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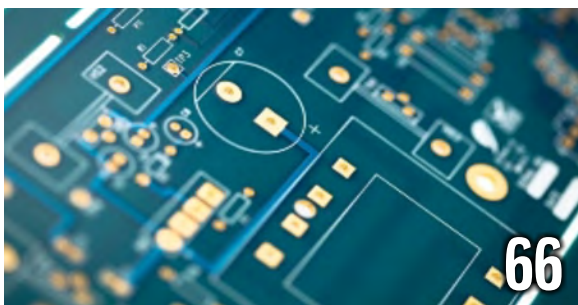
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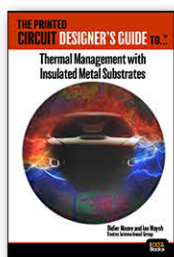
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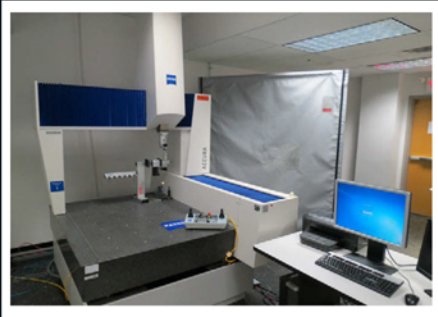
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Selling Has Changed: Have You **Changed** How You Sell?

Nolan's Notes
by Nolan Johnson, I-CONNECT007

As I write this column, the industry is preparing for IPC APEX EXPO 2019. By the time this issue of *PCB007 Magazine* goes into distribution, the show will be over, and the PCB fabrication industry will be well-and-truly launched into this year. What better time to devote an issue to sales strategies?

It seems that whenever we discuss selling in this industry, eventually someone says something like, “Selling a product is one thing, but selling a *service* is an entirely different set of challenges.” Is it? I did some research as we gathered opinions from sales strategy experts in this issue, and I have to admit that I learned a few things.

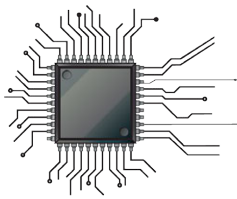
For example, in an article by Kevin Johnston ^[1], a Manhattan-based business and finance writ-

er, he states, “Products offer a uniform solution to customers’ problems. If you sell products, you sell identical versions to numerous customers...Your prospects can evaluate features before they buy. When you sell a product, you can focus more on selling than on customizing the product.”

But, Johnston points out, “When you sell a service, you sell an intangible. You do not have to limit your pitch to pre-existing features because you can adjust the features of a service to meet the needs of each customer.”

Johnston notes that selling a product means, “You must constantly estimate how much you need on hand to meet demand. That means you spend money on products before you make any income from them.” To sell a service, Johnston



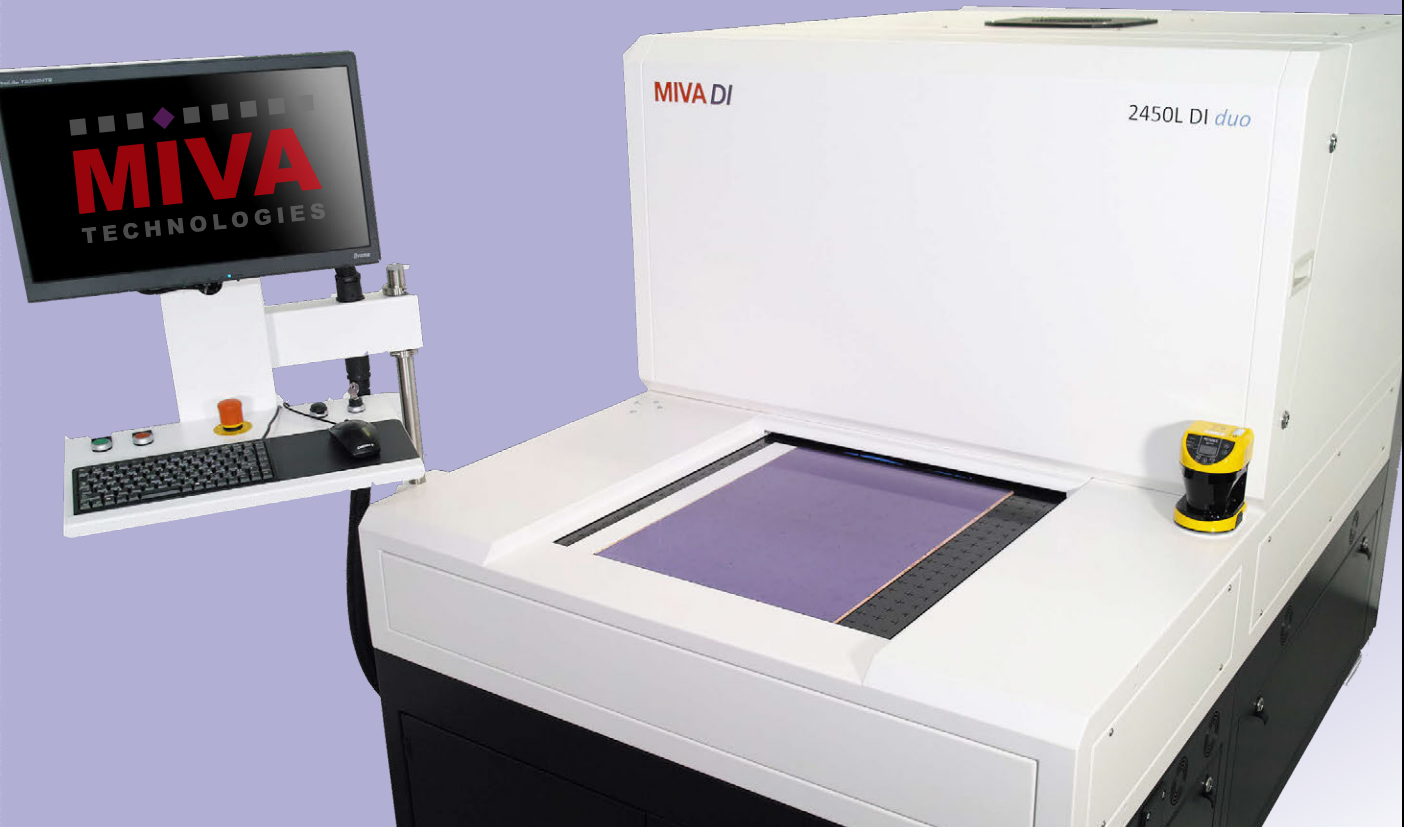


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explains, “You can emphasize aspects of your service that solve your prospect’s problems or satisfy their needs...Customers may express more reluctance when buying a service because unlike a product, they can’t evaluate it before they use it.”

Johnston’s categorizations simply confirm the debate. Is PCB fabrication a product or a service? It has clear aspects of both, after all. Interestingly, we might go so far as suggesting that it’s our services that are standardized, and it’s the product we build for our customer that is customized. So, how should we communicate our business proposition effectively?

In an article on the same subject, Nancy Wagner ^[2], marketing strategist and speaker, writes, “Service companies use marketing strategies that include building personal relationships with decision-makers through networking and sales calls that require them to listen to the customer’s problems and concerns. This type of marketing allows service companies to more carefully tailor solutions that meet the customer’s needs.” She continues, “Product companies, however, usually rely on advertising, promotional campaigns, and direct mail... High-end products are customizable to a certain degree, but smaller products are usually created to meet the greatest number of customer’s needs.”

Wagner’s marketing comments continue, “Companies that sell services must create mar-

keting messages that focus on the benefits of their offerings...what customers want...their likes and dislikes, the challenges they face, and the types of solutions they need to succeed. But if you sell products, you need to provide a healthy mix of both benefits and the product’s features to be effective.”

So, a service provider, according to Wagner, needs to prioritize relationships, networking, and strong interpersonal business methods. Further, Wagner suggests that while service companies might concentrate just on their benefits to the customer, product companies need to market both benefits and features.

Then, there’s the blog post from Denver-based Jim Keenan ^[3], CEO and “chief antagonist” of A Sales Guy Consulting, which pulls no punches, declaring, “There is no difference between selling a product and selling a service—absolutely none!”

Keenan continues, “Those of you who think there is a difference need to evaluate how you sell because you’re selling wrong.” He continues, “The salespeople who focus on their service or product as their selling approach are missing the point. Good selling doesn’t sell a product or a service. Good selling focuses on identifying problems, then offers a solution to solve the problem, and if it’s a kickass solution, no one cares if it’s a product or a service.”

And Keenan is not done yet. “If we’re selling correctly, we’re ultimately anchored in the cus-

tomers ‘gap’—the gap between where they are today and where they want to be tomorrow. We’re selling based on solving measurable, tangible, urgent, business problems. We’re not selling our service or product, but what our product or service can deliver for our customers in terms of their business value. When we’re selling like this, it’s all intangible. It’s always different for each client, each customer.”

There is definitely a wide spectrum of thought out there on selling services vs. products.



This issue of *PCB007 Magazine* looks at the current thinking in our industry from a number of perspectives.

Kicking us off is a column from Dr. John Mitchell, “Become an IPC Workforce Champion.” IPC is attacking the chronic shortage of industry-skilled workers with the launch of their IPC Workforce Champions campaign.

In a feature interview, “Dan Beaulieu on Magnetic Marketing,” Dan talks with us about creating magnetism around the services and products you sell, and the increase in sales success that results.

“The More Things Change, the More They Stay the Same,” is what Tara Dunn’s column considers this month. Tara reviews sales strategies that she’s seen and used over the years.

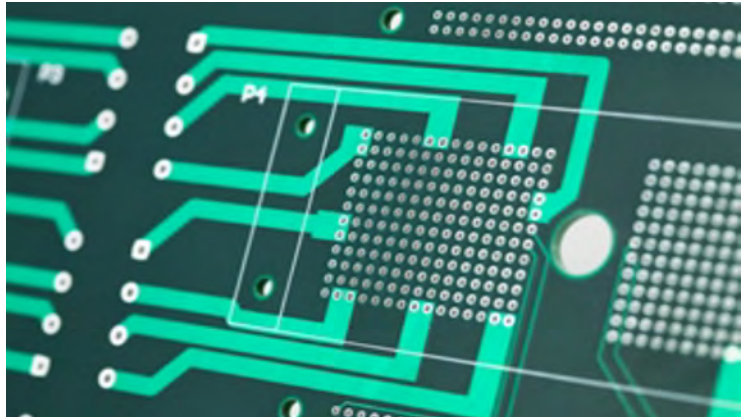
Next, I continue the conversation from last month with NCAB’s Wayne Antal. In this installment, Wayne shares insight NCAB has gleaned from taking their business model to market.

Steve Williams shows us “The Right Approach” to branding from a small business perspective in this month’s column. Branding is a key step in catching the attention of the right prospects for your sales process, and Steve gives great insight.

We spoke with expert recruiter Terry McNabb in this month’s issue of *SMT007 Magazine*. In this installment, Terry and I discuss the recruiter’s view on the effect of emerging technologies on your sales strategy. As you will see from our conversation, Terry works closely with his clients to find and solve the root problem with a strategic hire, making him well placed to pick up on industry trends.

In the PCB Norsemen column, Didrik Bech discusses global copper supply and demand effects. In light of our discussions on the supply chain in the January issues, Didrik’s information is a further reminder to think long-term strategically.

Rounding out our interviews this month is Sunstone Circuits’ Matt Stevenson. In this conversation with the I-Connect007 editorial team, we explore the evolution of online quoting and ordering in PCB fabrication. As you might ex-



pect, things are evolving. Matt catches us all up on the current changes.

Ending this issue on a technical note, Michael Carano’s “Trouble In Your Tank” column continues with part four in his series on “Moving into Microvias” regarding the metalization process.

In the end, traditional thinking on sales techniques certainly suggests that our offerings have most of the characteristics of both business models—product and service. And the outlier opinions make the point that none of those distinctions even matter. As you read through the perspectives in this issue, ask yourself how this all fits with the company where you work.

Let us know how all of this applies to you. We’re always open to reader feedback. If you have a topic to suggest or a response to something we’ve printed, contact us at editorial@iconnect007.com. **PCB007**

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1. Kevin Johnston. “Selling a Product Vs. Selling a Service,” Chron.com.
2. Nancy Wagner. “Selling a Product Vs. Selling a Service,” AZCentral.com.
3. Jim Keenan. “The Difference Between Selling a Product or Selling a Service,” ASalesGuy.com, February 8, 2016.



Nolan Johnson is managing editor of *PCB007 Magazine*. Nolan brings 30 years of career experience focused almost entirely on electronics design and manufacturing. To contact Johnson, [click here](#).

Become an IPC Workforce Champion

One World, One Industry

by John Mitchell, IPC—ASSOCIATION CONNECTING ELECTRONICS INDUSTRIES

As many of you know firsthand, one of the most difficult challenges facing today's electronics industry is a chronic shortage of adequately skilled workers. We at IPC have launched a new campaign called IPC Workforce Champions to tackle the critical issue of the skills gap.

What is the IPC Workforce Champions campaign? It's a commitment from IPC and its members to create one million new education, training, and career opportunities in the U.S. electronics industry over the next five years. How will we do that? By using a multipronged, demand-driven approach that will cover all aspects of skills building from middle school through adulthood.

We invite all of our member companies in the United States to become IPC workforce

champions by committing to at least three of the following five efforts:

1. **IPC Job Task Analysis Committee**

(JTAC): Volunteer to join the IPC JTAC to help document the core knowledge, skills, and abilities required to succeed in key roles in our industry. The outcome of this project will shape IPC's future certification and education programs for years to come.

2. **Earn and Learn:** Join IPC in partnering with electronics companies and academic institutions to develop apprenticeships, internships, and related opportunities that offer valuable, real-world skills in tandem with academic programs.

3. **STEM Programming:** Partner with IPC to work with schools and nonprofits on



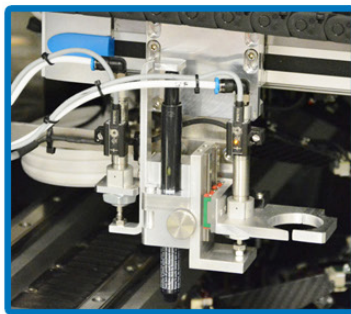
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programs to get middle and high school students excited about STEM subjects and make them more familiar with career opportunities in the electronics industry.

4. **IPC Education Foundation:** Make a commitment to contribute financially to the IPC Education Foundation, which will provide scholarships to deserving students.
5. **IPC Certified Workforce:** Adopt the IPC certification framework in your company to upskill existing workers and provide pathways for professional growth.



IPC members that commit to at least three of these activities will join us as IPC Workforce Champions, strengthening both their own reputations and IPC's reputation as world leaders on education and workforce issues. As IPC drives this campaign through education, workforce, and government relations efforts, we will highlight the members joining this campaign as companies leading the way to address the critical issue of the skills gap in the electronics industry.

As IPC is a global association supporting a global supply chain, IPC has committed to provide education, training, and career opportunities to more than 500,000 Europeans over

the next five years. Stay tuned for the official launch of our IPC workforce pledge for Europe in just a few weeks!

To our members in the U.S., come join us. Let's change the future for the next generation of manufacturing employees. Accept the challenge to build a strong, competitive workforce together. **PCB007**



John Mitchell is president and CEO of IPC—Association Connecting Electronics Industries. To read past columns or contact Mitchell, [click here](#).

Real Time with... IPC APEX EXPO 2019: A Conversation with Burkle's Kurt Palmer and David Howard

After almost 50 years in the PCB industry, Burkle North America's David Howard has chosen to take a well-earned retirement this year. In this video interview, Pete Starkey is introduced to his worthy successor, Kurt Palmer, vice president of Burkle's North American Electronic Product Group. Palmer has extensive leadership experience in the PCB industry, originally operating Tapco Circuit Supply in Chicago before joining forces with TCT Circuit Supply in 2015.

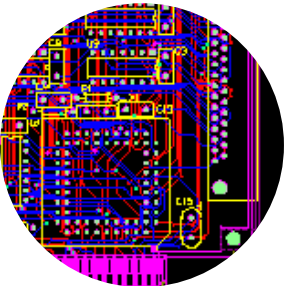
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Dan Beaulieu on Magnetic Marketing

A Conversation with Barry Matties
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Dan Beaulieu, president of D.B. Management Group, has over 30 years of experience in the PCB industry. In this interview, Dan provides his expert knowledge on selling strategies for companies, and covers magnetic marketing, the extent to which education leads to sales, methods of marketing that used to work but not today, and more.

Barry Matties: There's a lot of similarity in the strategies that people use for selling circuit boards, assembly, and so on. Most often, it's delivery, low cost, and high yields—all the bits and pieces that you normally hear about. When it comes to selling your services, what are the greatest challenges that you see that they need to overcome?

Dan Beaulieu: Every company that I talk to mentions how difficult it is to get appointments. Their generation doesn't really want to see people. They don't want their time invaded, if you will, like Seth Godin [author and marketing expert] talks about; you have to figure out other ways to get in there and bring something to the party that they need.

You see more and more companies offering technical expertise in the form of newsletters and other items that will help educate the customer and make them stand out in a crossover between traditional and modern. I know a couple of companies that are doing very well with technical bulletins using sales optimization companies. One company makes over \$11 million a year without outside salespeople, but they're putting their name in front of people. That is one way to do it, especially if you're not really selling technology.

If you're selling technology, it's important to create a sense of expertise so that the people who want that technology want to work with you. Years ago, all of the OEMs had their own experts and did their own R&D. Now, I think there are two R&D shops. Other than that, they rely on a circuit board fabricator to do this for them. The circuit board fabricator needs to have enough knowledge to be their PCB expert and to teach them about the board side of the product that they're building today. The fabricator must be willing to invest in the future so that the salesperson is more a guide into the PCB technology.



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The days of befriending a buyer, taking them to play golf, and then getting the big order when you come back to the office are over. There's a little bit of that, but for the most part, as the boards get more sophisticated, companies need circuit board experts. If you're a circuit board expert or you portray yourself that way through content—such as writings or technical newsletters—then you're going to be in good stead. I prefer to use the analogy that you can go fishing or you can get the fish to jump into the boat. If you position yourself as a technology expert, you're going to get them to jump into the boat.

