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# Community

## M A G A Z I N E

 VOLUME 1  
 NUMBER 1


PAGE 14

## Post-pandemic Labor Force Dynamics

By Shawn DuBravac

IPC's Chief Economist has drilled down on what's most important for you to know right now when it comes to today's labor force.



PAGE 18

## Building Community in Europe

IPC's version of "How to win friends and influence people—European style," as an IPC team meets with the top CEOs from EMS providers in Europe.



PAGE 24

## Rising to New Heights

A Q&amp;A with IPC Emerging Engineer Sandro Figueroa

Hard work and persistence have paid off for this young engineer whose steady focus through college is paying huge dividends: He's already a supervisor in his department. Follow his path to success.



PAGE 44

## From PIN to Publish

By Linda Stepanich

Standards are at the core of what IPC does, and we take you through the process of how a standard forms, from the idea to the final product.



PAGE 50

## Celebrating 30 Years of Connecting the Wire Harness Industry

IPC/WHMA eagerly celebrates WHMA's three decades of contributing to the electronics manufacturing industry. Take a step back in time and see how it all started.

FEATURED CONTENT



# Community

MAGAZINE

## ARTICLES

- 6** Community Connections  
A column by John W. Mitchell
- 22** Meet the IPC Europe Team
- 30** Let Them Eat Cake  
By Michelle Te
- 32** Class Act  
IPC Expands Instructor-led Courses  
on Technical Knowledge and Skills
- 38** Four Policy Decisions for  
Advanced Electronics  
By Chris Mitchell
- 42** Sustainability:  
IPC Leading the Way  
By Kelly Scanlon
- 48** Standards Update  
Newly Published Standards/  
Standards Revisions
- 54** And the Winners Are...  
IPC's Hand Soldering Competition  
Gets a Big Stage in 2022



## DEPARTMENTS


- 10** IPC MEMBER PROFILE  
GEN3: It's About Family
- 36** EDUCATION  
2023 IPC Training Schedule
- 40** The Colors of IPC
- 58** Regional Updates
- 62** MEMBER BENEFITS  
New Training Available
- 63** 2023 Programs Q1







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# WELCOME!

By John W. Mitchell, IPC President and CEO



## Welcome to IPC's new member publication, *IPC Community*!

This quarterly magazine was created for you to meet your need for information on manufacturing and management best practices and solutions, emerging technologies, IPC standards, government relations and environment, health and safety issues, industry intelligence, advanced packaging, sustainability, and more.

The name “Community” refers to all of us—the global team of electronics manufacturers throughout the vast, international supply chain. *IPC Community* is our way of honoring and serving that connection, that community of individuals who share the same goal and who work together to build electronics better.

Just like the electrical connections that power the products we make or design, the connections between us in this large industry are what make it unique. What affects a small company in Asia has a ripple effect on larger companies in Europe, in the same way that supply chain difficulties in the U.S. affect our members in India. The issues we face, the challenges we share, and the victories we achieve are what connect us to a broader, international community.

This magazine is meant to acknowledge the incredible work that you do, and the unique roles you play in building better electronics across the globe.







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One of the best parts of my position as IPC president and CEO is the opportunity to meet members across the world. It is always exciting for me, and I am continually enlightened by the new ways of approaching electronics manufacturing challenges I see in all the countries I visit. I hope that with this magazine, we can bring those unique and exciting stories to a broad readership, illustrating how innovative, creative, and phenomenal this industry is.

Inside *IPC Community* you will find features that celebrate member success stories along with articles on the issues affecting you and your company, such as advocacy efforts, committee and standards updates, education and workforce training developments, Factory of the Future solutions, advanced packaging updates, and emerging engineer and member profiles.

We know that you, as IPC members and members of the broader global electronics manufacturing community, look to IPC as a steadfast resource to keep you informed and educated on the latest industry developments. We're excited about the possibilities of *IPC Community* taking our ability to disseminate important information to the next level, all while making sure your stories are reflected and commemorated within the magazine.

In this inaugural issue, you'll get an inside look at the process for standards development; learn more about IPC's popular hand soldering competitions and many of the 2022 winners; get access to exclusive labor data from IPC's chief economist; read valuable updates from North America, Europe, India, and Asia Pacific; find out what's needed to propel advanced packaging forward; share in community building with European EMS companies; take advantage of a new member benefit that offers free trainings; and many more insightful features.



If you like what you see in this premiere issue and would like to receive it in your inbox each quarter, scan this QR code to subscribe. If you'd like to position your company front and

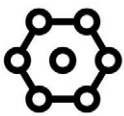
center to a readership of more than 60,000 electronics industry members, contact Barb Hockaday, at [barbhockaday@ipc.org](mailto:barbhockaday@ipc.org), for advertising opportunities. To suggest a member success story or any other editorial content, contact Michelle Te, *IPC Community* magazine managing editor, at [michellete@ipc.org](mailto:michellete@ipc.org).

Enjoy this first issue of *IPC Community*. We look forward to your feedback and future story ideas. 🌈

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# GEN3: It's About Family





GEN3 have been IPC members since 1994. Based in the United Kingdom and operating as a family business, it is a diversified engineering company active in the electronics industry. We spoke to Graham Naisbitt, president, about the founding of GEN3, its successes and challenges, and how the company benefits from its membership in IPC.

### *Graham, what's your company story?*

GEN3 is a third-generation family business operating for over 50 years. The business was founded by my father, Arthur Naisbitt (Generation 1), who operated in the world of heavy engineering. The company has operated on a dynastic basis and has enjoyed sustained growth throughout our IPC membership years. We are proud to be British and to export more than 75% of our products all around the world.

I'm Generation 2 and I spent my first 25 years working in major multinational companies, Fives Group of France, and Babcock International in Germany and the UK. The disciplines learned have been put to good use in a small family business.

Our third generation, Andrew Naisbitt, joined the business full-time in 2010 and assumed management in 2020 because of the lockdown. The pandemic necessitated structural change: Andrew was promoted to CEO, and I took the role of president (chairman).

### *What does your company do that you're most proud of?*

In 1987, when the research was begun to find alternatives to CFCs (chlorofluorocarbons, Freon, etc.), and to the introduction of no-clean fluxes, the only way to determine acceptable levels of "cleanliness" was found to be measures of changes to insulation resistance. AutoSIR (Automated precision Surface Insulation Resistance) was born. In 1995, the manufacturing rights to AutoSIR were offered to Concoat (now GEN3) and we set about introducing new standards for the industry using SIR.

In 2002, we helped introduce a new International Standard through ISO that was the precursor to all that followed in both IEC and IPC. As president of GEN3, I was the first of six Britons to be honoured with the Lord Kelvin IEC 1906 award, which I received in 2006, for my work in developing SIR as a test method for the electronics industry and sponsored by IPC legend Dieter Bergman.

### *How has the electronics industry changed over the years, and what has your company done to keep pace with the changes?*

We came into the electronics industry in 1979 and have witnessed some interesting changes. We recall being advised in 1980 that surface mount technology would completely replace "through-hole" techniques. It would be fair to say, 40 years later, that hasn't come true.

However, as our business was primarily involved with Humi-Seal conformal coatings, these materials have seen an ever-increasing market to help deal with fine pitch, SMT, and tin whiskers, as well as to mitigate the effects of electrochemical migration (ECM).

To "stay in the game," we firmly believe that you must be directly involved with research and standards development. Hence, we collaborated with IVF in Sweden from 1987 to 2005, NPL since 1989 through the present, and most recently, with the High Density Packaging Users Group (HDPUG), where we are leading a new research project into Low Voltage <2V SIR testing. We are involved with the European Centre for Power Electronics (ECPE)

Three generations  
(clockwise from top left):  
Alasdair and Andrew Naisbitt;  
their father Graham Naisbitt  
(seated right), and  
Arthur Naisbitt.



Andrew Naisbitt, CEO, and Graham Naisbitt, president, helped celebrate the company's 50th anniversary. GEN3 was established by Arthur Naisbitt in 1969, and the celebration had to be postponed three years due to shutdowns during the pandemic.

.....

in Germany and dealing with High Voltage >300V to 1000V in SIR. We are also heavily involved with CAF testing where our AutoCAF is being used to test at 4000V for 4,000 hours.

We are indebted to our collaboration program with Microtek Laboratories in China, owned by our good friend Bob Neves, chairman of the Board of Directors at IPC.

### *Would you share an obstacle or challenge that your company has overcome?*

The financial crash of 2008-09 hit us hard, and it took more than three years to recover. In 2013, we then faced total equipment redesigns because of widespread component obsolescence. Of course, like everyone else, we had to deal with the most recent pandemic. We greatly appreciate our wonderful staff, some of whom have been with us for more than 20 years.

### *Would you tell us your member story considering your IPC contributions/activities?*

In 2002, my company bought Multicore Soldering Process Instrumentation Division from Hen-

kel and we attended our first Solderability Testing Committee Meeting 5-23—and we knew nothing. I was asked a related question and my response was, "You might as well be talking to me in Swahili." Nevertheless, we volunteered with new research for lead-free alloys for which we received awards. Not bad for someone new to the subject.

### *What does IPC membership mean to you and what value does it provide?*


It's all about networking. Our company was originally named Concoat, and we joined IPC in 1988 because we had a specific interest in conformal coating and cleaning. When both the U.S. and British military standards were cancelled in 1985, the result was IPC's increased involvement in standards development, and it was obvious that we needed to be there. The networking introduced us to a huge number of industry professionals working with companies we would have had a hard time finding, and the doors were opened when it came to our helping develop new standards.

### *Would you tell us about your staff's work on standards committees?*

Our staff has won more than 20 awards for our work on committees—solderability, SIR, CAF, ionic contamination testing, and conformal coating—some of which were for committee leadership. We were largely responsible for introducing SIR testing that benefitted from significant research that was conducted by the UK National Physical Laboratory, a group with whom we enjoy an almost symbiotic relationship.

*Why are you an IPC member?  
"Because IPC is our front door to the market."*

### *What IPC member benefits do you take advantage of?*

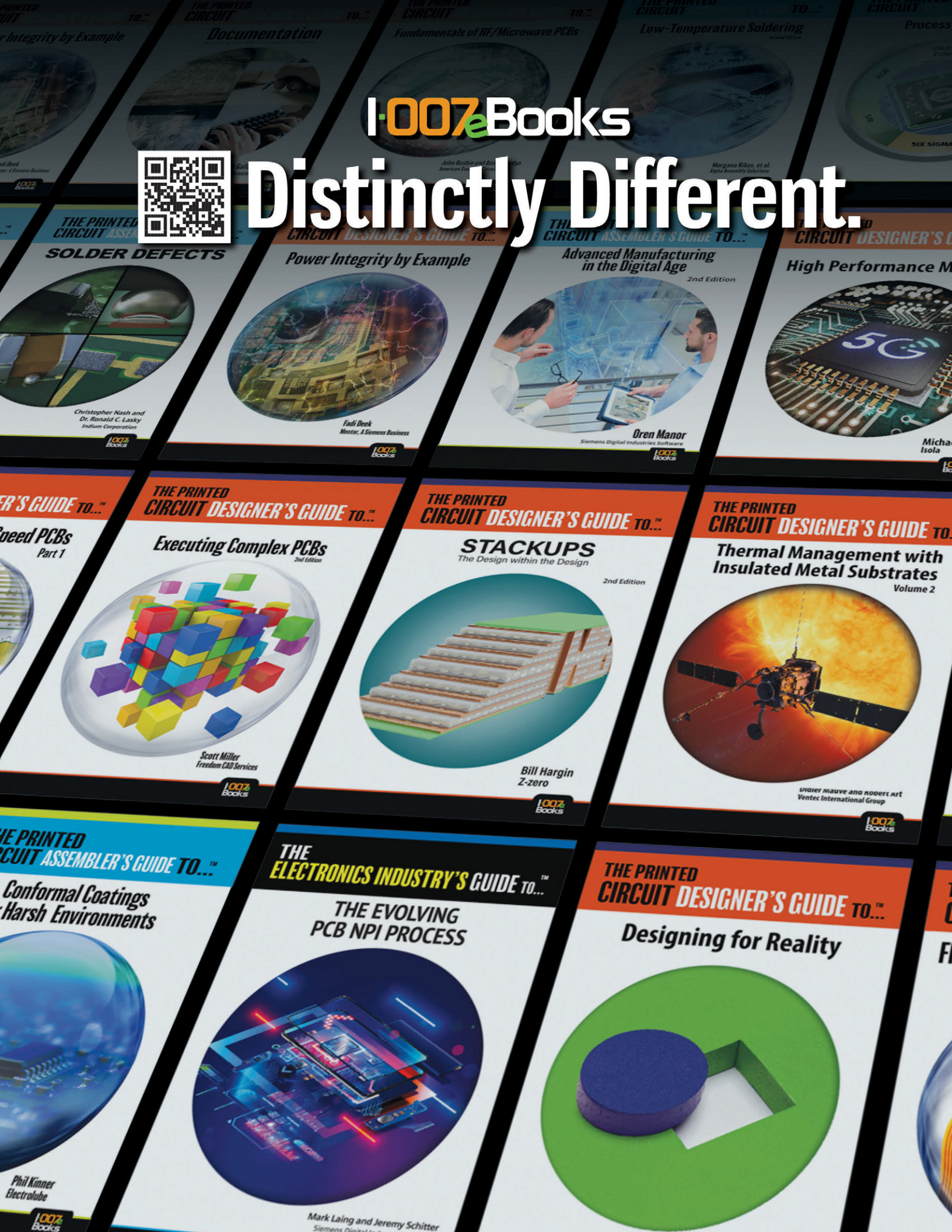
We have exhibited at every IPC APEX EXPO since its inception. We have attended most of the IPC Standards Development meetings since 1988 and chaired many committees. This ongoing commitment has helped us enjoy continuous product development to, and beyond, the very best IPC standards. 



