1. **Opening Remarks by the Chairman**

   The meeting was opened with a few introductory remarks by the Chairman of the Committee, Mr. Nick Earlam (UK).

2. **Presentation**

   Mr. Pascal Denizart (CEO, CETI, France) delivered a presentation with the topic “Upcycling of Cotton Fibres: CETI’s Recycling Platform” (see attached document no. 1).

3. **Panel Discussion: “Recycling of Textiles – Small Niche or Big Trend?”**

   **Panellists:**
   
   Moderator: Mr. Nick Earlam (JCC-Chairman, UK)
   
   - Ginner: Suresh Kotak, Kotak Ginning & Pressing Industries (India)
   - Trader: Ernst Grimmelt, Bremer Baumwollbörse (Germany)
   - Spinner: K.V. Srinivasan, Premier (India)
   - Retailer: Calvin Woolley, Ikea (Turkey)

   **Earlam:** May I please ask every one of you to give us a short history of who you are and what you do:

   - **Woolley:** Hello everybody. It is nice to be here again. My name is Calvin Woolley. I am the Supply Development Leader for IKEA, working with textiles. It is not the first time I have been at an ITMF Annual Conference and I always enjoy coming back. I am on this panel, because my colleague will be arriving later today. He is responsible for the work we do at IKEA in recycling and renewable in textiles but hopefully I can answer some of the questions on behalf of Nils. If not, we can refer to him later.

   - **Grimmelt:** Hello, my name is Ernest Grimmelt. I am Vice President of the Bremen Cotton Exchange and I have a spinning and a weaving mill in Germany. We consume mainly cotton in our spinning mill, producing open end yarns. With our weaving mill we are producing technical textiles.
- **Kotak**: I am Suresh Kotak. I am related to cotton not only as a business but cotton as a commodity and I believe that it has huge potential. I appreciate today’s presentation, but I would like to add my comments on that later on. Thank you.

- **Srinivasan**: I am Mr. Srinivasan from India and I come from the cotton textile industry. We are manufacturing cotton yarn and cotton home textiles. We have some experience in recycling and I will be happy to share my views on this.

**Earlam**: Maybe I can start with a question. Today we are moving so fast that if you are in a business, they say that the horizon is not far enough, you must jump over a precipice and build a plane on the way down. We are in a world today where the process of recycling is very small relative to the 110 million of fibre consumption we see in the world, same with organic cotton yet the major brands are promoting this as fast as they possibly. So perhaps Calvin, I can start with you, as IKEA, what is your thought process relating to recycling? Is it a niche business, is it a small business or is it a major trend and what sort of time span you see this happen in?

- **Woolley**: Like many of the other brands, we at IKEA are really looking to answer the needs of the customers today. And unfortunately, when it comes to recycling, we are not able to do that today and not at the speed as we would like to. Of course, change takes a lot of energy and we all know the complexities of, for example, the recycling of post-consumers goods whether it is the shortness of the fibres or the fibre blends. Another thing that we are doing currently is a project with H&M. We teamed up with H&M because they are facing the same struggles with regard to meeting their customers’ needs of recycled textiles. We did a study on recycled cotton. We took around 166 samples mostly of post-consumer but also of pre-consumers goods. We then did around 8000 tests on the chemical composition. Because as brands we are under heavy pressure not only from the customers but also of meeting the requirements of the legislations and all the different requirements that are put on us. Therefore, we wanted to do this test to know the chemical contents of these materials. We found some APO’s, toxins and things like that. But the good news is that we found what we believe is a good test methodology to start to work with identifying and doing testing chemicals. And this is going to be released into the industry as well in order to share the results with other brands as well. But we are really happy to work together with H&M on that. Going back to your question on when we believe it is important to achieve our goals. We are working on a 2030 goal of renewable and sustainable materials. Of course, recycled material has been part of it as well and I think we are not the only brand pushing that 2030 deadline. But we really want to move and push that forward. Of course, we know that there are many challenges to it, so I am hopeful that there are enough opportunities in this room who are interested to go on that journey because we have to respond to the needs of the customers today.

