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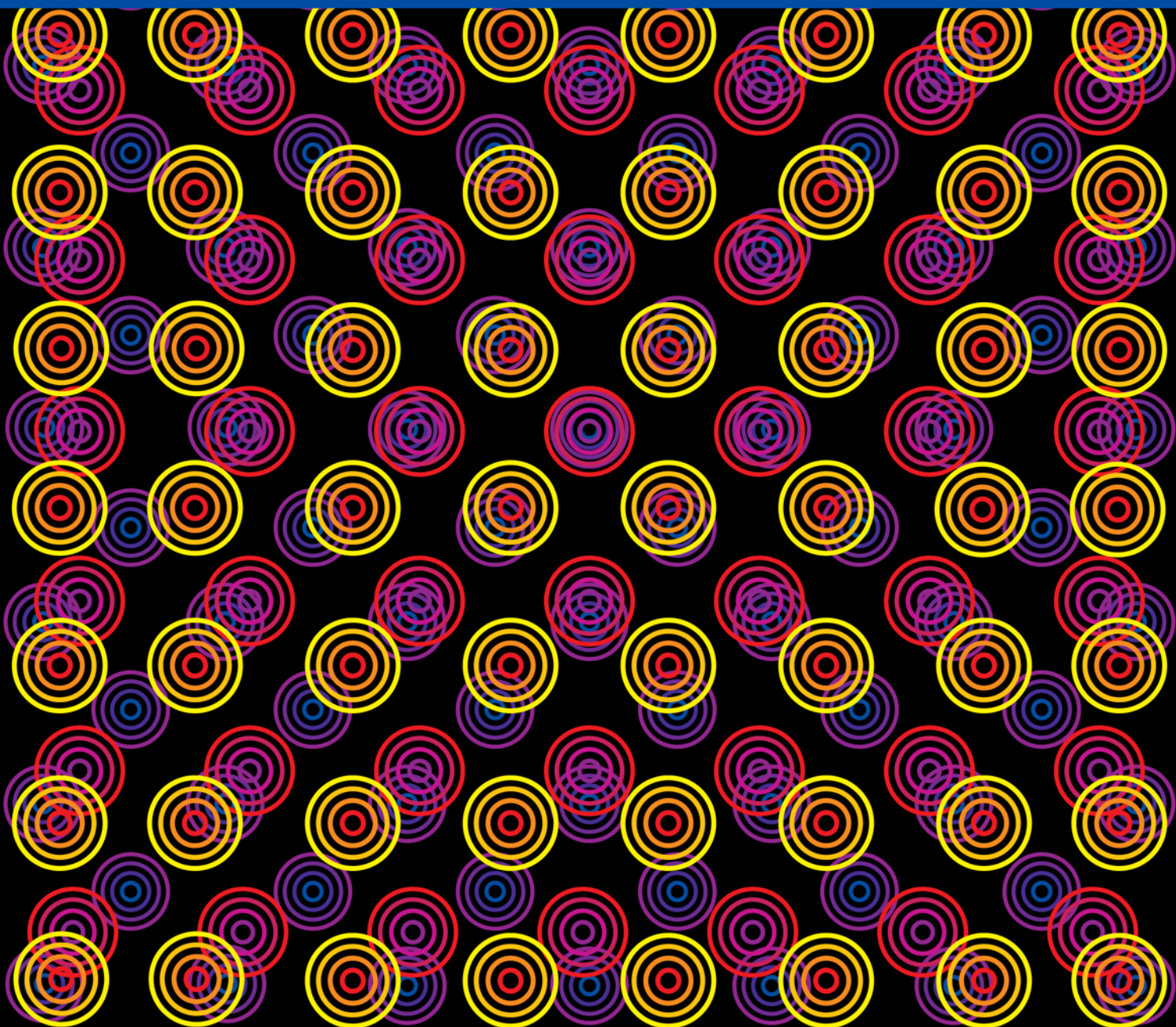
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LESSONS LEARNED: A SHIFT IN PERSPECTIVE





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Lessons Learned: A Shift in Perspective

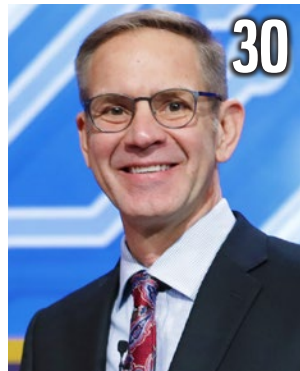
Responding to rapid changes in our industry can be a dizzying test of leadership and corporate skill sets. In this issue, we overcome that sense of vertigo (represented by our optical illusion cover art) to look at how we adapt, respond, and change in order to move forward.



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Manncorp's Response to the COVID-19 Virus



"Having our own in-house manufacturing tools from Manncorp allowed us to produce wearable devices that continually track early COVID-19 symptoms, from the hospital to home."

Anthony Banks, Director of Research at Northwestern University

Watch this video to see how the device works



Photo by Shirley Ryan AbilityLab

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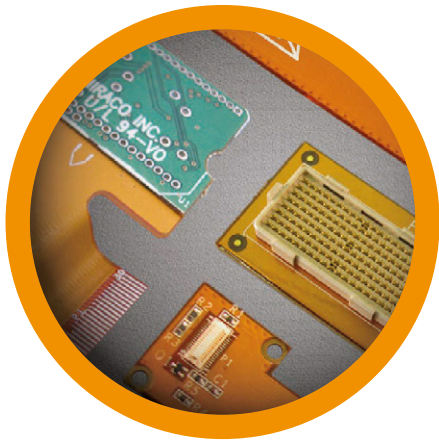


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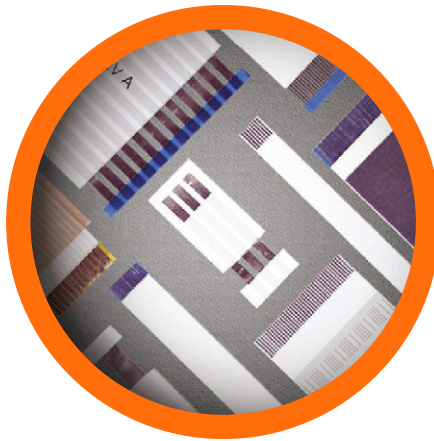
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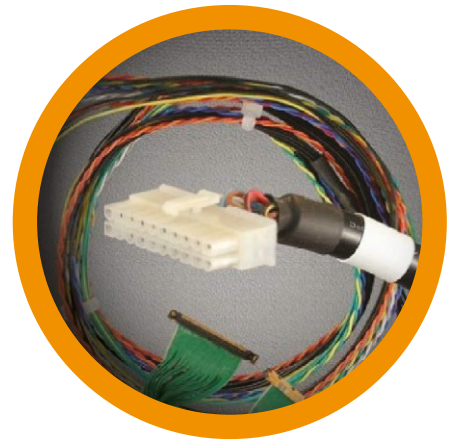
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Lessons Learned

Nolan's Notes

by Nolan Johnson, I-CONNECT007

I have carried “Chaos” around with me for most of my adult life. Well, perhaps I should clarify. I’m referring to “Chaos,” a print from I Ching. A parting gift from my college girlfriend, Cindy, as we went our separate ways after several years together, the text reads, “Chaos: Where brilliant dreams are born. Before the beginning of brilliance, there must be chaos. Before a brilliant person begins something great, they must look foolish to the crowd.”

Cindy knew I would understand the importance of this lesson and that I’d appreciate the reminder to remain fearless and confident in my creativity. On a number of occasions, I’ve found myself looking foolish—for a while. Cindy’s reminder kept me grounded and secure in those moments and encouraged me to keep pushing all the way to the breakthrough—to the moment when others would utter, “Oh, I see what you’re saying!”

As I grew in experience and years, I had occasionally watched others look foolish only to become a “visionary” when everyone else caught up to their thinking. I thought of the “Chaos” message 10 years ago or so, as I sat in a keynote by Apple alum Guy Kawasaki. In his presentation, he made one particular point that struck me hard. He warned the audi-

ence, “Don’t be a Bozo.” By this, he meant to keep an open mind about innovative new ideas, technologies, and businesses. Then, he tossed a quote on the screen in which the speaker dismissed an unnamed business idea as not viable long-term. Kawasaki admitted that the quote was his and that the company to which he was referring eventually became ebay.com/paypal.com. “Anybody can be a Bozo,” he warned the audience. It’s all related to the lessons we learn.

Do you feel foolish wearing your mask in public? Figure out how to make it express who you are. Personalize it. My elderly mother, bless her heart, is a masterful quilter. Lately, she’s been making masks instead. All of my family members and I have received

packages in the mail that included new masks made from fabric that expresses the recipient’s personality and interests (sailboats, marine animals, guitars and music, orange and black for Oregon State University, and blue and gold for the U.S. Navy). And she would make me one with electronics and circuits if she could find a fabric.

Our masks can either hide us or show the world something about who we are. I don’t know about you, but I’ve struck up conversa-





tions based on some design on a stranger's mask. "Batman. Nice! In the DC universe, I'm more of a Flash fan myself..."

In this issue, we asked the industry what lessons they've learned. That was a question rich with answers, as you'll soon see. Virtually every article, interview, and column is a feature. It seems we've all learned plenty!

I can't help but wonder how we'll all look at the next trade show. Something tells me that company logo masks will be the next big show floor giveaway. Will we feel foolish wearing our masks on the show floor, or will we feel foolish without them? Above all, pay attention to the lessons we've learned and change behavior to match the new circumstances. Stay nimble and healthy. There are valuable lessons to learn. **SMT007**



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

Disintegration of a Comet Observed by UCLA Astronomer

In images captured by the Hubble Space Telescope, UCLA professor David Jewitt observed a comet breaking into more than two dozen fragments. The images are the sharpest views of the death of the fragile comet C/2019 Y4. Jewitt estimated that many of the fragments are the size of a house.

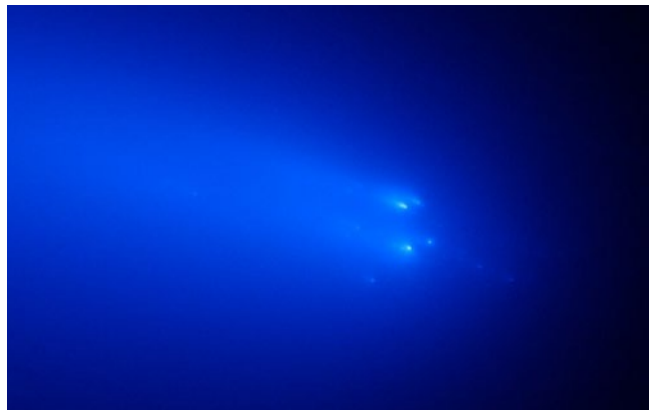
The observation provides evidence that comet fragmentation is probably common, and may even be the dominant mechanism by which the solid, icy nuclei of comets die. Because comets' deaths tend to occur unpredictably, reliable observations of their demise are rare, and astronomers are largely uncertain about what causes them to fragment.

Comets are icy bodies thought to be fragments left behind when planets form in the outer parts of planetary systems. Images from the Hubble are giving astronomers a look in unprecedented detail at the comet's pieces, which may yield new clues about the breakup.

"Breakup, although still not well understood, could be the main destructive process for comets," said Jewitt, a UCLA professor of planetary science and astronomy and leader of one of two research teams that photographed and analyzed the comet.

Jewitt said the appearance of the comet's fragments changed substantially from April 20 to 23, when the images were captured. "Suddenly, it has been thrust into the hot zone near the sun, and the stress of the new environment is causing it to disintegrate."

(Source: UCLA Science and Technology)





Robb Engle

Navigating the Current Supply Chain

Feature Interview by Nolan Johnson I-CONNECT007

Robb Engle, executive VP of Sono-Tek, and I discuss what the company has seen as far as supply chain challenges and changes to respond to in the past few months in response to COVID-19 and its related effects.

Nolan Johnson: Robb, what is Sono-Tek's business, and what is your role with the company?

Robb Engle: Sono-Tek is the originator of ultrasonic atomizers. Based on that proprietary technology, we build turnkey coating systems around that technology and sell and service them to many different industries around the world: electronics, semiconductor, medical, a lot of high tech research, defense contracts, and anything that you can imagine where a thin repeatable coating that is expensive or a high amount of reliability is warranted. The company was founded in 1973 based on the original inventor of the ultrasonic atomizer and spray nozzle. The company bounced around on grants for a number of years until it started breaking into the medical field, specifically with putting anticoagulant coatings inside blood collection tubes.

Then AT&T came to Sono-Tek in the very late 1980s as a result of the problems with the ozone layer and how it related to the electronics manufacturing industry. Sono-Tek was chosen to see if we could lead the industry in applying no-clean spray fluxes onto PCBs for high-volume manufacturing, and we excelled at that during the initial testing; for a while, the company focused on the spray fluxing electronics business. But in 2000, we learned that you don't want to have all your eggs in one basket because it was a pretty bad downturn in the electronics business that coincided with the end of the Y2K scare and the meltdown of the dot-com bust. Sono-Tek was able to survive that, and then we got highly diversified. Now we serve many industries, and we serve around the world.

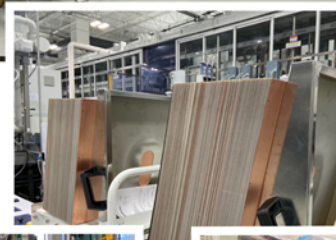
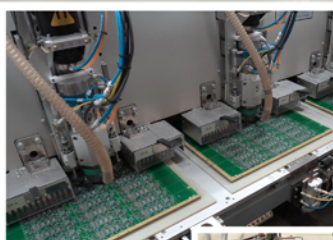
I joined the company in 2000 after my service to my country was completed with the U.S. Navy. I was a nuclear engineer on a fast attack submarine, and when I met Dr. Berger, I was fascinated with his mind and the way he was able to create equations out of thin air to solve problems for our customers, we have always provided unique solutions; he surrounded himself with a team of people that thrived in that environment. We still have many members of the original team that he put together.



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Sono-Tek products under construction.

We have a close core of highly-engaged individuals in the company, which is one of the reasons for our success.

The company operates solely out of our manufacturing facility in the mid-Hudson Valley in New York, which puts us near to ground zero for the United States for the COVID-19 situation we find ourselves in. We also have a very large network of international distributors, and one of our strongest network is in China, so we had a lot of insight into the situation in China relatively early on. We exchanged emails with our Chinese counterparts in mid-January and started to do some basic preparations. You can tell from our fiscal performance that has already been posted that we were in the middle of a huge surge in revenue, growth, and profitability. Right in the middle of delivering on that, we were hit with this. Our preparation was probably five steps ahead of everybody else that we spoke to throughout.

We canceled a trip to China in January. It wasn't going to be into a very critical area at the time in China, but we decided it was the right thing to do. That led to us getting highly creative about how to perform installations and commissionings with our distributor network, primarily through remote access to the machines and video-conferencing with our cus-

tomers and distributors. We even concocted a plan to send a tablet with every machine we shipped so that a customer could have access to us by video chat at the machine. It ended up we haven't had to do that, but it's in our offering to our customers.

Johnson: That makes sense; that's a couple of hundred dollars, which is less than the airfare to get to your customer's facility.

Engle: Exactly. We started talking about our supply chain, and the more critical components that we knew or suspected were manufactured in China. We haven't had a perfect experience or been unaf-

fected, but we have had a seamless experience so far with our supply chain. It was handled with a lot of direct contact. I talked with some key people on the phone, not through website submissions, emails, or POs. When crisis management might be needed, you must talk to people on the phone.

For our critical supply chain stuff, we have a very lean program and realized that some of our vendors might not want to face both challenges because we're kind of a challenging customer to deal with. We have very high standards and try to run a lean program. With many of our vendors, we have a lot of standing orders where we want just-in-time delivery. We tell them to reinforce our supply chain by 300% and not deliver us anything until we call for it. It was stressful for them, and some refused to do it, but we've had long-term relationships with many of them. Some requested higher commitments on our standing orders. We agreed to do that, and they need to do it, as long as we agree to give them a commitment to buy the stuff within 18 months.

Some of our vendors that we did not have standing orders with didn't agree to change to standing order and keep stock on their shelf for us, especially if they were very expensive items. The big, complicated, one-of-a-kind machines

that we sell run on very large, embedded system controllers that are pretty expensive. The core controller is as much as \$4,000 apiece. To say to somebody, “Put \$50,000–100,000 of stock on your shelf for us and deliver it within a week when we call for it,” that was an outright “no.”

We did increase our inventory specifically because of things like that. We were able to do so successfully because, as a company that went through a very violent downturn that I already spoke of in 2000, we realized a long time ago that cash is king. If you want to do business in the way that you need to, then the one thing that allows you to do that is to have a lot of cash. We have what we consider to be a healthy amount of cash, and where we needed to, we deployed it to reinforce our supply chain.

That has been our story. The one thing we didn’t get enough of right away was cleaning supplies. Because we’re a second-tier supplier to medical manufacturing companies, we identified ourselves as essential and realized that we were going to need to be doing nonstop sanitizing and disinfecting of the entire essential workplace area. We put on order a lot of supplies right away. That has probably been the most difficult supply chain to keep filled.

Johnson: Not your primary supply chain, but your support supply chain for basic business operations.