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# Post-pandemic Labor Force Dynamics

By Shawn DuBravac, IPC Chief Economist

It has been three years since the start of the pandemic-induced recession. After an abrupt, but short downturn, the economy—and especially the electronics industry—has experienced record growth. The economic recovery has had a pronounced impact on the labor market. As we enter 2023, there are several unique labor market dynamics to watch.

## Industry Employment Has Risen Sharply

The COVID-induced recession of 2020 was one of the most severe economic downturns in U.S. history. Overall employment fell over 14%. Roughly one in every seven workers lost their jobs. Moreover, the peak-to-trough decline happened in about 60 days, an unprecedented rate. Prior to this downturn, the worst decline in employment was the decline during the financial crisis of 2007–09. Peak-to-trough decline in employment during that recession was 6.3%. Roughly one in every 16 people lost their jobs, but it took 26 months for the economy to reach that level so job loss was much slower during that downturn.

During the COVID recession, the electronics manufacturing sector held up much better than other segments of the economy. Employment fell about 3.5%, and the peak-to-trough decline happened over about 12 months. After an initial

decline in employment corresponding with the early months of the pandemic and the uncertainty that followed, the U.S. electronics industry began to hire. In fact, the industry has added over 81,000 new jobs since that low point. The U.S. electronics manufacturing industry now employs over 1.7 million workers, surpassing levels not seen since 2009. On the surface, the gains may not seem significant, but these gains follow decades of secular decline in employment.

It remains to be seen whether job gains will continue at a similar clip in the year ahead. Industry employment gains in recent months have been relatively flat. The recent slowdown in hiring could be driven by several factors. First, demand for some durable goods categories has slowed, especially among consumers who have shifted toward spending on services like dining out and travel, categories especially hard hit by the pandemic. The slowdown in hiring could also reflect the difficulty of hiring.

## Competition for Workers Is Strong

Demand for workers is strong, even in the face of a slowdown in economic activity. Today there are over 10 million open jobs, about 750,000 of which are in manufacturing. At the same time, there are about six million people who are unemployed so there are nearly two job openings for every unemployed worker.

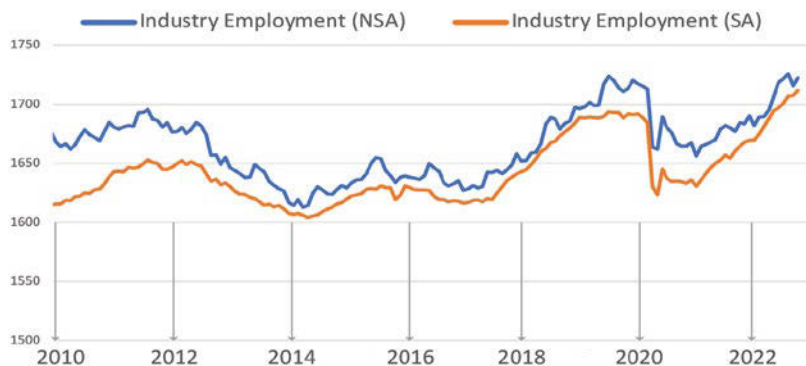


Chart 1: Industry employment gains.

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The number of job openings could misrepresent the actual number of open jobs. Perhaps some companies have active job postings, but they are only hiring if they get a really good candidate. Online job boards and AI tools like machine learning have likely made it both less expensive and less time consuming to post jobs and review applications so it is easier for companies to continuously maintain job openings. But the number of job openings is up nearly 50% from pre-pandemic levels so this would probably only explain a part of the growth in job openings.

On top of this, many companies report it is difficult to hire, suggesting many are actively looking for workers. The ability to find and hire workers is likely straining job gains in the electronics industry. According to data from IPC's monthly sentiment reports, less than 10% of industry executives report recruiting skilled talent is getting easier and almost half of North American executives report it is getting more difficult. The outlook over the coming months suggests ease of hiring could improve but there will likely only be marginal improvements.

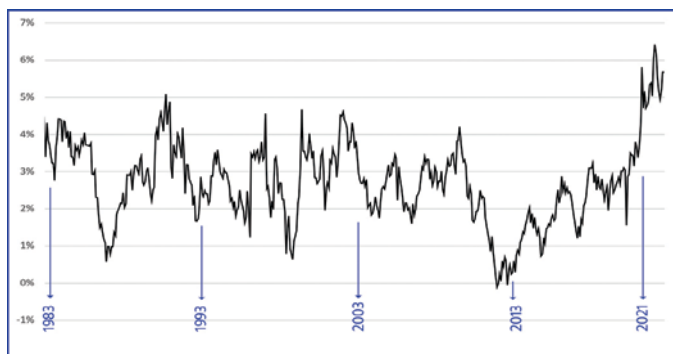


Chart 2: Average hourly earnings of production and nonsupervisory employees and durable goods.

As a result of strong demand for workers in the United States, wage growth has accelerated to levels not seen in 40 years. Headed into 2023, wage growth for manufacturing production workers is growing at 5.7% a year. Wages are up roughly 15% from the pre-pandemic levels and all signs point to higher wages in the year ahead. To put that into perspective, wages for production workers grew less than 14% from the start of 2014 to 2020. In

other words, production workers have seen wages grow in the last three years roughly to what they saw them grow in the eight years prior to that.

## Workers Remain Out of Labor Market

Despite historically strong wage gains, workers have remained out of the labor force; this has put further pressure on wages and hindered company efforts to hire. Labor force participation is down about 2% from pre-pandemic levels. While some of the decline in labor force participation has been ongoing for years, there are post-pandemic dynamics exacerbating the situation.

The unemployment rate for prime-age workers—workers between the ages of 25 to 54—is about 3%, but only about 82% report any paid work. The remaining 15% are not in the labor force, meaning they are neither working nor looking for work. But these stats mask an important dynamic that differs across genders. The percentage of prime-age men in the workforce is higher than women, 88.4% for men compared with 76.3%, though both share similar unemployment rates. This suggests 9% of prime-age men are neither working nor looking for work, while nearly a quarter of prime-age women are neither working nor looking for paid work. This also means that men “not in the labor force” outnumber unemployed men by three to one.

The percent of prime-age men participating in the workforce has slipped nearly 1 percentage point from pre-pandemic levels but this decline is part of a larger shift that has been ongoing for decades—fewer prime-age men are working or looking for work. Conversely, the labor participation rate for prime-age women has steadily been rising. Although it is down about six-tenths of a percentage point from the start of the pandemic, the participation rate is up half a percentage point from the start of 2019. The labor force participation rate for men is down a percentage point over the same time horizon.

There are likely myriad reasons for these declines. According to the PEW Research Center, an estimated 2.1 million fathers were stay-at-home dads in 2021, up 8% since 1989. But this would only



explain a sliver of the decline in prime-age working men who have left the workforce. A new study from the Federal Reserve Bank of Boston links the exit of men without college degrees from the labor force to a decline in social status related to an expected fall in earnings relative to the earnings of other workers in the labor market.

Some workers might be out of the workforce because of health issues. The Census Bureau's real-time Household Pulse Survey started asking adults about "long COVID-19" in 2022. Roughly 7 million adults not in the workforce say they are currently affected by long COVID. At the same time, for those reporting long-COVID-associated issues, the number who reported COVID illness as the reason they were out of the workforce was only 700,000. This included those who were out of the workforce to care for someone else.

Others have likely exited the workforce because their home situation has changed. The number of childcare providers in the U.S. has declined by nearly 100,000 workers since the start of the pandemic. The number of available childcare providers is down roughly 7.5%, while the overall number of workers is up approximately 1%.

Since the start of the pandemic there has also been a large decline in available workers who are 55 years or older. Labor force participation rates for this group had held steady for the 12 years prior to the pandemic and had risen strongly before that. But since the pandemic, labor force participation among this group has declined about 4.4% or nearly

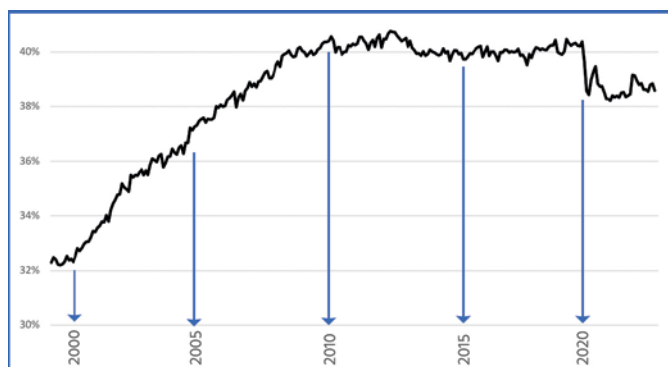


Chart 3: Labor force participation rate (55+).

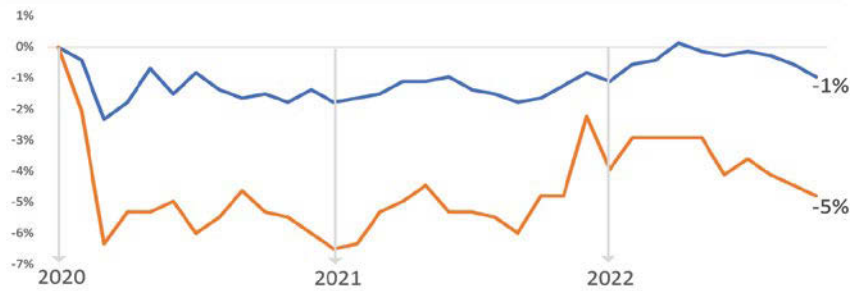


Chart 4: Labor force participation rates with no college (orange) vs. bachelor's degree or higher (blue).

two percentage points. If this shift continues, and these workers remain out of the labor force, it could be easily challenging for the electronics industry. The average age in the electronics manufacturing sector is about 45 years old, but over a quarter of the workforce is over 55. In other words, about 425,000 workers are over 55. A decline of just 5% would mean the industry needs to find over 20,000 new workers.

The forces impacting labor force participation appear to be especially impactful to workers with less than a college degree. Labor force participation rates among workers with a college degree has roughly recovered to pre-pandemic levels. For those without a college degree, participation levels are still down about 5%.

## Implications

Despite a slowing economy, it does not appear that U.S. labor scarcities will improve significantly anytime soon. Perhaps older Americans will return to the workforce after a period of retirement. Perhaps prime-wage workers will return as childcare options improve. Perhaps even higher wages will coax workers back to work. But none of these will likely solve the economy's, and the industry's, full employment needs in the coming years.

Companies will likely need to look at a mix of solutions to solve labor shortages including automation, training options, and perhaps new benefits and employee services that meet the needs of tomorrow's workforce. 🌈

# Building Community in Europe

By Michelle Te

Sanjay Huprikar is expanding his circle of friends in more ways than one. As president of IPC's organizations in Europe, India, and parts of Southeast Asia, Sanjay continues to forge new partnerships and build community among electronics manufacturers globally.

**IN** September, for example, Sanjay gathered a cadre of CEOs and other executives from 15 of Europe's largest electronics manufacturers to hold a workshop on how IPC can better partner with these leading EMS providers to establish active communication channels between the trade association and manufacturers.

"My role in Europe over the past three years has been singularly focused on building relationships with executives within OEMs and EMS companies," Sanjay says. "Historically, we had been mainly focused on manufacturing and training personnel representing our core of standards development and certification; the pivot in 2019 was to become more of a trade association and forward-looking organization, which required a completely different model and mindset for building relationships."





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He's begun to do that mainly with companies involved in aerospace (e.g., BAE Systems and Thales), automotive (e.g., BMW and Stellantis), and industrial (e.g., Siemens and Schneider Electric) because of their strong financial and leadership presence in the European marketplace. Joining Sanjay for September's workshop were Chris Mitchell, IPC's vice president of global government relations; Philippe Leonard, IPC Europe managing director; and Alison James, IPC Europe senior director of government relations. It was an opportunity not only to gauge the success of IPC's efforts but, more importantly, to demonstrate the level of partnership that IPC can play in the business success of these organizations. With nearly 2,000 EMS companies in Europe, gauging their successes and challenges is a herculean effort.

"We asked them to give us some indication of the challenges they are facing and how IPC can help them," Sanjay says of the outreach to EMS providers in Europe. "We want to serve the industry, but we need feedback from the industry about how to best do it. It would not

make any sense for us to operate in a vacuum and build something without any buy-in from the industry. Our goal is to focus on developing solutions that the industry needs and the only way to figure that out is to ask them up front."

This was, essentially, the pitch that IPC made to the 30 largest EMS providers in Europe. For the gathering, 15 executives were able to attend, and it turned out to be a monumental event. Sanjay and his teammates spent the day querying the attendees about their common struggles, individual perspectives, and how all those things factor and fit into the big-picture point of view.

The general theme: "What can we do to help you drive the industry forward and grow?" The process: "We spent the entire day listening," Sanjay says. "We asked: 'What's on your mind?' We probed: 'Tell us what's bothering you.' We stated: 'Let's write these things down on the board and at the end of the meeting, we'll take a vote on what are the dominant challenges or issues.'"

The first result: help policymakers, government officials, and media gain a better

*It has been great fun and insightful to meet almost all CEOs of the most relevant electronics companies in Europe.*

**— Rainer Koppitz**

CEO and co-founder  
KATEK



understanding of what an EMS company does and the important role that it plays in the electronics ecosystem.

