Tyler Kern (00:03):

Welcome to The Sunrise Podcast, powered by Sunrise Labs.

Tyler Kern (00:12):

Hello, everyone, and welcome to Making Bright Ideas Work, a podcast by Sunrise Labs. I'm your host, Tyler Kern. Thanks so much for joining us for this episode of the program. Today, we're talking about leveraging local resources with global networks. What does that mean? Local to global? We're going to talk all about it with our two subject matter experts today. We have Chuck Smith, the principal mechanical engineer at Sunrise Labs with us. Chuck, welcome to the show. Thanks for joining me.

Chuck Smith (00:35):

Glad to be here. Looking forward to it.

Tyler Kern (00:37):

I am looking forward to it as well, and we're also joined by Doug Browne, Director of Mechanical Engineering and Design Transfer at Sunrise Labs. Doug, welcome to the show. Thanks for joining us.

Doug Browne (00:46):

Thanks for having us on board.

Tyler Kern (00:47):

Well, I am thrilled to have you guys on the show today unpacking this topic. Let's just start off here. Introduce us to what it means to leverage local expertise when it comes to medical device development. What does that actually look like in practice? Doug, let me toss this to you first.

Doug Browne (01:02):

Sure, sounds great. Thank you. Well, first of all, at Sunrise Labs, one thing that I have to say that I enjoy so much at Sunrise Labs, is the definition of a medical device is so broad and the expertise that you need to bring to developing it is so broad. We have customers who have come to us for three instruments that they wanted to get done that might be highly complex. We have other customers who have come to us, a wellness device that they were really focused on, 700,000 a year, and so that volume spectrum and complexity spectrum between something that's wearable versus something... but one thing at Sunrise, all of our full product development entails electrical integration, circuit boards, software, mechanical.

Doug Browne (01:48):

We're not designing just high-volume widgets. We're designing complex systems, and we know over that, that it's a global economy. It's a global world. In order to meet customers' cost targets, you're going to need to reach out to a wide spectrum of manufacturing base as well as an engineering design base. We're humble enough to know we might not know everything, and we want to listen to our vendors. The one thing we'll just say is that that has worked out really well when we have a local connection that we're working with, allows people to meet, and we're leveraging the global capabilities to their fullest extent.

Chuck Smith (02:31):

Yeah. I mean, I think that I was really surprised when I moved to New Hampshire. I didn't really stop to think how Southern New Hampshire in particular, is well within the halo of all the tech startups that are spawning out of Boston, and MIT, and all the other universities there. That there is a huge array of technical companies within a one-hour drive of Sunrise Labs HQ. There's plasma cutting, specialty coatings, injection molding. It's-

Doug Browne (03:05):

[crosstalk 00:03:05].

Chuck Smith (03:05):

It's surprising how much stuff is hiding in the trees, and I have had parts picked up from the machine shop in the morning, dropped off at a brazing house in the afternoon, had them picked up the next day, and installed on a prototype before lunch; all within a very short distance. So I think that that's one thing that's very surprising about New Hampshire is that we have all of these resources really close. I think that that's specific to New Hampshire.

Chuck Smith (03:38):

I think a better example of the larger impact of this local to global is one project I was working on with 22 different injection molded parts. It had very thin walls, which can be something difficult to do. I was using an exotic material and I had ultrasonic weld features that were about half the size of standard limits, so well outside of the normal range that this kind of a thing would be done in. I worked with a stateside molder and partnered with a machine shop in Korea.

Chuck Smith (04:16):

So the molds themselves were made in Korea, were shipped back to the molder here. I stood by the injection molding machine while the parts were being run and the process was being tuned, doing fit checks, every couple hours, until we got a result that would succeed for this hermetically sealed box that I was designing. Once everything was fine-tuned, these same molds then went back to Korea where we could then mass produce the parts at a much more economical scale.

Chuck Smith (04:49):

I was kind of there the whole time, and without that molder being here, I would have to trust a molder in Korea. Even if you're getting overnight air freight shipping, instead of having that 15-minute cycle on changing a parameter and testing, it would be a day. So it's something that can simultaneously save money and time.

Doug Browne (05:22):

That said, Sunrise will ship engineers wherever we need to, granted the whole world with COVID right now has been crazy, so it's more difficult, but Chuck is right on there. One aspect that's been great for Sunrise is, if we're able to have both the instrument and the consumable, then as you're looking at the critical features and trade-offs, you can sometimes, trade-off where is the most cost-effective area as often. You want to keep the consumables as low a cost as possible.

Doug Browne (05:51):

So the whole DFX, design for manufacturing, design for manufacture assembly, design for serviceability in an ISO 13485 environment, is key. But we want as Chuck says, you want the engineers to be able to debate all the trade-offs, and that happens the world around globally. It is easier if you're able to tap local expertise.