**Earlam**: Thank you very much. Mr Grimmelt.

- **Grimmelt**: We see an increasing demand concerning recycled articles. As you know, my company Velener Textil has its own brand “WECYCLED” with a W. In a first step, we concentrated on the industrial waste that we see in the preparation. You have yarn left on the cones which we then separate in sheltered workshops. You then have two materials, the paper cones and then the raw material which we get back in the spinning mill and then open it to single fibres. The other component is what you have in the cutting section on the industrial side, not on the post-consumer side. In the cutting section there is a lot of waste which the customers throw away and even must pay money for. We collect and open the waste to single fibres and then make a very nice yarn out of it. Our aim is really to use 100% of the cotton with as little waste as possible. Now we are busy working with cutting waste of coloured fibers. This means that you do not need to do the finishing and dyeing. Hence, you save a lot of resources by using this waste. From the technical side, I would like to point out
that when you open these yarns you always have short fibres that you have to mix with long fibres. To produce good products, you cannot only use recycled fibres. We are happy that we get good feedback for our products. We are busy at the moment working on an industrial process solution for post-consumer materials that we can offer our customers. But it is not so easy because of Lycra and all the other fibres you have inside like for example blends of polyester and cotton.

Earlam: Thank you. Mr Kotak

- Kotak: The acceptance of the idea is all around. So, recycling is very relevant. There are two factors which have necessitated this thinking in the concept and in the business industry model. First, the resources of the world are limited which is a basic definition of economics and secondly, environmental issues are relevant for the human kind. So, this is a very important point but instead of the word recycle the word which is more important is upcycle. As a matter of fact, when you have come by Lufthansa today in Lufthansa magazine the first article itself is how they upcycle the whole aviation industry in a beautiful way with concepts built in. We in India are also thinking hard on the subject and we are also working because we have also realised that apart from cotton, the cotton has also a highest amount of residue. I would not call it waste. There are reusable residues that also need to be commissioned. In India – as far as I know – the agriculture residue is enormous. 20-25% could be related to cotton. Therefore, we are working on how best to reuse all parts of the cotton plant. That is why the topic is importance. We have also worked out how to recycle and upcycle and reuse. All those are important points for the consideration of resources. Furthermore, we have to change more fundamentally. For example, in India we have been successful in developing natural colour cotton. If we are able to succeed in this, we can definitively save a lot of resource. I agree with Andrew Macdonald that it is not correct to blame cotton when it comes to the environment. The Government of India agrees that the cotton residue has value too and that concept of recycling that was presented today is also one we are trying to adopt in our country. Several things are being worked on in India which I have referred to. I have even brought a sample of a garment made of natural coloured cotton. If anyone wants to see I can show them. Thank you.

Earlam: Thank you. Mr Srinivasan

- Srinivasan: I would like to talk about an experience in our company. We have been working on recycled cotton in Premier Mills and we now have a small spinning plant that runs 100% on cotton waste. There is no virgin cotton involved in it. It is 100% cotton waste and apart from the raw material, the energy that we use is 100% wind energy, so it is 100% green energy with 100% recycled cotton. We have been doing this for over 10 years and we have been successful with that. Apart from us there are also other industries that are using recycled cotton. As Andrew Macdonald mentioned cotton is an important raw material and which we need to sustain. There are companies in India which use fabrics. They shred the fabric completely, take the fibre out and then spin it into yarn. They buy a certain colour of fabric and then produce dyed yarn out of the recycled fabric. The dyeing processes are eliminated completely which again adds to sustainability. These are examples of how cotton is recycled and how it is sustained. I would like to add another point. It was mentioned earlier on how important the concept of sustainability is. There is no doubt that recycling and sustainability is going to be very important and the textile industry has a big role to play in it. But at the same time, we should follow certain ethics and standards. I mean that there is only that much cotton or material that can be recycled and only that much cotton or products that can be made of recycled yarn. There was a situation a few years ago when there were more organic t-shirts that organic cotton grown. Now that does not speak well for recycling and I think it is very important that not only the manufacturers but right down the value chain everybody
understands that there is a certain limit to sustainability and that this is respected and ethically followed. Thank you.

Earlam: Thank you very much. Perhaps I just open the floor for questions out there. Let me start with a question for Calvin. Looking at the goals which have been set by the major brands today, if I take someone like H&M and Zara, they have made goals that they are going to use 100% organic by 2023. Between them they consume over a million tons of cotton. There are 130'000 tons of organic cotton produced in the world. How do you get from there to where you want to be and the same relating to recyclable products? How do you get from there to where you want to be? How do you see that movement to the goals which are set by the major brands to achieve their goals and objectives? How can the industry help you achieve that?

