies, we see three core elements that determine their success or failure. Student leaders have executed their duties with precision in the following ways:

- They are student-driven. As students, they are the movers, shakers, and steerers of the chapter's goals and activities.
- By offering high value. They offer consistently high-value engagement opportunities to network, learn, and explore. They keep the lights on by organizing interesting events with excellent speakers who cover exciting topics.
- They optimize member benefits. They make the most of the benefits their IPC Student Membership offers.

Learn more about the IPC Student Chapter Program [here](#). 🌈



Meet Two Student Leaders

By Charlene Gunter du Plessis, Senior Director, IPC Education Foundation

At Auburn University in Alabama, I connected with both Shaheen Pouya, the newly elected IPC student chapter president, who is pursuing a PhD in industrial engineering, and Padmanava Choudhury, the outgoing IPC student chapter president, a graduate research assistant and a fifth-year PhD student in the Department of Mechanical Engineering. He is pursuing a doctoral degree in the reliability of electronics packaging.

The uniqueness of this student-centered approach inspires us. Our program evolves and grows as we attract more talented and passionate student influencers who are interested in pursuing careers in electronics manufacturing. We salute the high caliber of student leaders at Auburn University and extend our gratitude to the impeccable chapter advisors, staff, and mentors endorsing the IPC Student Chapter program on campus.

Shaheen Pouya

Why did you decide to serve in this leadership capacity?

Because I wanted to be part of a great team and organization. I have been engaged in student organizations for a long time. By nature,



Shaheen Pouya

these kinds of organizations have people working in them for a limited time—we all eventually graduate. I want to make sure that whoever joins our team and helps with events will experience a welcoming, professional, and warm community. IPC has a lot of potential both professionally and interpersonally, and I want to take that potential to its maximum.

PROVING

AMERICAN MANUFACTURING INGENUITY AND STRENGTH

Michael

Ensures chemical wet processes are in control with laboratory analysis.

Natasha

Exposes ink-coated panels with patterned UV light to define component openings.

Chris

Prepares inner core panels to promote strong adhesion during multilayer lamination.

Amy

Inspects panels for conformity before ENIG and after final surface finish is applied.

Aaron

Builds and laminates complex multilayer circuit boards for advanced applications.

Leah

Assembles drill bit cassettes for through-hole fabrication for layer-to-layer interconnection.



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What are the most valuable benefits of IPC student membership?

This is an easy question. When I first started working with this chapter, I was amazed by the spirit and support from IPC to the student chapter. Everything was friendly and easy. Regardless of the IPC benefits for courses and certificates, it was the support and friendliness from IPC that made me want to join. Even though networking is very important, it is the feeling that there is an organization that cares for and supports you.

What are your career aspirations?

After I earned my undergraduate degree, I worked for 12 years, and have now continued working while earning my master's degree. I have had many different positions in the industry, from a salesperson to a process engineer, from a project control officer to a CEO. I even started a company and ran it for more than five years before I sold it and came back to school. My career aspirations are to make things better. I want to bring advancements into the engineering world and help younger engineers develop their ideas. Maybe I will do R&D for a company that cares about that aspect or work for a cutting-edge technology-based organization. There are still many unknown parameters, but one thing for sure is that I have never found any sector in the industry as exciting and interesting as electronics manufacturing.

What degree are you pursuing and why?

I have been working for quite a while, and now is a good time to take it to the next level and help the engineering world fundamentally. A good engineer can bring a significant change to our lives, and I needed to be back at a university to do that. I am pursuing a PhD in industrial engineering, and I will use that title the way it is designed to be used: for inspiration and creation.

How do you plan to lead as president of your student chapter?

First, I want to create team spirit by having a good and strong team. Being an IPC member also provides countless benefits, and fortunately, we have many members who are highly involved in every process, decision, and plan we have. There are a lot of good relations between most of the team members because they are working in similar labs every day.

I try to make the meetings as much fun as possible and, accordingly, the members are very motivated and helpful. It works in two ways. First, as a team, we make the most of the potential that IPC offers. Second, there is a good feeling of being a part of a team, which is significantly higher among younger students. Imagine a group that helps develop engineering techniques in any field with members who enjoy spending time together while also benefiting from that organization. This has made it very easy to decide to join.

