

# FLEX007

A SPECIAL DESIGN007 MAGAZINE SECTION

## Flexible Circuit Technologies Offers a **Flex Roadmap** for the Future

### Interview by I-Connect007 Editorial Team

Andy Shaughnessy and Happy Holden recently spoke with two flex experts from Flexible Circuit Technologies: Carey Burkett, vice president of business development, and Mark Finstad, senior application engineer. They discussed their views on the future of the company and flex and rigid-flex technology, as well as the need for more flex training and educational opportunities.

**Andy Shaughnessy:** Carey, start by giving us a big picture view looking down the road for FCT, and then Mark can talk in more detail about the technology.

**Carey Burkett:** Flexible Circuit Technologies (FCT) has grown over the past five years, and we believe that trend will continue given the growing needs across all markets for the products and services that we offer. We provide design support services and produce flexible circuits, rigid-flex, flexible heaters, membrane switches, and plastic components. We offer expertise in EMS assembly services on flex and rigid-flex in producing assemblies, and take things further for our customers with product module builds all the way to complete product box builds.

Our optimism for continued growth has to do with the market drivers that we see across almost every industry. These trends include





Carey Burkett

miniaturization, IoT and connectivity, mobility, wearables, and requirements for high-speed data and increased signal integrity. These trends are also driving product designers toward the products and services that we offer.

For example, due to miniaturization, product development engineers are often required to pack more electronic capability into the same space or smaller spaces; this can lead to requirements for flex and/or rigid-flex circuits. Further IoT, connectivity, and high-speed data requirements across many industries are driving added needs. Beyond that, you have growing needs for devices based on mobility needs and, further, many wearable applications for a broad range of products. These trends continue to lead engineers to the types of solutions that we provide.

Another trend that we have responded to relates to customers moving from a transactional supply chain to a more value-added supply chain. Many OEMs are working to narrow their supply chain to a more manageable size. Given this trend, we have grown far beyond providing bare flexible circuits, rigid-flex, and flexible heaters. Today, as an EMS assembly organization, we offer expertise in assembly on flex, allowing us to meet increased needs

for assemblies. Beyond providing assemblies, customers often seek more. We offer plastic components for our customers; again, we perform product module builds to complete product box builds.

We were already supporting the design and build of the circuit and assembly that usually becomes the heart of the product or device. It was a natural step to move beyond that to where we provide additional value-added services. We recently added a plastic molding company to our portfolio, as we are often required to attach the assembly to a plastic carrier, or we may be required to input the circuit into plastic housing.

We continue to respond to customer demands. Today, that is evidenced by doing complete product box builds for FDA-registered products. This demonstrates our ability to meet the robust quality and traceability requirements that these programs demand.

Our headquarters is located in the Minneapolis, Minnesota, area, and all of our production facilities are located in Asia. In Minneapolis, we recently partnered with a local company, HSIO. HSIO offers expertise in advanced high-performing circuits. They are continuously performing R&D as they push the envelope relating to advanced circuits, and they also perform prototyping to smaller-scale production for their customers. We are leveraging them as an R&D group and attaining learnings from HSIO that can be applied to our production facilities in efforts to take a significant leap forward in our capabilities as they relate to supporting customers with advanced, high-performing circuit requirements.

This relationship is very important, as we are in the process of building a new state of the art production facility in Zhuhai, China. Our new facility will include the very latest in industry equipment, and we will also leverage our learnings from HSIO as we seek to meet the increased demand for advanced circuits that require tighter trace and space, more complex via structures, improved signal integrity, and more. We are extremely excited about our technical direction and look forward to the opening of our new facility in the spring of 2021.

**Shaughnessy:** Where do you see your technology moving in the future?

**Mark Finstad:** We see a lot of high-speed requirements. That has become a significant driver when people are selecting vendors. To support these high-speed applications, our new facility will be set up to process high-speed, low-loss materials, such as LCP and PTFE. A lot of the equipment we purchased will cater to processing those different kinds of high-speed materials.

I haven't seen devices getting a lot smaller because everything has already been shrunk to where it's almost too hard to handle. But now they're just trying to put 10 times more functionality into the same sized package. What that means to us is that even though the circuit may not be getting smaller, all of the features in that circuit are getting smaller. The challenge is to be able to do that in high volume and in a good yield.

**Shaughnessy:** Do you see more people who are being squeezed into having to use flex for the first time? I see some companies switching to flex because rigid boards won't fit in the application anymore.

**Finstad:** In reality, most flex circuits aren't replacing the rigid boards; they're replacing wires, wiring harnesses, and cable assemblies. Many customers find that they are running out of room for discrete wires because they take up a lot of space. They also find that wiring harnesses can have wiring errors and can be hard to assemble. Flex ends up being a lot more reliable, and it takes up a fraction of the volume with much lower mass. It's just a much neater, more reliable package when you're all done.

**Burkett:** Absolutely. We see many companies being driven to these solutions, given the trends mentioned earlier. Often, engineers and designers do not have extensive experience in using these solutions, and there is a lack of true expertise in the supply base. Typically, customers and prospects come to FCT to obtain design consultation and guidance. We also are doing



Mark Finstad

many educational webinars for customers and prospects in support of their efforts.

**Shaughnessy:** Do you get a lot of the new designers who have been designing rigid for 30 years and find they have to design their first flex circuit? Do they ask you what to do?

