

Analyze That episode transcript

Episode 17 | Lattice Medical

Inside the Lab: How Lattice Medical Develops Advanced Biomaterials

Participants

João Pinto

Digital Media Producer
AZoMaterials

Kévin Roux

R&D Process Engineer
Lattice Medical

Florian Plouviez

Business Manager
Lattice Medical

João Pinto

Hello, and welcome to another episode of the “Analyze That” series. Today, we have a very special episode for you because we came to meet a customer. We’re here at the Lattice Medical Laboratories in Lille, and we came to have a chat about their work on medical devices for soft tissue reconstruction. In this conversation, we speak about the scientific and engineering challenges faced by their team, the wider impact of their work, their use of extrusion, and also their outlook on the developments in the field for the next five to 10 years.

We’re joined today by Kévin Roux and Florian Plouviez, and first of all, guys, thank you so much for joining us. Let’s get started on a little introduction about you and your role. Do you want to get started, Kévin, maybe?

Kévin Roux

Yes, of course. So I’m Kévin. So I’m in Lattice since eight year now. I’m a material engineer, and I try to work on the machine and transfer the process from the R&D to the industrial production.

João Pinto

Amazing. What about you, Florian?

Florian Plouviez

So my name is Florian. I am in Lattice since three and half years now. I’m the business

manager, so I handle basically all the business around the biomaterials part in sales and contract manufacturing and product development for all the people.

João Pinto

Amazing. Thanks for joining us, guys.

Kévin Roux

Thanks.

Florian Plouviez

Thanks.

João Pinto

Let's get started with your work with regenerative medicine, and I would like to know: what does your work make possible, and what problems are you trying to solve? Let's maybe start there.

Florian Plouviez

So basically, to present a bit, Lattice Medical is a French company, created in 2017, and the main goal was to create something around regenerative medicine, as you mentioned. And the first project is around cancer treatment for women that have breast cancer. And we always push forwards in this direction.

And so basically, our work is to create and develop medical devices to... The aim is not to replace something, but it's to add a new way to heal by doing some reconstruction with biomaterials. We always trying to enhance tissue reconstruction with some polymer matrix, and basically what we want is to reconstruct with their own tissue of the patient. So this is basically the main baseline on the company. And then afterwards, you have several products around that.

So we have MATISSE for the breast reconstruction. We have also RODIN for the deep layer on the skin, mainly on the fat in the soft tissue. I don't know if you want to add something.

Kévin Roux

There is also Lattice Services, where we are creating filament for 3D printing, so implantable filament or medical-grade filament for skin contact application. And we are quite expert in extrusion now.

Florian Plouviez

And so this creation of medical devices is thanks to additive manufacturing technology. So we run all the medical devices under additive manufacturing.

João Pinto

Interesting. Thank you for mentioning. We'll delve more into the extrusion processes further down this conversation. But first, I would like to ask you: so you have the services, and you have also your two products that you mentioned. If someone follows your projects from concept to implementation, what would that journey look like really, and what are the most important scientific and engineering challenges that you face going through that, developing your projects?

Kévin Roux

Various different maybe aspects to this question. For me, the first part is to make a prototype that can be industrializable in the future. So we need to think in the future and not only make some R&D for R&D, but think something that can be feasible with our process. So we need to think at everything.

And the other part is to make this process with medical-grade material, so we need to find material that are already certified for implant, et cetera. So we can think at these different steps before to go further, and that's, I think for me, the most difficult part and the most challenging part.

Florian Plouviez

Yeah. I pretty agree with what Kévin said because, from also the customer perspective that we saw, it's always a challenge to come from an idea and R&D things to what can be industrialized. So this is also our expertise, to do that for our own, but also for the other people, and to know, okay, this way of work is working well on the research phase, academic phase, R&D phase, but now we need to think about putting it on the industrial part of the business, and so on.

So we need equipment that are validated for that, that are made to do medical grade or medical devices. We need biomaterial, as Kévin mentioned, that are certified or GMP grade or anything. So yeah, it's always a balance between the prototype and the design to something which is industrializable.

To something also where we find material and equipment to do that.

João Pinto

That's really interesting, that balancing act you always have to do. Let's go maybe more into the filament production that you were mentioning. And I would be really interested to see what role the Thermo Scientific™ Process 11 Parallel Twin-Screw Extruder plays in that. What role does that instrument play in your normal workflows, in everything that you do, basically?

Kévin Roux

The base is some customer want something that is different from the filament we propose initially, because at the base we propose pure filament without anything inside, and some client want some ceramics inside their filament in order to have some functionality. So we start to think about how to add this functionality on our filament, and we think twin-screw extruder, so that's why we buy the Thermo Scientific Process 11. And we start to make some R&D to put some, at the beginning, some hydroxyapatite inside our implantable filament. And we have quite good results.

