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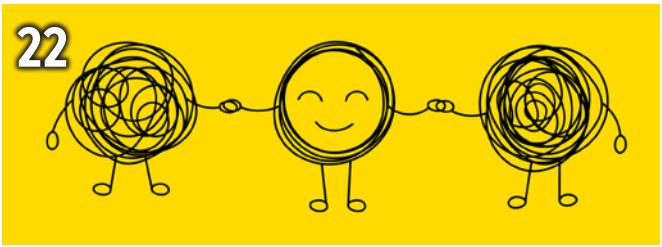
A Culture of Thriving

One cannot simply command thriving; it must be nurtured, developed, and encouraged. In this issue, we explore strategies to improve your working relationship model—both internally and externally—so you can grow your business in the process and create a culture of thriving.



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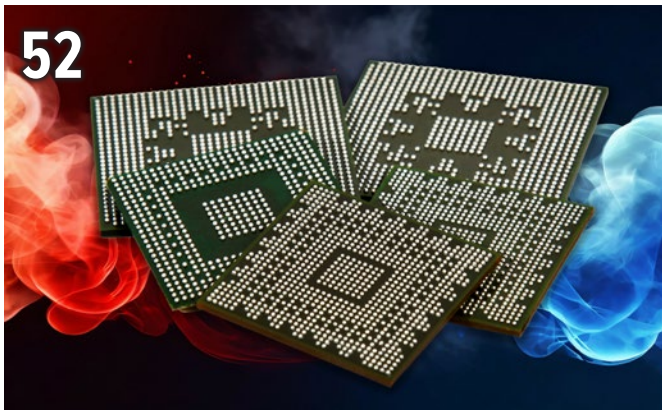

Thriving

Nolan's Notes

by Nolan Johnson, I-CONNECT007

Think back to a time in your life when you really felt like you were thriving. What did that feel like? What actions were you taking? How did you get there? What does it mean to thrive? While it is measurable in many ways, thriving is personal and somewhat intangible. It changes meaning from one person to the next. At its core, to thrive is ephemeral, rooted in an organic ideal. All living things, from plants and animals to ecosystems and people, have the ability to thrive.

What creates an environment where something can thrive? You can't simply wake up one morning and thrive. It is a state of being that must be nurtured, developed, and encouraged. It is a process.

Years ago, we lived in a home with a large yard filled with maple, locust, and fruit trees. I hired a tree trimmer to help some mature but struggling trees, including those that weren't producing much fruit. As he shed large limbs from the maple trees, the tree trimmer talked to me about how I could help my fruit trees to thrive.

"You have to think like the tree," he said. "What does it need?" He explained that each branch needed space for adequate sunlight and airflow. You need to prune out the diseased and unnecessary branches. Give it some extra nutrients, then continue to take care of it. It's not a one-and-done situation. With foresight and care, the tree will flourish. But remember, you are working within the constraints brought on by the tree itself. The arborist exerts his will on what the tree will become, but it also has its own restraints.

My tree trimmer had some interesting advice: "Trim the tree enough that you could toss a cat up through the center of it." With that visual in mind, I took to trimming the fruit

trees myself. I opened up the spaces, allowing for more sunlight, airflow (and a proverbial cat), and it worked. Our harvest of apples, pears, and plums that fall was much improved.

In business, we must create both an environment and a culture of thriving. From organizational charts to efficient use of space on the factory floor, much is within our control. Just as with my fruit trees, a thriving business is one in which there is room to breathe.

To demonstrate this concept, we reached out to experts around the world who offer solid leadership strategies for taking your business from surviving to thriving.

Mark Wolfe is an EMS consultant who introduces several key concepts that will immediately impact how you run your business. A thriving business focuses on open and honest communication, long-term perspectives, and a commitment to success both internally and externally. Implementing any one of his ideas will put you on a path to thrive.

Next, we contacted Tim McLean at TXM Solutions. He shares his Lean/5S experiences optimizing manufacturing companies and reminds us not to overcomplicate the process. TXM has extensive experience in a wide range of manufacturing sectors, much of which is directly applicable to circuit assembly.

Audrey McGuckin, CEO of the McGuckin Group, an agency focused on talent and leadership development, takes an even wider and more personal approach. "On every call with senior leaders, I hear the same thing: Their organizations are facing the cumulative fatigue of constant disruptions," she states. To move your team into a culture of thriving, Audrey suggests some time with your own personal "life map," and offers several ways to cultivate empathy in the workplace. This is really interesting reading.

Dr. John W. Mitchell, president and CEO of IPC, also shares his thoughts on workforce. "If I could pick just one thing that would make the biggest difference for your company and your individual success, it would be to surround yourself with people who are better than you are," he writes. John makes a good point. To thrive, you need a strong team, and that's something completely within your control.

Columnist Tom Yang, CEO of CEE PCB, is thriving because he's willing to step back and look at the bigger picture. He's strengthening relationships between the U.S. and China because he understands how we got to where we are and where we can go. Finally, SMTA's Mike Konrad suggests that fostering customer loyalty and consistently delivering superior products or services are paramount to long-term success. He offers effective strategies to not only keep customers loyal but continuously improve the quality of products and services.

This month we also include a paper originally published at IPC APEX EXPO 2024. Thriving, after all, is not restricted to big-picture stuff; it's in the details as well. In this paper, the research team at Jet Propulsion Laboratory recognized the current trends toward smaller, lighter, and denser, including system-in-package (SiP) and 2.5D/3D stacked packaging, added complexity and challenges. The authors note that a recent guideline on BGA and die-size BGA (DSBGA) was released for high-reliability applications with consideration of more extreme environmental requirements (such as use in space), which contains significant thermal cycle (TC) test data in the range of -55°C and +125°C, or lower TC ranges. This paper examines the reliability of various packages under those conditions.

Each piece in this issue offers actionable insights that will have an immediate impact on your personal and business life. Go forward and thrive, my friends. **SMT007**

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

Moving from Surviving to Thriving

Feature Article by Mark Wolfe
WOLFE CONSULTING

A few months ago, I shared some thoughts regarding the implications of the survival mode that most of us have lived in, at least for the past several years, within the electronics supply chain. In this article, I would like to share some additional thoughts about how companies can move away from merely surviving and work toward thriving across their supply chain. At a high level, here is what I believe the foundation of thriving looks like:

It is centered around open, honest, and transparent communication.

- All parties should work to understand the other's perspectives first.
- You should always try to assume that intentions are good even when it doesn't feel that way.
- Bad news is shared just as quickly as good news in both directions.
- When suppliers don't "win" (short-term opportunities), help them understand why not.

It should also involve long-term perspectives.

- When mistakes happen, work to focus on "what happened?" not "who did it?"
- Try to learn from mistakes and determine how to eliminate them in the longer term.
- Commit energy to long-term strategic conversations with your key suppliers.

Commit to and trust that all parties want everyone to win (over the long term).

- If you are looking up contract language when you have issues, then you are failing.
- Have the "what's fair" conversation whether a contract dictates otherwise or not.

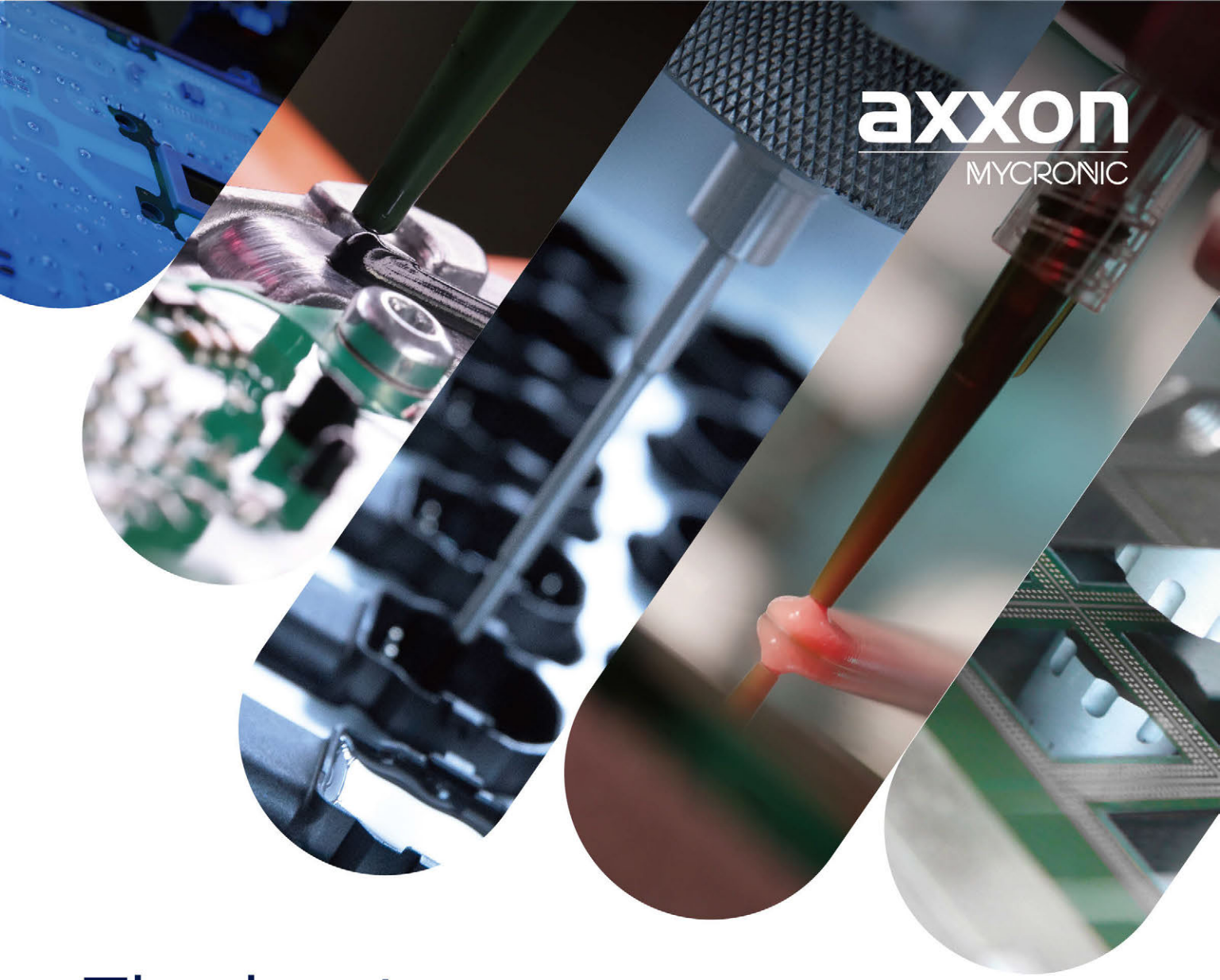

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Figure 1: A model for telling your story.

Philosophically, this works, but how do you really achieve any of it? Figure 1 shows the model I've developed over my years in the industry.

Thriving in Real Life

There is no one practice that ensures a thriving relationship and continuous supply of parts, and even all of them together may not get you where you need to be. Nevertheless, I don't think you can thrive in the absence of these behaviors.

When I initially moved into supply management and started applying many of these practices, I used to tell my suppliers that my goal was to gain an unfair share of their attention, support, and parts. Eventually I quit using the word "unfair" in my supplier communications. There is nothing "unfair" here. This is about differentiating yourselves from other customer choices your supply base often makes and engaging them in your mutual success.

Set High Expectations

A true thriving environment does place more pressure on both parties to perform. Setting expectations of being a preferred customer is appropriate. I was pleased when a supplier would describe me as tough but fair.

Set high standards for your suppliers and make sure you tell them what they are. I will talk later about the importance of making sure your actions demonstrate those high standards. At the same time, if you don't want to be treated like every other customer, then set high expectations of yourself as well.

Be warned that high expectations may drive some unintended short-term consequences. I recall a few trips to poor performing suppliers early in my supply management days that did not result in the outcomes I had hoped for. Instead of seeing marked improvement in performance after a visit, we received substantial price increases instead. The suppliers gave up and decided to harvest the business as opposed to working together to make improvements. I was actually very pleased that we had learned it was time to move on very quickly even as my team sometimes threatened to ban me from visiting a few key suppliers as a result. I never lowered them but admittedly learned to be a bit gentler with expectations over the years.

Invest in Building Relationships

Relationships still matter. Despite all the tools and technology of today, you are still dealing with people and, ultimately, they are

the ones who will often be making the decisions that most impact you.

Invest in relationships when times are good. You want to create "relationship capital" in reserve for a later time. If you only try to build relationships when you are having issues it won't work. Visit your suppliers at their facility. See their work environment. Learn about your supplier. Then, use that relationship capital carefully. Don't take advantage of those relationships just because you can. Draw on them when you really need them.

If you view relationship building a one-time event, you will likely fall short of the trust necessary to thrive. Trust is earned, not granted, and takes consistent words and actions by both parties. I am not suggesting it is blind trust; I have certainly always reserved the right to "trust but verify." Bottom line: It is about people getting to know each other and demonstrating they care about the success of both companies and the people who work for them.

> **If you view relationship building a one-time event, you will likely fall short of the trust necessary to thrive.**

Develop Design-level Sourcing Strategies

Too many companies allow sourcing strategies to happen after the design decisions have been made and they effectively become separate activities. They should not be separated. It is in everyone's interests, including suppliers, to ensure supply chain and design are aligned before key design components are ever decided.

Instead of allowing design decisions to spread across whichever parts look best from a web search, work with the designers to establish a core set of manufacturers who can meet your product needs and perform to your product lifecycle expectations in terms of cost, delivery, flexibility, or whatever combinations matter most to you.

This means you will need to agree on a small set of manufacturers that are most strategic and break the ties with others who do not move you towards those strategies. They need to meet design and product needs and perform at a high level in their day-to-day execution. You may still need to use many other manufacturers to meet unique design needs, but the benefits of leveraging a small number of strategic manufacturers will far outweigh the further dilution of the balance.

Share Your Real Demand With Long-term Commitments

Talk with your supply base about the best ways to protect your long-term supply while balancing the risk of committing to parts you may not need. Find that balance together. A good supplier knows it is not in their best interest long term to oblige you to parts you do not need, so give them the chance to help.

If you are in a constrained environment and you know you have recurring demands, don't be afraid to make multi-year commitments or enable suppliers to work directly from your forecasts. Recognize, however, that virtually all customer ERP systems are filled with negative numbers during allocation periods and talking about how negative your inventory balance is will be useless as a differentiator.

Instead, change the conversation to be about how end customers are affected. If you have a certain daily quantity that you need in order to keep a customer line running, then give the supply base that number and work to build the trust that you are not asking for any more parts than you need to satisfy your customers. Suppliers want to sell parts where they have the greatest impact and don't want the risk of you trying to return them because you were driving excess.

Create and Maintain a Level Playing Field

You should never "give" any business to any supplier, ever. I often had suppliers ask why I didn't "give" them a piece of business they quoted. That just isn't the way it should work. Your job is to create and maintain a level playing field where the best suppliers have a consistent chance to win new business.