Woolley: I can’t answer of course on behalf of H&M and Zara and what their goals are and their specific directions. But what I can say is that for IKEA many years ago we started the BCI-Initiative in the very beginning as one of the founding members of it and it is something, we really believed in. Setting a goal to really eradicate the conventional way of cotton farming in countries like India or Pakistan. We have set out these goals and we wanted to make sure that 100% of our products were sourced with cotton from sustainable sources by 2015. We really did not know how we would go about it. We did not know the best way to do it. But here we are knocking on the door of 2020. Five years down the road we are proud of what we have achieved. All our cotton products are sustainably sourced, and we strongly believe that we are in the same predicament when it comes to recycling and recycled textiles. We know that it is not easy and probably even more challenging because of the degradation of the fibres if you recycle mechanically. But we strongly believe that we set certain goals and we find partners, many of them in this room as well, to really help us reach those targets and goals. It is not just about what we want, it is the voice of the consumer we are talking about. And the customer is demanding, and the customer is putting this pressure on. I think it is important to reiterate again the thing that we did with BCI. We were adamant about not putting premiums on this product. This was not about the middlemen getting a premium or creating niche products out of it. It is about trying to create an affordable and sustainable product which anybody should be able to afford. Sustainability should not be a luxury of the few rich but should be for the many people and we have the same perspective regarding recycling.

Earlam: Would anybody else on the panel wish to comment on that as well? No, so perhaps we can open the floor up to questions to the Panel and to Mr. Denizart as well. Does anybody have any question?

Aziz Azkarow: Hello my name is Aziz from Uzbekistan and we are also famous in the world for our cotton. I would like to support Mr. Andrew Macdonald about his comments because why cotton? Is the disposal of cotton now the problem, if we think about environment friendly issues? I think that synthetics are more important. Disposing of synthetics is more a problem if we think about the nature. Furthermore, I was also surprised is that industrial waste, for example in our country, I have a few friends who are using this industrial waste for reuse. They use it for nonwovens, they use it for making insulation materials, as it is cheaper than using virgin fibres. My question is: why we are not focusing on reusing synthetic garments because cotton is natural and biodegradable. But synthetics you have to collect them, you have to recycle them, etc. Maybe it would be cheaper to recycle synthetics. This is in support of Mr. Macdonald’s comments. The question: why is the recycling of cotton and not of synthetics the issue? Thank you.

Denizart: I will make a short response to the question. I just want to comment on nonwovens. Nonwovens were the first area we looked at and continue to do so when it comes to downcycling the waste in nonwovens for insulation, acoustic and so on. It is true that it is easier to recycle. But where is the business model? Just have a look at the companies which are involved in such activities, what is their profitability? In a circular economy upcycling is
perhaps the right way to have a business model that accelerates this strategy. Of course, for some markets we can also look at downcycling. It is interesting but it is also a very competitive market and I am not sure that the textiles have all the lobbies and all the organisations like the well-established fibres. You are right that synthetic fibres also need to be recycled. Is it easier? Perhaps it is because of the length of the fibres. I think that at the moment when it comes to manmade fibres the best possibilities are with bio-based manmade fibres. The unique question at the moment is: where is the market of the final product and is it profitable or not? Just remember the two pillars of sustainability: it is people, and also economic profits. You cannot build a sustainable approach without thinking about the business.

- **Grimmelt:** Also, when you are busy with industrial waste you can extend the life cycle because you can also put it afterwards in the automobile industry.

**Earlam:** Is there anybody else who has a question?

- **Uday Gill:** I am Uday Gill from Indorama Ventures. I was just wondering how do we solve this big problem in an elegant manner? The complexity which these products cause to us, any garment, there are buttons, cotton fibres, viscose fibres, nylons, spandex, etc. All these are very complex issues to be resolved. Nature recycles everything. And nature does not do things mechanically and physically. Nature uses the bugs, the microorganisms, the enzymes and I was reading in one of the papers that even in nature there is a beginning evidence that there are microorganisms that have started digesting plastic. So, I am just asking Mr. Denizart, do we have a cutting-edge research on some kind of chemical or bio chemical recycling where we can use these enzymes, bugs and microorganisms as catalyst to discriminate and distinguish various polymers and fibres inside the fabric? We cannot just keep fighting and say that this is cotton and this is synthetic. No single fibre can deliver everything. So, we have to find a comprehensive solution using a more elegant technology than the physical.

