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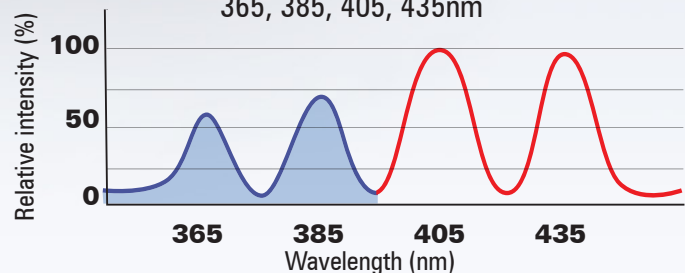
4 Smart Automation Seamless integration with MES systems

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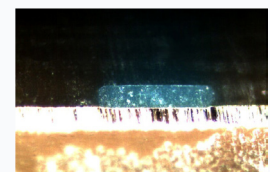
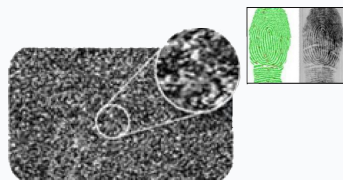
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Community

M A G A Z I N E



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Overheard on Social Media

**“Congrats David Raby and team!
Outstanding accomplishment!”**

— **Chris Peters, USPAE**

(Reaction to a Global Electronics Association post about STI Electronics building 1 million boards for night vision goggles)

“Participating in this conference helps us connect with experts in the same field, learn and share many new issues. It is an honor to participate.”

— **Erika Gem, Allied Electronics Automation**
(Reaction to a post about APEX EXPO 2025)

**“2 GREAT leaders sharing perspective!
Thank you John W. Mitchell and Otto Pukk!!”**

— **Audrey McGuckin, McGuckin Group**

(Reaction to a post from Evolve – Powered by the Global Electronics Association post spotlighting the two leaders discussing how sustainability challenges affect daily operations)

“Great to see IPC evolving into the Global Electronics Association. This kind of clarity and progression is exactly what’s needed right now to help fill the skills gap and give people multiple avenues to grow and thrive.”

— **David Philip Scutter, TMIET**
(Reaction to John Mitchell’s GEA announcement)

“Great to see sustainability taking center stage! We’ve helped several EMS partners turn excess and slow-moving inventory into value.”

— **Brian Chen, CEO, Caly Components**

(Reaction to I-Connect007 article “Beyond Recycling”)

“Sounds really insightful.”

— **Simon Wright, Germany**

(Announcement for IPC Day EMS Europe 2025)

“Gracias por compartir información importante en estos tiempos de nerviosismo y difícil toma de decisiones para poder continuar dentro del el mercado de la manufactura electrónica!!!”

— **Cesar Armando Gomez Martinez, ACL Staticide**

(Reaction to a Global Electronics Association blog about recent tariff announcements)

Join the conversation!

We welcome your insights on the issues and activities surrounding the electronics industry. Follow some of our LinkedIn pages:

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In the Spirit of... **'Think Global, Act Local'**

 By Sanjay Huprikar, Chief Global Officer, Global Electronics Association



Think Global Act Local: Sanjay, with his powder blue Fender, performs with Association "house band" Tin Whiskers at IPC Builds in Milwaukee.

In an increasingly interconnected world, the electronics industry sits at the heart of rapid innovation and complex supply chains. By monitoring global challenges and implementing region-specific initiatives, the Global Electronics Association is continuously striving to exemplify the principle of thinking globally and acting locally in support of our members.

At a Global Level

We are actively following the key trends and developments shaping the future of the electronics industry. These include the opportunities and risks associated with the advancement of AI, smart manufacturing and factories of the future, supply chain disruptions, sustainability and environmental initiatives, and trade flows. By building and maintaining strong relationships with multinational corporations and global partners, the Association is well-positioned as the leading voice on global issues affecting our industry.

A Standard for All

One of our core global contributions is the development of widely adopted industry standards, such as the IPC-A-610 for electronics assembly acceptance criteria and the IPC-A-620 for cable and wire harness acceptance criteria. These standards help ensure product quality, reliability, compatibility, and cost efficiency across international borders, enabling designers, manufacturers, and suppliers worldwide to work together seamlessly. Many of our standards have been translated into over 20 languages, allowing them to deliver real value and ease of use at a local level.

Working Together on Workforce

Another major area where the Global Electronics Association analyzes at a macro-level and executes at a micro-level is workforce development. We recognize the global skills gap in electronics manufacturing, and, along with the help of committees comprised of global subject matter experts, have developed industry-recognized certification programs, like IPC-A-600 and IPC-J-STD-001, which are then delivered through local training centers and institutions. These certifications help create job-ready talent that meets internationally recognized standards while addressing regional workforce challenges and needs.

Addressing Advanced Electronics Packaging

The Association is playing a leading role in preparing the industry for emerging technologies like advanced electronics packaging. Our global thought leadership on this topic ensures that our members remain ahead of the curve, especially when navigating various constraints and market demands.

However, each local region faces different barriers to implementing these new technologies, including infrastructure, investment, skilling, regulations, etc. The Global Electronics Association's solution



Recently, Gaurab Majumdar (left) and Sanjay Huprikar (right) visited with Balaji Srimoolanathan (center) from ADS Group Ltd. ADS Group is taking a leadership role in collaborating with multiple entities around the world to create communities focused on knowledge sharing and best practices.

has been to create region-specific initiatives. For example:

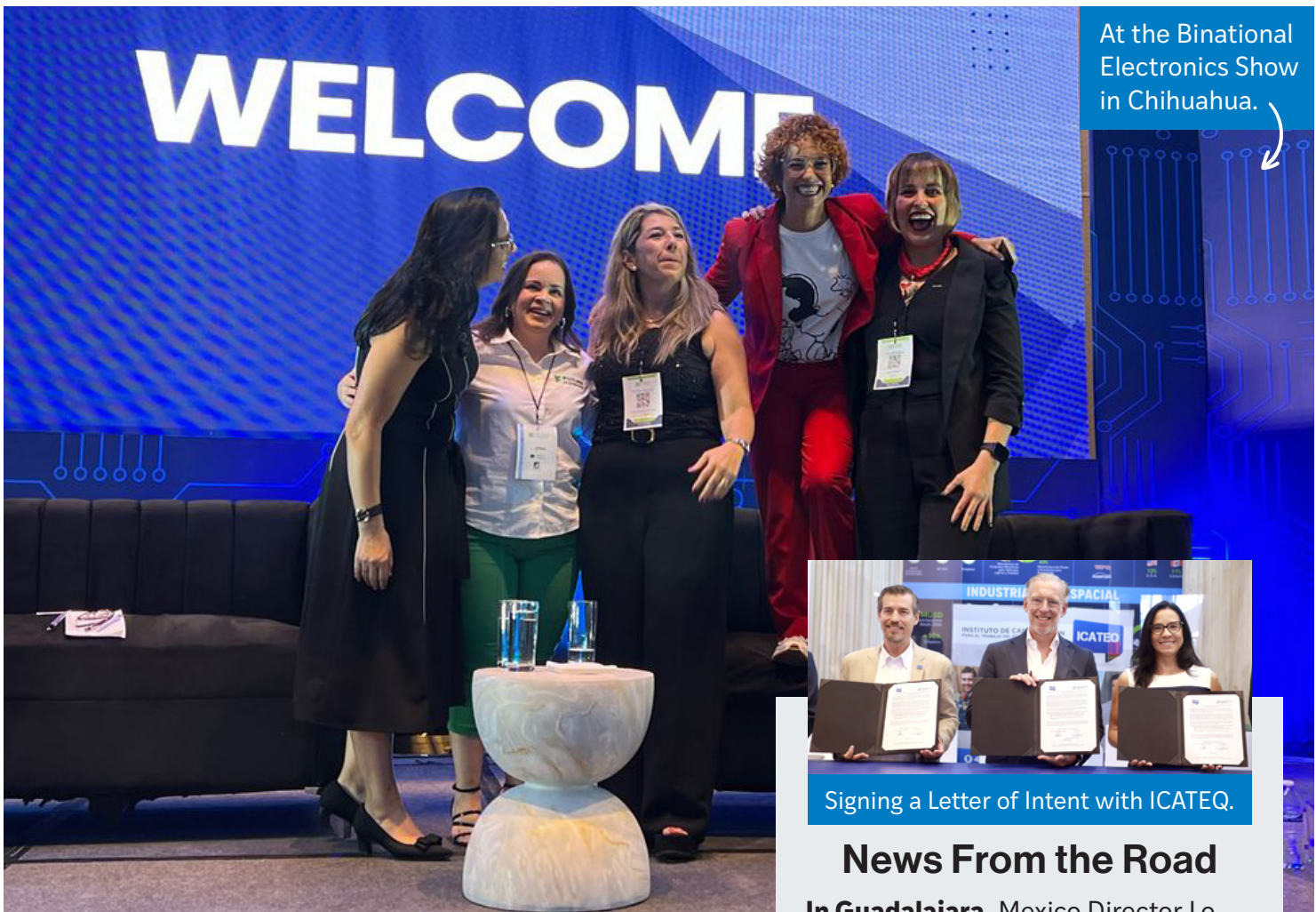
- In Southeast Asia, we are looking to develop local training programs through available funding with local governments
- In Europe, we are looking to partner with academia and research institutions on developing pilot lines through EU and member-state grant programs

The mark of a forward-looking association is acknowledgement and awareness that every region has its unique economic conditions, cultural nuances, regulatory environments, and operational limitations.

By aligning global strategies with local needs, we will continue to help our members stay competitive, compliant, and resilient in an evolving and interconnected global market as they build better electronics for a better world. 🌍

THE GLOBAL REPORT

The Global Electronics Association is connecting with its members all over the world



At the Binational Electronics Show in Chihuahua.

Deepening Member Alliances in Mexico

“Q3 was about turning momentum into measurable engagement across Mexico,” says Lorena Villanueva, director, Global Electronics Association Mexico. “The Global Electronics Association deepened ties with members and partners through new affiliations and visible industry moments. In Querétaro, we signed a Letter of Intent with ICATEQ (the state education institution), alongside Secretary of Sustainable Development Marco del Prete, officially welcoming ICATEQ as a new member.”

August also brought exciting growth with **Goaltech**, **PM Consulting Group**, and **DIRAM** as new members. “This reinforces Mexico’s role as one of the most dynamic regions in the Association,” Lorena says. 🌍



Signing a Letter of Intent with ICATEQ.

News From the Road

In Guadalajara, Mexico Director Lorena Vilanueva joined **Rehm Thermal Systems** to celebrate its 10th Anniversary and Technology Days, participating in the inauguration of Rehm's new Technology Center, and delivering a keynote on Mexico’s role in global electronics manufacturing.

In Guanajuato, we visited six advanced manufacturing plants, a powerful reminder of the innovation and talent shaping the region.

In Chihuahua, we participated in the Binational Electronics Show, where our director moderated the panel “Women Who Are Transforming Electronics,” spotlighting female leadership and academia-industry collaboration.

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An (IPC) Day Like No Other

IPC Days in Europe remain a popular avenue for members of the EMS supplier industry to gather and discuss their most pressing issues.

At **IPC Day EMS Europe** on Sept. 18 in Paris, more than 100 industry professionals gathered at the Astrolab, Musée de la Marine for networking. Panel sessions and workshops focused on the future of advanced electronics packaging.

Attendees explored the trends and technologies shaping the next era of electronics production: system-in-package design, PCB co-design challenges, and equipment and automation opportunities. Sponsors included **in4ma** and **IFTEC**.

A Gathering in Turkey

At **IPC Day Türkiye** in Izmir, also in September, more than 70 electronics professionals explored:

- SMT, inspection, and soldering advancements
- Operator ergonomics and ESD-safe performance
- Defect detection, design challenges and process optimization

The Global Electronics Association partnered with **EMT Electronics**, **Ankatek Elektronik**, and **ER-SA Elektrik** to host the event.

Europe Director Philippe Leonard also presented updates on IPC rebranding to Global Electronics Association, news on releases of IPC standards, and Evolve, the sustainability and circularity initiative.

“With a packed room and energized discussions, Izmir proves again that collaboration is at the core of progress in electronics manufacturing,” he said. 🌍



Advancing Government and Defense Interests

The future of advanced packaging is being shaped right here in the United States. In September, the Global Electronics Association acted as co-hosts with the **International Microelectronics Assembly and Packaging Society (IMAPS)** to bring together government leaders, the Defense Industrial Base, and industry experts to chart the path forward at the Onshoring Advanced Packaging Workshop in Arlington, Virginia.

Keynote speakers included **Dev Shenoy**, director of advanced technologies, USC Information Sciences Institute, University of Southern California; **Carl McCants**, principal engineer at Intel Corporation; **Michael Holmes**, program manager, Defense Advanced Research Projects Agency (DARPA) Next Generation Microelectronics Manufacturing; and **Dr. Yogendra Joshi**, DARPA Minitherms 3D program manager.

The mission of this workshop was to engage our workforce community in identifying the newly created advanced packaging programs. These programs address the U.S. government and defense requirements critical to the onshoring of the microelectronics assembly and packaging supply chain. 🌐



Electronics in Space

The Global Electronics Association partnered with the European Space Agency for the Electronics Manufacturing & Packaging Symposium (EMPS) 2025 in early October at the ESA/ESTEC headquarters in Noordwijk, the Netherlands.

This event focused on the latest developments in PCBs, electronic assembly, and packaging technologies. While space applications remained a core focus, the event also covered high-reliability market segments such as defense, automotive, medical, and data infrastructure, which are central to Europe's electronics manufacturing industry.

Alison James, senior director, Europe, said the event was "a wonderful example of cooperation between the public and private sectors on the important topic of defence. In a new geopolitical landscape, this will become increasingly important. There is critical work to be done in the EU."



Subscribe! Stay up-to-date on the latest news and insights on advanced electronics packaging! Subscribe **here** to the I-Connect007 Advanced Electronics Packaging Digest, a monthly email to your inbox. **Read the latest issue here.**

The Big One: CEMAC 2025

in By Blair Yan, Communications Manager, Global Electronics Association East Asia

The Global Electronics Association's largest-scale event in China, CEMAC 2025, took place Sept. 25–26 in Shanghai. The event gathered leaders from the electronics manufacturing industry for keynotes, technical forums, standards technical committees, and committee meetings, alongside industry standards releases, initiative launches, and collaborative discussions on the future of the industry.

“CEMAC was a great success,” says Sydney Xiao, president, Global Electronics Association East Asia. ‘Shaping a Sustainable Future’ was not only the

theme of this year’s conference but also a shared mission for the entire industry. Against the backdrop of technological breakthroughs, green and low-carbon transformation, and the restructuring of global supply chains, the Association is focused on advancing industry standards and technological innovation, strengthening talent, and enhancing supply chain resilience and sustainability. We’re working hand in hand with all sectors of the industry to drive innovation and transformation in electronics manufacturing.” 





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Growing by Leaps and Bounds in India and Southeast Asia

in By Gaurab Majumdar, Vice President,
Global Electronics Association India



Q3 2025 marked a period of strong momentum for the Global Electronics Association across India and Southeast Asia, with member engagements, high-participation events, and new standards initiatives driving the region toward a more resilient and globally competitive electronics ecosystem.

Membership and Growth

Membership closed Q3 on a strong note. As of July 31, 2025, we've reached 273 members in India and 68 in Southeast Asia. This represents a year-to-date increase of 44 new members in India and three in Southeast Asia, bringing the regional total to 341 members, up by 47 compared with 2024.

Member Engagement and Regional Expansion

The Association engaged with stakeholders across multiple regions. At **Efftronics Systems** in Vijayawada, discussions focused on training and certification, while a visit to **Keerthi Industries** highlighted its contributions as a PCB supplier for aerospace, defence, and medical sectors. In Karnataka, **Dexcel Designs** was

On the Move: Tracking Team India

The Global Electronics Association India team hosted several technical sessions, standards updates, and wire harness and hand-soldering competitions in the past few months. Here are the highlights:

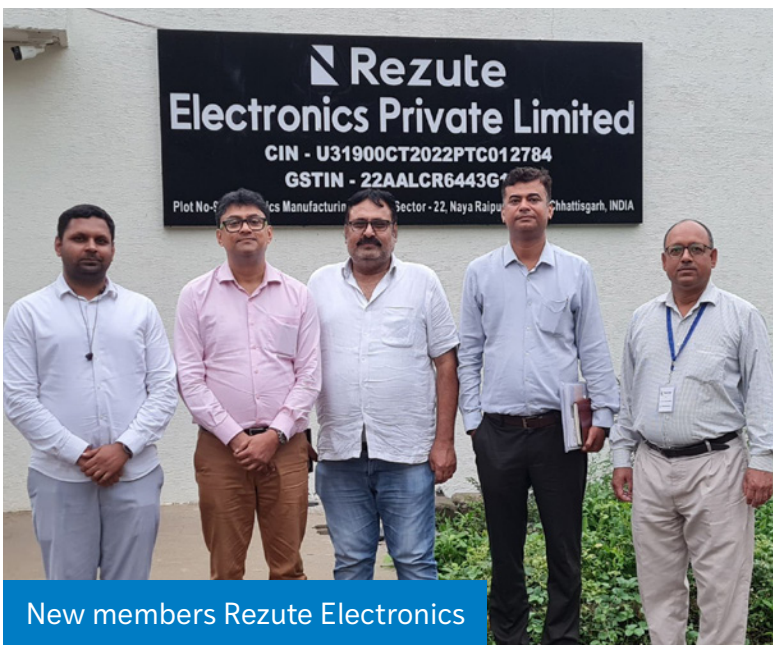
- A semiconductor chip industry session in Melaka, Malaysia
- A PCB design and ESD session in Selangor, Malaysia
- A wire harness competition, along with multiple IPC Standards sessions, in Penang, Malaysia, that together attracted over 400 participants
- The first Hand Soldering Skill Challenge in New Delhi, India
- A technical session in Chennai on electronics assembly and wire harness
- A webinar on IPC-A-610J vs. J-STD-001J and a Hand Soldering Fundamentals in Lamphun, Thailand
- The first wire harness competition in Bangkok
- A PCB and PCBA Conference at BITEC, together drawing participation from more than 130 professionals

More technical sessions and competitions are planned in Vietnam and Singapore, including NEPCON Vietnam and a Southeast Asia-specific webinar on coating removal in electronics.





A Technical Session in Chennai



New members Rezute Electronics



A panel session in Bangkok

introduced to membership opportunities, workforce courses, and the latest IPC-A-610J and J-STD-001J training. In the North, **Rezute Electronics Pvt. Ltd.** joined as a new member in Raipur, and discussions began with **Lucknow Metro Rail**.

We also met with the Japan External Trade Organization (JETRO) in Bengaluru to invite a Japanese delegation to IEMI 2026 (Jan. 29-30). In Jakarta, engagement with the Indonesian Electric Motorcycle Manufacturers Association confirmed its participation in IEMI 2026.

In the Philippines, **Northstar Technologies** explored membership benefits, participation in the up-

coming Wire Harness Competition, and involvement in the Philippines Standards Committee. In Malaysia, a strategic meeting with the Ministry of Science, Technology and Innovation (MOSTI) in Putrajaya focused on collaboration in semiconductor packaging, e-mobility, and workforce development.

As part of our long-term commitment to the region, Global Electronics Association India also plans to appoint an India intelligence manager and a government intelligence head to deepen market insights, strengthen policy engagement, and better align global strategies with India's growth priorities. 🌍

Tech, Talks, and Training in China

It was a busy summer for Global Electronics Association China. From sustainability training to networking and its biggest event, CEMAC 2025, these efforts are connecting Association members to help them succeed in today's business climate.

Standards training: Lead sustainability expert Peter Zhou provided an in-depth interpretation of ESG core concepts and their application in business operations in the IPC-1401 ESG Management System Standard training session in Suzhou on July 10. There were nearly 50 participants representing 41 companies.

Getting connected: SUNSDA technical expert Mark Li led a training on IPC-2591 (Connected Factory Exchange) on Aug. 1 in Shenzhen for 20 industry experts. He focused on explaining the standard's framework and its practical application in digital factory development.

Not just for social reasons: The Shenzhen CIT Club hosted a get-together on Aug. 16 to facilitate technical exchange and professional networking, and the South China Member Networking Meeting took place on Aug. 24 in Chengdu with 40 representatives from 17 companies. 🌈



A recent media seminar marked an important milestone in Japan. Dr. John W. Mitchell, president and CEO of the Global Electronics Association, joined Mr. Nobuhiro Endo, Honorary Advisor of NEC, and Mr. Akira Amari, former Member of Parliament and key architect of Japan's national semiconductor strategy, in a dialogue on the opportunities and challenges facing Japan's electronics industry.



A Taiwan Member Networking Event at the Taipei International Industrial Automation Exhibition brought together companies from the manufacturing, electronics, software, and equipment sectors.

