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A Circle is Infinite. Circularity is Infinited.

Textile Tech to Make Circularity an Everyday Reality.

Petri Alava, Co-founder and CEO, Infinited Fiber Company.
Background presentation for the Parliament of Finland's Committee for the Future.
16.6.2021.



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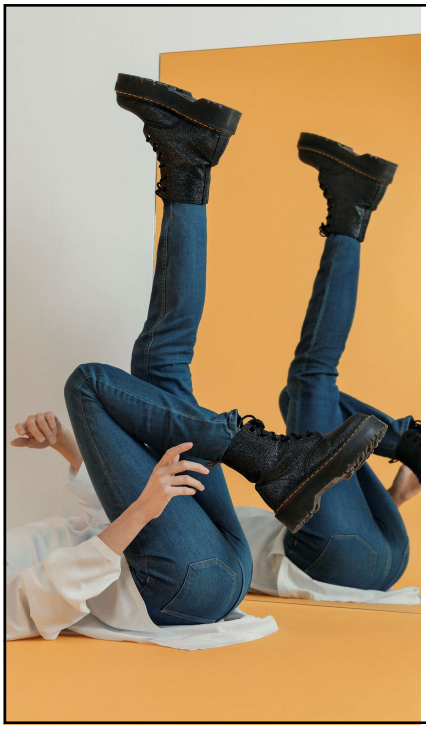

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Introducing Infinited Fiber Company.

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Turning Waste into a Source of Joy.

Who we are.

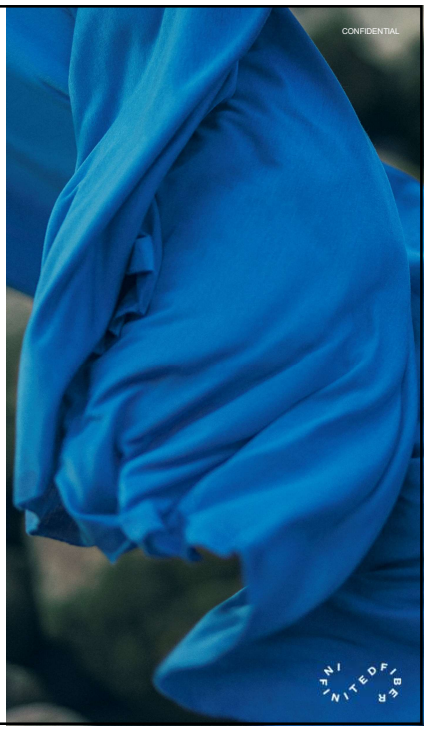
- A fashion and texile technology powerhouse on a mission to make textile circularity an everyday reality.
- We employ around 30 people. We've raised EUR 15 mln in total funding to date.

What we offer.

- A recipe for turning trashed textiles and other cellulose-rich waste into new textile fibers that look and feel soft and natural like cotton.
- A unique, premium-quality textile fiber endorsed by top fashion and nonwovens brands as a true alternative to conventional materials that rely on virgin resources.

Recent recognitions.

- Talouselämä Finland's 10 most promising start-ups 2021.
- 2021 Global Cleantech 100 Company.
- Europas 2020 Hottest Sustainability Tech Award winner.
- WWF's Climate Solver network member since 2016.



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Key Milestones.

- **2021.**
  Announcement of plans to build a flagship factory in Finland.
  1st limited-edition jeans made with Infinna™ sold out in 24 h on Weekday's online shop.
  Infinna™ trademark registered in the EU.
- **2020.**
  Second pilot facility opens in Valkeakoski, Finland.
  Commercial production preparedness demonstrated through 24-hour and 72-hour continuous production runs at Bioruukki.
  Major global brands endorse technology, and garments made with Infinna™ are showcased at Paris Fashion Week.
- **2019.**
  Engineering team achives process stability, demonstrating the technology's commercial readiness.
  H&M Group's Weekday and actor Maisie Williams co-design denim outfit made with 100% Infinna™ created 100% from post-consumer textile waste.
- **2018.**
  Pilot production begins at the Bioruukki facility in Espoo, Finland.
  H&M Group and Kipas validate the commercial quality of denim and single jersey fabrics made with Infinited's regenerated fibers.
- **2016**
  Ali Harlin and Petri Alava co-found Infinited Fiber Company to commercialize technology developed by VTT.

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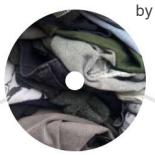
From Rags to New Robes – Our Technology in Brief.

1. Collection and sorting.
Textile waste is collected and sorted by type.



2. Disintegration.
Non-fibrous materials like buttons, zippers and so on are removed, and the textiles are disintegrated to fine shreds.



