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SNEAK PEEK IPC APEX EXPO PRE-SHOW ISSUE

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PRE-SHOW COVERAGE

This month's issue devotes its pages to a comprehensive preview of the IPC APEX EXPO event. Whether your role is technical, business, whether your experience level is new-to-the-industry or seasoned veteran, you will find value throughout this year's IPC APEX EXPO program.

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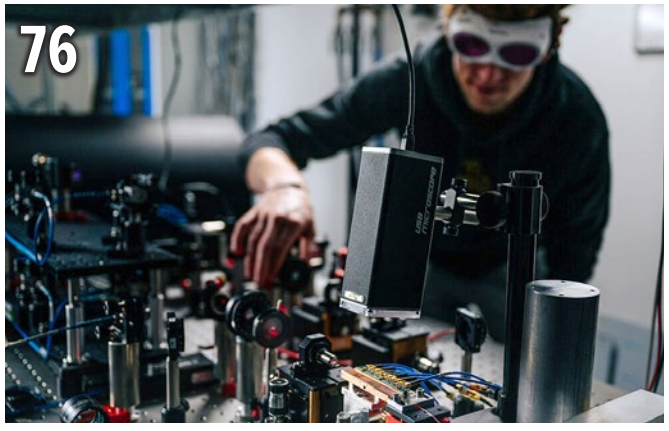

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The Time is Now

Nolan's Notes

by Nolan Johnson, I-CONNECT007

Time marches on—or does it? Researchers in a subfield of wave physics found evidence that it is possible to reverse time. Sort of. Here's how they do it: Since light can be both a wave and a particle, and just as a regular mirror reflects light, thus changing its location in space, researchers have been able to create a "metamaterial" that reflects photons back on their exact path through time, rather than space.[1]

Science can make light seem to go backward, but not forward. This may seem a little esoteric, but it's still fascinating. While we might all like to go back in time and re-do the past, for most of us, we continue looking forward—just as we're doing with this issue of *SMT007 Magazine*. We're unashamedly and excitedly looking ahead. Welcome to our IPC APEX EXPO preview issue.

There will be some déjà vu for some of you now that IPC APEX EXPO is back at the Anaheim Convention Center. Fortunately, you can expect the same high-value programs as ever, just in a different location.

We dedicated this issue to exploring the topics, events, speakers, meetings, and themes of IPC APEX EXPO 2024. The weeklong event, April 6–11, features several overlapping programs. There's the standards committee work at the heart of the IPC mission, and the technical program boasting papers and presentations on some of the most influential research in our industry. There's the enormous expo portion, of course, and if that weren't enough, the Electronic Circuits World Convention (a once-every-three years PCB symposium) will take place in parallel with IPC APEX EXPO. Then there are the professional development courses, the special sessions on emerging technical topics, plus keynotes from industry leaders, awards banquets, and networking opportunities galore—both formal and informal. Whether your role is technical or business, and your expe-

rience level ranges from new-to-the-industry to seasoned veteran, you will find value throughout IPC APEX EXPO.

What will you find in this issue? Plenty. IPC President John Mitchell begins our coverage with a welcome to the show. IPC Vice President David Bergman shares a primer on ECWC, followed by Chris Jorgensen's update on IPC Factory of the Future activities. Alicia Balonek, IPC's trade show director, details the Women in Electronics Reception, and Glenna Carrell introduces us to the expanded activity with the EMS Roundtable programs.

Julia Gumminger explains the technical conference available at IPC APEX EXPO, and Cory Blaylock explores the new apprenticeship programs as part of the workforce development initiatives at IPC.

Also in this issue, there's a brief history of the IPC APEX EXPO show itself, an explanation of how standards development benefits the industry, and an article about some technical programs of particular value to EMS professionals who are considering digital factory capabilities.

I especially enjoyed columnist Mike Konrad's primer on making the most of your trade show experience. This is valuable information, no matter which show you plan to attend this year.

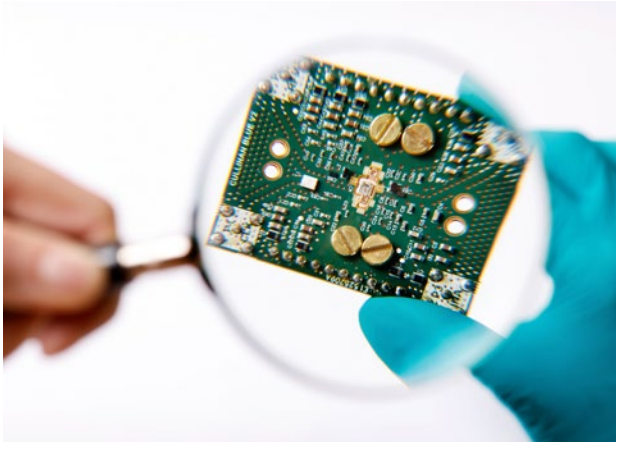
It seems appropriate that IPC APEX EXPO's theme for this year is, "What's Next Becomes Now." Yes, the times are changing, and as much as we might like to reverse time, we owe it to ourselves to keep up with those changes and move ahead. In the words of Mahatma Gandhi, "There goes my people. I must follow them, for I am their leader." **SMT007**

Reference

1. "Light Can Travel Backward in Time (Sort Of)," by Anna Demming, Scientific American, Dec. 5, 2023.

Nolan Johnson is managing editor of *SMT007 Magazine*. Nolan brings 30 years of career experience focused almost entirely on electronics design and manufacturing. To contact Johnson, click here.

Freezing Electronics to Control Diamond Spin Qubits



The functional quantum computer of the future will contain millions of quantum bits, or 'qubits.' They will be able to process complex problems much faster than classical computers, especially in fields like cryptography, optimization, and simulation.

Before that, a few challenges need to be overcome. One of these is maintaining the extremely low temperature at which the qubit typically operates. Why not freeze the whole computer, instead of just the qubits? The diamond qubits used here have several other advantages. They have better fidelity, they can be more easily remotely connected with each other, thus making space for nearby electronics, and they can operate at (relatively) higher temperature.

The work signifies a big step by showcasing cryogenic electronics for diamond qubits for the first time. While the very significant first step of controlling a single-qubit with cryogenic electronics has been now achieved, the researchers are already working on the next steps by adding all the other required functionalities, such as expanding from 1-qubit operation to 2-qubit operations and implementing the qubit readout functionality, and by generally scaling up to a larger quantum processors.

(Source: Delft University of Technology)

What's Next Becomes Now

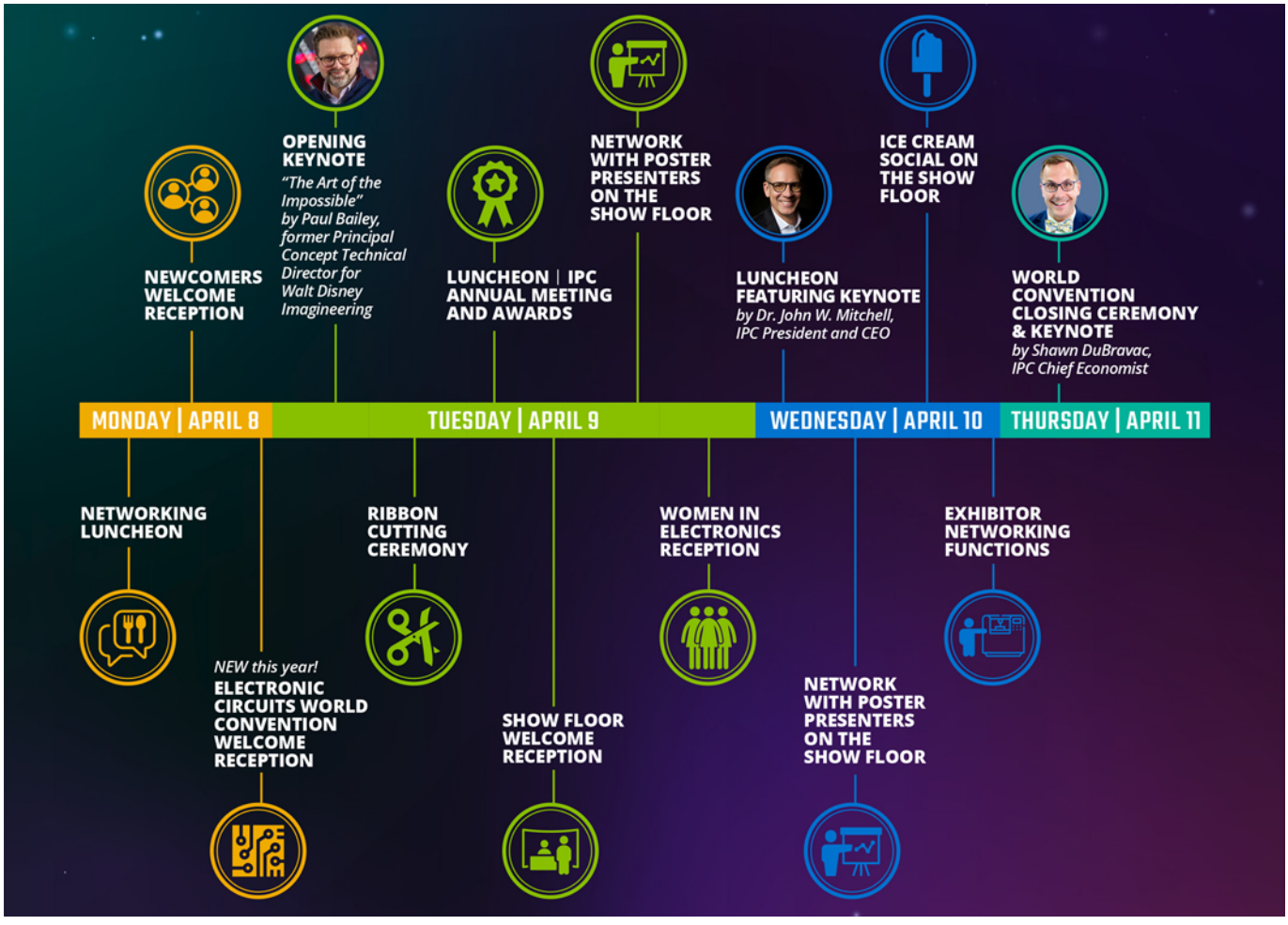
One World, One Industry

Feature Column by Dr. John W. Mitchell, IPC PRESIDENT AND CEO

An extraordinary experience awaits attendees in Anaheim, California, when IPC APEX EXPO 2024 hosts the 16th Electronic Circuits World Convention (ECWC), an international PCB symposium held every three years in different cities worldwide. Combined, IPC APEX EXPO 2024 and ECWC16 will bring over 9,000 professionals from 60+ countries together in one location. The opportunity to gain perspectives from peers and industry leaders, manufacturing innovators, and subject matter experts from all corners of the world is a valuable opportunity for all attendees.

What can you enjoy at IPC APEX EXPO this year?

The IPC APEX EXPO 2024 show floor will feature more than 300 exhibitors from every step in the electronics manufacturing supply chain. Walk the show floor to meet the indus-



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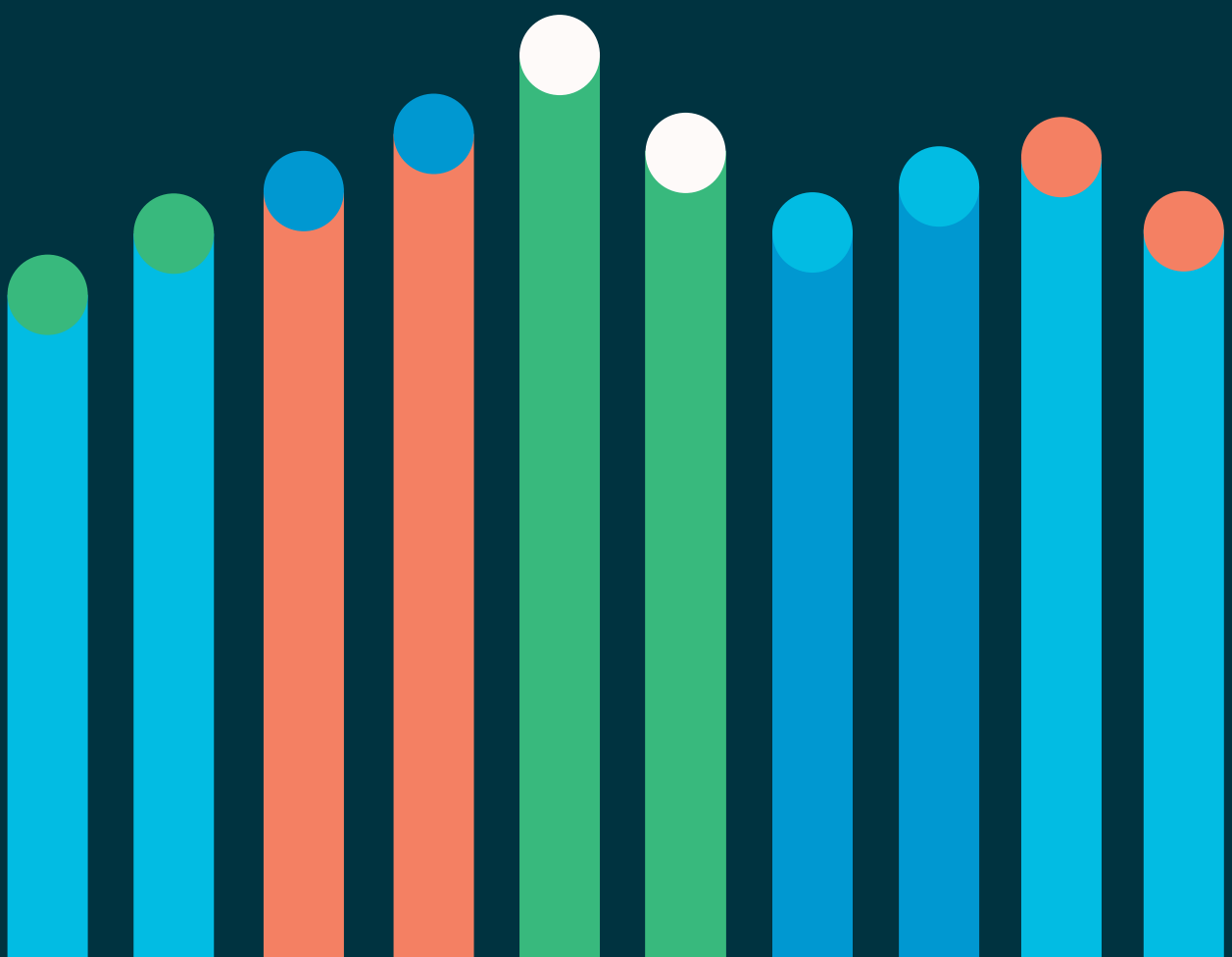

try's leading equipment manufacturers, suppliers, and innovators, and compare solutions, connect with existing suppliers, and find new partners.

We're excited to present three keynotes this year with a new twist: an opening keynote, one luncheon keynote, and for the first in a long time, a closing keynote. Former Principal Concept Technical Director for Walt Disney Imagineering Paul Bailey will provide anecdotes in his opening keynote about the creation of "Star Wars: Rise of the Resistance" and other "moonshot" projects while discussing the "why" and deep purpose behind the decisions made, as well as the human side of leading a team while attempting projects of such magnitude. Closing keynote speaker and IPC Chief Economist Shawn DuBravac will cover the dynamic changes paving the way for a new era of innovation and growth. And yours truly will explore the transformative impact of automation, artificial intelligence, and responsive technology, and hopefully dispel any doubts you may have about the role humans play in this changing landscape.

The EMS Leadership Summit on April 8 will bring together current and future industry leaders to solve problems, build business networks, and share insights into doing business better. Focused on high-level topics that drive business growth and financial success, leaders will gather insights from experts and discuss their own and potential new best practices during panel discussions and roundtables. This meeting of minds inspires action and builds resources for participants, future leaders, and the greater EMS industry.

Educational offerings at IPC APEX EXPO are unique, and 2024 will heighten the learner experience through the ECWC16 Technical Conference. IPC's Technical Program Committee (TPC) has convened an expert lineup of speakers and instructors in technical education and professional development, delivering

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the latest data and trends in materials, manufacturing, and electronics design. Attendees can select from nine topic tracks: Design; PCB Fabrication and Materials; Assembly Materials; Assembly Processes; HDI, UHDI, and Substrates; Sustainability for Electronics; High Reliability; and Factory of the Future. Two special sections within the technical conference will cover advanced packaging and EV electronics. Professional Development Courses will include something for everyone, from advanced classes exploring the details and depth of specific topics to informative classes catering to engineers just beginning their careers.

If you're interested in actively participating in the development, review, and update of the electronics industry's critical standards and guidelines, attend one of more than 100 standards development committee meetings. Standards committee meetings are the perfect place to meet and collaborate with new peers, industry leaders, and innovators.

For those visiting IPC APEX EXPO for the first time, we'll welcome you to the largest gathering of electronics professionals in North America. We are happy that you've chosen to spend your time with us. Be sure to take advantage of the many networking opportunities offered by signing up for educational sessions directly applicable to your work. You will meet manufacturing industry professionals from around the world facing (and solving) challenges like yours.

For returning attendees, we are thrilled to welcome you back. One of the best things about IPC APEX EXPO is the community we've built over the years, and we look forward to reconnecting with you again.

We at IPC are profoundly grateful to an industry that has encouraged and supported us in producing this event. We never lose sight of the fact that we could not host IPC APEX EXPO without the dedicated volunteers and industry leaders who share their time, expertise, and enthusiasm with us all.

I, for one, am so looking forward to IPC APEX EXPO 2024 and looking forward to seeing you. **SMT007**

Dr. John W. Mitchell is president and CEO of IPC. To read past columns, click here.

Information is knowledge, and IPC's weekly Global Insight newsletter provides curated, highly relevant content on what's happening within IPC and, on a broader scale, to help you make better business decisions and stay on trend in today's world of electronics manufacturing.

In this interview, Brian Knier, vice president and chief marketing officer at IPC, discusses the compelling reasons this newsletter is a must-read for a worldwide audience that wants to compete in this global marketplace.

Nolan Johnson: Brian, what is the importance of Global Insight? What content are you striving to deliver to the readership through this newsletter?

Brian Knier: We're in a very dynamic industry. Global Insight is an opportunity to provide curated content that is relevant and timely for our readers—IPC members and our nonmembers alike—so they know about the activities we're pursuing, outcomes we've learned, industry news headlines, what's coming up, benefits of IPC membership, and other things we're doing on their behalf. We keep it very streamlined and focused on the things that they need to know. It's easy to read and digest.

There is so much in the news to sort through; I'm sure a focused perspective is valuable.

An area where we get a lot of readership is in compliance and regulatory affairs. Those are ever-changing landscapes, and with the help of our advocacy team, we provide timely information for your business. The format of Global Insight allows you to easily scan the headlines and summaries and then choose the articles that are most relevant to you. The articles are short and easy to read. We are cutting through the clutter to bring our readers what we know will be most relevant and timely. These are the things you want to know right now.

Access to IPC Global Insight comes with IPC membership, but can nonmembers access the newsletter as well?