Engle: Yes. Getting our employees masks and sanitizing wipes has probably been the most challenging thing, but we’re tied hand in glove to a lot of chemical companies because our customers are spraying chemistries. We have a lot of very strong relationships with companies that supply us with test chemicals. We also ordered all the ingredients to make our own sanitizing solutions and have been doing that all along. We’ve been making our own hand sanitizer

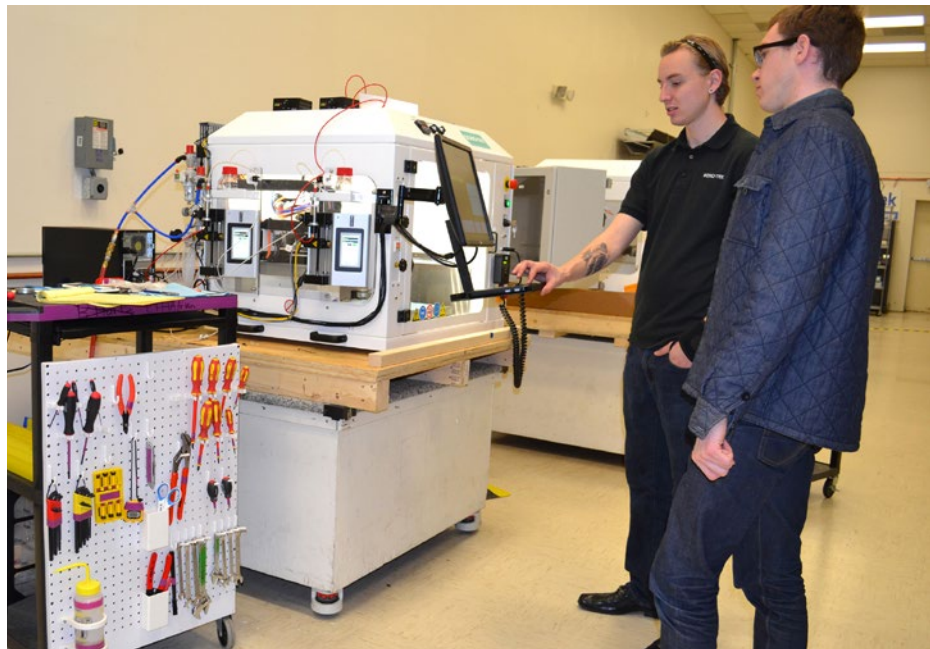
and buying the materials that we needed to make sanitary wipes in gross quantities.

Johnson: You’re not the only company in this industry that’s doing that. More than one company has said that they have the basic knowledge and equipment to do this; they’re simply making their own.

Engle: I’m not surprised. We made such large quantities of hand sanitizer that we were able to send employees home with two bottles every week so that they could feel safer and be safer in this environment. That stuff was initially hard to find.

Johnson: Other than cleaning supplies, was there anything that caught you off guard while adapting?

Engle: We’re a public company, so the board of directors is constantly challenging us. In a meeting at the end of January, I said, “We’ve invested 30 man-hours to solidifying the critical supply chain, but there were things that we didn’t think of because we’re not perfectly foresighted.” They said, “Don’t be surprised to hear anecdotal stories going forward where we’re going to get shocked by something that



Sono-Tek employees inspecting a production unit.



Precision bench work under way at Sono-Tek.

we never expected.” The truth is it didn’t happen in our supply chain for regular parts because of the tariff situation.

The tariff situation that the President was battling out with China revealed a lot of surprises, where some of our vendors that we thought were not related to the Chinese market at all were. We have a policy of the most local sourcing that’s reasonable for the company. We believe that if we employ our neighbor’s company as much as we can, we’ll have a better community and more enriching lives for our employees. We make it a point to ensure that as many purchase orders as possible are sent to the most local possible vendor, and we’ve made a lot of vendors in the area stronger as a result of that.

But a lot of our supply chain had already been tested because of the tariff situation. I studied our supply chain deeply as a result of the tariff situation before the virus because I suspected that a couple of the vendors were misrepresenting things. Our sheet metal people were saying that all of the sheet metal costs were going to have to double for the cost of materials because of the tariffs. I invited them to join me on some websites where you could see the spot prices of stainless steel, aluminum, etc. I showed them that the pricing of those lev-

els did not warrant a doubling of the cost. I helped them go back to their suppliers and say, “This is not right. You’re artificially driving up cost, and we’re not going to accept it.”

Two surprises happened. The first one is that I’m kind of a community partner to another larger manufacturing company. Someone from the company called me, lamenting the fact that he was going to have to lay off and shut down. I said, “Aren’t you a second- or third-tier supplier to an essential industry?” He responded, “Yes, the transportation industry.” So, I said, “Then you can’t shut down. If you do shut down, you’ll be doing the transportation industry a disservice.” He mulled it over and called me back, and I was

surprised that he had not been thinking about that as opposed to taking at face value what other people were telling him. He looked into it himself and made the decision to self-identify as an essential business. They stayed open and did the same thing we did, such as splitting our employees by shift and distancing to minimize the contacts, setting up a disinfecting program, etc.

I was also surprised that not everyone was looking for opportunities to figure out how to stay open. We’ve moved all of our medical customers’ orders to the front of the line, but we’re still taking orders for everything. And regarding those big, powerful, expensive controllers? Those come from overseas, but they’re distributed by a company in California. A few weeks into the governor’s shutdown of New York, I was told that we weren’t going to get any controllers from them because none of their employees were allowed to go into the warehouse to even grab one that was on the shelf and put it into shipping to send it out to us. They were prohibited from being able to do that.

We got on the phone with the operations manager for that distributor and said, “You need to know that this controller that I’m requesting is for a medical machine. It’s for a

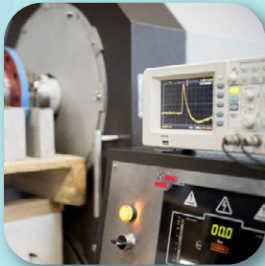


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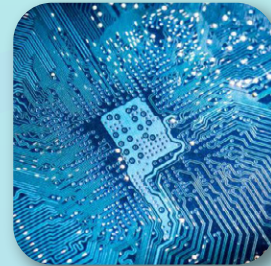
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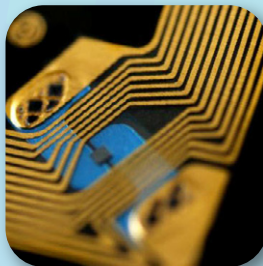
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machine that's going to do a medical project. I'm not at liberty to tell you what that medical project is, but I want you to rethink what you're doing. I want you to reconsider the fact that you won't let any employee go into the warehouse and put the stuff that I'm buying from you into a box and ship it to me." He called us back a day later, and we had changed their minds; they were going to start allowing for shipments that were considered for essential projects.

Johnson: It's interesting that your supplier didn't understand what applications were downstream from them. As soon as they knew that you were an essential customer, then they made the appropriate decisions and responded to the situation appropriately. They probably would have responded appropriately had they already understood what you do.

Engle: Or eventually, they would have realized that they could have some level of operations.

Johnson: That's a lesson learned for those of us elsewhere in the supply chain. You're using their finished good as a sub-assembly in your finished good, so do you know? Is your customer in a place where you need to stay operational or not? Not every manufacturer could say that about every one of their customers. They don't know well enough.

Engle: Right. For instance, our sales of spray fluxes have not changed through all of this, and we're a little bit surprised by that. But then we realized that even though we had heard of some electronics manufacturing companies closing, for the most part, their closures were only temporary; eventually, they also realized that some of their manufacturing is going toward essential services. They reopened, and we've seen a steady flow of orders coming in for spray fluxes for the electronics manufacturing business.

Johnson: From your perspective, how much has the COVID-19 outbreak affected our industry?

Engle: I think everybody has been absolutely turned upside down if you're talking about the industry and the places that I operate and in California. But in the places that I'm closest to, everybody is still managing, almost without exception. I'm not hearing anybody say, "I'm going to declare myself as non-essential," "I'm going to shut down for the safety of my employees," or "We're going to take the PPP money, shut down, and pay our employees anyway." Without exception, everybody's situation in this business in the U.S. is severely affected right now, but they're all managing.

Johnson: It seems like the business has shifted around a lot. Some facilities are able to reassign manufacturing to ventilator manufacturing and support tasks, and the other work that otherwise would have been at those shops is shunted over to shops that aren't certified for ventilators. Everything's shifting around a little bit. It does seem like it has turned everybody upside down, and yet the funnel for work has

stayed full of stuff that you didn't expect to be doing.

Engle: We've had a couple of orders that were directly related, and we did some amazing things with those orders. We moved systems that are normally a 12–15-week lead time out the door in less than four. It goes to show you what the capabilities of manufacturing in the U.S. are.

Johnson: Is that one of the key lessons you learned? As a country, the U.S. was able to respond and do manufacturing in that sort of way, even though at times over the past few years, maybe we've doubted that.

Engle: I've never lost sight of it or doubted it. The reason that many in the company never will, including myself, is because we do so many research projects. People come to us and say, "I have this idea to put this coating onto this thing; it's going to become this new thing." We could never talk about it at the time, but we see those things become a reality somewhere between three to 12 years down the road; we've

been participating in those experiments in real-time all the time, and we're still doing them today. Instead of having customers send us their chemistry and substrates and then schedule time in our lab to visit us, we do an elaborate video remote experience for them inside of our lab. Our lab technicians run their process on these cutting-edge technologies, and the customers view it as a real-time experience.

Because of that, I've never doubted the future of manufacturing in technology in the United States. Sometimes, people get short-sighted when it comes to pleasing shareholders before they please the rest of their stakeholders. It's as important to please all of your stakeholders, and probably the ones who we try to protect the most are our employees. We figure if we take care of the employees, the employees will take care of the customers, and the customers will take care of the shareholders.

Johnson: This has been a great conversation. Thank you for taking the time with this.

Engle: Absolutely. SMT007

Blue Ocean Robotics Acknowledged With Robot Product Leadership Award 2020 for Virus-Killing UVD Robots

Blue Ocean Robotics was selected by Frost & Sullivan for its Best Practice "2020 European Professional Service Robots Product Leadership" Award. The recognition was earned primarily based on the company's work with subsidiary UVD Robots, which combines autonomous robot technology with ultraviolet light to disinfect against viruses like COVID-19.

A subsidiary of Blue Ocean Robotics, Denmark-based UVD Robots' solution has been proven to eliminate pathogens within 10–15 minutes in a patient's room. The company's self-driving, disinfecting robots have been rolled out to more than 50 countries worldwide. "We are very proud to develop robots that not only help solve the world's problems but are also solid and lucrative investments for our owners," said CEO Claus Risager.



Frost & Sullivan Best Practices Awards are presented to companies that encourage significant growth in their industries, have identified emerging trends before they became the standard in the marketplace, and have created advanced technologies to catalyze and transform industries.

"Blue Ocean Robotics' flagship product, UVD Robots, especially enables hospitals to reduce disease transmission by killing 99.99% of bacteria and microorganisms," said Rohit Karthikeyan, industry manager with Frost & Sullivan. "It is the first and only autonomous mobile robot that disinfects a variety of surfaces using UV-C light, giving it superior utility over competing solutions. Uniquely, the UVD robot can be easily controlled with a tablet."

(Source: Business Wire)



Times of **Crisis** = Times of **Innovation**

Feature by Dan Beaulieu

D.B. MANAGEMENT

What do all these companies have in common: Disney, CNN, MTV, Hyatt, Burger King, FedEx, Microsoft, Apple, AT&T, IHOP, Eli Lilly, IBM, Merck, Hershey's, Coors, Texas Instruments, Fortune, GE, and Hewlett-Packard? They are all very successful companies with names that you recognize, but that's not the most important thing they have in common. Can you guess what it is? Give up?

Each of these companies was founded in times of adversity, during an economic recession. Further, each one of their stories proves the theory that "chaos creates opportunity."

From the book *Create the Future + The Innovation Handbook: Tactics for Disruptive Thinking*, author Jeremy Gutsche wrote, "Innovation is about creating an idea that fulfills an unmet need, and often, people need urgency to spot those needs."

Who would have imagined, a few months ago, when we first heard about the coronavirus in China, that we would be where we are right now in such a short time? Who could

have imagined our world order changing so rapidly—restaurants, stores, schools, and universities closed; product shortages; double-digit unemployment; people walking around in gloves and masks; and news outlets constantly discussing COVID-19 and the statistics. It makes one realize what a fragile world we live in. Even in these times where we take pride in insulating ourselves with the security of insurance, good jobs, and large portfolios, it can all be threatened or even disappear in just a few short weeks. Who knew at the turn of the new year what 2020 would be like?

But if we do nothing else, we have to gather up our courage, look at the future with clear-eyed optimism, and say, "We did it before, and we can do it again." But for now, let's move on with another popular saying—"It's a shame to waste a good crisis"—and start doing what those great companies did before us in their own hard times: Find a way to innovate, and find a new way to do things. If nothing else, let it not be said that we wasted this crisis.

Let's take a look at the obvious needs of today. These are all markets that are going to change drastically because of the pandemic,

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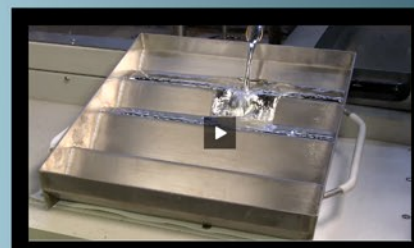
– Felix Valenzuela, Director of Engineering, Molex



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and some of them are changing right now: medical electronics, onshoring, consumer goods and shortages, remote meetings, medical testing, homeschooling, new product introduction, disinfectants, online universities, streaming, strong broadband, remote voting and campaigning, take-out services, e-tailing, remote religious services, car buying, remote routine medical care, elderly care, municipal services, car registrations, and more and more areas where we are already changing what we used to call standard operating procedures.

The thing to do is to look at everything that is changing and find a better way to not only change them but change them in a way that will be even better than the way we used to do—which, ironically, until now, we thought was the best way.

These times are not for the faint of heart, those who hate change, or for those who would rather fight than switch. No, these are times when innovation will rule, and great innovators will thrive. If you are a creative person, this is your time. If you are one of those people who looks at things the way they could be and says, “Why not?” this is your time. The old way of doing things is the most powerful enemy of your culture.

These times are not for the faint of heart, those who hate change, or those who would rather fight than switch.

Our job as innovators, team leaders, and company leaders is to study what is currently going on in the world today and do something about it. Capitalize on what we are seeing during our own darkest hour and find ways to improve our lives not only temporarily today but for the future as well. In fact, our job right now is to study the needs of today and match them with the solutions of tomorrow; by doing exactly that, we may even

come up with our own version of a “change the world” product.

As I review the list of things that are changing right before our eyes, I am tempted to look at one thing that is obvious as well as pertinent to our space of interconnect products, and that is NPI. There has never been a better example of a time when we all needed very rapid NPIs than right now. Just as the pandemic is fast-moving, so is the need for fast-moving NPIs in terms of medical electronics. Companies are frantically working on ways to produce better, cheaper, and more-effective ventilators, medical device disinfectant ovens, and testing devices.

I recently came across some amazing new products that were not even a twinkle in an inventor’s eye a few months ago. Check out these five inventions:

1. **A germ-killing face mask:** This mask is made out of material that allows it not only to protect from germs but to kill them on contact.
2. **A 3D, custom-made face mask:** This type of mask is formed perfectly to the wearer’s face so that it is comfortable but also snug-fitting (they should make this one out of that germ-killing material, don’t you think?).
3. **An autonomous sterilization robot:** You’ve seen robotic vacuum cleaners and lawnmowers. This is the same principle except it’s smaller and cleans and disinfects as it goes around your surfaces.
4. **A solar protective bubble:** This looks like a large, clear umbrella completely covering the top half of the person using it.
5. **A two-person ventilator:** These machines can support more than one person at a time.

Here’s the good news for our industry. Who is going to design and build these devices? We are—those of us in the electronics PCB and PCBA areas are the ones who have to support these new products. Are you prepared? Can you build products from schematic to reality in a matter of days? Here’s a

very broad hint. If you are the company that comes up with the fastest NPI time to market, then the name of your company might join those names that I mentioned at the start of this column, instead of the one standing there ruefully saying, “I should have thought of that.”

But here’s the thing that always fascinates me when it comes to innovation in times of chaos: Why do we have to have chaos to be innovative? Why does it take a crisis for us to get out of our comfort zones and start thinking about things in a new and different way? Certainly, it has been proven that not much gets done when things are going well.

In James C. Collins’ book *Good to Great: Why Some Companies Make the Leap...and Others Don’t*, he talked about how difficult it was to get out of the “good” zone on your way to greatness. But there has to be a way. I find that most of the time, there is a reluctance—nay, a downright resistance—to change in all of us. I see this in some of the companies I work with; people hate change, and people hate change-mongers more than they hate change. But if you hate change, you will never innovate because why should you? Things are fine as they are—or are they?

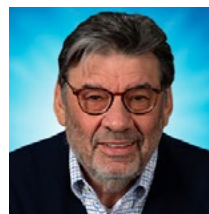
Here are seven things you can do as a company to encourage change and hence innovation:

- 1. Create a culture of innovation:** Encourage people to vent their idea freely. Most of the time, people with ideas will not mention them for fear of ridicule by the rest of the team. Get rid of that.
- 2. Allow people to take risks:** This also means allowing people to screw up. Encourage mistakes. Most companies have their employees trembling with fear at the sheer thought of making mistakes when in actuality, none of us are making enough mistakes to be creative.
- 3. Push people to think big:** Push people to make decisions based on wild and audacious ideas. Take the ceiling out of the room and let them shoot for the skies with their imagination.

- 4. Get rid of the rut:** Break routines and shake things up. Let people use their own biorhythms to let their facility of imagination flow freely. Some people are morning thinkers, while others are late-day thinkers. Allow them to roam freely with their ideas. Stop constricting them.
- 5. Introduce people to new ideas:** Get your team excited about an idea. The more passionate your team is, the more innovative solutions they will come up with.
- 6. Be different:** Be different in the Apple advertisement sense. Encourage those who act different, look different, and are different. These are the people to pay attention to when it comes to, forgive me, clearing the lemmings from your organization.
- 7. Can the naysayers:** The naysayers are usually anti-risk people who have won for years by playing by the proverbial playbook. There is a good reason that Tom Peters once said he would take a creative person who graduates with a solid “C” average over the “knows how to play the system and never makes waves straight ‘A’ students.”

And finally, in the spirit of under-promising and over-delivering, be the true leader when it comes to innovation. The best way to do that is to be the chief encourager or “empowerer” of your company, and if you have been smart enough to hire people smarter than you, you’ll do fine. Your company might even start innovating without being in the middle of a chaotic crisis. **SMT007**

Editor’s note: Parts of this article are from Dan Beaulieu’s recent “*It’s Only Common Sense*” column titled “*I Should Have Thought of That.*”



Dan Beaulieu is president of D.B. Management Group.

