

MAY 2023

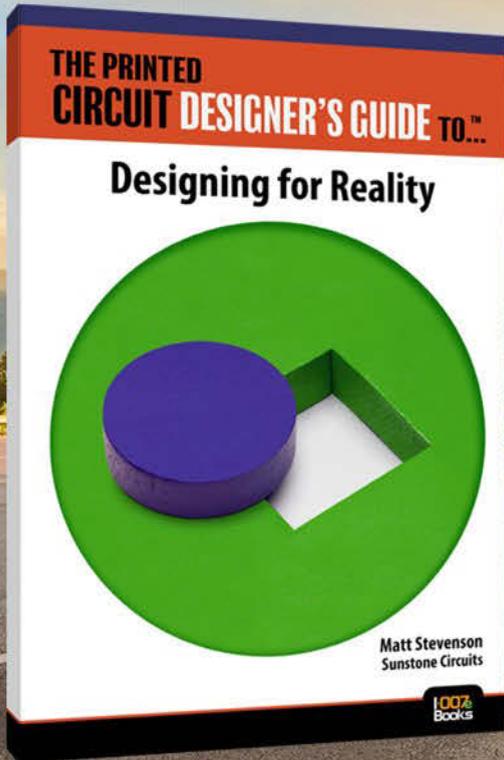
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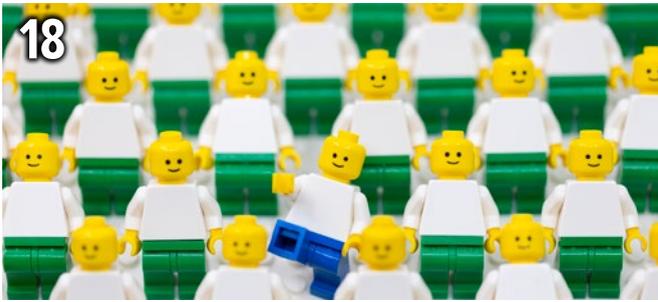


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Hiring and Training

Hiring the right employees is always a challenge, especially in today's business environment where there are fewer technical experts in the candidate pool and a shortage of labor overall. Once you've hired someone, how do you get them up to speed quickly? In this issue, we look at skills training to maximize new hire effectiveness.



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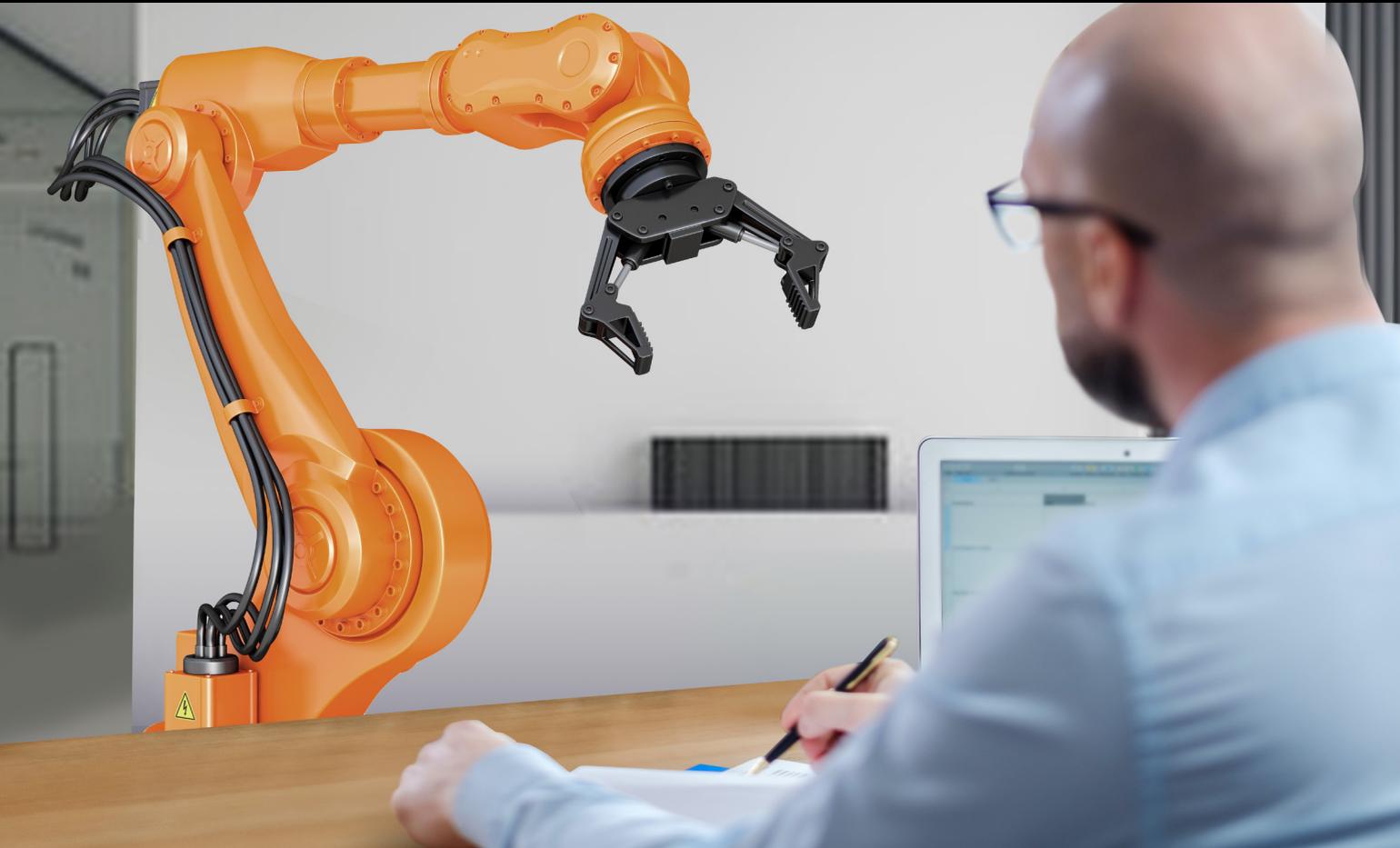


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How to interview a robot



It's important to know in the interview if the job-seeking robot:

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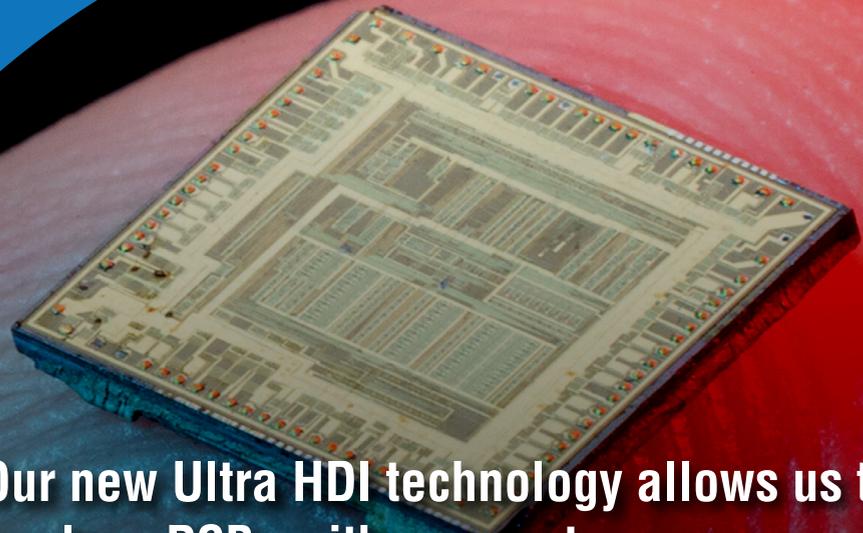


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Ready to Hire?

Nolan's Notes

by Nolan Johnson, I-CONNECT007

Staffing issues remain a top concern for electronics manufacturing companies—a ripple effect of the pandemic, to be sure. No sooner did supply chain issues soften than we realized nobody wanted to come work for us, and if they did, could we train them quickly enough? Therefore, what are today's best practices in on-the-job training? Are local technical schools recognizing the need and meeting the challenge set before them?

It reminded me of a conversation I had recently with Johnny Vanderford, director and assistant professor of PCB manufacturing, PCB design, MEMS and microelectronics at Lorain County Community College in Lakewood, Ohio. Johnny and I have chatted in the past about the school's nationally recognized programs¹, and he's well-spoken on the topic of "education for employability," the new buzzword for what had been termed vocational education.

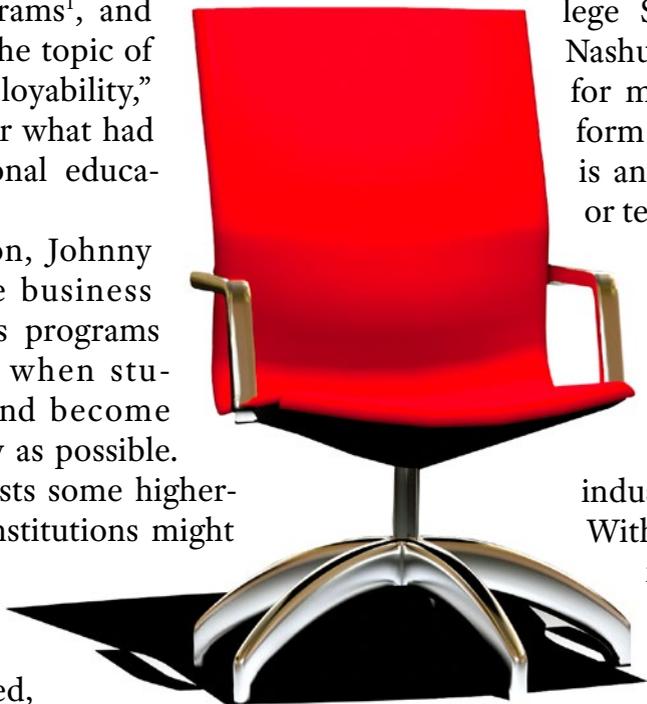
In this conversation, Johnny again described the business model at LCCC—his programs benefit financially when students earn degrees and become employed as quickly as possible. Conversely, he suggests some higher-tuition educational institutions might be more motivated by keeping their students enrolled longer than really needed,

giving me the sense that stretching out a degree program is more beneficial to the school than to the students themselves.

He repeatedly emphasized "employed" over "educated" or "degreed." Lorain's priorities are different, but quite clear. LCCC's board of advisors for the electronics curriculum, for example, is comprised of local industry representatives who actively hire from the school's graduate pool and are fully engaged in providing feedback on how to structure curriculum to ensure LCCC students are quickly prepared for employment.

So, are schools doing enough regarding today's workforce development needs? This is not a new question, says Jim Flis, a boot camp instructor in the Community College System of New Hampshire, Nashua. "I have seen this addressed for most of my adult life, in one form or another. Every time there is an advancement in technology or techniques, we encounter a situation where we lack skilled people. As a society, we have been in this predicament forever. However, to address the concern for today's new technologies, we need industry to invest in the solution. Without such support and investment, it simply won't happen."

Do you agree with Jim's sentiments? Are we in the



same place we've always been, or does it feel more dire now? As you read his interview with Marc Carter, I'll let you be the judge. Nashua has recognized the steep mountain to climb and is doing what it can to address the challenge. This group of educators responded quickly to a local industry need, but saw the potential to expand the program and turn out a better trained workforce.

Here is my point: The lack of labor pool for electronics manufacturing is a much larger problem than simply having enough bodies to hire. This is a STEM and vocational program challenge, a need for skilled labor even if they're working on the manufacturing floor. As our customers' designs become increasingly smaller and more complex, our factories, machinery, processes, and staff must evolve to match these needs. It's not just bodies to stand at machines; our workers need to be critical thinkers and technical problem solvers.

Our May issue is just the launching pad for what will surely be a more detailed and nuanced discussion in future issues. Here, I include the interview between Marc Carter and Jim Flis. I also share some best practices from Tara Dunn and Ron Lasky. In the future, we'll be looking to a semiconductor substrates facility and an OEM manufacturer of automation equipment as they share their insights into creative solutions and best practices for recruiting, hiring,

and retaining local talent. (Hint: It's all about skill building in the recruitment process itself. Already trained or skilled? You jump to the front of the line.)

Additionally, I include an interview with Bob Duke, who's now running a global sourcing division at American Standard Circuits. While supply chain issues aren't as dire as the past couple of years, it's still a direct financial and competitive issue for most EMS companies. Bob addresses some of those concerns, and kicks off a new I-Connect007 monthly column, which will publish in our daily newsletter starting this month. We also welcome new columnist Mike Konrad, vice president of communications at SMTA. In this first column, he addresses several questions on reliability in harsh environments, and in the future, he will be talking with other subject matter experts on a host of topics. Welcome to both of you! **SMT007**

References

1. "Lorain County Community College's Successful MEMS Program," interview by the I-Connect007 editorial team, *SMT007 Magazine*, December 2020.



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](#).