Why is it important for a school to have a student chapter?

There are so many benefits and good memories that students can only get through a chapter like this. A chapter also helps spread the word about IPC and gets younger students involved.

What advice do you have for other students in your position?

My advice is to enjoy and love the job you're doing. It's a great opportunity to manage an organization without thinking about salaries, jobs, taxes, and things like that, while working with members of a similar age and surprisingly having a lot of free time for fun. No matter how scientific and professional it might sound, there is always room for joy.



Padma Choudhury

What has been the highlight of your term as chapter president?

The highlight was the first seminar we organized. It was about wire harness and our speaker was Jackie Perry. It was a very interesting talk, mainly because it was about a topic we didn't have much exposure to, and we learned about the various options available to us. Another highlight was the job board discussion we had with you, Charlene. It was very refreshing because you understand the difficulties of being an international student.

How involved are the members of your chapter?

We used to have weekly chapter meetings, often for no other reason than to meet, have coffee, and enjoy being together.

Why do you think students should join a chapter?

Because of services and help from IPC, such as access to IPC member companies, scholarships, and courses that help us brush up on the broader aspects of packaging.

What did you struggle with during your term as president?

The major struggle was with time availability. Most of our members are graduate students, so having time to meet when they are already doing lab work was difficult.

How have you grown personally through this experience?

It has helped me learn how to make decisions quickly and actively listen to others.



Padma Choudhury

What is the best part of being part of the IPC Student Chapter at Auburn?

Meeting people from various departments. Thanks to being in a leadership position, I have met a lot of new people here, both students and administrators. I've also met you and your team, which has been very nice.

What advice do you have for Shaheen and the other leaders?

Something I wanted to do was reach out more to undergrads and show them the benefits of electronics because it would help the electronics packaging industry to improve vastly.

What makes a chapter successful?

It's successful when the members are dedicated, driven, and disciplined to promote our chapter and the overall industry. 🌈

To learn more about the IPC Education Foundation, please visit www.ipcef.org.

Gnomeapalooza '23

Delivering on the hype

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

This was the second year for Gnomeapalooza, and for A-Team members who attended, it delivered on the hype. If you've had experience attending face-to-face committee meetings, close your eyes and imagine a large conference room, coffee in the hallway, and the echoes from those tall ceilings. Scratch that for those attending Gnomeapalooza.

Getting a ticket to the October event was easy. There was no need to sit in a virtual room waiting for tickets to go on sale, and no stress trying to secure a ticket before the clock expired. For this event, team leaders asked their staff liaisons to set up a meeting and pick the dates. From there, it was simply a matter of getting travel arranged and preparing the agenda.

The much-anticipated week arrived, and everything was ready. Clumpy and Kloumpious greeted everyone at the door with a sign that said, "Welcome Home to Gnomeapalooza," and each received their VIP Backstage Pass. Some A-Team members knew what that meant, but others were surprised by the atmosphere that prevailed.

Each A-Team had a conference room to meet for business, and additional private spaces where members could meet independently or

take a call. The atmosphere fostered the ability to generate new content and address difficult topics in a productive and supportive environment. Here's what they worked on:

- **Bottoms-Up:** Content reviewed and prepared for the task group.
- **Wire Nutz:** Reviewed comments for IPC/WHMA-A-620F.
- **7-31BV Automotive Addendum:** Completed the relay race looking at the changes in the proposed J-STD-001J and IPC-A-610J documents and reviewed new proposed content.
- **Looks Like a Hangover:** Reviewed comments submitted during the circulation of the J-STD-001J and IPC-A-610J Proposed Standard for Ballots, and prepared for the next task group meeting.
- **Team Redundant:** Started reviewing the process and acceptance criteria in IPC/WHMA-620F for redundancy.
- **Blue Hedgehogs:** Discussed next steps for revising the ultrasonic welding section in IPC/WHMA-A-620.
- **Testing, Testing, 1, 2, 3:** Reviewing and making recommendations for revising the IPC/WHMA-A-620 Chapter 19 Testing requirements.



Solutions

will work with the electronics industry
identify and collaborate on finding
olutions to industry challenges.