Handling Supply Chain Disruption in Silicon Valley

Feature Interview by Nolan Johnson
I-CONNECT007

I spoke with Najat Badriyeh, CEO and president of Naprotek, about the current state of the supply chain as a contract manufacturer in Silicon Valley, adjustments the company has made, and what she anticipates for the future.

Nolan Johnson: Najat, for those who aren't familiar with Naprotek, what's your position with the company, and what does Naprotek do?

Najat Badriyeh: I'm the CEO and founder of Naprotek. We started in 1995. Naprotek is an electronic contract manufacturing service providing PCB assembly. We support many different technologies, and we specialize in prototype and small-volume production. Our primary market segments include military, medical, and industrial. We also support R&D, semiconductor equipment manufacturers, and networking customers. 2020 marks our 25th year of operation. I was working with my team to prepare an appropriate anniversary event when the pandemic began for our customers



Najat Badriyeh

and key suppliers. We immediately put all of that on hold when it became apparent how serious this situation would become.

Johnson: You're facing a lot of disruption in your business environment. What do you see, and how are you handling it?

Badriyeh: Naprotek continues to endure. We were fortunate that the leadership in California reacted faster than most other areas. Santa Clara County was one of the first counties to order shelter in place for all residents. On March 13, I asked everyone who had laptops to take their systems with them in case they had to work from home until we had more information about the pandemic and how it would affect our business. It was possible that they would need to work from home for some time, as the initial news was not encouraging. Subsequent events happened quickly. We closed on March 16 by 3:00 p.m. as we received the order from the Santa Clara County Health Officer that all residents were being directed to shelter in place. It was a shock to all of us.

Even though we had heard rumors about impending shutdowns and shelter-in-place



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Manufacturing floor at the Naprotek San Jose facility.

orders, we did not take it as seriously as we should have. We did react quickly by sending people home when the order was issued. The news about the spreading pandemic was uncertain, so we encouraged everyone to stay aware of the unfolding events and what was happening locally and around the world. We closed for approximately one week, waiting for input from the city leaders regarding shelter-in-place orders and how businesses should comply with the order.

Throughout that week, I was on conference calls with the city leadership team and in multiple meetings with other CEOs in Silicon Valley. In the beginning, there was chaos and panic because the orders were confusing. There were more questions than answers regarding operations, employee safety, the possible duration of this event, and what a recovery plan might look like. The leadership team did their best to respond, but it was clear this would be a longer-lasting event than most people realized at the beginning.

Initially, the orders were very specific regarding sheltering in place and what people were supposed to do in response. Gradually, we began to receive more answers about what would happen moving forward and how busi-

nesses would be affected. There were a lot of discussions about which types of businesses were considered “essential” and how companies should respond to that designation. Additionally, there was discussion around how the city would manage the process and what could happen regarding the high level of potential unemployment the pandemic might create. The biggest concern for everyone was the safety of our employees. For companies receiving the designation of “essential business,” the immediate thought was that we had employees returning to work during a pandemic that was still unfolding on a global basis. As a CEO, this presented a very difficult situation, knowing that we had employees working under very undesirable circumstances. This added a tremendous amount of stress as there was the ever-present question about our employees: How could we guarantee their safety while working?

I was very nervous and apprehensive at the beginning, especially the first week when we brought people back to work. We did it gradually and increased the numbers slowly. We asked them to take their temperature, making sure that employees did not come to work if they had any symptoms that could be

indicators of the virus. We strictly enforced the use of gloves, masks, frequent handwashing, and social distancing, and we provided alcohol-based hand sanitizer. We implemented all the precautions before we considered allowing any employees into the building for work.

Johnson: You were shut down for about a week as you figured out the whole situation, and then you received certification as an essential business.

Badriyeh: Yes, we were advised immediately that military and medical customers were both very essential. In one case, we received a letter from the Department of the Navy, indicating that our support was critical. Over the coming weeks, we began to see more customers receiving the designation of “essential business” as they supported military contractors, medical interests, or were vital to the national infrastructure. These customers were requesting their products quickly and for an indefinite period.

There was a lot of pressure to respond regarding our ability to support their requirements and what an eventual recovery to full operation might look like. Working under these circumstances was indeed very stressful. We required a lot of flexibility, both internally and from our customers. We had to maintain social distancing while working, and we could not bring our full staff back at that time. Additionally, when this event began, and we were shut down for a brief period, we notified our incoming carriers to hold shipments until we had direction regarding our return to work.

The first indication was that the shelter-in-place order would last until April 7. Based on this timing, we notified our carriers that they could release the shipments they were holding. Unfortunately, and in response to the pandemic, these carriers had also reduced their workforce. This resulted in a tremendous amount of material being held locally. They were not able to clear this backlog of deliveries for about three weeks after the initial notification to resume deliveries.

Johnson: That is an obvious disruption to your supply chain, just getting access to materials that were sitting at the carrier’s local facility. What were some of the other things that you experienced regarding the supply chain? Where did you have to make contingency plans?

Badriyeh: The first few weeks were the toughest. The most stressful part was having employees feel comfortable to return and feel safe at work. As for management, the reaction was more profound: “How risky is this situation? Am I taking too much risk by allowing people to return to work?” Even with social distancing, the news every day included new alerts about wearing masks and increasing social distancing guidelines. There was also news about how the virus traveled and spread so quickly and easily. I increased the safety by mandating that anyone who is coughing, sneezing, or had a cold or related symptoms could not be in the building. Even with this precaution, it was reported that people could carry it and transmit the virus even if they were not showing any symptoms.

I increased the safety by mandating that anyone who is coughing, sneezing, or had a cold or related symptoms could not be in the building.

To satisfy the requirements under social distancing, we allowed all employees who could work from home to continue to work from home for the foreseeable future. We moved some employees from the day shift to swing shift and rearranged some workspaces within the building to accommodate the spacing under social distancing rules. We continue to support the social distancing requirements for everyone at the building. Our work-from-home employees started to rotate back to the build-

ing in small numbers by coordinating with their teams to minimize the total number on-site at any time and to maintain their distance.

What has really helped is the fact that a large part of our work is internet-based. We can order materials and make payments online. Communication is supported using email and audio/video conferencing. This has been a massive relief and allows us to have employees continue to shelter in place while still allowing them to work in support of our customers. Having the flexibility to keep employees in their homes yet continue supporting the needs of the business has been a tremendous benefit.

It can be difficult at times, but we have discovered that with the communication tools available, generally, it is working well. Productivity may slow down a bit while everyone gets used to the “new normal.” Tasks may take a little longer, but the effectiveness of communication does increase over time as people get used to working under these conditions. We are aware of many larger companies in our area that have already mandated that their employees continue to work from home until at least the end of the year.

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but we have discovered that
with the communication
tools available, generally,
it is working well.**

It is not going to be a quick return to things being normal. I do not see that happening until there is a vaccine or anti-viral medication to prevent the spread or treat the symptoms of the virus. Currently, a potential vaccine is not on the horizon. Nobody knows when it might be available. It could be a year from now, or perhaps longer. There is a lot of pressure to reopen the economy as soon as possible. Locally, we are hearing that there could be some easing of

the shelter-in-place orders as early as June. I personally believe it is going to take a very long time for the economy to recover anywhere near where it was before the pandemic. It will definitely not be a matter of days or weeks.

Johnson: This is going to be our new normal, at least for a while. Has your supply chain stabilized, so you’re getting components and parts that you need to do your job and provide your service?

Badriyeh: Right now, it has. I did not see a major impact on material availability in the short-term. We are a small company, and our material requirement is small compared to large contract manufacturers and other, larger companies with greater demand. But if this is going to continue for a while, we may see a greater impact later.

We know that manufacturing will not return to normal in most areas for a long time. For us, the ongoing pressure of working under these circumstances will continue to affect production for a while. A lot depends on how the country moves through this pandemic. China went into lockdown in December 2019. They were able to flatten the curve and get control of the exposure by mandating a complete shelter in place. We do not have the ability to do that in this country.

We know that productivity has declined across the country. We expect to see the effects of this in Silicon Valley in the next few months. The larger companies will feel the impacts first and to a much greater degree. We are a small company, by comparison, so we may not experience it immediately or to the same degree. I am, however, expecting to see some slowdown in the coming months.

Johnson: It sounds like you’re already anticipating some changes to the supply chain long-term, or at least further out into the year. What sorts of contingency plans would you be willing to share here?

Badriyeh: Our biggest focus has been employee safety and coming back and doing the essen-



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The Naprotek facility in San Jose, California.

tial work carefully with a flexible schedule and working directly with our customers. Under normal circumstances, suppliers are measured and rated on delivery and service levels to the customer. Currently, customers must be a bit more flexible with us. We are working diligently on their behalf, and we are focusing more on safety and health.

What we worry about is being able to source material and building products to support our customers to meet their demands. We are mindful that with the pandemic affecting all geographies, there could be a future impact to supply through extended lead times for material and longer logistics chains for moving the raw materials to the production facilities for consumption. Behind all of this is the potential for cost increases as supplies become constrained, and the larger customers pull most of the available components into their companies for use in production. Right now, we believe that one of the best solutions is to have customers place orders in advance. This will help us drive supply to support their demands earlier and possibly avoid some of the potential constraints that may occur in the future.

Forecasting and placing orders will change under the new normal. The data has shown that the market remains reasonably strong

despite the impact of the pandemic. Customers have started to react quickly to plan ahead. We are encouraging them to take a longer view of their potential demand. If they are asking for us to quote for a quarterly demand, perhaps they could order two quarters or the whole year if the design will not change. That will allow us to order materials to support and lock in the supply required to better service the customer.

Johnson: It seems your best approach is to make sure that you have as much

notice as possible so that you can plan appropriately.

Badriyeh: Many customers have responded favorably in this area. We are starting to receive increased forecasts and orders covering a longer horizon. I'm very sure this is in direct response to the possibility of constrained material supply in the future.

Johnson: Some procurement departments are seeking secondary and backup sources. Are you considering that, or do you feel that better planning with your existing sources will be sufficient?

Badriyeh: Our present sources will be sufficient for the foreseeable future. We are not currently seeking secondary sources internally, but we are encouraging our customers to specify alternate or backup sources for their components to protect against supply shortages from any single supplier at any time. This is a general rule since supply constraints can be localized to a given geography and impact a small number of specialized manufacturers. If there are alternate components specified by the customer, we can exercise a backup source at that time to minimize the impact where possible.

It's always best to have maximum flexibility when sourcing materials to protect the customer in uncertain economic times.

Johnson: It's good to know that things are not necessarily as disruptive as some people might fear. That's great news. Do you have any final thoughts?

Badriyeh: This situation makes you realize how vulnerable the whole world is, especially when you look at healthcare providers and companies and the issues they face. It quickly illustrates just how vulnerable the healthcare system really is at any time. My biggest concern centers on the manufacturers of safety items and personal protective equipment (PPE). If this global situation continues for a year or more, will they be able to keep up with supply and build enough stock of safety equipment? We have already experienced shortages of basic supplies, along with increased cost and lead time. We successfully refocused on obtaining reusable masks that can be washed and reused to avoid the problems around sourcing disposable masks for our employees.

Another concern is the food industry and global food supplies. At the beginning of the pandemic, the stores were emptied out quickly. Over the past eight weeks, the producers and

distributors have been able to increase supplies, and stores are starting to see better overall supply. With the shelter-in-place orders and restaurant closures, the growers and producers were hit directly, and many food supplies normally routed to these customers were completely cut off. Entire industries were shuttered, and food stocks could not be distributed. Until these channels are reopened, the producers will continue to constrain production, which may result in periodic shortages to the consumer.

These are all long-term concerns that we currently see all over the world. Local concerns are more pointed as they apply to our business. What will the balance of 2020 look like for our company and our employees? Will there be a vaccine in the foreseeable future? Can we successfully maintain the social distancing rules and, hopefully, decrease the spread of the virus? These are the questions we face going forward.

Johnson: We are fortunate to be in an industry that was immediately identified as crucial and not to shut down but instead to ramp up. That has put us in a very different, fortunate place. Najat, thank you for taking the time on a Saturday afternoon to have this conversation.

Badriyeh: Thank you so much. SMT007

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IPC's Dr. John Mitchell: Leadership in Crisis

Feature Interview by Barry Matties
and Nolan Johnson I-CONNECT007



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On May 13, Barry Matties and Nolan Johnson spoke with Dr. John Mitchell, IPC president and CEO, in another installment in our series of industry updates.

In this interview, Mitchell discussed the challenges of leadership in crisis situations. In his role at the helm of IPC, Mitchell brought a unique insight into the power of leadership. He pointed out that a good leader will assemble a strong team, get out the team's way, and concentrate on breaking down obstacles.

Other observations from Mitchell included the balance of communicating with optimism and realism, and that while COVID-19 is testing leadership skills, it is also providing an opportunity for innovation within organizations. Mitchell concluded by sharing ways in which industry leaders are regularly networking, supporting each other, and sharing successful strategies.

Barry Matties: Welcome. Today, I'm talking with John Mitchell, IPC president and CEO. John, welcome, and thanks for taking the time to talk with us again.

John Mitchell: My pleasure. Thanks for having me, Barry.



Matties: John, we recently conducted another survey, looking at some of the lessons learned during the COVID-19 outbreak, along with the shifting priorities companies now have. What we found is a lot of the response is focused on leadership and leadership issues. As the president and CEO of IPC, you are certainly a highly visible industry leader, along with your team, and IPC helps lead the industry in so many ways. Today, I want to focus this conversation around leadership. To start, why don't you share what you think the role of a leader is, please?

Mitchell: In a broad and kind of generic context, the role of a leader is to cast the vision, and you bring in and work with a team that you enable and get out of their way (laughs). You also overcome obstacles that they encounter; if you have resources they need or challenges, your job is to help share that idea of where you're going so you and your team can work together to make sure that's a reality. But when obstacles come up, it's the leader's job to try to break those down.

Matties: There are a lot of different leaders out in the world—good, bad, and some right in the middle. What do you think makes a good leader?



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Mitchell: When I think of a good leader, you have to do the basic blocking and tackling that we talked about, but a good leader does more. It's a balancing act. It's challenging because it's kind of a lonely position, but at the same time, you need to interact with your team and your entire group—whether it's a team, a business unit, or an entire company, whatever the scope of your leadership responsibilities may be. In that role, you need to exude confidence. You have to show that you believe in a positive outcome, and you have to be a positive leader. If you're always negative or a downer, that's not going to play as well or be as inspirational.

You have to find the positive, but you also have to temper that with realism.

You have to find the positive, but you also have to temper that with realism. And in today's world, as leaders go forward, they want to have their organization be a place where talent becomes part of it and offer a fair wage; that's probably number five on the list of important things. Leaders also want to make sure they are doing something important and that they caught the vision of doing something important. You want to make sure you're contributing to society and taking care of your employees. The aspect of being a good leader by taking care of your employees has become enhanced with what we've seen happening lately.

A good leader today has to do all of that stuff they have been doing, and now they need to make sure that their employee feels safe and that their needs are being met. We're focusing on concerns regarding a safe workplace, being able to contribute, etc. It enhances that dimension even more than what we used to do, beyond just, "We have a healthcare plan." No, we actually make sure that, in your environment, we're doing all that we can, and we're

listening to what you do as well. That's the other aspect of a good leader that I would point out; you're not isolated to the point where you don't hear the real issues from your team.

Matties: As the industry adjusts to the new world realities, this brings new demands and challenges, as you were just keying in on, for business leaders in the environment. What changes, if any, do you already see in the way business leaders are approaching their businesses today and into the future?

Mitchell: A lot of the good leader qualities have to just be enhanced. It's about transparency and being willing to call a spade a spade, a nickel a nickel, or whatever it is. Helping your team see and hear the real situation will help them respond. You can be positive about that.

Let me just use an example from IPC. We shared that, "It doesn't look like we're going to hit some of the targets we had set out this year, and because of that, we want to change how we work." And what I hear from my staff is that they appreciate that forthrightness—not to be sitting there, ignoring the situation, but saying, "This is not going to be possible the way we envisioned it six months ago. Because of that, we're going to have to change how we act." Be transparent about that sort of thing, and be a good communicator.

And it's not just telling; it's also doing. Your actions need to align with those things as well. Your business today becomes even more important. And into the future, you have to be very responsive. One of the things also that COVID-19 has provided as an opportunity for leaders today is in the area of innovation. We know things have to change. We hear all about the "new normal." That new normal can also help you say, "I may need to leverage some innovation to respond to this." At the same time, that new innovation to respond to COVID-19 can help you solve some other problems that you may have been struggling to invest in previously. You can take advantage of making your organization even better in these circumstances.

What I see happening for businesses today in leaders is to find those opportunities where

you can innovate, whether it's buying new technology or changing your processes. Now, you have the reason that everybody understands. "Due to COVID-19, we had to change some things." We all did, so what did you change? "I changed this, this, and this," and because of those changes, we're going to be even more successful into the future.

Matties: That's a great point. Anytime you can get buy-in on change and direction is important because the most challenging times in any business is when they're creating change. And when you add a solid reason, it's a lot easier to get buy-in on that.

Mitchell: Yes. The other thing I want to mention is that as leaders, we don't have all the answers, and we know this. One of the tools that leaders are becoming more aware of and are starting to do more is reaching out to peers, whether they're in the same industry or not, to share ideas and test their thought processes. Again, being a leader is a lonely position. You're kind of set out there, and you are expected to have all the answers, but at the same time, you don't.

One of the ways that we've done this is we've been holding these executive forum calls where presidents, CEOs, and heads of the electronics manufacturing industry have gathered together for an hour or so in a very safe environment where they could say, "How are you doing this?" People are sharing, and the entire industry is better for it. Finding those kinds of opportunities where you can share executive to executive and leader to leader—whether they're in the industry or not—will become ways people can become even better leaders as we go forward.

