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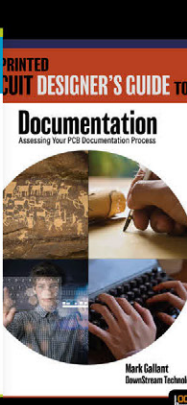
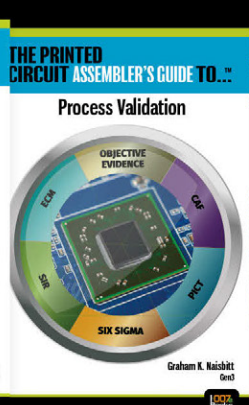
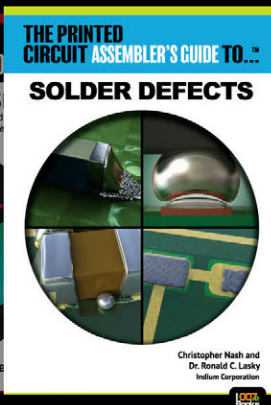
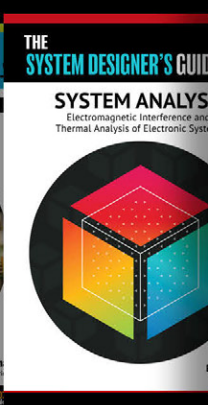
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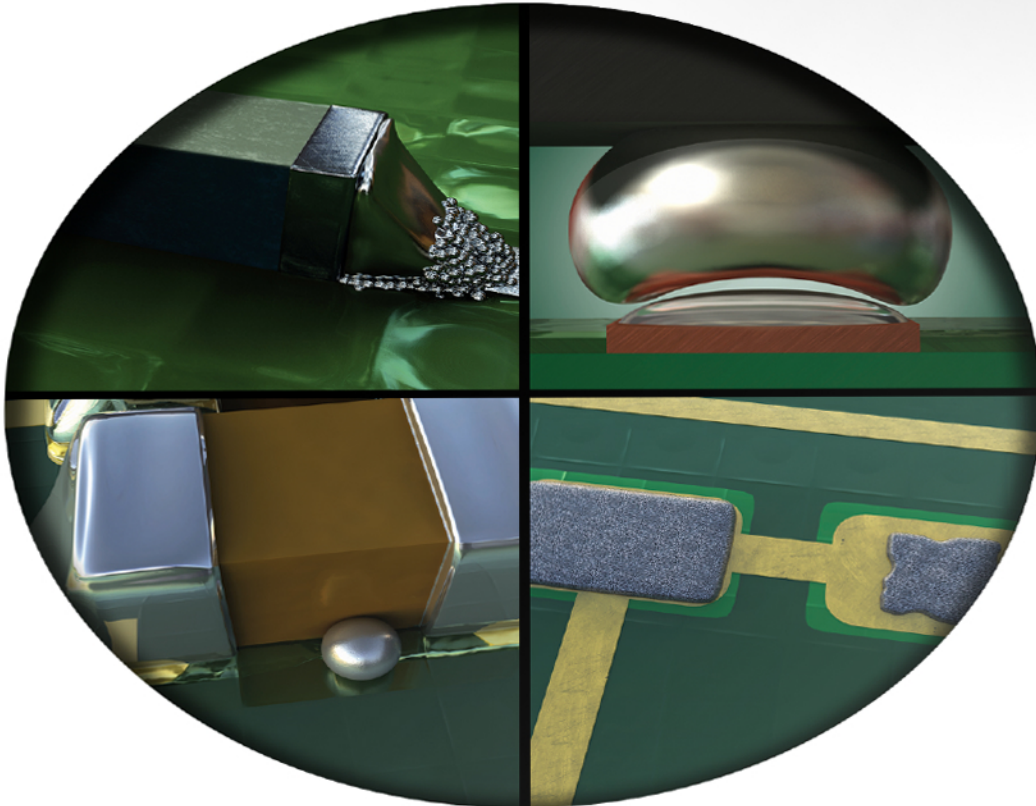


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Cybersecurity & Counterfeiting

Just as with consumer goods, supply chain concerns can easily lead to counterfeiting issues in electronics manufacturing. Meanwhile, cybersecurity is equally concerning. In this issue, we bring you several articles on cybersecurity, and we discuss what you need to know to leverage smart factory offerings to better manage supply chain and counterfeiting challenges.

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Ditch Insanely Long Lead Times: Switch to In-House Production



Brandi & David D'Aquin

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- David D'Aquin, CEO, CoralVue Inc.



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The Bottom Line on Cybersecurity and Counterfeiting

Nolan's Notes

by Nolan Johnson, I-CONNECT007

It was a little thing. I needed two size 2012 watch batteries to repair a light-up Christmas decoration. No big deal. As I walked through the grocery store to the batteries, there were empty spots on the shelves here and there. What was, in early 2020, an entirely empty aisle of paper products, had instead evolved into a sprinkling of missing products here and there. When I got to the kiosk of batteries, it looked similar: some of the hangers were empty. Sure enough, the batteries I needed were out of stock.

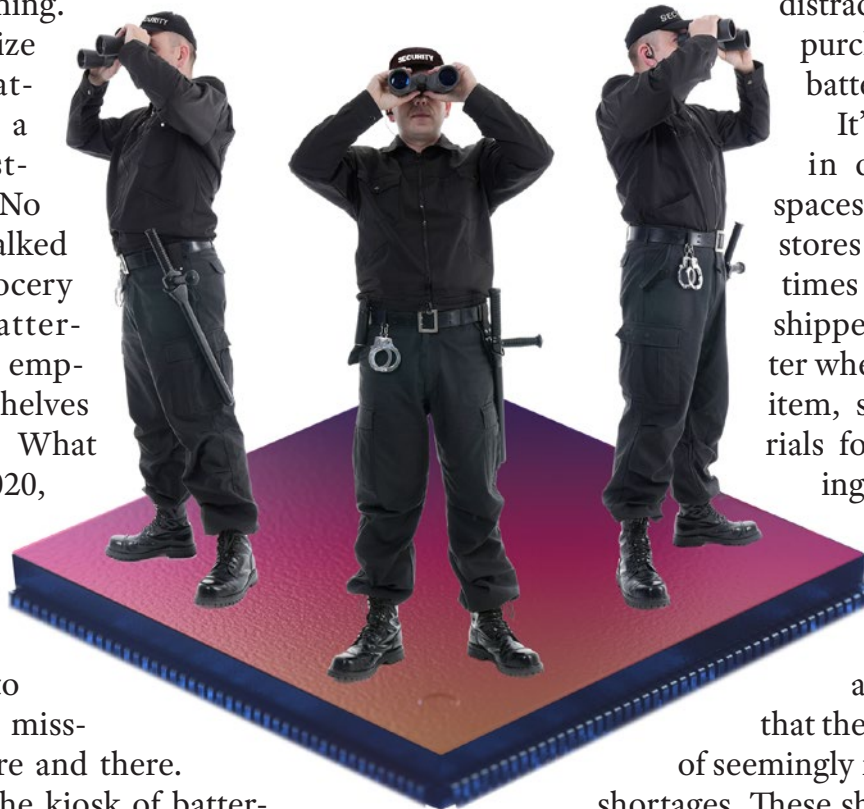
"No worries," I thought. "I'll just go to the hardware store near my next stop." It was the same story at the hardware store. Even though their inventory of batteries was more extensive, they were completely out of that elusive size 2012. But I had to be alert; the staff at the hardware store had filled the empty hanger with a different sized battery, thinking it was better to look full than to be accurate in sizes. Had I been

distracted, I might have purchased the wrong battery entirely.

It's a common sight in daily life: empty spaces on shelves in our stores and long delivery times for goods being shipped. It doesn't matter whether it's a business item, such as raw materials for the manufacturing floor, gift items for the holidays, or everyday groceries.

It's a truth we all know right now that the supply chain is full of seemingly random delays and shortages. These shortages create opportunities to be exploited by opportunists. Now, when I say opportunists, I don't mean the clerk who filled a hole in the store shelf with a different product. No, I mean those who pass off counterfeits as the real thing, or who engage in cyber-espionage or ransom attacks.

In recent newspaper article, an L.A. port director said, "Bad actors exploit e-commerce operations by selling counterfeit and unsafe goods through online platforms, particularly during the holiday season when shoppers are looking for deals. If the price of the product



Business Challenges for 2022

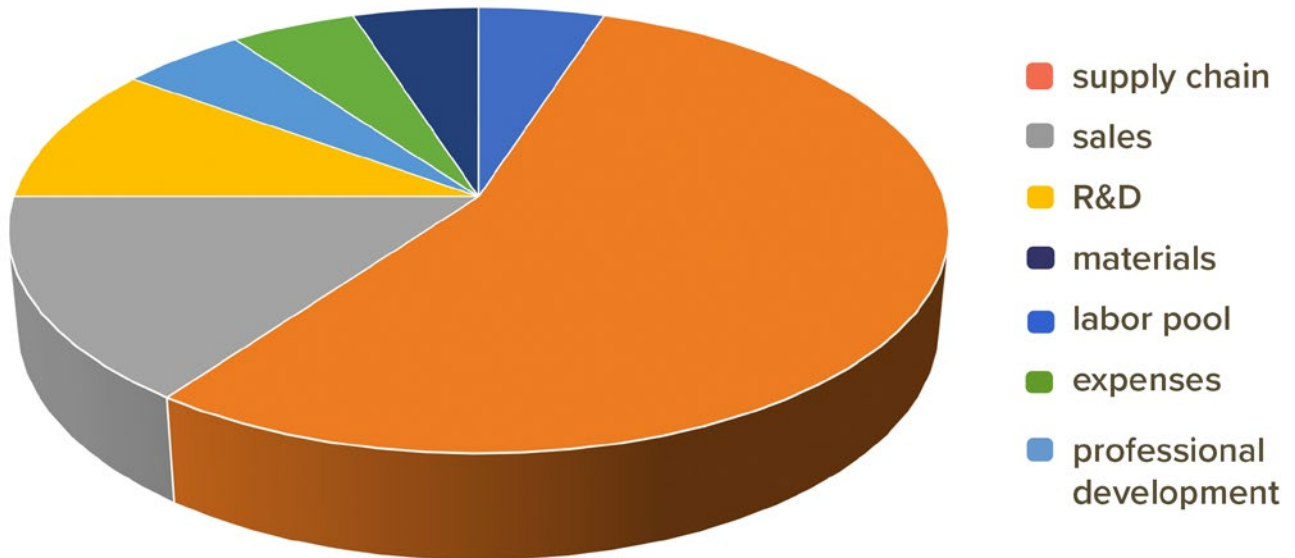


Figure 1: Supply chain is an overwhelming concern for PCB fabricators and suppliers, according to an I-Connect007 survey.

seems too good to be true, it probably is. Counterfeit goods are often of poor quality and can even be unsafe for you and your family.”¹

Another news piece taught shoppers how to spot a fake, reporting, “With fears over a shortage of goods this holiday season, officials from Department of Homeland Security investigations and the U.S. Customs and Border Protection are concerned shoppers will turn to non-reputable online sites or fall victim to counterfeit sellers.”²

Retailers are forming coalitions to address the online sale of stolen and counterfeit goods and calling on Congress for assistance. “While we constantly invest in people, policies, and innovative technology to deter theft, criminals are capitalizing on the anonymity of the internet and the failure of certain marketplaces to verify their sellers,” writes Mychael Schnell. “This trend has made retail businesses a target for increasing theft, hurt legitimate businesses who are forced to compete against unscrupulous sellers, and has greatly increased consumer exposure to unsafe and dangerous counterfeit products.”³

U.S. Customs and Border Protection, an agency under the Department of Homeland

Security, publishes counterfeit information at their website.⁴

It seems that anticipating an unpredictable supply chain has become way of life for us all.

I-Connect007 has reported on supply chain issues regularly over the past two years. Most recently, we devoted the March 2021 issue of *SMT007 Magazine* to supply chain concerns. Coincidentally, the Suez Canal was blocked by a container ship mishap at about the same time we went to print with the magazine; that certainly helped drive home our point with that issue.

Unsurprisingly, the supply chain concerns for electronics manufacturing continue. And it seems to be on everyone’s mind. Recently, we surveyed PCB fabricators, asking them to share their greatest challenges in their business. We structured the survey so that respondents could give their answer in their own words. No ticking of boxes, as that often inserts the survey writer’s bias into the survey. Once we had the replies, we categorized what we received, and this pie chart is what emerged (Figure 1).

Cybersecurity, while perhaps not as “in your face” as supply chain issues at this moment, is equally concerning. With the rise in ransom-

ware attacks worldwide, the concerns now are more than simply data theft.

Just as with consumer goods, supply chain concerns can easily lead to counterfeiting and cybersecurity issues in electronics manufacturing. It was reported that the “majority of global businesses believe supply chain attacks can become a major threat within the next three years, with 45% experiencing at least one such attack in the last 12 months. This figure is higher, at 48%, in the Asia-Pacific region, where organisations also are reporting more ransomware attacks and paying out higher ransoms than their global counterparts.” Writer Eileen Yu put some numbers to the trend: “Worldwide, 96% of respondents that paid the initial ransom had to pay additional extortion fees of \$792,493 on average. The report noted that 57% of companies that suffered a ransomware attack acknowledged they did not have a defence strategy in place to coordinate a response. This figure was 53% in Asia-Pacific.”⁵

In this issue, we bring you several articles on cybersecurity and counterfeiting, including submissions from I-Connect007 columnists Michael Ford and Bill Cardoso, as well as some really practical cybersecurity tips from IT specialist Divyash Patel. Furthermore, we discuss what you need to know to leverage smart factory offerings to better manage supply chain and counterfeiting. We share our “man on the street” interviews with industry representatives, discussing their take on the challenges and opportunities. We also interview Joel Scutchfield at Koh Young on how new product development is re-

sponding to these challenges. And, last but not least, as a special treat, we contacted some of the presenters at the SMTA symposium on Cybersecurity and Counterfeiting held earlier this year, and invited them to share their presentations here in the magazine. We’re proud to bring you four key presentations from Vernon Densler, Eyal Weiss, and David Mills.

In the spirit of “forewarned is fore-armed,” we hope this issue is informative and helpful. Our industry is benefitting from a growth period—we’re on the offensive again. Let’s not forget to play some defense as well. **SMT007**

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

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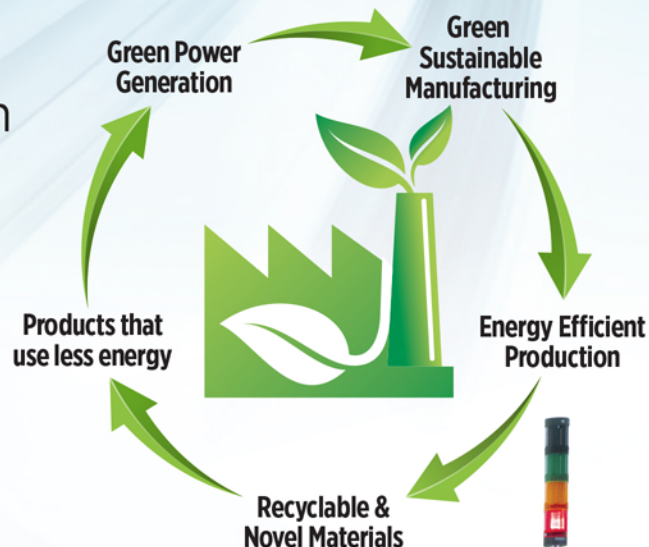


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Making the Most of a **Smart Factory** Initiative

Feature Interview with Nolan Johnson
I-CONNECT007

Nolan talks with Joel Scutchfield of Koh Young about trends he's seen in 2021 and what's ahead in 2022. "We see the expanded use of artificial intelligence in several areas," Joel says. "We see predictive maintenance as being something that customers are asking for, and continued refinement and reduction of the human element in the programming process, data analytics, etc. Customers are also driving the trend toward more connectivity, and I don't see that going away. It's in their control. They're going to make all of us get there."

Nolan Johnson: Joel, we are talking about Factory of the Future in a practical sense. But first, from your perspective at Koh Young, how was 2021? What seemed to be the market drivers? And what do you see for 2022?

Joel Scutchfield: There was a lot of uncertainty coming into this year. We still had COVID, and the vaccine rollout was still forthcoming.

We were just coming off an election in the U.S. where there was some controversy.

At Koh Young, we were cautiously optimistic, and it has turned out to be a record year for us in both sales and number of units sold. We couldn't be happier. Some of that was backlog from 2020, which wasn't a terrible year for us other than Q2 where everybody seemed to experience a little pain from the shutdown. But we rebounded nicely. Quarters two, three, and four of 2021 were explosive. We're looking to grow in 2022, around 12–14% for the Americas.

There is a very strong focus on EV, mil/aero, and industrial products. Certainly, anything cloud based, 5G servers, and the whole Factory of the Future concept that you noted at the beginning. We see all of that remaining strong in 2022. Because of that, our outlook is positive. In addition, if we can get some relief from the chip shortage, maybe toward the end of 2022, we should see some of our traditional automotive activity rebound.

We have a lot of new products and new applications that we are addressing with our



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Joel Scutchfield

to say, for example, “You might be just looking at an SPI machine right now to address this specific need, but you have to look at the big picture because your selection for that piece of hardware today could affect your ability to do all the things that you potentially may want to do from a smart factory perspective going forward.”

The consumers of our products need to be conscious of that and really be careful who they saddle up with. They need to do their homework, and make sure they’re not looking at things as a singular application. I think that’s the piece that’s changing. It intertwines “the head and the tail,” if you will.

Johnson: What are some of the top trends you’re seeing in inspection?

Scutchfield: We certainly see the expanded use of artificial intelligence in several areas. We see predictive maintenance as being something that customers continue asking for, along with the continued refinement and reduction of the human element in the programming process, and data analytics, etc. Customers are also driving the trend toward more connectivity, and I don’t see that going away. It’s in their control. They’re going to make all of us get there.

We see the expansion of more data points in the line going forward—increasing the amount of inspection being done on the line, coupled with more automation, which expands the capability of smart factories due to the additional data sets, and better use of the data for mistake-proofing, and self-healing. That’s really the end game. We can use our sensors—our systems—to identify that something is not quite right. Now, how do we help the other systems in the line correct for that automatically so we can self-heal on the fly?

There will be more plug-and-play as we go forward. You will see a push when we talk about sustainability, to have a more modular approach as we begin to expand into other areas beyond just the PCB and SMT lines to

core, proven technology, and we can tie all of that together with our KSMART Advanced Process Monitoring and Control smart factory software. We also have IPC APEX EXPO back to a live event, and lots of good things going on with that, so we are certainly looking forward to a good year in 2022.

Johnson: Which is the dog, and which is the tail? Is smart factory causing equipment purchases, or are your customers more likely to be getting new equipment because they need it and, while they’re at it, they decide to add some smart factory features?

Scutchfield: There’s some of both. Folks are starting to look at their purchases not as a single machine purchase as maybe they have in the past. They’re considering, rightly so, everything that the potential providers can bring to the table from an inspection systems perspective, but also, a smart factory perspective. Knowing what those suppliers are doing, what their roadmap looks like from a development, R&D perspective for new systems, application of the technology, and new and better ways to generate the data needed for smart factory attainment, is more important than ever. I like

more back-end applications. We see a lot of interest in that from our customers. How do we now apply our 3D measurement-based technology onto the back end, in module and box build areas, and so forth?

Our dispensing process inspection tool was an offshoot of our current technology, but it utilizes our core technology very well, so it very much made sense to expand our product offering into that area. We're keeping our eyes open in areas where our customer base may need solutions that do not exist today, or the current solutions are not providing the needed capabilities, and then utilize that information to stay ahead of the need and reduce our time to market, so they can take advantage of our ability to provide sooner rather than later.

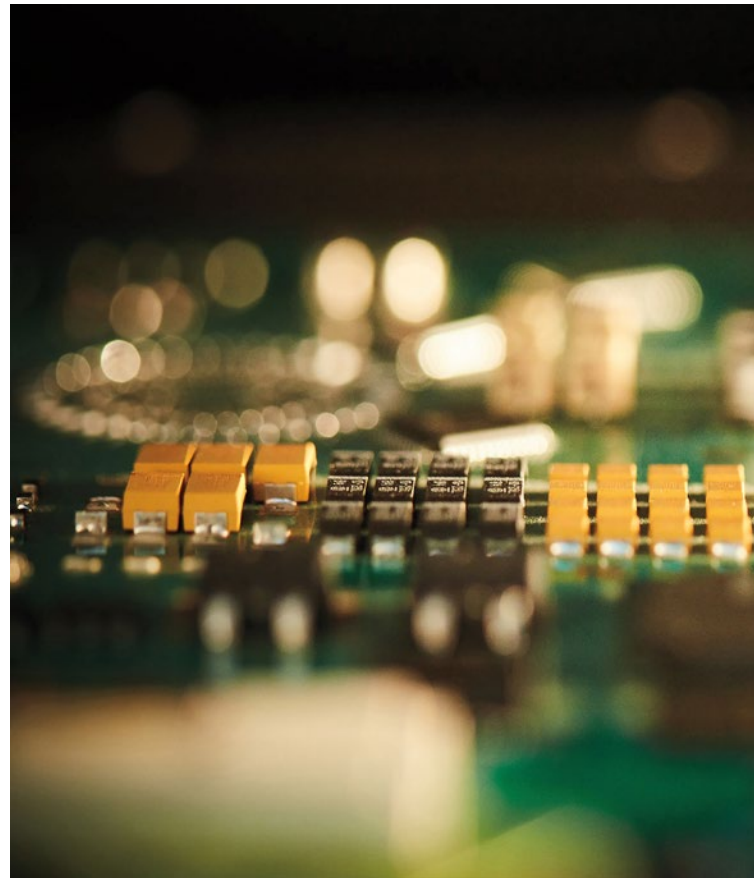
Johnson: What are the market-sized trends that you're seeing with your customers? Are they pivoting or are they staying their course?

Scutchfield: That's a great question because there are so many factors now, especially knowing the impact of the current supply chain situation and labor markets.

Obviously, the nearshoring (or reshoring) effort means customers are becoming much more vertically integrated, likely more than they ever intended. We have one particular customer that was forecasting an additional 17 of our machines to be acquired over a two-year period for one site alone, specifically due to nearshoring initiatives, and bringing component build back in-house.

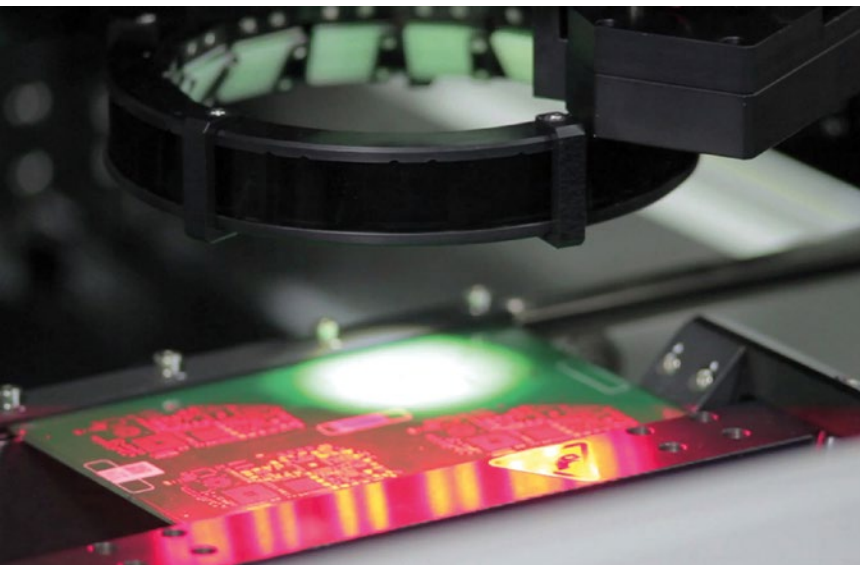
Then there's the labor shortage. How do you overcome that? Obviously, with more automation, more intuitiveness, auto programming, and auto data analysis. When we talk about trends, it's more than just the IoT, the connectivity, whether it be CFX or beyond. How do we help our customers get to a greater state of productivity and be able to use everything that all these initiatives provide?

We're increasingly applying artificial intelligence, and we see that growing because we



have the dataset to make that happen. We're fortunate in this industry to have highly automated processes. When we talk about being competitive here in North America, we have an advantage over some of the more labor-intensive industries. There's still more work to be done, and that's where the smart factory initiative concept comes into play. From a supplier perspective, we want to provide an environment where we don't need dedicated data analysts, an environment where operators and technicians can easily understand and apply all the information being provided.

Currently there are third party companies in the mix who are focused strictly on pulling data from all the various pieces of equipment up and down the line; putting them into one giant mixing bowl; understanding what needs to be utilized, when, and by whom; and providing that information in a dashboard setting or some type of very quick analysis tool that allows for those changes to be made very quickly.



Johnson: Koh Young certainly has a position on the manufacturing floor from which to provide quite a bit of data and information into the process, both as a feedback loop and as a feed forward loop.

Scutchfield: That's correct.

Johnson: How does Koh Young approach implementing these sorts of AI or analysis components into the products for customers?

Scutchfield: I think the answer starts with understanding that our dataset is different. This might be a long way to get you to your answer, but I'll try to keep it short. We came out of the 3D world from the inception and did not start with all the 2D technology that all our competitors did, as that's all that existed when Koh Young introduced the first 3D measurement-based plug-and-play system in 2010 and likewise with the SPI tool roughly eight years prior. It's with the right kind of dataset, which I quantify as "true 3D," the right kind, parametric, objective, profilometric measurement-based data that's gotten the right way, with the right tools and subsystems; what's under the hood really does matter when it comes to reliability and accuracy. And then finally getting all of that in the right amount to be useful from a statistically relevant perspective.

This now gets into the area of big data, where we are acquiring 32 three-dimensional images per FOV, for every field of view we inspect in order to render our 3D model from which our measurement-based results are provided. That's really where it starts. Now with that, we can begin to assess how that superior dataset can be applied with the use of, for instance, artificial intelligence, to automate the AOI programming process much more substantially where we can now cut the time it takes for a program to be regenerated, replacing what was done manually

at one time, with automation and artificial intelligence, by roughly 70%. That's significant. Again, it's applying the dataset to a scenario that it fits.

It's an incremental, evolving process. As our customers are ready for more, we provide more. There's some that say, "Give it all to me at once," and there's others who say, "Let's do this in smaller pieces." Fortunately, they all understand on the front end what the end game is. Then, it's just up to us to work with them to create the best path to get there.

Johnson: I'm sure that this is not just a plug-and-play process in a customer environment on the manufacturing floor. Setting up is more than just putting the equipment in and turning it on; it must connect into a data flow, gathering the data, and working to make it available for analysis. I would have to think that's complex. How does Koh Young help customers with that part of the process?

Scutchfield: I think we have been very successful at making our solutions as plug-and-play as possible. Again, that's primarily specific to our tools, our software, and our machines up and down the line.