"It has become abundantly clear on both sides of the Atlantic that when policymakers think about electronics, they think of only semiconductors—chips and ICs," he says. "Most of them don't understand the importance of PCBs or PCBA's. They also don't know how raw material and chemical suppliers fit in or how the automation equipment is being designed to build all these products. So, that is a source of great frustration for the EMS community."

Based on this information, IPC is developing a set of strategies to better promote and market the industry to the media, to policymakers, and to the large community in Europe in 2023.

The second result: growing concern that EMS companies have with the lack of sustainable processes to share confidential data, and of standards that can align with the sharing of that information.


"Every company seems to have its own way of doing it, and they asked us, as a standards organization, to bring some method to the madness, so to speak," Sanjay says. "Is there a way to harmonize how the data is being shared? Can we standardize the flow of data through the process and equitably determine who gets to see what? What's most important? What's least important? Can we create a structure around that?"

Having these insights has been invaluable for the IPC Europe team, which is now identifying consultants and partners to start addressing these two issues on behalf of the EMS providers. Sanjay is

encouraged about the trajectory of these conversations among EMS providers, many who happen to be direct competitors, yet were willing to meet together.

"When all was said and done, the CEOs and other executives had two main questions," he says. "One was, 'How quickly can you start working on some of these things?' and 'When can we do this again?' For me, the intangible value in all this is how we started building community. At a pan-European level, no one else was doing that. These types of activities are an absolute fit with our DNA and culture: Put smart people in a room together to collaborate, give them a meaningful challenge, and harness their energy and creativity in problem solving. The representative from one of the companies present, for example, told me that IPC was the only organization that

could bring together a group like that. He doesn't ever recall that happening where two of his largest competitors were sitting in the same room, and it didn't bother him at all."

"We made it very clear from the outset that we were not after any proprietary information, that we respected and understood that everyone has their own secret sauce, and we wouldn't discuss any of that," Sanjay says. "But we know for a fact that all of them have common challenges, and instead of trying to solve those common challenges on their own, we could do it in a group setting. They all understood that. It's a valuable reminder of what a neutral, third-party not-for-profit can accomplish with a credible mission, tenacity, and sincere messaging." 

## GET INVOLVED!

Attendees enthusiastically articulated their intention to spread the word and participate again.

The next meeting is tentatively planned for May 2023.

For more information, contact:

- [PhilippeLeonard@ipc.org](mailto:PhilippeLeonard@ipc.org)
- [SanjayHuprikar@ipc.org](mailto:SanjayHuprikar@ipc.org)



# Meet the IPC Europe Team



## **Sanjay Huprikar**

*President, IPC Europe  
and South Asia Operations*

Sanjay leads IPC's globalization initiative to expand the association's standards, education, advocacy, and solutions support to Europe, the United Kingdom, India, and several countries in Southeast Asia including Malaysia, Singapore, Indonesia, and the Philippines.

Sanjay can be reached at: [SanjayHuprikar@ipc.org](mailto:SanjayHuprikar@ipc.org)



## **Philippe Leonard**

*Managing Director, IPC Electronics  
Europe GmbH*

Philippe manages operations and supports the development of IPC activities in Europe, including organizing IPC hand soldering competitions, technical gatherings and member networking events, working closely with 35 IPC-licensed training centers operating in almost every European country, and liaising with hundreds of IPC member-companies across Europe.

Philippe can be reached at [PhilippeLeonard@ipc.org](mailto:PhilippeLeonard@ipc.org)



## **Alison James**

*Senior Director, European  
Government Relations*

Alison works closely with IPC's European membership as well as European government officials, institutions and public policy stakeholders. Based in Brussels, she represents IPC and the electronics manufacturing industry on issues including environment, health, and safety; workforce skills; and trade policy.

Alison can be reached at [AlisonJames@ipc.org](mailto:AlisonJames@ipc.org)



## **Peter Tranitz, Ph.D.**

*Senior Director, Solutions*

Peter focuses on IPC's key global initiatives including advanced packaging, e-mobility, and Factory of the Future as well as serving as a principal technical resource for regional activities in Europe.

Peter can be reached at [PeterTranitz@ipc.org](mailto:PeterTranitz@ipc.org)



## **Francisco Fourcade**

*Electronics Standards Manager*

Fran serves as IPC staff liaison to the growing number of new standards development committees forming in Europe, as well as a principal educational resource for regional training needs.

Francisco can be reached at [FranciscoFourcade@ipc.org](mailto:FranciscoFourcade@ipc.org)



## **Andrea Turcott**

*Office Coordinator/Research  
Assistant*

Andrea provides support to members, regional activities and staff in Europe, and works with research partners, including IPC's industry intelligence team on important data collection and analysis needs.

Andrea can be reached at [AndreaTurcott@ipc.org](mailto:AndreaTurcott@ipc.org)

## IPC Board Members in Europe



## **Robert Feuerstein, Ph.D.**

*Chief Information Security Officer,  
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Continental Automotive GmbH*



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# Rising to New Heights

By Michelle Te

Sandro Figueroa has a tenacious work ethic and always demonstrates leadership skills by helping and teaching others, whether as a student at Gwinnett Technical College (he transferred to Kennesaw State University and graduated in 2022 with a degree in electrical engineering) or in his new role (he is an industrial electronics repair supervisor at Radwell International).



## A Q&A with IPC Emerging Engineer Sandro Figueroa

Born and raised in Lima, Peru, Sandro is involved in IPC's Emerging Engineer Program, was an IPC Member Scholarship winner, and an IPC Student Leader Award winner in 2021. He served as

A large, colorful mountain with distinct horizontal bands of red, orange, yellow, green, and blue, known as Rainbow Mountain in Peru. The sky is blue with white clouds. A group of people is visible at the base of the mountain.

In mid-2010  
Rainbow Mountain Peru  
in the Andes began to attract  
tourists to this colorful site.  
The glacier cap that once  
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president of his IPC student chapter at Gwinnett Tech while working and going to school full time.

We asked Sandro to talk about his time at Gwinnett and how that has transferred into his professional role today.

### *Tell us about your educational experiences.*

I graduated with a four-year Bachelor of Science degree in electrical engineering. I initially completed a two-year Associate of Applied Science (AAS) degree in electrical engineering technology and a second AAS degree in mechatronics technology. While in school, I worked as an intern for Siemens, then started at Radwell. Getting started with Siemens was a great step in the industry but I was quickly craving more technical experience. Since I had to work full time to fund my education, the scholarship awards really helped me to afford course supplies and about one full course, which allowed me to take an extra class where allowed. This showed my employer more about my potential and allowed me to climb up the ranks.

### *What about your involvement in the IPC student chapter?*

I initiated the student chapter at Gwinnett and was heavily involved as the chapter president, even while working and going to school full time. I wanted to be sure all members received the most benefit

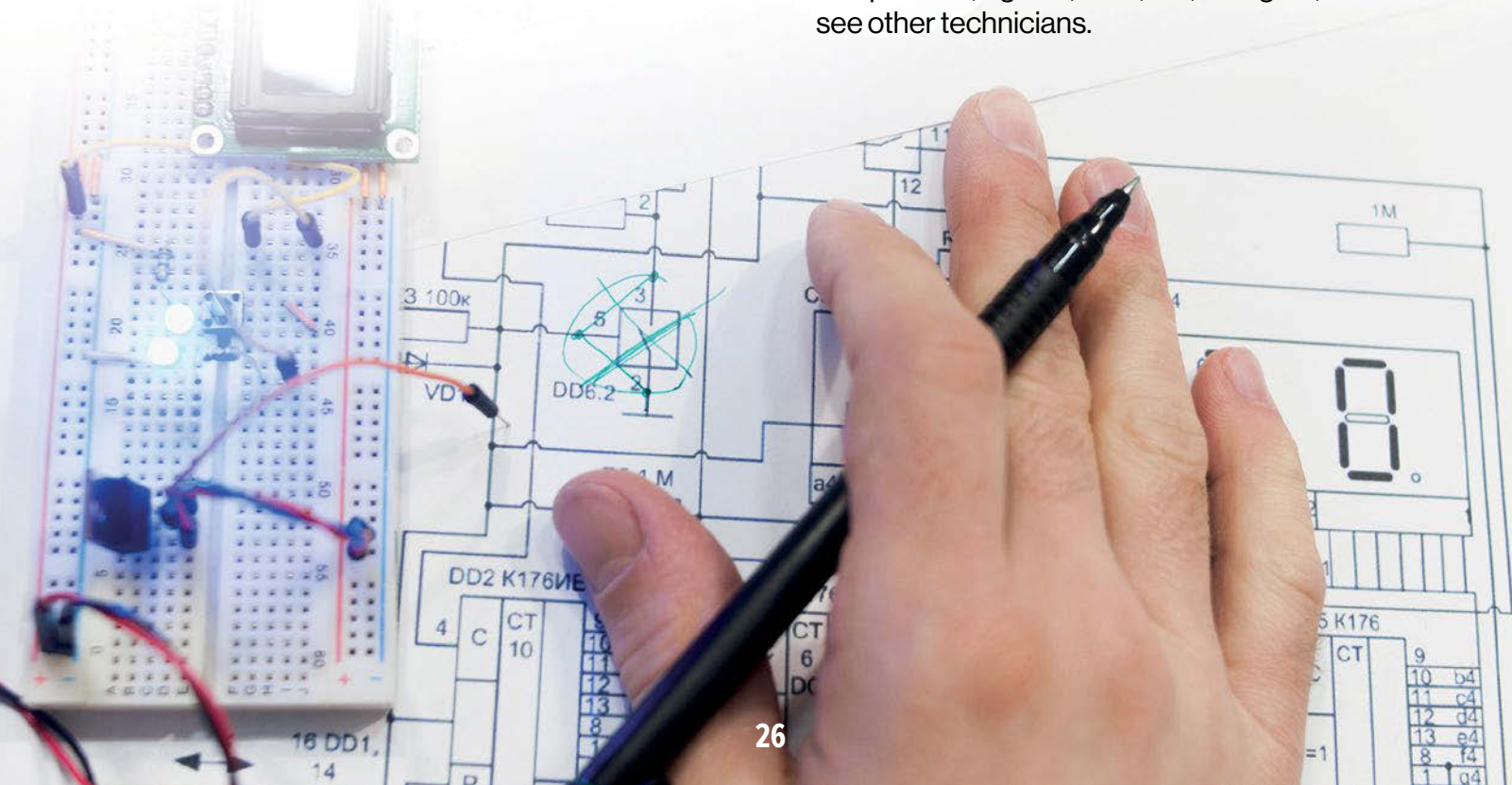
“As someone who started in an entry level position in the electronics industry, I am very excited to see this generation explore career paths in the industry, take action, and lead it to new heights.”

— Joe O’Neil  
Chair, IPCEF

from their membership. I kept them interested in competitions and participation in IPC by providing my own technical knowledge and carefully planning interesting activities for members.

### *What can you share about your work experience?*

I started at Radwell as an evaluation technician and became a supervisor within two years. I learned how to troubleshoot, repair, and test various types of products in the industrial automation industry. As a supervisor, I guide, train, aid, delegate, and oversee other technicians.







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### *Can you share some of your professional goals and aspirations?*

My goals have remained to study electronics design and troubleshooting techniques to be able to perform some of my tasks more effectively. A new goal of mine is to develop better interpersonal and leadership skills that will allow me to use my electronics knowledge to train and teach others.

I personally believe that studying electrical engineering technology and electrical engineering is really allowing my potential to shine. The deep hands-on learning from one and deep theory from the other is making it possible for me to understand and provide solutions for certain problems or advances in technology. I really love the electrical side of engineering like electronics and mechatronics.


### *What is the most valuable thing you've learned in the past year?*

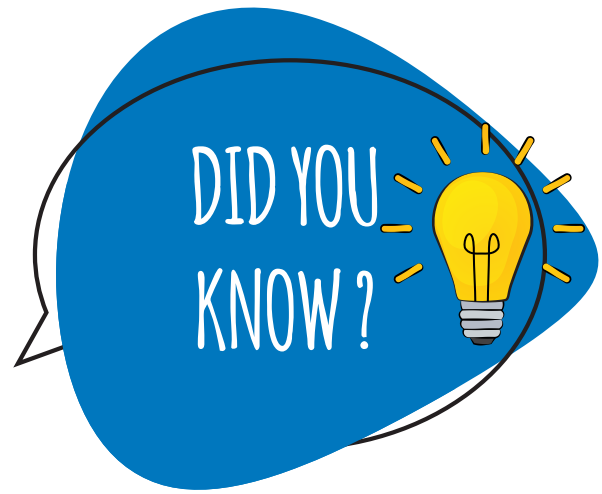
You can never learn enough in any sector of the electronics industry; it is ever-changing. Most importantly, I learned to be extremely grateful for all the learning opportunities that I received from IPC, Gwinnett, and other online resources. Having seen many workers try to come to this industry, there are many who have not learned the special bits of education that I have gained because I was hungry for education. If you have a strong will to learn, you can become so proficient at your tasks, and you'll find yourself feeling more fulfilled.

### *What accomplishments are you most proud of?*

I am most proud of my success of advancing my professional and educational life simultaneously. I maintained a good GPA while also accomplishing great feats at work, like getting "Employee of the Year" within a short time working with my company.

### *What do you love about the industry?*

To me, engineering is the application of multidisciplinary studies to create solutions to problems and advance in technology. I love the ability to create useful and specific applicable solutions to some everyday personal problems. You can accomplish much with just about any field of engineering, but I find electrical engineering more applicable and useful than most other engineering branches. 