Yes, it's designed with the entire industry in mind, but with a nod toward our members. We want them to be aware of the advantages of being an IPC member. There are unique benefits for members; it's always good for us to keep that in front of them, especially as new benefits become available.

For nonmembers, we feel that as they read the newsletter and learn more about what we do for the industry, they'll consider joining us as a member company.

Is there anything else you'd like to share about IPC Global Insight?

There is some new energy around our newsletter; we've recently moved production and support into IPC Publishing Group, which includes the I-Connect007 family of publications. We feel there is a much stronger partnership in developing the content and supporting our advertisers who want to reach that same audience. We've got some new energy, and that's pretty exciting for us.

Learn more here about subscribing to IPC Global Insight.

Electronics Circuit World Convention: A Brief History

Article by David Bergman
IPC

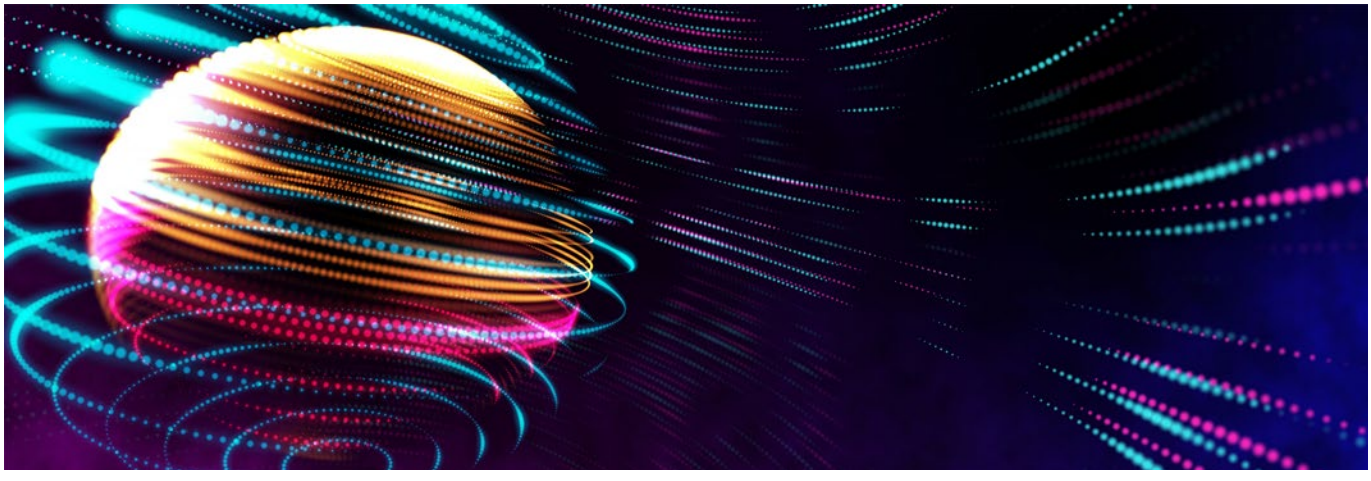
In 1978, a new event called the Printed Circuit World Convention (PCWC) was born.

It brought together printed wiring board (PWB) associations from around the world to focus on advancing technology, growing the market, and providing insight into the management of the manufacture of printed boards. It was the first major international event of its kind for the industry. The first event, PCWC I, was hosted by the Institute of Circuit Technology (ICT–UK) and the Institute of Metal Finishing (IMF–UK) was supported/sponsored by IPC USA, EIPC Europe, and JPCA Japan.

It was decided that the convention would be held every three years, rotating between the various associations and countries. In 1998, having had nearly 20 years to work together, the globally-located PCB associations agreed to form a global association, and the World Electronics Circuits Council (WECC) was formed. It comprised the following associations:

- IPC volunteered to serve as the first Secretariat of WECC
- Japan Printed Circuit Association (JPCA)
- China Printed Circuits Association (CPCA)
- India Printed Circuits Association (IPCA)
- Taiwan Printed Circuits Association (TPCA)
- European Federation of Interconnection and Packaging (EFIP), representing the following:
  - › Verband Der Leiterplattenindustrie (VDL)
  - › European Institute of Printed Circuits (EIPC)
  - › Printed Circuit Interconnect Federation (PCIF)

ECWC8 in 1999 changed a few things. First, the scope of the world convention was expanded to include electronics assembly, and PCWC became ECWC. Then, the naming



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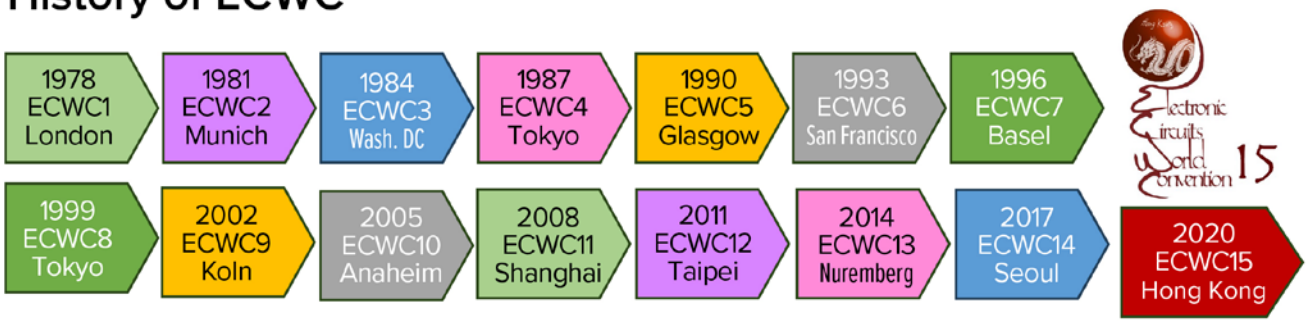

convention for the year of the event was changed from Roman numerals to numbers. In addition, many of the WECC members were starting trade shows for their members in their regions. The WECC decided in the future that a stand-alone event was no longer required and decided to have events in conjunction with the host organization's trade show. ECWC8 was the last stand-alone world convention.

In 2001, the Hong Kong Printed Circuit Association (HKPCA) joined WECC. The Korean Printed Circuits Association (KPCA) joined in 2003. The Electronic Industries Association of India (ELCINA) joined in 2017, and the Thailand Printed Circuit Association (THPCA) joined WECC in 2019.

The Electronic Circuits World Convention (ECWC) is the most notable and recognized international PCB symposium. It takes place every three years and is hosted by different members of the World Electronic Circuits Council (WECC). Thousands of presentations have been made to tens of thousands of delegates. Relationships have started, friendships have grown, and the world is a better place because of the collaboration that started in 1978. We hope you will join us at the 16th meeting of ECWC in April in Anaheim, California.

PCWC/ECWC

- **PCWC I:** 1978, London England, hosted by ICT and IMF
- **PCWC II:** 1981, Munich Germany, hosted by EIPC
- **PCWC III:** 1984, Washington, D.C., hosted by IPC (for the first time)
- **PCWC IV:** 1987, Tokyo Japan, hosted by JPCA
- **PCWC V:** 1990, Glasgow Scotland, hosted by European Federation of Interconnection and Packaging (EFIP)
- **PCWC VI:** 1993, San Francisco, USA, hosted by IPC
- **PCWC VII:** 1996, Basel Switzerland, hosted by EIPC
- **ECWC8:** 1999, Tokyo Japan, hosted by JPCA
- **ECWC9:** Cologne, Germany, hosted by EFIP
- **ECWC10:** 2005, Anaheim, California, hosted by IPC
- **ECWC11:** 2008, Shanghai, China, hosted by CPCA
- **ECWC12:** 2011, Taipei, Taiwan, hosted by TPCA
- **ECWC13:** 2014 Nuremberg, Germany, hosted by EIPC
- **ECWC14:** 2017, Seoul, South Korea, hosted by Korean Printed Circuit Association (KPCA)
- **ECWC15:** 2020, Hong Kong, hosted by HKPCA
- **ECWC16:** 2024, Anaheim, California, hosted by IPC (for the fourth time) **SMT007**

Resources

1. "Happy Holden: ECWC15 Virtual Event a Success," I-Connect007, Dec. 15, 2020.

David Bergman is IPC vice president of standards.

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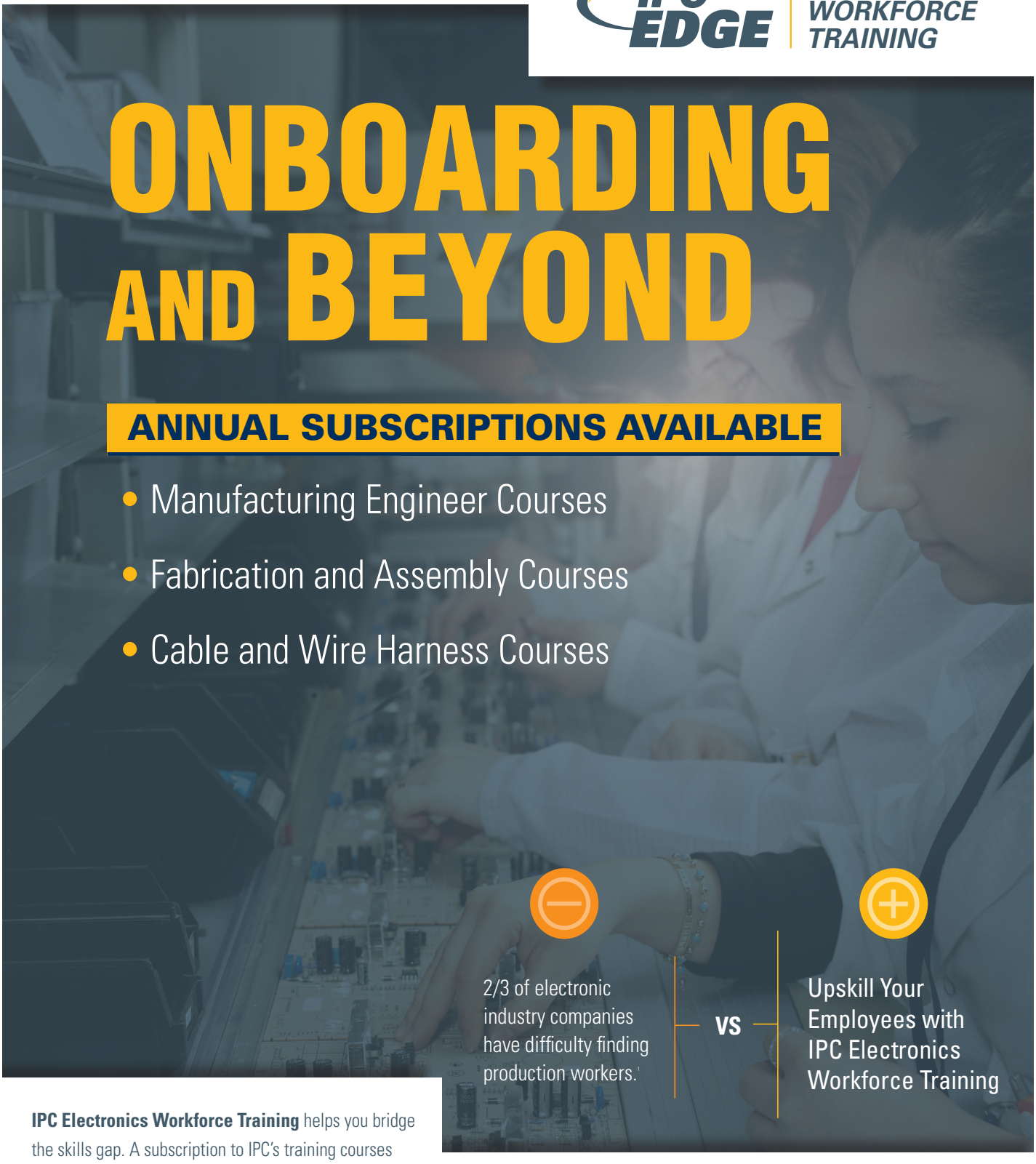

2/3 of electronic industry companies have difficulty finding production workers.[1]

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

Keynote Preview: Reshaping our Engagement With the World

Feature Article by Shawn DuBravac
IPC

Editor's note: Shawn DuBravac will provide the closing keynote at IPC APEX EXPO 2024/ECWC16, at 2 p.m. Thursday, April 11. The keynote is open to all attendees. Shawn has provided this preview of his planned comments.

Technology is reshaping our engagement with the world, propelling us toward a more sustainable, inclusive, and improved existence by integrating digital technology seamlessly into our lives. This move further democratizes access to information and tools, bridging gaps and creating opportunities that accelerate our journey toward a universally accessible and empowered future. These transformations are unfolding across multiple domains, including healthcare, the home, the automotive industry, and robotics. Each sector is experiencing a significant shift, embracing new technologies that redefine their operations and impact.

Where Do We See Artificial Intelligence?

The widespread integration of AI across various sectors is broadening its impact, from revolutionizing healthcare with Smart solutions to transforming homes into intuitive spaces, highlighting its crucial role in boosting efficiency and addressing complex challenges. In healthcare, we're witnessing a trend toward personalized care with AI-driven devices like intelligent pillows to mitigate snoring, sophisticated sleep monitors, and innovative patient

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monitoring systems. Smart home technologies are evolving toward creating adaptive living environments, featuring AI-equipped refrigerators that offer recipe suggestions and robotic aides for household chores. The implications of this AI infusion are vast, promising a future where technology seamlessly anticipates and fulfills individual and collective needs. This drives industries forward and improves quality of life on a global scale.

The Future of Automotive

The automotive industry is undergoing a significant transformation, moving from hardware-centric to software-defined vehicles. This change, fueled by cutting-edge software, introduces features such as over-the-air updates and real-time customization, elevating vehicle performance and safety with autonomous driving and advanced driver-assistance systems (ADAS). Vehicles are becoming dynamic digital platforms, evolving continuously to meet users' needs and regulatory requirements, thanks to partnerships with leading tech firms like NVIDIA, Qualcomm, and Bosch. This blend of automotive and technology sectors challenges and opens new opportunities for electronics manufacturers, pushing them toward software innovation to remain competitive and cater to consumers' changing expectations.

A Little About Robots

Robotics is stepping into a new phase, with robots becoming a core part of our daily lives and industrial activities. Enhanced by advanced AI, robots are now more interactive, autonomous, and capable, undertaking tasks from household management to emotional interaction. This progression poses challenges and opportunities for electronics manufacturers, necessitating innovation in both hardware and software to develop sophisticated AI-enabled robots. This shift toward AI-driven robotics indicates potential new market segments and societal impacts, urging continuous and responsible innovation.

A Focus on Emerging Technologies

Emerging technologies are unlocking previously unimaginable possibilities, from personalized experiences to operational efficiencies, fundamentally altering consumer interactions and industry standards. These technologies blur the lines between the digital and physical worlds, offering personalized experiences that adapt to individual preferences and habits. From vehicles that adjust to drivers' needs in real-time to Smart homes that proactively respond to occupants, these advancements enhance productivity and promote sustainability by optimizing resources and minimizing waste. As we approach this technological frontier, businesses face the imperative to rethink their approaches to product development, customer service, and overall business models that leverage these groundbreaking capabilities. **SMT007**

Shawn DuBravac is the chief economist for IPC.

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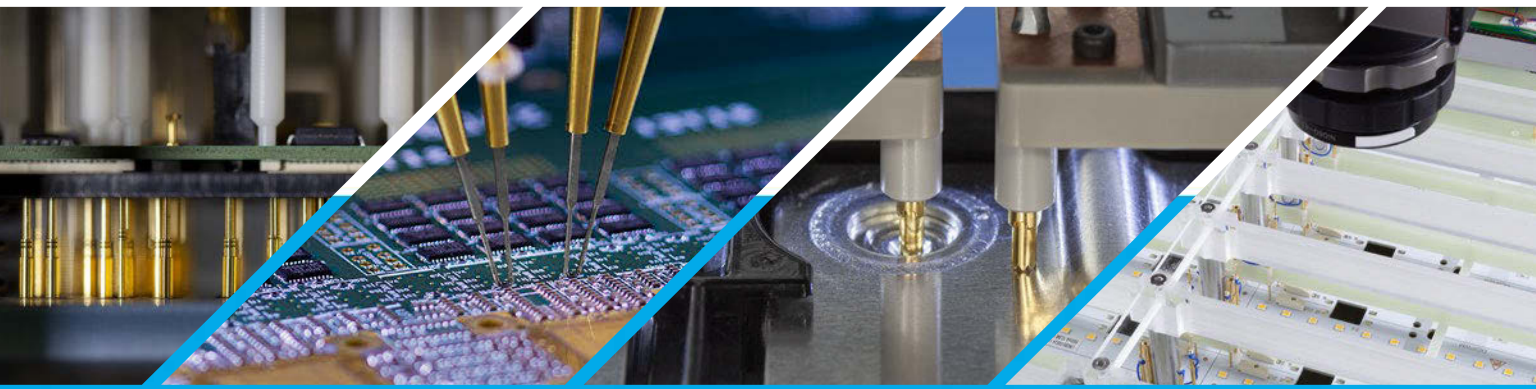

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ECWC16 Technical Conference Special Sessions

Feature Article by Julia Gumminger
IPC

The ECWC16 Technical Conference at IPC APEX EXPO 2024 will feature two curated Special Technical Sessions on Thursday, April 11. Building on the success of similar sessions last year, these sessions will feature leaders in the advanced packaging and e-mobility segments, focusing on technological challenges and innovations. Both sessions were curated by the Technical Program Committee (TPC), consisting of subject matter experts in their fields.

Session 1: Advanced Packaging

From 8:30 to 11 a.m., IPC Chief Technology Officer Matt Kelly will provide the latest insights from industry experts on next-generation IC substrate and UHDI needs for next-generation advanced packages. Application workloads (including AI), high-performance computing, and 5G/6G wireless communications, among others, drive the need for faster, higher bandwidth, more powerful processors, and more memory. Significant changes in semiconductor architectures and designs using chiplet-based, heterogeneous integration approaches are well underway. These changes directly impact IC substrates that interconnect directly with semiconductor chips and UHDI-printed circuit boards needed to connect the electronic package to the rest of the system.

Please join us for this important session that will provide a big picture of the needs for next-generation substrates, insights on the challenges of fabricating UHDI PCBs vs. IC substrates, discussion on next-generation organic build-up substrate advancements, and future substrate R&D needs and challenges. Additional speakers representing companies such as Intel, AT&S, Resonac, AMKOR, and Dia Nippon Printing will dive deeper into these important issues.

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Session 2: EV Electronics/E-mobility

From 11:30 a.m. to 2 p.m., the topic is "EV Electronics: Design, Manufacturing, and Reliability Challenges." It will include two topical sessions selected by a Technical Program Committee of EV industry experts chaired by Dr. Stanton Rak.

The first session, "PCBA Reliability and Test for EV Applications," will be moderated by Lenora Clark, director of autonomous driving and safety technology at MacDermid Alpha Electronics Solutions. Topics will include high-voltage test and reliability, solder and Ag-sintering material reliability, high-voltage PCB failure mechanisms, and testing protection materials.