To communicate that the field is level, you must make your expectations clear. If you care most about initial cost, lowest NRE, long-term cost reduction, total cost, life cycle, etc., then tell them. Give the supply base the opportunity to earn your business based on what matters most to you. There is no good reason to make them guess.

But make absolutely sure your message as to what matters most is demonstrated by your actual actions. Here's an example. I am a believer in it.

> "I am a believer in "best price first."

If my business matters, tell me the lowest price you can provide from the beginning, and we will award business accordingly. Despite my position on this, I initially received many updated offers from suppliers after they were informed that they had lost out on an award. In some cases, the updated offer was more attractive than the awarded level. Despite the temptations to realize these short-term benefits, by still saying "no" the behaviors changed over time as they saw the actions match the words. The initial offers from suppliers ultimately evolved into "best price first" because the actions and words aligned.

Truly Reward the Best Performers

Many of you are likely involved in some sort of supplier measurement program. Make sure that your measurements are aligned with what you are telling suppliers.

When I moved into a supply management leadership role, I inherited a very robust supplier measurement program. There were four levels of performance with very clear expectations set for each level. The trouble was the majority of the spend was with the lowest two categories with some of them having been in a self-explanatory "conditional" category for many consecutive years.

Why was this? While we talked about quality, technical support, cost reduction, responsiveness, and many other attributes that we said were important, the order still went to the lowest purchase order price. We said one thing and did something different, and the supply base knew it. As to actual supplier performance, we got what we deserved: It wasn't good.

How did it change? The lowest PO price stopped winning business automatically. The cost of non-conformance in all areas was factored into decisions. Ultimately, over 90% of the spend was shifted into the top two categories of performance. Just as importantly, those top categories became more aggressive about pricing because they were confident that performance mattered in the long term, and their business would grow as a result. Bottom line: I believe that you can really have both the lowest cost (not just "total cost" but even PO price) and the best performance at the same time if you are committed to achieve it with a long-term perspective.

Don't Jump Around Just Because You Can

As the customer, you can always rationalize that you are "right" but the reality is that we are often wrong, or at least less than fully informed. Suppliers, of course, are also often wrong. We both are.

With that understanding, when things go wrong, work toward a mindset that concentrates on "what happened?" not on "who did it?" This is an example of approaching situations with an abundance attitude as opposed


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to a scarcity attitude. Don't threaten to move business if you don't get what you want; any good supplier already knows that is your right. A good supplier will stick with you a lot longer and expend a lot more energy solving problems if they see that you are of a mindset to start with solving problems together first.

Tell Your Story

Last but certainly not least, tell your story. We have already talked about how suppliers often have as much choice, especially in the current market, as customers do, regarding who they do or do not supply. Or, more accurately in times of allocation, who they supply first.

If you are "big," don't just assume that is good enough all on its own. Help your suppliers understand that you are committed to the long term. Help them understand why you are going to grow. Help them understand that their extraordinary performance will be rewarded and allow you both to grow together. Think about it as if you are talking with a potential investor in your company; tell them why their money will grow more with you than with other choices. In a sense, that is exactly how they will look at you: as an investment. Especially when supply is constrained, they will be trying to decide which customers will generate the largest amount of margin for their companies over the long term. Whether they admit it or not, that's their job. **SMT007**

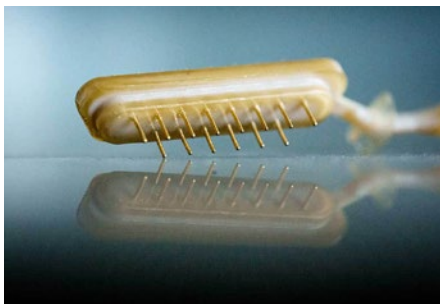
Mark Wolfe is principal of Wolfe Consulting and an executive EMS advisor for IPC.

In-House Advanced Manufacturing Techniques Help Meet Mission Needs

Sandia is transforming how it develops custom electronic connectors for weapons systems. The Rapid Development Connectors program is a five-year NNSA-funded project to build a team and lab space capable of fabricating and delivering functional connectors in less than four weeks.

The program's overall goal is to quickly provide production-representative development hardware to customers while working in parallel with commercial suppliers. Currently, obtaining custom hardware from external companies can take a year or longer. By delivering development hardware sooner, the program accelerates cycles of learning and reduces overall program risks.

Along with rapid development comes an opportunity for fundamental research in materials and processes essential for producing electrical interconnects. This understanding of materials science helps identify alternatives that meet performance requirements while being quickly manufacturable.



Co-locating various manufacturing techniques in the lab has sparked innovative ideas, including combining 3D-printing technology with injection molding for low-volume production of parts. Using additively manufactured molds for injection molding enables quick turnaround connector manufacturing with more design iterations.

Other ideas coming out of the lab include hermetic seals made with additive manufactured glass and a green alternative for materials used in lightning arrestor connectors. Michael Gallegos, the program's lead mechanical engineer, is hopeful the lab space will continue to lead to innovative ideas to reduce lead times.

"We want to provide design engineers the opportunity to test new ideas and think creatively without waiting months for hardware," Michael said. "Our goal is to offer as many cycles of learning for Product Realization teams as possible."

(Source: Sandia University)

To Thrive, Surround Yourself With Good People

One World, One Industry

Feature Column by Dr. John W. Mitchell, IPC PRESIDENT AND CEO

At various times in my career, I have been asked how to be successful or to thrive in business. There are many answers to this question, which differ depending on the situation you find yourself in. Some of the basics I have heard most often include working hard, staying focused on just a few things, always doing the right thing—it will ultimately pay long-term dividends—and many others.

But if I could pick just one thing that would make the biggest difference for your company and your individual success, it would be to surround yourself with people who are better than you are.

Sadly, there are people out there who find this threatening and who believe that if the people on their team are smarter, better, faster (cue the "Six Million Dollar

Editor's note: This column was originally published in the July 2024 issue of PCB007 Magazine.

"Teams that have great players on them tend to win, and people like winners."

Man" theme music) than they are, they will not be around very long. I believe the opposite is true. Teams that have great players on them tend to win, and people like winners. If you feel threatened by those you work with, you should think about how you can improve to become the best contributor in your area for your team.

On the other hand, what a great joy it is to have those around you impressing you with their dedication, ingenuity, passion, and creativity. This is not only personally satisfying but tends to lead to excellent outcomes. When you get great outcomes, that's a team worth investing in.

How do you find such great players to join your team? Well, that is the real challenge of this suggestion. It is not just about offering more money. You need to provide a vision of where you are trying to go. What is the mountain you are looking to climb? Share how this person will help to make that daunting objective a reality. When you get them on board, you need to clear obstacles from their path (and those will keep popping up internally and externally) and then get out of their way.

Clearing obstacles for great employees means finding ways to ensure that they stay, know they are valued, and that you will put the time and effort into their careers to encourage them to continue working for you. One important key to retaining your best people is ensuring that you train, retrain, and upskill them. Loyal and satisfied employees are those who have the right tools to do their jobs, are given options for growth within the company, and feel valued for what they provide to the company.

If you don't develop, train, upskill, and offer pathways for growth to your best people, you risk losing them. Upskilling provides employees who have mastered basic skills the necessary new expertise for today's positions and jobs. Pathways ensure that employees know that their job has a path forward and that with hard work and an openness to learning new skills, there is a clear track for career growth.

I cannot overstate how important it is to invest in development and training for your team. It's a clear sign that you value them and that they have an important place in your company. Building a culture of inclusion, acceptance, and lifelong learning will help your employees grow and improve your bottom line. Are you truly "seeing" your employees as individuals and recognizing what they bring to your organization? Engaged, valued employees are more productive, and less likely to look elsewhere for a new job.

Working with great talent makes the tasks before us—as insurmountable as they sometimes may seem—more approachable and achievable. When you surround yourself with great people, you will be pushed to do better and greater things. In my book, that is the secret of success. **SMT007**

Dr. John W. Mitchell is president and CEO of IPC.
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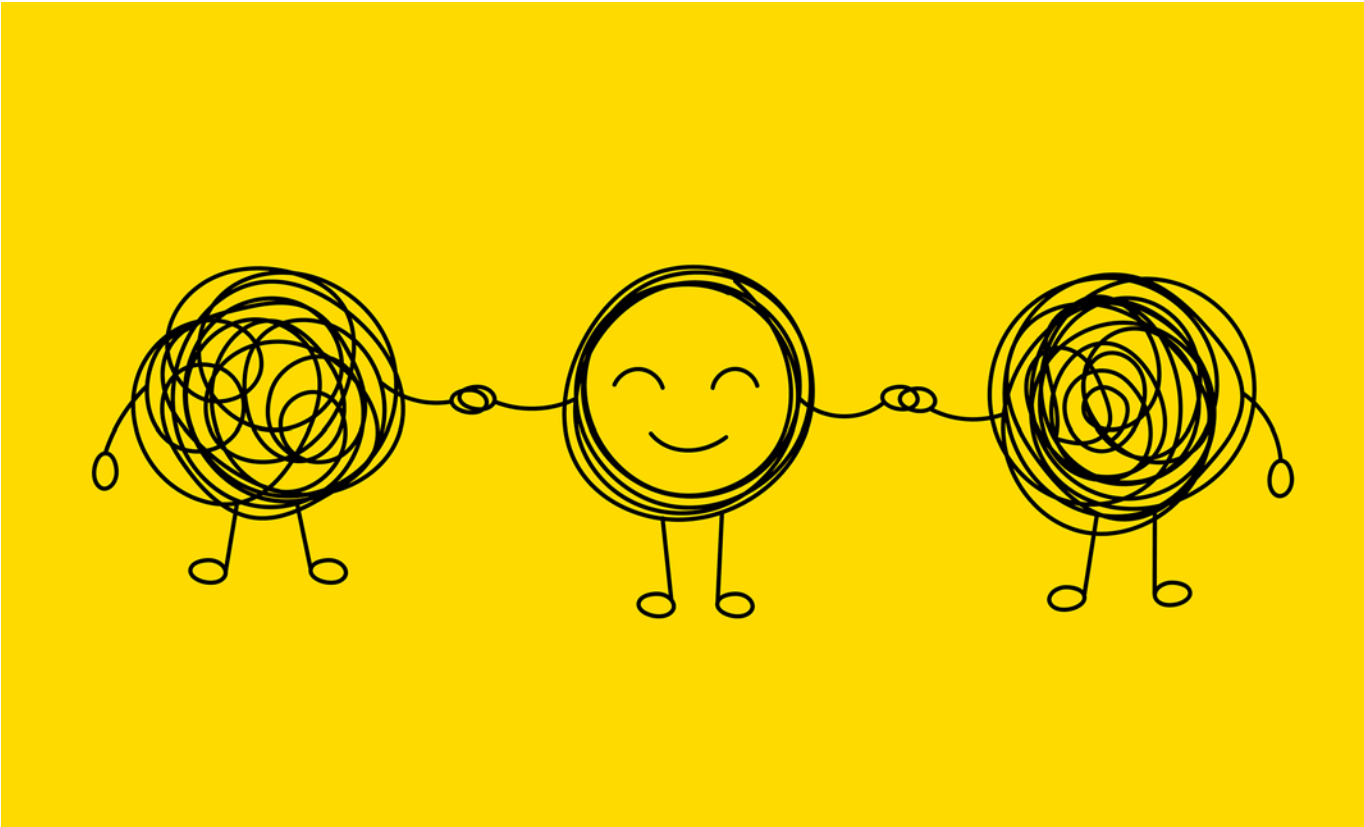


Why a Culture of Thriving Matters

Feature Article by Audrey McGuckin
THE MCGUCKIN GROUP

The Problem: Burnout and Disruption

On every call with senior leaders, I hear the same thing: Their organizations are facing the cumulative fatigue of constant disruptions. Crises from the pandemic to the war in Ukraine to supply-chain issues—coupled with pressures from return to work and constant transformation efforts—have led to widespread burnout.

In *The Devil Never Sleeps,* author Juliette Kayyem argues that the world we now live in will always have some level of disruption, making conditions tough for organizations and individuals. This context requires a fundamental shift in perspective, recognizing that such disruptions are now a continuous part of today's global environment—and they aren't going away.

The Solution: Leading With Empathy

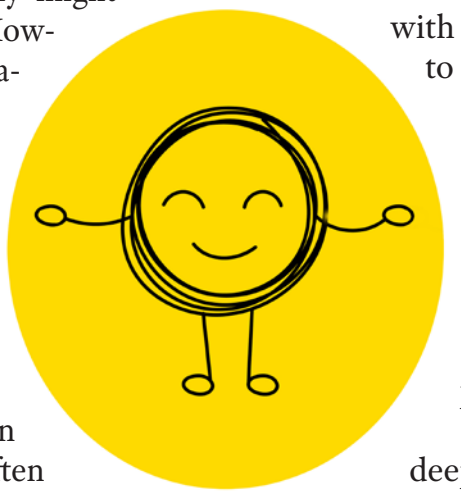
This shift necessitates a transformation in leadership approach that prominently emphasizes empathy. The traditional leadership competencies that used to be in high demand—such as results-oriented drive, execution focus, and strategic acumen—are now considered "table stakes," foundational qualities expected of any effective leader.

Simon Sinek says, "The real job of a leader is not being in charge. It's about taking care of those in our charge." As a leader, your primary responsibility is to understand your people. Each individual is navigating their own unique journey, which includes every employee within your organization. If they are experiencing burnout and not thriving, it's crucial to identify

ways you can effectively support them. While there are practical measures to assist someone with physical burnout, the focus here is not on detailing those strategies. Instead, it's vital that you know how to deeply understand and support your team members in whichever way will be most effective for them.

Why Should I Care About Empathy?

When explaining the current landscape, I often get this question: "Why would I even care about a culture of thriving?" Especially in environments where factual and technical skills dominate—such as engineering, supply chain, and finance—integrating empathy might initially seem nonessential. However, the fundamentals of empathetic leadership are universally applicable and can significantly enhance how teams in technical fields collaborate, innovate, and resolve issues. A thriving culture leads to increased retention and engagement. When employees feel engaged, they not only remain with the organization but also perform at their best, often going above and beyond expectations.



A Culture of Thriving Is a Differentiator

In addition to retention, engagement, and performance, one significant reason why fostering a thriving culture matters is that it directly impacts how customers feel about your organization.

In discussions with various organizations about why some attract more business than others despite having similar resources—such as access to technology, footprint, and supply-chain capabilities—the consensus points to organizational culture. All things being equal, a dynamic culture both differentiates these organizations and significantly contributes to their market appeal, ultimately affecting the bottom line. According to McKinsey & Company, companies with top-quartile cultures outperform median cultures by 60% and bottom-quartile cultures by 200%[1].

A recent Gallup report says an organization is only as strong as its work culture. In fact, 84% of the value of an S&P 500 company comes from talent, skills, knowledge, work ethic, and the health of its employees[2].

Healthy cultures also enable organizations to adapt. In an ever-changing world, the significance of culture becomes paramount. Organizations characterized by high-performing cultures excel in adapting to change. Conversely, those with unhealthy cultures struggle to cope with change effectively. Studies indicate that 70% of transformation initiatives fail, with 70% of those failures attributed to culture-related issues[2].