A banner with a dark blue, textured background. On the left, the text 'jobCONNECT007' is displayed in a large, bold font, with 'job' in light blue, 'CONNECT' in white, and '007' in yellow. Below this, the text 'Companies seeking talent with circuit board industry experience post their jobs with us.' is written in white. On the right side, there is a large magnifying glass icon. Inside the lens of the magnifying glass, the website address 'jobconnect007.com' is written in white.

A Solid Training Ground in New Hampshire

Better to Light a Candle

Feature Column by Marc Carter, AEROMARC, LLC

I've dedicated my career to facilitating the health and growth of the electronics manufacturing industry. In this interview with Jim Flis, a boot camp instructor at Nashua Community College, we discuss a successful and growing effort to provide the next generation of electronics manufacturing staff with the foundation they'll need to carry the industry into the future. Jim took over the boot camp program about five years ago and is quite proud of the students and what they've accomplished.

Jim, what can you tell us about your own background, and how your boot camps fit into the overall mission of NCC?

I have a bachelor of science degree in electronics engineering technology, and worked as a principle hardware engineer for Digital Equipment Corporation. My primary work was in the field of data communications (terminals, Ethernet, voice and modems) and TEMPEST work for DEC's government group. Upon leaving that field, I began working with youth groups, substitute teaching, and as a para-educator in our public school system.

NCC is located in southern New Hampshire on a campus that was first built in 1970. It serves about 1,700 students in multiple programs throughout the school year with 35 associate degree and 22 certificate programs.



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Jim Flis

The Microelectronics Boot Camp is a certificate program and is a non-credit 400-hour (40 hours a week for 10 weeks) program that teaches die attach/substrate attach and wire bonding with a focus on the microwave manufacturing environment. This program began in 2017, with 27 cohorts (groups) and more than 300 students graduating. I became the instructor in 2018, and have seen 209 students walk across the stage for their certificate. We boast a placement rate of 96% with a retention rate (after one year) of 92%.

Many in our industry are concerned about having enough properly prepared replacements for the future, especially because we're already struggling to fill openings.

This is not a new problem. I have seen this addressed for most of my adult life in one form or another. Every time there is an advancement in technology or techniques, we encounter a situation where we lack skilled people. It's a longtime societal issue, but in order to address it, we need our industry to become invested in the solution. Without that support and investment, it simply will not happen.

The identified industries need to define specifically what skills and knowledge are required. Further, they need to help the educational facilities with the materials (tools, equipment, raw materials, etc.) needed to properly conduct the desired training. In most cases, these industry members perform such training in-house but realize that they cannot train enough people fast enough, so they seek out

other places for this training. I think the biggest problem is that such specialized training is not possible unless they help build a facility for it.

That sounds like a major undertaking. I know industry partners have been an integral part of this effort from the beginning. Can you tell us how (and with whom) that works?

In the case of our boot camp, someone had to ask, and perhaps research, how many college campuses have direct (in lab) access to wire and ribbon bonders, bond pull machines, and microelectronic raw materials for practice. It's likely they discovered the answer is zero. To that end, the industry asking for this training (BAE Systems, in our case) provided the college with the equipment and raw materials to perform the very training for their immediate needs.

Could you run us through the history of how NCC became involved?

In 2016, BAE representatives met with leaders from many colleges and universities within the state of New Hampshire. Jon Mason, the corporate, community, and continuing education coordinator at NCC, said Nashua would work with BAE to develop a program. Together they defined and discussed the specific desired skills and needed equipment, and determined how to loan equipment and donate raw material to NCC to support this program. Jon coordinated a space on the NCC campus that would make a suitable lab, located an instructor, and looked into how to secure students who wanted to learn something new and exciting. It started with just four students in the first cohort, but today you see the results of those efforts.

While it began, frankly, as a feeder program as BAE grew its New Hampshire manufactur-



ing facilities, by the eighth cohort, this program was opened to the rest of the microelectronics industry in southern New Hampshire and northern Massachusetts. We now service over 25 companies, but none of this would have happened without the investment made initially with one company.

The early days of these kinds of efforts are critical. Could you outline the growth of the program (numbers, scope, etc.) especially how you navigated those first few “cohorts” (group of students)?

I was not involved in the early days of this program, having joined in 2018 with Cohort No. 10. Early on, the structure of the program was easier to establish, as we only had to address a single company’s need. BAE was able to clearly define what they needed the students to learn, so it was easy to tailor the class to meet that need. Because most everything being taught was based on BAE company specifications, it often did not match what other industry members implemented, so as we serviced more of the industry, we made some significant changes that would allow for continued success.

Therefore, one of our earliest changes was switching our focus to MIL-STD-883 as our manufacturing standard of choice—the entire industry followed that specification as a very minimum. We continue to keep a close eye on industry needs and make modifications to implement those changes. Additionally, the program has evolved as new training techniques are tried and perfected, resulting in a better trained recruit for the industry.

Can you describe the types of students who are most likely to attend, how the program is structured, and what skill sets you’ve focused on?

We seek out and accept a very diverse student body; they are primarily walk-ins who either



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SMT Engineer

A surface mount technology (SMT) engineer generally assists in the production line of surface mount technologies, which involve attaching electronic materials to printed circuit boards.

SMT engineers must be able to operate advanced placement machines. The person in this role must change out feeders and identify components per work instructions. They will troubleshoot and correct problems.

An SMT engineer also must be capable of identifying different electronic component types, including value and polarity. The engineer reviews and assesses the quality of the finished products.

A person in this role should be able to use simulation software, design software, and may also need to analyze and interpret data into charts, reports, and diagrams.

[Learn more here.](#)

learned about us via the news media, word-of-mouth from previous students, or from a state program, such as MY TURN, which partners students with academic and state agencies in career development. We have had students fresh out of high school as well as students in their 50s looking to make a change in their careers. All economic, social, and education levels have gone through our boot camp, and it's one of the things about this program that keeps me excited to continue teaching.

The program begins with introducing the student to the terminology, tools, devices, and techniques. They sit at a microscope and manipulate microelectronic components on the first day and progress to more challenging manipulations through this first week. By the second week, they begin practicing wire and ribbon bonding, working with epoxy (die attach), and being introduced to skills they will need in the coming weeks. By the third week, students receive a project due by the end of the week. In addition, they practice the skills for a project in the fourth week.

Each week the challenges become greater and the access to tools and equipment grows. Project 1 is die attach, project 2 is bonding, and project 3 is rework. Everything is performed on a flat wafer of gold-plated ceramic. Starting with project 4, the students work inside an enclosure (module) that better reflects what they will see in the industry. By this time, they have been exposed to a wide range of tools (bonders, bond pull machines, electronic fluid dispenser, and more). These later projects serve to expose the students to more challenges and devices, including pedestals, MMICs, air coils, diodes, thin film resistors, and beam leads. By graduation time, they should be very comfortable in the lab/

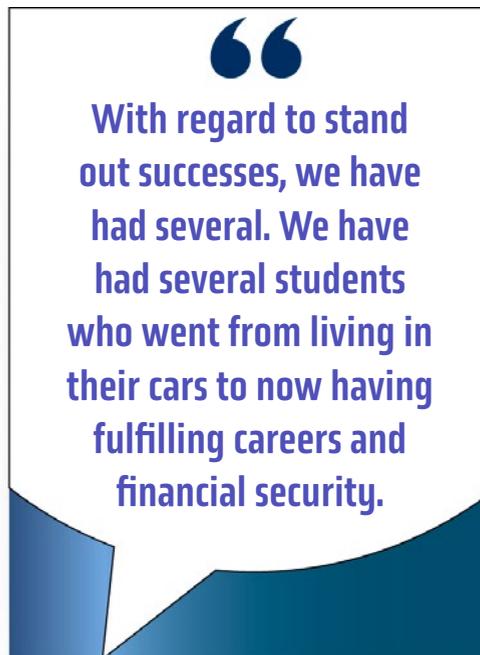
manufacturing environment and with their new skills.

Here's where you get to brag a little, Jim. Share a success story from this program. How many people have completed the program and how many are involved right now? What do you hear back from your students' new employers?

The feedback we get is generally very good. We have had some employers hire students from our program who had less than stellar work ethics and, unfortunately, the program often takes negative feedback for something we have

no control over. However, the positives far outweigh the negatives. Companies continue to hire our graduates. In our last cohort, some students were getting job offers as early as the second week of the program; by the sixth week, everyone in the class had offers and many had already accepted them.

With regard to stand-out successes, we have had several. We have had several students who went from living in their cars to now



**“
With regard to stand out successes, we have had several. We have had several students who went from living in their cars to now having fulfilling careers and financial security.”**

having fulfilling careers and financial security. One of my past students signed papers on her very first house, and she's just 19 years old. I recall one student in tears who showed up late for class three days in a row due to car troubles, during a week of heavy interviewing. She was concerned that the condition of her car might prevent her from maintaining employment. I explained that she simply needed to call a tow truck and an Uber to get to work. She looked at me incredulously and stated “I can't afford that!” I responded, “Not now, but you will be in a different place financially quite soon.” Her facial expression indicated she had not looked that far ahead. Three years later, she is still

gainfully employed, has a new car, and is feeling much more secure.

I had one student who was pregnant while going through the program and had to miss graduation because she went into labor. She had never missed a day until that last week. Like so many others, her life is stable and she has the beginnings of a long career.

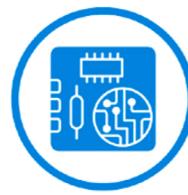
Finally, there have been a number of students in my cohorts that took entry level positions and have now moved up through management and engineering as they discover how many paths are now available to them.

What growth or expansion projects are you planning? What are the first steps?

With regard to the microelectronics boot camp, we are always evolving. After each cohort, we review what worked and what needs improvement. Could we have explained things better or introduced future classes to newer technology and techniques?

Case in point: In the past, all work in this boot camp was performed on a flat coupon (gold-plated ceramic disk) so we could expose the students to many challenges with regard to die/substrate attach and bonding. However, it did not reflect real-world assembly inside a metal enclosure. After teaching several cohorts, I was able to develop a reusable enclosure that incorporated a removable base. This allowed students to work in a more realistic environment with real-world challenges. The removable base allowed us, at the end of the cohort, to remove the base (containing all the students' work) and replace it with a fresh base for the next cohort. The bases are simple aluminum plates (inexpensive) whereas the enclosure walls are machined aluminum and much more costly. To date, these enclosures have been used in 13 cohorts with no sign of wear.

As for other (related) programs, we are currently preparing to hold our first J-STD



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Assembly Test Technician

Assembly test technicians are responsible for assembling different components or parts of semi-finished or finished electronic products to deliver a product that is ready to be sold in stores or other industries. They assemble parts or components to build a whole new product and perform regular test and inspection procedures to ensure that the product is formed per the specifications.

Assembly test technicians perform complex assembly of products according to established specifications and instructions. They perform high precision calibration and advanced adjustments using testing instruments. They also develop assembly and test procedures to promote the production of quality products and monitor the functioning of all equipment and report any problems or substandard conditions.

Assembly test technicians must read and understand drawings to be able to assembly equipment correctly.

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solder certification course at NCC. This Solder Boot Camp will perform two primary functions: Teach the students how to solder, with practical examples and exercises with enough practice time to hone their new skills, and certify the student to J-STD soldering level.

We are also actively exploring what would be involved in offering a “Test Technician Boot Camp,” where we would train students to perform the tasks necessary to qualify for that position in the industry.

What message would you like to share about getting involved, either in your project, or others around the country?

We really have two audiences to address: industry leaders and educators. At NCC, we are always looking for donated (or discounted) tools and raw materials. Local industry can contact Jon Mason through NCC to see how they can help. In return, we provide wall space for a company banner as well as help turning out qualified personnel for their factories. This can be beneficial during the many times local press and news media cover our activities.

As for others who are starting up similar programs (or any other program related to technological manufacturing), manufacturers need to communicate their needs, and educators need to explain their abilities and limitations. Beyond that you will need educators who will truly embrace the value of such training. Additionally, local manufacturers must be able and willing to provide (either via donation or loan) the expensive and specialized equipment necessary for the desired training.

Lastly, both the school and corporations need to establish some form of flow of raw materials. We often receive donations of scrap or out-of-production material for our class, which includes MMICs, thin and thick film resistors, capacitors, coils, beam leads, substrates and more. Without this flow of raw materials we would be unable to perform the high level of training we need to provide.

Thank you, Jim, for sharing such valuable information.

Happy to help. SMT007

SMTA Training Helps Companies Find the Right Fit for Talent

In a recent roundtable discussion with SMTA staff, we asked about identifying aptitude in job candidates. Gary Tanel, SMTA national ambassador, gave us this response.

SMTA resources, which could be used as part of onboarding, help employees determine whether they have the aptitude for this type of work and want to move on to certifications. Is providing those tools part of SMTA’s mission? Can a human resources department use SMTA’s training to ensure they’re hiring the right people?