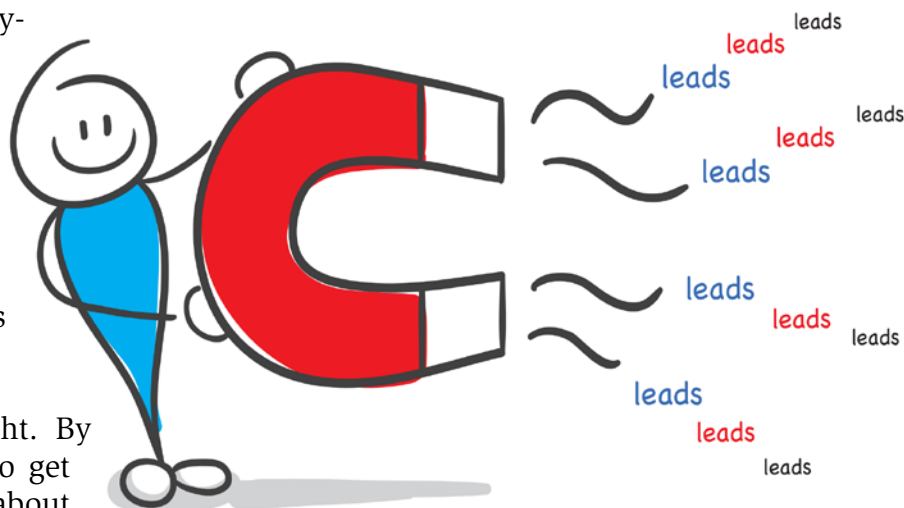
Matties: That's certainly what I call an order-taking strategy versus a selling strategy because the idea is to have magnetic marketing tuned to attract exactly the kind of prospect you want. It is one thing to be out there casting a net and hauling everything in; however, more importantly, in today's marketplace, you have to define a sweet spot and make sure that you're filling that. You do this because that's where your core competency is and the highest level of efficiencies and profit are found there.

Beaulieu: That's absolutely right. By casting the net, you're going to get all kinds of fish, and it will be about what you want to sell. Position yourself as an expert, which creates tribes of people with aligned interests. If you're a golfer, you're going to open every newsletter about golf. My wife, a quilter, opens up anything that involves quilting. If you're interested in RF and you're in the microwave business, you're going to open up anything that talks about RF and microwaves. It has to be very focused—magnetic marketing. It's about attracting people to you.

Matties: In larger companies, there are often defined roles, and they have a lot more resources. But when it comes to sales and marketing, often, you find that there is a sales manager or

a marketing manager—occasionally you find both. However, the role of marketing is a lot different than the role of sales, and I say that if you have a great marketer, then your salespeople become order takers. If you have salespeople out selling, then you're probably not marketing. The marketer has to take all of the value, put it in a story, and make sure that they're communicating that story to the right prospects. If you do that, with the idea of incorporating magnetic marketing, then your salespeople are truly just order taking and closing sales rather than selling and cold calling.

Beaulieu: Correct. What if you have some that are both? Those people should be coordinated well together. Today, I advise people to hire for passion, and you can teach the technology. Hire natural-born salespeople. That's where I



say marketing comes in because you're doing your training, teaching them the company story, and sending them out there.

Going back to magnetic marketing, if you talk about having something to offer, whether it's a webinar or seminar, it immediately puts you in the position of expert, so the customer wants to buy from you, which is what you're saying in terms of being the order taker. To a certain extent, you just have to get out there. They need to know who you are. Many times, people say, "I built this thing. Where is all the business?" It doesn't stop at that; you have to market and tell somebody.

Matties: We often build it and hire salespeople to go sell it, but we're not out marketing it because marketing is one of the areas that many companies struggle with. They may have a sales strategy, like hiring a rep or building a list, but they don't have a marketing strategy.

Beaulieu: Yes, because the things you mentioned aren't strategies, they're tactics. If you're going to describe it, marketing encompasses pretty much everything, and along the way, salespeople are the face and messengers of your company.

Another thing that happens is if you have a strong engineer and they're working in your manufacturing or PCB company, you might decide that you're going to send them out on the road as a salesperson. Unfortunately, when the title of "sales" goes on their business card, they lose credibility immediately. They'll walk into a company, and when it says "sales" on their card when they used to advise people on technology, they don't quite believe them anymore because the customer might think they are spinning the solutions to fit your company's shop. I've seen that happen where you're much better to have sales engineers than regular salespeople—especially as technology grows.

Matties: Circling back to where we started, education leads to sales. Content strategies are being implemented more and more because so many people are losing business to competitors who use them, so they're starting to adopt them. However, the problem now becomes that you then have to qualify the level of education that you're getting from that source. It's easy to say someone has been in plating for three years and is an expert versus a chemical engineer who's been doing it for 30 years. We now have to start validating the source of that knowledge.

Beaulieu: That's correct, and it's the same in medicine. My brother had a career in medicine and always told us to get the doctor who's just out of medical school because they know all

the latest techniques as opposed to the general practitioner who's been doing it for 30 years who hasn't kept up.

It's the same thing because when you have someone who's been plating for 30 years, what we find is as we deal with older companies, that plater knows that one company and hasn't experienced any other organization. I'd much rather hire a person who has worked for five companies in the last 15 years than one who's been at the same company for 30. I say this because the person who has been at five different companies has learned much more about the overall technology than the one who has been in the same house and learned the technology lore of that house.

**I'd much rather hire a person
who has worked for five
companies in the last 15 years
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same company for 30.**

Matties: When it comes to selling your services, there's a process—a checklist of things—that you have to have to make sure you sell it properly. First, you see if all of the light bulbs are working. Second, you have to understand what your story is. Third, you have to craft that into a story and have alignment in your organization on that message—this is the value, this is how we want to present it—and bring continuity to that. Lastly, you have to look at the delivery methods. When you look at storytelling, you have to start looking at it in different ways. People throw out the term social media—which we need to be on such as posting on Facebook or having a blog—but after you have the story, you must have the discipline to implement it.

Beaulieu: You absolutely need the discipline. Everything you said is correct. When I work

with a company, I aim to answer these questions: “What are they good at? Who are their best customers? Why are they good with those customers? Why do they like those customers?”

Then, develop the ideal customer profile, which includes technology among other things. The next step identifies who fits that ideal customer profile; from there, you develop target accounts and account plans. The importance of those steps is that you’re not doing it alone. You’re making sure the whole organization and management team is behind it.

Everybody agrees to go after the same kinds of customers: “We’re targeting these types of customers because they have the right amount and type of business and the right attitude that we want.” From there, I make spreadsheets and capture all of the steps. So, if you picture this chart on a wall, you have customers on the left and can see the movement. People start saying, “I get it—the basic step is to contact the customer—but what’s the next step?” The next step is progress to providing a quote, and then win the order. It’s all about having a system.

Matties: Yes, you have to have the system and the discipline to hold your team to utilizing that system because if they start circumventing the system, then you have nowhere to go for improvement because you don’t know what’s going on.

Beaulieu: An example to prove your point is by circumventing the system by going off the account list and throwing out the system. Then, four months later, you’re chasing a whole fleet of customers who aren’t even what the company signed up for. Along the way, you have to make those decisions because you need everybody in agreement, and the only way to track that is with a system. I like the word discipline

because we’re all scatterbrained. You need a path, or you’re not going to do it.

Matties: Yes, and the system needs to be visible as well because if it’s invisible, then you and your colleagues don’t know where it is. My belief is to make your work as visible as possible.

Nolan Johnson: Methods and discipline go together. One of the things that affects teams and organizations is when they start falling off of their assigned methods. Usually, it’s because

there’s either something about the official methods that are punishing, or there’s a reason that falling off seems to be more effective. It takes some digging to get down to that, but those are two things that tend to happen when you fall off of your processes and methods. Dan, what have you seen over the

past few years that may be methods that used to work, but don’t anymore?

Beaulieu: Like Barry was saying, you have to set the stage. You have to know what you’re going after. Years ago, you would buy a directory or get a disc and start calling. You checked out the Federal identification codes (FICs) and started “dialing for dollars.” That doesn’t work anymore. If people do not know who is calling them, then no one’s going to pick up the phone. It’s an intrusion on the customer’s time. It’s very black and white, and that method just doesn’t work anymore. That’s why you have to do touch marketing, and as Barry liked to call it, magnetic marketing.

The other thing that doesn’t work anymore is “winging it.” Every step of the way has to be coordinated and synchronized; you don’t just wing it anymore. If you get an appointment, you better know what you want to get out of that face-to-face conversation. Chances are you’re not going to make one order, but in



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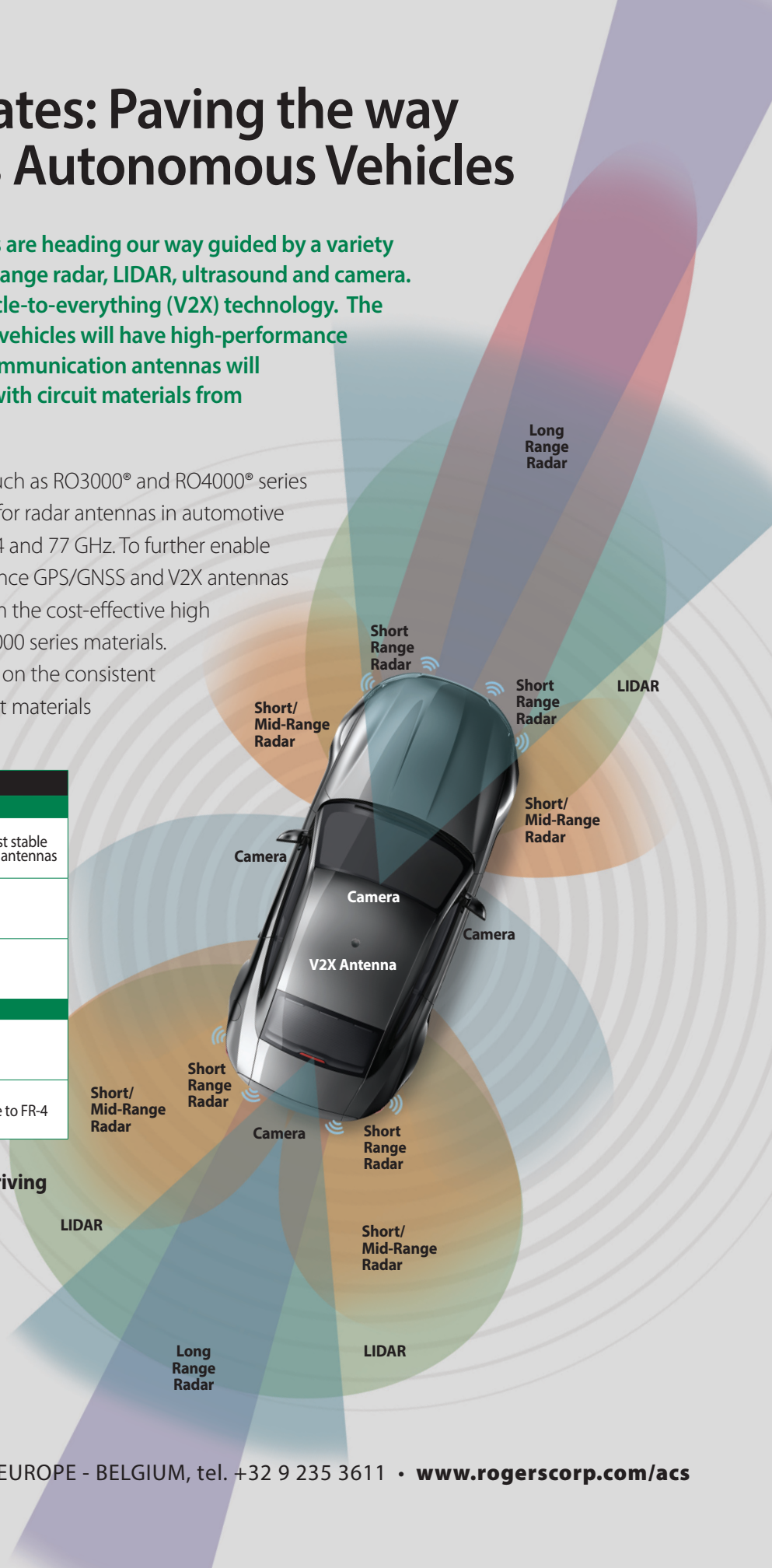
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stead you're in it for a process. The first meeting gets me this, the second meeting gets me this, and you have individual goals for each of those customer touches.

Matties: It's been stated that it takes somewhere on average of five contacts to close a sale.

Beaulieu: Yes, and it's becoming more.

Matties: If you're lucky enough to get a face-to-face appointment, that means that someone is really serious because time is so limited, and people are extremely selective as to who they are willing to spend their time with.

Beaulieu: They need something. They need you to be there. They don't want you there because you want to be there, they want you there because they want you to be there.

Matties: So, the best kind of appointment you can have is one that they call and invite you in rather than you calling in.

Beaulieu: Right, and that leads you back to marketing your story and content, telling people about your capability. You started this conversation by leading with delivery and quality. Everybody says that they have the best delivery and quality whether it's true or not. Meanwhile, we know that the quality and delivery of our American shops average 83%, and yet everybody has 98% quality. I don't quite understand that.

Matties: Here's another selling strategy that I recently witnessed at GreenSource Fabrication. Granted, the company started with a greenfield site in New Hampshire, but they've set up a manufacturing facility to produce the highest technology available at a low cost with zero waste—they're green. They also have the most control over process because it's completely hands-off and digital. GreenSource has so many positive attributes that they're creating a line of customers saying, "We want you to build our products."

I would call this a leap-frog strategy because everything else has become irrelevant with

this adaptation of PCB fabrication. Those that are left in the "red ocean" are just battling it out over those platitude attributes, whereas at GreenSource Fabrication, you walk in and measure everything. Things are being dealt with in a way that we've never seen before, at least in PCB fabrication in America and possibly in the world.

What does it take for a factory that's a brown-field site still working with cell or island manufacturing? You have plating department in one room, imaging across the hallway in another room, solder mask in another, and so on. How do they compete against a strategy like that?

Beaulieu: It's a very difficult thing to do. Even with trying to adapt some of those techniques, it's almost better to rip the whole thing apart and start over. Some equipment of the future is coming in—changes from the laser direct imaging (LDI) to the legend machine, to changes in the handling machines. To do that, it's going to take a while if you're talking about how to compete on a smaller change scale. There are probably things you can do, but they're more tactical than just starting from scratch. To answer your question, how does a 30-year-old shop compete against that? I'm not sure. It's almost overwhelming.

We all have friends in the industry who are chomping at the bit. I talked to a couple last week about GreenSource, and they said, "Why can't I do this here? Why doesn't any other owner have the vision to let me go at this?" One started talking for 20 minutes about all the things they could do. There is talent out there to do it, and maybe GreenSource will lead the way.

Matties: It also looks to GreenSource's roots, which started as a captive facility; as far as I know, it was the first captive shop opened in some time. Due to their results and capabilities, they are moving into an independent or job-shop model. Granted, they're not in full-pace production yet, but they're producing boards over there, and I think that many OEMs may find that staying at the captive facility might be a better way of going.

Beaulieu: I have a feeling that it's going to be non-U.S. companies that are more interested in this than U.S. companies. China, Taiwan, and Europe seem to be the most interested in what GreenSource is doing.

When contacts from the countries I've mentioned talk to us, they discuss building a shop in the U.S. to do some product-leader stuff, particularly in automotive. As you know, the automotive pre-production orders are very big for our country, and international firms are looking. I have one in particular who is looking at building a shop that will cost \$40 million to deliver automotive work with 25 people. In the U.S., I hope we'll have companies who look at this and have it create an impetus for them to move forward in that direction too.

Matties: When you look at the way that they approached it, GreenSource picked their path. They said, "Here's what we're going to do, how we're going to do it, and how we're going to win with this strategy and leave everybody else behind." I think they've accomplished that and are at the beginning of that strategy in full production.

Beaulieu: Yes, and I'm really anxious to go there. Years ago, there was a company that was one of the first to nest many part numbers on a single panel. Their marketing and advertising was all by hand. They would send out postcards. If you placed an order with the company, you never got rid of them. Their competitors were up in arms about this like they were cheating somehow, but they were just doing it a differently—not the way that GreenSource is doing it, but on a much smaller scale. For years, people complained that they dared to advertise and complained that they were putting many part numbers on a panel, which a lot of people do now.

Again, that was a game-changer that people didn't like.

Matties: Yes, and that's good; when you're in a crowded space, create a new strategy that makes everybody else irrelevant. We've talked about GreenSource Fabrication, but not everybody is going to be a GreenSource customer. There's certainly a lot of business still for those that are not competing head-to-head with GreenSource and that technology.

Beaulieu: Find a way. So many times, we'll come up with an idea for somebody, and the first instinct is to come up with 50 reasons why that idea won't work. Well, try it. I'm sure GreenSource didn't get it right the first time. They had to think, go to their drawing board, and figure things out; now, they have this gem, but you have to try it first. I'm sure some people said it wouldn't work or questioned how they would do it. That's the wrong attitude to have. That's not a good American attitude because that's not the way we made this country.

Matties: Great advice, Dan. When it comes down to it, people have to look at the value that they bring, identify how it's unique and how they can separate themselves apart from the competition bringing value, and communicate that story. Thank you very much for your time.

Beaulieu: Thank you. PCB007

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

Read more about GreenSource Fabrication; see our coverage in the October 2018 issue of *PCB007 Magazine*. [Click here](#).



The More Things Change, the More They Stay the Same

Flex Talk
by Tara Dunn, OMNI PCB

When I first heard that the theme for this issue was successful sales strategies, my initial thought was, “Nice! Writing this column should be a piece of cake.” After all, I have been in sales in this industry for most of my career, so I should have an opinion or two about successful sales strategies. But as I started to think this through in more detail, I realized that a successful sales strategy in this industry can be defined in many different ways.

To some, both salespeople and the fabricators they sell for, transactional sales and the thrill of chasing that next hot prototype order is their definition of success. The higher the number of new customers, the better. To others, doing a deep dive into a customer’s business and building a long-term sales model is considered successful.

I have an opinion on which method I find most successful, but it is just that—an opinion.