But What Is Empathy?

When discussing empathy, I frequently encounter questions such as "What exactly does empathy mean?" and "How do you begin to incorporate it?"

Empathy is about having a deep understanding of the diverse and unique needs of your people by metaphorically "walking in someone else's shoes." This is easy to say but hard to do, and one size doesn't fit all.

In all my conversations with our clients, I drive home the idea that "customization is king." In other words, you have to tailor your leadership approach to meet the wide and varied needs of your people. The specific requirements of a chief financial officer in their work environment will differ significantly from those of, say, an engineer.

Of course, overarching human resources strategies will continue to address compensation and retention, but here's the kicker: the real secret of successful leadership lies in your ability to lead with empathy and connect with your people. Establishing a thriving organizational culture begins with leadership that is not

only perceptive but also tailored to the specific needs of its people.

How to Get Started

Aristotle was right: "Knowing yourself is the beginning of all wisdom." To lead with empathy, you have to reflect inwardly. You must know yourself. Knowing yourself requires deep personal reflection, answering these questions: Who am I? What's my personal history? What are my roots? What are my values?

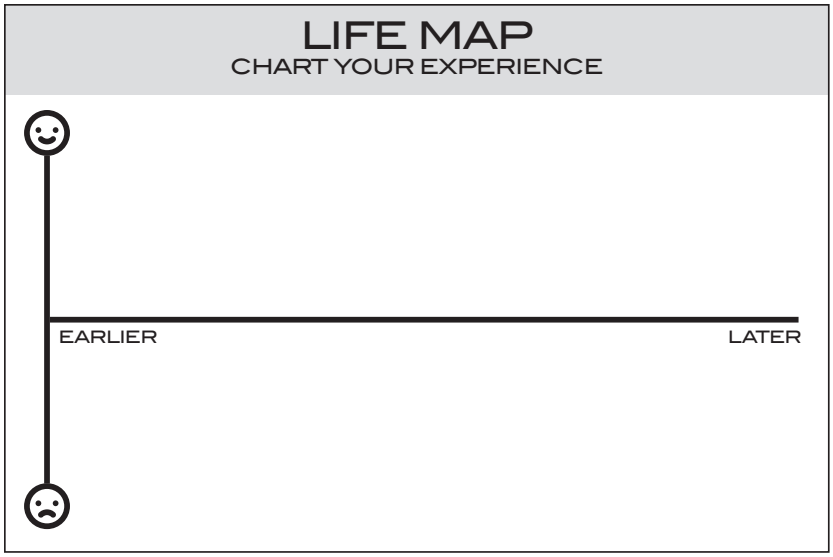


Figure 1: A blank Life Map.

Your Life Map

There is a reciprocal relationship between your life story and developing empathy as a leader—if you know where you've come from and why, you can better understand the challenges and motivations of others. The Life Map is a tool to create a visual representation of key moments in your life. In a developmental framework, it allows you to explore your life and accomplishments, identify themes and patterns of success, and gain insights. Mapping your life story helps you recognize what has been meaningful about your experiences, allowing you to clarify your purpose and connect authentically with yourself and others.

How to complete your Life Map:

1. You'll need to open up a document or note-taking app on your computer or phone.
2. Draw a line graph that represents a chronological timeline capturing the high and low points of your life, from birth to the present day.
3. Using words, pictures, or drawings, fill in important milestones and key events. Which moments have mattered the most? Consider the major events that have significantly impacted your life. Starting at the left-hand side of the sheet, which represents your first memory, graph the life events and experiences that have had the most impact on you.
4. Highlight accomplishments and important lessons. Include big events you can recall, both good and bad, as well as significant milestones. Examples could be moving to a new country, switching schools, or experiencing changes in family circumstances, such as losing a loved one.
5. Plot negative events or experiences below the horizontal line and positive ones above it. The more negative or positive the event, the farther it should fall from the "neutral" line.

Label the highs and lows with a short description of the event or experience, or use an image to represent that moment.

Often, this exercise yields great insights and clarity, helping you notice connections between events and emotions you otherwise might not have considered. You might think, "I didn't realize when my mom and dad got divorced, that was the effect it had on me," or "I didn't realize because we were army children and moved around a lot, I learned to connect with new people very quickly, and that's what makes me a great leader." Typically, your life experiences prior to age 24 have the greatest impact on shaping how you walk through life and who you are as a leader.

Once you have your life mapped out, take another hour to reflect on it and ask yourself questions like the ones below.

Questions to Ask When Reviewing Your Life Map

Once you've completed your Life Map, reflect on the experiences you identified by answering the following questions:

- Does anything on my Life Map surprise me?
- Do I see any themes or patterns emerging?
- What mindsets, assumptions, or beliefs have those patterns created for me?
- What did the moments that matter mean to me? How did they impact my view of myself?
- Which mindsets, assumptions, or beliefs identified in this exercise are still active in me today, and are those mindsets still serving me well?

For instance, an emerging theme is often loyalty. Through their Life Map, participants understand where they established this deep loyalty. As they get older, they realize maybe that quality doesn't serve them well everywhere. Maybe there are times when they need to let relationships or situations go.

"What are the key takeaways that make me the leader I am today?"

One of our clients had a team member who wanted to teach his kids never to quit. That value was so ingrained in him from an early age that he never questioned it. From day one on the team, it was clear that this person was in the wrong role; however, because his highest value was not quitting, he saw transferring to a different role as accepting defeat. It was awful and heartbreaking to watch because it was destroying his self-esteem, but it didn't have to be that way. Wrong role—that's it. He could have reframed this situation to see that transferring was different from quitting. His boss told him that the mindset of never quitting might not serve him in every situation. Finally, he saw the impact this belief was having on him and on the organization. It took him nine painful months—of honest feedback, hard coaching, and repeatedly telling him he was in the wrong role—before he finally transferred.

Keeping in mind that what you've learned from your experiences might differ from what you need to do in the future, ask yourself: What are the key takeaways that make me the leader I am today?

Remember, your story is constantly evolving. As your perspective grows and your mindset shifts, you may look back on your life differently.

What Does Empathy Look Like in Practice?

I'll give you an example of the practical application of empathy. For 25 years, I worked for Jabil, a $27 billion company, where I spent 10 years as the chief talent officer. During my tenure, I worked in Europe, Asia, and Mexico, and I had the privilege of being mentored by Bill Peters, the president of the company at that time. Bill was well-known for his principle-driven approach, always prioritizing the right course of action for people. His reputation for integrity and support made any opportunity to work with him highly sought after.

My assignment to Asia for three years marked a significant phase in my career, bringing its

own set of challenges. In the initial eight weeks, I faced considerable struggles that left me feeling overwhelmed. It was during this period that Bill's qualities as a leader shone most brightly. Upon reaching out to him, he not only offered encouragement but also actively guided me through devising a solution, reassuring me of his support.

The complexity of the situation stemmed from being both a woman in a predominantly male environment and a corporate representative, which sometimes led to critical decisions being overlooked or contradicted in smaller, local meetings—a practice common in the regions where we operated. Recognizing the issues I faced, Bill intervened directly. He contacted the senior executive team in Asia, instructing them to fully integrate and support me in the leadership agenda. He emphasized that my leadership was crucial for driving the regional strategy focused on building leadership capabilities and enhancing the organizational structure.

Bill's intervention represented a turning point. It signaled to the entire team the importance of alignment with the corporate objectives, setting a precedent for how to respect and follow leadership. The backing of another male senior leader, T.P. Yuen, who vocally supported me in town hall meetings, cleared the path for the initiatives we planned to implement.

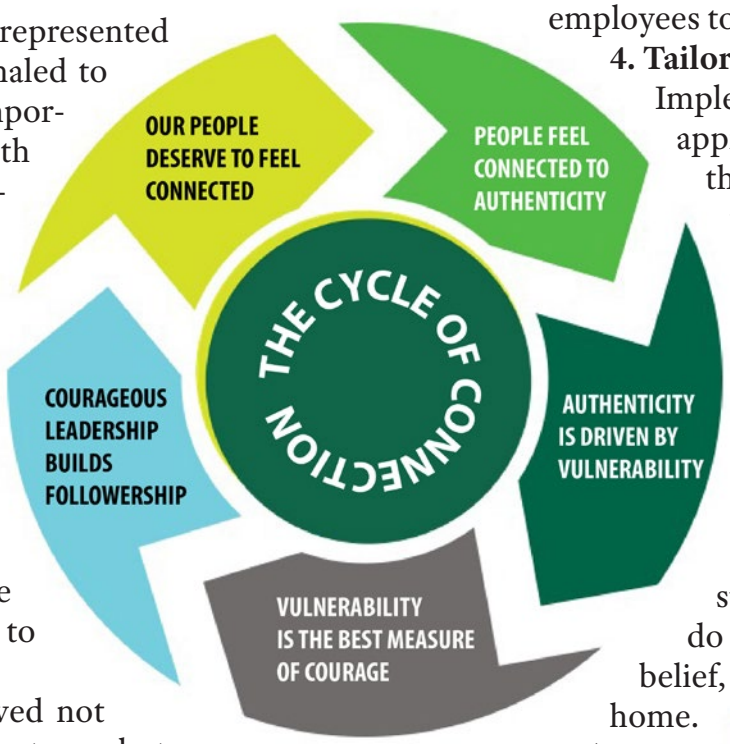
The support I received not only helped align the team but also played a critical role in the successful implementation of our strategies over the following years. This experience under Bill Peters's leadership left a lasting impression on me regarding the impact of leading with empathy and strength, and it underscored the importance of support from senior leadership in overcoming operational challenges and achieving significant growth.

Putting It All Together

One practical tool is a Cycle of Connection, which outlines how leaders can cultivate a culture of thriving. This model is designed to demonstrate how to implement empathy on a practical level.

The model emphasizes several key stages:

1. **Acknowledgment and understanding:** Start by recognizing the unique challenges and pressures faced by employees.
2. **Empathy and support:** Engage with employees on a personal level to understand their specific needs and struggles.
3. **Authentic leadership:** Be genuine in your interactions, showing your vulnerabilities and concerns, which, in turn, encourages employees to open up.
4. **Tailored strategies:** Implement personalized approaches that cater to the diverse needs of the workforce, rather than one-size-fits-all solutions.



The foundational belief that people deserve to feel connected underpins cultivating a thriving culture. This is the starting point; if you do not subscribe to this belief, you might as well go home.

The next question is, "How do we foster this sense of connection?" The answer goes beyond salary, compensation, or paid time off. People fundamentally seek a connection to authenticity; they yearn to engage

with something genuine, which is increasingly rare in today's world.

Next, how do you become a more authentic leader?

Authenticity fosters connection, since to be real, one must be vulnerable. Being vulnerable means leading by example, admitting your own difficulties and challenges openly. When you share your vulnerabilities, it encourages your team to reciprocate, creating a deeper bond. However, achieving this level of openness requires courage, especially in technical or engineering environments where such vulnerability may not be the norm.

The best measure of courage is being vulnerable, which is not easy. But think about the most effective leaders you have ever encountered. What traits did they exhibit?

I'll bet they exhibited openness, authenticity, and vulnerability, through a willingness to tell you stories and share personal anecdotes, details about their lives, and their own struggles.

Such openness defines true leadership. Demonstrating courage in this way both measures and inspires followership. By showing vulnerability, you encourage your team to support you and each other, ultimately fostering a culture of thriving where everyone feels a deep sense of connection and a desire to contribute to something greater.

Authenticity comes from your personal story, because it goes back to who you are, your purpose, why you exist, and how you were raised. Business schools rarely teach authentic leadership. We learn by seeing it in action. You can't fake it. Faking who you are feels stressful and uses too much energy. It causes burnout.

Take a few minutes to think of the following examples:

1. One instance of a boss you loved.
2. One instance of a boss you disliked.
3. Your own story of feeling connected at work.

If you haven't confidently tapped into your authenticity, you will second-guess your instincts and allow a fear of judgment to steer you.

Audrey McGuckin

Conclusion

The journey toward a thriving organizational culture is ongoing and requires consistent effort from senior leadership. By embracing empathy and authenticity, leaders can improve their workforce's morale and productivity while also driving their organizations to sustainable success—even in the face of ongoing challenges. **SMT007**

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Audrey McGuckin is CEO of The McGuckin Group.

Enhancing Customer Loyalty and Product Quality

The Knowledge Base

Feature Column by Mike Konrad, SMTA

In the fiercely competitive landscape of the electronics assembly industry, fostering customer loyalty and consistently delivering superior products or services are paramount to long-term success. This industry, marked by rapid technological advancements and dynamic market demands, requires a proactive approach to stay ahead.

Here are some effective strategies to not only keep customers loyal but continuously improve the quality of products and services:

Understand and Anticipate Customer Needs

Understanding and anticipating customer needs is the foundation of customer loyalty. This involves active listening and continuous engagement. Regularly conduct surveys, feedback sessions, and market research to gather insights into customer preferences and pain points. Use this information to tailor your offerings and services, ensuring they align with evolving customer expectations.

Deliver Consistent Quality

Quality is the cornerstone of customer satisfaction in the electronics assembly industry. Implement rigorous quality control processes at every stage of production. Adopt standards such as ISO 9001 for a structured approach to quality management. Conduct regular internal and external audits to identify areas for improvement and maintain high standards.

Invest in Advanced Technology

Staying abreast of technological advancements is crucial. Invest in state-of-the-art machinery and tools that enhance precision and efficiency in assembly processes. Automation, robotics, and the implementation of advanced automated optical inspection (AOI) and solder paste inspection (SPI) technology can significantly reduce human error and improve consistency. In addition, leveraging advanced software for design and simulation can lead to better product outcomes and faster time to market.

Emphasize Employee Training and Development

A skilled workforce is instrumental in achieving excellence in product quality. Invest in continuous training and development programs for your employees. This will keep them updated with the latest industry trends and technologies and boost their morale and productivity. Encourage a culture of continuous learning and improvement.

> "A skilled workforce is instrumental in achieving excellence in product quality."

Foster Strong Supplier Relationships

The quality of materials and components used in electronics assembly directly impacts the final product. Establish and maintain strong relationships with reliable suppliers. Regularly evaluate their performance and ensure they adhere to your quality standards. Collaborating closely with suppliers can also lead to innovation and improvement in material and component quality.

Implement Robust After-sales Support

After-sales support plays a significant role in customer retention. Provide comprehensive support service. A dedicated customer support team that responds promptly and effectively to queries and issues can significantly enhance customer satisfaction and loyalty.

Leverage Data Analytics

Data analytics can provide valuable insights into production processes, quality control, and customer behavior. Implement data analytics tools to monitor key performance indicators (KPIs) and identify trends. This can help in making informed decisions, optimizing processes, and proactively addressing potential issues before they escalate.

Enhance Communication and Transparency

Transparent and open communication fosters trust. Keep your customers informed about the status of their orders, any potential delays, and steps being taken to resolve issues. Regular updates and honest communication can prevent misunderstandings and build long-term relationships based on trust and reliability.

