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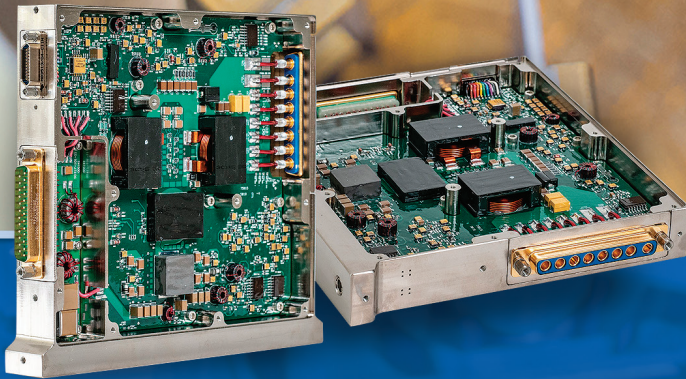
PART

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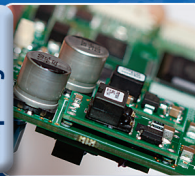
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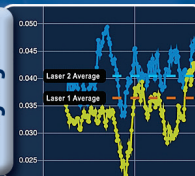
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Small Electronics Contract Manufacturer Offers Tier-1 Manufacturing Processes

BTW combines the customer support of a small firm with the state-of-the-art technologies of a large manufacturer

A small company that offers “large company” processes is one way to describe BTW, Inc., an electronics contract manufacturer in Coon Rapids, Minnesota. The company, established as a PCB assembly firm in 1993 by William (Bill) Bartley, specializes in surface mount technology (SMT), plated thru-hole assembly, and mixed technology assemblies. Its SMT lines include fully automatic vision screen printers, multifunctional high-speed Juki placement machines, automated optical inspection (AOI), and 13-zone convection reflow ovens.

“Our Juki SMT lines offer a high level of flexibility and throughput, enhanced by the on-staff support of two former Juki field service engineers,” the company states on its website. “Our manufacturing team has over 25 years of thru-hole and mixed technology placement experience.”

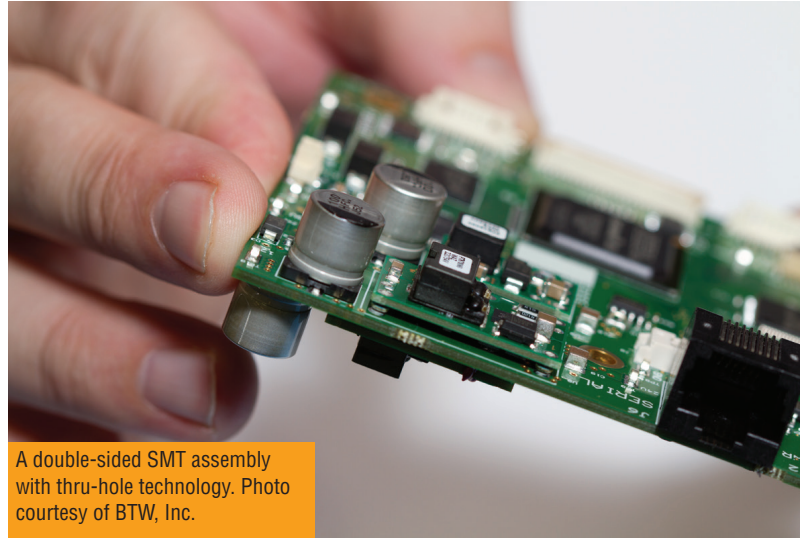
Since Bartley founded the firm, BTW (www.btw-inc.com) has evolved into a multi-faceted contract manufacturer that offers printed circuit board assembly and more. Today, BTW employs 55 team members at its 45,000-square foot facility just outside of Minneapolis, where it provides custom mechanical assembly of panels and box builds, electronic test development, and global supply chain management. The scope of the company’s ISO 9001:2015 and ISO 13485:2016 (medical device) quality management system certifications includes “manufacture, assembly, and testing of circuit boards and electronic subcomponents,” including, in the case of ISO 13485, for the medical device industry.

