

CONTEXT: Interviews conducted as part of an investigation into the barriers to, and opportunities for, achieving Circular Synthetics. Research was funded by Business of Fashion, Textiles and Technology Creative Research & Development Partnership (BFTT CRDP—£5.5 million) led by the University of the Arts London, part of the UK Creative Industries Clusters Programme (CICP) funded by the Industrial Strategy Challenge Fund, and delivered by the Arts and Humanities Research Council (AHRC) on behalf of UK Research and Innovation.

Interview ID: BFTT-WP5-280520-06

Interviewee: CEO, textiles and apparel research institute

Interviewer: 1

Interviewee: 2

1: The first question is, can you tell me a bit about the background of your organization and your role within that?

2: I'm the CEO of something called the [redacted]. We are a publicly funded Applied Research Center. We are funded through something called [redacted]. They form different Applied Research Centers to tackle different subjects. [redacted]

Innovation is a key area that they thought it would be important for us to engage with the industry in. Then in that, we work very much around sustainability is one of our core-- All our stakeholders who talked about sustainability is a core issue that they want us to help them with.

Industry 4.0 types of challenges and then to deal with changes in society that come up that we can play a role in. Materials for a pandemic, a recent topic that came up. Its topics like that that keep us busy.

1: Okay, perfect and what have your experiences been of dealing with synthetic textiles and circular synthetics within your organization?

2: Circularity is something that we have been grappling with for the last say about five, six years, and then we look at the world of recycling as synthetics or petroleum-based products, and then cellulose and then proteins. Synthetics is the biggest bucket for us, at least for this part of the world. More than half of the materials that we've been encountering for recycling is synthetic. For us, there is good focus about well, what are effective ways of dealing with that material?

The bit that we've been spending time on is on separation because what we've been finding is that it's not just that it's 50% plus of the materials that we're encountering are some form of synthetics, but most everything we encounter are some form of blended material and so until we can effectively separate them, it's just-- Our goal in circularity is to retain value for as long as possible. It's quite easy to down cycle it into insulation or carpeting or what have you, but if we want to keep the value, it seems like the first requirement is separation. That's been our focus for a while.

1: I know that you've been involved in different parts of the different levels of the recycling of garments. I read that you were doing something which is garments to

Interview date: 28/05/2020

garments, something which is fiber to fiber. Can you say a little bit about what the different approaches that you are taken to?

2: Right. One of the things that we are very fortunate and that we really take advantage of is that we don't have a funding challenge. The government has set aside this pool for innovation. Its [redacted], and we are a very small-research center and so we don't report into the government. We report into a industry board because the government said basically, "We know nothing about fashion and apparel. Set up a board and take care." We slipped through the cracks because we're not big enough. We're a rounding error in their budget. We said, "Well, here we have an opportunity. We don't have funding challenges. We don't have a lot of oversight so that gives us a lot of freedom." What we have been taking on as part of that is more high-risk types of challenges that it's not been practical for industry to work on, and it's too applied for universities to work on. We have been working on different types of recycling technologies, with the understanding that of these 12 things that we try, only one or two will work out. It's okay because we don't have the oversight and we have the appetite to take on to that.

Some of the things that you're seeing, the phenomenon you're seeing, the reason to the madness is we are trying to approach it from a different perspective. We try things like biological means of recycling. We have a whole series of using enzymes and fermentation technologies to recycle. We messed around with chemical recycling, ionic fluids and other things like that. We messed around with a highly-automated mechanical recycling.

Then in separation, we're trying all different ways to do separation and most successful is this hydrothermal separation, which is a completely new way of separating blended material. All that- if you casually look at what we're doing it to say, "Well, what are they doing," but actually, that's the big premise is we're trying all of this, and we're abandoning things as quickly as we encounter challenges. The other filter that we're looking through all this is that it's not just a science problem. It's a logistics problem. It's a business model problem.

There are different dimensions to it. Ionic fluids, we were very excited about it, but the cost was so prohibitive and we said, "There's no way we can--" So we abandoned that because of the economics. That's where we're in the middle of right now and it's not like we have the solution nor do we believe there's a silver bullet that is, "Ah, this is it." We're going through that discovery.

We know that in about a year or 18 months, we have to settle down and start making some big bets on a couple of the technologies and start rolling things out in real industrial scale, so that we have something in the marketplace to play with, but between now and then, we're still messing around.