Innovate Continuously

Innovation is the lifeblood of the electronics assembly industry. Encourage a culture of innovation. Regular brainstorming sessions, R&D and equipment investments, and collaboration with industry experts can lead to


Mike Konrad

groundbreaking solutions and improvements. Staying ahead of the curve enhances product quality and positions your company as a leader in the industry.

Environmental Responsibility

Sustainability is becoming increasingly important to customers, particularly those that have adopted an environmental, social, and governance (ESG) policy. Adopting environmentally responsible practices can enhance your brand image and customer loyalty. Implement energy-efficient processes, minimize waste, and use eco-friendly materials wherever possible. Communicating your commitment to sustainability can attract environmentally conscious customers.

Customer Engagement and Community Building

Building a community around your brand can significantly enhance customer loyalty. Engage with your customers through various channels, such as social media and newsletters. Attend industry events such as trade shows, local expos, and technical conferences. Create forums or user groups where customers can share their experiences and provide feedback. This fosters a sense of belonging and offers valuable insights for continuous improvement.

Reward Loyalty

Recognize and reward loyal customers. Implement loyalty programs that offer discounts and priority support. Personalized gestures, such as sending thank-you notes or gifts, can also make customers feel valued and appreciated.

Benchmark Against Competitors

Regularly benchmarking your products and services against competitors can provide insights into areas where you excel and those that need improvement. Understand the strengths and weaknesses of your competitors and use this information to refine your strategies and offerings.

Adapt to Market Changes

The electronics assembly industry is subject to rapid technological change and market demands. Being adaptable and responsive to these changes is crucial. Stay informed about industry trends, changes to regulations and standards, and emerging technologies. Flexibility and agility in your operations can help you quickly adapt to new opportunities and challenges.

A Holistic Approach

Maintaining customer loyalty and consistently delivering high-quality products requires a multifaceted approach. By understanding customer needs, investing in technology and training, fostering strong relationships, and continuously innovating, companies can not only meet but exceed customer expectations.

These strategies provide a comprehensive framework for achieving these goals. Embrace these strategies, and you'll be well on your way to building lasting customer relationships and a reputation for excellence in the industry. **SMT007**

Mike Konrad is founder and CEO of Aqueous Technologies, and vice president of communications for SMTA. To read past columns, click here.

Wriggling Out of 'the Squeeze'

Feature Article by Timothy McLean
TXM LEAN SOLUTIONS PTY. LTD.

At some point in the growth cycle of most businesses, they inevitably face "the squeeze"—when increasing complexity starts to overwhelm the business processes and management systems. The business then gets squeezed by rising overhead costs, falling efficiency, capacity constraints, and cash flow challenges. These often combine with poor delivery and quality performance to constrain the growth of the business.

When faced with "the squeeze," many manufacturing businesses make these same five mistakes, only making their problem worse.

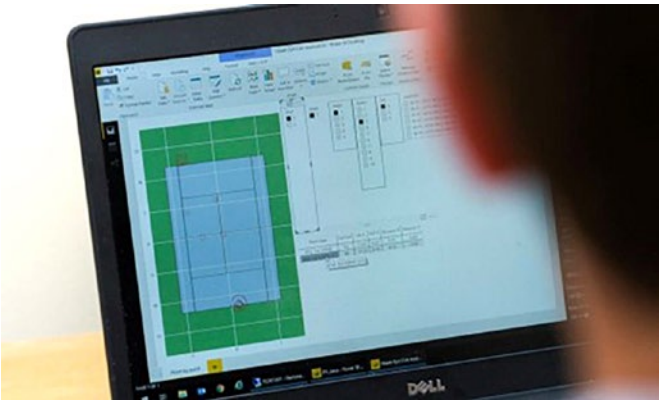

Figure 1: Software systems such as ERP systems are essential tools in most businesses. However, unless your underlying business processes are under control, implementing software can just make the confusion worse.

1. Seeing the Solution in Software

Recognizing the confusion in their business and frustrated by a lack of clear visibility into what is happening in their markets, many business leaders seek solutions in software. Usually, this involves ERP software, which is often sold as the "all singing, all dancing" software solution to everything. In fact, the software does not fix broken business processes; it just automates them. Therefore, if your business pro-

cesses are not robust then implementing ERP software will most likely make internal confusion worse, meaning that you may just have spent a lot of money automating chaos.

2. Looking for the Superhero

Another common mistake is to look for a brilliant operations manager or general manager who will come in and put everything right. Sometimes, you might get lucky, but usually, "the squeeze" eats managers for lunch. No leader or manager, no matter how good they may be, is a magic bullet solution for more deeply rooted and foundational problems. We know businesses that have changed operations managers 10 times in 10 years. Unless you live in the world of Marvel or DC, there are no such things as superheroes. Soon, you will see your brilliant, highly paid executive as part of the problem, not part of the solution, and start looking for a new superhero.

3. Buying the Big Machine That Goes Faster

Maybe if you could buy the latest piece of technology that produces twice as fast and requires half the labor, then you would improve your costs and margins. This looks good on paper, but the problem with "the big machine" is that it usually produces double the inventory, costs double the amount to run and maintain, and does not fix the underlying process and people problems in your business. Too often, growing manufacturing businesses buy new machines without thoroughly understanding the return on investment. They saddle themselves with a lot of debt and cost, making "the squeeze" much worse. Then your competitor buys the big machine that goes even faster, and any cost savings you gained through automation just get passed on to the customer.

Figure 2: Buying a new machine might speed up your manufacturing process, but it could also cause operational mistakes later on.

4. Giving the Problem to Someone Else

Also known as outsourcing, this approach seemed like a pretty good strategy over the past 20 years—until it wasn't. Hiring someone in the developing world to make your product might seem like a good idea until you find a quality issue and have three months' worth of stock in the warehouse or on the water and cannot get supply at all, or your supplier steals your intellectual property. When you source from offshore, your unit costs might be lower, but you will have to fund more inventory, sacrifice flexibility to meet customer needs, and increase your exposure to the risks of shortages and quality issues. That's not to mention wars, pandemics, and currency fluctuations.

5. A Bigger Factory

Most businesses feeling "the squeeze" are also squeezed for space. If only they had a bigger factory, they could spread out and get better flow. However, in most factories we visit, less than 50% of the space is used productively. Instead, we see factories filled with work-in-progress, crisscrossed by a veritable freeway system of forklift aisles and piles of waste everywhere. The bigger factory just means that this mess gets spread out further, giving staff further to walk and forklifts further to drive. Without the right thinking, a bigger factory can be less efficient than a smaller factory. Then you have the extra rent and building costs that all that bigger space involves.

Finding Hidden Capacity in Your Factory

Applying the five points above will help you build good foundations of robust processes and management systems to ease the squeeze on your team. However, your business still may be prevented from growing by a lack of capacity. Increasing production capacity in a manufacturing business is often a costly exercise. It can involve the purchase of new software, new machinery, employment of additional staff, and renting or buying additional buildings. However, before investing in these costly options, ensure you are using all the capacity in your existing buildings, machines, and people. In our experience, most businesses have hidden production capacity they don't realize they have, starting with these three.

Figure 3: (Left) Before, heavily congested with high level of work-in-process (WIP) stored on pallets, creating excessive work for the team, multiple handling of stock with potential for costly damage. (Right) After a massive reduction in WIP with custom-built transport and clearly marked, Kanban-controlled areas, creating space and a better working environment.

Downtime

Many years ago, a production manager who reported to me presented a spreadsheet demonstrating that his department was out of capacity. The department was running 24 hours per day, seven days per week, and was not keeping up with customer demand. Our office was in the middle of the factory, so I asked him to step outside his office door with me.

We then observed his eight blow-molding machines, only two of which were running. While this was not a particularly scientific approach, it illustrated that there was, potentially, a lot of hidden capacity to be exploited. Over the next few months, we focused on discovering why the machines stopped and eliminating the causes of downtime.

Our measure of downtime was overall equipment efficiency (OEE), which we improved from 45% to 80% over the following year. This delivered another three to four machines' worth of additional capacity and meant that we could catch up on customer demand and stop working on weekends.

I frequently visit factories and see many machines stopped without any clear explanation. While breakdowns may be a factor, the biggest reduction in downtime usually comes from simple process and organizational changes that are quick to implement and cost nothing.

You can make dozens of improvements to reduce downtime and liberate hidden machine capacity. The starting point is to measure your downtime and analyze the potential causes. You then chart these on a Pareto chart and start by focusing on reducing the top two or three causes to have the biggest impact.

Wasted Space

We often get approached by clients who have run out of factory space. This is particularly true in businesses that make large bulky products such as modular buildings, furniture, and heavy machinery. They often consider the difficult and expensive option of relocating to a larger factory. After all, most businesses do outgrow their premises at some point.

Before making the decision to move, however, you need to challenge how your current

space is being used. In most factories we visit, we find that less than 50% of factory space is used effectively. Typically, more than 50% of factory space will be filled up with materials—raw materials and especially work in progress. Inventory is a function of how your business runs. Having more inventory does not add value to your customers, but it certainly consumes your business' working capital and uses up a lot of space.

The root causes of large amounts of inventory might include making product in large batches, unbalanced processes where upstream processes run faster than downstream processes and are allowed to overproduce, and "push" production where MRP software is used to "push" product from one process to the next based on a forecast (which is inevitably inaccurate).

To free up space, you need to reverse some of these approaches. Combining processes into "one piece flow" cells can be challenging, but it effectively eliminates WIP and dramatically reduces lead time. Restricting work-in-progress downstream of "fast" processes—implementing a FIFO lane, for example—can prevent excessive build-up of WIP. When the FIFO lane is full, the big upstream machine is required to stop until downstream processes can catch up and clear the backlog.

Another key space waster in factories is forklifts. Typically, a forklift needs an aisle-way at least 3 meters wide to enable it to travel and maneuver safely through the factory. Moving things around on the forklift is not an activity that the customer will pay you for. Mixing forklifts and people in a workplace is also a major safety challenge. Therefore, try to eliminate the need for forklifts by bringing processes closer together (which you will be able to do because you will have reduced your WIP) and using other methods of transport, such as trolleys or roller conveyors, to move products through the factory.

In job shops, another problem can be partially completed jobs waiting for parts, or even for final decisions to be made on the design. If the product is large, the factory can soon fill up with jobs you cannot finish, preventing the start of any new jobs. A simple rule here is, "Don't start what you can't finish." Put in place a "ready to build" process that ensures you have all the parts and the design fully completed and signed off by the customer before you release the job to production.

Non Value-added Time

In processes where the rate of output is driven by the efforts of front-line employ-

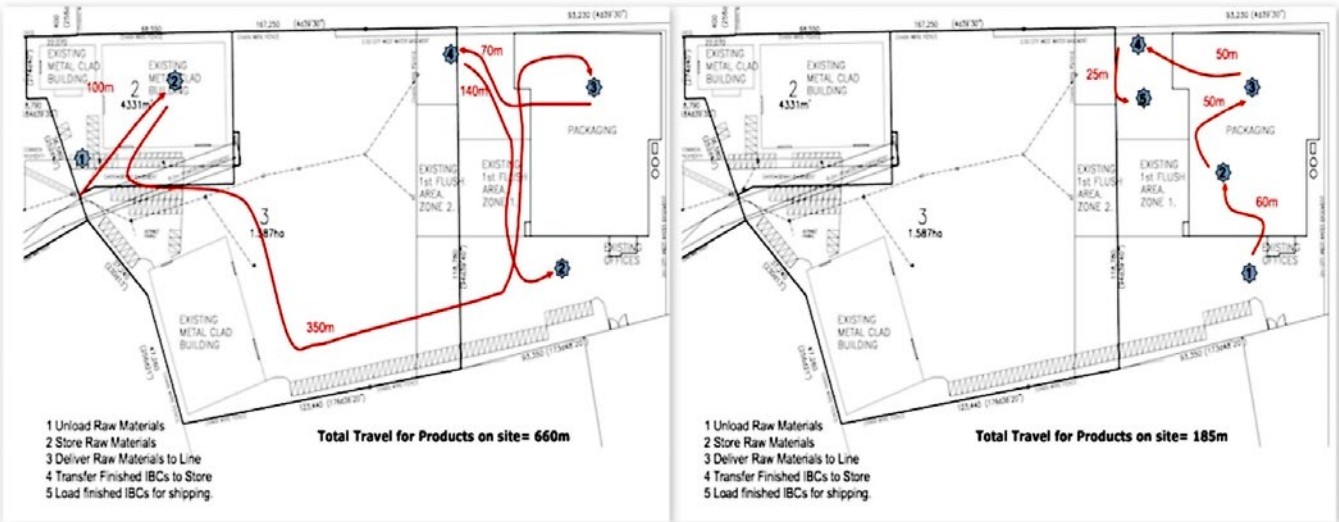

Figure 4: In this diagram you can see non value-added time from the wasted time in motion moving around the factory.

ees (rather than the throughput of machines), capacity can be limited by available staff. While the answer is to hire more people, that is not an easy or quick solution given the difficulty of hiring the right staff and the time it takes to train them. In Lean and 5S, we talk about the eight wastes. To find hidden capacity in your workforce, focus on eliminating four of these wastes. When you do so, you will increase your productivity and probably make the job of your front-line team easier and less frustrating.

The four wastes to look for are unnecessary motion, over-processing, transportation, and wait times. Unnecessary motion is the easiest to spot. As a rule of thumb, each step of each member of your team takes one second. Add up all the steps your staff takes daily, which is a lot of time. Start with the most obvious motion waste.

If you find your operators in the office searching for information or in the warehouse searching for parts, that tells you something has gone wrong. Operators should not have to leave their workstations to find parts, tools, or information. Look at the task design: Is the walking your operators do to complete their tasks necessary, or are things they need daily located in inconvenient places? Practical 5S® can really help identify and eliminate unnecessary motion.

The next target is transportation. By bringing processes closer together, reducing big batch sizes, and creating one piece flow, you can eliminate much of the need to transport materials around your factory. A spaghetti flow map can show you where your team needs to go and highlight obvious opportunities to improve the location of vital materials. This can be a huge opportunity in a warehouse where the items most often picked should be kept close to where orders are collated.

Waiting is harder to spot, so look for unbalanced processes where the cycle time of one process is much longer than the other. This usually means that the person with the shorter process will have to wait at some point for the other person to catch up. Another form of waiting I refer to as "machine staring." That is, operators staring at an automated machine watching it operate while they are waiting for a machine to complete its cycle. Instead, this time can be used for tasks that might be completed when the machine stops. Such examples include preparing packaging, assembling completed parts, preparing the setup for the next job, or assisting the operator with the slower cycle time.

Finally, challenge yourself about whether the task is really needed at all. Is it truly value-added or is it just over-processing? We define over-processing as a task that does not add value to the customer. Typical examples of over-processing include unnecessary inspection or QC checks, work-in-progress packaging, and de-burring or cleaning parts when improvements in the upstream process could eliminate the issues in the first place.