'Hello, AI, I'm Your IPC Standard'

What happens when AI meets IPC standards? On Aug. 22, the Global Electronics Association hosted a technical seminar, "AI and the Factory of the Future," at the Taipei International Industrial Automation Exhibition, focusing on the application of IPC-2591 CFX and the advancement of the Qualified

Products List (QPL). A group of 81 participants from 58 companies discussed the practical results of AI and IPC standards in smart manufacturing, including case studies on predictive maintenance and quality optimization, showcasing the innovation value driven by data. 🌈

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Standards, Certifications, and New Initiatives in India



Saurab Saxema (left) and Gaurab Majumdar (center) handed out certificates to top-performing participants during the Hand Soldering Skills Challenge at IPCA Electronics Expo India 2025 in August.

Standards development in India and surrounding regions is really beginning to take shape.

The **Vietnam Standards Committee** has been growing stronger, and an initiative was launched in India to develop Mobile & Consumer Electronics Manufacturing Process Guidelines. Survey findings from 15 companies were presented, with the study now expanding to 200+ organizations to address process reliability and quality standards. We've hired a professional agency to capture input from industry, which will help refine the guidelines for broader acceptance.

Meanwhile, the **Indian Project Team 6-10J** (IPC-2232), **Guidelines for Printed Board Design and**

Manufacturing of IoT Products, is preparing to release its Final Draft for Industry Review (FDIR).

In workforce development, 1,000 CIT and CIS certifications were completed, and 150 operators and trainers were certified across India and Southeast Asia. Updates on the IPC-A-610J and J-STD-001J revisions were rolled out through targeted training and webinars. New programs with hands-on training on “Zero Defect Soldering” and “Fundamentals of Cable and Wire Harness” were conducted in Sri Lanka. In Singapore, members are engaged in education programs aimed at accelerating workforce skills and supporting organizational goals. 🌍



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Come Together



Tom and his wife Renate with Timmy, a mini Aussie, and Lulu, a mixed breed they adopted from a shelter.

Tom Marktscheffel used data to build CFX into a global factory standard

in By Sandy Gentry, Contributing Editor, Community Magazine

When Tom Marktscheffel, director of product management software solutions at ASMPT, looks back on his nearly three decades in electronics manufacturing, one word stands out: data.

“Data is the new gold,” he says. Without it, automation, artificial intelligence, and the factory of the future are impossible. With it, the industry can move from manual, error-prone processes to smart, connected systems that make real-time decisions.

That vision lies at the heart of the Connected Factory Exchange (CFX) standard, which Tom has helped lead since its inception. Today, he chairs the 2-17: Connected Factory Initiative Subcommittee and 2-17A: IPC-CFX Standard Task Group and is an active member of the CFX A-team, the Plug & Players. These are working groups of volunteers shaping how factories communicate and operate worldwide. Besides his CFX activities, he chairs the 2-10: Electronic Product Data Description Committee and co-chairs 2-17B: IPC-HERMES-9852 Standard Task Group.

Why CFX Matters

Nearly a decade ago, the industry faced a communication problem. Each equipment vendor had its own “standard” for data exchange—if it had one at all. Integrators and software providers spent countless hours writing translation layers to get machines to talk to each other. “It was like trying to build a global factory where every machine spoke a different language,” Tom says.



CFX changed that. By defining not only what data is communicated, but also how it is structured and transmitted, the standard ensures that every machine can “speak the same language.”

Tom often explains it with a simple analogy: “When you call someone on your phone, you don’t think about whether they’re using an iPhone or Samsung or anything else. The protocol just works. That’s what CFX does for factory equipment.”

Today, CFX provides structured, normalized data for everything from machine performance and process control to predictive maintenance and energy management. That consistency enables powerful applications—automation, analytics, and AI—that depend on clean, comparable data.

A Global Effort, With Local Challenges

CFX is a truly global initiative. Its working group spans the United States, Europe, and Asia, though time zones make collaboration challenging. “For



Tom and Michael Ford were instrumental in forming the CFX standard.

someone on the West Coast, it might be 6 a.m., while it's evening in Asia," Tom explains. "But people still show up, because they believe in the work."

Interestingly, while most of the active development team is based in the U.S. and Europe, adoption has been strongest in Asia. The Shanghai office has championed CFX in China, and several companies in Asia have showcased the standard's capabilities in action. In the U.S. and Europe, it has gained more traction in the market and is now established as the standard of communication in EMS factories.

"The funny thing is, sometimes my first connection with a company comes through sales discussions, and then I find out they're also part of our A-team," Tom says. "That's how these stories weave together."

Evolution Through Collaboration

From its launch at APEX EXPO 2019, CFX has grown through member-driven innovation. Version 1.0 focused on integrating machines with manufacturing execution systems (MES), reducing the costly custom work that integration once required. Later revisions expanded to include inspection data, predictive maintenance, and process optimization.

Every six to nine months, the A-team publishes a

new version. Each is backward-compatible, ensuring factories never lose functionality when upgrading. "That's one of the biggest strengths of CFX," Tom says. "It evolves with technology—AI, sustainability, robotics—without leaving anyone behind."

The process is rarely dull. Members bring proposals, debate their merits, and code solutions into the free software development kit (SDK) that underpins CFX adoption. Occasionally, disagreements flare. "Once, after months of discussion, another company dropped in a code proposal that bypassed the process," he recalls. "The team was frustrated, but we worked it out. In the end, collaboration always wins."

A Personal Journey

Tom's Global Electronics Association journey began in 2015, when Michael Ford invited him to join a traceability committee. He was hooked. "Suddenly I wasn't just hearing from customers; I was hearing from the entire industry," Tom says. "That broader perspective was fascinating."

From there, he helped launch CFX, driven partly by his background as an R&D manager. "It hurt to see my developers spending so much time on data translation instead of building customer value," Tom says.



“We knew the industry needed something better.”

The turning point came in 2019, when CFX made its public debut at APEX EXPO. Vendors across the show floor displayed the CFX logo on their machines, feeding real-time data to a cloud simulation. “I could open my smartphone browser, show an unexpected machine stop, and people saw it just worked. That broke the ice.”

Life Beyond Standards

For all his technical focus, Tom has a life firmly rooted in the outdoors. Living near the mountains in Germany, he enjoys skiing, sledding, biking, and hiking, often accompanied by the family’s two dogs. His wife is active in dog sports, and one of their pets, a mini Australian shepherd, is even a trick-dog grand champion.

“Me, I’m more the entertainment guy with the dogs,” he says, laughing.

Tom Marktscheffel

- **IPC Committee Activity:** Tom is involved in 25 committees, a combination of chairing or active involvement in a variety of subcommittees, task groups, A-teams, and councils.
- **Career:** 25+ years in SMT manufacturing, R&D manager background
- **Award winner:** President’s Award (2025); Dieter Bergman Fellowship Award (2023); Rising Star (2022)
- **Hobbies:** Skiing, biking, hiking, and dog walking

Looking Ahead

As retirement approaches, Tom has no plans to step away from the Association. “I’ve worked in this industry for 25 years,” he says. “I could just relax, but why waste the experience? This allows me to keep contributing without the pressure of delivery deadlines, but with plenty of challenges to solve.”

Those challenges include sustainability and the emerging Digital Credential Exchange standard, which will extend communication beyond the factory to governments and across enterprises. Together

with CFX, it will complete the digital foundation of the Factory of the Future.

For Tom, the motivation is simple: the people and the problems. “Committee meetings are never boring,” he says. “We bring challenges to the table, and together we find solutions. That’s what keeps me coming back.” 🧑🏻‍🤝‍🧑🏻

Cut to the Chase

What September's Fed shift now means for manufacturers

in By Dr. Shawn DuBravac, Chief Economist, Global Electronics Association

The United States Federal Reserve began easing after a first rate cut in September, marking the transition from its inflation-fighting stance toward a phase of interest-rate normalization. Markets and forecasters increasingly expect a modest reduction in the coming months, with subsequent rate cuts to follow in 2026. Yet it is important to recognize the start of easing will not take us back to the near-zero interest rates of the 2010s. The new cycle is likely to feature policy rates that remain historically higher for longer than many anticipate.

There are strong structural and policy reasons for this higher baseline. The Fed's own projections point to a funds-rate path that steps down only gradually

from restrictive territory, not a quick march toward the lower bound.

In the June 2025 Summary of Economic Projections, the most recent publicly available figures, the median participant anticipates the federal funds rate at 3.9% at the end of 2025, 3.6% at the end of 2026, and 3.4%

at the end of 2027. The longer-run estimate, a proxy for the neutral rate, sits at 3%. Even the "destination" is notably above the near-zero world that prevailed for much of the past decade. The futures market currently expects slightly more aggressive cuts over the next 15 months, but with a similar narrative. It expects a federal funds rate of 3.5%–3.75% by the end of 2025 and 2.75%–3% by the end of 2026.

Chair Jerome Powell recently cautioned that the neutral rate, the real interest rate that neither stimulates nor restricts economic growth, may be higher compared with the 2010s, reflecting shifts in productivity, demographics, fiscal dynamics, and the global balance between desired saving and desired investment. If the neutral rate is higher, the Fed will need a higher nominal policy rate to achieve the same degree of restraint or stimulus, even once inflation is near target. That points to a floor on how low rates can reasonably go in this cycle.

Market structure is pushing in the same direction. Real yields are positive along the curve, and term premia have reappeared after years of being compressed by global savings, quantitative easing, and disinflation. The New York Fed's ACM model shows Treasury term premia in positive territory in 2025, while U.S. Treasury



SHAWN'S SUGGESTIONS FOR MANUFACTURERS

- 1. Recalibrate your hurdle rates and capital-budgeting decisions.** Assume a structurally higher cost of capital when screening projects. Hurdle rates that were set during the 2015–2021 era likely understate the discount rate appropriate for the next several years. Rerun net present value and internal rate of return analyses with higher real rates, and prioritize projects with faster paybacks, robust cash yields, and flexibility under multiple rate scenarios.
- 2. Strategically lock in rate risk.** As easing begins, consider terming out a portion of variable-rate debt, especially for mission-critical capacity or long-lived assets. Blend-and-extend refinancings, interest-rate swaps, and interest caps can hedge exposures. Use the first cuts as a window to shop terms, not as a reason to wait for 2010-style lows that are unlikely to return.
- 3. Rethink equipment financing.** With policy rates stepping down only gradually and term premia positive, lease-versus-buy decisions may tilt toward operating leases for noncore assets, preserving balance-sheet flexibility. For core production assets with high utilization, fixed-rate purchase financing can protect margins against rate volatility. Work closely with OEM captives and banks to compare all-in costs and residual assumptions.
- 4. Tighten working-capital discipline.** Higher real rates increase the opportunity cost of cash tied up in receivables and inventory. Sharpen your credit policies, expand the use of dynamic discounting with key customers, and accelerate the cash conversion cycle through better demand forecasting and inventory optimization. Supply chains are no longer in crisis, which allows tighter reorder points and more surgical safety stocks.
- 5. Pressure-test your M&A math.** Valuation multiples tend to compress when real rates are higher. If you are a buyer, model more conservative exit multiples and cost of capital. If you are a seller, build a value story around resilient cash flows, pricing power, and cost takeout rather than relying on multiple expansion. Private credit remains available for quality deals, but underwriting is selective and covenants are stricter than in the last cycle.
- 6. Prioritize automation that substitutes for scarce or expensive labor.** Where labor availability and wage growth remain firm, automation and advanced analytics that raise throughput and reduce scrap can deliver high risk-adjusted returns even with a higher discount rate. Focus on modular deployments that show value within 12 to 24 months, then scale.
- 7. Reduce your complexity to release capacity and cash.** Higher real rates raise the cost of holding inventory and work in process. Trim low-velocity SKUs, standardize components, extend run lengths, and cut changeovers.
- 8. Strengthen supplier negotiations.** The ISM Prices Index and the Global Electronics Association's sentiment indexes indicate persistent input-cost pressure in key categories. Leverage multi-year volume commitments and vendor-managed inventory to trade price stability for demand visibility. Where feasible, dual-source critical components to reduce exposure to single-supplier price shocks.
- 9. Use the easing window to refinance receivables programs.** As the Fed trims rates, asset-based lending spreads may narrow modestly, even if standards stay tight. Refresh supply-chain finance and AR securitization facilities to capture incremental savings and diversify liquidity sources ahead of 2026.
- 10. Plan for currency and trade uncertainty.** Positive U.S. real yields can support a firmer dollar, which pressures exporters while reducing the cost of imported machinery and inputs. Build pricing strategies that can flex with exchange-rate moves, and continue to regionalize supply chains where total landed cost, policy risk, and lead-time benefits justify it.

data confirm that 10-year real yields remain above zero. Why does this matter? Positive real rates and a nontrivial term premium will keep borrowing costs for long-duration projects elevated relative to the past decade, even as the policy rate edges down.

Credit conditions also remain firm. The Fed's July Senior Loan Officer Opinion Survey reported tighter lending standards and weaker demand for commercial and industrial loans across firm sizes in the second quarter. Banks described standards as sitting on the tighter end of their historical ranges across most categories. Even if the funds rate declines, tight underwriting can keep all-in financing conditions restrictive, slowing the pass-through of policy easing to the real economy.

Manufacturing enters this next phase from a mixed starting point. The August ISM Manufacturing PMI stayed in con-

and pair each trigger with tactics you can execute immediately, such as swap ladders, forward-starting swaps, caps, or collars. Keep term sheets, board approvals, and hedge documentation pre-cleared so you can act the moment a favorable window opens.

Sequence investments so the early moves strengthen cash generation and resilience, then add capacity only when demand is confirmed through firm orders, signed contracts, or clear pipeline visibility. Focus first on throughput gains, yield improvement, maintenance that reduces downtime, and tighter working capital. With credit standards tight, treat internally generated cash as a strategic resource and recycle it into the highest-certainty returns.

Use operating data to fight margin compression by tracking prices paid, order rates, production, and inventories at a granular level, then adjust

purchasing and pricing in near real time. Apply dynamic pricing and mix man-

agement where customers value speed or reliability, and target scrap, rework, and changeover losses to lift yield. Use these signals to time purchases, negotiate vendor terms, and protect gross margin while demand remains uneven.

The overall takeaway is straightforward. The first cut in September will mark the start of normalization, not a return to an emergency regime. The Fed's own dots, a higher neutral rate, positive real yields, and sticky credit standards all argue for a world where money remains more expensive than it was for much of the last decade. Manufacturers that build this into their strategic thinking will be positioned to grow through a higher-for-longer environment. 🌈

“That backdrop suggests manufacturers will welcome incremental rate relief, yet they should not plan around a return to ultra-cheap money.”

tractionary territory, with the headline index at 48.7 and the production and employment subindices also subdued. Prices paid remain elevated, reflecting ongoing cost pressures in metals and other inputs. That backdrop suggests manufacturers will welcome incremental rate relief, yet they should not plan around a return to ultra-cheap money.

What To Do Now

Manufacturers should assume a funds rate that settles in the mid-3s over the next two years, with long rates staying positive, and translate that view into a practical rate playbook. Manufacturers should predefine explicit triggers for CapEx approvals and refinancings,

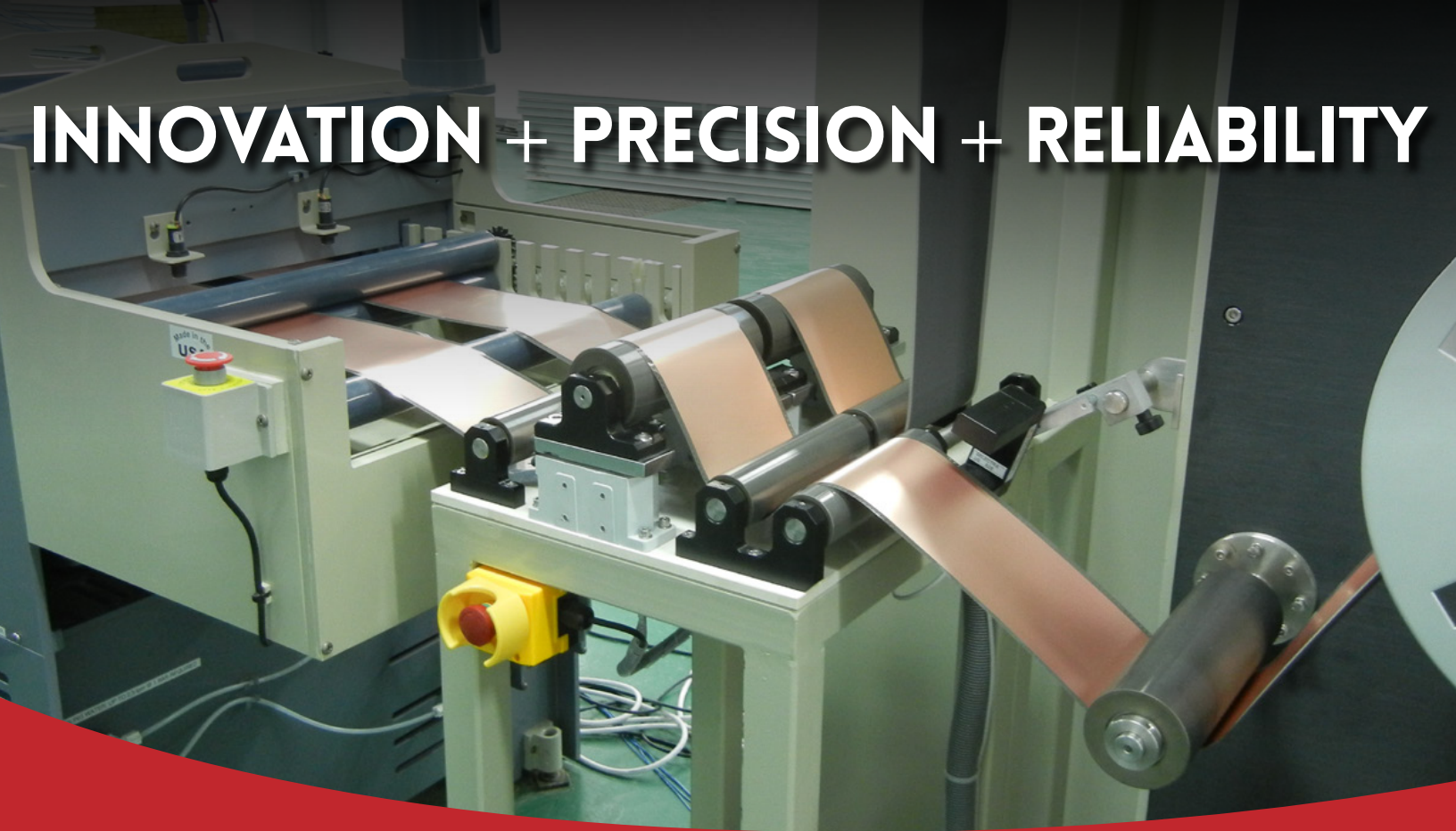
Are Tariffs Terrific or Trouble?

Tariffs are making waves across the electronics industry, and members of the Global Electronics Association are feeling the impact.

In a blog post, Global Electronics Association leaders Sanjay Huprikar, Sydney Xiao, Lorena Villanueva, and Joe Schneider shared their perspectives on how recent tariff announcements are shaping their regions, and what it could mean for the global electronics value chain.

“The general sentiment from most politicians and business leaders is that evading an all-out transatlantic trade war and achieving predictability and stability in the trade relationship was important in continuing a long-term dialogue on eventually dismantling barriers,” wrote Sanjay Huprikar, chief global officer.

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Life is a Highway

A family of 8 turned the entire United States into their backyard, while Dad kept the electronics industry moving

 By **Steven Bowles**, LM Associate Fellow, Lockheed Martin

The Opening Scene

It's 6:45 a.m. in a modern A-frame cabin tucked into the misty edges of the Cascade Range in Arlington, Washington. I've just made a quick Nespresso, checked my calendar of virtual meetings, and verified the Airbnb's Wi-Fi speed is holding steady. In the next room, my wife Lynsey corrals our six kids into breakfast while planning a day trip to Seattle's Children's Museum. By 7:30, I'm camera-ready in a makeshift office nook, leading a discussion on HDI PCB design for an IPC standards committee. After a busy day, our Bowles crew, ranging in age from 1 to 10 years old, is hands-on with activities and exhibits in the museum.

That duality—precision engineering in the morning, full-throttle exploration by evening—has defined our family's life for the past 18 months. While maintaining a full-time career in PCB engineering at Lockheed Martin and supporting multiple IPC working groups, our family of eight has traveled full-time across all 48 contiguous U.S. states. Our journey has been part professional juggling act, homeschooling experiment, and a masterclass in intentional living.