**\$38,000**

Amount IPCEF awarded in scholarships in 2021

**\$27,000**

Amount awarded to IPC student members for their accomplishments in IPC Student Chapters

**\$1,000**

Amount of IPC Student Member Scholarship

### **Academic Assistance:**

**The IPC Student Chapter Leadership Awards are available exclusively to IPC Chapter leaders after serving a 12-month term.**



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# LET THEM EAT CAKE!

By Michelle Te



*Teresa Rowe will be the first to admit: Standards development, in general, can be boring.*

It's a very firm set of rules and you must follow the rules to get where you want to go. Not always the stuff dreams are made of.

Yet, as IPC's senior director of assembly and standards technology, Teresa also understands that her department—aside from IPC's customer service and membership team—is likely the most important and forward-facing within the trade association. Developing standards for the industry requires immense participation and buy-in from IPC members who sit on committees that often require many hours, weeks, or even months of review before a new document can be published.

Thus, when a document is finally done, all revisions have been reviewed and approved, and the committee has accomplished its goals, what better way to celebrate than with a little party?

"We celebrate when we finish a document," Teresa says. "My IPC/WHMA-A-620 group, for example, has been working on this document for three years and they told me that they wanted a cake. Not just any cake either, but something special. So, two revisions ago, I had our staff order a special cake so we could celebrate."



During IPC APEX EXPO 2017 and 2020, Teresa called her committee into a room, where they anxiously stood by as catering rolled in a giant cake in their honor.

"We literally had a 20-minute party," she says, her voice growing in enthusiasm as she remembered the events. "It was like a birthday party or graduation party for the document."

So, when the group meets again, they're already looking forward to another party, even asking for the same special cake. "We will be in Anaheim starting in 2024, but the next celebration for this group will be in 2026," Teresa says. "They are already asking about 2026, and yes, the story is correct. They wanted to know if the cake can be shipped to Anaheim. They are looking that far into the future. To me, that's a work of passion and commitment that these volunteers are putting in."

Even more, she appreciates the collaboration among the generations of volunteers who sit on the committees—from the seasoned veterans to those who are newer to the industry and want to see what standards development is all about.

"But there's fun at the end," she says. "It's not always cake. Sometimes we'll go out to lunch and we'll just talk. We'll talk about other things. It just becomes a family, it really does." 🌈





# Problems solved!





# CLASS ACT

## IPC Expands Instructor-led Courses on Technical Knowledge and Skills

By Kelly Allen,  
IPC Training Manager

**I**f you're looking to enhance your learning in electronics manufacturing, IPC can provide a personalized approach where you feel engaged and ready to strengthen your on-the-job performance.

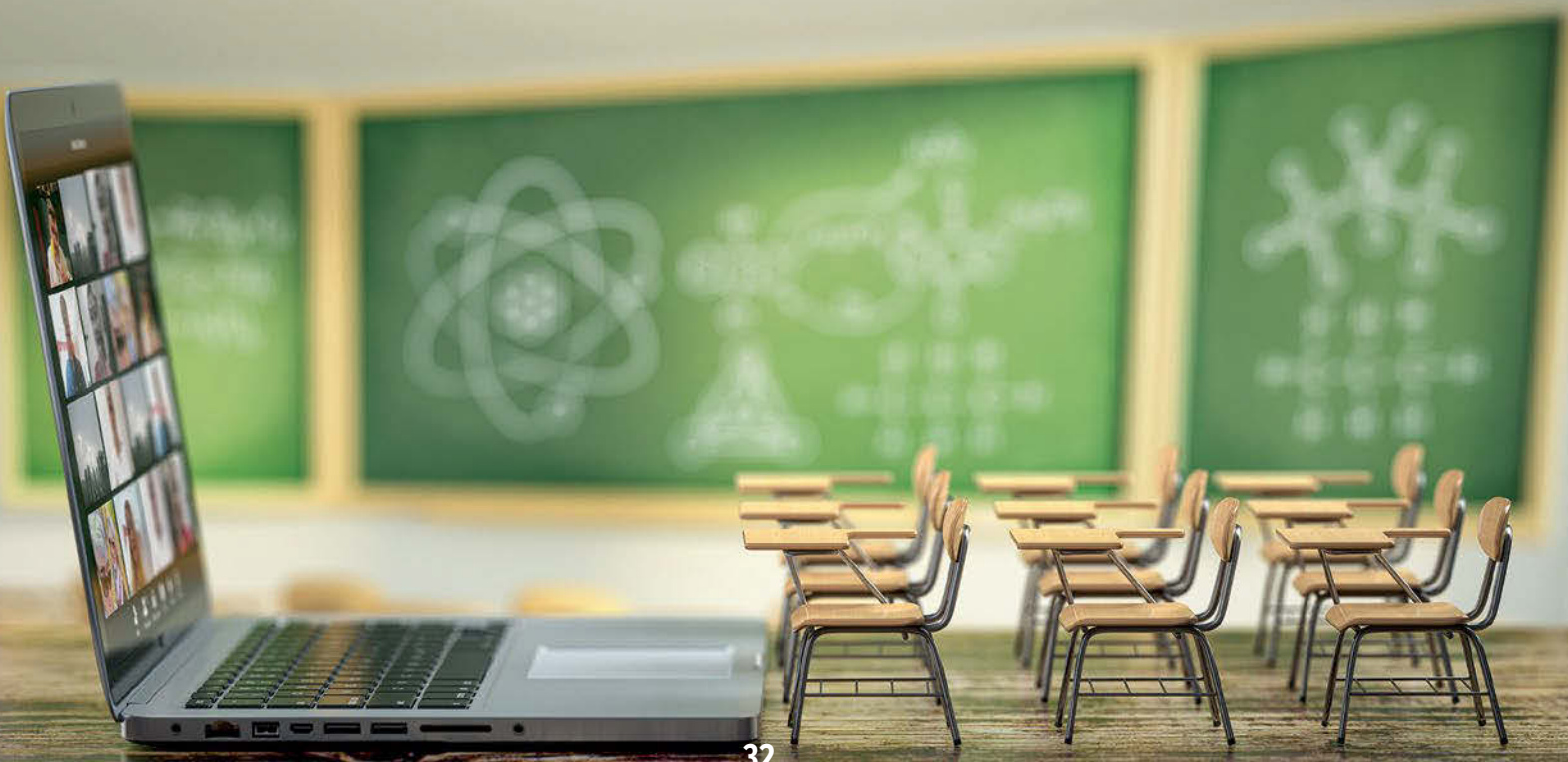
2022 was a great year for our instructor-led courses. We have reached a point where our industry has embraced the flexibility of online learning. Online lectures are a great option.

Why do they work so well? Because students in these classes most often have full-time jobs or other commitments that prevent them from attending in-person instruction.

Interestingly, students can still build important and unique professional relationships with their instructors and fellow students because they have opportunities to schedule virtual meetings outside of class time. IPC encourages students to reach out and discuss assignments, and IPC course instructors are available via email or Zoom to review material for better clarity.

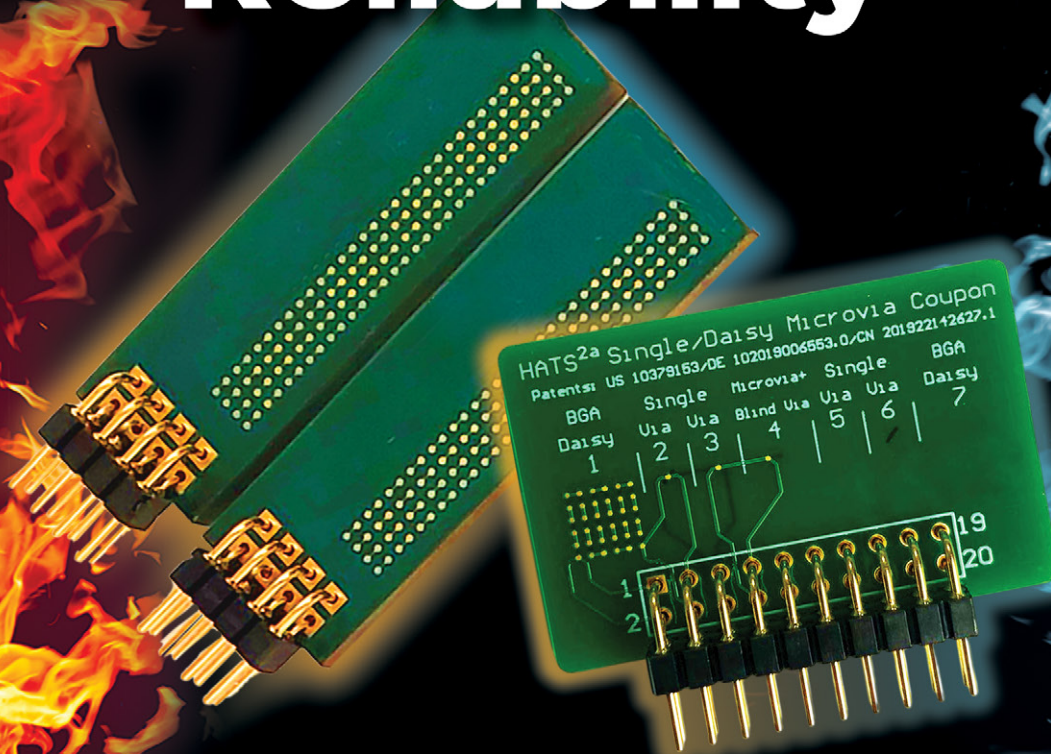
Industry experts lead these online courses, which are always recorded so students can revisit and review the lectures on their own time.

Our courses are designed to challenge and test existing knowledge. We encourage students to step out of their





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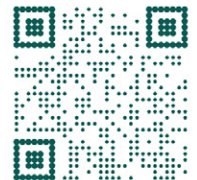
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comfort zone and not be intimidated by challenging courses. Consider where you want to be in your career and utilize IPC courses to gain hands-on, real-life experiences to help you advance.

Student participation increased so significantly in 2022 that IPC has responded by expanding our offerings to meet customer demand.

The following is a breakdown of what you can see this year:

## PCB Design I and II

These course offerings are driven by the high demand, where courses have been near capacity all year. We believe we are meeting students' expectations of our courses based on their positive feedback.

## PCB Design for Military and Aerospace Applications

PCB design students have demonstrated great enthusiasm for the coursework and new knowledge of this course. One former student told us, "The information was relevant to my current work and enlightened me in areas where I could use improvement in process and documentation." Another student from PCB Design II commented, "My learning experience was better than what I experienced in college. What I learned in college was just basic electronics routing. During this course I learned how IPC guidelines can help to produce a quality PCB."

### We Need You

If you're an industry expert in design, assembly, or fabrication interested in presenting a webinar or becoming a course instructor, contact Kelly Allen at [KellyAllen@ipc.org](mailto:KellyAllen@ipc.org)

## Advanced Troubleshooting and Defect Analysis

This training course will be taught by IPC Hall of Famer Michael Carano.

But it is not just PCB design courses that are growing. Check out these additional courses:

## Certified Electronics Program Manager Training and Certification Program


Led by Susan Mucha, a longtime industry consultant, this is the only program management course developed exclusively for electronics manufacturing and includes two sessions on contracts. The sessions are led by an industry lawyer from the firm F&B.

Of the course, Susan says, "The CEPM program provides EMS program managers and their OEM counterparts with a credential that demonstrates that they are familiar with both the business and technical aspects of their roles. More importantly, when I've talked with EMS CEOs, I've also heard that program managers who earn their CEPMs tend to stand out as more proactive in early issue identification and ability to negotiate with customers."

## Advanced Design Concepts

This is a new course as a result of student feedback in other courses. Launching in March, it is part of our comprehensive PCB design curriculum and will feature blended content from three previously offered courses: Embedded Design, HDI/Advanced Packaging, and Printed and Wearable Devices.