Doug Browne (06:16):

And so far, Chuck and I have been talking a lot on the manufacturing side, but that also goes on the design side again, we have about 80 something engineers at Sunrise Labs, 100 employees, but we also have specialists that we reach out to when needed, because there are some areas when it gets into the specialty electronics or sterilization of products, or we have optics in-house but certainly in areas... like we had a human heart booster that had to go 80 million cycles, getting the reliability of something to that, that's specialized to make sure you've got it nailed. There's an area where being able to bring in and having that global connection of experts is huge.

Tyler Kern (07:01):

Yeah. I think that's a great way of putting it Dou, and from what you guys were saying, I think it's pretty clear that there are some benefits that come out of this process. So I would love to hear more about some of the benefits, from what Chuck was saying, just in a lot of different areas, but having that collaborative approach and that ability to collaborate, I think is one of the benefits, but what are some of the other benefits that can come out of this particular process?

Chuck Smith (07:29):

I think I've already touched on this briefly before. I think one of the big benefits would be for our clients who are startups, some of our clients are Fortune 500 manufacturers that have the production line, that have molding in-house, that already have a great deal of knowledge and vetted resources. So I think one of the big benefits that we can offer is for those startups, that we have a lot of the resources already lined up that they don't need they know, that they might be thinking that they wanted to do some injection molding, and when we find out they're making 100 units a year, that we can come back and say, "Well, no injection molding is not a very economical process for that. Let's revisit and do thermo-forming. And we can go a few miles away to the thermo-former that we have a very good relationship with." So I think that that's something that is a big help here.

Doug Browne (08:37):

Or even 3-D printed parts in those volumes. We're seeing more and more firms looking of using additive methods to get to market on there. But the key theme on this, it's faster to market with fewer iterations on your tooling, and another key aspect where we try to reach out and get the supply chain established and aligned early, is to get that real material and real manufacturing process into the clinical units, into testing early. It just really greatly risk reduces the launch and that is a key theme across all of this of trying to expand.

Doug Browne (09:16):

I think I mentioned it again that Sunrise Labs is a design firm, we're 1345 qualified, but we are not a contract manufacturer ourselves. We can do clinical builds, but we are not a for volume for sale contract manufacturer, because of the variety of products coming in, if we were our own contract manufacturer, we would not be tapping into that global expertise that we can tap right now. And again, as on the theme of this, boy, it sure works best when there's a local element to that conversation.

Tyler Kern (09:50):

You guys made some excellent points there on that question. I guess I'm curious, what are some of the elements that a strong partner can provide? We talked about benefits in the previous question, but when it comes to elements and what a partner actually does, what are some of those things that they can provide them and bring to the table?

Chuck Smith (10:06):

I do a little bit of a roundabout answer to that. Most of my previous engineering jobs before coming to Sunrise Labs, all do a new product every three to four years. The other companies I worked for had manufacturing floors, had production lines, and so after doing the design of the product, I would be involved in automating the production line, dealing with the first batch of RMAs. So there's a great deal of engineering support after the design is done at Sunrise Labs, like Doug said, we're not contracting, we're not manufacturers, we're not building these things.

Chuck Smith (10:41):

So when the design gets done, we often move on to another project right away. So now I'm working on three or four different devices every year, which is very exciting. And between the 80 engineers, each working on three to four different products every year, we're getting a vast array of technologies coming at us.

Chuck Smith (11:04):

And sometimes we're very familiar with the technologies if it's a simple optical system, but invariably something will come along in which we just don't know an element of the design. For example, thermal properties of evaporating fluids and with biological fluids evaporating. It's like, "No, I never studied the process of blood plasma evaporating in college." There will always be something with those 80 engineers, three to four products a year, there'll be some element that comes along that we just don't know. And so that's where it's very important to have those partners to have fluid dynamics experts who that's all they do; a day in and day out. And we have those contacts.

Chuck Smith (12:01):

Another example where I had a very complex, very large welded frame, and I sat down with the engineer at the welding house and we, side-by-side, looking at the CAD model, he would go through and he would show me the fixturing method that he was going to use to set this up. And being able to do that, being able to be right there with him, we were able to say, "Oh, well, if this is a problem for your fixture, if I move this bar over half an inch, it does nothing to my design, but it eliminates one of the fixtures," and you can negotiate an improvement to the manufacturability to save 10%, 20%, 30% of the cost of making some of these more complex components.

Chuck Smith (12:52):

There are a lot of companies that you can go to nowadays where you can upload a CAD file and click a button, get a computer-generated quote, and order something, and those services will not give you that interaction that I'm talking about, that you will be paying more for what is potentially a less functional part than by being able to interact with the people who are going to be doing that construction. Sometimes it's an engineer, sometimes it's the welder themselves, who's been doing this longer than I've been alive. I have to respect that expertise and be willing to admit that I can learn from that.