Yes, and it’s why we’ve hired Tara Dunn as SMTA director of training and education. When we’re talking to the tier one companies, we learn that they

want to outsource the training; they don’t want to hire permanent staff to do it. They say, “We’ve got 100 engineers coming and going every year, and we need an easy way to direct them toward training classes.” Every new employee takes ESD training, sexual harassment training, and so forth. The training doesn’t just have to be how to put flux on a board. But that’s a good point; offering something to help people decide whether this is the right fit.



Gary Tanel

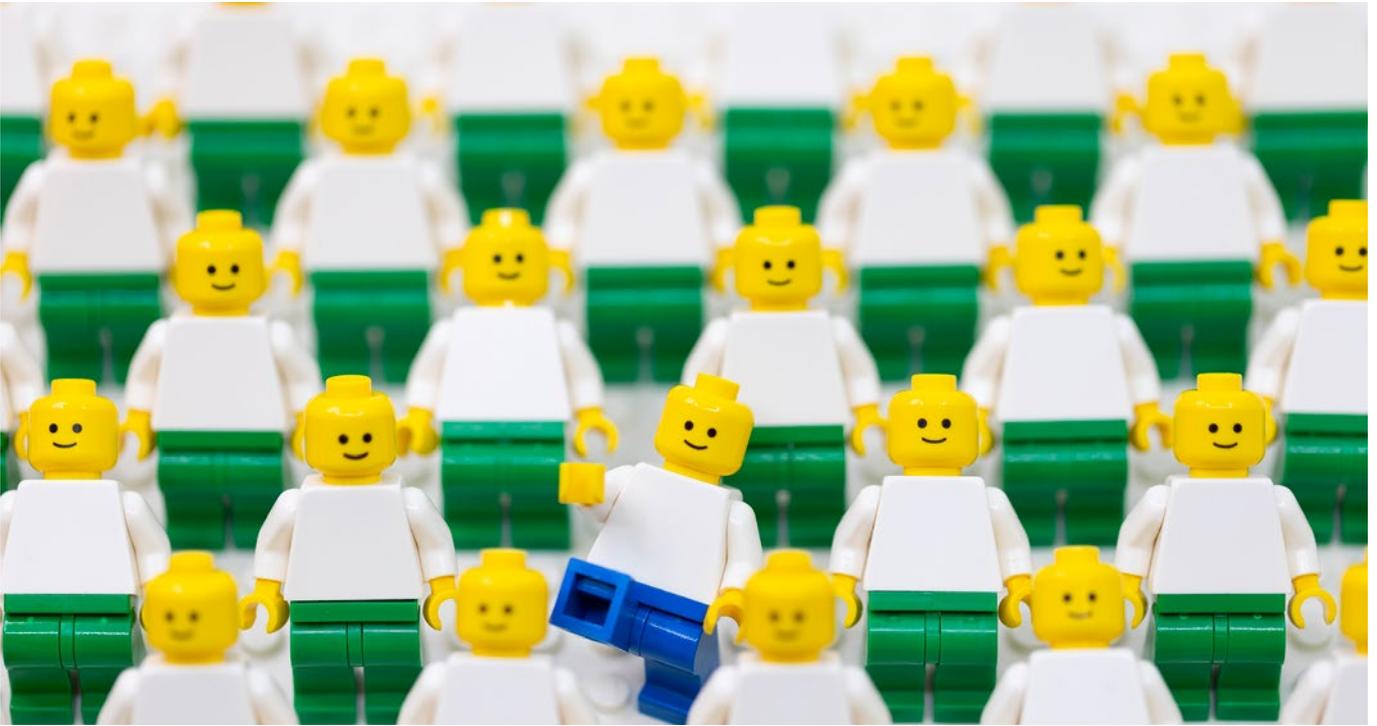
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Workforce Development and a **Networking** Mindset

Feature Article by Tara Dunn

SMTA

Is effective networking a skill or a mindset? I can remember the anxiety I felt around my first few networking events in the electronics industry when my skills weren't as honed as they are now. I wondered, "How will I remember everyone's names? Will I be nervous to approach strangers and start a conversation? What will we talk about?" It was always a highly stressful situation for me, and I bet many of you can relate to this.

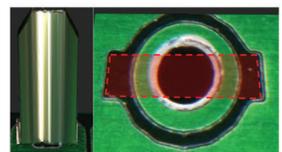
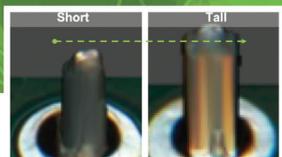
While I fully believe it helps to develop some skills in these situations—for example, don't cross your arms and frown, or don't stand in the corner with your eyes glued to your phone—I'd like to address a networking mindset and how that relates to workforce development and recruitment.

Our industry is in a dire position; a very significant number of jobs will be unfilled over the next few years. So, when looking at our workforce development and recruitment efforts, it's imperative to understand the landscape. We must create interest, engagement, and partnerships with multiple organizations and with individuals. This is a nationwide challenge that will not be resolved in a silo.

We can and should create a network that goes beyond the industry. Networking has traditionally been seen as a way to advance your career, build friendships to collectively solve industry challenges, and to mentor those new to the industry. However, it's even more important that we expand our network to include academia, and state and local govern-



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Koh Young is delivering solutions to increase production efficiency with measurement-based inspection for boards with a mix of component types. The Zenith and KY-P3 product offerings provide automated back-end solutions that combine advanced optics and innovative AI-powered vision algorithms for through-hole leads and pins, as well as traditional surface mount components on the same assembly.

Typically, manufacturers required two separate machines for surface mount and through-hole inspection, but the updates to our best-in-class Zenith and KY-P3 machines afford mixed technology capabilities that reduces capital investments by delivering machines capable of both surface mount components and through-hole leads and pins.

The traditional surface mount components and through-hole leads and pins are inspected with our multi-projection Moiré interferometry system. With proprietary, AI-powered algorithms for blow or pin holes, solder volume, bridging, insufficient, excessive, solder balls, and solder fillet, missing or offset pin, pin height, polarity, plus foreign material, the machines are more powerful than ever. When considering pin inspection challenges, the KY-P3 addresses single, array, press-fit, and fork arrangements, as well as pins within a connector shroud, inner and outer wall distances, fork pin separation, and paste height measurement to help manufacturers increase yields.

Incorporating the world's first True3D™ quad-projection probe, the systems deliver shadow-free measurement with low false calls. Additionally, the "Stop-and-Go" probe movement allows it to capture 3D measurement data without system vibration, image stitching, or data interpolation. The machines deliver True3D™ measurement capabilities for automotive electronic control units (ECMs), industrial products, and computer boards, as well as backplane and connector assemblies. Its quantitative True3D™ measurement-based approach delivers best-in-class accuracy and repeatability for electronics manufacturers.



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Going for ice cream is a favorite networking activity. Yum!

ments as we recruit talent and build a renewed interest in our vital electronics manufacturing industry.

Our enthusiastic industry veterans are sharing what gets them excited to come to work. Many of our subject matter experts have made themselves available to a new workforce. How can we amplify this enthusiasm and knowledge sharing?

SMTA has structured programs through local chapter meetings, regional expos, and national and international conferences that bring people together. These opportunities allow individuals and companies to expand their connections and create relationships at all levels, and this can be a true differentiator in a workforce development crisis.

I recently heard this phrase: “Create an environment that first drives interest in our industry and then drives an employee’s investment to stay.” It has resonated with me and left me asking important questions about what more we need to do, and how and where we can help.

I believe we must combine forces; a partnership among industry, academia, and government entities will create a more far-reaching impact than an individual agency.

We recognize that different regions of the United States have unique challenges to overcome when it comes to hiring and training. Workforce needs in the upper peninsula of Michigan are different than needs in the central

corridor of Florida or Boston or Silicon Valley. SMTA, along with the Electronics Manufacturing Technical Education project (EMTE), is leveraging the strength of local and regional volunteers to address these challenges and create more connections. It’s proving to be a successful strategy.

We’re expanding from our core mission to connect industry and academia to build interest in training and educational programs that demonstrate potential career paths. SMTA encourages its membership to review the core principles, then adapt them in a way that supports their particular needs.

Michigan Tech already had a successful program but opted to expand its reach to include Gogebic Community College. The two schools work with local electronics manufacturing companies to build interest and skill sets for post-secondary students and others new to the industry. Through this partnership, they strategize ideas for training and educational programs that have now become part of the college curriculum and can be used to train incoming employees unfamiliar with the electronics industry.

Through a partnership with Palomar College, multiple SMTA chapters in California help students network with local industry to build connections for job placement after graduation. Local employers are leveraging the PCB design course offered at Palomar to train



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SMTA Penang Chapter with their durian harvest during a networking event.

their employees who are interested in expanding their skill sets.

I've also seen momentum in some other regions. In just one example, a company has sponsored a lab within a high school and post-secondary college that uses engineers as adjunct professors to share newly developed curriculum and provide resources of supplies, equipment, and raw materials.

In all this, I see two common themes. First is the need for SMTA and the electronics manufacturing industry to adapt its workforce development and hiring practices in such a way that it builds enough interest and momentum to increase recruitment efforts. Not only do we need to work diligently, swiftly, and creatively, but we must then engage the workforce in a way that keeps them invested for years to come.

Second, because the electronics manufacturing industry has always been a tight-knit group, we can use that strength to create standards, share best practices, develop training/education programs, pioneer processes, improve on

existing processes to advance electronics capabilities, and simply show support and help each other connect and overcome challenges.

We must leverage our strengths to support the current workforce. We can share that feeling of camaraderie with those who are considering a move to this industry, and we can participate in programs that link the industry with academic institutions.

I know we can make a significant impact across our nation. I challenge you to expand your network, join an association, reach out to local schools, and be creative in industry partnerships. If you are a subject matter expert, please share your experience, excitement, and expertise. This is vital to the health and longevity of our industry. **SMT007**



Tara Dunn is director of training and education at SMTA.

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Brenda Clunie

Training for New Hires

Feature Q&A with Brenda Clunie

EPTAC

Since training is such a key component in converting an inexperienced new hire into a valued contributor on the manufacturing floor, we asked Brenda Clunie, vice president of sales and operations at EPTAC, exactly how their certification programs deliver on this promise for new hires.

How much demand do you see for new hire training among electronics manufacturers?

As the electronics industry grows and evolves, there is an increasing demand for new hire training amongst electronics manufacturers. With advancements in technology and new market trends emerging, it is essential for

manufacturers to ensure their employees are equipped with the knowledge and skills necessary to keep up with this fast-paced industry. From learning about new production techniques to understanding the latest regulations and compliance standards, new hire training has become a crucial aspect of maintaining a competitive edge in the electronics manufacturing sector. As such, we can expect to see a continued demand for high-quality training programs designed to help new hires thrive in this dynamic industry.

We also see a significant number of experienced employees leaving the industry due to retirement, and this drives significant competition for talent. Increased labor costs increase

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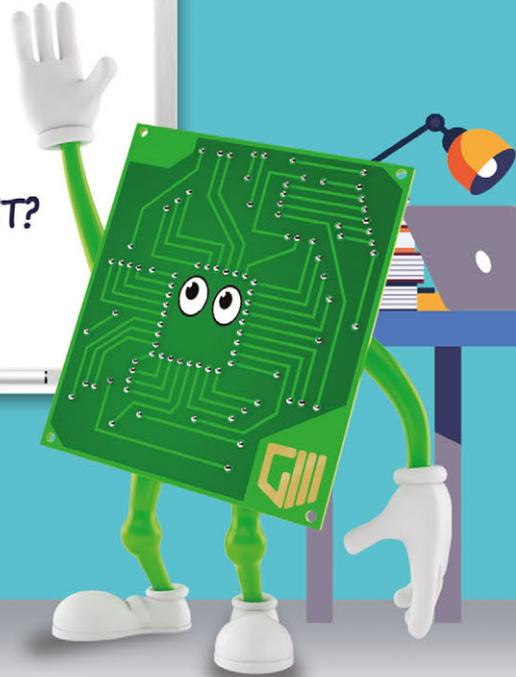


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inspect and submit them for instructor inspection and feedback. Their final workmanship pieces are graded for certification. This experience allows students to spend nearly three-quarters of the time experiencing the technology first-hand.

Many electronics manufacturers also need to get their employees certified according to the requirements of the products they focus on. Based on our experience, IPC-610, “Acceptability of Electronic Assemblies,” and IPC-620, “Requirements and Acceptance for Cable and Wire Harness Assemblies,” are the most in-demand certifications for new hires.

the importance of training new hires to be ready to contribute as quickly as possible.

On the other hand, the increased complexity of products and certification requirements drives the need for higher qualifications of employees, which translates into continued training of employees vs. a one-time new hire training.

EPTAC provides over 1,500 scheduled classes a year at 24 locations across North America. We also work with electronics manufacturers to customize the trainings to their specific needs and can have the trainings onsite at their facilities.

What topics/skills does the typical new hire training course contain?

We offer a broad range of training for new hires as well as experienced employees. Our new hire training includes skills around soldering, cable/wire harness, and inspection techniques. Specifically, our hand soldering certification classes are the most popular training for new hires. This five-day training teaches the foundation of soldering knowledge and the hands-on skills and techniques. Attendees solder practice pieces, then

What are the post-training performance metrics that your clients report with their new staff?