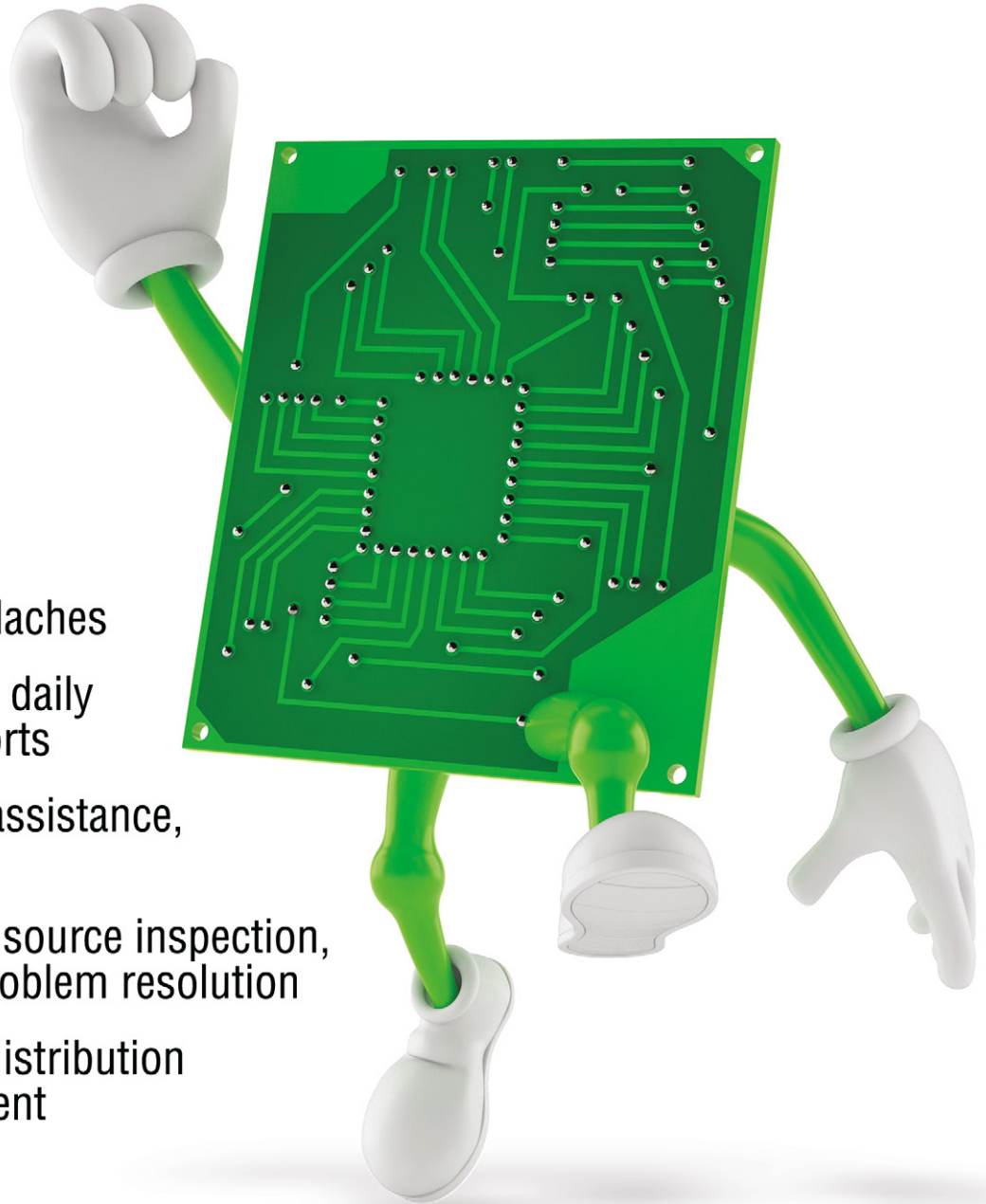
## Engineering Webinar Series

IPC launched this series in November and December 2022 as a member benefit. The series includes four live educational experiences discussing key issues of quality, defect detection and remediation, and design finalization and fabrication. A team of industry leaders covered topics like SMT yield, gold and aluminum wire bonding, preventing manufacturing defects, and e-textiles. These stand-alone topics were "modules of information" of IPC APEX EXPO 2023 Professional Development courses. Check out the IPC Events calendar for more webinars scheduled throughout 2023. 



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# 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 electronics products.

Course Name	Date	Days	Time GMT	# Weeks
<b>Feb–Mar 2023</b>				
PCB Design for Manufacturability	Feb 21 – Mar 23	T/TH	5 PM GMT	3
Certified Electronics Program Manager (EUROPE)	Feb 21 – Mar 30	T/TH	4 PM GMT	6
PCB Design for Radio Frequency Boards (RFB)	Mar 13 – Apr 19	M/W	4 PM GMT	6
PCB Advanced Design Concepts	Mar 13 – May 3	M/W	11:30 PM GMT	8
PCB Design II	Mar 14 – May 4	T/TH	4 PM GMT	8
PCB Design II	Mar 14 – May 4	T/TH	11:30 PM GMT	8
<b>Apr–Jun 2023</b>				
Advanced Troubleshooting & Defect Analysis	Apr 3 – Apr 26	M/W	11:30 GMT	4
PCB Design for Rigid Flex Boards (F/RF)	June 5 – July 12	M/W	4 PM GMT	6
PCB Design for Military, Aerospace & Other Extreme Applications	June 5 – July 12	M/W	11:30 PM GMT	6
PCB Design I	June 6 – July 13	T/TH	4 PM GMT	6
PCB Design II	June 6 – July 27	T/TH	11:30 PM GMT	8



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

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



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

# Four Policy Decisions for Advanced Electronics

By Chris Mitchell, IPC VP Global Government Relations

The passage of the U.S. CHIPS and Science Act was a testament to the fact that U.S. policy-makers can still work on a bipartisan basis to tackle complex and daunting challenges, but building a more robust, domestic ecosystem for advanced electronics will require four key policy decisions.

**1 Invest in advanced packaging capacity.** The CHIPS Act makes \$39 billion available over five years for government investments in manufacturing capacity. Much of this funding will go to silicon fabricators, but at least nine figures should be earmarked for advanced packaging segments including IC-substrate fabrication and final component assembly and test, with a focus on building short-term capacity both organically and through foreign investment or partnerships.

**2 Invest in research and development.** The U.S. is 10 to 20 years behind its peers in advanced packaging, especially IC-substrate fabrication. Playing catchup is a losing strategy, so the U.S. needs to invest in leapfrogging technological advancements. Fortunately, the CHIPS Act allocates \$2.5 billion for advanced packaging R&D, funds that should be used to support innovations in equipment, materials, and processes that support advanced electronic interconnection.

**3 Promote supply chain partnerships instead of supplier relationships.** Component makers and their suppliers need to see each other more as partners than as customers and suppliers. Partners support each other's success; customers too often seek the lowest price even if it weakens the supplier's ability to remain solvent and invest in new capabilities. In the context of rising geopolitical tensions and global supply chain risks, customers and suppliers are dependent upon each other's success, and the business relationships should reflect this fact.

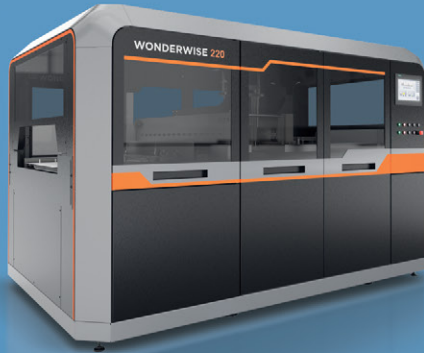
**4 Make strategic decisions on what we are building and for whom.** The global electronics supply chain has largely moved out of the United States and allied nations in Europe. Bringing it all back is highly unlikely. Instead, the U.S. government needs to determine what items need to be made in the U.S. and allied countries—either for strategic autonomy or security purposes—and then focus on building capabilities accordingly.

As global competition for semiconductor leadership intensifies, the CHIPS Act is a bold move on the part of the United States. But those billions are a drop in the bucket in the context of overall private sector investment in the industry. As the U.S. government begins to make decisions on how best to invest its limited dollars, the focus needs to be on leveraging these funds to maximum effect and steering investment into long-term, sustainable industries. The only way to do this is by complementing investments in silicon with investments in advanced packaging, the driving force for innovation in microelectronics.

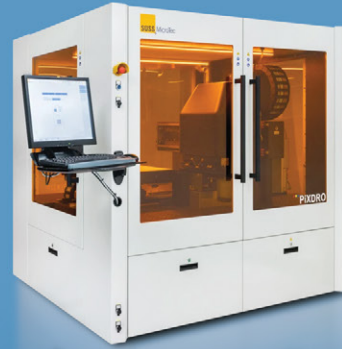
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# What IPC is doing to further the conversation


IPC has been actively working to educate policy-makers on the importance of investing in the entire semiconductor supply chain, including advanced packaging and printed circuit boards, to achieve the goals of the CHIPS Act. An IPC report last winter found the U.S. has only just begun to invest in advanced packaging, while nations in Asia have the lion's share of capabilities and capacity. A more recent report by IPC, based on a survey of nearly 100 industry leaders in semiconductors and related fields, shows strong industry support for increased public and private investments in advanced packaging efforts.

The recently enacted CHIPS and Science Act includes IPC-backed provisions to invest at least \$2.5 billion in advanced packaging capabilities in the U.S. in 2023. An IPC-convened symposium on the topic in Washington, D.C., was well attended by representatives of the U.S. government and all sectors of the electronics industry. We succeeded in nominating several packaging experts to a new

USG advisory panel on microelectronics. IPC has also submitted official comments on the issue to the U.S. Department of Commerce and to the European Commission, both of which are planning major investments in the semiconductor supply chain in 2023.

# How IPC members can get involved

No matter who you supported in the last election, it's more important than ever to make sure they hear you as the new Congress gets down to business. IPC needs its members and friends to make their voices heard, and the best place to start is pledging to stay informed and engaged in IPC advocacy in 2023-24. When you sign up, IPC will keep you informed about the issues and send you timely opportunities to contact your elected officials on key issues.

Scan the QR code; it only takes a few clicks and will add so much to the industry's advocacy effort. 



Learn About the Cover

# The Colors of IPC

## Advocacy

IPC is the voice and champion of the electronics industry.

## Global

IPC supports all aspects of the supply chain within the electronics industry across the globe.

## Certification

IPC is the leading global certifier of qualification, competence or authority among the electronics industry workforce.

## Standards

IPC enables reliable, high-quality electronics by developing the trusted standards that drive the global electronics industry's success.

## Education

IPC helps companies—and the industry as a whole—become more efficient and capable.

## Membership

IPC member companies—which represent all facets of the electronics industry, including design, printed board manufacturing, electronics assembly, test, and advanced packaging—leverage valuable member benefits to improve product quality, reliability, consistency, and profitability.

## News

Our News Center and newsletters provide recent media coverage, news releases, and access to IPC resources.

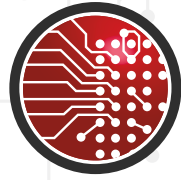
## Industry Intelligence

As an industry thought leader, IPC exists to help its member-companies innovate, compete and succeed.

## Events

Our future-focused industry events, help companies provide better service, deliver superior products and strengthen their bottom lines.





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  - Consistently Reliable Quality
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# SUSTAINABILITY

## IPC LEADING THE WAY

By Kelly Scanlon, IPC Lead Sustainability Strategist

**E**lectronics manufacturers build electronics better by balancing reliability, performance, cost, innovation, and sustainability. Sustainability is critical—that is, with increased resource efficiency and decreased impacts, intentional life cycle management (e.g., design for recyclability), and awareness of concepts, approaches, and metrics for continuous improvement.

### How It's Being Addressed

Some electronics manufacturers are doing this by identifying and reporting on the most relevant sustainability topics to their business operations. We see that leading organizations inside and outside the industry, both independently and sometimes collectively, are establishing or expanding sustainability-related requirements for their operations and their value chains.

However, this results in multiple requests of value chain members to respond to numerous comprehensive, complex, and discordant surveys and contract requirements. The outlay of resources to track requirements from policymakers, or their value chains to manage these requests—and the diverse exper-

tise to respond to these surveys and requirements—is expected to grow.

We see that electronics manufacturing companies are prioritizing reporting on greenhouse gas emissions, life cycle management of products, diversity and inclusion, supply chain risks (such as responsible sourcing, human rights and worker rights), and pollution prevention. IPC recognizes that we can expand our standards, education, and advocacy efforts to be more inclusive of these concepts and topics.

“Some of these issues and topics IPC has worked on with industry for years, but there are opportunities to address additional industry-relevant sustainability topics. IPC’s sustainability efforts include projects that will help IPC to build a strategy enabling the industry to understand, influence, and meet the sustainability requirements coming very soon,” says John W. Mitchell, IPC president and CEO.

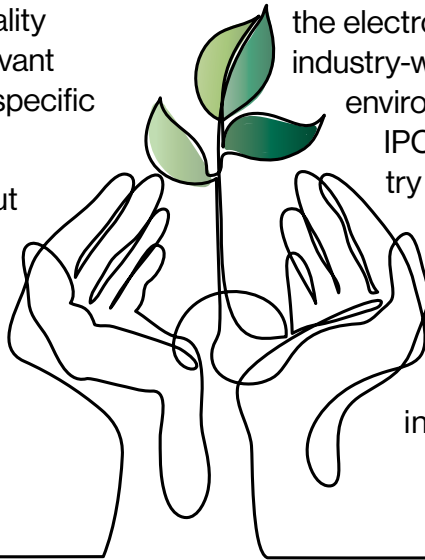


## The Sustainability Initiative

In 2021, IPC convened an ESG for Electronics Steering Group comprising companies from the electronics manufacturing value chain who address environmental, social, and corporate governance (ESG) issues. In 2022, we heard from even more companies about their challenges staying ahead of and in tune with the dynamic landscape of sustainability requirements. They are ready for IPC to codify its own sustainability initiative to ensure we are the go-to for trusted and relevant standards, education, and advocacy resources that industry uses to achieve their sustainability aims.


In 2023, IPC will develop an evidence-based sustainability strategic plan. To do this, IPC is:

- Convening a Sustainability for Electronics Leadership Team to offer peer review and direction to IPC
- Conducting an industry-wide Materiality Assessment to identify the most relevant electronics manufacturing industry-specific material risk factors
- Increasing our communications about emerging policies and regulatory requirements, existing IPC standards development activities, and insights into risk factors and how to address them and report on them through sustainability reporting



“Sustainable practices are essential to the long-term success of any business and TTM actively works with IPC to develop and promote sustainable industry standards...”  
—Tom Edman, TTM Technologies Inc.

“Sustainable practices are essential to the long-term success of any business and TTM actively works with IPC to develop and promote sustainable industry standards and EHS best practices,” says Tom Edman, TTM Technologies Inc.’s president and CEO and IPC Board vice chair. “IPC’s sustainability initiative comes at a most critical time for the electronics industry as we work to provide industry-wide solutions to continue to drive environmental improvements.”

IPC is well-positioned to lead the industry through its existing competencies in standards, education, and advocacy as well as utilizing our access to subject matter experts from across the globe. We’re excited to move forward with this sustainability initiative. 