Doug Browne (13:37):

To add to what Chuck is saying, we've had a water project that we're global in nature, as well as... there's also, and this gets tricky to recognize, there are cultural aspects. Many of our providers that we've been with for years, who are local, will tell you very openly, "We don't think you should go that way here. We suggest this. This better fits our process." There are definitely cultures when we're dealing with the off-shores, you have to be careful that they don't want to offend. They're more hesitant to tell you you're wrong. And we want partners to say it's okay.

Chuck Smith (14:13):

Absolutely.

Doug Browne (14:14):

I've settled this by going out, after work in China, and having a drink with the engineer I'm working with [crosstalk 00:14:20], and saying, "Please, if you have an idea and you think I'm on the wrong track, please, put that on the table and tell me. You are not insulting me at all. I respect your input," because they're such industrious people, and they've seen so much, we want to build off of this and they bring a different viewpoint to it. So recognizing that, and leveraging that, helps us immensely. All our partner firms and partners we work with, nicely challenge us.

Chuck Smith (14:49):

Yes. Whenever I start working with a new vendor, I try to always have the opening line of, "Tell me what I'm doing wrong. Tell me what could be done better. Tell me what can I do to make this better?" And I think a little bit of humility and like Doug was talking about, kind of coaxing the honest feedback out of these people. There are some vendors who don't want to say anything bad for fear of hurting the pride of the engineer, for fear of losing the purchase order, if they're too aggressive with criticism. I think that everyone working at Sunrise is more than comfortable with being told how to do something better.

Tyler Kern (15:43):

That's a really great point. And I love that cultural aspect that you brought into the answer, Doug, because I do think that that is so crucial, just understanding how to best communicate with people. And we also learned that Chuck missed blood plasma evaporation day, missed that class for some reason. I don't know. But just kidding, just messing with you Chuck.

Tyler Kern (16:06):

But that really is an interesting impact and it kind of dovetails nicely into what I wanted to talk to you guys about next, and that was just how to make sure that you're forming a collaborative partnership across every aspect of a project because that communication aspect like you brought in Doug is so, so important. So how do you make sure that everyone catches the vision for the final product and is on the same page throughout the duration of a project?

Doug Browne (16:31):

Well, I'll just say it starts early in product development. We work with our customers to identify the supply chain in the top-tier contract manufacturer as early as we can. Some wait in the project, but most work with us to get that identified. Even if that contract manufacturer is just joining us during the alpha design, to join in design reviews and seeing, and contributing from there and aware of what's going on. A key question we try and work with our customers upfront is, "Is this a fairly complex

mechanical system? And the in-process testing is really going to drive the need? Is it a complex electrical system and all of the electrical processing and testing needs are going to drive... is it sterile? Does the product have to be sterile and made in a cleanroom? How does that come into play?"

Doug Browne (17:18):

With all these factors, no one vendor can meet everything. So it's a matter of trying those trade-offs, getting it aligned early for them on their, and understanding what our customers need, helps us select that we have the right vision for this product and how it's made. Volume comes in and COGS. COGS; the Cost Of Goods Sold, has to be on the forefront of every engineer, every minute of every day if we're going to meet that target on there.

Doug Browne (17:48):

That will affect the vendors, is that number three. And are we bringing it to a finished box good and the customer may have other needs from distribution and repair on there? It's a complex dance, but it's one you want to get aligned early so that those strong partnerships... and the other thing it's really nice. We have some partner firms we have worked with forever in a day. The path is so well-worn, we know how to trade BOMs into their format, Bill Of Materials. We know how to have it real-time so they're seeing the Bill Of Materials real-time.

Doug Browne (18:25):

We have a shared PDM system, the Ameri-CAD system so that the contract manufacturer can see real-time what's going on. So it allows us to bring the manufacturing partners in earlier or design specialty partners in earlier. But that's the goal is to get their expertise into the mix while the design is still fluid. And that can be inherently messy because it means things aren't defined yet and requirements may still be changing, but in the end, it works best.

Chuck Smith (18:54):

And I'm going to go off on a little bit of a tangent here because Doug just reminded me of something. I have a soft spot for the startup clients that we have, who are bringing into the world entirely new technologies, entirely new therapies, new diagnostic methods. A lot of the stuff that I find really satisfying is moving what was previously hospital equipment into the home environment, so when these startup companies are doing all of this, there's a lot of tendential things that they're going to need that we know they don't know, to turn that around, that Sunrise is very happy to provide services.

Chuck Smith (19:40):

Things like focus groups, human factors evaluation, industrial design manuals, packaging, all of those things are services that we know people who do that or we do it ourselves. In regard to how we make a good connection with the client to ensure that the work we're doing meets their vision and their goal and how to really make sure that we're moving in lockstep on that, we implement agile systems on a lot of these projects, we'll have daily meetings, brief daily meetings to keep the client informed of what are our key achievements, what are the key blockers that we have, what are the next critical objectives that we have?