3. Fiber separation.
The cellulose-based fibers are separated from fibers like polyester and dyes.



4. Carbamation.
The cellulose reacts with urea and a stable, dissolvable cellulose carbamate powder is born. Different feedstocks can be mixed for carbamation or later in the process.



5. Dissolving and wet-spinning.
The cellulose powder is turned into a honey-like liquid and impurities are filtered out. The new fiber filaments are born when the cellulose crystallizes during the wet spinning process.



6. Infinna™.
The fiber filament is cut, washed and dried and the premium-quality regenerated textile fibers – Infinna™ - are ready for the next phase in the textile manufacturing supply chain.



7. Delivery.
The Infinna™ staple fibers are delivered to yarn spinners or nonwovens manufacturers to be made into products like clothing and home textiles, or wipes and diapers.



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It's Unique. It's Infinna™.

- **An alternative to virgin materials.**
  A premium textile fiber that's soft and versatile like cotton and eliminates the need to grow or use new resources by capturing the value of what's already been produced.
- **Born from waste and fully circular.**
  Enables fiber-to-fiber textile circularity. Clothes and textiles made with our regenerated fibers can be recycled with other textile waste to be reborn again as Infinna™.
- **Only natural ingredients**.
  Infinna™ is as natural as manmade can be. It's created with responsible chemistry out of cellulose, which is a building block of all plants.
- **Biodegradable, no microplastics.**
  Infinna™ is biodegradable and doesn't contain microplastics to clog our oceans.
- **Soft and natural to the touch.**
  Whether you use it to make a T-shirt, a hoodie, denim or bedsheets, Infinna™ feels soft to the touch and lovely on skin.
- **Saves water.**
  Producing the fibers to make one T-shirt with Infinna™ takes a fraction of the water needed to produce a similar amount of cotton. Multiply by the 2 billion T-shirts made annually, and you see the scope of what's possible.

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Keeping Great Company.

These companies are leading the way in giving our industry a fresh start and we're proud to be working with them.

H&M Group
PVH
NOMENNESCIO
ANDRITZ
patagonia
INOVAFIL
Wrangler
BESTSELLER
tekstina SINCE 1828
LinzTextil
EUSEBIO fabrics for SUSTAINABLE future
Suominen
KIPAS TEXTILES
REUBEN SELBY

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Project Flagship.

- **What?**
  Infinited Fiber Company plans to build a flagship factory to produce 30,000 metric tons/ annum of Infinna™. That's roughly equivalent to the fiber needed for 120 million T-shirts.
- **Why?**
  To meet the rapidly growing demand for Infinna™ from the global fashion brands and nonwovens manufacturers looking for circular alternatives to virgin materials.
- **When?**
  Construction is due to start in 2022. The factory is expected to become operational in 2024.
- **Where?**
  In Finland. The exact location will be decided during 2021. Once up and running, the factory's direct employment impact will be around 250 jobs.
- **How?**
  The plant will require total investments of around EUR 300 mln (EUR 220 mln for factory set up). Infinited Fiber Company expects to complete its evaluation of financing options soon.



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Why the World Needs Infinna™.

Some Background.

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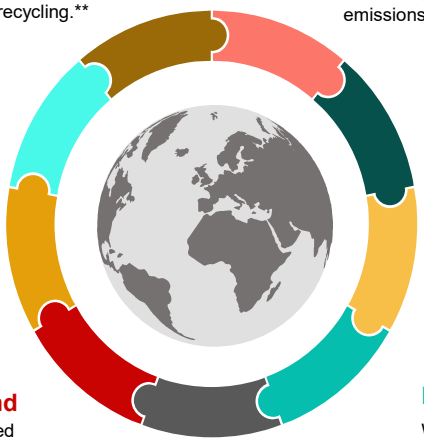
Fashion – One the World's Most Polluting Industries.

Lost opportunities
$500 bln of value lost every year due to clothing underutilization & lack of recycling.**

Global warming
8-10% of global greenhouse gas emissions.**

Green premium
The higher price of sustainable innovation is holding back the scaling of green tech.



Water pollution
20% of industrial wastewater pollution.**

Missing incentives
Lack of regulatory and corporate monetary incentives for sustainable choices.

Trash
Garbage truck of textile waste burned or landfilled every second.^

Rapid growth in demand
Global textile fiber production doubled in 20 years to 111 mln tons in 2019, and is expected to grow 30% to 146 mln tons by 2030.^^

Mircoplastics
Washing synthetic clothes causes 35% of microplastics in the environment.^o

Planetary boundaries
Limits of agricultural land, irrigation water & crude oil.

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The Problem With the Way Things Are Today.

The linear take-make-waste model that drives fashion.

