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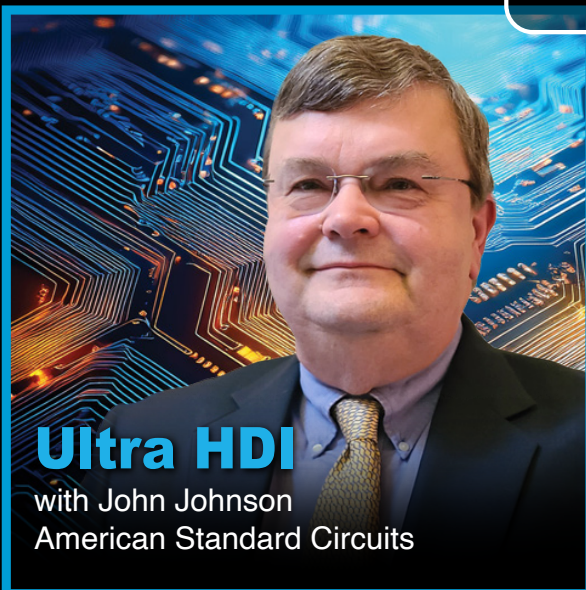
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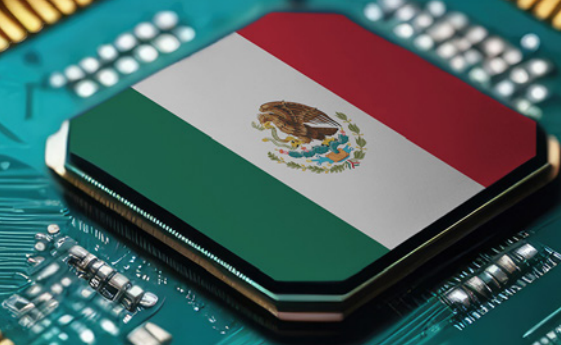
Mexico isn't just part of the electronics manufacturing conversation—it's leading it. From growing investments to cross-border collaborations, Mexico is fast becoming the center of electronics in North America.

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DAY OF THE DEAD



About the Cover



Our cover for this month's issue honors Día de los Muertos, a vibrant Mexican holiday celebrated November 1 and 2. It's a joyous time to remember deceased ancestors

through happy memories and stories. This cover reflects the past, present, and hopeful future for Mexico's electronics manufacturing industry.

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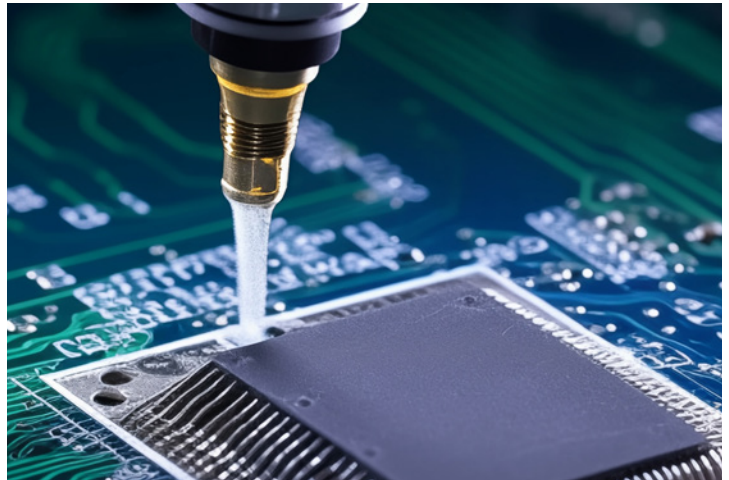
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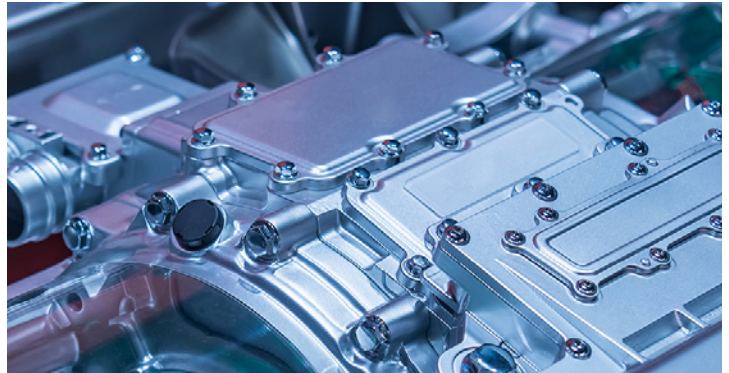
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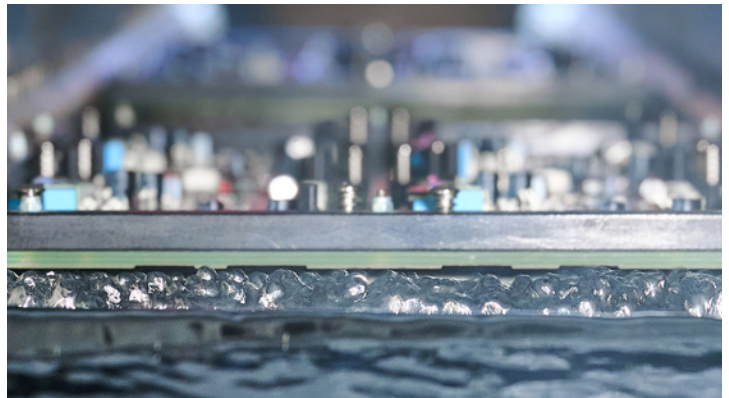
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Is Mexico the Pulse of Electronics in the Americas?

by Nolan Johnson, I-Connect007



Last year, I attended **SMTA Guadalajara**, where I saw the results of the Mexican investment in electronics manufacturing. The U.S. was still operating under the Biden administration, and while Mexican EMS companies had expanded capacity to support EV manufacturing, the demand dropped significantly. In my conversations at the show, the sentiment was one of patience. They knew the EV business would likely come back. However, they didn't expect an overhaul of U.S. trade agreements and tariffs that would shift a more diversified portfolio in Mexico's direction.

Now, with a new U.S. administration regulating its own tariff strategies, we might easily conclude

that Mexico operates in the shadows. Yet, Mexico almost always lands among the top 10 global producers. In electronics assembly, Mexico ranks in the top five. In other words, Mexico is a quiet economic powerhouse that plays an increasingly important role in the EMS sector, and chances are good you're either collaborating or competing with Mexican firms somewhere in your supply chain.

Location plays a key role in Mexico's ongoing success. In addition to its proximity to the Panama Canal, Mexico recently completed a competing transportation corridor called the Interoceanic Corridor of the Isthmus of Tehuantepec (CIIT). Claudia Sheinbaum Pardo, president of Mexico, hailed

the project a success, noting that Salina Cruz's port is "still being developed" with public and private investment. Even so, larger ships have already been docking at the Salina Cruz breakwater, reminding us that distribution resilience is as important as manufacturing resilience.

In a global environment in which trade agreements are being reworked wholesale, Mexico is making changes as well. Just last month, Mexican media reported that Mexico plans to impose new tariffs on imports from countries with which it doesn't have a trade agreement—a move that appears primarily aimed at China. President Sheinbaum sought congressional approval for tariffs of up to 50% on such countries.

To gain more clarity, we worked closely with Global Electronics Association Mexico, where staff members have been researching the issues and collaborating with government, academia, and private enterprises across Mexico that have a vested interest in electronics.

We start our coverage with "Mexico's Moment," an overview from Lorena Villanueva, director of the Association's Mexico office. She sets the stage for a wide-ranging scenario regarding tariffs, government initiatives, IPC standards and certifications, the role of women in the industry, and sustainability. Our other authors include Barjouth Aguilar of Flex,

Ada Gastelum, Juan Balderrama, Yazmin Elizabeth González Vázquez from the state of Guanajuato, and Ivan Luna on IPC training.

To drive further engagement with our Mexico content, we tip our hat to our Spanish-speaking colleagues by including most of these articles in Spanish. Please share this issue with someone you know who could benefit from the informational content in their native Spanish language.

In other EMS supplier content, MacDermid Alpha presents a study on "Advances in Conformal Coating Materials and Methods" by Saskia Hogan, and columnist Nash Bell explores solderability test methods. Stan Rak continues his "Road to Reliability" series by focusing on the power electronics driving electric vehicles.

SMT007 Magazine continues its focus on electronics manufacturing in varying points around the globe. Please review past issues for our India content as we prepare next to focus on Europe. ¡Manos a la obra! **SMT007**

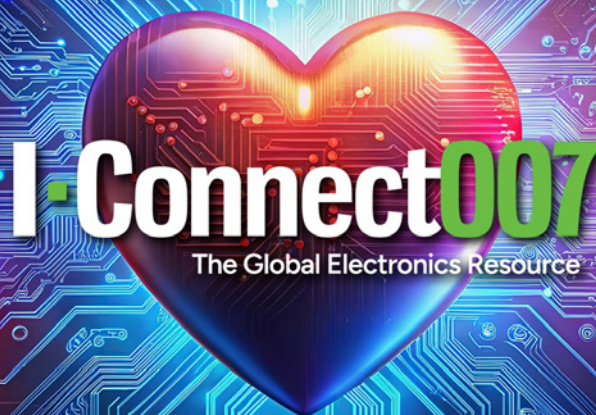


Nolan Johnson is managing editor of *SMT007 Magazine*. Nolan brings 30 years of career experience focused almost entirely on electronics design and manufacturing. To contact Johnson, [click here](#).

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Mexico's Moment in Electronics Manufacturing



(Editor's note: Some insights were gathered from "Interconnected: Global Electronics Trade in an Age of Disruption" by the Global Electronics Association.)

On a weekday morning in the Bajío, Mexico, a training lab reviews accept/reject criteria before a line changeover. By mid-afternoon, a cross-border shipment clears in El Paso that left Ciudad Juárez at dawn. Farther south, a university team finalizes intake for a new electronics pathway blending online modules with factory practicum. These scenes—routine yet transformative—explain why Mexico is becoming the most strategic partner for the United States to ensure a resilient, innovative, and sovereign electronics supply chain in North America.

In a world shaped by constant disruption, the Global Electronics Association has tracked a decisive shift: Supply chains are being redesigned around regional resiliency and workforce capabil-

ity, not just unit cost. The "Interconnected: Global Electronics Trade in an Age of Disruption" analysis underscores five durable realities:

1. Supply chains are de-risking and regionalizing
2. Standards-based quality is the universal language of trust
3. Trade policy is now a design constraint
4. Digital traceability is moving from optional to essential
5. Sustainability has become a board-level requirement

Mexico sits at the confluence of all five.

From Fragility to Resilient Design

A decade ago, electronics were optimized for scale and cost. Today, they are engineered for resilience and responsiveness. Logistics variability, tariff regimes, export controls, and end-market expectations now shape what gets built and where. Mexico's

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advantages—proximity to North America, time zone alignment, deep manufacturing know-how, and a rapidly maturing technical workforce—are turning constraints into competitive strengths. When a buyer in Austin or Detroit can start the morning with real-time quality data from Guanajuato, the business case speaks for itself.

Tariffs and Policy: The New Gravitational Fields

Once background noise, trade policy and tariffs now act as gravitational forces reshaping supply chains. Whether legacy tariffs between major economies or thematic regimes tied to security and sustainability, manufacturers must treat policy as a first-order variable.

Mexico's strategic position is reinforced by the U.S.-Mexico-Canada Agreement (USMCA) and a wide trade agreement network that favors North American content, rules of origin, and predictable market access. For electronics OEMs and EMS providers, this translates into lower volatility, clearer tariff frameworks, and closer integration with customers, paired with greater responsibility: documentation rigor, content verification, and the ability to demonstrate processes through internationally recognized standards and training.

Mexico's Formula: People, Processes, Proximity

People: Talent is the foundation. Across states, we partner with public training institutions and universi-

ties to create skill pathways that match real factory demand. In Guanajuato (IECA-CEDECI), Queretaro (ICATEQ and UNAM), and Ciudad Juarez (CIITA-IPN), partners align curricula with competency-based standards—from ESD/FOD and component ID to acceptability criteria and connected factory concepts. Dual training models turn knowledge into on-the-floor performance.

Processes: Quality is a language. Standards like IPC-A-610 (Acceptability of Electronic Assemblies), J-STD-001 (Requirements for Soldered Electronics and Electrical Assemblies), and IPC/WHMA-A-620 (Requirements and Acceptance for Cable Harnesses) are the grammar. Their adoption and related training drives consistency, fewer reworks, reduced waste, and greater customer trust. Companies that embed standards into their operating systems become natural nodes in resilient networks.

Proximity: Geography reduces friction. No other country shares nearly 2,000 kilometers of border with the world's largest economy. Same-day communication, synchronized engineering changes, and rapid prototype iteration compress design-to-delivery cycles. Proximity also protects IP and enables collaborative problem-solving: engineers troubleshoot side by side with customers, quality teams align face to face, and leadership walks the line together when it matters most. I know because I've walked that line with operators, supervisors, and engineers to listen and understand their training needs.

Active Industrial Policy for Electronics

As geopolitical tensions grow and supply chains shift, governments are racing at different speeds to address gaps in domestic electronics manufacturing. Mexico is making its move through an active industrial policy:

- **Semiconductor Industry Master Plan:** Launched with the U.S. Embassy and CANIETI, the plan aims to double exports and tech jobs by 2030, anchoring design, testing, and advanced manufacturing capabilities.
- **National Lab for Semiconductor Design and Advanced Electronics (Aguascalientes):** A new platform to strengthen design, testing, and packaging capabilities extending Mexico's role beyond final assembly.



- **Investment and content incentives:** Programs tied to local content, supplier development, and rules of origin compliance that foster deeper integration and stronger value chains.
- **State-level training tools:** The most effective incentives aren't just fiscal, they're training seats, custom curricula, and co-funded labs. Partnerships with IECA, ICATEQ, UNAM, and CIITA-IPN are already expanding capacity.

The thread connecting these efforts is that policy reduces friction, the workforce lifts capability, and standards guarantee consistency, unlocking large-scale private investment.

Interconnected Data: Mexico Diversifies and Grows

Mexico plays a unique role in the global electronics chain. As one of the top seven importers of both finished electronics and electronic inputs, it serves as a regional manufacturing hub and increasingly vital node in the North American tech ecosystem. In 2023, Mexico imported around \$150 billion in electronics-related goods¹: \$93 billion in inputs and \$59 billion in finished products, driven by internal demand, re-export production, and rising nearshoring by U.S. and international firms.

Fears that Mexico is merely a channel for Chinese goods are not supported by trade data. Between 2017 and 2023, finished electronics imports rose 23% (from \$48 billion to \$59 billion), while those from China grew just 8%, with their share dropping more than any other major supplier. Vietnam, Thailand, and South Korea gained ground. For inputs, the story is similar: Imports jumped from \$62 billion to \$93 billion (+52%), with China's share falling, and Taiwan, Vietnam, and the EU gaining.

Mexico is diversifying, not increasing, its dependence on China. This broader sourcing strategy aligns with Mexico's ambition to become a more complete production hub. While China remains important, its relative weight is declining in both finished goods and inputs.

Integration With the U.S.

A large portion of Mexico's electronics imports go into final products exported to the U.S., from consumer electronics to automotive systems and

industrial controls. Regional integration shortens shipping times, supports geographic diversification, and, under USMCA, enables tariff-free access, giving Mexico a structural edge in North America, especially for tariff-sensitive categories. Access to the U.S. market is Mexico's strategic advantage; its future hinges on scaling capacity and connectivity.

The Surge in Numbers, and What They Signal

According to U.S. trade data, Mexico's exports of advanced technology to the U.S. grew over 35% in 2024, surpassing \$100 billion for the first time. This surge underscores Mexico's position as a secure, nearshore electronics partner, especially as U.S. tariffs on Chinese goods continue reshaping global supply chains. With strong policy backing, a skilled workforce, and regional integration via USMCA, Mexico is quickly closing the gap with China and outpacing traditional exporters like South Korea and Germany.

Sustainability: From Compliance to Competitiveness

Sustainability is no longer a checkbox; it's a competitive advantage. OEMs evaluate suppliers on energy efficiency, waste reduction, circularity, and transparency across tiers. Mexico's pivot toward standards-based quality and digital traceability aligns naturally with these expectations. Reducing rework and waste is sustainability by design; implementing ESD, FOD, and process discipline each shift turns environmental goals into line-floor outcomes. The Association's sustainability programs in Mexico help companies translate policy into practical roadmaps, from dashboards to corrective action discipline.

What Buyers Want, and How Mexico Delivers

Sourcing leaders and CTOs share the same checklist:

- Standards-based quality with audit-ready documentation
- Shorter lead times and local response to engineering changes
- Traceability from incoming inspection to shipment

- Transparent compliance in trade, labor, and sustainability
- A credible talent pipeline that withstands turnover and growth

Mexico's most competitive plants deliver by making standards a daily practice (not just a certificate on the wall), training continuously, and digitizing what matters.



Lorena Villanueva

The results show that the cost targets are met without sacrificing risk posture or responsiveness.

Latin America on the Radar

Other Latin American countries are also advancing. Costa Rica is attracting semiconductor investment; Brazil and Colombia are expanding electronics manufacturing; Argentina and Uruguay are growing in digital and clean tech sectors. But structural challenges remain that only deeper integration, investment, and cooperation can overcome. In this landscape, Mexico already stands as the operational hub of a smarter, closer, more resilient electronics supply chain.

Collaboration in Action: Real Cases We're Working On

Our Mexico office lives the essence of the electronics triple helix—government, academia, and industry—aligned in standards, learning, and digital manufacturing to scale talent at the speed of investment.

- **Guanajuato, talent as strategy:** In partnership with the state and IECA, industry is building a pipeline in PCB design, safety, ESD/FOD, component ID, and electronic assembly acceptability—creating a repeatable flow that accelerates ramp-up and stabilizes performance.
- **Queretaro, aerospace rigor at automotive scale:** With UNAM's High Tech Unit and ICATEQ, courses link to real plant problems, giving students a ladder from basics to advanced certifications—resulting in fewer defects and better inspections.

- **Ciudad Juarez and Chihuahua, border-speed centers of excellence.** With CIITA-IPN and local industry, border innovation means faster line launches, real-time changes, and quality loops closed in hours, not weeks.
- **Aguascalientes, design and semiconductors in motion:** A new alliance with government and universities aligns design, semiconductors, and digital manufacturing—gap mapping and upskilling pilots are underway.
- **Jalisco (IDEFT), immediate talent:** Pilots in ESD, safety, FOD, and acceptability, plus instructor development and the Open House/IPC Conecta agenda, a scalable model for Guadalajara's corridor, "Latin America's Silicon Valley."

Conclusion: Designing the Next Decade, Together

Electronics is the nervous system of the modern economy. As the world regionalizes to manage risk and speed, Mexico isn't a backup plan; it's a design decision. Proximity, policy, and people converge to deliver what global customers demand: reliable quality, rapid response, and transparent compliance, powered by a workforce fluent in IPC standards.

Through alliances with governments, universities, and companies across the country, the Global Electronics Association is helping build a repeatable architecture for the next decade of growth, from electric mobility and aerospace to smart factories. The world is being reconfigured. Mexico is ready. **SMT007**

References

1. Figure based on UN Comtrade, following the methodology of the "Interconnected" study. The total (~\$150 billion) combines imports of components and finished electronics, not just HS Chapter 85 (which covers most of the electrical and electronics sector).

Lorena Villanueva is director of Global Electronics Association Mexico



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El Momento de México en la Manufactura Electrónica

(Nota del editor: Algunas ideas fueron tomadas de “Interconectados: El comercio global de la electrónica en una era de disrupción” de la Asociación Global de Electrónica).

En una mañana laboral en el Bajío, México, un laboratorio de capacitación revisa criterios de aceptación/rechazo antes de un cambio de línea. Para media tarde, un envío transfronterizo que salió de Ciudad Juárez al amanecer se libera en El Paso. Más al sur, un equipo universitario finaliza la inscripción a una nueva ruta académica en electrónica que combina módulos en línea con prácticas en planta. Estas escenas—rutinarias y a la vez transformadoras—explican por qué México se está convirtiendo en el socio más estratégico para Estados Unidos en asegurar una cadena de suministro electrónica resiliente, innovadora y soberana en Norteamérica.

En un mundo definido por la disrupción constante, la Global Electronics Association ha seguido un cambio decisivo: las cadenas de suministro se rediseñan en torno a la resiliencia regional y la capacidad de la fuerza laboral, no solo al costo unitario. El análisis de la Asociación, “Interconnected: Global Electronics Trade in an Age of Disruption,” subraya cinco realidades duraderas: las cadenas de suministro se están fortaleciendo y regionalizando; la calidad basada en estándares es el lenguaje universal de la confianza; la política comercial es ahora una restricción de diseño; la trazabilidad digital pasó de opcional a esencial; y la sustentabilidad se ha convertido en un requisito de nivel directivo. México se ubica en la confluencia de las cinco.

De la Fragilidad al Diseño Para la Resiliencia

Hace una década, la electrónica se optimizaba para escala y costo. Hoy, se diseña para resiliencia y tiempos de respuesta. La variabilidad logística, los regímenes arancelarios, los controles de exportación y las expectativas de mercado final moldean ahora

qué se fabrica y dónde. Las ventajas de México—proximidad a Norteamérica, alineación horaria, profundo conocimiento en manufactura y una fuerza laboral técnica en rápida maduración: transforman restricciones en fortalezas competitivas. Cuando un comprador en Austin o Detroit puede iniciar su mañana con datos de calidad en tiempo real desde Guanajuato, el caso de negocio es evidente.

Aranceles y Política: Los Nuevos Campos Gravitacionales

Los aranceles y la política comercial—antes ruido de fondo—hoy funcionan como campos gravitacionales que desvían las cadenas de suministro. Ya sean aranceles heredados entre grandes economías o regímenes temáticos ligados a seguridad y medio ambiente, los fabricantes deben planear la política como una variable de primer orden.

La posición estratégica de México se refuerza con el Tratado entre México, Estados Unidos y Canadá (T-MEC) y una amplia red de acuerdos comerciales que favorecen el contenido norteamericano, el cumplimiento de reglas de origen y un acceso predecible al mercado. Para los OEMs y proveedores EMS de electrónica, eso significa menor volatilidad, bases arancelarias más claras y una integración más estrecha con los clientes—acompañada de responsabilidades: rigor documental, verificación de contenido y capacidad de demostrar procesos mediante estándares y capacitación reconocidos internacionalmente.