Matties: Since you still have those meetings, are they growing in size, or what's the future of those?

Mitchell: We were doing them every week, while COVID-19 was most urgent in North America and Europe. We have just shifted to every other week because we're getting to the

point where people are getting what we need to do. There are fewer questions, so it depends on the topics. Going forward, I expect this will be a new norm that we'll do.

We'll have this maybe once a month where we'll set up specific topics, bring in a specific expert or person to share an idea about that, and then let the group that's interested in that topic and attending collaborate together and share their ideas. I've heard from the industry that they value this opportunity. While I don't think we'll be able to keep the pace of every week—because as business gets back to booming, they have other things to do—once a month for an hour will be helpful as new things come up, because things are always coming up.

Matties: As leadership skills are honed throughout a career, along the way, we all have mentors or role models or leaders that we admire. Why don't you share with us some of the leaders, past or present, who have influenced you or who you most admire?

Mitchell: I'm sure there are iconic leaders everybody thinks of, but the first place my mind goes is people like Albert Einstein or Richard Feynman. Most people don't really think of them as leaders, but they were leaders of their discipline and industry. Sorry I went to physicists, but they built on and were aware of the history, and they weren't afraid to strike out on a new path and challenge the status quo; they did so in a way that it could be explained to others. I appreciate that.

As far as living, I recently watched a three-hour documentary on Bill Gates. I used to be one of those "Oh no. Not Microsoft" people when I lived in my IT world. But frankly, what Bill has done lately in his retirement or after leaving Microsoft is he hasn't sat there and said, "I need to go build another Microsoft." Instead, he said, "I'm going to help solve world hunger, sanitation, or many other different challenges as global issues," which is admirable. But he didn't do it by saying, "I'm the world's greatest leader in this stuff." He leveraged the skills he has. He's a very

structural thinker. He is trying to apply innovation and technology to solve these problems. That's his bailiwick, and even though he's doing something completely different, he's leveraging the strengths and talents he developed along the way.

We have an opportunity to learn from our experiences, hone those specific skills that we are best at, and then leverage those skills in whatever we're doing. That's why I thought of those folks. They are clear communicators, directional leaders, and boundary breakers, and they're diverse in their approaches to different problems but grounded in their methodology with which they approach them.

Matties: What advice, John, would you have for our industry leaders today?

Mitchell: The first thing I would say is everyone's an industry leader. I don't care if you don't have any reports. I don't care if you're an individual contributor. You still have the opportunity to be a leader. Every one of us has not only the opportunity but also the responsibility to be a leader. We can lead out on issues. We can raise concerns. We can do the best work we possibly can. We can share ideas to improve things. Everyone should think of themselves as a leader, no matter how many reports they have or don't have.

Every one of us has not only the opportunity but also the responsibility to be a leader.

My other advice is to be transparent, nimble, and innovative. Don't be too stuck in the way things have always been done. I really think that we should find ways to explore new opportunities. We don't need to only do what we've known; we can take the opportunity and change like this, whether it's good or bad, which provides us that opportunity to act. My last piece of advice would be to take action.

Don't over plan. You need to take some steps. Just do something and learn from it.

Matties: You're right. The past often gets in the way of the future.

Nolan Johnson: Within the confines of IPC and the work that you're doing, how do you push leadership as a culture down into your organization?

Mitchell: When I first interviewed to come to IPC, one of the questions they asked me was, "How have you been successful in the past?" The answer to that is the answer to your question because I've brought in good people, and I've gotten out of their way. Don't micromanage. Allow people to be leaders, ask them questions, and listen to those answers.

If you're the president of an organization, your line manager probably knows more about that product than you ever will. Thus, listening and having the opportunities to have them be listened to not only improves your business, but it will also improve their sense of worth within the organization. That's part of the leadership responsibilities as well. You give them the opportunity to say, "I don't know what the answer is going to be on this. Here's an opportunity for you to come up with a solution, and please do so. Let's see it."

Mistakes are going to happen, and that's okay. We're going to learn from and say, "We spent \$10,000, but hopefully not that much, meaning a lot of money on whatever that solution was. Is there a better way we could have done it where we only spent \$25 on that?" And then we do it. You learn, and it grows, but you give people the opportunity—a safe space if you will.

Matties: John, thanks again for taking the time to help keep our industry well-informed. We greatly appreciate that, and we wish you all the best.

Mitchell: Thank you so much. I always enjoy talking with you. **SMT007**



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Know Your Cybersecurity Risks



Mike Landeck

Feature Interview by the I-Connect007 Editorial Team

Mike Landeck, information risk strategist, talks about what companies should consider when it comes to investing in cybersecurity, especially with so many people working from home in the midst of a global pandemic. Mike explains how it all starts by knowing your cybersecurity risks.

Nolan Johnson: Mike, as a cybersecurity expert, let's talk about cybersecurity—particularly for manufacturing—although I'm sure there are some very fundamental concepts that apply to virtually any industry. Can you introduce yourself and share your background and expertise?

Mike Landeck: I would be considered a security subject-matter expert (SME) in the area of software security assurance. When you write software, my expertise is how you test to make sure it's secure, which has primarily been at Hewlett-Packard and a few other companies. My other area of expertise would be government-funded healthcare. When you go

for Medi-Cal or the U.S. healthcare exchanges, there are some very specific security requirements for which I would be considered an SME. As a generalist, I've been doing cybersecurity for about 20 years.

Johnson: Do you see any fundamental changes with everybody shifting to working remotely? Is that changing the landscape?

Landeck: Yes and no. Some companies have been working remotely for a very long time. For these companies, their laptops don't know where they're located; it doesn't know if it's your home office, Starbucks, or your corporate office. The way it works is through networking. Traditionally, companies have what's called an internal network, which may also be referred to as an intranet, a LAN, or a WAN. They have a network that's protected from the outside world, and when you walk into the office, you plug your computer into the wireless or a jack, and your computer has permission to be inside that network. What came about in the late '90s was the concept of virtual private networks, or VPNs, which is a piece of software on your computer that will remotely enter your



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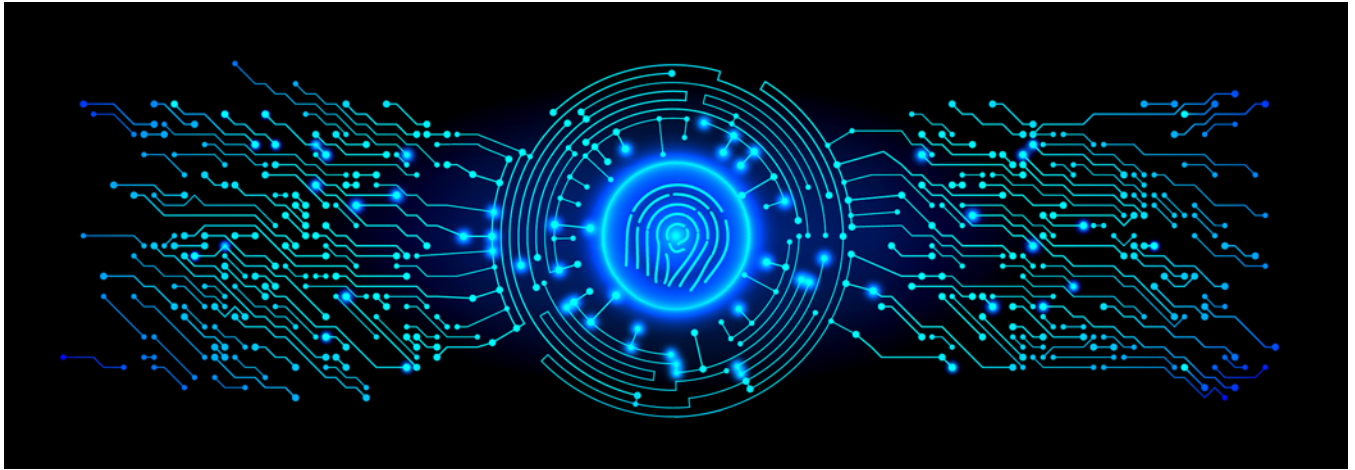
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corporate network; for all practical purposes, that computer is inside your network.

For companies that have embraced this for a long time, the move to working from home is not a big deal. But for companies for which this is new, they have challenges about how they very quickly allow access into their corporate networks. I suspect the number of companies in this situation is very low. I've seen it mostly in state agencies that have prohibited work from home policies or companies that process very sensitive data that have a reason not to have computers allowed outside their network. But for the most part, we haven't seen a big difference in how people work. They're sitting at a different desk, but from a technology point of view, there's not a big difference.

Johnson: What might you consider the key pillars to good cybersecurity, whether it's at the manufacturing facility or how it applies to a distributed workforce?

Landeck: The fundamentals hold true. You have to know what you're protecting. If you're a company, for example, that writes public announcements or anything to do with the public, your need to restrict who sees what is very small. If you're a company that writes intellectual property, and you live and die by the competitors not seeing it or not seeing it early, your need to protect that data is very high. If you're in the healthcare world, you have very specific legal penalties and requirements on who can see people's medical infor-

mation. The first pillar is knowing what you have and why you're protecting it. If you have a company where nothing you have is sensitive, trying to invest money to keep that protected doesn't make a lot of business sense. If you're about to revolutionize an industry with a very disruptive new technology, protecting intellectual property is probably a good investment. It's knowing what you have and knowing why you're protecting it.

There are two concepts in regard to accessing your information and technology. First, there's the concept of authentication. Authentication is proving that you are who you say are; for your iPhone, this could be done by using your eyes, face, fingerprint, or password, for instance. The second concept behind that is called authorization, meaning, "Am I allowed to see it?" Even if I can prove I'm Mike Landeck, I may not have a reason to see that at your company. Knowing who's allowed to see things and maintaining an access control list is important. The mistake we've seen a lot is that these lists don't get updated. For example, if you hired me as a software developer, I work on that project, you give me full access, and then I change jobs to being a server administrator, I no longer have any need to see that source code. More often than not, companies won't update that access. If I'm given access once in my career, I'll probably have it for the rest of my time there. This process is called access management.

The last pillar is "detect and respond" and knowing what's happening in your world. To

go back to my analogy, if I'm in your network as Mike Landeck, you know I live in Sacramento and am in the Pacific Time zone. I work Monday through Friday during regular business hours. If someone using Mike Landeck's account logs in from Eastern Europe on a Friday at 3:00 a.m. and accesses source code that I shouldn't see, that should trigger an event somewhere in your network. There's lots of logging going on, and in a solid program, there will be some kind of alert that says, "This looks suspicious and needs to be looked into." Now, you may look into it and find out I was in Eastern Europe on vacation, and the login event was legitimate because the CEO called me with an emergency. But the important thing is to have someone see it and respond.

The last part of that cycle is if you have someone in your network who's not Mike Landeck, how do you cut them off? How do you block me from being there? How do you see what I did to know what happened, and how do you make sure it doesn't happen again? How do you learn from it?

Johnson: Is there an audit process that a company should go through to make sure that they don't have any gaps?

Landeck: Yes. Most companies are regulated by different organizations or different bodies. For example, if I'm processing credit cards, the payment card industry (PCI) requires a very specific type of audit to happen once a year. The people that do that audit are certified in that area. If you work in healthcare, for example, you have your certain various HIPAA audits. In the manufacturing world, I'm not sure what that would be, but typically, you'd have what's called an SOC audit—a verifiable auditing report which is performed by a certified public accountant. Most publicly-traded companies that do business with the government are required to do the SOC audit. The SOC audit will cover everything I mentioned.

Dan Feinberg: Let's say your internal security is secure. I had a situation with a client where their internal security was totally locked down,

and they talked to me about a patent that they were going to apply for. They said, "We have a nondisclosure agreement with you, so this is under that." But I thought, "How do they know that my setup is secure?" because we were talking through Zoom.

Landeck: That's a great question. That's where the SOC audits come in. There's a concept in security called third vendors risk management. Nowadays, no one company is alone. Companies depend on other companies for supply chains, maintenance, or staff augmentation—even janitorial. The question you're raising is, "How do I know that?" For the most part, it's your SOC audit. If you were to come to my company and say, "We want to do business with you," part of your contract may very well be that we're required to give you a SOC audit report each year. That's very common.

There's a concept called a zero-day vulnerability. What that means is that it's a weakness in a device or piece of software that can be exploited that no one knows about yet. You can secure it in every way you know how, and the industry will come in and say, "You've done everything possible." There's still the concept of the zero-day that's exploited all the time; it's essentially a backdoor that can be hacked through. You may have passed your SOC audit. However, they may disclose to you on Zoom something that you're not comfortable knowing because it's so valuable, and your computer may have a zero-day.

Feinberg: You mentioned VPNs. One of the big weaknesses of a VPN that I've seen over the years is that they're slow. I understand that some companies have come out with a new VPN that's supposed to give about 95% of your normal speed. Have you heard anything about them, or do you have any information on what they've done that's different?

Landeck: What you're talking about is a choke-point. With your network, there are two things. There's a number we call "hops away," which refers to distance. Nowadays, that's almost not an issue. Then, there's the bandwidth, which

is how much data you can push through a connection at once. When you start doing interactive videos, you increase your bandwidth significantly. What you described with your question is the chokepoint, or the smallest part—the VPN—and that could be because the VPN isn't big enough, meaning the bandwidth or processing power is too small.

If you go to my house right now, I have a red cable on my floor because my home wireless cannot handle my entire family video conferencing at once. I've talked to dozens of people now who have shifted from wireless to wired in their homes for this reason. The pros are it's very stable and strong. The cons are you have this tripping hazard eyesore on your floor.

Johnson: For the company that goes through this process only to find out that they have some work to do, what resources can they use?

Landeck: A lot of companies are doing this right now. When I started in cybersecurity 20 years ago, it wasn't a thing. There were no college classes that taught it. It was largely people that were self-taught, and there was not a lot of work for it. Most of us started off as software developers or administrators and did this on the side. Now, there are two things that are happening that are driving this. One is risk. An organization gets hacked, finds out not having security is more expensive than having it and pushes to start having it. The other issue that drives it is regulations. Almost any industry

you're in now says there's a minimum level of security you must have. When you go to your doctor's office, the security there is because they have to or they want to do both. But what happens is HIPAA says, "At a minimum, you have to do this."

If you're a small software company here in Sacramento, you're going to need something. Talking to a security consultant about what to do makes sense, and one thing I always emphasize is a cost/benefit analysis. If you're a small software company, you shouldn't be spending millions of dollars on security unless your business analysis tells you that you should. It goes back to how we started the conversation. As a company, figure out what's important and what you do and don't need to spend a lot of money on. What are your crown jewels? Do you have intellectual property? Do you have a database on customers you don't want to lose, and if you did, would you lose their trust?

Before you spend a lot of money, figure out what it is you're trying to protect, and then get a consultant to help you understand what you're protecting it from and how. Do your homework. What is it going to cost you to respond to the security event?

Then, there's a replacement loss, and this is probably another example of ransomware. If they "brick your system," where they encrypt your system to the point it can no longer be useful, and you don't pay the ransom, you have to replace that or those devices. When we talk about intellectual property, we're talking about competitive advantage. If I'm a local company with a database of users that gets breached, if my competitors have my list of customers, I'm losing a competitive advantage.

When a company decides to start implementing more cybersecurity, they need to figure out what kind of losses they're afraid of. Once they figure out what could hurt their business, as a third-party consultant, I



can help them quantify it. You can create actuarial tables using what's called a Monte Carlo analysis to give them ranges.

Happy Holden: Let me ask the question that everyone is afraid to ask: How many different ways can somebody hack in?

Landeck: Emails are the most common. A great resource would be the Verizon Breach Report. A lot of companies are hit every day, and they have a large team that looks at all the breaches and how they happen. It breaks down by percentage the various things that can happen, so they will tell you based on the last 1,000 breaches, X% happened due to the emails. Going back to the VPN topic, an organization has a protected network, so while there's internet outside, they have this fortress called their LAN or WAN that they have the VPN to get into. If I'm a hacker and want to get into your network, I have to find a way in.

A very difficult way is to find the outside routers, hack through your routers, and then figure out how to go through your routers and servers. It is much easier for hackers to go to LinkedIn. If I want to hack I-Connect007, I would do a LinkedIn search and find someone who works there, such as Barb Hockaday. I would then Google Barb and see that she likes dogs. As a hacker, I would craft an email, make an educated guess as to Barb's email address, and then send her an email, saying, "I'm from the dog rescue and would like to work with I-Connect007." These emails can look very real. If she clicks it, the email unlocks the malicious payload, then the criminal hacker can infect your machine.

Here is another scenario I use when teaching. As a hacker, I can pick a company and find out who their chief information officer or chief information security officer is. Then, I would find a couple of their database administrators on LinkedIn and send a fake email, pretending to be the CIO. It's an easy email to forge. If the DBA's name is Bob, I can say, "Bob, attached is part of the logs that show your account was accessing databases incorrectly and stole some data. I hope this is a big mistake. Please take

a look at this attached file to prove it was not you. I'm copying HR." You can send Bob to every security training there is about phishing emails, etc., but the minute Bob gets an email from the CIO copying HR saying, "You're being accused of stealing data in your job," no matter how many red flags in his head say, "This is a trick," Bob may open that email.

These emails can look very real. If she clicks it, the email unlocks the malicious payload, then the criminal hacker can infect your machine.

For the victim, their brain says, "This is a risk. This could be a fake email." And yet, you have the other part of their brain saying, "I am being wrongfully accused. I don't want to lose my job. I'm going to get in front of this right now." What makes email phishing so dangerous is you have the human factor, and Bob, for example, has a VPN into your network. Rather than me hacking into your network, if I can hack Bob from outside of your network, I can pivot into your network without doing a lot of work.

Back to the vacation example, a hacker can find out if the CIO is in Cancun on vacation, away from his email, based on their social media pages. I can send an email to Bob, saying, "I'm on vacation right now, so don't bother calling me, but you need to get on top of this right now." At that point, Bob is stuck because he can't evaluate whether it's true or not. Bob doesn't want to risk losing his job, so he might click on a suspicious email or link.