Plotting the Great Escape

In 2023, with remote work solidified and the housing market boiling over in our former home base near Denver, Lynsey and I decided to ditch the traditional model: Mortgage payments and static routines gave way to curiosity and Airbnb experiences.

Lynsey and I realized we didn't need a permanent house to continue raising our kids. But to make this work, we knew we needed flexibility, opportunity, and fast internet. In the course of our discussions, we made two pivotal decisions:

1. **Airbnb over RV life:** Rather than commit to towing a fifth-wheel or navigating campground reservations, we chose to bounce between Airbnb homes—sometimes for a week, usually for a month—chasing good weather, local charm, and reliable Wi-Fi.
2. **Work stays constant:** I would keep my full-time job and continue as a core contributor and chair for multiple IPC standards development committees, so wherever we landed, it had to support a high-functioning home office.

Once the decision was made to travel, we needed to create a system that would make it work. We filtered Airbnb listings by high-speed internet, family-friendly space, and a washer-dryer. Bonus points were given for nature access, board game closets, and enough bedrooms to keep sibling rivalries at bay.

A Typical Day on the Move

What is it like with six children living in a rented space in a place you don't know so well? It's different from day to day. In the morning, I might be leading a discussion on microvia design best practices with engineers from three different time zones. By dinner, I'm deep in a discussion about whether it's okay to eat cereal with a fork.





ROAD TRIP!

The Bowles family started from their home base in Colorado and followed this route to hit all 48 contiguous states in just 18 months. Some of their favorite spots included:

- The state of Washington
- Cape Canaveral, Florida
- Hilton Head Island, SC
- Lake Ozark, Missouri
- Great Wolf Lodge (multiple locations)

Here's a glimpse of a day-in-the life for us:

7 a.m.: I'm sipping coffee as I prepare for the day's meetings. Lynsey double-checks museum hours, national park trail conditions, or grocery pickup times.

8 a.m.: Our children start homeschooling in shifts. The oldest two work on Reading Eggs at the kitchen island while the two middles practice Life of Fred, and the two youngest learn numbers and letters. Both Lynsey and I are certified substitute teachers, so we felt comfortable taking on the homeschooling role.

9:30 a.m.: I join an IPC work group call on flex circuit design, speaking from a standing desk set up in a converted bedroom.

Noon: Lunch is served and the whole family reads scripture, discusses plans for the evening, and gets ready for either reading or nap time, depending on age and regenerative needs.

5 p.m.: Meetings wrap, and our family piles into our 15-passenger van for a hike, museum trip, or quick round of disc golf.

Evening: After dinner and some downtime, I might prepare slides for an internal knowledge share or work through a time-zone-delayed meeting. The kids build pillow forts or journal about the day's adventures.

The Global Electronics Association in Motion
Maintaining involvement in the Global Electronics Association while bouncing between Airbnbs presented its own challenges, yet surprising advantages.

I still serve as a key contributor, committee chair,

and project champion across numerous IPC working groups, including those focused on high density interconnects (HDI), flex circuits, and fabrication. My schedule includes everything from early morning votes to late-night email chains with international collaborators.

It didn't matter if I was in Maine, Montana, or Mississippi. If the Wi-Fi was solid and the calendar synced, I could contribute just as effectively as if I were in a corporate office. In fact, having to stay hyper-organized made me a more focused leader. I didn't have time for scope creep or rehashing old decisions. When you're living out of suitcases and sharing a living room with six kids, efficiency becomes second nature.

“When you're living out of suitcases and sharing a living room with six kids, efficiency becomes second nature.”

Homeschooling in the Contiguous United States
With Lynsey at the helm, our kids have experienced an extended education that few could imagine:

- **Science:** Plant biology and photosynthesis in Marysville, Washington and lizard species classification in Cape Canaveral, Florida
- **History:** Visiting the Liberty Bell in Philadelphia, and Mount Rushmore in South Dakota

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BY THE NUMBERS

23,000

Miles covered in 18 months

48

Number of states the Bowles have visited in 18 months. Still left: Alaska and Hawaii

8.5

Longest hours at once between stops (Washington to Montana, and Montana to North Dakota). "That was our threshold."

30

Longest amount of days living in one location (an Airbnb)

64

Total number of places they've stayed (**12** Airbnbs, **41** Hilton Hotels, and **11** times they had fun at Great Wolf Lodge)

45

Number of parks, attractions, and museums the family visited

Priceless

Number of times they got to stay with family



- **Math:** Playing the License Plate Tally Game while driving and learning about the physics of launching space vehicles in Rocket City (Huntsville, Alabama)
- **Miscellaneous:** Scavenger hunts absolutely everywhere!

Lynsey built unit studies around local landmarks and researched available curriculum to ensure the kids stayed on track academically.

"Our kids might learn about tectonic plates from a textbook, then go climb around them the next day in California," she says.

Learning milestones have held strong, and the kids have become confident, curious, and deeply bonded to one another. "They've become resourceful and adaptable," Lynsey adds. "They know how to read a subway map, cook dinner, and help pack a cargo trailer like a pro."

Flexibility, not frugality, was the driving force. Still, our family offset costs by booking long stays (28+ days unlocks big Airbnb discounts), cooking many meals at

home, and leaning on reciprocal museum memberships and free activities like farmers markets, disc golf, and community events.

Not Without Its Challenges

As much as this sounds like a utopia on wheels, this kind of endeavor doesn't come without challenges, whether it was interpersonal relations or workplace situations. Here are a few things we encountered:

- **Wi-Fi woes:** One mountain Airbnb promised “high-speed internet,” only to deliver 3 Mbps. I ended up leading a design discussion from the hotspot on my phone in the van.
- **Healthcare:** Telehealth helped, but finding dental care in small towns required creative scheduling and a few detours in routes.
- **Long drives:** To break up the monotony that comes with driving on the open road, our kids napped, snacked, studied, played road games, read books, and played Nintendo Switch.
- **Holidays on the road:** Christmas in an unfamiliar house was bittersweet. The solution was a Home Depot three-foot Christmas tree and shipping gifts via Amazon to a random Hilton Hotel.

However, these challenges forged deeper family resilience. We've had to learn to trust each other, fix what breaks, and hold the vision even when it gets hard.

What's Next?

We're now eyeing a potential move to an undisclosed location to settle down for a while and check off the last two states: Alaska and Hawaii. But even if we trade AirBnBs for a more permanent base, we plan to maintain our adventurous spirit.

“We still want to spend summers exploring and winters where the sun is shining,” Lynsey says. “A house won't change who we are, it'll just give us a place to unpack the suitcases.”

The Big Picture

The Bowles family didn't just prove that you can work from anywhere, we showed that you can live from anywhere, too. With 48 states behind us, our journey is far from over. Whether leading IPC standards reviews from a desert loft or teaching our kids geography by standing on state lines, Lynsey and I have built a life full of purpose, presence, and unforgettable views.

At the end of the day, my committee deadlines still get met. But my kids also grow up seeing that the world is big, fascinating, and theirs to explore. 🌈



DID YOU KNOW?

Steven Bowles received an IPC President's Award in 2023. He is a LM Associate Fellow and works as an electromechanical engineer. Steven followed in his father Scott's footsteps. [Read here](#) about their journey in the electronics industry in this *Community Magazine* article.



Beyond Federal Dollars

How state and local funding is powering workforce growth

in By Victoria Hawkins, M.A.Ed., Director, Workforce Grants and Funding, Global Electronics Association

Employers in the electronics sector face constant pressure to secure skilled talent. For years, federal funding has been the primary driver of workforce development initiatives. Yet, with federal dollars increasingly constrained, the most impactful opportunities are now being found at the state and local levels.

As director of workforce grants and funding at the Global Electronics Association, I identify and secure resources that help employers strengthen their talent pipelines through upskilling, apprenticeship, and workforce

development. Today, it's clearer than ever that state and local programs present some of the more powerful and timely opportunities: flexible solutions that employers can leverage right now to meet pressing workforce needs.

Spotlight on Texas: DETEX Corporation

This spring, DETEX Corporation was awarded a Texas Workforce Commission (TWC) Apprenticeship Critical Skills Initiative Grant to expand training capacity. With this funding, DETEX is investing in Registered Apprenticeships,

Fun Fact!

The United States has more than 550 local workforce development boards operating under the Workforce Innovation and Opportunity Act (WIOA). Together, they manage nearly \$3 billion in federal funding each year. What makes them unique is that each board is led by a majority of local business representatives, ensuring that employers themselves help design training programs to meet the real needs of their regional economies.

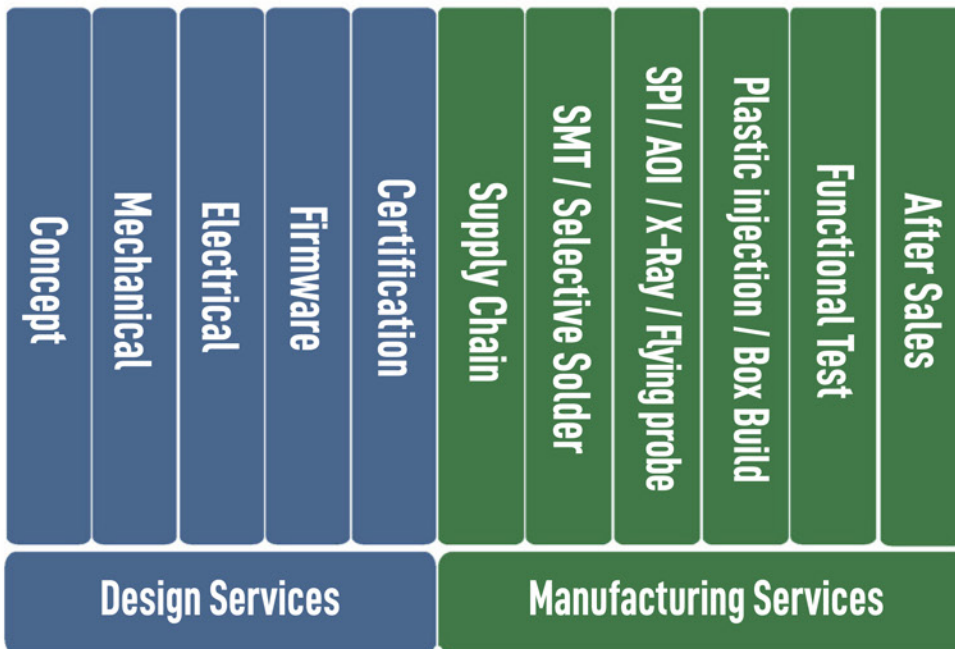
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“This grant has allowed us to upskill both current and future employees with the critical technical skills needed in our industry,” says Martha Rodriguez, HR manager at DETEX. “By building a strong, skilled



workforce and preparing team members for advancement, we boost morale and retention. Employees see long-term career paths here, and that makes a difference.”

The program’s success lies in strong community partnerships. DETEX recently collaborated with Texas State Technical College (TSTC), Skillpoint

Alliance, local high schools, the Global Electronics Association, and its local Chamber of Commerce to provide essential training. Together, these partners are sustaining a pipeline of talent that not only benefits DETEX but also strengthens the entire New Braunfels community.

Florida: Local Workforce Board Solutions

In Broward County, Florida, the local workforce board provides grant funding to help manufacturers launch apprenticeship programs. These funds reimburse on-the-job training (OJT) costs, allowing local companies to redirect resources toward instructor certification and/or program expansion.

With their successful implementation of our Registered Apprenticeship Program, results are almost immediate. Companies can successfully train apprentices and, due to cost savings, can consider multiple cohorts of apprentices while reimbursing costs for their training. This example demonstrates how even modest local grants can accelerate growth and lower barriers to entry for employers.

Workforce Solutions Rural Capital Area: Building Pipelines in Texas

In Central Texas, Workforce Solutions Rural Capital Area, supported by a federal grant, is partnering with

the Global Electronics Association and the Electronics Foundation to bring career awareness and pre-apprenticeship training into high schools. By providing hands-on activities, industry and career awareness, and ultimately embedding our Association curriculum into Career and Technical Education (CTE) programs, students will graduate with industry-recognized credentials that make them job-ready for local manufacturers.

This model has already proven successful at Diboll ISD in rural east Texas, where workforce board funding enabled students to complete pre-apprenticeship training before graduation. Many transitioned directly into employment with local manufacturers, demonstrating how strategic funding can create sustainable pipelines from classroom to career.

Why State and Local Funding Matters

Unlike federal programs, which can be broad and slow-moving, state and local grants tend to be more agile and responsive. They allow employers to target specific skill gaps, design customized training, and act quickly to meet workforce needs. When paired with community partnerships, these grants support not only the company but also the surrounding economy.

The most impactful funding is no longer found only in Washington; it’s in our own backyards.

At the Global Electronics Association, we help employers see and explore the possibilities in workforce development and funding. Our role goes beyond connecting you to apprenticeships, certifications, or pre-apprenticeship programs. We partner with you to reimagine what a sustainable talent pipeline looks like and uncover funding strategies that make growth attainable. From building future-ready teams to reducing training costs, the Association empowers employers to move beyond traditional models and tap into innovative solutions that strengthen competitiveness. 🌈



Connect with me!

Let’s talk about exploring your state and local funding opportunities to strengthen your workforce.

victoriahawkins@electronics.org
+1 847-597-2943

All About Apprenticeships

20

**APPRENTICES
REGISTERED IN
FEBRUARY 2024**



CURRENT NUMBER OF
**APPRENTICES
REGISTERED:**

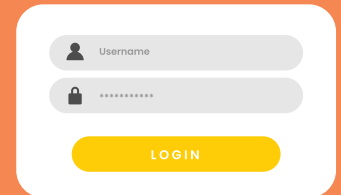
103

**WITH 50+ LATER
THIS YEAR**



14

**COMPANIES
REGISTERED
TO DATE**



**NUMBER OF
COMPETENCIES IN
AN OCCUPATION:**

ELECTRONICS ASSEMBLER:

**14 TECHNICAL
15 BEHAVIORAL**

PCB DESIGN ENGINEER:

**23 TECHNICAL
15 BEHAVIORAL**

PCB FABRICATOR:

**27 TECHNICAL
15 BEHAVIORAL**

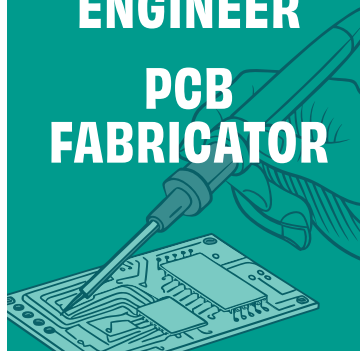
OCCUPATIONS:

3

**ELECTRONICS
ASSEMBLER**

**PCB DESIGN
ENGINEER**

**PCB
FABRICATOR**



9

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BUILDING PCBs *and Policy in* EUROPE

Group ACB champions advocacy, standards development, and technical leadership—one microvia at a time

in By Linda Stepanich, Contributing Editor, Community Magazine

How does a European PCB manufacturer navigate the competitive manufacturing landscape in Europe? By participating in standards development committee meetings, testifying before the European Commission on industry issues, and sponsoring hand-soldering competitions in the region.

Group ACB, based in France and Belgium, focuses on high-reliability applications. The 37-year-old company is also active in the Global Electronics Association, giving credit for helping ACB to raise awareness of electronics manufacturing in Europe.

“In fact, our largest PCB plant is in Belgium,” says Joachim Verhegge, plant director. “It is convenient that we are close to Brussels because the decision-making happens in Brussels.”

Kevin Tastets, group sales director, agrees. “In the U.S., you have the CHIPS Act, and we have set up the same thing in Europe with the European Chips Act,” he says. “The Association is very active in this, and

since we are a key player in the supply chain in Europe, this is a critical issue for us. We advocate for the industry by telling the European Commission that we need a supply chain in Europe, we need some players, and some independent supply for critical projects. During COVID-19, for example, when we had a shortage of respirators, the politicians discovered what happens when you depend on another continent.”

Advocacy at the EU Level: Making PCBs Visible in Brussels

PCB fabricators have learned they needed to raise a common voice for Europe, “because we are not too organized on a national level,” Kevin says. “For example, there is the French Association, the Italian Association, the German Association, and the UK—even if they are not part of the European Union they are still part of the European continent—and the Global Electronics Association can have a voice to speak for all the countries.”



► MEMBER PROFILE

Joachim singles out the Association's Alison James, executive director, Europe. "Alison is the bridge between all ideas," he says. Kevin agrees, indicating that "she has all the knowledge of how the European Union works. You can't just walk in and give your complaint; you need an Association to help."

Joachim and Kevin discovered that advocating for the European electronics industry can be challenging if policymakers are unaware of your work.

"They don't know you exist," Joachim says. "You have to show them what you do."

He described a visit from members of the European Commission to ACB in 2024. "We were able to demonstrate what a PCB is," Joachim says. "We illustrated how our PCBs are made, highlighted our struggles, and explained the supply chain challenges. We emphasized that copper is essential for our operations, yet we currently have only one copper sheet supplier in Europe. Additionally, we rely on base materials coming from Asia due to the limited supply of these materials in Europe."

"But they don't have a feeling about it," Kevin says. "In the minds of people, the chip is a chip, so they invest a lot in the chip. So, they put in the money to have the chip. But we say that, no, you need something to put the chip on. If any links of the chain are missing, you cannot manufacture electronics. That's the message we try to push with Alison's help. It's not only the PCB, but also the assembly."

Uniting a Fragmented Landscape

Joachim and Kevin agree that the Association's advocacy efforts have made a significant impact in conveying their message to the European Commission. "We are all companies with a core business of making PCBs," Joachim says. "We don't know how to open doors to address these complex policy matters, and the Global Electronics Association can be a huge benefit for each company."

"It is the voice of electronics in Europe," Kevin says.



"We are an SME company. Europe will not listen to an SME company. We need an association that bundles everything and says, 'Okay, my industry wants to talk with you, and you should listen.'"

He notes that the Association asks for input from industry members to effectively represent their needs. "They will advocate for PCB fabricators, EMS providers, and OEMs," Kevin says. "For instance, tariffs are a significant concern. Our message to the European Commission is clear: If you want to support us, eliminate all tariffs or at least put the tariffs on PCBs imported from outside Europe. This would encourage the industry to utilize local sources."

Standards, Research, and HDI Reliability

In addition to advocacy work, Group ACB participates in standards development committees, most recently IPC-4101, *Specification for Base Materials for Rigid and Multilayer Printed Boards*. Kevin recounts his first experience serving on a committee in 2016, and the detailed discussions on specific grades of material.

"The first topic we discussed was the specific material for the space grade quality called Appendix A grade, which is a cleanliness material," he says. "In that meeting, we had a point with a space stakeholder to have a specific grade of the material registered, one that suppliers can provide. That is the kind of discussion we can have in committee meetings."

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MORE INFO



Kevin and Joachim attend the conferences offered at APEX EXPO and often contribute technical papers. “It is always interesting to learn the latest developments in our industry during APEX EXPO,” Joachim says. “As Group ACB, we try to contribute to that as well. In 2022, Maarten Cauwe from imec won a Best Paper award for a paper we co-authored on an R&D project with the European Space Agency.”

Joachim has also presented at APEX EXPO, specifically on HDI microvia reliability. “HDI reliability is our focus point on the R&D level,” he says. “It’s not that we make state-of-the-art microvias in a way that they are not more complex than what others can do. But we can manufacture them in

a more reliable way. I would say that these recent R&D activities on HDI reliability have placed us at the top level in Europe.”

To add a bit of fun to their daily work, Group ACB encourages companies to participate in hand-soldering competitions by sponsoring events throughout the year. Joachim notes, “The winners over the past four or five years have been our customers who use our PCBs daily. This competition serves as a way for EMS or OEM companies to recognize outstanding operators on their teams. The competitors can travel, meet their peers, and compete against key players in the supply chain. We take pleasure in sponsoring these events.” 🍷

Off the Clock

Where can you find Kevin and Joachim when they are not at Group ACB?

“I recently bought a racing bike, so that’s where you’ll find me—on my bike.”

— Joachim Verhegge

“I cannot be as good as a Belgian on a bicycle, so I am somewhere on the road far beyond Joachim, trying to catch up to his wheels!”

— Kevin Tastets

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I-007eBOOKS

Hot Topics for Standards Development

 **By Joe Schneider**, Vice President, Global Electronics Association United States/Canada



One topic gaining significant momentum is liquid cooling. It's rapidly becoming a critical focus for new standard development.

Liquid cooling is transforming data center thermal management as power densities surge, especially with AI workloads. Industry leaders are seeing the

need to define minimum viable process standards addressing flush frequencies, biocide concentrations, and reuse criteria. This momentum is fueled by sustainability goals and manufacturing efficiency.

Despite limited public operational standards, ongoing efforts aim to develop comprehensive guidelines based on best practices and cross-industry collaboration to ensure reliability and eco-responsibility. This topic exemplifies how emerging technologies necessitate agile, clear, and practical standards to support rapid innovation and scale.