La Fórmula de México: Personas, Procesos, Proximidad

Personas: El talento es la base. En los diferentes estados que visito todas las semanas, en la Global Electronics Association trabajamos con instituciones públicas de capacitación y universidades para crear rutas de habilidades que respondan a la demanda real en planta. En Guanajuato (IECA-CEDECI),

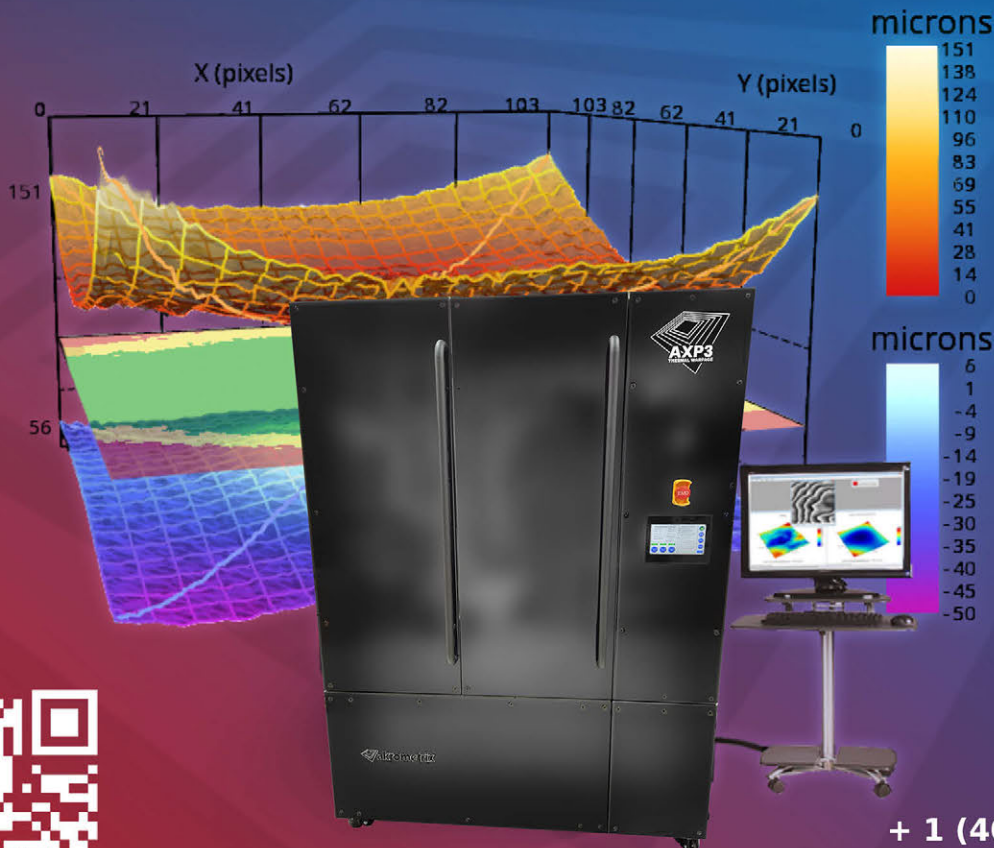
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Querétaro (ICATEQ y UNAM) y Ciudad Juárez (CIITA-IPN), los aliados alinean planes de estudio a competencias basadas en estándares—desde ESD/FOD e identificación de componentes hasta criterios de aceptabilidad y conceptos de fábrica conectada. Los modelos de aprendizaje dual convierten conocimiento en desempeño en piso.

Procesos: La calidad es un idioma. Estándares como IPC-A-610 (aceptabilidad de ensamblajes electrónicos), J-STD-001 (requisitos para ensamblajes eléctricos y electrónicos soldados) e IPC/WHMA-A-620 (requisitos y aceptación para arneses de cables) son la gramática. Su adopción—y la capacitación asociada—impulsa consistencia, menos retrabajos, menos desperdicio y mayor confianza del cliente. Las empresas que integran los estándares a su sistema operativo se vuelven nodos naturales en redes resilientes.

Proximidad: La geografía reduce fricciones. No existe otro país en el planeta además de México, que comparta casi 2,000 kilómetros de frontera con la mayor economía del mundo. Comunicación el mismo día, cambios de ingeniería sincronizados y giros rápidos en prototipos acortan los ciclos de diseño a entrega. La proximidad también protege la propiedad intelectual y facilita la resolución colaborativa de problemas: ingenieros corrigen junto con clientes, equipos de calidad se alinean cara a cara y líderes caminan la línea juntos cuando más importa. Lo sé, porque la he caminado con los mismos operadores y al lado de sus supervisores e ingenieros, para escucharlos y para entender sus necesidades de capacitación.

Acción Gubernamental: Una Política Industrial Activa Para la Electrónica

A medida que aumentan las tensiones geopolíticas y las cadenas de suministro se desplazan, los gobiernos compiten—con distintos ritmos—por atender vulnerabilidades en la manufactura electrónica doméstica. México apuesta con una política industrial activa para aprovechar el momento:

- **Plan Maestro para el Desarrollo de la Industria de Semiconductores.** Presentado con la Embajada de EE. UU. y CANIETI, busca duplicar exportaciones y empleos tecnológicos al 2030—anclando capacidades de diseño, pruebas y manufactura avanzada.

- **Laboratorio Nacional de Diseño de Semiconductores y Electrónica Avanzada (Aguascalientes).** Una nueva plataforma para fortalecer diseño, pruebas y empaquetado—ampliando el rol de México más allá del ensamble final.
- **Incentivos a inversión y contenido.** Programas ligados a contenido local, desarrollo de proveedores y cumplimiento de reglas de origen que impulsan integración más profunda y cadenas de valor más firmes.
- **Instrumentos estatales de capacitación.** Los incentivos más efectivos no son solo fiscales—son asientos de entrenamiento, planes de estudio a la medida y laboratorios cofinanciados. Aquí, las alianzas que hemos logrado con IECA, ICATEQ, UNAM y CIITA-IPN ya expanden capacidad.

La política reduce fricciones, la fuerza laboral eleva capacidades y los estándares garantizan consistencia—desatando inversión privada a gran escala.

Datos de Interconnected: México se Diversifica—y Crece

México juega un rol único en la cadena global de electrónica. Como uno de los siete principales importadores tanto de electrónicos terminados como de insumos electrónicos, funge como centro regional de manufactura y enlace cada vez más importante en el ecosistema tecnológico norteamericano. En 2023, México importó alrededor de 150 mil millones de dólares en bienes relacionados con la electrónica¹—93 mil millones en insumos y 59 mil millones en electrónicos terminados—reflejando fuerte demanda interna, producción para reexportación y creciente nearshoring de empresas estadounidenses e internacionales.

Las preocupaciones de que México sirva como conducto de bienes chinos no se respaldan en los datos comerciales. Entre 2017 y 2023, las importaciones de electrónicos terminados crecieron 23% (de 48 a 59 mil millones), mientras que las provenientes de China solo aumentaron 8%, y su participación cayó más que la de cualquier otro proveedor relevante. Vietnam, Tailandia y Corea del Sur, en cambio, aumentaron su presencia. En insumos, el patrón fue similar: crecieron de 62 a 93 mil

millones (+52%), con la participación de China cayendo frente a un crecimiento mayor desde Taiwán, Vietnam y la Unión Europea. En resumen: México está diversificando, no aumentando la dependencia de China.

Esta estrategia de abastecimiento más amplia se alinea con el objetivo de México de convertirse en un centro productivo más completo. Si bien China sigue siendo un proveedor importante, su importancia relativa está disminuyendo tanto en productos terminados como en insumos.

Integración Con EE. UU.

Gran parte de los componentes electrónicos importados a México se ensamblan en productos finales que se exportan a Estados Unidos—desde electrónicos de consumo hasta sistemas automotrices y controles industriales. La integración regional acorta tiempos de envío, apoya la diversificación geográfica y—bajo el T-MEC—proporciona acceso libre de aranceles que da a México una ventaja estructural en Norteamérica, especialmente en categorías sujetas a aranceles. El acceso al mercado estadounidense es la ventaja de México; su futuro depende de ampliar capacidades y conectividad.

Impulso en Cifras—y lo Que Señalan

Según datos comerciales de EE. UU., las exportaciones mexicanas de tecnología avanzada hacia ese país crecieron más de 35% en 2024, superando por primera vez los 100 mil millones de dólares. Este aumento notable refleja la ventaja de México como socio electrónico seguro y cercano—especialmente mientras los aranceles estadounidenses a productos chinos siguen reconfigurando las cadenas globales. Con sólido respaldo político, una fuerza laboral calificada e integración regional bajo T-MEC, México reduce rápidamente la brecha con China y supera a exportadores tradicionales como Corea del Sur y Alemania.

Sustentabilidad: De Cumplimiento a Competitividad

La sustentabilidad es cada vez más una ventaja competitiva. Los OEMs evalúan a sus proveedores por eficiencia energética, reducción de desperdicios, circularidad y transparencia a lo largo de los niveles. El giro de México hacia la calidad basada

en estándares y la trazabilidad digital se alinea de manera natural con estas expectativas. Reducir retrabajo y desperdicio es sustentabilidad por diseño; aplicar ESD, FOD y disciplina de procesos en cada turno convierte metas ambientales en resultados de línea. Los programas de sustentabilidad de la Asociación en México ayudan a las empresas a traducir política en hojas de ruta prácticas, desde tableros hasta disciplina en acciones correctivas.

Lo Que los Compradores Quieren Hoy, y Cómo México Responde

Los líderes de abastecimiento y CTOs repiten la misma lista:

- Calidad basada en estándares con documentación lista para auditoría
- Tiempos de entrega más cortos y reacción local a cambios de ingeniería
- Trazabilidad desde la inspección de entrada hasta el embarque
- Cumplimiento transparente en comercio, laboral y sustentabilidad
- Un plan de talento creíble que sobreviva rotación y crecimiento

Las plantas más competitivas de México entregan al hacer de los estándares una práctica diaria (no un certificado en la pared), capacitar de manera continua y digitalizar lo que importa. El resultado: se cumplen metas de costo sin sacrificar postura de riesgo ni capacidad de respuesta.

América Latina en el Radar

Otros países latinoamericanos también avanzan. Costa Rica atrae inversión en semiconductores; Brasil y Colombia expanden manufactura electrónica; Argentina y Uruguay crecen en sectores digitales y de tecnología limpia. Sin embargo, la región enfrenta retos estructurales que solo se van a superar con mayor integración, inversión y cooperación. En este panorama, México ya es el hub operativo de una cadena de suministro electrónica más inteligente, cercana y resiliente.

Casos de Colaboración en Los Que Estamos Trabajando

La oficina regional en México de la Global Electronics Association, que con orgullo lidero, vive a diario

la esencia del modelo de la triple hélice de la electrónica—gobierno, academia, industria—alineado en estándares, aprendizajes y manufactura digital para escalar talento al ritmo de la inversión.

- **Guanajuato, talento como estrategia.** En alianza con el estado y el IECA, la industria construye un semillero en Diseño de PCB, Seguridad, ESD/FOD, identificación de componentes y aceptabilidad para ensamble electrónico—creando un flujo repetible que acelera arranques y estabiliza rendimientos.
- **Querétaro, rigor aeroespacial con escala automotriz.** Con la Unidad de Alta Tecnología de la Facultad de Ingeniería de la UNAM y con el Instituto de Capacitación del Estado (ICATEQ), los cursos se conectan a problemas reales en planta, dando a los alumnos una escalera de lo básico a certificaciones avanzadas—traducido en menos defectos y mejores inspecciones.
- **Ciudad Juárez y Chihuahua, Centro de Excelencia a velocidad fronteriza.** Con el CIITA-IPN y la industria local, la innovación en frontera significa líneas que arrancan más rápido; cambios que se propagan sin desfase horario; y ciclos de calidad que se cierran en horas, no semanas.
- **Aguascalientes, diseño y semiconductores en marcha.** En arranque de alianza con gobierno y universidades para articular diseño, semiconductores y manufactura digital—mapeo de brechas y pilotos de upskilling.
- **Jalisco (IDEFT), talento inmediato.** Pilotos de ESD, seguridad, FOD y aceptabilidad; formación de instructores y agenda de Open House/IPC Conecta—modelo replicable en el corredor Guadalajara, “el Silicon Valley de Latinoamérica”.

Conclusión: Diseñando Juntos la Próxima Década

La electrónica es el sistema nervioso de la economía moderna. A medida que el mundo se regionaliza para gestionar riesgo y velocidad, México no es un plan de respaldo; es una decisión de diseño. Proximidad, política y personas se combinan para entregar lo que los clientes globales necesitan: calidad con-

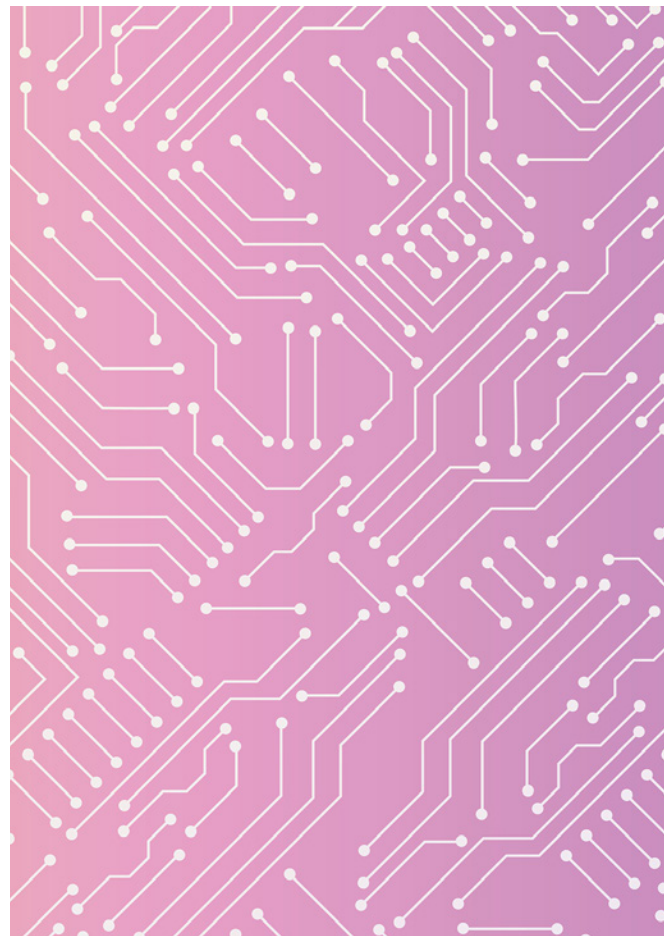
fiable, giros rápidos y cumplimiento transparente—impulsado por una fuerza laboral que habla el lenguaje de los estándares, las normas IPC.

A través de alianzas con gobiernos, universidades y empresas en todo el país, la Global Electronics Association está ayudando a construir una arquitectura repetible para la próxima década de crecimiento—desde movilidad eléctrica y aeronáutica espacial hasta fábricas inteligentes. El mundo se está reconfigurando. México está listo. **SMT007**

Referencias

1. Dato basado en UN Comtrade según la metodología del estudio “Interconnected” (Global Electronics Association). El total (~\$150 mil millones) combina importaciones de componentes de electrónicos terminados, no solo el capítulo HS 85 (casi la totalidad de la industria electrónica y eléctrica).

Lorena Villanueva es directora de Global Electronics Association México.





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Mexico's Evolving Trade Landscape for Electronics

The electronics industry is one of the strongest pillars of global trade, generating more than \$580 billion annually in EMS companies. It drives innovation in automotive, telecommunications, medical devices, and clean energy.

The U.S. Census Bureau reports that Mexico has consolidated its position as a strategic hub in North America. Mexico exports more than \$100 billion in electronics each year, employs over 330,000 specialized workers, and ranks among the top five global exporters in several categories. The ongoing wave of nearshoring has further strengthened Mexico's role as a reliable partner for resilient and regionally integrated supply chains.

In this context, Guanajuato is a key logistics and manufacturing center connecting the heart of Mexico's industrial corridor. From this vantage point, COFOCE (Coordinadora de Fomento al Comercio Exterior de Estado de Guanajuato) works hand-in-hand with companies to ensure compliance, competitiveness, and continuity in a rapidly changing trade environment.

Mexico's Proposal: A Legislative Adjustment in Process

On Sept. 9, 2025, the Mexican government submitted to the Mexican Congress a reform to the Import and

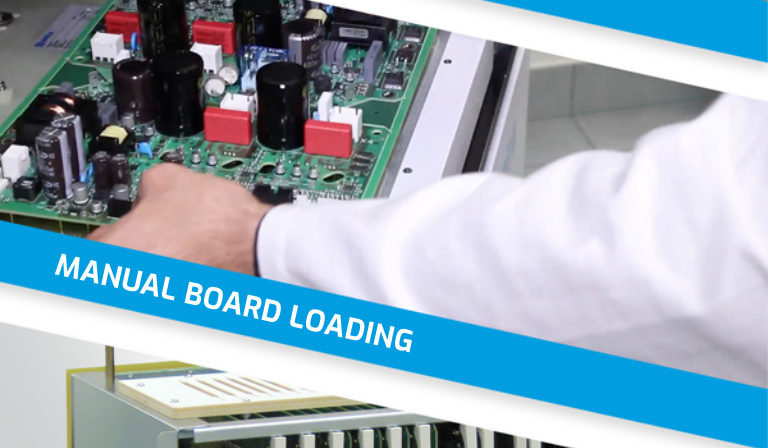
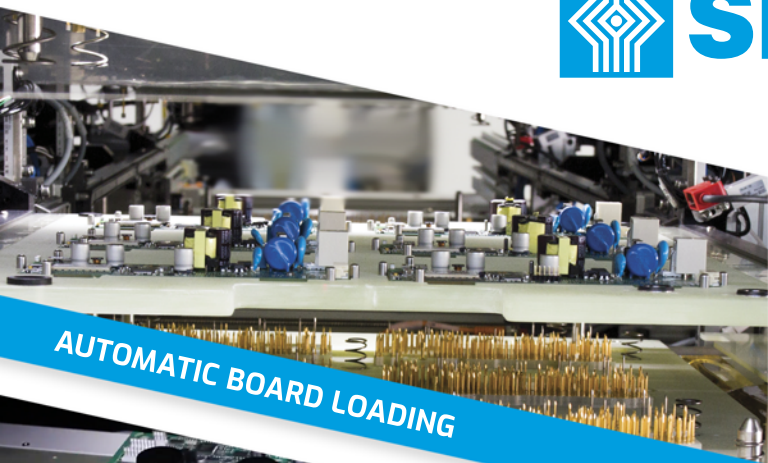
Export Tax Law (LIGIE). It is still a proposal—part of the 2026 Economic Package—and must go through several legislative stages before becoming law:

1. Review by the Economy, Trade, and Competitiveness Committee of the Chamber of Deputies.
2. Debate and approval by the full Chamber of Deputies.
3. Review and approval by the Senate.
4. Final promulgation by the Executive in the Official Gazette of the Federation.

Debate and voting were expected between September and October 2025. If approved, the changes would take effect 30 days after publication, likely in late 2025 or early 2026, and remain valid until Dec. 31, 2026. However, based on previous extensions, the industry should anticipate a longer duration.

The initiative proposes tariff increases between 10–50% on 1,241 tariff lines, specifically for products imported from countries without a free trade agreement (FTA) with Mexico. Trade under existing agreements, such as the U.S.-Mexico-Canada Agreement (USMCA) and the European Union, would remain unaffected. Mechanisms such as the Sectoral Promotion Program (PROSEC) and Rule 8 would also continue to operate, mitigating potential impacts on critical inputs.





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The message is that Mexico is not closing its market; it is strengthening its industrial platform and protecting strategic sectors.

International Reactions: Early Dialogue and Constructive Tone

China and South Korea reacted quickly, yet both chose dialogue over confrontation. China launched a formal investigation into the proposed measure. Shortly after, on Sept. 25, Mexico's Secretary of Economy Marcelo Ebrard met with Ambassador Daojiang Chen. The meeting was described as constructive; Mexico clarified that the proposal carries no political motivation, and both parties agreed to maintain a technical dialogue to avoid tension.

South Korea expressed concern, particularly in the automotive and electronics sectors. Through bilateral meetings, both governments agreed to establish technical working groups to safeguard current investments and assess possible exceptions.

These early engagements confirm that the focus remains on stability and business certainty—not confrontation.

Potential Impacts on Mexico's Electronics Industry

For electronics manufacturing, the main areas of attention are:

- Higher costs for sensitive inputs (connectors, harnesses, plastics, subassemblies) if sourced from non-FTA countries
- More stringent documentation requirements to prove origin and secure preferential treatment
- Adjustments to just-in-time models, potentially requiring buffer inventories or supplier diversification

Overall, the risks appear manageable. Companies with strong compliance processes and supply chain flexibility are well positioned to adapt. Many operations could even strengthen their competitiveness by maximizing USMCA benefits and leveraging existing government programs.

Alternatives and Strategic Options

To mitigate risks and seize opportunities, companies should:

- **Strengthen origin compliance:** Reinforce traceability and certification under USMCA and other FTAs.
- **Leverage PROSEC and Rule 8:** Use key instruments to reduce tariffs on critical imports.
- **Diversify suppliers:** Expand sourcing within North America, Latin America, and Europe.
- **Develop domestic supply chains:** Particularly for cables, plastics, and connectors, where substitution is feasible.
- **Adjust contracts and finances:** Include tariff-adjustment clauses and build working-capital buffers.

Guanajuato and Mexico: Partners for a Reliable Future

The proposed tariff reform should be viewed not as a threat to openness but as part of Mexico's evolution toward a more resilient and strategically aligned trade model.

For the global electronics industry, several realities stand firm: existing treaties safeguard core supply chains; diplomatic engagement with Asia remains constructive; and Mexico continues to offer a skilled workforce, specialized clusters, and unmatched proximity to the United States.

From Guanajuato—the industrial heart of Mexico—COFOCE is supporting companies navigating these changes, ensuring that the state continues to lead as a reliable hub for global electronics manufacturing. In a shifting world economy, Guanajuato's commitment to innovation, compliance, and international collaboration reaffirms one truth: Mexico remains open for business and Guanajuato is at its core. **SMT007**



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Yazmin is an international trade professional with over two decades of experience in customs, automotive, and global logistics. Currently at COFOCE, she advises companies on trade compliance and cross-border operations, while also sharing her expertise as a university lecturer. Her work bridges policy, practice, and strategy in Mexico's role within global trade.



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La Evolución del Panorama Comercial de México en la Industria Electrónica

La industria electrónica es uno de los pilares más sólidos del comercio global, generando más de 580 mil millones de dólares anuales en empresas de servicios de manufactura electrónica (EMS). Impulsa la innovación en los sectores automotriz, de telecomunicaciones, dispositivos médicos y energía limpia.

El Buró del Censo de los Estados Unidos informa que México ha consolidado su posición como un centro estratégico en América del Norte. México exporta más de 100 mil millones de dólares en productos electrónicos cada año, emplea a más de 330,000 trabajadores especializados y se ubica entre los cinco principales exportadores mundiales en varias categorías. La actual ola de nearshoring ha fortalecido aún más el papel de México como un socio confiable para cadenas de suministro resilientes e integradas regionalmente.