Dr. Udo Welzel, senior expert at Robert Bosch GmbH, will moderate the second topical session, "EV Power Electronics Design and Manufacturability." Speakers representing companies such as Semikron Danfoss, Robert Bosch, Zestron, Indium Corporation, MiroTek, and TRUMPF will deliver brief technical presentations followed by a panel discussion with audience participation. Topics include high current and high voltage connections with PCB, laser welding for busbars, power electronics, and more. The e-mobility session is supported by IPC's e-Mobility Quality & Reliability Advisory Council, and closely aligns with the council's mission to help deliver e-mobility quality, reliability and safety while protecting the drive for innovation.

"On behalf of the TPC, I invite you to attend Thursday's Special Sessions, built for conference attendees to learn from and network with industry leaders," Kelly says. "Amazing things are happening in electronic packaging and eMobility applications. We are delighted to bring you strong, high-quality technical insights shaping the future of electronics manufacturing."

Plan your travel accordingly to attend these exciting Thursday morning sessions. Flexible registration options allow attendees to attend these Thursday sessions by selecting the option that works best with their schedules: These Special Sessions will be included in the following registration packages: "All-Access," "World Convention," "Committee Meetings Plus Conference," and the "Full Technical Conference." Other attendees may wish to register for one or both Special Sessions using the "Technical Conference Single Session Pass" option. **SMT007**

Julia Gumminger is the manager of professional development and events for IPC.

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Much Ado About Factory of the Future

Feature Article by Chris Jorgensen
IPC

For attendees looking for guidance on modernizing their manufacturing, IPC APEX EXPO 2024 will provide plenty of opportunities to learn about the latest innovations and how to begin applying them in your operations today.

Get Connected

Think you know all there is to know about IPC-CFX, how to implement it, and the myriad benefits you can reap from it? IPC APEX EXPO will provide the latest updates on this plug-and-play shop floor communication standard and how to put yourself on the path to success.

When walking the show floor, look for the IPC-CFX flags at vendor booths. These are equipment vendors who know the importance of IPC-CFX for their customers and the industry, and have demonstrated proficiency in IPC-CFX implementations.

These vendors will represent a large portion of the more than 90 pieces of equipment on the IPC-CFX-2591 Qualified Products List (QPL). Ask them about their implementations and how IPC-CFX can benefit your operations.

Want to peek behind the curtain at plans for IPC-CFX Version 2.0? Attend the IPC-CFX Standard Task Group meeting, 10:15 a.m. to noon Monday, April 8. The task group has a

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lot in store for this full-version update, including the addition of capabilities for dispensing equipment, hand soldering stations, and wave soldering machines, not to mention support for getting IPC-CFX into existing lines with legacy equipment.

Analyze That

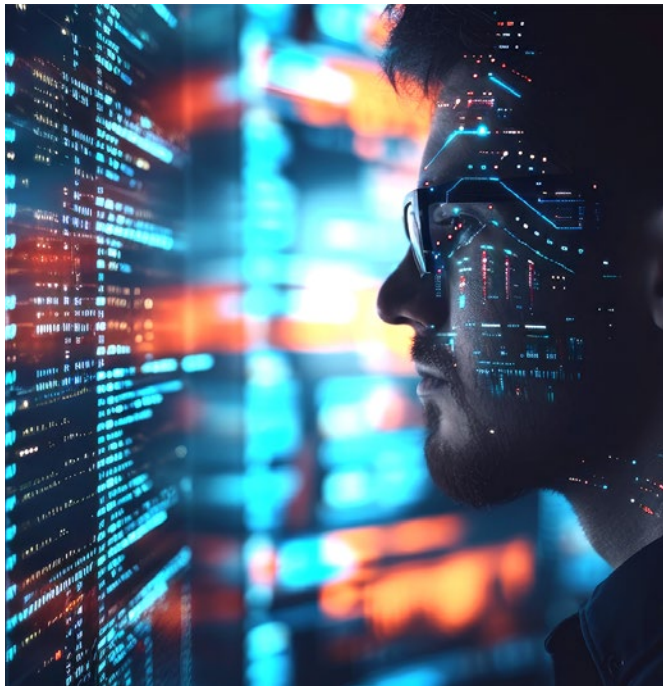
Is your company getting the most out of the data flowing through your operations? As our industry evolves to meet new challenges and respond to more complex demands for electronic devices, there is an increasing need to use manufacturing data to improve the way our operations are run.

Get a leg up on best practices for understanding and analyzing the data from your equipment to help you respond to problems faster or before they happen. Attend the professional development course, "Introduction to Machine Data Analytics in the EMS Industry," led by Tim Burke, PhD, chief technology officer, Arch Systems Inc. This course, on Monday, April 8, will use anonymized data sets from real-world SMT equipment for students to learn how to read and analyze the data and then contextualize it for their factories.

Visit IPC booth #4420 Tuesday through Thursday to grab your free copy of the new IPC Industry Intelligence white paper, "Outlook for Data Analytics in the Electronics Manufacturing Industry." This white paper provides a nuts-and-bolts approach to the need for data analytics with EMS companies and provides a top-five list of data analytics use cases.

Just the Facts

To best prepare our industry for sustainability reporting requirements, a new task group is developing IPC-2553, *Global Standard for Digital Sustainability Credentials*. This standard will establish the framework, content definition, and secure interoperability mechanism to provide the ability to exchange facts that influence environmental sustainability, without the risk of IP leakage. You can learn all about this standard and when it will be available for industry comment when the Digital Sustainability Credentials Standard Task Group meets from 1:30 to 3 p.m. Tuesday, April 9.



Security!

At some point—if it hasn't happened already—your company and/or one in your shared supply chain will be subject to a cyberattack. When this happens, the social and business ramifications can be insurmountable.

To address such attacks and how to report them through the supply chain, the Cybersecurity Protection Standard Task Group has developed IPC-1792, Standard for Cybersecurity Management in the Manufacturing Industry Supply Chain, which establishes requirements to provide assurance that products have been manufactured in cybersecure environments, ensuring that there has been no risk of impact to the product due to cybersecurity incidents.

You can learn about this standard and its importance to your operations and guide the task group on additional needs that can be served through the standard by attending the task group meeting from 8 to 10 a.m. Wednesday, April 10.

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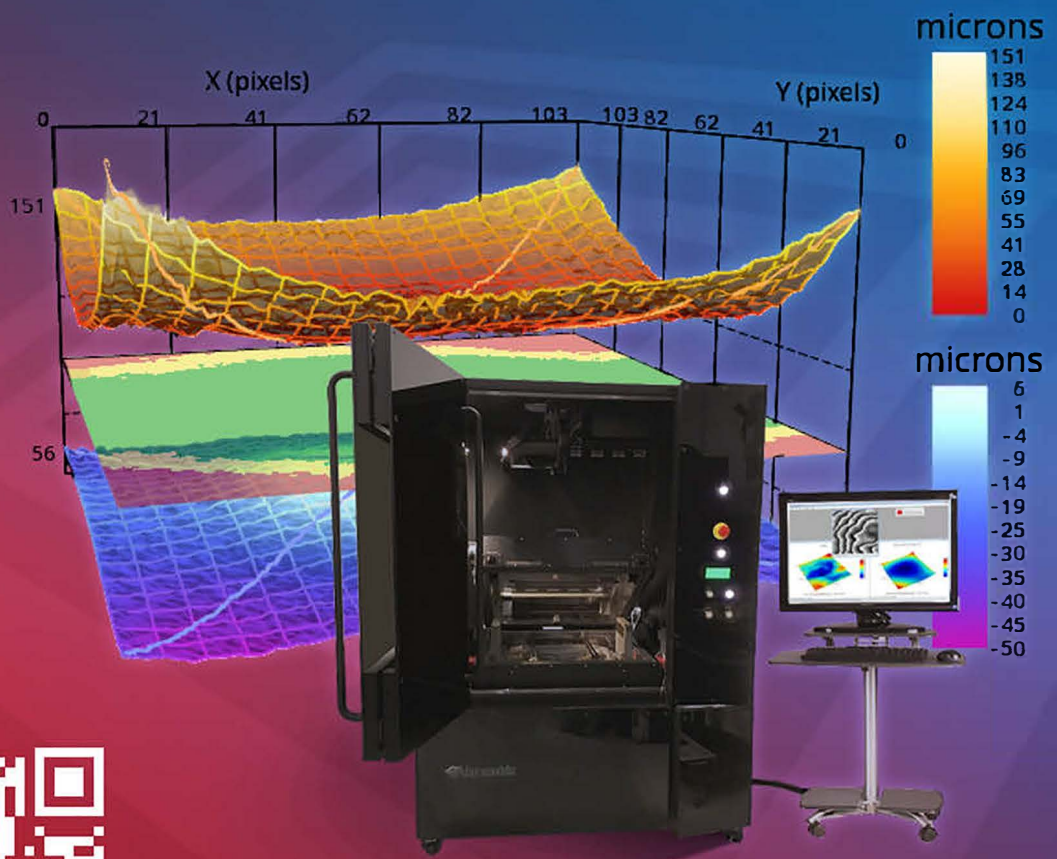

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Get Real About Digital Twin and Artificial Intelligence

It seems like every time you turn around, you see another article or social media post about the approach wave of digital twin and artificial intelligence for our industry. APEX EXPO 2024 and the Electronic Circuits World Convention (ECWC16) Technical Conference provide the opportunity to gain real-world knowledge about these applications and standards that are underway and in the pipeline to provide ease of adoption.

The Generic Requirements for Digital Twin Task Group will meet from 10:15 a.m. to noon Wednesday, April 10, to seek industry feedback on opening IPC-2551, International Standard for Digital Twins, for revision or amendment. In addition, the task group leadership will share recent updates on the development of supporting standards to feed into the IPC-2551 standardized digital twin architecture, as well as the development of JSON descriptions to support the standard.

Also plan to attend the Model Based Definition (MBD) for Digital Twins Task Group meeting, where you will learn about IPC/DAC-2552, General Electronic Components Model Based Definition (MBD). Task group leadership will share plans for its first version update and recent discussions to utilize the IPC/DAC-2552 framework as a baseline to create sister standards for MBDs to support board design and assembly. That group meets from 3:15 to 5 p.m. Tuesday, April 9.

In addition to the standards development meetings, digital twin and AI sessions during ECWC16 will be the place to be. These technical presentations are from 10 a.m. to noon Tuesday, April 9, and 1:30 to 3 p.m. Wednesday, April 10. Presentation titles are listed below:

- **"Achieving Equipment Orchestration Through Equipment Integration"**
  Presenter: Yu Xian Ang, camLine Sdn. Bhd. Shi
- **"Applying Hierarchical Machine Learning Forecast to Manufacturing Process Sequences"**
  Presenter: Mohan Rangan Govindaraj, Siemens EDA
- **"Automatic Measurement Method for Solder Void Ratio and Solder Coverage Using Deep Neural Networks"**
  Presenter: Ryusuke Ueki, Qualtec Co., Ltd.
- **"Factory of the Future: Automating Simulation Creation as Part of a Digital Twin Initiative"**
  Presenter: Craig Dickson, Flex Ltd
- **"How Artificial Intelligence (AI) Helps on Automated X-ray Inspection (AXI) Process"**
  Presenter: Wei Ken Hee, Vitrox Technologies Sdn Bhd
- **"Machine Learning-Based Solderability Check of THT Solder Joints"**
  Presenter: Reinhardt Seidel, Ph.D., Friedrich-Alexander-Universität Erlangen-Nürnberg, Lehrstuhl für Fertigungsautomatisierung und Produktionssystematik (FAPS)

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The April 10 luncheon keynote, "The Future of the Human Workforce: Maximizing Potential in an Automated World," by Dr. John W. Mitchell, IPC President and CEO, will explore the transformative impact of automation, artificial intelligence, and responsive technology, and dispel doubts about the role humans will have in this changing landscape.

The April 11 closing keynote, "The Next Wave in Electronics: Trends Reshaping Our Industry," by Shawn DuBravac, IPC chief economist, will uncover the dynamic changes paving the way for a new era of innovation and growth, including AI breakthroughs and other emerging shifts.

It All Adds Up

Is your company trying to demystify additive manufacturing and its current and future within our industry? Have you already adopted these technologies within your ecosystem and are looking for standards to support the manufacture of reliable product? Then mark these important events on your calendar.

IPC recently formed three task groups to undertake the development of a performance specification, visual acceptability standard, and test coupons for additively manufactured electronics. These three groups will meet jointly from 1:30 to 3 p.m. Tuesday, April 9, where you will get a progress update on the developments for these two new standards and their supporting test coupons.

ECWC16 will also play host to a technical session for those with an interest in additive manufacturing. The session is from 8 to 10 a.m. Wednesday, April 10, with the following technical presentations:

- "**Implementation of 3D Printed Near Chip-Scale Interposers into X-Band Dual Channel MMIC Assembly**"
  Presenter: Emily Lamport, University of Massachusetts Lowell
- "**Liquid Metal Patterning for Electronic Circuits and Thermal Management**"
  Presenter: Michael Dickey, Ph.D., NC State University
- "**On-Demand Manufacture of Small Satellites through Advancements in Direct Digital Manufacturing**"
  Presenter: Jason C Benoit, Sciperio
- "**Reliability Validation of Direct-Write Printed RF Devices**"
  Presenter: Tom Rovere, Lockheed Martin

Chris Jorgensen is director of technology transfer at IPC.

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Women in Electronics Reception

Feature Article by Alicia Balonek
IPC

Women comprise about 47% of the workforce and are statistically underrepresented in STEM fields, yet the number of women in STEM positions has steadily increased. In 1970, women comprised 8% of STEM roles. Today, they represent 27%. This jump is an encouraging sign for aspiring women in tech, but it shows there's still a long way to go in ensuring the tech and STEM industries reflect the general workforce.

In the early years of this event, we introduced the Women in Electronics reception to allow the very few females at this event to meet and network with each other. Since the launch of IPC APEX EXPO in 2000, we've seen an increasing number of females attend the event each year.

Thankfully, through the years, we have had plenty of female trailblazers paving a path for the younger women entering this industry. Each year, we look forward to helping these women build their network so they can share their journey, learn from each other's experiences, and support each other well beyond IPC APEX EXPO.

This year's Women in Electronics Reception is scheduled from 6 to 7:30 p.m. Tuesday, April 9. It will feature a panel discussion led by IPC Hall of Famer Karen McConnell, Northrop Grumman, on work-life balance. Panelists include:

- Debie Vorwald, Collins Aerospace
- Despina Davis, Ph.D., Boeing Defense, Space & Security
- Paige Fiet, TTM Technologies
- Christina (Tina) Landon, Naval Surface Warfare Center, Crane Division (NSWC Crane)

They will discuss and highlight success stories and lessons learned on managing a successful career and family and how it's possible for women to do it all.

Anyone attending IPC APEX EXPO is invited to this event, and we look forward to seeing you there. **SMT007**

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

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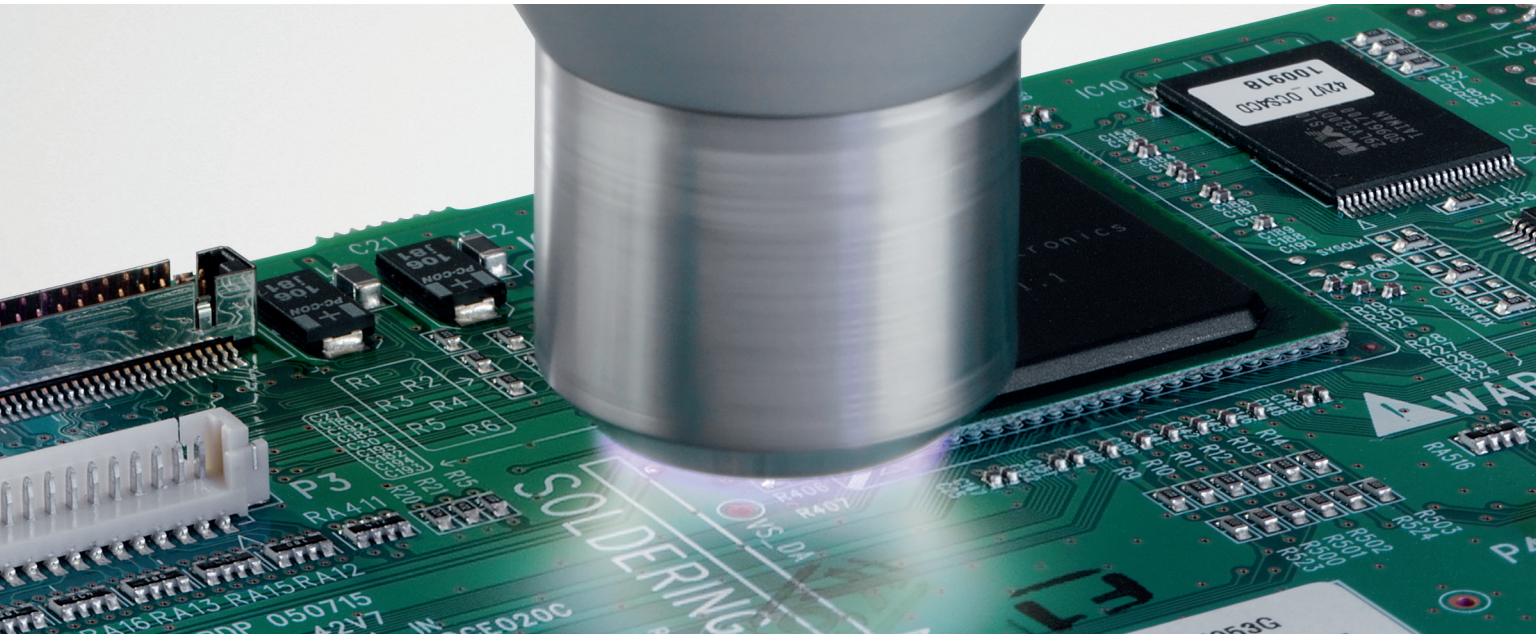

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EMS Roundtables: Leaders Helping Each Other

Feature Article by Glenna Carrell
IPC

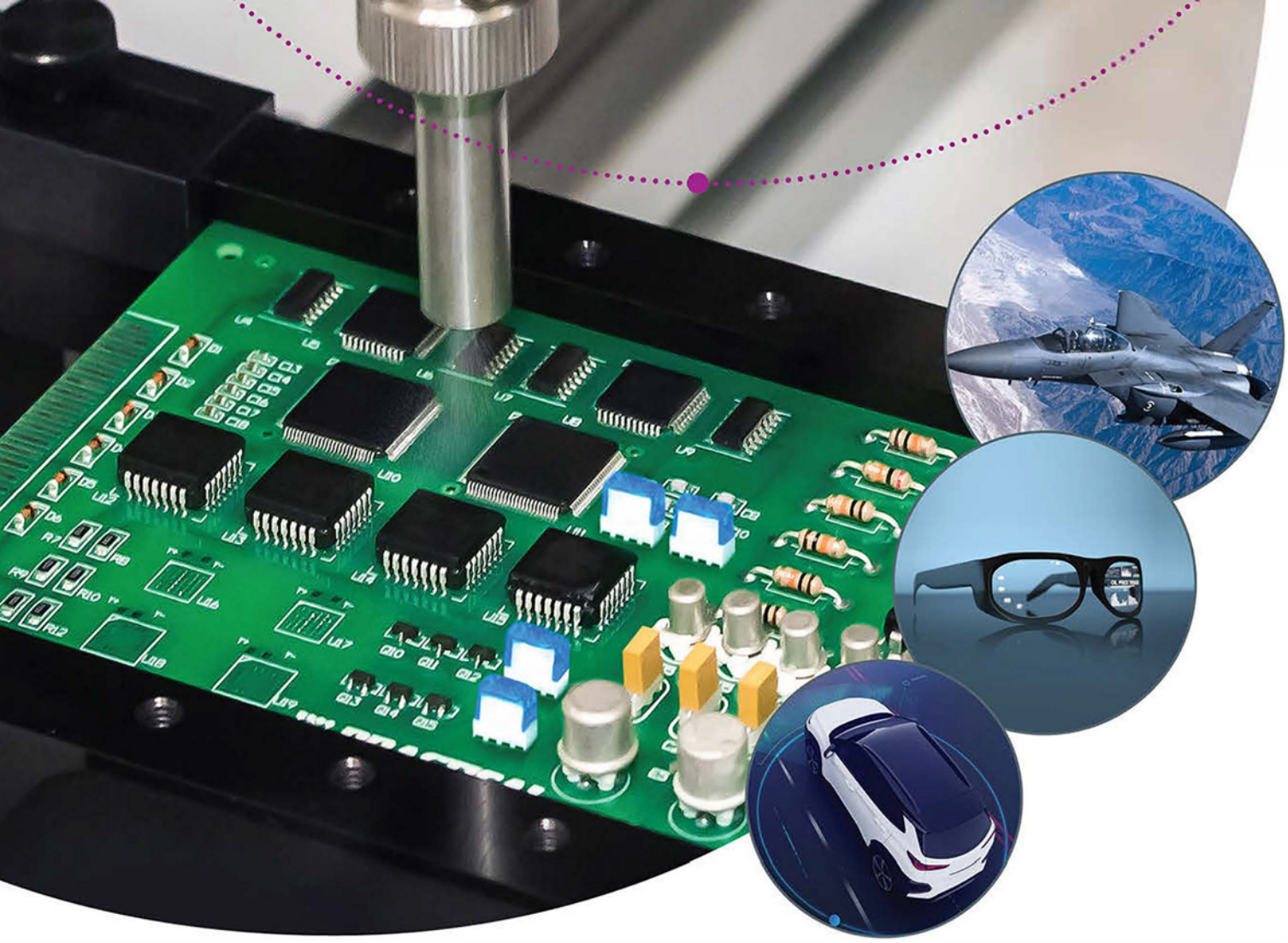
This year, as an extension of our yearly EMS Leadership Summit at IPC APEX EXPO, we have begun hosting regional roundtables. These meetings primarily provided an opportunity to network with fellow EMS leaders in each region. At these scheduled receptions and dinners, leaders gather to solve problems, build business networks, and discover potential new insights. At the same time, IPC facilitators share information regarding IPC initiatives and EMS market data.