Two of BTW’s key engineers, Director of Manufacturing Support Dan Juelich and Engineering Manager Scott Oestreich, spoke with D2P recently about the company’s strengths and differentiators, some of the trends they’re seeing in the electronics industry, and how they manage to achieve superior quality control. Dan has been with BTW for seven years; Scott, for 13. Following is a transcript of the conversation, edited for clarity and length.

D2P: *How would you describe BTW’s niche in electronics manufacturing?*

Dan Juelich: We do low-to-medium volumes, so we’re not a huge contract manufacturer, but we feel that we cater to and specialize in solving issues for customers and getting product to market quickly for them. We put our specialties in our customer support, and supporting what our customers’ needs are.

D2P: *What would you say are some of the specialty capabilities that differentiate your company from other electronics manufacturing companies?*



A double-sided SMT assembly with thru-hole technology. Photo courtesy of BTW, Inc.

DJ: We pride ourselves on our customer support. We have processes that are more along the lines of what a large company would offer, like a Tier-1 type manufacturing process, but we still have the customer support and personal approach of a smaller company. So, we’re able to support customers from smaller startups to large manufacturers.

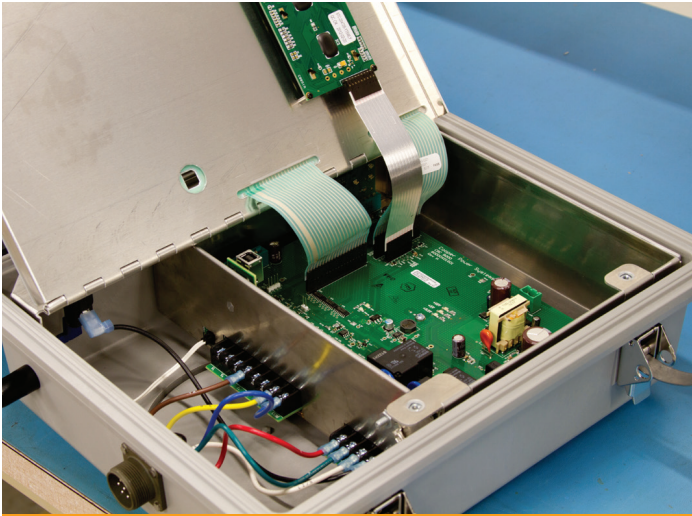
D2P: *What enables you to do that—to have that kind of a range in the ability to service different customers?*

DJ: We pride ourselves on our people, so our employees are a big piece of the success of BTW. Also, Bill Bartley, the owner of the company, believes in keeping our equipment up to date with technology, so we continue to upgrade our equipment as needed to support the customer requirements that keep coming up.

D2P: *BTW’s quality certifications, for both ISO 9001 and ISO 13485, refer to the contract manufacture, assembly, and testing of circuit boards and electronic subcomponents. What types of electronic subcomponents do those include?*

DJ: When we talk about manufacturing, we build things from circuit board assemblies all the way up to finished product. We’ll put a printed circuit board into what we call a DVA, which is a device-level assembly. That device-level assembly goes through some processes, and then it gets placed into a top-level assembly, called a TLA, which, many times, could be the customer’s finished product that goes to their actual customer. So, it’s a finished assembly. We can do all types of assembly levels, and that’s what we’re talking about when we say electronic subcomponents.

D2P: *What do those quality certifications say about BTW’s capabilities?*



In addition to surface mount technology (SMT), plated thru-hole (PTH), and mixed technology assemblies, BTW's specialties include customized turnkey box builds. Photo courtesy of BTW, Inc.

DJ: I think when people see these types of certifications, they have a comfort to know that we have controlled processes, we have procedures in place, and we've covered all aspects of the manufacturing process. So, they know we are repeatable, we'll do the same thing every time, and everything's in control.

Even though we don't have certification for automotive, we still follow a lot of the automotive processes, like PPAP, APQP, all those different types of processes. Before, when I said we're a small company, but we have large company processes, these are what we're talking about. We not only support ISO, but we are supporting the large company processes, like automotive industry processes.

D2P: *How did the company get started?*

DJ: Bill Bartley worked for a company that was a contract manufacturer for ZEOS Manufacturing, and they manufactured computers, mainly motherboards, for PCs. Bill decided to purchase the contract manufacturing side from ZEOS, and that's how he started BTW.