A highly extractive wasteful economic model…

Take → Make & use → Waste

Extraction of finitive resources **98 million tonnes** (2015)[1]

60% of clothing is landfilled or burned within a few years of being made[1]

99% of materials are not recycled in a closed loop

…that results in massive economic value loss and many negative impacts

Annual economic value loss	Share of annual carbon budget by 2050	Other negative impacts
$500 billion	**26%**	**22m** tons of plastic microfibers stemming from textiles clogging the ocean between 2015 & 2050

1 The textiles industry used 98 million tonnes of non-renewable resources in 2015, including oil to produce synthetic fibres, fertilisers to grow cotton, and chemicals to produce, dye, and finish fibres and textiles. Ellen MacArthur Foundation, A New Textiles Economy: redesigning fashion's future (2017)

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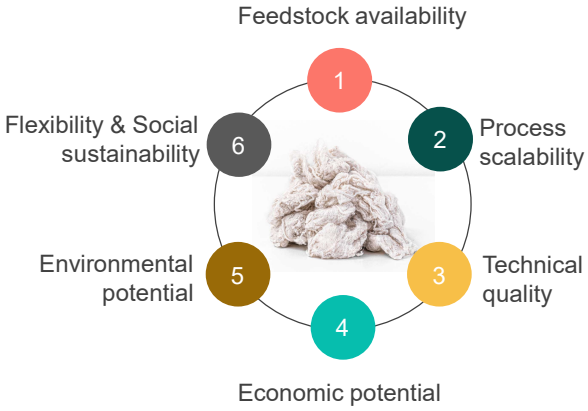
The Good News? Circularity Is Going Mainstream.

- Growing demand for sustainable fibers driven by:
  - Environmentally conscious consumers.
  - Public commitment to circularity by top brands.*
  - Limited supply: less than 1% of clothing currently recycled back into apparel.
- Sustainability is defined by how fibers are made, not by fiber type.**
- Sustainable vs. unsustainable is the result of supply chain choices from cradle to grave.
- Fiber production choices are the easiest way to reduce a textile's environmental footprint.***
- Ultimate sustainability goal: use only 100% waste-based feedstock, produced with 100% renewable energy and designed to be 100% circular.
- **Infinited Fiber's technology makes this possible.**

Key evaluation criteria for sustainable fiber production



Main source: Mistra (The Fiber Bible part 2).

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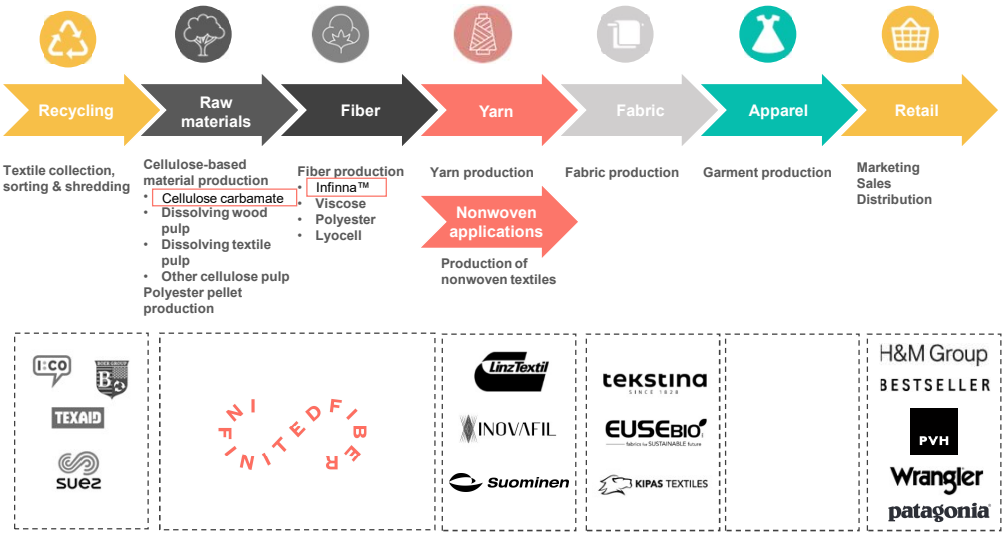
The Big Picture: Where Does Infinited Fiber Fit In?



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Agenda 2030 – How Infinna™ Fits the Bill.

And the Drivers of International Competitiveness.

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The UN SDGs and Meeting the Agenda 2030 Goals.

Infinited Fiber Company's business strategy:

1. Technology licencing to existing textile fiber manufacturers, existing pulp manufacturers and new players to meet the long-term global demand for Infinna™ and establish Infinna™ as a mainstream textile fiber in the 2030s.
2. Flagship plant in Finland to meet the short- to medium-term demand for Infinna™ from global brands and to demonstrate the feasibility of circular textile fiber production.