Focused meetings like these require a lot of energy. A catered lunch in various cuisines was provided, and there was a dessert with each meal (ice cream, cinnamon rolls, cheesecake, etc.). There were also a lot of sweet and savory snacks to keep the attendees fueled throughout the day. Chicago-mix popcorn, iced cookies, hard pretzels, and other munchies were available, and sodas, water, tea, juice, and coffee could be found in the kitchen. It was a self-serve environment, and the goal to keep everyone happy instead of “hangry” prevailed.

The A-Teams made great progress toward their goals during Gnomeapalooza 2023.

There are many virtual A-Team meetings held throughout a calendar year, but most will admit that nothing beats the face-to-face opportunity when the tough questions are posed. The A-Teams who met this year in Chicago had an experience that they will remember for years to come.

Milea Kammer of Honeywell International and co-chair of Looks Like a Hangover, wrapped up her week by saying, “The experience allowed for team building/bonding in a productive and supportive environment. I can’t wait to return for another year of Gnomeapalooza in 2024.” 🍷

Gnomeapalooza '23 Review 10/10, 5 stars!



“Our A-team signed up for Gnomeapalooza to facilitate in-person working sessions to quickly make substantial progress against our document goals/deadlines. Getting a ticket was easy, our team leaders just had to ask our staff liaison to set up a meeting and pick the dates! There were even guest appearances by Clumpy and Kloumpios, swag for attendees including a backstage pass, and some incredible food. Sweet and savory snacks were available all day, and lunch was catered in

covering a variety of flavor profiles, ensuring everyone had something to enjoy. There was even dessert with each meal (ice cream, cinnamon rolls, etc.).

The experience was intimate, allowed for team building/bonding, and also fostered the ability to generate new content and address difficult comments/ideas in a productive and supportive environment.”



—Milea Kammer,
Honeywell International

SMASHING!

A Review of the IPC High Reliability Forum

By Teresa Rowe, IPC, and Martin P. Goetz, Northrop Grumman Corporation

In the electronics industry, we all agree about the expectation that items leaving Earth must work all the time. Back here on Earth, we expect the same level of reliability from our

communications systems and our cars. There may be differences in the hardware, but vigilance during design and build is integral to ensuring mission success.

We kept this expectation in mind for nearly two years, as we planned and then executed the IPC High Reliability Forum, Oct. 17-18, in Baltimore, Maryland. The forum had been postponed due to the pandemic, but we came back with a mission to make it better than ever. We heard presentations on topics ranging from what it takes to smash into an asteroid, to the challenges of making reliable consumer products.

Welcome to Day One

We began the event with a panel discussion featuring Terry Hoffman and Valentino De Leon of CISCO Systems, Steve Murray of Northrop Grumman, Kevin Kusiak of Lockheed Martin, and Brian Chislea of Dow Chemical Company. We moderated the panel and set the meaning of “high reliability.” The panel participants, representing various sectors of the industry, noted that a lessons-learned database provides a way to ensure information is archived, updated, and maintained so that new projects benefit even as progress is made and the industry advances.

Ed Reynolds of Johns Hopkins Applied Physics Laboratory (APL) presented the keynote titled, “The DART MISSION: Earth Strikes Back” (using a “Star Wars” reference there). He provided an in-depth perspective of the mission challenges experienced while working to change the trajectory of an asteroid traveling at 14,000 miles per hour in space. In other words, it was like playing the video game “Asteroids” for real. The sophistication of technology and precision of guidance to the target left the audience in awe.

Also on the docket were presentations by Chris Peters of USPAE, and Theresa Campobasso and Trevor Stansbury of Exiger. Chris emphasized the importance of communication and collaboration between organizations that provide high-reliability products and services.

Theresa and Trevor emphasized the importance of “knowing where your components are coming from” beyond the standard flow-down requirements from customers. Understanding the risks of limited visibility all the way down to the discrete components and materials is paramount to ensuring reliable products.

The Tuesday meeting concluded with remarks and a video from Sal Sparacino of Zestron, which sponsored the welcome reception.