Most of our trainings have a certification component that has both a written and hands-on exam. This ensures that the objectives of the training have been achieved for each participant.

Some of our clients also measure post training performance by conducting a skills assessment test that evaluates employees’ ability to perform tasks they were trained on. This test can be used to identify areas where employees may require additional training, and can track progress over time. We work with these clients to craft customized training programs to address gaps where additional training is required.

At the end of the day, our main goal is to help our clients increase quality standards, improve productivity, and maximize profits. **SMT007**

Electronics in Harsh Environments Conference



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MilAero007 Highlights



The Government Circuit: PCBs, Advanced Packaging Key to CHIPS Act Success ▶

In this column, we'll discuss the recent efforts made by the United States and Europe to invest in the entire semiconductor supply chain and strengthen the electronics industry. Also, read on for fresh environmental policy updates, as well as ways to get involved in IPC's advocacy efforts.

Watch Now: Episode 4 of the Micro Webinar Series: 'Smarter Manufacturing Enabled with Inspection Data' ▶

Episode 4, "Envisioning the Factory of the Future" from Koh Young's new micro webinar series 'Smarter Manufacturing Enabled with Inspection Data' is available now.

Raytheon, Northrop Grumman Team Down-selected for U.S. Army's Next-generation Precision Strike Missile ▶

The U.S. Army selected Raytheon Technologies to advance its design for the Long Range Maneuverable Fires program, intended to become Precision Strike Missile (PrSM) Increment 4.

Aegis Combat System Successfully Intercepts Target During Flight Test ▶

USS Daniel Inouye (DDG 118) successfully intercepted a Medium Range Ballistic Missile (MRBM) target using upgraded Aegis software during a recent flight test.

Bigelow: Bullish on Fab's Future ▶

Twenty-plus years is a long time to lead a business during a long decline in the industry, but

IMI President and CEO Peter Bigelow remains quite confident about the future. What's his biggest challenge? He may not have all the answers, he's clearly got insight to share.

IPC Welcomes U.S. Presidential Determination Prioritizing Domestic Development of Printed Circuit Boards and IC Substrates ▶

IPC welcomes the action of U.S. President Joe Biden today in issuing a "presidential determination" that prioritizes the domestic development of printed circuit boards (PCBs) and advanced packaging, including IC substrates, under Title III of the Defense Production Act (DPA).

Panel Discussion: CMMC and Cybersecurity ▶

With the introduction of the Cybersecurity Maturity Model Certification (CMMC) framework, businesses will soon be required to meet specific, more stringent cybersecurity standards to bid on Department of Defense contracts. This has made cybersecurity hygiene and CMMC compliance more important than ever for businesses in the sector.

Invested in Growth ▶

The I-Connect007 team paid a visit to American Standard Circuits in West Chicago, Illinois. While there, we talked at length with CEO Anaya Vardya about the issues on his mind as he pushes technology, expands his floor space, and considers the implications of the CHIPS Act, staffing issues, and what's happening in China.

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Building Reliable Electronics for Harsh Environments

The Knowledge Base

by Mike Konrad, SMTA

Editor's note: Welcome to our new column, The Knowledge Base, from SMTA. This column will have multiple voices. We are happy to introduce the first contributor, Mike Konrad, vice president of communications for SMTA. These monthly columns will feature conversations with industry experts and leaders across the electronics manufacturing spectrum. Over the years, Mike has often been asked about how to build reliable electronics in harsh environments. In this first column, he has compiled those queries into a question-and-answer format.

The explosion of Internet of Things (IoT), electric vehicles (EV), wearables, medical devices, and other applications have presented substantial challenges for electronics manufacturers. Chances are, anyone who currently owns an electric vehicle is keenly aware of some of these challenges. It has been widely reported that up to 30% of public charging stations are inoperative. This fact is also known to the U.S. government, which is funding the expansion of high-speed charging stations through the CHIPS Act—with a caveat that the reliability of publicly funded high-speed charging stations must be greater than 90%.

With the SMTA Electronics in Harsh Environments Conference scheduled for May 23–25 in Amsterdam, I thought this would be a good opportunity to talk about the challenges and risks associated with building reliable electronics for use in harsh environments. I will also deliver a keynote address at the conference entitled, “The Remarkable Return of Post-Reflow Cleaning as a Mainstream Process to Improve Reliability.”



What makes harsh environments challenging for electronics?

There are several challenges associated with electronics in harsh environments. These challenges include extreme temperatures and temperature cycles, shock and vibration, electrostatic discharge (ESD), electromagnetic interference (EMI), and moisture, perhaps one of the least understood challenges.

What are the challenges and mitigation strategies regarding moisture?

Moisture on its own is not particularly harmful. The real issue is electrochemical migration (ECM). Moisture serves as a catalyst for ECM.



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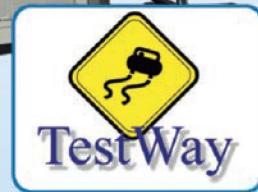
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What is ECM?

ECM is the dissolution and movement of metal ions in the presence of electric potential, which results in the growth of conductive dendritic structures between cathodes and anodes. This results in electrical shorts. The process is most observed in printed circuit boards where it may significantly decrease the insulation between conductors.

How does moisture serve as a catalyst for ECM?

There are three basic “ingredients” of ECM: electrical bias, conductive residues, and moisture. The main factor facilitating ECM is humidity (moisture). Usually the process involves several stages: water adsorption, anode metal dissolution, ion accumulation, ion migration to the cathode, and dendritic growth.

While ECM is not a new phenomenon, its occurrence is at historically high levels.

What is driving the historically high levels of ECM?

While there are several factors influencing the rising levels of ECM, the two primary factors are widespread adoption of no-clean fluxes and miniaturization. When no-clean fluxes were first introduced in the early 1990s, circuit assemblies were vastly different than they are today. Modern circuit assemblies and components are considerably smaller than any time in history. Previously, through-hole components were larger and placed farther apart. Larger spacings between cathodes and anodes provide a higher degree of residue tolerance. Modern circuit assembly designs have all but eliminated the spacing between conductors, reducing an assembly’s tolerance for residues.

The combination of a higher density of residues combined with smaller spacing between conductors has increased the propensity for ECM.



Mike Konrad

Isn't it true that no-clean fluxes are residue-free?

All fluxes, including no-clean, leave behind residues. It is accurate to describe the residues from no-clean fluxes as both invisible and relatively benign. The primary issue at hand is not the residues left on an assembly from the no-clean flux, rather it is the totality of all process residues left behind on the assembly after reflow. Formerly, before the introduction of no-clean fluxes, virtually all circuit assemblies were cleaned after the soldering process. Not only did the cleaning process remove the flux residues, it also removed all process residues.

What other residues besides flux are left on the assembly?

Residues from board fabrication and component fabrication, as well as process and human residues, combine with flux residues to create a problematic totality of ECM-causing residues.

One should consider that when the industry stopped removing flux residues via a post-reflow cleaning process, it also stopped removing all residues. I frequently remind assemblers

that we should not refer to residue removal as a “defluxing process” and more accurately rename it a “cleaning process,” because flux is only one residue species present on an assembly. It is the totality of residue species that, when combined with an electrical bias and moisture, creates an ECM potential.

You stated moisture is an ECM catalyst. If we simply apply conformal coating to the assemblies, won't that prevent moisture-induced ECM?

While that is a widely held view, the fact is, conformal coating does not prevent moisture intrusion.

All conformal coatings are permeable. While they effectively prevent large volumes of fluid from contacting the assembly, they do allow small amounts of moisture to permeate through the coating. While conformal coating can delay an ECM event, it does not prevent it.

Another factor to consider is conformal coating adhesion. All conformal coating manufac-

turers recommend cleaning prior to coating. Coating over uncleaned surfaces may result in the delamination of the conformal coating.

“
The fact is,
no-clean fluxes
and pastes are
by far the most
popular flux types
used today.”

Do you recommend assemblers move away from the use of no-clean fluxes?

Absolutely not. The fact is, no-clean fluxes and pastes are by far the most popular flux types used today. The sheer popularity of no-clean flux has created an environment whereby it is the most highly engineered and supported flux type within our industry. My recommendation is to continue using no-clean flux and identify

and clean what assemblies need to be cleaned based on the cost of failure, the assembly's tolerance for residues, and the expected reliability requirements.

Thank you, Mike.

My pleasure. Thank you for the opportunity to discuss this important and relevant topic. **SMT007**

MIKE KONRAD ON HIRING

Retention Means Seeing the Larger Perspective

In a recent roundtable discussion with SMTA staff, we asked about current challenges in hiring and staffing. Mike Konrad, SMTA board member and vice president of communications at SMTA, gave us this response.

As a business owner and a member of the SMTA board, what do you believe are the current challenges in hiring and staffing?

Recruiting is probably the most challenging, but everything seems to be challenging—recruiting and retention.

As an employer we're up against a lot of competition, particularly with younger people. Prior generations would try and get a job for life. The challenge now is getting people connected to something that they feel excited about so we can com-

pete with other employers; getting them to be part of something larger than themselves is, I think, the goal. If they think they're being hired to put a screw in a nut all day long, or load boxes and put tape around them all day long—while that may be what they're doing—they need to feel part of something bigger and be connected to what the company provides its customers.

In our world, when we get an order, we put a description of what our customer builds on our factory bulletin board. If someone asks, “What do you do for a living?” they can say, “I work for a company that improves the reliability of electronics so that when I send my kids on a flight to Orlando, they're safe,” or, “My grandfather's pacemaker won't fail.” We want that to be the reason. Putting things in boxes? That's the small perspective. We want people to have the large perspective.



Shopping for a Soldering Robot

Feature Article by Ed Zamborsky
THERMALTRONICS

When I visit factories, I witness what's happened to our workforce since the pandemic. Sometimes it looks like operator separation for social distancing, working extra shifts to cover for lost or missing employees due to illness, workers who now work from home, or those who have simply found working no longer suits them.

We saw this great shift starting in April 2021, a year into the pandemic. Unemployment jumped by 10.3 percentage points to 14.7%, with the pattern continuing into July when unemployment passed more than 4 million. More people were home and not working, but they continued their same buying habits. This presented a challenge for manufacturers who had fewer workers and increased demand. What could they do?

One possible solution when you can't hire skilled technicians is to look at automation, particularly automation for soldering. Robotic soldering systems, however, have always shadowed the hand soldering market. For many it was a "feature piece" for the obligatory factory tour just to demonstrate to potential customers they are forward thinking. Now it's a reality to solve a true workforce shortage issue. But why use a robotic soldering system?

A Robotic Solution

Using a robotic soldering system can increase quality and produce a significantly higher process yield due to increased efficiencies of movement, higher precision for complex soldering locations, and higher repeatability of solder joints. These can only be achieved with properly



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designed robotic movements. You reduce the need for extensive operator training and overhead, as it's faster to train the robot "operator" because it requires less skilled technical ability and a faster ramp-up.

But how do you find the right one for your needs?

While it may look simple, the hand-soldering process is a complicated orchestration of subtle hand movements carried out for each solder joint. These movements are combined with constant visual observation and feedback from a highly skilled operator, thus your soldering robot must have several key features to replicate this demanding process.

It must include 6-axis control:

1. The X and Y axes work together to move the soldering cartridge into position over your solder joints. On some systems, it will be a combination of both head and board holder movements to achieve this positioning. On others, it may be just the head.

2. The Z axis will be responsible for moving the soldering tip up and down to contact the solder joint.

3. Theta (Q) will allow you to position the soldering cartridge around taller components or connectors to best reach the solder joints at the optimum position for proper reflow and solder via fill.

4. With the solder feeder, the responsibility is the proper and consistent movement of your solder into the solder joint. It also can pre-tin the soldering tip for better thermal conductivity as well as flooding the soldering tip at the end of the cleaning cycle to protect soldering cartridge life while they sit idle between operations.

5. Z2 is the independent control from the solder feeder assembly. Have you ever watched your most skilled soldering technicians move their soldering iron independent of the solder wire? This axis can be mission critical for the correct soldering of many solder joints, especially higher mass joints or stranded wire attachments. This can allow you to solder in very tight locations where only the soldering tip can fit, essentially transferring the solder loaded on the tip to a pre-fluxed location to the target solder joint.

6. Curie Point soldering cartridges provide the best heating technology for today's soldering robots. The fixed temperature and variable power provided by this technology protects your board assemblies from over-heating and the near instantaneous thermal response ensures no cold solder joints.