In general, we succeed to have a good biocompatible result. So it pass the R&D, and we start to think to commercialize this, not only make custom implant for a client; we want to sell this. And now there is a market, and many of our client want this, so we succeed to make this very specific filament with this specific equipment.

Florian Plouviez

Yeah. This is really a kind of a market insight that we hear from clients or leads. We

have several materials, biomaterials in the range, and we have materials that are made for the bone reconstruction.

And some of our clients give us the idea, okay, it's good for osseointegration, for bone regeneration, but how can we enhance that? Can we add some ceramics inside? Can we load it? Can we functionalize it? And so we tried, and as Kévin mentioned, now with the expertise and with the reliability also of the Process 11, we managed to create off-the-shelf filaments made with ceramics.

It's also good for us because we extend the portfolio, but we also have capacities on custom demands. It happens sometimes that some customers need, for their research, or research teams need, something that is not available on the market. So we do that custom, and when it comes to functionalizing or blending polymer matrix with some fibers or powders, we can use the Process 11, and it's pretty good for us because it allows us to work on small quantities also.

But we can also have a good output to have good quantities if we need to do production. So it's kind of this versatility that is really interesting between the production and the industrialization, but also the research with the research team that needs smaller quantities.

João Pinto

Okay, that's interesting that you mention the smaller quantities because we were chatting about this before starting recording, obviously. You were mentioning that often you need to work with your suppliers and with your clients with smaller quantities because obviously the costs are so high working with these materials. So our question would be, how do you navigate that? I know you've spoken a lot about these trade-offs and these things that you need to evaluate. How does that condition influence the work that you do, your production, basically?

Kévin Roux

Maybe I have a good story because at the beginning of Lattice, we don't have extruder or anything, so we are looking for something on the market, but we don't find anything.

And the first thing to do was to create filament. So we buy pellets, and we go to a classic extruder, and you say, "We need 10 kilograms of material to make a first try." And the kilogram of pellets was several thousand euros. So it was a big investment for the company. At the beginning, we don't have so much money.

So we try this, and at the end of this extrusion, we only obtain, I think, 500 grams of filament. So it was very few, and it was a big disappointment for the company. So that's why we start to internalize this, and we search different equipment. So we start with different extruders.

And now with Thermo Fisher Scientific, we have this experience, and we know that we don't need very huge extruders that are industrial. We need something that is more R&D or a pre-industrial extruder.

And we succeed to extrude some material with 500 grams at the beginning and obtain maybe 300 grams of filament with this type of equipment.

So it's very interesting because we don't lose so much material with the purge or the calibration of the different parameters. So it's very nice for us because each gram is money.

Florian Plouviez

That makes sense. But it also makes value for the customers because, when it comes to custom extrusion, all the [unavoidable] losses are for the client.

João Pinto

Of course.

Florian Plouviez

So for example, if we try to do a batch with one kg or half a kg, if we have 300 grams of loss, this is pure loss. So by having something which is reliable, which allows us to work on small quantities, and with the experience and expertise that we gained from all those years of R&D, that's why we launched also Lattice Services for the sales of the biomaterials.

So now we have, as Kévin said, less loss from the purging and [parameter setting], and we know the materials well now. But yeah, it's always in small quantities because, as it's really, really expensive materials, when it comes to do some iteration and some trials, you do that on small pieces. And even on the implantable parts, the implants are really small because this is something that needs to degrade inside the body, so you need smaller volume. And so basically, our customers require small amounts.

And so, as mentioned earlier, having this versatility between being capable to deliver a kg per day to do production and to have a good production line, but also to do some small quantities for research team, R&D, it's always good. But for everyone—for us also in the business, because we can address a lot of demands, but also for the academics and the research teams and the startups—because you need to try something, you need to iterate, and you need to have small quantities. You cannot afford buying some kgs just for a trial.

So it's always a good thing for us that we can help other people to create the future and the medicine of the future. So it's a good achievement also for us.

João Pinto

That's incredible. It's really interesting to hear your story because obviously, in this series, we interview different researchers that use the twin-screw extruder for completely different applications.

Kévin Roux

Yes.

João Pinto

And it's interesting to see the needs of it in your industry, where because you need those smaller quantities or you need that versatility, this type of extruder is actually much more suitable to your line of work. Interesting. Thank you so much, and thank you for sharing the story, Kévin. It's actually really interesting insight.

João Pinto

Let's maybe abstract a little bit, and I'd like to speak to you more about how do you see your work changing in the next five, 10 years. Are there any technologies or advances that you're particularly looking forward to, and how do you see, in general, things changing for Lattice Medical in the next five to 10 years, say?