Heads Up on Day Two

What were flying silicon frogs doing at the High Reliability Forum? For those playing along with the trivia, the answer was “conformal coating.” The panel discussion, and the reference to frogs, explored the need for excellence in cleaning and coating solutions in the automotive industry. The panel members—Kevin Kusiak, Brian Chislea, Brian



Johns Hopkins APL’s Ed Reynolds with Elena Adams, DART mission systems engineer, during a press conference after DART’s successful impact at asteroid Dimorphos on the evening of Sept. 26, 2022. (Source: NASA/Johns Hopkins APL/Craig Weiman)

O’Leary of Indium, and Debbie Carboni of KYZEN—discussed the results of a project and the challenges facing the automotive industry to bring electric vehicles (EVs) to a mass market. Interestingly, only one attendee admitted to having an EV, and we noted that we should revisit that statistic in five years to see how it changes as solutions are identified for the reliability issues discussed.

The EV industry appears to be in the infant stages of understanding, much less embracing high-reliability electronics as part of their products. Uncoated, unprotected electronics within charging stations in various locations around the world, exposed to outside elements such as heat, cold, moisture, wind, etc., clearly indicated cause for concern about their ability to provide a source for charging vehicles anywhere beyond a home base. Another surprising observation: There are over 400 EV companies in China alone, suggesting that in the overall EV market, many players are jumping on the bandwagon and trying to get their products into the market with a low barrier to entry. Although safety is still considered paramount for these vehicles, reliability is not considered as high a priority.

Presenters Leslie Kim of MacDermid Alpha Electronics Solutions and Gerry Partida of Summit Interconnect shared technical information on microvia reliability; Kaixiang Yang of Ericsson spoke about using both modeling/simulation in combination with experimental results of solder joint fatigue; and Dr. Cynthia Chestek introduced the audience to “how brain machine interfaces or neural prosthetics have the potential to restore movement of people with paralysis or amputation, bridging

gaps in the nervous system with an artificial device.”

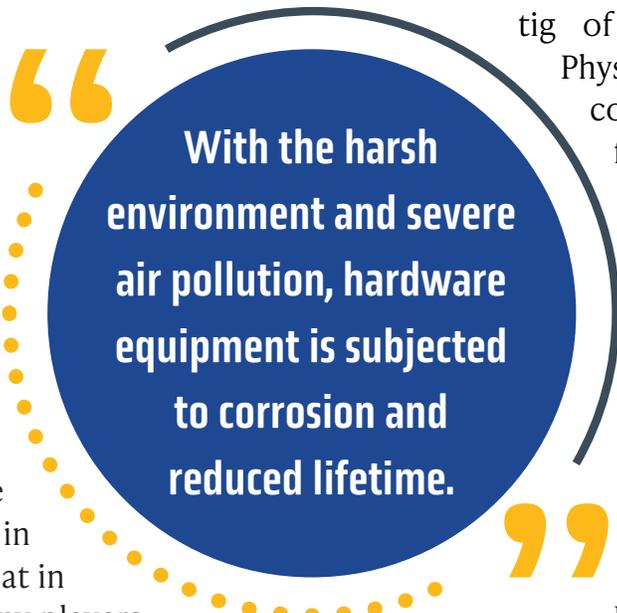
Dr. Kunal Shah of Lilotree focused on IT equipment in the big data/server applications, 5G/6G high frequency, edge computing, and AI applications. It was interesting because one might think of IT equipment and big data servers as living in a tightly controlled environment. However, he said, “With the harsh environment and severe air pollution, hardware equipment is subjected to corrosion and reduced lifetime.”

The final two presentations of the day focused on cleaning from Rachel Hartig of Johns Hopkins Applied Physics Laboratory (ceramic column grid array packages for space applications), and Mike Konrad of Aqueous Technologies (with an entertaining video package of no-clean flux).

On to Day Three

Joe Rousseau of Precision Analytical Laboratory carefully described the language used in IPC J-STD-001 Section 8 to properly analyze PCB assemblies for cleanliness; Dennis Barbini of Zestron was the perfect follow-up as he debated the pros and cons of approaches to cleanliness; and Ray Zhao of Northrop Grumman Mission Systems described what the U.S. Air Force has created for defense industry companies to achieve required performance over the life of the electronics.