## Which sustainability issues are most likely to impact the operating performance of electronics companies?

Last year, we scanned more than a dozen companies’ sustainability reports. We looked at reports from PCB, EMS, wire/cable, and OEMs in Asia, Europe, and North America. These were publicly available reports from 2021 and 2022. Companies methodically choose which key topic areas to focus on in their reports. Their priorities generally included the following:

- Climate change
- Circular economy and life cycle management
- Occupational health
- Diversity and inclusion
- Human rights
- Supply chain risks
- Energy
- Waste and water management

# From PIN to Publish

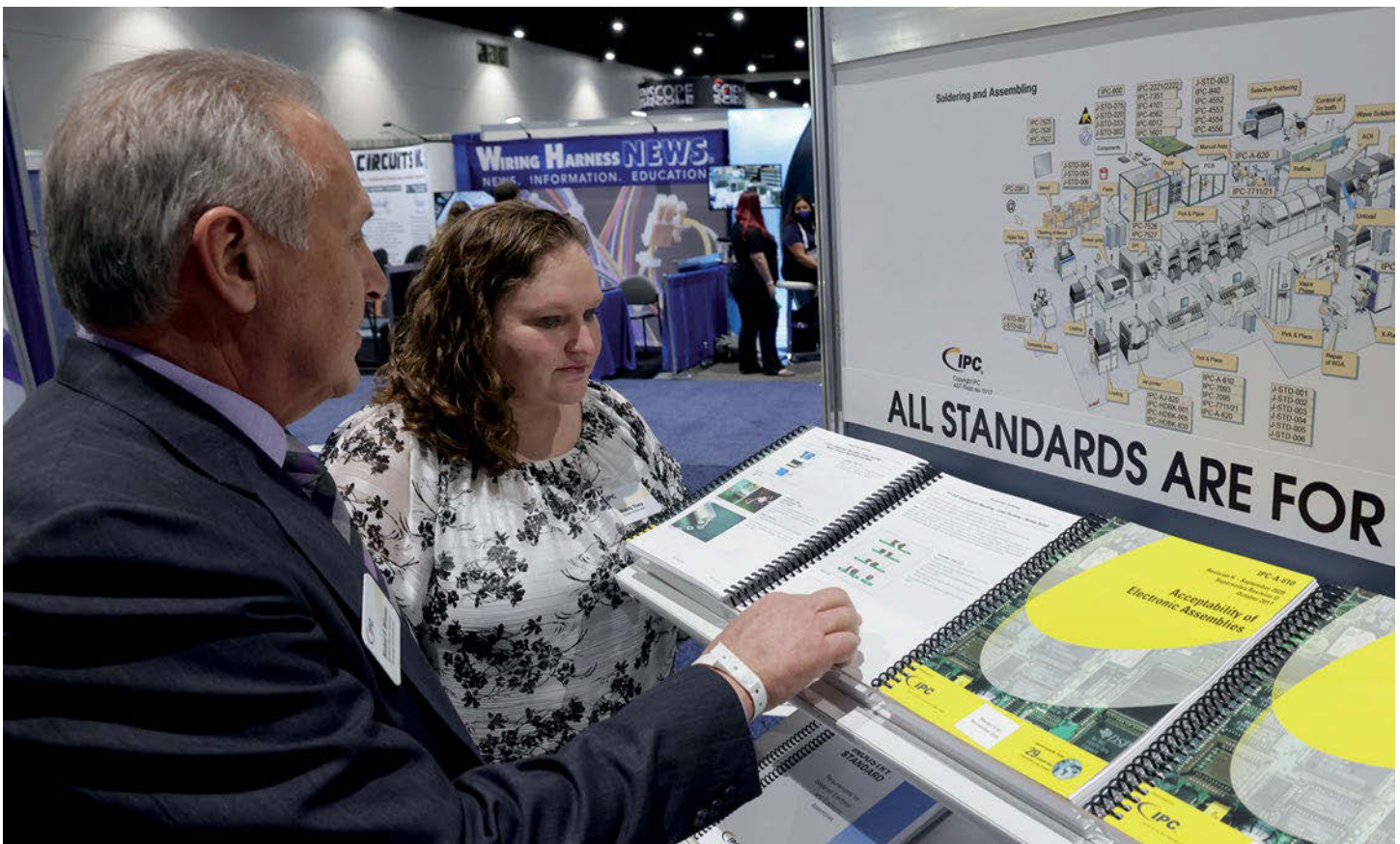
## What is the process for creating a new standard?

### It all starts with a need...

By Linda Stepanich

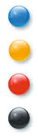
Anyone who has contributed to an IPC standards development committee meeting has experienced that moment of “What have I gotten myself into?” before recognizing the importance of the difficult, but ultimately rewarding work of drafting and helping to publish the standards that constitute the body of knowledge for the electronics manufacturing industry.

IPC standards represent the collective knowledge and best practices from the global supply chain. Importantly, all IPC standards are developed by volunteers, ensuring that they truly represent the global electronics manufacturing industry. They provide the information needed to produce safe, reliable, high-performing products that ensure reliability and best practices.





# The New Objective Evidence Website is Now LIVE



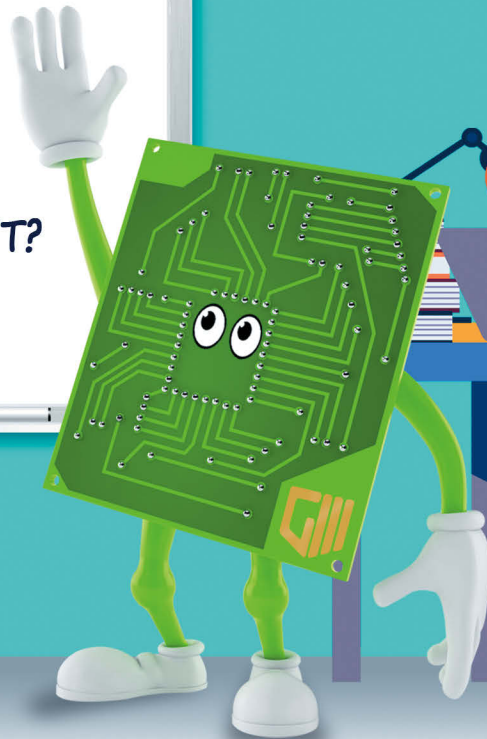
OBJECTIVE EVIDENCE

AS REQUIRED BY IPC-J-STD-001

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WHY IS IT IMPORTANT?

HOW & WHERE CAN I TEST FOR IT?



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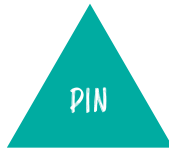


OBJECTIVE EVIDENCE

BY GEN3

What are the rules for IPC standards development? We hope to answer those questions with a short primer on how we get from PIN to Publish.

## How Are Standards Created?



It all starts with a PIN, or Project Identification Notification, submitted by any group of industry members seeking to develop a specific standard, be it a guideline or a specification. A PIN is created in response to a need for a standard that currently does not exist, or an important revision to an existing standard. IPC staff does not write IPC standards, but staff liaisons—the deeply knowledgeable IPC technical staff members working with committees—assist committee members in every step of the process. Liaisons understand the industry and are uniquely capable of setting up a committee to create the standard and ensure that documents make it to publication.



Once a PIN is submitted by IPC staff, it is sent to the Global Technical Activities Executive Committee (TAEC), which conducts an initial review of the PIN, and from there it is submitted to the general TAEC standards development oversight committee for final approval. TAEC members adhere to principles of standardization, indicating that standards should:

- Show a relationship to Design for Manufacturability (DFM) and Design for the Environment (DFE)
- Minimize time to market
- Contain simple (simplified) language
- Just include spec information
- Focus on end-product performance
- Include a feedback system on use and problems for future improvement

But standards should not:

- Inhibit innovation
- Increase time-to-market
- Keep people out
- Increase cycle time
- Tell you how to make something
- Contain anything that cannot be defended with data



Once a PIN is approved, the document becomes a Working Draft, a process that can take up to three years, leading to detailed and painstaking work on the path to publishing. A sense of humor is essential, as is a willingness to work toward industry consensus.

As Teresa Rowe, senior director, Assembly and Standards Technology, states, “I have certainly overheard comments such as, ‘This is torture,’ when we’ve spent an inordinate amount of time arguing over the use of ‘should,’ or ‘shall,’ and I’ve seen members new to committee meetings overwhelmed by the process, not sure how to handle the tedium that is the hard work of standards development and editing.”

Teresa came to IPC after many years in the industry, winning awards for IPC standards development, and brings a depth of experience that is beneficial for all involved. She focuses on the need for industry consensus, indicating that “sometimes members





come in with preconceived notions, expecting to get exactly what they want out of the process, and there is a learning curve.

“We are always open to new interpretations and changes to standards if the entire committee agrees on the choices we are making,” she says. “If we are having difficulty and a standard is stalled, we are open to swapping out roles of chairs and committee members to find consensus.”

IPC A-Teams are relatively small, dedicated groups of volunteers within existing IPC working groups who take on a significant amount of work on behalf of their groups. Their creativity is reflected in the names of their teams. For example, roles on two A-Teams were swapped out recently: The IPC A-610 A-Team, “Looks Good from Here,” changed roles with the leaders of the IPC-J-STD-001 A-Team, “Toe Hangover Gang,” to create the “Looks Like a Hangover A-Team,” and this group is busy finding consensus on those standards.

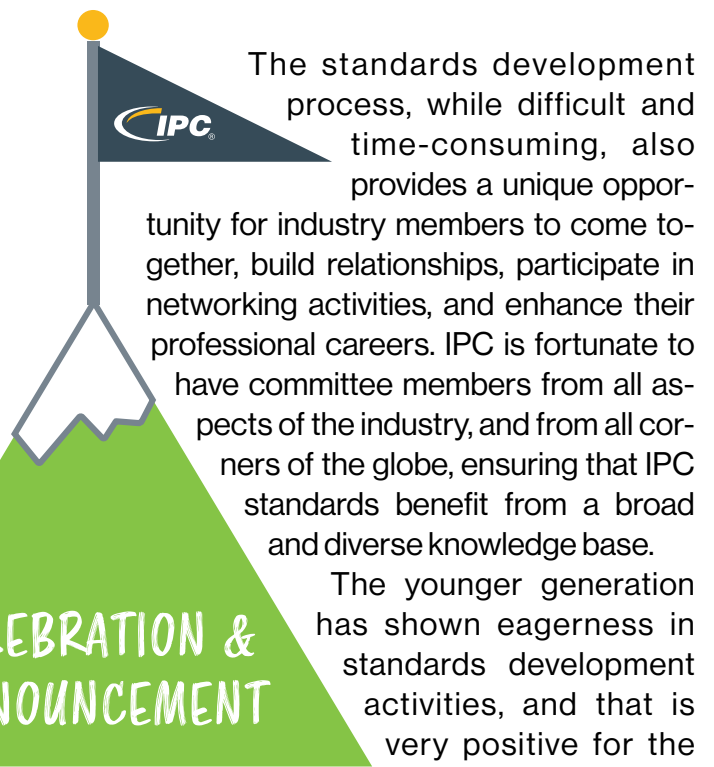


Following the Working Draft, the document goes into the Final Draft for Industry Review (FDIR) stage where the comments can come from both within and outside of the originating group, often becoming more “heated” as the document gets closer to approval, and the editing process becomes intense. “This is where we find the committee members who are detail-oriented and enjoy the process, hunting for the best way to develop the standard,” Teresa says.



After FDIR, the document goes to the Proposed Standard for Ballot (PSB) stage and the originating group votes on its release. When a standard is finalized and passes the ballot process (perhaps involving a Negative Ballot resolution phase), celebrations ensue, usually at either IPC SummerCom or IPC APEX EXPO.

## CELEBRATION & ANNOUNCEMENT



to Teresa. “We have found so much energy in our emerging engineers—we benefit from their youth, energy, and new way of looking at things. Hopefully by working on standards, they are benefitting in ways that will help their careers.”

Udo Welzel, Robert Bosch GmbH (Germany) and co-chair of the IPC Technical Program Committee, highlights three critical aspects of the need for standards in electronics manufacturing.

“First, standards development leads to acceleration of innovation, by transferring novel concepts, technologies and materials to the state of the art. Second, quality improvements are fostered by meeting standards requirements. Last but not least, harmonization of requirements and procedures along the supply chain can also bring about cost-savings by reducing variations—stakeholders can more efficiently focus on commonly accepted requirements.”

Stanton F. Rak, SF Rak Company, chair of the IPC Technical Program Committee and active in standards development for two decades, says that “standards tie everything together—suppliers and OEMs are all involved in the development, and everyone has an opportunity to provide input, making it much more efficient for the industry if they share common goals.” 

# Standards Update

## Newly Published Standards/Standards Revisions

### IPC/WHMA-A-620E

#### **Requirements and Acceptance for Cable and Wire Harness Assemblies**

The only industry-consensus standard for describing materials, methods, tests, and acceptance criteria for producing crimped, mechanically secured and soldered interconnections and the related assembly activities associated with cable and harness assemblies.

### IPC-7352

#### **Generic Guideline for Land Pattern Design**

Standard provides generic recommendations on land pattern geometries used for the attachment of electronic components to a printed board, as well as design recommendations for achieving the best possible solder joints to the devices assembled.

### IPC-7092A

#### **Design and Assembly Process Implementation for Embedded Circuitry**

Standard describes the design, materials, and assembly challenges associated with implementing embedded circuitry into a printed board.