En este contexto, Guanajuato es un centro logístico y de manufactura clave que conecta el corazón del corredor industrial de México. Desde esta posición estratégica, COFOCE (Coordinadora de Fomento al Comercio Exterior del Estado de Guanajuato) trabaja de la mano con las empresas para garantizar el cumplimiento, la competitividad y la continuidad en un entorno comercial que cambia rápidamente.

Reescribiendo las Reglas: La Propuesta Mexicana, un Ajuste Legislativo en Proceso

El 9 de septiembre de 2025, el Gobierno de México presentó ante el Congreso una reforma a la Ley de los Impuestos Generales de Importación y de Exportación (LIGIE). Aún se trata de una propuesta—parte del Paquete Económico 2026—que deberá pasar por varias etapas legislativas antes de convertirse en ley:

1. Revisión en la Comisión de Economía, Comercio y Competitividad de la Cámara de Diputados.
2. Debate y aprobación en el pleno de la Cámara de Diputados.
3. Revisión y aprobación por el Senado.
4. Promulgación final por el Ejecutivo en el Diario Oficial de la Federación.

Se esperaba que el debate y la votación tuvieran lugar entre septiembre y octubre de 2025. En caso de aprobarse, los cambios entrarían en vigor 30 días después de su publicación—probablemente a finales de 2025 o inicios de 2026—con vigencia hasta el 31 de diciembre de 2026. No obstante, con base en precedentes, la industria debería anticipar una posible extensión.

La iniciativa propone incrementos arancelarios de entre 10% y 50% en 1,241 fracciones arancelarias, específicamente para productos importados de países que no tienen un tratado de libre comercio (TLC) con México. El comercio bajo acuerdos existentes, como el Tratado entre México, Estados Unidos y Canadá (T-MEC) y el acuerdo con la Unión Europea, permanecería sin afectaciones. Mecanismos como el Programa de Promoción Sectorial (PROSEC) y la Regla 8 también continuarían operando, lo que mitigaría posibles impactos en los insumos críticos.

Reacciones Internacionales: Diálogo en Lugar de Confrontación

China y Corea del Sur reaccionaron con rapidez, aunque ambas naciones optaron por el diálogo en lugar del conflicto. China inició una investigación formal sobre la medida propuesta; poco después, el 25 de septiembre, el secretario de Economía de México, Marcelo Ebrard, se reunió con el embajador Daojiang Chen. El encuentro fue descrito como

constructivo: México aclaró que la iniciativa no tiene motivación política, y ambas partes acordaron mantener un diálogo técnico continuo.

Corea del Sur manifestó preocupación, especialmente en los sectores automotriz y electrónico. A través de reuniones bilaterales, ambos gobiernos acordaron crear grupos de trabajo técnicos para proteger las inversiones existentes y analizar posibles excepciones.

Estos primeros acercamientos confirman que el enfoque de México sigue centrado en la estabilidad y la certidumbre empresarial, no en la confrontación.

Lo Que Está en Juego Para la Industria Electrónica

Para la manufactura electrónica, los principales puntos de atención son:

- Aumento de costos en insumos sensibles (conectores, arneses, plásticos y subconjuntos) provenientes de países sin TLC.
- Mayores requisitos de importación: para acreditar origen y mantener trato preferencial en los productos provenientes de países con Tratado comercial.
- Ajustes a modelos just-in-time, que podrían requerir inventarios de respaldo o diversificación de proveedores.

En general, los riesgos son manejables. Las empresas con procesos sólidos de cumplimiento y cadenas de suministro flexibles están bien posicionadas para adaptarse. De hecho, muchas podrían fortalecer su competitividad al maximizar los beneficios del T-MEC, otros Tratados comerciales y aprovechar los programas gubernamentales existentes.

Opciones Estratégicas Para la Resiliencia

Para mitigar riesgos y aprovechar oportunidades, las empresas deberían:

- Fortalecer el cumplimiento de origen: Reforzar la trazabilidad y certificación bajo el T-MEC y otros TLC.

- Aprovechar PROSEC y Regla 8va: Instrumentos clave para reducir aranceles en importaciones críticas.
- Diversificar proveedores: Ampliar el abastecimiento dentro de América del Norte, América Latina y Europa.
- Desarrollar cadenas locales de suministro: Especialmente en cables, plásticos y conectores donde la sustitución sea viable.
- Ajustar contratos y finanzas: Incluir cláusulas de ajuste arancelario y mantener reservas de capital de trabajo.

Guanajuato y México: Socios Para un Futuro Confiable

La reforma arancelaria propuesta debe entenderse no como una amenaza al libre comercio, sino como parte de la evolución de México hacia un modelo más resiliente y estratégicamente alineado.

Para la industria electrónica global, las certezas permanecen: los tratados existentes protegen las cadenas de suministro esenciales; el diálogo diplomático con Asia continúa en un tono constructivo; y México sigue destacando por su talento especializado, sus clústeres industriales y su cercanía geográfica con Estados Unidos.

Desde Guanajuato—el corazón industrial de México—COFOCE está preparada para acompañar y asesorar a las empresas en este proceso de cambio, asegurando que el estado continúe liderando como un centro confiable para la manufactura electrónica global. **SMT007**



Yazmin Elizabeth González

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GUANAJUATO

Be One of Many: How **Women** Are Shaping Electronics



One of my favorite ads is a recent one by Mercedes-Benz titled “Be One of Many.” It asks, “What if I didn’t have to be the exception? What if I just want to be one of many?” That simple question cuts deep, revealing how systemic inequality often hides behind the idea of women as rare anomalies.

The truth is, in 2025, we’re still having the same conversations: “37% of the manufacturing workforce in Mexico is made up of women,” “the wage gap persists,” “women remain underrepresented in leadership.” None of this is new, and that’s the problem.

Even today, when female leaders in electronics speak publicly, they’re often asked: “How do you balance your personal and professional life?” It seems like no one asks men that, leaving women feeling expected to justify wanting both a career and a family.

History as Proof

Let’s leave the statistics and revisit history. During the War of the Triple Alliance (1864–1870), Paraguay lost nearly 90% of its male population. Women—known as *residentas*—took over farms, businesses, logistics, and even combat. They rebuilt the nation from ashes, proving that leadership, resilience, and technical skill are not gendered traits. The story of Paraguayan women resonates with me because it is the country of my mother’s birth, but also because it is a reality repeated in Mexico and across all of Latin America.

That same spirit exists today in electronics manufacturing, where women operate with precision on the production line, in R&D, and in quality assurance. Yet, they can often remain invisible in the leadership structures that shape the industry.



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Science as Evidence

Modern neuroscience confirms what history shows: Women lead differently, blending empathy with strategy. I've read studies that reveal women often

Modern neuroscience confirms what history shows: Women lead differently, blending empathy with strategy.

have a thicker corpus callosum, enhancing communication between emotional and cognitive centers, which is ideal for complex decision-making.

Women's brains are also highly neuroplastic, adapting across hormonal transitions and life stages. Research shows they exhibit greater adaptability in problem-solving, an asset in an industry driven by constant technological change.

These qualities—attention to detail, problem-solving, collaboration—are exactly what electronics manufacturing demands, and the Global Electronics Association is making it a priority to expand women's access to technical education. Through online training, globally recognized certifications, and mentorship programs, we are equipping women not only to join the industry but to lead it. Take it from someone who's seen it firsthand as part of the Association's work in Mexico.

Business as Imperative

Women influence 70–85% of household purchasing decisions, yet many electronics companies still design products without their input, losing both innovation and revenue. Their leadership is not just socially just, it's strategically smart.

Unfortunately, too many HR policies still treat women as liabilities rather than assets. In Mexican manufacturing, this means moving beyond symbolic gestures toward real structural change:

- Flexible scheduling for shift-working mothers
- Gender-neutral hiring pipelines
- Targeted leadership development for women on the floor
- Maternity policies that are not only legal, but dignified

Industry associations can lead this shift by setting global workforce standards, advocating for fair policies, and ensuring training is accessible regardless of geography or background.

The Challenge Ahead

The electronics sector thrives on precision, innovation, and consistency—qualities women deliver in abundance. Yet, when women remain exceptions rather than the norm, the industry loses untold potential.

The Mercedes-Benz tagline is a call to action. Women have rebuilt nations, advanced science, and shaped markets. In electronics, they are already driving transformation from the assembly line to the C-suite.

Our mission must be to create pathways where women's skills, ideas, and leadership aren't rare, but standard. The question isn't whether women can lead in electronics—it's whether companies are ready to let them lead. Because when women are

truly "one of many" in our industry, the world benefits from what they build. **SMT007**



Ada Gastelum is the former operations manager at Global Electronics Association Mexico.

Electronics Industry Warns Mexico Tariffs Could Undercut U.S. Manufacturing and Supply Chain Resilience

Negotiations over U.S.-Mexico trade policies reached the Oct. 29 deadline, and concurrently, the Global Electronics Association released a new policy brief, ["From Risk to Resilience: Why Mexico Matters to U.S. Manufacturing."](#) The report warns that proposed 30% tariffs on electronics imports from

strong trade partnership with Mexico is a top priority for manufacturers on both sides of the border. Many of its members report that U.S.-Mexico trade is their single most important policy issue. The report underscores that many electronics systems and components cross the U.S.-Mexico border mul-

multiple times before final assembly, reflecting deeply integrated supply chains that support competitiveness, jobs, and security across the region.

The release of the report comes at a critical moment: the current extension for U.S.-Mexico trade negotiations expired on Oct. 29, and the Office of the

U.S. Trade Representative (USTR) is accepting public comments on the United States-Mexico-Canada Agreement (USMCA) through Nov. 3. The Global Electronics Association will submit formal comments on behalf of the industry and plans to testify at the USTR's public hearing on Nov. 17.

The Association urges policymakers to finalize a bilateral trade agreement that preserves tariff-free access, strengthens enforcement, and reinforces Mexico's role as a co-builder of North American manufacturing resilience.

(Source: Global Electronics Association)



Mexico would fracture North American supply chains, raise costs for U.S. manufacturers, and undermine efforts to reshore production and strengthen domestic competitiveness.

The report concludes that Mexico has developed into a full-fledged production hub within the North American ecosystem, drawing on a diversified global network of suppliers. Data shows that Mexico's imports from China have declined significantly since 2017, with sourcing shifting to Vietnam, South Korea, Taiwan, and the European Union.

The Association emphasized that maintaining a

Ser Una Más: Cómo las Mujeres Están Dando Forma a la Electrónica

Uno de mis anuncios favoritos es uno reciente de Mercedes-Benz titulado “Be One of Many” (ser una más). Pregunta: “¿Y si no tuviera que ser la excepción? ¿Y si solo quisiera ser una más?” Esa simple pregunta cala hondo, revelando cómo la desigualdad sistémica suele esconderse tras la idea de que las mujeres son rarezas.

La verdad es que, en 2025, seguimos teniendo las mismas conversaciones: “El 37% de la fuerza laboral manufacturera en México está compuesta por mujeres”, “la brecha salarial persiste”, “las mujeres siguen subrepresentadas en puestos de liderazgo”. Nada de esto es nuevo... y ese es el problema.

Incluso hoy en día, cuando las líderes femeninas en la industria electrónica hablan en público, a menudo se les pregunta: “¿Cómo equilibras tu vida personal y profesional?” Parece que a los hombres nadie les hace esa pregunta, lo que deja a las mujeres con la sensación de que se espera que justifiquen su deseo de tener tanto una carrera como una familia.

La Historia Como Prueba

Dejemos las estadísticas y volvamos a la historia. Durante la Guerra de la Triple Alianza (1864–1870), Paraguay perdió cerca del 90% de su población masculina. Las mujeres—conocidas como residentes—se hicieron cargo de granjas, negocios, logística e incluso del combate. Reconstruyeron la nación desde las cenizas, demostrando que el liderazgo, la resiliencia y la habilidad técnica no son rasgos exclusivos de un género. La historia de las mujeres paraguayas resuena conmigo porque es el país de origen de mi madre, pero también porque es una realidad que se repite en México y en toda Latinoamérica.

Ese mismo espíritu existe hoy en la manufactura electrónica, donde las mujeres trabajan con precisión en la línea de producción, en laboratorios de

I+D y en control de calidad. Sin embargo, a menudo pueden permanecer invisibles dentro de las estructuras de liderazgo que dan forma a la industria.

La Ciencia Como Evidencia

La neurociencia moderna confirma lo que la historia demuestra: las mujeres lideran de manera diferente, combinando la empatía con la estrategia. He leído estudios que revelan que las mujeres suelen tener un cuerpo calloso más grueso, lo que mejora la comunicación entre los centros emocionales y cognitivos, algo ideal para la toma de decisiones complejas.

Además, el cerebro femenino es altamente neuroplástico, adaptándose a lo largo de transiciones hormonales y etapas de la vida. Las investigaciones demuestran que muestran mayor capacidad de adaptación en la resolución de problemas—un activo clave en una industria impulsada por cambios tecnológicos constantes.

Estas cualidades—atención al detalle, solución de problemas, colaboración—son exactamente lo que la manufactura electrónica demanda. Por eso, organizaciones como Global Electronics Association han hecho de la expansión del acceso femenino a la educación técnica una prioridad. A través de la capacitación en línea Electronics U, certificaciones reconocidas globalmente y programas de mentoría, la Asociación equipa a las mujeres no solo para ingresar en la industria, sino para liderarla. Tómelo de alguien que lo ha visto de primera mano como parte del trabajo de la Asociación en México.

El Negocio Como Imperativo

Las mujeres influyen en el 70–85% de las decisiones de compra en los hogares, y aun así muchas empresas electrónicas siguen diseñando productos sin su aportación—perdiendo innovación y rent-

abilidad. Su liderazgo no solo es socialmente justo, es estratégicamente inteligente.

Desafortunadamente, demasiadas políticas de recursos humanos aún tratan a las mujeres como un riesgo y no como un activo. En la manufactura mexicana, esto significa ir más allá de gestos simbólicos hacia un cambio estructural real:

- Horarios flexibles para madres con turnos de trabajo
- Canales de contratación con criterios neutrales de género
- Programas de desarrollo de liderazgo dirigidos a mujeres en planta
- Políticas de maternidad no solo legales, sino dignas

Las asociaciones industriales pueden liderar este cambio estableciendo estándares laborales globales, abogando por políticas justas y asegurando que la capacitación sea accesible sin importar la ubicación o el contexto.

El Reto Por Delante

El sector electrónico prospera gracias a la precisión,

la innovación y la consistencia—cualidades que las mujeres aportan en abundancia. Sin embargo, cuando las mujeres siguen siendo la excepción y no la norma, la industria pierde un potencial incalculable.

El eslogan de Mercedes-Benz es un llamado a la acción. Las mujeres han reconstruido naciones, impulsado la ciencia y moldeado los mercados. En la industria electrónica, ya están liderando la transformación, desde la línea de ensamblaje hasta los niveles ejecutivos. Nuestra misión debe ser crear caminos donde las habilidades, ideas y liderazgo de las mujeres no sean algo excepcional, sino la norma. La pregunta no es si las mujeres pueden liderar en la industria electrónica, sino si las empresas están listas para permitirles liderar. Porque cuando las mujeres sean verdaderamente “una entre muchas” en nuestra industria, el mundo se beneficiará de lo que ellas construyan. **SMT007**



Ada Gastelum fue gerente de operaciones de Global Electronics Association México.



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The Heart of the Electronics Industry Beats in Guanajuato

Alejandro Hernández

Guanajuato is no longer just a land of history, culture, and tourism. It's emerging as a key player in Mexico's electronics manufacturing ecosystem. This vision is brought to life by Alejandro Hernández, undersecretary for Investment Attraction at the Ministry of Economic Development and Sustainability of Guanajuato.

The discussion unfolded less like a formal interview and more like a strategic conversation between partners committed to a shared goal: positioning Guanajuato as a hub for advanced manufacturing, especially in electronics.

"Guanajuato has always been at the forefront," Hernández says. "Now we're turning our focus to building our own electronics industry, just as we've done with the state's other 12 industrial clusters."

A Strategic Move, Not a Stroke of Luck

Guanajuato's growing presence on the electronics map is no coincidence. What's happening here is the result of clear, deliberate strategy.

"The government has

made a conscious effort to attract key investments, develop local talent, and provide legal certainty," Hernández says. "We're not improvising."

An Ecosystem Ready for Expansion

Today, companies like Bosch, ELRAD, Kostal, and TYW Helion Young Electronics already operate in Guanajuato, conducting SMT processes and producing high-value components.

"The car of the future is essentially a computer on wheels," Hernández says. "Automotive, aerospace, and even home appliance sectors are increasingly demanding electronics."

These shifts are driving the integration of electronics into Guanajuato's broader industrial fabric.

Education and Talent: The Crown Jewels

What truly sets Guanajuato apart is its investment in human capital. The state's IECA (State Training Institute) and CEDECI (Electronic Design and Integrated Circuits Center) have become national benchmarks.

Through partnerships with organizations like Global Electronics Association, SEMI, and the Iberoamerican Technology Foundation, Guanajuato is adapting technical training programs at the speed of industry demands.



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Nearshoring Isn't Magic

While nearshoring is trending, Hernández offers a reality check: “It’s not a magic wand,” he says. “Proximity to the U.S. isn’t enough. You need legal certainty, infrastructure, skilled talent, and a government that makes things happen.”

He defines Guanajuato’s approach as that of a “business-oriented government,” one committed to delivering results for investors.

Looking Ahead: From Workforce to ‘Thinkforce’

The vision is ambitious: to become Latin America’s leading electronics manufacturing hub. To achieve this, Guanajuato is upgrading infrastructure, fostering innovation, and creating meaningful public-private partnerships.

“We don’t just have a skilled workforce,” Hernández says. “We have a skilled thinkforce. That’s what sets us apart.”

What’s Next? The Future Is in Motion

Guanajuato is already working on the design of public policies to support the evolution of key sectors toward electronics integration. From support in IPC certifications to the attraction of semiconductor processes such as ATP (assembly, testing, and packaging), the state is preparing for what’s coming.

And while strategies are still being refined at the federal level, Guanajuato already has a plan in motion. “In the electronics sector, Guanajuato has set things in motion and defined its course,” Hernández says. “We work tirelessly to ensure that the companies that place their trust in us see long-term results—not just in profitability, but in operational excellence and social impact. We do this hand in hand with Global Electronics Association, IECA, and a growing network ready to thrive.” **SMT007**

Lorena Villanueva is director of Global Electronics Association Mexico.

El Corazón de la Industria Electrónica Late en Guanajuato

Alejandro Hernández

Guanajuato ya no es solo tierra de historia, cultura y turismo. Hoy, se perfila como un epicentro estratégico para la industria electrónica en México. Así lo confirma Alejandro Hernández, Subsecretario de Atracción de Inversiones de la Secretaría de Desarrollo Económico Sustentable del estado, en una entrevista para SMT007 México Edition.

La charla, más que una entrevista formal, fluyó como una conversación entre aliados estratégicos que comparten una visión: convertir a Guanajuato en un nodo clave de manufactura avanzada, especialmente en el sector electrónico.

“Guanajuato siempre ha estado a la vanguardia”, dice Hernández. “Ahora estamos enfocando nuestros esfuerzos en construir nuestra propia industria electrónica, tal como lo hemos hecho con los otros 12 clústeres industriales del estado.”

Una Estrategia Consciente, No Una Coincidencia

En los últimos años, Guanajuato ha escalado rápidamente posiciones en el mapa de la electrónica, y no por casualidad. Lo que está ocurriendo en Guanajuato es resultado de una estrategia clara y bien ejecutada.

“Desde el gobierno se ha hecho un esfuerzo consciente por atraer inversiones clave, desarrollar talento local y ofrecer certeza jurídica”, dice Hernández. “No estamos improvisando”.

Un Ecosistema Listo Para Crecer

Actualmente, el estado alberga operaciones de empresas como Bosch, ELRAD, Kostal, TYW Helion Young Electronics, entre otras. Muchas ya realizan procesos de ensamblaje electrónico (SMT) y fabricación de componentes de alto valor.

“El vehículo del futuro será una computadora con ruedas”, explica Hernández. Y por eso, muchos clústeres tradicionales como el automotriz, aeroespacial y de electrodomésticos ya demandan cada vez más electrónica.

Educación y Talento: Las Joyas de la Corona

Uno de los pilares que distingue a Guanajuato es su enfoque en el desarrollo de talento. Instituciones como el IECA (Instituto Estatal de Capacitación) y el CEDECI (Centro de Diseño Electrónico y Circuitos Integrados) son referentes nacionales.

Además, se están ajustando currículos técnicos y educativos en tiempo real, en colaboración con asociaciones como Global Electronics Association y organizaciones internacionales como SEMI o la Iberoamerican Technology Foundation, para responder a las necesidades aceleradas del sector.

Nearshoring: Oportunidad Que No Cae Del Cielo

A pesar del auge del nearshoring, Hernández es claro: “No es una varita mágica. No basta con estar cerca de Estados Unidos. Hay que ofrecer certeza jurídica, infraestructura, talento capacitado y un gobierno que haga que las cosas pasen”.

Guanajuato, asegura, se ha convertido en un ejemplo de lo que significa ser un “business-oriented government”, un gobierno enfocado en resultados para la inversión.

Visión a Largo Plazo: Mente de Obra Calificada

La meta es clara: consolidarse como hub de manufactura electrónica de excelencia en Latinoamérica. Para ello, el estado está preparando infrae-

estructura, fortaleciendo alianzas público-privadas y fomentando la innovación.

“En Guanajuato no solo tenemos mano de obra calificada, tenemos mente de obra calificada”, remarca Hernández. “Eso hace la diferencia”.

¿Y el Futuro? Ya Está en Marcha

Guanajuato trabaja ya en el diseño de políticas públicas que acompañen la evolución de sectores clave hacia la integración electrónica. Desde soporte en certificaciones IPC, hasta atracción de procesos de semiconductores tipo ATP (assembly, testing, and packaging), el estado se prepara para lo que viene.

Y mientras a nivel federal aún se afinan estrategias, Guanajuato ya tiene un plan en marcha. “En el rubro de electrónica, Guanajuato ha arrancado la marcha y definido su rumbo”, concluye.

“Trabajamos incansablemente para garantizar que las empresas que confían en nosotros vean resultados a largo plazo, no solo en rentabilidad, sino en excelencia operativa e impacto social”, concluyó Hernández. “Lo hacemos de la mano de la Global Electronics Association, el IECA y una red en crecimiento lista para prosperar.” **SMT007**

Lorena Villanueva es la directora de Global Electronics Association México.

Rehm Wins Mexico Technology Award for CondensoXLine With Formic Acid

Modern electronics manufacturing requires technologies with high reliability. By using formic acid in convection, condensation, and contact soldering, Rehm Thermal Systems' equipment ensures reliable, void-free solder joints – even when using flux-free solder pastes. Thanks to the integrated formic acid process, subsequent cleaning of the assemblies can be eliminated. This innovative technology was recognized with the Mexico Technology Award at the SMTA Guadalajara event.