Johnson: What's the one thing you would tell a manufacturing company to check on right now?

Landeck: For any industry, know your risks. What bad thing would a cyber-event do to



your company? What are the bad things a cyber-attack would do? I know that's not a very sexy answer, but it's a very appropriate answer. If you have lots of data backups and the ability to store laptops quickly, you may not care about a ransomware attack—especially if you're a small company. If you're a company that doesn't have intellectual property, trying to lock down your file shares may not make sense.

Feinberg: Of course, there is no cure for stupidity.

Landeck: I had a client that was hit by a pretty big event. It happened through email, and the email said, "There was a problem with your online banking transfer. Please click here to fix it." We found victim zero—the first person to click it. I asked her, "Have you done any banking transfers before?" She said, "No, I never have." And I said, "Why did you click an email that said you have to fix the problem with your transfer?" Her exact words were, "I wanted to see what would happen." There was nothing about that email that made any sense to her except curiosity.

Holden: We're all familiar with the Iranian nuclear facility's centrifuges that were hacked into to make them spin out of control. Did they come in surreptitiously, or on somebody's email?

Landeck: You're talking about Stuxnet. All we know is what was made public, so according to news outlets, what happened was called an air-gapped network, meaning it talked to nothing outside. There was no VPN; you physically had to touch that device. According to news sources, the malicious payload that did the corruption was put on a USB drive and brought in. It's unlikely you'd have a factory floor that was fully air-gapped. It's possible if you're making something that sensitive or that

regulated, but the average smart factory won't be air-gapped; it will have what's called a network boundary, which will protect what comes in and out.

Johnson: Although, the point is you can even overcome an air gap if you want to.

Landeck: Yes, apparently, there are some people that overcame an air gap.

Holden: On a scale of zero to 100, how would the U.S. rate in terms of protecting our infrastructure of energy, power, banking, water, utilities, finance, etc.? Are we more aware of it and coming up, or do we have a long way to go?

Landeck: The more we rely on our phones, laptops, etc., the better the attackers get, and the more we have to stay on our game. There will always be threats out there. But all in all, if I can work from home, VPN into my work, talk on my cellphone, buy things from Amazon, and have my lights on, things are working.

Johnson: As our manufacturing facilities move to be more digital and online with even more sensors, it seems that we could be more exposed to ransomware-type attacks. If that happens to an electronics manufacturer, what should they do?

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Landeck: Let's take it up a level and identify three categories: integrity, confidentiality, and availability. I'll start with integrity. Can an attacker log in and change things about you? Stuxnet was integrity. They logged in, changed things, and the machines overheated. Then, there are confidentiality breaches like we see with credit card thefts. They can log in and take things. The third category is availability. Ransomware wants to take a company offline. But if your business depends on your sensors connecting and an attacker disrupts your factory's connection, do you have a redundant data connection? If you have all Acme sensors and you buy a non-Acme product, will the sensors still work?

Instead of focusing on ransomware, my guidance would be focusing on availability. Let's say that with the pandemic, your workers can't come in. A smart factory is supposed to be hands-off or lights-out. What that means is it's completely people-free. During this pandemic, how do you support even a hands-off, lights-out data-driven manufacturing center? The answer is if the bad guys can figure out how to monetize it, it will be a risk someday. If you're using a sensor that can be infected with ransomware, the bad guys will figure out how to do it. But if you're protecting it from the internet, you're doing better.

With online devices, though, we haven't seen a lot of ransomware. The big threat we've seen is devices being converted to bots. Most of these sensors will have small CPUs and memories because they have to be inexpensive to make. We have seen attackers who are able to log in because the passwords aren't being changed properly. They're taking that sensor that's supposed to be monitoring a piece of pipe, for example. They log in and re-purpose that device from monitoring the pipe to sending out spam or digital requests as part of a distributed denial of service (DDOS) attack. Now, your sensor is no longer monitoring your pipe; it's part of an attack. And while you may



not care about the fact that it's being used as an attack sensor, that pipe is no longer being monitored. Ransomware may hit the IoT market soon. Right now, we don't see ransomware as much as bots.

Johnson: Do you have any parting thoughts, Mike?

Landeck: What your readers will probably want is a panacea to say, "If you buy this device, then all my security needs will be taken care of." The guidance says there is no panacea. Stuxnet is an example where they did everything right. Even an air-gapped environment can still be hacked. While your readers may want a panacea, it goes back to principles. As a business owner, what are you afraid of? If you're afraid of your workers not being able to work, then you ought to invest in the endpoint protection against antiviruses for your phones, tablets, computers, etc. If you're worried about your data being stolen, you should invest in access control.

Know what it is you have to lose. Understand what those losses are, as well as the most cost-effective way to protect them. On an ongoing basis, have audits to confirm that's still happening. We all have blind spots and miss things.

Johnson: This has been very informative. Thank you for your time.

Landeck: Thank you! SMT007

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ein Electronics Industry News and Market Highlights



GTX CEO Chairs So. California COVID-19 Supplies Taskforce and GTX Is Recognized as a Top Revolutionary IoT Company ▶

GTX Corp, a pioneer in the field of health and safety wearable technology, announced that CEO Patrick Bertagna now chairs the Southern California Biomedical Counsel COVID-19 Supplies Taskforce.

SAMWHA ELECTRIC Receives Attention in Electronics for Smart City Industry ▶

SAMWHA ELECTRIC, a manufacturer specializing in electrolytic capacitors in Korea, draws attention in the world electronics market by launching a conductive polymer hybrid electrolytic capacitor, leveraging advanced technology to cope with increasing demand for electronic components used for smart city industry—a future strategic market.

Intel Capital Invests \$132 Million in 11 Disruptive Technology Startups ▶

Intel Capital, Intel Corporation's global investment organization, announced new investments totaling \$132 million in 11 technology startups. These companies bring to market breakthrough innovations in artificial intelligence, autonomous computing, and chip design.

Draganfly's 'Pandemic Drone' Conducts Flights Near NYC ▶

Draganfly Inc.—a manufacturer within the commercial unmanned aerial vehicle, remotely piloted aircraft systems, and unmanned vehicle sector—announced the first-ever series of U.S. pandemic drone test flights in Westport, Connecticut—considered a COVID-19 hotspot—to identify social distancing and detect symptoms presented by the virus in an effort to keep the community safe.

NVIDIA Chief Scientist Releases Low-Cost, Open-Source Ventilator Design ▶

NVIDIA Chief Scientist Bill Dally released an open-source design for a low-cost, easy-to-assemble mechanical ventilator.

Compound Photonics Backplane Enables World's Smallest MicroLED AR Displays ▶

Compound Photonics U.S. Corporation—providing compact, high-resolution microdisplay solutions for augmented and mixed reality (AR/MR)—announced the wide availability of its high-performance digital backplane to leading microLED developers worldwide for integration into complete microdisplay subsystems.

Garmin TeamX Unveils the Seven-Inch Format Aera 760 Portable Aviation GPS ▶

Garmin International, Inc., a unit of Garmin Ltd., announced the aera® 760—a premium aviation portable that is purpose-built for the pilot and the cockpit.

Corelis Introduces New ScanExpress Version 9.6.0 Boundary-Scan Software Suite ▶

Corelis, a supplier of high-performance boundary-scan test and measurement software and hardware, announced version 9.6.0 of its ScanExpress™ Boundary-Scan Suite of Software is now available.

Global Silicon Wafer Area Shipments Rise in Q1 2020 Despite COVID-19 ▶

Worldwide silicon wafer area shipments rose 2.7% to 2,920 million square inches in the first quarter of 2020, compared with fourth-quarter 2019 shipments of 2,844 million square inches, but dropped 4.3% year-over-year, the SEMI Silicon Manufacturers Group reported in its quarterly analysis of the silicon wafer industry.

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Leaning on Leadership

Feature Interview by the I-Connect007 Editorial Team

It goes without saying that in times of crisis or great uncertainty, we often look to those in leadership positions to guide us and give us direction. In this interview with Barry Matties and Nolan Johnson, Tom Forsythe, executive VP of KYZEN, shares his insight on leadership and what he believes makes a good leader.

Barry Matties: Tom, as a business leader, what do you feel is the most important aspect that someone in a leadership role needs to learn from this outbreak?

Tom Forsythe: One of the key things is the old adage “expect the unexpected.” This clearly blindsided the planet with very few exceptions, yet in the U.S. and even in Europe, we had some advance warning. What did people do in view of that? That’s what a leader’s job is. Nobody’s a soothsayer, but if there’s something coming at you, you should be able to hear it or see it before it whacks you in the head, hopefully. Then, what do you do?

You duck, jive, bob, and weave. In times like this, that’s what you see. People care about whether you care about them. In the U.S., 30 million people unemployed who had jobs six weeks ago.

Matties: Right, but in many cases, nobody saw this coming. It was fast-moving.

Forsythe: But even in the first few weeks, there was a lot of, “Who’s on your team and lives with their parents? Maybe they should not come to work for a while. Who’s at risk? Who has been exposed?” For example, back in January, we were identifying people in the building who had jobs who could function pretty well remotely, and we had our IT people making sure they had what they needed and that everybody had high-speed Internet.

Matties: What you’re saying, if I summarize, is that the leadership must make sure that the tools and support are there for the employees. That’s a big role in achieving the culture, motivation, and work environment while keeping their business financially sound.

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KYZEN leadership team pictured L to R: Erik Miller, VP Global Sales; Ram Wissel, VP Global Technology; Tom Forsythe, Executive VP; Kyle Doyel, President & CEO and Dr. Mike Bixenman, CTO & Executive VP.

Forsythe: Correct. All businesses depend on people. We have people who make our products, sell our products, and invent tomorrow's products, and all of them make a difference. If the organization isn't worried about their best interests and communicating that they are, those talented people are going to go find something else.

Matties: In general, what attributes make a good leader?

Forsythe: There are a lot of different flavors, and a couple of them tend to pay off. Empathy is important. Make sure you can understand what your team is dealing with; it's the inverse of the "ivory tower syndrome," which is well-documented, unfortunately. The key is to communicate early and often. When people get stressed, most people's communication skills decline. If they're usually great at communicating, their skills will become average, and if their communication skills are typically not very good, they will be even worse in times of

stress. You can't always be right, and you can't always be a fortune teller, but you can call it as you see it in the present. Hopefully, leaders are engaged in the industry so that they get the benefit of more than one point of view.

Each of us has our own silos, operations, perspectives, and daily interchanges. When things get odd or weird, we spend a lot of time on the phone, reaching out to our friends and colleagues in the industry. "What have you heard? What do you know? What do you see?" We try to paint that picture to be a little more complete. That will allow for better decisions because you don't always have great information to make decisions, but more information makes for better decisions generally.

Matties: What do you feel employees expect from leadership?

Forsythe: The team is trying to perceive some of those things I talked about. Do they feel like the leadership has their best interests at heart? Do they worry about them? Sometimes, that's

big or little stuff. In the last month or two, we have tried to make sure we have enough PPE for everybody or we brought in lunch so that people don't have to go out and get lunch or worry about making lunch when even going to the store is a hassle these days. We have aimed to take one thing off the worry list; two would be better, but one is a good start.

Matties: Something I often hear is that employees expect to understand the direction or strategy of the company. They want to know how to measure their success. How do they know when they win? Those are some of the things that—especially in good times or bad, like during this outbreak—are even more important. How do you feel about those?

Forsythe: I agree. I'm not the biggest psychobabble guy, but I'm a big believer in Maslow's hierarchy of needs. At times like this, people tend to gravitate toward that bottom rung. The good news is I'm in the lifeboat, and there's no water in the lifeboat. Now, I wonder where the lifeboat's going. If I don't answer those first two questions right, then it doesn't really matter what the answer to the third question is. In times of stress and challenge, like we're dealing with by any measure today, it starts with those basic things from a company's perspective. Are the lights on? Is payroll being made? Are we paying suppliers, or are customers paying us? That basic Maslow core is functioning.

From an employee perspective, was it just dumb luck that we were selling Clorox wipes when the pandemic hit? You wouldn't have to be too much of a savant to do well if that was your line of work right now. Or were we more typical and, frankly, got dealt an array of challenges? How is the team doing with it? Do I think we're going to come out on the other side? Right now, I'm not sure many people are worried about 2021 earnings.

It's like anything else. When things are calm, you can look to the future, and hopefully, all that earlier planning allows you to execute during these challenging times where we don't really need a new strategy. We just need to do

what we do well. We might need some different techniques, but all the goals are the same. The expectations are similar. It reminds me of a conversation I had with some marketing folks a number of years ago who said, "We want to update things, but we know who we are. We want to get our hair done; we don't want a brain transplant."

People perceive that, and the companies know who they are in these difficult times. That comes from the leadership and employees together defining that over a long period of years. What's the company's "it," and as the people and team embrace that, does that "it" stay the same when times get tough? It's like the old story about two angels. There's an angel on each shoulder, and one is the better angel. Do they listen to the better angel? Or when they're stressed out, do they cut and run? That's the stuff that employees are looking for. Are they with me when times are tough? If they are, then I'm probably with them.

Matties: Even in a regular routine of work, employees want a measure. They want to be held accountable. They want to know when they're doing well and when they're not, including areas to improve. They want to know that leadership is looking at it as a process and not just a number.

Forsythe: It's very important that people have growth opportunities. There are lots of ways to grow and learn more. It makes me think about how KYZEN has changed, as well as the world. Even though we believe we are still true to ourselves, what goes on daily is different than what it was 30 years ago. The company has grown, as well as our people. We have added individuals to the team and had those new people fit in well and help the overall team grow. These things are key to growth because you're right that most people want to improve themselves. It can be in modest or big things, but it's the idea of lifelong learning. You don't necessarily have to learn a language in a week, but you can learn things that make you a better, more interesting person and perhaps a more valuable employee. Over time,

wise organizations encourage people to be that kind of person who can get that done.

Nolan Johnson: There's plenty of discussion about how to build a leader, and the leadership has a lot to do with following by example, encouraging people to grow, and putting challenges in front of them that they overcome. It seems like there's nothing quite like a crisis situation to cause the leaders to either hunker down or step up and challenge their people. What's your take on that?

Forsythe: I agree. When the chips are down, that's when most people thrive because they see the challenge and rise to it. The shared experience of dealing with these challenges is, frankly, the stuff of legends. There are mountains of books that have been written about that, and the scouts are certainly part of that sort of thing. It's the idea of when this blows through, which it will at some point, because we know no storm lasts forever. When your people sit back and look at it, they say, "How did it go?" You might respond, "It wasn't nearly as scary as I thought it was going to be when a lot of people were scared." That may be good,

but what did you do? Did everything keep going? How many things changed? If you were lucky, not a lot changed, and there were fewer people in the building, but you were properly trained and prepared, it may be okay.

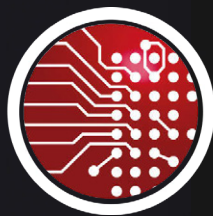
That's the sign of an organization that is functioning, has its people well set, and is ready to deal with the task at hand. Then, they look back at it and say, "There were a few long days because somebody's kid was sick or something, but, lo and behold, we got where we needed to go because we had it all together." There was no moment of panic. I grew up in the military, and I make this joke a lot: "If nobody's shooting at us, there's no need to be nervous."

Matties: In this case, people might really feel like they're being shot at.

Forsythe: They do because there's a lot of fear. One of my daughters feels that way. She's really freaked out about this. We need to help calm people down because this is one of those things where you don't know everything, but you know a lot. Yes, we have to stay in our Petri dishes, but by and large, if you're careful



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mostly, you'll be okay. Look at the statistics. When you're the person who's sick, the statistics don't mean anything. We've been really on top of those numbers because we have people in a lot of places and a bunch of people around here, and we're staying abreast of those numbers because that helps people understand the risk. When we were in our shop in Malaysia, people live in tight quarters. We felt that if we can keep the factory open, that was eight or nine hours a day where people are social distancing. When they're home, they're probably not.

Matties: Every environment and circumstance is unique.

Forsythe: Exactly. By definition, leadership means there's a group of people that are either somehow reliant or depending on the leader to help that little entity accomplish its goal, whatever that is.

Matties: The only way to know if you're a leader is to look behind you and see if somebody is following.

Forsythe: That's it. Or, as you painted this vision, when the chips get down, is it like turning the lights on in an old, crummy apartment? When times are stressed, you see that the team pulls together. Sometimes, that's organic, but a lot of times, the leaders have a lot to do with it, such as setting the tone and environment. The team has a lot to do with it as well, but there are many examples of where a good team with the wrong leader doesn't do very well.

Johnson: Do you see leadership as a talent, a gift, or a skill?

Forsythe: In every endeavor, there are genuinely talented people that you just sort of marvel at, whether they're throwing a football, painting, or being a leader. For the rest of us

mere mortals, leadership, like anything, is a little bit knack and a lot of hard work. It's sharpening the saw. They're generally the exception, but they're out there. Most people wind up being a leader in some way, shape, or form at some point in their lives.

The difference is the people who take that knack and work hard to improve their skills in that area because it is something that you can learn by doing. You can learn by talking to others, as well as through trial and error; that's how you get better. Learning is fundamentally a feedback loop. The only way to improve is to make sure that you're getting some feedback so that you can make those adjustments because none of us are perfect every day. A healthy organization has feedback. It's not necessarily always about paperwork, but the quiet moments where somebody says, "What are you doing?" or where the boss says to an employee, "This doesn't seem like you. What's going on?" That's the most personal and productive part of leadership.

Matties: Do you have any final thoughts about leadership?

Forsythe: Leadership is very important, and it's not always one person. Most organizations have the penultimate person, but good organizations have leadership not only at the top but throughout the ranks in small teams at the lower levels of the organization. There are leaders there, and they're growing, and they all need to work on becoming a little bit better. The guys who are a few steps ahead need to be working with those people—particularly people who don't think they're leaders. A lot of terrific leaders don't think they should be. Helping them get over that inhibition or denial is often the most rewarding stuff.

Matties: Tom, thank you for all your insights.