Other standards-related topics have also sparked dialogue. In sintering, discussions focus on silicon carbide (SiC) and gallium nitride (GaN) applications. We have been reviewing existing standards while identifying potential gaps, given the materials' growing use in advanced semiconductors.

Digital manufacturing innovations like Connected Factory Exchange (CFX) and Collaborative Robots (COBOTS) promise exciting opportunities for aligning standards to enhance interoperability and streamline processes. In my discussions, I've learned that our members are excited to learn about our Association's positive development with IPC-2591.

The unique cleanliness challenges in optics assem-

bly within cleanrooms brought attention to the need for tailored standards that go beyond current cleanliness protocols, accounting for optics' heightened sensitivity to microscopic contaminants.

Debates about dispensing processes—thermal pastes, coatings, and potting—centered on defining practical limits for voids, defects, and cosmetic imperfections, moving away from “zero tolerance” aims that challenge manufacturability.

Battery packaging for industrial energy storage systems is a critical safety concern. The lack of formal standards means a reliance on informal practices, raising questions about rework allowances, coating specs, porosity limits, and overall consumer and operator safety considerations. If these topics spark your interest, please contact me directly to join the exploratory team. This is an opportunity to shape future guidelines and contribute your expertise. 🧑🏻‍🔬

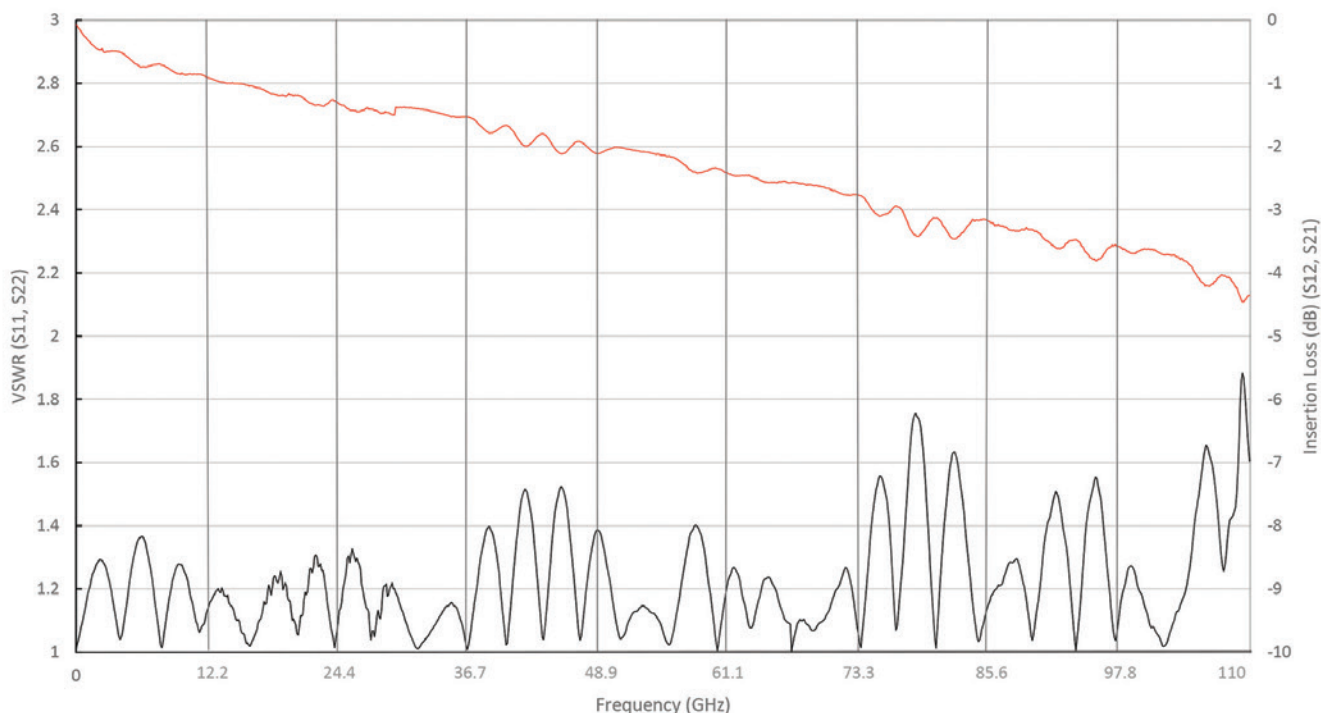
Member Meetups

Joe Schneider, vice president, Global Electronics Association United States/Canada, is somewhat new to the Association, and spent Q3 on the road getting acquainted with members. “I have enjoyed traveling to meet executives of our member companies and discussing innovation and standards,” he says. “I have been asking questions about how our member companies apply our standards and receiving questions about innovation and what we are working on that is new.”

Engaging with our members, Joe says, has been “a dynamic and rewarding experience, marked by a shared commitment to advancing our industry.”

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Test Data: VSWR/ Insertion Loss



OPERATOR:	DD	DATE:	03/25/24	MODEL #:	24359-011SF
FILE NAME:	DataFile#5.s2p	PART #:	81W70350		
DESCRIPTION:	1.0mm J 2H VL STRPL, DEDD-001, BBRT	LOT #:	160475&158981-000		

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Standards Update

IPC-4556A

Specification for Electroless Nickel/Electroless Palladium Immersion Gold (ENEPIG) Plating for Printed Boards

This performance specification sets the requirements for the use of Electroless Nickel/Electroless Palladium/Immersion Gold (ENEPIG) as a surface finish for printed boards. This performance specification defines ENEPIG deposit thicknesses for applications including soldering, wire bonding, and as a contact finish. It is intended for use by chemical suppliers, printed board manufacturers, electronics manufacturing services (EMS), and original equipment manufacturers (OEM). This standard may be used to specify acceptance criteria to meet performance requirements in addition to those found in the IPC-6010 series (IPC-6012, IPC-6013, and IPC-6018) of standards.

IPC-2591 V2.0

Connected Factory Exchange (CFX)

This standard establishes the requirements for the omnidirectional exchange of information between manufacturing processes and associated host systems for assembly manufacturing. This standard applies to communication between all executable processes in the manufacture of printed board assemblies—automated, semiautomated, and manual—and is applicable to related mechanical assembly and transactional processes. This Connected Factory Exchange (CFX) standard provides a true “plug and play” Internet of Things (IoT) communication environment throughout manufacturing, where all equipment, manufacturing processes, and transactional stations can communicate with each other without the need for the development and use of bespoke interfaces. CFX-enabled equipment and solutions from different vendors work seamlessly together.

IPC-4203C

Cover and Bonding Materials for Flexible Printed Circuitry

This standard establishes the classification system, qualification, and quality conformance requirements for dielectric films coated with an adhesive on one or both sides, which are to be used as cover material and/or bondply for flexible

printed circuitry and supported or unsupported adhesive films to be used in the fabrication of flexible printed circuitry.

IPC-7530B

Guidelines for Temperature Profiling for Mass Soldering Processes (Reflow and Wave)

This document provides useful and practical information for developing thermal profiles to produce acceptable SnPb and Pb-free electronics assemblies using reflow, vapor phase, laser, selective, and wave soldering equipment. The document also includes a troubleshooting guide for addressing common defects that can be attributed to profiling.

IPC-8911

Requirements for Conductive Yarns for E-Textiles Applications

This standard identifies categories and establishes a designation system and qualification/quality conformance requirements and test methods for conductive yarns used in e-textiles. The standard enables suppliers of conductive yarns to demonstrate their products’ performance against real-world processing and end-use environments, leveraging eight IPC Test Methods developed specifically for conductive yarns.

IPC-8981

Quality and Reliability of E-Textiles Wearables

This standard defines classification levels and testing thresholds to assess the reliability of e-textile wearables in their intended end-use environments. It establishes baseline criteria for evaluating durability under mechanical stressors, such as abrasion, flexing, and UV exposure, and environmental conditions, including perspiration, washing, water/saltwater, alkalis, and acids. Supported by 14 IPC Test Methods developed specifically for e-textile products, the standard also provides guidance for identifying affected and critical areas for reliability testing.

To view a complete list of published standards and standards revisions, translations, proposed standards for ballot, final drafts for industry review, working drafts, and project approvals, [click here](#).



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SICK as they celebrate
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CELEBRATING INNOVATION TOGETHER



Koh Young is proud to celebrate the installation of our 25,000th inspection system. The Zenith 2, renowned for its cutting-edge 3D measurement accuracy and reliability, was installed at SICK Hungary. This landmark moment coincides with SICK's 30th anniversary in Hungary, making it a dual celebration of innovation and partnership. Congratulations to SICK on three decades of excellence, and here's to many more years of shared success!

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CHAPTERS *IN ACTION*

The Electronics Foundation helps students connect, learn, and lead

in By Charlene Gunter, Senior Director, Electronics Foundation

Forward-thinking partnerships between students and local industry allow university and high school students to engage directly with industry professionals in gaining hands-on experience, developing in-demand skills, and broadening their career horizons.

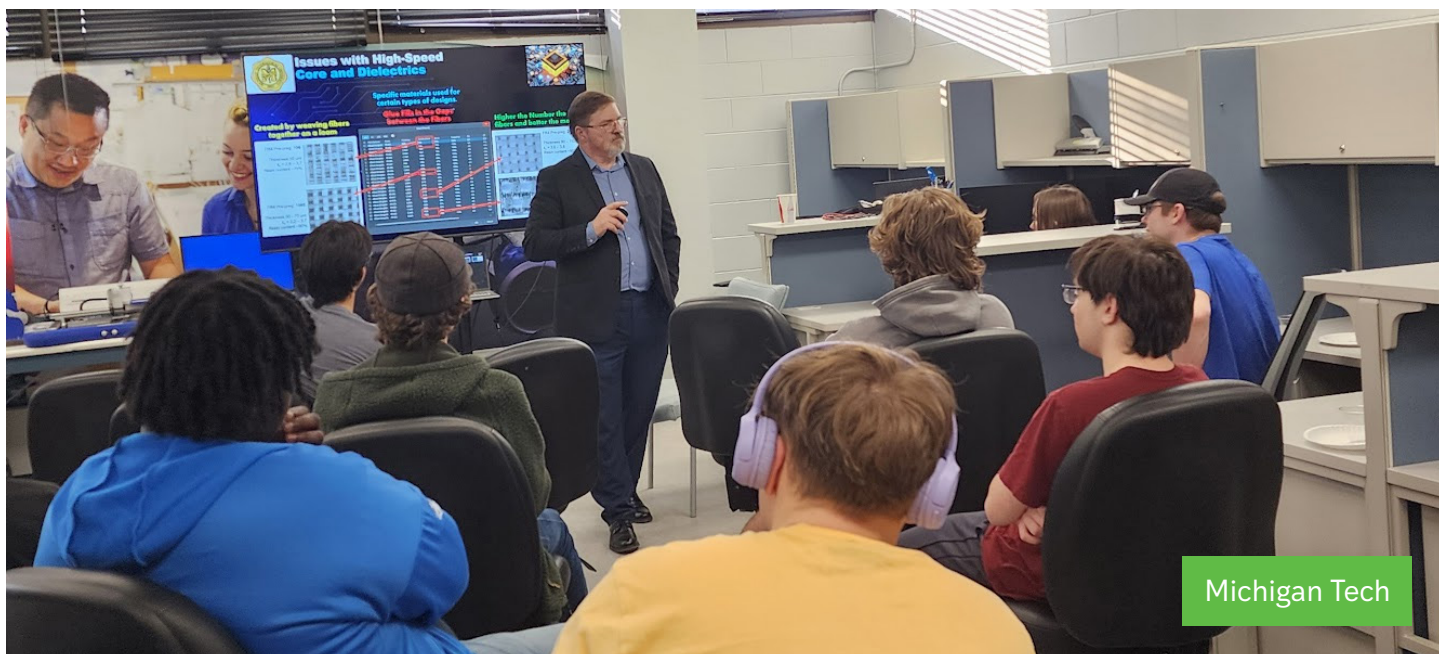
The Electronics Foundation (formerly IPC Education Foundation), part of the Global Electronics Association, is focused on preparing U.S. students for careers in the electronics industry by fostering collaborations through student chapters.

Here are five initiatives that are cultivating a new generation of talent ready to meet the challenges and innovations of modern manufacturing:

AUBURN UNIVERSITY STUDENT CHAPTER

The Auburn Student Chapter in Georgia hosted a virtual guest speaker session with **Matthew Geyer**, supervisor of Early Careers Global Talent Acquisition at Zebra Technologies in Naperville, Illinois. He spoke about resumé building and interview preparation, and students appreciated his energy and practical advice.





The Auburn student chapter leadership also participated in a tour of the Kia West Point Assembly Plant, where they saw high-volume electronics and automotive manufacturing in action. “It was such an eye-opening experience,” says **Waad Tarman**, outgoing chapter president. “We really enjoyed seeing how the entire production process flows seamlessly from start to finish. The mix of advanced robotics with skilled human work was impressive, and we loved observing the teamwork on the assembly line.”

One special moment for Waad was watching a finished car come off the assembly line every 60 seconds. “It was fascinating to see how every detail is checked before it rolls off the line,” she says.

The facility tour also demonstrated a wide range of STEM, business, and skilled trade career pathways that align with their interests, whether technical, managerial, or operations.

PARTNERING WITH MICROBOARD

Microboard, an EMS provider in Seymour, Connecticut, has partnered with the Electronics Foundation to support the company’s goal of fostering early interest and hands-on skills among the next generation of engineers and technicians.

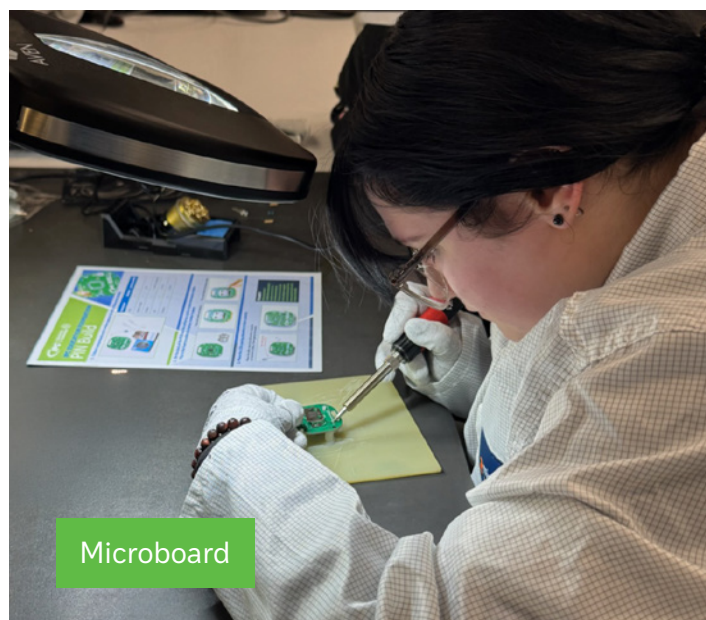
As part of our outreach efforts, Microboard offers presentations, factory tours, and experiential learning activities to local students. These opportunities help bridge the gap between classroom theory and the practical demands of electronics manufacturing.

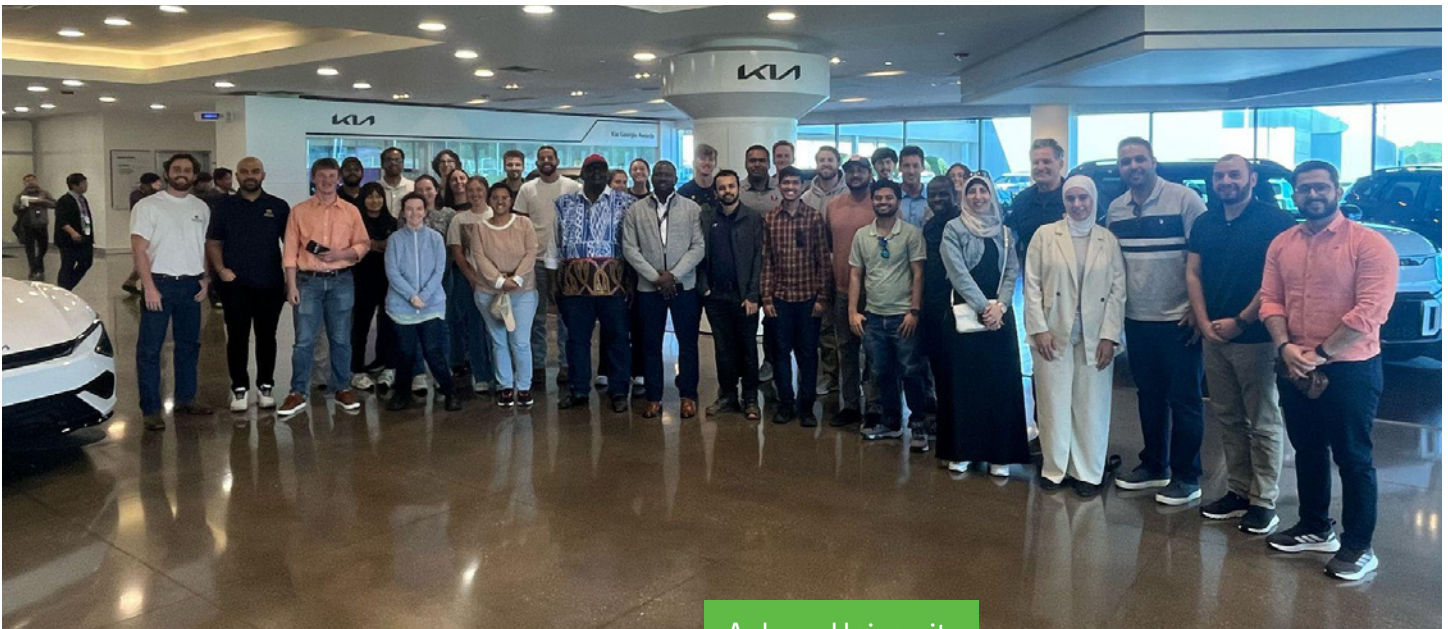
Nearby schools like Shelton and Ansonia High have

participated in facility tours and soldering workshops, where students build LED boards and explore manufacturing in action. By aligning with the Electronics Foundation’s mission, Microboard not only strengthens its own talent pipeline but also contributes to the broader effort of sustaining a skilled and inspired workforce.

PROTRONICS INDUSTRY EVENT AT NC STATE

Electronics professionals and students gathered at NC State University’s Monteith Engineering Research Center this year for a specialized hands-on soldering workshop. Protronics, a quick-turn contract manufacturer in Knightdale, North Carolina, facilitated the workshop, and the Electronics Foundation provided





Auburn University





all necessary materials for students to learn essential manufacturing techniques. The strong interest in the workshop and enthusiasm for further training opportunities reflect the growing demand for practical, career-oriented education.

MICHIGAN TECH STUDENT CHAPTER

John Watson, a senior PCB designer and mentor, addressed students at Michigan Tech during an on-campus industry topic networking event hosted by the student chapter under the leadership of Stu-

dent Board Liaison **Emily Daley**. His topic was “High-speed PCB Design: Signal Integrity and Beyond.”

“John integrated course content and provided real-life applications of why certain topics need to be considered,” Emily says. “He began with the fundamentals of circuit board stackup, then increasingly went into depth on PCB design practices and considerations. He highlighted key factors pertaining to stackup, trace widths, polygon usage, EMI/EMC considerations, shielding, and more.”

Emily says the group appreciated his helpful analogies to convey his points, regardless of the students’ level of experience in PCB design. “Overall, I feel it was very beneficial to all the students who attended,” she says.

INDUSTRY LEADERS!

The Electronics Foundation invites you to help our next generation of talent:

- Support hands-on learning experiences
- Host facility tours
- Share your expertise through on-campus speaking engagements
- Partner with us to inspire and engage students

Together, we can bridge the gap between education and industry, ensuring a well-prepared, enthusiastic workforce ready to meet tomorrow’s challenges.

Connect with us and let’s spark the next wave of innovation in electronics manufacturing.

UC, IRVINE STUDENT CHAPTER

The UC, Irvine Student Chapter has been experiencing a record high year of active student participation. With the start of our Irvine Hacker Fab initiative (the first student-led microfabrication program in the UC system), 44 new students joined within these two weeks of the start of the school year.

“This level of involvement is a drastic increase in club members from our 91 active members last year, and the number of students interested in such a short period of time has not been achieved in these past years,” says **Amirtha Chandrasekaran**, the chapter’s corporate outreach coordinator. “We are excited for more members to join as we progress on the Irvine Hacker Fab initiative and more events in the near future.” 