Chuck Smith (20:25):

We will absolutely make sure very early on in the project, one of the first things that the Sunrise staff will do is look at the system, look at the application, and present to the client, what are the risks? The risk may be scheduled, the risk, maybe technical, the risk may be an unrealistic cost target, but we

don't go plowing ahead to a finished design until the customer and Sunrise are in agreement as to what those crucial risks are. We also have a phased gate process where we'll have formal meetings and approvals at various points throughout the design and production transfer process to make sure that we're continuing to aim at the right target.

Chuck Smith (21:13):

Some of the clients that come to us will come to us with only a concept, not even a bench-top prototype. I'm working on something right now that we're developing the very first physical instantiation of a novel anesthetic device. And absolutely when you're doing that, when you're building something that has never been built before, you're going to find out things in the design process and fabrication process that that customer didn't know about.

Chuck Smith (21:41):

So you are absolutely going to need to change what it is you're aiming at. And so we have a formal requirements database that gets updated and gets put in front of the customer and formally approved at each of these gates to make sure that we are tracking on the things that we consider the most important for that product. We might not be quite so attentive to exactly what Pantone color is going to be on the box or exactly what cosmetic texture will be put on a bezel, but those risky things and the key requirements, we'll absolutely keep track of those and keep them in front of ourselves and in front of the customer.

Tyler Kern (22:30):

Absolutely. One of the things about this process is that the first prototypes can actually be built while the learning and all of this sort of thing is still taking place. How does that benefit the overall process when you're able to get that done early? Tell me a little bit more about that and why that's beneficial, Doug.

Doug Browne (22:49):

Well, [inaudible 00:22:50], you want to work early, you want to make your discovery early, you want to iterate early and fast. I give all my engineers mulligans and we proudly put on the table each week, what went wrong, and what did we learn, because it is a learning process to get a device to work that helps identify if there's the expertise that needs to be brought to bear.

Doug Browne (23:13):

It helps identify early what manufacturing challenges lay ahead, and therefore we can start talking early, who will be best to go make something. But we want to learn early, discover early, break things early. That's part of our core culture at Sunrise. Because ultimately, the sooner we get to the real materials and the real electronics in there, we're able to really de-risk the project before we enter in where there have been large capital expenditures. We have a 3D printing firm and laser cutter that our engine and milling machines and classics attractive as well as local partners to make circuit boards quick and rapid because it is a key point.

Doug Browne (23:58):

And that is probably one of the best fortes of Sunrise is the ability to get a prototype in front of the customer fast. We will never beat one for one of my favorite projects and my favorite clients were one of our strong mechatronics engineers who was going to go to Poland for vacation, so I had him get a prototype done for the kickoff meeting. And kudos to our president, Eric Soederberg for letting us do

that at risk before the kickoff meeting. It has set a precedent we can't often match of having a prototype at the kickoff meeting, but that allowed us to learn early, and that has really become a core culture is hit the design hard first early with a lot of different core ideas and be able to show and teeth out because it is a learning process.

Doug Browne (24:52):

Our engineers get tired of us [inaudible 00:24:54], "You want me to do an analysis? Design, build, test. You want to do the right amount of analysis? You want to design it and get into CAD. You don't want to get into CAD too quickly. You want to build it as quickly as you can test it, and that testing will tell you what you should have analyzed more, to begin with. Now do it again." And a few spins through that cycle, and you've pretty well got all the teething worked out. Now it's ready to get it ready to bring in the contract manufacturers.

Chuck Smith (25:22):

Okay. I think I want to do a little bit bragging about Tomacz, who is the mechatronics specialist at Sunrise that Doug was just referring to. We found out that after the initial kickoff meeting for that project where we showed them a functional prototype, the team at our clients in their main meeting room at their offices, wrote across the top of the whiteboard in big bold letters, "What would Tomacz do?" So they adopted one of our engineers as their mascot of inspiration and engineering.

Doug Browne (25:58):

Good point.

Chuck Smith (26:00):

And I said earlier, that design is almost always a moving target. And Doug was talking about de-risking the project by establishing the functionality of some key elements and that de-risking does something that a lot of clients are very keen which it removes variability from the schedule. That we can provide a much clearer idea of when things will be done and out the door, and that makes a lot of our clients very happy to know that.

Chuck Smith (26:36):

I have a couple of examples of some early prototypes that came to mind. We were going to be building a $50,000 prototype of a refrigerator-sized piece of lab equipment that was going to have a lot of different touchpoints. The operator would have to go through high and low. And before any designers sat down and started doing that 3D CAD model, that was going to contain all the complex components, Doug Browne over there, he grabbed some tape, put it up on the wall, outlined the device, and started putting his best guess where things would go, and we would have a short person come in and try to make sure they could comfortably reach the top.