Forsythe: I appreciate it, Barry. SMT007

Physicists Measure a Short-lived Radioactive Molecule for the First Time

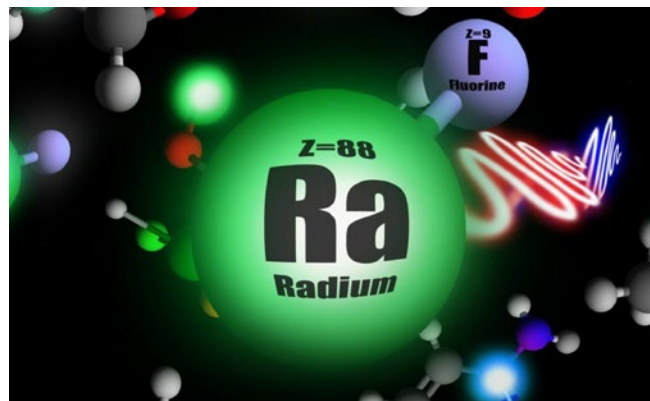
Researchers at MIT and elsewhere combined the power of a super collider with laser spectroscopy to precisely measure a short-lived radioactive molecule, radium monofluoride, for the first time. The results are published in *Nature*.

Precision studies of radioactive molecules open up possibilities for scientists to search for new physics beyond the Standard Model. The team's experimental technique could also be used to perform laboratory studies of radioactive molecules produced in astrophysical processes.

"Our results pave the way to high-precision studies of short-lived radioactive molecules," says the study's lead author, Ronald Fernando Garcia Ruiz, assistant professor of physics at MIT.

The team looked for a way to make radium monofluoride, or RaF—a radioactive molecule that contains a heavy, unstable radium atom, and a fluoride atom. This molecule is interesting because certain isotopes of the radium nucleus are themselves asymmetrical, resembling a pear, with more mass on one end of the nucleus than the other.

Theorists predicted that the energy structure of radium monofluoride would make the molecule amenable to laser cooling—a technique using lasers to decrease the temperature of molecules and slow them enough to perform precision studies. While most molecules have many energy states they can occupy, with large numbers of vibrational and rotational states, radium monofluoride favors electronic transitions between a few energy levels—an unusually simple molecule to control with laser cooling. (Source: MIT News)



It's Not What You Have: It's How You Use It

Smart Factory Insights

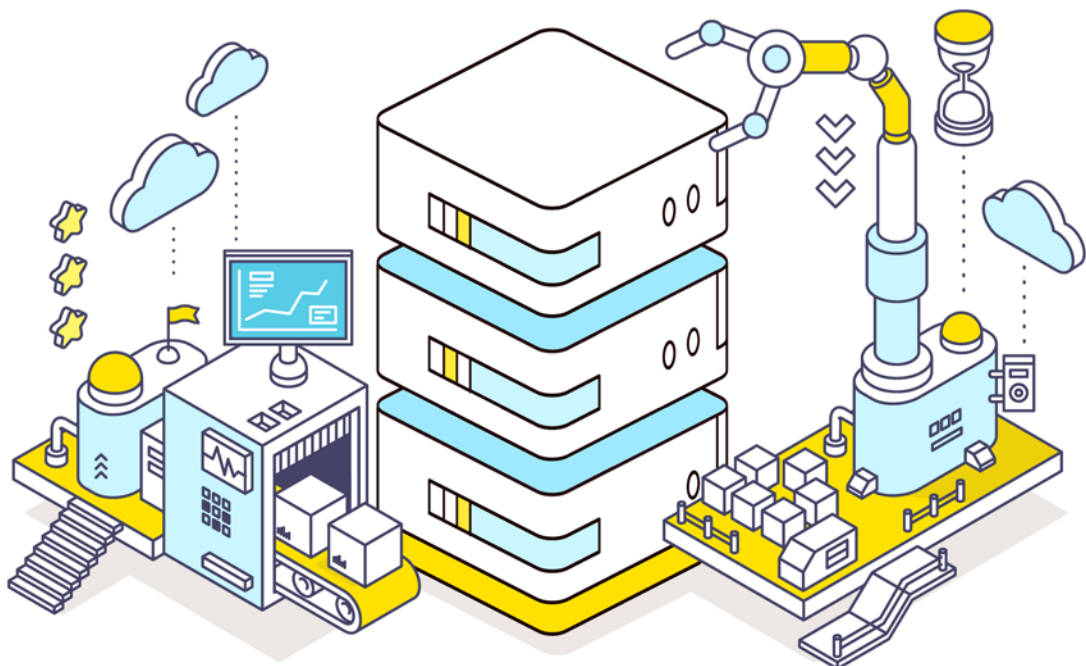
Feature Column by Michael Ford, AEGIS SOFTWARE

According to the reports, all the machines in the factory are performing well, but the factory itself appears to be in a coma, unable to fulfill critical delivery requirements. Is this a nightmare scenario, or is it happening every day? Trying to help, some managers are requesting further investment in automation, while others are demanding better machine data that explains where it all went wrong. Digital technology to the rescue, or is it making the problem worse?

Having machine data—or not having it—is not an indication of good or bad. My evil self could go into any factory shut down due to COVID-19 today and find ways to take out production reports that show that over the recent period, no scrap was made, no parts were lost, there were no line imbalances, the factory achieved zero-defects, there were no missed

deliveries, and there was no sign of productivity loss on any machine. No time was lost for manual operators taking restroom breaks, there were no accidents, nobody was late for work, and there was no need for any overtime. In different circumstances, these statistics would be excellent news, and while they may be true, they don't have any meaning. These statistics would show that you can take a certain view with data and make a case to justify all manner of things.

Though perhaps not as extreme, this practice is happening all the time. Metrics are crafted from simple data sources to promote the positive; after all, we each look forward to a good review at the end of the year, but isolated “facts” can hide an overall negative situation. Money first seeps, then pours through the cracks, covering over fundamental operational



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issues for which there is little or no visibility other than symptoms that appear as business limitations or even failure.

Analysis of data needs to be more intelligent. Machine learning and line-based closed-loop systems are great at using raw machine data to automate process improvement. Beyond these narrow solutions, however, the analysis of machine data in isolation is relatively pointless. We would expect these days that automated machines work well when able to do so, providing that positive spin opportunity. The real challenge is how to perform analyses of what is happening in between the machines, where there is no data being reported.

The real challenge is how to perform analyses of what is happening in between the machines, where there is no data being reported.

At the simple level, no machine data means potential loss. Machines are stopped and perhaps blocked, starved, not needed, or broken down; there could be material issues, quality concerns, lack of operators, a scheduled vacation, or even a pandemic. The machines don't know; they only say that they are stopped. Through the correlation of data from multiple disciplines—such as material logistics, planning, and quality management—what needs to be discovered are the root causes and net effects of any key exception in the process preventing operational progress.

Then, there is a more complex level. We should look at the progress of a product through manufacturing rather than just looking at the performance of the machines themselves. Consider the typical international tourist experience at an airport. How much time is actually needed to check-in, drop a bag, enjoy the security check, walk to the gate, and get on

the plane? Probably about 10 minutes door to door, but we are told to arrive at the airport at least two hours before the flight leaves. Therefore, added-value time at the airport is about 8%, and the other 92% is waste, but owners of the shops and cafés may tend to disagree.

To report about 8% efficiency in manufacturing would probably get you fired, but I could go into most factories working normally today and get reports that show efficiencies measured in such a way as being much worse than 8%. We are fixated by looking at machine data rather than using the data to truly analyze the effectiveness of the factory in doing its job, taking materials, and making end products. The stock of raw materials should be minimized, as should be the holding of sub-assemblies, areas of semi-finished goods, and finished goods in the warehouse. We should not have so many products awaiting repair or retest, being repaired or tested, going through quality inspection, being in quarantine, or being piled up in front of processes that are not yet set up and ready to execute. All of these aspects of manufacturing have a far more significant effect on the business than the simple operation of any particular machine.

Machine data acquisition has been revolutionized of late, with data gathering from machines being easier, more detailed, timely, and accurate without the need for middleware or customized machine interfaces. This is notably true in the case of using the IPC Connected Factory Exchange (CFX) standard.

There are no interfaces for the gaps in between the machines. These are the areas that have a major impact on the operation. Take the example of an individual product simply leaving one process and moving to another. The product gets to the end of the line and stops. It is stored—somewhere, somehow—waiting for the others in the batch, job, or work order to be completed. The next process has to be as efficient as possible, so planning delayed the start time until it was sure that all products had been completed by the prior process, a vacancy had opened up, and it was optimal timing to do so.

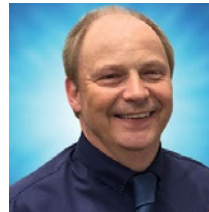
Minutes, hours, or days could pass. There's so much increased opportunity for handling issues, further delays from failing equipment, missing materials, effects of engineering revisions, and contamination, resulting potentially in more inspection, cleaning, processing, and more delays and storage. Being able to digitally track the paths of products during assembly creates significantly more opportunities for efficiency improvement and cost savings. To do this, the data from individual machines and processes also needs to be used to create a live virtual "movie" of everything happening in the factory—a live manufacturing "digital twin" that's the real thing, not a simulation.

Unlike people, software does not need to create fancy 3D animations and images to be able to apply a rules-based engine that takes contextualization of data holistically from machines, materials, quality, and planning, as well as knowledge of working line configurations and products to create an omniperspective-based digital twin model. The manufacturing digital twin "movie" extends back in time in terms of near-term performance history to learn what works well and where everything currently is. It also extends forward in time, as extrapolations based on current trends are analyzed, to detect any issues that

could be avoided by implementing changes and decisions now.

In effect, this rules-based manufacturing digital twin is controlling and managing the whole production operation, creating visibility and automation around challenges and addressing the core business needs and improvement opportunities within the factory. This is no ordinary MES solution; instead, it is the redefined, modern IIoT-driven MES solution built specifically around the rules-based digital twin architecture.

Therefore, gathering data from around the factory is step one toward making digital solutions work for the betterment of manufacturing. However, you do need to take more than one step to get to the next level. How you use the data is far more significant than just having it, making dashboards from it, and performing machine learning and analytics. The true digital twin for manufacturing within IIoT-based MES execution is here. **SMT007**



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

Solar Energy Farms Could Offer Second Life for Electric Vehicle Batteries

Modeling study shows battery reuse systems could be profitable for both electric vehicle companies and grid-scale solar operations. The study, published in *Applied Energy*, was carried out by six current and former MIT researchers.

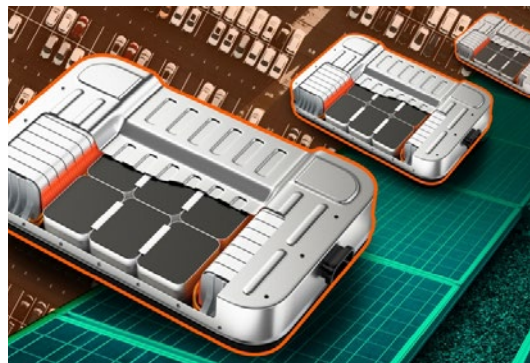
As electric vehicles rapidly grow in popularity worldwide, there will soon be a wave of used batteries whose performance is no longer sufficient for vehicles that need reliable acceleration and range. But a new study shows that these batteries could still have a useful and profitable second life as backup storage for grid-scale solar photovoltaic installations,

where they could perform for more than a decade in this less demanding role.

As a test case, the researchers examined in detail a hypothetical grid-scale solar farm in California. They studied the economics of three scenarios. They found that the new battery installation would not provide a reasonable net return on investment, but that a properly managed system of used EV batteries could be a good, profitable investment as long as the batteries cost less than 60% of their original price.

To read the full article, [click here](#).

[Source: MIT News Office]





Supplier Highlights



Electrolube's Nano-Coating Alternative to 3M Novec 2702 Gains Additional Traction ►

Electrolube, global electrochemicals manufacturer, recently formulated and launched a new conformal coating product named FPC. The product was specially developed to resolve a number of issues experienced by a specific user of surface modifier materials.

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The Assembly Solutions division of MacDermid Alpha Electronics Solutions promotes its ALPHA SnCX Plus 07 silver- and lead-free wave solder alloy as a new solution for moderately complex assemblies.

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High-tech engineering company Manz AG will support a leading European medical technology manufacturer in automating its production processes. The two companies recently signed a corresponding agreement for the planned strategic cooperation. Manz will adapt its many years of expertise in electronics production to the fully automated production of smart medical devices.

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Indium Corporation Expert Chosen as MMTA Board Vice-Chair with Chair Position Commencing in 2021 ►

Indium Corporation's Donna Vareha-Walsh, director of sales and global supply chain and trade compliance, has been selected as the next chair of the Minor Metals Trade Association Board of Directors.

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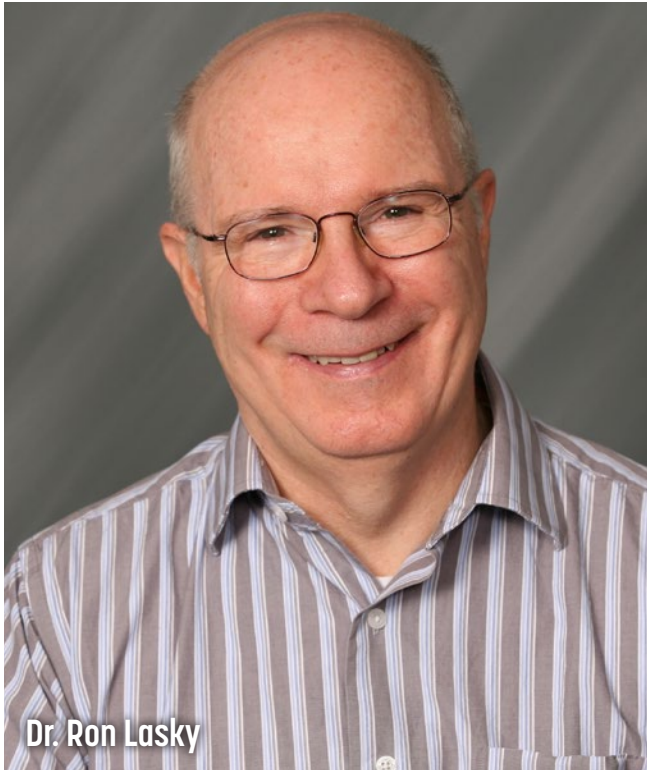
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Dr. Ron Lasky

TQM: The Tyranny of the Urgent

The I-Connect007 editorial team spoke with Dr. Ron Lasky about what's stopping companies from improving their processes, especially regarding productivity.

Nolan Johnson: Ron, thanks for joining us in this conversation. What's your role in the industry?

Dr. Ron Lasky: My day job is as a professor of engineering at Dartmouth, and I also work with Indium Corporation as a senior technologist.

Barry Matties: What do you teach?

Lasky: I teach engineering statistics, optimization, technical project management, and topics in manufacturing and design. At Dartmouth, we have a program called a Master of Engineering Management (MEM). It's a graduate program for students that are engineers but would like to get into management. Most of the courses I teach are in this program. Half of the MEM program is taught by the MBA Tuck School of Management, and the other half is taught by the engineering department. The topics that I focus on—and I have an additional program at

Dartmouth on this—are Lean Six Sigma topics like process optimization, design of experiments, and statistical process control. In my class on topics in manufacturing and design, I focus on one manufacturing process mostly, and that's electronic assembly because that's what I know the best.

The optimization work I do is quite general; it's not specific to solder paste or electronic assembly. Our Lean Six Sigma program at Dartmouth has become quite successful; since Dartmouth is part of the Ivy league, people like the fact that they get a certificate in a yellow belt through master black belt that was granted by the school of engineering at Dartmouth College, but it isn't specific to electronic assembly.

Matties: This is an industry that has complained—especially on the bare board side—that there's no profit left, and we're making the argument that there's plenty of profit; you're spending your profit on a lot of waste in your process.

Lasky: I can definitely address that. That's something I teach. I've been kind of frustrated

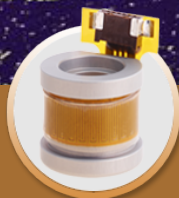
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in that if I propose a paper on how to minimize defects in voiding, I will get all sorts of interest, but if I propose a paper on how to improve productivity, there's not as much interest. That baffles me because when I go and do audits, most of the places could make a lot more money if they implemented some common-sense improvements in productivity.

Matties: This topic is near and dear to my heart because we've been utilizing total quality management (TQM) for many years. I started my business in the '80s, and people would say, "I didn't know TQM applied to magazine publishing." We recently talked to some designers, Rick Hartley and Dan Beaker, and they discussed the cost of re-spins because people aren't doing it right the first time. They're not using an optimized process to even start with design, and they're not looking at the costs throughout. Your statement is there'll be more interest in the process of the defects versus overall process optimization. Do you think that there's a skill set that's missing in the companies today? What's keeping them from doing this?

One of the things is that, as sad as this sounds, when I go out and do audits of companies, many of the people running the lines are not very knowledgeable in almost all aspects of assembly.

Lasky: One of the things is that, as sad as this sounds, when I go out and do audits of companies, many of the people running the lines are not very knowledgeable in almost all aspects of assembly. Most aren't concerned with productivity, either. To demonstrate the importance of productivity, let's say that Treasury Secretary

Steve Mnuchin contacts Nolan and says, "I'm going to give you a printing machine, and I'll let you print money because we need money in the economy. You can print as many \$100 bills as you want. You can spend them and give them to friends." Nolan is excited about this, and they even give him the right paper and ink, so he can crank away. If Nolan gets tired, he may need a break, but he'll hire someone to take his place while he's on break so that the printing press can continue operating. He would figure out a way to have the printing press going 24/7.

There is no difference between that printing press and an assembly line. The assembly line is the only thing in a company that makes money, and yet the way that people handle productivity, in almost every place I've ever been, is comically bad. For example, for most businesses, lunch is at noon. I had a boss tell me that they only take a 30-minute break for lunch, so I asked, "Can I hang around the line?" What I found out was that at 20 minutes before noon, the operators shut down the line because they want to make sure they're ready for lunch. They left for lunch but didn't get back until 12:40 p.m., and it took 20 more minutes to get the line going. They didn't lose a half hour for lunch; they lost an hour and 20 minutes.