Controlling the Motion

The best soldering robots utilize Windows-based systems that allow you to program your PCB using a friendly GUI (graphical user interface) that provides prompts for each step and ensures that all your parameters are met so you have a short downtime and fast changeovers. It prompts the engineer to load the board,

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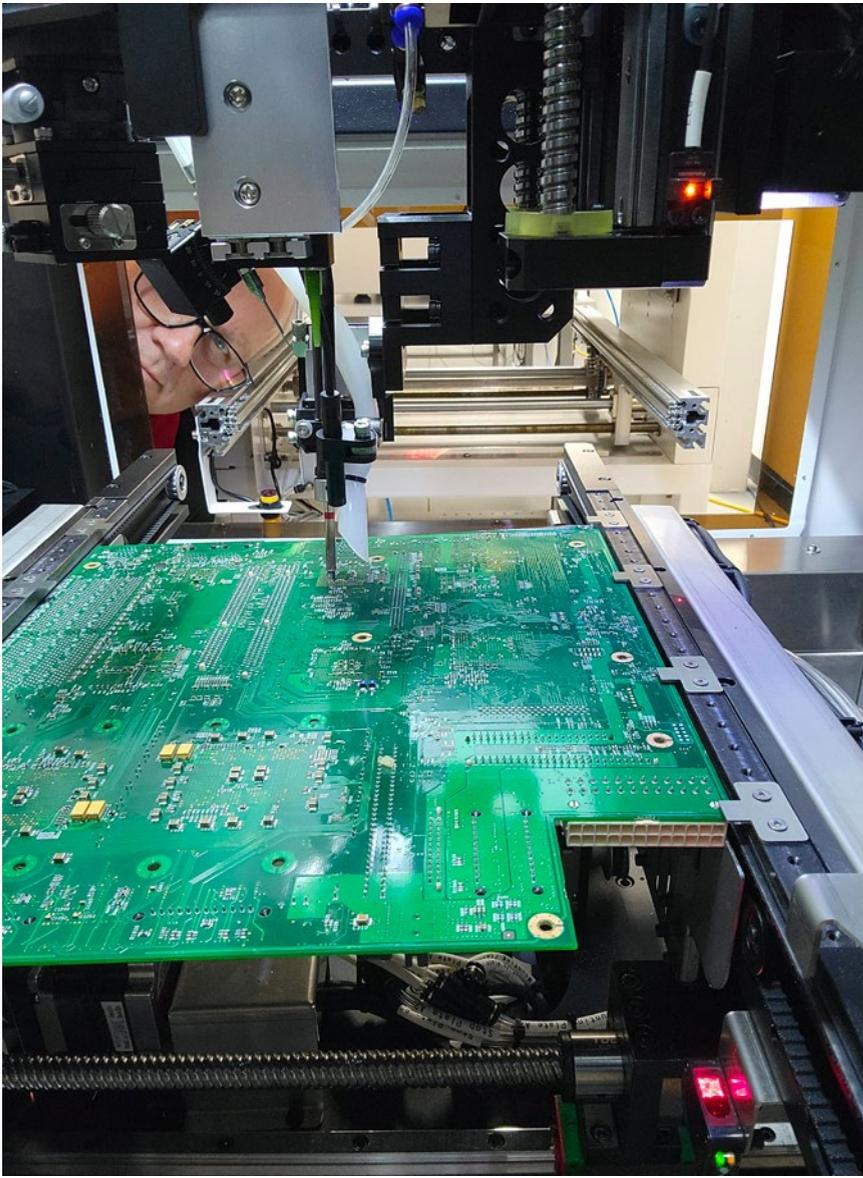
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identify the fiducials for proper PCB location, and take a complete photograph of the board. Once you have the photograph, the engineer can easily identify the solder joint locations as well as the angles, direction, and solder feed amount for the soldering tip to address the solder joints. If you are encountering difficulty in filling solder vias and need solder flux deposition, adding flux deposition to the solder joints is a simple step. It requires additional flux from the built-in fluid dispenser controlled by the soldering robot. The solder and flux positions are stored, copied, pasted, and edited all on the user-friendly GUI.

Now, are you soldering post-reflow or worried about warpage? Laser height detection

is standard on the modern soldering robot. This technology enables the soldering tip to meet the solder joint at the precise height for the proper creation of the soldered connection. Like your operator, this ensures a repeatable and reliable solder joint that your inspectors and customers will appreciate.

Older technology robots are programmed with a teach-and-learn pendant that increases programming time and makes programming changes very difficult.

Once you understand the critical features of a soldering robot, you want to ensure the application fits the soldering robot upgrade. Reputable soldering robot manufacturers build their own systems, have more control over their final product, and provide field support. You should understand pre-sale support and qualification services, and be able to test a sample for quality, reliability, repeatability, and programmability. If they

can't run your PCB in their controlled evaluation lab, you won't be able to run it in your own factory.

Conclusion

These past few years have been tough on our industry. With high consumer demand and an ongoing global worker shortage, consider factory automation. Having a soldering robot may no longer be the luxury it once was. **SMT007**



Ed Zamborsky is regional sales manager at Thermaltronics.

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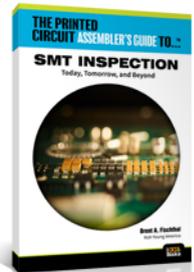
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SMTA Process Engineer Certification

Feature Article by Dr. Ronald C. Lasky
INDIUM CORPORATION

For years, I thought it would benefit the electronics assembly industry to have a certification program for SMT process engineers. In the fall of 2001, I discussed this with my like-minded friends, Phil Zarrow and Jim Hall, and we developed an outline of a possible SMT certification workshop and exam. After we were comfortable with the outline, we discussed the possibility of establishing the program with SMTA's director, JoAnn Stromberg. She was supportive and so was the SMTA Board.

In what felt like record time, the first SMTA Certification Workshop took place at SMTA International 2002. From the beginning, Phil, Jim, and I were committed to the program being rigorous and comprehensive. In addition, we were passionate that the exam be a problem-solving exam, not a multiple-choice

exam, as it occurred to us: "When your assembly line is down, God does not send a tablet with a choice of A, B, C, or D to solve your problem."

The SMTA Certification Workshop we developed is three days long. Approximately half is a presentation of more than 500 slides as a review of SMT assembly. The assumption is that a candidate has quite a bit of experience coming into the workshop. So, the intent of the workshop is to review SMT assembly and cover material that the candidate might not have been exposed to. It can't be expressed enough, though, that this program is not entry level.

The two-part exam consists of a brief closed book test, usually in the last part of the second day. The third day is devoted to the much



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longer open book test. One of the typical problems on the open book test is often to design an SMT assembly line that will produce a certain amount of PCB assemblies in a year. The line should have the lowest cost, given a choice of equipment presented in the problem. Algebra and considerable arithmetic calculations are required for this problem. The candidates may use a calculator or Excel, if desired.

Often, another type of problem is matching a reflow profile to a solder paste specification (Figures 1 and 2). Can you solve this problem? When you get an answer, send an email to rlasky@indium.com and I will tell you if you are correct.

About 80-90% of candidates who take the tests achieve a passing grade of 70% or more. Those who become certified are justly proud of becoming an SMTA Certified Process Engineer. **SMT007**

Reflow Profile Details	SAC305 Parameters	
	Recommended	Acceptable
Ramp Profile (Average Ambient to Peak)— Not the Same as Maximum Rising Slope	0.5–1°C/second	0.5–2.5°C/second
Soak Zone Profile (Optional)	30–90 seconds	30–120 seconds
	160–180°C	150–200°C
Time Above Liquidus (TAL)	45–60 seconds	30–100 seconds
Peak Temperature	230–260°C	230–262°C
Cooling Ramp Rate	2–6°C/second	0.5–6°C/second
Reflow Atmosphere	Air or N ₂	

Figure 1: A solder paste recommended reflow temperature profile. (Source: Indium)

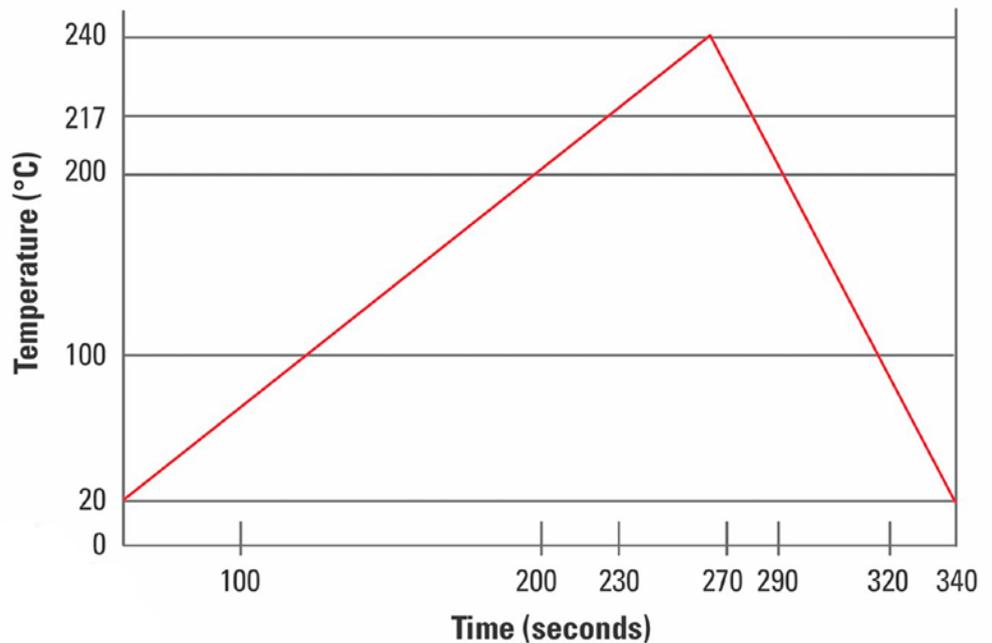
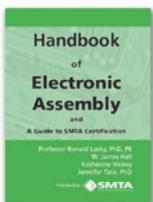


Figure 2: A reflow temperature profile.



Dr. Ronald C. Lasky is an instructional professor of engineering for the Thayer School of Engineering at Dartmouth College, and senior technologist at Indium Corporation.



Workshops are given multiple times throughout the year. If you are interested in becoming an SMTA Certified Process Engineer, visit this site (smta.org/page/certification) to find the dates and locations of future workshops. I would be pleased to answer any questions about this important program.



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Successful Skills Training

Feature Q&A with Sharon Montana-Beard

Successful skills training is a crucial part of the onboarding process and can take experienced staff members away from their primary jobs on the manufacturing floor. Effective training to onboard new employees can not only speed up ramp-up times, but can be customized to a company's specific needs. We posed these four questions about new-hire training to Sharon Montana-Beard, vice president of sales and operations at Blackfox.

What topics/skills does the typical new-hire course of training contain?

At Blackfox, our typical entry level training follows a set course flow. In phase one, we begin with how to recognize through-hole surface

mount components. Then we move on to ESD and safety with electronics. Phase two moves into soldering workmanship per IPC-A-610 and J-STD-001 standards, with a course on terminal and post soldering, through-hole soldering, and then continuing to surface mount soldering and fine-pitch workmanship.

If cables and wire harnesses knowledge is needed, we train on the following, to IPC/WHMA-A-620 workmanship requirements:

1. Safety
2. Documentation and print reading
3. Wire preparation
4. Terminal and post soldering
5. Crimping
6. Wire harness assembly

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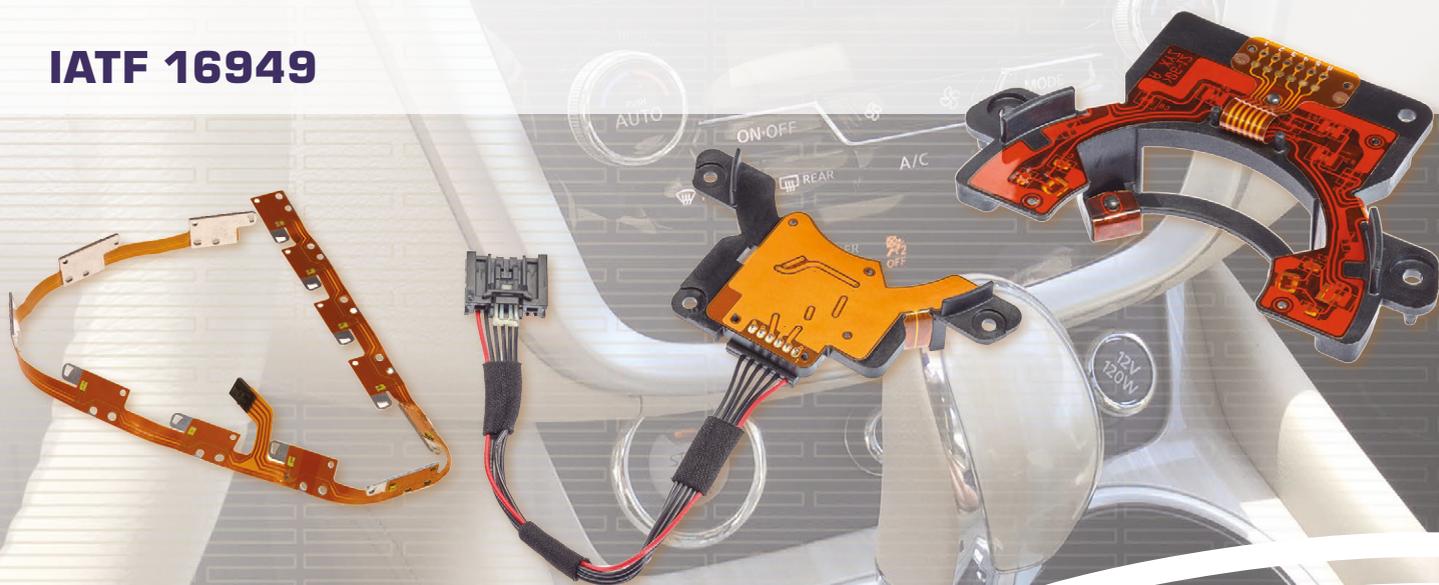
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How much latitude is there for customer-specific training? Can HR pick skills a la carte?