Chuck Smith (27:18):

We had a tall person come in and make sure they could comfortably reach the bottom. We found out that the original layout Doug came up with wasn't quite right, so we moved things around before any real engineering design had happened, before any models were there, we already knew one element of the device was going to be successful, which was proven later on when we had a physical prototype and did formative testing.

Chuck Smith (27:42):

So a $3 piece of tape can be something to get you one of those early prototypes. Another fun example. I love solving engineering problems on the cheap. We were designing a pressure vessel and we had a critical to safety sensor in this pressure vessel that we were designing was used to prevent 32,000 pounds of force from being generated inside the device.

Chuck Smith (28:10):

And we ended up spending $100 on a pool filter enclosure that was the same size of our eventual pressure vessel, and we were able to prove the functionality of this critical to safety pressure sensor with that $100 pressure pool filter. The alternative that we did not do was spend $10,000 on a prototype of what we thought the real pressure vessel was, and it takes four weeks to get and then try the sensors out. And so we were able to do that cheap solution, proved at work and able to work into the real enclosure, a couple of minor tweaks that the sensor would require.

Chuck Smith (29:05):

So we worked that in before we even made that first real pressure vessel. The alternative could have been we spend 10,000, wait four weeks, find out that it doesn't work, and have to make changes and wait another four weeks and spend another $10,000. And I know that all of the project managers at Sunrise would definitely get pale if I told them I just delayed the project four weeks. So I think those are a couple of fun examples of early prototypes that don't require plasma cutting and injection molding that got us real information that was needed for the successful development of the product.

Tyler Kern (29:46):

I think those were some really good examples. And we've talked about contract manufacturers a couple of times, so I've been itching to get to this question because when it comes to choosing the correct contract manufacturer, what difference can this make in the long run in the process? And what are the benefits of choosing the right contract manufacturer, Doug?

Doug Browne (30:09):

Throughout our careers, all of us here, most of the products we've designed have made it to market. They must make it to market, to be of any good to anyone on there. And the contract manufacturer is key on establishing the right quality, the right cost, the right distribution on there to be able to get it the right skills on there. And that's why I Sunrise partners with Stevrol because it's different. We recently brought a breast cancer tracking device to market. And we used contract manufacturers, a lead contract manufacturer that we know well.

Doug Browne (30:45):

So first we try and align with their vendor base, their AQL supply, I'm sorry, their approved supplier list. If the skills that they don't have, like in this case, the surgical part, going into the body in vitro needed to be sterilized. So we worked with another contract manufacturer that we knew, was able to make the sterile part, and then it gets shipped to the top-tier contract manufacturer. So having that and having it established where, like in this case, we were working with a molder who was both one of our long-term vendors and their long-term vendor. So the path was well-made.

Doug Browne (31:23):

I know their toolmaker designed well. We were able to go through and figure out [inaudible 00:31:28] and objectors and slides and all the details on those to achieve what we need. And I just had the

utmost confidence in them. So it was really nice that that was a sub tier vendor, if you will, who was known to both parties, but on the plasma unit that Chuck has mentioned that he was our lead mechanical engineer on, and wanted complex parts on it and different assemblies that had to be brought together that one was heavily mechanically centric and its assembly, and then the ability to test it, whereas, on that product, the circuit board was much easier to outsource to someone else.

Doug Browne (32:10):

We have other projects where the electronics are the predominant concern, be it the type of circuitry and the connection and the antenna design and whatever there. And then we'll have contract manufacturers who really are an expert in that area and the plastic housing might be the part that gets out. So rare is it that the top-tier contract manufacturer is doing everything. Except for some of the firms we've partnered with who are the larger CMs and the international agents.

Doug Browne (32:39):

They may have everything under one roof, but it's not just selecting the right CM to be the top tier; it's working with them to get the sub-tier vendors aligned and aligned quickly. And again, ideally with ones that they already use. So we're not introducing too many new players into the mix.

Chuck Smith (32:57):

I agree with a lot of what Doug was saying. There's a giant list of things that a contract manufacturer might need to be able to handle, to develop the medical products that we're designing. The FDA has very strict requirements on traceability for inventory and production lots. Exotic components may have very lengthy lead times that require some thoughtful logistics being able to rapidly respond to engineering change orders. Frequently after product launch, you're going to find out stuff when your device gets out in the wild, you want to be able to change it, and document that change and keep track of which device is where and what revision. There might be a clean room requirement; you might have some sensitive optics that require laser alignment systems and not every vendor is going to have that.