Rehm Thermal Systems is responding to the industry's growing demand to eliminate traditional fluxes and complex cleaning processes with an innovative and exclusive solution. By successfully integrating acid-based technology into the Condenso series, the company marks another technological milestone.

In the flux-free soldering process, the inert carrier gas (N_2) is enriched with formic acid ($HCOOH$) and introduced into the process chamber. The excellent heat transfer of the medium, combined with vacuum technology, ensures an optimal soldering process. Unlike traditional fluxes, which leave residues that must be removed, the formic acid completely decomposes into gaseous by-products (CO_2 , CO , H_2O), enabling clean solder joints. This makes subsequent cleaning of assemblies unnecessary.

The Mexico Technology Awards 2025 were announced by the trade magazine *Mexico EMS* during a ceremony held at the Westin Hotel in Guadalajara,



Jalisco. Forty-five companies were recognized for their contributions to the Mexican electronics industry. Once again, Rehm Thermal Systems Mexico received a Mexico Technology Award, joining the ranks of companies driving technological innovation, improving productivity and manufacturing quality, and delivering cost-efficient solutions. The CondensoX-Line FA 2025 has also been nominated for the Produccion Innovation Award.

Rehm's presence in Mexico is developing into an important hub for electronics manufacturing, particularly in consumer electronics and the automotive sector. The location recently celebrated its 10th anniversary and hosted a well-attended Technology Day. In its new 960 m² facilities in a modern industrial park in Guadalajara, Rehm supports both OEMs and EMS providers with locally adapted process technology.

(Source: Rehm Thermal Systems)



10

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The Heart of the Electronics Industry Beats in Guanajuato

Salomón Ceballos

Technological revolutions aren't only measured in gigabytes, robots, or PCBs. They're also measured in people. In Guanajuato, the most strategic resource being built is not machinery, but talent. At the center of this transformation is Salomón Ceballos, general director of the State Training Institute (IECA).

What makes IECA unique isn't just its facilities, it's its approach. Unlike most training institutes under the Education Department, IECA is part of Guanajuato's Ministry of Economy, and that changes everything.

"We don't focus on long academic programs that quickly become outdated," Ceballos says. "We listen directly to the industry and build custom pro-

grams tailored to length, format, and subject matter."

IECA has built a network of more than 980 instructors and works closely with companies like Michelin, American Axle, and Fabromex. Many of these companies have their own classrooms inside IECA campuses. That level of integration allows for real-time problem-solving and rapid responsiveness.

A Talent Pool That's Ready to Compete and Win

As new investments pour in due to the nearshoring boom, companies expect one thing: trained, certified talent from day one.

"Companies don't come asking if we're ready," he says. "They arrive assuming we are. They expect to see skilled people already certified."

That's where IECA's partnership with the Global Electronics Association comes in, helping certify students and instructors alike in IPC standards. "This takes us to another level," he adds.



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Innovation Through Collaboration

IECA's strength lies in its constant interaction with the ecosystem. At its Innovation Centers—like CEDECI—the government, academia, and industry come together to anticipate needs and approve smart investments.

“From identifying a need to getting funding approved and purchasing new equipment, it can all happen in under two months,” Ceballos says. “That’s what allows us to stay one step ahead.”

Thanks to this model, IECA has invested more than 130 million pesos in industry-driven training programs.

Is Guanajuato Ready to Compete Globally?

Guanajuato is more than just infrastructure, industrial parks, or demographics. It’s a living ecosystem, where universities, training centers, and industries collaborate daily.

“University students come to IECA for hands-on

training,” Ceballos says. “Some schools may have great theory but lack the industrial equipment. That’s where we come in.”

With 47 industrial parks and IECA campuses strategically located nearby, technical education has become a key driver for attracting investment. “Other states are now asking to replicate our model,” Salomón adds.

Not Just Skilled Hands—Skilled Minds

We closed our conversation with a phrase that perfectly captures IECA’s mission: “Here in Guanajuato, we don’t just train a skilled workforce,” he says. “We train a skilled thinkforce, and that makes all the difference.” **SMT007**

Lorena Villanueva is director of Global Electronics Association Mexico.

I-007e

Get smarter here.

El Corazón de la Industria Electrónica Late en Guanajuato

Salomón Ceballos

La revolución tecnológica no solo se mide en gigabytes, robots o PCBs. Se mide también en talento. Y en Guanajuato, ese talento se está formando con una visión estratégica, en un ecosistema donde gobierno, industria y academia trabajan como uno solo. A la cabeza de esa transformación educativa se encuentra Salomón Ceballos, director general del Instituto Estatal de Capacitación (IECA).

Lo que distingue al IECA no es solo su infraestructura, sino su enfoque. A diferencia de otros institutos ligados al sector educativo, el IECA depende directamente de la Secretaría de Economía del estado. Esto cambia todo.

“No nos enfocamos en programas académicos largos que se desactualizan rápido. Escuchamos directamente a la industria y respondemos con programas hechos a la medida: en duración, formato y contenido”, dice Ceballos.

El IECA cuenta con una red de más de 980 instructores, y colabora activamente con empresas como Michelin, American Axle, Fabromex y muchas otras que incluso instalan sus propias aulas dentro de los planteles. Esta cercanía permite detectar necesidades en tiempo real y responder con agilidad.

Talento Listo Para Competir... y Ganar

La llegada de nuevas inversiones, sobre todo en el marco del nearshoring, trae consigo una exigencia: personal calificado desde el primer día.

“Las empresas no llegan a preguntarnos si estamos listos”, dice Ceballos. “Llegan asumiendo que lo estamos. Y por eso necesitan ver talento ya capacitado y certificado”.

Ahí es donde entra la alianza con Global Electronics Association, que ha permitido que el IECA y centros como el CEDECI (Centro de Diseño Electrónico y Circuitos Integrados) certifiquen personal en normas internacionales como las IPC. “Eso nos pone en otro nivel”, dice.

Innovación Que Nace de la Colaboración

Una de las grandes fortalezas del IECA es su conexión constante con el ecosistema: gobierno, industria y academia se sientan juntos en consejos de innovación, como el del CEDECI. De estas sesiones nacen inversiones estratégicas, como las destinadas a inteligencia artificial, cuartos limpios y electromovilidad.

“En menos de dos meses podemos detectar una necesidad, aprobar la inversión y adquirir el equipo. Eso nos permite ir un paso adelante”, dice.

Gracias a esta dinámica, el IECA ha invertido más de 130 millones de pesos en capacitación directamente vinculada con las necesidades del sector productivo.

¿Está Guanajuato Listo Para Ser Un Hub Global?

La respuesta es contundente: sí. Guanajuato no solo tiene parques industriales, infraestructura y capital humano. Tiene un ecosistema vivo, donde universidades, centros de capacitación y empresas colaboran cada día.

“Los jóvenes vienen a los planteles del IECA a completar su formación práctica. Muchas universidades no tienen el equipo necesario, pero nosotros sí. Esa sinergia es clave”, dice Ceballos.

Con 47 parques industriales cercanos y planteles estratégicamente ubicados, el IECA se ha convertido en una pieza crítica en la atracción de inversiones. “Cada vez más estados quieren replicar nuestro modelo”, dice Ceballos.

La Diferencia: Formar No Solo Manos, Sino Mentes

Cerramos la entrevista con una frase que resume la filosofía del IECA y del gobierno de Guanajuato:

“Aquí no solo formamos mano de obra calificada”, dice Ceballos. “Formamos mente de obra. Y eso es lo que realmente hace la diferencia”. **SMT007**

Lorena Villanueva es la directora de Global Electronics Association México.

Mexico's First Soldering Championship



There were no stadium lights, roaring crowds, or a referee blowing a whistle. But on Sept. 25, the energy felt exactly like a championship final. The Richard E. Dauch Institute for Education and Development at IECA, in Silao, Mexico, transformed into a battleground—not for goals, but for flawless solder joints. The audience held its breath, knowing they were witnessing something historic: Mexico's very first National Hand Soldering Championship.

The Road to Glory: A Grueling Elimination Round

Nearly 200 professionals joined the “group stage,” but only 12 made it to the grand final. The playing field? Workstations lined with soldering irons, tim-

ers, and strict technical requirements. The competition followed the IPC-J-STD-001 and IPC-A-610 standards at the toughest level: Class 3, the gold standard for sectors like aerospace, defense, and medical devices, where failure is not an option.

Every solder joint felt like a penalty kick in overtime requiring precision, nerves of steel, and zero room for error.

The Crowd and Sponsors: Backed by Industry Giants

No major championship is complete without an all-star lineup. In this case, the sponsors and partners brought elite support: JBC Soldering Tools, Hakko, the Government of Guanajuato, AHR Training Center,

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Pablo César
Pérez Medina



decisive performance. His name echoed through the room like a last-minute goal: Pablo César Pérez Medina, representing Diram.

With calm determination and surgical precision, Pablo claimed the title of Mexico's first national hand-soldering champion. His victory wasn't just personal; it was symbolic of an industry stepping confidently onto the world stage.

Next Stop: Munich

Pablo's win came with more than just a medal. He also earned a ticket to the world finals at productronica, the premier international electronics manufacturing event, held in Munich, Germany Nov. 20–21.

There, he'll represent Mexico against the world's best, like stepping into the World Cup of soldering, ready to make his mark.

Repstronics, Almit, REHM Thermal Systems, Indium, Quantum Storage, Plato, AVEN, Chemtronics, Coventry, and Techspray.

Key players from both the public and private sectors attended, including Lorena Villanueva (director of Global Electronics Association Mexico), Ángel David Ortiz Laguna (Guanajuato Ministry of Economy), Salomón Ceballos (director of IECA), and Daniel Montes (director of JBC North America). Their message was unified and powerful that Mexico has the talent to compete at the highest level globally.

The Winning Moment: A Champion Emerges

The competition was tight and intense. Every contestant gave their all, but only one delivered the final,

A Spark Ignites: The Start of a New Legacy

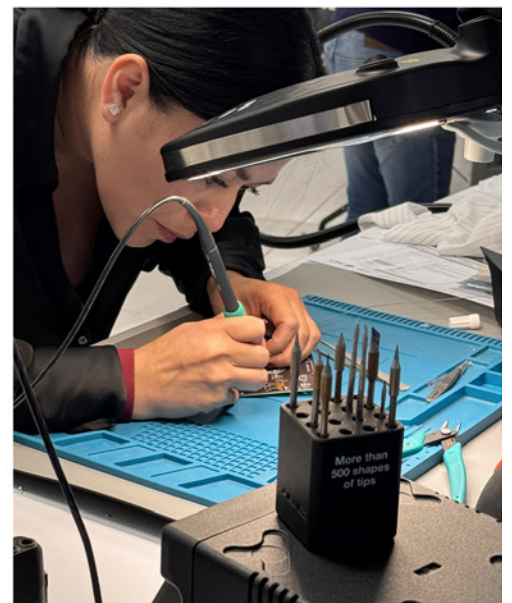
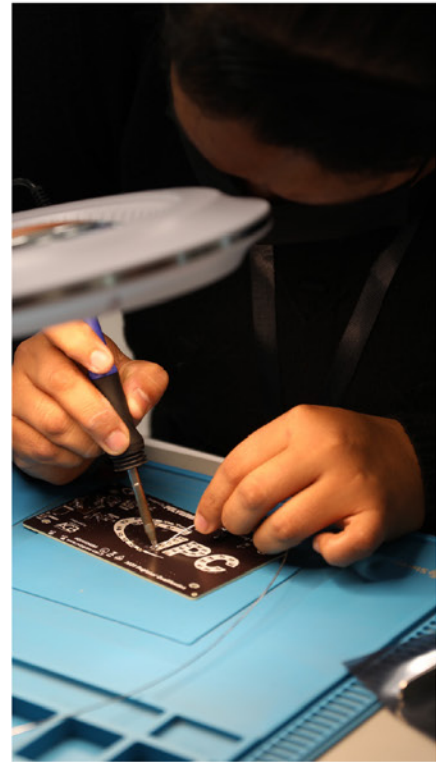
What took place in Silao wasn't just a contest, but the birth of a tradition that fuses talent, discipline, and a global vision.

The final whistle may have blown, but the story is just getting started. The soldering iron is now in Pablo's hands and with it, the hopes of an entire country heading into its biggest match yet. **SMT007**



Juan Balderrama is the commercial and growth manager at Global Electronics Association Mexico.





México ya Tiene a su Campeón del Hand Soldering Championship

El 25 de septiembre no hubo estadio ni árbitro con silbato, pero sí se vivió la misma intensidad de una final de campeonato. El Instituto de Educación y Desarrollo Richard E. Dauch del IECA, en Silao, Guanajuato, se transformó en una arena donde los goles fueron reemplazados por uniones de soldadura perfectas y los aplausos por la respiración contenida de un público que sabía que estaba presenciando historia: el primer Campeonato Nacional de Soldadura Manual en México.

Primer tiempo: la eliminatoria más dura

De casi 200 profesionales que iniciaron en la “fase de grupos”, solo 12 finalistas lograron llegar a la cancha principal. No había balones ni porterías: había caudines, cronómetros y un reglamento implacable. La prueba estuvo regida por los estándares IPC J-STD-001 e IPC-A-610, aplicados en su nivel más exigente: clase 3, donde la confiabilidad es vital porque se trata del mismo nivel de calidad que demandan sectores como aeronáutica, defensa y dispositivos médicos.

Cada punto de soldadura equivalía a un penalti en tiempo extra: precisión quirúrgica, temple absoluto y cero margen de error.

La afición y los patrocinadores: el once ideal

Todo gran torneo necesita un cuadro de lujo. En este caso, los patrocinadores y aliados fueron auténticos “titulares indiscutibles”: JBC Soldering Tools, Hakko, Gobierno de Guanajuato, AHR Training Center, Repstronics, Almit, REHM Thermal Systems, Indium, Quantum Storage, Plato, AVEN, Chemtronics, Coventry y Techspray.

En la tribuna se dieron cita líderes de la industria y del sector público: Lorena Villanueva (Directora de Global Electronics Association México), Ángel David Ortiz Laguna (Secretaría de Economía de Guanajuato), Salomón Ceballos (Director del IECA) y Daniel Montes (JBC Norteamérica).

Todos coincidieron en un mismo mensaje: México tiene talento y disciplina para competir en el escenario global.

El gol de la victoria: un campeón con nervios de acero

El marcador estuvo cerrado durante horas. Cada competidor dejó todo en la mesa, pero solo uno logró el golpe decisivo. El nombre resonó en la sala como un gol en el minuto 90: Pablo César Pérez Medina, de Diram.

Con nervios de acero y manos de precisión milimétrica, Pablo se convirtió en el primer campeón nacional de soldadura manual. Su triunfo no solo simboliza excelencia técnica individual, sino el potencial de toda una industria que hoy levanta la mano a nivel mundial.

Tiempo extra: el boleto a Múnich

La medalla no fue el único premio. Pablo también obtuvo el pase directo a la final mundial en Múnich, Alemania, los próximos 20 y 21 de noviembre, en el marco de Productronica, la feria más importante del mundo en manufactura electrónica.

Allí enfrentará a los mejores del planeta. Será como disputar un mundial: y México ya tiene a su representante listo para dejarlo todo en la cancha.

El legado: un campeonato que encendió la chispa

Lo vivido en Silao no fue un evento aislado, sino el inicio de una tradición que une talento, estándares globales y visión competitiva.

El silbatazo final sonó en Guanajuato, pero la historia apenas comienza. Hoy el balón o más bien, el caudín— está en las manos de Pablo, quien llevará el nombre de México a jugar su partido más importante en la arena global de la electrónica. **SMT007**



Juan Balderrama es gerente comercial en Global Electronics Association México.



EL ENFOQUE EN EL CLIENTE IMPULSA LA EXCELENCIA OPERATIVA



Construyendo alianzas sólidas para el éxito y la excelencia en la manufactura

Impulsar la excelencia en la manufactura en México comienza con alianzas locales sólidas. Koh Young es su aliado de confianza, ayudándole a acelerar la competitividad mediante la automatización y la transformación digital en toda la región.



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Forjando una
asociación tecnológica
a largo plazo



Revolucionando las
operaciones: el poder de las
alianzas con los proveedores

A Mindset of Sustainability Beyond Compliance

In recent months, global discussions about corporate sustainability regulations have intensified. There's a great deal of uncertainty and ambiguity about what lies ahead, but it's equally true that many companies are already moving beyond compliance. We're not just reacting to regulation; we're acting because we believe it's the right thing to do and because it makes business sense.

At its core, sustainability is about meeting the needs of businesses, communities, and indi-

viduals today, without compromising the ability of future generations to meet theirs. In more modern terms, sustainability is about creating value for people and the planet, while also ensuring profitability. This triple bottom line—people, planet, and profit—is not just a framework; it's a mindset that redefines how we do business.

In the past, many companies treated sustainability as a side initiative, something desirable but dispensable. It was often siloed, disconnected from the core of

business strategy. That was a mistake. Many of us working in sustainability have spent the last decade correcting that course. We've been building strong, stable governance structures within our organizations that understand the business, its challenges, and its pain points. Based on that understanding, we've crafted strategies that are not isolated but integrated. If we can move forward in one area today, we do. If we can advance in another way tomorrow, we will adapt.

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business needs—and vice versa—is not an easy task. It requires patience, a deep willingness to learn, and the ability to speak the various languages of the business, including finance, operations, legal,

When sustainability is embedded in a business's DNA, it becomes resilient, relevant, and impactful.

supply chain, and more. But this is the only way to ensure that sustainability programs endure. When sustainability is embedded in a business's DNA, it becomes resilient, relevant, and impactful.

Leadership plays a pivotal role in this journey. Values and culture set the direction, and when they align with a sustainable vision, they become powerful drivers of change. It's this combination—leadership, values, and culture—that enables successful sustainability programs to flourish. These are not just internal virtues; they are strategic assets.

Yes, we are living through challenging times with global issues that are real, urgent, and complex. But within these challenges lie immense opportunities. For the first time, we are seeing sustainability, efficiency, value creation, and resilience being discussed in the same breath. This convergence presents an opportunity to reassess the role of business in society and to reconfigure business models that are both responsible and profitable.

To everyone working in sustainability, I offer this invitation: Awaken your hunger to learn. Don't limit yourself to what you already know or love—whether it's emissions, human rights, or labor practices.

Expand your perspective. Dive into finance. Understand legal frameworks. Explore supply

chain dynamics. Study operational efficiency. These are not distractions, but the very tools that will make your sustainability program successful.

Sustainability is not a trend. It's not a checkbox on a compliance form. It's a way of doing business that recognizes the interdependence between corporate success and the well-being of the world around us. It's a long-term commitment to innovation, collaboration, and shared value. Above all, it's an opportunity for companies to become agents of positive change.

In conclusion, while the regulatory landscape may remain uncertain, companies have the power and the responsibility to lead with purpose. By embedding sustainability at the heart of strategy, we not only prepare for the future, we help shape it. Because at the end of the day, doing what's right is also doing what's smart. **SMT007**

Barjouth Aguilar is senior director of sustainability and foundation officer at Flex.



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La Sostenibilidad en Tiempos de Incertidumbre

En los últimos meses, el mundo empresarial ha sido testigo de un creciente debate sobre las regulaciones globales en materia de sostenibilidad corporativa. Es innegable que existe una gran incertidumbre y falta de claridad sobre lo que deparará el futuro en este ámbito. Sin embargo, también es cierto que muchas empresas han decidido ir más allá de lo que exige la normativa. Lo hacen no solo por cumplir, sino porque creen firmemente que es lo correcto y que, además, tiene sentido desde una perspectiva estratégica y de negocio.

La sostenibilidad, en su definición más básica, busca alcanzar los objetivos de empresas, comunidades y personas en el presente, sin comprometer la capacidad de las futuras generaciones para alcanzar los suyos. En sus versiones más modernas, este concepto se ha enriquecido: ahora se entiende que la sostenibilidad debe beneficiar simultáneamente a las personas, al planeta y a la rentabilidad empresarial. Esta triple dimensión—social, ambiental y económica—es la base de un modelo de negocio verdaderamente sostenible.

En el pasado, muchas empresas trataban la sostenibilidad como una iniciativa secundaria, algo deseable, pero prescindible. Esta visión fragmentada ha demostrado ser ineficaz. Por ello, muchos líderes en sostenibilidad han trabajado arduamente para construir una gobernanza sólida y estable dentro de las organizaciones. Una gobernanza que entienda profundamente el negocio, sus desafíos, sus dolores, y que, a partir de ese entendimiento, diseñe estrategias integradas y no aisladas. La clave está en avanzar paso a paso, adaptándose a las circunstancias, pero sin perder de vista el objetivo final.

Integrar la sostenibilidad a las necesidades del negocio—y viceversa—no es tarea fácil. Requiere paciencia, una gran capacidad de aprendizaje y, sobre todo, la habilidad de hablar los múltiples lenguajes que conviven dentro de una empresa: el financiero, el legal, el operativo, el comercial, entre otros. Esta integración es la única forma de garantizar que los programas de sostenibilidad no solo sobrevivan, sino que prosperen y generen verdadero impacto.

El liderazgo empresarial juega un papel fundamental en este proceso. Los valores y la cultura organizacional marcan el rumbo, y cuando se alinean con una visión sostenible, se convierten en motores de cambio. Es esta

combinación de liderazgo, valores y cultura la que permite construir programas de sostenibilidad exitosos, capaces de adaptarse a los tiempos y de generar valor a largo plazo.

Sí, estamos viviendo tiempos desafiantes con problemas globales que son reales, urgentes y complejos., también es cierto que estamos ante una oportunidad histórica. Nunca antes se había hablado tanto de sostenibilidad, eficiencia, propuesta de valor y resiliencia en una misma conversación. Esta convergencia nos permite repensar el rol de las empresas en la sociedad y rediseñar sus modelos de negocio para que sean más inclusivos, responsables y rentables.

A todas las personas que trabajan en el mundo de la sostenibilidad, les hago una invitación sincera: despierten esa hambre de aprender. No se limiten a profundizar en los temas que ya dominan o que les apasionan—como las emisiones de carbono, los derechos humanos o las prácticas laborales—amplíen su mirada. Sumérjanse en el mundo de las finanzas, comprendan los aspectos legales, estudien la cadena de suministro, analicen la eficiencia operativa. Solo así podrán construir programas robustos, capaces de dialogar con todas las áreas de la empresa y de generar impacto real.

La sostenibilidad no es una moda ni una obligación regulatoria. Es una forma de hacer negocios que reconoce la interdependencia entre el éxito empresarial y el bienestar del entorno. Es una apuesta por el largo plazo, por la innovación, por la colaboración y por la creación de valor compartido. Sobre todo, es una oportunidad para que las empresas se conviertan en agentes de cambio positivo en el mundo.