So now, how do we take it to the next level? I have a customer that loves everything we're showing and providing with our KSMART

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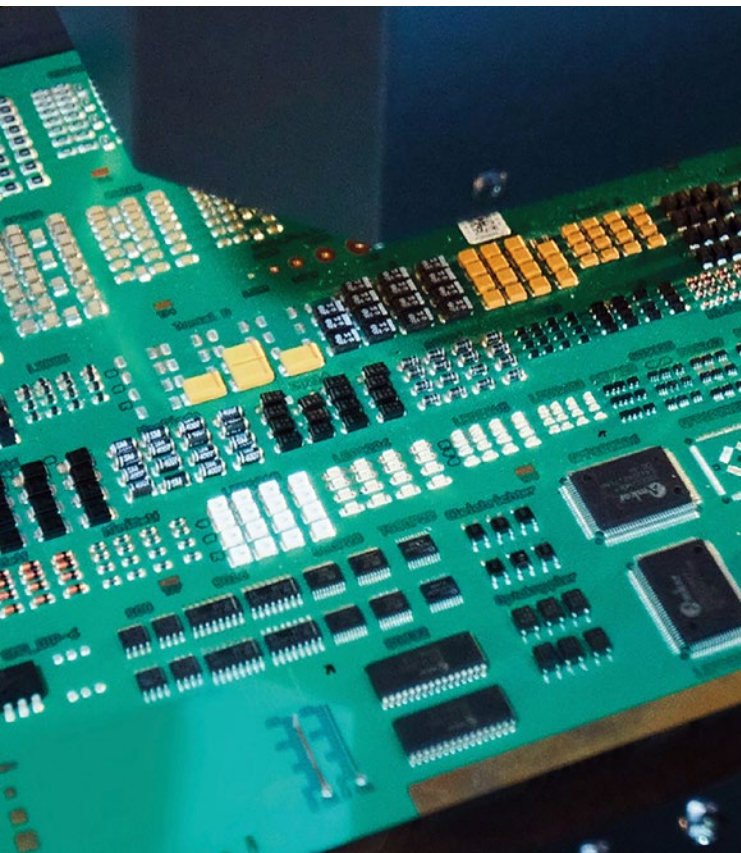
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Suite of tools. They're using it to its maximum extent, it's providing them with excellent results, and they're very happy. But then they say, "I need Koh Young to tie all the information you are providing into a next level MES system, let's say, where all of the data can be seen in a dashboard that's not necessarily specific to Koh Young, but something that encompasses additional machines up and down the line, non-Koh Young machines specifically."

This is very normal and it's the next big step, and the direction we want to go from a smart factory perspective. There are the communication solutions from providers like us where we maximize the ability for our tools to talk to each other, provide results, and adjust. The next level is talking to and working with other systems on the line. We've created that for, specifically, the screen printer and the mounter process where we can close-loop both of those processes with our KPO (process optimizer) tools. In addition, the results data from both of those processes can be extracted and exported into a next-level system for analysis.



Now comes the CFX element. CFX is currently helping us get the data to a central location. The next step is looking at how that protocol can allow everybody to communicate with everybody else, regardless of make and model, but also allow for customers to continue utilizing the tools that they have and really like, such as our KSMART tools. I sat in on a panel discussion a few weeks ago with some of my competitors, who I know well and respect. We talked about this very openly. There are certainly customers that, for whatever reason, are specific about what they want in terms of make, model, etc., and they want everyone else to provide the same capabilities that we provide when using our own tools, in multiple locations with competitive tools, just as an example.

When we've gotten to that point, I think we'll know we have arrived. Now we have absolute connectivity up and down the line regardless of who the provider is for that specific tool or system. We would then still have the capability to utilize those preferred tools from the providers. It's now all integrated into one seamless operating system, one MES system. From a single point, you can basically control everything. That's the end game. I think CFX is working to move us in that direction.

We are seeing results. This is no longer just a concept. Users are taking advantage of and benefiting from it. Now we must continue to expand, and that's the initiative going forward the next few years.

Johnson: As an equipment manufacturer in the environment that is embracing interoperability for equipment from all the manufacturers, how do you compete?

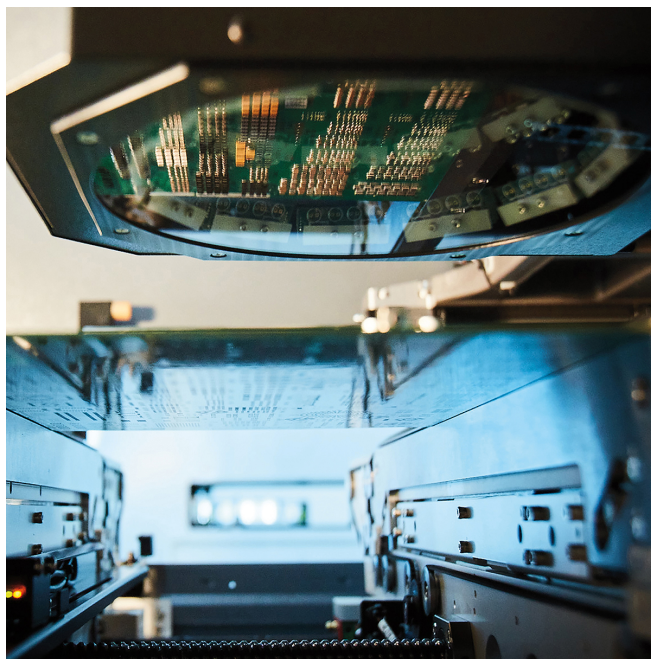
Scutchfield: We've done it by aligning ourselves with what we consider to be the top line market leaders in their specific space for the print process, the mounting process, in particular. That will continue to expand. Likewise, from a software perspective, being able to pushing

our information up to a third-party next level control entity will most likely be necessary. We've formed those partnerships early on and worked hard to really expand and maximize the use of what we can do together with them.

This in turn is now being seen from a customer's perspective, as something you can only get using these combinational tools, whether it's us and printer company X or mounter company Y, these are the deliverables that we can provide because of the initiatives that we've invested in significantly. Those are differentiators.

With respect to overall smart factory success, I'm going to go back to that dataset topic that I spoke about earlier. Not everybody can get there (smart factory realization) to the degree that others will be able to, and this is due to the dataset that they're generating (or not generating). That's the key. You must start at the ground floor and climb the ladder one rung at a time. You don't get to jump to the top without doing all the little things in between, and without having that true 3D dataset—the right kind, right way, right amount. It all comes back to that.

We've been able to do things that others have not because we have that superior dataset, and we've been able to apply that in our partnerships with, again, the screen printer and mounter companies, along with other software/MES companies that we work with to maximize the value to the customer. That's the competitive piece at this point. Going forward, if everything has been leveled and now there are protocols and things in place that allow everybody to play with everybody nicely in the sandbox, you will have achieved the full line connectivity. But you won't necessarily have maximized the effects of what you could be producing with that type of capability unless you partnered with the right providers who can provide the right data that drives the right solutions, and provides the self-healing capabilities, etc. I see the potential for "various levels" of smart factory attainment for



EMS providers, and the level of success in the form of maximized results will be determined by the partners that our customers/EMS providers have chosen.

The whole concept of smart factory is 100% reliant on the accuracy and repeatability of the data and the robustness of the data. We can do a lot of things from a connectivity standpoint and still not be where we want to be in terms of getting the most out of our smart factory because our dataset is still lacking. It goes back to my comment about it not being a single machine application or decision that you're making today. You're deciding that it will carry you forward because of all the other things that the supplier that you're going to align with can do and provide to you long term. This cannot be overstated: it's really important to understand as you're making equipment provider decisions.

Johnson: Joel, thanks for taking the time to discuss all this.

Scutchfield: My pleasure. SMT007



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Every Cloud Has a Silver Lining

Feature Article by Dan Beaulieu
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These are interesting times we live in. The pandemic brought on with many dark clouds of challenges, from restrictions on visiting customers and attending trade shows, to business closures and the scarcity of goods, especially those imports from Asia (particularly China). Everyone has faced some sort of challenge for almost two years.

But the good news is that every dark cloud has a silver lining, and the smart companies in our industry are taking advantage of every silver lining they can see. Here are some of the trends (silver linings) that the pandemic has brought us as well as what some of the smarter and more forward-looking PCB and PCBA companies are doing to take advantage of them.

New Inspirational Innovation

Our world is just exploding with new ideas right now. The pandemic-caused shutdown has served as a sabbatical to many creative and innovative people. We are seeing a surge in the arts, for example. Musicians are putting out more songs than ever. Artists and writers have been more inspired, and most importantly to us, there is an increase in innovative electronics.

Look around and you will be astonished at what is being brought to life just in the medical field—new devices, less expensive ventilators, respirators, purification devices, and no-touch products like door openers. The pandemic created an obvious need for products like these and others. The best part is they want them built right here where they know their ideas—their intellectual property—will be protected.



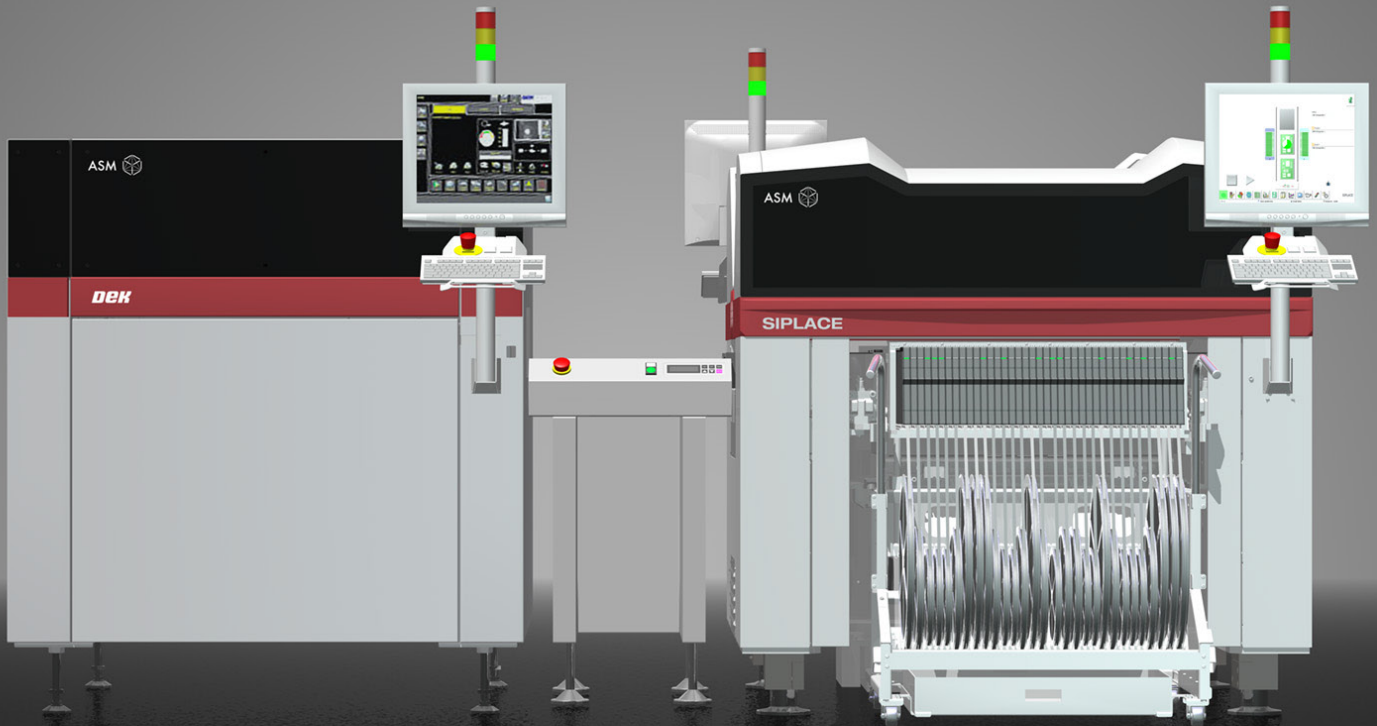
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The smart companies in our industry are focused on finding opportunities for growth. In fact, many have grown during the pandemic and are enjoying record sales.

Complete, One Stop Solutions

One of the most exciting things that has happened through the pandemic is the demand for a complete PCB solution, from concept to reality: design, fabrication, and assembly with one vendor, one purchase order. Many of our customers are developing new products so they are looking for vendors that are trustworthy and reliable, and most importantly, who

can build their new products quickly, efficiently, and economically.

That is why many companies are offering a complete synergistic solution. Some companies already offer design, fabrication, and assembly under one roof, while others are cleverly creating alliances with other associated companies to provide their customers with that complete solution.

Onshoring

The PCB and PCBA business is coming back to North America, but let's not fool ourselves; it will never come back to the levels that it once was. But the low- to mid-volume work is being "onshored" as a result of COVID restrictions and the geopolitical atmosphere surrounding us today. Our domestic companies have seen an increase in the number of quotes, and it's looking more like the numbers Asia has been getting for the last 10 years. Smart companies are finding ways to take advantage of this trend. It means leaving their comfort zone, but they are finding it's well worth the effort.

Another facet of onshoring is accommodating companies/customers that do not want to deal with China but still want the economical efficiencies of dealing with offshore vendors. Those domestic PCB and PCBA suppliers that have been providing their customers with a Chinese solution are now converting it to a global solution by partnering with other companies in other Asian



countries. I expect this trend to grow rapidly in the next year.

Domestic Marketing Cooperation

This is one of the trends I am most excited about. PCB companies, for example, are talking to each other, helping one another find ways to provide their customers with the right solutions. They are cooperating when it comes to technology, capabilities, and commodities, buying and selling hard-to-find laminates from one another. Some are even exploring the possibilities of buying in bulk to get a better price.

This is a strategy similar to what American farmers once did in the old Grange system. This is going to be an interesting trend to watch play out and I hope it continues. Especially since the zero sum, winner-take-all mentality we have seen in our industry for the last 50 years contributed greatly to our near demise.

Increase in Capital Expenditures

We are starting to see an increase in technology spending where more companies are buying direct imaging equipment as well as automatic screening machines, thus becoming much more efficient when it comes to technology and process. This is a good sign. Companies are investing in themselves.

Another encouraging sign is that we are building fabrication centers of the future. From New Hampshire to Utah, new and efficient “factories of the future” are coming on. The one in New Hampshire has been up and running for over two years and the one in Utah will be running in early 2022. This is a trend worth investigating and, most importantly, worth implementing. Keep your eye on that trend.

Customer Partnerships

Smart and forward-thinking PCB and PCBA companies are working closely with their customers, especially those customers building products of the future who need

PCBs of the future. These entities are making sure that the board suppliers can keep up with the customers’ PCB demands. In many cases, they are sharing not only R&D, but money as well. The larger customers are investing their own money into their vendors to make sure that they can keep up with their technology demands.

It’s certainly refreshing to see our customers respecting the fabricators and their technology enough to be willing to support them.

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Probably the most important aspect of this trend is that customers are smart enough to understand that they must do what they can to support their domestic PCB and PCBA suppliers enough that they stay healthy, not only in terms of technology, but in terms of their financial health. This is a complete turnaround from what it has been since PCB time began.

It is worth saying once again: It is a shame to waste a good crisis, and the smart companies in our industry are doing all that they can to take full advantage of this one. **SMT007**



Dan Beaulieu is president of D.B. Management Group and an I-Connect007 columnist. To contact Beaulieu, or read past columns, [click here](#).

Who Will Maintain Control of Global Chip Manufacturing?

Feature Article by Dan Feinberg

I-CONNECT007

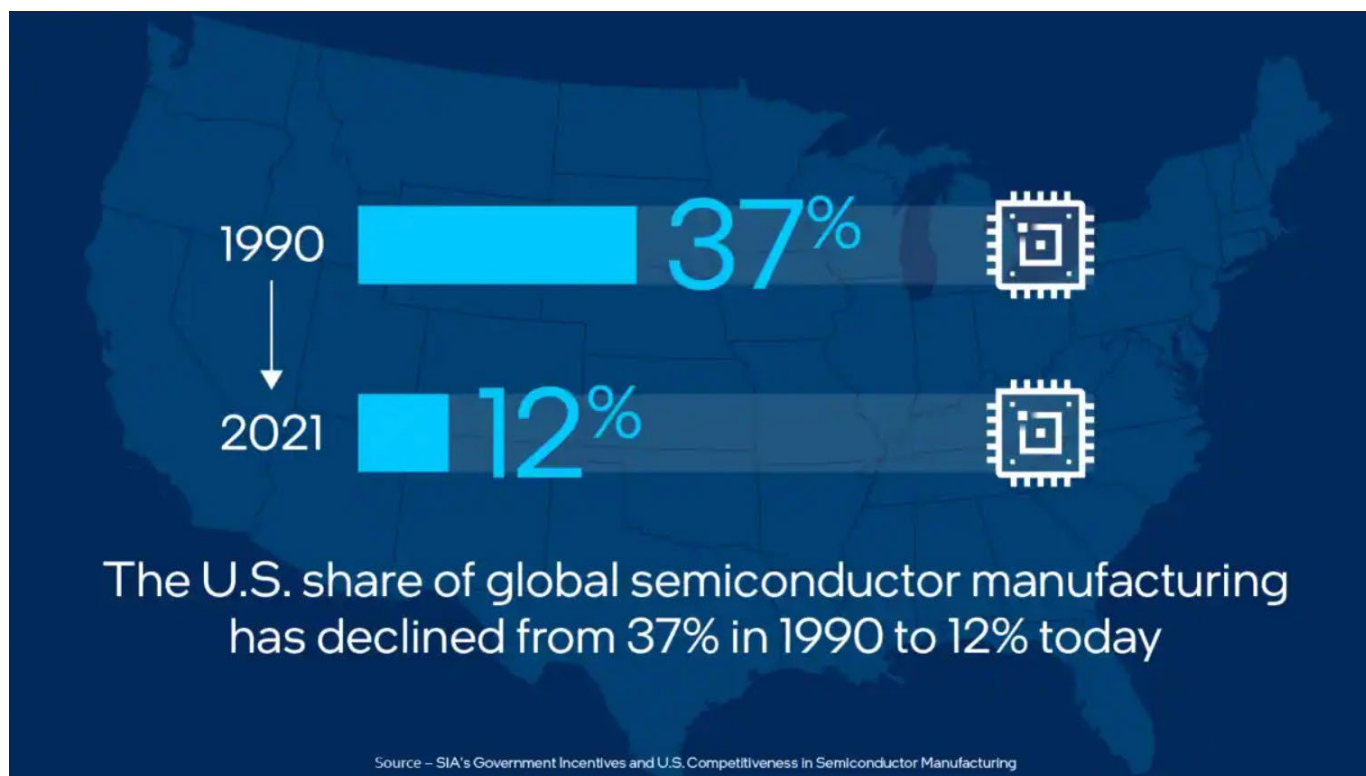
In 1990, the U.S. dominated the world in its use of chips, with about 40% of the total global production made in the United States. That number was down from its peak, but it was still significant.

Much has changed in 30 years. Today the U.S. supplies approximately 12% of the global chip market, even though U.S.-based companies use a much higher percentage of the chips.

And even though total U.S. chip production has been steadily growing, the U.S.'s share of the rapidly-growing market is still declining as countries such as Taiwan and Korea outpace the U.S.

Also concerning is the growing number of facilities outside the United States which can produce the most advanced devices. This concern is particularly connected to the supply chain and the somewhat “iffy” relationship between China and the United States, as well as apprehension regarding China looming over Taiwan. Many American companies, government leaders, and citizens are aware of China’s eye on Taiwan and the possibility of a takeover.

Not being able to supply key components locally (for technology initially developed in the United States) has both economic and security impacts and has raised significant concerns. There is a growing consensus that this decline in capability and needed local capacity must stop, be reversed, and that the U.S. must do so rapidly.



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Intel's newest factory, Fab 42, became fully operational in 2020 on the company's Ocotillo campus in Chandler, Arizona. In late Sept. 2021, the \$20B project to expand this campus with two new chip factories broke ground. (Source: Intel)

There are indications that this reversal may already be in the works but does the U.S. government bring the necessary support? Let's look at a few recent examples.

Intel, a leading U.S.-based chip supplier, had lost market share for computer CPUs over the past few years and seemed to be on a downhill path. However, earlier this year Intel announced that its board of directors had appointed 40-year technology industry leader Pat Gelsinger as its new chief executive officer, and shortly thereafter announced its plans to spend \$20 billion to build new chipmaking factories in the United States

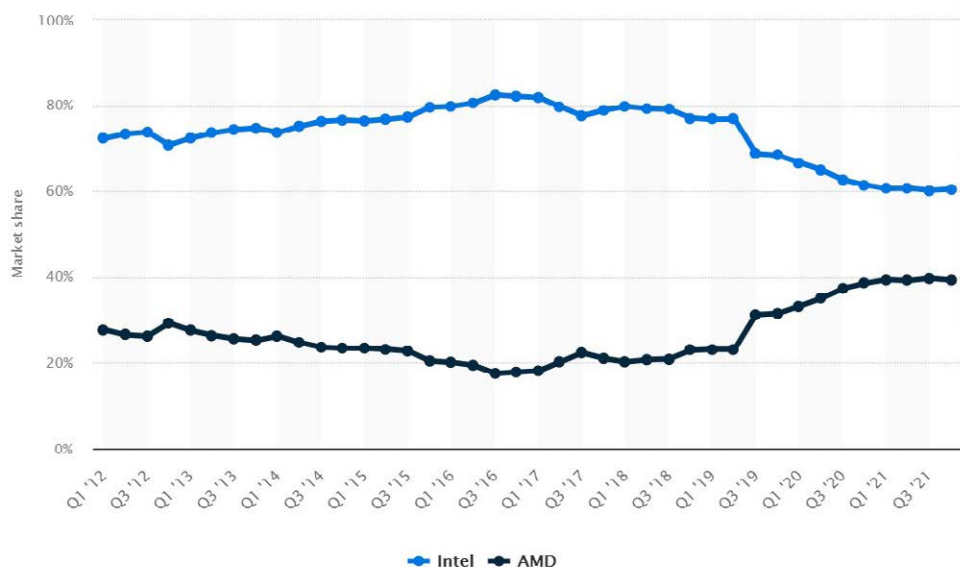
In addition, Intel has recently released a new CPU line led by the flagship Core i9-12900K CPU. The 12 Gen Alder Lake chips, as they are known, are getting rave reviews and the pricing on the newer Intel chips seems to be more competitive than a few years ago. I'll be writing about this in greater detail in an upcoming column.

Intel may be at the beginning of a turnaround, and these moves seem to show that the company, and the U.S., are serious about regaining global leadership in this crucial technology. But it also indicates how far Intel and the U.S. had fallen behind.

As part of its plan, Intel said it would open its factories more widely to make chips for other companies, highlighting its manufacturing expertise and renewed ambition. But at the same time, Intel said it would outsource production of some of its most advanced chips to Taiwan Semiconductor Manufacturing Company (TSMC), one of the world's largest and most advanced chip manufacturing companies. This company recently announced significant expansion plans, much of it outside of Taiwan.

TSMC's overseas expansion plans come amid concerns over the concentration of chip-making capability in Taiwan—an island that sits uncomfortably close to mainland China, which has not ruled out the use of force to bring the democratic land under its control.

However, TSMC leads Intel in using extreme ultraviolet lithography (EUV) to put more compute power on a chip by squeezing transistors closer together. As one of the world's large-





est contract chipmakers, TSMC recently announced it is reviewing a plan to set up a specialty technology wafer fab in Japan.

As TSMC's revenue grows, the company has indicated it will expand production capacity in China but that does not rule out the possibility of a "second phase" expansion at its \$12 billion factory in Arizona. So, while TSMC may not be American owned, made in Arizona is still made in America.

There are other major chip companies considering manufacturing at least some of their chips in the United States; some already are. These include NVIDIA, Samsung (the world's largest), SK Hynix, Micron Technology, Qualcomm, and others.

These companies, and others, have been considering building new plants to meet the growing demand and to help reduce the supply chain chip shortage, with some of that production coming to the United States. This would put significant manufacturing back on U.S. soil, strengthening both our economic and national security.¹

Chip makers, dealing with this year's continuing semiconductor shortage, are planning to diversify their supply chains to avoid future supply chain problems, especially as the demand for advanced electronics in many sectors continues to grow. TSMC and Samsung are two of the leading possibilities, but along with Intel and others, many have suggested that

they may pull the plug on making chips in the United States unless government assistance is on the table. Company executives are hinting that if they don't get tax breaks and other incentives, they'll build their semiconductor factories elsewhere.

If our lawmakers do not listen and just continue to plan to raise taxes, they will effectively end American ambitions to return chip manufacturing to its shores. The need for more global chip fabrication is now and is globally recognized.

The cost is large and the time to build these facilities is long. The opportunity is real, and the timing is now.

We can expect to hear more on this topic over the coming months. Will the United States gain back significant chip manufacturing share or will the decline in capability continue? I expect there will be some updates and announcements soon and you can be sure we will follow this topic and report back to you regarding the status. **SMT007**

References

1. "Semiconductors: Key to Economic and National Security," Senate RPC, April 29, 2021.



Dan Feinberg is an I-Connect007 technical editor and founder of Fein-Line Associates. To read Dan's column, *Fein-Lines*, or contact him, [click here](#).

‘Trust Me, I Have Your Chips Right Here’

Feature Article by Michael Ford
AEGIS SOFTWARE

When making the decision to purchase materials, there is a strong benefit from a trust in the supplier. When materials are in short supply, however, there is no time to establish trust with a new supplier, especially when it's the only one that can fulfill a requirement. While the manufacturing world is seeking methods to find trust with previously unknown suppliers, there are also those who are getting cleverer at disguising their often-nefarious activities—ones that could bring catastrophic results. In the real world, how can supply chain trust be established and maintained, or is it safer to assume that everyone is out to get us?

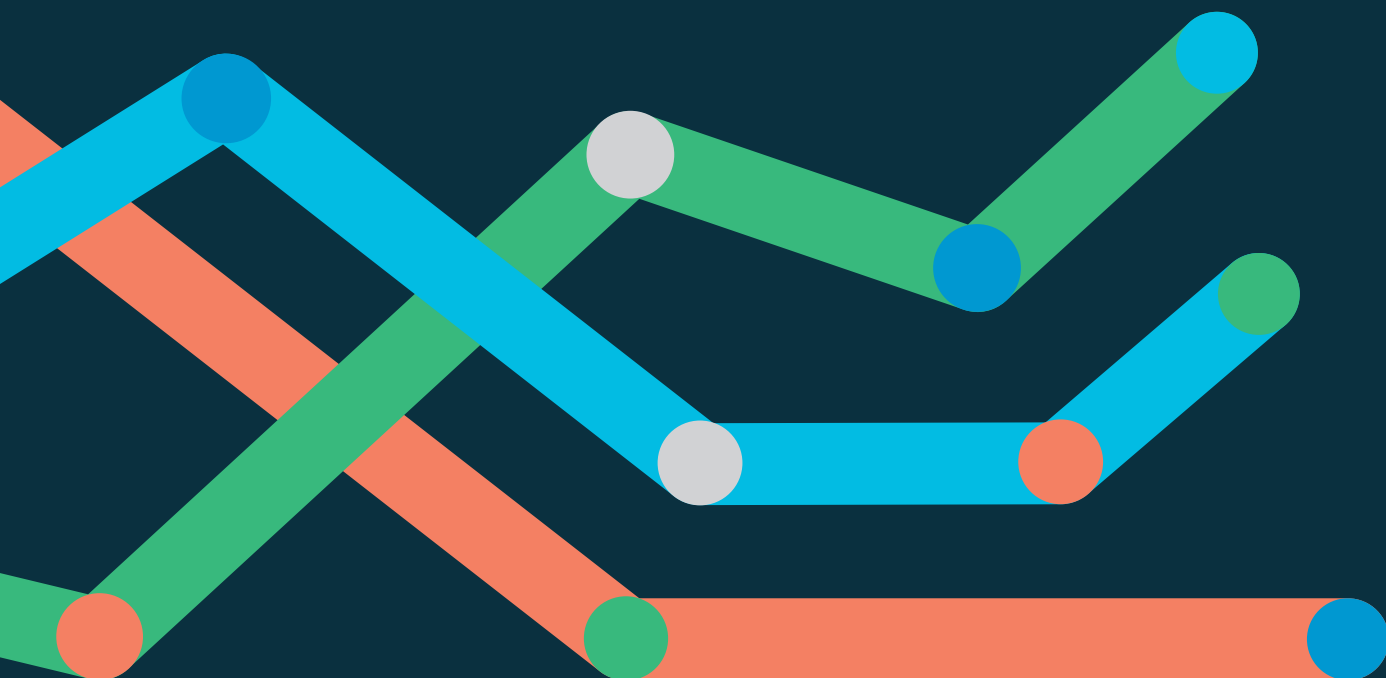
Trust Me

Long-standing supply chain relationships once dominated the industry, with quite personal interaction between companies that brought investment in mutual business opportunity and growth. There were, of course, examples of “bad apples” in the “family,” individuals taking a selfish approach that sometimes compromised the relationship, but it was quite rare, relatively visible, and reparable. As the world has expanded over the years, companies are now larger, more remote, and more anonymous. In social media posts, we occasionally see extreme opinions and challenges being shared, knowingly or even intending, to be hurtful. Anonymity shields the protagonist from potential repercussions, reigniting

the “us vs. them” narrative that is opposite in nature to the trust in relationships that we want to build.