Summary

For your business to grow, it must increase capacity. However, most businesses have hidden production capacity that can be obtained without the need for additional machines, people or buildings. For a holistic approach to understanding your capacity, we use a value stream map. Our facility layout development process™ is a structured and effective way to find ways to make the most of your space, human capacity, and machine capacity. In the past year, we have seen our customers increase productivity by more than 200% and reduce factory footprint by more than 50%. Finding your hidden capacity really can transform your business. SMT007

Timothy McLean is managing director of TXM Lean Solutions Pty. Ltd.

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From Concept to Reality: Building Alpha Circuit

Feature Interview by Barry Matties
I-CONNECT007

You've just sold your pharmaceutical business and have a lot of extra cash. Where would you spend it? "On a new 45,000-square-foot factory to manufacture high-tech printed circuit boards," said one man.

Meet Prashant Patel, one of the industry's newest PCB fabricators. Prashant was a pharmacist for his entire career and did very well. Surrounded by friends with decades of PCB industry experience who willingly shared their outlook on the industry, Prashant decided to acquire Alpha Circuit in Elmhurst, Illinois, in 2021. Alpha Circuit was established in 1981, where the primary focus had been on low-tech. That has all changed.


Prashant Patel

Prashant and his team broke ground on a new 45,000-square-foot building in Schaumburg, Illinois—meaning this factory was being built from the ground up. Keep in mind that Prashant had no experience in PCB fabrication and had to learn everything, literally, from the ground up. After spending a few hours with him, it's easy to see he is a good student.

The following interview highlights Prashant's PCB journey.

Barry Matties: We're here at Alpha Circuit's brand-new facility, a project that has taken three and a half years. Prashant, tell us about the journey of setting up this new facility.

Why did you undertake it this way, and how was the process of bringing it together?

Prashant Patel: I wanted to do something in the manufacturing industry, where I have an extensive network of friends and family. We purchased this building, and everything other than the four walls is brand new, including the flooring, lights, HVAC, roof, and equipment.

We did the factory floor layout and sourcing of equipment ourselves. With over 25 years of experience and expertise in the industry, our engineering team knew what they were looking for. You have to know the right questions to ask for each process. If it's a wet process, how do we want the nozzles? How do we want the angles? How do we want the brushes? They are the experts, so I let them define exactly what we wanted and needed. My part was to find the manufacturers that could give us the best equipment that met all our requirements, including what kind of service they would offer. How soon can a technician get to you if something is not working? Service was the second most important consideration. After those two variables, it was lead time. When could we get the equipment? What can we live with, and what can't we live with? SMT007

Continue reading this article, which appears in the July 2024 issue of *PCB007 Magazine*.

MilAero007 Highlights

CACI Awarded $2 Billion Task Order to Provide Modern Digital Solutions to NASA ▸

CACI International Inc announced that it won an eight-year contract valued at up to $2 billion to provide digital solutions technology to standardize and centralize 11 of NASA's IT services under the NASA Consolidated Applications and Platform Services (NCAPS) award. NCAPS expands CACI's current relationship with NASA and will bring enterprise-wide automation across more than 200 systems from various NASA locations into a single program, thus enhancing efficiency while boosting productivity.

ispace RESILIENCE Lunar Lander Successfully Achieves Testing Milestone in Preparation for Mission 2 ▸

ispace, inc., a global lunar exploration company, announced today that the flight model of its HAKUTO-R Mission 2 RESILIENCE lunar lander has successfully completed thermal vacuum testing and remains on schedule for a Winter 2024 launch.

BAE Systems, GlobalFoundries Collaborate to Strengthen Supply of Essential Semiconductors for National Security Programs ▸

Under the strategic agreement, the companies will align technology roadmaps and collaborate on long-term strategies for increasing U.S. semiconductor innovation and manufacturing, with the joint goal of advancing the ecosystem for domestic fabrication and packaging of secure chips and solutions for use in aerospace and defense systems.

Lockheed Martin Selected To Develop Next Generation Weather Satellite Constellation ▸

NASA has selected Lockheed Martin to develop and build the nation's next generation weather satellite constellation, Geostationary Extended Observations (GeoXO), for the National Oceanic and Atmospheric Administration (NOAA).

Shane Whiteside Appointed as New PCBAA Chair ▸

Summit Interconnect President and CEO Shane Whiteside was recently appointed as chair of the Printed Circuit Board Association of America (PCBAA), replacing Travis Kelly, CEO of Isola Group. Shane's distinguished career in PCB manufacturing lends itself well to PCBAA's mission as an important advocacy vehicle for the PCB industry.

NASA, Boeing Provide Next Update on Space Station Crew Flight Test ▸

NASA and Boeing continue to evaluate Starliner's propulsion system performance and five small helium leaks in the spacecraft's service module, gathering as much data as possible while docked to the International Space Station.

DARPA Researchers Highlight Application Areas for Quantum Computing ▸

DARPA's Quantum Benchmarking program kicked off with the goal of reinventing the metrics critical to measuring quantum computing progress and applying scientific rigor to often unsubstantiated claims about quantum computing's future promise.

DESIGN TIPS #124:

ETCH COMPENSATION

What is minimum space and trace? The answer depends on the starting copper weight.

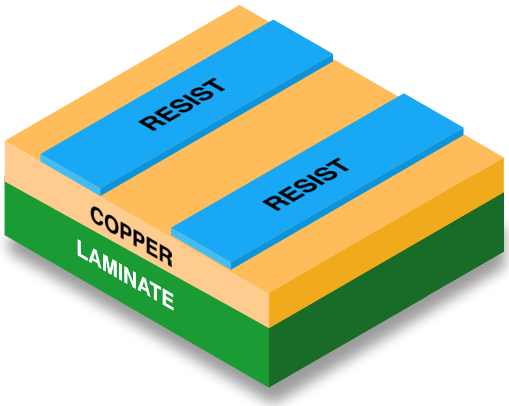
This is because we must do an etch comp on the traces in CAM to compensate for known etch loss. The space between traces after compensation will play a role in whether a board can be manufactured.

The lower the spacing width, the higher the cost. Designers don't always account for the proper starting copper weight after edge compensation.

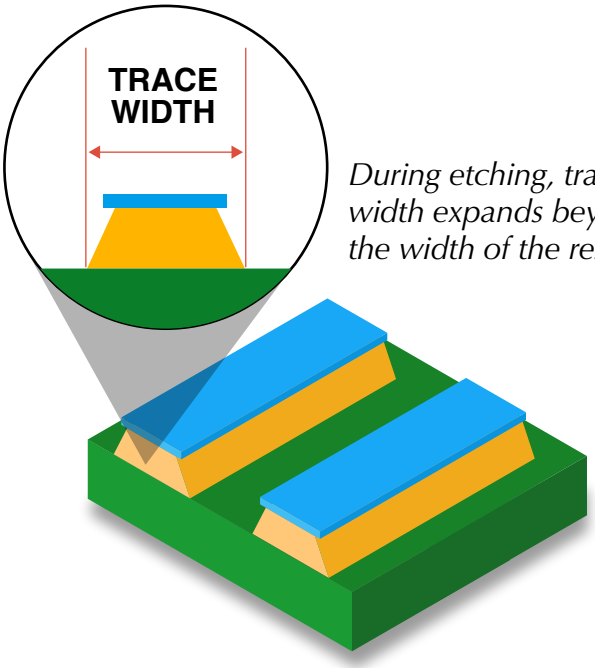
Design tips:

- For accurate starting copper weight, **add a half mil (.0005") to all copper features**.
- **Start with 3/8 or 1/4 oz. foil**, reducing etch comp and less likely to cause a spacing issue.
- **Boards that call for full body electrolytic gold are not comped** to avoid gold slivers occurring during the etching process.

Before etching



After etching



During etching, trace width expands beyond the width of the resist.

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The Nexus of Chinese and American Business Relations

Global Citizenship

by Tom Yang, CEE PCB

Many people I talk to feel there are very few similarities between how Americans and Chinese do business. However, I believe that's not true. That's why I researched the similarities between our cultures for this second column on global citizenship.

Americans Built the Chinese PCB Industry

Remember, it was American companies that taught China how to manufacture circuit boards. Our factories have your fingerprints all over them. So, it should come as no surprise that Chinese and American business practices—while shaped by distinct cultural, historical, and socio-economic factors—nevertheless share several similarities. We still mostly use Western-made equipment and follow IPC standards developed in North America and Europe.

As we have grown more independent in recent years, for example, in manufacturing our equipment and laminates, our commonalities are becoming more relevant as globalization and technological advancements intertwine the economies of both nations. Understanding these similarities can foster better communication, collaboration, and mutual respect between Chinese and American business professionals.

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Emphasis on Networking and Relationships

Chinese and American business cultures place significant importance on networking and building strong relationships. In the U.S., we often see this in networking events, industry conferences, and business lunches. U.S. professionals understand that knowing the right people can open doors to opportunities, partnerships, and critical information.

Similarly, the Chinese concept of "guanxi" (关系) is paramount. Guanxi refers to the network of relationships that facilitate business and social interactions. Building and maintaining guanxi involves a continuous exchange of favors and a deep understanding of the mutual obligations within these relationships. Trust and personal connections are crucial for long-term business success in both cultures.

Focus on Long-term Partnerships

There is a strong preference for long-term partnerships over short-term gains in Chinese and American business environments. American businesses often seek to establish enduring relationships with suppliers, clients, and partners, recognizing that sustained collaboration can lead to greater stability, trust, and profitability.

Chinese businesses similarly value long-term partnerships, often viewing business deals as the beginning of lasting relationships rather than one-time transactions. This long-term perspective is reflected in the careful cultivation of guanxi, as well as the emphasis on loyalty and consistency in business dealings.

Negotiation Strategies

Negotiation is a critical business component in both China and the United States, and both cultures employ strategic negotiation tactics. American negotiators usually prepare meticulously, focusing on win-win outcomes and leveraging analytical data to support their positions. They value direct communication and transparency and aim to create mutually beneficial agreements.

> "Negotiation is a critical business component in both China and the United States..."

Chinese negotiators also prioritize thorough preparation and strategic thinking. While they may place a greater emphasis on building personal relationships and understanding the broader context of the negotiation, the goal is often to achieve a harmonious agreement benefiting all parties. Both cultures recognize the importance of flexibility, patience, and finding common ground during negotiations.

Importance of Hierarchy and Leadership

Both business cultures recognize the importance of hierarchy and leadership, albeit in slightly different ways. In the United States, businesses often have a more structured hierarchy, with clear roles and responsibilities. Leadership is typically associated with individual achievement, vision, and the ability to inspire and drive teams toward common goals.

In China, hierarchical structures are often more rigid and deeply embedded in cultural norms. They tend to emphasize collective achievement and harmony within the organization. China expects its leaders to act as paternal figures, guiding their teams with wisdom and ensuring the well-being of their employees. Despite these nuances, both cultures

understand the need for strong leadership to navigate complex business environments.

Adaptability and Innovation

Adaptability and innovation are key drivers of success in Chinese and American business practices. American companies are renowned for their entrepreneurial spirit, willingness to take risks, and ability to adapt to changing market conditions. The U.S. business landscape is characterized by the constant pursuit of innovation, whether through technological advancements, new business models, or creative marketing strategies.

Chinese businesses have demonstrated remarkable adaptability, particularly in the face of rapid economic and technological changes over the past few decades. They are known to quickly scale operations, enter new markets, and integrate cutting-edge technologies. Both cultures prioritize innovation to stay competitive and meet the evolving needs of consumers.

Customer-centric Approaches

A customer-centric approach is a hallmark of successful businesses in both countries. American companies often emphasize customer satisfaction, using data-driven insights to tailor products and services to meet consumer demands. Customer feedback is actively sought and integrated into business strategies to enhance the customer experience.

In China, the customer-centric approach is also prevalent, with businesses striving to cater to the unique preferences of their consumers. The rise of e-commerce and digital platforms in China has further amplified the focus on customer engagement and personalized services. Both cultures recognize that putting the customer at the center of business decisions is essential for long-term success.

Ultimately, the only way for a company to succeed is by being customer-centric regardless of location or culture. That's just good global universal business practice.

Global Outlook

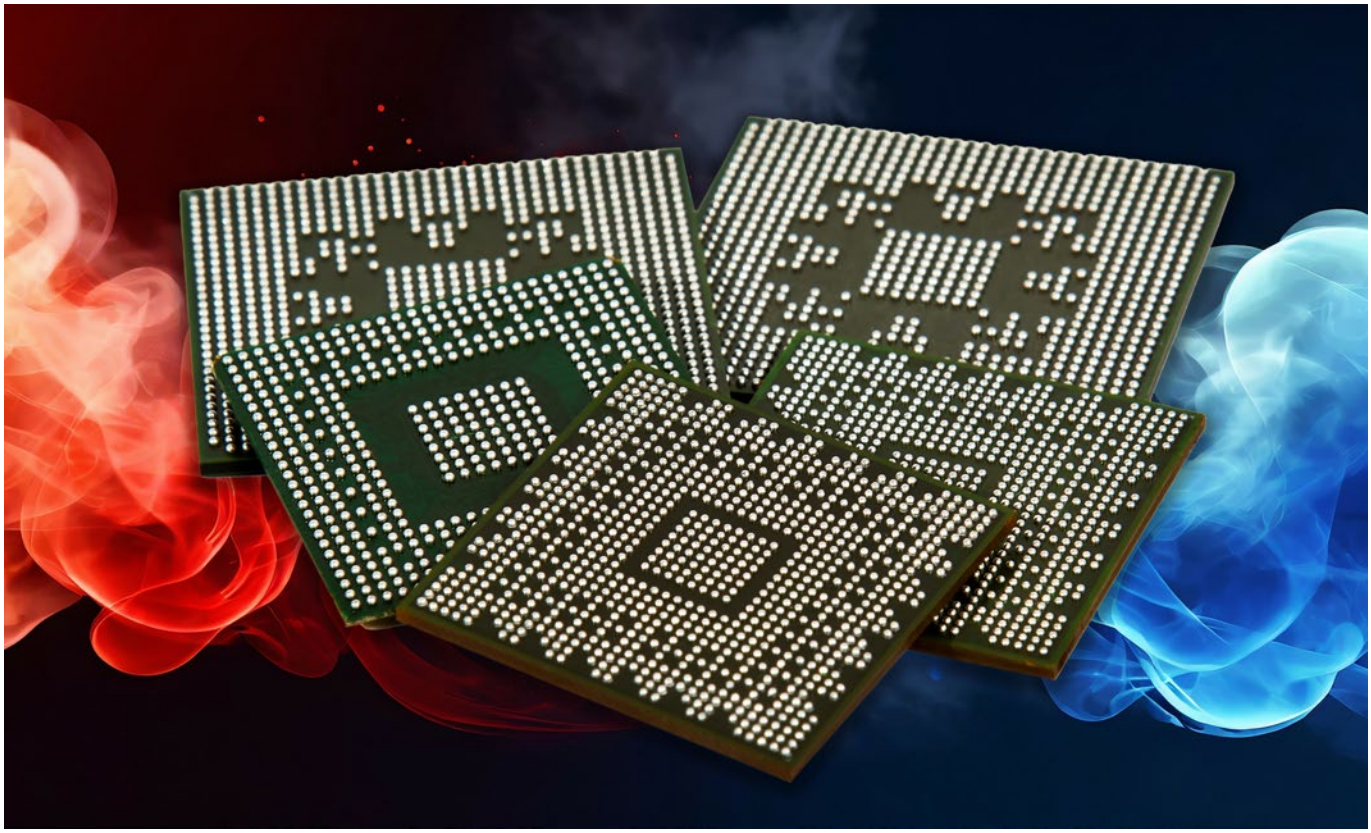
Chinese and American businesses operate with a global outlook, seeking opportunities beyond their domestic markets. American companies have a history of international expansion and leveraging their brand recognition and expertise to establish a presence in global markets. This global mindset is supported by a robust infrastructure for international trade, finance, and communication.