En conclusión, aunque el panorama regulatorio global pueda parecer incierto, las empresas tienen en sus manos la posibilidad de liderar con propósito. Al integrar la sostenibilidad en el corazón de sus estrategias, no solo estarán preparadas para enfrentar los desafíos del futuro, sino que contribuirán activamente a construir un mundo mejor. Porque al final del día, hacer lo correcto también es hacer buen negocio. **SMT007**

Barjouth Aguilar es directora senior de sustentabilidad y oficial de la fundación en Flex.

Redefining IPC Training in the Digital Era

Standardization has always been at the core of the electronics industry. Until 2020, one rule was unquestionable: All IPC certifications had to be delivered in person. Even certifications of a primarily theoretical nature, such as IPC-A-600, IPC-A-610, IPC/WHMA-A-620, or the CID (Certified Interconnect Designer), were subject to the same in-person delivery model as standards with highly practical components. This approach created significant challenges: elevated travel costs, lost production hours, and limitations in scaling training across organizations with multiple plants or international operations.

The Post-COVID Disruption: Digitalization and Accelerated Adoption

The pandemic reshaped how we work and train.

Faced with the impossibility of gathering groups on site, the Global Electronics Association authorized for the first time the online delivery of certifications of an exclusively theoretical nature.

This landmark decision enabled standards such as IPC-A-600, IPC-A-610, and IPC/WHMA-A-620 to be conducted virtually, generating immediate benefits:

- Simultaneous access for participants across multiple regions
- Expanded reach for training key personnel throughout the value chain

In contrast, practical standards such as IPC-J-STD-001 (assembly and soldering) and IPC-7711/21 (repair and rework) remained strictly in-person, ensuring the hands-on validation of critical skills in the lab.



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The Differentiated Model as the New Normal

Today, IPC training operates under a differentiated model:

- Theoretical standards (IPC-A-600, IPC-A-610, IPC/WHMA-A-620) can be delivered online with global reach
- Practical standards (IPC-J-STD-001 and IPC-7711/21) must be conducted in person at specialized training centers

This allows companies to optimize resources, ensure operational continuity, and strengthen talent development strategies without compromising quality or reliability.

Moreover, digital training has become a strategic tool for talent attraction and retention a critical factor amid the shortage of skilled labor in Mexico and other manufacturing-driven economies.

AHR's Added Value in Workforce Professionalization

At AHR IPC Training Centers, with facilities in Nogales

and León, we have embraced this shift as an opportunity to reinforce training quality.

Our instructors, beyond holding international accreditations, also possess nationally recognized CONOCER certifications, including:

- EC0301: Design of training courses, evaluation instruments, and manuals for workforce development
- EC0217: Delivery of workforce training courses in face-to-face, group settings

This combination ensures a structured pedagogical approach that elevates the teaching/learning process and guarantees that competencies are measured with clear performance indicators.

Technology as an Enabler of Training Excellence

Digital transformation goes far beyond moving content online. At AHR, we have integrated learning management platforms, micro-training modules, digital simulators, and automated assessments that enable organizations to:

- Monitor individual and group progress in real time
- Correlate training with plant metrics such as rework, waste, and productivity
- Generate traceable, verifiable reports that are audit-ready and recognized by international clients

In this way, training extends beyond the classroom to become a strategic driver of continuous improvement and global competitiveness.

Conclusion: From Contingency to Strategy

The digital transformation of technical training was not a temporary solution to the pandemic; it marked the beginning of a new paradigm. Today, leaders in production, quality, procurement, and human resources face a context where standardization is fundamental to global competitiveness, certified talent is the ultimate competitive advantage, and digitalization amplifies the impact and reach of training across organizations.

In a context shaped by nearshoring and Mexico's increasing integration into high-tech supply chains, differentiated training theory online and practice in



person has become a strategic pillar to secure quality, productivity, and sustainability in the electronics industry. **SMT007**



Ivan Luna is the commercial director of AHR IPC Training Center.

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Redefiniendo la Capacitación en la Era Digital

Un Punto de Inflexión en la Capacitación Técnica

La estandarización siempre ha estado en el centro. Hasta el 2020, existía una regla incuestionable: todas las certificaciones IPC debían impartirse de manera presencial. Incluso aquellas de naturaleza principalmente teórica, como IPC-A-600, IPC-A-610, IPC/WHMA-A-620 o el CID (Certified Interconnect Designer), se regían por el mismo modelo presencial que los estándares con componentes altamente prácticos.

Este enfoque generaba grandes desafíos: altos costos de viaje, pérdida de horas productivas y limitaciones para escalar la capacitación en organizaciones con múltiples plantas o con operaciones internacionales.

La Disrupción Post-COVID: Digitalización y Adopción Acelerada

La pandemia transformó la manera en que trabajamos y, con ello, la forma en que capacitamos. Ante la imposibilidad de reunir grupos en sitio, IPC autorizó por primera vez la impartición en línea de certificaciones de carácter exclusivamente teórico.

Esta decisión histórica permitió que estándares como IPC-A-600, IPC-A-610 e IPC/WHMA-A-620 pudieran realizarse de manera virtual, generando beneficios inmediatos:

- Acceso simultáneo para participantes de distintas regiones.
- Mayor alcance para capacitar personal clave a lo largo de toda la cadena de valor.

En contraste, los estándares prácticos como IPC J-STD-001 (ensamble y soldadura) e IPC-7711/21 (reparación y retrabajo) se mantuvieron estrictamente presenciales, garantizando la validación práctica de habilidades críticas en laboratorio.

El Modelo Diferenciado como la Nueva Normalidad

Hoy, la capacitación IPC opera bajo un modelo diferenciado:

- Estándares teóricos (IPC-A-600, IPC-A-610, IPC/WHMA-A-620) → pueden impartirse en línea, con alcance global.
- Estándares prácticos (IPC J-STD-001 y IPC-7711/21) → deben realizarse presencialmente en centros de capacitación especializados.

Este esquema combinado permite a las empresas optimizar recursos, asegurar la continuidad operativa y fortalecer sus estrategias de desarrollo de talento sin comprometer la calidad ni la confiabilidad.

Además, la capacitación digital se ha convertido en una herramienta estratégica para la atracción y retención de talento, un factor crítico ante la escasez de mano de obra calificada en México y en otras economías impulsadas por la manufactura.

El Valor Agregado de AHR en la Profesionalización del Talento

En AHR IPC Training Center, con sedes en Nogales, Sonora y León, Guanajuato, hemos adoptado este cambio como una oportunidad para reforzar la calidad de la capacitación.

Nuestros instructores, además de contar con acreditaciones internacionales, poseen certificaciones nacionales reconocidas por CONOCER, entre ellas:

- EC0301: Diseño de cursos de capacitación, instrumentos de evaluación y manuales para el desarrollo de capital humano.
- EC0217: Impartición de cursos de capacitación presenciales, de manera grupal.

Esta combinación asegura un enfoque pedagógico estructurado que eleva el proceso de

enseñanza-aprendizaje y garantiza que las competencias se midan con indicadores de desempeño claros.

La Tecnología como Facilitador de la Excelencia en la Capacitación

La transformación digital va mucho más allá de trasladar contenidos a una plataforma. En AHR hemos integrado plataformas de gestión del aprendizaje (LMS), micro-módulos de entrenamiento, simuladores digitales y evaluaciones automatizadas, que permiten a las organizaciones:

- Monitorear el progreso individual y grupal en tiempo real.
- Correlacionar la capacitación con métricas de planta como retrabajos, desperdicio y productividad.
- Generar reportes trazables, verificables y listos para auditoría, reconocidos por clientes internacionales.

De esta forma, la capacitación trasciende el aula y se convierte en un motor estratégico de mejora continua y competitividad global.

Conclusión: De la Contingencia a la Estrategia

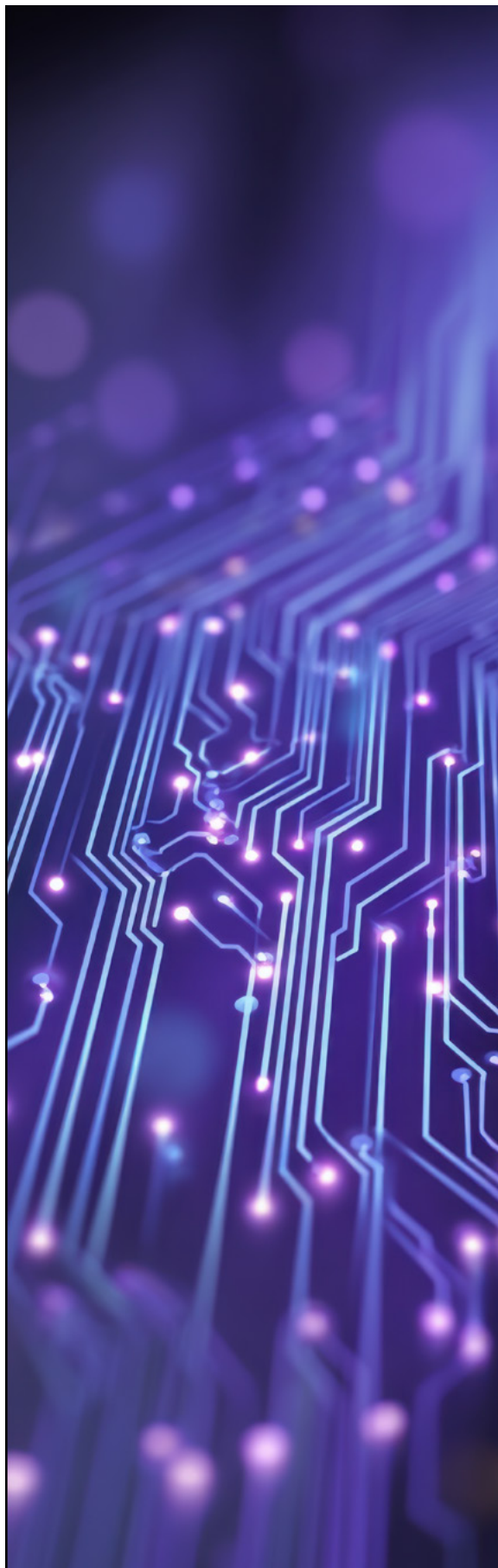
La transformación digital de la capacitación técnica no fue una solución temporal ante la pandemia; marcó el inicio de un nuevo paradigma. Hoy, los líderes de Producción, Calidad, Compras y Recursos Humanos enfrentan un contexto donde:

- La estandarización es fundamental para la competitividad global.
- El talento certificado es la ventaja competitiva definitiva.
- La digitalización amplifica el impacto y el alcance de la capacitación en toda la organización.

En un entorno marcado por el nearshoring y la creciente integración de México en las cadenas de suministro de alta tecnología, la capacitación diferenciada —teoría en línea y práctica presencial— se ha convertido en un pilar estratégico para garantizar la calidad, la productividad y la sostenibilidad de la industria electrónica. **SMT007**



Ivan Luna es director comercial de AHR IPC Training Center.



Goaltech: Engineering the Workforce of Tomorrow



Noe Rojas

In the global supply chain, technical standards are the common language. But behind every production line lies something even more fundamental: skilled and certified people. That has always been the mission of Goaltech, a Mexican company that for over 15 years has been dedicated to raising the competitiveness of the industry through training, certification, and technological integration.

Engineering With Purpose

Goaltech was founded in Chihuahua with the goal of becoming a bridge between the industry's needs and the human talent that supports it. Today, with nearly its entire team certified by the brands it represents, with offices in Chihuahua and Querétaro, and operations that cover all of Mexico, Goaltech has positioned itself as a national benchmark in training, certification, and technical consulting.

"Our purpose has always been to equip Mexican companies with the tools they need to compete in a global market, and those tools start with knowledge," says Aarón González, general manager. "At Goaltech, we aim to be more than providers. We want to be strategic partners, integrating digital

tools and cutting-edge solutions that help our clients face today's industry challenges."

The company has been recognized eight times as Meso Partner of the Year by Siemens, an award that highlights its commitment to excellence in technical training and its impact on the industry.

Leaders in Industrial Digital Transformation

Goaltech drives digital transformation in Mexican electronics manufacturing, combining the experience of its team with high-tech tools. Its strategic partners include Siemens Software, Creaform in 3D scanning, and 3D Systems in 3D printing.

Thanks to these technological alliances, Goaltech offers solutions that enable its clients to automate processes, improve traceability, and raise quality, helping them adapt to the challenges of modern industry.

Engineering Applied to Change

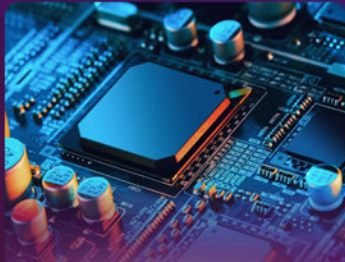
One of Goaltech's main contributions has been its role as a strategic partner in the development of specialized technical talent. Through hands-on training, consulting, and structured programs like the Electronics Manufacturing Academy (EMA), the company promotes the adoption of technologies that allow users to transform their production processes.

EMA, with the support of Siemens' Value, was launched in collaboration with leading electronics associations to educate users on digital transformation. Through a series of technical modules, participants learn to integrate technologies, optimize SMT processes across different machine brands, and establish a clear path toward digitalization.

"We identified a paradigm shift in how the industry approaches problem-solving," says Noé Rojas, EMA developer. "With emerging technologies, experience, and dedication, we are bringing this knowledge closer to users. Sooner or later, they will implement it in their companies and transform their vision of the industry."

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Through EMA and its communities, Goaltech promotes workshops, demonstrations, and personalized consulting that enable users to apply what they learn directly to their production environments. The success of its clients is its best engineering, demonstrated in every module, visit, and shared project.



Positioned to Transform

Goaltech maintains a direct presence in Chihuahua and Querétaro, two key regions for the development of Mexico's electronics industry. These areas stand out for their industrial ecosystem, technical talent, and manufacturing vocation, making them strategic hubs for driving technological transformation.

From these locations, Goaltech stays close to its clients, understands their operational challenges, and provides solutions tailored to the real needs of each plant. This proximity has enabled the development of technical training projects, technology integration, and continuous improvement initiatives that have strengthened the competitiveness of numerous companies across the country.

Integration That Creates Impact

Training is part of a comprehensive strategy that connects knowledge, technology, and continuous improvement. In addition to developing technical talent, the company is also a provider of digital solutions, offering specialized software that helps clients optimize processes, improve traceability, and make data-driven decisions.

Its programs are designed to meet the industry's real needs, combining theory, practice, and technical support. Goaltech accompanies its clients through times of change, understanding their challenges and offering solutions that evolve alongside their plants.

This combination of training, technology, and operational proximity makes Goaltech a trusted partner for industrial transformation.

Challenges That Inspire Us

Goaltech's future is aligned with the current challenges of the electronics industry. Its vision focuses on:

- Expanding technical training to more regions and profiles, with accessible and customized formats
- Growing its portfolio toward advanced electronics, smart manufacturing, and sustainability
- Strengthening alliances with governments and universities in triple-helix initiatives
- Promoting Mexican talent on international stages
- Consolidating its national presence while maintaining close operational support for clients
- Continuously improving its content and methodologies
- Actively listening to its users
- Staying updated in technology to continue delivering effective solutions

In an industry where quality is non-negotiable, Goaltech has become the partner that trains the people who make it possible for Mexican electronics to compete globally. With over 15 years of experience, a certified team, and strategic alliances with technology leaders, the company has not only elevated hundreds of Mexican companies but also positioned the country at a higher level of reliability in the eyes of the world.

What sets Goaltech apart is not only its technical capacity but also its holistic approach: structured training programs, applied innovation in every module, and real closeness with clients during times of change. In every project, Goaltech supports its users with tailored solutions, strategic vision, and a genuine commitment to their growth. **SMT007**



Alejandra Luna is the marketing & sales manager, and Noe Rojas is the application engineer at Goaltech.



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Goaltech: Ingeniando la Fuerza Laboral del Futuro

En la cadena de suministro global, los estándares técnicos son el lenguaje común. Pero detrás de cada línea de producción, hay algo más fundamental: personas capacitadas y certificadas. Esa ha sido siempre la misión de Goaltech, una empresa mexicana que, desde hace más de 15 años, se ha dedicado a elevar la competitividad de la industria a través de la formación, la certificación y la integración tecnológica.

Ingeniería Con Propósito

Goaltech fue fundada en Chihuahua con el objetivo de convertirse en un puente entre las necesidades de la industria y el talento humano que la sostiene. Hoy, con prácticamente todo su equipo certificado por las marcas que representa, con oficinas en Chihuahua y Querétaro, y una operación que abarca todo México, Goaltech se posiciona como un referente nacional en capacitación, certificación y consultoría técnica.

“Nuestro propósito ha sido siempre dotar a las empresas mexicanas de las herramientas necesarias para competir en un mercado global, y esas herramientas empiezan con el conocimiento”, explica Aarón González, gerente general. “En Goaltech, buscamos ser más que proveedores: queremos ser aliados estratégicos, integrando herramientas digitales y soluciones de vanguardia que ayuden a nuestros clientes a enfrentar los desafíos de la industria actual”.

La empresa ha sido galardonada en ocho ocasiones como Meso Partner of the Year por Siemens, reconocimiento que destaca su compromiso con la excelencia en formación técnica y su impacto en la industria.

Líderes en Transformación Digital Industrial

Goaltech impulsa la transformación digital en la manufactura electrónica mexicana, combinando la experiencia de su equipo con herramientas de alta tecnología. Sus socios estratégicos incluyen Sie-

mens Software, Creaform en escáneres 3D y 3D Systems en impresión 3D.

Gracias a estas alianzas tecnológicas, Goaltech ofrece soluciones que permiten a sus clientes automatizar procesos, mejorar la trazabilidad y elevar la calidad, adaptándose a los retos de la industria moderna.

Ingeniería Aplicada al Cambio

Una de las principales contribuciones de Goaltech ha sido su papel como aliado estratégico en el desarrollo de talento técnico especializado. A través de entrenamientos prácticos, consultoría y programas estructurados como la Electronics Manufacturing Academy (EMA), la empresa impulsa la adopción de tecnologías que permiten a los usuarios transformar sus procesos productivos.

EMA, impulsada con el respaldo de Valor de Siemens, es una iniciativa lanzada junto con las principales asociaciones de electrónica, con el propósito de educar a los usuarios en la transformación digital. A través de una serie de módulos técnicos, los participantes aprenden a integrar tecnologías, optimizar procesos SMT entre diferentes marcas de maquinaria, y establecer una ruta clara hacia la digitalización.

“Detectamos un paradigma en la forma en que la industria busca resolver problemas”, dice Noé Rojas, desarrollador del EMA. “Con tecnologías emergentes, experiencia y dedicación, estamos logrando acercar este conocimiento a los usuarios. Tarde o temprano, lo implementarán en sus empresas y transformarán su visión de la industria”.

A través de EMA y sus comunidades, Goaltech impulsa talleres, demostraciones y asesorías personalizadas que permiten a los usuarios aplicar lo aprendido directamente en sus entornos productivos. Goaltech considera que el éxito de sus clientes es su mejor ingeniería, y lo demuestra en cada módulo, visita y proyecto compartido.

Ubicados Para Transformar

Goaltech tiene presencia directa en Chihuahua y Querétaro, dos regiones clave para el desarrollo de la industria electrónica en México. Estas zonas se distinguen por su ecosistema industrial, talento técnico y vocación manufacturera, lo que las convierte en puntos estratégicos para impulsar la transformación tecnológica.

Desde estas ubicaciones, Goaltech mantiene cercanía con sus clientes, comprende sus retos operativos y brinda soluciones adaptadas a las necesidades reales de cada planta. Esta proximidad ha permitido desarrollar proyectos de formación técnica, integración tecnológica y mejora continua que han fortalecido la competitividad de múltiples compañías en todo el país.

Integración Que Genera Impacto

La capacitación forma parte de una estrategia integral que conecta conocimiento, tecnología y mejora continua. Además de formar talento técnico, la empresa también es proveedora de soluciones digitales, ofrece software especializado que ayuda a sus clientes a optimizar procesos, mejorar la trazabilidad y tomar decisiones basadas en datos.

Sus programas están diseñados para adaptarse a las necesidades reales de la industria, combinando teoría, práctica y acompañamiento técnico. Goaltech acompaña a sus clientes en momentos de cambio, entendiendo sus retos y ofreciendo soluciones que evolucionan junto con sus plantas.

Esta combinación de formación, tecnología y cercanía operativa convierte a Goaltech en un socio confiable para la transformación industrial.

Retos Que Nos Inspiran

El futuro de Goaltech está alineado con los desafíos actuales de la industria electrónica. Su visión se enfoca en:

- Llevar la capacitación técnica a más regiones y perfiles, con formatos accesibles y personalizados
- Expandir el portafolio hacia electrónica avanzada, manufactura inteligente y sustentabilidad
- Fortalecer alianzas con gobiernos y universidades en iniciativas de triple hélice

- Impulsar el talento mexicano en escenarios internacionales
- Consolidar su presencia nacional, manteniendo cercanía operativa con los clientes
- Mejorar continuamente sus contenidos y metodologías
- Escuchar activamente a sus usuarios
- Mantenerse actualizada en tecnología para seguir ofreciendo soluciones efectivas.

Conclusión

En una industria donde la calidad es innegociable, Goaltech se ha convertido en el aliado que forma a quienes hacen posible que la electrónica mexicana compita globalmente. Con más de 15 años de experiencia, un equipo certificado y alianzas estratégicas con líderes tecnológicos, la empresa no solo ha elevado a cientos de compañías mexicanas, sino que también ha puesto al país en un nivel más alto de confiabilidad frente a los ojos del mundo.

Lo que distingue a Goaltech no es solo su capacidad técnica, sino su enfoque integral: programas de capacitación estructurados, innovación aplicada en cada módulo y una cercanía real con el cliente en momentos de cambio. En cada proyecto, Goaltech acompaña a sus usuarios con soluciones adaptadas, visión estratégica y compromiso genuino con su evolución. **SMT007**



Alejandra Luna

es la gerente de mercadotecnia y ventas de Goaltech.



Noé Rojas el ingeniero de aplicación de Goaltech.

Advances in Conformal Coating Materials and Methods

High-performance electronics must endure everything from rain, dust, and oil to extreme temperatures, shock, and vibration. These reliability demands now share the stage with other priorities such as size reduction, lightweighting, and environmental sustainability. Combined with constant pressure to cut costs, accelerate production, and boost manufacturing efficiency, material suppliers are racing to develop advanced conformal coatings that deliver it all: compatibility with finer-pitch circuitry, durability, eco-friendliness, and manufacturing efficiency.

The history of protective coatings spans more than a century, beginning with early epoxies and advancing to sophisticated chemistries engineered to meet evolving reliability and manufacturing requirements. Building on this foundation, Electro-lube® UVFlex™. UVFlex is set to represent the next phase in coating innovation. It combines rapid curing and robust mechanical performance with environmental responsibility, delivering exceptional surface insulation resistance (SIR), thermal cycling durability, and component coverage while remaining solvent-free, PFAS-free, and 30% bio-based.