As companies increase in size and become more remote, purchasing relationships change, with dedicated roles within each organization taking on more control, and a wider view. Trust can be destroyed by a warehouse operator or van driver, likely to be earning relatively little, who can be more easily corrupted. Counterfeiters and others are, by contrast, becoming quite clever and sophisticated in their attacks and cover-ups, and are very skillful at





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identifying potential targets. Maintaining trust in existing supply chain partners becomes increasingly difficult, never mind the selection and onboarding of new suppliers. We are all at the mercy of the weakest links in our organizations, those who believe that a short-term gain will not result in responsibilities or consequences for those people and organizations that they care about.

For the Lack of a Single Part

The pressure is on. With material shortages in the supply chain (real or perceived) being a fact of life, doors have been opened to new sourcing strategies. With opportunities taken by many to hoard materials, things are worse than they needed to be. Just one missing part in a BOM containing potentially thousands of items is enough to halt production. As

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product lines change, overstocked and unusable materials become available, a burden to the holder in terms of investment, space, and depreciation. Off-loading such materials back into the supply chain can generate more profit than using them in assembly, if you can sell at the right time, to a desperate customer who will pay an extraordinary amount to fulfill the final line item in the BOM that prevents the company from shutting down a configuration, and risk disappointing a customer. It's the balance of risk vs. pressure tips. For counterfeiters, there has never been such an amazing opportunity to simply piggyback on this trend.

The Joys of Counterfeit

The best-case scenario with counterfeit materials is a break-down in the supply chain, as substandard materials are found and quarantined. Much worse scenarios are the resultant quality and reliability issues in products where counterfeits were not discovered, and worse still, created potential security and safety concerns. Counterfeiters don't care about this, however; they don't believe that they themselves, for example, may become a victim of the compromised car, that may be hacked and driven into a ditch. Safety in numbers, and trust that the counterfeits are detected—as long as there is no link back to themselves—works as part of their business model. This is a dangerous equation to manage, but short-term gains are the only motivation, as they can simply move their operations from one target to another, relatively unhindered. As there are many counterfeiters at work, they are just one of many. Individually, they can think that they are doing no significant harm. They are wrong.

Of course, there are many kinds of materials that we refer to as counterfeit, including the substitution of genuine parts of a different tolerance, quality, or specifications close to what is needed. Other examples are simply plastic shapes with legs, designed to look just like the originals. At the other extreme, there are counterfeit materials that behave like the originals, but with some added nefarious content, such as back-doors and spyware. Ingress of each of these types of counterfeits represents significant risk.

The Cost of Trust: Physical Inspection

A couple decades ago, the quality of materials generally was far less than it is today. A regime of incoming inspection at that time was normal, built into most factory operations. Many procedures, rules, and standards were created over time, designed to build trust and assurance into the supply chain. The best MES solutions have incorporated these rules, making inspection efficient and effective. As trust is

built, the rules adapt, reducing the time, effort, and cost needed for routine inspections. Manufacturing benefits greatly from the reduced cost, effort, lead-time, and scrap, while suppliers take more responsibility. Counterfeit material ingress changes all that. Cost savings are eliminated as increased inspection is required to find cases and evolving strategies of counterfeit materials. Who knew that the counterfeiters would also take notice of inspection regimes and use that information against us? Reels of SMT materials on a feeder have been found, for example, that start with 200 genuine components, then, every seventh piece is counterfeit. Someone just increased their inventory by around 15%, in a way that defeats most incoming inspection procedures, and causes enough confusion within manufacturing that the source of the ingress could not be traced.

The defense industry has an extreme solution. Buying direct from the manufacturer, with direct secure shipping to the point of use, eliminates opportunities where counterfeit materials can be introduced. But, actually, the risk is only reduced. There are still those vulnerable people in the warehouses and driving the trucks. We have seen extreme cases where armed escorts for certain materials are provided door to door, all adding significant expense, and yet still not addressing the root cause of the problem.

The Cost of Trust: Digital Inspection

If the physical supply chain itself can be secured during all transport events, there should be no need for physical inspection. Tamper-evident packaging and identification exists, with many technology options available. If you can trust the packing and unpacking stages, then all should be well, no matter what path the packages may have taken. They could even have been bought by one company as a “material insurance,” to be sold back into the supply chain “grey” market. The IPC-1782A Secure Supply Chain standard explains exactly

how this can be done, and means that for unopened packages, value of materials can be retained, and risk of counterfeit eliminated. If packages are opened, then a clear responsibility for the repackaged and secured contents is re-assigned, and the buyer can take their choice. This standard is based on immutable IDs of packaging and/or individual materials, working as a digital fingerprint that cannot be copied or cloned. Information associated with each ID is stored on a secure server, and is itself made tamper-evident, using blockchain technology.

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The combination of physical and digital tamper-evidence, as built into the IPC-1782A standard, provides an interoperable and effective mechanism that allows the early detection of counterfeits, complementing any physical material testing. It also, crucially, provides the ability to know the exact responsibility for the source of each counterfeit ingress event. The weakness in the supply chain is identified, procedures put into place to eliminate a repeat, and there is a good chance that enough evidence can be found to identify the criminal party. Not a good day to be in the counterfeiting business, which is what we want.

A new IPC standard, IPC-1783 Component Level Authentication (CLA), is under development, which takes this a step further by defining how immutable digital fingerprints for each key electronic component, PCB, sub-assembly, and module, as well as mechanical components, work together to provide

the ultimate provenance throughout the supply chain in an automated and cost-effective way.

The Role of MES Exact Traceability

Any factory that is involved in the manufacture or assembly of anything that will become part of the end product has a crucial role to play in product security. Traceability is not a new subject, being routinely used, we hope, for active quality management and proof of conformance, as well as being the tool that identifies the scope of issues related to underperforming materials for whatever reason.

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From a material perspective, the main function of exact traceability is to record precisely which materials have been used for each product created. It is very simple theoretically, not without challenges, but is very valuable. Should any quality issue be detected with a material, including the potential of counterfeit ingress, the use of exact traceability identifies which materials and products are affected, using the association of unique material and product IDs. Rather than having to quarantine all potential materials and products that were present in the factory over a specific period, the exact identification of the affected units reduces the scale of consequences in terms of risk, re-work, and scrap, as well as brand image and customer

disappointment, by two orders of magnitude or more.

The same exact traceability solution is used to combat the effects of cybersecurity intrusion that may seek to alter software or firmware in devices, alter the bill of materials or material sourcing flags, and other hacks that effectively create counterfeit products within genuine manufacturing facilities, much like a virus that infects a cell in the body and replicates itself. Some very modern problems are solved with this very established technology, represented by IPC-1782, the only true industry standard for traceability in electronics assembly. The modern MES solution supporting IPC-1782 provides not just the mechanism for automated, efficient, holistic traceability data capture and storage, but also establishes procedures for the preservation of integrity of data captured from machines that may have limitations in their material verification capabilities, or from human operators who exercise a degree of free will.

Provenance and Privacy

Unfortunately, we are not done with this issue. It is easy for various groups around the industry to get together and talk about the need for factory-based traceability data to be shared throughout the supply chain, helping to eliminate counterfeits, keeping the supply chain safe and secure, even promoting the elimination of risk from materials on the grey market, but what has been forgotten is that sharing of traceability data is practically impossible.

There are three very good reasons for this. First, the format and content of traceability data from any combination of factories, especially where the supply chain includes semiconductor, fabrication, and assembly, are almost always completely different. Each factory uses its own choice of traceability solutions; different standards apply to different areas within the supply chain, many of which are customer-driven requirements rather than



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real standards. It is almost impossible, without very serious investment, to combine traceability datasets together, ensuring that all the right detail is connected and consistent. Second, and perhaps more importantly, factories do not want to share their traceability data with others due to the risk of loss of privacy and exposure of operational IP. Finally, there is the issue of the size of traceability data. Even with a hierarchical structure that IPC-1782 represents, many terabytes of data will be created each week, month, or year depending on the scale of the manufacturing operation. Multiply that by all the manufacturing and assembly sites that work every day as part of the supply chain and it is enough to trigger a cloudburst. The costs of data storage, as well as access to such data, is rather extreme.

Each factory uses its own choice of traceability solutions.

As part of the IPC-1783 CLA standard, a solution to these three issues is being developed, utilizing the principle of “verifiable credentials.” This approach is also being pioneered for public sharing of private information, such as that related to COVID. Where access is restricted for people, such as to a bar, restaurant, or crowded event, the COVID passport allows venues to assess the eligibility for entry based on a question made to a trusted central entity that simply returns permission to enter or not. The decision is made based on private data submitted to the trusted entity issuing the passport, but none of that private data is shared with the venue, only the result. Whether permission was denied due to a positive test result, lack of vaccination, age, or any other reason, is not disclosed. Privacy assured. The def-

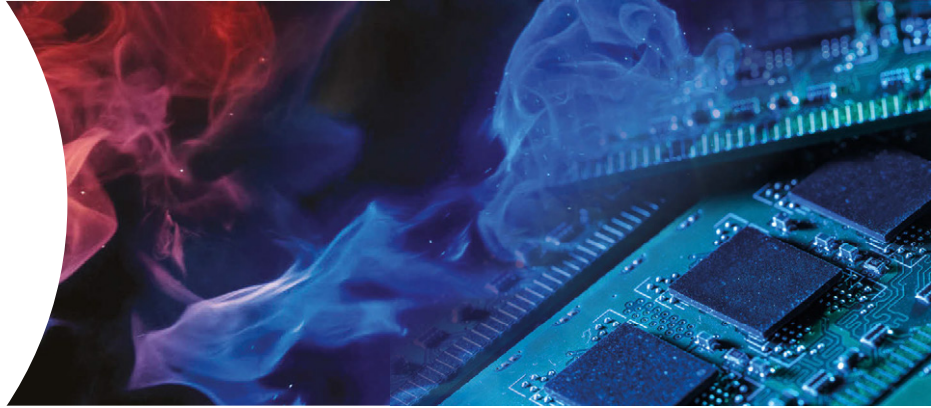
inition of what is needed in the supply chain, derived from local traceability, together with the set of “questions” or “challenges” that may be asked about that information, are being defined as part of the IPC-1783 standard. A trusted industry organization, likely distributed in nature, similar to blockchain and using such technology, will provide a “supply chain authentication passport” for products and materials as they move throughout the supply chain, and indeed, throughout the life of the product, as it is serviced and repaired, etc. This process enables the value of MES traceability to be retained locally, and key requirements for the elimination of counterfeit activity in the supply chain fulfilled, in a cost-effective and practical way that assures privacy.

Conclusion

We all must face the fact that some change is needed, as we cannot continue to suffer escalating material quality and counterfeit risk. We also cannot tolerate the exposure of our IP and we must address something that other parties are threatening. To make the breakthrough, however, requires that all parties in the industry acknowledge the problem, and start to play their role. Suggesting changes with new procedures and technologies is never the easy option, but the consequence of not doing so multiplies the magnitude; even worse, it is just not felt immediately. As with climate change, the future of the supply chain is in our hands. **SMT007**



Michael Ford is the senior director of emerging industry strategy for Aegis Software and an I-Connect007 columnist. To read past columns or contact Ford, [click here](#).



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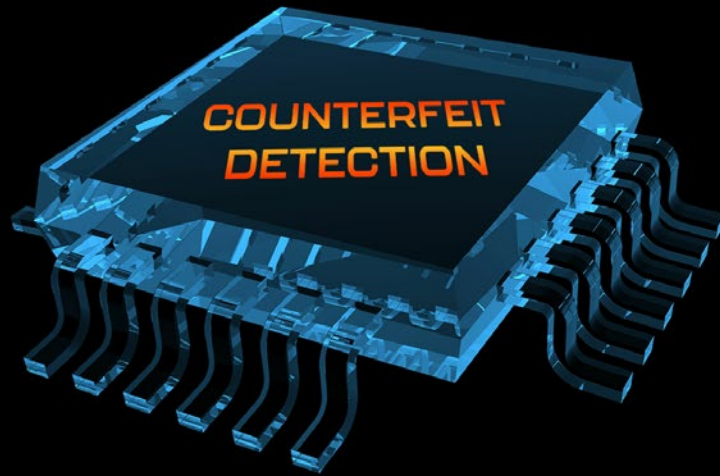
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The Under-Reported Story of the Semiconductor Shortage: Counterfeits

Feature Article by Bill Cardoso
CREATIVE ELECTRON

We are all aware of the semiconductor shortage. While chips are still in short supply, there's been no shortage of news stories about the chip shortage. If media coverage of the problem could actually generate chips, the shortages might well be over. We've all seen stories about exploding demand for consumer electronics, factories shuttered during COVID-19 lockdowns, supply chain bottlenecks, a dearth of raw materials, and even drought, all trying to explain why we can't get enough of these critical components.

What's been lacking in all this news coverage is the age-old problem that accompanies shortages of just about anything, which is the counterfeits that inevitably rush to fill the void. In the case of counterfeit semiconductors, whether they are refurbished, re-marked, fakes, working or not, or even just a fake online storefront, the resulting fraud, and the damage it causes mount as the chip shortage persists.

Under normal circumstances, customers can purchase components directly from the manu-

facturer or franchise distributor. Chain of custody is easily tracked, and authenticity is rarely in question. During supply chain disruptions like we are experiencing now, many companies must look for components on the "gray market" from third party distributors. This is where the opportunity for counterfeits to corrupt inventories starts. Chips purchased through these channels can look perfectly legitimate, and many of them will be, but there are those that, on close inspection, can reveal a completely different component on the inside. The COVID-19 pandemic, with factories shut down or slowed, combined with its huge spike in demand, created the perfect environment for counterfeiters to flood the market with fake chips.

Third party independent distributors are not all created equal. Many run highly professional and trusted operations, and they fill an important need in our industry for both finding a home for excess inventory and as sources for obsolete components. Some of the best of these gray market distributors are members of IDEA (Independent Distributors of Electronics Association) and ERAI (Electronics Resellers Association International), organizations



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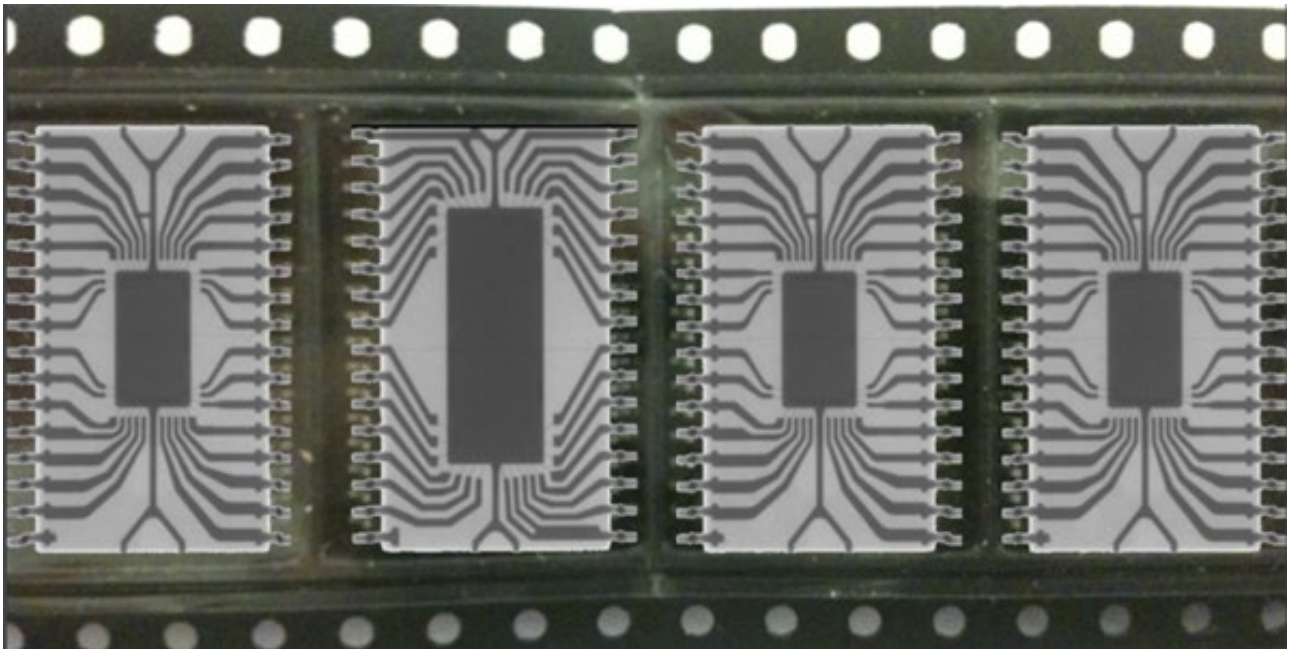


Figure 1: Visually identical on the outside, X-ray easily identifies internal differences.

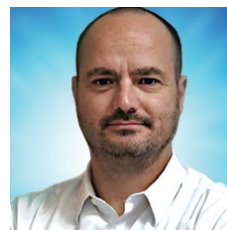
that hold their members to high quality standards and practices, including screening for counterfeit parts.

There are, unfortunately, many unscrupulous dealers who are perfectly happy to pass on fake components, and then just change their DBA and web address like a pit crew changes tires. Legitimate resellers will have strict practices for evaluating the authenticity of components, and purchasers of chips should too. If you don't already have one in place, this would be a great time to implement a counterfeit detection program. While the chip shortage will end, it will likely persist through 2022, and maybe a bit beyond. Counterfeiters, on the other hand, will persist forever.

So, what advice does an X-ray expert have when it comes to the problem of counterfeit chips? First, carefully vet all new suppliers. Don't let the limited availability of parts and the pressure that creates cause you to make an exception to your normal evaluation process. Second, X-ray them (the parts, not the vendor), of course. The self-serving nature of that advice aside, X-ray imaging makes an important contribution to authenticating electronic components. X-ray can reveal internal connections within chips that can be compared to

documentation or an image of a known good component. Sometimes the inspection can be as simple as identifying a missing die. Other times, inspection may only indicate a subtle difference that renders a part suspect. X-ray, because it is non-destructive, is also one of the few counterfeit interdiction techniques that is suitable for 100% inspection. When combined with AI software and automation, X-ray inspection of components can even be fully automated.

The semiconductor shortage has been a headache, to say the least, but it won't be the least of your headaches if you have a close encounter with counterfeits. I encourage you to utilize the resources of organizations like IDEA and ERAI in developing best practices and connecting with quality distributors. Likewise, my inbox is always open if you have questions about how best to avoid the scourge of counterfeits. Stay vigilant, my friends. **SMT007**



Bill Cardoso is CEO of Creative Electron and an I-Connect007 columnist. To contact Cardoso or read past columns, [click here](#).

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Sunstone **Growing** With Supply Chain Strategies

Feature Interview by the I-Connect007 Editorial Team

Barry Matties and Nolan Johnson talk to Sunstone Circuits' Matt Stevenson, Kelly Atay, and Dawn DelCastillo about the current supply chain challenges and how they are adapting. They also share insights on market conditions.

Barry Matties: Let's jump right into the supply chain. What sort of changes are you making and how are you helping your customers through the supply chain challenges?

Dawn DelCastillo: We're finding more ways to help our customers through some of the challenges, and not just parts, but the overall supply chain issues. Can we help find parts? Can we do something else for you? We are being more of a full-service supplier.

Matties: Have you noticed the ways your customers are working through this?

Matt Stevenson: We have heard several interesting approaches. There's one customer who

has five revs of a single board, for example, and they will order a rev depending on which parts they can get.

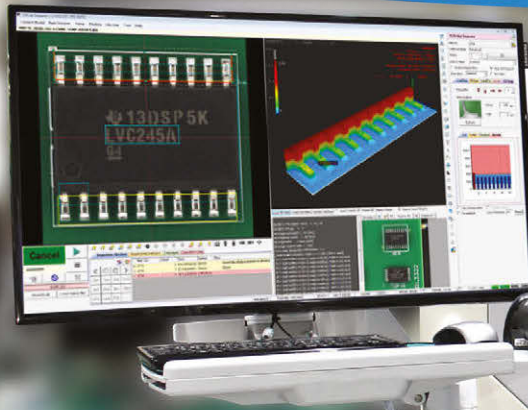
Matties: Are you seeing your overall customer base grow?

Kelly Atay: Yes, in fact our number of new customers is increasing recently. There was a lull in that metric throughout much of 2020 but we are starting to see it come back.

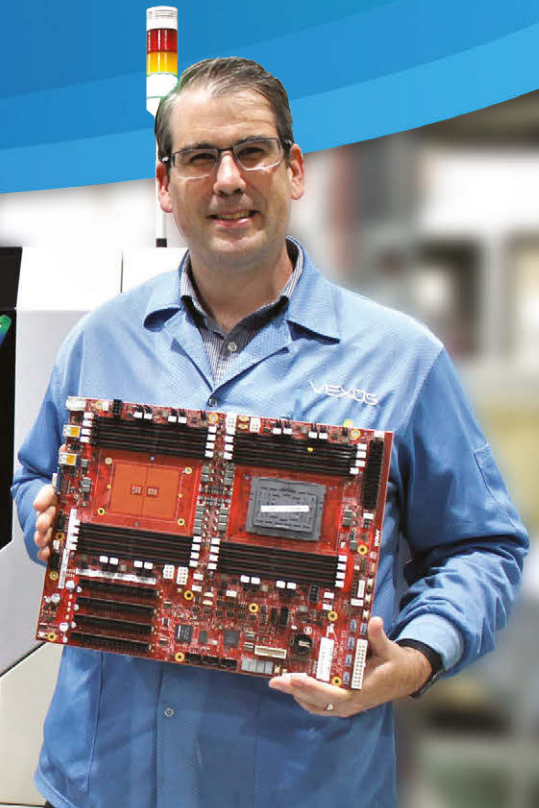
Matties: Does the reshoring mentality influence new customers?

DelCastillo: Reshoring is a trend we've been watching, and we've done some marketing around it. I think now is the time to capitalize on that. There are plenty of people out there who are exhausted from the challenges of doing business offshore these days, and many of them are willing to bring their designs back to the United States to avoid these unpleasant challenges.

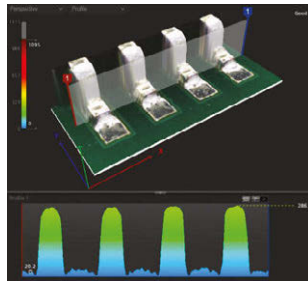
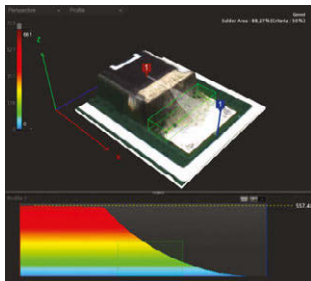
Matties: It feels that the supply chain issue, especially with ships stacked up at the ports, is



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Matt Stevenson

just accelerating the need because now people realize it's not price alone that you must deal with when offshoring. There are a lot of issues.

Stevenson: We are feeling optimistic about 2022. In general, we think the economy is doing well. Electronics is doing very well, even though parts will still be a problem through 2022, into 2023, and beyond. So, until the supply chain with parts gets dialed in, it will be a struggle, but it will continue to improve as everyone gets more comfortable doing business in today's environment.

Matties: That supply chain squeeze is felt through increased demand. At some point, where they can't justify the price, perhaps they go to China or somewhere else. But where is that point?

Stevenson: It depends. Some customers believe we've already exceeded that price point. For others, there are grumblings that we are getting close, while still others pay whatever they need to in order to keep their suppliers domes-

tic. It is really a balancing act by these purchasers with cost, lead-time, availability, and customer service.

Matties: What are you doing to lower your costs? Obviously, labor and materials are the two big costs there.

Stevenson: With every capital purchase that we have had since last year, we have looked at ways to build in any kind of efficiency into the process through automation or material handling. By doing so, we have less need for labor, especially for the menial, mundane jobs. This way, we can reallocate people to do something that requires more skill. In general, labor is going to be a problem for American manufacturing; it may get to the point where we will not be able to find what we need.

Even more than finding the labor will be retaining those employees. We're not going to have 20-year employees anymore. We will be lucky to have a quality, hardworking employee who wants to work five days a week for two or three years. We need to understand that benchmark, speed up our training, and find even more ways to automate our product.

Nolan Johnson: You're talking about moving the specific knowledge of how, the art of that, if you will, into your systems so that it's not with your operators anymore.

Stevenson: Right.

Matties: It's the smart factory mentality, but we know smart factories aren't a flip of the switch. As you look at the potential of smart processes, what would be the most important area to automate right now? What process do you have where you could take out the human aspect?

Stevenson: We're concentrating on our mechanical operations problems right now, mainly drill and fab. Any time that they must make a choice, such as on a cutter size for a rout pro-

gram or how high for a drill stack, there's the chance of making a wrong decision.

Matties: What are you doing to offset or correct that?

Stevenson: We are concentrating on software-type solutions—taking the choice out of the process and creating a more repeatable and quality output. As long as they follow what the software has documented, there should be less opportunity for a wrong decision.

Matties: The big challenge is how to come in and fully automate the system like that. How can it be done? How much scrap or frustration do you experience before you just decide to do it?

Stevenson: Right, but with automation, you can build a whole lot of scrap pretty quickly if you do not have the right checks in place to identify that the process has deviated from the norm. Engineering controls that keep an eye on the process in real time is another very important piece with the automation.

Matties: You still need to have your rules in check.

Stevenson: Exactly. We take out the human error and put the main things on the maintenance staff to make sure the PMs and SPC are done.

Johnson: Can you see automatic board handling solutions on the way?

Stevenson: They make a lot of sense, but with our constraints in the building—and every square foot is valuable real estate—it is tough to just add equipment. It must be strategically done so as to not leave out something that's needed. We're seeing we need to have a larger footprint on a deburr machine for better rinsing and better scrubbing. Everything is getting



Dawn DelCastillo

bigger, especially if you put automation at the ends of them now.

Johnson: Do you see changes in customer quote behavior? What seems to be the customer priorities?

Stevenson: Their priorities are price, delivery, quality, and reputation.

Atay: And now parts.

Stevenson: Because of our business methods, I think it's just more an effect of the internet model, in that there are so many competitors on the internet now. They're not being proactive and pricing up parts before they design. The thinking seems to be, "I'm going to design this part, and then I'm going to figure out how to get it made."

Atay: They're not designing to a fabricator and they're not going to find who has the best.

Stevenson: Everybody probably has an internal algorithm for what's most important to them

for each design. It may be that this time I'm worried about price and next time it's going to be lead time.

Atay: Plus, you've got design teams who are designing the boards, and then they're sending them off to the purchasing department which is shopping around for price.

Matties: We hear so many times what a mistake that process is.

Atay: It makes it tough, communication-wise.

Matties: It makes it tough for optimal design, for DFM, because if they're talking to you and they know the capabilities of this shop as they're designing, it's a win for them.

Atay: What's our percentage of orders that go on hold because it was placed incorrectly?

Historically, about 18% of all orders go on hold for a variety of reasons.

Stevenson: Historically, about 18% of all orders go on hold for a variety of reasons. It's come down a bit in the last 18 months. We've started tracking that as one of our key metrics and working to reduce the holds.

Matties: When you say "on hold," is that when your engineering team has to pick up the phone and ask a question? Is that considered on hold?

Stevenson: We have a couple options in the order process where the customer can hold for a review before going into production or they call us and request to update the file set. All of those get counted, whether it's customer driven, customer support driven, or our CAM

team finding something that doesn't match, and so forth.