**Burkett:** We do. Typically, engineers seek guidance in the design phase. We encourage customers and prospects to seek design support as early on in the process as possible. Attaining experienced design consultation is where customers can gain significant savings, including cutting down the number of revisions to get to the final solution and attaining true cost-effective designs that will perform properly within the given application.

Given the rapid growth in the need for flexible circuits and rigid-flex, it has created a limited pool of true experts that can support customers with design expertise. Mark is our director of application engineering and co-chairs the IPC-2223 Flexible Circuit Design Committee; he is one of the top experts on the globe. Mark, along with our team of application engineers and our CAD team, offers 25–30 years of flex/rigid-flex expertise. Our group of



experts understands the materials, material properties, and what can and cannot be done, and their expertise is incredibly supportive to our customers in guiding them to a cost-effective solution that is manufacturable at higher yields and will perform within the given application. There's no doubt that design support is one of the most critical aspects of what we offer.

**Finstad:** We do a lot of training. I present at PCB West and IPC APEX EXPO every year, and we also do flex design training at a lot of smaller venues. I usually start by telling the class that I have them captive from anywhere from two to four hours, and I hope that they can retain some of what I talk about. But in the end, there's only going to be one person leaving that room as a flex design expert, and that's me. But I will also leave you with a great tool for when you have questions—my business card with my phone number. If you have a question, give me a call.

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I still have customers from my military days who call me and have me review their drawings, even though we can't build the circuits because they're ITAR. I review the drawings and make sure that everything looks good because I don't want bad flex circuit designs out there.

**Happy Holden:** I was going to ask about LCP, but you mentioned that your new facility would focus on LCP and other new materials. Does that also include materials that would be suitable for wearables?

**Finstad:** It will include anything required for high speeds and low loss. That really seems to be the key factor there. I wouldn't steer any-

body toward those materials if they are not required because they are more expensive. Recently, all of the big flex material manufacturers have come out with their own mix of low-loss materials, which laminate at more standard pressures and temperatures, allowing us to use existing equipment. If you look at the performance of these materials compared to thermoplastics, they're actually as good as, if not better than, thermoplastics.

As far as wearables, we have supported projects where we've used stretchable materials. These materials have not gained widespread acceptance in the industry yet, so processing knowledge is limited. We typically work with the customer in a developmental capacity to determine if those types of materials can be used successfully with an application that they might bring forth.

**Holden:** There are also highly flexible solar cells in the wearables so that they won't be burdened down with batteries, or the batteries will be flat printed electronic batteries.

**Burkett:** For wearables, we have addressed applications from head to toe. Certainly, there are added considerations that must be accounted for when designing for specific wearable solutions. We have utilized certain newer materials (i.e., stretchable materials and stretchable inks), and we are also keeping an eye on advancements that are being made within this space so that we can take appropriate steps in support of our customers.

**Holden:** Is the growing area of 3D and printed electronics beginning to be applied as a hybrid between what you're doing traditionally and what they would like to do but can't do yet?

**Finstad:** We do printed electronics, and we've been doing it for decades. Some of our biggest customers are in disposable medical applications for printed electronics. I have one very high-volume disposable medical application right now that uses a regular flex, all polyimide and copper. It's used one time in surgery and then tossed in the garbage.

**Holden:** One company in Michigan makes vitamins and nutrients, as well as cosmetics. A research area is in electrophoretic flexible masks to remove wrinkles; it's just a printed battery in a circuit. Their chemicals are electrophoretically driven into the skin, and once it's depleted, you can throw the whole thing away.

**Finstad:** We serve that market, too. There are a couple of products designed to create "micro-injuries" below the skin surface. This creates scar tissue, and it tightens everything; it's almost like a facelift without having any cutting done. You go in for these treatments, and a month later, you look 10 years younger. In some of these applications, the flex circuit is visible to the patient, so they want it to be visually appealing.

**Shaughnessy:** Mark, you and Nick Koop from TTM presented your flex class at the virtual PCB West. Tell us about that.

**Finstad:** It was good. We like doing livestreams. I've watched a few of them where I've just had to listen to a voice and look at the slides go through, and I lose interest pretty quickly. We wanted to do something that was livestreamed to bolster what we normally do because Nick and I both like interaction with the class.

There's going to be a learning curve in working with these virtual things, but overall, it went really well. We had good interaction. In the three hours we talked, we addressed 30–40 questions and had another 15–20 comments.

**Burkett:** We probably had 65–75 attendees.

**Finstad:** It was good. We started with total attendees in the upper 60s, and we retained them through the whole class. We never dropped under 60 for the entire three hours.

**Shaughnessy:** Do you think the virtual format is here to stay? It's not the same as a live event, but lots of people like it because they can watch while they're at work and they don't have to fly halfway across the country.

**Burkett:** We are doing a lot more events like that, and we're learning as we go. As you mentioned earlier, some of our attendees are being forced into flex. We put on a webinar on this topic, and we usually get really good attendance. The interaction is a bit different when compared to being on-site and in a classroom. That stated, our attendees have responded with very positive comments related to the training that we provide.

**Shaughnessy:** I appreciate both of you taking the time to do this.

**Burkett:** I enjoyed hearing some of your background and stories, Happy.

**Holden:** Thank you. Like you, I've been in this industry for a long time. We have a lot of stories to tell. **FLEX007**

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