Chuck Smith (33:47):

And I'm working on a device right now that requires ultrasonic welding. And we don't want to pick a vendor that has never done ultrasonic welding, a contract manufacturer that has never done ultrasonic welding. Because if something goes wrong in the production line, you want someone familiar with the process who can, without having to stop everything and call up the client and get us involved, you want people who are informed on the ground at the manufacturing site who can troubleshoot minor difficulties and fix things in a timely fashion to get the production line back up and running.

Tyler Kern (34:23):

Yeah. I really like how you guys put that. And I think you really thoroughly answered that question. And I think that makes a lot of sense. One of the other big benefits is that outsourcing can connect you with an international network of vendors. Tell us more about that and what that process can provide, and what it means to really be connected with that outside world. It's that idea that we've been discussing since the beginning, local to global, right? Tell us about that global aspect and how it can be so beneficial, Doug.

Doug Browne (34:51):

And Chuck will add, I'm sure, some color to recent examples he's had on some very large plastic beam machine the initial capability brings. So I was in Shenzhen, China, transferring a wellness device of wound healing over the counter device. I was in Shenzhen, China, for three weeks, transferring that. So impressed at the industriousness of the people and the management's willingness to throw a large number of people to solve the problem that while you're there for those three weeks. More happened in those three weeks because you just couldn't bring that number of toolmakers and machinists and assemblers and testers together on there.

Doug Browne (35:33):

It took an effort on there and the willingness to, like I said, to get done what was needed. So the advantage when something is labor-intensive, it is hard to beat the ability to bring that many industrious people together at once. The area and this is where the boots on the ground of the engineer who knows the product is key, is that many people helping all at once can be a little chaotic. And I mentioned the cultural and communication challenges.

Doug Browne (36:10):

This is where having someone who is a local, if you will, interpreter, they're working for the contract manufacturer and they're there with you helps immensely. We had this wellness device, there were a couple of features in the part that were out. The management. Agreed, "Yep. We'll fix it tonight." Here, stateside, that would have been a welding operation in reforming that feature. But because they were able to bring a lot of people to bear, they remade the entire core side of the tool overnight. We're back up again, molding the next day, that feature looked beautiful. All of a sudden features that were in yesterday though, elsewhere in the part, we're now out.

Doug Browne (36:57):

It took me forever to understand that they had rebuilt half the tool because they had the capability. It was not in my mental construct that that was possible because there is no way you would bring that many resources to bear in a cost-effective way. So there's a definite advantage and you just need to be able to utilize that advantage to its fullest and expect the unexpected, that way it's a different world and they're willing to work.

Doug Browne (37:32):

Like I said, just very industrious and very helpful, willing to say that they can do things that you really have to challenge back. It's okay to say, "No, I can't get it to you for the morning or tomorrow. It's going to take a few days," and go but the ability to have that outsourcing. And so, I'll hand it over to Chuck, he can talk about how key containment vessel that he's been mentioning. You had that all machined out of a billet, which was amazing.

Chuck Smith (38:05):

I'll come back to that. I want to talk about your story a little bit. And I think that it's a wonderful cautionary tale. Early in my career, I remember being beaten down by one of the product managers who is desperate to reduce the cost. And I found it was a Korean company that did an amazing bid on the parts, they made prototypes and they sent them off and the prototypes were great and we did the big order and the parts all showed up dramatically different. That was clear that there was not inspection happening that was called out on the drawings. And, it was a mistake that I have not repeated. A quote that's too good to be true often is.

Chuck Smith (38:58):

So, I think there's a couple of things that come away from that, that Sunrise is able to do. Number one, we know the vendors that kind of put their money where their mouth is, that will deliver according to print, if something is wrong, they will take the time to correct it and do it right. And I think you also need to have, the engineers, at Sunrise who are doing this, if it's a big dollar item, or if it's critical to function.

Chuck Smith (39:31):

If Doug hadn't been there overseeing that operation and being able to find out about that error while he was there and get that corrected, that could have been a considerably worse outcome. So I think that that's very important for this to work. You can't just go online and get a quote; you need to know who it is you're working with. The engineers need to be willing to put down the mouse and walk into the shop, walk into the factory.

Doug Browne (40:08):

And just adding to that, it's also key, which a lot of times firms will just quote a part, be it a circuit board or a molded part like that. But the devil is in the detail and that's where the engineers need to be. Circuit boards often have panels that hold them in place. And that means mouse bites, and you need to know where these little break-off tabs are, and where are the test points that they're putting in. In molded parts, you need to know where the cooling lines are, and where the ejectors are, and where all the features that may have secondary implications on your design are. That requires the right partner overseas to make sure you're seeing all that information. It's best if you can be there, but we do it remote all the time to on there, but it's a matter of finding, so it, isn't just a black hole that you're sending it over to, and then you're getting parts back afterwards.