1: That sounds amazing to have that freedom. You're in a playground if you like and you can [crosstalk] and that's where the creativity will come right?

2: Yes.

1: That's fantastic. Just one last small thing on that, what sort of role does engagement or public engagement have within that? Because the sense that I got, I couldn't get loads of information, but the sense that I got from some of the English translated stuff that I saw, was that it was almost- it was quite public-facing. some of it. Can you say a bit about that?

2: We try to become a catalyst. One of the other freedoms that we have that we take advantage of, is that we don't have to publish, like a traditional University and we don't have any profit challenge. The way we approach research is a little bit different from these extremes. What we say, well what should we do? What we want to do is, we want to create these collaborative platforms. Because we want to solve multiple facets of the problem at the same time, what we are trying to do is to get lots of stakeholders to come on board to share, and we don't- we're not very- we don't mess around with IP's or exclusivity that much, and we're not very secretive at all. Because we think that if we can get enough people, and they all bring some value to the solution, then everybody wins. That's sort of why we have the public-facing effort, is to get people who are interested. Who may be on very different ends of the supply chain. It's like a tier-three, a cotton farmer working with a brand and working with us to improve some farming method and things like that. That's the kind of thing that we believe that on one hand, we're very small and all that but on the other hand, we're quite ambitious. We want to do things that just is hard to do in another context. Which is why we have these- we try to be the Switzerland of the industry.

[redacted]

1: That's really interesting. Fantastic, thank you. I'm going to move on because otherwise, we're going to run out of time. You've talked a little bit about this, but could you pinpoint for me where you think the biggest barriers are to developing these circular synthetic systems?

2: For us, it's two obvious ones. There may be more but when we start, one is the blended problem is that we've created these linear business models. One of the linear business models is that we blend without any thought about, well, how do you untangle this stuff? That's a challenge. The other one is as a result of that retaining value is a problem. The other one is logistics. We have built this linear global supply chain that optimizes to make in the East, consume in the West. So the materials that need to be recycled are in the wrong part of the world where there is no industrial base. The clunky solution is you ship everything back and that, the economics of that doesn't work. So what we're trying to create are, are their first world more localized solutions that can do part of the transformation in the consuming economies. Anyway, that's sort of the challenge and the answer to that. Those are parts of- I think those two stay with [inaudible 00:17:16]

1: Perfect. That could move on nicely to where you think the opportunities lie. When you talk about the logistics, is there any specific opportunity you see there to innovate?

2: Yes, for sure. Well, first of all, we shouldn't try to move things around the world like the way we do today. The circularity has to be in the localized processing solutions. For instance, last year, we opened up a recycling mill in Hong Kong, the

Interview date: 28/05/2020

world's most expensive city. Labor is expensive, rent is expensive, electricity expensive. All that really was to prove a point, that in one of the world's most expensive cities, if we can operate this profitably, then any city in the world should be able to operate these recycling mills profitably. It's not without special tax grants, without artificial skews to make it possible. The way we've done it is to focus on automation. This is now a three-ton a day processing plant of post-consumer apparel to yarn mill.

1: Amazing.

2: It produces end products which are dry blended. There's a computer vision system that dry blends it to approximately the color that the end-user would like it to be in. It goes back to yarn form, and then unfortunately, because we have no manufacturing in [redacted], it goes mostly to China to be made back into garments again. It's cheaper than comparable virgin material because of all the wet processes that it saves. It's an end to end dry process.

1: Sorry, just what is the yarn? What's the composition of the yarn that comes out?

2: Here, we're trying a new business model that we've sold to one or two customers. We roughly separate into proteins, cellulose, and polyester. Every day, and we blend some versions in. We get some of their performance and hand feel standards and the color and we blend to that. To do that, we probably somewhere between 30 to 40% of the finished product is virgin material, but 55 to 60, sometimes 70 chief value is always recycled. We basically lack trust to those three tons and that's the content [crosstalk]

Then if they really want it to be cheap value cotton or something like that, that's why we blend enough cotton in so that we know it's at least 55% cotton or something like that, but it varies. The intent there is if the hand feel is what you want, if the color is in the ballpark, think of it as denim, there's a sort of a shape into it, and the performance is what you want, then that's what you get. Instead of I want precisely, 85% cotton, 15% poly or what have you, this doesn't- and consumers really don't care for general application. If three tons is enough of a lot for them to say "Oh, yes, that could satisfy a run of materials for me."