Wrapping up the event, the Technical Program Committee responsible for the forum convened for a panel discussion, reflecting on the lessons learned from the forum and what challenges the industry continues to have moving forward. 🌈



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Inspiring Innovation



IPC Around the World

North America

By Brian Knier

Vice President, Marketing, Member Success, and Sales

The final quarter of 2023 was exceptionally productive for the North American government relations and education offices. Amid National Apprenticeship Week, Nov. 13-19, IPC was recognized by the U.S. Department of Labor for our National Program Standards of Apprenticeship. IPC has long worked to raise the profile of apprenticeship as a clear path to career development as well as a strategy for bridging the skills gap in the electronics manufacturing industry. The IPC National Program Standards of Apprenticeship is the first in the electronics industry to be approved on the federal level, recognizing our industry's need for more skilled workers and IPC's leadership in workforce training. IPC is now authorized to register with each state's Eligible Training Provider List, meaning companies can begin implementing apprenticeship programs that meet national standards and are eligible for public funding support.

In the final week of November, IPC welcomed the actions outlined by the U.S. government "to strengthen supply chains critical to America's economic and national security." The COVID-era disruptions experienced by the U.S. electronics manufacturing industry

spotlighted the extent to which the United States has outsourced its industrial base, impacting everything from automobiles to aircraft to consumer products. The investments being made under the CHIPS and Science Act, Defense Production Act, and Inflation Reduction Act must cover more than just a few key products such as semiconductors—they also need to include the full electronics manufacturing system that enables semiconductor chips to function, including printed circuit boards (PCBs) and integrated circuits (IC) substrates.

The U.S. Partnership for Assured Electronics (USPAE) collaborated with the Department of Defense's (DoD) Manufacturing Capability Expansion & Investment Prioritization Directorate (MCEIP) to host the Defense Business Accelerator (DBX) Microelectronics Challenge, an opportunity for advanced technology innovators to vie for funding of up to \$2 million each to further commercialize their emerging technologies. The challenge aims to revolutionize how the DoD drives the development of dual-use technology, which can be used for both civilian and military applications. Seven microelectronics firms received nearly \$10 million in combined funding to commercialize technologies of interest to the U.S. military services.

For more information on these initiatives, visit the [IPC news page](#).

Europe

By Sanjay Huprikar

President, IPC Europe and South Asia Operations

The IPC Europe team is hosting two new events during the first quarter of 2024.

WinterCom Debuts in Spain

Volunteers of IPC standards development committees around the globe will gather in Barcelona, Spain, Jan. 22-25 to participate in IPC WinterCom 2024. The event represents the first time these vital face-to-face sessions will occur outside the United States. The meeting topics for discussion will include materials, design, PCB fabrication, PCB assembly, wire harness technologies, Factory of the Future, e-textiles, and plastronics—with the committees engaged and focused on developing and maintaining the standards that the electronics industry needs to build electronics better.

Attendees will be treated to insightful morning keynote addresses on urgent challenges facing the industry, including workforce development and sustainability for electronics. If you have questions about WinterCom,

please contact TeresaRowe@ipc.org or FranciscoFourcade@ipc.org.

Workshop Addresses Workforce Issues

We are pleased to partner with Advanced Rework Technology, Nano Electronic Services, and Grinsty Rail to present a workshop titled “Insight into Electronics Manufacturing,” on March 7 at Grinsty’s location in Redditch, England. As part of IPC’s focus to help electronics manufacturers address labor shortages, this workshop will highlight the importance of core skills that are lacking in the industry, like precision hand soldering and rework/repair, and simultaneously serve as a job fair for local manufacturing companies in the Midlands region of the U.K. Our thanks to Debbie Wade, Steve Drew, and Naim Kapadia for their energetic leadership. If you have questions about this event, please contact PhilippeLeonard@ipc.org.

In addition to our new events, we look forward to participating in two large industry trade shows in Q1: Southern Manufacturing and Electronics in Farnborough, England, Feb. 6-8; and Global Industrie in Paris, France, March 25-28.



Asia

By Glenn Gong

Marketing Director, IPC Asia

The IPC Asia team made significant efforts at networking and collaboration by successfully hosting a series of exciting events that garnered active participation from member companies, industry experts, and relevant government representatives in the Asia region.

The 2023 IPC China Electronics Manufacturing Annual Conference (CEMAC) on Oct. 27 in Shanghai received enthusiastic participation from more than 300 industry colleagues representing 200-plus companies. Focused on industry hot topics such as automotive electronics, workforce development, intelligent manufacturing, advanced packaging, and sustainability, the conference featured collaboration with 40 outstanding industry experts and scholars, presenting an event that showcased cutting-edge technology and ideologies.