Fab notes have always been one of those things. The fab notes don't meet the order form selections that they have made, whether that's a purchaser not understanding or just canned fab notes from years ago. Or they don't need to follow those notes in prototype but will in production. Incomplete file sets are one of the biggest banes of our CAM team. They'll get file sets missing solder mask layers, drill files, copper layers, you name it; and missing files where they ordered a four-layer board but there are six layers contained in their ZIP file.

Atay: And usually the ones like that are the ones that need the boards the quickest. That's basically why it happened because they were in such a hurry.

Johnson: You mentioned that you're moving more toward ODB++ with your customers. Is that helping mitigate the problem?

Stevenson: Not necessarily. If they make that order incorrectly, then it typically doesn't matter if it's Gerbers or ODB++. We are working toward updating our online quoting process to actually review the files and make order form selections from the data. This should speed up the quoting process and improve the accuracy of the quotes.

Johnson: Plus, the chance to flag that something is missing.

Stevenson: Exactly, right up front before it becomes an order to put on hold. You put that back in the customer's court: "Oh, I need to get my solder mask layers in there if I want mask on this." I'm hopeful we'll be moving to a model like that sometime in the next year.

Matties: Do you see an increase in web orders or are you seeing more people wanting direct contact with your team to place an order?

Stevenson: Seems like about a year ago when we were three, four, five, six months into the pandemic that there was a strong move away from the e-commerce type model and toward calling in.

Matties: People had more time on their hands, right?

Atay: They also found it quicker to find out if we're still open. Are you there? Is somebody working? Are you running the boards? It was interesting, because our support team would say they've had more conversations with people not only talking about boards but how we're doing in the pandemic, or what the outlook is for us.

Johnson: Where do you see the technology, the capabilities of production, going in the next 12–18 months?

Stevenson: We're putting pieces in place to move toward a more HDI type model. Adding or improving our high aspect ratio plating process, via fill, controlled impedance, and finer line capabilities are in process and will be getting us closer to the that goal.

Matties: Have there been any significant surprises in those capabilities' conversations with your customers?

Stevenson: There are certain segments of the business where they're going smaller and faster all the time. We hear, "We want cost effective, we want high yields, and we want something that's going to work every time." That's where we're going to continue to build toward.

Johnson: Are there new markets that you are targeting?

Stevenson: There are a few that we're focusing on. I would really like to see our RF business double in the next 18 months.



Kelly Atay

Matties: You said double? It's a huge market.

Stevenson: It is.

Matties: And it's definitely a growing market, right?

Stevenson: It's one of the few markets we're in where parts don't seem to have as big of an issue. The circuit design is where most of the magic happens and we're seeing increasing success with it; our RF quoting guy is busy as can be.

Matties: If you're going to double RF sales, what's your strategy?

Stevenson: Step one is making sure that manufacturing is dialed in for yields, that material is available/stocked, that we're hitting our lead times, and that we're hitting our quality goals. We're going to allow people to quote it online. That's the traditional Sunstone answer, and I think we'll get there in the next year to 18 months.

Johnson: You've been developing expertise with the exotic materials?

Stevenson: We've had a lot of success stories as of late, but in some of the hybrid builds, which we had shied away from for a long time.

Matties: More demand for that?

Stevenson: More demand, and customers are also willing to pay for them. They understand that it's not easy and that the materials are expensive. But when they're able to condense digital in a RF type product into one board, it cuts down their footprints and costs.

Matties: What's the challenge?

Stevenson: For us it is getting to the point where it's the same as everything else, but it flows through the shop in a similar type of manner. It's more of a fear factor for the operators who don't know it. They hear that it's difficult and challenging and, for a lot of them, they're saying, "I don't want to touch it. I don't want that scrap on me. That's expensive material, expensive orders, and I don't feel comfortable. Some-

body else can do it." Even experienced operators who haven't really had their hands in it are leery of it. More exposure and cross-training is helping us to remove that fear.

Matties: If it's going through your manufacturing process, what's their concern?

Stevenson: With the RF, there are still a lot of manual setups. Every panel size is different. We may not have the same tooling, the hard tooling, like we did with our standard FR-4 panels. We've been optimizing how to make a jig so we can run it like normal. We really try to put in those fail-safes.

Matties: So, the manual setup is what they're most concerned about because the process is the process once it's set up, right?

Stevenson: Exactly.

Matties: Thanks for sharing your thoughts with us today, we greatly appreciate your time.

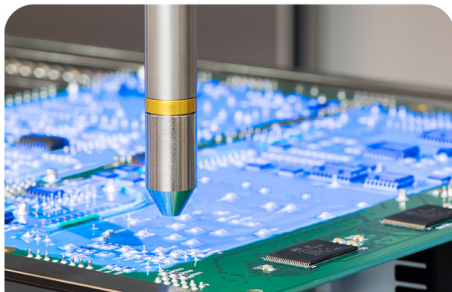
Stevenson: Thank you. SMT007



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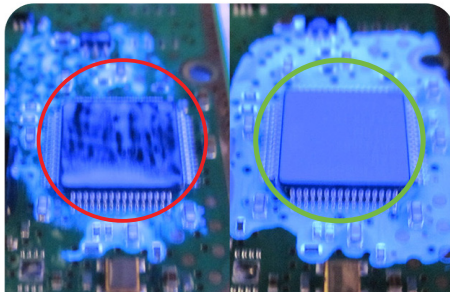


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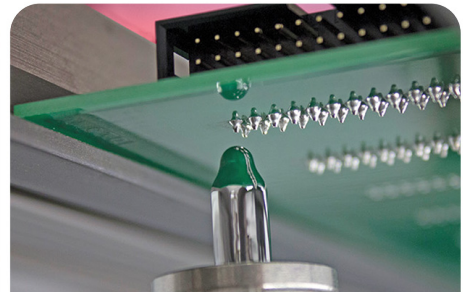
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Don't Hit the **Snooze** on Cybersecurity

Feature Article by Divyash Patel
MX2 TECHNOLOGY

I have good news for small manufacturers looking for ways to stand apart from the competition: By delaying the launch of the Cybersecurity Maturity Model Certification (CMMC), the Department of Defense (DoD) may have done you a favor. They've handed you a golden opportunity to zig when everybody else is zagging.

If your competitors are small- and mid-sized businesses that supply the DoD, their concerns aren't too different from yours. They're probably aware that CMMC requirements are coming, but that's an IT issue, so it's not a top-of-mind concern—especially compared to labor shortages, supply chain issues, inflation and so on. They know that cybersecurity is important, but it's tangential to operations—like having locks or alarms on the building. Sure, this CMMC stuff is coming, but it doesn't seem urgent. Whenever a deadline gets close, there is another delay. It is as if there was a regulatory

hurricane forming somewhere out in the open ocean; it might be headed our way, so we will keep half an eye on it and hope it dissipates or turns before making landfall.

As everyone knows, waiting until the hurricane has knocked out a good part of the local power grid is a poor time to go shopping for a generator.

While the DoD works out the details and timing of CMMC 2.0, its basic, foundational elements are easy to predict. As Bob Dylan put it, "You don't need a weatherman to see which way the wind blows." Eventually, and well before the deadline, CMMC requirements will make their way into more and more federal contracts. Clearly, those companies that have moved toward compliance already will have a much easier time certifying, but compliance is not the only business benefit to cybersecurity. As strange as it might sound, certification itself might be the least important—for now, anyway.

Your advantage will come from simply understanding, documenting, and establishing



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- Where and how often is your company data backed up?
- How would the company access and deploy the backed-up data if you needed it right now?
- Who in your organization has access to what?

How would you answer them?

Not long ago, I asked these questions to a new client—a good-sized manufacturer. The leaders in the room weren't sure, so I excused myself from the meeting, called my office and had one of our tech team meet me with an external hard drive. We made immediate back-ups (snapshots) of the critical systems. Now at least we could all be certain that the client had a moment-in-time back-up.

Pausing the meeting sounds like theatrics, but it was not. In fact, if you answered “no” or “I don't know” to any or all of them, I suggest you stop reading this right now and find out. It's that important. Why? Because the future is uncertain, and accidents happen.

Awhile back I got a call at 6 a.m., which almost always means trouble in my world. The client said it was the strangest thing, but there was a lock on all their files, and they couldn't open any of them. In those days, ransomware was a new threat and the anti-virus tools were in catch-up mode. We quickly determined that it was an actual breach, and their data was being held hostage for X amount of dollars (this was before cryptocurrency). We'd automated nightly back-ups for them long before the attack, so within 15 minutes or so we were able to get them back online and running with minimal interruption.

True, you might never be the victim of a cyberattack. But unfortunately, hackers are not the only threat to your data or your business. How about something like this: Your operations grind to a halt for hours and hours because a server with all the critical data tied to it crashed. With a good back-up, several hours of down time can become a few minutes. Also,

your offices and manufacturing facilities are just as vulnerable to fire, flood, or misadventure as any structure. Sure, you carry insurance for property damage, but data loss is a whole different animal—yours and your customer's. A back-up can be the difference between survival and bankruptcy, so it's a plenty good reason to stop a meeting.

Next, you must ensure the key people in your organization know how to access the back-up. If you are the only person who knows where the back-up is or how to contact your IT service provider, then God forbid you have a health emergency or a debilitating accident. If that key IT resource is not you, but an employee, what happens if that person disappears?

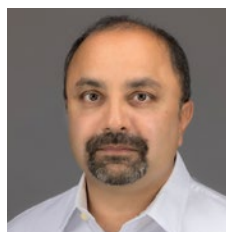
Also, make sure that your back-ups are run and tested regularly. Verification doesn't require much effort: just access a document or two. If they open properly, you're likely good to go.

Lastly, document your back-up information, and communicate it to the key people in your organization so they can act in an emergency.

You might operate for another 50 years and never be the victim of a cyberattack or an accident. In fact, I hope that's the case, but hope is not an adequate business continuity strategy.

Right now, as you read, do you know where all your mission critical software and documents (including email attachments) are? Do you know who has access to any or all of them? Do all your people know how to keep them safe?

You can call answering these questions “preparing for CMMC” if you like. I call it good business practice. **SMT007**



Divyash Patel is president of MX2 Technology.

Humidification for **ESD Control** in PCB Rework/Repair

Knocking Down the Bone Pile

by Bob Wettermann, BEST INC.

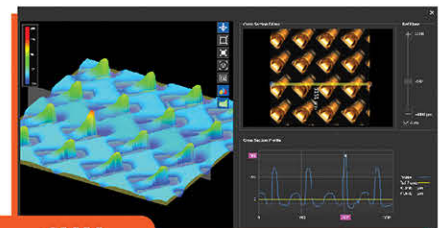
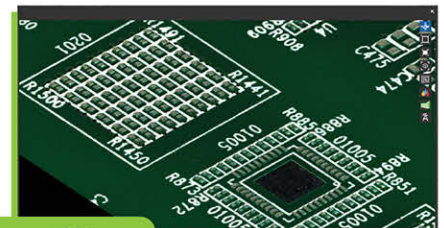
The amount of charge generated in an electronics rework and repair area is affected by a variety of factors, including but not limited to, the materials used and the amount of frictional interaction between materials, as well as the relative humidity of the environment. During the cold winter months in northern climates when the heating systems dry out the plant air and the relative humidity falls, higher electrostatic charges develop, all other things being equal. Lower humidity can increase the number of ESD events, so theoretically it stands to reason that keeping the rework area at higher humidity levels will reduce the chances for charged-induced damage to components.

To get to the “right” relative humidity level in the PCB rework/repair area, several variables need to be taken into consideration. The electronic components being reworked need to fall within their specified RH operating range. In addition, the rework processing steps, such as the length of time the repair epoxy takes to cure or the amount of time the conformal coating material needs to cure, are some of the process steps which will be impacted by the humidity level. Too high of a relative humidity level may result in unwanted quality problems such as corrosion, hand soldering defects, and unwanted MSD damage to moisture sensitive devices. Solder paste will not have the



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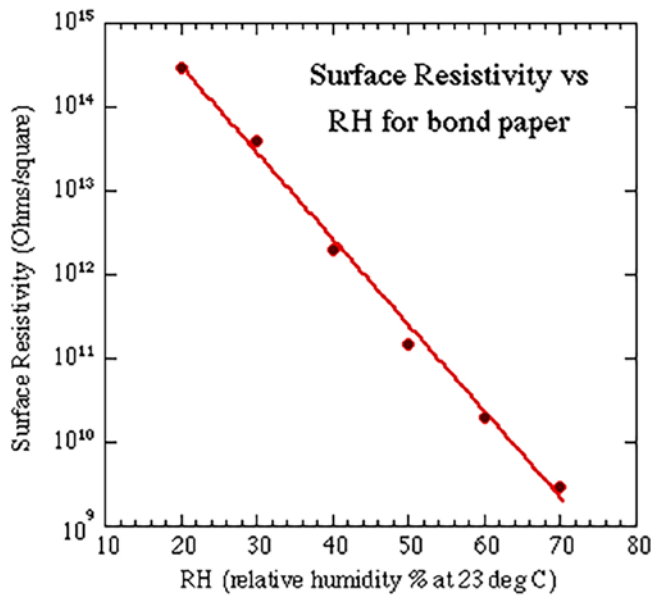


Figure 1: Example of relative humidity vs. surface resistivity for bond paper.¹

right printing and slump properties at higher relative humidity levels. This may impact paste printing rework processes such as leadless device or BGA component site printing. Typical relative humidity ranges for the PCB rework and repair area are between 30-60%. With a 40% relative humidity level, surface resistance is lowered on floors, carpets, table mats, and other susceptible areas (Figure 1).

Increased humidity levels can be accomplished through humidification systems. Humidifiers add water vapor to the air, which forms a thin protective film on surfaces and serves as a natural conductor to dissipate electrostatic charges. When humidity levels drop below 40% RH, this protection disappears, thereby increasing the possibility of damage or defects within electronic components and devices.

There are numerous risks to operating the PCB rework and repair area when the air is at low relative humidity. If any existing static monitoring or control systems fail (e.g., a ground connection becomes disconnected, operators missing a wrist strap, foot grounders, or grounding mats will have had coating spilled on them making them insulating surfaces), there is no backup to controlling static charge-

ing impacts. Secondly, any reworked board which is not touching an ESD-safe surface or handled properly by an ESD-protected rework technician can be damaged. In many cases, controlling the humidity levels is easier than ensuring that non-charge-generating material does not enter the workspace. These are some of the risks to operating the rework area in a low humidity environment.

Adding humidity to the rework area cannot replace a robust ESD control system just by employing humidification, rather it may be used in conjunction with such a control program. Such a program should contain the following elements:

- A training/retraining program of PCB rework/repair technicians
- Operators wearing wrist straps when handling ESD product
- A static dissipative floor
- All ESD benches identified as such and properly connected, each with its own connection to ground
- Operators wearing dissipative footwear
- Operators wearing ESD-safe smocks correctly
- Charting/monitoring of the relative humidity along with monitoring alarms
- Keeping insulators out of the rework/repair operating zone per EOS/ESD 2020 requirements



Figure 2: Typical humidification nozzles. (Source: Condair Corporation)

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- An audit system in place to monitor all the above, with sufficient frequency for each method to ensure compliance and effectiveness

Air humidifiers cannot replace these and other ESD control measures. Adding moisture to an environment where two materials of differing electrostatic potential come into contact and separate (like Kapton™ tape being pulled off a dispenser) will not stop the charging from occurring. However, adding moisture to the environment will reduce the number of ESD events. No humidity control system will prevent this.

Commercially available industrial humidification systems have a variety of features as part of their design. The systems designed for electronics assembly are typically closed-loop systems where moisture is measured, and the level is controlled. The water used passes through hygienic multi-stage filtering systems including UV lighting. This helps ensure that the water vapor being dispensed does not damage machinery and electronic assemblies. Many

systems have line flushers to purge out impurities from time to time.

At the end of the day, in the deep of winter in northern climates, the heating systems employed in the PCB rework area will dry out the air and move the relative humidity to low levels. This in turn will allow ESD events to occur more readily, putting pressure on the robustness of the ESD control and monitoring program. While humidification systems are not required in all cases, their use in certain conditions may be warranted. **SMT007**

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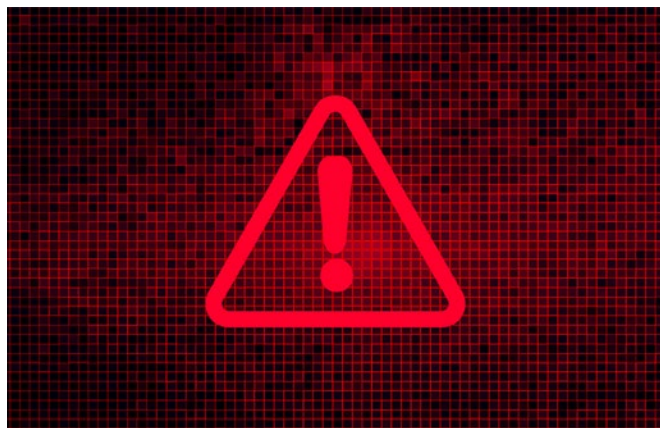


Bob Wettermann is the principal of BEST Inc., a contract rework and repair facility in Chicago. For more information, contact info@solder.net. To read past columns or contact Wettermann, [click here](#).

Lessons Learned from a Cyberattack

"With ransomware—it was built to not only infiltrate our network, but also determine the types of PCs we had in the shop to do the most damage. It wreaked havoc across our facility."

Two years ago, [Prototron was hit was a ransomware attack](#) that brought the business to a screeching halt and forced a full rebuild. The cyberattack originated in the Redmond, Washington facility, but branched out and hit multiple PCs and infrastructure in their Tucson, Arizona facility as well.



"Because of the extent of how this software works and how advanced it was, we had to do a 50,000-foot view of shutting everything down and doing a complete rebuild," said Eric Cormier, a cybersecurity consultant who worked with Prototron. "We couldn't take what we had that was still working and reuse it. It did some serious damage."

Now, two years later, Prototron president Dave Ryder looks back on what happened, the process to rebuild, and lessons learned moving forward. [In this brief interview](#), he expresses his thoughts on the true cost of a cyberattack, from lost files to restructuring new orders, and the possibility of just paying the ransom to get everything restored. One important tip: Make sure to check your insurance policy.

[Click to listen to Dave Ryder's update.](#)



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Supplier Highlights



Lite-On Included on the Dow Jones Sustainability Indices ►

Lite-On Technology Corporation is pleased to announce that it has been listed in both the “World Index” and the “Emerging Market Index” on the Dow Jones Sustainability Index (DJSI). This marks Lite-On’s 11th consecutive year of inclusion since 2011.

Optomec Establishes 3D Printed Electronics Technical Advisory Board with Top Industry Leaders ►

Optomec, a leading manufacturer of solutions for 3D Printed Electronics and 3D Printed Metal, announced the formation and meeting of its Printed Electronics Technical Advisory Board (TAB).

Aurelius Technologies Berhad Launches Prospectus for Main Market Listing ►

Aurelius Technologies Berhad (ATech), a provider of electronics manufacturing services for industrial electronic products enroute to a listing on the Main Market of Bursa Malaysia Securities Berhad (Bursa Securities), is pleased to announce the launch of the Company’s prospectus for the initial public offering (IPO).

Amtech Reports Q4, Fiscal 2021 Results ►

Amtech Systems, Inc., a manufacturer of capital equipment, including thermal processing and wafer polishing, and related consumables used in fabricating semiconductor devices, such as silicon carbide (SiC) and silicon power devices, analog and discrete devices, electronic assemblies, and light-emitting diodes (LEDs), reported results for its fourth quarter and fiscal year ended September 30, 2021.

New Factory to be Constructed at TAIYO YUDEN (CHANGZHOU) ►

TAIYO YUDEN CO., LTD. will construct a factory on the premises of TAIYO YUDEN (CHANGZHOU) CO., LTD., and start producing multilayer ceramic capacitors in 2023.

Research and Development Leads to Biogreen Coatings ►

Phil Kinner of Electrolube, shared a preview of the company’s newest products that the company planned to launch at the show in Munich. “This is the first show that we’ve been to in a while, and we have a couple of new products we are launching,” said Kinner. “One is a thermal gap filler, designed in China by our Chinese team with a thermal conductivity of 6 watts per meter K, which is really decent. We also have a new conformal coating with a high degree of bio-renewable source materials.”

LeeMAH Electronics Selects Juki’s G-Titan Screen Printer ►

Juki Automation Systems (JAS), Inc., a world-leading provider of automated assembly products and systems and subsidiary of Juki Corporation, is pleased to announce that LeeMAH Electronics purchased a new G-Titan Screen Printer with auto dispensing.

New BlueWave FX-1250 LED Flood-Curing System from Dymax ►

Dymax, leading global manufacturer of rapid-curing materials and equipment, introduces the newest addition to its line of renowned light-curing systems, the BlueWave FX-1250 LED flood-curing system.



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Getting the **Most** Out of IPC APEX EXPO 2022

Article by Dan Beaulieu
D.B. MANAGEMENT GROUP

It's going to be a big deal for many of us to attend a large trade show like IPC APEX EXPO again. In fact, this was the last show I attended before locking down in early 2020—and that feels like a decade ago.

With that in mind, going to IPC APEX EXPO this month will probably be the most important and valued trade show experience we have had in a very long time. We should all be doing everything we can to make this trade show experience as beneficial as possible.

Here are some tips on how to make this show, as well as any other show you attend, a meaningful experience so that you will be sure to get a great return on your investment.

- 1. What are your goals?** What do you hope to accomplish? Why are you exhibiting at this show? Why are you spending all that money? Make sure you have the right answers to these questions before you even think about signing up for a trade show.
- 2. Develop the objectives.** Are you there to sell equipment? Is this the right audience? Will the right decision makers, be there? Are you there to sell your services to other exhibitors, or are you there because you're worried people will think you have gone out of business if you're not there? (This is a terrible reason to exhibit at a show, by the way). Are you introducing a new product and want to deliver a white paper at the show? (This is a great reason to attend a show.)
- 3. Develop a comprehensive plan** for when you and your team will be at the show. This means developing a daily schedule of who will be tending the booth and the times they will be there. But the schedule is not only about booth coverage. You also need to plan who will attend the sessions and why they will be attending them as well.
- 4. As far as booth coverage,** make sure you have salespeople accompanied by technical people so that together they can handle all the inquiries from the right booth visitors, especially those ad hoc meetings from interested people who are just stopping by to learn more. Many a sale has resulted from these chance meetings
- 5. Leave room for booth visitors.** Don't have so many of your own people and their friends in the booth that a visitor is made to feel like they are crashing a party. In short, make room for the right people you want to meet and sell to.
- 6. Be prepared with collateral material.** Have well-written print material to hand to your visitors. If your product is small

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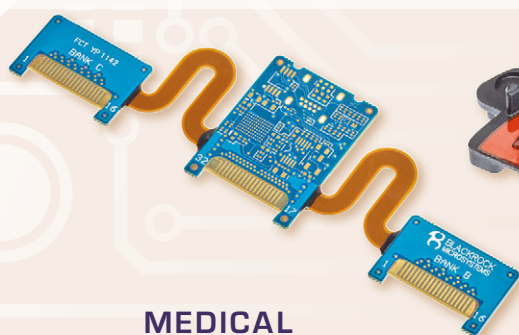
Membrane Switches

Plastic Moldings

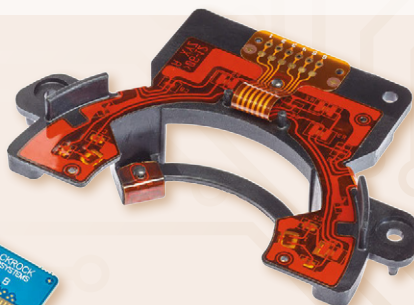
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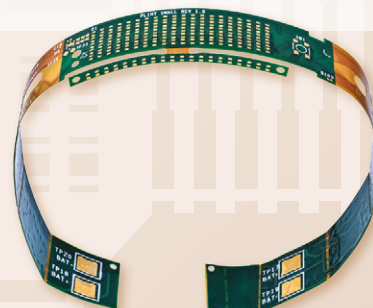
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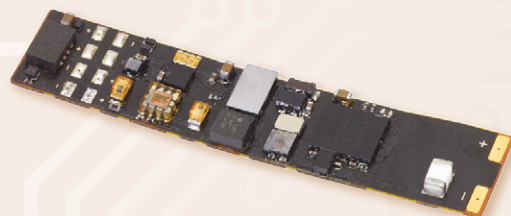
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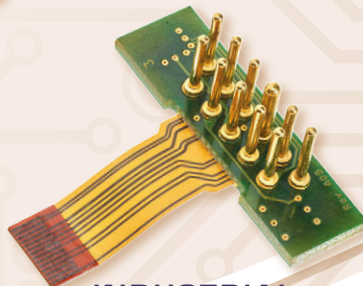
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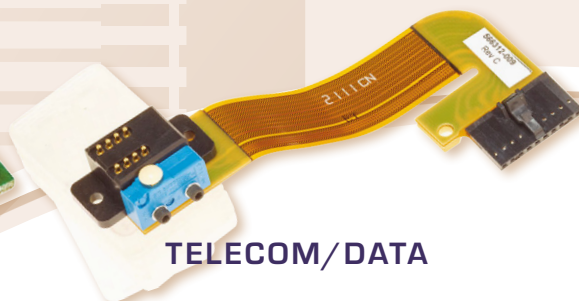
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enough (like PCBs), make sure you have a good array of product samples to touch, feel, and learn about. The better these are displayed, the more potential customers will be impressed by them and with your company.

7. Schedule business meetings. A large IPC APEX EXPO is the one time of the year when, chances are, everyone you want to meet will attend. You will all be in San Diego at the same time for the better part of a week. This is a great time to get together with customers, partners, reps, salespeople, and even competitors. Use all your time wisely, not just the classroom time or the exhibition time, but all the time. Plan breakfast, lunch, and dinner meetings. Plan on meeting the right people for drinks. Make every meal and minute count. This is an expensive exhibition in one of the most expensive cities in the country; you cannot afford not to make use of all your time in San Diego.

8. Don't wing it. The opportunity is too serious. Plan and set up meetings well in advance. Develop a planned schedule of appointments before you even arrive in San Diego. Create a log on your calendar of who you will meet with, when and where you will meet them, their contact information, why you want to meet with them, and what you want to accomplish in this meeting. I cannot emphasize this enough.

9. Tell people you are going to be at the show. Send out press releases to the media. Send out email invitations and newsletters to your customers and potential customers letting them know that you will be at the show and where your booth is located. I strongly suggest that you give them a reason to come to your booth. Offer a free consultation, a free sample, or a free demo. Make the right people want to come your booth.

10. Use the media at the show. Take advantage of any opportunity to talk with the media. If someone like I-Connect007 offers you an interview, take it. If they don't, then ask them for one. This is critical. Get as much publicity as you can from the media outlets at the show.

11. Create a follow-up plan. After all, the real reason you are at this show is to mine the right contacts. Take notes of what they are interested in and the questions they have asked. Then refer to them in your follow-up emails, letters, and phone calls. Speaking of follow-up, make sure it's done promptly. You should send the prospects you meet an email that very evening and then a longer, more comprehensive follow-up package within a week of meeting them. This plan should also include adding the booth visitor's name and contact information to your company database. Finally, distribute those contacts to your sales team, giving them the names/leads of those people and companies in their territory.

12. Do a post-mortem within 48 hours of leaving the show. Make a list of what worked and what didn't work. What should you do next time? Should you attend again? Is there anything you did not bring that you should have? This is an important and often overlooked point.

And in the spirit of under promising and overdelivering, here is one more to make it an even bakers' dozen.

Have a great time!

See you in San Diego. SMT007



Dan Beaulieu is president of D.B. Management Group and an I-Connect007 columnist. To contact Beaulieu or read past columns, [click here](#).

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In anticipation of this month's IPC APEX EXPO—and to give readers a glimpse into what they can expect at the show—we asked demonstrators to provide highlights of their Factory of the Future presentations. And boy, did they deliver! In this section, you'll find overviews from five of the 13 companies represented in the Factory of the Future Pavilion, located at booth 1701, connecting you with the companies and the technologies reshaping the face of electronic manufacturing.