So far, regional roundtable gatherings have taken place in the Midwest, Great Lakes, Pacific Northwest, Southern California, and the California Bay Area. All have received excellent feedback. Ongoing EMS regional meetings will be scheduled twice a year with an annual national/global EMS Summit event at IPC APEX EXPO. Future regional gatherings are planned this year in Texas, Florida, and the Northeast Coast of the United States. All EMS leaders are encouraged to attend; there is no cost, and you do not need to be an IPC member.

To give you a sense of the discussions ongoing at the roundtables, here are some excerpts and examples:

How can we make the EMS industry sexy again?

In 2024, there are challenges and opportunities at the forefront of the EMS industry. We continue to see a tight labor market and supply chain issues resulting in uncertainty for



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the future. Efficiency and optimized workforce management were on everyone's minds. Both large and small EMS companies face a commonality with the retirement of experienced staff/workers, skilled labor shortages, and decisions on how to be ready to hire a new and inexperienced workforce. Mark Evans of Green Circuits asked, "How do we make the EMS industry sexy again?" In other words, what will bring the new and younger generation into this industry?

The great unknown: What does the EMS future bring?

Digital innovation—robotics, automation, and artificial intelligence (AI)—promises to transform the industry in years to come, stretching all the way from development to design to fabrication to assembly. Electronics manufacturing is experiencing rapid expansion, new cutting-edge technology, and moving in great strides with innovative processes and design. The priority will be to gather, understand, and implement this data effectively across this industry.

Concerns were voiced about how new digital innovations will change the way manufacturers operate, the profitability of the new innovations, the effects of smart manufacturing on the workforce, and the resiliency of the supply chain.

ERP: Is there one that really works?

Reach out and let us know your thoughts. Future regional gathering dates and registration information can be found here.

Join us and continue the conversation at the EMS Leadership Summit at IPC APEX EXPO 2024. The EMS Leadership Summit brings together current and future EMS industry leaders to focus on high-level topics that drive business growth and financial success. Leaders gather insights from experts and discuss their own and potential new best practices during panel discussions and roundtables. This meeting of minds inspires action and builds resources for participants, future leaders, and the greater EMS industry. Relax and continue making connections at the EMS Networking Dinner after the summit adjourns. Dinner is included with your summit registration. **SMT007**

For additional information, contact **Mark Wolfe** at MarkWolfe@ipc.org or **Glenna Carrell,** GlennaCarrell@ipc.org.

IPC Mourns Loss of Former Vice President of Industry Programs, Tony Hilvers

It is with sadness that IPC announces the passing of Tony Hilvers, former IPC vice president of industry programs, on Tuesday, Feb. 6. Hilvers left IPC in 2012 after 29 years of service.

During his long tenure, Hilvers was responsible for the association's market research, government relations and environmental policy, meetings, and professional development departments.

In addition, he was responsible for industry segments including the PWB and EMS Management Councils, the PWB Suppliers Council, the Surface Mount Equipment Manufacturers (SMEMA) Council, the Solder Products Value Council, and associated events, including IPC APEX EXPO. While he was vice president of industry programs, IPC APEX EXPO was named one of the top 25 fastest-growing U.S. trade shows in attendance by Trade Show News Network.

While serving as director of educational services and marketing communications, he formed the EMS Management Council and published the first market research study on the EMS industry in 1984. Hilvers was also instrumental in launching IPC Printed Circuits Expo, IPC APEX Conference and Exhibition and the co-located IPC APEX EXPO and worked with the Hong Kong Printed Circuit Association to launch the HKPCA/IPC International Printed Circuits and Assembly Fair.

Said David Bergman, IPC's vice president of standards and technology and long-time colleague of Hilvers, "I had the privilege of working with Tony for nearly 30 years. I did sales visits, traveled internationally, collaborated, supported and was supported by Tony and his team. I always admired his ability to listen to a group of business leaders, figure out a program to solve a problem they were faced with, and then convince others that this program was worth their support. Tony's passion for the industry and his natural sales ability facilitated his creation of many new programs for IPC."

IPC extends its sincere condolences to Tony's family, friends, and former work colleagues.

(Source: IPC)

Professional Development: From AI to DFM

Feature Article by Julia Gumminger
IPC

The Professional Development Course program at IPC APEX EXPO 2024 will offer attendees a diversity of topics taught by new and returning instructors. Electronics industry professionals at any stage of their career will benefit. Thirty-two courses covering all aspects of the electronics manufacturing supply chain will be offered on Sunday, April 7, and Monday, April 8.

Participants in these courses will gain new knowledge and real-world skills that will equip them to rapidly respond to changing demands for new technologies, materials, and processes. Attendees will find updated content from veteran instructors and innovative courses from new instructors.

The diversity of educational content includes courses about chiplets and heterogenous integration, soldering, AI and machine learning, design for manufacturing principles, and designing for harsh environments. We highlight just a few of the courses you can expect to see.

Paul Cooke of Ventec International will address design and fabrication for high reliability. "Designing printed circuit boards and assemblies is more difficult than ever due to complexity, component availability, thermal requirements, signal integrity, material selection, layer counts, harsh environments, and increased functionality all required in smaller form factors," Cooke says. "We will look at all the elements to successfully design a PCB that can meet all the designers' requirements and perform to the customer and industry standards as well as survive in today's harsh environments. We will look at everything from materials to surface finishes and testing to ensure the product is robust as possible with a high level

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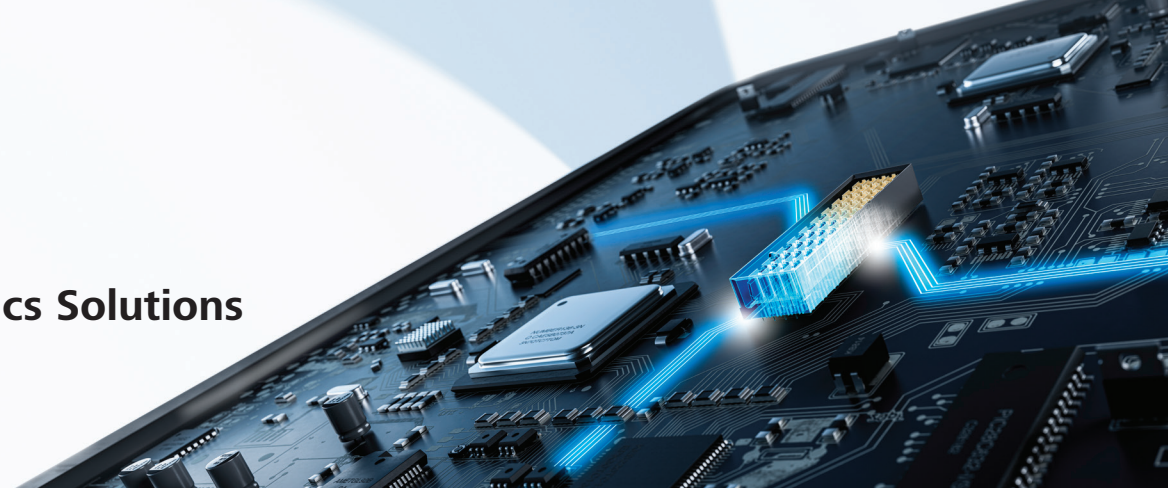

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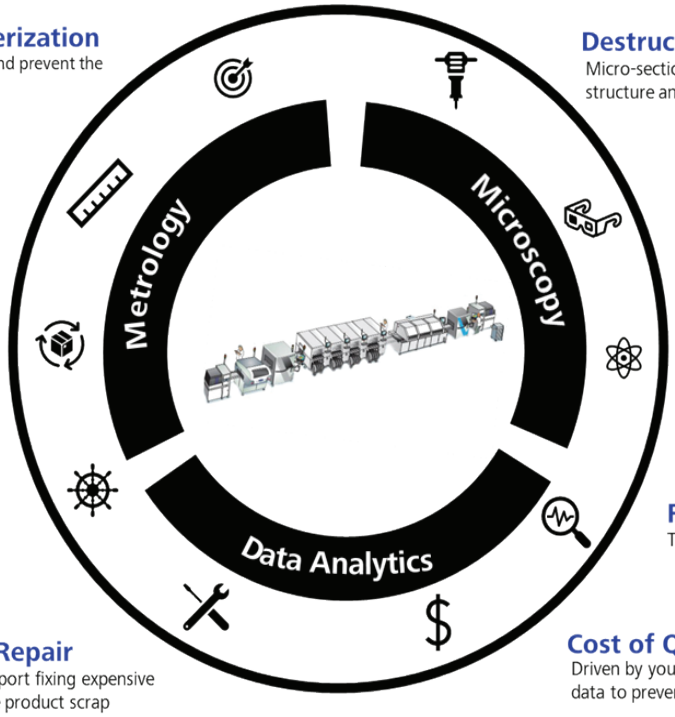

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Dr. Tim Burke, chief technology officer at Arch Systems, will provide an introduction to machine data analytics in the EMS industry. "As EMS manufacturers advance toward Industry 4.0 and the Factory of the Future, there are massive opportunities to leverage the large-scale capture and analysis of machine data to improve almost all aspects of factory operations," he says. In this course, Burke will cover domain-specific forms of data analysis appropriate for the EMS industry on top of machine data such as what is produced by SMT machines inside an EMS factory. The course assumes familiarity with SMT equipment such as PnP machines, SPI/AOI machines, and solder paste printers. He covers topics ranging from what kind of data is produced by these machines, how to visualize time series of parameters from machines, examples of identifying specific machine problems in the data, and freely available open-source tools that are appropriate for analyzing EMS machine data.

Cecelia Rios, rework and repair technician at Hi-Tek Electronics, will discuss solder techniques. Students will leave with an ability to identify parts and know how to solder in accordance with classes 1, 2, or 3.

Dr. John Lau, senior project assistant at Unimicron, will present a course titled, "Chiplet Design and Heterogenous Integration (SiP)." Chiplet is a chip design method, and heterogeneous integration is a chip packaging method. "Chiplet design and heterogeneous integration packaging have been generating a lot of traction lately," Lau says. "For the next few years, we will see more implementations of a higher level of chiplet designs and heterogeneous integration packaging, whether for cost, time-to-market, performance, form factor, or power consumption. His lecture will cover the reasons behind chiplet design, how it relates to heterogenous integration packaging, lateral communication between chiplets, and multiple systems in various scenarios.

Design engineer Vern Solberg will teach two courses. This first tutorial will furnish the design for manufacturing principles established for flexible and rigid-flex circuit fabrication. Additionally, guidance will be presented in developing surface mount component land pattern geometry and methods for providing the physical reinforcement criteria that will contribute to ensuring quality, reliability, and manufacturing efficiency.

The second course "will furnish PCB design engineer guidance for developing and implementing the new generations of advanced multiple function semiconductor packaging technology, high-density circuit boards, as well as ultra-high-density interposers," Solberg says. "Driven by the need to maintain a competitive edge and technical advantage, product developers are relying heavily on more innovative IC package solutions. Although integrating several semiconductor functions onto a single die element (system-on-chip) appears to provide a viable solution for some, development cost and time have often proved excessive. On the other hand, semiconductor companies, working together with other companies, are establishing the universal chiplet interconnect express (UCIe) standard as a high-bandwidth, low-latency connector for those computing blocks to communicate inside a chip and lead the ecosystem to create the UCIe Consortium.

Frank Richter, CEO of Greenectra will provide a comprehensive introduction to Li-ion battery technology. "We cover the main topics needed to understand how Li-ion batteries work as well as the challenges for the implementation within battery systems," Richter says.

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Rita Mohanty, senior scientific principal at Henkel, presents a course on the fundamentals of thermal interface material. "The cooling of electronics is critical to the safety, performance, and reliability of contemporary electronic systems," Mohanty says. "Electronics industries continue to move toward highly integrated devices with smaller feature sizes and higher currents with smaller footprint devices. Higher functionality comes with the price of high heat generation due to higher power dissipation. In general, heat from a system can be removed by conduction, forced convection, and radiation. For most electronic applications, heat is primarily removed by transferring heat by conduction through a solid medium. Polymer-based thermal interface material (TIM) is one of the most effective solid media used in thermal management today."

Mark Finstad, director of engineering at Flexible Circuit Technologies, and Nick Koop, director of flex technology at TTM Technologies, will give a joint "ask the flexperts" course about lessons learned in design through test. There will be two sessions. Mark is the IPC-2233 committee chair, and Nick is the IPC-6013 committee chair. They will cover the following topics: mechanical design/material selection, cost drivers, bending and forming concerns, testing, and issues unique to rigid-flex. This course also includes a complete virtual plant tour of a flexible circuit manufacturing facility to help attendees understand the manufacturing processes. Throughout the presentation, the instructors will share many real-life stories of flexible circuit applications gained over 35+ years in the industry. Some of these are success stories and others not so much, but all provide excellent lessons learned. The instructors also welcome and encourage questions, and enjoy "wandering off course" with lively interactive discussions on specific topics from the class.

Gerjan Diepstraten, manager of advanced technology at ITWEAE, will discuss how to develop a robust selective soldering process. "Boards can be soldered in different ways," he says. "What is the best method and how can we define this in the design phase?"

Dr. Jennie Hwang, CEO of H-Technologies Group, will present a course on the opportunities, challenges, and possibilities of artificial intelligence. "As we move into an artificial intelligence (AI) era, the new AI tools and platforms are remaking our daily lives and every aspect of workplace, including design, research, engineering, manufacturing, and management across all industries, from semiconductor and printed circuit board design to life sciences and new material design," Hwang says. "Even not being an AI technologist, staying in the core knowledge zone is a viable strategy to remain proficient and competitive in the workplace."

Fil Arzola, senior PCB design engineer at Raytheon, will teach a course on how to set up, organize, and engineer a mixed-signal wire-bonded board design. This course will instruct technical professionals to understand the basic guidelines. This course is intended for PCB designers at all levels of design experience. Arzola will present material on improved design methodologies, how to define a well-defined stackup to engineer to the ideals of packaging complexity, and the need to understand basic structures of wire-bond design.

SMT007

Julia Gumminger is manager of professional development and events at IPC.

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with Matt Stevenson, ASC Sunstone

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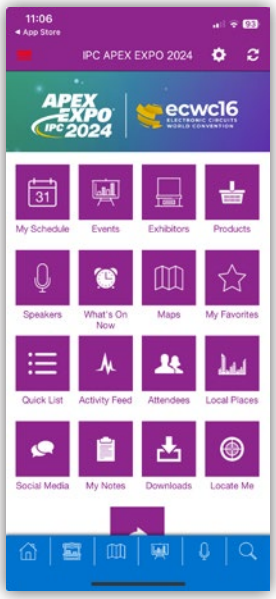
by Kim DiCianni
IPC



With so many things to do at a large trade show and conference like IPC APEX EXPO, you cannot possibly take every class, attend every talk, or see every vendor on your list. But you can plan your days and maximize your time with the IPC APEX EXPO mobile app. The app allows you to easily view the show's daily agenda, keynote speakers, the conference and professional development schedules, and, of course, flag and make notes on exhibitors. Planning your show experience through the app tool will allow you to design a personal show experience that meets your specific business needs. It will even give you alerts per your schedule and flagged items.

Events and timelines for the 2024 show will be updated sometime in March, but download the app now to start setting up your profile and learning your way around.

Finding the app: For iOS and Android devices, search your App Store or Google Play for "IPC Shows."

Getting to Know the App

When you first log into the app, you'll be greeted by a tutorial. Click through the helpful tips for information about navigating the app. You can access this app tutorial at any time by clicking the gear icon at the top of the dashboard and selecting "Reset App Tutorials."

Once the IPC show application has downloaded, launch the app and choose 2024 IPC APEX EXPO. If you already have the IPC Shows mobile app downloaded, you may need to exit any previously loaded app to the "event list" so that you are able to select the most current version. Remember, IPC APEX EXPO 2024 information will be ready by mid-March.

Complete Your Profile

Once you are in the 2024 show, new users will be prompted to set up a profile. Do this by clicking on the "My Profile" icon at the bottom of the dashboard or the gear icon at the top of the dashboard, then select "My Profile" to complete your app profile. To save your profile, your name, email, and industry are required. If you have already set up your Agenda Planner, just log in with your planner log-in ID, your badge number, and last name. All your information will automatically be pulled in to create your profile. In addition, when you log in through your agenda planner, it will pull in your schedule, exhibitors you have flagged, and other things you have already set up in the agenda planner.