On November 9, IPC successfully organized the inaugural IPC Korea Festival of Electronics Standards and Technology (K-FEST) in Seoul, drawing the participation of almost 100 local industry colleagues and government representatives. Attendees celebrated and shared the achievements of IPC in Korea, laying a solid foundation for deeper cooperation and mutual development in the future.

In October, IPC held regional hand soldering competitions in Taiwan and Japan, with nearly 100 participants engaging in the competitions. In November, at the 2023 IPC Hand Soldering Competition World Championship in Munich, three contestants from China and Japan won the global first, second, and third places.

In addition to events, the Asia team actively conducted one-on-one customer visits. In Greater China, we visited companies such as Phoenix, Delta, and Mitac for in-depth discus-



sions on the possibilities of future factories. In Japan, IPC's executive team visited leading companies in various fields, including Fujitsu, Rapidus, Resonac, and Ajinomoto, and had fruitful discussions with government leaders on hot topics such as standards, advanced packaging, and sustainability.

Expectations in 2024

Looking ahead, we hope IPC can maintain efficient operations in the evolving landscape. Southeast Asia is a popular destination for new industrial investments, and we are seeing more members opening new facilities there.

As IPC expands efforts in new initiatives such as advanced packaging and sustainability, IPC must work more closely with our members in China, Japan, and Korea. To achieve this, the IPC Asia team plans to develop more committees that offer the industry high-quality platforms for collaboration. We will work on establishing closer relationships with relevant government departments and peer organizations to amplify our influence in the industry. You may expect more IPC communications in local languages, such as member newsletters and local language magazines. Lastly, the IPC Asia team will host more impactful and insightful events that facilitate industry learning and networking, and there will be more international activities, such as an Asia delegation to IPC APEX EXPO. Let's stay connected and we look forward to a great year.

India

By Gaurab Majumdar

Executive Director, IPC India

On Nov. 21, IPC India proudly marked a historic day in the automotive industry with the unveiling of IPC-1771, *EMS Automotive Supplier Check Sheet*. This landmark achievement, born from a collaborative effort between global automotive leaders and suppliers, signifies a monumental stride in the industry. IPC-1771 is more than just a guideline; it's a transformative step that raises the bar for quality and compliance in automotive manufacturing. By establishing unprecedented benchmarks for excellence and reliability, this check sheet not only improves the performance and safety of automotive products but cultivates a culture dedicated to continuous enhancement and rigorous adherence to high standards.

PCB Design Competition Award Ceremony

The IPC India Region PCB Design Compe-

tion is more than just a contest; it's a platform for professionals to demonstrate their expertise, learn from each other, and stay abreast of the latest trends and technologies in PCB design. It also serves as an inspiration for aspiring designers, showing the heights that can be achieved with dedication and skill. The awards ceremony on Nov. 22 was not just a celebration of individual achievement but a reflection of the growing expertise and innovation in the Indian electronics industry. IPC's initiative in organizing this event underscores its commitment to fostering talent and promoting excellence in electronics design and manufacturing.

The highlight of the event was the announcement of the winners, marking a proud moment for the individuals and their respective companies. A hearty congratulations to the achievers:

Winner: Dinesh G from Sienna ECAD Technologies Private Limited

Runner Up: Ajeesh Francis T from Tessolve Semiconductor Pvt. Ltd.

The image is a promotional graphic for IPC India Region 3 Month Industry Networking Events. It features the IPC logo (BUILD ELECTRONICS BETTER) and the IEMI logo (Integrated Electronics Manufacturing & Interconnections). The main title is "INDIA REGION 3 MONTH INDUSTRY NETWORKING EVENTS". Below this, a calendar lists events from Jan 6 to Mar 15, including technical sessions on hand soldering, digitalization, and PCB manufacturing, as well as a wintercom meeting and an IEMI road show. Locations for these events are listed on the right, including Kolkata, Barcelona, Baddi, Bengaluru, Mysore, Hyderabad, Penang, Colombo, Coimbatore, Goa, and Hosur. A QR code is provided for registration, and contact information is given as edindia@ipc.org.