Factory of the Future, **Today** With Aegis' FactoryLogix Platform

Article by Michael Ford
AEGIS SOFTWARE

Smart Industry 4.0 in electronics manufacturing is coming alive, thanks in no small part to contributions made by IPC members to "Factory of the Future" standards, such as IPC-CFX. Smart manufacturing is inclusive of many innovations that help optimize and automate Lean, flexible, defect-free manufacturing, but is also a crucial element in the ability to maintain the security of manufacturing operations and Intellectual Property (IP).

These two equally important aspects of digital manufacturing are highlighted in demos and discussions using our FactoryLogix single platform, IIoT-based MES solution in our booth at the Factory of the Future pavilion.



Michael Ford

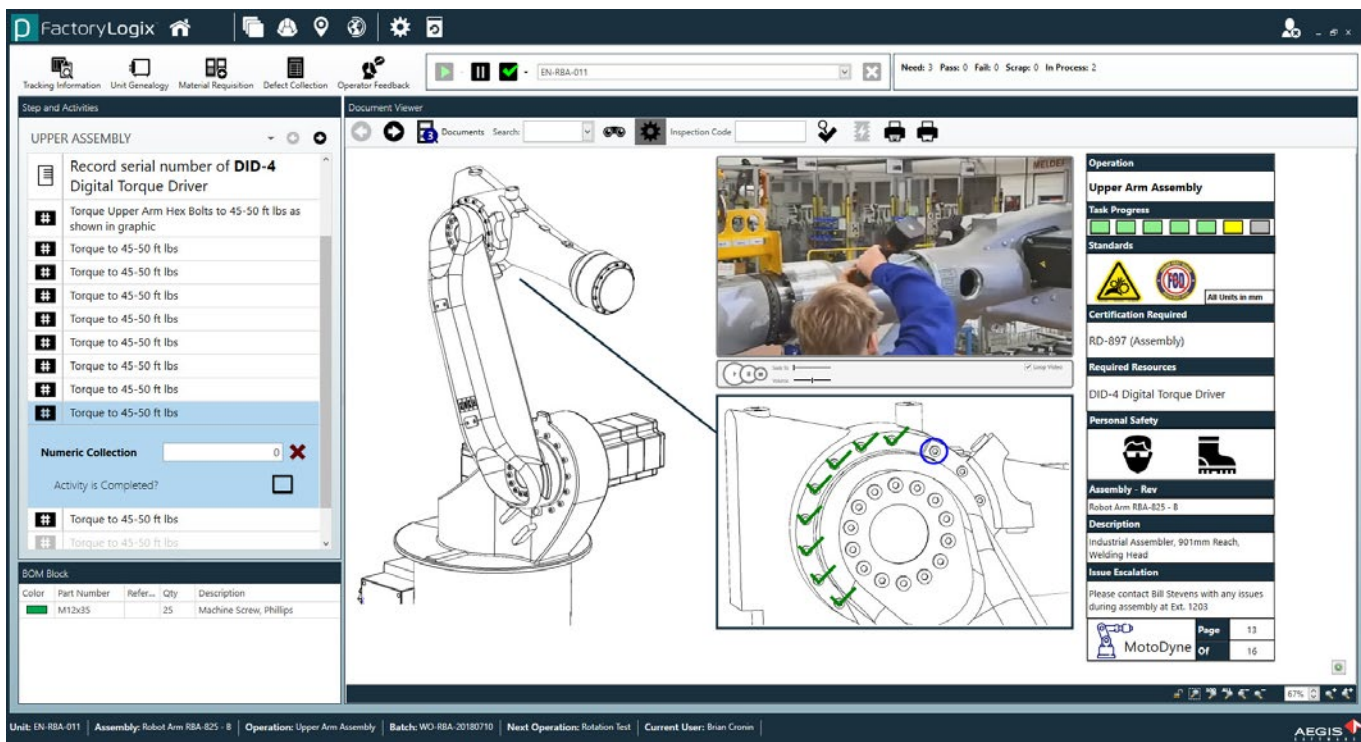
Smart Industry 4.0 Right Now

Aegis FactoryLogix was designed from the ground up using modern, innovative technology, anticipating the need for a single-platform, IIoT-based solution, promoting interoperability between key enterprise solutions, shop-floor machine-based automation, and Human 4.0 innovation. With IPC-CFX providing a "plug and play" communication language, representing the "last interface anyone needs," as well as Aegis' extensive library of interfaces, ERP integration and smart operator cockpit, FactoryLogix brings complete visibility and control to manufacturing execution, with advanced quality and Lean material management tools, supporting every type of manual and automated discrete manufacturing assembly operation, including SMT, with

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Software automation within FactoryLogix provides benefits in many ways, including an expansion of capacity across existing assets, the increase of agility and flexibility, reduction of engineering effort as manufacturing complexity increases, and the realistic ability to achieve a zero-defect operation.

Secure Industry 4.0 Right Now

Though increasing data in manufacturing brings huge benefit opportunities, it also increases the risk of IP exposure in a way that enables others to take advantage. Complex security issues typically involve the theft of design data which enables cheap clones and counterfeits to be introduced quickly into the market, as well as threats of ransomware, loss of privacy, and the compromise of products in terms of security, safety, and performance.

FactoryLogix possesses the crucial ability to provide both process and material traceability, including the exact relationship of each specific material used in each specific product. This

function is a pivotal technology, which FactoryLogix fully supports, when considering the requirements for IPC's Factory of the Future digital supply chain trust standards, including the existing IPC-1782 Internal Traceability, IPC-1782A Secure Supply-Chain, and IPC-1791 Trusted Supplier standards, as well as the upcoming IPC-1792 Cybersecurity and IPC-1783 Component Level Authentication standards.

Factory of The Future Roadmap

Aegis continues to drive smart and secure innovation, including, for example, the combination of secure CFX messaging and single-file design data standard, IPC-2581 DPMX, promoting full-digital bidirectional exchange of data between design and manufacturing, including the creation and promotion of ultra-secure access mechanisms that eliminate risk of design IP leakage, even when used across continents. Factory of the Future software automation advances the needs in equal measures of Smart innovation and security assurance, inspiring confidence in digital factories, their suppliers and products. **SMT007**

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Working With Arch Systems' ArchFX Manufacturing Excellence Platform



Jennifer Davis

Article by Jennifer Davis

ARCH SYSTEMS

At IPC APEX EXPO, Arch Systems will provide demonstrations on modules within the ArchFX Manufacturing Excellence Platform, which leverages factory data to drive actionable insights and analytics. Millions of messages from all over the globe are sent every hour through ArchFX's advanced AI/ML technologies, providing a comprehensive view of operations- powering action management across the entire organization.

The ArchFX Platform combines direct-to-machine connectors, globally scalable data brokers, and cloud-based analytics for an end-to-end solution that achieves record speed from project conception to analytics-driven actions. For SMT manufacturers, data is extracted and processed from sites, lines, and machines worldwide in just days and weeks, not years, all without disrupting existing operations.

The rich, centralized data powers global key performance indicators and predictive analyt-

ics. Automating loss-reason understanding, Arch analytics models are enabling electronics manufacturers to reclaim from 20% to as much as 60% of untapped performance and utilization.

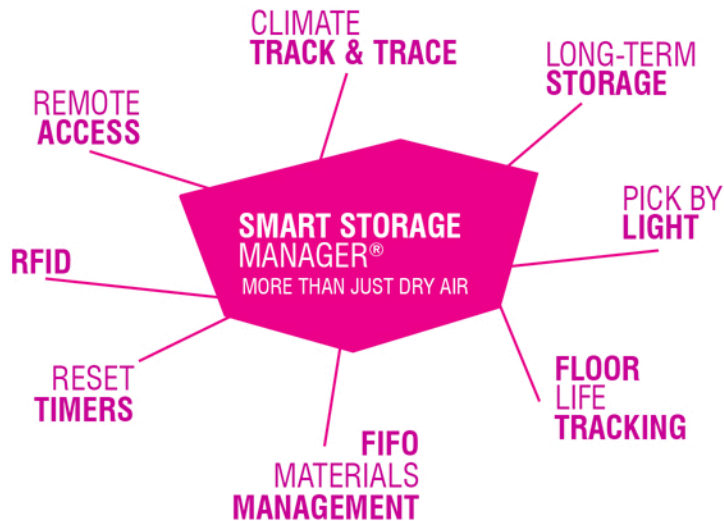
Arch has built the largest collaboration of industry domain experts that work hand-in-hand with data scientists to constantly map new signals in the data, adding them to the ever-growing library of operational analytics and recommendations. These signals and recommendations are changing how manufacturers tackle their most complex problems, allowing them to simplify and align actions both on the shop floor and the top floor. Arch is a recipient of the 2021 Global Technology and Mexico Technology Awards for their ArchFX platform. ArchFX provides the machine connectivity, data management and advanced insights needed to achieve digital transformation and drive business decisions across the manufacturing organization. **SMT007**

Jennifer Davis is head of marketing and communications at Arch Systems.



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KIC's Action Plan for Factory of the Future



Miles Moreau

Article by Miles Moreau
KIC

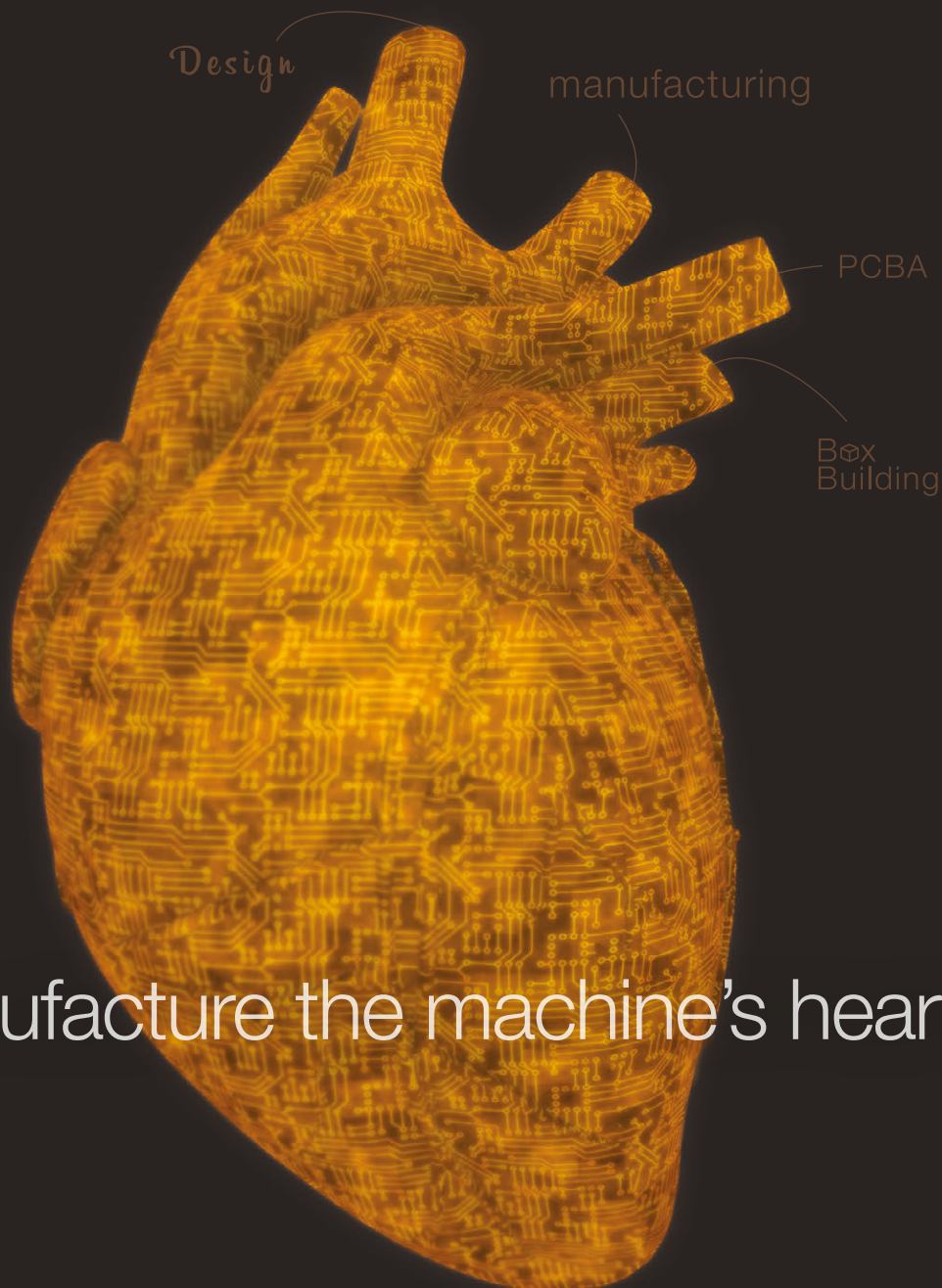
What is the Factory of the Future? Imagine machines with intelligence, able to communicate and make decisions in real-time, capture information, share and analyze it. Furthermore, the machines constantly track and adjust to keep things running smoothly while maintaining a high level of manufacturing automation and quality. With the implementation of Hermes machine-to-machine communication and CFX Smart Factory integration you can effectively maintain data analysis across the line and determine which adjustments need to be made and on which processes autonomously and in real-time.

Imagine trying to make those decisions without real-time information from one of the key steps. No SPI with data about the print. How would you do it? No AOI with information about the placement of final assembly. How would you do it? You can't. So, how can you do it without RPI for the reflow profile. With reflow soldering, "heat is added" for soldering but without real-time inspection of the production temperature profile you cannot achieve the Factory of the Future. The key is

to make sure you have actionable data across the three major steps of SMT manufacturing to make well informed decisions.

With reflow process inspection, KIC introduced the next level of inspection for the reflow process. Knowing that your production reflow temperature profile is inspected and monitored to maintain process control, traceability and quality solder joints for every product run through your oven. This critical data should be a part of your overall Industry 4.0 smart factory solution to ensure all production through the oven is within specifications and that profile data is readily available for each individual board.

The Factory of the Future, with Reflow Process Inspection (RPI) providing a Hermes link related to true "process/machine ready" status, and integrated real-time profile data delivered to the CFX broker, will allow for a true smart manufacturing line with on-the-fly adjustments made to the oven recipe based on not just machine temperature settings, but in true form like SPI and AOI, adjusting on all the information available from the CFX broker including the actual temperature profile of every production board. **SMT007**



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Leveraging the IPC CFX Qualified Product List



Ivan Aduna

Article by Ivan Aduna

KOH YOUNG AMERICA

IPC-2591 Connected Factory Exchange (CFX) is an industry-developed open standard for assembly manufacturing that uses a secure, omni-directional, AMQP protocol and JSON data encoding to enable plug-and-play solutions to simplify and standardize both machine-to-business and machine-to-machine communication. Koh Young implements IPC-CFX natively on its inspection systems through its KSMART Business Rules Management and the open-source IPC-CFX Software Development Kit. Koh Young was the first inspection equipment supplier to officially certify using the IPC-CFX Validation and Certification Program and

obtain a Qualified Product Listing (QPL) for SPI and AOI, which guarantees CFX support. Nevertheless, this is only the first of a series of steps to create a true smart factory. There are multiple factors that create a smart factory; yet there will be key differentiators that will make a company thrive in the Industry 4.0 transformation. Security, reliability, and interoperability are concepts that will resonate strongly among companies looking to stay competitive in the digital transformation race.

There are two key inspection processes that monitor SMT lines: SPI and AOI. SPI reviews the board after exiting the printer and AOI inspects the components after reflow soldering. The processes are complementary: SPI ensures the proper solder paste deposition, while



Figure 1: Two key inspection processes monitor SMT lines: SPI and AOI.

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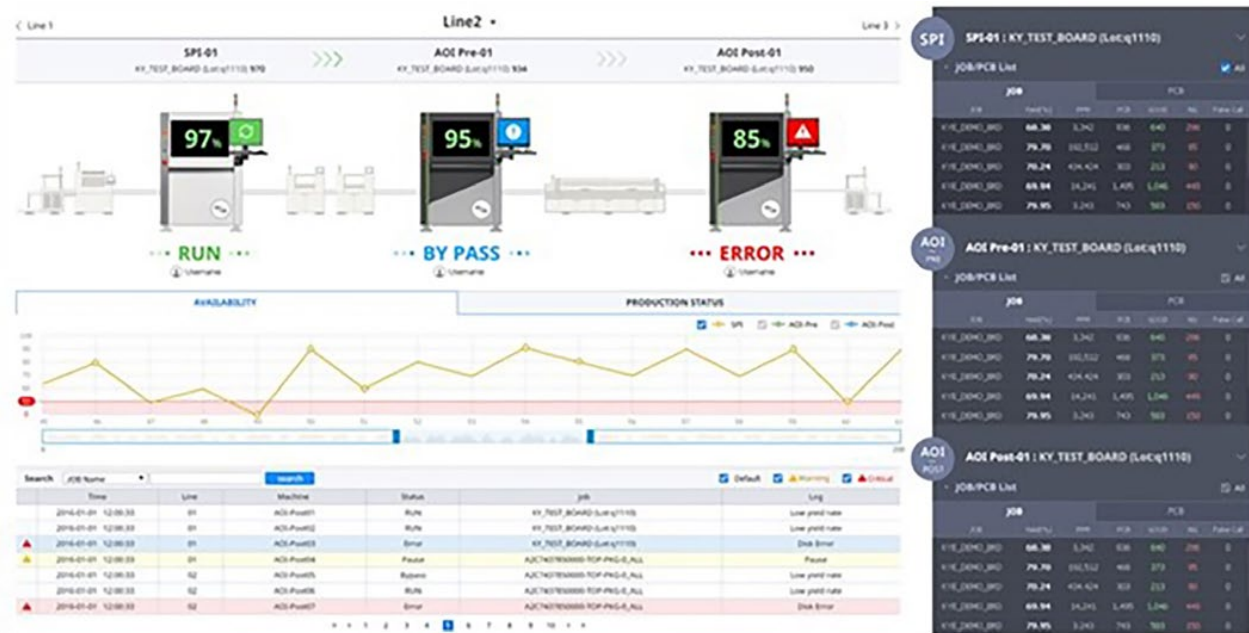


Figure 2: A sample production status dashboard.

AOI ensures the populated boards have the correct components placed, soldered, and orientated. These inspection systems perform a critical role in quality management and process optimization but require accurate and reliable 3D measurement-based data for a true smart factory. Inspection systems using AI-based learning will focus on generating and converting data into process knowledge and actionable insights, and IPC-CFX will facilitate a secure and reliable environment to share the data throughout a smart factory.

IPC-CFX delivers many topics, messages, and sections to aid with the integration process. One of the most essential messages for inspection systems is “StationStateChanged,” which is sent by a process endpoint when the production state transitions from one state to another per its state model. Some common applications developed using this message include remote monitoring, production status dashboards, machine utilization, line efficiency, and overall equipment effectiveness (OEE) metrics. Figure 2 depicts a sample production status dashboard that can check machine sta-

tus to help correlate and analyze machine performance across different processes and shifts. The information therein goes beyond simple status updates. Advanced solutions can be created by utilizing historic data to predictive and schedule production line capacity, while suggesting efficiency improvements.

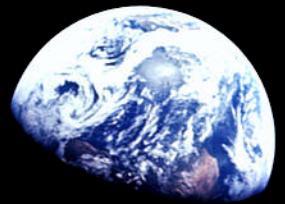
There are many ways to create a smart factory via IPC-CFX, but the key is to understand how far you can go with the available data and create the necessary tools and applications that will help companies succeed in the next industrial revolution and digital transformation. Using the protocol and its messages, plus the QPL certification is critical for inspection systems in the IPC CFX Validation and Certification Program. Hence, the best advice is to invest the time to review the information contained in these messages, and then ask yourself: How do I want the smart factory landscape to look like in the next five to 10 years? **SMT007**

Ivan Aduna is an MES Software Developer for Koh Young America. Ivan co-hosts the I-007e micro webinar series, *Converting Process Data Into Intelligence* with Joel Scutchfield.

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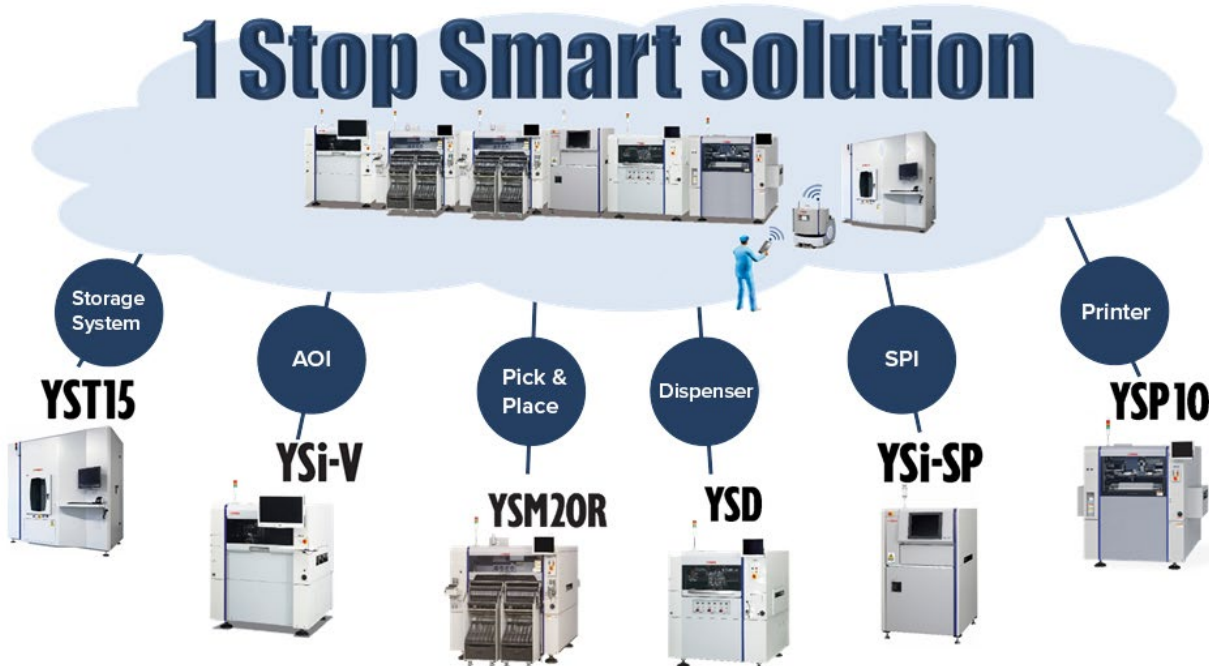
Miguel
Colomer

Article by Miguel Arroyo Colomer

Yamaha Motor Intelligent Machinery (IM), a subdivision of Yamaha Motor Corporation, will introduce its “One Stop Smart Solution” in the IPC APEX EXPO Factory of the Future pavilion, and also in booth #1114 and at IPC/

APEX 2022 in San Diego in January. The YAMAHA One Stop Smart Solution encompasses Yamaha’s equipment, technologies, and services in one Industry 4.0 integrated production solution.

Yamaha will also offer an audiovisual presentation outlining the One Stop Smart Solution,





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highlighting elements and components including the latest feeders, an advanced rotary head, the stencil printer single blade squeegee that will be on display, and more. The presentation illustrates how Yamaha has integrated all of its systems into one “smart solution, including the automation of the MRP system (logistics), product changeover, machine performance, machine real time monitoring, and remote support.

Highlights of the One Stop Smart Solution include the following:

- Yamaha can maximize the symbiotic effects of M2M (Machine to Machine) cooperation to improve production efficiency and quality
- GUI has been refined to be similar across all the platforms, reducing the amount of training required
- Auto Loading Feeder that allows preloading an additional reel that can be automatically loaded on the mounter without interrupting production.

Equipment on Exhibit

YRM20

The YRM20 is Yamaha’s premium high-efficiency, high speed modular mounter. The YRM20 features an exceptionally high-speed rotary (RM) head that achieves up to 115,000CPH. It boosts mountability for tiny components, maintaining high speed production, since head replacements are no longer needed. The RM head can handle components ranging from extremely tiny 0201mm components on up to medium-sized odd-shaped components of 12 x 12mm dimensions with heights of 6.5mm.

YRi-V

The YRi-V multi-purpose optical inspection systems is designed to serve all markets that require ultra-high speed and precision 3D inspections, YRi-V systems feature mounted coaxial lighting and 5µm lenses that support high-accuracy performance that is especially necessary in the device sector. The YRi-V can achieve 56.8cm²/sec. inspection speeds under optimum conditions, with accuracy ensured by its 8-way projector and 4-way oblique imaging through its 20 Megapixel 4-angle camera.

YSP10 printer

YSP10 is the industry’s first solder paste printer that features a completely automatic changeover system. The YSP10 is the successor to the YSP, a high-end printer that features a completely programmable squeegee angle adjustment and stencil suction mechanism as standard equipment.

The YSP10 enables full automation of production changeover.

YSM20R

The YSM20R flexible SMT mounter is a high-performance, high-efficiency modular mounter that enhances the production capabilities of the YSM20 and joins the series lineup as a premium model designed to enhance the customer’s competitiveness. With the YSM20R, Yamaha has focused on increasing X-Y axis speeds and revising the actions involved from pickup to placement. **SMT007**

Miguel Arroyo Colomer is product applications manager for Yamaha Motor Corporation, USA.



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ein Electronics Industry News and Market Highlights



LPKF Opens Biolab for ARRALYZE Technology ▶

In its 45-year history, LPKF has repeatedly developed groundbreaking technologies and opened new markets in the electronics, research and development, automotive and solar sectors.

Study: Semiconductor Supply Chain Remains Vulnerable Without Federal Investment ▶

A new study about the current state of advanced packaging in the semiconductor value chain finds that urgent action is required to strengthen domestic packaging ecosystem to meet increased production of semiconductor chips, without which the semiconductor supply chain is likely to remain weak and vulnerable.

Samsung Electronics Announces New Advanced Semiconductor Fab Site in Texas ▶

Samsung Electronics, a world leader in advanced semiconductor technology, announced that it would build a new semiconductor manufacturing facility in Taylor, Texas.

CEOs Call on Congress to Strengthen U.S. Semiconductor Research, Design, Manufacturing ▶

The Semiconductor Industry Association (SIA) applauded a letter sent recently to congressional leaders by a broad coalition of 59 CEOs and senior executives urging swift action to fund the CHIPS for America Act and enact a strengthened version of the FABS Act

to bolster U.S.-based semiconductor research, design, and manufacturing.

North American Semiconductor Equipment Industry Posts October 2021 Billings ▶

North America-based semiconductor equipment manufacturers posted \$3.74 billion in billings worldwide in October 2021 (three-month moving average basis), according to the October Equipment Market Data Subscription (EMDS) Billings Report published by SEMI.

Keysight Joins Anterix Active Ecosystem Program to Advance Private LTE Broadband Deployments ▶

Keysight Technologies, Inc., a leading technology company that delivers advanced design and validation solutions to help accelerate innovation to connect and secure the world, has joined the Anterix Active Ecosystem Program to help advance private Long-Term Evolution (LTE) broadband deployments in the United States.

Intel Powers New Amazon EC2 Instance ▶

Amazon Web Services (AWS) announced the general availability of the Amazon EC2 R6i instances powered by Intel® Xeon® Scalable processors.

Qualcomm Sets New Growth Targets and Financial Guidance Through Fiscal 2024 ▶

Qualcomm Incorporated said it is continuing to expand its chipset business to meet the growing opportunity for its technology at its 2021 Investor Day.



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The Impact of **Obsolescence** and Shortages on Counterfeit Risk

Feature Article by Vernon Densler

While obsolescence and shortages have always been an issue, recent large-scale disruptions have made the electronic components supply chain even more volatile.

Since last December, the global chip shortage has caused pricing shifts, lead time delays, and widespread stock-outs. The shortage is bringing a higher-than-normal number of counterfeit parts into the supply chain.