1: That's really interesting. It sounds like you must have quite a multi-disciplinary team there to know what to put in, to have the right hand feel, the right color. I presume that you also have some manual sorting as well. Do you?

2: This is three tonnes and the whole factory is run by six workers. The six workers, basically, are the people cutting out the zippers and the buttons for the old clothes that come in but the sterilization of the old clothes, the color sortation is all done automatically. We have some spectrometers that we've automated. It's just a couple miles of automated tracks that are going around and then a lot of robotic arms.

1: That's incredible. I would love to come and see it.

2: It's become a little bit of a tourist attraction.

1: I bet. A magic machine.

Interview date: 28/05/2020

2: It's a little factory and big machinery running and things like that. We've been running tours two or three times a week-

1: Incredible.

2: -for people who are curious about this. A factory in the middle of [redacted], I'd like to see that. It's an economic model. It's a science model and it's a business model. The point there is to help people think about this because we know that in about 12-18 months, we can sort and separate a lot better in a more precise management but between now and then, that should not be a reason for us not to try something like this. This is just gets people interested, curious and whereas we started out with—[redacted] produces 300 tonnes of post-consumer waste that heads towards landfill every day.

1: Wow.

2: This is a drop in the bucket. We get our raw material for free, basically, because it's either this or incineration or landfill, so we get that. We also have a growing business with people who produces a lot of uniforms. Old uniforms and hospitality, not until recently. They have towels and sheets and things that they want to deal with. There's all sorts of different angles and different ways of using the same system. We have fun.

Your question about multi-discipline is, because of our belief that in applied solutions, it has to be multi-discipline. We have half of the team more than half, 60, 70% of the team, our real research scientists. We have real labs and people in lab coats doing things like that. The rest are people from the industry and people who know how to deal with the government. We're not good at communicating and I apologize for our website and stuff that we have out there. We just don't spend time on it. We need to get better at it, but that's what the rest of the team are building up. We just want to be able to talk about what [inaudible 00:24:47] and get people more excited about this [crosstalk]

1: Sounds amazing and I'm very envious of your situation.

2: We are lucky.

1: Yes, you are lucky. Anything else you'd like to say about opportunities? I just like to add on to that, specifically on the fiber to fiber side, how long do you think it will be before it's mainstream?

2: First, I think there is several horizons to look at that. The first horizon is to fix the mess that we've created already in the marketplace. Which is the stuff that we did without thinking about recycling or any sort of circularity thought. That, we're creating, millions of tons of every day. How do we fix that? This is where some of these mechanical solutions, some of the current work is on.

The second horizon is to then think about, if we truly want things to be circular, how do we create that pathway? Is it labeling? Is it ways of separating the material out so that we can reuse it? Is it the whole reuse? What's the second life? What's the third

life of the material? How do you create that transparency and visibility and get alignment about how the whole thing would work?

The third horizon, is to create brand new types of materials so that we don't have to deal with this problem, right? It would be, what are things that are inherently meant to be used again, that we think of its current state only as its current state? Right? We know it needs to live for three years as a T-shirt, but the next two years, it's going to be something else and in the next few years after that, it's going to be something else. We intentionally designed that into the material so that it's fit for use that way. Then, we build in the infrastructure to support that. It's like, "Why aren't there more electric cars?" "Because there's not enough charging [inaudible 00:27:24]"

We have to solve both the product and then the processing solution for that. That, I think takes a long time, the whole infrastructure of that. Between now and then, we have to deal with horizon one and horizon two.

1: So quite a long time, then?

2: The UN says we have 10 years to get this under control. I think the urgent one is the current mess that we're in. Another way to look at it is the less more good way. We're trying to do less bad things. We will never get to zero.

1: No.

2: We'll just do less bad things. The more good is-- By doing less bad, it buys us enough time to figure out what the more good is.

1: Sure. Okay, perfect. How are you doing for time? Because I know that you're busy.

2: I'm good. I've got about 12 minutes, if that's Okay.