Publishing Your Profile

You must select whether you want to publish your profile for all to see. If you choose to publish, only your name and industry will be visible to anyone other than your friends.

Setting Up Your Agenda Planner

This is where the rubber hits the road regarding value and time saved. In the Agenda Planner, you can completely plan your schedule for each show day, filling your time with speakers, conferences, professional development, business meetings, and visiting select exhibitors.

Personalizing Your Experience

Create your personalized My Favorites list by clicking the star for each entry. If a record has been starred, this will add it to your *My Favorites* list, easily accessed from the dashboard. This will include events, exhibitors, and more.

Navigating the Schedule

The schedule of events is sorted by date and time within the day. Click the different days at the top of the schedule to navigate between event dates. Click on any session to see more information and details about the session, along with information about the session's presenters.

Finding Your Way Around

Click the Maps icon on the dashboard to see property maps uploaded for the venue.

Remember that you can access the app tutorial at any time by clicking the gear icon at the top of the dashboard and selecting Reset App Tutorials.

Here's to a great show!

Kim DiCianni is director of trade shows and events at IPC.

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MilAero007 Highlights

After Three Years on Mars, NASA's Ingenuity Helicopter Mission Ends ▸

After its 72nd flight on Jan. 18, 2024, NASA's Ingenuity Mars Helicopter captured this color image showing the shadow of a rotor blade damaged during a rough landing. NASA's history-making Ingenuity Mars Helicopter has ended its mission at the Red Planet after surpassing expectations and making dozens more flights than planned. While the helicopter remains upright and in communication with ground controllers, imagery of its Jan. 18 flight sent to Earth this week indicates one or more of its rotor blades sustained damage during landing and it is no longer capable of flight.

NOAA's Newest Weather Satellite From Lockheed Martin Arrives in Florida to Begin Launch Preparations ▸

The next-generation Geostationary Operational Environmental Satellite (GOES)-U has successfully arrived at Kennedy Space Center, Florida, to begin preparing for its spring launch. It is the final of four satellites in the National Oceanic and Atmospheric Administration (NOAA)'s GOES-R weather satellite series.

NASA Puts Next-Gen Exoplanet-Imaging Technology to the Test ▸

The Coronagraph Instrument on NASA's Nancy Grace Roman Space Telescope will demonstrate new technologies that could vastly increase the number of planets outside our solar system (exoplanets) that scientists can directly observe. Designed and built at the agency's Jet Propulsion Laboratory in Southern California, it recently passed a series of critical tests ahead of launch.

U.S. Army Selects CACI for $382 Million Signals Intelligence and Electronic Warfare Systems Task Order ▸

CACI will provide advanced software and full life cycle support for the Trojan family of systems across the Army military intelligence enterprise at all echelons. CACI will deliver and enable cutting-edge intelligence collection, processing, exploitation, and dissemination (CPED) capabilities through dynamic data fusion and adaptable software solutions to ensure information advantage for multi-domain operations.

Airbus Boosts 'Make in India,' Awards Additional Manufacturing Contracts ▸

Demonstrating on its 'Make in India' commitment, Airbus has signed contracts with Tata Advanced Systems Limited (TASL) and Mahindra Aerospace Structures Private Limited (MASPL) to procure commercial aircraft components.

Honeywell to Invest $84 Million in Expansion of Kansas Aerospace Manufacturing Facility ▸

This expansion will create one of Honeywell's most technologically advanced aerospace manufacturing facilities. The 560,000-square-foot facility currently manufactures components for Honeywell's avionics, safety and flight control systems and complex radio frequency systems for traffic collision avoidance, radar altimeters, and weather radar.

DESIGN TIPS #124:

ETCH COMPENSATION

What is minimum space and trace? The answer depends on the starting copper weight.

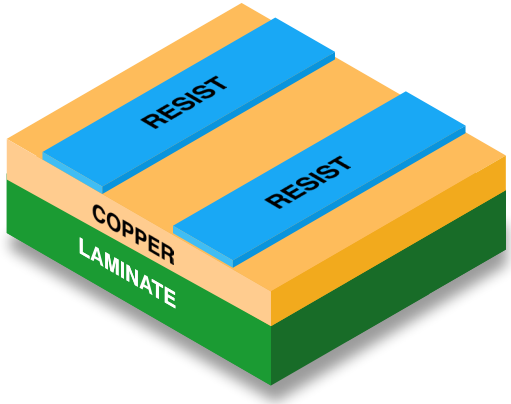
This is because we must do an etch comp on the traces in CAM to compensate for known etch loss. The space between traces after compensation will play a role in whether a board can be manufactured.

The lower the spacing width, the higher the cost. Designers don't always account for the proper starting copper weight after edge compensation.

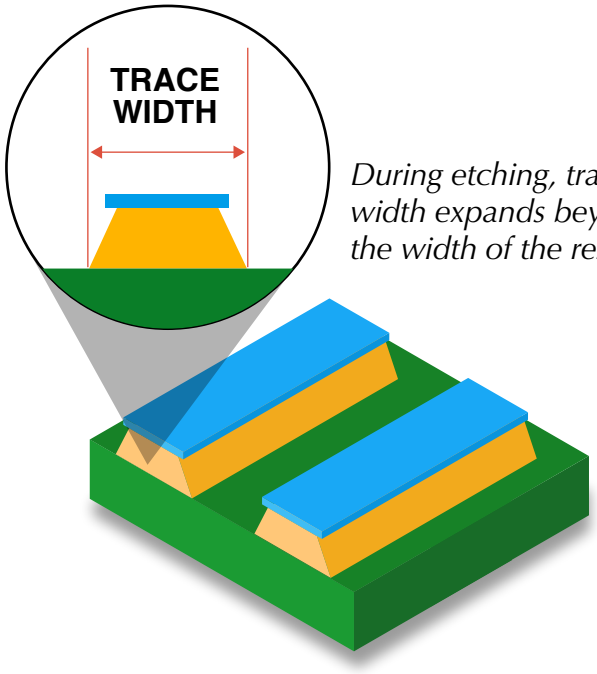
Design tips:

- For accurate starting copper weight, **add a half mil (.0005″) to all copper features**.
- **Start with 3/8 or 1/4 oz. foil**, reducing etch comp and less likely to cause a spacing issue.
- **Boards that call for full body electrolytic gold are not comped** to avoid gold slivers occurring during the etching process.

Before etching



After etching



During etching, trace width expands beyond the width of the resist.

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Technical Conference: Innovation Communication

Feature Article by Nolan Johnson
I-CONNECT007

IPC APEX EXPO continues to build upon a long tradition of technical program depth. In recent years, the technical program staff has fostered an increased depth of research in the technical program and expanded the scope and variety of the special sessions.

Of particular interest to EMS-oriented attendees is the Factory of the Future technical track, which is comprised of three separate sessions and 10 presentations. These two-hour sessions take place Tuesday, April 9, and Wednesday, April 10, and range in topics that include artificial intelligence, machine learning, digital twin, automation, and additive manufacturing.

To illustrate what attendees can expect from the technical sessions, we reached out to the presenters in the Factory of the Future sessions and invited them to share a little about the topic of their presentation. The following four presenters responded with a summary of their presentations.

In addition to the increased technical depth in IPC APEX EXPO technical programs, IPC has expanded the Special Conference Sessions. This year, special sessions will explore EV electronics, moderated by MacDermid Alpha Electronics Solutions' Lenora Clark, and advanced packaging, led by IPC CTO Matt Kelly. These sessions take place sequentially on Thursday, April 11.

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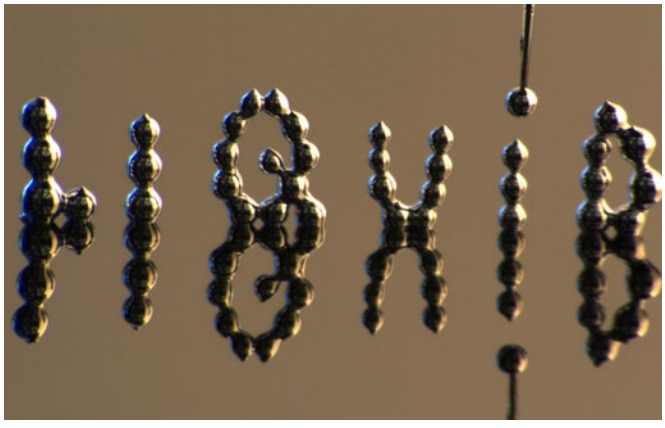
"Liquid Metal Patterning for Electronics"

Presenter: Michael Dickey, NC State University

This talk will explore the fascinating and unique properties of liquid metals based on gallium. These metals are liquids at room temperature and can be patterned into useful shapes to create soft and stretchable electronic devices.

Click here for the video.

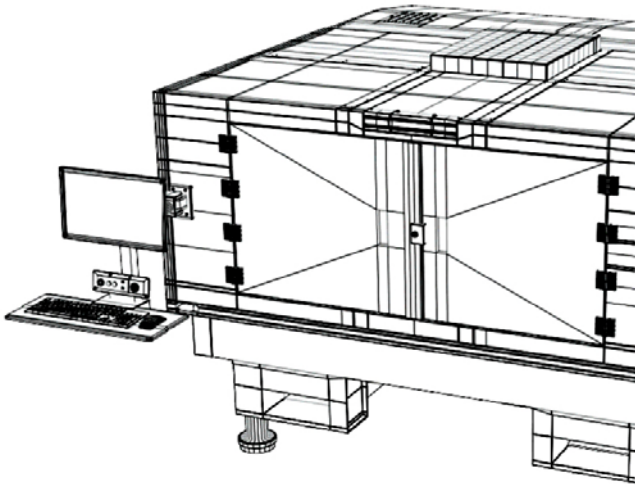


"How Artificial Intelligence (AI) Helps on Automated X-ray Inspection (AXI) Process"

Presenter: HEE WEI KEN (WK), ViTrox Technologies Sdn Bhd

The increased adoption of inspection systems in production, driven by automated technologies, has resulted in optimized operations, reduced resource consumption, and improved yield and quality. The automated 3D X-ray inspection solution (AXI) addresses hidden defects not captured by other systems, prompting the integration of artificial intelligence (AI) across various inspection stages.

AI's introduction represents the forefront in technological innovation, offering automation benefits, streamlining of tasks, and enhancing efficiency. The research focuses on systematically investigating the integration of AI into the AXI system, assessing its impact on detection accuracy, program quality assurance, and inspection effectiveness. Data collection involves customer site trials, AI model testing, and measures to ensure model generalization and robustness. The study aims to provide insights into the benefits, challenges, and considerations of AI integration into AXI, emphasizing its potential for substantial long-term cost savings.



"THT-Solder-Copilot: A Machine Learning-based Solderability Check of THT Solder Joints"

Presenter: Dr. Reinhardt Seidel, Institute for Factory Automation and Production Systems (FAPS), Friedrich-Alexander Universität Erlangen-Nürnberg

The future of solderability checks and THT solder process development is digital. No more scrap during process development. New machine learning approaches are capable of calculating the solder hole-fill according to PCB layout and solder parameters. With this modeling approach of the THT soldering process, machine-specific digital twins can be built. The solderability of a PCB in selective and wave soldering can be checked early during PCB design to reduce time to

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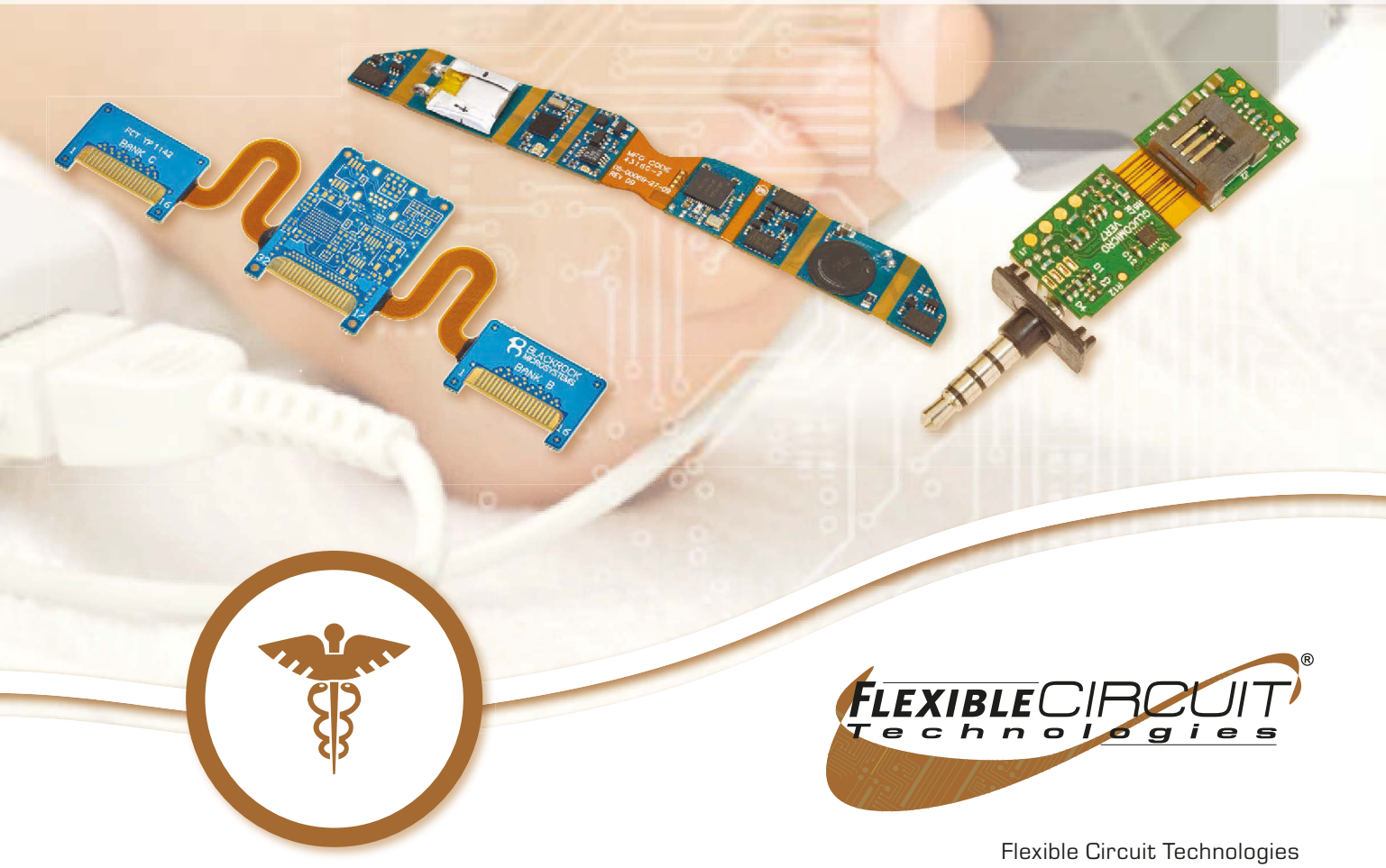

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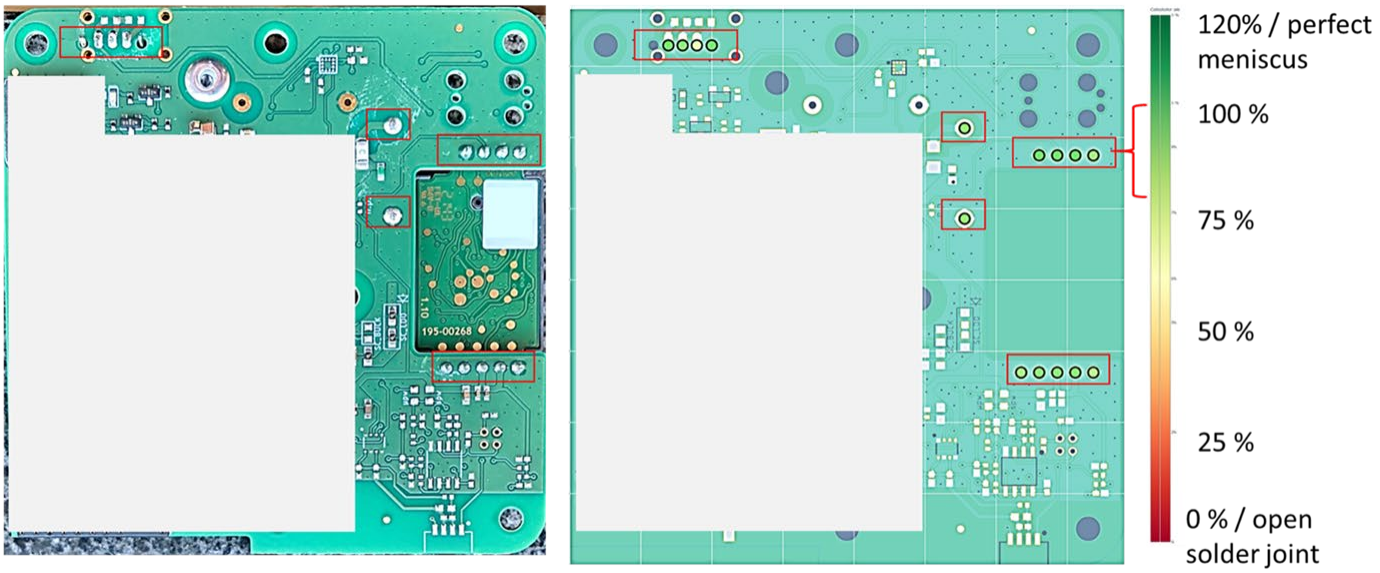
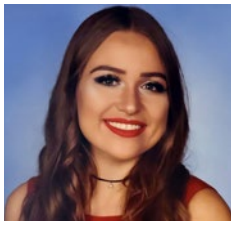


Figure 1: The machine learning model gives green light for production start, as sufficient solder hole-fill is to be expected. (Courtesy: Sentinum GmbH)

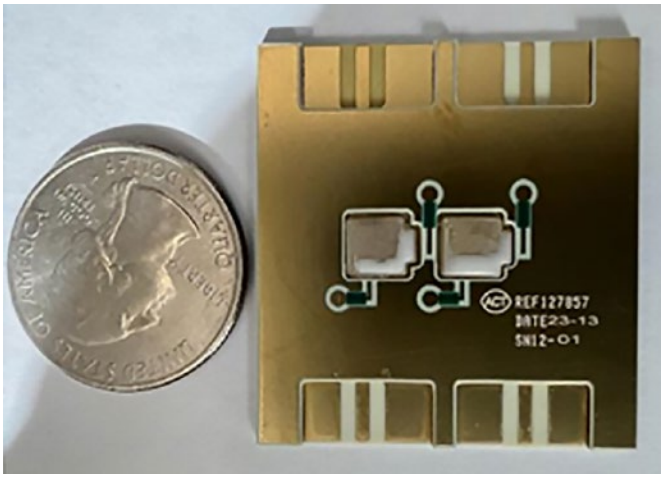
market. The process development and optimization can be carried out by soldering a PCB with the digital twin of a soldering machine. During production ramp-up, the solder process parameters can be optimized to maximum productivity at high solder quality.