Electronics U

by Global Electronics Association

A fresh identity on learning for a global future

in By David Hernandez, Vice President of Education, Global Electronics Association

IPC EDGE is now Electronics U. Our rebrand marks more than a name or design change. It reflects the reality of who we are today: a trusted global hub for electronics training, professional development, and workforce advancement. At the heart of this transformation is our unwavering commitment to electronics education and training and our renewed engagement with members, partners, and the broader industry to shape solutions that strengthen the future of electronics manufacturing. Find us at: electronicsu.org.

Why the Rebrand Matters

For years, IPC EDGE has been recognized as a platform for certification and training. But our services have grown and so has our vision. Today, we empower learners, companies, and educators with comprehensive offerings that extend far beyond traditional certification:

- **Apprenticeships and workforce pipeline programs** designed to meet regional industry needs
- **Instructor-led online training** that connects professionals worldwide with experts in the field
- **Subscription-based learning paths** that give engineers access to curated resources tailored to their roles
- **Specialized offerings** like STEM kits and multilingual courses that expand access across audiences

Three Core Themes for Electronics U

1. **Credibility and trust:** Reinforcing our reputation as the go-to authority in electronics education.
2. **Flexibility and accessibility:** We demonstrate our commitment to meeting learners where they are, whether through subscriptions, bundles, or custom company solutions.

3. **Global growth:** Showcasing our reach as a worldwide center for workforce development, utilizing multilingual training and helping individuals and companies keep pace with rapid technological change.

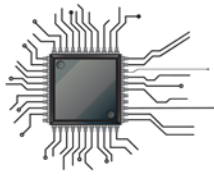
What Learners and Partners Can Expect

- The same deep commitment to electronics education and training that has defined Electronics U from the beginning
- A cleaner, more intuitive design that makes it easier to explore programs, subscriptions, and bundles
- Updated course descriptions and refined navigation to help learners discover the right content faster
- Expanded resources including engineering subscription bundles and webinars
- Renewed engagement with our membership and the wider industry to collaborate on and deliver training solutions that meet the evolving needs of electronics manufacturing

Looking Ahead

This rebrand is just the beginning. We are actively exploring new tools, content formats, and regional partnerships to ensure Electronics U remains the leading destination for electronics workforce development.

As we move forward, our promise remains the same: to empower individuals and organizations with the knowledge, skills, and confidence to thrive in the electronics industry while working side by side with our members and partners to advance the future of electronics manufacturing. 

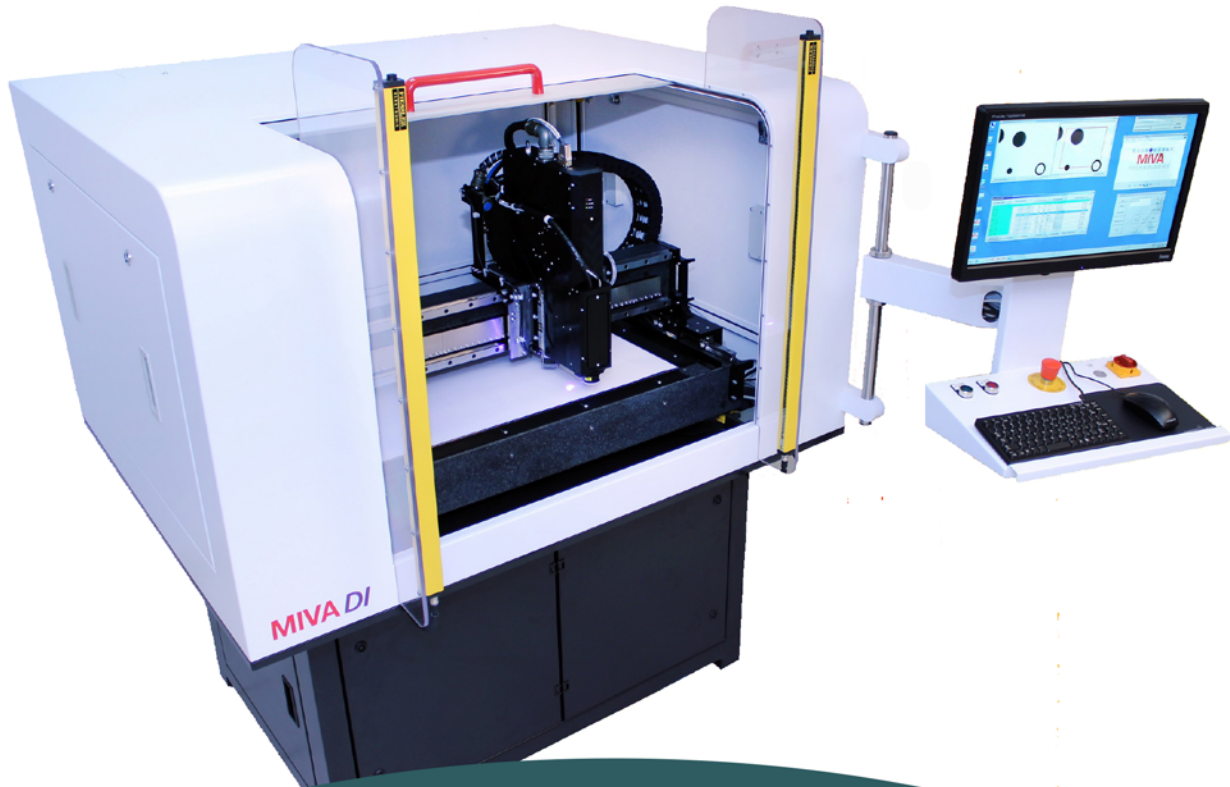


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Scan

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- Acquire up to 120 tooling locations in just 3 seconds
- Outer-layer, Sub-lam and soldermask applications
- Rasterize every panel to eliminate variance
- Throughput increasing technology

Align

- Dart Scan:** Alignment algorithms significantly enhanced by high population tooling
- Grid Registration:** Separate each drill stage into composite layers for independent alignment
- Zone Register:** Create as many zones needed within the panel
- Measure Mode:** Permits the user to perform CMM quality measurement of target positions

Control

- Feature Size:** Ability to measure features post-etch to digitally compensate during imaging
- First Article:** Confirm feature sizes post-develop, post-etch or post-plate prior to job processing
- Process Control:** Systematic DES process control & verification at the operator level. Visual confirmation of clogged nozzle, A/B pressure imbalance

Learning, Exploring, and Connecting

A roundup of member activities in China in 2025

By **Cindy Zhang**, Member Service Manager, China, Global Electronics Association



In early 2025, the Global Electronics Association China Office launched the Membership Service Enhancement Program, filled with exclusive member activities, training courses, company visits, and networking events. Here are some highlights.

Learning Together Through Training Courses



IPC-HERMES-9852 Training

Twenty-one representatives from 18 companies—including Foxconn, Delta, and Flex—explored the global standard for machine-to-machine communication in SMT assembly on April 10 in Shenzhen, gaining insights into how standardized data transfer enables smart manufacturing.



Connecting People Through Networking Events

IPC WorksAsia Standards Technical Seminar

A seminar on standards and supply chain collaboration on April 24 in Shenzhen attracted 157 professionals from 101 companies. It was followed by an evening networking dinner featuring an ice-breaker game and anniversary awards for long-term members.



IPC-2591 (IPC-CFX) Introductory Course

Delegates from 20 companies learned the basics of the Connected Factory Exchange standard on Aug. 1 in Shenzhen, building a foundation for data-driven production line upgrades.



Exploring Innovation Through Company Visits

Delta Electronics

Members toured Delta's CFX-enabled smart factory on Aug. 27 in Jiangsu, witnessing real-time data exchange across SMT, AOI, assembly, and logistics systems. Discussions focused on implementation challenges, integration, and ROI.



Member Networking Meeting

The Global Electronics Association Southwest China Member Networking Meeting on Aug. 29 in Chengdu focused on IPC standard updates, including technical exchange and a 10-year anniversary award for Chengdu Railway Communication Equipment Co., Ltd.



Closing Note

For the China team, member success is our ultimate goal. We will continue to expand our efforts, creating more opportunities for learning, collaboration, and innovation to help every member thrive in the global electronics industry. 🌈

How Insight Becomes **Impact**



Christoph Solka is delivering practical, outcome-driven intelligence for a global industry

 **By Chris Mitchell**, Vice President, Global Government Relations, Global Electronics Association

When Christoph Solka joined the Global Electronics Association earlier this year, he brought a passion for connecting data with real-world impact. Now leading Industry Intelligence in Europe, Christoph is helping

Association members see the bigger picture in an industry that's changing faster than ever. We spoke with Christoph about his journey, goals, and why good intelligence is more than just numbers on a page.

Christoph, could you share a bit about your background and how it led you to the Global Electronics Association?

Christoph Solka: I began my career in strategic marketing with leading companies in industrial equipment and electronics manufacturing. In these roles, I worked closely with operations, which allowed me to develop an appreciation for the kind of practical research that helps companies understand the market better and make strategic decisions.

Over time, I gravitated increasingly away from marketing and toward market analytics and intelligence, translating complex industry developments into clear, decision-ready insight for leaders and teams. Joining the Global Electronics Association allows me to leverage this blend of operational experience and analytical rigor to serve a broader community through industry intelligence.

What attracted you to the role of Director of Industry Intelligence?

This role sits at the intersection of data, strategy, and impact by connecting research to real manufacturing challenges and providing insights that leaders can act on. Our global perspective underscores the value of comparative intelligence across countries and regions and is rooted in real industry outcomes. Contributing focused European insight within this global context is both intellectually compelling and meaningful in the impact it makes.

Besides your focus on Europe, what are your key goals and objectives?

The immediate priority is to give manufacturers insight into European market dynamics, together with our partner company, with whom we cover the Euro-



Chris Mitchell and Christoph Solka

“ The immediate priority is to give manufacturers insight into European market dynamics. ”

pean EMS industry. However, we want to develop and expand our data programs further to provide greater insights across the value chain, verticals, and geographies, to create a truly comprehensive picture of electronics manufacturing. All of this, of course, feeds directly into the objectives of the Association serving the industry, supporting leadership decisions, and being a community touchpoint. The key, therefore, is to keep the work practical and outcome-oriented.

You have touched on the importance of relevance and practicality. What methodologies or approaches will you use to keep the industry informed?

The approach combines structured statistical programs, segment analysis, and synthesis of macro-economic and policy developments into periodic intelligence deliverables. I'll share these insights through recurring reports, briefs, and presentations at our events and forums, and invite feedback that continuously sharpens the relevance and applicability of the data. This ensures a closed loop between analysis and action, making industry intelligence both a compass and a catalyst for the community. I hope to consistently turn information into outcomes for the people building the future of electronics.

How does industry intelligence support the Association's mission?

Industry intelligence is core to the organization's

“ We help members benchmark themselves, adapt to disruptions, and seize growth opportunities. ”

mission because it empowers our members to better navigate a fiercely competitive and incredibly complex global marketplace marked by increasing supply chain volatility. These insights on the market contextualize global developments related to trade, technology, and regulation. We help members benchmark themselves, adapt to disruptions, and seize growth opportunities. Industry intelligence provides the evidence base for effective advocacy and standards work, strengthens collaboration across companies and governments, and ensures our members remain competitive in the ecosystem.

It sounds like you have very ambitious goals. What does your day-to-day work look like and what is next on your agenda?

My day-to-day work involves preparing for upcoming industry events, where I will present insights on the European EMS market. I have a busy schedule with speaking engagements in Switzerland, Poland, Sweden, the Netherlands, and France. I'm also always working on enhancing our data foundation and our strategic initiatives. 🎁



Modern Wanderer

I grew up in southern Germany and now live in the greater Munich area. In my free time, I especially enjoy spending weekends outdoors and exploring the countryside. This gives me a chance to relax, discover new places, and appreciate the natural surroundings of Bavaria. Living close to both the city and scenic landscapes is something I really value, as it offers urban amenities and peaceful nature. It's the best of both worlds.

We Are All In!

Whether you need help with sales, marketing, recruiting or strategic direction, the sky is the limit when Dan and his team get involved.

“As Sierra Proto Express continues to grow into one of the industry’s leading printed circuit board companies, Dan continues to be a consistent help to me in defining the goals, strategy, and direction of the company.”



Ken Bahl
President, Sierra Circuits



Joe O'Neil
President, OAA Ventures

“I have worked with Dan for a long time. From the days when we needed to put together a sales plan and team in place to having him facilitate strategic sales meetings. He has grown with us and provided the solutions we’ve needed.”

If you are ready to make your company better, contact Dan today, 24/7



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Japan's Voice in Global Electronics Standards

Inside the 7-31BV-JP Automotive Addendum Task Group



By Norihito Suzuki, Tokai Rika

Tokai Rika's journey toward adopting IPC standards for automotive electronic assemblies was long and complex, taking about a decade to complete. Traditionally, Japanese automotive electronics manufacturers relied on domestic or in-house standards, often differing from overseas suppliers. These differences created significant barriers in global procurement, making it harder to source parts from IPC-compliant overseas suppliers and creating cost inefficiencies due to duplicate testing and process requirements.

The turning point came around 2021, when Toyota formally adopted two core IPC standards—IPC-A-610, *Acceptability of Electronic Assemblies*, and IPC-J-STD-001, *Requirements for Soldered Electrical and Electronic As-*

semblies—into its Toyota Technical Standards (TS). This move advanced IPC adoption in Japan's automotive supply chain but also revealed a gap: Japanese companies were not participating in IPC's standards committees, meaning that revisions and addenda were being decided primarily in the U.S., Europe, China, Southeast Asia, and India without Japanese input.

Tokai Rika's Path to IPC Adoption and Remaining Challenges

For Tokai Rika, the adoption process was protracted due to the need to verify—through extensive, hands-on testing—that IPC-compliant products could match Japan's stringent quality benchmarks. Japan's unique standards, while ensuring exception-

Tokai Rika is a Japan-based manufacturer specializing in automotive components, including electronic control units, switches, and security systems. The company plays a key role as a Tier-1 supplier to leading automakers, with a reputation for advanced manufacturing technologies and strict quality control. Beyond its domestic base, Tokai Rika operates globally, supplying high-reliability components essential for modern vehicles, from safety systems to electronic assemblies. Its strength lies in combining innovation with uncompromising quality standards, which has positioned it as a trusted partner in the automotive supply chain.

al reliability, often diverged from IPC specifications, creating friction in dealing with overseas suppliers.

Up to 70–80% of potential partners declined business opportunities outright, judging that meeting Japan's demands was unprofitable. Those who engaged often aimed to learn Japanese production methods during early business, only to raise prices later, forcing Tokai Rika to re-source suppliers.

To prepare for alignment with IPC standards, the company conducted a detailed gap analysis of Japanese versus IPC requirements, classifying them into three categories:

- **Addressable through process control:** Requirements manageable within normal production oversight
- **Non-critical and adjustable:** Terms with negligible impact on quality, allowing alignment to IPC
- **Needing validation:** Points requiring confirmation through reliability testing on actual products

Validation was rigorous. Used vehicles were dismantled to recover boards, which were then inspected for whitening, CAF growth, blistering, migration, whisker formation, and solder cracks. EBSD analysis on boards subjected to thermal shock testing confirmed that IPC-compliant assemblies met Tokai Rika's reliability standards.

Despite these findings, differences between Japanese and IPC requirements still required frequent technical justifications to overseas OEMs, consuming substantial engineering effort. The absence of

Japanese representation in IPC committees meant the country's quality philosophy was absent in global standard-setting, posing strategic risks for competitiveness and market access.

Formation of the 7-31BV-JP Automotive Addendum Task Group

In 2022, with liaison support from Yusaku Kono, IPC Japan representative, the 7-31BV-JP task group was launched, chaired by Tokai Rika's Norihito Suzuki with Hisao Nishimori, Toyota Motor Corporation, as vice-chair. Comprising 23 companies and 49 members as of July 2025, it meets quarterly to develop Japan's proposals for automotive-specific addenda to IPC-A-610 and IPC-J-STD-001. The group allows open discussions between customers and suppliers, avoiding past biases toward manufacturer-driven agendas. Proposals are presented to the global 7-31BV committee at APEX EXPO.

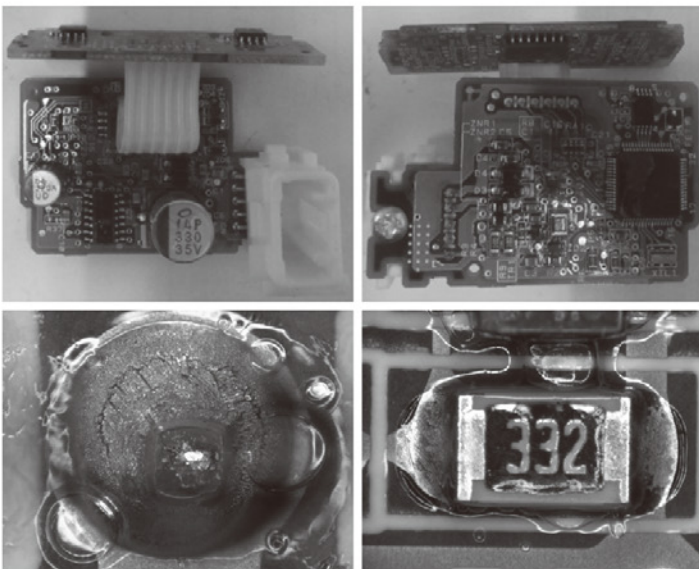
Committee Focus and Achievements

The committee's key focus is visual acceptance criteria for automotive soldering. The forthcoming IPC-A-610JA and J-STD-001JA revisions, due later this year, will incorporate Japanese proposals, including standards for mechanical-only terminals on surface-mount connectors. Looking ahead to the KA revision in 2028, topics under discussion include through-hole reflow solder fill, SOIC solder contact, and ceramic capacitor defect definitions. Broader PCB issues such as cleanliness, warpage, and press-fit terminals are also on the agenda.

Impact and Outlook

Adopting IPC standards has streamlined Tokai Rika's business with overseas partners, reduced redundant inspections, and opened a channel for Japan to influence what are effectively international standards. Broader Japanese engagement in the Global Electronics Association is seen as essential for strengthening global competitiveness and ensuring the country's manufacturing excellence is embedded in future standards. 🌍

Translation and editing for this article was done by Yusaku Kono, Japan Representative, Global Electronics Association.



Committed to *Environmental* Stewardship

*Sustainability is a core component of
Koh Young's corporate strategy,
governance, and culture*





 By Brent Fischthal, Head of Global Marketing, Koh Young Technology

Koh Young has taken several measurable steps toward a more sustainable future. Its holistic approach reflects a deep understanding that sustainability and innovation are not competing priorities but mutually reinforcing forces that shape a more prosperous, responsible, and future-ready enterprise.

Addressing Climate Change With Measurable Action

We view climate change as a fundamental threat and have committed to measurable, high-impact action. In 2023, we completed RE100 consulting to establish a long-term decarbonization strategy and followed through with investments in renewable energy, including a 75 kW rooftop solar installation at our Seoul R&D center. This project alone is expected to generate 95,396 kWh annually and reduce emissions by 44 tCO₂eq (a measurement unit used to evaluate the impact of different greenhouse gases on the environment and to cumulate their emissions).

Fleet electrification efforts are also well underway: 50 of 97 corporate vehicles are electric, with seven more conversions planned by 2025. Plans are in place to pursue ISO 50001 Energy Management certification, institutionalizing energy-saving practices. These actions cut emissions and lower operating costs, enhance energy resilience, and support broader decarbonization goals.

“Sustainability is not treated as a short-term initiative but as a core component of corporate strategy, governance, and culture.”



Maximizing Resource Circulation: From Design to Disposal

Environmental responsibility extends beyond carbon reduction into circular economy principles. Advanced 3D SPI and AOI inspection systems detect defects early in the SMT process, significantly reducing scrap and rework. One report example highlights that

cling. Since 2021, we have eliminated disposable cups in workplace cafés, distributed eco-bags to employees, installed food waste processors in cafeterias, and even upcycled coffee grounds into promotional items.

Responsible Waste and Resource Management

All waste and hazardous substances are handled in compliance with global environmental and safety standards. A RoHS 2 compliance program eliminates restricted substances at the supplier selection stage, and MSDS protocols ensure proper handling and storage of hazardous materials. Certified contractors manage industrial waste, and 100% of recyclable waste streams are fully recycled, supplemented by food waste reduction efforts using upgraded kitchen technology and awareness programs.



a conventional inspection approach produced 300 units of waste from 3,000 PCBs, while this technology cut that figure to just 32 units, underscoring how innovation can drive sustainable production at scale.

Internally, we foster a culture of reuse and recy-

all conventional faucets have been replaced with water-saving models, reducing annual usage by an estimated 200 tons. The WRI Water Risk Atlas assesses local water stress, with regional supply actively monitored to prevent contributing to scarcity.