1: Okay, we'll carry on. Perfect. I will just ask you, because we've got a bit of time, I will just ask you the next question. I was going to skip it, but I'll just ask you briefly. It's about COVID-19. I'm wondering how the pandemic, you think, will have changed what we can do, in what time scale, et cetera, or is it just a blip?

2: Yes. I think we all want to go back to normal. I think if we sit down and think about it, there probably is no normal to go back to. That whatever it is, it will not be what it was, is one and then two, the other thing about this, we're in the middle of our first global pandemic. Certainly, a lot of stakeholders' supply chain, in the conversations I have, again, because we're Switzerland. What I hear a lot from people is, "Now I see the true values of the people that I deal with and the organizations I deal with in my supply chain." Which is that if sustainability is the first thing you jettison because you are running out of money, then it was never that important to you in the first place, right? Or CSR or whatever it is.

I think the thing that I caution people about is that it's you-- The disconnect between what you say and what you do is how people judge you. The greater the distance between the two, the more unbelievable you are. A kind word to say. Internally, your associates will be very, very skeptical and I think they would worry. Externally, I think

Interview date: 28/05/2020

your partners will lose trust, because you said you're going down this road but your actions say a differently, one.

Two, the reality of the pandemic is that companies that are not doing well have pre-existing conditions, much like victims of the pandemic itself. They're dying because they had big loans to begin with or something like that. Companies that were not in good shape, let's just push them over the cliff. I think what happened is that those companies that were healthy, that had the right priorities will be the big winners out of this. There will be winners and losers, and it will be a binary. You just have to figure out which side of that you're going to be on.

The changes to consumption will be the big variable for everybody because we really don't know what consumption patterns will look like come September. For sure, consumers will spend a lot more time and resource and money on things that keep them healthy, protect them to support the lifestyle changes as a result of the pandemic and the consumption will be very different, but more online, omnichannel, and a lot less strolling through shopping malls and things like that.

I think for different companies, it will end fairly differently. The market will be smaller. I think just people just will spend less time on discretionary consumption but then there'll be fewer players. At least in the short term, I think.

1: That's interesting. Thank you. I'm going to move on now to look at these examples from our case study. If you look in the chat, there should be a link there to a Google Sheet.

2: Hang on, yes.

1: Do you see it?

2: Yes.

1: I've done it like this because I have the intention that people could type into it if they wanted to, but in practice, actually, of course, it's easier if I just type everything. At least then you can if you want to, or you have the reference that you can respond to as well. In front of you, what you have is a pair of running tights, the ladies running tights that are 100% polyester. They have an embroidery on them or a print of a brand. Then we also have this polyester fleece, which is 100% polyester, but it has these zips and the ID as well on it. Probably, it's not so interesting to look at what happens now but just briefly, because we'll go on to talk about what it would look like ideally. If you could talk a little bit or do you have any thoughts on what the lifecycle for these garments looks like now in your experience.

2: These are recycled already or [crosstalk] cotton?

1: No, these are brand new virgin garments.

2: They're 100% polyester?

1: They are, yes.

Interview date: 28/05/2020

2: Right now, there will be a small percentage probably single digit that will be recycled and the rest is probably the landfill or incineration.

1: Large portion landfill. We talked about this already but why are more of them not recycled currently? I guess that's the--

2: We perceive these as disposable anyway. Our attitude to this type of clothes is that they're cheap and they are used and throw away because of the fashion cycles. It's not something that we value. Nor, do we think there's a lot of residual value with them once you're done with them.

1: No residual value. Perfect. That's really interesting. I don't think many people have picked up on the consumer perception side of these particular things. You mentioned that at the moment, you are looking at manually removing zips.

2: Yes.

1: Do you feel like it's got to get to the point where we don't have metal zips anymore, or is this actually not too much of a barrier?

2: There are ways to automate that I just didn't choose to automate that in our current project because it's just easier. Humans can do that faster and more accurate.

1: Onto the next slide probably more where you might have more to say is, what would it look like in the future? What does this look like ideally for these garments? Would they be different? Where would they end up? What location or anything that you'd like to say about that.

2: Ideally, in the future, they would have a certain percentage that- our content will be a certain percentage of recycled content. Fleece is challenging because of the microplastic challenge. Whether that is a suitable golf ball with material. At least a make and wash care of that will be very different.