"Implementation of 3D Printed Near Chip-Scale Interposers into X-Band Dual Channel MMIC Assembly"

Presenter: Emily Lamport, PhD student at University of Massachusetts Lowell



Additive manufacturing (AM) offers numerous benefits over traditional manufacturing methods, such as realization of unique form factors, decreased waste in material, decreased cost and lead time of tools, and the ability to create rapid prototypes. It is for these reasons that there has been a significant increase in its use in different technical applications, including electronic packaging. In previous studies, AM techniques have been used to create poly-ether-ether-ketone (PEEK) Near Chip-Scale Interposers (NCSIs) into BGA PCBs manufactured via traditional methods. The conformal vertical interconnects were made using aerosol jet printing (AJP) in five-axis configurations, and the interconnects that connected the interposer to the BGA leads were printed using syringe-dispense methods. This work expands on the prior research by using the optimized parameters and design of experiments to implement AM interposers into a dual-channel, X-band MMIC assembly. Using both AM and traditional manufacturing methods in tandem, the advantages of both methods are leveraged to optimize manufacturing processes. SMT007



THE ROAD TO APEX EXPO IPC 2024

2000

2001

2003

2007

2008

2012

2014

2015

2016

2017

2024

- Anaheim
- Las Vegas
- San Diego
- Los Angeles
- Long Beach

Dip Your Hand in the IPC APEX EXPO Candy Jar

The New Chapter

Feature Column by Hannah Grace, TEXAS INSTRUMENTS

As IPC APEX EXPO quickly approaches, aligning your agenda with personal and professional development goals is necessary to get the most out of your show week. If 2024 is planned for growth opportunities, whether presenting, expanding your technical repertoire, or learning something new, this show and conference is for you. I see several opportunities that can easily align with those goals.

Keynote Presentations

To kick off the show, the keynote speaker is Paul Bailey, former principal concept director for Walt Disney Imagineering, who will be discussing some of his former projects, including Disneyland rides Star Wars: Rise of the Resistance, and Millennium Falcon: Smugglers Run. We will learn what goes on behind the brain of an Imagineer and see the depth of managing blockbuster projects.

Artificial intelligence (AI) has been the rave in the industry. Almost every day, I hear someone talking about how AI will take over our jobs. IPC President and CEO Dr. John W. Mitchell, and IPC Chief Economist Shawn DuBravac will be highlighting AI implementation in their keynote presentations. Mitchell will be discussing the future of the workforce and how AI and automation may be incorporated into jobs we see every day. He will also teach us how to embrace the ever-changing work environment we live in. DuBravac will highlight emerging technologies gaining interest, which of course, includes AI. The 2024 conference is looking bright with this set of incredible speakers.

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Technical Conference

After attending IPC APEX EXPO the past two years, one of my favorite parts is attending a variety of presentations in the Technical Conference and the Professional Development Courses. They have enough to satisfy anyone's career development needs. My favorite course from last year was on RF antenna design. The presenter gave real-life examples and theory to help design and use your very own antenna. I left the presentation inspired to do some independent study, and I designed several of my own antennas based on the theory I learned from this professional course.

Attending the technical paper reviews has helped broaden my awareness of the electronics industry and helped me grasp where the industry is focused concerning new technology. This year, you can expect to see tracks from design to manufacturability, and I'm really excited to learn from the technical track about emerging technologies.

> "IPC sets the standards for all things PCB, and your company's voice needs to be heard."

Networking Opportunities

Did you know IPC APEX EXPO is more than just grasping technical knowledge? It may be the place where you find your company's next technical expert or maybe you'll meet a mentor to help propel your professional career forward. Networking is one of the biggest opportunities you'll have there. To help with networking, IPC hosts several events that bring together companies, technical presenters, and experts in their specified fields. Other opportunities include a newcomers networking reception, women in electronics reception, and chatting with poster presenters and people on the show floor. After all that hard work, you will definitely want to cool down at the ice cream social. Companies from all over the world, even Lockheed Martin, NASA, and Apple, will be in attendance. Whether you're looking to grow in technical knowledge or build out another area of interest, be sure to have your business cards in hand and get ready to mingle.

Standards Development

Last but not least, I think the most important part about attending the conference is participating in standards committee meetings. IPC sets the standards for all things PCB, and your company's voice needs to be heard. From IPC-J-STD-001 to IPC-610, participating in standards committee meetings will set the tone for the latest technologies and help grow the development of technologies that may not even be on the market yet. Participating in committees, even those that my work does not directly align with, have been incredibly useful in expanding my technical expertise. I can learn about topics from manufacturing tolerances to chemical bare boards. Meanwhile, I can also contribute my thoughts and ideas on changing documents, even while being a first-year engineer.

Conclusion

For a young engineer like me, IPC APEX EXPO is a candy factory full of powerful networking opportunities and a vast technical repertoire. It is a place that encourages technical and professional growth. The experiences I have gained there have helped in my own decisions about my career. So, if 2024 is a year of growth for you, attending IPC APEX EXPO 2024 should be number one on your bucket list. **SMT007**

Hannah Grace is a process engineer at Texas Instruments and in the IPC Emerging Engineer Program. To read past columns, click here.

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Real Progress Toward Solving U.S. Workforce Problems

Interview by the I-Connect007 Editorial Team

IPC achieved a landmark in 2023 by creating an apprenticeship program approved by the U.S. Department of Labor. With such a registered framework in place, industry can work through IPC to secure local, state, and federal dollars for workforce development in a way they've never been able to do before. Cory Blaylock, director of workforce partnerships at IPC, has been instrumental in developing and moving this program toward adoption and outlines what companies need to know to get involved.

Michelle Te: IPC is not just embracing a change in the revolution of workforce development but driving it as well. What is behind IPC's efforts?

Cory Blaylock: There has been a solution in the industry for developing talent that offers career pathways, giving employers what they want as well as catering to developing employees. IPC wants to be the one owning it because we're representing everybody in electronics manufacturing.

Apprenticeships, and workforce development, in general, are not user-friendly in their current state. There's a lot of nuance and things that people don't know or understand unless they work in it every day. They may not understand what's required for a registered apprenticeship concerning the rules and regulations of the Department of Labor. We've worked through all the red tape so it could be utilized without having to go through all the rigamarole.

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Te: Can you define an apprenticeship?

An apprenticeship is an earn-while-you-learn model. Traditionally, we think of apprentices in jobs like plumbing and HVAC. IPC is joining that space to expand and diversify pathways into good jobs and careers in advanced manufacturing. In an apprenticeship, there are three components. You have an apprentice learning a skill, a journey worker who is already proficient in a skill, and you have related technical instruction to get the theoretical background and the technical information you need to be successful. The mentor teaches the apprentice all the skills they need to be fully competent by the time their apprenticeship is over through the on-the-job learning aspect.

There's also a behavioral competency portion, which considers the soft skills that everybody always complains that people don't have. Are you able to show up on time to work? Are you trustworthy? In the electronics industry, are you making sure you're recording the date and batch codes and serial numbers appropriately so that there is traceability for parts and components that could be recalled later? Do you have attention to detail? It's things like that which are often established in a company culture.

Marcy LaRont: Explain the importance of the mentor/mentee relationship and how the apprenticeship manages or highlights it. That seems key.

The mentor/mentee relationship is a crucial component of IPC's National Program Standards of Apprenticeship. This relationship plays a significant role in the successful development and progression of apprentices within the program. When looking at the importance of these relationships during an apprenticeship, it's important to consider the structured transfer of knowledge through hands-on training and on-the-job experience facilitated by mentors. Throughout the apprenticeship, there are mechanisms for regular performance assessments and feedback discussions


Cory Blaylock

between mentors and apprentices. We recognize the mentor/mentee relationship as a cornerstone for apprentice development. Mentors play a key role in providing constructive feedback on an apprentice's performance, which aids their professional development. The standards outline clear expectations, responsibilities, and mechanisms for managing the importance of this relationship to ensure a successful and well-rounded apprenticeship experience.

Te: What is the financial incentive to the apprentice?

Participating in IPC's apprenticeship programs offers several financial incentives for apprentices. These incentives are designed to attract individuals to apprenticeships, support them during their training, and enhance the overall attractiveness of apprenticeship as a career pathway.

Earn while you learn: Apprentices receive wages for the work they perform during the on-the-job training component of their apprenticeship. This model allows apprentices to start earning a paycheck from day one, making apprenticeships financially viable for individuals entering the workforce.

Wage progression: Apprenticeship programs follow a structured wage progression, where apprentices receive incremental pay increases as they advance through the program. It provides a clear path for income growth, incentivizing apprentices to continue and complete their training.

Competitive salaries: Apprenticeships often lead to careers with competitive salaries. As apprentices acquire valuable skills and experience, they become more qualified for higher-paying positions within their chosen industry. Completing an apprenticeship enhances long-term earning potential.

Industry-recognized credentials: Completing IPC's apprenticeship program results in the attainment of industry-recognized credentials and certifications, as well as a nationally recognized credential from the U.S. Department of Labor, upon completion of the program. These credentials enhance an apprentice's marketability, making them more attractive to employers and potentially leading to higher-paying job opportunities.

Te: What was involved in creating the IPC apprenticeship program?

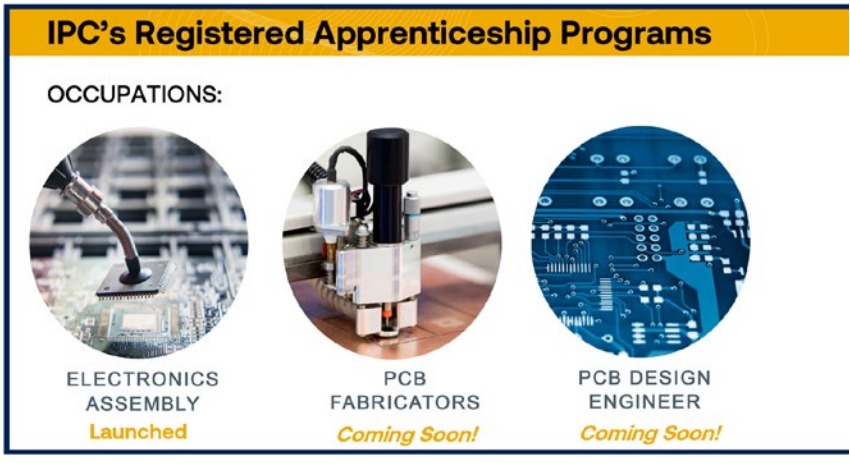
Creating the IPC Apprenticeship National Program Standards was a comprehensive and collaborative effort aimed at bridging the gap between industry needs and workforce development. Our program is designed to cultivate skilled professionals in the electronics assembly, aligning with the dynamic demands of the industry.

LaRont: What was the process for getting to the adoption stage? Which apprenticeships are currently launched and which are still in the works? What are the timelines?

The process to make our national standards applicable across the industry involved the following steps. We are working on steps five to seven with our currently registered occupations, but as we register additional occupations with the Department of Labor to meet the needs of industry, this becomes an iterative process. One of our goals is to have these apprenticeship programs be a "plug and play" workforce training option that employers can adopt, which is beneficial to them and their employees.

The Seven Steps

1. **Needs assessment:** Conducted thorough research to identify key skills required in electronics manufacturing.
2. **Stakeholder collaboration:** Engaging with industry, education, and apprenticeship experts for a holistic perspective.
3. **Curriculum alignment:** Developing a curriculum aligning theoretical knowledge with IPC standards for practical skills.
4. **Registered apprenticeship structure:** Formally structuring the program as a registered apprenticeship, meeting Department of Labor criteria.
5. **Educational partnerships:** Forging partnerships with high school CTE programs, technical colleges, and universities to ensure high-quality program delivery.
6. **Continuous improvement:** Establishing feedback mechanisms for ongoing program refinement.
7. **Outreach and promotion:** Conducting extensive awareness campaigns targeting potential apprentices and employers.



Our current occupations are Electronics Assembler and PCB Fabricator. We plan on having additional occupations registered in 2024 to include PCB Design Engineer, Wire Harness Assembler, and even a Program Management role.

Te: Why is it important to have an apprenticeship program approved by the Department of Labor?

It allows the approved apprenticeship from the Department of Labor to be registered with each state. Since we have employers in all 50 states, we wanted to have a plug-and-play type apprenticeship so that all employers, whether they are small mom-and-pop shops, medium-size employers, or large PCB and EMS companies, can utilize a registered apprenticeship model to help standardize training across the industry.

Te: What feedback was IPC getting from industry? Did you see companies needed more help with training, and that companies would be open to this type of model?

Yes, and the other benefit for employers is there are many funding opportunities available to help offset training costs because it's a model that has already been vetted by the Department of Labor. There are local and state workforce dollars, and sometimes federal funding is available for employers to utilize for registered apprenticeship programs. It also offers career pathways for the employees so they're able to have a career instead of just a job.

Te: What are the costs involved in a company having an apprenticeship program?

Employers must bring in employees regardless, so they're incurring the cost of recruitment, interviewing, and training all on their own time. We want them to be able to partner with entities in their region, like workforce boards, community colleges, high schools, universities, and manufacturing associations so they can have a workforce ecosystem in place. This way, they're better able to utilize those dollars that might be available for recruitment and training. One option is through the federal government's Workforce Innovation and Opportunity Act, which funnels federal dollars down to states to help offset training costs through registered apprenticeships. Because it is a structured framework and a national program standard, that means that employers in any state can utilize it.

LaRont: Federal (and state) grant money seems to be a huge opportunity, but it also seems that our companies are just not aware that this may be for them. How does IPC help companies access these funds?

Accessing federal and state grant opportunities is indeed a valuable avenue for companies, and IPC is committed to supporting our industry partners in navigating and capitalizing on these funding resources. IPC is dedicated to provide education, guidance, advocacy, and resources to help empower companies to leverage these opportunities for growth, innovation, and workforce development.

Victoria Hawkins, IPC's director of education grants and proposals, recently joined the U.S. Education Department and she and I are working very closely to provide education and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awareness, grant navigation assistance, grant writing support and technical assistance, and advocacy for industry inclusion in the grant landscape. As employers are adopting IPC's apprenticeship standards, we are working hand in hand with their leadership teams to identify funding sources that can help offset the training costs available to them in individual states as well as making them aware of federal opportunities as we become aware of newly available grants, changes in eligibility criteria, and deadlines, ensuring that companies remain informed and can take timely action.

LaRont: So, these are DOL-approved apprenticeship programs, but you still must get approval in each individual state?

A federally approved national program standards of apprenticeship provides a consistent framework and set of guidelines that serve as a foundation for apprenticeship programs across the country. While the standards are established at the federal level, their implementation and oversight occur at the individual state level. Reciprocity agreements, facilitated by the Office of Apprenticeship state designation, further enhance coordination and standardization across state lines, fostering a more seamless and efficient apprenticeship system. There are also some states that operate State Apprenticeship Agencies (SAA), which are responsible for overseeing apprenticeship programs within their jurisdiction. SAAs work in partnership with the federal DOL to implement and enforce national standards while tailoring them to meet the specific needs and regulations of their state.

LaRont: How many states are currently registered or have adopted this apprenticeship program and which states are they? Who looks to be next?

National Program Standards of Apprenticeship provide a standardized framework applicable across all U.S. states and territories and can be implemented "as is." However, including apprenticeships on a state's Eligible Training Provider List (ETPL) offers additional benefits, particularly in utilizing Workforce Innovation and Opportunity Act (WIOA) funds. Apprentices and employers can tap into WIOA funding to cover various costs associated with apprenticeship programs. This may include tuition, books, and other related expenses, providing a valuable financial resource for both apprentices and employers.

IPC is currently included on the following state's ETPL: Texas, Colorado, Utah, Georgia, Illinois, Indiana, New York, New Hampshire, and Florida. We are actively coordinating the addition of IPC's registered apprenticeships in California, Arizona, North Dakota, Kansas, Iowa, Arkansas, Mississippi, Alabama, South Carolina, Michigan, New Jersey, Connecticut, Maryland, and Massachusetts. The list is growing weekly as companies in various states contact us about apprenticeship opportunities in their state.

Te: I understand that IPC is working with three high schools in the United States, hoping to find 200 students to become apprentices.

We have three schools—one in Texas, one in Colorado and one in Massachusetts—that offer workforce training courses to high school stu-

dents that align with the technical instruction piece of our registered apprenticeship. We want those high school students to already have some industry-related knowledge, certification, and even credentials when they graduate. They will get their IPC-J-STD-001 and IPC-610 certifications so they can join an employer partner as a registered apprentice and get credit for prior learning that they completed while they were in high school. This is another benefit to employers because they're not providing all the training. High school can open the students' eyes to manufacturing career opportunities, and do the training themselves.

For the past 20 years, the U.S. has fallen far behind in offering manufacturing jobs as a career, and now we're dealing with the setbacks. We've asked kids what they wanted to be when they grew up, and they all said they wanted to be a lawyer, doctor, or teacher. Manufacturing wasn't sexy, and nobody wanted those jobs, so they didn't even know it was an option. We now have high school students not only exploring those options but also getting training in things like soldering. So, if college is not their path—and only about 36% of high school graduates continue on to college—training can be offered that gives them industry-based credentials and a career path.

For example, in Texas, there is the "60 by 30" initiative, which means that 60% of high school graduates will have an industry-recognized credential by the year 2030. Their goal is for every high school graduate to have a credential recognized by an industry. Some high schools are offering OSHA and Cisco certifications so graduates will be employable as soon as they graduate high school. Why can't the electronics manufacturing industry join in with that? Why don't we get our training out there for high school students so that we're just adding another vein in the talent pipeline? Let employers start establishing relationships and building that workforce ecosystem to include high school and CTE programs.

When the high schools offer the training and the state pays for it, the employer reaps the benefits.

Te: What has been the level of interest from high school students?

We are conducting surveys before and after their workforce training so we can judge their reaction. I don't have that data yet, but the teachers at the schools have been very excited. They love the curriculum. They like that the students can work self-paced, but then they can support the instruction in class. It's been very positive from the teacher and instructor standpoint and we're waiting on more data from the students.

> Some high schools are offering certifications so graduates will be employable as soon as they graduate.

Te: With the DOL approval in place, what has been the reaction from industry?

Companies are enthusiastic about it. Zentech Manufacturing, headquartered in Baltimore, Maryland, with production facilities in Bloomington, Illinois, and Richardson, Texas, is the first employer partner to adopt IPC's national program standards of apprenticeship. We're working on helping them secure grant funding dollars available through those states that will help offset their costs incurred with training. We are also working with national apprenticeship intermediaries that have incentive funding available for employers who are new to adopting apprenticeship as well as federal grantors with funding allocated for reimbursement for the related technical instruction component of apprenticeship in advanced manufacturing occupations.

Like I said, they're having to bring these people in regardless, and so they might as well take advantage of the registered apprenticeship model. The training, being asynchronous and computer-based, is an investment in their employees.

Across the industry, we have several letters of support from companies that have committed to supporting our apprenticeship programs and implementing them in their U.S. facilities.

Te: How does this align with the CHIPS Act?