Florian Plouviez

For the Lattice Services biomaterial part, what we saw in the last two years with the launch of this loaded filament made with the Process 11, is there is so much more demand on the functionalized material and filaments than before. Also, on the scientific publications, related articles, et cetera, there is a really big market for that.

I think in the future, it comes to this change to have more functionalization, more blending, more copolymers doing that. And so I think we are really ready for that. And in the last two years, this is a big part also of the work for us.

And things evolving a lot, so you have also hydrogels, which is really interesting to put sometimes on the scaffolds. You can really work on finding the right synergies that are working with additive manufacturing. I don't know if you see something.

Kévin Roux

But there is plenty of things because there is not only the extrusion. There is the extrusion, but after that, we need to make the 3D printing. So 3D printers evolve every year, and with the AI now, there is a lot of change also. Maybe the extrusion also will be much simpler, with something that can detect when there is a problem or adjust the parameters easily.

And more for Lattice Medical, I think we will increase our range of products. We will also produce more and more because we need to extrude more and more, because there is much more client every year. So we will also hire this year someone to produce. So we hope in five years to have maybe two or three people to make this extrusion every day.

And of course, we will also change site next year. So we will have our own—

Florian Plouviez

Facility.

Kévin Roux

—facility and clean room, because now the production of Lattice Medical is in a clean room of 30 or 40 square meters.

Florian Plouviez

I think it's 40.

Kévin Roux

And the idea is to multiply this size by 10. So in five years, we will have space and produce it in very good conditions, very clean control, and it will be easier for us to access all the demand of all the different clients.

Florian Plouviez

Yeah. And also one of the pivots that we had these last two years was the creation of the CDMO part, in which we are doing co-development and manufacturing on medical

devices. We are manufacturing our own medical devices, MATISSE and RODIN, and the other ones which are in R&D phase now.

But we have this expertise. We have the knowledge of launching medical device, creating medical device, prototyping them on the biomaterial part, on the extrusion. And so we put that for the other people who want to do the production in the clean room, ISO 7. We have the facilities, we have the team, we have the equipment.

And so we help a lot of people with the R&D, as the academics with the small quantities, as we said. The aim is, okay, now the project is good. They have the proof of concept. They need to create startups. Also, maybe sometimes they are already incorporated, so they are already small businesses and startup and medical device company. But they don't want to invest into a clean room, into a full-scale production. So we can do that for them.

And so I think this is really the future. Basically, biomaterials are the start of the funnel. And after, you have the production inside the clean room. And we are actually in a lot of discussions to do that. And we have one Process 11 in the lab. Maybe in a few months, we will have another one in the clean room for our production. So it's pretty cool also for us, because it also shows that it's reliable equipment and usable in production.

João Pinto

Amazing. Thank you so much for sharing the general impact and the things you want to see developed in the future and that you're excited about.

I guess my final question would be: working in this field and these applications for soft tissue reconstruction and regenerative medicine, they obviously have a much broader and wider impact for patients, for clinicians, for the researchers you work with every day. So I guess the final question would be, knowing all these impacts, what motivates you every day to do what you do, basically?

Florian Plouviez

For me, my motivation is more like also because I'm not really working with MATISSE and RODIN, for example, with the Lattice Services part. It's more giving access to plenty of people and researchers to such good and quality biomaterials for their research.

And by extension, maybe we contribute to create the medical device from tomorrow, or to shaping—if we go to the analogy of the production—but to shaping the next implant and everything. The thing I will be proud of will be that in the future, some medical devices are on the market because, with the team and everyone, we made it in the clean room. We sell filaments to the people. We created a custom filament for them, for example.

I think there are the two parts. The part where we can help a lot of people in a lot of medicine parts. It could be sports medicine, aesthetics, orthopedics, and also the part of the reconstruction that we are making also for the patient with our product.

Kévin Roux

I think most of the people in Lattice—we are maybe 20 people, even more—and most of the people want to help other people because the leading project is MATISSE, and the

idea is to help women to have a reconstruction, to reconstruct themselves also because it's not only physical, it's also psychological when you lose your breast. So that's the thing that many people are motivated for.

Florian Plouviez

I think a lot of people here work here because they also wanted to have an impact on the society, on the people, and to give a sense, a way of why they are working, who they are working for. I work for that. I have the results. I know that I am helping other people, and I think a lot of the people in the team are motivated by that.

João Pinto

Amazing. Thank you so much to both of you, and what a final inspiring way to wrap up this conversation.

João Pinto

Thank you for welcoming us at your lab.

Florian Plouviez

Thank you.

João Pinto

And keep doing the great work you're doing.

Kévin Roux

Thank you. Thank you for coming by.