Conserving Water and Mitigating Risk

At major sites in South Korea,

A Clear Path for Renewable Energy

Onsite renewable energy generation has increased by nearly 200% between 2021 and 2024, growing from 84 MWh to 527 MWh. Facilities now feature multiple solar arrays, including 151 kW and 100 kW systems at the Yeosu Manufacturing Center and a 75 kW array at the Gwanggyo R&D Center. Forecasts project total renewable generation reaching 640 MWh by 2025. Though renewables currently account for just under 9% of total electricity use, expansion plans and improved energy management are in place, with targets directly tied to GHG emissions reductions.

Designing for Environmental Contribution

Precision-based design drives sustainability in its products. KY8030 series and Zenith AOI platforms improve production yields, reduce material consumption, and minimize rework—lowering the environmental impact of manufacturing while improving customer efficiency.

The KSMART platform adds AI-driven defect analysis, automated feedback, and predictive maintenance, enabling resource optimization across production lines. Paired with KPO (Process Optimizer) solutions, these tools integrate AI, real-time data, and 3D measurement to foster sustainable, high-performance manufacturing.



Brent Fischthal

Transparency, Accountability, and Alignment

Our environmental reporting follows GRI 2021 Standards, TCFD, and SASB frameworks, with participation in the Carbon Disclosure Project (CDP) and third-party verification of emissions data. Beyond compliance, collaboration with suppliers ensures sustainability values extend across the value chain.

A Long-term Transformation

Koh Young is proud that sustainability is not treated as a short-term initiative but as a core component of corporate strategy, governance, and culture. Investments in R&D, facilities, and digital innovation are deliberately linked to environmental outcomes. This integrated approach demonstrates how treating sustainability as a central business pillar can become a catalyst for growth, trust, and lasting value—uniting innovation, collaboration, and a mindset of continuous progress.

As a proud member of the Global Electronics Association, working as part of Evolve, we encourage members of the industry to contact us to learn more about what we've done to help in their own ESG and strategic business planning. Contact me at brent.fischthal@kohyoung.com. 🌍



The Circle of Electronics Life

in By Dr. Diana Radovan, Director of Sustainability Policy, Global Electronics Association

Smart sustainability policies that both protect the environment and foster competitiveness for the global electronics sector require proactive technical and socio-economic input from the experts impacted by them daily.

One such emerging policy is the Circular Economy Act (CEA), expected in Q4 2026. The CEA builds on recent political momentum—including the Antwerp Declaration, the Budapest Declaration, and reports by Letta and Draghi—and priorities outlined in the 2024–2029 Political Guidelines, Competitiveness Compass, and Clean Industrial Deal.

The European Union aims to achieve a circular economy by 2050, and electronics manufacturing

has a major role to play. On Aug. 1, 2025, the European Commission (EC) finally launched its long-anticipated public consultation and call-for-evidence¹ for this act, both open until Nov. 6, 2025. If you operate in one capacity or another in Europe, you will be impacted by the CEA sooner rather than later, therefore, you must make your voice heard early enough in the process.

The CEA is a central pillar of Europe's Clean Industrial Deal and is co-led by the Directorate General (DG) Environment (B3—From Waste to Resources) and DG GROW (I4—Sustainable Products). It focuses on strengthening the circular economy within the European Single Market, particularly in the area of electrical and electronic equipment waste (e-waste).

Despite already existing legislation (e.g., the Waste Framework Directive, the Ecodesign for Sustainable Products Regulation, and the Packaging Waste Regulation), progress toward circularity has been negligible in the past decade.

E-waste skyrocketed from 34 million tons in 2010 to 62 million tons in 2022, with an estimated 82 million tons by 2030, according to the United Nations Environment Programme (UNEP)². Additionally, the amount of e-waste produced has grown five times faster than collection and recycling capacities over the same period³. Moreover, on July 16, 2025, the EC revealed its plan for the post-2027 Multiannual Financial Framework (MFF), where revenue streams will partially come from a new proposed tax on e-waste, modeled on the already existing tax on nonrecycled plastic waste, a model that is not without its own flaws.

Circularity Goals

Circularity aims to create systems where resources are reused, recycled, or repurposed to minimize waste and maximize efficiency. It is vital for sustainable development, reducing environmental impact, conserving resources, and creating economic opportunities.

Expected benefits include:

- **Resource conservation:** Minimizing extraction of finite materials through reuse and recycling, and other “r” terms that promote recovery
- **Waste reduction:** Designing products for longevity and reparability
- **Energy efficiency:** Reducing energy demands in production
- **Economic growth:** Unlocking business opportunities in recycling and refurbishing
- **Environmental protection:** Lowering emissions and pollution⁴

This all sounds good and straightforward in theory, but we know that the practical hurdles are real, and we aim to address the main ones and get the conversation started.

What’s Being Proposed in the CEA?

The CEA will focus on two key intervention areas:

1. Tackling e-waste, the fastest-growing waste stream in the EU, with less than 40% currently

recycled. The initiative may involve updating existing legislation to improve collection, recycling, and market uptake of secondary raw materials.

2. Creating a true Single Market for secondary raw materials and waste, through reforming end-of-waste criteria, simplifying and digitalizing Extended Producer Responsibility (EPR) schemes, and introducing targeted criteria for public procurement to stimulate demand for circular goods and services.

Both legislative and non-legislative measures are on the table, with a focus on reducing administrative burdens and improving economic viability for circular systems.

What’s in the CEA Consultation?

The questionnaire format includes approximately 30 questions across key themes:

- General perspectives on the circular economy
- Challenges and opportunities for e-waste
- Barriers to circular business models in the European Single Market
- Supply and demand for secondary raw materials
- Improving waste management and circular processes

This is a critical opportunity to shape a legislative framework that supports innovation, investment certainty, and cross-border compliance for circular business practices.

Circularity Challenges, Weak Areas, and Possible Solutions for Electronics

The transition to a circular economy, especially for the electronics sector, remains challenging due to several factors, including complex regulations, market barriers, and the current lack of a standardized approach to ensure similar quality for recycled materials and components.

There are, nonetheless, actionable ways for electronics manufacturers to implement meaningful changes and integrate circularity into daily operations to promote sustainable technologies. Achieving circularity for electronics means working together to overcome key challenges⁵, including the need for:

- **Data availability and standardization:** There is currently a lack of reliable, consistent (or standardized) data, which hinders lifecycle assessments (LCAs) and informed decision-making.

- » **Proposed way forward:** A standardized approach to ensuring similar quality for recycled materials and components is still required. Your input will determine how such standards will look in the future on a global level.
- **Economic incentives:** The insufficient return on investment in adopting circular practices discourages investment. Virgin materials are often cheaper than recycled ones.
 - » **Proposed way forward:** According to the Clean Industrial Deal, the CEA will introduce incentives to promote the use of metal scrap and measures to stimulate demand for secondary materials and circular products. Your input on how this can be achieved in practice is required.
- **Design for circularity:** Existing products are not designed for reusable or repairable disassembly nor optimized for material recovery when life extension is not feasible.
 - » **Proposed way forward:** Integrate circularity into product roadmaps from the start.
- **Supply chain coordination and market access:** Fragmented supply chains struggle to align efforts for effective circularity. Moreover, Europe does not yet have a true Single Market.
 - » **Proposed ways forward:**
 - Empower customers to act as suppliers.
 - Establishing cross-industry partnerships for materials recovery and scaling circularity solutions.
 - Call for the uptake of EU-wide rules for a functioning EU Single Market.
- **Awareness and education:** Limited understanding of circular principles among stakeholders.
 - » **Proposed way forward:**
 - Consult our Circularity Resource Hub⁴ for our strategic recommendations.
 - Engage in timely dialogue and information exchange with industry partners, with us, and, through us, with policy makers, to shape future policies linked to circularity, including the CEA.

Why Taking Part in the CEA Consultation Matters

The circular economy is seen by policymakers as essential to economic security, competitiveness, resilience, and decarbonization.

evolve

by Global Electronics Association

The Global Electronics Association has been featuring a series of short video interviews with leaders in the electronics industry about sustainability initiatives within their companies.

Companies like Northrop Grumman, Flex, Panasonic Connect, TTM, Worthington Assembly, KYZEN, Incap Corporation, Koh Young, and several others answered questions about their top sustainability priorities, goals for the coming year, and one aspect of the industry they would change regarding sustainability.

Find the short, informative videos on **LinkedIn**, **YouTube**, and the **Evolve website**.

- **Electronics are in the spotlight:** New rules will prioritize repairability, recyclability, and extended product lifetimes for devices such as phones, laptops, and displays.
- **Tackling e-waste:** The key pillar of this policy, including potential fines, will have a massive impact on global electronics manufacturing and distribution.

Help Shape the CEA

The circular economy is seen by policymakers as essential to economic security, competitiveness, resilience, and decarbonization. This is your chance to contribute to one of Europe's most significant upcoming sustainability frameworks. We continue to coordinate feedback on behalf of members. Contact me at DianaRadovan@electronics.org, by Nov. 6, to share your thoughts. 🎁

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3. "Electronic Waste Rising Five Times Faster than Documented E-waste Recycling: UN," Unitar, United Nations Institute for Training and Research.
4. [Circularity Resource Hub](#), Global Electronics Association.
5. "3 Ways the Electronics Industry Can Transform E-Waste and Boost Sustainability," by Dr. Kelly Scanlon, Design News, Aug. 25, 2025.



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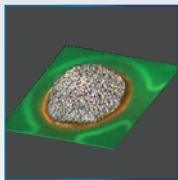
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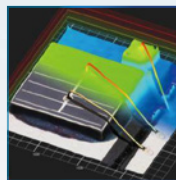
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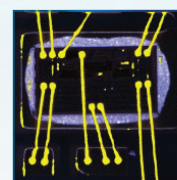
Solder Bump



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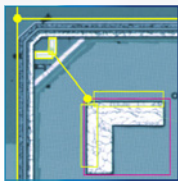
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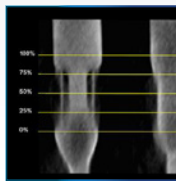
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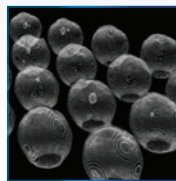
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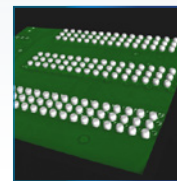
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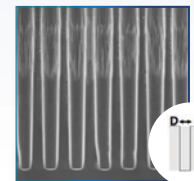
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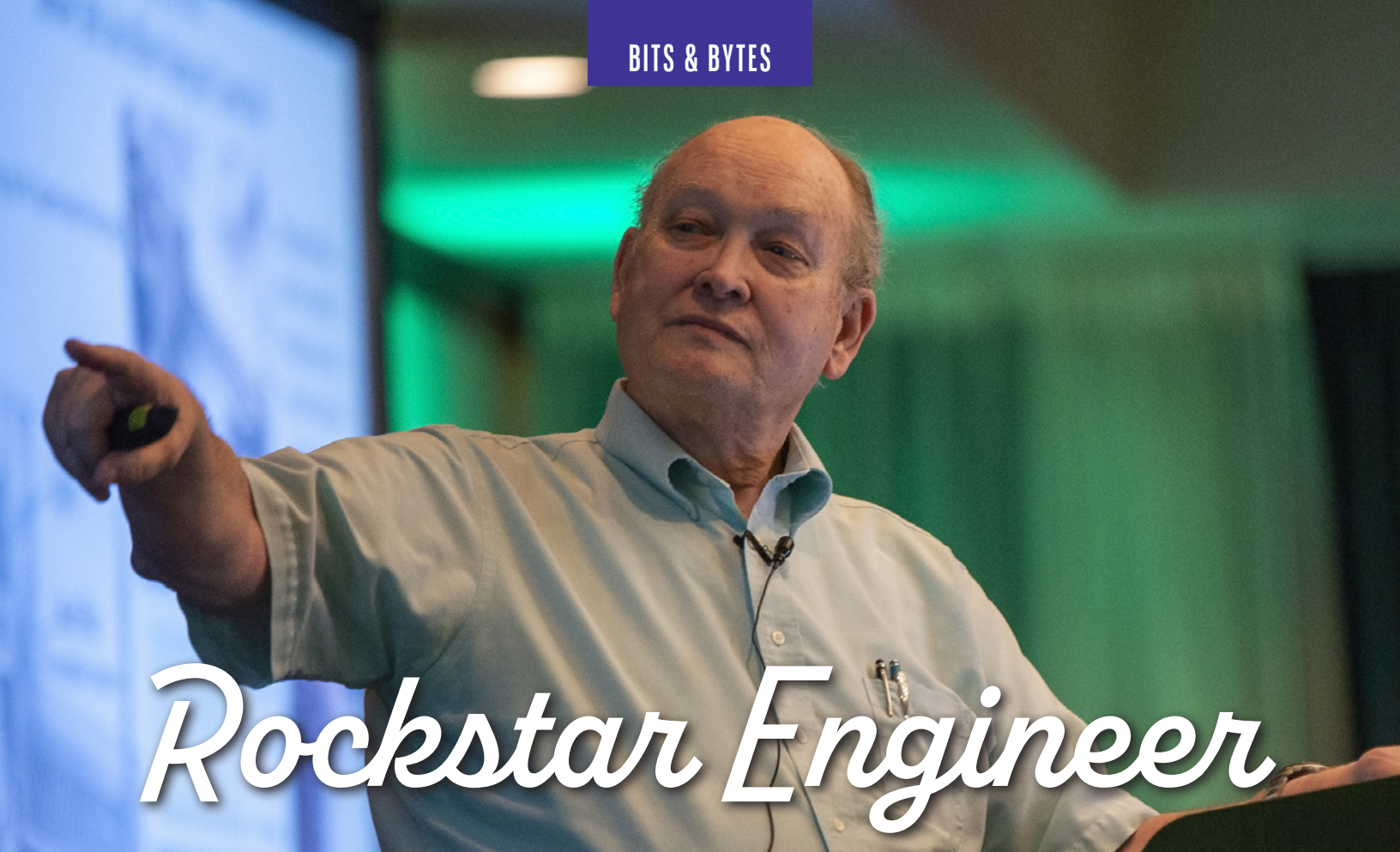
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Rockstar Engineer

Happy Holden's passion and data-driven approach are inspiring the next generation

By Barry Matties, Contributing Writer, Community Magazine

Happy Holden's vast knowledge, passion for the industry, and commitment to sharing knowledge with the next generation are unmatched and inspiring. Happy's dedication to teaching and making information available to the engineering community can be found in many places, including universities, trade events, books, and webinars. When he's not busy preparing for his next keynote or lesson, you will likely find Happy working on a book project or writing his next Tech Talk column for I-Connect007.

What makes Happy stand out as a teacher is his approach to engineering. When he talks to young engineers, the first thing he tells them is to delve into statistics. Happy is an engineer driven by data, believes in TQM, and has many examples of success to share with his students.

Happy is truly an icon. When he steps on stage to teach a room full of young engineers, he is greeted with thunderous applause and cheering. After the session, you will find him signing autographs and answering questions. Who knew chemical engineers were so cool?

Knowing and working with Happy for so many years has been amazing. He has shared insight on so many topics and continues to help us understand the value of past lessons and the ongoing need to learn and train for the future.

Happy, why is it important for you to teach the next generation?

Happy Holden: I actually started out teaching my own generation. When I was promoted to engineering manager at Hewlett-Packard, they started sending me to courses like "Managing Management Time" by Bill Onken. Both Hewlett and Packard had a lot of faith in young engineers. They realized they had to train new technical managers out of the old saying, "If you want it done right, do it yourself." HP made me very successful as a young engineer, and they gave me projects and assignments that normally would have gone to more experienced or senior engineers. But I was successful because my boss—the PCB engineering manager—didn't try to do my job or tell me how to

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Automotive



Space



Consumer Electronics



Computing & Datacom

“ I am the result of professionals who not only taught me engineering, but also taught me how to think. ”

—Happy Holden



Paige Fiet, former Student Board Liaison, always looks forward to her chats with Happy at APEX EXPO.

do it. He focused on making me successful and keeping me out of trouble, to successfully avoid potholes/roadblocks.

As HP grew in manufacturing, one of my new roles as an engineering manager was recruiting at universities. Of course, I went back to my alma mater, Oregon State University, but HP had a list of universities they favored and had been successful with their graduates. I had attributed my success as a PCB process engineer to my chemical engineering education and, particularly, training in engineering statistics, DOE, and problem solving¹. But in recruiting engineers, most universities had to drop the engineering statistics and problem-solving classes to make room for newer engineering courses. Since I considered this a

major skill that my engineers needed to have, I started teaching these problem-solving concepts to my new hires. Fortunately, HP agreed with the idea and provided the model and resources to make my teaching a success. This also applies to the next generation of engineers. I wrote *24 Essential Skills for Engineers* as a way for them to learn what I (and other experts) thought were essential engineering skills.

What is the most important lesson you teach?

You will never get a break from learning something new. That is the industry you are heading into and it will be fun. If it's not, then shop around until you find the role that is fun every day. I've been in this industry for 55 years, and it has been a hoot.

Why is this so important to remember?

There can be obstacles and trauma in your future, but if you love your work, you can find that every day is a joy.

What skills should young engineers double down on?

The first five years of a young engineer's career is the time to acquire skills like TQM, statistical analysis, DOE, formal problem solving, and others I've listed in my book. Some are useful if you want promotions; others will help to solve problems quickly before they impact customers. These other skills will help advance your company's success in the marketplace. My suggestion is for you to read my book and decide for yourself which skills feel most important.

What intangible skills are you looking for in the next generation?

I look for someone who displays a high level of curiosity, wants to make a contribution to the industry, has

a variety of interests, and is willing to do what it takes to get a job done correctly. They must be dedicated to the cause.

Everyone is excited about AI technology. How do you think it will change the fundamentals of learning?

I am not sure. AI certainly is a tool to be mastered. My hope is that it will make many tasks or skills easier to accomplish. If it lessens the need to learn the fundamentals of science or engineering, then it will not be that useful for you. Current AI tools can have the tendency to "hallucinate," and by that I mean make things up, so you still have to be the master and know what to believe.

Who inspired you the most in your career?

I had the pleasure of working personally with both Bill Hewlett (on the HP-35 calculator) and David Packard (on the Monterey Bay Aquarium). These men knew exactly how to make you (and themselves) successful while making money and getting the job done.

Any additional thoughts you would like to share?

I am the result of professionals who not only taught me engineering, but also taught me how to think. I was a fortunate student of many outstanding teachers (including my father-in-law, who was an engineering professor) who tutored me in the basics of engineering in college. Before that, I went to a high school tucked into the mountains of western Oregon, where we had only 92 students, but it was considered one of the most successful in the state. I had army training, and boy, did they focus on problem-solving. HP also offered many training courses, so I was a continuous student throughout my career. It has served me well and I thank them all. 🌈

References

1. *24 Essential Skills for Engineers* by Happy Holden.



Dylan Nguyen is an engineering student at Oregon State University.

INSTRUCTOR-LED CLASSES

Time is running out to secure your spot in the next lineup of online, instructor-led courses. Classes begin as early as Oct. 20, and with seats limited, engineers and managers alike are encouraged to register now to ensure access.

Building Sustainable Model-based PCBs

October 20–November 5 | Instructor: Fil Arzola

Kicking off the October series, this course provides a practical approach to designing and building sustainable model-based printed circuit boards. Participants will gain insight into balancing design considerations with environmental and reliability requirements, preparing them to implement best practices across product lifecycles.

Advanced Packaging: HDI Enabling Technology

October 20–29 | Instructor: Mike Carano

Industry veteran Mike Carano explores how high density interconnect (HDI) technology is reshaping advanced packaging. Engineers will learn about the critical processes and materials enabling next-generation packaging, as well as how to apply HDI techniques to improve performance and reliability.

AI Applications of Machine Data in the EMS Industry

October 21 and 23 | Instructor: Tim Burke

Artificial intelligence is transforming electronics manufacturing. This focused course covers how machine data can be applied to real-world electronics manufacturing services (EMS) challenges, from defect detection to predictive maintenance, equipping participants with actionable strategies.

Flex and Rigid-Flex Design for Manufacturability

October 28–November 6 | Instructor: Nick Koop

Flex and rigid-flex circuits bring new possibilities and challenges. This new course helps engineers design with manufacturability in mind, ensuring product reliability while avoiding common pitfalls in fabrication and assembly.

Troubleshooting and Defect Analysis for Electronics Assembly

November 3–12 | Instructor: Jim Hall

Jim Hall brings decades of experience to this essential course, guiding participants through the systematic process of identifying, analyzing, and resolving defects in electronics assembly. Engineers will leave with a stronger toolkit for ensuring quality on the production floor.

Train the Trainer

November 3–12 | Instructor: Karen Smalls

This course equips participants with essential skills to deliver engaging and effective workshops, including facilitation techniques, needs analysis, and managing technical and challenging topics. Taught by a Certified Master Trainer, attendees will learn how to create a comfortable learning environment for CITs or anyone teaching to an in-house audience that enhances understanding and participation.