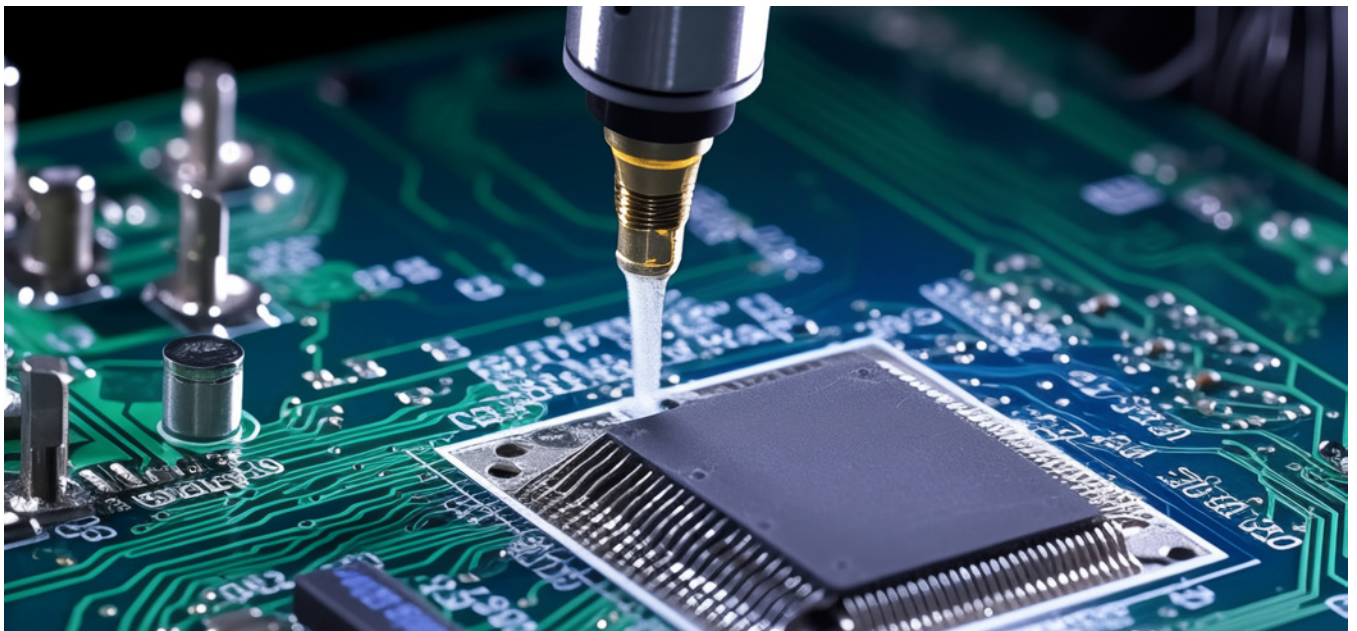
Comparative testing demonstrates that UVFlex surpasses traditional acrylic, silicone, and urethane coatings on finer-pitch circuitry exposed to severe environmental stress, including thermal cycling from -40 to +125°C, 85°C/85% RH aging, and condensation exposure.

The Road to Modern Conformal Coatings

Protecting circuits with a polymeric barrier is not a new concept: Thomas Edison experimented with phenolic insulators back in the 1800s. However, the real breakthroughs came in the 1960s, when NASA engineers recognized the need to protect mission-critical electronics from moisture and contaminants.

At that time, PCBs were either left bare or covered with thick, two-component epoxies, which were prone to cracking under large temperature swings. Fractured solder joints were common, and repairs were painfully difficult, requiring hardened epoxy to be chipped away.

By the 1980s, conformal coatings were standard in high-reliability military and aerospace applications. At that time, most coatings required oven curing to





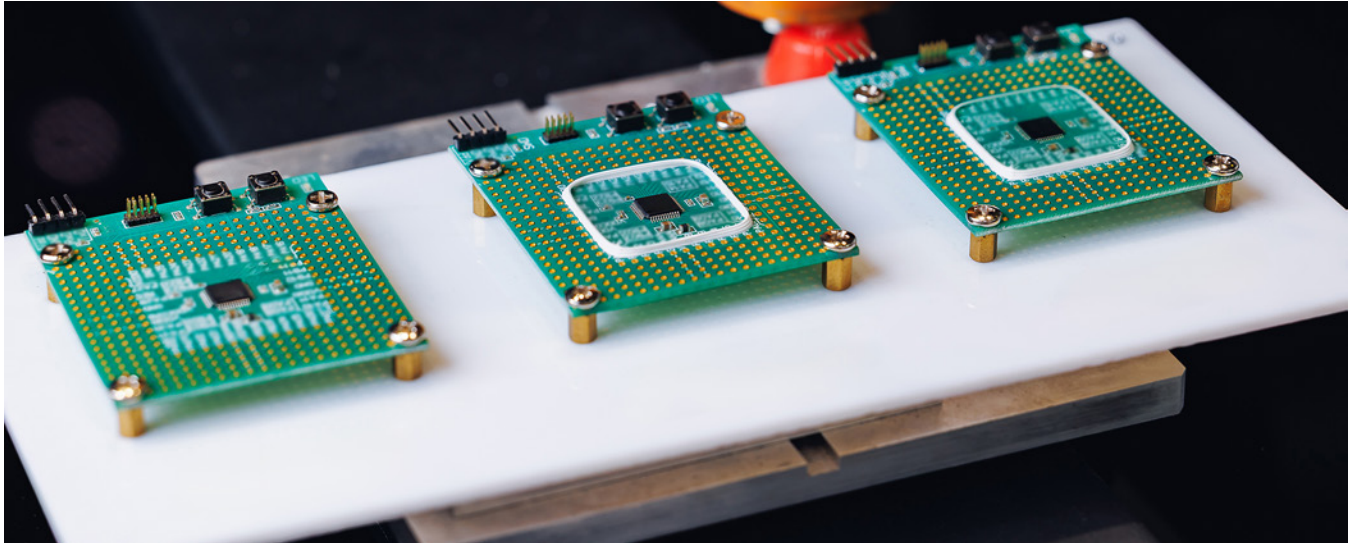
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drive off solvents, a process that slowed production and consumed substantial energy. Silicones were the leading choice due to their inherent flexibility and high-temperature tolerance, though their permeability to water vapor and gases could allow corrosion to develop more quickly than with other chemistries. They also tended to outgas volatile organic compounds (VOCs), limiting their use in optoelectronic applications where VOC residues are undesirable.

By the 2000s, production speed and automated assembly became primary drivers of coating technology. Single-component, solvent-based coatings simplified application, urethanes added toughness and moisture resistance, and UV curing enabled films to harden within seconds, dramatically reducing energy consumption compared to oven curing.

Today, performance demands are higher than ever. Modern conformal coatings must withstand wide temperature fluctuations, moisture, chemicals, and other contaminants, while also preventing electrochemical migration (ECM), which is the formation of metal dendrites that can create short circuits, and create a risk that increases with finer-pitch circuitry. At the same time, RoHS, REACH, and VOC regulations are driving the need for safer, more sustainable coating chemistries.

Market Pulse: Conformal Coatings in High-stakes Industries

Conformal coatings are seeing steady growth in demand. The global market is projected to expand from approximately \$1.1 billion in 2024 to more than \$2.1 billion¹ by the early 2030s, driven by increased

adoption in automotive, aerospace, and defense sectors. Acrylics currently hold the largest market share at approximately 47%², while UV-curable coatings, particularly those based on urethane acrylates, represent the fastest-growing category, expanding at a compound annual growth rate (CAGR) of 7%, due to their rapid curing and throughput advantages.

Automotive electronics are expected to remain a key growth driver as vehicles increasingly rely on electronics for critical functions, from engine control units (ECUs) to advanced driver assistance systems (ADAS). Conformal coatings protect these electronics from harsh operating conditions, such as extreme temperatures, moisture, salt spray, corrosive gases from air pollution, dirt, and dust, while also helping manufacturers meet stringent automotive qualification and reliability standards.

Similarly, in aerospace and defense, electronics are essential for mission-critical systems, including surveillance, navigation, communication, and missile guidance. Conformal coatings provide a protective barrier against moisture and contaminants, while electrically isolating components from high voltages. This helps prevent electrochemical migration (ECM), a failure mechanism where metal ions move between conductors under the influence of moisture and an electric field. ECM can cause dendritic growth that leads to short circuits and, in severe cases, catastrophic failures such as fire.

Emerging Challenges in Conformal Coating Technology

Conformal coatings are available in a wide range

of chemistries, including acrylics, silicones, polyurethanes, alkyds, urethanes, and polyolefins, each offering distinct barrier performance advantages and trade-offs. While these formulations have reliably served the industry for decades, the increasing complexity of electronics and the expanding demands of modern applications are giving rise to new challenges. As a result, designers and manufacturers are turning to material suppliers for advanced conformal coating solutions that can address issues such as:

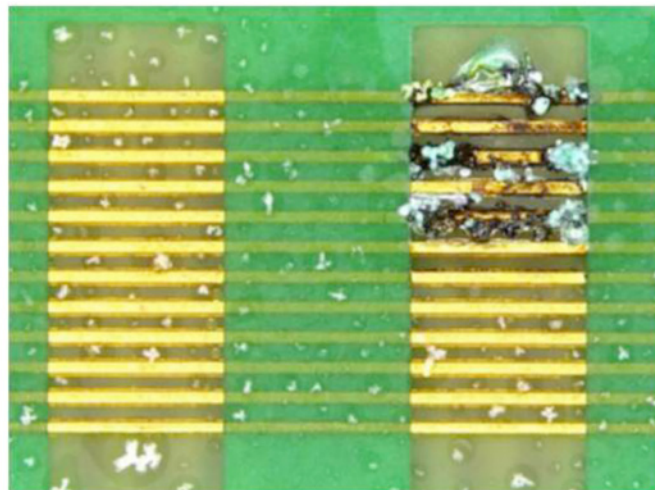
- **Electrochemical Migration (ECM)**

ECM is a well-documented failure mechanism in modern PCBs. It occurs when metal ions migrate between conductors under the combined influence of moisture, ionic contamination, and an electric field. This migration can result in the formation of conductive dendrites. If dendrites grow long enough, they can bridge adjacent traces and cause short circuits.

Traditionally, ECM was not a major concern because circuit traces were spaced relatively far apart, meaning dendrites would have needed to grow much longer to create a failure. In contrast, today's miniaturized circuits feature much finer trace spacing. As a result, dendrites can span the gap and induce short circuits in only a matter of hours under favorable conditions.

What are those conditions? The primary triggers are moisture and ionic contaminants, especially

when flux residues are present. Conformal coatings are essential because they function as a protective barrier against moisture and contamination. Flux residues, however, require additional mitigation strategies, which we will explore in the next section.



Corrosion due to flux residues. ▲

Solder Paste Compatibility Issues

Flux residues from solder pastes, particularly those that contain halide activators like chlorine or bromine, can promote corrosion and degrade solder joints over time. This can be particularly problematic in humid environments. Additionally, flux residues can interfere with the proper adhesion of conformal coatings, making them unable to adequately seal PCBs from moisture and contamination.

For these reasons, flux cleaning is often recommended to remove residues and enhance coating adhesion. An alternative is the use of no-clean solder pastes. While not completely flux-free, these formulations are less reactive and more stable in humid conditions. Their popularity comes from the fact that they typically do not require cleaning after reflow soldering, which simplifies manufacturing and increases throughput. However, it is important to note that certain no-clean solder pastes may still be incompatible with some protective coatings.

To address this challenge, MacDermid Alpha develops solder pastes and conformal coatings designed specifically for compatibility. SIR testing is conducted on these material sets to validate performance. When reliability issues, such as corrosion or ECM occur, the root cause may be material incompatibility.



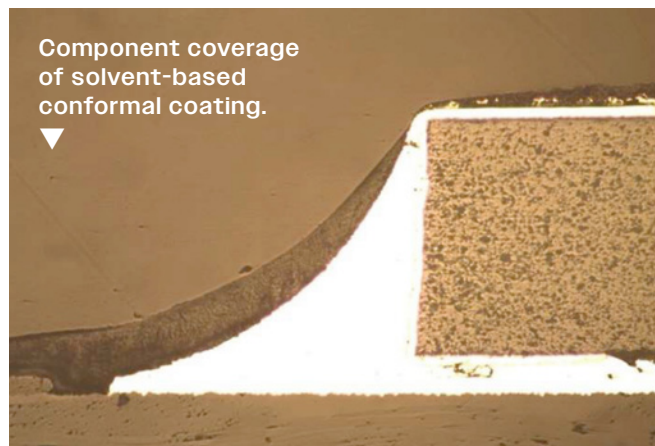
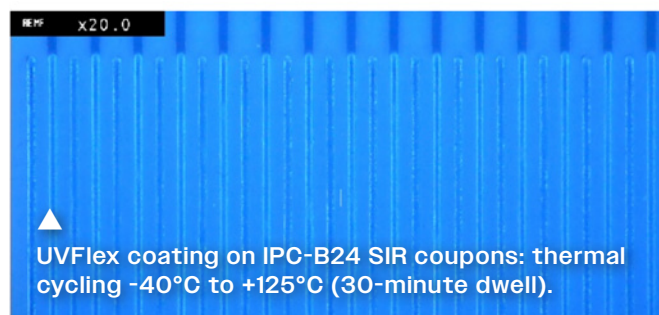
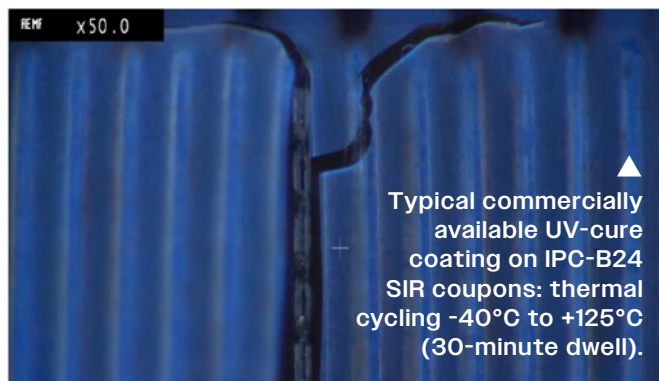
▲
Dendrite growth
due to ECM.

- **Flexibility vs. Stiffness and CTE Mismatch**

The modulus of elasticity (E), or Young's modulus, describes how a material deforms under stress. A higher modulus indicates a more rigid material, while a lower modulus indicates a more flexible one. This property is critical when selecting a conformal coating because flexibility generally allows a material to better accommodate coefficient of thermal expansion (CTE) mismatches, differences in rates of thermal expansion and contraction between the coating and the PCB.

The CTE describes how much a material expands or contracts with temperature changes. If a coating is too rigid, it may crack fragile component leads during thermal cycling as the coating and PCB expand at different rates. Conversely, if the coating is too flexible, it can tear, creating gaps in the protective barrier that allow moisture and contaminants to penetrate the electronic assembly.

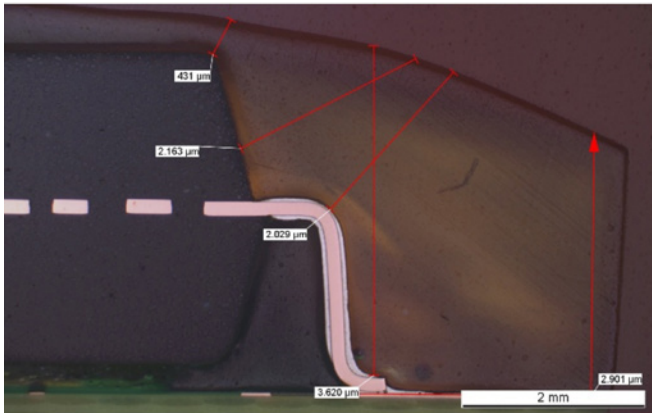
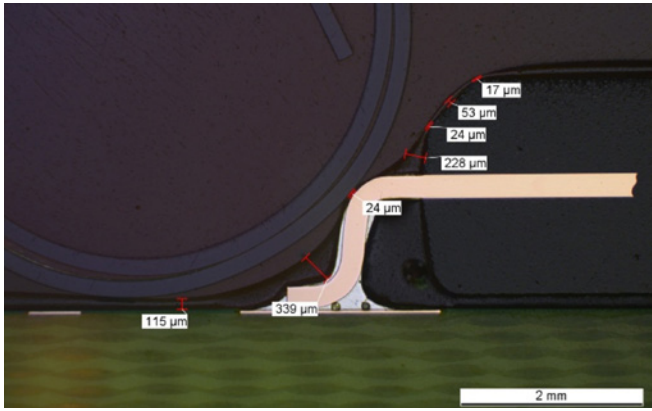
To address this, material suppliers are formulating conformal coatings with E values tailored for specific temperature ranges, adjusting the glass transition temperature (T_g) to balance toughness and flexibility. At MacDermid Alpha, these design principles guide the development of advanced conformal coatings to ensure long-term reliability even under thermal cycling.



- **Component Coverage and Coating Thickness**

Most conformal coatings on the market are solvent-based. Their low viscosity allows for uniform application by brushing, dipping, or spraying, typically at thicknesses between 25–75 μm . However, surface tension and capillary effects create challenges in achieving uniform coverage. As the coating flows, it thins out over the top surfaces and along sharp edges of components, leaving insufficient protection in these areas. These weak points create entry points for condensation, humidity, or other contaminants. At the same time, capillary forces drive the coating to accumulate at the base and lead terminations of components, forming thicker deposits that are prone to cracking under thermal cycling stresses (CTE mismatch).

By contrast, MacDermid Alpha's new solvent-free, thixotropic coating is engineered to enable controlled flow and improved component coverage. At rest, it remains thick and viscous, preventing dripping and unwanted flow. During spray application, the applied shear temporarily decreases the viscosity, enabling a smooth, controlled application. This rheological profile makes the solvent-free coating highly compatible with automated selective-spray systems, enabling controlled deposition and consistent component coverage at film thicknesses ranging from 150–350 μm and higher. Combined with programmable robotic arms and spray nozzles, this technology ensures the coating is applied only where needed, optimizing material usage and reducing waste.



▲ Examples of component coverage with UVFlex conformal coating.

• **Surface Insulation Resistance (SIR)**

SIR is a critical metric for evaluating the electrical performance of conformal coatings, particularly in high-reliability sectors such as automotive, aerospace, and defense. SIR testing exposes conformally coated PCBs to extreme conditions, including temperature cycling, humidity, and condensation, often while a large bias voltage is applied. The test then measures the board's resistance to surface leakage currents.

A high SIR value indicates that the coating is effectively blocking moisture and contaminants, thereby reducing the risk of ECM, dendritic growth, and short circuits. In mission-critical applications, consistently high SIR values are essential to meet stringent standards and demonstrate the coating's ability to prevent latent failures that could compromise safety or functionality.

Industry standards such as IPC-TM-650 and IEC 60664 typically mandate sustained SIR values

of 108Ω , even after prolonged high-stress aging, such as exposure to 85°C and 85% relative humidity under bias voltage for several hundred hours.

• **Sustainability and Greener Materials**

The electronics industry is under increasing global pressure to reduce its reliance on solvent-based PCB assembly materials that emit VOCs. At the same time, environmental regulations such as RoHS and REACH are driving suppliers away from toxic “forever chemicals” like PFAS and toward safer, more sustainable alternatives, such as bio-based ingredients derived from renewable plant sources rather than crude oil.

UVFlex: Redefining Conformal Coating Performance

Electrolube UVFlex is a breakthrough UV-curable, high-elasticity conformal coating based on urethane acrylate chemistry. It delivers an optimized balance of flexibility and toughness, combining excellent moisture and chemical resistance with the speed and efficiency of UV curing. Together, these properties are establishing a new benchmark for conformal coating performance.

Key Properties of UVFlex

- **Flexibility and toughness:** Maintains a low modulus of elasticity (E) after thermal aging, demonstrating flexibility even at -40°C
- **Thermal performance:** Tg of -42°C, with a continuous operating temperature range of -40°C to +135°C
- **Moisture and chemical resistance:** Excellent barrier properties, even under severe environmental stress
- **Efficient dual-cure system:** Rapid UV cure supports fast processing, while secondary moisture cure ensures thorough crosslinking and complete cure even in shadowed areas
- **Inspection and process control:** Built-in fluorescent UV tracers simplify inspection and enhance process control
- **Precision application:** Thixotropic formulation supports applications with automated selective-spray equipment, ensuring uniform coverage even on sharp edges

- **Environmental profile:** Solvent-free (100% solids), PFAS-free, and formulated with 30% bio-based renewable content; fully compliant with RoHS and REACH
- **Compatibility:** Verified adhesion and SIR performance with many of MacDermid Alpha's no-clean solder paste chemistries, reducing the risk of adhesion and ECM issues
- **Electrical reliability:** Maintains SIR > 10⁸ Ω after 1,000 cycles of thermal cycling (-40°C to +125°C) followed by 1,000 hours of 85°C/85% RH SIR testing and demonstrates exceptional performance in condensation testing

UVFlex: Performance Validation Testing

Thermal shock cycling: Boards coated with UVFlex were subjected to 1,000 thermal cycles from -40°C to +125°C with 30-minute dwell times. UVFlex showed no cracking or delamination and maintained SIR values above 10⁸ Ω throughout the test. Competing UV-curable coatings developed microcracks and failed SIR requirements before 500 cycles.

Condensation resistance: On a QFP component test board, UVFlex demonstrated excellent resistance to condensation. In a condensation chamber at -40°C, 80% RH, and under a 50V bias, uncoated assemblies failed in less than 500 minutes. By contrast, assemblies coated with UVFlex maintained electrical insulation with only minimal SIR fluctuation, confirming its effective component coverage and moisture barrier performance.

ECM resistance: Testing in accordance with IPC standards on uncleaned flux residue demonstrated that UVFlex significantly reduces the risk of ECM failures. Its combination of low moisture permeability with tolerance to ionic contamination preserved high SIR values throughout 1,000 hours of 85°C/85% RH aging.

Mechanical reliability: Elasticity testing showed that UVFlex maintained a low modulus (E) even after aging at 130°C for 120 hours. In contrast, benchmark UV coatings became brittle, with E-values increasing more than tenfold after aging under the same conditions.

Sealing the Future with Advanced Conformal Coating Materials

Conformal coatings are an essential defense for

electronics operating in harsh environments. A wide range of traditional chemistries is available, and selection has long depended on balancing application requirements with the coating's unique barrier performance. Decades of field experience confirm that no single material excels across all performance metrics; instead, each chemistry offers distinct strengths and trade-offs in areas such as moisture resistance, flexibility, reworkability, ruggedness, and environmental compliance. Engineers must therefore carefully evaluate these factors to identify the optimal solution for each application.