To adequately address the problem, it is important to understand its root causes, exacerbating factors, and how its impact can be avoided.

What Are Shortages and Obsolescence?

Obsolescence refers to parts that manufacturers no longer produce, and vendors no longer carry. Traditionally, microelectronic devices move into obsolescence after reaching end-of-life (EOL), the point when their manufacturer no longer makes, sells, or markets them. Since the item's lifecycle is over, distributors commonly discontinue carrying and providing support for EOL items.

Shortages occur when specific electronic components are unavailable or only available

in constrained quantities. Bottlenecks commonly occur when market demand for certain items exceeds the available supply and production capacity. Shortfalls can sometimes occur when production and delivery are interrupted by natural disasters or geopolitical conflicts. Moreover, parts shortages occur if raw materials used in their construction become hard-to-find or unavailable.



What Drives Shortages and Obsolescence?

Obsolescence is typically driven by a lack of market demand, mergers, acquisitions, or product line consolidation.

Notably, recent events have exacerbated the impact of the latter two factors on the semiconductor market. In 2020, various microelectronics companies announced a record \$118 billion in M&A agreements.¹ As those deals conclude, firms will streamline their combined component portfolios to eliminate redundancies and reduce costs.

Moreover, IHS Markit revealed in April 2021² that chipmakers are increasingly making their aging parts EOL to address shifting end-market priorities. High demand exceeding production capabilities typically creates shortages.

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That imbalance is a significant driver of the current global chip bottleneck.

Although material and device shortfalls are common in the semiconductor industry, COVID-19 precipitated a global component crunch. An unseasonal spike in demand for consumer electronics and a temporary collapse in automobile interest worldwide in 2020 threw off typical production schedules. While vehicle demand returned late last year, manufacturers lacked the production capacity to address both market segments.

Over time, the supply-demand imbalance spiraled into a multisector chip shortage, which industry experts believe will persist into 2023.

How Do Shortages and Obsolescence Increase Counterfeit Risk?

When components are not available in the marketplace, buyers are willing to pay more to acquire the parts they need. That makes these products prime targets for counterfeiters. These bad actors attempt to capitalize on the unmet demand by creating fake products and selling them on the gray market.

When components are not available in the marketplace, buyers are willing to pay more to acquire the parts they need. That makes these products prime targets for counterfeiters.

Consequently, increases in obsolescence and protracted shortages create a big opportunity for criminal operators.

During periods of economic uncertainty, like the current moment, people worldwide face diminished or lost income. In desperation,

some fabricate counterfeit chips to make up for their lost earnings. Because of their small size and lack of individual markings, microelectronics are easier to fake than other commodities.

At the same time, manufacturers are hurting financially because of skyrocketing operating costs and widespread stockouts related to the global chip shortage. As a result, some firms have lowered their vendor qualification standards in hopes of acquiring badly needed parts. That poor judgment has unintentionally created more room for counterfeiters to operate in the marketplace.

How the Department of Defense Deals with Obsolescence and Shortages

The U.S. Department of Defense considers obsolescence and shortages a major issue that requires a holistic solution. To that end, it created the Diminishing Manufacturing Sources and Material Shortages (DMSMS) program to prevent those issues from hurting readiness, scheduling, and cost.

The DoD defines DMSMS as the loss, or impending loss, of manufacturers or suppliers of items, raw materials, or software. DMSMS-generated shortages in the ongoing production capability or lifecycle support of a weapon system or scarcity in any training, support, or test equipment already in the field, can endanger mission effectiveness.

While DMSMS issues can be caused by many factors, their occurrence is inevitable. Accordingly, the DoD developed a series of policies, best practices, and strategies to engage with the problem actively. Its comprehensive framework includes valuable methods electronics companies can use to protect themselves from obsolescence and shortages.

How Can I Avoid the Impact of Shortages and Obsolescence?

Ensuring you have a solid obsolescence and shortage management plan is an excel-

lent takeaway from the DoD's establishment of the DMSMS program. It tackled the problem head-on by creating a system to preserve its operational efficiency in the face of an ever-shifting landscape. By adopting it, OEMs, CMs, and EMS providers can proactively approach issues like critical parts going EOL or a new part shortage emerging.

Also, firms can utilize a case management system to track their obsolescence and shortage issues. Manufacturers should make that a best practice because it enables them to react to unexpected problems across their organizations.

Given the status of the components landscape, obsolescence and shortages increase the risk of counterfeits moving into the marketplace. Desperate times make people desperate, but leaders should not allow adverse conditions to drive poor decision-making. Having

a robust obsolescence and shortage management process in place is critical to steer clear of fake microelectronics and cost avoidance.

Ultimately, proactive parts management is the key to overcoming adversity and succeeding in the contemporary semiconductor industry. **SMT007**

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Vernon Densler is product marketing manager at Sourceability N.A. LLC.

Batteries of the Future Could Be Paper-Thin and Biodegradable

NTU Singapore scientists have developed paper-thin biodegradable zinc batteries that could one day become an environmentally sustainable option for powering flexible and wearable electronic systems.

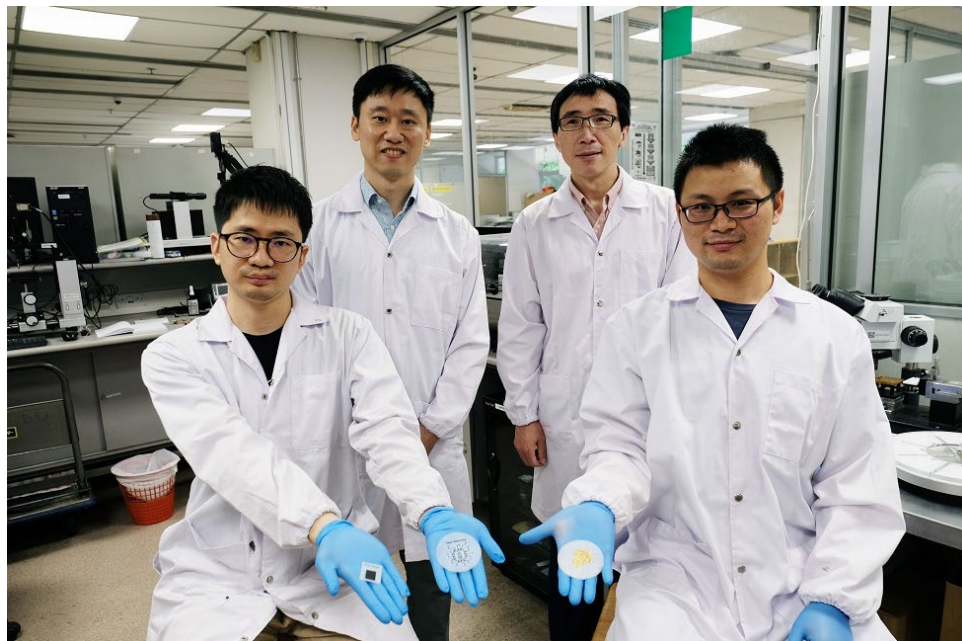
These zinc batteries are made up of electrodes (through which the electrical current leaves or enters the battery) screen-printed onto both sides of a piece of cellulose paper that has been reinforced with hydrogel.

Once the battery has been expended, it can be buried in soil, where it breaks down completely within a month.

The scientists think their printed battery could be integrated into flexible electronics such as foldable smartphones that are

already on the market, or biomedical sensors for health monitoring.

(Source: NTU Singapore)





MilAero007 Highlights



iMUGS Consortium Demonstrates Unmanned Systems ►

The iMUGS Consortium, in charge of a 32,6 MEUR project developing the European standard unmanned ground system (UGS), demonstrated how defense forces can use tactical 4G/5G communications networks and UGS' equipped with ISR and signal intelligence payloads, jammers, acoustic sensors, and various other technology to conduct missions.

DoD Faces Growing Risks from Reliance on Lead in Electronics ►

The U.S. defense community is facing a small but growing problem that is increasingly undermining U.S. military readiness and technological dominance. The problem is lead—specifically, the lead-alloy solders that traditionally have been used to attach electronic components to printed circuit boards. Over the last 15 years, the commercial electronics industry has shifted to lead-free solders, prompted by environmental health regulations in Europe and elsewhere. However, the U.S. Department of Defense (DoD) and its contractors never made the switch and are still heavily reliant on leaded solders. Now, leaded electronics are becoming harder to find and more outdated.

Adventures in Engineering: Data Management Not Just Checking the Boxes ►

Good product data management is rooted in the thoughtful strategy, process, and execution of preserving your company's product data. A robust data management strategy is key to giving direction to your company's data management processes. Product portfolio, pedigree,

and regulatory requirements are used to identify how to implement a data management plan/process to support your company's products. The day-to-day tactical ins and outs of product data management should be executed per plan and in faith to the strategy.

Sparton's Bill Toti Retires; Tracy Howard Tapped as Next President & CEO ►

Sparton President and Chief Executive Officer Bill Toti has retired after leading the company for three years, including through the company's transition to Elbit Systems of America during 2021.

Siemens Reconfirms Commitment to Shipbuilding 4.0 with CESENA Opening ►

Siemens has inaugurated the Center of Excellence of the Naval Sector (CESENA) in Ferrol, Spain, where state-of-the-art facilities are equipped with the latest technologies to improve all phases of the ship design and construction process with the aim of transforming the entire value chain of the shipbuilding industry and boosting its competitiveness.

Zulki's PCB Nuggets: Cleanliness is Next to Reliability ►

Today's PCBs are highly populated with increasingly smaller device packaging. As a result, these advanced device packages are extremely difficult to clean due to tight densities and configurations, especially with bottom terminated components. Current OEM system designs and those on the drawing board are driving these newer technologies, which are the foundation of advanced PCB assembly and manufacturing.



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Counterfeit Mitigation by In-line Deep Visual Inspection



Feature Article by Eyal Weiss, Ph.D.
CYBORD

Introduction

The COVID-19 pandemic has caused supply chain disruptions and component shortages. The pandemic shut down many avenues for raw materials and bulk electronic components, leaving manufacturers with half-finished products and idle capacity. Allocations are forcing manufacturers to purchase components on the free market. This is increasing the risk of counterfeit, out-of-date¹, mixed lots, badly handled, recycled, and defective components, from the typical 0.5–1.5% when purchasing from trusted sources, to 5–10% of purchasing in the free market. While this risk is conventionally mitigated by performing sample lab tests on components purchased in the free market according to SAE AS6081, sampling only a small fraction of the components carries many risks². Lab testing does not address out-of-date, mixed lots, badly handled, tampered, or defective components which may be randomly scattered within a package.

In this work we show that all the evidence needed to deem components suitable for use exist on their external packaging. The packaging of components has subtle intrinsic features imprinted during the packaging process that serves as a “fingerprint” of the component manufacturer. Recycled components may undergo black topping, remarking, and repackaging—all leaving visible evidence on the component’s exterior. Cloned, overproduced and defective components are packaged using a different source, presenting a different package. Re-dating old components may be detected externally by the poor state of the leads. These subtle features may be used to authenticate components.

We also present a novel method to estimate the apparent age, and as a result, the solderability of the component based on the optical surface of the soldering leads¹. The solder leads are the fastest aging part of the component, as it is made of a metallic compound that corrodes and decays by intermetallic interaction³. As a result, lead condition is an excellent indicator of a component’s apparent age, storage conditions, and handling conditions.

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We introduce a novel method that allows checking the components visually and evaluates their compliance⁴. The inspection utilizes the vision system that is already operating in the pick-and-place mounting machines to obtain the images of the components right after the pick-up and before placement without causing delays or adding additional production stages. The images are processed on the fly by a series of artificial intelligence algorithms capable of authenticating the manufacturer, determining the conditions of the soldering leads, finding defects, and evidence of unauthorized programming.

Conventional Mitigation

Taping of counterfeit components today is designed to avoid detection by sampling. An example can be seen in Figure 1, where production images taken by the pick-and-place machine vision system (ASM's Siplace SX), and extracted by Cybord's SMT software, shows that the beginning of the reel is authenticated to the documented manufacturer (Taiyo Yuden, in this example) and the rest of the components

on the reel are manufactured by an unknown source (counterfeit) as also exemplified by the example images and the measured dimensions.

Another example of a mixed reel can be seen in Figure 2, where four groups of components were found on a single reel during production. In this case, the different sources are mixed within the reel uniformly.

Authentic components that were badly handled have no record of that. They may infiltrate production. They cause solderability issues during assembly and reliability issues during the product life cycle¹. An example can be seen in Figure 3 for components with poor quality of soldering leads with forged date codes.

Inspecting the entire reel is essential for meeting reliability expectations, but lab inspection services cannot scale efficiently to support this requirement⁴. The digital transformation of the electronic component inspection process removes the dependence on human judgment and demanding labor. The patented^{5,6} software visually inspects and detects suspect and fraudulent components, achieving 100% component inspection coverage.

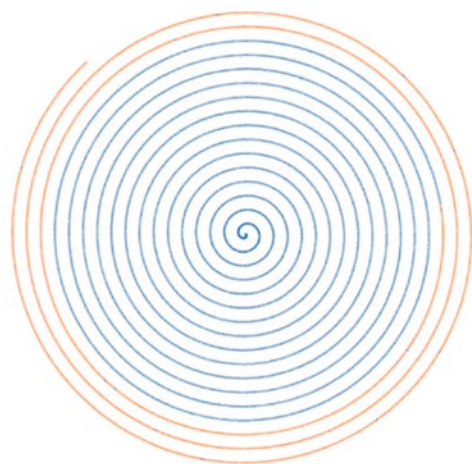
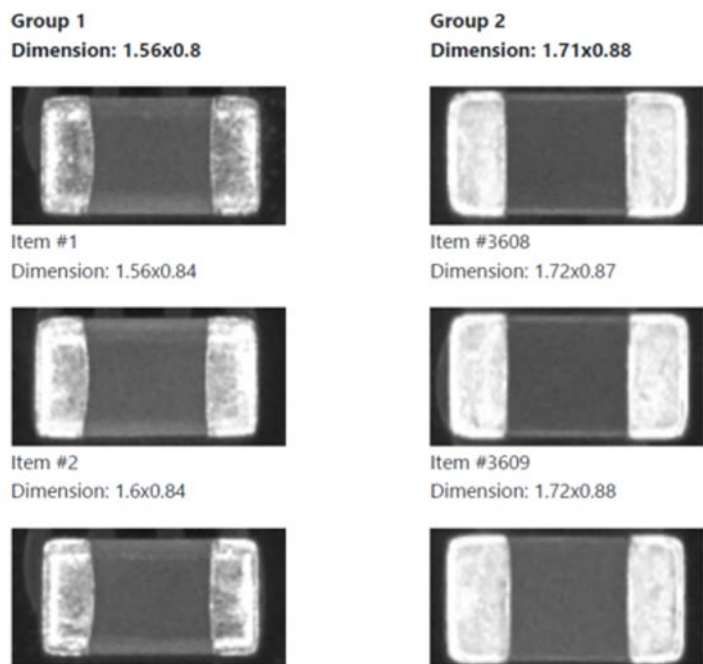


Figure 1: An example of a reel comprising concatenated sources. The spiral on the bottom represents the position on the reel where each color stands for a different detected group. The outer shell of the reel is detected as 0603 MLCC made by Taiyo Yuden and the internal group is of an unknown source.

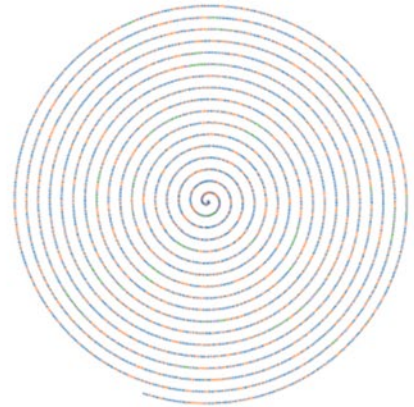
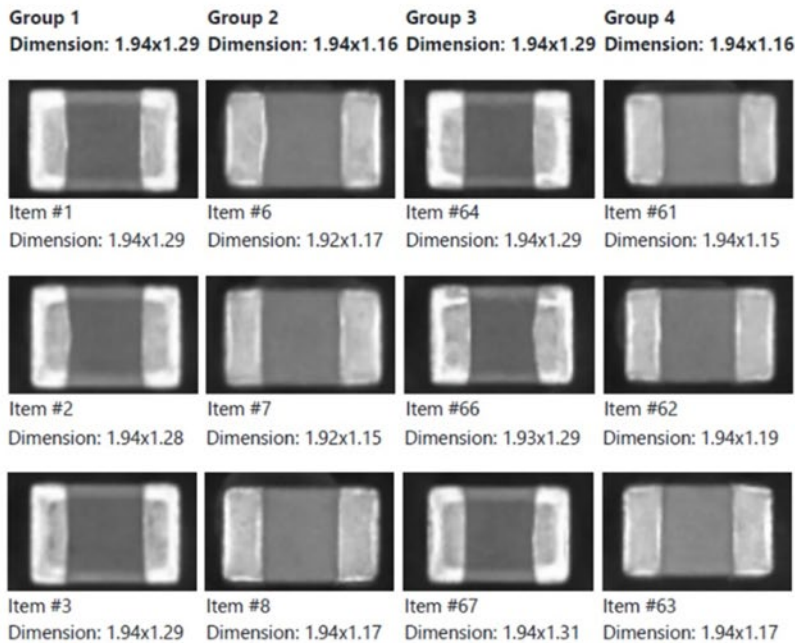


Figure 2: An example of a mixed population reel. The documented manufacturer is Samsung 0805 MLCC where four distinct groups were detected, and none of them was manufactured by Samsung.

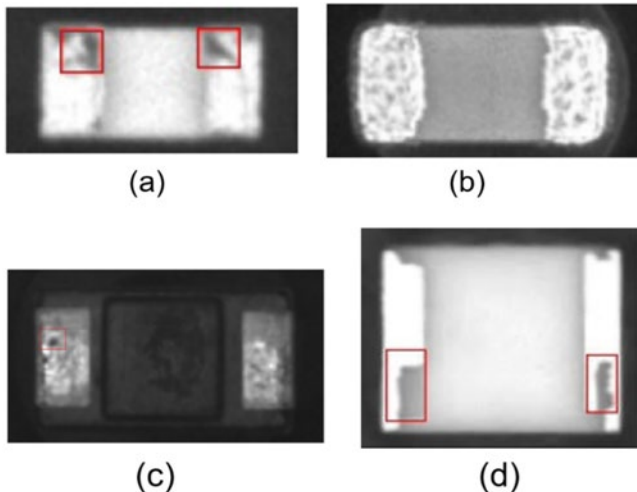


Figure 3: Passive components with poor soldering leads quality detected during assembly:
a) peeling leads; b) oxidized leads;
c) scraped leads; d) lifted leads.

Type of Counterfeits Known in the Market

Counterfeit electronic components are electronic parts that are misrepresented as to their origins or quality. There are recycled components, which are most counterfeit incidents, cloning (fakes), overproduced and out-

of-spec/defective parts, and tampered parts that serve as a back door where secret information from the chip can sabotage system functionality.

In the following section we briefly explore the types of counterfeiting and the evidence they leave on the components. The evidence will be classified as internal and visible from the external by the prominence of the evidence. It is not suggested that the classification is absolute, that is, there are ways to detect counterfeit components by both internal and visual external forensic examination. However, the focus is on the most dominant aspects of each counterfeit type.

Recycled Components

Recycled components are ones that are manufactured and used in devices for some time, discarded and scrapped. Scrap electronics are collected and sold to developing countries, they are dismantled into bare circuit boards and the components are crudely extracted by harsh processes, sorted, cleaned, remarked, and re-tapped. It is estimated most of the coun-

terfeits are in this class. The components are typically damaged considerably due to usage, aging, and the recycling process.

Recycled components are usually manufactured by an original component manufacturer (OCM), and although they may utilize an older inner design, all evidence of the recycling process is on the components' exterior packaging as the inside of the component remains unscaled.

Copies and Cloning

Copies, cloning, or just simply fakes are components that are manufactured by a copy manufacturer and not by the original manufacturer. They may be reverse-engineered components using fraudulent technology or IP. The unauthorized manufacturer is attempting to duplicate the original design, process, and materials to obtain the same level of functionality as the original. However, in most cases the copy is inferior to the original in every aspect as the fraudulent manufacturer has no liability to the quality or performance of his products and no improvement by feedback can be achieved. In some cases, copies are manufactured under license from the OCM, but they are marked and labeled accordingly.

In some cases, copies are manufactured under license from the OCM, but they are marked and labeled accordingly.

Copies or clones are different from the original in both the interior and the exterior as they are produced and packed at a different manufacturing site.

Overproduced Components

Overproduced components are illegally manufactured by the contract foundry of the OCM.

In some cases, the OCM is using the fabless model by designing the IP and masks for their components and the fabrication foundry holds the knowledge of the fabrication process and has all the production masks. The contract foundry may overproduce parts by fabricating the yield data and then sell the extra chips to the market.

Out-of-Spec Components

Out-of-spec/defective components originate from a criminal foundry which can sell defective parts that will most likely pass an initial screening as it is unlikely that the defect will appear in the normal operation of the chip in the first few hours or months. Eventually, though, it will fail. Out-of-spec parts underperform the design specification (leakage current, dynamic current, performance, temperatures, etc.)

Overproduced and out-of-spec/defective components are identical from the inside as they are manufactured by the same foundry using the same process and materials. However, their exterior may be different from the original because the component packaging process is rarely performed by the same foundry.

Fore-dated Components

Fore-dated components are old components sold as new. They may be made by the OCM, but their tracking information and labels are forged. Components are typically good for the SMT process within 18–36 months of their production. Following that period their soldering leads may grow thick oxidation layers and their metallic formation may alter due to intermetallic reaction in the alloy on the leads. In some cases, the leads may be re-tinned to accommodate for the expected low solderability.

Fore-dated components may be almost identical from the inside of the component, except for utilizing the older design. External evidence may be by older packaging techniques or by the condition of the leads. As seen in Table 1, all common counterfeit types leave visual evidence on their external parts.

Counterfeit types	Interior evidence	Exterior evidence
Recycled	✗	✓
Cloned, copied, faked	✓	✓
Overproduced, out-of-spec, defective	✗	✓
Fore-dated	✗	✓

Table 1: Common counterfeit types leave visual evidence on their external parts.

Conventional Counterfeit Mitigation Tools

The tools in place are highly sophisticated and expensive research and forensic tools. A brief description of the available tools is presented in Table 2.

Examining Table 1 reveals an interesting picture. Almost all tests are focusing on the internal parts of

Method	Operating Principle	What it Tests	Sampling
External visual inspection (EVI)	Operator visual inspection	<ul style="list-style-type: none"> • Date and Lot Codes • Microscopy • Shipping labels • Lead quality • Dimensions and Weight • Marking quality 	116/c samples
X-ray imaging	Imaging	<ul style="list-style-type: none"> • Internal structure • Consistent size/shape of the die and lead-frame • Wire bonds attached 	3
Blacktop Testing	Chemical	Blacktopping, remarking, etc.	3
Scanning acoustic microscopy (SAM)	Imaging	Reveal cracks, voids, and delamination	3
Optical inspection	Operator visual inspection	<ul style="list-style-type: none"> • Internal structure • The top surface of a die • Metallization traces of a thin-film resistor 	3
Wire pull	Operator wire pull force	Assembly quality	3
Die shear	Operator shear force	Assembly quality	3
Scanning acoustic microscopy (SAM)	Operator visual inspection	Internal structure and layout	3
Scanning electron microscopy (SEM)	Operator visual inspection	Internal structure and layout	3
X-ray fluorescence (XRF)	Operator spectroscopy	<ul style="list-style-type: none"> • Metallic material composition • Lead finish examination • Plating material(s) identification 	3
Fourier transform Infrared / Raman spectroscopy (FTIR)	Operator spectroscopy	Package material composition	3
Contact test	Operator manual	Contact, power consumption, leakage, output short, propagation, set-up/hold time, rise/fall time, function, memory verification, etc.	3

Table 2: A brief description of the available lab tests.

the component. The only tests that are looking for external evidence are the chemical tests (FTIR, chemical) which can detect black-topping and clones and are also covered by most of the other internal examinations and the EVI.

The EVI is an optical examination at 3X to 100X. Theoretically, a high-potency EVI is sufficient for detecting all counterfeit types.

It raises the question: Why are all the other methods part of the counterfeit mitigation standard? Unfortunately, this is because the conventional EVI alone is not potent enough to detect many of the counterfeit evidences there are in counterfeit components.

**Theoretically, a
high-potency EVI is
sufficient for detecting
all counterfeit types.**

Solderability Estimation

Electronic component solderability is an essential capability in the electronics manufacturing domain. It stands for the ability of an electronic component to be reliably and repeatably soldered onto a circuit board in an automated production environment¹. There are several available methods to inspect electronic components^{2,4}. To obtain a reliable and repeatable soldering process, all the production parameters are utilized and optimized by the electronics manufacturer. This process includes managing the board preparations, solder paste dispensing, component placement, and reflow parameters.

However, the conditions and the solderability of the soldering leads in the electronic components are rarely evaluated before assembly. This is because of the assumption that the proficiency of the process is sufficient to mitigate the variations within the acceptable param-

eters of the component leads. In the defense industry, it is required that samples from component batch are inspected for solderability according to MIL-STD-202, Method 208^{7,8}, and in other industries such as the automotive ISO-26262 standard⁹. Typically, samples of the tested components are selected and tested under specified conditions to gauge the solder wetting ability on the component leads. The evaluation process is by visual examination of the solder coverage on the leads after the solder dip process. This conventional process is manual, labor-intensive, expensive, and performed on samples only.

Soldering quality assessment after the assembly as a part of the automatic optical inspection (AOI) was presented¹⁰ while machine learning convolutional neural network (CNN) was performed^{11,12}. The average true positive accuracy of manually detecting the soldering faults with the aid of a magnifying glass is almost 90% and the faults detection accuracy using CNN, in this case, was 84%. The visual processing of the soldering quality based on CNN can be powerful in achieving human-level accuracy if they are trained on a large dataset with an equal number of diverse examples.

Unfortunately, in many cases, this is not sufficient to ensure a reliable bond for all the assembled components. This is because the underlying assumption is that sampling one component out of a batch represents the entire population. At the same time, there are many cases where this assumption yields to the re-

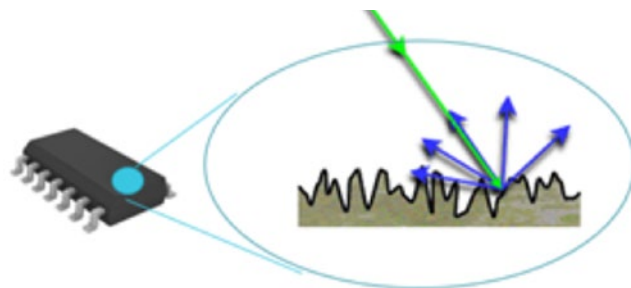


Figure 4: An illustration of the effect of surface roughness on emissivity.

ality of electronic components trade. For example, contemporary counterfeit components can be mixed with authentic ones in variety packs and avoid detection by sampling screening techniques. Another example is that components in the inner part of a reel package have different humidity exposure than the reel's outer part¹³⁻¹⁶.

Solderability Assessment Method

We classify the solderability of the leads by learning how the solder-lead of a component reflects the light vs. how a lead with poor-solderability component does. The light reflection can be performed by analyzing the component image and/or analyzing its reflectance spectra in the UV/Vis band. In addition, the component's apparent age, can be estimated based on the gradual degradation of the lead's reflectance.

This information is available by examining the surface of the soldering leads. We have found that visual analysis of the component image using artificial intelligence methods can detect the degradation of the soldering leads that leads to poor solderability. In order to train a model that correlates the image of the leads and its solderability, we need to design a neural network based on multiple images of leads.

Solderability Estimation Algorithm

The solderability is estimated by deep learning methods performed on the images of the soldering leads of the components. First, we use the manufacturer year code to calculate the manufactured age of each item. We use this data to train a model so it can predict the items' age with the least prediction error.