Date	Event	Location
Jan 6	Technical Session - Hand Soldering	Kolkatta, West Bengal
Jan 22-25	Wintercom - Global Standards Development Meetings	Barcelona, Spain
Jan 23	Technical Session - Hand Soldering	Baddi, Himachal Pradesh
Jan 30	Standard Development Meeting	Bengaluru, Karnataka
Jan 31	Technical Session - Hand Soldering	Mysore, Karnataka
Feb 2	Technical Session - Digitalization & Sustainability of Electronics Manufacturing	Hyderabad, Telabgana
Feb 6	IEMI ROAD SHOW	Penang, Malaysia
Feb 13	Technical Session - Hand Soldering	Colombo, Sri Lanka
Feb 27	Technical Session - Importance of Design in Electronics Manufacturing	Coimbatore, Tamil Nadu
Mar 5	Technical Session - Hand Soldering & Sponsor Presentation	Goa
Mar 15	Technical Session - Best Practice on PCB Manufacturing & Electronics Assembly	Hosur, Tamil Nadu

IPC Validation Services

The IPC Validation Services Program continues to be a vital tool for companies striving for excellence in the electronics industry. The recent accomplishments of GPV Lanka, Amphenol, and SGS, as evidenced by their inclusion in the QML, highlight the program's significance. This initiative not only elevates the standards within the industry but instills confidence among consumers and stakeholders in the reliability and quality of electronic products.

A Pioneering Meetup in Malaysia

Gaurab Majumdar and key Malaysian partners and members met in Penang to discuss future collaborations and initiatives. The primary objective was to strengthen ties within the electronics manufacturing community in Malaysia and to explore new opportunities for growth and innovation. The discussion also included the ways in which IPC standards and education programs can further enhance the local industry's capabilities.

Furthermore, IPC IEMI 2024 (Integrated Electronics Manufacturing Interconnections)

Forum in Penang is generating significant interest. This event promises to be a confluence of experts, industry leaders, and innovators.

Kickstarting the Year with Innovation

The first quarter of the year is poised to be an exhilarating period filled with a series of technical sessions and networking events across India, all culminating in the lead-up to the much-awaited annual event, the Integrated Electronics Manufacturing India (IEMI). These activities in the next six months are designed to foster learning, collaboration, and innovation within the electronics manufacturing community. They include:

- Technical sessions on hand-soldering assembly
- Hand-soldering workshops
- Design seminars
- Networking events

All these activities form part of a comprehensive six-month promotional campaign for IEMI, the annual flagship event. 🇮🇳



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2024 Programs Q1

Stay connected with IPC through some of these regional events in January, February, and March. Visit our online calendar of events for more information.

JANUARY

January 22–24

IPC WinterCom

Barcelona, Spain

January 24

Hand Soldering Technical Session

Baddi, India

January 24

Unlocking Success with IPC Electronics Workforce Training

Online

January 29–30

Standards Development Meetings: Design, EMS, Wiring Harness, Aerospace and Defense

Bangalore, India

January 31

Hand Soldering Technical Session

Mysore, India

FEBRUARY

February 2

Electronic Design, Assembly, and Automation Technical Session

Hyderabad, India

February 6–8

IPC Hand Soldering Competition 2024 Regional Qualification, United Kingdom

Farnborough, England

February 7

Overcoming the Challenges for Implementing IPC-J-STD-0001 in Your Factory

Online

February 7

Hand Soldering Technical Session

Abu Dhabi, UAE

February 10

Hand Soldering Technical Session

Dubai, UAE

February 13

Hand Soldering Technical Session

Colombo, Sri Lanka

February 13–15

WHMA's Annual Global Leadership Summit

Myrtle Beach, South Carolina, USA

February 22

Hand Soldering Technical Session

Kanpur, India

MARCH

March 5

Hand Soldering Technical Session

Goa, India

March 7

Insight into Electronics Manufacturing Workshop

Redditch, England

March 15

Electronics Assembly Technical Session

Hosur, India

March 16

IPC CIT Club

Dongguan, China

March 19–20

IEMI Road Show

Penang, Kuala Lumpur

March 28

IPCWorks Asia

Shenzhen, China



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MEETINGS
& COURSES

APRIL 6-11

CONFERENCE
& EXHIBITION

APRIL 9-11

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