I am fortunate to know many highly skilled, successful salespeople in our industry. I thought it would be interesting to reach out and ask them for their best advice and thoughts on what strategies they have found

to be most successful. Here a few of the comments I received.

Strategy #1

“There are no problems—only opportunities. All suppliers occasionally make a mistake, and how you deal with it separates the ‘men from the boys.’ If a customer receives bad boards, jump in the car, meet the customer, and let them know how concerned you are and what you are going to do to get it fixed. Don’t hide from the problem; face it.”

I happen to know this advice was given about 25 years ago, and still holds true today. Some of the strongest relationships built come from facing a difficult situation and working through it together.

Strategy #2

“When you are meeting customers and exhibiting at a trade show, give every impression that this is important to you and you are excited to be there. Dress in something nicer than your everyday business attire; this is a special occasion. Make direct eye contact, say hello, and ask genuine questions. Engage the



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customer. There should be no sitting behind a table, working on the computer, burying your nose in your phone, or eating in the booth space. The most important thing for those few hours is to make an introduction and lay the foundation for future conversations.”

Another great sales strategy. Be sure that the customer feels that they are the most important thing at that moment.

Strategy #3

“Successful salespeople, at least in our industry, view themselves as problem solvers. We all know that when building a complex, custom product, there will be surprises and issues that come up. When that happens, successful salespeople know how to navigate the issues internally and move things forward efficiently. They also know how to navigate the issue with their customers. What will the impact be? Is this an engineering board or a qualification lot? How can the impact of an unexpected issue be minimized? Taking the time to think through all of these things to find the best solution for everyone rather than just throwing issues over the wall is the key to successful sales.”

Yet again, another great piece of advice. Review the situation from all angles and start the conversation with the goal to find the best path forward for all parties.

Strategy #4

“People like to do business with people they like. Treat customers the way you would expect to be treated. If you are kind, respectful, and have a genuine interest in serving the customer, things will always work out.”

Once again, excellent advice. Put the customers’ needs at the forefront. They are, after all, the reason we are selling.

Strategy #5

“Network. Get to know the people ahead and behind you in the product chain. Refer business to them and have business referred to you. Be creative and expand your reach beyond the traditional avenues for prospecting.”

Finally, this advice is from someone excelling at transactional sales where the number-one goal is the highest number of new customers.

Relationship-driven Sales

The advice in this column leans on the side of relationship-driven sales. Be sure that your customer feels important. If there is an issue, how you deal with it differentiates you and builds a relationship. Be a problem solver and treat customers with kindness and genuine interest in how you can best assist them. Even the advice about networking relies on building relationships.

Thinking about long-term relationship driven sales brings up another interesting point for us industry veterans. When I started in the industry, the primary method of communication was in person or via telephone. Customers often visited their fabricators to discuss design issues, learn more about the fabrication process in general, and give the fabricator the opportunity to learn about their business challenges. This provided a natural way to get to know each other and build a strong business relationship. In that era, if you were not out visiting customers in person, it was normal to be on the telephone most of the day talking with customers. Even though we had email, most people still liked to speak to each other.

Today, it seems that most people prefer to do business via email rather than speak on the phone, and it is rare that customer goes on a field trip to visit their fabricator. How does this change how we build relationships with customers? After pondering that for quite some time, I believe that for successful salespeople, it doesn’t change how relationships are built, just the way the information is exchanged. To be successful, a salesperson still needs to be sure that their customers feel their needs are important; deal with issues in a proactive, respectful manner; be an active problem solver; and be thoughtful and sincere.

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ing connections. Our Geek-a-Palooza event is hosted specifically to provide a venue for people in the electronics industry to gather together, interact face to face, and make a personal connection that email communication just can't replace. Looking at the people I feel have a successful sales strategy in the PCB industry, one trait that most have in common is an ability to relate to their customers on a personal level. That may be knowing their kids and family, hobbies and causes that are important, and of course, knowing what things are most important for their customers to be successful in the job they are doing.

So, while I think the digital world and our swiftly changing industry has changed the

way we interact, a successful sales strategy continues to be rooted in building connections and genuinely being interested in what is important to a customer. Once that is established, moving forward with the complexities of a new opportunity, solving an issue, and simple daily communication are much more effective. Each small success will build on the next. **PCB007**



Tara Dunn is the president of Omni PCB, a manufacturer's rep firm specializing in the printed circuit board industry. To read past columns or contact Dunn, [click here](#).

Tiny Silicon Nanoparticles Cement New Era for Ultra-high Capacity Batteries

Scientists believe that silicon could be the answer to your battery woes with the potential for a charge capacity 10 times larger than current lithium-ion batteries. But while promising, silicon has the tendency to fracture and break with numerous charge and discharge cycles due to volume expansion and contraction as silicon absorbs and releases lithium ions.

Now, University of Alberta chemists have published research that takes a critical step in solving this problem, studying the effect of nanostructuring the silicon within lithium-ion batteries to understand the importance of size.

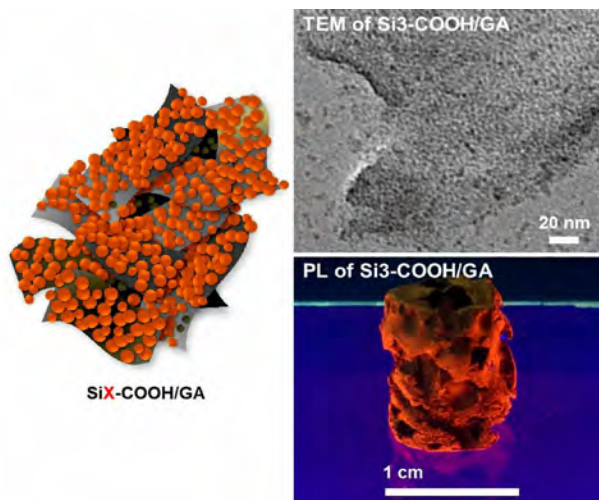
"We wanted to test how different sizes of silicon nanoparticles could affect fracturing inside these batteries," explained Jillian Buriak, professor in the department of chemistry and Canada Research Chair in Nanomaterials for Energy. "As the particles get smaller, we found they are better able to manage the strain that occurs as the silicon 'breathes' upon alloying and dealloying with lithium upon cycling."

In their research, the researchers examined silicon nanoparticles of four different sizes within highly conductive graphene aerogels. The results show that the smaller the particle, the less likely it is to crack or fracture upon lithiation.

"Imagine a car with the same size battery as a Tesla that could travel 10 times farther, charge 10 times less frequently, or had a battery that was 10 times lighter. The potential applications here are anything that relies upon energy storage using a battery," said Jonathan Veinot, professor of chemistry and co-author on the study.

The next steps, Veinot explained, are to develop technology for creating silicon nanoparticles in a faster and less expensive way, making these tools more accessible for industry and technology developers.

The paper was published in *Chemistry of Materials*.
(Source: University of Alberta)



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NCAB Group Builds Sales On Relationships and Expertise

Feature Interview by Nolan Johnson I-CONNECT007

Wayne Antal, a key account manager with NCAB Group, discusses sales strategies that NCAB has found to be successful in the current market in part two of our conversation. Last month, *PCB007 Magazine* published part one of this conversation on supply chain issues.

Nolan Johnson: Today, I'm speaking with Wayne Antal from NCAB. Wayne, could you introduce yourself and describe what NCAB is doing in the industry?

Wayne Antal: I've been with NCAB Group for about five years now. My industry experience goes back into the '80s just coming out of high school. I joined the military to start electronics training. After getting out of the military, I started working for various contract manufacturers and OEM companies. Before, I worked with CMs mostly as a program manager, and then in the last five years, I've gone to circuit boards only at NCAB. My time with NCAB being a key manager is an outside sales position, but I don't consider myself a prototypical salesperson; I'm more of a problem solver. The circuit board is the key component towards any electronics build; it's the platform that everything starts and moves forward from. From

that standpoint, finding out what the customer's needs are is the main avenue we use to create a value-add within our customer base, and maybe it will pick me up some new customers.

Johnson: NCAB has seen a lot of success lately.

Antal: That's right. We've unlocked success. Our best customers are the most informed customers who know what they're looking for, especially the newer customers that I have; they come to me knowing what they want, what our capabilities are, and they understand what the value-add is, which are always the best customers to have.

A lot of the more recent customers I've picked up have done their homework and said, "We know NCAB. We've looked at it and want you to come in. We want to transfer it." The last customer I picked up wanted to transfer their business to me in mass—the whole quantity. They had to step into us and ramp us up to what their requirements were, but they sought me out specifically. I came from the upstate New York region in Endicott. My name was known there, so this latest customer I picked up is from upstate New York as well. They knew of me and did their homework on NCAB, and I've been there several times to explain what our further value-add statement is.



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Johnson: That's interesting. As a customer, having a pre-existing relationship with the person who's going to be your sales rep, and being familiar with NCAB and taking you seriously is huge. Let's look at familiarity with NCAB part for a moment. What is NCAB doing from your perspective that makes it much easier for you to close this kind of business?

Antal: Overall, NCAB has a tremendous footprint. The only thing that recently has held us back is name recognition now that we're here opening offices throughout the United States and coming up to speed on the five offices that we have. That was the only throttle back for us. Now that we're out there and have the marketing, we have the name recognition. It's about trying to find those customers who we best mesh with from a value-add standpoint. What I mean by that is taking customers who don't necessarily have the critical mass to go to the quality factories offshore, and they just don't have the buying power to stay offshore.

It's about trying to find those customers who we best mesh with from a value-add standpoint.

That's where we would come in and have more of a leg up on that area. One of the things we do is give access. We also have engineering support directly stateside and offshore and design support offshore. There are other factors such as warehousing and the like, but our main thrust is being local to the customer by having offices throughout the U.S. and being local to the factory by having a presence in China and people in the factories in China. Then, we leverage our \$150 million spent in circuit boards only to get the best terms and conditions out of the factories that we work with. That's been a golden statement for us, and it's going in-

to finding these customers who would benefit most from that platform.

Johnson: So, you're in a place where you're more selective.

Antal: Yes, they're somewhat selective. If you look at even some companies who are doing direct offshore purchasing, we still may play a role somewhere in their supply chain. Being in the circuit board industry and knowing that some larger customers have less than high volume, which may be considered high volume to us, but high volume offshore to them. They look to have some mix on the high-mix low-volume side, which is where we would come into play as well. We have some part to play in both large and mid-range companies.

The mesh comes down to how well the company understands what their needs are. If the company is looking for transactional, we may not be the best fit for them, but if they really look at what they need and say, "We need to hire somebody or bring somebody in—a supplier. Who is the source for that?" In our case, it's circuit boards. Then, we will fit very well with them because my particular sell to customers is, "We are an extension of your manufacturing." When a problem arises at a customer site, I want them to be able to pick up the phone and call me as if they were calling their own circuit board or manufacturing group and say, "This is what we need." It needs to be that clear. That dialogue has to be established very early on. Part of my success is that I make sure there are no barriers in the way of providing that service.

Johnson: I'm starting to get a picture from this conversation, Wayne. If I just look at the major companies like Apple and Amazon with their hardware designs and product reach, they will obviously be doing a lot of manufacturing work with overseas firms where they set up long-term strategic partnerships. In that case, there will be Apple or Amazon employees handling the communication on both sides of the ocean—China as well as here in the U.S. They'll handle that within their own company

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reporting structure to make sure that the communication is right. Not every company can do that; they don't necessarily have the resources to put reps all the way along the supply chain to pay attention to their employer's best interest.

Antal: Yes. One of the interesting things about NCAB is that NCAB and I are a combination. I am that person both on the China side and the U.S. side. I have relationships offshore with the factory management team directly, so the key account managers for NCAB develop relationships with the factories as well as our factory management team in China and the customers. It circumvents any of the diluting of urgency or message that we get from our customers.

Johnson: And I'm sure there's a whole slice of the electronics manufacturing industry that would love to benefit from this type of a global presence and get the benefit of clear, crisp, accurate communications together all at once.

Antal: That's one of the key points with NCAB. As I said, quality is first, and now the quest is, "How do we maintain our quality?" Our primary focus is on circuit boards only; we don't delude into any other avenues. There's no assembly or anything of that nature, we just do circuit boards. That's part of what makes it purer, and full responsibility is the other piece of it. It makes that tenant that we have with the key account managers like me having access to both sides—front to back end of the supply chain—and allows us to have that full responsibility where it's in our hands to make sure that that happens. It's a tall order, but it's also very powerful to have that on both ends. That's part of why we are so successful.

Johnson: That, and making sure that the leads coming into the sales funnel are the right kind of customers for you.

Antal: That's right. As we qualify customers, it's really the relationship between me and the customers and factories and the ability for us to maintain and grow those relationships. We tend to have very long-term customers because of that.

Johnson: Relational versus transactional?

Antal: Yes. Any company, especially if you're trying to find ways of showing your value-add, should avoid being transactional because if it was to get to that point, your value-add gets completely washed under.

Johnson: Right. So, that seems to be one of the major trends going on right now for successful companies rather than those who are struggling. Have you gone into a place where you're building relationships versus just basically providing a transactional service?

Antal: Definitely. Let me give you an example. I went into one company where there was an account. Somebody left the company and I took over an account, and I was able to double the size of it. It's hard to know how the chemistry between you and the existing account are going to be until you get there, but for some reason, we clicked on all cylinders, and they felt super comfortable with me taking over the account; they were very excited. Like anything, you try to find ways of gaining trust in those companies. I give tons of industry information to them, which is what ended up happening. I gave them more information on the economy in China to what the expectations were and what we saw in the marketplace. I also helped the purchasing manager do some reports for their customers that had more to do with circuit boards to try to help mitigate risk.

Once you start to get into the risk mitigation portion of it, then you pass that information along, which sealed the deal. I was able





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to double our business with this one long-term customer we had. Now, I'm introduced into their customer base. They're a contract manufacturer. They feel comfortable bringing me in, and in some cases, even getting direct business from their own customers that they don't have the capabilities to do from an assembly standpoint. They passed those opportunities onto me.

Johnson: That certainly creates a certain level of magnetism toward you from the entire customer supply chain.

Antal: That's what I try to do. I've visited customer sites and all of a sudden you get pulled into a meeting because they're having an issue with a circuit board. I win business that way as well, which is fantastic. I even get a phone call once from the CEO of the company who said, "We have a problem with the board." I thought, "Oh, no." They continued, "It's okay, it's not yours." It goes from one of those dreaded phone calls to things being fantastic, and

then they had an issue where there were some boards in the field failing. I took a couple of sample boards back, had my team diagnose the actual boards and the layout, and they had a solution within five minutes. We won the business, and we still have it to this day. Those things make all the difference, such as the ability to have the resources available to you and knowing when to call them in. As you gain experience through the electronics industry, you learn what your customer is looking for and how to best help them resolve their issues and limit their risk.

So, the key points are building relationships with those who are making the purchasing decisions of your customers, and providing a value-add for them.

Johnson: I think that's true, especially in these times. A relationship and a perfect track record in helping mitigate risk is extremely valuable. Thank you for your time, Wayne.

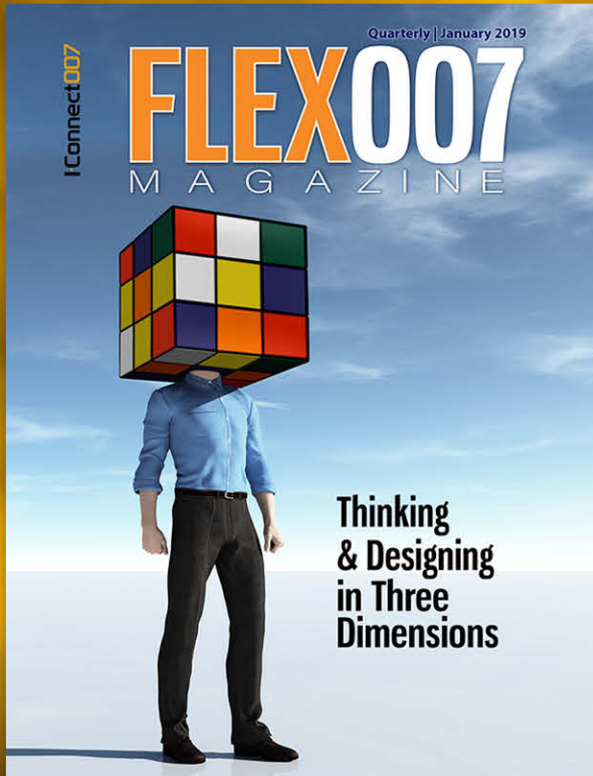
Antal: Thank you. I really appreciate it. **PCB007**

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Donald Monn, Midwest regional sales manager for Taiyo America, turns the tables on I-Connect007 Technical Editor Pete Starkey and quizzes him about his knowledge of Taiyo's new crack-resistant white solder mask for automotive, and the company's standard photoimageables re-formulated for laser direct imaging (LDI) that avoid the need for UL requalification.

Click on the image to watch the interview.





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Branding: A Small-business Perspective

The Right Approach

by **Steve Williams**, THE RIGHT APPROACH CONSULTING

Starting a small business is hard. I woke up one morning in 2013 and realized, with great trepidation, that after 40+ years in manufacturing, I now found myself in sales. What follows is an account of my personal journey transitioning from a career of making stuff to having to sell myself and my services.

What Now?

When I woke up that day, I thought, “I have a company, I have services, but I have no customers. What now?” Coming from a family of entrepreneurs and sales professionals, I had direct access to a vast amount of experience to draw from. I was also fortunate to have a good colleague and friend in the business I had just hung my shingle in that provided—and continues to provide—invaluable advice, counsel, and guidance.

Company Name

The first decision to make was the company name, which may seem like a no-brainer, but

was a struggle for me. Do I leverage my name recognition in the industry or create an autonomous name? After much discussion with family, friends, and colleagues—plus market research—I ignored all the feedback and advice and named the company after myself. After a year, I rebranded the company with a name that reflected what the company actually does. Best decision ever. The takeaway here is don’t take this task lightly, and focus on what you do—not who you are.

Logo

This decision is just as important as the company name because it is the first thing people see and one of the sticky things people remember. Just like the name, it should be a visual representation of what the company does. I would advise that you don’t try to develop a logo by yourself. The last thing you want to convey is a logo that was clearly self-developed. Hire a professional graphics or branding company to develop it for you.