Blackfox offers 26 different courses, all of which are kept updated to IPC standards workmanship requirements. Training organizers may mix and match the custom solder training courses as appropriate for their training needs.

Does Blackfox develop customer-specific training courses? What is involved?

If a customer has a specific skill set, they need their operators or technicians to learn that Blackfox can do that. Ideally, we perform a customer site assessment to better understand what needs to be taught. If it is not possible to visit the customer site, then we work with the customer to obtain photos, specific information, instructions, and such. Essentially, we perform a series of information fact-finding exercises.

Once that is completed, if that training is similar to an existing Blackfox course, we add their company-specific images and instructions to the content and remove the portions that do not apply. Next, we evaluate the time needed to customize that course, course duration, and other details to the customer in the form of a course proposal. Sometimes, the proposal includes paid development time for new content.

Once completed, the customized training course is reviewed and approved by the customer. When they accept the training course, a training schedule is then agreed upon.



Sharon Montana-Beard

What did you find were the results of your training??

There are several key indicators that result from training programs, including:

- **Credibility with customers:** Employees are trained by professional trainers, learning quality workmanship, and how to properly solder or assemble.
- **Instructional design:** Companies do not have to create and develop the training materials.
- **Equipment availability:** Blackfox provides all tools and equipment for onsite training so as to not take away from tools that are needed in production.
- **Professional trainers:** Training need not require taking someone away from what they are doing to train new employees.
- **Effective allocated time:** Training time is minimized to speed the process of adding the new worker to the workforce.
- **Immediate results:** Once the employee is successfully trained in specific skills, they are immediately productive, performing quality tasks for their products.
- **Minimize attrition:** Properly trained new employees have the confidence to do a good job and tend to appreciate that a company has invested in them. If not properly trained for their assigned job, they may feel lost, become frustrated, leading some to eventually lose interest and leave. SMT007

You know you're working for a great company when...



Source: I-Connect007

The Tale of the Cost-Estimate Problem

Maggie Benson's Journey

by Dr. Ronald C. Lasky, INDIUM CORPORATION

Editor's note: Indium Corporation's Ron Lasky continues this series of columns about Maggie Benson, a fictional character, to demonstrate continuous improvement and education in SMT assembly.

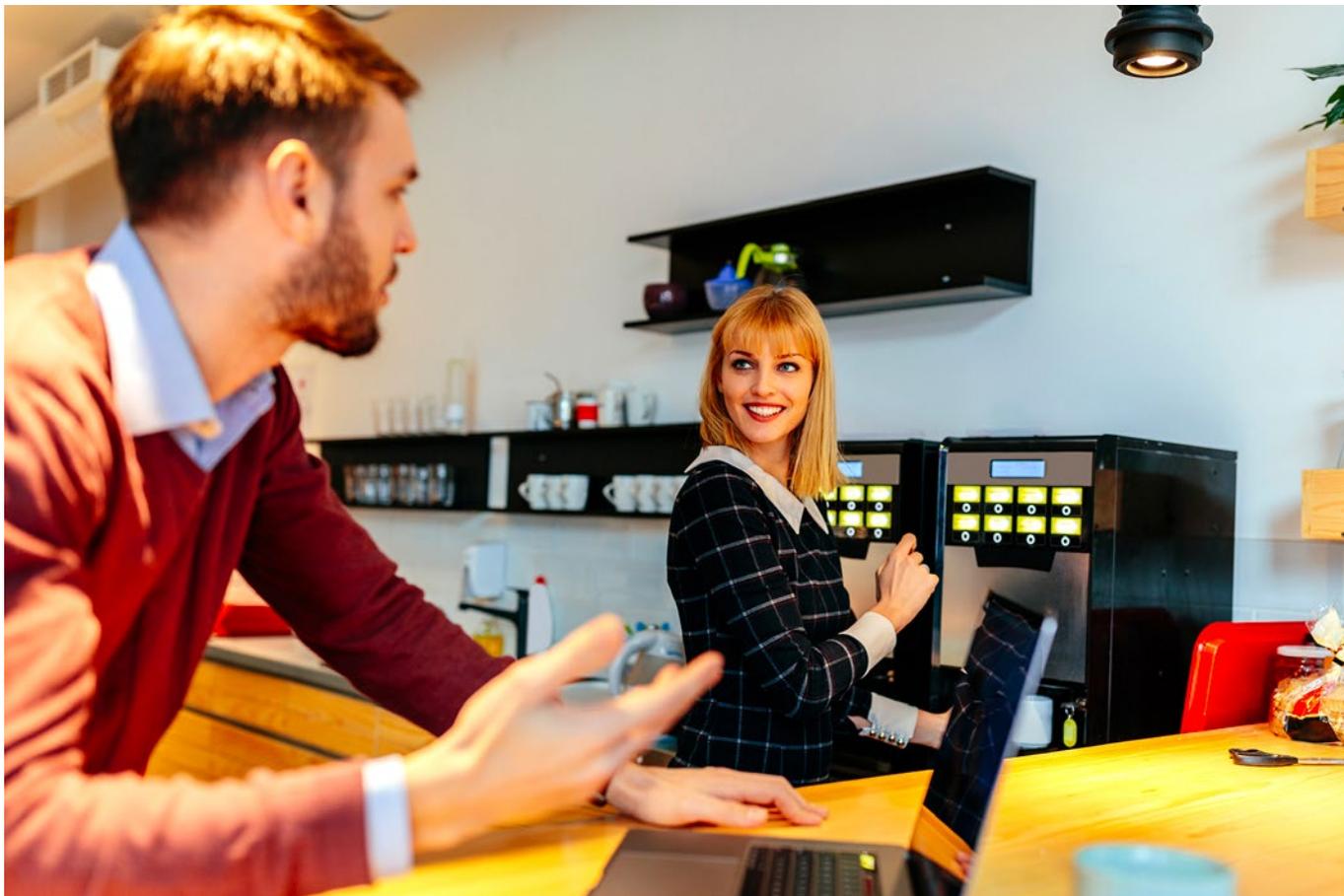
Andy Connors never remembered being so nervous. He'd hardly slept a wink and now that his bedroom clock showed it was 6 a.m., he knew he might as well get up. After taking a

shower, he ate a light breakfast and headed out to pick up Sue.

The reason for his nervousness? He and Sue, his fiancée, were going to "help" distinguished Ivy University Professor Patty Coleman with a cost-estimating problem. He certainly didn't feel qualified to accomplish this task.

"Hi, sweetie," Andy said as he greeted Sue.

"I am so nervous," she said. "Me too," he responded.



HIGH RELIABILITY FORUM

October 17–19, 2023

Hilton Baltimore BWI Airport
Linthicum (Baltimore), MD

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DATE**

**IPC's
High Reliability
Forum is back
in-person for
the first time
since 2019!**

IPC's High Reliability Forum Technical Conference focuses on **Class 3 electronics for mil-aero, automotive, and long-life applications** that are subjected to harsh use environments. Subject matter experts will facilitate true problem solving and cooperation to share best practices across applications focused on exceptional reliability requirements.

For more information visit: ipc.org/event/high-reliability-forum

They both shared stories about not being able to sleep, then Sue said, “Remember, Professor Coleman wants us to call her Patty.”

“When we are with her and I start to talk, my mouth just can’t form the word Patty,” Andy responded. “I have an idea: Let’s call her Professor Patty, like Sam does.”

“I agree. It’s kind of cute and endearing, too.”

After a 20-minute drive, they arrived at Ivy U and parked. A short walk took them to Professor Coleman’s office.

“Hello,” Professor Patty said as they walked in. “How are Ivy U’s two most recent and famous students doing?” Both youngsters blushed at the compliment.

After a brief discussion of their adventures in Mexico, Patty suggested they head to her car to begin the 40-minute drive to the factory for the cost-estimating project. In the car, Sue and Andy shared their experience with estimating costs at Sam’s Auto Repair.

“We both understand how Sam determines what he needs to charge to be fair to his customers yet still make a fair profit,” Sue commented.

“But we are both a little nervous about how to help your friend,” Andy said.

“Let me tell you a little bit about Matt Hartman, the business owner,” Patty said. “He and I went to Tech together. He was a year ahead of me. He worked for a few years and then got his MBA at Ivy U’s Tucker Business School. He was number one in his class. Then he worked for about 10 years at Delle and Tush Consulting and saved enough to buy the electronics assembly company he named Hartman Electronics.

“He’s only owned the company for a few months, so he doesn’t know much about SMT assembly, or even that much about running a

small business. Oh, and he was my boyfriend for a while back at Tech,” Patty added with a chuckle.

Andy and Sue asked a few more questions as Patty pulled into the parking lot.

As soon as they walked in the door, they saw a handsome, athletic man run up to Patty. He gave her a hug and a brief kiss on the lips. Patty seemed flustered as Matt exclaimed, “Patty, it’s great seeing you. You look terrific.”

Still a bit flushed, Patty said, “Matt, this is Sue March and Andy Connors, the two students I told you about.”

Sue expected Sam to shake her hand, but instead he gave her a hug that Andy later described as too familiar. Matt also shook Andy’s hand and gave him a big bear hug.

A bit taken back, Sue and Andy looked at Patty. She mouthed the words, “That’s just how he is.”

After a few moments of exchanging pleasantries, Patty shared the story of Andy and Sue’s rise through the ranks at

Ivy Benson Electronics and their success at getting their associate degrees through night school. She also mentioned their acceptance as juniors at Ivy U and their recent experiences at Castellanos Electronics, where they held SMT workshops for employees.

“Needless to say,” Patty said, “they are two of the most impressive students at Ivy U, and it is my privilege to be their mentor.”

Sue and Andy stood there with gaping mouths. Finally, Andy whispered to Sue, “Is she talking about us?”

“Yes,” she whispered back. “There’s no one else in the room she could be talking about.”

“Matt,” Patty said, “why don’t you tell us about your new project?”

“We have been asked to perform final assem-



bly of some units for the FAA,” he replied. “It involves taking PCBs that we assembled on our SMT lines and connecting the PCBs together with wiring in a housing about the size of a small refrigerator. We estimate we’ll need 20 operators and five supporting engineers.”

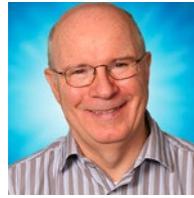
Matt then gave them a tour of the facility, responding to their questions along the way.

“I pay the operators about \$20 per hour and the engineers \$40 per hour,” Matt said. “I figure a 40% premium is fair. So, in the future I plan to charge \$28 per hour for the operators and \$56 per hour for the engineers. Does that seem about right?”

Sue and Andy stared in disbelief at Patty.

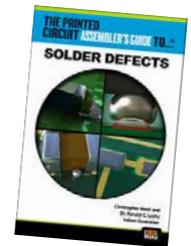
Could Matt make a profit with these new rates? What did Patty and the young couple recommend?

Note from Dr. Ron: I’m sure that many readers think that this post is just a work of fiction. After all, no one could be as clueless as Matt. As with all my posts, this one is based on a true story. **SMT007**



Dr. Ronald C. Lasky is an instructional professor of engineering for the Thayer School of Engineering at Dartmouth College, and senior technologist at Indium Corporation. To read past columns, [click here](#).

Download *The Printed Circuit Assembler’s Guide to... Solder Defects* by Christopher Nash and Dr. Ronald C. Lasky. You can also view other titles in our full I-007eBooks library.



Dan’s Biz Bookshelf:

Who: The ‘A’ Method for Hiring

We’ve all hired the wrong person at one time or another. It’s a mistake that, if left uncorrected, can keep on giving for a long time. It reminds me of the adage, “Hire slow, fire fast.”