- **Denizart:** Your remark is very pertinent regarding enzymes and microorganisms. We are also working on the separation of polymers. I think this approach is for midterm solutions. For the short-term, we have this initiative for mechanical recycling as a response to the huge amount of waste that we produce. But there is research going on in the UK, in Japan and in France using microorganisms to recycle products. Therefore, the third pillar of sustainability is the planet. We should observe the planet and learn from it. I am in complete agreement with you. This approach is a midterm issue of around 5-10 years according to my observation of the research.

**Earlam:** We are coming to the end and I can take one more question

- **Gary Bell:** My name is Gary Bell and I am from Canada. Before I ask my question. Mr. Gill, I have actually eaten a mushroom which was grown by a researcher in the University of Montreal on a pile of plastic. So in fact that research is being done and I am still standing here today and I ate the mushroom about a year ago. The question is for Calvin. A bravo to IKEA for taking initiative on so many of the issues and one of the challenges the industry faces is when brands and retailers actually apply price pressure during these development processes. So what is IKEA’s position and can you speak in general on developing technologies and the challenges that it places on the suppliers that you have?

- **Woolley:** It is always a good question because it is the tough one when it comes to investment. But in IKEA we are really committed to finding solutions and if that means we would partner up to invest, we would invest in new technologies. The important thing is that we can scale that up as fast as possible. Of course, for us is to provide these sustainable
solutions for everybody. It is not a niche perspective, it is not a niche part just for a few persons which can afford it. So, we are always interested to understand what technologies we can invest in and support investments to that we can scale them up so that as many people as possible can enjoy those solutions and they are asking for those solutions today. So, we welcome technology. If you have any ideas let me know!

_Earlam:_ We have come to the end of the meeting. I would like to put all the panellists on the spot, if I could. Recyclables: niche, small or major trend? Please, one-word answer:

- **Srinivasan:** There is an example of where cotton waste has been used to print currency notes. That is niche.
- **Kotak:** Niche. The enzymes have also answered the point of Mr. Uday Gill that we are also able to use the cotton linters and residue for mushroom growing and the finest mushroom are grown out of that and that is niche.
- **Grimmelt:** I think it will be a trend. We see more and more customers and retailers discussing about recycled products and I think it is a trend.
- **Woolley:** It is happening. Happening is the word I would like to use, and it is here to stay and is just getting bigger. So, I encourage all of you to be part of it.
- **Denizart:** Major trend that needs to capitalize for the moment on niche successes.

_Earlam:_ Please give a round of applause to Mr. Denizart and the Panellists. This concludes the meeting. Thank you.
“Reinventing the end of life of cotton textiles in order to design more responsible products.”

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The CETI is a center for technological research and development, covering, in 2018, a significant perimeter from TRL 3 to TRL 8 (Technology Readiness Level). CETI is providing proof of innovation from the idea to the industrial transfer but also helping in successful introduction on the market thanks to its tools of innovation valorization.

The proof of innovation by making it

**PERFORMANCE OF FIBREUS MATERIALS**
- Tri-Component Spinning
- Advanced Functionalized Fibres and Nonwovens
- Multiples combinations of Nonwovens Technologies
- 3D Nonwovens

**4.0 DESIGN REVOLUTION**
- Co-creation with New Customers Experiences
- 2D & 3D Conception & Zero Waste Design
- 3D Collaborative Prototyping and Virtual Reality
- Disruptives Functionnalities Materials and Products
- Personalization and Integrated Short Circuit

**ECO-RESPONSIBLE DEVELOPMENT**
- Eco-Conception of Products
- Eco-Conceived Fibers (Bio-Based, Natural, Organic)
- Circular Economy
- End-Of-Life Treatments for Products
The present Context

- In the world, 80 billions of kg of textile articles are produced each year.
- In Europe, 660 million of kg of textiles are scrapped each year, from which 30% only are recycled.
- In France, 210 000 tons of used garments have been collected in 2017.
- 25% of pesticides consumed at world scale are used for cotton growing.
- About 10 000 l of water are necessary for the production of 1 kg of cotton fibres.
- 200 000 l of water on average, are necessary for the making of one ton of textile articles.