Today, advances in coating chemistries are expanding the boundaries of electronics reliability. Performance validation of Electrolube UVFlex exemplifies this progress, narrowing the performance gap between traditional potting compounds and conformal coatings. It demonstrates a new level of protection against ECM, improved tolerance to CTE mismatches, enhanced thixotropic flow for precise and uniform coverage, superior SIR, rapid dual-curing mechanisms, and safer, more sustainable ingredients. These performance gains are now advancing UVFlex toward commercialization.

As technical standards evolve and environmental regulations tighten, such next-generation coatings will be key to enabling tomorrow's high-reliability electronics across demanding industries.

Readers interested in learning more about conformal coating technologies and their role in product reliability can find further details at MacDermidAlpha.com. **SMT007**

References

1. "Conformal Coatings Market Size, Share, and Trends 2025 to 2034," Precedence Research, Feb. 5, 2025.
2. "Conformal Coatings Market Size, Share, Trends and Forecase by Type, Technologies, Operation Method, Edn Use, and Region, 2025-2033," imarc.



Saskia Hogan is the global product manager for Conformal Coatings at MacDermid Alpha, with over 10 years of experience in the electronics and automotive sectors, based in the UK.



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UK Space Agency Goes Global with 23 New Projects ►

This is the second round of projects from the successful International Bilateral Fund (IBF), representing a £6.5 million boost for UK companies and universities collaborating internationally on space innovation with partners in Australia, Canada, France, Germany, India, Japan, Lithuania, and the USA.

RTX Unveils new APG-82(V)X Radar Enhanced With Gallium Nitride ►

The new radar variant incorporates cutting-edge gallium nitride (GaN) technology to enhance the radar's effectiveness, delivering increased range, advanced air-to-air, air-to-ground and electronic warfare capabilities.

Saab to Lead NATO's New Underwater Battlespace Project ►

The Saab-led MANGROVE consortium has been selected by NATO to lead the Allied Underwater Battlespace Mission Network project (AUWB-MN). The project formally commenced September 1, 2025 and will deliver interoperability for Maritime Uncrewed Systems and conventional platforms across allied nations.

Space Forge Inc. and United Semiconductors LLC Partner to Develop the Supply Chain for Space-grown Semiconductor Materials ►

Space Forge Inc has announced the signing of a strategic Memorandum of Understanding (MoU) with United Semiconductors LLC. The agreement formalizes the ongoing collaborative efforts that started over a year ago, marking a significant step forward in strengthening the partnership between the two companies.

INVISIO Earns US Coast Guard 10-year Contract for Wireless Boat Crew Communications System ►

Under the agreement, INVISIO will provide wireless interface and integration systems consisting of the INVISIO Intercom system in combination with the new INVISIO Link™ wireless solution, as well as

headsets, controllers, intelligent cables, training, and installation materials for all the Coast Guard's small boats.

Redwire Awarded Contract to Provide Roll-out Solar Arrays for Axiom Space's First Space Station Module ►

Redwire Corporation has been awarded a contract from Axiom Space to develop and deliver roll-out solar array (ROSA) wings for Axiom Station's Payload Power Thermal Module (AxPPTM)—the first module for the company's commercial space station.

RTX's Advanced Electronic Warfare Prototype for F/A-18E/F Super Hornet Passes Critical Review ►

Raytheon, an RTX business, has successfully completed a major review of its new Advanced Electronic Warfare (ADVEW) prototype for the U.S. Navy's F/A-18E/F Super Hornet. This new system is set to replace current electronic warfare systems on the aircraft to enhance its defensive capabilities and survivability.

Honeywell Successfully Demonstrates Counter Swarm Drone Technology to Military Operators ►

Honeywell successfully showcased its Stationary and Mobile UAS Reveal and Intercept system and its ability to counter swarm drones in two recent demonstrations to local military operators in the United States. The system can be operated directly from a ground vehicle.

Highlights From the IMAPS Onshoring Advanced Packaging Workshop in Washington, D.C. ►

IMAPS and the Global Electronics Association co-hosted the Onshoring Advanced Packaging and Assembly Workshop in Washington, D.C., in early September. Government leaders, including those from the Department of Defense, attended and were directly involved in organizing the content of the sessions. Jim Will, director of the U.S. Partnership for Assured Electronics, speaks about his role in the event.

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Inside the Machine: Power Electronics Driving the Road to Reliability

The silent, seamless propulsion of an EV masks the incredible complexity and engineering finesse required to make it all happen. Beneath the vehicle's floor or under its hood lies a dense cluster of power electronics systems comprised of coordinated, high-performance modules that collectively control, convert, and condition energy from the battery to the wheels. These systems not only govern how smoothly an EV accelerates or how efficiently it uses its charge but also play a defining role in the long-term reliability, safety, and serviceability of the vehicle.

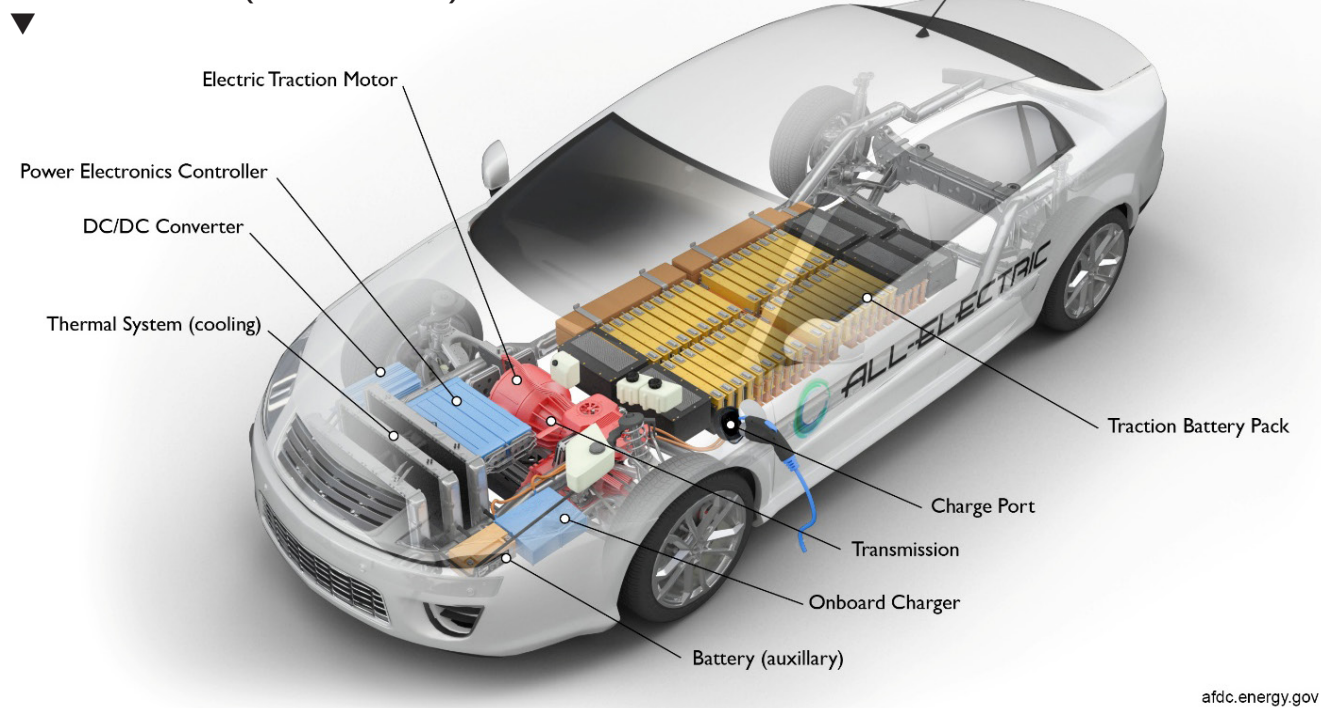
At the core of these systems are three foundational technologies: the battery management system (BMS), traction power inverter/DC-DC con-

verter, and onboard charger (OBC). Their interdependence, power density, and harsh operating environment create both opportunities for innovation and challenges for durability. Each module is shaped by evolving design-for-reliability (DFR) practices that span materials science, electrical engineering, and software design.

Battery Management System (BMS): The Nerve Center

While the lithium-ion battery pack holds the energy that powers the vehicle, the BMS ensures it can be used safely, efficiently, and predictably. Acting as both guardian and gatekeeper, the BMS monitors critical parameters such as state of charge (SOC),

Key EV electronic components in an all-electric vehicle. (Source: US DOE)



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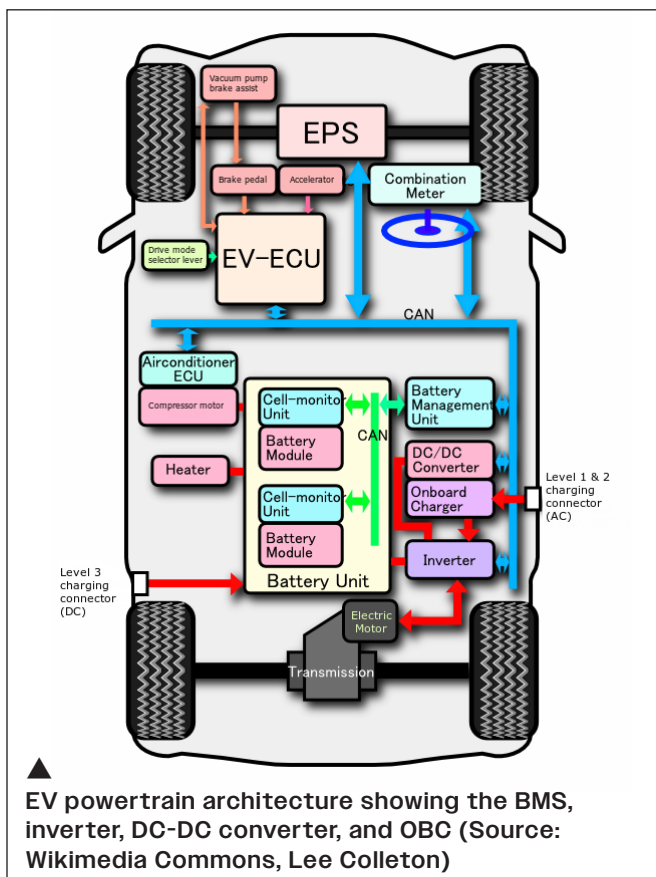


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state of health (SOH), cell voltages, current flow, and thermal conditions across hundreds of individual cells. Anomalies detected by the BMS can trigger balancing operations, cooling commands, or system shutdowns.

Reliability begins with accurate sensing and robust communication between the BMS controller and its distributed sensor network.

Reliability begins with accurate sensing and robust communication between the BMS controller and its distributed sensor network. In centralized architectures, the controller resides within the pack, offering compactness and reduced latency, but increasing exposure to heat and vibration. Distributed BMS architectures, in contrast, place smaller modules near individual cell groups, easing thermal burden but increasing the complexity of wiring and communication protocols³.

DFR efforts in BMS design now include the use of high-accuracy redundant voltage measure-

ment ICs, fault-tolerant communication buses, and advanced diagnostics and early failure detection⁴. Physical separation of analog sensing from digital processing can mitigate crosstalk and EMI, while predictive analytics help forecast aging behavior. Failures in BMS operation, whether due to software faults, moisture ingress, or sensor drift, can disable an EV or lead to battery safety incidents, making its robustness non-negotiable⁵.

Thermal Management System: Keeping Cool Under Pressure

Thermal regulation of the battery is inextricably linked to BMS performance. BMS thermal management typically aligns with broader battery thermal management systems (BTMS) and includes indirect liquid cooling, passive and active air cooling, and hybrid cooling technologies. Indirect liquid cooling, consisting of cold plates and glycol-based solvents, is the predominant technology used in EVs. Passive and active air cooling is widely deployed in lower-cost EVs and two-wheelers, especially in entry-level vehicles in emerging markets. Hybrid cooling solutions such as active liquid cooling plus phase change materials (PCMs) comprise the smallest percentage of the BTMS cooling units today but are faster growing, especially in high-performance EVs, because they can smooth temperature spikes.

Newer BTMS designs are co-optimized with mechanical pack architecture and DFR techniques, including thermal simulations under mission profile conditions, high-cycle temperature testing, and degradation modeling at connector interfaces⁶.

Power Inverter: Bridging Battery and Motor

The power inverter is the real-time translator between the battery's DC output and the motor's AC needs. Using silicon carbide (SiC) or gallium nitride (GaN) switches, modern inverters pulse energy at high frequencies to optimize motor torque and efficiency. However, this switching creates immense thermal and electrical stress, requiring careful balancing of materials, geometry, and controls⁷.

Internally, the inverter contains a gate driver board, power module, capacitor bank, and heat sink or cold plate assembly. Each interface presents reliability challenges, from delamination at die

attach to solder fatigue at capacitor leads. Wide-bandgap semiconductors improve efficiency but increase sensitivity to parasitic inductance, requiring short interconnects and multilayer busbars⁸. Thermal management is critical. Junction temperatures can exceed 200°C in aggressive duty cycles. Hence, power modules are often attached using silver sintering or pressure contact methods for improved longevity. Heatsinks must combine low thermal resistance with mechanical compliance to accommodate differential expansion⁹.

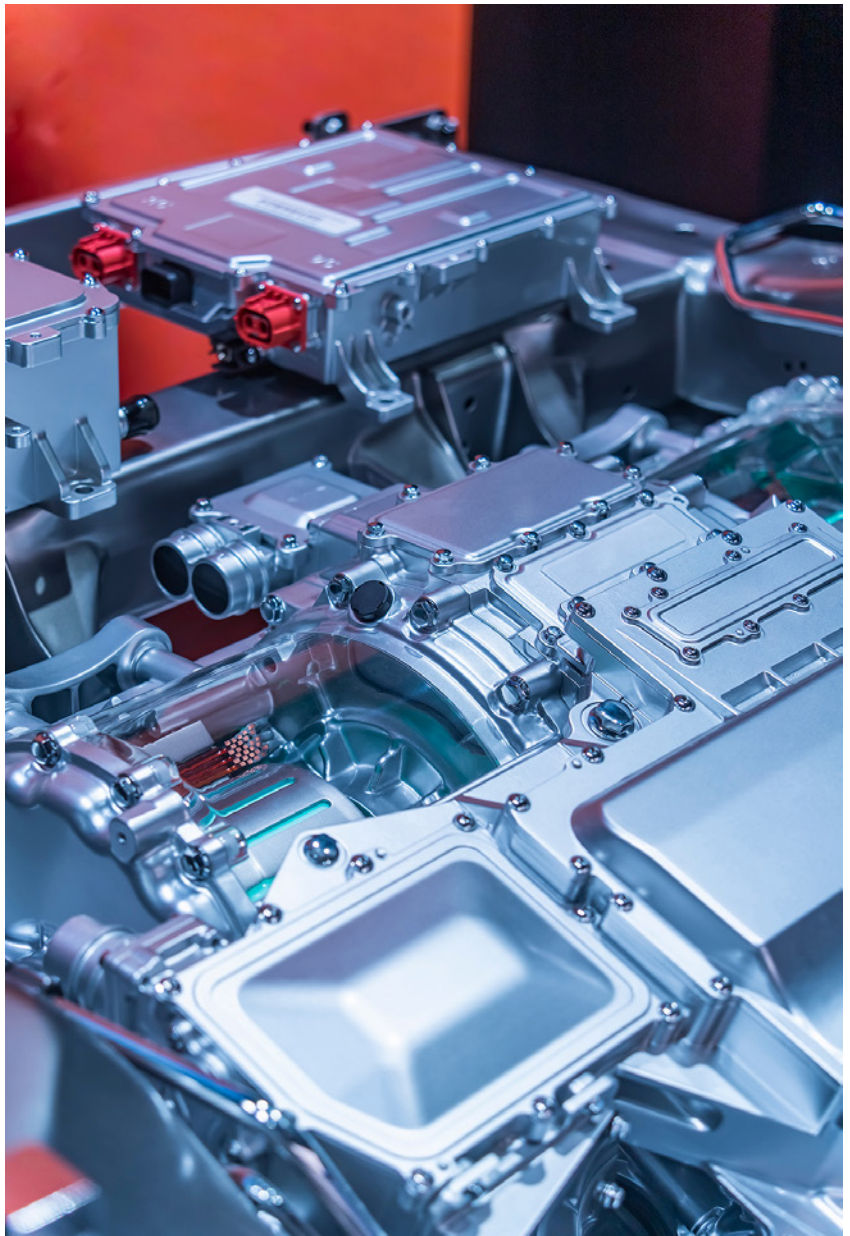
DFR considerations extend to transient overvoltage protection, gate drive timing, and thermal interface materials. Design tools now integrate electro-thermal co-simulation, allowing engineers to predict hot-spot formation or thermal runaway before first builds¹⁰. OEMs and Tier 1s employ vehicle digital twins to define key environmental/mechanical/thermal stressors from extended mission profiles, and system reliability is a sum of sequential and additive stressors¹¹. Board-level tests such as highly accelerated life testing (HALT) and power cycling are also increasingly standard¹².

DC-DC Converter: Silent Support System

While the traction battery powers high-voltage systems (e.g., drive motor, compressor), a DC-DC converter steps voltage down, often from 400–800 V to 12–48 V, to supply lights, infotainment, sensors, and safety modules. It also keeps the low-voltage auxiliary battery charged. Despite its secondary role, its reliability is paramount because a failure here can disable safety-critical systems like braking or lighting. Internally, the converter resembles a miniaturized inverter with its own power stage, controller, and isolation transformer. Size and weight constraints have driven the use of multilayer ceramic capacitors (MLCCs), planar magnetics, and integrated switching

controllers. However, compact designs raise thermal and EMI challenges.

DFR practices include derating of passive components, thermal isolation of control circuits, and PCB layout rules to minimize parasitic coupling. Isolation barriers must withstand long-term, high-potential stress, especially in humid or contaminated environments¹³. Redundant converters or failover strategies are gaining interest in commercial vehicles and automated platforms where uptime is mission-critical. Robust fault detection algorithms are now being embedded in digital controllers, helping identify incipient degradation without relying solely on external sensors¹⁴.



Onboard Charger (OBC): Gateway to the Grid

Closely related to the DC-DC converter is the OBC, which converts AC input from a wall or public charger into regulated DC voltage for battery charging. Depending on market and grid specs, OBCs must accept 120–240 V AC input, and provide 3–22 kW output. OBCs face unique stresses like grid voltage fluctuation, lightning-induced surges, and long idle periods punctuated by high-power operation. Galvanic isolation and power factor correction are required by standards, but implementation strategies vary. Newer bi-directional OBCs (for vehicle-to-grid applications) face even higher reliability demands due to frequent mode switching.

DFR in OBCs involves high-voltage isolation design, common-mode EMI filtering, creepage management, and protection against harmonic distortion from poor grid conditions. Weatherproofing is essential in externally mounted chargers, and liquid cooling is often integrated for 11 kW+ units¹⁵.

Conclusion: A Systematic Path to Durable Propulsion

The propulsion electronics of an EV are more than a collection of components; they're an orchestrated system where failure in one area cascades across others. As performance demands grow, DFR becomes a strategic pillar. Techniques like predictive analytics, hardware-in-the-loop testing, and digital twin simulation are allowing designers the opportunity to foresee and prevent failures, instead of just reacting to them. Long-term field reliability is now inseparable from design methodology, especially for power electronics.

As automakers compress development cycles and scale across multiple platforms, all while facing fierce cost competition, only those who factor in reliability from the outset will see consistent performance on the road.

Please note the importance of reliability in EV/automotive/power electronics will be highlighted at the upcoming APEX EXPO Technical Conference in March 2026, where over 30 contributions have been received that delve into the advancement of reliability for these applications through design, materials, assembly, test, and metrology best practices. Be sure to attend. **SMT007**

References

1. Alternative Fuel Data Center, U.S. Department of Energy.
2. Mitsubishi iMiEV (System Diagram) F.
3. "Scalable, Decentralized Battery Management System Based on Self-organizing Nodes," by A. Reindl, H. Meier, M. Niemetz, *Architecture of Computing Systems*, 2020.
4. "High-Accuracy Battery Monitor ICs," Application Note, Texas Instruments, 2023.
5. Nine EV BMS & battery pack field incidents reported by NHTSA and other sources were reviewed. Additional information can be provided separately.
6. "Thermal Design Considerations for Traction Inverters," White Paper, Infineon, 2022.
7. "Designing with SiC Power Modules for EV Traction Inverters," Application Guide, Wolfspeed, 2023.
8. "Road to Reliability Webinar Series: Design for Manufacturing," by Michael Schleicher, Global Electronics Association, July 24, 2025.
9. "Road to Reliability Webinar Series: Design for Reliability," by A. Mackie, Global Electronics Association, May 22, 2025.
10. "Multiphysics Simulation for Electric Drive System Design," White Paper, ANSYS, 2021.
11. "Extended Mission Profile Model," by Lewitschnig, et al, AECRW, Oct. 4, 2023.
12. "The Importance of Reliable Charging Station Electronics for Building a Sustainable EV Ecosystem: 'R' YOU READY?" by Brian Chislea, EV Quality and Reliability Group, Global Electronics Association, July 2025.
13. IPC-2221B, Generic Standard on Printed Board Design, Global Electronics Association.
14. "Digital Control of DC/DC Converters in Automotive Applications," App Note, STMicroelectronics, 2022.
15. "OBC Test Challenges in EV Power Electronics," Tech Paper, Chroma Systems, 2023.



Stanton Rak is principal consultant of SF Rak Company and co-chair of the APEX EXPO Technical Committee.