In their book *Who: The ‘A’ Method for Hiring*, Geoff Smart and Randy Street share the best ways to hedge your bets in hiring and improve your select-

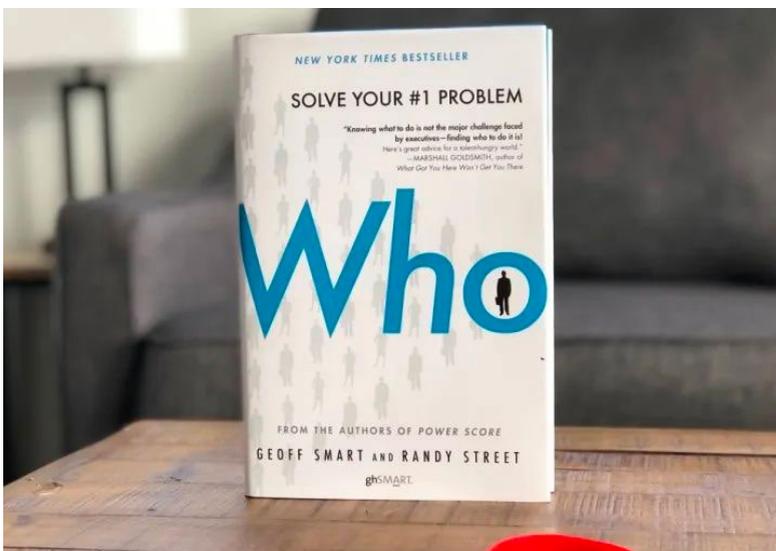
ing and hiring techniques. You will probably get rid of your hiring headaches and mistakes, which are often caused by putting more emphasis on *who* we hire than on *why* we hire.

Smart and Street say that hiring mistakes happen when managers:

- Are unclear about what is needed in a job
- Have a weak flow of candidates
- Do not trust their ability to pick out the right candidate from a group of similar-looking candidates
- Lose candidates they really want to join their team

In this book, learn about the 10 types of “Voodoo Hiring,” four methods to minimize or eliminate it, and how to look for competencies which will matter after hiring.

This review was written by Dan Beaulieu. To read the entire article, [click here](#).





BESPOKE

Custom Is Never a Commodity

Interview by Nolan Johnson

I-CONNECT007

American Standard Circuits provides more services than strictly bare board fabrication. During a recent visit to the ASC facility in West Chicago, Illinois, Nolan Johnson spoke with Bob Duke, president of ASC's Global Sourcing division, about the dynamics of helping a customer source custom commodity subassemblies.

Bob, would you talk about the mission of your division?

I use the experience I gained working in Asia to bring in other custom types of products—outside of the printed circuit boards—for those customers who need a competitive price and understand the value of sourcing offshore for products like metal, metal fabrication, die casting, stamping, precision machining, and CNC-

type machining. We source plastic injection molding, blow molding, and magnetics; transformers and coils are products that make sense for offshore sourcing. We also source membrane switches and wire harnesses. In other words, anything that's high labor content is an opportunity to save some money over domestic manufacturing.

Customers come to you for their specific PCB needs, but there are the other pieces of the BOM that make up the subassembly for the PCB. Is that where you come in?

That's correct. When you look at the electronic assembly, it's ultimately a box build, and it's associated with these other things that we offer as a solution. Now, the customer can come to us and say, "We have other custom items.



Bob Duke

Metals and wire harnesses are part of our assemblies, so do you have anything in those areas? Those are very expensive.” In the past, some of our larger customers told us they considered going offshore to find more competitive pricing and needed some help with developing relationships.

Before long, when a customer sees that you’ve done a good job with a particular commodity, they get excited about other opportunities. “This has really worked out better than we expected,” they say. “Now, what about helping us with other custom projects?”

With our feet on the ground in Asia, it’s likely we can find a supplier, put them through our rigorous approval process, test them out, have some prototypes and samples made, and develop a source for a customer who has that need.

I’m imagining that this turns into a complete kit for the EMS box build supplier.

It could be. On the printed circuit board assembly side, of course, there are a lot of components involved. We’re not buying components; if it’s not custom, and you can get it from a distributor, then it’s not something we focus on.

Obviously, this works well as a supplement for ASC’s customers. What feedback are you getting from customers? What is the need for this?

Let me share an example of a large industrial customer in the safety business with a product widely used in the market. They had an excellent reputation, and it was something everybody wanted.

But just because you have the best market share, don’t think you can fall asleep at the wheel; there are many competitors nipping at your heels. Over time, when their orders dwindled, the company slashed its budgets. Smaller, nimbler competitors were beating them on price and the company was losing market share.

The sales department said, “Our prices are too high. We’re being beat, and we don’t know how.” Well, it was easy to see how it happened: Other companies did a better job with procurement. With this large company, it had a specific rule in purchasing not to run out of material, but when you have that kind of attitude, purchasers are just re-buyers; they’re trying to keep up with the demand. That’s when the company must ask itself, “How do we repair this?”

We believe they must develop a supply base that can provide more competitive products. If the purchasing department doesn’t have the skills to go offshore, this becomes a problem that can’t be solved in just a few months. If a company isn’t being as competitive as it can, competitors will move in and business slows down. It’s easier for an outsider to see what’s happening, and I often find companies resist the help. “We’re buying it from this person for a reason,” they say. “We’ve had a relationship there for 10 or 20 years.” It keeps them from doing the right thing.

In this particular situation with the industrial customer, they admitted, “We don’t do this very well, and we’re relying on you to manage your inventory so that we don’t have to inventory it ourselves. You’ll need to provide sam-

ples and approval every time we source something. Now, what are our limits?” We selected one commodity at a time and developed a supplier for each of the commodities. While the purchasing department had an attitude of partnership, they were willing to step back and let us take care of the phone calls, purchase orders, and language issues. They wanted us to be their solution for offshore sourcing.

How has the economic dynamic in Asia changed? Are your customers paying close attention to that?

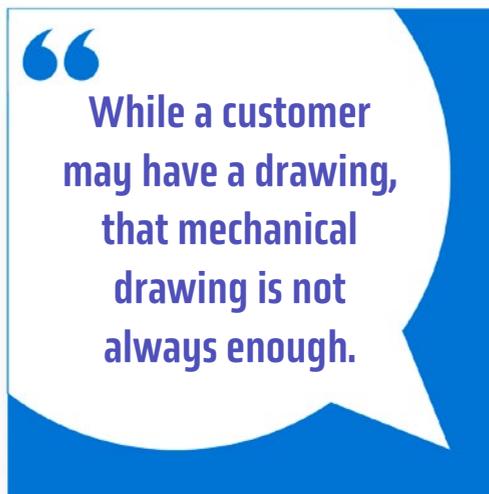
The customer cares about vulnerability. Our model is to have our suppliers quote based on the customer’s estimated annual usage (EAU) vs. what they might need at that moment. For example, for a 1,200-piece EAU, we may have a minimum order quantity of 300 pieces, which would be a quarter’s worth. We bring a quarter in, and as it starts dwindling down, we get permission from the customer to reorder the next batch of material before running out of stock. It also allows us to verify whether the revision has changed. It’s important to have product stocked locally because it eliminates shipping times. Having that buffer makes all the difference when it comes to keeping your production lines running. Some customers are concerned that, because of tariffs, that reliability may not be there. You can bring in a year’s worth of inventory, but like the chip shortage, there’s no end in sight; it may be another year before you get additional material. It’s been chaotic.

We’re constantly aware of that and have the ability to move that product elsewhere—in an approval process—should that happen. But our buffered stock means we have an opportunity

to spend some time doing so. By the way, you never burn a bridge when you leave a domestic supplier. Worst case scenario, I’ll go back to that supplier, so I don’t run out of inventory.

How active are your suppliers in making suggestions to optimize designs?

The suppliers we deal with are not bashful about making recommendations for better options, particularly for lower cost. When that happens, we definitely consider them, keeping in mind that we’re dealing with custom commodity products. It could be a new design, but they usually tend to be legacy. Our suppliers just follow the drawings.



While a customer may have a drawing, that mechanical drawing is not always enough. If you supply a sample of your product along with the mechanical drawing, the suppliers will analyze it closely enough to determine whether that sample matches the print. Of course, what the customer wants is what has been working. But before we can proceed, we need to clarify whether we

make it per the print or make it per the sample.

Thus, the question, which one is the gold standard—the as-built or per the drawing?

Exactly. Quality departments are a safeguard. It could be that the first few shipments that come in from the domestic supplier—or any supplier—work just fine, but over time, things change a little bit. The design is open enough that several deviations will probably work, but that’s not a decision we make—that’s on the customer.

Bob, thanks for walking me through this.

Anytime. **SMT007**

IPC SummerCom: Helping the Electronics Manufacturing Industry Build Electronics Better

Hundreds of experts from around the world will discuss electronics manufacturing standards in more than 80 meetings May 13–18, 2023 at IPC SummerCom in Milwaukee.



Heraeus Electronics Develops New Production Friendly Flexible End Termination Ink



Heraeus Electronics is pleased to announce the development of a production

friendly, flexible passive component termination ink. ET2010 Flexible End Termination Ink is a first of its kind material in the market utilizing advanced polymer technology.

SMTA Boise: More Than Potatoes in Idaho

At Tuesday's SMTA Boise Expo, Barry Matties visited with SMTA Boise Chapter President Tony Whitt, who talked about the genesis of this regional show, and what he's learned about selling in today's digital world. Two big companies in the Boise area support the region's electronics manufacturing industry, and these companies are having the same struggle as so many others—where are the people who actually want to work?



Koh Young's Axel Lindloff to Speak on AI-powered Process Optimization at eSmart Factory Conference

Koh Young, the industry leader in True3D measurement-based inspection solutions, will be speaking at the eSmart Factory conference 2023 held all day at the Sheraton Carlton Hotel in Nürnberg, Germany the day before SMTconnect.



Green Circuits Appoints Vice President, Sales & Marketing



Adam Szychowski

Green Circuits, a full-service Electronics Manufacturing Services (EMS) partner to leading OEMs, is pleased to announce the appointment of

Adam Szychowski to Vice President, Sales & Marketing.

Flex Recognized as a 2022 Supplier of the Year by General Motors

Flex announced it has been recognized by General Motors (GM) as a 2022 Supplier of the Year. This award recognizes global suppliers that distinguish themselves by exceeding GM's requirements, in turn providing customers with innovative technologies that are among the highest quality in the automotive industry.



Automation and Flexibility: Essential Components for Future-thinking EMS Companies



The near future for electronics manufacturing services is all about automation and flexibility. The high cost of labor, maintaining a reliable

supply chain, and an increasing variety of products mean that quality trained personnel are essential and that the supply of both product components and machine parts must remain stable.

Garry McGuire: Aiming for the Stars

Garry McGuire of the Jacobs Space Exploration Group at Marshall Space Flight Center in Huntsville, Alabama, reflects on the serendipitous moment that led to a leadership role at IPC. With the rapid advance of technology constantly pushing the industry forward, Garry urges newcomers to jump in and experience all IPC has to offer.

Foxconn GHG Reduction Targets Validated by SBTi

Hon Hai Technology Group (Foxconn) announced it received internationally recognized, science-based validation for its near-term targets to reduce greenhouse gas (GHG) emissions by the end of this decade, affirming their climate mitigation.

Pricer Opens New Facility with Zollner Elektronik AG

Pricer opens a new production line in Germany to increase capacity and production flexibility—key factors to meeting the growth of the

market for electronic shelf labels.



For the latest news and information, visit [SMT007.com](https://www.smt007.com)

Career Opportunities



Find industry-experienced candidates at jobConnect007.

For just \$750, your 200-word, full-column ad will appear in the Career Opportunities section of all three of our monthly magazines, reaching circuit board designers, fabricators, assemblers, OEMs, suppliers and the academic community.

In addition, your ad will:

- be featured in at least one of our newsletters
- appear on our jobConnect007.com board, which is promoted in every newsletter
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Career Opportunities



THERMAL SYSTEMS

Sales Engineer SMT North Mexico

Rehm Thermal Systems, a leading German manufacturer of reflow soldering systems with convection or condensation and drying and coating systems, has produced energy-efficient manufacturing equipment for the electronics and photovoltaics industry since 1990. We also offer tailor-made applications related to the soldering, coating and hardening of modules.

Responsibilities:

- This position is responsible for expanding our customer network and maintaining existing customer relationships in the Northeast Mexico region. The Sales Engineer would work closely with the German headquarters and the General Manager Rehm Mexico to implement the sales strategy.
- A candidate's proximity to Monterrey, Mexico, is a plus.

Qualifications:

- An Engineering degree or comparable qualification with a strong technical background is required.
- Sales-oriented attitude, good communication skills and willingness to travel frequently within Mexico is essential.

We offer innovative products, a great dynamic work environment and exciting training opportunities in our German headquarters.

To learn more about Rehm Group please visit our website at www.rehm-group.com.

Please send resumes to: Mr. Luis Garcia at luis.garcia@rehm-group.com.

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Europe Technical Sales Engineer

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

PRIMARY FUNCTION:

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

ESSENTIAL DUTIES:

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

QUALIFICATIONS / SKILLS:

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

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

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Career Opportunities



BLACKFOX

Premier Training & Certification

IPC Instructor Longmont, CO

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

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

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

Salary: Starting at \$30 per hour depending on experience

Benefits:

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

Schedule: Monday thru Friday, 8–5

Experience: Electronics Manufacturing: 5+ years (Required)

License/Certification: IPC Certification—Preferred, Not Required

Willingness to travel: 25% (Required)

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**Prototron
Circuits**

Sales Representatives

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

Reasons you should work with Prototron:

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

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

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Career Opportunities



Regional Manager Midwest Region

General Summary: Manages sales of the company's products and services, Electronics and Industrial, within the Carolinas and Mid-Atlantic Region. Reports directly to Americas Manager. Collaborates with the Americas Manager to ensure consistent, profitable growth in sales revenues through positive planning, deployment and management of sales reps. Identifies objectives, strategies and action plans to improve short- and long-term sales and earnings for all product lines.