Chinese businesses have increasingly adopted a global perspective, driven by government projects such as the Belt and Road Initiative, and the growing influence of Chinese companies on the world stage. Chinese firms are investing in overseas markets, acquiring foreign companies, and forming strategic alliances to expand their global footprint. Both cultures understand the importance of globalization in driving growth and competitiveness.

In the end, while there are distinct differences between Chinese and American business practices, the similarities are both striking and significant. Both cultures emphasize the importance of relationships, long-term partnerships, strategic negotiation, strong leadership, adaptability, innovation, customer-centricity, and a global outlook.

These shared values and practices provide a foundation for mutual understanding and collaboration in an increasingly interconnected world. Recognizing and leveraging these commonalities can enhance business interactions, foster cooperation, and drive shared success between Chinese and American enterprises. The more we understand and appreciate these similarities, the more we can take advantage of them by working more closely in the spirit of good global citizenship. **SMT007**

Tom Yang is CEO of CEE PCB. To read past columns, click here.



Reliability Comparisons of FPBGA Assemblies Under Hot/Cold Biased Thermal Cycle

Article by Thomas Sanders, Seth Gordon, and Reza Ghaffarian
JET PROPULSION LABORATORY, CALIFORNIA INSTITUTE OF TECHNOLOGY, PASADENA, CALIFORNIA

Current trends in microelectronic packaging technologies continue in the direction of smaller, lighter, and higher density packages. The telecommunications industry and particularly mobile/portable devices have a strong need for lighter and smaller products. The current emerging advanced packaging (AP) technologies, including system-in-package (SiP) and 2.5D/3D stacked packaging, added another level of complexity and challenges for implementation. The AP covers a set of innovative technologies that package integrated circuits (ICs) to increase functionality, improve performance, and provide added value[1]. In contrast, traditional packaging methods cover different I/O density and I/O pitch depending on the targeted application's requirements, performance, and cost. The AP with heterogeneous integration added additional thermal challenges compared to a single die package[2].

For single-die packaging technologies, the density requirement led to a progression in ball-grid-array (BGA) packaging technologies implemented in early 2000. With increased I/O density and decreased package size, the new generation of fine pitch BGA (FPBGA) packages, such as chip scale packages (CSPs) are introduced. A variety of studies have been conducted examining the reliability of printed circuit board assemblies (PCBAs) using BGAs and FPBGAs[3-6]. Recently, a guideline on BGA and die size BGA (DSBGA) was released for

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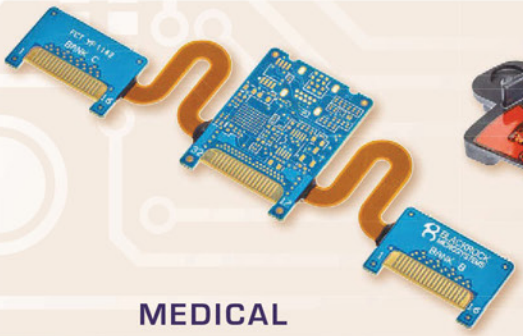

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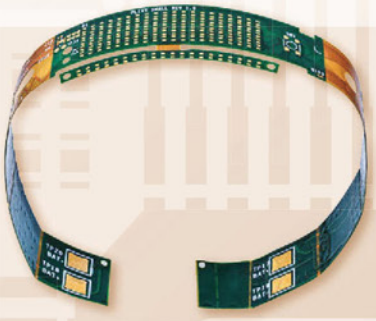

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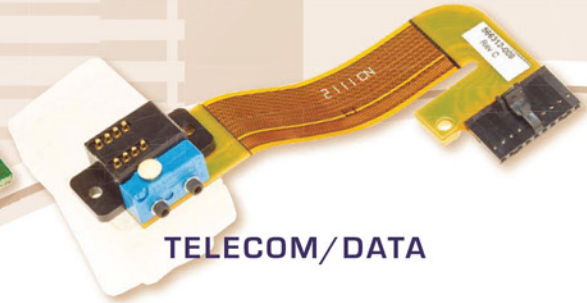

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high-reliability applications with consideration of various environmental requirements for a number of NASA mission applications[7]. There are significant thermal cycle (TC) test data in the range of -55°C and 125°C, or lower TC ranges, for commercial and even high-reliability applications, which is covered by IPC 9701[8].

However, thermal cycle test results under extreme cold and cryogenic conditions, representative of deep-space mission applications, is rare. Tudryn et al.[9], presented detailed thermal cycle evaluation for Martian environment including die attachment with wire bonds. Recently, Ghaffarian[10] and Ghaffarian et al[11] compared the low temperature thermal cycles, including -110°C to 20°C for SnPb solder assemblies. The test results covered surface mount technology (SMT) packages including column grid array (CGA) to hand-soldered plated through-hole (PTH) ceramic pin grid array (PGA) assemblies.

At IPC APEX EXPO 2022, the effect of burn-in at two temperatures was presented for a numerous FPGA package presented for FPBGA assemblies under hot-biased thermal cycle in the range of -40°C and 105°C[12]. In the current research, the cold-biased thermal shock cycles over the temperature range of -105°C to +40°C were performed for SnPb solder joint FPBGA assemblies. The cold-biased cycle has the same overall ΔT of 145°C with reversing the high and low temperature dwells. Cycles-to-failures after 3,000 with Weibull plots are compared for hot/cold-biased cycles for CTBGA228 since there were no failures of CABGA208 to 3,000 cycles. Optical microsection with 3D X-ray failure analyses are also presented.

Experimental Methods SnPb FPBGAs

FPBGAs and PCBAs

Several FPBGAs, LGAs, and resistor parts were considered for SnPb temperature assembly and thermal cycle reliability evaluation. The daisy-chains FPGAs were:

1. Very Thin Chip Array® ball grid array with 208 balls (CABGA208)
2. Thin core ball grid array with 228 balls (CTBGA228)
3. Very thin chip array with 360 balls (CVBGA360)

Pitches were 0.8, 0.5, and 0.4 mm, respectively.

The test vehicle was designed to accommodate a number of daisy-chain FPBGAs and other components while providing experimental flexibility. Each test PCB uses the FR-4 substrate material, allowing for easy data comparisons, and is 0.91-inch thick. There are 16 individual zones, each of which can be separated easily for analysis and which contains its own individual pads for probing electrical. Fourteen zones are dedicated for FPBGAs and and LGAs, with the remaining two allocated for smaller components.

The test matrix included different solder balls and solder paste alloys, but this work evaluated a subset of FPGAs with SbPb solder balls and reflowed using SnPb solder paste. Reflow was performed using a convection reflow oven with 10 heating and three cooling zones. For SnPb solder paste reflow, direct ramp to 206˚C at 0.75˚C/ and -1.4˚C/s cooling rate (Figure 1) were used. All assemblies were inspected via 2D X-ray to assess the quality of the solder joints prior to environmental exposures.

The basic process flows used for test vehicle assembly and evaluation prior to testing were:

1. Solder paste printing (Eutectic SnPb) over the printed circuit board
2. Component placement
3. Solder reflow
4. Perform daisy-chain verification and 2D X-ray inspection
5. Select those specified for thermal cycling exposures

Figure 2 shows a test PCBA covering various packaging styles on the right. On the left

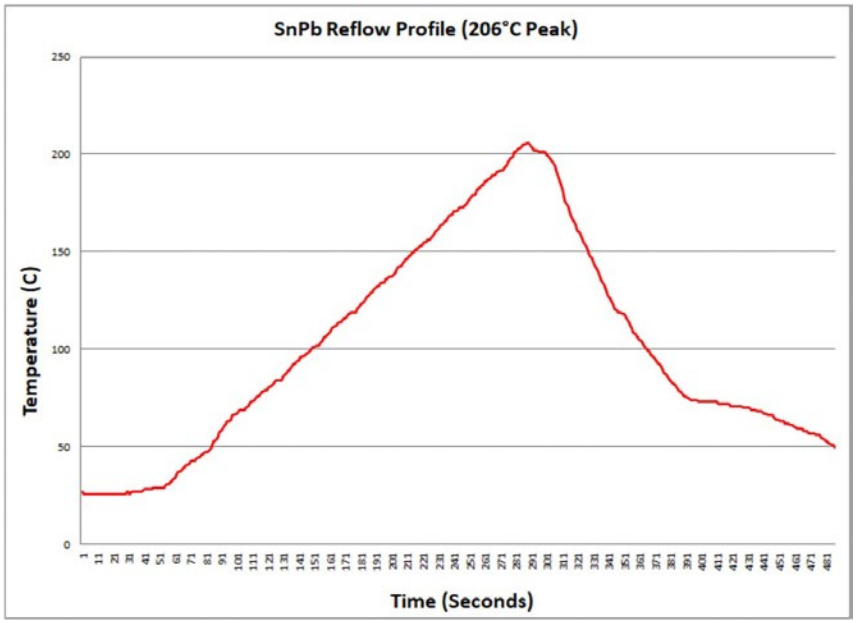

Figure 1: Reflow for SnPb assembly: direct ramp to 206˚C at 0.75˚C/s and -1.4˚C/s cooling rate.

is an enlarged image showing the lands, daisy-chain pattern, and probing pads in one of the CTBGA228 zones.

Environmental Testing

In previous testing, eight[12] test vehicles with two different burn-in conditions were subjected to accelerated hot-biased thermal cycle (-40°C and 105°C, with 15-minute dwells) testing in order to evaluate the solder-joint reliability. During thermal cycling, an event detector was used to detect resistance spikes that exceeded 500 ohms and 200 nanoseconds, per IPC 9701[8], thus capturing solder joint failures. For the current test, three identical SnPb test vehicles were subjected to cold-biased air-to-air thermal shock testing with hot and cold zone, which TVs shuttle between the two zones as shown in Figure 3.

Figure 4 shows cold-biased thermal shock profile that was performed over the temperature range of -105°C to +40°C with seven-minute dwells and >100°C/min ramp rates. This temperature range has the same overall ΔT of 145°C, while reversing the high and low temperature limits with respect to the hot-biased version. Three thousand cycles were performed on FPBGA assemblies before failure analyses. The resistance of each channel (i.e. zone) was measured every 10 seconds using a data acquisition unit during testing. In-situ resistance measurements were taken during thermal cycling to detect any component experiencing a change in resistance +/-20% from the nominal reading, which was considered a failure. Also, hand-probed

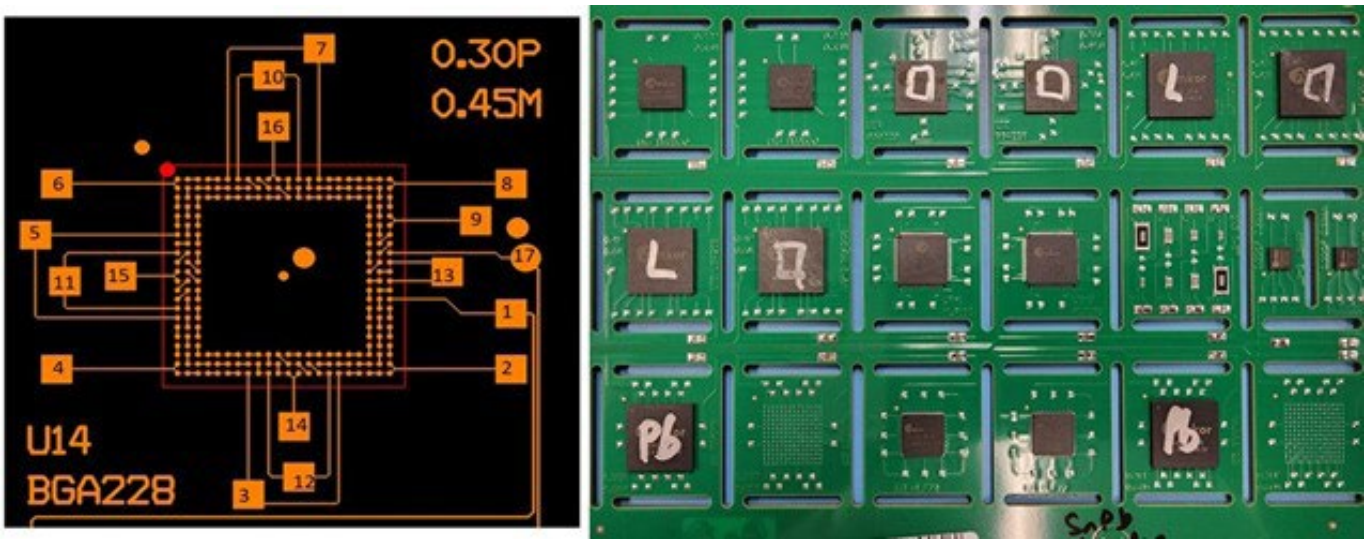

Figure 2: CTBGA228 land pattern and daisy-chain (left) and top-down view of an assembly (right).

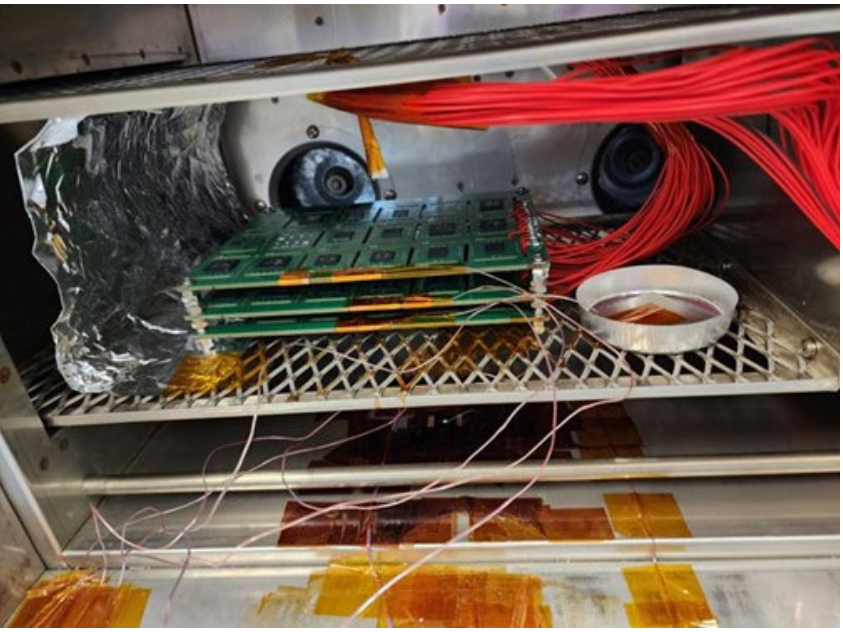

Figure 3: A photo of thermal shock cycle chamber for cold-biased TC with hot/cold zones and monitoring equipment.

resistance values were also taken before testing and at key points between sets of thermal cycles for each channel.