And these are the kinds of things that can have a big impact. The quitting time will be 4:00 p.m., and they'll start getting ready to shut the line down at 3:20 p.m. There isn't a sense that the only thing that is making money in the entire factory is the assembly line. You can take action to keep the line going, and it doesn't have to be particularly unpleasant if done as a team effort. I went to one company a few years ago and asked, "How much do you pay your workers?" They said, "\$10 an hour." I said, "You could pay them \$15 an hour if you could work out a scheme where you didn't shut down at lunch. You have two assembly lines, and with 20 people working on them, it's possible to keep a line going for half an hour with four or five people." When I showed them that this would tremendously increase their profits, the first thing they told me was, "We can't do



Results of productivity audits reveal typical production lines run only 20% of the time.

that because the workers are friends, and they eat lunch together.” This was before I mentioned that they could increase their salary by \$5 an hour and still make more money.

I replied, “Work something out where only one day a week, an operator does not eat with their friends. One day a week, it’s their turn to be on the crew of five people that keeps the two lines going for half an hour. The other four days of the week, they get to go have lunch with their friends. If the company did that, they could increase the salary they’re paying the workers by \$5 an hour and still make more profit.” They asked, “You mean for the lunch hour, right?” and I said, “No, for 40 hours a week.” Their profit margins were so little that that modest improvement in productivity tremendously increased their profit margins.

This is one of the things I teach at Dartmouth. I developed a software program called Profit-Pro™, where you can model these things and show that doing something like that, saving an hour and 20 minutes a day doubled or tripled profits because their profit was only 2–3% initially. The reason for this strong increase in profitability is that the fixed costs have not increased, yet you are making more products. The unit costs go down for all assemblies, and the profit goes up for all assemblies. More profit on each assembly and more assemblies produced means that profits rise dramatically.

I started writing a blog in 2005 when blogging was new and covered topics such as, “Do XYZ to improve your productivity and the quality of your stencil printing.” I wrote about all topics related to electronics assembly, even

if they aren’t necessarily things that relate to solder. About five years into it, I thought, “This is getting kind of boring. Why don’t I invent a few characters and have them portray true stories,” like the ones I just shared. I posted blogs on these topics for 6–7 months, and then there were enough of them that we incorporated them in a book.

I gave a hard copy of this book to one of my associates and said, “All I ask you to do is read the first story, which is eight pages, and tell me what you think.” He sent me a note and said, “It’s too fantastical. Nobody could be this bad.” He hadn’t realized that the stories were all true—even the numbers. I’ve spent quite a bit of time encouraging folks to focus on productivity, but I get discouraged because I can’t get anybody interested. You’d think they would be, but our business is run by what a pastor of a church I went to called the “tyranny of the urgent.” People are scrambling all the time and only on urgent problems. “The line is down because we have a problem with the head-in-pillow defect, or something isn’t working well.” There’s so much responding to crises that they don’t want to do the type of things that will help them long term. I’ve been preaching this for more than 10 years now, so you get a little tired (laughs).

Matties: When you tell people, what’s their reaction? Why don’t they want to change?

Lasky: Again, the only thing I can say is, in most places, they’re so busy putting out fires that they don’t have time to go to the bath-



where they write down the things they need for the next job. But when it's time to get going, they find they can't find the stencil or some components. Some companies lose an hour and a half on a regular basis because they can't find the stencil or some components.

I even worked with a company that was pretty organized, but part of their getting

room. I come in with something that's admittedly going to take them a little time to change the way they do things, but in the long run, it will make them healthier and make more money. I have had some success having them make the right changes for a while, but because it does require a little discipline, they slip back into bad habits. With the scenario I mentioned, with running the line with a skeleton crew through lunch, one of the things that I do when I first visit is I use my Profit Pro software and model their company. I ask them if they can give me some high-level metrics like how much money they made last year, how many workers they have, and how much they pay them. In about an hour, I can make an Excel model of their company and show them that if they don't shut the line down over lunch, they'll make this much more in profit.

I've had a few companies that have agreed to try these things, but the tyranny of the urgent takes over, and in a couple of months, they're back to scrambling. There's also a lot of what one of my colleagues called "floundering time." When I do a productivity audit at a company, the managers are shocked by their low uptime numbers, and they tell me, "That can't be right. That doesn't apply to our company," but world-class uptime—the amount of time the line is running—is about 30–40% because 60–70% of the time, the line is down. Meanwhile, 20% is more typical, and 80% of the time, the lines are not running. A typical reason for poor uptime is that a company that has a lot of changeovers might try to be organized and ready, so they have a whiteboard

set up for the next job, they called "shopping time." They could find 80% of the components quickly, and then 10% of the components they needed for the next job; they have a storage facility where some of their components were mislabeled. The remaining 10% would take three hours to find. If they could get a handle on these things and set up a system to try to minimize them, these places could go from making 2–3% to making 8–9% profit. However, I haven't found many to take me up on that.

Matties: It sounds like the first thing that they need to understand is where they're leaking efficiency. Do they have a basic benchmark? Are they documenting or understanding these times?

Lasky: With the first story in my book, when I told them that their uptime was only 10%, I was asked to leave! I was invited to the company by a young guy who attended one of my workshops. They had two assembly lines, and they couldn't produce enough, and they were going to install a third assembly line. Fortunately, they were a captive facility, so their business was assured. I said, "Why don't we measure your uptime to see if you could develop a little more productivity. Then, you wouldn't need it to buy another line." I asked for some metrics, ran some calculations, and came up with an estimation: "Your uptime is 10%." Again, let's understand what that means; the line is running only 10% of the time.

One of the junior executives, a guy in his 40s, got so angry. His face was red, and he started



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shaking and was fuming. He was going to kick me out because of the insult that I made. So, I said, "Let's measure the uptime, maybe my calculations are off." They said, "How do we do that?" I knew that they had five engineers, so I stated, "One day, it will be Charlie's turn. Every half hour, he'll go out and see if the lines are running. And if they are running, he'll put a little 'one' in an Excel spreadsheet cell. And if it's not running, he'll put a zero. He'll do that every half hour for Monday, and then it will be Mary's turn on Tuesday, and Fred's turn on Wednesday, and Sally's turn on Thursday, and Joe's turn on Friday. "Do this for two weeks, and I'll come back, and we'll see what your uptime is." They did that, and it was 9.8%.

Most people don't recognize that the lines aren't running. I remember another case where a new executive joined a consulting company I worked at, and I wanted to show her what electronics assembly was. We visited a facility in Massachusetts that had 5-6 assembly lines, and I wanted to show her one running. We were there for three hours, and in that time, none of the lines ran. They said, "We couldn't find the stencil, or one of the pieces of equipment is down." Everybody accepts these things instead of saying, "We need to do something about this."

Johnson: You mentioned that for our industry, world-class uptime is about 30-40%. What would be a more typical number for manufacturing as a whole?

Lasky: It depends. Some companies have figured this out. I haven't toured auto factories, but many have assembly lines that run close to 24/7. Some companies understand all of this, but the electronics industry grew up in a different way. There may be some places that are doing better than 40%, but I've been in more

than 60 factories worldwide and never seen better than about 40%.

In addition to uptime, one of the ways you assure that your line is the fastest it can be is that the amount of time

spent by the chip shooter should be as close as possible to the same amount of time spent by the flexible placer when placing components. This process is called "line balancing." In the 60 plus factories I've been in the world, I've seen only one or two that were line balanced. In some factories, the flexible placer is waiting 20 seconds for the chip shooter. If

you took some of the chips off the chip shooter and put it on the flexible placer, it would decrease the cycle time by, say, two seconds. People hear that and then say, "Big deal. It's just two seconds," but they don't understand. If the cycle time on an assembly line is 30 seconds, and you can reduce it to 28, and your profitability is 2-3%, it's not going to go up whatever fraction that is; it's going to go up a lot more because again you're amortizing your fixed costs over more production.

If you improve production 1%, the profit doesn't go up 1%; it goes up 2-3% because all of your fixed costs don't increase. You're making 1% more circuit boards, but your fixed costs stay the same. You don't have any more people to pay, and you use only marginally more electricity or whatever. These common-sense business things are not understood by most managers in the electronics assembly business in my experience. Most of this productivity loss is from the tyranny of the urgent issues, with some exceptions. I'm not saying it's everybody, but at least in the 60+ factories I've been to, about 58 were bad.

Matties: Dr. Ron, thank you for your time today. We greatly appreciate it.

Lasky: Thanks so much. SMT007



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MilAero007 Highlights



Dominate the Electromagnetic Spectrum: Lockheed Martin Cyber/Electronic Warfare System Moves Into Next Phase of Development ▶

The Consortium Management Group/Consortium for Command, Control, and Communications in Cyberspace, on behalf of the U.S. Army, awarded Lockheed Martin a project agreement to move into the second phase of development for the “Air Large” component of its Multi-Function Electronic Warfare family of systems program.

What It Takes to Be a Milaero Supplier, Part 3 ▶

The decision to pursue military and aerospace (milaero) certification impacts every facet of the organization, and not every shop is prepared to make this transformation. In Part 3, Anaya Vardya explores what it takes to be a milaero supplier in the areas of purchasing and quality.

Murrietta Circuits Appoints Kevin McCartney Business Development Manager ▶

Andrew Murrietta, CEO and co-owner of Murrietta Circuits, announced that his company appointed Kevin McCartney to the position of business development manager.

BAE Systems Wins DARPA Contract to Develop Machine Learning Analytics as a Service for Constant Global Situational Awareness ▶

BAE Systems aims to develop machine-learning analytics as a service—a first-of-its-kind, cloud-based model for the government—that can leverage commercial and open-source data to deliver constant worldwide situational awareness for a diverse range of challenges.

Parrot to Manufacture Short-Range Reconnaissance Drone Prototypes for DoD ▶

Parrot has passed another milestone in the United States Army’s Short-Range Reconnaissance drone program. As the final steps of this selection process, Parrot will participate in an operational assessment to support an Army production award decision.

Defense Speak Interpreted: What’s an RCV, and What Do Electronics Have to Do With It? ▶

In “Defense Speak,” RCV does not stand for ranked-choice voting, a remote control vehicle, a riot control vehicle, or a refuse collection vehicle, although the second one is close; it stands for a remote combat vehicle. Denny Fritz explores this concept and its defense applications.

Raytheon Technologies Supporting the Supply Chain ▶

To support its small business suppliers, Raytheon Technologies formed a Small Business Supplier Stimulus Team focused on coordinating support to its supply base. This team brings together cross-functional members from each of the company’s businesses, creating a hub of knowledge, expertise, and experience.

Air Force Selects Single Contractor for Long-Range Standoff Nuclear Weapon ▶

The Air Force announced plans to continue the Long-Range Standoff Weapon’s development with Raytheon Company as a sole-source contractor. The LRSO cruise missile is a critical element of the Air Force’s ongoing nuclear recapitalization efforts.



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Correlating COVID-19 With Reliability?

Quest for Reliability
Feature Column by Eric Camden, FORESITE INC.

I submit this month's column from my secure bunker while safely—and smartly, if I may say so myself—practicing social distancing. The word quarantine is more “popular” than ever in that I hear it upward of 4,562 times per day. Before COVID-19, the first thing that popped into my mind when I heard the word “quarantine” was the cages in the receiving area for non-conforming products or similar spaces for built hardware that doesn't pass some sort of inline test. Having said that, I certainly don't think of non-conforming products now, but I do think I can make some apt comparisons. Stay with me, though; some of this may be a stretch, but it's not like I'm keeping you from a hot date.

I am certainly not suggesting that a PCB with misaligned fiducials is the same thing as a global pandemic; again, I said some of this was a stretch. But the similarity of not being part of normal production and sheltering in

place isn't that big of a stretch. Putting yourself in quarantine is to make sure you aren't in the general population and possibly spreading the virus. Keeping bad raw materials in the quarantine cage prohibits it from being built only to find out there is a flaw that prevents it from functioning as expected—giving a PCBA a 104°F fever, if you will. (Okay, that was yet another stretch. I'll try to do better.)

Just as the states have their list of milestones that must be accomplished before lifting the quarantine, there is (or should be) a list for material disposition. Number one on many states' lists is the need for testing, which can certainly apply to questionable material as well. Testing might be the only way to determine if a product is acceptable for use as-is or if it needs to be returned to the manufacturer for repair and/or replacement. (I do not have a comparison for that one, so feel free to insert your own.)

When dealing with a non-conformance issue, you need to lay out a good testing strategy for disposition. Many companies—too many, if you ask me—rely on the material supplier to include a certificate of conformance with every shipment and never question it. This goes back to one of my biggest industry peeves: just checking a box. In the lab, we have tested many fail-



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ures that were shipped with a certificate of conformance. What this tells me is that historical pass/fail criteria imposed by the customer or offered from the suppliers may not be sufficient for your product.

Segregation of material from standard production normally falls into one of three buckets: releasing, reprocessing/reworking, and rejecting. I mostly think of issues around quarantine to be related to incoming raw materials as they are received and go through the standard paperwork checks. You can certainly use the same word for an assembly during the build process.

Many companies—too many, if you ask me—rely on the material supplier to include a certificate of conformance with every shipment and never question it.

Most times, the assembly in question will be segregated from the line and put into a special tray or rack for further review and disposition. When raw materials are received and don't conform to the specs on the drawing or the purchase documents for one reason or another, that material needs to be segregated to a part of your receiving area and tagged so that it is not used in normal production until disposition is decided.

This also applies to raw materials used directly for assembly like bare boards, raw components, solder paste, and fluxes, but should also apply to anything that can have an impact on your product. Often, handling materials like gloves, finger cots, pink foam, and ESD bags are overlooked when there isn't a direct measurement for accept or reject conditions. All of these materials will most likely come into contact with your product at some point. Any material that contacts your product will always be a risk for contamination,

but that isn't what this column is about, so I digress.

Releasing is easily the best of the three buckets, as the material will be reviewed by a supplier quality engineer (SQE) or someone similar and, if deemed acceptable for use, released into production. With incoming raw materials, the best-case scenario is a typo on the paperwork side where the shipping documents don't match the purchase order. Remember, I don't work in purchasing, which might be why I think that is the better option. When inspecting assemblies that have been deemed out of specification for some reason during the build process, it may be a more difficult call to just release it. Testing of some sort like functional or possibly more strenuous environmental exposure might need to be done before a decision can be made.

The second bucket—reprocessing/rework—is normally reserved for work in progress assemblies that fail some sort of ICT, visual inspection, or other end-of-line testing. An assembly that fails some inspection during the build can be sent to a rework and repair area and brought back into spec for use. Issues are caused by conditions like insufficient solder joints or misplaced components, among others.

There are many variables to consider when determining if it is acceptable or not, and many times—especially in the case of high-reliability products—rework and repair may not even be allowable. Form, fit, and function will always be the first criteria, but beyond that, it's important to see if the customer has imposed any other metrics you need to meet. Bucket number two is normally reserved for assemblies, but it could apply to incoming raw materials too. If bare boards or components need to be cleaned before use due to some issue at the supplier, it would be considered a reprocessing/rework. This is not something I have seen on a regular basis, but we have seen it, so there's a chance.

The last bucket is rejecting the material and returning to the supplier for replacement. This is normally the worst of all buckets. Rejecting incoming materials is never fun because that can cause delays in your build schedule while you wait for new conforming material. That is



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a snowball that causes a lot of issues all the way downstream.

When you have to reject an assembly and send it to scrap, the issues can be just as great. There is an added financial consideration since most or all of the components have already been installed, and it reduces the number of parts ready to be shipped. It is very important to perform root-cause analysis on any assemblies that have been rejected to determine if this is a one-off issue, or if it is something much more systemic. Systemic may be the easier of those two options since the failure would be more repeatable and most likely easier to correct, but the cost of getting to that point might be considerable.

It seems I ran out of steam on the coronavirus/reliability comparisons, and I can only assume we are both thankful for that. The point remains that keeping suspect material away from normal production until deemed fit for use will have a gigantic impact on reliability. Now go wash your hands. **SMT007**



Eric Camden is a lead investigator at Foresite Inc. To read past columns or contact Camden, [click here](#).

When Baby Planets Melt

Coalesced from dust exploded outward by the solar nebula, planetesimal blobs aggregated due to gravity to form the rocky planets in the innermost part of the solar system. Their identity is complicated by the fact that Mercury, Venus, Earth, and Mars are different in chemical composition.

Two MIT scientists in the Department of Earth, Atmospheric, and Planetary Sciences (EAPS) recreated in a lab the first magmas these objects might have produced. There's also physical evidence of these magmas in meteorites.

Tiny pieces of planetary building blocks exist to this day in meteorites, fitting into two major categories. Chon-

drites are made of original material and are the most common type. Achondrites come from parent bodies that have experienced some sort of modification. Ureilites, the second most abundant group of achondrites, were the original subject of this investigation.

The scientists carried out the experiments using a device at MIT that kept the system "closed" and retained all alkalis. They loaded a tiny metal capsule with the same chemical elements that might be present in a planetesimal and subjected it to conditions of low oxygen, rock-melting temperatures, and pressures expected in the relatively small bodies' interiors. Once those conditions were met, the sample's magma was frozen by dropping to room temperature quickly.

Analyzing the magma, cooled into a glass, was tricky. Once they measured the samples, the pair was shocked at the implications. Previously, it was assumed dissimilarities between the terrestrial planets came about during the initial scattering of elements in the solar nebula and related to how those elements condensed from gases into solids. Now, with the melts hosting a lot of the alkalis, it would only take some method of melt removal to leave the residual planetesimals depleted in potassium and sodium.

(Source: MIT News)



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TOP 10

Editor's Picks from SMT007.com

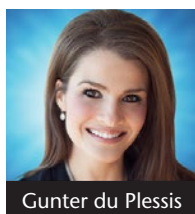
1 Process Ionic Contamination Test (PICT) Standard Roundtable With Industry Experts ►

With standards committees set to release the first of four new test standards, industry experts discussed the process ionic contamination test (PICT) standard, which was recently approved by the IEC for publication.