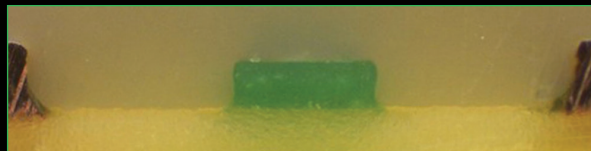
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in

Branding

A very painful lesson I learned is that the key to success is to laser focus on what you do. When I first launched the business, my list of services was extremely large and disconnected. When I rebranded the business, the company name, logo, and services were totally in sync and focused. The adage “you can’t be all things to all people” is especially true in this case. Another painful lesson learned is that my personal likes and dislikes do not necessarily reflect what my customers like. Again, as with the logo, I would strongly suggest getting professional help from people whose job is to understand your market and how your product or services fit in.

...as with the logo, I would strongly suggest getting professional help from people whose job is to understand your market and how your product or services fit in.

Once your brand is created, it takes daily diligence to build your brand continuously. The biggest lesson to be learned here is that every single contact you have with a customer or potential customer is an opportunity to reinforce your brand. Your business card is a powerful tool that can make or break that first purchase order after an introduction. The mistake I first made was to cram my first business card with things that don’t belong on a card and fill up both sides. That is the fastest way to get a potential customer to toss your card in the circular file instead of adding it to their contacts. I took a minimalist approach with the rebranded card that resulted in a simple, clean look with a blank back. Especially during large meetings and trade shows, people like to make notes on the back of business cards, and since

the goal is to get someone to keep your card, this works.

Website and Social Media

In today’s business environment, your website is often the first introduction to potential customers. It needs to be simple, visually pleasing, and highly functional. In my case, functional means having all the pertinent contact information, a lot of content (articles, white papers, videos), e-commerce, and a call to action. My first website had some of these attributes, but the rebranded version has them all along with a fresh, clean look. Once again, my personal likes and dislikes in the original website proved to not match my customers. You will be much happier if you step back and let the professionals do what they do.

Social media is also a powerful lead-generation and prospecting tool, and if used strategically, can be much more effective than cold calling and knocking on individual doors. There still is a great value to knocking on doors, but that is one lead at a time. I personally don’t have much use for Twitter and Facebook, but a tool like LinkedIn can put an article about your business in the hands of millions of professionals with a single click. Some of the advanced features can target specific audiences by industry, company, title, etc., to focus your message even further. Constantly build your social media pages and provide meaningful content specific to your business. Believe me, this takes a concentrated and ongoing effort, but the payback is fast and lasting.

Conclusion

Overall, what I can offer is my most valuable lesson learned in this transition. It doesn’t matter how great your service or product is, if you can’t reach your targeted audience with your message, it really doesn’t matter. **PCB007**



Steve Williams is the president of The Right Approach Consulting. To read past columns or contact Williams, [click here](#).

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Nano Dimension Expands EMEA Presence ►

Nano Dimension Ltd. has signed contracts with two EMEA-based resellers to market Nano Dimension's award-winning DragonFly Pro additive manufacturing platform for printed electronics in Belgium, the Netherlands, Luxembourg (the Benelux region), and Israel.

National Circuit Assembly Renews AS9100D Certification ►

National Circuit Assembly—a provider of PCB, cable, and electromechanical manufacturing and test services to leading OEMs—announced that it successfully completed the recertification audit for its AS9100D certification.

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All Flex is proud to assist Minnesota Wire with several new exciting technologies expanding their iSTRETCH product line using innovative stretch flex technology.

Eltek Reports Revenues of \$8.5 Million in 3Q18 ►

The third quarter of 2018 was the first quarter for Eli Yaffe as Eltek's CEO. Revenues were \$8.5 million—up 10% from Q3 of 2017—and the net loss decreased to \$463,000 from a net loss of \$1.2 million in Q3 of 2017.

ILFA Takes Off as Certified Aerospace Supplier ►

ILFA is a high-tech PCB manufacturer located in Hanover, Germany, for 39 years, and has been working with well-known customers from the aviation and aerospace industry for a long time.

Amphenol Invotec Secures Nadcap Approval for its Telford Site ►

Amphenol Invotec's Telford site has been awarded Nadcap accreditation. This achievement complements the Nadcap Merit status already awarded to its Tamworth site and represents a clear demonstration of the company's commitment to the highest standards of reliability and quality.

Defense Speak Interpreted: PERM—Pb-free Electronics Risk Management ►

In this column, I explore PERM—the Pb-free Electronics Risk Management Consortium. No, the group members do not all have curly hair! The name was chosen around 2008 by a group of engineers from aerospace, defense, and harsh environment (ADHE) organizations.

ESI's Chris Ryder: There's More to Choosing a Laser Than You Think ►

At the recent HKPCA show, ESI's Chris Ryder, director of product management—HDI—discussed considerations for choosing a new laser system, and how ESI uses its decades of flex and rigid-flex drilling experience to help guide customers in their decision-making process.

China Set to Impose Stricter Regulations on PCB Industry ►

China will implement a new set of strict regulations on the operations of the PCB industry on February 1, which may threaten the survival of small- to medium-size makers.



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How Emerging Technologies Should Impact Your Sales Strategy

Feature Interview by Nolan Johnson I-CONNECT007

While attending the IEEE Rising Stars Conference in Las Vegas, Nevada, I had a long and insightful conversation with veteran technical recruiter Terry McNabb. We covered so much information that the interview has been broken into two sections. In this section, we dive deep into how to sell your services.

Be sure to read the other part of my conversation with Terry in this month's issue of *SMT007 Magazine* where Terry and I discuss the shortage of mid-career expertise in the workforce and best practices for hiring experienced technical staff.

Nolan Johnson: I'm here with Terry McNabb who is a senior regional trainer from MRINetwork. Welcome back! Can you refresh us on your role and organization?

Terry McNabb: MRINetwork is one of the largest executive search and recruitment organizations in the world. It has been in business

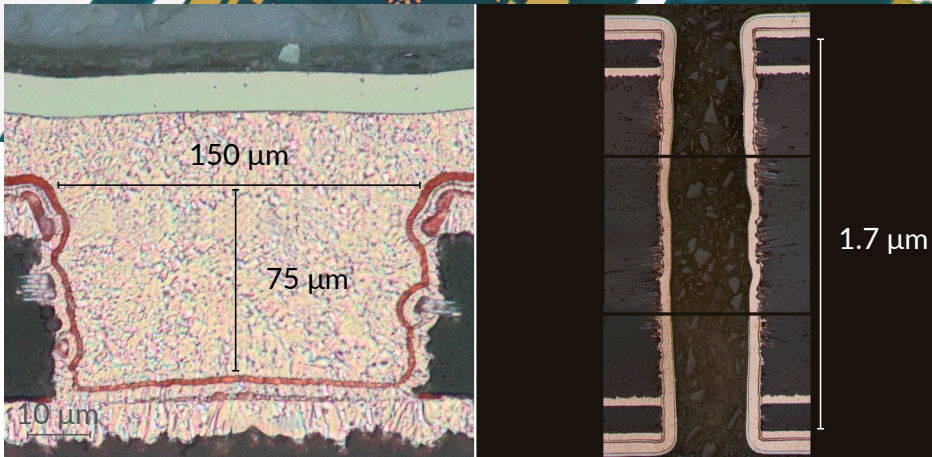
as a franchise organization for over 50 years with approximately 400 offices spanning four continents. The most interesting thing about MRINetwork is that, for instance, most of the people who place electrical engineers are electrical engineers, so they understand the industry. They have a depth of understanding from years of working in it. Then, we teach them the recruiting process and how to identify the top performers in any marketplace, engage those people, and deliver them to our client companies.

Johnson: Let's talk about sales and marketing, which have been your particular specialty.

McNabb: At this point, I've been pretty equally split between the two—18 years recruiting and now 16 years training. But I do have some interesting things to share on the sales and marketing side.

Johnson: We certainly are seeing a change in the electronics manufacturing industry. Some companies succeeding and other companies

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are failing in a market that is generally growing. There are a lot of dynamics involved. One of them, of course, is how companies approach sales and marketing. What trends are you seeing overall?

McNabb: What I'm seeing is companies are getting more sophisticated when it comes to advancing their sales success. For instance, imagine that you make a medical device and have great sales with four out of the five hospitals in town. What we do at MRINetwork is look for the person who walks into that fifth hospital and has everybody react with, "Nolan! It's good to see you."

Who was a solid relationship within those accounts and can help us make that transition more smoothly? If there's a distribution network, who has worked with that network? It's that proven track record of success rather than hiring a probability of success. That is an important distinction.

One of the favorites from my career is I worked with a company that developed a cool new technology.

It was a filter that would evacuate the carcinogenic plume created by laser surgeries; you don't want to kill everyone in the operating room suite! They intended to sell the device to the hospitals directly, so that the hospitals could put one in every operating room. That seemed fair and made sense.

But because I was in a position to be an aggregator of insight and was able to talk to so many smart people, one of them said, "Why don't they sell this on an OEM basis instead? They can attach one of those to each laser that they sell. Now, they sell a machine that doesn't kill people." The net effect was the company jumped from a one-million-dollar first year's sales expectation to four million dollars.

Johnson: It's an easier sell to the hospital because that feature is already built in.

McNabb: Right. Another company I worked with was about to launch a new product that they were really excited about. They were competing in a market segment dominated by two powerful companies. They came to me and said, "We want someone with sales experience in this broad sector." I responded, "Why don't we find salespeople who have experience with this exact product?" They answered, "How can they? If they have gone to these customers for the last five years and said, 'This is the best there is,' how can they suddenly show up with our product?"

I told them, "For the last five years, I brought you this because it was the best there was. Now, there's something better, so I've switched. I think you should switch too." It was very easy. They passed that first giant competitor in eight days, and it became the number one product in the world in their category in about nine months.

Johnson: Wow.

McNabb: Their success was way beyond expectations, simply because they got a bit more strategic about how they approached the market. They reached #2 in eight days, and became #1 in less than nine months.

Johnson: I'm going to give for you a thought experiment speaking from my industry. Let's use the example of a PCB manufacturing shop. They do a lot of chemical engineering and chemistry work. They manufacture the PCBs that then go into all electronics. The chips and connectors get attached to the PCB to become the finished working electronics.

These fabricators make the boards to the customer's custom design. Teams design their boards, then submit them to a fabrication shop to manufacture them. Obviously, there's a lot of this since the raw number of boards being manufactured is on the rise. There are a lot of dynamics surrounding overseas production and then coming back,



Terry McNabb

and the tariff situation has also made it much more complex.

Some companies that are thriving, and others are struggling. The roles were reversed five years ago. The struggling companies had previously found a way to be successful, but have lost their edge somehow. Maybe it was e-commerce, which has shifted in its mechanics over the years. In that environment, what's your advice for putting together a sales strategy?

McNabb: Absolutely. By the way, that's true in recruiting as well. There has been a massive commoditization of recruiting, and people who approach it from a commodities standpoint are suffering. Meanwhile, people who are truly search consultants and recruit in that way tend to bring radically more value through the consulting process itself, and are doing better than ever.

In any world, the most exciting opportunities happen at the edge of change. The cutting edge is where great things happen; not so much on the bleeding edge. There will be opportunities for PCB companies. They need to pay attention to new technologies that are now using PCBs. My refrigerator now needs to interact with my smart house, for example.

Johnson: One-hundred million Echo Dot devices have been sold.

McNabb: Exactly. Things are changing in really fascinating ways. Technology is going to drive change; it makes some of those manufacturers winners and others losers, which will happen in several ways. It will open up new revenue streams and markets. There will be new products that haven't used them before, which will change the demands. Now, we have new challenges in terms of heat management and new approaches and technologies. Some will get that, move with the demands, and win, while others will miss it and lose.

Johnson: I'm sitting here wondering about the costs and benefits of committing so many resources on my sales team to paying attention to emerging technologies. If I have a sales team,

should I be taking a subset of my total time and directing it toward watching the market?

McNabb: It should not be a subset; it should be every single member of your team. From this simple standpoint, if you're in sales, the best way to engage anyone is to talk about their favorite person, and that's not you. If I'm calling on an engineer, they're not interested in talking to me about hiring because that's not their passion, but they love discussing new technologies and problems, solutions, and opportunities happening in the marketplace. The best way for your company to stay on the cutting edge is also the best way for your salespeople to engage their customers.

Johnson: Let me turn that on edge just a little bit. As a hypothetical fabricator, my business is based on an active customer list probably four digits long of different accounts who order regularly. And from that list, I have a \$50-million a year business. Clearly, I shouldn't ignore those regular customers.

McNabb: I understand, and I'm not telling you to ignore them. What I'm saying is you should engage them on a more advanced level.

Johnson: So, I should talk to my existing customers about what they're doing next?

McNabb: Yes. If I already know exactly what I want, then you can be replaced with a catalog, and the internet is the world's largest catalog. I'm perfectly happy to pay a premium to you if you save me from buying the wrong thing. That's the only time I'm willing to pay a premium, and the only time I will be loyal to you. Giving me the best price does not create loyalty, but helping me make the right decision is key. You want people to say, "I'm much smarter when I talk to Nolan first."

If you're only addressing their needs and specifications, then your solution is no better than their ability to articulate their needs and choose their specifications. That puts you in great danger, but the good news is needs never exist in a vacuum; they're always the result of

some problem in achieving a goal. I'm going to follow that upstream, and at each step, I create substantially more value.

All of your salespeople should be focused on building stronger relationships and creating more value by bringing the insight that they can gain. Just like our search consultants, a good sales rep talks their clients and a lot of that company's competitors to learn the issues. They're learning about the new opportunities and problems.

All of your salespeople should be focused on building stronger relationships and creating more value by bringing the insight that they can gain.

Johnson: That's a huge point to consider.

McNabb: Change typically comes in one of three major categories. I talked about new technologies—which is certainly going to impact the people with PCBs—but there are also new regulations such as tariffs or different EPA specifications. There are a host of regulations. Again, every time there's a change, some people gain, and some people lose. My favorite definition of insight is understanding what's changing and the implications of those changes. What new problems and opportunities have been created? What are the implications? Harry S. Truman said it best: "It's a recession when your neighbor loses his job; it's a depression when you lose yours. It's about that immediate personal impact.

Finally, the third thing that will have the biggest impact on the PCB manufacturers are market shifts. Eighty million baby boomers are approaching retirement, which is changing the way they're investing and also changing their technology needs. That changes everything.

They're also approaching retirement differently. In the past, if I needed an orthopedic implant, then I wanted to be able to walk around the house. Now, my expectation is that I'll still be able to compete in an Ironman contest. It's changing radically.

We always think about the U.S. baby boomers because that's the greatest shift domestically, but the largest shift in the world is in the BRIC nations. Brazil, Russia, India, and China where so many are moving from poverty to middle class. They want consumer goods, electronics, and choices.

Johnson: For example, that's one of the reasons why there are reshoring dynamics going on.

McNabb: Exactly. If your entire sales force is engaging people and learning about the new problems and opportunities they're experiencing, then they can go to other companies and say, "It seems like a lot of the companies are struggling with this. Where are you in that process?" That's so much more intriguing than, "How many PCBs do you want to buy this month?" If our only relationship is a vendor relationship and that company can get that same PCB for a half a penny less, you've lost the account.

Johnson: So it comes back to a relationship over a transaction.

McNabb: It does. It comes back to legitimate, profound value, and that only happens in a relationship. I'm amazed. As a recruiter, one of my favorite questions to ask HR managers is, "How many times do you find yourself paying for postings or ads, slugging through mountains of resumes, and then end up paying a recruiter on top of all of that?" The inefficiencies in the world are epic, and the world is starving for people who will come through and create order out of chaos and certainty out of indecision. Yes, I can find a world of information on the internet, but most of it doesn't relate to what I was asking for.

Johnson: In the electronics manufacturing industry, it's a little bit harder because there is a

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custom fabrication part for that subassembly circuit. The fabricator is selling a service, and the finished good is the customer's product, not yours. Consequently, you're selling your reputation, peace of mind, the ability to catch a problem before the customer has committed to a design respin because they screwed up.

McNabb: Again, a good salesperson is a consultant. It was always funny to me when I'd talk to people with lots of technical knowledge and strong communication skills, and they would say, "I'm not pushy enough to be a salesperson." I'd ask them to think of the pushiest person who calls on them. After complaining about that person for a while, I would ask, "How much stuff do you buy from that person?" Usually, the answer was, "Nothing. I hate them."

From there, I'd ask them to think about the person they buy the most stuff from. The typical response is, "They know my world and give me great ideas and advice." My point is they might not be pushy enough to be an utter failure, but are they helpful enough to be successful? A good salesperson helps others make better choices.

In the world that you described, a good salesperson is going to be a consultant who knows the issues. They're going to be able to say, "Here are the things that you should consider when you're making this board or the completed assembly."

Johnson: You're pretty much spot on. There are a whole bunch of constraints that both designers and fabricators have to work around. What's the best design? How reliable is it going to be once it goes through fabrication? What are the yields going to be? Will half of the boards that were just manufactured fail in the field because of a critical design issue that doesn't always manufacture properly?

McNabb: The next thing that sales rep might do is say, "In this marketplace right now, 80% of your sales are for laptop computers. That's a mature market, and the competition has gotten so stiff that the margins are smaller. Mean-

while, many of the top companies are shifting their sales focus into these other technologies where the margin is better. How can we help you succeed in that new sector? Here are some of the things that you should consider."

Johnson: I want to go a little bit further into having a good relationship with your customer and consulting with them because that makes sense, especially in this marketplace. However, there is a school of thought that if you do your homework well enough, the sales team becomes order takers.

McNabb: Any time your salespeople become order takers, they are going to suffer from commoditization. They are not creating the same level of value. I think of it in two ways, and I guess I'm a little bit spoiled because I see this so vividly in recruiting. The first level of value is the vendor value where the customer says, "This is exactly what I want. Here are the specifications. Go find that." In that role, I can be replaced with a catalog. The best possible thing I can say in that situation is, "Would you like fries with that?" It's very limited.