The CHIPS Act has a big focus on workforce development. IPC's National Program Standards of Apprenticeship aligns seamlessly with the goals of the CHIPS Act to bolster semiconductor manufacturing in the U.S., by providing a supportive framework for workforce development within the electronics manufacturing industry. Because we're focusing on a PCB fabricator occupation, we're able to further support the CHIPS Act by having a trained workforce that can allow PCBs to be fabricated here in the U.S., so we're increasing PCB fabrication that supports the chip production. We have to support that onshoring effort in the PCB world, as only 4% of PCBs are currently manufactured in the U.S.

Te: Cory, what are you most enjoying about your work in this program?

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

Te: You came to IPC after teaching in a classroom, and then doing instruction at Lockheed. Now you get to work with so many different companies.

Yes, I get to have an impact on shaping what the workforce will look like in the future. This may be the single most important thing that has been done to address the workforce issue for our industry in the United States.

Te: Cory, thank you for sharing about the IPC apprenticeship program, and congratulations on all your hard work. We look forward to seeing how it expands and progresses as you move forward.

Thank you. **SMT007**

Make the Most of Your Marketing and Trade Show Investment

Trade shows are an investment of valuable resources: time, money, labor, travel, and time away from the office. In fact, the average trade show investment in the United States is between $40,000–$60,000 (inkwellusa.com) simply for a booth. Trade shows take tremendous effort, and every exhibitor's goal is to get the greatest return on investment, which translates into closing sales.

Being at the show and having products ready to present is just part of the ROI equation. It is also critical to make your booth a destination so magnetic that prospects arrive at the event with a plan to seek you out, ready to do business. To really maximize your investment and success, the work begins long before the show doors open. Pre-show marketing is a critical part of any successful trade show strategy.

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Mastering Trade Show Success for Exhibitors

The Knowledge Base

Feature Column by Mike Konrad, SMTA

Trade shows serve as invaluable platforms for businesses to showcase their products, network with potential clients, and stay abreast of industry trends. However, amidst the hustle and bustle of a trade show, standing out can be challenging. Exhibitors must employ strategic planning and execution to maximize their investment and achieve tangible results. In this guide, I'll review the best practices for exhibiting at a trade show to ensure your participation is not only successful but also memorable.

Understanding Your Objectives

Before diving into the logistics of exhibiting, it's crucial to define your objectives. Are you looking to generate leads, increase brand awareness, launch a new product, or perhaps establish partnerships? Clarifying your goals will inform every aspect of your trade show strategy, from booth design to engagement tactics.

Choosing the Right Trade Show

Not all trade shows are created equal. Selecting the right event that aligns with your industry and target audience is paramount, so research various trade shows, evaluate attendee demographics, past exhibitors' experiences, and the reputation of the organizers. Prioritize quality over quantity; it's better to participate in fewer

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highly relevant shows than spreading yourself thin across multiple events.

One of the decision factors I consider is whether the trade show includes a technical program. Many trade show attendees need specific solutions to their problems, and a trade show incorporating technical sessions attracts attendees seeking solutions. It's important to note that, frequently, attendees may not fully understand the problems they are facing. I have been the benefactor of educated attendees who leave the technical sessions with a better understanding of their issues and are more focused on seeking the most appropriate solution to their problems, and frequently find those solutions on the exhibit floor.

Strategic Booth Design

Your booth is your storefront at the trade show; it must be inviting, visually appealing, and effectively communicate your brand message. Consider factors like layout, signage, lighting, and branding materials. Aim for a design that reflects your brand identity while creating an immersive experience for visitors. Incorporate interactive elements, product demonstrations, and multimedia displays to capture attendees' attention.

Pre-show Marketing

Building anticipation before the trade show can significantly enhance your visibility and attract more visitors to your booth. Leverage various marketing channels such as email campaigns, social media, press releases, and targeted advertising to promote your participation. Offer incentives like exclusive previews, giveaways, or contests to incentivize attendance and generate buzz.

Training Your Staff

Your booth staff are the face of your company during the trade show. Ensure they are well-trained, knowledgeable about your products or services, and equipped with effective communication skills. Train them to engage with attendees proactively, qualify leads, and handle inquiries professionally. Emphasize the importance of a positive attitude, approachability, and active listening to leave a lasting impression on visitors.

"Your booth staff are the face of your company during the trade show."

Engaging Attendees

Passive booth setups are unlikely to attract much attention amidst the sea of exhibitors. Instead, focus on creating interactive experiences that encourage attendee participation. Host live demonstrations, interactive games, or product sampling sessions to draw people in. Offer value-added content such as workshops, seminars, or industry insights to position your booth as a knowledge hub. Remember to collect contact information and qualify leads during interactions for follow-up after the event.

Networking and Relationship Building

Trade shows provide unparalleled opportunities for networking and forging new connections within your industry. Encourage your team to proactively network with fellow exhibitors, industry influencers, and potential partners. Attend networking events, after-parties, and organized meetups to expand your professional network. Building relationships beyond the confines of your booth can lead to fruitful collaborations, partnerships, and future business opportunities.

Post-show Follow-up

The work doesn't end when the trade show concludes. Implement a robust follow-up strategy to capitalize on the leads and connections generated during the event. Reach out to prospects promptly with personalized messages,

thanking them for visiting your booth and expressing interest in further discussions. Nurture leads through targeted email campaigns, phone calls, or meetings to move them along the sales funnel. Don't forget to evaluate your performance, gather feedback, and analyze the ROI to inform future trade show strategies.

10 Common Mistakes Exhibitors Make at Trade Shows

Despite the potential benefits, many exhibitors fall short of maximizing their trade show investment due to common pitfalls. Recognizing and avoiding these mistakes is essential for achieving success. Here are some prevalent errors exhibitors often make:

1. Poor booth design.

A lackluster or cluttered booth design can deter attendees from engaging with your brand. Avoid overcrowding your space with excessive signage, furniture, or promotional materials. Instead, prioritize a clean, visually appealing layout that highlights your key messages and products effectively.

2. Inadequate staff training.

Unprepared booth staff can undermine your efforts to engage attendees and generate leads. Failing to adequately train your team in product knowledge, customer service, and lead qualification can result in missed opportunities. Invest time and resources in comprehensive training to ensure your staff represents your brand professionally and effectively.

3. Neglecting pre-show marketing.

Relying solely on the trade show to attract visitors to your booth is a missed opportunity. Neglecting pre-show marketing means you're not maximizing your potential audience.

4. Lack of follow-up.

Collecting leads is only the first step; failing to follow up effectively afterward can render your efforts futile. Delayed or generic follow-up messages can result in lost opportunities and diminish the impact of your participation. Implement a structured follow-up plan to nurture leads promptly and keep your brand top-of-mind after the trade show ends.

5. Overlooking networking opportunities.

Trade shows offer more than just exposure to potential customers, they're also prime networking opportunities. Exhibitors who focus solely on attracting leads and neglect networking with industry peers, influencers, and potential partners miss out on valuable connections that could benefit their business in the long run.

6. Ignoring feedback and evaluation.

Without evaluating your performance and gathering feedback, it's challenging to identify areas for improvement and measure your return on investment. Neglecting post-show evaluation means you're likely to repeat the same mistakes in future trade show appearances. Take the time to analyze your results, gather attendee feedback, and assess what worked well and what didn't.

7. Lack of clear objectives.

Exhibiting at a trade show without clearly defined objectives is akin to navigating without a compass. Without a clear understanding of what you hope to achieve, it's challenging to develop an effective strategy or measure success. Take the time to establish specific, measurable goals that align with your overall business objectives.

8. Failure to adapt and innovate.

In today's dynamic business landscape, standing still is akin to falling behind. Exhibitors who fail to adapt to changing trends, technologies, and customer preferences risk becoming obsolete. Embrace innovation, experiment with new engagement tactics, and stay abreast of industry developments to maintain a competitive edge.

9. Stay off your phones!

We've all walked past booths and seen their employees sitting on chairs with their head buried in their screens. When I see that, I keep walking. If you need to check your email, social media, or any other non-tradeshow related function, leave your booth.

10. Chairs are meant for customers.

Avoid sitting and waiting for attendees to arrive. Wear comfortable shoes and consider upgrading your carpet padding so your booth staff can welcome attendees while standing up. Booths with staff sitting on chairs are considerably less likely to attract visitors.

By recognizing and addressing these common mistakes, exhibitors can enhance their trade show experience, maximize their investment, and achieve greater success in attracting leads, building relationships, and driving business growth.

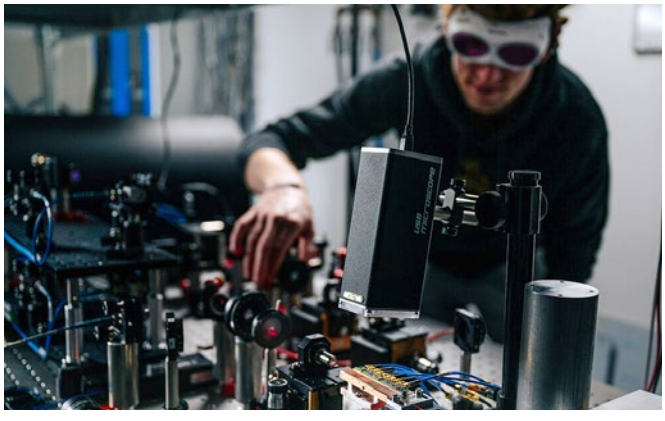
Conclusion

Exhibiting at a trade show presents myriad opportunities for businesses to showcase their offerings, engage with prospects, and elevate their brand presence. By adhering to best practices and adopting a strategic approach, exhibitors can maximize their investment and achieve tangible results. From meticulous planning and booth design to proactive engagement and post-show follow-up, every aspect of the trade show experience plays a crucial role in driving success. Embrace these best practices to unlock the full potential of your participation and leave a lasting impression on attendees. **SMT007**

Mike Konrad is founder and CEO of Aqueous Technologies, and vice president of communications for SMTA. To read past columns, click here.

Scientists Realize New Method for Determining Quantum States

Scientists at Paderborn University have used a new method to determine the characteristics of optical, i.e., light-based, quantum states. For the first time, they are using certain photon detectors—devices that can detect individual light particles—for homodyne detection. The ability to characterize optical quantum states makes the method an essential tool for quantum information processing. Precise knowledge of the characteristics is important for use in quantum computers, for example.



"Homodyne detection is a method frequently used in quantum optics to investigate the wave-like nature of optical quantum states," explains Timon Schapeler from the Paderborn "Mesoscopic Quantum Optics" working group at the Department of Physics. Together with Dr Maximilian Protte, he has used the method to investigate the so-called continuous variables of optical quantum states. This involves the variable properties of light waves. These can be, for example, the amplitude or phase, i.e. the oscillation behaviour of waves, which are important for the targeted manipulation of light, among other things.

For the first time, physicists have used superconducting nanowire single-photon detectors for the measurements—currently the fastest devices for photon counting. With their special experimental setup, the two scientists have shown that a homodyne detector with superconducting single-photon detectors has a linear response to the input photon flux. Translated, this means that the measured signal is proportional to the input signal.

(Source: Paderborn University)

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A Brief History of IPC APEX EXPO

Feature Article by Alicia Balonek
IPC

Although IPC APEX EXPO was launched in 2000, the story began in 1994 with the opening of the IPC Printed Circuits Expo in Boston, where more than 1,700 people attended the event, which hosted 158 exhibitors.

In 1998, the Surface Mount Equipment Manufacturers Association (SMEMA) approached IPC for help. Because of IPC's success with the Printed Circuits Expo and recognizing the need to establish control of its own event, the discussions between SMEMA and IPC ensued. This led to a merger between the two organizations and provided SMEMA with IPC member benefits. To further meet the needs of equipment manufacturers as well as other suppliers to the assembly industry, a new conference and exhibition was born. The goal of IPC and SMEMA councils was to produce the premier event for the electronics assembly industry, providing a cost-effective forum for user/supplier dialogue with the guiding principles of reduced costs, focus, and fairness. Named APEX, this new event focused on the full electronics manufacturing process and associated technologies.

In 2004, IPC took the next logical step by co-locating the Printed Circuits Expo and the Designers Summit with APEX to create one event for the entire electronics interconnection industry. The intent of the APEX event was to concentrate solely on the electronics

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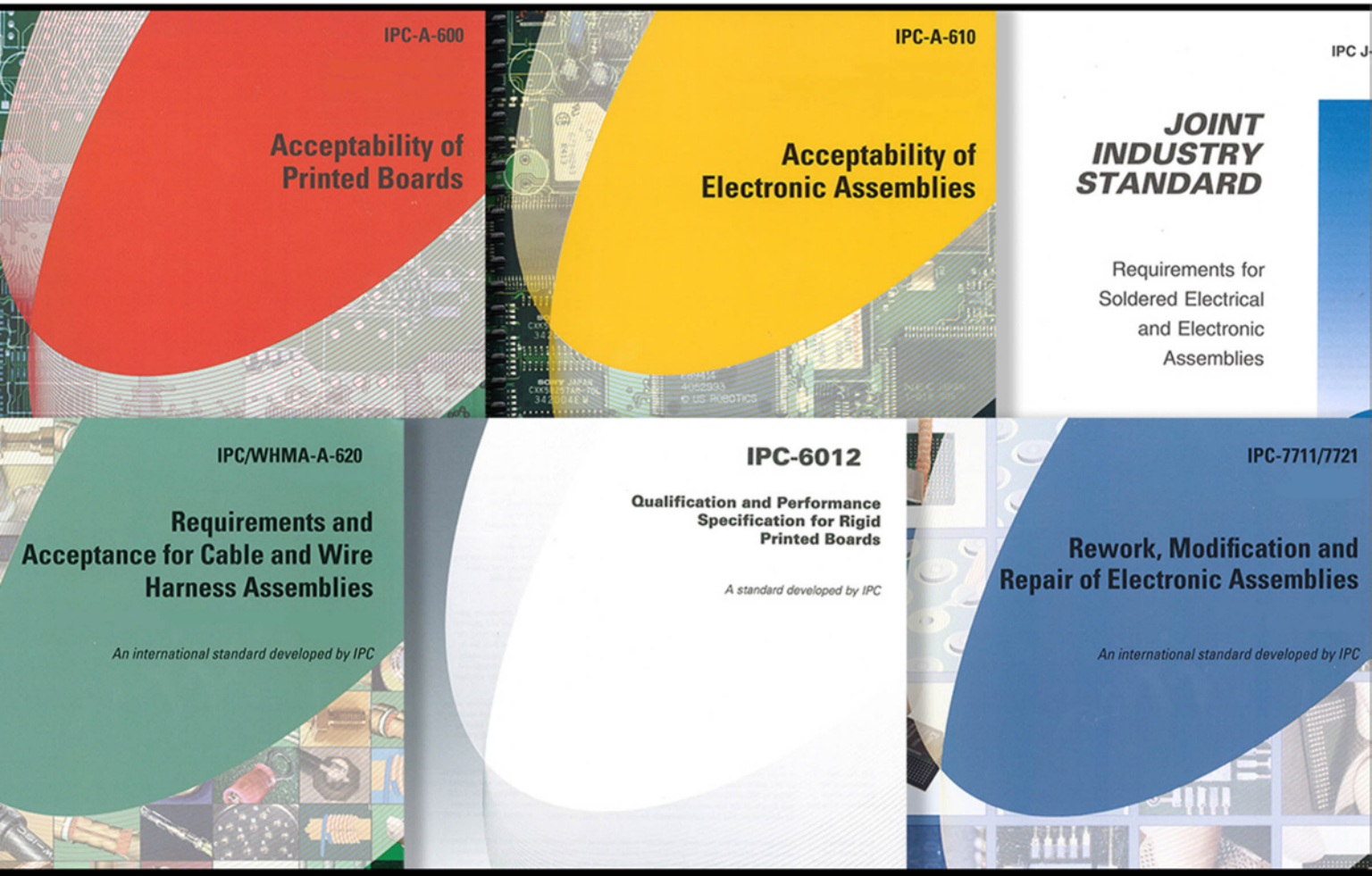

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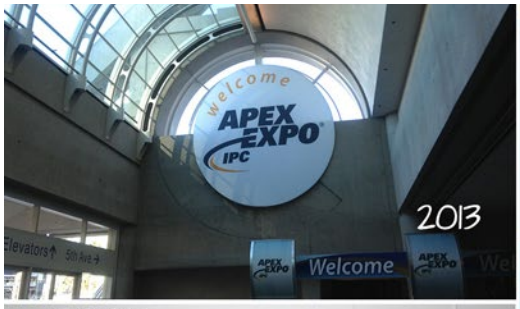


assembly industry. EXPO, the trade show floor exhibition, was designed to ensure that each exhibitor, regardless of booth size, is provided an equal opportunity to select exhibit space and that all show rules are fairly and uniformly applied to all exhibitors.

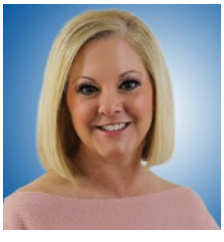
To that end, the exhibitor lottery drawing has remained the best way to guarantee each exhibitor has an equal opportunity to choose the best exhibit space. In keeping with IPC's 40-year policy and to support the integrity of this important industry event for all paid exhibitors, no one who is not a part of the event's official program can conduct or sponsor a function of any kind from the opening to the closing of the event. In short, any function that is not part of the event's official program is prohibited.

In 2009, the trade show name was changed to IPC APEX EXPO and is now viewed as a single trade show event consisting of many different elements and serving the full electronics supply chain. In keeping with IPC's original intention of seeking a new and independent trade show event that would better serve industry members—IPC APEX EXPO—IPC remains committed to keeping this a cost-effective show as it pertains to exhibit space while promoting the philosophy of competition based on the merits of the company products and services, not only the size of their booth or hospitality events.

Today, the show's technical conference, paper and poster presentations, professional development, and robust business networking opportunities make for a full week for all levels of participants and a show that seems to get better every year.

A year after its inception and to this day, IPC APEX EXPO has been recognized as one of the top 250 trade shows in the U.S. and has received many accolades since. In 2012, 2013, and 2018, IPC APEX EXPO was awarded one of the 25 fastest-growing shows for attendance by Trade Show News Network (TSNN). In 2017, IPC APEX EXPO was awarded one of the 50 fastest-growing shows for attendance and exhibiting companies by Trade Show Executive Magazine. Most notably, in 2019, IPC APEX EXPO was recognized as the fastest-growing association show for attendance in the United States for 2016–18 by the Trade Show News Network (TSNN).

As we inch closer to the 25th anniversary of IPC APEX EXPO in 2025, it's nice to share how it all began and I'm proud to say I've been here every step of the way. **SMT007**



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

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Standards Development Propels the Industry Forward

Feature Article
by Teresa Rowe, IPC

IPC standards are recognized around the world. As our industries delve more deeply into challenging areas, such as ultra high density and electric vehicles, standardization within and across the supply chain becomes even more pressing.

Standards development task groups will meet face-to-face at IPC APEX EXPO, April 6–11. The technical discussions provide an opportunity to share knowledge, learn from other subject matter experts, and network with others who have similar technical interests. You may remember the urgent need for coffee and the possibility of snagging a cookie or a granola bar to maintain the necessary energy level for these marathon sessions.

The schedule for this year's meetings looks as complicated and intense as years gone by. For 2024, we are adding several new projects, including IPC's Factory of the Future initiative and the IC Substrates Task Group, which meets in an international setting for the first time.