The actual future of the sorted tonnages

Key figures 2017

- 624 kt TLF placed on the market
- 210 kt Collected
- 184 kt sorted

- Re-use: 55%
- Wiping: 15%
- Fraying: 12%
- Incineration: 10%
- Paper-Cardboard: 8%
Reinventing the end of life of cotton textiles in order to design textile goods more responsible.

Cotton has a bad environmental footprint since growing it requires the use of pesticides and a large amount of water. However, it remains the favorite raw material of clothing manufacturers because of its softness and easy-care qualities. Circular recycling will help bring a true added value to cotton. The REWIND project is inscribed in the ethical circle of a circular economy and plans to deploy industrial installations that can collect, sort, fray and recycle post-consumer textile articles. Brands and clothing manufacturers will be able to use recycled materials that will, over time, considerably help reduce the volume of virgin materials and production costs while optimizing the cotton fibers’ environmental footprint.
OBJECTIVES

The REWIND project objectives are:

- Automatization of sorting,
- Automatization of dismantling
- Recycling through spinning
- Validation by panels of users-customers of DECATHLON.
- Gradual inclusion of recycled cotton fibers in textile sport goods.

Building the upcycling pilot line
Building the upcycling pilot line
A pilot product development line resulting from the recycling of post-consumer textile and production waste

From fabric to frayed fibre

Passage from fibre to yarn

Sorting: a roadblock?

- Several constructors of machines are actually proposing different solutions:
  - Use of NIR to determine the nature of fibres
  - Use of image analysis to sort by color
  - Use of image analysis to sort by type of fabrics (Woven or knitted fabrics)

- Limitations
  - Surface analysis: multi-layered fabrics cannot be sorted correctly
  - Speed of sorting can be a bottleneck for productivity
Dismantling: a roadblock?

- Objectives
  - To detect hard points and contaminants: buttons, zips, seams, embroideries, ...
  - To extract them from the fabrics

- Solutions
  - Mechanical solutions: cutting in small pieces and use of the weight of the hard points
  - Detection of hard points or seams, cutting around them and extraction

- Limitations
  - Mechanical solutions: do not remove the fine seams
  - Detection mainly on one face of the fabrics, do not detect fine seams

Dyeing: a roadblock?

Objectives: to avoid a dyeing operation by mixing fibres of different colors
SHARING THE ADDED VALUE

Development of a recycled cotton product line operational for DECATHLON’s Solognac brand.

A pilot line "UPCYCLING" unique in Europe for product development. (sorting, fraying, spinning open end, weaving)

Development of a fraying activity and investment of a dedicated industrial line

Development of new LAROCHE machines upstream of the spinning process

Technical specifications for a future demonstrator for the automation of the demantling

RESULTS/ A 100% cotton yarn succeeding in knitting & weaving tests

30% 70%

Virgin fibre
From organic cotton

Recycled fibre
from 100% cotton used garment

Nm 50
ON SEPTEMBER, THE 19th
CETI HAS OFFICIALLY
INAUGURATED
THE FRENCH DEMONSTRATOR
FOR THE MECHANICAL
RECYCLING
OF SHORT FIBRES
The recycling of cotton textile articles will allow:

- To maximize the percentage of recycled fiber in new products to develop innovative products, and restore value to what otherwise would be destroyed.
- To reduce the volume of waste, preserve natural resources and limit pollution, and thus optimize the environmental footprint of cotton textiles.
- To revitalize jobs and create new jobs.
- To develop a local recycling network including the collection, sorting, material preparation and production of articles from recycled fibers in an economically viable model that is not widespread in France.

Give a sence to consumerism

A new and ambitious challenge for Brands & Major Companies involving the Global textile chain
Setting up a new business model

The circular fashion value chain
- Indirectly enabled by a more closely integrated value
- Enabled by reverse logistics
- Enabled by automation

AN ESSENTIAL BRICK FOR
THE FASHION 4.0

Design innovation
with us

Thank you

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