PCB Design for Manufacturability

November 4–20 | Instructor: Dana Korf

Dana Korf leads this deep dive into designing printed circuit boards that balance innovation with manufacturability. Participants will explore design choices that reduce risk, streamline production, and minimize costly rework.

Spotlight: Three Courses with Dr. Jennie Hwang

Dr. Jennie Hwang, an internationally recognized authority on packaging, materials, and reliability, teaches three courses this November and December. These courses can be taken individually or as a powerful learning track.

- **PoP Packaging and Assembly: Materials, Processes, Reliability—November 11 and 13**
- **BTC Packaging and Assembly: Materials, Processes, Reliability—November 18 and 20**
- **Reliability of Electronics: Role of Solder Joint Voids—December 2 and 4** 🇺🇸

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The De Facto Standard

More South Korean companies, especially automotive, are embracing IPC standards

in By Tina Choi, Korea Representative, Global Electronics Association

In April 2025, the Korean government promoted the active adoption of IPC standards by Korean companies and encouraged their participation in IPC standards development through the following policy tools.

- Subsidizing small- and medium-sized enterprises (SMEs) to become members of the Global Electronics Association
- Providing financial support for expert travel and meeting expenses to encourage active participation in standards development

- Supporting the organization of standard promotion events such as IPC K-FEST
- Establish Standard Contribution Awards to recognize outstanding contributions by companies and individuals in standards development

Typically, a standard is called an “International Standard” when it is established by a public standardization body, such as the International Organization for Standardization (ISO) or the International Electrotechnical Commission (IEC). When a standard set by an





Now Available in Korean

In Korea, industry volunteers have completed over a year of work translating IPC-A-610J/J-STD-001J into Korean, now in the final proofreading stage. At the same time, the government-supported De facto Standard Forum has funded engineers from Daeduck Electronics, LG Energy Solution, and KPIA to participate in IPC Builds and contribute input to international standards.

industry organization—rather than the public standardization body mentioned above—is widely accepted and used internationally in a specific field, it is called a “de facto standard.”

To resolve various difficulties faced by companies in responding to international standards and to establish field-specific activity strategies, the Korean Agency for Technology and Standards

(KATS), under the Korean Ministry of Trade, Industry and Energy, held the inauguration ceremony of the “De Facto International Standardization Strategy Council” in December 2019.

In 2022, after COVID-19, KATS started to support the standardization of the “De Facto Standard.” Since then, IPC standards have been designated “De Facto Standards of the Korean Electronics Manufacturing.” 🇰🇷

Razor-sharp Focus

Jeff Barth built JWB Manufacturing through focus, trust, and innovation

in By Brittany Martin, Contributing Writer, Community Magazine

For Jeff Barth, entrepreneurship has always come naturally. He grew up in the Midwest, always looking for the next challenge—from setting up lemonade stands to mow-

ing lawns and shoveling snow for neighbors.

“I’ve always loved the game of business,” says Jeff, now president of JWB Manufacturing, “by chal-

lenging myself, learning new skills, and building relationships that help everyone grow.”

That drive never faded. After two decades in financial services, Jeff



saw an opportunity to channel his entrepreneurial spirit into manufacturing. In 2008, he purchased the assets of a small machine shop serving the wire processing and cable assembly industries. That venture became JWB Manufacturing, which today is known worldwide for its standard and custom wire cutting and stripping blades.

“When I first acquired the business, I had no idea these parts were even needed,” Jeff admits. “But I jumped in with enthusiasm and a belief that manufacturing would see a resurgence in the U.S. It’s been an incredible journey.”

JWB Manufacturing distributes products in more than 17 countries, sells through its e-commerce platform in 13 countries, and exports more than 60% of its sales outside the United States. Over the past five years, the company has seen consistent 20–30% year-over-year growth, establishing itself as a trusted partner in a highly specialized niche.

At the heart of JWB’s success is Jeff’s leadership. In the early days, with only two employees, he embodied the “get it done” mentality, doing everything from machining to sales. But as the company grew, Jeff realized sustainability meant empowering others.

He implemented what he calls the 1:3:1 approach: Employees identify a problem, create three possible solutions, and recommend the best option. This method has helped develop a culture of accountability and critical thinking, where team members feel ownership of their work and pride in their contributions.

“My role is no longer to have all the answers,” Jeff says. “It’s to create an environment where my team can solve problems, take risks, and grow as decision-makers.”

JWB’s guiding philosophy reflects



“ I love the sport of business. For me, it’s about more than products. ” —Jeff Barth

both resilience and continuous improvement. The company's culture emphasizes bouncing back from setbacks, learning from failures, and relentlessly striving to improve products for customers.

Building customer trust has been central to the company's growth strategy. JWB invests in site visits, maintains an active digital presence, and participates in trade shows to ensure accessibility and reliability.

"Trust comes from showing up, whether that's through our website, at an event, or when a customer simply needs us to deliver on time," Jeff says.

While product excellence is essential, visibility has been equally important to JWB's rise. Recognizing early on that digital marketing would shape customer engagement, Jeff prioritized JWB's online presence.

works, but every attempt gives us new knowledge. That's how we've built visibility in a very specific market."

What Sets JWB Apart

While only a few competitors are in the aftermarket blade manufacturing space, JWB has carved out a distinct position. Jeff points to the company's relentless commitment to product improvement, customer-first service, and innovative purchasing options.

"Our competitors are excellent companies with strong ethics," he says. "But at JWB, we've focused on serving customers the way they want to be served, whether that's locking in pricing, making online purchasing simple, or selling through Amazon. We always stand behind our blades."



JWB's future is one of both refinement and expansion. Over the next decade, Jeff plans to strengthen the company's internal production processes, expand its leadership team, and explore crossover opportunities in electronics assembly and PCB manufacturing. Growth in Mexico is also a priority, along with a continued push to expand JWB's digital footprint.

This growth has been helped by his membership in the Wire Harness

The company has maintained an e-commerce store for nearly 15 years (still a rarity in this niche) and continues to grow through platforms like YouTube, Facebook, and Amazon.

Jeff filmed the first YouTube videos himself, often in a single take to avoid editing. Today, those same videos still generate views and contribute to JWB's reputation for credibility and expertise. The company has also experimented with a wide range of marketing strategies (some successful, others not), each providing insights that strengthened its digital approach.

"We've tried everything from trade shows to online tutorials to digital classes," Jeff says. "Not everything

Manufacturer's Association (WHMA). Belonging to WHMA has brought Jeff closer to the industry's leading thought leaders. As a supplier, he has found it helpful to learn, ask questions, and receive introductions to leaders across the wire processing and cable assembly industry. This involvement has deepened his understanding of the industry and allowed him to develop many new friendships.

"I love the sport of business," Jeff says. "For me, it's about more than products; it's about building a company that challenges itself, empowers its people, and strengthens the entire industry. JWB has come a long way, but our journey is just beginning." 🧩

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The Road to **Bengaluru**

Skilled pros are competing in wire harness competitions ahead of IEMI 2026

in By Arpita Das, Marketing and Communications Manager, Global Electronics Association India

Southeast Asia, the Middle East, Africa, and India are emerging as key hubs, not just to meet the demand of an evolving and growing wire harness market, but also as centers for workforce development and manufacturing. For example:

- The UAE is advancing in automotive wiring
- Vietnam and Malaysia are scaling up production
- Thailand and the Philippines are boosting industrial electronics
- Sri Lanka is nurturing skilled talent
- India's wire harness sector is accelerating, driven by its expanding electronics ecosystem and rising demand across EVs, aerospace, defense, and industrial sectors

With technologies like 5G, IoT, and AI reshaping connectivity needs, India is poised to become a major player in innovation and exports, contributing to a global market projected to reach \$165.3 billion by 2034.

The Global Electronics Association has launched an initiative to elevate technical expertise and unify practices under globally accepted benchmarks. Central to this initiative is the Wire Harness Competition, a high-impact, skill-driven platform culminating in the World Wire Harness Championship.

This global competition brings together elite talent from across continents to demonstrate precision, speed, and workmanship in wire harness assembly. The road to the championship includes regional qualifying rounds held from April to December 2025 in Sri Lanka,



Sri Lanka



Australia

the UAE, Vietnam, Malaysia, Thailand, Australia, and the Philippines. All rounds adhere to IPC/WHMA-A-620 Revision E, the global benchmark for high-reliability cable and wire harness assemblies, ensuring consistency, fairness, and technical excellence.

Regional Champions Leading the Way

In regional competitions, skilled professionals are stepping up to represent their countries on the world stage. Among the recent champions are:

- **Ishara Maduhansi**, Cable Solutions (PLC) Ltd.: Winner of the Sri Lanka round
- **Sai Praneeth Jasti**: Winner of the national round in Australia
- **Venketesha Gopala**, Lucy Electronics: Winner of the national round in Abu Dhabi
- **Nguyen Minh Thuan**, Thermtrol (VSIP) Co. Ltd.: Winner of the South Region round in Vietnam
- **Ng Zhi Hao**, Estek Automation: Winner of the Malaysia round

These regional winners reflect the dedication and skill that define the future of wire harness manufac-

turing. “Representing my country on a global stage is an incredible honor,” says **Ng Zhi Hao**, Estek Automation. “This competition pushes me to sharpen my skills, embrace global standards, and showcase the craftsmanship behind wire harnessing.”

World Championship at Upcoming IEMI

India will take center stage as it hosts the prestigious World Wire Harness Championship, Jan. 29-30, 2026, in Bengaluru, as part of the Integrated Electronics Manufacturing & Interconnections (IEMI) show. This milestone event spotlights India’s rising global stature in electronics manufacturing and celebrates its commitment to nurturing world-class talent and promoting international best practices.

The championship is more than a competition; it’s a catalyst for industry transformation. It empowers professionals to benchmark their skills, offers companies a unique branding and talent acquisition platform, and gives sponsors high-impact visibility.

[Click here](#) for more information about the Wire Harness Competitions in 2025. 🌍



From Mailing Standards to Guiding Them

John Perry has been in and around the industry for most of his life, thanks to his mom

By Barry Matties, Contributing Writer, Community Magazine

John Perry's journey with the Global Electronics Association

started when he was 8 years old, inspired by his mother's role in organizing IPC company meetings. Driven by his passion for aviation and standards, he went on to a career in computer science and IT. Today, he is the director of Printed Boards Standards & Technology for the Association, collaborating with industry leaders, including those at Lockheed Martin.

Barry Matties: John, you have a long history with the Global Electronics Association, thanks to your mother. Tell me how you got started.

John Perry: Yes, she (Virginia Bergman) was the manager of the Meetings Department. This was in the early 1980s, when we had two semiannual meetings in the spring and fall. There was no IPC APEX EXPO back then. She would scout and book the location, and put together the schedule for the entire event, including all the committee meetings for standards, the tech paper sessions, and any workshops. I'd come home from school, and the dining room table would just be laid out with all kinds of papers. She would also do the layout for the schedule onsite, which we on staff affectionately called the "Pocket Weasel," because people could shove the schedule in their pockets. But there was no word processor for her to work on, no Microsoft Office. She was making corrections with X-ACTO blades and those little white strips. I think it was Avery's white strips. The papers would be strewn out for weeks, and then she'd compile them all and bring them to the printers, and that was how she put together the onsite guide.

Find John
here:





You were literally raised right in the mix?

Yeah. I would come home from school, look at that stuff on the table, and think, “What is that?” It was printed circuit board design and flex circuits, but it was a mystery to me. But it was intriguing, and I would think, “Someday, I might want to know what the heck that means.”

I eventually worked at (IPC) in the summers during high school and between fall and spring semesters

in college in the mail department, back when we had a full physical inventory of all our standards. Since there was no internet yet we had to do all our correspondence with our members or committee leaders through physical mailings, so I’d help out.

What did you study at college, and did you start work at the Global Electronics Association right after college?

I studied computer science. I got a job in the IT net-



working management industry. Then, in late 1998, I got a call from Dave Bergman. He said, “We’ve got a couple of positions open if you want to interview.” One position was in the IT department and network management, which of course matched my college degree, and the other was in the Standards Department. I interviewed with Jack Crawford, Chris Jorgensen, and Dave Bergman. I was intrigued with the idea of getting out and meeting with the members, as opposed to addressing networking issues in an office environment. I wanted to match faces with the names of people I had remembered from high school when I worked in the mail department and stole the occasional glance at a standard.

I’d pull down a copy of the IPC-SM-840 solder mask performance specification or the IPC-RB-276 specification for rigid board performance and wonder, “Who puts this stuff together?” I’d look at the names of the people from companies like Vought [Aircraft], ATV, Lockheed, Martin Marietta, and Hughes [Aircraft], and think, “Wow, these are the guys that actually design these systems for use in helicopters, aircraft, missiles, and space technology.”

I’d always been a big aviation fan. My family would often take me to air shows across the country to see performers such as the U.S. Air Force Thunderbirds and the U.S. Navy Blue Angels. So, I thought this was

my opportunity to meet the very same people who designed and created the electronic systems used in these aircraft and see how they developed and revised the very same standards that I used to shove in envelopes and help mail out. So, I joined the Association in early 1999. I’ve attended IPC APEX EXPO for 26 years since then. It was a decision I will never regret.

That’s fantastic. So, who was running the Association when you were with your mother around the dining room table?

It was still Ray Pritchard, and Dieter Bergman was our technical director. It was a small staff. I believe Dave Bergman was hired into the Technical Department in 1980 and it did not take long before he was steering that ship. At the time, the office was in a single-story house in Evanston, Illinois, near Chicago.

You’ve come a long way, from an 8-year-old to now. What’s one of the most enjoyable memories you’ve had here?

Seeing some of these standards come to fruition and watching the committees you work with hash stuff out. Some committees involve only a handful of people, while others have over 300 people. It’s no surprise that most of them come representing their company’s interests. You have the suppliers, their cus-

Vacuum Reflow Oven

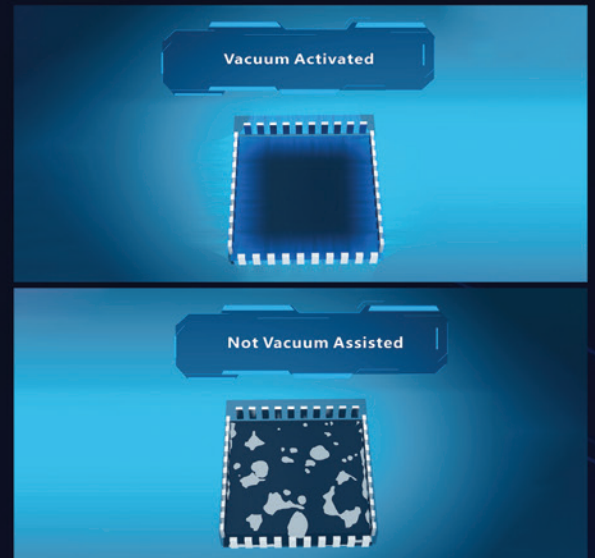


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tomers, people from academia, and people from government, and they often have different expectations. You're finally getting them in a room where they can argue, sometimes vigorously, but come to terms together. They're usually people who are competitors on any other day, but in that meeting room, they're collaborators. That's a pretty cool thing to see. Seeing these publicly available standards get published after all that work is pretty rewarding to me.

Did you get a chance to meet some of the people connected to those cool fighter jets? What was that like?

I met **Don DuPriest** from Lockheed Martin when I joined in 1999. That was pretty cool. Don is a legend in our industry and a recipient of our Association's highest honor, the Raymond E. Pritchard Hall of Fame Award. We had a workshop in Fort Worth in 2011, and he had arranged a tour of their aircraft division plant, where they had the assembly line for the F-35 Joint Strike Fighter up and running and we got to walk (and sometimes cart) from one end to the other. They start at one end of the plant with some wheels, and then there's a portion of a wing and the fuselage, and you go down the line and watch the aircraft slowly getting pieced together. It's a mile-long plant, and at the other end, a brand new F-35 is ready to roll out. That was pretty cool.

Tell me more about your job here. You're helping lead the effort to create the standards.

My focus is on the standards addressing the bare printed boards, whether they are rigid, flexible, HDI, or the ultra HDI boards we're trying to address now. The committees I work with develop and maintain standards for the design of the boards, their fabrication, testing and lot acceptance, and their continued reliability—everything that happens with the board before it goes to the assembler.

John, thank you for doing this interview. I greatly appreciate it. It's wonderful to get to know you a little better.

Great talking with you, Barry. It was a nice trip down memory lane. I think I got something in my eye... 🌈



MEMBER MILESTONES

Congratulations and thank you to
Global Electronics Association members who are
celebrating milestone (25-year+) anniversaries
in the fourth quarter of 2025.

**60
YEARS**

Sypris Electronics, LLC
Tampa, Florida, USA

Axiom Electronics LLC
Hillsboro, Oregon, USA

China Circuit Technology Corp.,
Lóng hú qū Shantou, Guangdong, China

STI Electronics Inc.
Madison, Alabama, USA

**40
YEARS**

Altek Electronics
Torrington, Connecticut, USA

NIST
Gaithersburg, Maryland, USA

Taiyo America Inc.
Carson City, Nevada, USA

**35
YEARS**

American Hakko Products Inc.
Valencia, California, USA

Lackwerke Peters GmbH & Co KG
Kempfen, Nordrhein-Westfalen, Germany

Prismark Partners
Cold Spring Harbor, New York, USA

**30
YEARS**

Analog Technologies Corp.
Burnsville, Minnesota, USA

Cogiscan Inc.
Bromont, QC, Canada

Dynamic Source Manufacturing Inc.
Calgary, AB, Canada

Flexible Circuit Technologies Inc.
Plymouth, Minnesota, USA

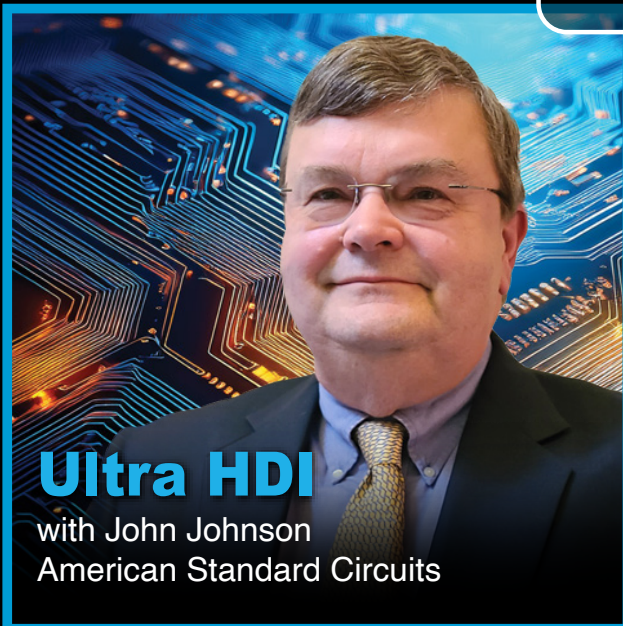
Vexos Markham CA
Markham, ON, Canada

Nihon Superior Co. Ltd.
Suita City, Osaka Prefecture, Japan

Schippers & Crew Inc.
Seattle, Washington, USA

**25
YEARS**

Now Playing



PODCAST SERIES

Florida Manufacturers Need Workers. **Here's How to Make It Happen**

By **Lea Tavani**, Human Resources Director, Mack Technologies

In April, President Donald Trump signed an executive order to encourage the expansion of apprenticeships, setting a goal of 1 million new active apprentices. The order demonstrates that policymakers now understand what manufacturing employers have long felt: If we want to bring more manufacturing back to the United States, we need ways to build talent pipelines.