But the moment I can say, "It sounds like you're trying to solve this problem, and here's a better way to solve that problem." Our big win is to cause that customer or client to say, "I hadn't thought of that! My decision wouldn't have been as good if I hadn't talked to you first." Helping them redefine their needs to solve specific problems is a major escalation.

At MRINetwork, we find that we do about five times as much business per year with those customers compared to a strict vendor relationship. When you talk with them about their goals and help them recognize problems that they hadn't noticed yet, then you hear this even bigger reaction where they wonder, "How in the world did we miss that?" Again, you've created roughly five times as much value as you did a moment ago.

Johnson: Fantastic. Thank you, Terry.

McNabb: You're welcome! PCB007



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SMART Marketing

Feature by Barry Matties
I-CONNECT007

Editor's note: This is an excerpt from Read Threads: SMART Marketing (Strategic, Measurable, Aligned, Relevant, Timely Marketing Wisdom).

The Power of Branding

Oftentimes, marketers expect more from their branding ads than they should. These are usually the short-term marketers. The one question they ask is, “How many clicks did my (branding) ad get?” When they hear the results—typically a low number—the usual response is, “Advertising doesn’t work.” Smart advertising absolutely works. We see examples of that everywhere. Smart advertising is strategic, thoughtful, and takes time.

Branding is about creating awareness about your company and/or product in a way that differentiates your presence in the marketplace. Short-term thinking and expectations should not be applied here. This is an ongoing, long-term process. Creating a strong company brand increases the value of your product, thereby allowing you to charge more for it, which pays for marketing and increases your profits.

We experience the power of branding in supermarkets all the time. Generic brands are

usually perceived to be lower quality. Leading brands are the ones we think of as the best quality, the leaders, the ones we pay more for. Ironically, generic brands have their own branding success: they’re cheap. You expect to pay less. That’s their branding.

So how do we measure branding? Branding is measured not in the short-term, but over years of dedication to building a brand. For example, if I ask you to name a fast food restaurant, you are most likely to say McDonald’s, even if you don’t eat there. They have owned that space for many years yet continue to advertise every day.

The quickest way to own a brand in the marketplace is to find an opening where a name brand doesn’t already exist. Here’s a great ex-



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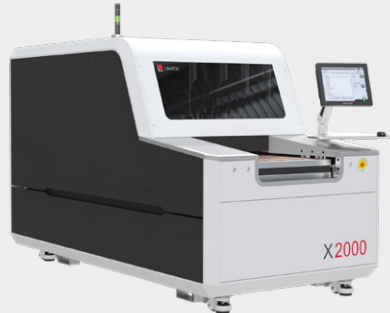
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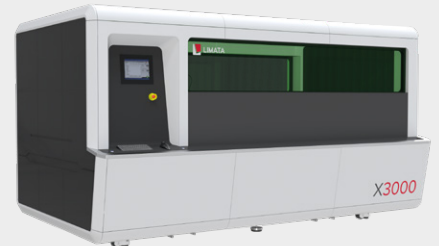
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ample: bed pillows. Many people never considered brand names when they thought of bed pillows—not until MyPillow came along. Now, MyPillow is the brand that most know. They don't even consider a second choice. If you watch American TV, you have most likely seen MyPillow ads. In 15 years, the brand has become a household name with nearly \$300M in revenue. I don't expect the MyPillow guy to stop building his brand anytime soon. (In fact, he's about to publish an autobiography.)

So how do you measure the result of branding? The simple measure is number of impressions into your target market. Remember, if your target markets are B2B, then there are not going to be ever-growing numbers. B2B markets are defined by a fixed number. The measure is not how many people saw your ad one time; it is how many times you can get your ad in front of the right people in your market. In other words, you want each prospect to see your message as many times as possible.

Of course, the other measures come over time as well. You start to see your sales increase. You notice a higher demand for your products. More people are contacting you to do business. Overall, more people think of you first in your chosen category, like McDonald's did with fast food or MyPillow did with pillows.

Successful branding is also about making your message memorable. Message recall can happen with saturation, as we see with the MyPillow company. The other factor that im-

pacts recall is having a message that resonates with the emotional mind of the prospects.

I know, here we go talking about emotions. We know that the higher the emotional content, the greater the recall. So, when we say resonates with the emotional mind, what we're talking about is decreasing the number of impressions needed for prospects to have a clear recall of the message. Combining saturation with a message that appeals to the emotional mind is the best approach.

What's Your Message?

First, let's define message. In this case, message is the stated value that defines your offering and communicates to your customers. The message shouldn't focus on how great you are, but rather on the benefits the customer receives by doing business with you.

Consider these two messages:

- **Everyone wins with our product!**
- **Improve your yield by 35%!**

The first statement is vague and targets everyone as a winner. It hardly serves as a compelling argument to gain attention. The second message talks directly to you, the potential customer. What you will gain—a 35% increase in yields—is very clear. This value is strongly compelling to prospects who want increase yields. It gets their attention. It positions you as a yield improver.

Once you have a clear message, this is what you use to build your story: your marketing message. This includes all communication, everywhere you go. You become your message. Bring your message into your branding ads, write columns to share your expertise with prospects, write a book on the subject, put it on your business cards. However, most of all, your whole team needs to be aligned and talking about it all the time.

In this case, when people think of increasing yields, you want them to think of you first. That's how it should be for your message; they think of you first.



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The other thing to keep in mind about your message is it should be clear, concise, and stand on its own. You don't need a paragraph of text to explain it. Remember, the mind doesn't like complexity. It likes simplicity.

So, the final question: what's your message?

What Do You Stand For?

"I don't know who you are, I don't know your values, I don't know your reputation, and I don't know what you stand for. Now, what is it you want to sell me?"

This may seem extreme, but don't assume your prospects may already know this about you. In fact, they may know something quite the contrary if you leave it up to your competitor to educate them about you.

Why does this matter? It matters because people want to do business with the companies they know—those with strong reputations and solid core values. What you stand for are the values you bring into your business and lead your team with each day. These values are the ones you instill in your team to guide them in all of your business dealings.

Hubris can get in the way, and oftentimes, it does. When it comes to values, it's not what you say or think you said, but rather what you do because how you act is what you communicate. We all hear of or know companies that are "shady" or "questionable." They promise everything and deliver disappointment. Those are the ones we don't want to do business with. The core values in these organizations are not aligned with building a long-lasting relationship with their customers, suppliers, or employees.

Core values don't change with market conditions—they stand the test of time. The best way for your customers to know yours is to be in front of them every day living your values.

This includes all of your marketing, ads, columns, interviews, shipping boxes, or any point where you are in contact with a prospect or customer. Make sure your prospects know who you are, your reputation, and what you stand for. Live, share, and reinforce that every day.

By doing so, it will make doing business with you a much easier choice for prospects.

There are a few companies you already know that are safe to do business with. The ones that consistently do what they say they will do, when they say they will, without hidden cost. Amazon is one that comes to mind. They are not perfect, but when they do miss the mark, you already know they will strive to make it right. It would be nice if all business transactions

were that predictable.

Amazon has built a solid reputation with consumers. Their marketing plan is strong, and their branding is everywhere—right down to their shipping box with a smile. You know it's Amazon.

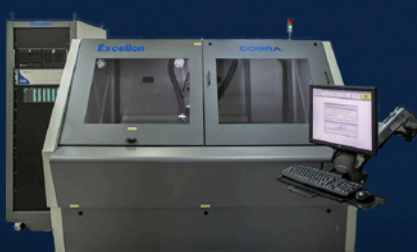
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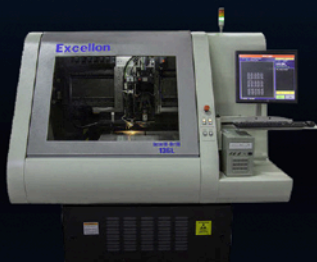
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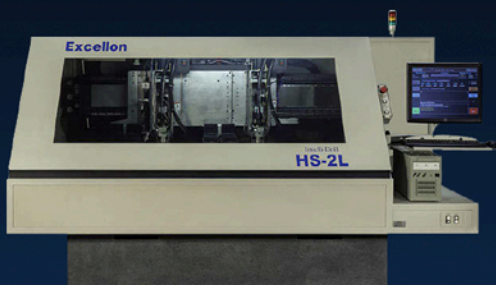
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Supplier Highlights



Itronics Starts R&D to Recover Tin and Copper from Its “Breakthrough Technology” PCB Refining Pilot Plant ►

Itronics Inc., a “creative green technology company” that produces GOLD’n GRO fertilizers and silver products, has started research and development to recover tin and copper from the silver bullion being produced by its “breakthrough technology” PCB refining pilot plant.

Robert Art on the Importance of Thermal Management ►

Robert Art, global account manager for IMS materials at Ventec International Group, discusses future market requirements for thermal management materials, the need for a better understanding of the concept of thermal impedance, and an initiative to propose a consistent industry-standard method for measuring thermal conductivity while at electronica 2018.

Agfa on Revolutionary Inkjet Solder Mask Applications ►

Does inkjet solder mask have the potential for volume production? Mariana Van Dam, global sales manager for PCB imaging solutions, and Dr. Frank Louwet, business unit manager for advanced coatings and chemicals, discuss Agfa’s latest developments, plus some novel applications for inkjet etch and plating resists.

Chris Nuttall Discusses NCAB Group’s IPO and Future Plans ►

Editor Nolan Johnson sat down with Chris Nuttall, COO and VP of technology at NCAB Group, to discuss software tools, predictive reports, and the company’s recent IPO.

Printed Circuits Installs Burkle High-Temp Lamination Press ►

Flex and rigid-flex circuit board manufacturer Printed Circuits has purchased and installed a new Burkle high-temperature, vacuum lamination press.

Ventec Expands Global OEM and U.S. Sales Team With Two New Hires in the USA ►

Ventec International Group Co., Ltd. has appointed Lynn Kahler (East U.S.) and Ken Butte (West U.S.) as OEM marketing managers.

TTM Technologies’ Guangzhou, China, Facility Recognized as a Green Factory ►

TTM Technologies Inc. has announced that its largest manufacturing facility located in Science Park, Guangzhou, China—part of TTM’s Mobility Business Unit—has achieved the status to be listed as a “green factory” by the Ministry of Industry and Information Technology (MIIT) of China.

MacDermid Enthone Discusses Consolidation Benefits ►

At the 2018 electronica exhibition in Munich, Frando van der Pas, director of marketing and sales for MacDermid Enthone—Europe, and Technical Editor Pete Starkey discussed the consolidation benefits and the vision and future of the company.

CCL Makers Stick to Capacity Expansion Plans ►

Copper-clad laminate (CCL) makers will continue their production capacity expansion projects in 2019 despite volatility in the PCB market.

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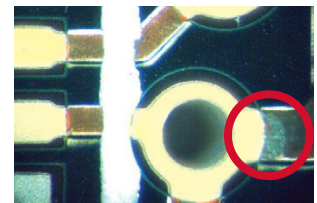
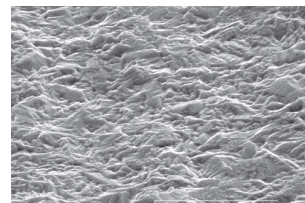
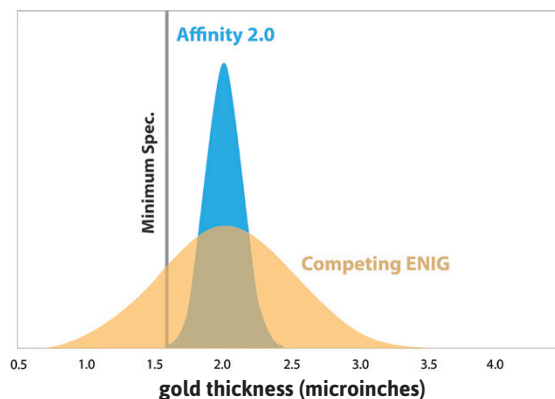
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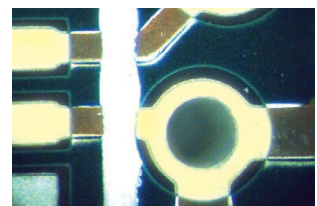
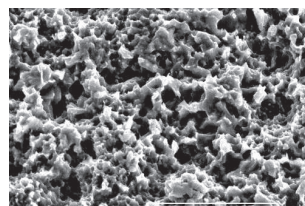
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2019 Copper Development and Onward

The PCB Norsemen
by Didrik Bech, ELMATICA

The dawn of 2019 is upon us, and economic turmoil, international cooperation, tariffs, export regulations, conflicts, and Brexit are affecting the market and demand for natural resources such as copper. These challenges—combined with a stringent and continuous paradigm shift from the combustion engine to electric and hybrid energy systems—indicate that the copper price for 2019 will be stable compared to 2018. In this month's column, I will address the expected demand and supply of copper after 2019, and particularly in one key industry—automotive.

The Copper Situation

This industry is rapidly starting to affect the demand for copper, not least in the years to come. The key characteristics of copper are its electrical and thermal properties—tough, recyclable, non-magnetic, antimicrobial, and cata-

lytic—and its status as an affordable resource compared to materials with similar attributes. Thus, copper is a vital resource for current and future industries like power, medical, automotive and renewable energy. What these industries have in common is not only a significant demand for copper but also a high demand for PCBs. Copper is one of the key raw materials in PCB manufacturing and is consequently price sensitive to changes in copper demand and supply. Manufacturers, customers, organizations, and governments are constantly aligning their interest in the automotive industry as the demand for electric and hybrid energy systems increases.

Copper Demand and Supply

One research paper estimates global copper demand until 2100 (Figure 1) ^[1]. Their findings indicate that infrastructure and transpor-

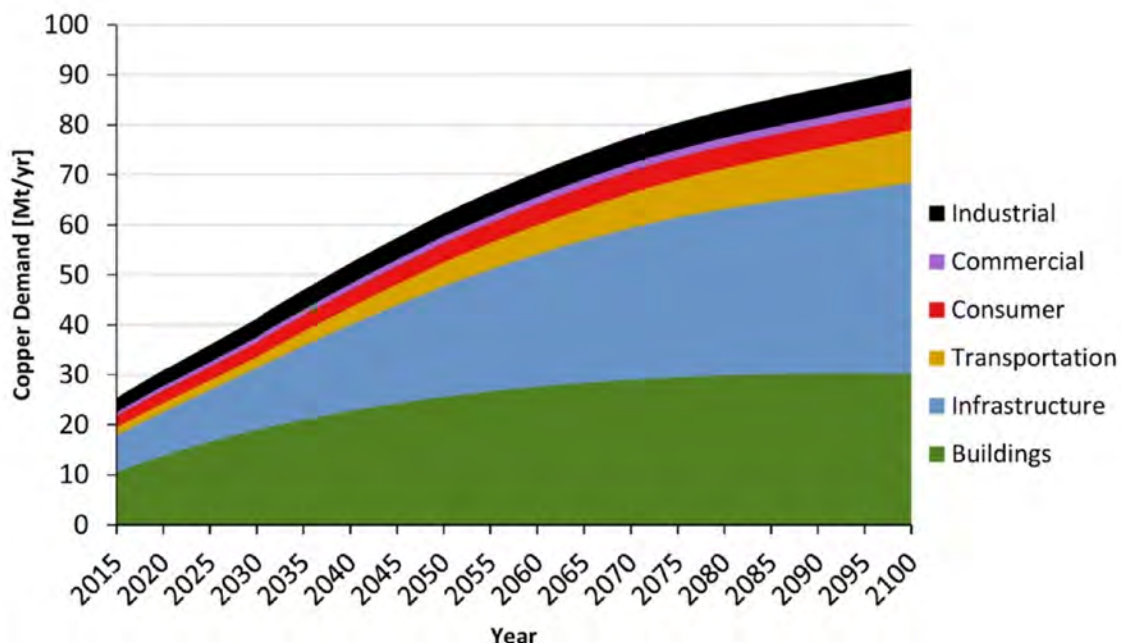
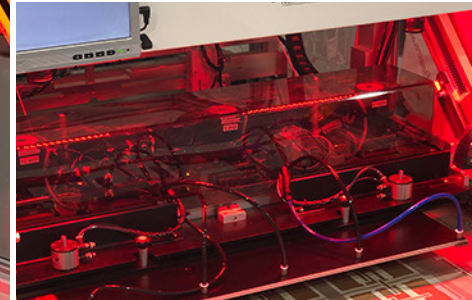


Figure 1: Global copper demand estimates ^[1].

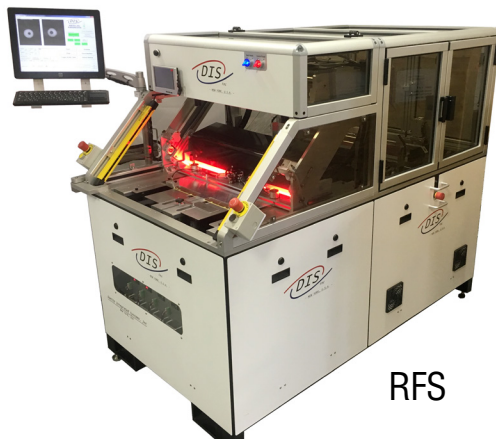


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tation represent future significant sectors for increased copper demand. The automotive industry is already directly affecting these sectors. In most cases, electric vehicles require extensive upgrades of the local and central power distribution network (PDN) to allow users access to an efficient and fast charging apparatus. An estimated 85% of all copper mined is still in circulation because the resource is highly recyclable. Unfortunately, this recyclable attribute is not properly addressed in many papers, which constitutes a challenge in regard to better estimating future supply and demand.

Copper supply is estimated by Wood Mackenzie to grow until approximately 2020 (Figure 2). Then, the demand will outstrip supply unless the global market experiences increased turmoil as mentioned earlier. This leads us to draw the preliminary finding that the price of

copper for the short term of 2019 will be stable; for the medium term from 2020–2023, it will increase, and in the long term of 2035, the demand will grow with over 50%. It is important to state that it is a challenge to estimate the future demand for copper because copper estimates from ScienceDirect and Bloomberg differ from a yearly demand in 2025 from 35 to 24 million tons.