In addition, sample FPBGAs were sectioned from the test vehicles pre- and post-thermal cycling. These components were used for a combination of non-destructive 3D X-ray and destructive micro-sectional analyses. Non-destructive 3D X-ray was first performed to determine if cracking conditions could be identified for subsequent destructive analysis by micro-sectioning. 3D X-ray virtual cross-sections were compared to optical images of the physically destructive micro-sections. In addition, a comparison of the 3D X-ray "images" before and after 3,000 cycles was performed for the CTBGA 228 component.

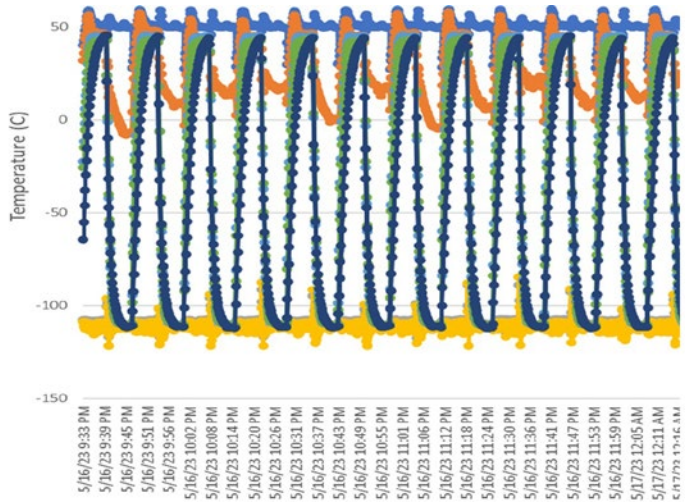

Figure 4: A representative profile of cold-biased thermal shock cycle (–105°C to 40°C).

Test Results and Discussion

Thermal Cycle Results: As received/burn-in SnPb BGA228 assemblies

Three FPBGA assemblies completed 3,000 cold-biased thermal cycles (-105°C and +40°C). Each assembly had four BGA196, four BGA208, two BGA228, two BGA360, two LGA97, two MLF100, two MLF72, and SMRs. Figure 5 shows resistance continuous monitoring for CABGA208 and CTBGA228 assemblies up to 3,000 biased thermal cycles. As apparent, there were no failures of CABGA208 to 3,000 cycles; therefore, the biased hot/cold failure cycles could not be compared to previous CTF result presented for CAB208[12].

However, as shown in the monitoring plots, there were two failures for CTBGA228, one at 2,128 and the other at 2,372 cycles. This allowed us to generate a qualitative comparison with the hot-biased thermal cycle (-45°C and +105°C) results. Resistance monitoring test results clearly indicate that once failure initiated, within less than 10% CTFs and with 10 consecutive cycles, resistance increases more than 20% as required by IPC 9701.

Figures 6 shows the qualitative comparison of Weibull data plots for cycles-to-failure for the CTBGA228 under hot/cold-biased conditions, each a separate test (-40°C/+105°C and –105°C/+40°C), respectively. Testing to the extreme low temperature showed higher CTFs. With limited sample size, especially for the cold-bised case, it is difficult to draw a conclusion, but it could be stated that possibly

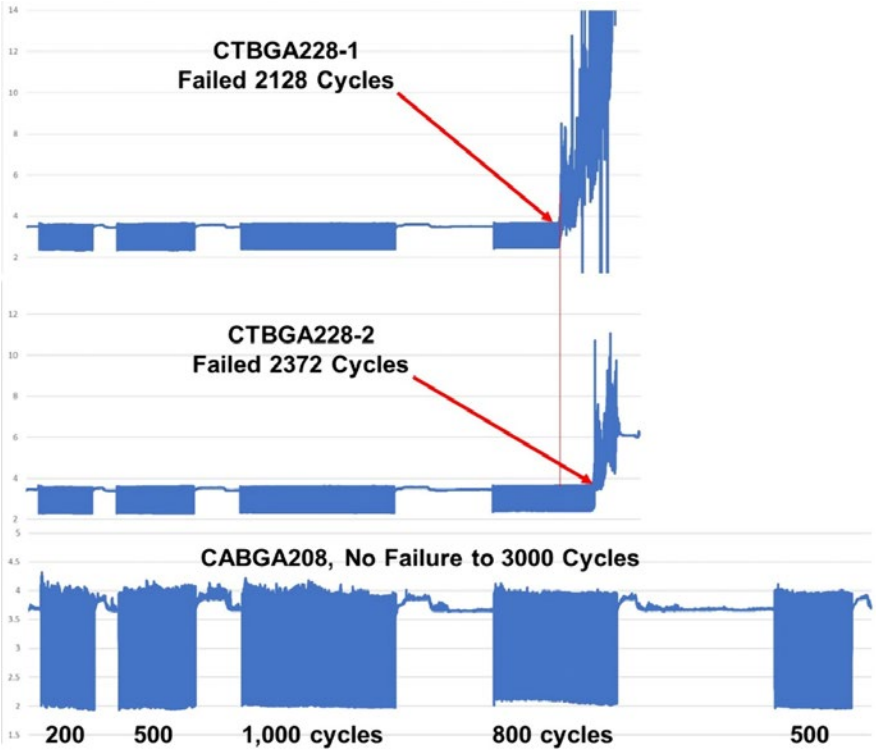

Figure 5: Resistance monitoring graphs with two failures for CTBGAs and no-failure for CABGA208.

the chance of an early failure increases with an increase in extreme hot temperature.

Failure Analysis

The latest version of IPC-9701[8] section 6.2, is dedicated to failure analysis and procedures. As is normal, IPC-9701 categorizes failure analysis methods into non-destructive techniques such as electrical probing, visual inspection, X-ray analysis, and C-mode scanning acoustic microscopy (CSAM), and destructive techniques such as microsectioning (IPC 9241) and dye-and-pull (IPC-TM-650 Method 2.4.53). As emphasized by the standard, failure analysis should always begin by using non-destructive methods, with destructive analysis techniques only brought to bear later. The exact selection of non-destructive and destructive techniques will vary depending on the specific assembly design and configuration. In terms of destructive FA techniques, dye-and-pull provides an easy method to find the general location of failed solder joint(s) within a package. However, it does not provide detailed information regarding failure mechanism and mode. Cross-sectioning can provide more details about the failure mode, as well as the location of failure within a solder joint.

For this test, in addition to continuous daisy-chain resistance monitoring, computed tomography (CT) and failure analyses (FA) were performed. CT was performed on a failed BGA228 to determine the location of the failure before performing destructive analysis. Dye-and-pry and cross-sectioning were then performed at these locations to further visualize the location of fracture interface in a sectioned plane. Figure 7 shows the location of interest based on the CT images (area of interest found to be in the middle row of solder balls).

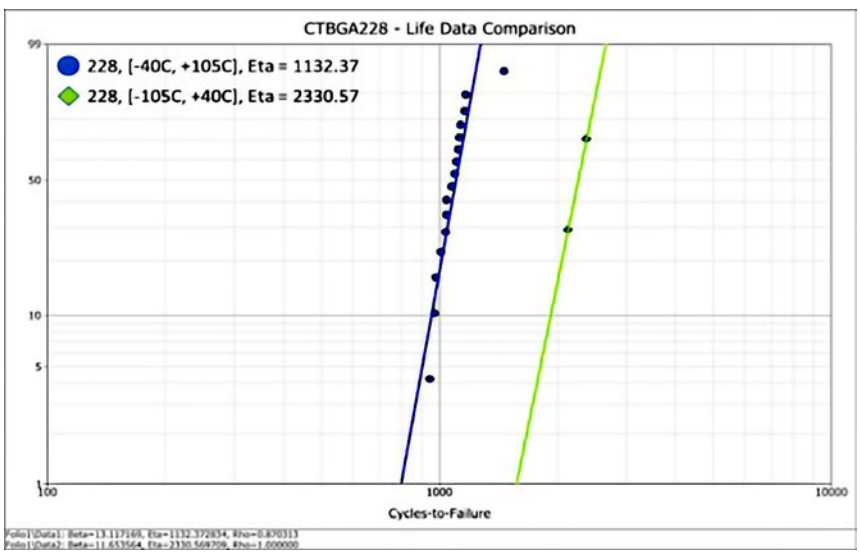

Figure 6: Weibull Comparison of CTBGA228 for [-40°C+105°C] and [-105°C,+40°C].

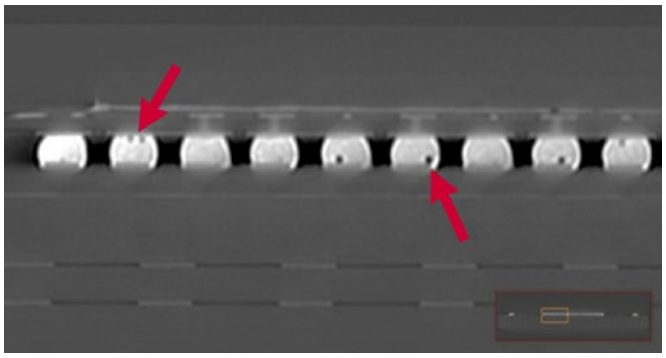

Figure 7: CT image of area of interest for failed CTBGA228.

Figure 8 shows an overall cross-section image of the same location presented by CT scan. It presents one failed CTBGA228, which showed signs of failure initiation at 2,188 cycles. Failed CTBGA assembly separated and submitted for cross-section and dye-and-pry analysis. Cross-section along the edge of the device did not show major anomalies in the interconnect anywhere along the outer row. Dye-and-pry analysis revealed significant solder ball disconnects, specifically in the middle and inner rows of the BGA. Following the results of dye-and-pry, a second cross-section plane was performed on the second row of the CTBGA228. Most of the solder balls on the second plane cross-section exhibited near-complete cracking through the solder ball.

A failed CABGA208 SnPb assembly was evaluated by micro-sectioning for further failure verification, which failure was established by continuous daisy-chain resistance monitoring. Figure 9 shows a typical shear failure for an "As Received" condition that showed a fine, straight crack path at the package side. Crack initiated at the balls under the corner die edges that are shown to be the most susceptible to cracking due to the highest CTE mismatches.

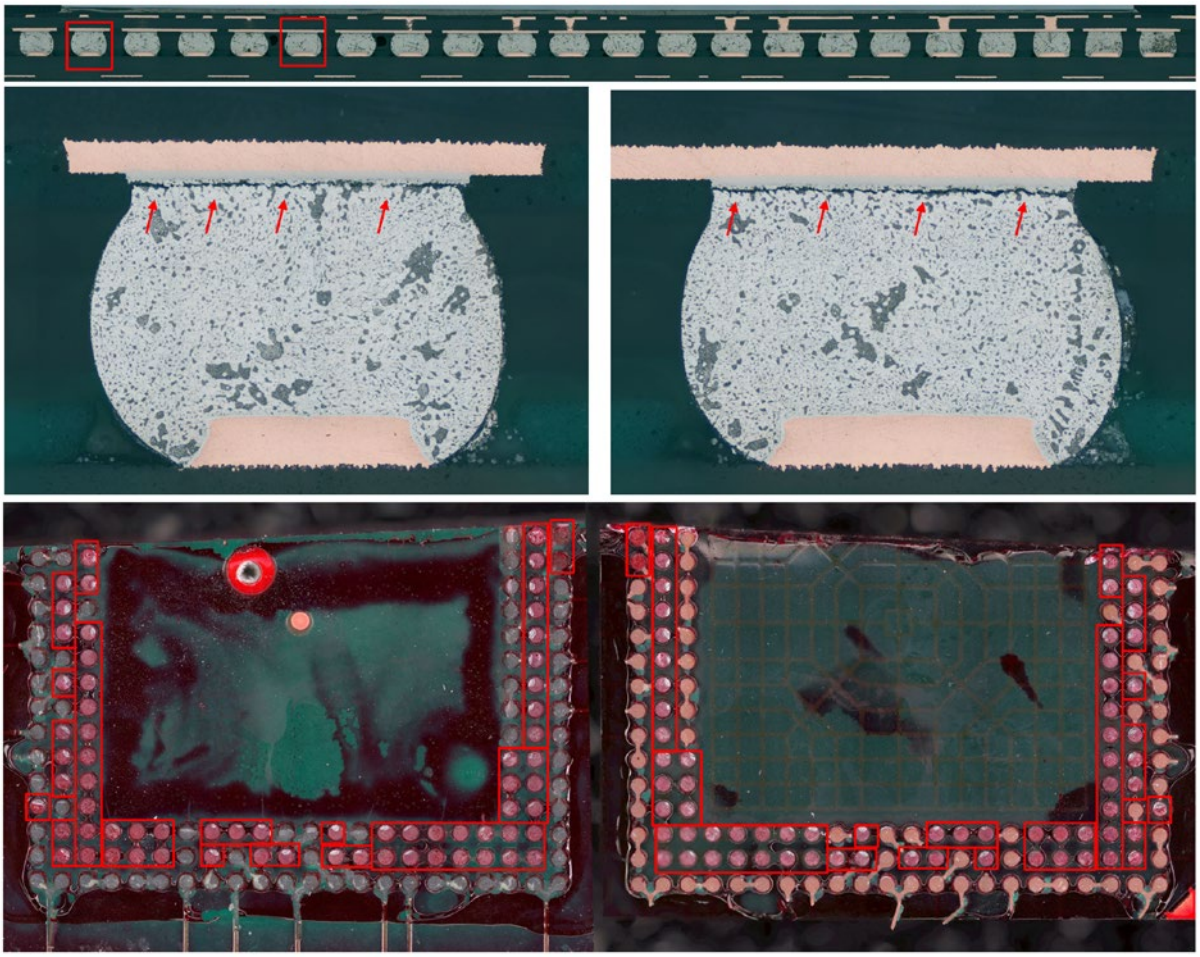

Figure 8: Cross-section and dye-and-pry images for CTBGA228 assembly at 3,000 biased cold TCs, which failed at 2188. Failures were in solder and at the package side.

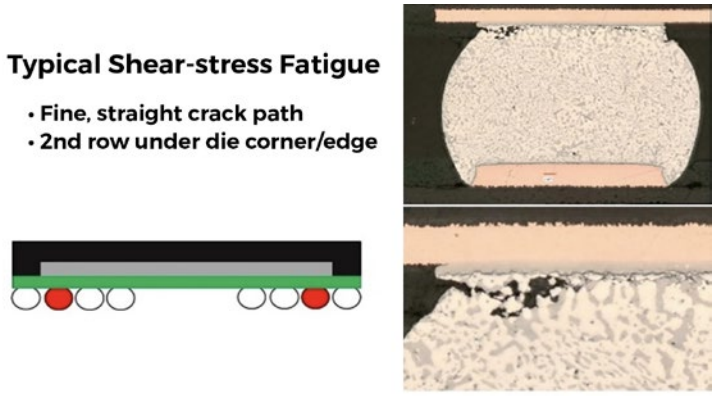

Figure 9: A typical shear failure for SbPb CABGA208 showing fine, straight crack path at the package side.