### IPC-1402

#### **Standard for Greener Cleaners Used in Electronic Manufacturing**

Standard applies to cleaning products used in Electronics Manufacturing, including but not limited to original equipment manufacturers, electronics manufacturing services companies, board manufacturers, cable and wire harness manufacturers, and electronics industry suppliers.

### IPC-2292A

#### **Design Standard for Printed Electronics on Flexible Substrates**

Standard establishes specific requirements for the design of printed electronic applications and their forms of component mounting and interconnecting structures on flexible substrates.

### IPC-9202A

#### **Material and Process Characterization/Qualification Test Protocol for Assessing**

Electrochemical performance using the IPC-B-52 Test assembly, the test protocol that records changes in Surface Insulation Resistance (SIR) on a representative sample of a printed circuit assembly (PCA).

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



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## Celebrating 30 Years of Connecting the Wire Harness Industry

As the Wiring Harness Manufacturer's Association (WHMA) celebrates its 30th anniversary this year, we're taking a "look back" to the vision of nine wiring harness manufacturers that came together to create the association in the fall of 1993.

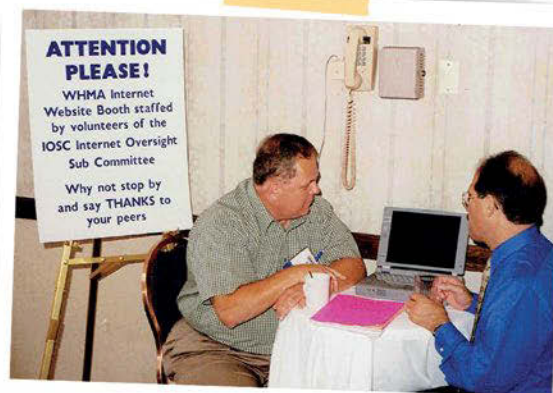
Executives from Unlimited Services Inc., Montello Products, Spring Green Technologies, Tay-Mor Industries, Inc., Oak Hill Engineering, Inc., TM Morris Mfg. Co., AES Interconnect, Monona Wire Corp., and Wiring Harness News formed WHMA's Board and made plans to hold its first annual conference in 1994.

"When WHMA was formed 30 years ago, we all agreed that a trade association was one of the elements that was missing in the cable and wire harness industry," says Norm Sagon, a founding member and former WHMA Board chair. "We felt that if we could develop such an organization, the association could serve many of the common

needs of wire harness companies and could act as a clearing house for new ideas, networking, and best practices. Today, WHMA has grown into a well-respected association, leading, educating, and connecting the global cable and wire harness industry."

The only trade association exclusively representing the global cable and wire harness manufacturing industry, WHMA is dedicated to providing members with technical support, access to leading-edge technology, benchmarking, and networking opportunities with the leaders in wire processing equipment, services, and manufacturing.

No matter what challenges lay ahead for our industry, the strength of our volunteer leadership and commitment to serving the needs of our members will continue to be the hallmark of WHMA for many years to come.



Historical images courtesy of David Bergman



# 1994

The First Annual Convention is held September 25-26, 1994 at the Ramada O'Hare in Rosemont, Illinois, and is well attended. The schedule of events includes a networking reception, committee meetings and technical presentations.

WHMA hires a Chicago-based management company to manage the association and bestows them with the position of Executive Director. During this

10-year management period, WHMA membership doubles in size.

*Wiring Harness News* (WHN) launches as the premiere wire harness/cable assembly industry journal. WHN partners with WHMA to give members a free subscription to this informative industry print magazine.

# 1998

WHMA signs MoU with IPC to develop an industry standard for wire harness/ cable assembly workmanship, titled IPC/WHMA-A-620, Requirements and Acceptance for Cable and Wire Harness and Assemblies. Today, Revision E which was released in October 2022, has more than 700 full-color pictures and illustrations. Included in the 19 chapters are criteria on safety wires and prep, requirements for individual wire seals, soldering

to terminals, crimping of stamped and formed contacts and machined contacts, insulation displacement connectors, ultrasonic welding, splicing, connectors, molding, marking, coax/biax cables, raceways, grommets, shielding, assembly, over-molding of flexible flat ribbon, and wire-wrap terminations. IPC/WHMA-A-620 is the only industry-consensus standard for requirements and acceptance of cable and wire harness assemblies.

# 2019

WHMA signs an affiliation agreement with IPC. Per the affiliation agreement, IPC and the WHMA Board work to grow the involvement of the cable assembly and wire harness industry globally. All current WHMA members become part of IPC's membership and

receive all IPC member benefits including education, standards development, leadership, advocacy, and solutions to industry challenges and opportunities. IPC Vice President of Standards and Technology David Bergman is named as WHMA's executive director.



# Annual WHMA Conference


## You won't want to miss it!

The 2023 WHMA 30th Annual Wire Harness Conference is scheduled for Feb. 14–16 in Albuquerque. It is here that attendees can learn, grow, share, and discover new approaches geared exclusively to global leaders in the wire harness industry.

“With anniversary celebrations for both the association and conference, attendees can build relationships and make powerful connections through peer-to-peer discussions with current and potential business partners,” says David Bergman, WHMA executive director. “Industry thought leaders will present on topics important to wire harness manufacturers, OEMs, and suppliers. We urge all to take advantage of peer-to-peer networking, best-practices roundtables, a technical education workshop, and an exhibit hall with industry-leading suppliers. This is a conference you won't want to miss.”

### KEYNOTE SPEAKER

Dan Thurmon, peak performance coach and work/life balance expert, addresses:

- Improving work/life alignment
- Effective leadership
- Performance management
- Recruiting
- Retention
- Body language cues in corporate negotiations
- Insights on issues facing the global electronics industry, including supply chain resiliency/uncertainty, trade wars, skilled workforce shortage, and the expanding role of electronics in the global economy as well as a detailed economic report and outlook for WHMA members. 



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# And the Winners Are...



## IPC's Hand Soldering Competition Gets a Big Stage in 2022

With something akin to the run-off for a state playoff, more than 160 skilled finalists from Europe and Asia pitted their skills against each other, the clock, and their handiwork in regional IPC hand soldering competitions in 2022.

After several regional events in Asia and Europe, where contestants represented approximately 80 companies, the top winners traveled to Munich, Germany, for an exciting final event this past November. Who came out victorious?



### First Place

Eliane Chesnais, Thales, 556 out of 558 max points,  
59 minutes, 37 seconds



### Second Place

Pauline Duval, Thales, 551 out of 558  
max points, 58 minutes, 19 seconds



### Third Place

Xiangchao Wang, Shenyang , Railway  
Signal Co., Ltd., 550 out of 558 max  
points, 60 minutes, 0 seconds





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It's clear these competitors knew what they were doing. For the first time in a hand soldering competition, eight of the 10 finalists produced functioning PCBs in accordance with IPC-610 Class 3 standards.

"We were thrilled to host such a skilled, sensational group," says Philippe Leonard, IPC Europe managing director, who was on hand at electronica 2022 to crown the world champions, two of whom came from the same company.

Lest anyone think this is a competition meant for beginners, the technically challenging projects often required contestants to rework a functional electronics assembly within a 45- to 60-minute

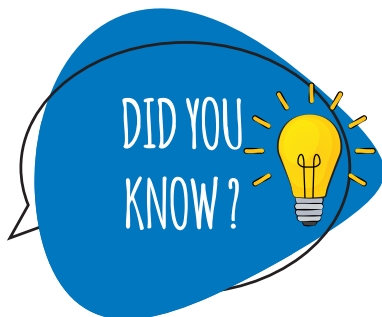
time limit. Assemblies were judged on soldering in accordance with IPC-A-610H, IPC J-STD-001H, IPC-7711/21C - Class 3 criteria, the speed at which the assembly was produced, and overall electrical functionality of the assembly.

The contestants, however, recognize that this competition is all in a spirit of fun and showmanship.

"The goal of the competition is to do soldering both fast and well," says Pascal Levivien of Dassault Aviation. "It is quite different in the real aeronautical industry where we must do it very well with longer time requirements than the IPC recommendations. Aeronautics is a field of excellence in which the skills of men and women are essential." 🌈



Time for a red carpet walk for the three winners at Global Industrie 2022 Hand Soldering Competition in May 2022. Pictured left to right: Philippe Léonard, IPC Europe managing director; Jonathan Albrieux, IFTEC; first-place winner Manuella Anani, Dassault Aviation; second-place winner Alison Guermond, Safran Fougères; third-place winner Nathalie Foubert, Safran Fougères; and Patrick Mellet, IFTEC.



*IPC Hand Soldering Competitions in Asia originated in China in 2010, and now regional competitions also take place in Vietnam, Thailand, and Japan.*



Contestants were allowed 45 to 60 minutes to build an assembly in accordance with IPC-A-610 Class 3 at IPC Hand Soldering Competitions, such as this one at the Global Industrie Competition in Paris.





Contestants only had 45 minutes to rework a functional electronics assembly at the IPC Hand Soldering and Rework Competition in Nagoya, Japan, in October 2022. First place went to Masaki Nakamichi, Panasonic Corporation, who received a cash prize of \$500, and qualified for the world championships in Munich the following month. Second place: Yuki Mayashita, FUJIFILM Healthcare Manufacturing Corporation; third place: Nao Morita, Advantest Corporation.



At the IPC Hand Soldering Competition in Tallinn, Estonia, in October 2022, there were 31 competitors. The Best Company Team Award went to (left to right): Timmo Antso, Ave Esko, and Siret Kegel, Scanfil Pärnu (Estonia). They are joined by Philippe Léonard, IPC Europe managing director.



Felicitations to Thalès Etrelles for sending three winners to IPC's Hand Soldering Competition in October 2022 at SMTConnect in Nuremberg:: Eliane Chesnais, David Gasnier, and Magali Edin.

## The Importance of Hand Soldering

“In electronics production, machines long ago replaced soldering done by hand. But it is impossible to fully replace the personal skill in soldering because solder joints made by machines still might require rework and correction by hand. There are still a few components that outmatch the automatic process. In our case, these hand skills are even more important because we work only on prototypes, and automatic production processes are not always available for this phase. It is important for us to save prototype boards to use when we need to practice making them operative.”

—Pascal Levivien, Dassault Aviation

IPC is a global organization with offices around the world. Here are some updates from each of IPC's regional directors.



## North America

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

### Gnomeapalooza Hosts IPC A-Teams for Standards Development Activities

Gnomeapalooza, held at IPC headquarters in October 2022, welcomed A-Team committee members to collaborate as they edited and revised many of the vital standards that support the electronics manufacturing industry. IPC A-Teams are comprised of small, dedicated groups of volunteers within IPC working groups who take on a significant amount of work on behalf of those groups. The event is named for IPC's fictional TechNet gnomes, Clumpy and Kloumpios, who bring a bit of comic relief to a very long and detailed process. The gnomes can be found on Instagram (@clumpy-andkloumpios). In the spirit of fun, the names of the A-Teams are creative and playful. Here are just a few examples:

- **Bottoms-Up:** A-Team reviewed the document and identified chapters that need to be updated or improved. Also assigned a member to each chapter or subchapter.
- **Pillow Fighters:** Reviewed all open action items and content provided by team members. Identified areas needing additional improvement or expert involvement.
- **Champagne:** Drafted a new white paper about champagne voids.
- **Inkpendables:** Completed a first pass-through of new working drafts for printed electronics for rigid application standards.
- **Traceblazers:** Completed first pass-through of a new standard for printed electronics e-textiles reliability.
- **Wire Nutz:** Started a new revision (Rev F)! Looked at deferred comments, created a few new A-Teams to address, and started work. Considering this group met the same day that the typeset 620E was approved to be published, it was a memorable day.



### CHIPS Act Implementation Requires Strong Focus on Advanced Packaging

The recently enacted U.S. CHIPS and Science Act authorizes at least \$2.5 billion in Fiscal 2022 alone for a newly established National Advanced Packaging Manufacturing program. Leaders of top semiconductor, microelectronic, IC-substrate, PCB, EMS, and OSAT companies along with the U.S. government and European Commission, gathered in Washington, D.C., in October at the inaugural IPC Advanced Packaging Symposium. The goal: Building the IC-substrate and package assembly ecosystem to discuss expanding advanced packaging capacities and capabilities to go along with expanding production of semiconductor chips.



The two-day event welcomed 153 attendees from 10 countries in North America, Europe, and Asia, with 100 companies and organizations sending executive, government, industry, and academic leaders, as well as representatives from commercial and defense electronics.

## Efforts in Mexico to Train and Build Relationships

In Mexico, IPC's Education Team has been busy providing specialized training courses, certification programs, and products in Spanish to help local companies meet industry standards. With the help of IPC Mexico Director Lorena Villanueva, IPC has launched several pilot programs with key companies to help them achieve better quality, lower costs, and improve productivity. IPC also participated in the AutoSummit in Leon, Guanajuato, as well as meetings with local governments in Chihuahua and Guanajuato, the most important industrial clusters of Mexico's automotive industry.

## Europe

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

### Boldly Engaging the European Electronics Community in 2023

We had a whirlwind of member support activities in Europe in 2022. In addition to being on track to certify a record number of Europeans to IPC standards, our expanding staff has been actively engaged on numerous fronts ranging from international trade shows and regional technical conferences to local "IPC Day" gatherings and facilitating important discussions between the EU policymakers in Brussels and our members. The response from the industry leaders we work with regularly has been consistent: "We strongly welcome IPC's participation in our community; and the need for standards, education, advocacy, and solutions has never been more urgent." The formation of our legal entity, IPC Electronics Europe GmbH, in May 2022 has been a significant enabler to the growth in activity.