D2P: *How have you seen the electronics manufacturing industry change over the years?*

DJ: When Bill started out, it was a lot of surface mount, with thru-hole assembly. Then, as the company grew, customers would request, 'Can you build this to the next level?' And he grew it from there, branching out into in-circuit test, functional testing, box assembly, integration, third party logistics. We went from having two to three customers to, right now, having over 50 active customers in many different industries.

D2P: *What would you say are BTW's key strengths that enable you to provide custom manufacturing?*

DJ: We revolve around customer support and relationships. BTW is not in the market just to win business and get purchase orders, and then that's the end of it. We build relationships with our customers.

One of our strengths is that we have customer focus teams here. We have three customer focus teams, and those teams have a program manager, a procurement person, a process engineer, and a doc (document) control person. They all work on a set of customers, so they become very familiar with that customer base. And the way we become successful is they become very knowledgeable and understanding of how to support their customers, which is one of the reasons we have customers that have been here for the entire evolution of BTW—the entire 27 years we've been in business.

So, we pride ourselves on those strengths, but, also, our employees. We have a great group of people that work here, and that contributes to our on-time delivery, our high quality, and, overall, our success.

D2P: *You mentioned the customer focus teams, which include a process engineer. Would you say that engineering is a key capability for what you do?*

DJ: Definitely.

D2P: *Approximately how many engineers do you have on your team?*

Scott Oestreich: We have nine engineers, and four documentation people, and that encompasses process, manufacturing, and test engineering.

D2P: *How are you able to help customers get products to market faster?*

SO: We start that partnership with customers in the beginning, sometimes before the quote stage, and collaborate with them on design suggestions for manufacturability—from the front end, all the way to the back end of the assembly process. And, as Dan mentioned before, we continuously upgrade our equipment to stay with technology trends and keep ahead of the game. That's a big part of it.

D2P: *Your website states that BTW is "a solutions partner for circuit board assembly, as well as mechanical assembly for panels and box builds, electronic test development, and global supply chain management." What are your strengths in these areas, particularly with electronic circuit board assembly?*

SO: In our circuit board assembly area, we have parallel SMT lines, so I can be very flexible and quickly change from one line to another if I need to. Uptime is a key thing in that process. We have state-of-the-art equipment in there that gives us that ability to get to the top of that technology sector. We've just installed some new AOI (automated optical inspection) machines to complement the line and add capability as well.

On top of all that, we have a paperless factory. We use Aegis Manufacturing software, which allows us the process control and traceability and data collection for quality analytics at the end of the process.

D2P: *How about your capabilities in mechanical assembly of panel and box builds?*

SO: It's kind of the same thing; it's the second phase. We build the circuit boards—not all the time, but most of the time—and that evolves right into a mechanical build with some functional testing, or maybe even some "bed of nails" type bench testing, things like that. Everything there, as well, goes through the Aegis Manufacturing software—the paperless factory. So, there's full traceability, accountability for everything.

DJ: One of the nice features that Aegis adds to it, as Scott said, is that when you get into mechanical assembly and box build, we start taking out the automation and adding in human beings. But the Aegis Manufacturing software is forced routing. It gives people the instructions, but they can't skip steps—they have to follow the process. They have to go from A to B to C. They can't skip B and move to C unless they've done them all. So, it helps error-proof the processes that human beings do, which are mechanical, panel box build type assemblies.

SO: The Aegis Software is a key partnership between us and Aegis to help us be successful with our business.

D2P: *What would you say is the outstanding benefit that the Aegis software provides, in a nutshell?*

DJ: We have an ERP (enterprise resource planning) system, which

controls our purchasing of parts, and scheduling. Whereas on our production floor, Aegis controls all the assets of our production. So, from kitting to shipment, this software tracks everything. All of our boards and assemblies have bar codes on them at every point on the production floor.

So, it gives us traceability, control, visual aids—everything they need to do to manufacture the product and for us to track the product to the production floor. No longer does our account manager have to run out on the floor and go, ‘Where’s all my stuff?’ It’s all right at their desk. They know exactly where their stuff is and when it will be done.

It also gives us defect tracking, which gives us the quality metrics behind areas we’re having issues with, or places that Scott’s team needs to start investigating on how to correct—issues on the production floor.

D2P: What would you say is the key to your electronic test development?