Staff liaisons for the task groups are busy preparing the documentation and hosting our technical community. Files are being prepared, comments gathered and logged, and drafts updated. This electronic documentation will be available in IPC Works for standards committee members prior to the meeting in Anaheim. Those who wish to download it can bring their individual copies to the meetings.

Industry leaders will be present at each meeting to guide the industry in decision-making; IPC staff will assist the leaders. In some groups, the leaders are new to their roles, and they, too, are excited to have the opportunity to lead discussions. No matter the size of the group meeting, everyone present will be encouraged to participate and contribute to the true spirit of standards development.

Several groups have presentations that will provide a foundation for recommended changes to existing content. These presentations may be made by A-Teams reporting on action items assigned at an earlier meeting. The A-Teams, known for their quirky names such as "The Inkpendables," "Testing, Testing, 1, 2, 3," and "Terminal Happiness," have continued to work diligently on technical content for task group consideration at this year's meeting. We expect spirited conversations on these topics.

If you have not attended a standards development meeting, we encourage you to stop by a task group meeting and see what's happening. From design to final products, there is something for everyone. Make sure to introduce yourself to the staff. We welcome all to IPC APEX EXPO 2024. **SMT007**

Teresa Rowe is IPC's senior director of assembly and standards technology.

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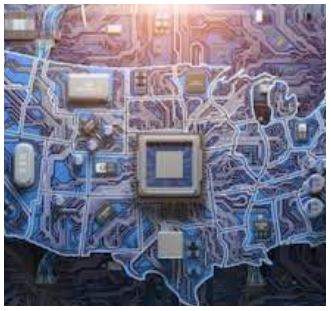
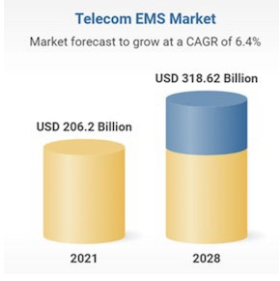
EDITOR'S PICKS



IPC Releases February 2024 Global Sentiment of the Electronics Supply Chain Report

When asked about expectations for a recession in 2024 and 2025, industry executives believe there is a 39 percent chance of a recession in 2024 and a 34 percent chance in 2025. Notably, manufacturers in Europe report a 2024 recession would most likely begin in Q1 while those in North America believe it would likely begin in Q2.

Telecom EMS Market Poised for Growth with Increasing 5G Adoption and High Internet Penetration



The telecom electronics manufacturing services (EMS) market is set to witness significant expansion, bolstered by a compound annual growth rate (CAGR) of 6.41% from 2021 to 2028. This growth trajectory is largely attributed to the escalating demand for smartphones, burgeoning internet services, and an uptrend in smart electronic gadgets.

I-Connect007 Explores Designing for Reality With ASC Sunstone in Latest Podcast Series


Matt Stevenson

In this new season of the "On The Line With..." podcast, host Nolan Johnson visited ASC Sunstone in Mulino, Oregon, for a series of in-depth conversations with VP, Manager, and published author Matt Stevenson about the specifics that can affect your circuit board during the manufacturing process.

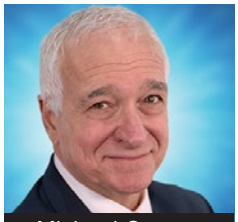
Exploring Cold Milling as an Alternative PCB Component Removal Method

Thermal stress can induce various issues, including delamination, warping, compromised solder joints, and damage to heat-sensitive components like integrated circuits or capacitors. To counter these risks, one approach involves a unique process called "cold milling," designed to mitigate the adverse effects of additional thermal stress.

SMTA Introduces Ultra High Density Interconnect (UHDI) Symposium

SMTA is excited to introduce a new event for the electronics manufacturing industry which takes place on March 26, 2024 in Peoria, Arizona, USA. The Ultra High Density Interconnect Symposium will be held at the Peoria Sports Complex. This event sets the stage for researchers, engineers, designers, and academia to address the complexities and innovations reshaping the world of Ultra HDI technology.

Brain Power on Tap: IPC's Thought Leaders Program Provides Insights on Key Issues


Michael Carano

IPC's strategic vision is to build its leadership position on topics and issues that drive change for the industry. With these goals in mind, IPC has created the Thought Leaders Program (TLP), comprised of industry experts who will assist IPC on key industry issues and offer valuable insights to IPC members and key external stakeholders.

Ansys, Schaeffler Collaboration Drives Sustainable Product Development

Ansys will strengthen Schaeffler's digital thread by democratizing simulation and improving material intelligence across engineering disciplines. For example, including data about material composition in the research and development process will result in more innovative and sustainable products.

Global Semiconductor Manufacturing Industry Poised for 2024 Recovery, SEMI Reports

The global semiconductor manufacturing industry recovery is taking hold with electronics and IC sales increasing in the final quarter of 2023 and more growth projected for 2024, SEMI announced in its fourth quarter 2023 publication of the Semiconductor Manufacturing Monitor (SMM) report.

Best Papers from SMTA International Announced

Winners were selected by members of the conference technical committee. This year awards were given for the "Best of Proceedings" category but also for a new designation of "Best Practical and Applications-Based Knowledge." A plaque is given to primary authors of all winning papers for these exceptional achievements. The authors will receive their awards during a ceremony at SMTA International 2024.

Yamaha Introduces Latest Upgrades to its 3D AOI Systems


Yamaha YRi-V

Yamaha Robotics SMT Section has revealed performance-boosting upgrades for the YRi-V 3D AOI system, including faster board handling, multi-component alignment checking, and enhanced LED coplanarity measurement.

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Career Opportunities

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Senior Printed Circuit Board (PCB) Designer

Garmin is seeking a full-time Senior Printed Circuit Board (PCB) Designer in our Olathe, KS, Cary, NC or Salem, OR location. Relocation allowance provided.

Essential Functions

- Partners with Product Design Engineers and Mechanical Engineers to produce loosely defined complex PCB Designs that are timely, robust, and economical
- Key technical contributor and ECAD/MCAD interface expert in the design of new or challenging PCB designs or projects bearing directly on organizational objectives
- Leverages thorough knowledge of Garmin processes and procedures through leadership of major research or product development projects consisting of multiple modules or sub-projects that align the team with Garmin and departmental mission and vision
- Leads the advancement of team capabilities through identification and testing of new PCB design technologies for ECAD software
- Connects engineering teams, communicating effectively with all project stakeholders (ex. Electrical, Process and Mechanical Engineering)
- Serves as an expert in PCB Design and Engineering processes including mentoring one or more PCB Designers

Basic Qualifications

- Associate's Degree in Electronics Technology or related field AND a minimum of 10 years relevant experience performing similar consumer electronics industry duties OR an equivalent combination of education and experience
- Demonstrates expert proficiency using Garmin's ECAD tools (Cadence Allegro)

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GARMIN

Lead eCAD Librarian

Garmin is seeking a full-time Lead eCAD Librarian in our Olathe, KS or Cary, NC location. Relocation allowance provided.

Essential Functions

- Ability to define library solutions with a cross functional understanding of the overarching library impact
- Manages/delivers a global library database solution within established Garmin standards
- Develops reliable solutions for exceedingly complex eCad Library parts which require the regular use of individual thought and creativity
- Verifies/validates schematic symbols and physical footprints for parts created by other librarians for accuracy
- Leads advancement of team capabilities through identification and definition of eCAD Library technical strategy
- Expert in evaluation of new eCAD features and capabilities as they relate to the eCAD Library
- Ability to define eCAD Library process for new technologies and capabilities
- Ability to mentor one or more eCAD Librarians

Basic Qualifications

- Possess a minimum of 15 years experience in an eCAD librarian position OR an equivalent combination of education and relevant experience
- Demonstrates expert proficiency of eCAD Library best practices and design standards for all PCB technologies used in current Garmin designs
- Demonstrates a working knowledge of all types of electronic components
- Demonstrates proficiency to interpret Manufacturer Data Sheets
- Demonstrates proficiency of PCB manufacturing processes

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Career Opportunities

Field Service Engineer (or) Field Service Technologist

SCHMID Group is currently in search of a Field Service Engineer or Field Service Technologist for its USA subsidiary SCHMID Systems, Inc. (SSI). This position acts as an advocate for the company providing worldwide customer service on-site or remotely.

General scope of duties includes machine installation, commissioning, maintenance, and repair of PLC and PC-controlled systems primarily in the company's proprietary industrial machines within the wet chemical processing industry as well as automation technology.

This is a full-time exempt position with limited supervision. SSI provides full-time employees different options for benefits including medical, dental, vision, flex, 401K, and more.

Contact Bob Ferguson:
Ferguson.ro@schmid-group.com

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pluritec®
MACHINES FOR PRINTED CIRCUIT BOARDS

Sales Manager, Remote

Location: North America

Experience: Minimum of 4 years in the PCB industry

Job Description: We are looking for a highly motivated and experienced sales manager to join our team. The ideal candidate will have a minimum of 4 years of experience in the PCB industry and a proven track record of success in sales. The successful candidate will be responsible for developing new business and sales network, maintaining existing accounts, and achieving sales targets. The candidate must be able to work independently, have excellent communication and interpersonal skills, and be willing to travel.

Qualifications:
- Minimum of 4 years of experience in the PCB industry
- Proven track record of success in sales
- Excellent communication and interpersonal skills
- Strong technical process background
- Ability to work independently.
- Willingness to travel

Education: Technical or related field preferred

Compensation: Competitive salary and benefits package

Pluritec develops high end equipment for the printed circuit board (PCB & PCBA) manufacturing industry. We offer a wide range of equipment including drilling and routing, wet processing, spray coating and more. We are a global supplier with more than 3,000 systems installed worldwide.

Contact Nicola Doria
nicola.doria@pluritec.org to apply.

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Career Opportunities

The Test Connection, Inc.

Rewarding Careers

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

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

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

Associate Electronics Technician/ Engineer (ATE-MD)

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

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

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TAIYO AMERICA

Europe Technical Sales Engineer

Taiyo is the world leader in solder mask products and inkjet technology, offering specialty dielectric inks and via filling inks for use with microvia and build-up technologies, as well as thermal-cure and UV-cure solder masks and inkjet and packaging inks.

PRIMARY FUNCTION:

1. To promote, demonstrate, sell, and service Taiyo's products
2. Assist colleagues with quotes for new customers from a technical perspective
3. Serve as primary technical point of contact to customers providing both pre- and post-sales advice
4. Interact regularly with other Taiyo team members, such as: Product design, development, production, purchasing, quality, and senior company managers from Taiyo group of companies

ESSENTIAL DUTIES:

1. Maintain existing business and pursue new business to meet the sales goals
2. Build strong relationships with existing and new customers
3. Troubleshoot customer problems
4. Provide consultative sales solutions to customer's technical issues
5. Write monthly reports
6. Conduct technical audits
7. Conduct product evaluations

QUALIFICATIONS / SKILLS:

1. College degree preferred, with solid knowledge of chemistry
2. Five years' technical sales experience, preferably in the PCB industry
3. Computer knowledge
4. Sales skills
5. Good interpersonal relationship skills
6. Bilingual (German/English) preferred

To apply, email: BobW@Taiyo-america.com with a subject line of "Application for Technical Sales Engineer".

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Career Opportunities

BLACKFOX
Premier Training & Certification

IPC Instructor
Longmont, CO

This position is responsible for delivering effective electronics manufacturing training, including IPC certification, to adult students from the electronics manufacturing industry. IPC Instructors primarily train and certify operators, inspectors, engineers, and other trainers to one of six IPC certification programs: IPC-A-600, IPC-A-610, IPC/WHMA-A-620, IPC J-STD-001, IPC 7711/7721, and IPC-6012.

IPC instructors will primarily conduct training at our public training center in Longmont, Colo., or will travel directly to the customer's facility. It is highly preferred that the candidate be willing to travel 25–50% of the time. Several IPC certification courses can be taught remotely and require no travel or in-person training.

Required: A minimum of 5 years' experience in electronics manufacturing and familiarity with IPC standards. Candidate with current IPC CIS or CIT Trainer Specialist certifications are highly preferred.

Salary: Starting at $30 per hour depending on experience

Benefits:
- 401k and 401k matching
- Dental and Vision Insurance
- Employee Assistance Program
- Flexible Spending Account
- Health Insurance
- Health Savings Account
- Life Insurance
- Paid Time Off

Schedule: Monday thru Friday, 8–5

Experience: Electronics Manufacturing: 5+ years (Required)

License/Certification: IPC Certification–Preferred, Not Required

Willingness to travel: 25% (Required)

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Prototron Circuits

Sales Representatives

Prototron Circuits, a market-leading, quick-turn PCB manufacturer located in Tucson, AZ, is looking for sales representatives for the Utah/Colorado, and Northern California territories. With 35+ years of experience, our PCB manufacturing capabilities reach far beyond that of your typical fabricator.

Reasons you should work with Prototron:
- Solid reputation for on-time delivery (98+% on-time)
- Capacity for growth
- Excellent quality
- Production quality quick-turn services in as little as 24 hours
- 5-day standard lead time
- RF/microwave and special materials
- AS9100D
- MIL-PRF- 31032
- ITAR
- Global sourcing option (Taiwan)
- Engineering consultation, impedance modeling
- Completely customer focused team

Interested? Please contact Russ Adams at (206) 351-0281 or russa@prototron.com.

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Career Opportunities

EMA Design Automation®

Technical Marketing Engineer

EMA Design Automation, a leader in product development solutions, is in search of a detail-oriented individual who can apply their knowledge of electrical design and CAD software to assist marketing in the creation of videos, training materials, blog posts, and more. This Technical Marketing Engineer role is ideal for analytical problem-solvers who enjoy educating and teaching others.

Requirements:

- Bachelor's degree in electrical engineering or related field with a basic understanding of engineering theories and terminology required
- Basic knowledge of schematic design, PCB design, and simulation with experience in OrCAD or Allegro preferred
- Candidates must possess excellent writing skills with an understanding of sentence structure and grammar
- Basic knowledge of video editing and experience using Camtasia or Adobe Premiere Pro is preferred but not required
- Must be able to collaborate well with others and have excellent written and verbal communication skills for this remote position

EMA Design Automation is a small, family-owned company that fosters a flexible, collaborative environment and promotes professional growth.

Send Resumes to: resumes@ema-eda.com

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ARLON ELECTRONIC MATERIALS

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

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

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

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

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

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

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Career Opportunities

INSULECTRO

Are You Our Next Superstar?!

Insulectro, the largest national distributor of printed circuit board materials, is looking to add superstars to our dynamic technical and sales teams. We are always looking for good talent to enhance our service level to our customers and drive our purpose to enable our customers to build better boards faster. Our nationwide network provides many opportunities for a rewarding career within our company.

We are looking for talent with solid background in the PCB or PE industry and proven sales experience with a drive and attitude that match our company culture. This is a great opportunity to join an industry leader in the PCB and PE world and work with a terrific team driven to be vital in the design and manufacture of future circuits.

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MivaTek Global

Field Service Technician

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

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

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

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

More About Us

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

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Career Opportunities

eptac

TRAIN. WORK SMARTER. SUCCEED.

Become a Certified IPC Master Instructor

Opportunities are available in Canada, New England, California, and Chicago. If you love teaching people, choosing the classes and times you want to work, and basically being your own boss, this may be the career for you. EPTAC Corporation is the leading provider of electronics training and IPC certification and we are looking for instructors that have a passion for working with people to develop their skills and knowledge. If you have a background in electronics manufacturing and enthusiasm for education, drop us a line or send us your resume. We would love to chat with you. Ability to travel required. IPC-7711/7721 or IPC-A-620 CIT certification a big plus.

Qualifications and skills

- A love of teaching and enthusiasm to help others learn
- Background in electronics manufacturing
- Soldering and/or electronics/cable assembly experience
- IPC certification a plus, but will certify the right candidate

Benefits

- Ability to operate from home. No required in-office schedule
- Flexible schedule. Control your own schedule
- IRA retirement matching contributions after one year of service
- Training and certifications provided and maintained by EPTAC

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American Standard Circuits

Creative Innovations In Flex, Digital & Microwave Circuits

CAD/CAM Engineer

Summary of Functions

The CAD/CAM engineer is responsible for reviewing customer supplied data and drawings, performing design rule checks and creating manufacturing data, programs, and tools required for the manufacture of PCB.

Essential Duties and Responsibilities

- Import customer data into various CAM systems.
- Perform design rule checks and edit data to comply with manufacturing guidelines.
- Create array configurations, route, and test programs, penalization and output data for production use.
- Work with process engineers to evaluate and provide strategy for advanced processing as needed.
- Itemize and correspond to design issues with customers.
- Other duties as assigned.

Organizational Relationship

Reports to the engineering manager. Coordinates activities with all departments, especially manufacturing.

Qualifications

- A college degree or 5 years' experience is required. Good communication skills and the ability to work well with people is essential.
- Printed circuit board manufacturing knowledge.
- Experience using CAM tooling software, Orbotech GenFlex®.

Physical Demands

Ability to communicate verbally with management and coworkers is crucial. Regular use of the telephone and e-mail for communication is essential. Sitting for extended periods is common. Hearing and vision within normal ranges is helpful for normal conversations, to receive ordinary information and to prepare documents.

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PODCAST! Designing for Reality with ASC Sunstone

In Season 2, listeners can expect in-depth conversations with VP/manager and published author Matt Stevenson about the specifics that can affect your circuit board during the manufacturing process. Part tutorial, part tips and tricks, Stevenson details the interrelationships between design, fabrication, yields and cost optimization.

I-007eBooks

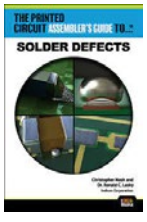
Process Control

by Chris Hunt and Graham K. Naisbitt, GEN3

In this book, the authors examine the role of SEC test and how it is used in maintaining process control and support for objective evidence (OE.) Issues, including solution choices, solution sensitivities, and test duration are explored.

The Companion Guide to... SMT Inspection: Today, Tomorrow, and Beyond

Advances in artificial intelligence have been limited exclusively to the human world until now, but there are far-reaching applications within the manufacturing sector, too. In this guide book, learn how equipment providers like Koh Young are enabling the Smart Factory of the Future by adopting AI to generate "knowledge" from "experience."



Solder Defects

by Christopher Nash and Dr. Ronald C. Lasky, Indium Corporation

This book is specifically dedicated to educating the printed circuit board assembly sector and serves as a valuable resource for people seeking the most relevant information available.

The Evolving PCB NPI Process

by Mark Laing and Jeremy Schitter, Siemens Digital Industries Software

In this book, the authors look at how market changes in the past 15 years, plus the slow-down of production and delivery of materials and components in recent years, have affected the process for new product introduction (NPI) in the global marketplace. As a result, we feel that PCB production companies need to adapt and take a new direction to navigate and thrive in an uncertain and rapidly evolving future.

Smarter Manufacturing Enabled with Inspection Data

with expert Ivan Aduna

In this 12-part webinar series, viewers will learn about secure data collection, AI-powered solutions to manage and analyze data, and how to leverage the IPC CFX-QPL to succeed in the transformation to Industry 4.0.

Our library is open 24/7/365. Visit us at: I-007eBooks.com

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