Challenges for the Automotive Industry

The automotive industry is experiencing a challenging setting as governments all over the world are placing a ban on the new sales of combustion engines. Over 15 countries representing over 1.5 billion people have officially stated that the gasoline and diesel engine for new car sales will be banned. The country to first implement a ban on new car sales with gasoline or diesel is Costa Rica by 2021, and

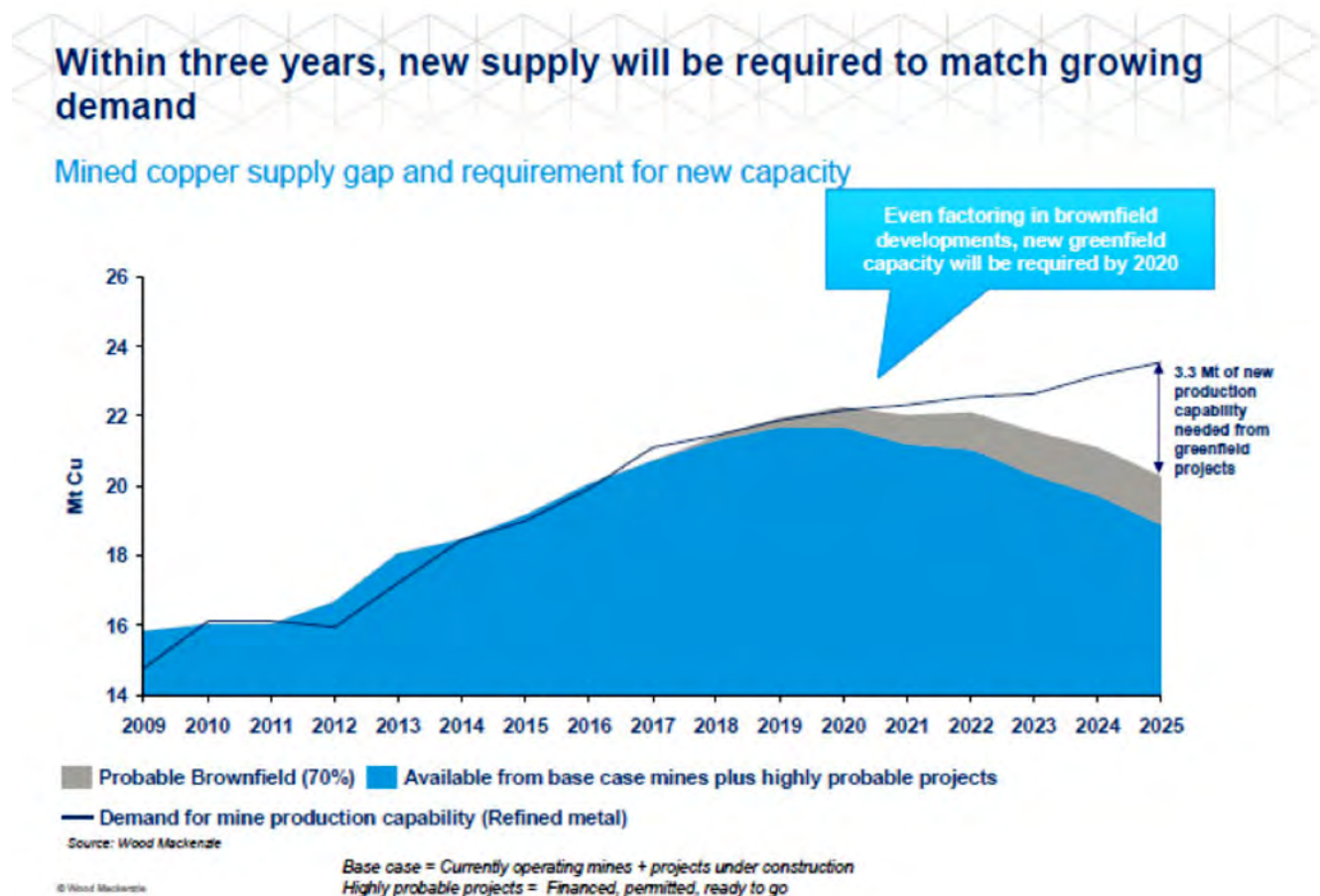


Figure 2: Mined copper supply gap and requirement for new capacity. Within three years, new supply will be required to match growing demand. (Source: Wood Mackenzie)



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the latest is Germany with 2050. The median is around 2030, so this will not occur overnight. However, it leads us to estimate that the sale of electric cars will increase substantially within only a couple of years.

The increase in the sale of electric vehicles will depend on the battery package, increase the demand for copper per car from typically nine to 25 and even 90 Kg ^[2]. One can assume that the quality, efficiency, and amount of batteries will continue to increase, which will lead to a further demand for copper per car. As an example, a luxury car has an average of two to three square meters of PCBs, and an electric vehicle has five to eight square meters of PCBs ^[3]. The PCBs for electric cars are also more advanced and costly because the car is practically a computer on wheels.

Batteries vs. PCBs: Competing Copper Resources

The copper foil used in batteries is more or less a direct competitor to the copper foil used for PCBs. An increase in the demand for electric vehicles will therefore directly affect the copper foil price for PCBs. Rather, the question is, "How much and how fast will the demand for electric vehicles increase, and what is the consequence for the battery supply?" In relation to BMW, one article states, "They are especially worried about the battery pack" ^[4]. Volkswagen alone has a battery contract for over \$48 billion USD ^[5]. Over 30 different types of electric cars with different battery packages are planned to be on the road by 2025, which is likely to be an understatement ^[6].

The international energy agency estimates a growth from a total current sale of electric cars of three million from 1900 to 2018 to a total sale of over 125 million by 2025 ^[7]. The total number of cars sold in 2018 was approximately 80 million ^[8]. Bloomberg estimates a yearly sale of 11 million electric vehicles by 2025 ^[9]. If these presumptions are correct, then the effect on copper foil demand (not including upgrading PDNs, charging stations, critical infrastructure for electric vehicles, etc.) can be estimated to be 803,000 tons of copper per year ^[10]. This constitutes growth in

the demand for copper per year from 2025 by approximately 2.7% ^[11].

Start Planning

Now is the time to start planning. The automotive industry will not shift overnight. The production line takes time to adjust, and new copper mines, technologies, and projects will improve the supply of copper. The question is perhaps, "How should you prepare if the adoption of electric cars is faster than anticipated, let alone considering tax cuts, environmental considerations, and customer demands?" **PCB007**

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9. Bloomberg. "Electric Vehicle Outlook 2018."
10. Calculation: 90-kg copper electric car - 17-kg combustion car $((9 + 25) / 2) * 11$ million cars
11. Calculation: 2.7% $(803,000/30,000,000 (30 \text{ million } (35 \text{ million} + 25 \text{ million}) / 2))$



Didrik Bech is the CEO of Elmatica. To read past columns or contact Bech, [click here](#).

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Matt Stevenson Discusses Online Quoting and Ordering

**Feature Interview by Barry Matties,
Nolan Johnson, and Patty Goldman**
I-CONNECT007

Matt Stevenson, director of marketing at Sunstone Circuits, discusses investments into their website, the impact of moving to online quoting and ordering, and the importance of strategic staffing.

Nolan Johnson: Sunstone is pretty good at online ordering and doing quotes over the internet. As you move closer into this sort of conversation, do you expect to see some changes in how you're interacting with your customers on the web?

Matt Stevenson: Yes, with everything we do on a daily and weekly basis. We try to add features to the website to allow people to do more. With that being said, we're trying to at least maintain the level of interactions where they want a customized quote. By adding more to the website, we will hopefully remove some of the burdens on the quoting team. As we add these other higher technology requirements,

that burden will get shifted back to those people. We're hoping to maintain that at a manageable level, but we do expect there to be some definite spikes and increases as we add it to the website and our internal quiver.

Barry Matties: I'm glad you brought that up, Nolan. I was thinking along the same lines. We're not looking for you to give away any strategies that you feel incorporate your strategic advantage, but could you talk about your strategy with the website? That's a very well-known strategy for you, Advanced Circuits, and a few other companies that have embraced the online ordering process. We're hearing out in the industry that that strategy, while it has a stronghold, is not as strong as it previously was, and that people want more of the marketing relationship with their suppliers.

Stevenson: No problem. Approximately 20 years ago, Sunstone (at the time, ECD) was one of the first to be on the internet quoting and ordering of circuit boards as PCBExpress. We went all in with that strategy and developed our business model around it. It was



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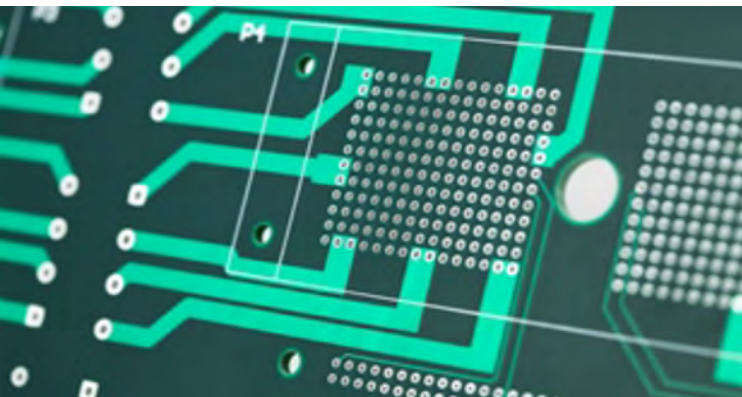
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great cash flow because we had credit cards coming in with the orders. We didn't have to spend the labor to quote every order down to the nth degree. With some orders, we may have lost money; meanwhile, we had a pretty good margin on some, but overall, we did well from a margin standpoint.

Fast forward to about four or five years ago as all the competition came online and started making that the go-to way. You mentioned Advanced Circuits, Sierra Circuits, many companies in China, and the Midwest got on board with that. We saw a shift back towards, as you said, with relationship management. We've added a couple of account representatives to be that person for the majority of the customers that want to interact that way.

We're looking to add another one or two, hopefully, this coming year. And we're going back the other direction. We're still keeping our presence with the website by continuing to offer more so that the customers that do want to continue ordering that way have it available, and we make that a good experience for them. However, we are adding quite a bit more internal resources to help the people that want that personal touch and relationship, so they want to partner with Sunstone and interact with us, before the order, during the order, and after the order.

Matties: It's an interesting shift because I know a lot of people were really excited about the internet. When you're looking at selling your services, generally speaking—not on the web so much but with the relationship—what's the greatest challenge in selling services?

Stevenson: At this point, with the tremendous amount of competition out there, even the overseas suppliers have pretty decent quality, and with some of the changes to the customs, etc., they're able to respond quickly as far as the shipping goes. Trying to differentiate the values that Sunstone brings to a potential customer is a challenge in a short-burst digital world. How do you show the value-add that Sunstone brings when you have 28 words in a Google ad, or you have 300 by 600 pixels to do it in a display ad? How do you differentiate yourself from the myriad of people out there quickly and effectively, and how do you sustain that?

Matties: Being unique in the marketplace is a great challenge where we all say, "It's quality, price, delivery." All of the attributes became platitudes. When you add the digital speed, as you mentioned, and the capability of China to produce low-volume, high-mix, your challenges continue to grow. What's your strategy for overcoming all of that?

Stevenson: Sunstone is making a concerted effort not only to add that personal touch and develop those relationships with our current customers, but we want to expand those relationships within the companies that we already have relationships with. How do we attract the other engineers that are sitting around a particular customer that we already have? We're targeting a couple of industries that are really hot and growing, trying to get out in front of those people that are at the beginning of their design process or the entrepreneurial candidates. How did they get their product to market? How can Sunstone be involved from the beginning? To supply them a good quality product, give them the content that they need to help them succeed. How do we truly partner with them to get it from concept to reality?

Johnson: Are you still targeting those who are looking for smaller volumes?

Stevenson: We have seen a little bit of a shift of ordering; obviously, fewer prototype spins because of some of the technology that's out

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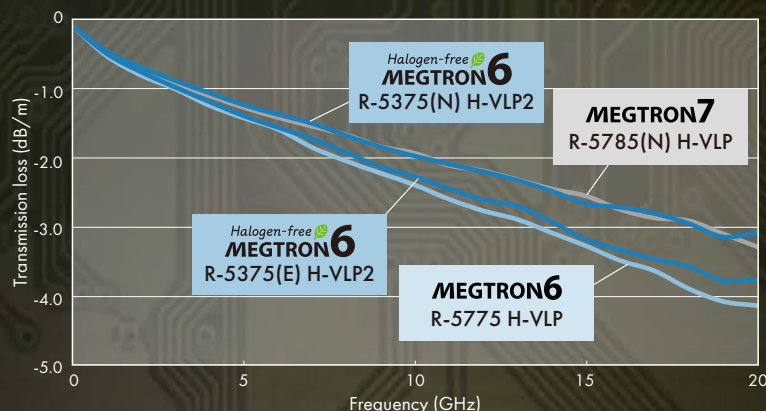
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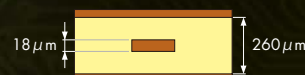
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there, and fewer boards because they're able to do their bench testing without having to do as many hacks and changes to it to try and save a buck or two here or there. But overall, we think the market is in a good place right now, and the electronics industry is set for some really good things going forward. Everything is becoming more and more electronic in one form or another, and most of those electronics all need some kind of circuit board. Maybe we have the opportunity to build fewer prototypes for a customer, but hopefully, they're doing more and more products and building volumes of prototypes rather than spins and spins on the same prototype.

Matties: It's interesting because I don't know if you caught our recent issue featuring the new GreenSource Fabrication facility in New Hampshire. They have probably invested \$40–50 million, and the strategy that they're adopting is to be an automated factory producing the highest technology that you can receive in the shortest amount of time. Essentially, it's a dark factory in that the only people there maintain equipment; they're not operators because all of the operations are through a digital strategy.

People are knocking on their doors to doing business with them. They don't have to sell, per se. They're taking orders and doing it because they've done something remarkably different. As VP Alex Stepinski said, a typical HDI board may take a couple of weeks with all the lamination, cycles, and so on. They're able to produce it in 48 hours. They've also streamlined the process of eliminating the steps that you would need if you let your board sit on racks and queues waiting for the next process for a day or two.

That strategy of leading technology is filling their sales pipeline and order desk. What they've done is created through process management a desire for people to do business with them. And when you talk about building the relationships and that sort of thing, truth be told, that's what many fabricators are saying: "We want to get there early. We want to collaborate, and we want to help." So, you're still competing in the same space with the

same language that everybody else is competing. Meanwhile, I look at GreenSource's digital strategy, and I see something entirely different.

Since Sunstone had such a strong presence on the internet, what sort of digital approach are you bringing into your factory, or do you see that as a strategy that you should explore?

Stevenson: Overall, we haven't really explored a digital manufacturing strategy at this point. As we upgrade and replace equipment, typically, we are going to some more of the cutting-edge digital equipment. That being said, we still have a lot of manual processes, such as the plating departments, etc. Sunstone is in a unique situation where part of our competitive advantage is our people. Our average length of service on the manufacturing floor is 12+ years. We have people that have been doing circuit boards for a long time. They know our business model, they live it and breathe it.

**We have people that have
been doing circuit boards
for a long time. They know
our business model, they
live it and breathe it.**

We don't have a lot of queue times either between our manual processes. We have a drumbeat on the floor where orders move from cam to drill to plate, and they just go through. We're able to do what we do very effectively in a short amount of time. Could we throw HDI in here and do that the same way? No, because that's not where we want to go at this point. However, we do want to instill that type of methodology to some of the fringe products, such as RF, and other critical processes rather than just the FR-4 product. We want to do what we do well on different types of materials and designs.



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Matties: You mentioned HDI. We were looking at Lee Ritchey. He's one of our authors of the design book as well and gave a keynote last year. He said, "If you're not doing HDI now, you're about to be doing HDI because this is where the industry is moving." But there's a strong argument as you're making for staying in the RF space because with 5G coming around, there's so much in the RF space and more than what people can even imagine right now. I think that's a good strategy one way or the other. The other thing GreenSource did that is appealing is they're a zero-waste facility. They did that out of necessity, but that has a selling strategy. We're also seeing other assemblers that are using the green strategy in their selling process. Do you think that's a factor with customers, and how would you address that?

Stevenson: At this point, I'm kind of up in the air. I think it is definitely a differentiator today. They're hitting some of the hot buttons from environmental and regulatory standpoints that haven't really been done before. The PCB industry has been known as a pollutant industry over the years from the heavy metals, acids, and everything else that goes into circuit board manufacturing. It's very chic right now. If they can sustain that and continue to use that as a differentiator, I think it's a great strategy. I don't know if pricing and overall customer impact are going to continue to fuel that in the long term. At the end of the day, it's going to come down to quality, price, and being on

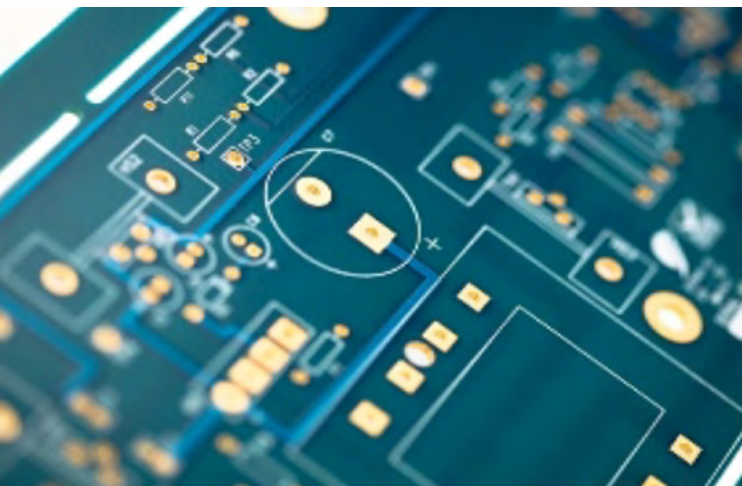
time. If they can do zero waste within those bounds, I think they will do great, but to me, it's a bit too early to tell.

Matties: As it turns out, what they discovered is, first, if they can't maintain it, there won't be a facility because New Hampshire doesn't allow circuit board facilities unless you're absolutely zero waste. Second, what they're reporting is that not only did zero waste reduce emissions, but it lowered their total operating cost substantially. So, it's giving them a higher profit margin and more latitude in pricing. The strategy actually lowers their total operating cost.