We've got another exciting year ahead in 2023 as we help build and proudly serve the electronics community. One

of our main objectives is to increase the number of OEM volunteers contributing to our standards development activities. Continuing to strongly promote our consensus-building, global, fair, and open process will be a key focus as we continue to engage the aerospace, automotive, industrial, and medical sectors. In addition, we work toward helping the industry develop newer standards in areas covering new materials, e-mobility, and factory automation. Our team is looking to ramp up these activities in the new year.

Hand-soldering competitions continue to gain popularity in Europe. They appropriately spotlight key global standards like IPC-A-610 and the importance of skills development, which is a critical component of Europe's workforce development focus. In 2022, we had our first regional contest in Estonia, which joined the ranks of regular competitions IPC has been holding in Germany, France, Hungary, Poland, and the UK over the last several years. In 2023, we plan to add competitions in Italy, Turkey, and Switzerland. These are possible because of the strong support and contributions we receive from the local IPC-licensed training centers.

One of IPC's global initiatives is to move closer to leading-edge advanced packaging technologies. On a practical level, this will eventually help our PCB members expand into IC substrates and our EMS members expand into OSAT. Both are important for Europe to improve its supply chain resiliency by driving toward more regional supply chains. Our Government Relations and Solutions teams will take the lead to drive this throughout Europe. We are planning a symposium mid-year to bring these groups together so that they can start learning from and sharing with each other.

For more information, please contact Philippe Leonard, IPC Europe managing director, at [Philippe-Leonard@ipc.org](mailto:Philippe-Leonard@ipc.org).



# Asia

By Sydney Xiao, President, IPC Asia

## Celebrating Membership Growth and Involvement

IPC established its first overseas office in Shanghai, China, in 2002, the result of the globalization of the electronics manufacturing industry. After 20 years of development, IPC Asia has evolved into an international team with more than 40 employees from Greater China, Japan, South Korea, Thailand, and Vietnam. Offices are located in Shanghai and Shenzhen, China, and in Taiwan. Thanks to the rapid development of the electronics industry, IPC in Asia has grown to more than 850 members.

IPC Asia has been focused on the localization of standards. Every year, the team selects standards that are internationally recognized and then translates them into Asian languages. It must be accurate and make sense, which is not an easy process. We have established more than 10 standards task groups in China; Japan recently established the first regional task group; and the first task group in South Korea will be launched this year. At present, there are more than 600 task group members in Asia. In addition to contributing to existing standards, some new standards activities have been launched.

We also have training centers in China, Taiwan, Thailand, and Vietnam, and we provide training cer-

tification services through our partners in Japan and South Korea. At present, about 6,000 industry professionals in Asia participate in IPC training and certification every year.

Since 2016, many companies have earned a spot on IPC's Qualified Manufacturers List. They agree that it has helped them improve their manufacturing processes and customer acquisition abilities.

CEMAC is our signature annual event in China, where we offer dozens of industry seminars to share the latest information. Our 2022 event had to be postponed because of closures relating to COVID-19, but we look forward to its return this year, where members can exchange the latest trends in the industry and continue to network.

In addition to innovation in technology and management, our industry also needs a steady stream of talent. In 2020, IPC Asia's Scholars Program was established to connect top students with the most innovative and influential companies in the electronics industry. The Scholars Program provides meaningful and challenging internship opportunities for students to cultivate their talents and abilities. With the support of the TTM Asia team, more than 100 students have completed internship projects.

Finally, with our core value to celebrate member success, we created an Asian member online community where members can freely express their views and discuss issues. We now have more than 1,000 registered members. We see that digitalization and automotive electronics are the most pressing issues for Asian members.

If you are interested in the activities of IPC Asia, please contact Sydney Xiao, president of IPC Asia, at [sydneyxiao@ipc.org](mailto:sydneyxiao@ipc.org).



IPC Asia 2022 Scholars winners YuTing Xiao (left), and JiaHui Yang (right).

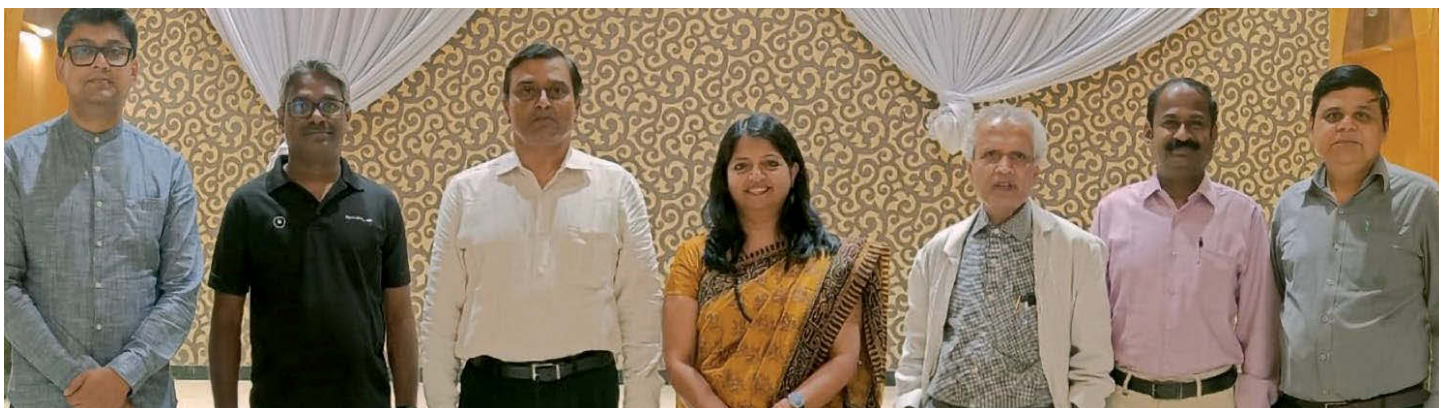
# India

By Gaurab Majumdar, Executive Director, IPC India

## India at IPC APEX EXPO 2023

For the first time, IPC APEX EXPO is showcasing an "India Pavilion" with 16 Indian companies. The initiative was undertaken by the Ministry of Commerce and Industry, Government of India, and implemented by the Electronics and Computer Software Export Promotion Council (ESC India). The main objective of the India Pavilion is to promote India's electronics manufacturing capabilities and provide a platform for Indian organizations to





IPC India's regional design committee celebrated their first meeting in Bengaluru, Karnataka on October 18, 2022 where task and regional working groups were initiated.

showcase their strengths. Indian companies in electronics sectors such as EMS, wire harness, material suppliers, design companies, and PCB manufacturers are part of this pavilion.

## Integrated Electronics Manufacturing and Interconnections (IEMI)

IPC celebrated a decade of service to the Indian electronics manufacturing industry by organizing the inaugural edition of Integrated Electronics Manufacturing and Interconnections (IEMI) at New Delhi on Aug. 2 and Bangalore on Aug. 4, 2022. Approximately 1,000 attendees participated in more than 200 business-to-business meetings, presentations by experts, panel discussions, technical sessions, product and service exhibits, and final skill challenge competitions. The second IEMI event is scheduled at Chennai on Aug. 1, 2023, and Pune on Aug. 3, 2023.

## New Dimension to IPC Skill Challenge Program

For the first time, IPC India took skill challenge competitions for hand soldering, wire harness, and PCB design onsite to member companies. More than 100 companies and 1,500 employees were involved in the first round of competitions from January to April 2022. The three best competitors from each company competed in semi-final rounds, which were held from May to July 2022. The semi-finals were held at different locations in India, as well as Colombo (Sri Lanka) and Dubai (UAE). Workshops and networking events were organized during the sessions to create awareness on IPC standards and skills development. The final round of the competitions took place at IEMI in Bengaluru.


## Industry Engagement in Standards Development

IPC India recently formed an IPC standards development department to work with industry volunteers from India to help revise existing IPC standards and develop new ones. Looking at India's growth in Electronics System Design and Manufacturing (ESDM), IPC India created a regional committee on electronics manufacturing design. The first committee meeting took place on Oct. 18 in Bangalore, and the following work areas and sub-sectors were formed:

Key Areas	Sub Area
IoT	PCB Design Standard for IoT-based Designs <ul style="list-style-type: none"> <li>• Militarization – HDI</li> <li>• Sensors</li> </ul>
Electric Vehicles	<ul style="list-style-type: none"> <li>• Thermal management of PCB assemblies</li> <li>• Electronic component derating guidelines for automotive applications</li> </ul>
EMI EMC	<ul style="list-style-type: none"> <li>• Standard to define best practices for design at PCB level</li> </ul>

## IPC Validation Services in India

IPC India has helped support IPC's Validation Services program, assisting EMS providers and their suppliers to optimize product quality, reliability, and consistency across the entire supply chain. With support from auditors in the U.S., IPC India conducted standard gap analyses for two Indian companies, which led to both companies earning an IPC Qualified Manufacturers Listing (QML).

For more information, contact Gaurab Majumdar, IPC India executive director, [GaurabMajumdar@ipc.org](mailto:GaurabMajumdar@ipc.org) 

# NEW TRAINING AVAILABLE

By Dave Hernandez, IPC VP, Education

Many industries have well-defined career pathways leading from “What do you want to be when you grow up?” all the way to “Happy Retirement.” Electronics manufacturing is not one of those industries. The lack of well-developed education pipelines feeding ready-to-work talent into the industry leaves electronics manufacturing companies with little choice but to take on the full burden of training new workers.

The knowledge and skills needed for careers in electronics manufacturing are specialized and evolve frequently. While schools can prepare entry-level candidates in math and communication, these new workers enter the industry with almost no knowledge about electronics or manufacturing.

Even the best electrical engineering programs focused on producing quality engineers lack instruction in practical industry knowledge.

IPC is committed to addressing the core work-force-related challenges facing our industry, but some of these challenges cannot be addressed quickly. They require systemic change. We recognize the immensity of the problem and are committed to addressing it long-term. But we also recognize that our industry is facing real problems that need immediate solutions.

Training is an investment in the quality of your product. With economic uncertainty tightening training budgets and a need for quality instruction that has never been higher, IPC wants to make it eas-


ier for companies to utilize the fundamental training programs that are necessary for quality electronic products. Over the last year, our Education Team developed two new online training programs, ESD Control for Manufacturing and Safety for Electronics Manufacturing that are free to all IPC and WHMA members. These programs include engaging online instruction, access to instructor tools and tracking, assessments to validate understanding, and a traceable credential for auditing purposes.

During August 2022, IPC field-tested these courses with 10 companies. The

reviews were overwhelmingly positive. Technical training advisor Keith Jackson at Ultra Precision Control Systems in the UK commented, “The ESD course is relevant, speedy, and interactive. The information is presented

clearly, concisely, and to the point. I love how it keeps you focused and entertained as well. IPC has totally hit the mark.”

These streamlined interactive courses cover the required topics, and feature three modules each with a total running length of 40 to 45 minutes per course. Participants receive a unique serialized certificate by scoring more than 80% on the final exam.

IPC member companies can access the new courses through IPC EDGE, IPC’s online learning platform used by industry companies to train thousands of employees across the globe. Both courses are now available in English, Spanish, French, and German. Course details and instructions on how to access the courses are available on [Education.ipc.org](https://Education.ipc.org). 





# 2023 PROGRAMS Q1

Stay connected with IPC through some of these regional events in February and March. Each issue we share events happening within the quarter. Visit our website for more information as events are happening.

## FEBRUARY

### Technical Workshop: Best Practices on Electronics Assembly

Nashik (State of Maharashtra), India

### Technical Workshop: Design Standards Development

Bangalore, India

### Technical Workshop: Supplier Checklists

Pune, India

## FEBRUARY 7-9

### IPC Hand Soldering Competition at Southern Manufacturing & Electronics

Farnborough, Hampshire,  
United Kingdom

## FEBRUARY 10

### Technical Workshop: Best Practices for Electronics and Wire Harness Assembly

Rudrapur (State of Uttarakhand),  
India

## FEBRUARY 14-16

### 2023 WHMA 30th Annual Wire Harness Conference

Albuquerque, New Mexico

## FEBRUARY 7-10

### IPC Hand Soldering Competition at Global Industrie

Lyon, France

## MARCH 28-30

### IPC Hand Soldering Competition at InnoElectro

Budapest, Hungary



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## ADVERTISER INDEX

American Standard Circuits.....	2
APCT.....	41
Arch Systems.....	27
Chemcut.....	19
DB Management Group.....	25
DirectPCB.....	35
EPOCH.....	29
EPTAC.....	5
GEN3 Systems.....	45
I-Connect007.....	13, 31
IPC.....	53, 64
Koh Young.....	7
NCAB.....	23
Prototron Circuits.....	15
Reliability Assessment.....	33
Summit Interconnect.....	9
Technica USA.....	39
TTM Technologies.....	49
Viscom.....	55



## SUBJECT MATTER **EXPERTS NEEDED**

The **IPC Education** team is working hard to create and update **workforce training and certification programs** that allow participants to learn, apply, and validate the job-specific knowledge and skills they need to meet and exceed organizational goals. But, we need your help!

### **Share Your Knowledge and Expertise with the Industry.**

- Review education program outlines, storyboards, and completed courses for accuracy and relevance.
- Provide real-life scenarios, best practices, and lessons learned that can be used to create practice activities, assessments, and job aids.
- Write test questions for IPC certification programs.



*If you can lend your expertise in these areas, all you need to do is scan QR code to complete a form and indicate your areas of expertise. The next generations will thank you!*

For more information, send an e-mail to Julia Gumminger, IPC Professional Development and Events Manager at **[JuliaGumminger@ipc.org](mailto:JuliaGumminger@ipc.org)**.