1: The way it's produced and the--

2: The maintenance

1: And maintenance, yes. I'll put washing because that's a key one, isn't it?

2: Yes.

1: That's brilliant. Also again, really interesting because no one's mentioned that yet. Although obviously, I put it in there thinking maybe someone would. You mentioned about collections and logistics. How would that look?

2: Right now, both these types of items will probably not be 100% polyester, by the way. It probably has a large percent of Lycra, or spandex [unintelligible 00:37:51] elastin and [unintelligible 00:37:52] hopefully, there is a polyester substitute for that because that always [inaudible 00:38:00] that becomes a recycling challenge.

1: You're actually involved in a project right now to remove Elastane? Is that right?

2: Yes, because it gums up the works.

1: Yes, that's what I understood. In that case, if you find a solution for that, does it need to have a substitute or you still think that it will be much easier. Even if you have a solution if it's a polyester substitute?

2: If apparel is mono-material, it is great for recycling, makes recycling a lot easier. The reason why we've been putting some elastic into most of our clothes is that it's comfortable, it fits better, and it hugs the body better. The solution may be a hybrid, that we do a better job with tapering. We find a polyester substitute and then maybe some compatible to feel that recyclable or easier to manage than some of these elastic lycra and what have you. They're problematic especially running pants like those or yoga pants.

1: I'm just going to pick up on what you said about consumers' perceptions. Obviously, we're talking about, at the moment, fiber to fiber recycling but there's a place here, isn't there? For the increased consumer value in their clothes in the first place, right?

2: Yes, durability could be the key characteristic for any type of material. We go back to the comment I made earlier about our attitude towards our clothes as disposable. We are one of the first generations in civilization to think of clothes as disposable. Up till maybe our grandparents' generation, clothes are durables. Mothers passed them on to their daughters as dowry. Clothes are valued and are repaired, men wear the same jackets most of their lives.

This change in attitude is necessary or we need to go back to thinking of these as durables because this whole disposable idea really came from-- I don't know whether it's fast fashion or from some desire for us to increase our consumption and it has made consumption unsustainable as a result. It's amazing how much more clothes we are buying, wearing, and throwing away.

1: I'm just going to put marketing in there. I'm going to put that I thought of it. I'm just thinking, where's the origin of this? I think that maybe marketing is one of those.

2: Absolutely. I'm sure. [unintelligible 00:41:38]

1: Just quickly on this one. I put fiber to fiber in there but from your perspective, what do you see as the most exciting technology that's coming through on the horizon which could be like a big game-changer for this?

2: Especially circularw polyester.

1: Yes.

2: Which is true circularity. I think that's the one that I think is something that I get very excited about. Today, a lot of even recycled polyester is still a linear solution. A lot of these tights are made then they say, "Oh, we made them from PET bottles." Or something like that. There you took a unrecyclable PET bottle and you made it an

Interview date: 28/05/2020

unrecyclable PET pair of tights. It didn't really solve the problem, you just prolonged the problem more than anything else. What we need there is true recyclability.

The reason why PET bottles are usually not recycled as PET bottles is it needs a certain amount of structural integrity and tensile strength. The reason why they go from bottle to clothes is because knitted polyester, the requirement for the tensile strength is much lower than a bottle with carbonated soda in it or something like that. What we need to do is then to be able to create a more robust form of polyester that is durable and that is meant to be recycled over and over again.

Mechanically, we need to look at the characteristics of the material because if the material, especially a synthetic material is meant to be used over and over again and can be processed over and over again, then you can change- it's just a matter of melting it down and then respinning it. Then you can change the look of it.

1: Sorry, just to interrupt you slightly. Are you talking about designing the polyester or the PET so that it can be mechanically recycled without loss of--

2: Yes.

1: It could be melted [crosstalk] rather than--?

2: -loss of the mechanical strength or tenacity or something like that. It's a different type of polyester. They will become brittle. You just can't reuse them as is. We haven't thought of durability because the notion there is that, oh, this is a fashion item. In six months, that color, that style will no longer be fashionable. You can see [inaudible 00:44:41] anyway and so just throw it away.

You can have changes to your look if you can have that, it's like a-- The way we think about aluminum cans. Aluminum is almost 100% recycled and used again because we've designed it into the material. That's why we don't use tin cans anymore because those are much harder to manage. Is there a aluminium can of apparel in synthetics?