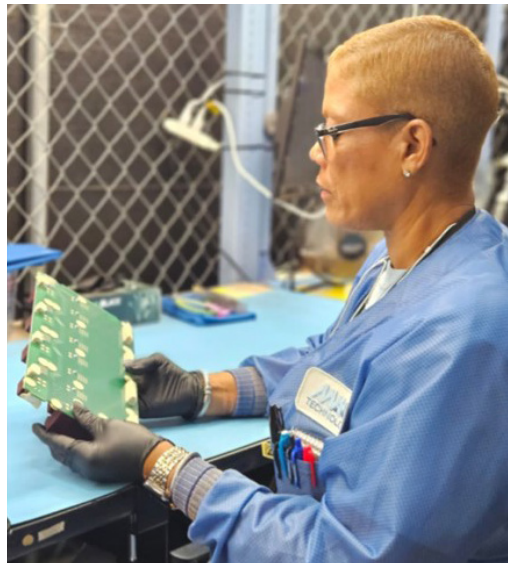
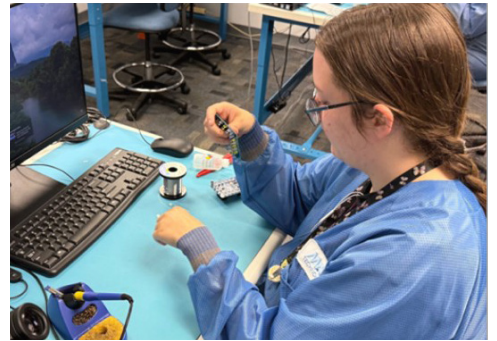
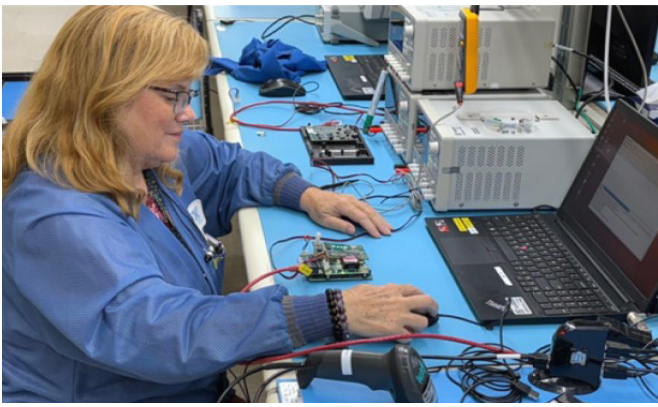
Workers are the backbone of our industry, and right now, we need more of them. More than two-thirds of employers in electronics manufacturing reported difficulty in finding and retaining skilled workers in an industry survey by the Global Electronics Association. By 2031, the U.S. manufacturing sector is projected to have 2.1 million unfilled jobs.

For employers, the benefits of apprenticeship are well documented. In the United States, employers report an average return of \$1.44 for every dollar invested in apprenticeship. Apprenticeship helps employers with hard-to-fill roles, as well as increases the productivity of workers. But even though apprenticeships are an age-old idea (dating back to Ben Franklin and Paul Revere) with plenty of data to back them up, they remain underused.

The good news is that interest in apprenticeships is growing: The number of active registered apprentices in the U.S. has nearly doubled in the past decade. While apprenticeship has the deepest roots in the skilled trades, it's also expanding to new industries like firefighting, teaching, and healthcare. Can the approach work in fields like electronics manufacturing as well?

At Mack Technologies, we piloted our first apprenticeship in 2024, with four apprentices graduating from the Surface Mount/Circuit Board Technician apprenticeship program in Melbourne, south of Port Canaveral on Florida's east coast. After the success of the initial





Mack Technologies' first graduating class!

group, we've now expanded the effort, rolling out new apprenticeship programs in partnership with the Global Electronics Association. What we've learned can help others across the manufacturing industry build and implement apprenticeships to solve their workforce challenges—in ways that help fulfill the president's vision for a stronger American apprenticeship system.

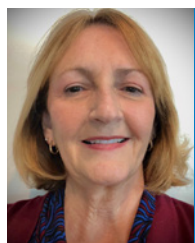
First, it's important to think of investing in apprenticeships as a competitive advantage, leading to both a talented workforce and a culture of learning. We've seen those benefits firsthand: 93% of apprentices who complete our program remain employed with us,

on-the-job, apprentices can have a wide range of backgrounds—whether they have hands-on experience but no formal credentials, or no prior exposure to electronics at all. The apprenticeship model gives them a path to a new career, while both earning and learning at the same time.

One of our apprentices, for example, came from retail and was looking for a more stable career. Today, she's mastering soldering and printed circuit board assembly, key skills on our production floor. "This program gave me a career path I never imagined," she says. These stories reflect what apprenticeship can

offer: a way to help businesses develop the talented workforce they need while creating real economic opportunity for individuals.

With the success of our first 20 apprentices, we're



“We’ve seen those benefits firsthand: 93% of apprentices who complete our program remain employed with us, reducing turnover and recruitment costs.”

—Lea Tavani

reducing turnover and recruitment costs. As apprentices earn industry-recognized certifications, we've also seen fewer errors and greater efficiency on the production floor. With support from state and federal programs, we've also reduced upfront training expenses and received financial incentives for each apprentice trained, all while building a workforce with the skills and readiness our operations require.

Second, think expansively about who your apprentices should be. Because the training is provided

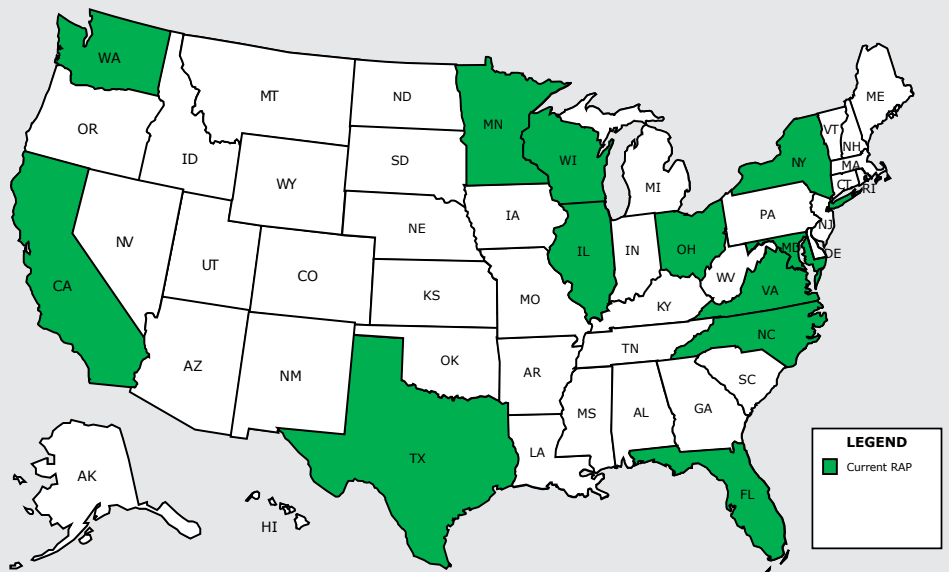
continuing to bring more talent into the field in Florida. But just as importantly, we hope that others in the industry can expand on what we've learned and build their own apprenticeship programs. For manufacturers looking to stay competitive, apprenticeship offers a practical way to build capabilities, strengthen teams, and invest in the long-term health of the industry.

(This article originally appeared in the *Tampa Bay Times* in Florida, on Aug. 14, 2025.)



We're Working!

The Global Electronics Association has apprenticeship programs in the states marked in green, and is actively working to secure programs in more states.



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Big Ideas, **Big Events**

in By Sanjay Huprikar, Chief Global Officer, Global Electronics Association

The **Global Electronics Association** team in Europe has had the privilege to serve thousands of regional industry participants at numerous events and conferences from the United Kingdom to Turkey, and all points in between, during the first three quarters of the year. Our members in Europe continue to give us

great feedback on key initiatives ranging from design to advanced electronics packaging to advocacy efforts in support of a resilient electronics industrial base.

We're looking forward to engaging our European members at several significant industry events:

Making a big splash: At productronica, Nov. 18–21, the Global Electronics Association is thrilled to again exhibit at Europe's most important electronics equipment event. The newest attraction in our booth at Messe Muenchen will be a demonstration of best practices in wire harness and cabling led by master trainers throughout the week. This will be a prelude to new competitions beginning in 2026. Back by popular demand will be the Electronics Industry Forum, with live presentations and panel discussions on topics that include workforce development, sustainability, factories of the future, and aerospace and defence.

Calling all designers: For the Pan-European Electronics Design Conference, Jan. 21–22, 2026, we will be partnering with FED to host the second annual two-day technical conference in Prague. This event showcases next-generation topics in design for excellence, software tools, and AI.

A showcase of machinery: The Southern Manufacturing & Electronics Show, Feb. 2–5, 2026, will launch the 2026 wire harness competition season in Farnborough, UK. This annual exhibition showcases new technology in machinery, production equipment, electronic production and assembly,



and tooling. We will look forward to meeting many of the OEMs that have technical staff regularly participate in IPC standards development committees, and numerous EMS companies, which manufacture

PCBAs for the UK's expanding aerospace and defence industry.

To learn more about these activities, contact PhilippeLeonard@electronics.org. 🌍

A banner for the IPC K-FEST 2025 event. The background is a vibrant blue and purple with abstract light streaks. On the left, the text 'IPC K-FEST 2025' is prominently displayed in white, with 'by Global Electronics Association' below it. To the right, the title 'Korea Festival of Electronics Standards & Technology' is written in white, followed by the date and location '2025 년11월4일 (화) | 서울 로카우스호텔 서울 용산'. At the bottom center, the Korean slogan '표준과 기술의 만남 새로운 미래를 만듭니다' is written in white.

IPC K-FEST 2025
by Global Electronics Association

Korea Festival of Electronics Standards & Technology
2025 년11월4일 (화) | 서울 로카우스호텔 서울 용산

표준과 기술의 만남 새로운 미래를 만듭니다

The Global Electronics Association **Korea Electronics Standards and Technology Festival (K-FEST)** will be held on Nov. 4 in Seoul, bringing together industry experts to discuss the latest developments in manufacturing. In addition, the Korean editions of IPC-A-610J and J-STD-001J are scheduled for official publication within the year, providing local companies with authoritative technical references.

A banner for the IMPACT 2025 session. The background is a deep blue with a subtle pattern of white dots. At the top left, the 'IMPACT 2025' logo is shown, along with a '20 YEARS' anniversary logo. The date and location '13:00-15:00, OCT 21st 5F, TaiNEX 1, Taipei' are in the top right. The main title 'Component to System-Level Integration by GEA' is centered in white. Below the title are four portrait photos of speakers, each with their name, title, and company below them. At the bottom, a yellow rounded rectangle contains the hashtags '#Large BGA Assembly #AI #System level'.

IMPACT 2025 20 YEARS
International Microsystems, Packaging, Assembly and Circuits Technology conference

13:00-15:00, OCT 21st
5F, TaiNEX 1, Taipei

Component to System-Level Integration by GEA

 Raja Swaminathan Corporate Vice President AMD	 CP Hung VP Corporate R&D ASE	 Dennis (Tiang-Hao) Lin Kinsus	 Ander Hsieh Deputy Executive Director Wistron
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#Large BGA Assembly #AI #System level

The Global Electronics Association will host a session during the **IMPACT conference** at the Taiwan Printed Circuit Association Show on Oct. 21, addressing topics such as the “Advanced Electronic Packaging Program at the Global Electronics Association,” “Next Generation AI: The Importance of System Level Architecture,” and “Challenges and Improvement Opportunities for Large BGA Assembly.”

Get Ready to Be Transformed at **APEX EXPO 2026**

APEX EXPO 2026, the Global Electronics Association's flagship event for the electronics industry, is scheduled for March 14–17, 2026, at the Anaheim Convention Center in Anaheim, California.

This event is for OEMs, EMS providers, PCB manufacturers, and industry professionals from around the globe who come together to access the latest technical content, contribute to standards development, and network with the industry's largest gathering of capital equipment manufacturers, suppliers, and product innovators in design, printed board manufacturing, electronics assembly, and test.

What to Expect?

The Technical Conference has been renamed: Advanced Electronic Packaging Conference 2026 Component- to System-Level Integration. The name reflects a strategic evolution of the growing conver-

gence of packaging, interconnect, and manufacturing technologies at every level of integration.

“While the format and scope of the conference are being transformed, the technical content our industry relies on is not only being preserved—it’s being expanded to better reflect today’s full component-to-system-level view,” says **Stanton Rak**, co-chair of the Technical Program Committee.

[Get the details here.](#)

The Learning Lounge, a workforce training and certification track on the show floor, is also returning. Professionals, educators, trainers, and industry leaders are invited to submit presentation proposals that focus on the strategies, tools, and best practices that support training, certification, and workforce development in the electronics manufacturing industry. The deadline to submit a proposal is Dec. 10, 2025.

[Get the details here.](#) 🎨

APEX EXPO[®] 2026
by Global Electronics Association

transform
**TOMORROW
TODAY**

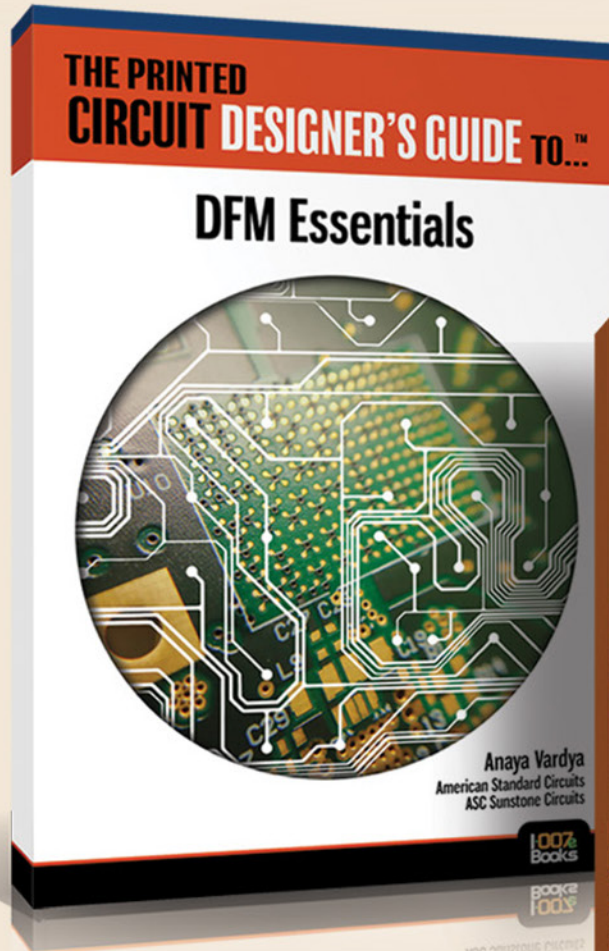
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3.14–3.19
meetings & courses
3.16–3.19
conference
3.17–3.19
exhibition
ANAHEIM CONVENTION
CENTER | CA

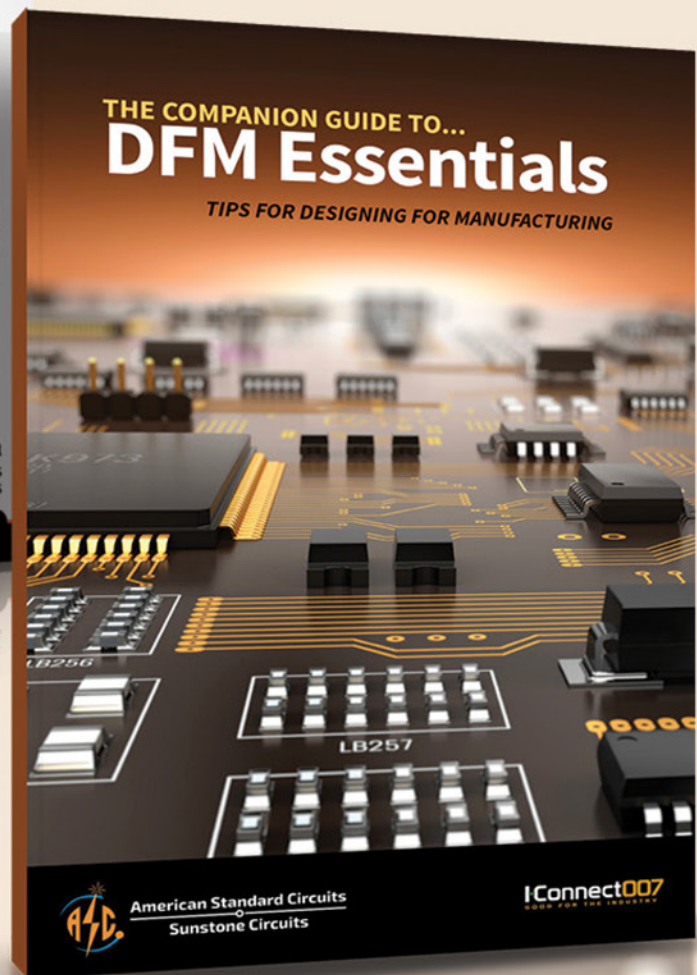
E-BOOK COMPANION GUIDE

Essential Tips for Optimal DFM



This expert-driven guide covers everything from ODB++ formats and layer stackups to via fills and back-drilling—plus tips to avoid costly CAM issues through early collaboration.

Download now and optimize your next design.



I-007eBOOKS

Q4 2025 Programs

Stay connected with the Global Electronics Association through some of these regional events in October, November, and January. Visit our online calendar of events for more information.

OCTOBER



October 21–24
IMPACT 2025
Taipei, Taiwan

October 22–24
**Hand Soldering Competition—
Regional Qualification**
Tallin, Estonia



October 27–30
IPC A-Team Europe Meeting
Munich, Germany



October 28–30
Wire Harness Competition
Manila, Philippines

October 29–31
**Hand Soldering Competition—
Regional Qualification**
Nagoya, Japan

NOVEMBER



November 3–4
**IPC K-FEST (IPC Korea Festival
of Electronics Standards and
Technology)**
Seoul, Korea



November 12
**Component to System Level
Packaging Workshop**
Penang, Malaysia

November 18–21
IPC Forum at productronica
Munich, Germany

November 18–19
**Hand Soldering Competition—
Regional Qualification**
Munich, Germany

November 20–21
**Hand Soldering World
Championship**
Munich, Germany



November 21
**Wiring Harness: Key Growth
Driver of Indian Defence/
Aerospace/Automotive
Industry Networking Event**
Hyderabad, India

DECEMBER

No events scheduled
for December

JANUARY



January 21–22
**Pan-European Design
Conference**
Prague, Czech Republic



January 27–29
**WHMA's Annual Global
Leadership Summit**
Las Vegas, Nevada

SAVE THE DATE!



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- Automatic access to a free single-user copy of every new or revised standard as they are released
- Discounts on IPC Certifications for both internal and external training through IPC certification centers
- Full access to WHMA membership, an affiliate of the Global Electronics Association
- Exclusive research: Studies and statistical programs on market and technology trends
- News and insights: Global Advocacy Report, Industry Intelligence Insights, and more!

Opportunities like this are rare, so act now to make sure your company doesn't miss out on the savings, insights, and influence that come with membership.

Managing Editor: **Michelle Te**
971-409-9792; michellete@electronics.org

Contributing Editor: **Sandy Gentry**
sandygentry@electronics.org

Contributing Editor: **Linda Stepanich**
lindastepanich@electronics.org

Business Development Manager: **Barb Hockaday**
916-365-1727; barbhockaday@electronics.org

Marketing Services: **Tobey Marsicovetere**
916-266-9160; tobeymarsicovetere@electronics.org

Digital Marketing Manager: **Brittany Martin**

Art Director/Production Mgr: **Shelly Stein**

Magazine Layout: **Mariel Evans**

Ad Design: **Mike Radogna**

Executive Director: **Marcy LaRont**
marcylaront@electronics.org

Director of Digital Operations
& Media Systems: **Bryson Matties**

Cover: **Shelly Stein**

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**Global Electronics
Association™**
Validation Services

VALIDATION SERVICES

Building Trusted Suppliers

Qualified Manufacturers List

Qualified Products List

COVERING IPC STANDARDS:

J STD-001/IPC-A-610,
J STD-001 Space/Military Addendum,
IPC-1791
IPC/WHMA-A-620, IPC-4101, IPC-4103

OVER 145 TRUSTED QML & QPL COMPANIES TO CHOOSE FROM

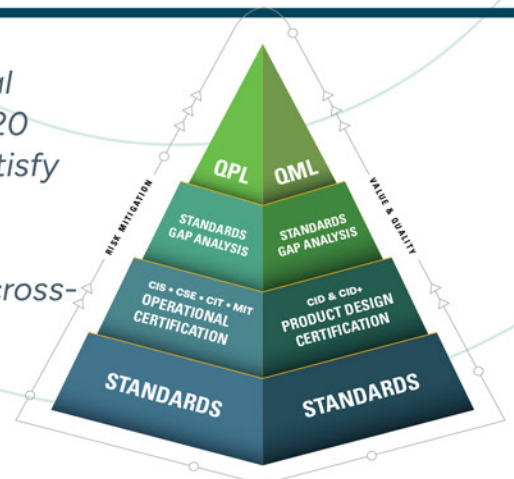
PURPOSE — Verification that companies can manufacture, assemble and supply in accordance with IPC standards

VALUE — Products that demand the highest reliability and quality

GOAL — Building a network of TRUSTED SOURCES in the electronics supply chain

"In the past, we have let AirBorn's customers know our internal process procedures were written to yield an IPC/WHMA-A-620 compliant product. This statement alone seemed to rarely satisfy customer concerns. Since acquiring the IPC/WHMA-A-620 Qualified Manufacturing Listing we are able to back up our statement and confirm to our customers our dedication to across-the-board compliance to IPC/WHMA-A-620 standard."

- Dwayne Zimmerman, Regional Quality Manager, AirBorn Interconnect



For more details go to www.electronics.org