Chuck Smith (41:01):

There's an overseas vendor that I like to use a lot, that when you get an injection mold, you get a weekly report, you get an updated schedule, you get photos of the molds in progress. You're getting continuous updates proactively; you're not having to call them every day to try and… people aren't dodging your calls and you're not getting ghosted. So, it's knowing who those vendors or a way that you can get the advantages without the risks.

Doug Browne (41:28):

And I think coming back to that large containment vessel, the shell that you had machined up out of ABS. I think the first ones were done in Mexico near the US border, and then as we went to second iteration, a little bit more refined stuff like that at a higher volume, you were in Taiwan if I recall correctly, but all under the same company. So, the same engineers, the same expertise, they were just leveraging what equipment they had around the globe to make it.

Chuck Smith (41:58):

Yeah, I think you got a couple of details backwards. And this is one of my favorite stories of working at Sunrise. So, I'll go back to the beginning, it was a machine enclosure that the chunk of plastic that was being machine had to be six inches thick. This is about four inches thicker than anything that I have ever machined. 18 inches wide and three and a half feet long, it was a huge slab of plastic. There were local vendors stateside who did just flat out no quote because of the size of the raw material they were starting with. But the supplier that I worked with partners with one of the companies that make the plastic itself.

Chuck Smith (42:50):

So, they were well set up to take sheets of this plastic and chemically weld it together into a very large chunk that they could then machine. And I think one set of these pressure vessel components was going to be $50,000 and a five-week stateside. And through our network of working with one of these multinational fabricating companies, I ended up getting three sets for the same price one week faster.

Chuck Smith (43:29):

And as Doug said the initial prototypes came from Taiwan which was their kind of higher-tech facility, where they worked out the process for making the billets in a reliable way, because it was a pressure vessel. We couldn't just put glue on there and hope it doesn't come apart. And they worked out the fixturing to get down into some of the deep recesses, the deep narrow recesses that were going to be challenging. And once I had negotiated the final design with the engineers who were in contact with the Taiwanese facility, we could then copy and paste the process in the Mexico facility to shave even more money off of the components.

Tyler Kern (44:16):

Well, that's a great story, and then I was going to ask for examples as my next question, just examples of how this has worked in the real world. And it sounds like that's a really fantastic example, Chuck. Do you guys have any other favorite stories, Chuck, I think you said that was one of your favorite stories to be able to tell. Do you guys have any other stories that you want to share just about how this has worked to the benefit, in the long run, this entire process?

Doug Browne (44:40):

Well, I can definitely say one area in medical device, whether it be labware or true medical device. One of the first decisions to come around is the cleanliness of the product and its testing, but if something is going in vitro and it needs to be sterilized, or if there's things that way, then now you're layering on another layer of complexity to make sure that the whole supply chain is one with that because you have to have a controlled bioburden when you're getting the product to the sterilizer, they have to know exactly what they're getting is incoming. So that adds a vector that we've done with a lot of customers of saying, "No, this vendor… that this other vendor is planning on using, does not have sufficient controls in place. You would not be comfortable going that way."

Doug Browne (45:34):

And so, it's an area providing it. I also mentioned we've had products go to market that had something seemingly small, like the world's smallest O-ring developed for it, and everything is fine. And then all of a sudden, the customer calls and they've got some leaks and it turns out the vendor that they selected, they decided to increase the number of cavitations and go from six cavities to like 32 cavities on that O- ring.

Doug Browne (46:03):

Partying line differences, for example, on that, in that example, this was after we were done on design, but naturally, they come back and they're asking, "Why is it not working now?" And you suddenly tease out that there's now more manufacturing variation. And in this case, there was partying line flash on the O-rings. So technically one could argue the O-ring didn't meet print as we didn't allow that, but it just wasn't something that was in our mindset because when we had finished it was done. And so that's another good lesson if you get brought back in, in the real world, is what has changed since the product was launched, or since you went to prototype development on there.

Chuck Smith (46:46):

A very simple story that makes me happy is; this is the first time in my career that I've worked for an engineering services company. I've worked for a lot of companies that manufactured their own stuff. And one of the things that are really satisfying to see, there's a bunch of customers who keep coming back. That we've done right by them before, and they come back for new products. They come back and we help them fix a problem that… Like Doug was just talking about where a vendor does change and we help them figure out what went wrong and why things aren't working and we get the line back up again.

Chuck Smith (47:28):

The thing that is just super satisfying about this job, it hasn't happened to me yet, but I know Doug was in the hospital with his mother who was having a great deal of difficulty, and the doctors and nurses wheeled in something that he himself had designed and made to help treat his mother and help her recover. So that might be a little bit off-topic, but that's why we do what we do. We want to make the world a better, healthier place.