It is important to note that the manufactured year does not directly reflect the real quality of the lead. This is due to differences in storage and handling conditions that may cause accelerated aging to the soldering leads, thus, degrading the "age" of the leads. In addition, there is a distribution to the conditions of the

leads in both leads with good and poor solderability.

The network is designed to fit a linear regression model so that the distance from the input dataset to the line is minimized. The next step is to use the regression model to predict the age of components from the validation set. The components are sorted by the estimated or predicted age and then we choose a split point (age value) to split it into two groups. The splitting point is at least three standard deviations between the two groups.

The network is designed to fit a linear regression model so that the distance from the input dataset to the line is minimized.

The solderability is evaluated by using a tier algorithm. The first tier evaluates the bulk uniformity of multiple components from the same transport package (reel or tray) using an unsupervised approach. The second tier classifies each lead to a group of manufacturing years using a classification algorithm. The third tier classifies each lead to two extreme classes of solderability state: good or poor solderability using a classification model.

Solderability Analysis

A non-destructive mass volume method for assessing the solderability of electronic leads based on deep visual inspection (DVI) is presented. The method allows real-time assessing of all assembled components. It may be deployed during the SMT mounting process and by a reel-to-reel incoming inspection.

The solderability is correlated to surface reflectance and degradation in solderability caused by corrosion and intermetallic reactions in the surface of the leads. This may be

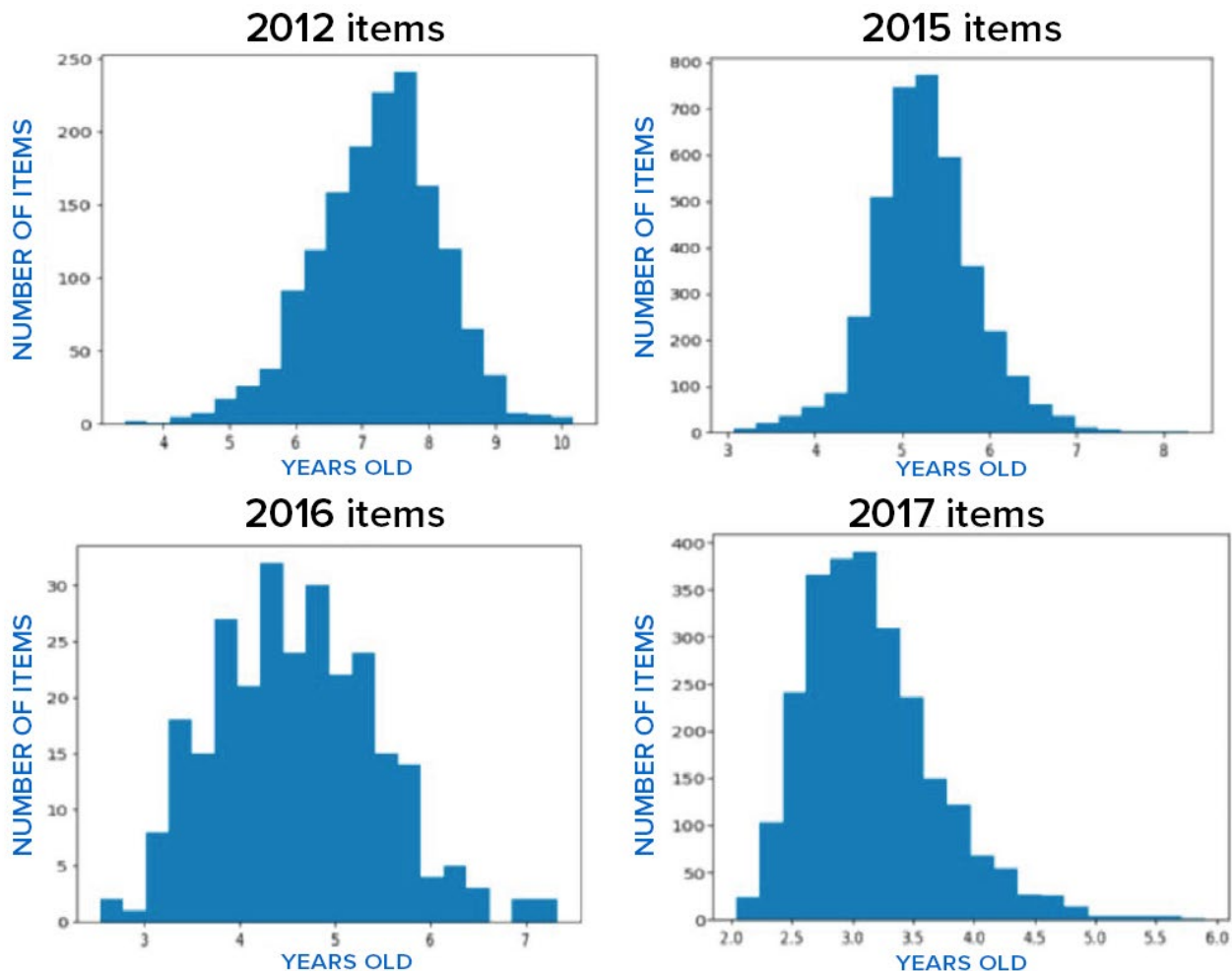


Figure 5: Distribution histogram of the apparent-age of solder-leads of 0805 resistors of four different ages. This was measured in 2020. The 2017 item components present a one-tailed normal distribution, 2012 and 2015-2016 have a double tailed normal distribution.

illustrated as the reflection of a smooth mirror compared to an age-dulled mirror.

The inspected components' solderability is obtained by a multi-tier classification network that is looking into micro-features in the component's images. The network classifies leads to good and poor solderability based on their apparent-age. The models were trained by multiple images of the same type of different manufacturing ages and therefore of different solderability conditions.

Figure 5 shows components from the same package may have non-uniform solderability. The apparent-age is not a discrete function as it is distributed across a range of ages. Nevertheless, while most of the solder-leads' age match-

es their apparent-age, some of them had apparent-older age. This phenomenon may result in lower soldering quality and poor reliability.

The results presented allow continuous real-time 100% component screening with classification accuracy exceeding 97%, and processing time of ~7 ms per component, allowing real-time verification during components assembly. This method paves the way for a radical improvement in manufacturing quality and repeatability with no added hardware and processing time.

Conclusion

The evidence for the quality of electronic components can be derived from its exterior



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package. This is because all common cases of fraud and bad handling leave evidence on the exterior of the component package.

A method to utilize images of components taken during assembly by the pick-and-place camera already installed on the SMT machine or by a reel-to-reel inspection machine is presented. The method employs image processing and deep learning networks to classify the source of the components based on big data comprising over 0.5 billion components and growing at a rate of over 30 million components a day.

A method to further estimate the apparent age of the soldering leads of the components as a part of a component qualification algorithm is presented.

This novel method assuring the quality of electronic products by inspecting 100% of the electronic components is presented. Assuring the quality and authenticity of all assembled components will have a huge impact on electronics quality. **SMT007**

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Eyal Weiss, Ph.D., is CTO and founder of Cybord.



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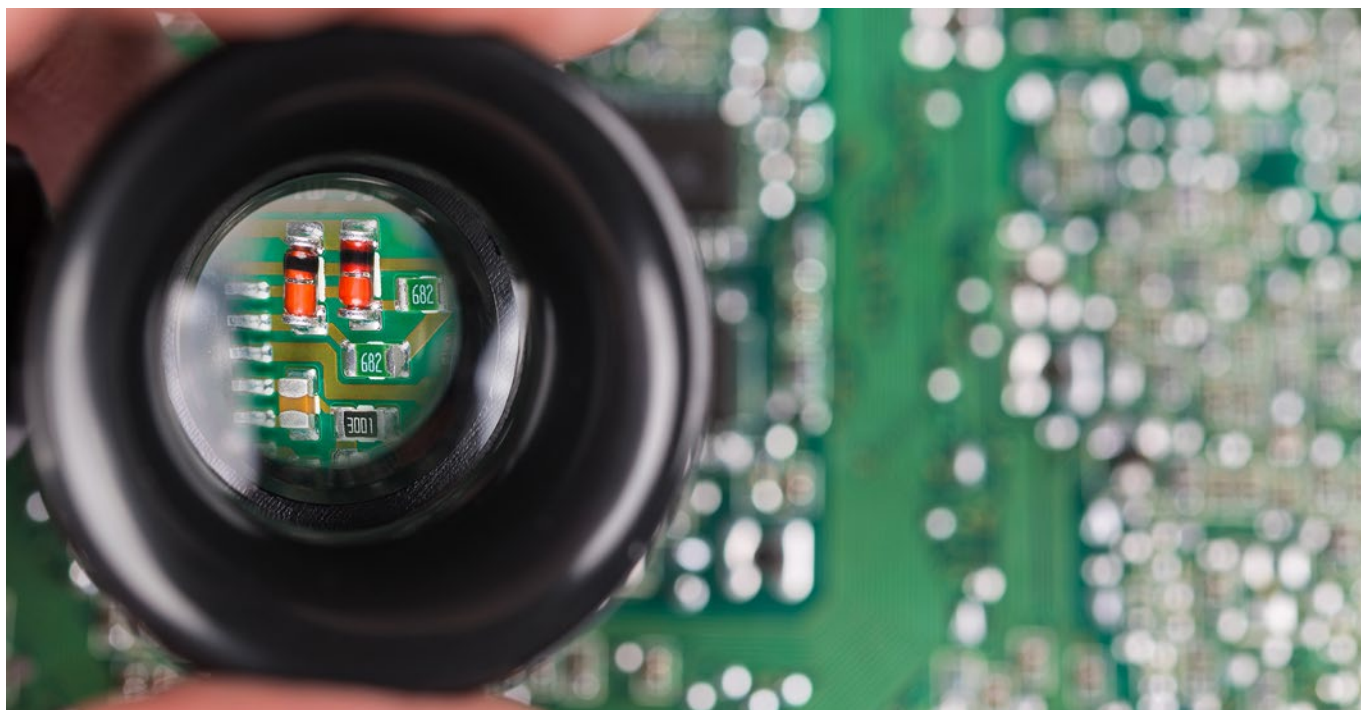
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Component Level **Traceability** in a Counterfeit World

Feature Article by David Mills
ALITHEON, INC.

According to the Alliance for Gray Market and Counterfeit Abatement,¹ it is estimated that legitimate electronics companies miss out on about \$100 billion of global revenue every year because of counterfeiting. In addition to the tremendous loss of revenue, counterfeit parts often have inferior quality and different specifications, making them potentially hazardous if incorporated into mission-critical systems such as military equipment, aircraft navigation, life support, or space vehicles. The financial damage of counterfeit components goes far beyond the cost of merely replacing the items.

The electronics industry is badly in need of standards and solutions which can provide reliable authentication and provenance, at the component level, to support Industry 4.0 initiatives and end-to-end traceability. IPC-1783 is a new standard under development which establishes the methodology for the absolute authentication and provenance of singular ma-

terials and composite products using immutable unique identification (immutable ID).

What is an Immutable ID?

The proposed IPC-1783 standard calls out the need for an “immutable ID” that can be linked to the product. This immutable ID, by design, must be a secure, digital representation of a physical object. It must enable secure and traceable authentication as part of product lifecycle provenance. As a “crypto-anchor,” it must provide positive identification throughout the hierarchy of manufacturing and distribution operations.

We are all familiar with some of the more common methods used to “tag” and identify products, like barcodes, RFID tags, and other “additive” methods. However, these methods have their challenges as they:

- Can be difficult to secure
- Are vulnerable to failure or mishandling
- Can be counterfeited
- Require physical alteration of the part or component

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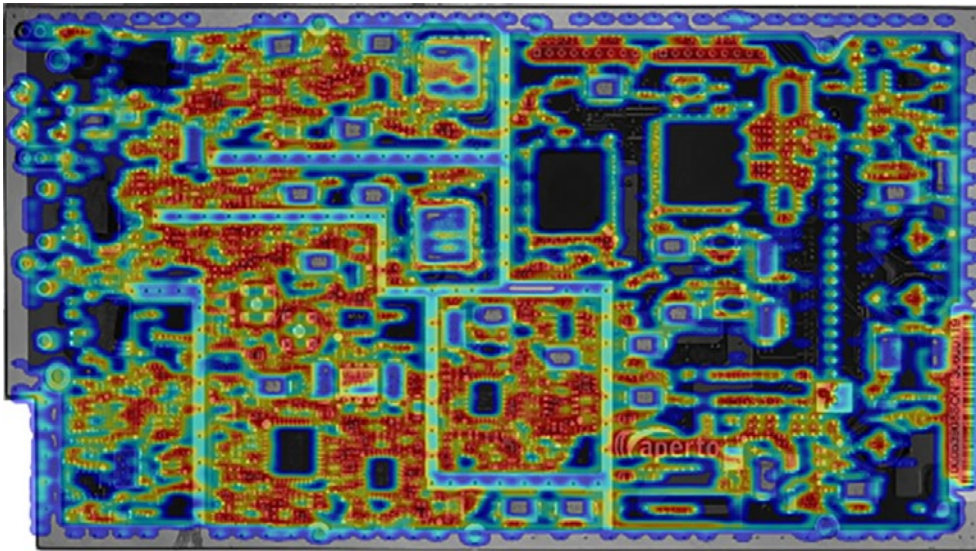


Figure 1: PCB “heatmap” image representing what the software sees.

How Does One Create an Immutable ID?

Fortunately, there are newer, more secure methods emerging in the market to meet the need for an immutable ID and create the requisite “crypto-anchor” to a physical object. In this article, I will focus on a proven method for producing a unique and secure “fingerprint” using digital images.

All objects, even those that are visually identical to the human eye, can have tens of thousands of unique surface characteristics or features if you can look closely enough. By looking at a digital image of an object at a pixel level, software, and algorithms, such as Alitheon’s FeaturePrint™, you can see these features on the surface of any object. The system can then map the strongest of these features and store this map as a math equation and unique fingerprint for each object.

At the point of origin or manufacture, a new product can be inducted into the system using this method when a digital image is taken and then registered in the system with its own unique ID. The ID and associated data are stored in a secure, cloud-accessible database. When an object needs to be identified later for authentication purposes, another digital picture is taken, and the ID is again extracted and uploaded to the cloud. Next, the algorithms compare the new ID with those in the refer-

ence database and return either a “match” or “no match” indication to confirm whether the system has seen this specific object before. This process of creating an ID during registration or authentication happens in milliseconds.

Not only does this method for creating an immutable ID rely on standard digital images, but it also leverages standard commercial-

ly available hardware. Standard industrial cameras (e.g., Basler and Allied), lenses, and lighting are used to capture images while standard PCs (e.g., NUC), monitor, and keyboard can be used to run the camera service (Figure 2). Because the software can work with images from a 12MP camera, it is possible to use iPhones with 12MP or better cameras in mobile authentication scenarios. The reliance on commercially available components also enables flexible designs which can be easily retrofitted into existing facilities and manufacturing processes.



Figure 2: Standard industrial cameras, lenses, and lighting are used to capture images while standard PCs, monitor, and keyboard can be used to run the camera service.

Product and Process Provenance

As mentioned above, the proposed IPC-1783 standard distinguishes between product and process provenance. It will define the creation and enrollment of unique identifiers, the building of the relationships of components as they are used or applied, including mandates and requirements for the associated secure information technology infrastructure, while ensuring interoperability between process provenance cluster data. The standard will apply to all areas and silos that connect materials and discrete manufacturing, including semiconductors, electronics, printed board fabrication, printed board assembly and the application of the product in the market.



Figure 3: A closer look at the process.

So, how will the FeaturePrint system support and enable these standard requirements? In addition to enabling serialization and traceability of objects within the system, standardized API interfaces allow secure import of data from, and export to, external systems for reporting and analytics or consolidation for parts and process provenance. The immutable ID and associated data can be securely linked, as the “crypto-anchor” of the physical part, to a blockchain ledger or other system for process provenance. So, important information such as part serial numbers, date and location of manufacture can be tied to this immutable ID. Parts or assemblies can be registered and serialized at key supply chain and manufacturing sites. After delivery, an item may be authenticated once again, its traceability history updated from anywhere in the world.

How Is This Image-Based Immutable ID Different?

- It is not an image. It is a set of numbers characterizing the surface of a product or item.
- It represents a single item, not a class of objects. The system does not have to learn over time what an object is, for example, “This is a PCB”; it simply knows if it has seen that specific PCB before.
- It is not a proxy for authentication. The item or product is the ID. Most identification systems today use proxies such as barcodes, QR codes, or RFID tags. These proxies can easily be obscured, detached from the object, or themselves be counterfeited. By making the object its own identifier, the system does not need to have anything added to an object to register and authenticate it.

Summary

This digital image method for creating an Immutable ID provides a powerful item-based machine vision capability to standard cameras, hardware, and optics. With easy retrofit into existing industrial and supply chain environments, you can quickly begin to trace items that were previously untraceable and support your Industry 4.0 initiatives and emerging IPC standards. **SMT007**

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David Mills is director of marketing and product management at Alitheon, Inc.

Can a **Dirty** Factory Be Fixed?

Maggie Benson's Journey

by 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. In this installment, Maggie and John, new owners of Benson Electronics, are speaking with Professor Patty Coleman about adding more lines through an acquisition of Ivy Electronics. But, why is Patty down on Ivy Electronics?

"Yikes! What is wrong with Ivy Electronics?" Maggie implored.

"It would be easier to ask what is right with that flea bag company!" Patty exclaimed.

"Can you be more specific?" John inquired, sheepishly.

Patty paused, then said, "I'm sorry if I am speaking too negatively. When I worked with ACME, Mike Madigan (the CEO) asked me to perform an audit to see whether ACME should

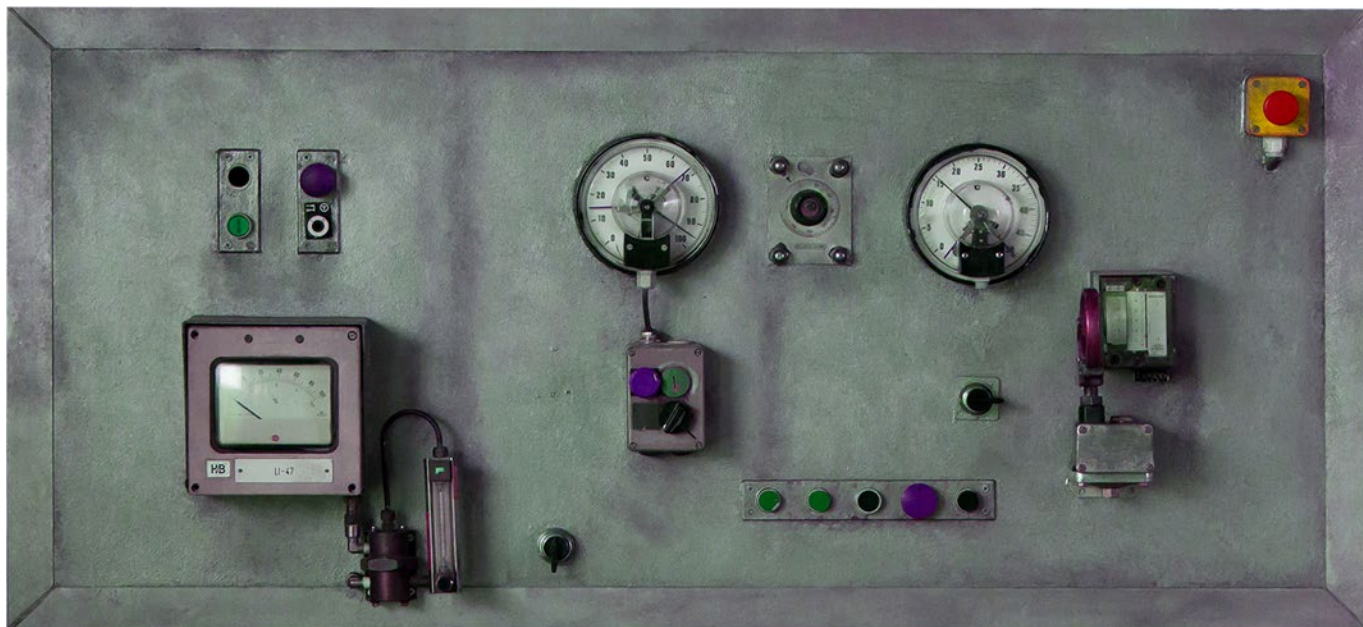
buy Ivy Electronics. The conclusion was a resounding no. The equipment was worn out, the owner was abrasive and difficult to deal with, and the staff had little training and very poor morale."

"From our preliminary analysis, none of this surprises us," Maggie said.

"Well, then, why are you interested in buying it?" Patty asked.

"Our business is booming and even with our dramatic improvement in uptime, we are turning away business," John responded. "We could use the two lines that Ivy Electronics has to offer."

"Just be careful," Patty said. "I would suggest a complete audit of their assembly equipment and the entire operation. Also, talk to the staff and look at the books. My sense is that the only way it could be a good deal is to get it for a low price."



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

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

“Frank worked with us on the finances, and it seems the asking price is fair,” Maggie said.

“The owner, Ned Price, is a piece of work,” Patty said, then warned, “Be careful.”

Three days later, the Benson Electronics (BE) team of Maggie, John, Frank, and Chuck visited Ivy Electronics. They first met with two service technicians from the companies that manufactured the equipment in the two assembly lines.

The service techs planned to evaluate the state of the equipment for BE. The first issue the BE team noticed was the overall filthiness of the shop floor. Frank used the restroom and commented that it was so disgusting that it felt violating. After the initial meeting with the service technicians, the BE team continued by visiting with Ned Price, owner of Ivy Electronics, in his office. He was waiting for them, along with another staff member.

“Welcome to Ivy Electronics,” Ned began. “Here is my lead technician, Phil Consol.”

The BE team introduced themselves.

“We were hoping we could look around the shop, and chat with some of the staff,” Maggie cheerfully requested.

“Talking to the staff would be a waste of time,” Ned responded with an obvious amount of disgust. “Most of them are dumb losers. Phil, here, is the best of the lot, and he’s nothing to write home about.” Phil remained stoic.

The BE team was stunned. Ned seemed like an unpleasant person at a minimum.



Figure 1: The bathrooms at Ivy Electronics were almost unusable.

“Well, we will want to chat with a few of them anyway,” John said, firmly.

“Suit yourself,” said Ned. “But they really are all losers. You can start your conversations with Phil here.”

The BE team found a small conference room to chat with Phil.

After repeating introductions, Maggie said, “Phil, tell us about Ivy Electronics and your role here.”

Phil seemed reluctant to open up, and John sensed this first.

“Phil, we are likely going to buy the company,” John said, reassuringly. “Anything you say is between us and won’t be disclosed to Ned.”

The relief on Phil’s face was palpable.

“I’m the lead technician,” Phil began. “I set up new jobs and manage the operators. I also do some on-the-job training on how to run the machines.”

“Is there any formal training?” Chuck asked.

“No,” Phil responded. “Mr. Price says training is expensive and takes time away from the operators running the machines.”

Frank then spoke up, “I’ve noticed that the facility is really filthy. The restrooms stink and they are almost unusable. What is the story on that?”

“Mr. Price says it is too expensive to hire cleaning staff, so any cleaning is done by myself and the operators during breaks,” Phil responded. “If we don’t bring in toilet paper and soap, there is none. I also believe the bad odor may be because the sewage system needs repair.”

“Phil, the pay here is quite low. Why do the people stay?” Frank asked.

“Most of them don’t have high school degrees, and with Mr. Price constantly berating them, I believe they don’t feel capable of being hired elsewhere,” Phil answered.

“How is the assembly equipment?” John asked.

“That is our biggest challenge,” Phil told the group. “Mr. Price doesn’t want to pay for service, so we spend a lot of time keeping the equipment limping along.”



Figure 2: If BE buys Ivy Electronics, they will have to purchase a new stencil printer like this one within six months.

Maggie and John continued talking with Phil and then with a few other staff members, while Chuck and Frank walked around the facility to investigate.

At the end of the day, the four got together with the assembly equipment service technicians to summarize what they had learned.

“What do you two think about the equipment here?” Maggie asked the two service techs. Fred Dempski and Ron Johnson.

“We both agree all of the equipment is just about shot,” Ron said.

“Yeah, it’s almost comical, especially the stencil printer,” Fred continued.

“Elaborate please,” John requested.

“There is so much dried solder paste on the printer, we will need chisels to get it off,” Fred told him.

After much more discussion, Maggie finally requested developing an action plan.

“We can keep the equipment limping along for six months,” Fred said, while Ron added, “But you should have a plan to replace the equipment on both lines.”

After a bit more discussion about the equipment, the group went on to the other issues.

“The operation has considerable challenges along the lines of 5S¹ and the Seven Mudass²,” Chuck stated.

Chuck was one of the company’s experts in Lean Six Sigma, having recently earned his Green Belt, so 5S and the Seven Mudass were natural for him to comment on.

“Something definitely needs to be done about morale,” Maggie added.

“The place needs a thorough cleaning,” Frank chimed in.

More recommendations concluded with action plans, assuming that Benson Electronics still wanted to buy Ivy Electronics.

Will BE buy Ivy Electronics? What will the price be? What is in the action plan? What is 5S and the 7 Mudass? Stay tuned to find out the answers to these questions and more.

Note from Dr. Ron: I know this story about Ivy Electronics seems too hard to believe. You might think no company could be so bad. However, the facts of the story are from an audit of an electronics assembler that I performed quite a few years ago. The bathroom story is also true. **SMT007**

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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, or contact Lasky, [click here](#).

Download *The Printed Circuit Assembler’s Guide to... Solder Defects* by Dr. Ronald C. Lasky. You can also view other titles in our full I-007eBook library [here](#).

Standard of Excellence: Great Customer Service is a Two-Way Street



Anaya Vardya

We all enjoy great customer service. Actually, we love great customer service. We love it so much that we are always happy to tell everyone we know when one of our vendors provides us with great customer service. We want to let people know that we are getting special services from our vendors. We might even want to evangelize about them. And that is the point of this column. The best way to get great customer service from your vendor partner is to be open to it. Here are seven ways to be sure you always get the best customer service possible.

Keytronic Awarded New Contract with a Leading Power Equipment Company

Keytronic Corporation, a provider of electronic manufacturing services, announced that it expects to begin manufacturing in 2022 for one of the world's leading power equipment companies.



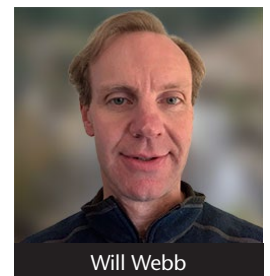
Siemens Positioned in Visionaries Quadrant of Gartner Magic Quadrant for Industrial IoT Platforms



Siemens Digital Industries Software announced it has been positioned by Gartner in the Visionaries Quadrant of the Gartner® Magic Quadrant for Industrial IoT platforms.

Design to Production Flow: DFT and Test Coverage Using Industry 4.0 Principles to Produce Good Products

Achieving design for test (DFT) can be challenging for both design and test groups, as sometimes both expect that the other will be the one to manage DFT. The design and test groups might be in the same organization, or they could be an OEM vs. an EMS company. It works best if both the design and test groups are engaged in the process of DFT and trying to achieve the goal of the best test coverage and lowest rate of field returns.



Will Webb

X-Rayted Files: Three or More Intriguing Thoughts on Reshoring



Bill Cardoso

The ground beneath us is always shifting, and while the term “unprecedented” can be somewhat over-used, it does seem to be a little tougher to keep our balance these days. For almost every economic disruption, there emerges some argument for how reshoring can

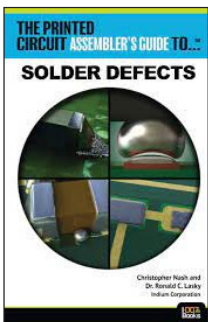
mitigate it. This time around, though, there’s a bit of a tug-o-war between the disruptions that are shaping the manufacturing landscape and the broader economy.