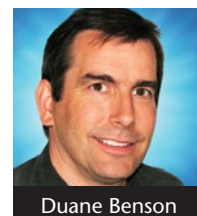
2 Foundations of the Future: Online Resources Offer Opportunities for Professional Growth ►

At a time where 42 states have stay-at-home orders and thousands of school districts are transitioning to a remote learning environment, online resources are essential. Charlene Gunter du Plessis recaps some of the ways to learn about the electronics manufacturing industry online.



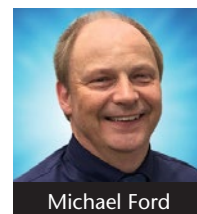
3 Powerful Prototypes: Why Datasheets Matter ►

Some parts just look cooler than others. One of Duane Benson's favorites is the edge mount high-speed RF connector. Unfortunately, "I like the look" doesn't necessarily translate to "it is easy to build." The edge mount connector requires a proper footprint and a match with the PCB thickness, and this is where the datasheet comes in.



4 Smart Factory Insights: Seeing Around Corners ►

Each of us has limitations, strengths, and weaknesses. Our associations with social groups—including our friends, family, teams, schools, companies, towns, counties, countries, etc.—enable us to combine our strengths into a collective, such that we all contribute to an overall measure of excellence.



5 'Coatings Uncoated!' Micro-webinar Series Review ▶

I-Connect007 collaborated with Electrolube's Phil Kinner to create a 12-part series of 5-minute micro-webinar sessions entitled "Coatings Uncoated!" offering the opportunity to gain a comprehensive basic understanding of the technology of conformal coatings, chemical types and application techniques, benefits and limitations, and the practicalities of where and how to use them. Pete Starkey provides a review.



Phil Kinner

6 The Government Circuit: Government Policy Moves Are More Important Than Ever During a Pandemic ▶

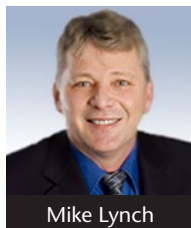
Isn't it amazing how quickly and thoroughly the COVID-19 pandemic has changed the world? Chris Mitchell shares several of the top stories of recent weeks from an IPC government relations perspective, including issues that IPC is continuing to work on.



Chris Mitchell

7 Libra Industries Promotes Mike Lynch to Director of Quality Assurance ▶

Libra Industries, a privately held systems integration and EMS provider, is pleased to announce that Mike Lynch was promoted to director of quality assurance.



Mike Lynch

8 GEN3 Invests Further in Talent to Meet Growing Demand ▶

During these unprecedented times, the need for electronic component test equipment is growing. As a certified and specialist maker of test equipment, GEN3 has responded to this industry requirement by bringing Sharon Beckett into the team.



Sharon Beckett

9 IPC Issues Call for Participation for High-Reliability Cleaning and Conformal Coating Conference ▶

IPC invites experts in all areas of cleaning and coating for electronic assemblies to submit technical conference abstracts for the High-Reliability Cleaning and Conformal Coating Conference, presented by IPC and SMTA, to be held November 3-5, 2020 in Dallas, Texas.



10 iNEMI Roadmap Highlights Series: Portable and Wireless and Smart Manufacturing ▶

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Chief Technology Officer

SOMACIS Inc. is a well-established (over 45 years in business), advanced technology, high-reliability PCB manufacturer, located in Poway, California.

The CTO will be our first technology go-to expert and play an integral role in setting the company's strategic direction, development and future growth.

CTO will:

- Be responsible for the implementation, maintenance, and improvement of all processes and procedures
- Review current and future technologies and make recommendations as to the most suitable direction for the future technical development of the company
- Ensure company is in compliance with legislative and regulatory requirements
- Supply technical support in all areas throughout the company in accordance with instructions of the operations director
- Collaborate with both quality and production departments to ensure the quality of the product
- Plan and manage the evaluation, introduction and acceptance trials of new equipment and processes
- CTO will manage the operational and fiscal activities of PCB engineering processes, procedures, technology, and the Somacis Process Engineering Team

Required skills:

- B.S. degree in chemical, electronic, mechanical or manufacturing engineering technology or 10 years of progressively responsible experience as an engineer in the PCB industry
- Minimum ten years' engineering experience in related manufacturing industry
- Ten years' progressively complex technical experience in PCB manufacturing processes involving the latest state-of-the-art applications and techniques

Excellent benefits and relocation reimbursement.
Salary negotiable and dependent on experience.

Send resume to:

Cindy Brown, cindyb@us.somacis.com

[apply now](#)



Image Department Operator

Alpha Circuit Corporation is a manufacturer of printed circuit boards located in Elmhurst, IL. We are currently seeking an operator in our Image department.

- All safety gear will be provided
- No experience required but a plus
- Full paid training provided
- Benefits: Health Insurance, 401(k), paid time off

Responsibilities:

- Expose dry film and liquid photo imageable ink
- Develop exposed photo imageable ink
- Develop exposed dry film
- Laminate dry film resist on inner layer and outer layer printed circuit panels
- Learn, understand, apply, and accept responsibility for in-process quality standards
- Be able to lift up to 15 lbs. shoulder high

If you are interested in this position,
please contact Nita Buccino.
Email: nvb@alphacircuit.com,
cell: +1-847-489-2341.

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Career Opportunities



Service Engineer Schmoll Laser Drilling and Direct Imaging

Burkle North America seeks a full-time service engineer in the Northeastern U.S. This position will provide expert-level service on multiple laser drilling and direct imaging product lines. Install, commission, and maintain Schmoll products at multiple customer sites across the Northeast. The candidate will perform modifications and retrofits as needed. Maintain complete and detailed knowledge of Schmoll products and applications and handle a wide variety of problems, issues, and inquiries to provide the highest level of customer satisfaction. Assist customers with the potential optimization of their machine functions and work with clients on application improvements.

Qualifications

Required: Bachelor's degree from a technical college/university in an associated field. Three years directly related experience, or equivalent combination of education and experience. Must possess a valid driver's license and have a clean driving record.

Preferred: Experience in control systems and electronic troubleshooting, as well as in general electrical and mechanical service tasks. Experience and knowledge in the PCB manufacturing process, with a focus on laser drilling and/or direct imaging.

Send resume to hr@burkleamerica.com.

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Process Engineering Director

Whelen Engineering Co., Inc. seeks full-time process engineering director in Concord, NH, to develop, plan and execute GreenSource Fabrication, LLC Div.'s process technology business strategy; manage process engineering activities, staff and compliance; improve process design, cost, quality and resource utilization; interact w/ customers and incorporate feedback; develop financial capital and labor projections; travel internationally for conferences, supplier and customer visits (15-25% work-time); write white papers, IP applications and give talks re. Division's products/processes.

Min. req.: U.S. Bachelor's or foreign equivalency in environmental science or engineering; min. 10 yrs. work exp. in: PCB fabrication process engineering; comprehensive and current experience in PCB fabrication/substrate markets w/ SAP tech; developing chemical and mechanical processes, chemistries and equipment for PCB manufacturing demonstrated by international experience implementing complex processes; ability to direct and troubleshoot PCB manufacturing problems; min. 5 years exp. leading, managing and training process engineering teams, developing and executing process technology business strategies and plans in worldwide PCB markets, including Japan, Taiwan, China, Europe; min. 3 years exp. giving talks, writing and presenting white papers; ability to travel internationally (15-25% worktime).

Send CVs to: Corinne Tuthill,
ctuthill@greensourcefab.com
or GreenSource Fabrication, LLC,
99 Ceda Road, Charlestown, NH 03603.

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Career Opportunities



Sr. PCB Designer–Allegro

Freedom CAD is a premier PCB design service bureau with a talented team of 30+ dedicated designers providing complex layouts for our enviable list of high-tech customers. Tired of the commute? This is a work-from-home, full-time position with an opportunity for overtime at time and a half.

Key Qualifications

- EXPERT knowledge of Allegro 16.6/17.2
- Passionate about your PCB design career
- Skilled at HDI technology
- Extensive experience with high-speed digital, RF and flex and rigid-flex designs
- Experienced with signal integrity design constraints encompassing differential pairs, impedance control, high speed, EMI, and ESD
- Experience using SKILL script automation such as dalTools
- Excellent team player that can lead projects and mentor others
- Self-motivated, with ability to work from home with minimal supervision
- Strong communication, interpersonal, analytical, and problem solving skills
- Other design tool knowledge is considered a plus (Altium, PADS, Xpedition)

Primary Responsibilities

- Design project leader
- Lead highly complex layouts while ensuring quality, efficiency and manufacturability
- Handle multiple tasks and provide work leadership to other designers through the distribution, coordination, and management of the assigned work load
- Ability to create from engineering inputs: board mechanical profiles, board fabrication stack-ups, detailed board fabrication drawings and packages, assembly drawings, assembly notes, etc.

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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



APCT, Printed Circuit Board Solutions: Opportunities Await

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

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

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

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

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Development Chemist Carson City, NV

Develop new products and modify existing products as identified by the sales staff and company management. Conduct laboratory evaluations and tests of the industry's products and processes. Prepare detailed written reports regarding chemical characteristics. The development chemist will also have supervisory responsibility for R&D technicians.

Essential Duties:

- Prepare design of experiments (DOE) to aid in the development of new products related to the solar energy industry, printed electronics, inkjet technologies, specialty coatings and additives, and nanotechnologies and applications
- Compile feasibility studies for bringing new products and emerging technologies through manufacturing to the marketplace
- Provide product and manufacturing support
- Provide product quality control and support
- Must comply with all OSHA and company workplace safety requirements at all times
- Participate in multifunctional teams

Required Education/Experience:

- Minimum 4-year college degree in engineering or chemistry
- Preferred: 5-10 years of work experience in designing 3D and inkjet materials, radiation cured chemical technologies, and polymer science
- Knowledge of advanced materials and emerging technologies, including nanotechnologies

Working Conditions:

- Chemical laboratory environment
- Occasional weekend or overtime work
- Travel may be required

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Career Opportunities



Multiple Positions Available

The Indium Corporation believes that materials science changes the world. As leaders in the electronics assembly industry we are seeking thought leaders that are well-qualified to join our dynamic global team.

Indium Corporation offers a diverse range of career opportunities, including:

- Maintenance and skilled trades
- Engineering
- Marketing and sales
- Finance and accounting
- Machine operators and production
- Research and development
- Operations

For full job description and other immediate openings in a number of departments:

www.indium.com/jobs

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SMT Field Technician Huntingdon Valley, 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

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Career Opportunities



U.S. CIRCUIT

Sales Representatives (Specific Territories)

Escondido-based printed circuit fabricator U.S. Circuit is looking to hire sales representatives in the following territories:

- Florida
- Denver
- Washington
- Los Angeles

Experience:

- Candidates must have previous PCB sales experience.

Compensation:

- 7% commission

Contact Mike Fariba for
more information.

mfariba@uscircuit.com

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ZENTECH

Zentech Manufacturing: Hiring Multiple Positions

Are you looking to excel in your career and grow professionally in a thriving business? Zentech, established in Baltimore, Maryland, in 1998, has proven to be one of the premier electronics contract manufacturers in the U.S.

Zentech is rapidly growing and seeking to add Manufacturing Engineers, Program Managers, and Sr. Test Technicians. Offering an excellent benefit package including health/dental insurance and an employer-matched 401k program, Zentech holds the ultimate set of certifications relating to the manufacture of mission-critical printed circuit card assemblies, including: ISO:9001, AS9100, DD2345, and ISO 13485.

Zentech is an IPC Trusted Source QML and ITAR registered. U.S. citizens only need apply.

Please email resume below.

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Career Opportunities



IPC Master Instructor

This position is responsible for IPC and skill-based instruction and certification at the training center as well as training events as assigned by company's sales/operations VP. This position may be part-time, full-time, and/or an independent contractor, depending upon the demand and the individual's situation. Must have the ability to work with little or no supervision and make appropriate and professional decisions. Candidate must have the ability to collaborate with the client managers to continually enhance the training program. Position is responsible for validating the program value and its overall success. Candidate will be trained/certified and recognized by IPC as a Master Instructor. Position requires the input and management of the training records. Will require some travel to client's facilities and other training centers.

For more information, click below.

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President, Company Leader, Business Builder

This professional has done it all. Built new businesses and turned around hurting businesses and made them successful. A proven record of success. This candidate is a game-changer for any company. He is seeking a full-time leadership position in a PCB or PCBA company.

General Manager PCB and PCBA

Senior manager with experience in operations and sales. He has overseen a number of successful operations in Canada. Very strong candidate and has experience in all aspects of PCB operations. He is looking for a new full-time position in Canada.

Regional Sales Manager/Business Development

Strong relationship management skills. Sales experience focused on defense-aerospace, medical, high-tech PCB sales. Specializes in technical sales. Also has experience in quality, engineering, and manufacturing of PCBs. He is looking for a fulltime position in the South-eastern U.S.

Field Application Engineer (FAE)

Has worked as a respected FAE in the U.S. for global companies. Specializes in working alongside sales teams. Large experience base within the interconnect industry. He is looking for a full-time position.

Business Development Manager

Understands all aspects of interconnect technical sales from PCB design and fabrication to assembly and all technologies from HDI microvias to flex and rigid-flex. Has also sold high-tech laminates and equipment. Proven record of sales success. He is looking for a full-time position.

CEO/President

Specializes in running multi-million dollar companies offering engineering, design, and manufacturing services. Proven leader. Supply chain manager. Expert at developing and implementing company strategy. Looking to lead a company into the future. He is looking for a full-time position.

PCB General Manager

Forty years of experience serving in all capacities, from GM to engineering manager to quality manager. Worked with both domestic and global companies. Available for turn-around or special engineering projects. He is looking for long-term project work.

Process Engineering Specialist

Strong history of new product introduction (NPI) manufacturing engineering experience: PCB/PCBA. Held numerous senior engineering management positions. Leads the industry in DFM/DFA and DFX (test) disciplines. He is looking for either a full-time position or project work.

VP Sales Global Printed Circuits

Worked with a very large, global company for a number of years. Built and managed international sales teams. Created sales strategies and communicated them to the team. One of the best sales leaders in our industry. He is looking for a full-time position.

Plant Manager

This professional has years of experience running PCBA companies. Led his companies with creative and innovative leaderships skills. Is a collaborative, hands-on leader. He is looking for a full-time position.

National Sales Manager

Seasoned professional has spent the past 20 years building and growing American sales teams for both global and domestic companies. Specializes in building and managing rep networks. He is looking for a full-time position.

Global Engineering Manager/Quality Manager

Has experience working with large, global PCB companies managing both engineering and quality staff. Very experienced in chemical controls. She is interested in working on a project-by-project basis.

CAM Operators and Front-end Engineers

These candidates want to work remotely from their home offices and are willing to do full-time or part-time projects.

Get the Facts About Testing Your High-Reliability Boards

Today's high-reliability electronics require accurate test methods. Learn to achieve electrochemical reliability and more with the latest offering in the I-007eBook library: *The Printed Circuit Assembler's Guide to... Process Validation*.



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The Printed Circuit Assembler's Guide to...



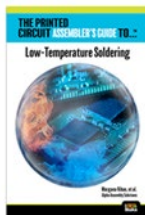
Process Validation, by Graham K. Naisbitt, Chairman and CEO, Gen3

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



Advanced Manufacturing in the Digital Age, by Oren Manor, Director of Business Development, Valor Division for Mentor a Siemens Business

A must-read for anyone looking for a holistic, systematic approach to leverage new and emerging technologies. The benefits are clear: fewer machine failures, reduced scrap and downtime issues, and improved throughput and productivity.



Low-Temperature Soldering, by Morgana Ribas, Ph.D., et al., Alpha Assembly Solutions

Learn the benefits low-temperature alloys have to offer, such as reducing costs, creating more reliable solder joints, and overcoming design limitations with traditional alloys.



Conformal Coatings for Harsh Environments, by Phil Kinner, Electrolube

This handy eBook is a must-read for anyone in the electronics industry who wants a better understanding of conformal coatings. Kinner simplifies the many available material types and application methods and explains the advantages and disadvantages of each.

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COVER: **SHELLY STEIN**

COVER IMAGE: **ADOBE STOCK © POLYGRAPHUS**

SMT007
M A G A Z I N E

SMT007 MAGAZINE®
is published by BR Publishing, Inc.,
942 Windemere Dr. NW, Salem, OR 97304

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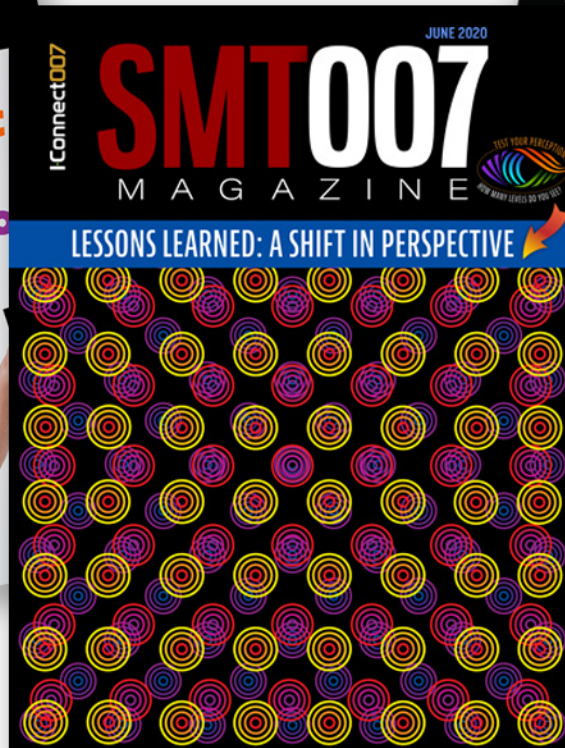
June 2020, Volume 35, Number 6
SMT007 MAGAZINE is published monthly,
by BR Publishing, Inc.

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