Doug Browne (47:59):

It is nice to be a fly on the wall with your fingers, crossed, hoping everything works well, and saying, "That's a little bit beyond a formative or summative test, [inaudible 00:48:08] being used for real, and the nurse and doctor don't know, we'd engineered or a technical "We" is six feet away watching on a family member. So yeah, that is a unique event, but it also shows in that case, I knew the whole supply chain well on that. And I knew the partners, that particular device Chuck is referring to goes back to previous company I worked at before Sunrise.

Doug Browne (48:35):

I hope all engineers have the opportunity to see their devices in use. But it does come back again on there as we started this off, we're humble enough to know there are times for experts to be brought in, to supplement us. And there's a lot of expertise at the entire supply chain who have been making devices and parts day in and day out. And we want to make sure in those DFM reviews early on, that their voice is heard.

Tyler Kern (49:06):

Yeah, that's an excellent point, man. That's a really powerful story, about Doug having that experience in a hospital, that is really an incredible example of the work that you do. So, guys, as we begin to wrap up this conversation today, it's been a fascinating conversation and really, really good. At the end of the day, the reason for bringing in experts is to help empower the efforts of your team and maximize their efforts and what they're doing. So, what are some of the keys to making that happen for everybody across an entire project?

Chuck Smith (49:39):

I think the humility that we're willing to say that there's things we need help on; being open to changes, that's critical. We're good customers to a lot of these, vendors and these contract manufacturers that, if we take their advice, if we spend time working on the design, we make sure that they get the purchase order. A lot of these contract manufacturers that have some of the sophisticated capacities that our customers often need, we have given them business in the past. And so, they want to keep us

happy so, that we often get bumped if they're getting a bunch of calls from a bunch of people, we'll often get bumped to the top of the list.

Chuck Smith (50:25):

And it's also gone in reverse before. There's one contract manufacturer that we've used before that got us design work. It was working with a new customer, and I think that history and being a good business partner. The really big thing is that with a lot of these companies that we've talked about, Sunrise has a history. And that's not, something that… you can't just show up with a checkbook and expect to get the exact same kind of consideration that I think we've earned with these people.

Doug Browne (51:01):

Well said.

Chuck Smith (51:02):

And then as a complete counterpoint to Doug's story about his mother, which I think is one of the most moving stories I've ever heard, any engineer tell, I was sitting in a dentist office and I was getting an x-ray done. And there was a device used to help align the x-ray head to the sensor inside my mouth. It was a device I had designed and the hygienist was using it wrong. And I attempted to explain to the hygienists the right way to use it. And I just got this nasty look and she like shook her finger at me and said, "I've been doing this for 10 years, hold still." I went and got a new dentist for my very next checkup.

Doug Browne (51:47):

Nice story.

Tyler Kern (51:48):

What an incredible story, Oh my goodness.

Chuck Smith (51:51):

It shows the training and things, and it also shows that your devices can often be used in ways you never envisioned. And that comes back to the whole risk analysis on everything. A lot of things our UCD team will bring to bear on making sure that the human factors in the ergonomics are right, and that it's intuitive to use. And those are areas where it's nice that we have in-house at Sunrise now. There was a day- years back when those were areas of expertise we reached out to.

Chuck Smith (52:26):

I think that's actually, interesting because, I told that story is as a bit of a joke but I think it's interesting because the product, isn't the chunk of plastic with the electronics inside. The product is, the manufacturer making it right, it being packaged so it's shipped successfully, it doesn't get damaged in transit. The human factors, user interface, stuff that Doug was talking about, can you read the display if it's something that needs to be used in a dark room, the training of the final operator, which was clearly something that broke down in the example I gave.

Chuck Smith (53:06):

And all of these things, when you look at the holistic system, and you can even get into stuff like, how do you eloquently handle RMAs when things go wrong? What is the service manual look like, how serviceable is the device? There's a huge amount of work that goes into a successful product and it would be very egotistical for any, 100-person size company to say, "Oh, we can do everything." But we know about all this other stuff and we can pull it in as we need.

Doug Browne (53:44):

And as we said, at the beginning of this, it's a global world. There's a lot of local expertise, we're blessed to have the local expertise that we're here in our context, but it is a global world, and we reach out globally every day. The key is knowing when and how and how to integrate that together so that it all nicely dovetails together to bring the product to market.

Tyler Kern (54:08):

Well, fantastic stuff. I think you've done an incredible job explaining this today. Chuck Smith and Doug Browne guys thank you so much for joining us here on this episode of Making Bright Ideas Work a podcast by Sunrise Labs. Gentlemen, it's been an absolute pleasure.

Chuck Smith (54:21):

Yeah. Lots of fun. Thank you.

Tyler Kern (54:23):

And everyone. Thank you for tuning in to this episode of the program. We appreciate you joining us today. Of course, stay tuned for more episodes of the podcast. You can also subscribe on Apple Podcasts or Spotify for more, but for my guests today, Chuck and Doug, I've been your host today. Tyler Kern. Thanks so much for listening.