Discussion

Although 3,000 cold-biased thermal shock cycles were performed, relatively few failures were observed in the package daisy-chain resistance data. Comparing the CTFs of CTBGA228 under cold-biased cycles, they failed at much higher than CTFs under hot-biased conditions. A Norris and Landzberg relationship[13], even though not applicable for cold-biased thermal cycled condition, it projects an AF ~2.9 times, which somewhat predicts the increase in the CTFs.

Joint failures in the CTBGA228 package appear to be highest in the second row of solder joints, presumably due to being near the high-stress region associated with the edge of the silicon die shadow. The observed failure mode for solder joints in the cold-biased test is cracking along the intermetallic compound (IMC) boundary with the bulk solder. This failure mode is in common with previous results for hot-biased thermal cycling of the same package. However, closer examination of representative solder joints from the cold-biased and hot-biased test groups does reveal key differences. Specifically, due to the high temperatures experienced during thermal cycling, solder joints from the hot-biased group exhibit more grain coarsening. Also, crack initiation can be seen within the bulk solder in the near-intermetallic compound region in some joints. Solder joint graininess and crack initiation of this type is not seen in the joints subjected to cold-biased thermal cycling. Although not the dominant mode, this secondary failure mode, which relies on thermally-driven grain growth, appears exclusive to hot-biased thermal cycling.

Conclusions

This paper presented details on the effect of cold extreme temperature cycle (-105°C to +40°C) when compared to the inverse hot extreme (-40°C to +105°C) for several advanced FPBGAs with SnPb solder assemblies. Cold-biased thermal shock cycle was representative of deep-space missions; however, in highly accelerated rapid rate and low dwell time conditions. Key findings are summarized below.

- Cycles-to-failures under cold-biased thermal cycles were about twice longer than those under hot-biased conditions. CABGA208, which previously showed failure under hot-biased TC, did not fail under cold-biased TC; therefore, CTFs for CTBGA228 were compared for CTFs.
- The 3D X-ray could not clearly identify the location of failures. Micro-sectional evaluation, however, indicates that failures under both cold- and hot-biased conditions are in solder joint at the package side with hot-biased showing higher grain growth. Failures were from the edge of the die for both cases as well.
- Even though it is known that Norris Landzberg relationship for solder joint is not applicable for cold-biased thermal cycle conditions, nevertheless it projects an AF of about three times of (cold-biased)/(hot-biased) CTFs whereas the limited test data shows an AF of about two times.

The lessons learned and qualification guidelines presented allow testing under highly

accelerated thermal cycles for narrowing applicability of newly advanced electronic packaging technologies for high-reliability applications.

Acknowledgments

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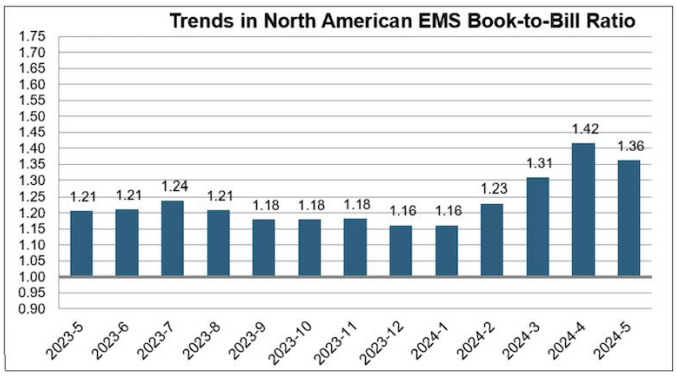
TOP TEN

EDITOR'S PICKS

North American EMS Industry Up 5% in May

Total North American EMS shipments in May 2024 were up 5.0 percent compared to the same month last year. Compared to the preceding month, May shipments increased 3.7 percent. Book-to-bill stands at 1.36.



KYZEN Welcomes Michael McCutchen as Director of Global Sales


Michael McCutchen

McCutchen previously served as KYZEN's Co-Global Product Line Manager for electronics and returns to KYZEN after several years as a business development specialist with Plasmatreat.

New IPC Europe Report, Advocacy Campaign

In June, IPC published a new study on the next steps needed to reinforce the European electronics value chain "from silicon to systems." Also, IPC and leading European electronics manufacturers will launch a fresh advocacy campaign on these issues.

Career Opportunities Are Knocking

Finding and keeping qualified employees is continually cited as one of today's greatest business challenges. That's why I-Connect007 features Career Opportunities in every issue and on our jobCONNECT007 web page.

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New Breakthrough in Double-Sided Reflow Part Retention from Alltemated

Alltemated's PLACE-N-BOND™ underfilm passed testing and was implemented in volume production to aid in component retention during the second pass reflow of printed circuit assemblies. This successful testing and implementation occurred in various applications with components such as capacitors, inductors, transformers, connectors, and larger ICs.

Banking Electronic Chips for the Next Boom (or Bust)

Many companies—particularly those that build critical equipment like medical, military, industrial controls, and automotive—are now considering how they can protect themselves from future vulnerability. They experienced serious chip shortages and want to ensure a reliable, ready supply at a reasonable price without tying up capital.

ROCKA Solutions Continues Expansion in Brazil with New Location in Manaus

Having expanded into Brazil earlier this year with a location in São Paulo, ROCKA is pleased to announce an upcoming second location in Manaus, key to the global growth strategy.

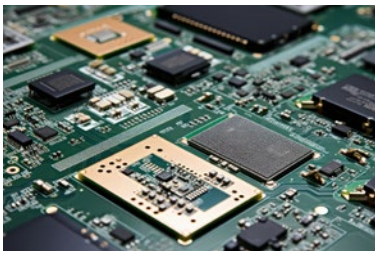
BTU International Appoints E-Tronix as Its Representative in Six States

E-Tronix will be responsible for promoting and selling BTU International's thermal processing equipment. Their team of experts will also provide localized technical support and service, ensuring that BTU's customers receive the highest level of support and expertise in North Dakota, South Dakota, Minnesota, Iowa, Wisconsin, and Illinois.

EMS Market Size to Grow $735,390 Million by 2030 at a CAGR of 4.8%

The expansion of consumer electronics, automotive electronics, and industrial automation is driving the steady growth of the Electronics Manufacturing Services (EMS) market. The Electronics Manufacturing Services (EMS) Market was estimated to be worth $509100 million in 2023 and is forecast to a readjusted size of $735390 million by 2030 with a CAGR of 4.8% during the forecast period 2024-2030.

Counterfeit Detection Course: It's the Real Deal



Anthony (Tony) Bryant is a trained expert in component counterfeiting techniques who has been collaborating with IPC on a new intermediate-level course on counterfeits.

Find Industry-experienced Candidates at jobConnect007

For just $975, your 200-word, full-column ad will appear in the Career Opportunities section of all three of our monthly magazines, reaching circuit board designers, fabricators, assemblers, OEMs, suppliers and the academic community.

In addition, your ad will:

- be featured in at least one of our newsletters
- appear on our jobConnect007.com board, which is promoted in every newsletter
- appear in our monthly Careers Guide, emailed to 26,000 potential candidates

Potential candidates can click on your ad and submit a resume directly to the email address you provide, or be directed to the URL of your choice.

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Contact barb@iconnect007.com to get your ad posted today!

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GOOD FOR THE INDUSTRY

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Career Opportunities

all4-PCB®
NORTH AMERICA

Capital Equipment Sales Go-getter

all4-PCB is a well-established distributor that represents a wide range of manufacturing equipment for the printed circuit board manufacturing and chemical milling industries, as well as other high-tech markets.

Looking for a self-driven, dynamic, high energy, results-focused, well-organized sales personality—a closer. Ideal candidate is a fast learner, can retain a lot of information, and understands that selling machines is about selling a process solution to a customer.

A sales-driven personality with a high level of interest in and aptitude for learning about technology can be a star performer. The target market wants consultative selling addressing customer needs.

The sales process includes all means of customer prospecting with up to 50% travel expected. Generating quotations, clarifying commercial and technical details/expectations between customers and the international equipment supply partners, negotiations, sales closing, and the required follow-up work are all part of this role. The sales territory is the U.S. & Canada.

This technical sales representative position can be located in either all4-PCB's Glendale, Calif., office or remotely in an area with a higher concentration of potential accounts.

This role is ideal for applicants interested in a position that provides extensive international exposure, a generous commission system, and freedom to get things done in a small, yet professional, business environment.

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VGTPCB Inc.

General Manager

VGTPCB Inc. is seeking a full-time general manager for its Santa Clara, Calif., office.

Responsibilities:

- Develop and lead the company's strategic development directions in both domestic and international markets
- Independently manage a business/sales division directed at sales efforts in the U.S.
- Present business operation standings to management; present monthly, quarterly, and annual reports to the board, vice presidents, and president
- Make and implement management policies, and promote policies among all internal business divisions and company leadership
- Create and maintain unique company culture to promote great work performances
- Develop and improve the company's human resources evaluation processes and promotion policies

Requirements:

- Master's degree (or foreign equivalent) in Business Administration, Management or related.
- 24 months of experience in the position offered or any occupation related to job offered.
- Any experience with:Business intelligence and data analysis software such as IBM Cognos Impromptu, Salesforce software, Oracle Business Intelligence, and Qlik Tech QlikView; Database user interface and query software; LinkedIn; Enterprise resource planning ERP software such as Oracle PeopleSoft Human Capital Management.

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Career Opportunities

schmoll america

Service Engineer

Join the Schmoll America Team as a Service Engineer—Where Innovation Meets Customer Excellence!

Are you a technical mastermind with a passion for solving complex problems and delivering exceptional customer experiences? Look no further than Schmoll America!

As a Service Engineer, you'll be the driving force behind our customers' success, providing top-notch technical support and maintenance services for our PCB industry-leading equipment.

What you'll do:

- Install, commission, and maintain Schmoll equipment at customer sites
- Troubleshoot and repair equipment with ease and precision
- Provide technical training and tailored applications solutions to customers

What we offer:

- A dynamic and supportive work environment where your voice matters
- Opportunities for professional growth and development in a cutting-edge industry
- A competitive salary and benefits package
- The satisfaction of knowing you're making a real difference in our customers' lives

What we're looking for:

- Engineering degree preferred
- 3+ years of experience in an engineering role
- Strong technical knowledge of electrical and mechanical systems
- Excellent problem-solving and analytical skills
- Willingness to travel (up to 75%) to customer sites and HQ in Germany

If you're a motivated professional looking for a challenging and rewarding role, we want to hear from you! Please submit your resume and cover letter to HR@SchmollAmerica.com.

apply now

TAIYO AMERICA

Europe Technical Sales Engineer

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

PRIMARY FUNCTION:

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

ESSENTIAL DUTIES:

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

QUALIFICATIONS / SKILLS:

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

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

apply now

Career Opportunities

The Test Connection, Inc.

Sr. Test Engineer (STE-MD)

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

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

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

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

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The Test Connection, Inc.

Rewarding Careers

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

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

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

Associate Electronics Technician/ Engineer (ATE-MD)

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

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

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Career Opportunities

BLACKFOX
Premier Training & Certification

IPC Instructor
Longmont, CO

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

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

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

Salary: Starting at $30 per hour depending on experience

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

Schedule: Monday thru Friday, 8–5

Experience: Electronics Manufacturing: 5+ years (Required)

License/Certification: IPC Certification–Preferred, Not Required

Willingness to travel: 25% (Required)

apply now

Prototron Circuits

Sales Representatives

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

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

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

apply now

Career Opportunities

ARLON ELECTRONIC MATERIALS

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

- **Engineering**
- **Quality**
- **Various Manufacturing**

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

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

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

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

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INSULECTRO

Are You Our Next Superstar?!

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

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

apply now

Career Opportunities

MivaTek Global

Field Service Technician

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

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

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

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

More About Us

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

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eptac

TRAIN. WORK SMARTER. SUCCEED.

Become a Certified IPC Master Instructor

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

Qualifications and skills

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

Benefits

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

apply now

Career Opportunities

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

CAD/CAM Engineer

Summary of Functions

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

Essential Duties and Responsibilities

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

Organizational Relationship

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

Qualifications

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

Physical Demands

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

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PODCAST! Designing for Reality with ASC Sunstone

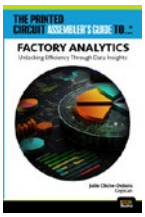
VP/manager and published author Matt Stevenson talks about the specifics that can affect your circuit board during the manufacturing process. Part tutorial, part tips and tricks, Stevenson details the interrelationships between design, fabrication, yields and cost optimization.

I-007eBooks

Low Temperature Soldering, Volume 2

by Morgana Ribas, Ph.D., et al., MacDermid Alpha Electronics Solutions

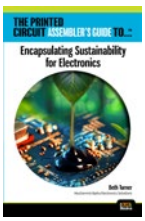
Since the first volume of The Printed Circuit Assembler's Guide to...™ Low-temperature Soldering was published over five years ago, considerable changes have occurred in the low-temperature soldering landscape. Here, the authors review the evolution of solder alloys from traditional eutectic SnBi solder to the fourth-generation HRL3 low-temperature solders. Read about innovations and challenges for achieving optimal processing with low-temp solder pastes, as well as what's next in LTS.



Factory Analytics: Unlocking Efficiency Through Data Insights

by Julie Cliche-Dubois, Cogiscan

Using and understanding factory analytics is the future for electronics manufacturers. Those who strategically prioritize analytics and properly leverage the insights generated throughout their entire operation systematically will stand the test of time. In this fast-changing, deeply competitive, and margin-tight industry, factory analytics can be the key to unlocking untapped improvements to guarantee a thriving business.



Encapsulating Sustainability for Electronics

by Beth Turner, MacDermid Alpha Electronics Solutions

This is a guide to encapsulation resins and their use in ruggedizing electronics. Learn about aspects such as their chemistry, application, and relevant test methods in different industries. The book also discusses the growing demand for sustainable solutions in the market and highlights examples of bio-based resins and the demand from emerging technologies.

Process Control

by Chris Hunt and Graham K. Naisbitt, GEN3

In this book, the authors examine the role of SEC test and how it is used in maintaining process control and support for objective evidence (OE.) Issues, including solution choices, solution sensitivities, and test duration are explored.

Manufacturing Driven Design

by Max Clark, Siemens

This book introduces a new process workflow for optimizing your design called Manufacturing Driven Design (MDD) and is a distinct evolution from DFM. Manufacturing certainly plays a critical role in this process change, and manufacturers do certainly benefit from the improved process, but it is design teams that ultimately own their overall product workflow; they are the ones who need to drive this shift. **Get empowered now!**

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