Stevenson: Mostly through eliminating a lot of the labor probably, right?

Matties: Well, the labor, but also the actual consumption of water; it's all recycled. They don't buy any copper because all of the etchant that they etch off of panels they use in their copper baths. They're using a lot of smart technology that while the end result is zero waste, the real benefit is that it lowers their total manufacturing cost and increases the quality of their product. It seems like this is a growing trend. I'll be visiting a company in China—Victory Technology—which just opened up a \$220 million facility that George Dudnikov is running. It's a fully automated HDI factory in China that's also zero waste. We're also seeing this in other places in China. They're having factories move out of cities within two years if they don't meet a zero-waste mandate, so I think that there's an advantage for people from cost and maybe a selling strategy.

Johnson: To pick up your point, Barry, part of the motivation has been governmental in a lot of cases. But also it seems that, as GreenSource is seeing, the customers are driving that. At the same time, they're asking about conflict minerals in the supply chain and counterfeit parts and all of those other issues knowing that they can point to their supply chain as being sustainable and green, which helps overall with their product.



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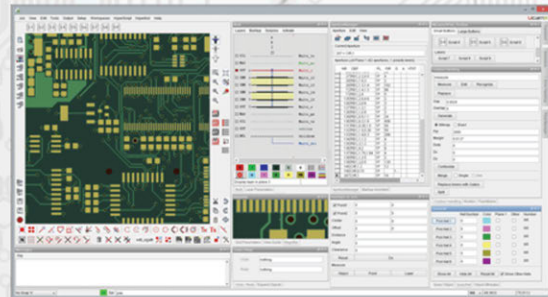
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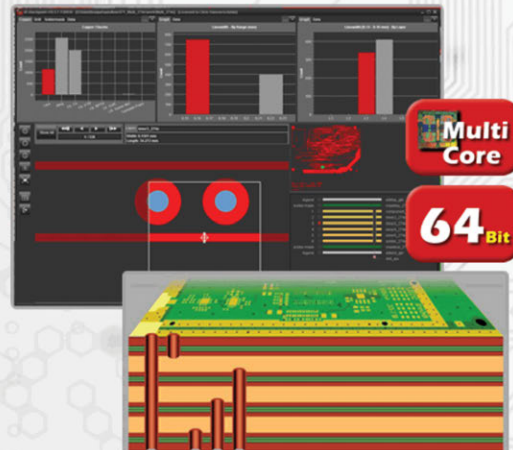
Software

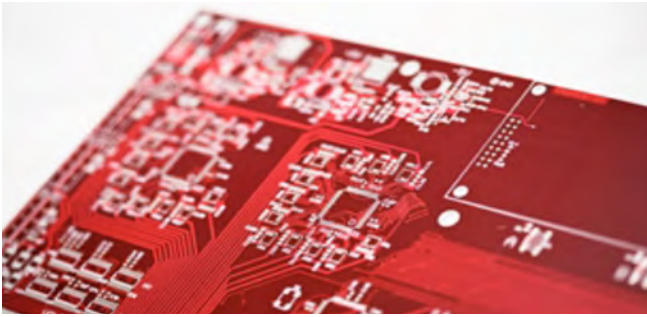
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Matties: Interesting trends, Matt. I will pay close attention as you re-engineer your services and strategies to see how that plays into lowering your cost and adding a strategic advantage because while it's something that you have to be committed to doing, I don't think it's something that is terribly complicated to achieve. It just has to be a decision and an action that a company takes. Now, we have multiple models in the marketplace showing how it's done.

Stevenson: Yes, I wonder about the ability to retrofit a lot of the factories that are already built as opposed to being able to build GreenSource as they did.

Matties: I had a conversation with Happy Holden, who I'm sure you know, but that's the exact question that was presented, and he said it's absolutely possible. There's plumbing segregation that needs to go on and repainting because what we've done is we've built islands in manufacturing. You have the plating department. If you go into another room, you have the imaging department. Then, you go to another room for solder mask, and it's not all connected because they're just islands. What we have to do is segregate the waste streams and deal with them, and a lot of it is point-source control. You deal with it at the point of generation rather than shooting it down a big pipe. It's absolutely achievable; it just comes down to that commitment. But again, we're talking to people and seeing motivation because it's green. But I agree with you, I think ultimately, that's a nice addition, but people still are driven by price in this competitive market. Pennies matter even still.

Stevenson: For sure.

Patty Goldman: You do a lot of quick-turn stuff and prototypes. What do you see happening with the printed boards like the Nano Dimension machine that's supposed to print circuit boards? Have you looked into that or do you see it as a threat?

Stevenson: At this point, we're keeping our eye on that technology. The chemist in me says, "Wow, that's really cool." From what I understand so far, the cost factor of those is very prohibitive for doing it unless there is a need that outdrives the cost (i.e., security of files and/or speed). But it's going to get better. They're going to become more mainstream, I'm sure of it. And they are going to be a competitor down the road in two, five, or 10 years. For me, it's too early to tell when that competition is going to be there for us as a mainstream product, but it's coming.

Matties: That's a great question, Patty. To add on to that, I did talk to Simon Fried, president of Nano Dimension USA, about service centers where a design service bureau would start offering rapid prototypes and/or a fabricator like yours, Matt.

Goldman: Sunstone is pretty rapid, but presumably these things are supposed to be extremely rapid.

Matties: Four hours.

Stevenson: Yes, one of the case studies I heard was a person needed a 10-layer board. He plugged it into the machine overnight, and it was done the next morning. With traditional methods with shipping and whatnot, you can't compete with that. Regarding materials and machine costs, it was probably a multi-thousand dollar cost for that one particular circuit board, and at that point, there isn't solder mask on top of it. So, there are some challenges as well as some additional processing that would need to happen outside of just getting a board with all the copper and dielectric layers there.

Matties: I'm not sure about the exact technology, but I don't think you need to solder mask the way they're printing these, but I'm not exactly sure. I think that was the brilliance of it.

Goldman: I was going to say the idea is, "Is there any hope for this little design to work? Let's see what happens when we basically throw it into one of these things," as opposed to a good finished product.

Matties: It probably depends on your need too. If you're just trying to get a board to test a rapid prototype, then it's going to be well suited. But if you need 50 boards for a product line, you'd probably go with a traditional approach through Sunstone.

Goldman: It wouldn't make any sense to do that for a good board.

Matties: I think you're right, Matt. It's something you must pay attention to in the coming years because it's only going to improve, just

like how we went from dot matrix printers to the incredible laser printers that we have now.

Stevenson: That is true.

Johnson: There's room for companies like Nano Dimension to start to whittle away at the quantity two or four orders.

Stevenson: And maybe their target market now is the defense contractors—the DARPA people who don't want their stuff getting outside of their walls, so they're able to build it in-house.

Matties: There's certainly a lot of that, and they were just approved by the Department of Defense (DoD), which was a big deal for them. Thank you for your time today, Matt.

Stevenson: It was fun. Thanks for the opportunity.

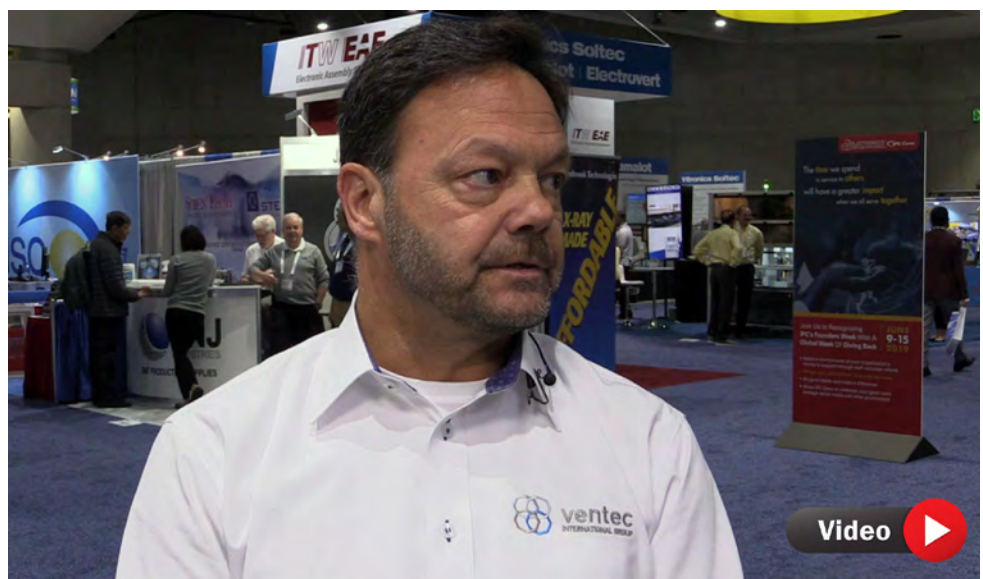
Johnson: Thanks so much. PCB007

Real Time with... IPC APEX EXPO 2019: Ventec Highlights Core Solutions for Thermal Management

Jack Pattie, president of Ventec International Group, speaks with I-Connect007 Guest Editor Kelly Dack about the many heat issues associated with circuit boards right now—whether in general applications, power applications, PCs—as everyone demands smaller, faster, and more powerful systems.

Pattie talks about how they are helping their customers address their thermal management issues, and his outlook for the year.

Click on the image to watch this interview.



ein Electronics Industry News and Market Highlights



Indian PCB Market to Reach \$5B by 2023 ►

The PCB market in India was worth US\$ 2.02 billion in 2017. PCBs are non-conductive, copper-laminated boards that help to connect electronic and electrical components without the use of wires.

North American PCB Sales and Orders Decreased in November ►

IPC—Association Connecting Electronics Industries—announced today the November 2018 findings from its North American PCB statistical program. Year-over-year sales and order growth turned negative in November, and the book-to-bill ratio declined to 1.01.

China Set to Impose Stricter Regulations on PCB Industry ►

China will implement a new set of strict regulations on the operations of the PCB industry on February 1, which may threaten the survival of small- to medium-size makers.

VR's Consumer Market Success Spurs Growth in Enterprise VR PoC Projects ►

The consumer virtual reality (VR) market continues to dominate in terms of both shipments and value chain revenue, and by 2023, the consumer VR hardware market will reach \$5 billion in revenues, according to a recent report by ABI Research.

Worldwide Spending on IoT to Reach \$745B in 2019 ►

Worldwide spending on the Internet of Things (IoT) is forecast to reach \$745 billion in 2019—an increase of 15.4% over the \$646 billion spent in 2018, according to a new update to the International Data Corporation (IDC) Worldwide Semiannual Internet of Things Spending Guide.

Single Axis Solar PV Tracker Market's Increased Adoption of Microgrids Drives Growth ►

The global single-axis solar PV tracker market research report by Technavio predicts the market to post a CAGR of close to 28% during the period 2019–2023. However, the growth momentum of the market is expected to decelerate due to a decline in the year-over-year growth.

Global 5G Equipment Market to Post 71% CAGR during 2019–2023 ►

The global 5G equipment market is expected to post a CAGR of close to 71% during the period 2019–2023, according to the latest market research report by Technavio.

Global PCB Market to Witness a CAGR of 4.2% during 2018–2024 ►

The global PCB market was valued at \$60.42 billion in 2017, and is expected to reach \$80.38 billion by 2024 at a CAGR of 4.2%.

Smartphone Assembly Volumes Down 4% in Q3 ►

Worldwide smartphone ODM/EMS assembly shipment volumes dropped 4.4% year over year during the third quarter of 2018 due to weakening channel demand.

Flash Memory Remains Primary Target for Capex Spending ►

Flash memory trailed the foundry segment in capex in 2016, but took an extra-large jump in 2017—growing 92% to \$27.6 billion—and increased another 16% to \$31.9 billion in 2018 as manufacturers expanded and upgraded their production lines for 3D NAND to meet growing demand.

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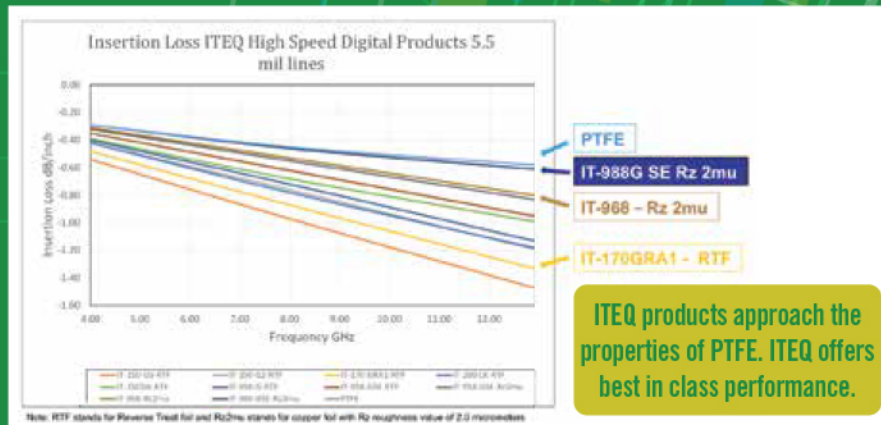
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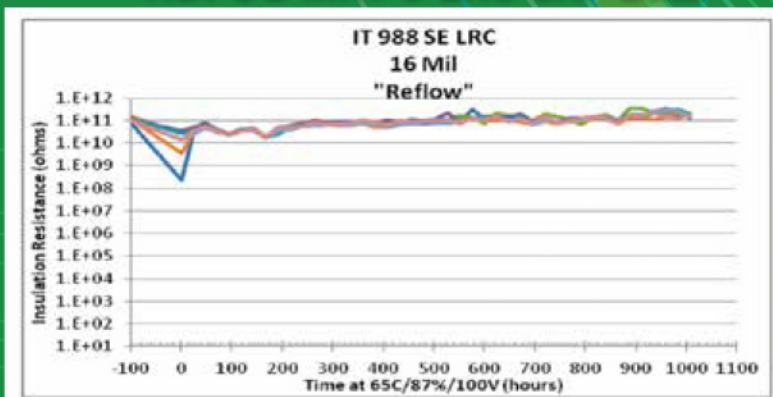
Sequential Lamination

7 Lamination cycle data

Lamination	DMA	DSC	TMA	T200 with CU	Solder Dip PCT: 1h @ 121°C	Td 2wt% / 5wt%
1	213	187 / 187	182	> 60	> 60	408 / 435
2	216	194 / 199	193	> 60	> 60	417 / 438
3	214	186 / 192	185	> 60	> 60	417 / 442
4	216	193 / 194	184	> 60	> 60	424 / 443
5	217	194 / 199	190	> 60	> 60	418 / 442
6	218	191 / 197	188	> 60	> 60	405 / 436
7	218	190 / 197	194	> 60	> 60	425 / 444

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HDPUG MRT-6 LRC CAF Data



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Moving in Microvias, Part 4

Trouble in Your Tank
by Michael Carano, RBP CHEMICAL TECHNOLOGY

In Part 3 of this column series, I discussed critical aspects of desmear technology related to the preparation of microvias before metalization. In this month's column, metalization of the via is presented. It is important to understand that getting the metalization process dialed in is the first step to ensuring long-term reliability. However, in general, just how reliable are microvias when compared to through-hole reliability?

Reliability

Extensive reliability testing was performed by IPC—Association Connecting Electronics Industries—and the Interconnection Technology Research Institute (ITRI) in the late 1990s about the reliability of microvias ^[1]. Other groups like the High-Density Packaging Users Group (HDPUG) and Jet Propulsion Laboratory (JPL) have also produced reports on the superior reliability of small-blind vias over through-hole vias ^[2].

Understanding why is quite simple! The via aspect ratio (AR, or depth-to-diameter ratio) is less than 1:1 compared to a through hole that has an aspect ratio of greater than 6:1 that goes as high as 20:1. This is a result of the thin materials and low Z-axis TCE materials used in HDI. Materials available for high-density interconnect (HDI) designs are numerous. Thus, these materials are covered by IPC-4104A and not IPC-4101B. In addition, industry consortia such as HDPUG have undertaken multiple studies on material performance as related to HDI.

There continue to be extensive studies on materials used for the fabrication of printed wiring boards. This includes the HDI market and technology segment of the supply chain. Therefore, thin HDI materials are suited for thermal heat transfer as covered in the IPC HDI design standards (IPC-2226).





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Lower Cost

In addition to the added reliability with microvias, an astute designer can construct a complex interconnect device in a way that lowers overall costs. In *The HDI Handbook* ^[3], which is available for free download, the authors go to great lengths to show how layer counts can be reduced using microvia and HDI technology. In the end, it is about wiring density. As semiconductor and packaging technology drive pin counts up, so goes the wiring density required to support those devices. Thus, one either must increase layer counts and reduce line widths and spaces along with higher AR through holes or redesign the board with microvias. Increasing layer counts, creating finer lines and spaces, and increasing overall cost becomes a significant show stopper.

**Increasing layer counts,
creating finer lines and spaces,
and increasing overall cost
becomes a significant
show stopper.**

For example, when designing classical PWBs, there is a wiring barrier created by the size of component lands, traces, and vias. If you look at a square inch or PCB real estate, there are only so many SMT land patterns, traces connected to the land, and vias connected to the trace that you can put in that one square inch before it is full. Depending on the SMT land size, this barrier is called the wiring density barrier. Understanding the barrier ramifications as well as the cost-density tradeoffs will help the designer (as well as the fabricator) in this endeavor.

With through holes, there is a reduction of routing channels, which necessitates an increase in layer counts to support wiring densities required for today's semiconductor chip

technology. If we create more routing channels on the inner layers by placing the blind vias on the surface, we connect more traces per layer, eliminate the through holes on the surface, and increase connections. Hence, there is a significant opportunity here to enhance long-term reliability and reduce form factor and overall cost through iterative design using microvia technology. Opportunities to reduce layer counts, dielectric thicknesses, and routing density are among the many benefits of going to HDI type structures.

The Importance of Via Formation and Metalization

If the blind vias are properly drilled and plated, they will perform with many times the thermal cycle life of typical through holes, but this is not a trivial statement. I discussed many of these issues in my last column. Via shape, cleanliness of the target pad, consistency in the performance of the metalization process, and the electroplated copper uniformity all add up to the reliability of the vias. However, these process steps go hand in hand with the plating processes. One can't expect to enjoy success without the other steps fully optimized.