How Infinited Fiber can contribute to the unachieved targets of Finland's Agenda 2030 goals

- **Target 12.5 – Substantially reduce waste generation**. (+ 12.2 Achieve the sustainable use of renewable natural resources.)
  - Infinna™ is a virgin-quality textile fiber that can be created 100% from textile waste and other cellulose-rich waste streams, like cardboard, paper and wheat straw. Once operating at full nominal capacity (expected by end-2024), Infinited Fiber Company's planned flagship factory will be able to use 100% of the cotton-rich textile waste generated in Finland as its raw material. This will account for 1/3 of the factory's annual raw material needs, with additional textile waste imports needed from other markets.

Contributing to the achievement of the UN SDGs globally:

- Background: The textile industry is global as are its problems. Every second, a truckload of textile waste is landfilled or incinerated, causing air, land and water pollution. Less than 1% of clothes are currently recycled back into clothing. The industry's use of toxic chemicals is a threat to millions. Concurrently, there is a **growing need for a sustainable alternative** to virgin cotton (water, fertilizer and pesticide intensive), polyester (petrochemical-based) and viscose (tree-based and toxic chemical process). Through Finnish innovation we can provide a solution for these multiple global problems.

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Contributions Towards reaching the UN SDGs.



How Infinited Fiber Company's technology can make a difference.

- **SDG12 Responsible consumption and production.**
  Infinited Fiber Company's technology turns waste into a valuable new circular material, while at the same time reducing the burden on precious virgin raw materials, inlucluding agricultural land and irrigation water. The technology is a true enabler of circularity in the textile industry, and clothes made with this fiber can be recycled again in the same process together with other textiles.
- **SDG6 Clean water and sanitation**
  Producing the fibers to make one T-shirt with Infinna™ takes only a faction of the water (~15 liters) needed to produce a similar amount of virgin cotton (~600 liters). Multiply by the 2 billion T-shirts made annually, and you see the scope of what's possible.
- **SDG15 Life on land + SDG2 Zero hunger + SDG14 Life below water**
  By decreasing the amount of land used to grow cotton, more land can be used to grow food or be left to wilderness to support biodiversity, and the need for pesticides and fertilizers reduced. Infinited Fiber's planned flagship factory capacity is 30,000 metric tons of Infinna™ fiber. On average, you can harvest 2-4 metric tons of cotton per hectare. Shifting 30,000 tons of cotton production to Infinna™ production would free up 7,500-15,000 hectare of arable land for food production. In India, for example, you could grow 25,000-50,000 metric tons of wheat on this area of land to feed 187,000-375,000 people.
- **SDG14 Life below water**
  Washing synthetic clothes accounts for 35% of primary microplastics released into the environment. Infinna™ is biodegradable and contains no microplastics. The textile treatment chemicals, dyes, and other non-cellulosic particles contained in the raw material (textile waste) are removed and captured in the process, preventing them from polluting landfills and waterways. The technology also replaces the toxic chemical carbon disulfide (needed to make viscose) with animal feed-grade urea, offering a significantly safer production process for creating cellulose-based textile fibers.

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Measures Needed to Support Competitiveness.

Trade policy considerations:

- **Fair play**.
  - There is a need for strong global intellectual property rights and protection, especially in Asia, home to most of the textile industry to enable investments into new innovations to generate profits.
- **Levelling the playing field** for more sustainable, circular products vs. those created from virgin resources/according to the linear model of production.
  - Application of the EU carbon border adjustment mechanism and other measures to textiles to compensate for the green premium on circular products and to provide transparency on the environmental costs of products to consumers.
  - Implementation of gloablly unified taxation policies on waste and the use of virgin materials to support the creation of circular production models.

Waste legislation to support circularity:

- **Enabling new operating models** that enable circular production at industrial scale.
  - How materials traditionally viewed as waste are classified has a major impact on how they can be transported across borders and the cost and requirements for further processing. As the EU requirement for collecting textile waste comes online in 2025 (and in 2023 in Finland), it will be critical to define whether used textiles are classified as waste or as raw material. Finland alone does not produce enough textile waste to cater to the needs of our planned flagship factory. We will need to import cotton-rich textile waste from abroad to serve our raw material needs.
  - The European Green Deal, the Circular Economy Action Plan (CEAP) and the Industrial Strategy identify textiles as a priority sector in which the EU can pave the way towards a carbon neutral and circular economy. Infinited Fiber's technology can help achieve the goals entailed in the "New Circular Economy Action Plan".

Public funding instruments:

- **Sharing risk and reward.**
  - Developing public funding mechanisms to share the risk with private investors is essential to enabling investments into the industrial-scale production for innovative, early-stage companies that support the achievement of the national Agenda 2030 goals as well as the international SDGs. Government returns from such projects include job creation and tax income generation.

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Thank you!

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