DETAILS OF FUNCTION:

- Develops and maintains strategic partner relationships
- Manages and develops sales reps:
 - Reviews progress of sales performance
 - Provides quarterly results assessments of sales reps' performance
 - Works with sales reps to identify and contact decision-makers
 - Setting growth targets for sales reps
 - Educates sales reps by conducting programs/ seminars in the needed areas of knowledge
- Collects customer feedback and market research (products and competitors)
- Coordinates with other company departments to provide superior customer service

QUALIFICATIONS:

- 5-7+ years of related experience in the manufacturing sector or equivalent combination of formal education and experience
- Excellent oral and written communication skills
- Business-to-business sales experience a plus
- Good working knowledge of Microsoft Office Suite and common smart phone apps
- Valid driver's license
- 75-80% regional travel required

To apply, please submit a COVER LETTER and RESUME to: Fernando Rueda, Americas Manager

fernando_rueda@kyzen.com

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Technical Marketing Engineer

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

Requirements:

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

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

Send Resumes to: resumes@ema-eda.com

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Career Opportunities



MACHINES FOR PRINTED CIRCUIT BOARDS

Field Service Engineer Location: West Coast, Midwest

Pluritec North America, Ltd., an innovative leader in drilling, routing, and automated inspection in the printed circuit board industry, is seeking a full-time field service engineer.

This individual will support service for North America in printed circuit board drill/routing and x-ray inspection equipment.

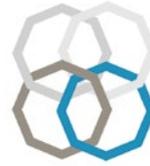
Duties included: Installation, training, maintenance, and repair. Must be able to troubleshoot electrical and mechanical issues in the field as well as calibrate products, perform modifications and retrofits. Diagnose effectively with customer via telephone support. Assist in optimization of machine operations.

A technical degree is preferred, along with strong verbal and written communication skills. Read and interpret schematics, collect data, write technical reports.

Valid driver's license is required, as well as a passport, and major credit card for travel.

Must be able to travel extensively.

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騰輝電子

European Product Manager Taiyo Inks, Germany

We are looking for a European product manager to serve as the primary point of contact for product technical sales activities specifically for Taiyo Inks in Europe.

Duties include:

- Business development & sales growth in Europe
- Subject matter expert for Taiyo ink solutions
- Frequent travel to targeted strategic customers/OEMs in Europe
- Technical support to customers to solve application issues
- Liaising with operational and supply chain teams to support customer service

Skills and abilities required:

- Extensive sales, product management, product application experience
- European citizenship (or authorization to work in Europe/Germany)
- Fluency in English language (spoken & written)
- Good written & verbal communications skills
- Printed circuit board industry experience an advantage
- Ability to work well both independently and as part of a team
- Good user knowledge of common Microsoft Office programs
- Full driving license essential

What's on offer:

- Salary & sales commission--competitive and commensurate with experience
- Pension and health insurance following satisfactory probation
- Company car or car allowance

This is a fantastic opportunity to become part of a successful brand and leading team with excellent benefits. Please forward your resume to jobs@ventec-europe.com.

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Career Opportunities



Technical Service & Applications Engineer Full-Time — Midwest (WI, IL, MI)

Koh Young Technology, founded in 2002 in Seoul, South Korea, is the world leader in 3D measurement-based inspection technology for electronics manufacturing. Located in Duluth, GA, Koh Young America has been serving its partners since 2010 and is expanding the team with an Applications Engineer to provide helpdesk support by delivering guidance on operation, maintenance, and programming remotely or on-site.

Responsibilities

- Provide support, preventive and corrective maintenance, process audits, and related services
- Train users on proper operation, maintenance, programming, and best practices
- Recommend and oversee operational, process, or other performance improvements
- Effectively troubleshoot and resolve machine, system, and process issues

Skills and Qualifications

- Bachelor's in a technical discipline, relevant Associate's, or equivalent vocational or military training
- Knowledge of electronics manufacturing, robotics, PCB assembly, and/or AI; 2-4 years of experience
- SPI/AOI programming, operation, and maintenance experience preferred
- 75% domestic and international travel (valid U.S. or Canadian passport, required)
- Able to work effectively and independently with minimal supervision
- Able to readily understand and interpret detailed documents, drawings, and specifications

Benefits

- Health/Dental/Vision/Life Insurance with no employee premium (including dependent coverage)
- 401K retirement plan
- Generous PTO and paid holidays

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

- Engineering
- Quality
- Various Manufacturing

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

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

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

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

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Career Opportunities

INSULECTRO

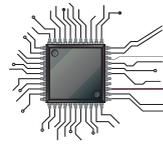


Are You Our Next Superstar?!

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

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

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MivaTek

Global

Field Service Technician

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

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

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

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

More About Us

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

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Career Opportunities



eptac
TRAIN. WORK SMARTER. SUCCEED.

Become a Certified IPC Master Instructor

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

Qualifications and skills

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

Benefits

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

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American Standard Circuits
Creative Innovations In Flex, Digital & Microwave Circuits

CAD/CAM Engineer

Summary of Functions

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

Essential Duties and Responsibilities

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

Organizational Relationship

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

Qualifications

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

Physical Demands

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

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Career Opportunities



APCT
Passion | Commitment | Trust

APCT, Printed Circuit Board Solutions: Opportunities Await

APCT, a leading manufacturer of printed circuit boards, has experienced rapid growth over the past year and has multiple opportunities for highly skilled individuals looking to join a progressive and growing company. APCT is always eager to speak with professionals who understand the value of hard work, quality craftsmanship, and being part of a culture that not only serves the customer but one another.

APCT currently has opportunities in Santa Clara, CA; Orange County, CA; Anaheim, CA; Wallingford, CT; and Austin, TX. Positions available range from manufacturing to quality control, sales, and finance.

We invite you to read about APCT at APCT.com and encourage you to understand our core values of passion, commitment, and trust. If you can embrace these principles and what they entail, then you may be a great match to join our team! Peruse the opportunities by clicking the link below.

Thank you, and we look forward to hearing from you soon.

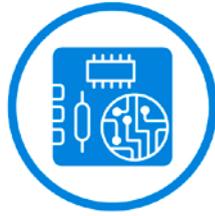
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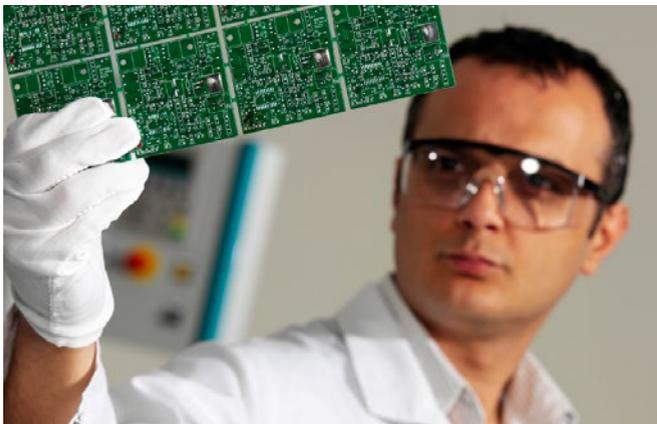
careers in **ELECTRONICS**

Electrical & Electronics Engineering Technicians

If you enjoy solving problems through a practical, hands-on approach and contributing to the invention, manufacture, and repair of electrical and electronic equipment, then you should consider becoming either an electrical engineering technician or an electronics engineering technician.

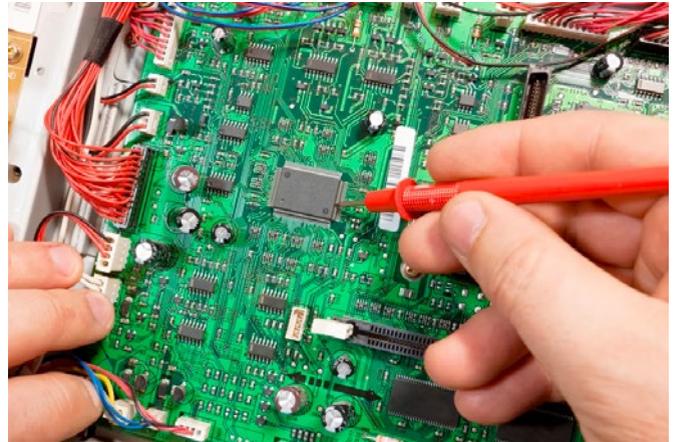
Depending on your area and employer, you could be working on automation, communication, computer, medical monitoring, and other types of electrical and electronic equipment.

Electrical engineers design, develop, test, and supervise the manufacture of electrical equipment. Electronics engineers design and develop electronic equipment, including broadcast and communications systems.



What Electrical & Electronics Engineering Technicians Do

Electrical & electronics engineering technicians test, evaluate, adjust and repair electrical and electronic equipment, the measuring tools and diagnostic devices you use could include current, voltage; and other electronic measuring probes; digital voltmeters (DVMs) and other voltage and current meters; and function generators. Of course, you will also use other, more general types of hand tools, such as wire strippers and power screwdrivers. Depending on your specific responsibilities,



you might need to be facile with a range of software platforms.

Electrical engineers design, maintain, implement or improve upon electrical instruments, facilities, components, equipment products, or systems. They perform various engineering tasks by operating computer assisted design or engineering software and equipment. They meet with customers, engineers, and other relevant parties and discuss the existing or potential engineering products and projects and ensure that installation and operations conform to standards and customer requirements. They also estimate the material, labor, and construction costs, and assist in budget preparation.

Electronics engineers analyze customer needs to determine requirements, capacity, and cost to develop an electrical system plan. They evaluate systems and develop maintenance and testing procedures for specific electronic components and equipment. They recommend design modifications or equipment repairs where applicable. They inspect electronic equipment, instruments, and systems to ensure they meet safety standards and applicable regulations and develop applications and modifications for electronic properties to improve their technical performance.

[Learn more here.](#)

NEW WEBINAR! On Demand: Free 12-part Webinar Series

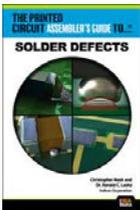
Smarter Manufacturing Enabled with Inspection Data

with expert Ivan Aduna

A smart factory is created from many parts, and inspection systems will play a critical role for process optimization in the next industrial revolution. Accurate, reliable 3D measurement-based data is essential, and a key element for a true smart factory. [In this 12-part webinar series](#), viewers will learn about secure data collection, AI-powered solutions to manage and analyze data, and how to leverage the IPC CFX-QPL to succeed in the transformation to Industry 4.0.



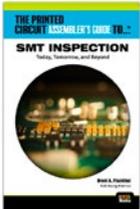
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Solder Defects

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

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



SMT Inspection: Today, Tomorrow, and Beyond

by Brent Fischthal, Koh Young America

An in-depth insight into new and exciting true 3D inspection technology is provided in this book, along with a look into the future of leveraging big data management and autonomous manufacturing for a smarter factory.



Smart Data: Using Data to Improve Manufacturing

by Sagi Reuven and Zac Elliott, Siemens Digital Industries Software

Manufacturers need to ensure their factory operations work properly, but analyzing data is simply not enough. Companies must take efficiency and waste-reduction efforts to the next phase using big data and advanced analytics to diagnose and correct process flaws.



Process Validation

by Graham K. Naisbitt, Gen3

This book explores how establishing acceptable electrochemical reliability can be achieved by using both CAF and SIR testing. This is a must-read for those in the industry who are concerned about ECM and want to adopt a better and more rigorous approach to ensuring electrochemical reliability.

I-007eBooks *The Electronic Industry's Guide to...*



The Evolving PCB NPI Process

by Mark Laing and Jeremy Schitter, Siemens Digital Industries Software

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

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AD DESIGN: SHELLY STEIN, MIKE RADOGNA,

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CREATIVE TECHNOLOGIST: BRYSON MATTIES

COVER: SHELLY STEIN

COVER IMAGE: ADOBE STOCK © SPENCER

SMT007
MAGAZINE

SMT007 MAGAZINE®

is published by IPC Publishing Group, Inc.,

3000 Lakeside Dr., Suite 105N, Bannockburn, IL 60015

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May 2023, Volume 38, Number 5

SMT007 MAGAZINE is published monthly,
by IPC Publishing Group, Inc., dba I-Connect007.

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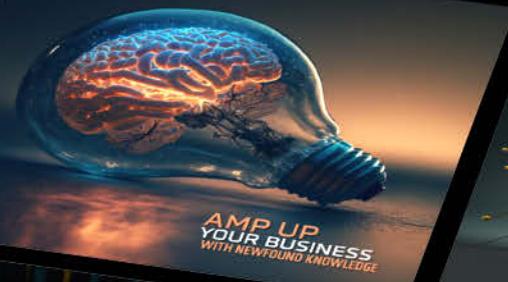
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