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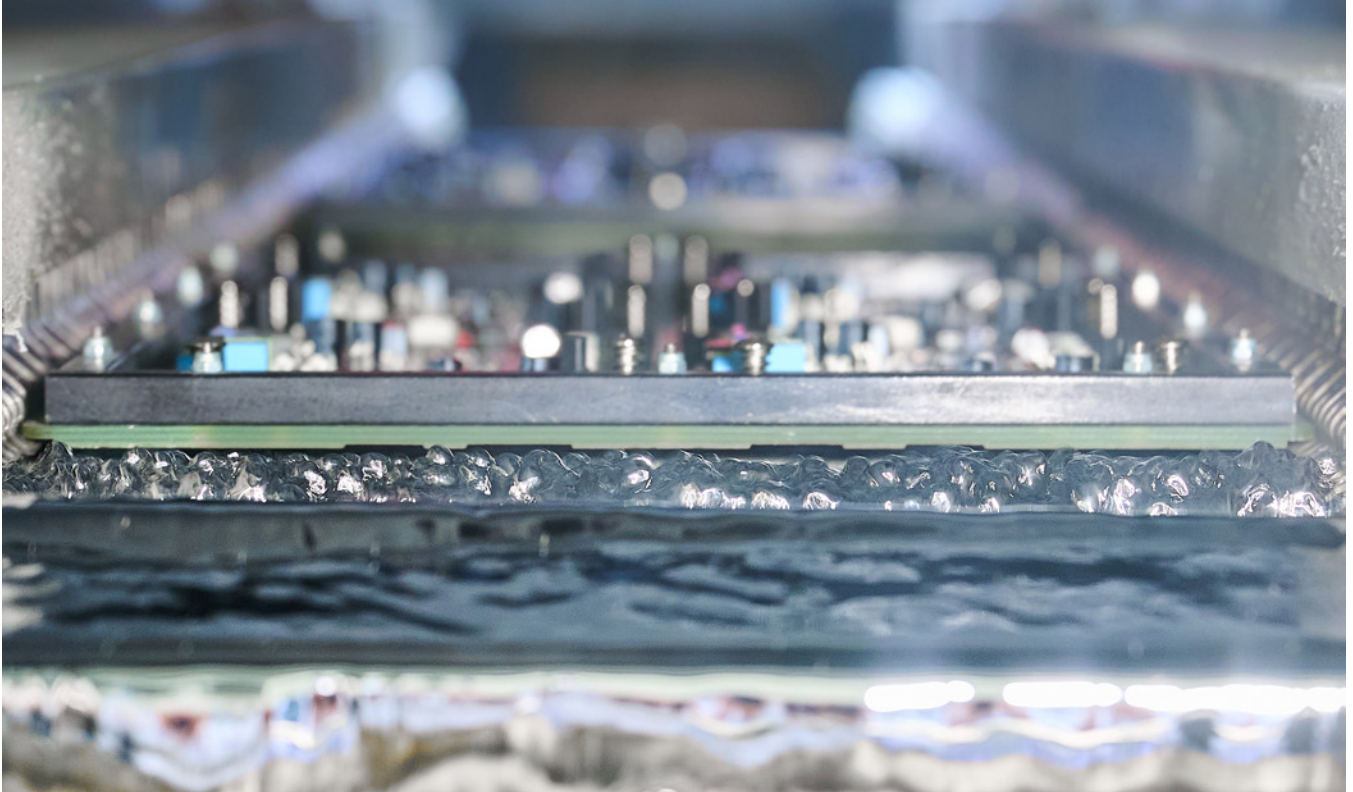
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Solderability Test Methods, Myths, and Realities

by Nash Bell, BEST, Inc.



Solderability testing answers a simple question: How readily will a termination form a sound solder joint under defined conditions? It is not component preconditioning. Rather, it evaluates wetting—the speed and extent to which molten solder spreads and adheres to a surface—using controlled methods (e.g., visual “dip-and-look” or wetting-balance measurements). Results reflect the combined effects of termination finish, storage and handling, flux activity, and the solder alloy in use. Because lead-free alloys wet differently than SnPb, the same part can exhibit noticeably different solderability depending on the alloy and process conditions.

Why Test Solderability?

Solderability testing verifies that device terminations (and other solderable surfaces) will achieve

the degree of wetting needed for a robust, reliable joint with either SnPb or Pb-free alloys. It’s used to:

- Qualify and compare finishes, fluxes, pastes, and alloys, and screen incoming components
- Monitor aging and shelf life, catching oxidation or contamination before it reaches the line
- Support PCB manufacturing and assembly process control, including evaluation of board finishes and coatings

Weak solderability results signal risk—slow or incomplete wetting, non-wetting/de-wetting, higher rework, and field-reliability concerns—prompting corrective actions before volume build.

Qualitative vs. Quantitative

Solderability testing evaluates how readily molten

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solder wets component terminations and other suitable surfaces for soldering. The two most common methods are the dip-and-look method and the wetting balance method.

- **Dip-and-look (qualitative):** Specimens are fluxed and dipped into a solder bath under defined conditions, then inspected against acceptance criteria for coverage, de-wetting, non-wetting, and other visual indicators. It's a quick, comparative, go/no-go screen well-suited to incoming inspection or finish comparisons.
- **Wetting balance (quantitative):** A load cell records the net wetting force vs. time as the specimen is immersed in solder, yielding a wetting curve from which metrics such as time-to-zero force (wetting time), maximum wetting force, and slope can be extracted. This method provides numeric data for process development, alloy/flux studies, and aging evaluations.

Standards in Common Use

Several specifications define test setups, preconditioning, fluxes, solder alloys, acceptance criteria, and reporting requirements. The most frequently applied are IPC-J-STD-002, MIL-STD-883 Method 2003, and MIL-STD-202 Method 208, each tailored to specific component types and applications.

Dip-and-look Test Method

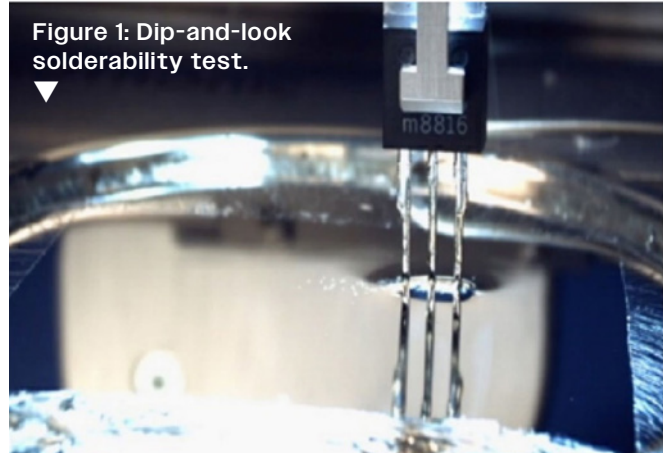
This method is a comparative, visually inspected immersion test: Parts are fluxed and dipped into a solder bath under defined conditions, then judged for wetting and defects. It's popular because it is:

- **Simple and fast:** No complex instrumentation and is well-suited to shop-floor screening and finish comparisons
- **Low cost:** Minimal capital outlay vs. wetting balance systems
- **Broadly accessible:** Short training curve; easy to deploy at incoming inspection or on production lines

Inherent limitations

This type of evaluation is inherently subjective, as

Figure 1: Dip-and-look solderability test.



results depend heavily on the inspector's judgment, viewing conditions, and consistency of evaluation. Without tight standardization, variations in outcomes are common. Additionally, the method is qualitative—it provides only a basic go/no-go indication of wetting behavior, such as coverage, non-wetting, de-wetting, or pinhole presence, rather than quantitative data like force or time measurements.

Another significant limitation is that the results are highly sensitive to process conditions. Factors such as flux activity, solder bath cleanliness, temperature, dwell time, immersion speed and angle, and specimen preparation can all strongly influence the outcome.

Best use cases

Despite these limitations, this approach remains valuable in several contexts. It is well-suited for rapid screening of components and board finishes, where speed is a priority. It is also useful for comparing fluxes, solder pastes, or alloys to understand their practical wetting performance. Additionally, it is often the preferred choice for production line checks, where efficiency and cost-effectiveness are more important than absolute precision.

How to reduce subjectivity (quick wins)

To improve consistency and minimize subjectivity, several straightforward measures can be implemented. Standardizing inspection conditions—including illumination, magnification, and viewing angle, for example, by using a fixed light box and loupe—helps ensure more reliable observations. Inspectors should also use reference photographs or “golden sam-

ples” along with a clearly defined checklist of defect criteria to guide their evaluations. Finally, thorough documentation of process parameters, such as bath temperature, dwell time, immersion rate, flux type, and any preconditioning steps (e.g., steam aging), should be recorded directly on the traveler to provide valuable context for the results. (Figure 1)

Wetting Balance Test Method

This is an instrumented immersion test that records net wetting force vs. time, producing a wetting curve (Figure 2). Common metrics include:

- t_0 /zero-crossing: Time to transition from buoyancy to net wetting
- t_{wet} : Time to a defined wetting threshold
- F_{max} : Peak wetting force
- Initial slope: Rate of wetting onset

Why it's powerful

This method stands out because it is quantitative and highly reproducible, capable of detecting subtle differences in wetting behavior that simple visual inspections often overlook. Its precision makes it particularly valuable for engineering applications, including alloy and flux development studies, evaluating surface finish aging, assessing storage or shelf-life impacts, and supporting process optimization. Moreover, it is data-rich, generating measurable results that enable the establishment of baselines, guardbands, and trend charts—essential tools for continuous process monitoring and improvement.

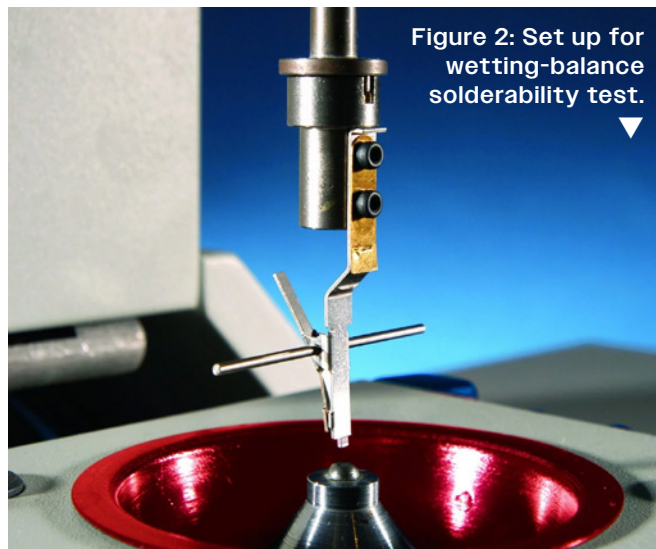


Figure 2: Set up for wetting-balance solderability test.

Important limitations

Despite its strengths, this approach also comes with notable limitations. One key challenge is that there is no universal pass/fail criterion—industry standards do not define a single acceptance limit for force or time measurements. As a result, most organizations develop their own internal baselines and control limits, tailored to each finish, alloy, and flux. Additionally, specialized expertise is required to correctly interpret the data; poor calibration, contamination, or setup errors—such as misalignment or incorrect buoyancy correction—can all lead to misleading conclusions. Finally, the method demands strict laboratory discipline, including stable temperature control, a verified and calibrated load cell, clean solder and flux, and consistent specimen preparation and geometry.

Best use cases

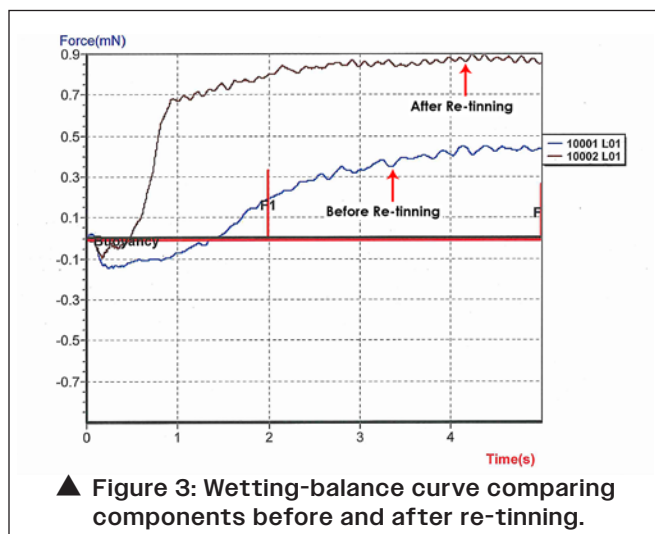
This technique is especially well-suited for qualification and reliability studies, particularly when preconditioning steps like steam aging are part of the evaluation. It is also ideal for comparing re-tinning or re-finishing processes and tracking degradation over time. In manufacturing environments, it provides valuable numeric discrimination when more precise performance data is needed than visual methods can offer.

Good practice (to keep curves honest)

To ensure data integrity and reliable results, certain best practices should be followed. Calibration and buoyancy correction are essential, along with verifying immersion depth, angle, and speed. Standardizing flux type and solder alloy/temperature—and regularly refreshing solder baths to prevent contamination or dross buildup—helps maintain consistent conditions. Finally, using replicate measurements and reporting key parameters, such as initial time (t_0), wetting time (t_{wet}), maximum force (F_{max}), slope, and relevant bath, flux, and aging details, ensures that the resulting curves are meaningful and comparable. (Figure 3)

When to Combine Methods

Because a strong wetting force does not guarantee a defect-free joint, many teams pair wetting balance (quantitative sensitivity) with dip-and-look (visual



defect screening), especially for pass/fail decisions or supplier qualification. For stringent requirements, include environmental preconditioning (e.g., steam aging or controlled storage) and, where appropriate, destructive analysis (cross-sections, X-ray) to correlate wetting data with joint integrity.

Additional Testing for High-reliability Applications

Many sectors—industrial, automotive, medical, and aerospace and defense—expect devices to remain serviceable for years, which often means long-term component storage. In these contexts, engineers should verify solderability, a leading indicator of interconnect reliability, beyond basic incoming inspection.

This matters because long storage and harsh environments promote oxidation, contamination, and intermetallic growth on terminations, which slow or prevent wetting. Supplemental testing helps confirm that finishes (including re-tinned surfaces) still deliver robust joints at end-of-life storage.

Stressing for Shelf-Life: Steam Aging

Steam aging accelerates natural aging by exposing components to elevated humidity and temperature under controlled conditions. The goal is to simulate years of shelf life in days or hours, then measure whether the finish still wets promptly and completely under your standard test method.

In practice, teams should apply steam aging to representative lots or post-re-tin samples, follow

the relevant standard's time/temperature/humidity profile and handling steps, and immediately evaluate solderability after aging to minimize confounding re-oxidation.

Recommended Supplemental Regime

A comprehensive evaluation strategy combines complementary methods to deliver both qualitative insights and quantitative data. The primary screening step should use a dip-and-look test to quickly assess visual indicators such as overall coverage, non-wetting or de-wetting, pinholes, and other surface defects. This rapid inspection provides an immediate go/no-go assessment and helps flag potential issues early in the process.

Next, a quantitative wetting balance test should be performed to measure key parameters such as wetting time, peak wetting force, and the shape of the wetting curve. These results can then be compared against your established baselines to detect subtle performance shifts and confirm whether the soldering process is meeting expected standards.

When deeper insight is needed, correlation methods such as cross-sectional analysis, X-ray, or CT imaging to evaluate voiding, and shear or pull tests should be employed. These techniques help link observed wetting behavior directly to joint integrity, providing a more complete understanding of how surface interactions affect mechanical reliability.

For re-tinned components, it is important to conduct testing both before and after the re-tinning process, as well as following steam aging. This ensures that any observed improvements in wetting performance are long-lasting and robust, rather than temporary enhancements that degrade over time.

Interpreting Results

When interpreting results, treat wetting-balance metrics as engineering data; use control limits derived from known-good parts/finishes rather than universal pass/fail numbers. Use replicates and report the full context (finish, flux, alloy, bath temperature, immersion rate, preconditioning). If dip-and-look passes but force/time metrics trend worse, investigate bath cleanliness, flux activity, or surface contamination; conversely, strong force data with visual defects still warrants fail and rework.

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Process Controls for Long Storage

Specify packaging and storage (sealed barrier bags, desiccant, controlled temperature/RH) and re-bake or re-tin triggers by date code or measured solderability drift. Also, maintain lot-level traceability linking steam-aging conditions, test data, and final disposition.

Conclusion

Under MIL-STD-883 Method 2003, the dipped portion of each termination must show $\geq 95\%$ continuous solder coverage. Visual defects—pinholes, voids, porosity, non-wetting, or de-wetting—may not exceed 5% of the dipped area.

This matters because solderability is a first-order driver of assembly yield and long-term reliability. Since the porous-finish failures of the 1980s, industry standards and test protocols have matured to prevent recurrence and to ensure robust interconnects.

To Meet the Bar:

- Use dip-and-look for fast, visual confirmation of coverage and defects

- Use a wetting balance for quantitative sensitivity to finish, flux, alloy, and aging effects
- Pair methods with sound process control—documented flux/solder/bath conditions, disciplined pre-cleaning, and consistent specimen prep
- Include aging simulations (e.g., steam aging) where life cycle demands warrant it, and correlate results with cross-sections or mechanical tests when reliability is critical

Taken together, these practices verify surface condition, validate long-term performance, and help deliver reliable, standards-compliant assemblies that stand up to stringent industrial, automotive, medical, aerospace, and defense requirements. **SMT007**



Nash Bell is president of BEST, Inc. To read past columns, [click here](#).

BOOK EXCERPT

The Printed Circuit Assembler's Guide to... Low-Temperature Soldering, Vol. 2 Chapter 6: The Dawn of Ultra Low-temperature Solders

By Morgana Ribas, Pritha Choudhury, Ramakrishna H V, and Rahul Raut, MacDermid Alpha Electronics Solutions

Drivers of Electronic Platforms of Tomorrow

Electronic structures and assembly materials and technologies are undergoing radical changes. For example, electronic structures and interactive HMIs (human machine interfaces) in consumer and au-

tomotive electronics are undergoing rapid transformation. Furthermore, electronic circuits and devices are being integrated with displays using novel packaging and assembly techniques to produce aesthetically compelling, compact, interactive, and lightweight structures. These structures can take

a variety of formats including flat, slightly curved (2.5D) and full 3D.

Furthermore, human machine interfaces (HMIs) are transitioning to tactile, smart, interactive structures from their current physical and mechanical forms. These emerging capacitive touch smart structures are replacing traditional switches and knobs in many next-generation devices. To facilitate these next-generation structures and devices, flexible PCBs, novel assembly technologies, and integration approaches are needed.

To enable this crucial technological shift, an entire ecosystem must be developed. This ecosystem should comprise high-performance and high-reliability materials, as well as high-volume, high-yield, and sustainable manufacturing processes.

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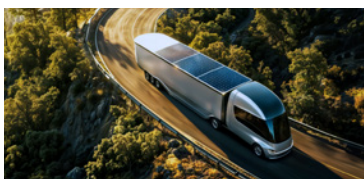
Global Electronics Association Strengthens Role as Industry Convener, Announces Upcoming Events to Advance Innovation and Collaboration



The Global Electronics Association launches a series of flagship events to convene leaders of a \$6T industry as they navigate new technologies, AI implementation, supply chain resiliency, and more. The Association's upcoming conferences and trade shows connect leaders, engineers, and technologists with the solutions and insights they need most.

Mapping the EV Landscape: Markets, Platforms, and Powertrains

From compact urban commuters to heavy-duty trucks and city buses, each category of EV presents distinct performance demands and environmental challenges that shape both the design of its electronics and the manufacturing processes behind them.



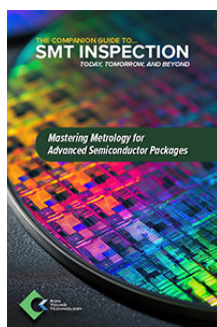
The Training Connection, LLC Welcomes Industry Veteran Jack Harris to Lead Training Partnerships

Known for his deep industry knowledge and ability to connect people, processes, and technology, Harris will lead TTC's outreach and partnerships within the OEM, EMS, and education sectors—strengthening collaboration and driving the evolution of training programs that meet real-world production challenges.



SMTA Next Gen 10 Emerging Leaders Announced

The SMTA is proud to announce the Next Gen 10 award recipients for 2025. The program recognizes young leaders who demonstrate outstanding success in their careers and contributions to the electronics manufacturing industry.

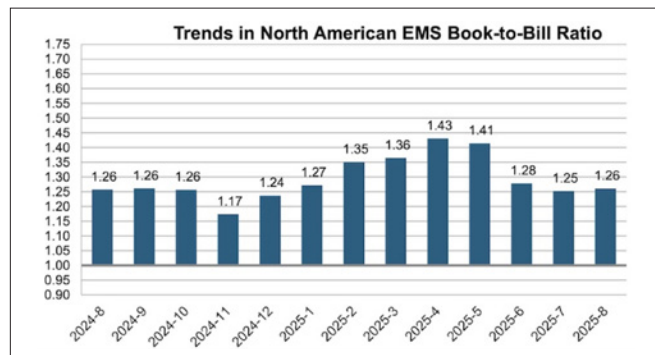


Now Available: *The Companion Guide to... SMT Inspection: Today, Tomorrow, and Beyond: Mastering Metrology for Advanced Semiconductor Packages*

As the industry advances toward increasingly compact and high-performance devices, the demand for precise inspection has never been greater. This downloadable guide explores the pivotal role of metrology in advanced semiconductor packaging.

North American EMS Industry Shipments Down 1.4% in August

The Global Electronics Association announced the August 2025 findings from its North American Electronics Manufacturing Services (EMS) Statistical Program. The book-to-bill ratio stands at 1.26.



Hardware Engineers, Manufacturing Leaders Ready to ‘Build Better’ Electronics

“Build Better is really about cross-pollination and sharing,” Instrumental’s dynamic CEO Anna-Katrina Shedletsky said, as she highlighted the importance of supporting this type of sharing in tech, which may be more important than ever before.



How PCBA Excellence Transforms High-mix Operations



With the demanding requirements of high-reliability electronics and the unpredictable nature of oil and gas industry demands, operational excellence requires a fun-

damentally different approach than conventional high-volume manufacturing.

Global Sourcing Spotlight: Finding the Balance Between Cost and Quality



In global sourcing, pursuing lower costs often takes center stage. It’s the shiny lure that gets buyers to cast their lines into unfamiliar waters. But seasoned professionals know that in the long run, sourcing is less about price tags and more about value. The real magic—and margin—lies in finding the balance between cost and quality.

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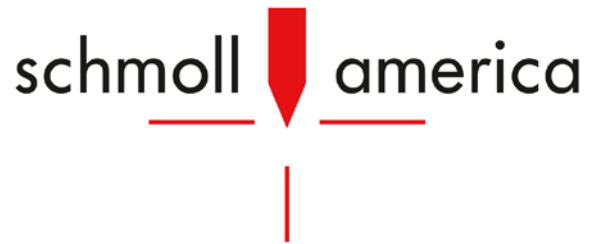
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- Associate degree or equivalent experience in electronics manufacturing
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Sr. Test Engineer (STE-MD)

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

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

- Candidate would specialize in the development of in-circuit test (ICT) sets for Keysight 3070 (formerly Agilent & HP), Teradyne/GenRad, and Flying Probe test systems.
- Strong candidates will have more than five years of experience with in-circuit test equipment. Some experience with flying probe test equipment is preferred. A candidate would develop, and debug on our test systems and install in-circuit test sets remotely online or at customer's manufacturing locations nationwide.
- Proficient working knowledge of Flash/ISP programming, MAC Address and Boundary Scan required. The candidate would also help support production testing implementing Engineering Change Orders and program enhancements, library model generation, perform testing and failure analysis of assembled boards, and other related tasks. An understanding of stand-alone boundary scan and flying probe desired.
- Some travel required. Positions are available in the Hunt Valley, Md., office.

Contact us today to learn about the rewarding careers we are offering. Please email resumes with a short message describing your relevant experience and any questions to careers@ttci.com. Please, no phone calls.

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Associate Electronics Technician/Engineer (ATE-MD)

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

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

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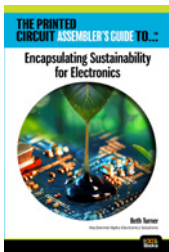
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