SO: We have the right test engineers in place that are very knowledgeable with that aspect of the business. We offer full test development capability here, if the customer desires, or we support their testing requirements fully from the back end.

D2P: What do you offer in the area of global supply chain management for customers?

DJ: We have three purchasing people here. Our purchasing manager has been with us, I think, close to the entire time our company’s been open. She has great connections in the industry and we rarely have problems finding the parts we need. I know it’s hard to find tantalums, and now it’s getting hard to find resistors, but they’re up to the challenge and they keep us fully stocked with parts. We rarely have a part issue, which is great. But it’s the experience of all of those specialists that keeps us going, for sure.

D2P: I understand you use a lot of the state-of-the-art technology for inspection and quality control.

DJ: Yes. As Scott mentioned, we just installed two brand new AOI machines last month. We had AOI machines before, but we decided to replace them. Our previous AOIs were before the reflow oven, and now we’ve put them after our reflow oven. So, now they’re inspecting not just for presence, polarity, and part markings, but for solder shorts and opens also. So, we enhanced our detection capability with those two new machines.

D2P: Could you give a brief overview of the basic steps involved in your printed circuit board assembly process?

SO: After the documentation process happens, and the product hits the production floor, new products go through a validation process at each resource that they go through.

The SMT lines are kind of the heartbeat of our company. That starts out with a screen printer, which is fully automated and has 2D inspection capabilities for coverage and all of that information. Then it processes through a state-of-the-art pick-and-place line that has all the capabilities to place pretty much anything in the industry. After that, we have a 13-zone reflow oven that orders process through, and then it goes into our new 3D AOI machines.

From there, it can branch out into whatever resources it needs to go to next. In through-hole soldering, we have wave solder capabilities, lead free and leaded. We have selective solder capabilities,

lead free and leaded, as well. And we also have hand assembly operations, where we have people involved, on staff, to physically do hand soldering in instances that require it.

After all of that has been assembled and processed, it will either go through an inspection process, and then into shipping and out the door, or it follows on down the line and goes through the mechanical assembly process and functional test, and then to shipping from there. That’s the nutshell.

D2P: Are there any major differences in the circuit boards, or the types of circuit boards, that are required for these markets?

DJ: I think it just depends on the complexity of the assemblies they’re building. We get a lot of products that are very simple or that are smaller, and a lot of customers are trying to pack more into a smaller space. But a lot of the differences are the complexities. We get everything from double-sided surface mount, double-sided through hole, all the way up to just a single-sided surface mount board that gets built, packaged, and shipped right on our surface mount line.

In addition to the complexity, it also depends on what level they’re looking for, and whether it’s a medical device. We can build to IPC class 1, 2, or 3. A medical device has to go through special processes in the building because they have different requirements. So, it really depends on their requirements and what the customers are asking for.

D2P: Are you more apt to see smaller size circuit boards in certain industries, like, for example, in medical?

DJ: I would say the majority of the medical products are a standard size board. The smaller boards we’re getting are for wireless technologies, tracking devices, things that track vehicles, and things like that.

D2P: What industries would you say are your biggest, in terms of the amount of work that you do for them?

DJ: Right now, utilities and power management is one of our biggest. Also, wireless technology, communication and networking, audio/video, and then, last, is automotive.

D2P: I’m curious about some of the trends and developments that are happening in electronics design and manufacturing. Are there any that are impacting your work?

SO: Some of the work that we see relates to everything going to miniaturization. Smaller packages put more into a smaller space, so we’re seeing a lot of microvias, different things like that; thermal processes that require special attention. Beadless components are big, and they’ve been big for a while. It’s more common now to see smaller, micro BGAs (ball grid arrays), QFNs (quad-flat, no-leads), and components of that nature, which pose challenges for automation.

D2P: What are some of the challenges in design and development of the new products that you encounter?

DJ: We don’t do design, internally, at BTW; we only help with their designs. With that said, Scott’s team does a lot of design for manufacturability for customers. And the sooner we get involved with a customer’s design, the more we can help them make sure it’s manufacturable.

SO: Those are some of the challenges, to make it manufacturable. Clearances are tighter, parts are closer to the edges of the board. How do we compensate [for] that and still be able to manufacture without causing any impact to the quality of the product? Those are probably some of the biggest challenges that we have.