After the desmear process, the next task is to ensure a continuous, conductive, and void-free deposit on the via walls and capture pad. Today, several processes can be utilized to render vias conductive including:

- Conventional electroless copper
- Palladium-based direct metallization
- Graphite
- Carbon black
- Conductive polymer

These metallization processes (collectively known as "making holes conductive" or MHC) are well developed for both plated through-hole and blind via metallization. Direct metalization is applicable to horizontal processing, although vertical systems can also be used. These processes typically involve the deposition of a conductive coating (e.g., palladium, conductive polymer, graphite, carbon black, etc.). This step is then followed by electrolyt-



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April 2

King of Prussia, PA

Process and Acceptability Requirements: Utilizing J-STD-001 and IPC-A-610 Together

May 7

Milwaukee, WI (in conjunction with Electrical Wire Processing Technology Expo)

The Evolution of IPC's Cable & Harness Documents — IPC-D-620, IPC/WHMA-A-620 and IPC-HDBK-620

September 10

Huntsville, AL

Process and Acceptability Requirements: Utilizing J-STD-001 and IPC-A-610 Together

November 12

Raleigh, NC (in conjunction with PCB Carolina)

Topic Coming Soon

December 3

Anaheim, CA

Process and Acceptability Requirements: Utilizing J-STD-001 and IPC-A-610 Together

MEETINGS

March 5–7

Raytheon in Huntsville, Alabama

PERM Meeting

May 21

Washington, D.C.

IPC IMPACT Washington, D.C.

June 15–20

Raleigh, NC

IPC SummerCom: IPC Committee Meetings

CONFERENCES

February 19–22

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2019 WHMA 26th Annual Wire Harness Conference

May 14–16

Baltimore (Hanover), MD

IPC High Reliability Forum

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June 5

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September

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IPC E-Textiles 2019

EUROPE

April 1–2

Ingolstadt, Germany

IPC Tech Ed – Cleaning Forum (in partnership with Zestron)

May 6–7

Nuremberg, Germany

IPC Automotive Electronics High Reliability Forum

September 23–24

Prague, Czech Republic

IPC Wire Innovation Conference

September 26

Paris, France

IPC Transportation Electronics Reliability Council Annual Meeting (ITERC)

November

Brussels, Belgium

IPC IMPACT Europe

November 11–12

Munich, Germany

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ic copper. Thus, the actual electroless copper step is eliminated.

These processes have been presented and thoroughly discussed elsewhere ^[3]. While direct metalization processes may reach certain limitations for use with very high AR rigid circuit boards, these processes are very efficient and effective for HDI. Direct metalization systems primarily function by coating the substrate as opposed to a true chemical reaction such as in electroless copper. Contrarians of direct metalization point to sheet resistance measurements of the direct metalization coatings versus electroless copper. Yet, while the DM films are somewhat slightly more resistive than conventional electroless copper, these processes are well established in the industry.

For the fabricator, there are many options to enhance the fabrication process for HDI. I will provide more insight into this in a future column. **PCB007**

References

1. Happy Holden. "How To Get Started In HDI With Microvias," November 2003.
2. [HDPUG](#).
3. Happy Holden, et al. *The HDI Handbook*, I-Connect007, 2009.



Michael Carano is VP of technology and business development for RBP Chemical Technology. To read past columns or contact Carano, [click here](#).

Materials Chemists Tap Body Heat to Power Smart Garments

Trisha Andrew, materials chemist at the University of Massachusetts Amherst, and Linden Allison, her Ph.D. student, have developed a fabric that can harvest body heat to power small wearable microelectronics such as activity trackers.

Writing in *Advanced Materials Technologies*, Andrew and Allison explain that in theory, body heat can produce power by taking advantage of the difference between

body temperature and ambient cooler air—a thermoelectric effect. Materials with high electrical conductivity and low thermal conductivity can move electrical charge from a warm region toward a cooler one in this way.

"What we have developed is a way to inexpensively vapor-print biocompatible, flexible, and lightweight polymer films made of everyday, abundant materials onto cotton fabrics that have high enough thermoelectric properties to yield fairly high thermal voltage—enough to power a small device," says Andrew.

The researchers took advantage of the naturally low-heat transport properties of wool and cotton to create thermoelectric garments that can maintain a temperature gradient across an electronic device known as a thermopile, which converts heat to electrical energy even over long periods of continuous wear. This is a practical consideration to ensure that the conductive material is going to be electrically, mechanically, and thermally stable over time.

The researchers believe this work will be interesting for device engineers who seek to explore new energy sources for wearable electronics and designers interested in creating smart garments.

The research was supported by the National Science Foundation and by the David and Lucille Packard Foundation.

(Source: University of Massachusetts Amherst)



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TOP 10

Editor Picks from PCB007

1 Better to Light a Candle: Chapter One—Prepping the Next Generation ▶

There has been a considerable amount of (electronic) ink and words shared in our industry bemoaning the graying-out of our industry and the growing shortage of skilled people at all levels. (See the May 2017 *PCB007 Magazine* column “Help Wanted—and How!” for just one example). As is usually the case, though, when all is said and done, more has been said than done.



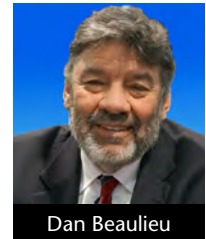
Marc Carter

2 Itronics Starts R&D to Recover Tin and Copper from Its “Breakthrough Technology” PCB Refining Pilot Plant ▶

Itronics Inc., a “creative green technology company” that produces GOLD’n GRO fertilizers and silver products, has started research and development to recover tin and copper from the silver bullion being produced by its “breakthrough technology” PCB refining pilot plant.

3 It’s Only Common Sense: A Word From the Future—CES 2019 ▶

If only we could invent something that would stop hunger and poverty, give us world peace, or stop us from being so angry with each other all the time—something we desperately need and could use right now. That would be something, wouldn’t it? It’s only common sense.



Dan Beaulieu

4 CES 2019: More Show Floor Favorites ▶

In my final piece covering CES 2019, I will review more automotive technology, updates on 3D printing, and some trending devices such as smartwatches and new computer components for those that either need or just want to have extremely powerful and impressive-looking computers.



Dan Feinberg

5 ESI's Chris Ryder: There's More to Choosing a Laser Than You Think ▶

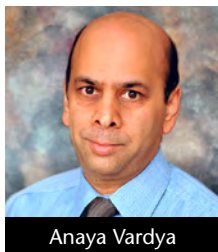
At the recent HKPCA show, I sat down with ESI's Chris Ryder, director of product management—HDI—to discuss considerations for choosing a new laser system, and how ESI uses its decades of flex and rigid-flex drilling experience to help guide customers in their decision-making process.



Chris Ryder

6 Standard of Excellence: Keep Your PCB Supplier Sharp ▶

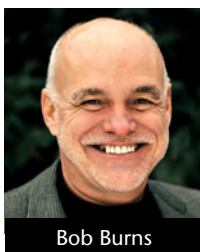
The best way to create a solid and productive partnership with your PCB supplier—and all of your suppliers for that matter—is to keep an open line of communication with them. No matter what kind of relationship you currently have with your suppliers, you can never communicate enough. Let them know at all times what you need from them.



Anaya Vardya

7 Flex Time: Pointers for Your First Rigid-Flex Design ▶

If you are new to rigid-flex designs—or have never done a rigid-flex PWB layout—you might wonder how it is similar to and different from hard-board design. In this column, I'll address critical items you need to know to successfully create a stable and robust rigid-flex design.



Bob Burns

8 Agfa on Revolutionary Inkjet Solder Mask Applications ▶

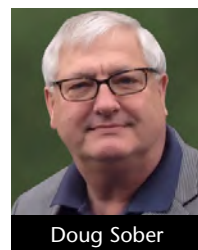
Does inkjet solder mask have the potential for volume production? Mariana Van Dam, global sales manager for PCB imaging solutions, and Dr. Frank Louwet, business unit manager for advanced coatings and chemicals, discuss Agfa's latest developments, plus some novel applications for inkjet etch and plating resists.



Pete Starkey

9 Mr. Laminate Tells All: Good Morning, Vietnam! ▶

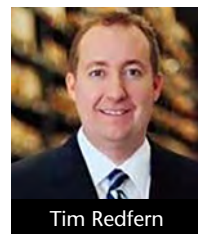
Many electronics-based OEMs and their supply chains are looking for China alternatives in the current economic and political landscape. Of all the remaining locations possible in Southeast Asia, Vietnam is coming to the forefront as a viable choice for successful export manufacturing. Every day, we see evidence of large OEMs shifting their focus to Vietnam.



Doug Sober

10 Insulectro Names Tim Redfern President of Printed Electronics Division ▶

Insulectro has named veteran industry exec Tim Redfern to helm its new printed electronics division. Redfern is managing partner of Redfern Partners and a past president and CEO of Insulectro.



Tim Redfern

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Barb Hockaday at barb@iconnect007.com or +1.916.608.0660 (-7 GMT)

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GOOD FOR THE INDUSTRY



Career Opportunities



Technical Service Rep Waterbury, CT

Do you have what it takes? MacDermid Alpha Electronics Solutions is a leading supplier of specialty chemicals, providing application-specific solutions and unsurpassed technical support.

The position of the Technical Service Rep will be responsible for day-to-day support for fabricators using MacDermid Alpha's chemical products. The position requires a proactive self-starter that can work closely and independently with customers, the sales group and management to ensure that customer expectations and company interests are served.

- Have a thorough understanding of the overall PCB business, and specifics in wet processing areas.
- Prepare action plans for identification of root cause of customer process issues.
- Provide feedback to management regarding performance.
- Create and conduct customer technical presentations.
- Develop technical strategy for customers.
- Possess the ability to calm difficult situations with customers, initiate a step-by-step plan, and involve other technical help quickly to find resolution.

Hiring Profile

- Bachelor's Degree or 5-7 years' job related experience.
- Strong understanding of chemistry and chemical interaction within PCB manufacturing.
- Excellent written and oral communication skills.
- Strong track record of navigating technically through complex organizations.
- Extensive experience in all aspects of Customer Relationship Management.
- Willingness to travel.

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Service Engineer USA

Limata GmbH, a provider of direct imaging system solutions for the global PCB manufacturing industry and adjacent markets, is looking for qualified candidates to fulfill the role of service engineer in the United States.

Duties:

- Assemble, install, service, and maintain our products
- Inspect the unit towards operating conditions
- Solve technical problems on-site
- Resolve problems with our customers and technical department
- Ability to support our customers in all technical questions

Qualifications:

- Proven experience in microelectronics is preferred
- Willingness to travel
- Strong verbal and written communication skills

To be part of our team, please click below and send your resume to karriere@limata.de.

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Career Opportunities



SMT Operator Huntingdon Valley, PA

Manncorp, a leader in the electronics assembly industry, is looking for a technician to operate our new in-house SMT LED assembly lines.

Duties and Responsibilities:

- Set up and operate automated SMT assembly equipment
- Prepare component kits for manufacturing
- Perform visual inspection of SMT assembly
- Participate in directing the expansion and further development of our SMT capabilities

Requirements and Qualifications:

- Prior experience with SMT equipment, or equivalent technical degree preferred
- Basic computer knowledge
- Proven strong mechanical and electrical troubleshooting skills
- Experience programming machinery or demonstrated willingness to learn
- Positive self-starter attitude with a good work ethic
- Ability to work with minimal supervision

We Offer:

- Paid training period
- Health and dental insurance
- Retirement fund matching
- Continuing training

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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



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Technical Support Engineer, Germany

We are looking for a technical support engineer to join our team at our German facility in Kirchheimbolanden. The successful candidate will assist potential and current customers in appreciating the benefits of using and optimizing the use of Ventec materials in their PCB manufacturing processes, enhance customer loyalty and satisfaction, spread the use of Ventec materials, and grow sales. The technical support engineer will provide a two-way channel of technical communication between Ventec's production facilities and U.K./European customers.

Skills and abilities required for the role:

- Scientific and technical educational background
- Experience in the PCB industry in engineering and/or manufacturing
- Strong communications skills (German and English) with the ability to write full technical reports for group or customer distribution
- Ability to work in an organized, proactive, and enthusiastic way
- Ability to work well both in a team as well as an individual
- Good user knowledge of common Microsoft Office programs
- A full driving license is essential
- Willingness to travel regularly throughout Europe and occasionally to Asia

We offer:

- Excellent salary and benefits commensurate with experience

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

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

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ventec
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Technical Sales Engineer, Germany

Want to advance your career by joining our globally successful and growing world-class CCL manufacturing company and help drive that success? Tasked with driving sales in the German-speaking markets, you will be a key member of the technical sales team. Your focus will be on Ventec's core market segments: military/aerospace, automotive, and medical offering a full range of high-reliability materials including polyimide, IMS, and thermal management products.

Skills and abilities required for the role:

- Seven to 10 years of experience in the PCB industry in engineering and/or manufacturing
- Strong communications skills (German and English)
- Project management experience
- Detail-oriented approach to tasks
- Ability to manage tasks and set goals independently as well as part of a team
- Knowledge of Microsoft Office products
- A full driving license is essential.
- Willingness to travel regularly throughout Europe and occasionally to Asia

We offer:

- Excellent salary and benefits commensurate with experience

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

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

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Career Opportunities



Field Service Engineer West Coast

Pluritec North America, Ltd., An innovative leader in drilling, routing and Automated Inspection in the Printed Circuit Board industry, is seeking a full-time Field Service Engineer, located on the West Coast.

This individual will support service for North America in Equipment installation, training, maintenance and repair. Candidate must be able to handle trouble shooting electronic and mechanical issues as well customer applications in the field. A technical degree is preferred, along with strong verbal and written communication skills. The position requires the ability to travel 2-3 weeks per month.

Please send your resume to:
Carolina.zeppieri@pluritec.org

[apply now](#)



Sales Personnel, Japan

The Gardien Group is looking to expand the sales team in Tokyo, Japan, and seeking highly motivated team players with a positive attitude. Prior experience in the PCB industry is an advantage but not necessary for the right candidate.

The role involves working closely with the customer to identify their needs and deliver the right solution. The candidate should be able to offer a high level of customer satisfaction to ensure ongoing sales.

Training will be provided along with a competitive benefits package, excellent growth opportunities, and periodic bonuses.

Interested candidates, please contact us at careers.jp@gardien.com with your resume.

Kindly note only shortlisted candidates will be notified.

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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.

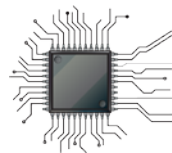
Compensation:

- 7% commission

Contact Mike Fariba for
more information.

mfariba@uscircuit.com

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Global

Multiple Positions Available

Want to work for a fast-growing company? MivaTek Global may be the place for your next career move. 2018 has brought significant growth, increasing sales and revenue. And, we are just getting started! To support the current customer base and fuel further expansion, we are looking for bright and talented people who are energized by hard work in a supportive and flexible environment.

Open Positions:

- Technical Service Technicians
- Regional Sales Representatives
- Regional Leader for Asia Sales and Support

Proven experience in either PCB or Micro-electronics and willingness to travel required for all positions.

More About Us

MivaTek Global is a distributor of manufacturing equipment with an emphasis of Miva Technologies' Direct Imager, Mask Writer, Flatbed Photo-plotter imaging systems and Mach3 Labs X-Ray Drills. We currently have 45 installations in the Americas. Expansion into Asia during 2018 has led to machine installations in China, Singapore, Korea, and India.

To be part of our team, send your resume to n.hogan@kupertek.com for consideration of current and future opportunities.

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Career Opportunities



We Are Recruiting!

A fantastic opportunity has arisen within Electrolube, a progressive global electrochemicals manufacturer. This prestigious new role is for a sales development manager with a strong technical sales background (electro-chemicals industry desirable) and great commercial awareness. The key focus of this role is to increase profitable sales of the Electrolube brand within the Midwest area of the United States; this is to be achieved via a strategic program of major account development and progression of new accounts/projects. Monitoring of competitor activity and recognition of new opportunities are also integral to this challenging role. Full product training to be provided.

The successful candidate will benefit from a generous package and report directly to the U.S. general manager.

Applicants should apply with their CV to
melanie.latham@hkw.co.uk
(agencies welcome)

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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.

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Career Opportunities



A Siemens Business

PCB Manufacturing, Marketing Engineer

Use your knowledge of PCB assembly and process engineering to promote Mentor's Valor digital manufacturing solutions via industry articles, industry events, blogs, and relevant social networking sites. The Valor division is seeking a seasoned professional who has operated within the PCB manufacturing industry to be a leading voice in advocating our solutions through a variety of marketing platforms including digital, media, trade show, conferences, and forums.

The successful candidate is expected to have solid experience within the PCB assembly industry and the ability to represent the Valor solutions with authority and credibility. A solid background in PCB Process Engineering or Quality management to leverage in day-to-day activities is preferred. The candidate should be a good "storyteller" who can develop relatable content in an interesting and compelling manner, and who is comfortable in presenting in public as well as engaging in on-line forums; should have solid experience with professional social platforms such as LinkedIn.

Success will be measured quantitatively in terms of number of interactions, increase in digital engagements, measurement of sentiment, article placements, presentations delivered. Qualitatively, success will be measured by feedback from colleagues and relevant industry players.

This is an excellent opportunity for an industry professional who has a passion for marketing and public presentation.

Location flexible: Israel, UK or US

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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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Events Calendar

SMTA Pan Pacific Microelectronics Symposium ▶

February 11–14, 2019
Kauai, Hawaii, U.S.

EIPC 2019 Winter Conference ▶

February 14–15, 2019
Milan, Italy

China International PCB & Assembly Show (CPCA Show 2019) ▶

March 19–21, 2019
Shanghai, China

MicroTech 2019 ▶

April 4, 2019
Cambridge, U.K.

Medical Electronics Symposium 2019 ▶

May 21–22, 2019
Elyria, Ohio, U.S.

PCB Pavilion @ LCD EXPO Thailand ▶

June 27–29, 2019
Bangkok, Thailand

Additional Event Calendars



Coming in March to *PCB007 Magazine*:

SMART FACTORIES

Across the globe electronics manufacturers are retooling to Industry 4.0 smart factories. We explore some of the reasons for the switch. And is it right for you?

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