EMS Leadership Summit at IPC APEX EXPO 2022 Brings Together Current and Future Industry Leaders

New and experienced managers will gather at the EMS Leadership Summit at IPC APEX EXPO on January 24, 2022, to discuss strategies for advancing the industry and enhancing leadership skills.

Ron Lasky: A Perspective on Writing About Solder Defects

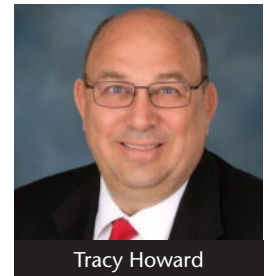
Nolan Johnson speaks with Dr. Ron Lasky About *The Printed Circuit Assembler's Guide to... Solder*



Defects. Ron is a full professor at Dartmouth College, but works part-time at Indium Corporation, helping their customers solve defects. This I-Connect007 eBook, he says, is a compilation of all he’s learned over the years as well as the deep technical knowledge of the team at Indium.

Sparton's Bill Toti Retires; Tracy Howard Tapped as Next President & CEO

Sparton President and Chief Executive Officer Bill Toti has retired after leading the company for three years, including through the company’s transition to Elbit Systems of America during 2021.



Tracy Howard

John Mitchell: Focus on the Future

In a far-ranging interview, Dr. John Mitchell and Barry Matties discuss the upcoming IPC APEX EXPO, IPC programs, and the challenges (and opportunities) facing our industry. If you think Dr. Mitchell’s assessment would be pessimistic, you’d be wrong. We’re an industry that enjoys and needs to work together, and we’ve been held at bay for too long.



Navigating the Supply Chain Storm with ICAPE

Guillaume Chauvet of ICAPE Group, vice president of sales-Americas East, discusses managing the supply chain through transportation issues, raw material shortages, and longer production times. He also details how he helps customers manage different suppliers and divergent technologies.



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Ucamco is looking for a sales engineer for our front-end software in the German-speaking area (Germany, Austria, German Switzerland) as well as adjacent markets in the South and East.

Ucamco is a market leader in PCB CAM, pre-CAM software and laser photoplotters with more than 35 years' experience developing and supporting leading-edge, front-end tooling solutions for the global PCB industry.

Responsibilities:

- Selling software solutions
- Selling support contracts and upgrades
- Developing and implementing customer acquisition plan
- Organizing and taking part in roadshows, seminars, exhibitions
- Follow up of current customers and sales
- Contributing insights into the marketing plan
- Reporting to Ucamco's sales director

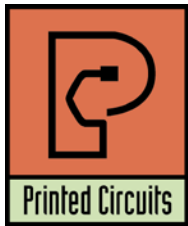
Requirements:

- Fluent in German, good knowledge of English; other languages a plus
- Frequent traveling to prospects and customers—live contact is important
- Feeling for technical software
- Motivated to succeed as a solution seller
- Strong empathy for the customer
- Self-starter, able to work independently, organized
- Honest, trustworthy, dependable, credible
- Sales and technical expertise in PCB industry a big plus
- Knowledge of market and customer base in German speaking area a big plus
- Used to working from home office
- Traveling to headquarters in Gent (Belgium) for sales and customer meetings
- Good feeling for software is more important than strong sales experience

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- Additional incentives at the leadership level
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- Highly collaborative corporate and manufacturing culture that values employee contributions

Laminator Technician

Nature of Duties/Responsibilities

- Layup cover lay
- Layup rigid flex
- Layup multilayer/CU core boards
- Oxide treat/cobra treatment of all layers/CU cores
- Shear flex layer edges
- Rout of machine panel edges and buff
- Remove oxide/cobra treatment (strip panels)
- Serialize panels
- Pre-tac Kapton windows on flex layers (bikini process)
- Layup Kapton bonds
- Prep materials: B-stage, Kapton, release sheet
- Breakdown: flex layers, and caps
- Power scrub: boards, layers, and caps
- Laminate insulators, stiffeners, and heatsinks
- Plasma cleans and dry flex layers B-stage (Dry)
- Booking layers and materials, ready for lamination process
- Other duties as deemed necessary by supervisor

Education/Experience

- High school diploma or GED
- Must be a team player
- Must demonstrate the ability to read and write English and complete simple mathematical equations
- Must be able to follow strict policy and OSHA guidelines
- Must be able to lift 50 lbs
- Must have attention to detail

Wet Process/Plating Technician

Position is 3rd shift (11:00PM to 7:30AM, Sunday through Friday)

Purpose

To carry out departmental activities which result in producing quality product that conforms to customer requirements. To operate and maintain a safe working environment.

Nature of Duties/Responsibilities

- Load and unload electroplating equipment
- Fasten circuit boards to racks and cathode bars
- Immerse work pieces in series of cleaning, plating and rinsing tanks, following timed cycles manually or using hoists
- Carry work pieces between departments through electroplating processes
- Set temperature and maintains proper liquid levels in the plating tanks
- Remove work pieces from racks, and examine work pieces for plating defects, such as nodules, thin plating or burned plating
- Place work pieces on racks to be moved to next operation

- Check completed boards
- Drain solutions from and clean and refill tanks; fill anode baskets as needed
- Remove buildup of plating metal from racks using chemical bath

Education and Experience

- High school diploma or GED required
- Good organizational skills and the ability to follow instructions
- Ability to maintain a regular and reliable attendance record
- Must be able to work independently and learn quickly
- Organized, self-motivated, and action-oriented, with the ability to adapt quickly to new challenges/opportunities
- Prior plating experience a plus

Production Scheduler

Main Responsibilities

- Development and deployment of a level-loaded production plan
- Establish manufacturing plan which results in "best possible" use of resources to maximize asset utilization
- Analyze production capacity of manufacturing processes, equipment and human resource requirements needed to produce required products
- Plan operation manufacturing sequences in weekly time segments utilizing production labor standards
- Maintain, align, and communicate regularly with internal suppliers/customers and customer service on key order metrics as per their requirements
- Frequently compare current and anticipated orders with available inventory and creates replenishment plan
- Maintain master distribution schedule for the assigned facility, revise as needed and alert appropriate staff of schedule changes or delays
- Participate in periodic forecasting meetings
- Lead or participate in planning and status meetings with production, shipping, purchasing, customer service and/or other related departments
- Follow all good manufacturing practices (GMPs)
- Answer company communications, fax, copy and file paperwork

Education and Experience

- High school diploma or GED
- Experience in manufacturing preferred/3 years in scheduling
- Resourceful and good problem-solving skills
- Ability to make high pressure decisions
- Excellent written and verbal communication skills
- Strong computer skills including ERP, Excel, Word, MS Office
- Detailed and meticulous with good organizational skills
- Must be articulate, tactful and professional at all times
- Self-motivated

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Career Opportunities



Galvanic Systems Director

Whelen Engineering Co. seeks FT Galvanic Systems Dir. in Charlestown, NH to lead technical team to optimize GreenSource Fabrication, LLC Division's first-gen equip. by applying PCB mfg. concepts per cust reqs. Ensure process engg. meets co.'s needs; develop and validate process changes; plans to improve process capability using statistical & root cause analysis & eval'ing equip, including Atotech equip, thru design of exper & testing; travel int'lly 15-25% to eval biz plan & strategy to markets. Min reqs: U.S. Bach degree or foreign equiv. in chem sci or chem engg; knwl of entire PCB mfg. process, including process flows, indiv. processing steps, & tooling, w. knowledge of PCB pattern plating, including subtractive etching processes, additive processes, and printable techs as demo'd by 12 yrs' exp. in PCB industry; Theoretical knwl of PCB Plating Processes, including MLB, HDI, and SLP-type PCB fab processes, as demo'd by 10 yrs' exp w. PCB plating processes; 5 yrs' exp working w. Atotech Equipment prod lines & their specialty chems; Prior work exp in R&D enviro. including app of lab analysis concepts and knowledge of cross section and wave form patterns.

Apply to: Corinne Tuthill,
ctuthill@greensourcefab.com or at
Greensource Fabrication, LLC,
99 Ceda Rd, Charlestown, NH 03603

[apply now](#)



Service Engineer Schmoll Laser and Direct Imaging

Reports to: Field Service Manager

Location: North America

SUMMARY:

Provide expert-level service on multiple laser drilling and direct imaging product lines. Maintain high customer satisfaction, timeliness, accuracy, efficiency, cost effectiveness, and safety.

DUTIES AND RESPONSIBILITIES:

- Install, commission, and maintain Schmoll products at customer sites. Perform modifications and retrofits as needed.
- Troubleshoot, diagnose, and calibrate products via telephone or at customer sites.
- Handle a wide variety of problems, issues, and inquiries.
- Provide training for customers and others in the effective operation, calibration, and maintenance of all products.
- Lead the project management team for retrofit/upgrade requests and recommendations for Schmoll equipment until the end of commissioning and final payment.
- Assist customers with potential optimization of their machine operations and work with clients on application improvements.

QUALIFICATIONS:

- Must possess a valid driver's license, clean driving record, major credit card (for business travel), and passport.
- Ability to read and interpret technical documentation, compile reports, and compose routine correspondence, define problems, collect data, and draw a valid solution.
- Must be able to travel extensively, partly international, to support customer needs. While Burkle makes every attempt to avoid Sunday and Friday evening travel, sometimes it is required.

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Career Opportunities



Fuji America Corporation is a rapidly growing electronics assembly equipment distributor. We support the factories of the future and smart factories globally. We offer an exciting and challenging career for a software support engineer and an applications engineer who want to join our growing company.

Software Support Engineer

As a software support engineer for Fuji America Corporation, you will be a customer-facing technical advisor with the opportunity to solve technically complex problems for our proprietary software. As a trusted advisor to our customers, you will have influence over a broad range of solutions that create business value. As a valued member on our team, the software support engineer will use advanced troubleshooting methods and tools to solve technically complex problems. These highly complex, escalated problems require broad and in-depth product knowledge, as well as exceptional troubleshooting skills.

- Field installation of proprietary software/automation equipment throughout North America
- Field troubleshoot, repair, training, and process support of proprietary software
- Provide remote and on-site technical support
- Troubleshoot Windows 10/Windows server installing, configuration, and support
- Networking experience—setting up and supporting networks.
- Exposure and/or experience with Oracle or Microsoft SQL server databases
- Strong verbal communication skills with both customer and other technical depts.
- Flexibility to travel and perform job assignments on short notice
- Strong aptitude with current computing applications and networking processes

Experience

- Bachelor of Science in computer science or related field preferred

Applications Engineer

As an applications engineer, you will be responsible for doing cycle time and studies in preparation to make recommendations of Fuji products for customers' applications. Support implementation of activities within the technical center such as customer visits, demonstrations, evaluations, testing, inspection of Fuji products, including peripheral equipment from other vendors.

- Assist sales representatives in technical aspects relating to machine and software functions and utilization.
- Assist sales representatives and customers with providing CTA (Cycle Time Analysis) to them for recommending Fuji products to customers' specific applications. This includes the sFAB machine as well as all other SMT machines.
- Schedule and perform product demonstrations on all available types of equipment and software to potential and existing customers.
- Test and evaluate existing as well as new technologies on equipment and software performance and reliability.
- Assist in the coordination of any new FAC projects by utilizing your full potential.
- Responsible for the setup of the equipment and its demonstration for various trade shows.
- Assist FAC staff in any technical issues which may require attention.
- Assist in the coordination of design and manufacture of customs tooling for placement equipment.
- Perform inventory checks every six months according to the schedule and manner regulated by the company, if applicable.

Experience

- Minimum five years programming/computer experience
- Bachelor's degree preferred

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Career Opportunities



Technical Marketing Specialist Waterbury, CT

JOB DESCRIPTION:

Responsible for providing technical knowledge and support to marketing communications professionals. Cross training and acting as liaison between the Innovation and the Marketing Communications teams for both Circuitry Solutions and Semiconductor Solutions.

Chemist 1 Waterbury, CT

JOB DESCRIPTION:

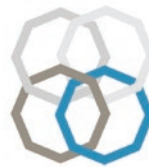
Perform analysis—both chemical and mechanical—of customer-supplied samples. These include both structural and chemical testing using various instruments such as SEM, Instron, ICP, and titration methods. Perform various failure analysis functions, including, but not limited to, chemical analysis, SEM analysis of customer parts, and cross-section evaluation.

Applications Manager Waterbury, CT/New England Region

JOB DESCRIPTION:

Applications Manager in the Electronics Specialties/Circuitry Solutions group to provide applications process knowledge, training and technical support of new products leading to sales revenue growth. Requires working through the existing sales and technical service organizations to leverage this knowledge globally. Experience in multilayer bonding along with dry film and solder mask adhesion processes a plus.

[apply now](#)



Customer Service Representative, UK

We are looking to expand our UK Customer Service/Internal Sales team. As Customer Service Representative you will provide great sales and customer service support and respond to the needs of clients from industries including Aerospace, Defence, Automotive and Pharmaceutical. Duties include:

- Maintain & develop relationships with new and existing customers
- Make rapid, accurate cost calculations and provide quotations
- Accurately input customer orders through bespoke MRP System
- Liaise with colleagues at Chinese HQ and other Overseas Business Units to manage domestic and international requirements
- Assist sales team with reporting, sales analysis and other items at their request

Skills and abilities required for the role:

The ideal candidate is a proactive self-starter with a strong customer service background. Friendly, approachable, and confident, you should have a good phone mannerism and be computer literate.

- Previous experience in a Customer Service background, ideally management or supervisor role
- Experience with MRP Systems
- Good working knowledge of Microsoft Office Tools such as Outlook, Excel etc.

What's on Offer:

- Excellent salary & benefits commensurate with experience

This is a fantastic opportunity to become part of a successful brand and leading team with excellent benefits.

Please forward your resume to HR@ventec-europe.com

[apply now](#)

Career Opportunities



Rewarding Careers

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

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

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

Associate Electronics Technician/Engineer (ATE-MD)

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

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

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Test Engineer (TE-MD)

In this role, you will specialize in the development of in-circuit test (ICT) sets for Keysight 3070 (formerly HP) and/or Teradyne (formerly GenRad) TestStation/228X test systems.

- Candidates must have at least three years of experience with in-circuit test equipment. A candidate would develop and debug our test systems and install in-circuit test sets remotely online or at customer's manufacturing

locations nationwide.

- Candidates would also help support production testing and implement Engineering Change Orders and program enhancements, library model generation, perform testing and failure analysis of assembled boards, and other related tasks.
- Some travel required and these positions are available in the Hunt Valley, Md., office.

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Sr. Test Engineer (STE-MD)

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

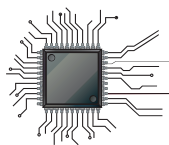
Contact us today to learn about the rewarding careers we are offering. Please email resumes with a short message describing your relevant experience and any questions to careers@ttci.com. Please, no phone calls.

We proudly serve customers nationwide and around the world.

TTCI is an ITAR registered and JCP DD2345 certified company that is NIST 800-171 compliant.

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Career Opportunities



MivaTek

Global

Product Manager

MivaTek Global is preparing for a major market and product offering expansion. Miva's new NG3 and DART technologies have been released to expand the capabilities of Miva's industry-leading LED DMD direct write systems in PCB and Microelectronics. MivaTek Global is looking for a technology leader that can be involved guiding this major development.

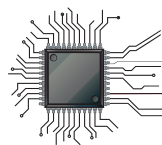
The product manager role will serve as liaison between the external market and the internal design team. Leadership level involvement in the direction of new and existing products will require a diverse skill set. Key role functions include:

- **Sales Support:** Recommend customer solutions through adaptations to Miva products
- **Design:** Be the voice of the customer for new product development
- **Quality:** Verify and standardize product performance testing and implementation
- **Training:** Conduct virtual and on-site training
- **Travel:** Product testing at customer and factory locations

Use your 8 plus years of experience in either the PCB or Microelectronic industry to make a difference with the leader in LED DMD direct imaging technology. Direct imaging, CAM, AOI, or drilling experience is a plus but not required.

For consideration, send your resume to N.Hogan@MivaTek.Global. For more information on the company see www.MivaTek.Global or www.Mivatec.com.

apply now



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.

apply now

Career Opportunities



Sales Manager

**New Business Development (m/w/d) –
Sales Territory: Germany**

CML Group is a global leader in the Printed Circuit Board industry, specialized in PCB manufacturing and sustainable PCB supply solutions. Our products are made to the highest quality and reliability standards, including automotive requirements.

For the expansion of our target markets, we need you to generate new business, drive new projects from RFQ stage and manage the customer relationship.

Your responsibilities:

- Develop new customers and build long-term customer relationships
- Understand the customer requirements and acquire new contract enquiries from all market sectors
- Proactive market and customer research
- Identify new potential electronic industry sectors
- Result-oriented sales management including support and consulting on new projects
- Independent management and organization of your accounts
- Price and contract negotiations with customers and contractual partners

Your profile:

- Several years of professional experience in sales and key account management
- Knowledge of printed circuit board production/industry would be an advantage
- Fluent in Business English and willingness to travel internationally
- Flexible and an open-minded mentality
- Strong communication skills, team player
- Self-motivated, well-organized, professional
- Your home base is in Germany

Interested? Looking forward to your application!
Please send your application to hr@cmit.support.

For more information visit
www.cml-globalsolutions.com

[apply now](#)



PCB Field Engineer– North America Operations

ICAPE Group is a European leader for printed circuits boards and custom-made electro-mechanical parts. Headquartered in Paris, France, we have over 500 employees located in more than 70 countries serving our +2500 customers.

To support our growth in the American market, we are looking for a PCB Field Engineer.

You will work in our North America technical center, including our U.S. technical laboratory, and will be responsible for providing technical and quality support to our American sales team.

You will have direct customer contact during all phases of the sales process and provide follow-on support as required.

RESPONSIBILITIES INCLUDE

- Feasibility recommendations
- Fabricator questions and liaison
- Quality resolutions
- Technical explanation (for the customer) of proposals, laboratory analysis or technology challenges

REQUIREMENTS

- Engineering degree or equivalent industry experience
- 5 years' experience with PCB manufacturing (including CAM)
- Excellent technical understanding of PCBs
- Experience with quality tools (FAI, PPAP and 8-D)
- Good communication skills (written and oral)

Communication skills are essential to assist the customer with navigation of the complex process of matching the PCB to the application.

SALARY

Competitive, based on profile and experience.
Position is full time in Indianapolis, Ind.

[apply now](#)

Career Opportunities



SMT Operator Hatboro, PA

Manncorp, a leader in the electronics assembly industry, is looking for a **surface-mount technology (SMT) operator** to join their growing team in Hatboro, PA!

The **SMT operator** will be part of a collaborative team and operate the latest Manncorp equipment in our brand-new demonstration center.

Duties and Responsibilities:

- Set up and operate automated SMT assembly equipment
- Prepare component kits for manufacturing
- Perform visual inspection of SMT assembly
- Participate in directing the expansion and further development of our SMT capabilities
- Some mechanical assembly of lighting fixtures
- Assist Manncorp sales with customer demos

Requirements and Qualifications:

- Prior experience with SMT equipment or equivalent technical degree preferred; will consider recent graduates or those new to the industry
- Windows computer knowledge required
- Strong mechanical and electrical troubleshooting skills
- Experience programming machinery or demonstrated willingness to learn
- Positive self-starter attitude with a good work ethic
- Ability to work with minimal supervision
- Ability to lift up to 50 lbs. repetitively

We Offer:

- Competitive pay
- Medical and dental insurance
- Retirement fund matching
- Continued training as the industry develops

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SMT Field Technician Hatboro, PA

Manncorp, a leader in the electronics assembly industry, is looking for an additional SMT Field Technician to join our existing East Coast team and install and support our wide array of SMT equipment.

Duties and Responsibilities:

- Manage on-site equipment installation and customer training
- Provide post-installation service and support, including troubleshooting and diagnosing technical problems by phone, email, or on-site visit
- Assist with demonstrations of equipment to potential customers
- Build and maintain positive relationships with customers
- Participate in the ongoing development and improvement of both our machines and the customer experience we offer

Requirements and Qualifications:

- Prior experience with SMT equipment, or equivalent technical degree
- Proven strong mechanical and electrical troubleshooting skills
- Proficiency in reading and verifying electrical, pneumatic, and mechanical schematics/drawings
- Travel and overnight stays
- Ability to arrange and schedule service trips

We Offer:

- Health and dental insurance
- Retirement fund matching
- Continuing training as the industry develops

[apply now](#)

Career Opportunities

SIEMENS

Siemens EDA Sr. Applications Engineer

Support consultative sales efforts at world's leading semiconductor and electronic equipment manufacturers. You will be responsible for securing EM Analysis & Simulation technical wins with the industry-leading HyperLynx Analysis product family as part of the Xpedition Enterprise design flow.

Will deliver technical presentations, conduct product demonstrations and benchmarks, and participate in the development of account sales strategies leading to market share gains.

- PCB design competency required
- BEE, MSEE preferred
- Prior experience with Signal Integrity, Power Integrity, EM & SPICE circuit analysis tools
- Experience with HyperLynx, Ansys, Keysight and/or Sigrity
- A minimum of 5 years' hands-on experience with EM Analysis & Simulation, printed circuit board design, engineering technology or similar field
- Moderate domestic travel required
- Possess passion to learn and perform at the cutting edge of technology
- Desire to broaden exposure to the business aspects of the technical design world
- Possess a demonstrated ability to build strong rapport and credibility with customer organizations while maintaining an internal network of contacts
- Enjoy contributing to the success of a phenomenal team

***Qualified applicants will not require employer-sponsored work authorization now or in the future for employment in the United States. Qualified Applicants must be legally authorized for employment in the United States.*

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Logistics Assistant

Koh Young America is looking for a Logistics Assistant to assist and oversee our supply chain operations. Working alongside a Logistics Specialist, you will coordinate processes to ensure smooth operations using a variety of channels to maximize efficiency. You must be an excellent communicator and negotiator well-versed in supply chain management principles and practices. Also, you should be meticulous with a focus on customer satisfaction. These attributes are ideally complemented by a Bachelor's in Supply Chain Management or equivalent professional experience in the manufacturing industry.

This position is in our Duluth, Georgia, headquarters, where we serve our customers within North and South America. We offer health, dental, vision, and life Insurance with no employee premiums, including dependent coverage. Additionally, we provide a 401K retirement plan with company matching, plus a generous PTO policy with paid holidays.

Koh Young Technology, founded in 2002 in Seoul, South Korea, is the world leader in 3D measurement and inspection technology used in the production of micro-electronics assemblies. Using patented 3D technology, Koh Young provides best-in-class products in Solder Paste Inspection (SPI) and Automated Optical Inspection (AOI) for electronics manufacturers worldwide.

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Career Opportunities



Sales Representatives

Prototron Circuits, a market-leading, quick-turn PCB shop, is looking for sales representatives for all territories.

Reasons you should work with Prototron:

- Serving the PCB industry for over 30 years
- Solid reputation for on-time delivery (99% on-time)
- Excellent quality
- Production quality quick-turn services in as little as 24 hours
- AS9100
- MIL-PRF- 31032
- ITAR
- Global sourcing
- Engineering consultation
- Completely customer focused team

Interested? Let's have a talk.

Call Dan Beaulieu at

207-649-0879

or email to

danbbeaulieu@aol.com

[apply now](#)



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

[apply now](#)

Career Opportunities

Now Hiring

Director of Process Engineering

A successful and growing printed circuit board manufacturer in Orange County, CA, has an opening for a director of process engineering.

Job Summary:

The director of process engineering leads all engineering activities to produce quality products and meet cost objectives. Responsible for the overall management, direction, and coordination of the engineering processes within the plant.

Duties and Responsibilities:

- Ensures that process engineering meets the business needs of the company as they relate to capabilities, processes, technologies, and capacity.
- Stays current with related manufacturing trends. Develops and enforces a culture of strong engineering discipline, including robust process definition, testing prior to production implementation, change management processes, clear manufacturing instructions, statistical process monitoring and control, proactive error proofing, etc.
- Provides guidance to process engineers in the development of process control plans and the application of advanced quality tools.
- Ensures metrics are in place to monitor performance against the goals and takes appropriate corrective actions as required. Ensures that structured problem-solving techniques are used and that adequate validation is performed for any issues being address or changes being made. Develops and validates new processes prior to incorporating them into the manufacturing operations.
- Strong communication skills to establish priorities, work schedules, allocate resources, complete required information to customers, support quality system, enforce company policies and procedures, and utilize resources to provide the greatest efficiency to meet production objectives.

Education and Experience:

- Master's degree in chemical engineering or engineering is preferred.
- 10+ years process engineering experience in an electronics manufacturing environment, including 5 years in the PCB or similar manufacturing environment.
- 7+ years of process engineering management experience, including 5 years of experience with direct responsibility for meeting production throughput and quality goals.

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Now Hiring

Process Engineering Manager

A successful and growing printed circuit board manufacturer in Orange County, CA, has an opening for a process engineering manager.

Job Summary:

The process engineering manager coordinates all engineering activities to produce quality products and meet cost objectives. Responsible for the overall management, direction, and coordination of the engineering team and leading this team to meet product requirements in support of the production plan.

Duties and Responsibilities:

- Ensures that process engineering meets the business needs of the company as they relate to capabilities, processes, technologies, and capacity.
- Stays current with related manufacturing trends. Develops and enforces a culture of strong engineering discipline, including robust process definition, testing prior to production implementation, change management processes, clear manufacturing instructions, statistical process monitoring and control, proactive error proofing, etc.
- Ensures metrics are in place to monitor performance against the goals and takes appropriate corrective actions as required. Ensures that structured problem-solving techniques are used and that adequate validation is performed for any issues being address or changes being made. Develops and validates new processes prior to incorporating into the manufacturing operations

Education and Experience:

- Bachelor's degree in chemical engineering or engineering is preferred.
- 7+ years process engineering experience in an electronics manufacturing environment, including 3 years in the PCB or similar manufacturing environment.
- 5+ years of process engineering management experience, including 3 years of experience with direct responsibility for meeting production throughput and quality goals.

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Career Opportunities



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 co-workers 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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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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Career Opportunities



U.S. CIRCUIT

Plating Supervisor

Escondido, California-based PCB fabricator U.S. Circuit is now hiring for the position of plating supervisor. Candidate must have a minimum of five years' experience working in a wet process environment. Must have good communication skills, bilingual is a plus. Must have working knowledge of a plating lab and hands-on experience running an electrolytic plating line. Responsibilities include, but are not limited to, scheduling work, enforcing safety rules, scheduling/maintaining equipment and maintenance of records.

Competitive benefits package. Pay will be commensurate with experience.

Mail to:
mfariba@uscircuit.com

[apply now](#)

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 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.

View our opportunities at
[Insulectro Careers \(jobvite.com\)](https://www.insulectro.com/careers)

[apply now](#)

Career Opportunities



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.

[apply now](#)



IPC Instructor Longmont, CO; Phoenix, AZ; U.S.-based remote

*Independent contractor,
possible full-time employment*

Job Description

This position is responsible for delivering effective electronics manufacturing training, including IPC Certification, to 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 conduct training at one of our public training centers or will travel directly to the customer's facility. A candidate's close proximity to Longmont, CO, or Phoenix, AZ, is a plus. Several IPC Certification Courses can be taught remotely and require no travel.

Qualifications

Candidates must have a minimum of five years of electronics manufacturing experience. This experience can include printed circuit board fabrication, circuit board assembly, and/or wire and cable harness assembly. Soldering experience of through-hole and/or surface-mount components is highly preferred.

Candidate must have IPC training experience, either currently or in the past. A current and valid certified IPC trainer certificate holder is highly preferred.

Applicants must have the ability to work with little to no supervision and make appropriate and professional decisions.

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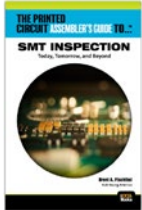
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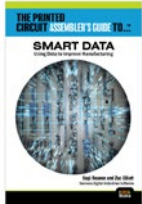
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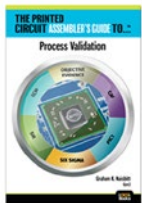
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