1: At the moment, the technical solution to that is to go chemical, isn't it? To take it back. In that way you can get your tenacity back. What you're saying is a material where you don't have to go so far back but it still retains its tenacity?

2: Yes. The problem with PET and polyester, in general, is that the wear and tear being used right now is such that it becomes brittle and it loses its tensile strength so it breaks but the very nature of synthetics is that if you design it properly, it's quite durable. There are some scientists who believe that every single molecule of plastic that we have created is still around because it's stuck in durable material. Its form of the material that we haven't been creative enough with.

1: Perfect. That makes sense. I never thought about it like that. I just want to move on to the third slide just quickly because I know we're running out of time now. In terms of a road map, I've noted down your several horizons which I can add on here later but is there anything else that you think it needs to happen and who does it need to happen with within the next 5 to 10 years?

2: I think there is a sequence of events for this to be practical. The first is and a very high level has got to be this technology, how we are dealing with waste, and how we think about recycling has to change. There's some sort of legislation that needs to take place so that it mandates that we change the way we deal with our material. We are not paying the true environmental cost for the things that we use. We start there so some sort of a tax or some sort of legislation about the user will have to pay the true cost or pay the lifecycle cost of the material.

1: Do you think the extended producer responsibility will do that?

2: Yes. It could be that but it may be a consumer responsibility, right? When you buy this pair of tight, understand that these are the things that you have to do with it once you get tired of them. That could be one beginning. At the conclusion level or at the brand level, let's start at the brand level. The brand level is new business models. This could be the leasing model, it could be the sharing model, it could be some sort of a different ownership idea which is that, "I'm going to let you use this pair of tights for three years and then you have to give it back to me because I'm going to make something else out of it." Or something like that. That's a commercial decision about how we make money and how we interact with consumers.

At the consumer level, some new idea about our responsibility and this could be a first, transparency and education. Just understanding what happens before and what happens after we buy stuff. That could be things like maybe the nutrition label for apparels that we decide to purchase. If apart from a country of origin and a content, you have some information at the point of sale which says by buying this you are using X and you are creating Y waste and it has to be dealt with in this following way, then you can make an informed, intelligent and intentional decision about your purchasing.

1: That also implies that information about materials has to be much better definitely.

2: Right. It really starts with transparency and understanding what is going on.

1: Okay. Got that. That's really interesting. That links it all together nicely, actually. Like a nice knit. Perfect. That's great. We'll move really quickly because I know we're out of time. Onto these terms. On the fourth slide, I just reproduced them. Is there anything that you would add or change about those?

2: Let's see.

1: If you'd like, you can do it after the call and email me.

2: Well, I think these are fine. I would look at this as the byproduct and not the end-product.

1: Okay. That's interesting.

2: The reason why I say that, I think because these are not ambitious enough. What we're trying to do is to do less bad, it's still not the more good. The more good has to be our use of the fibers. We enrich the communities that make the fibers for us. We create meaningful jobs and careers for the people who manufacture this stuff for us

Interview date: 28/05/2020

and by the use of the material, we actually provide solutions to the problems that we face today, and of course, climate change is one of them. By using these materials, water gets cleaner, soil gets richer, communities are better and we sequester greenhouse gas. That should be the end game, right? It's a completely additive look at the whole industry. I know that everybody thinks of it as a 2040, 2050 type of a solution because there's a lot of science that basically, you can have a material that has synthetic photosynthesis in use or something like that. Then you're creating O₂ and absorbing CO₂. That's the ideal.

I think it will take 10 years or 20 years of research to get there so it is something that we have to put on the table. As we have to start now otherwise, this just won't happen fast enough and everything that we're doing today is a drop in the bucket and we won't get to the UN goals within the timeframe that we are given. By engaging in all of this, it will also change people's attitudes and mindsets.

1: Wow. Thank you so much. It has been hugely helpful and very insightful to get your perspective.

2: I hope that [crosstalk]

1: Yes, that is true. Also, what we'd like to do with all of our 2s is- once we've come to some kind of an output from this, we've synthesized it and analyzed it and that sort of thing, that we would then be able to get your feedback on that as well.

2: Sure.

[end]

[00:53:58] [END OF AUDIO]