Faktaark om genanvendelse

Baseret på Hempkhaus et al: "Circular Economy in the Textile Sector – Study for the German Federal Ministry for Economic Cooperation and Development (BMZ)" 2019

Name	Fibertype	Process	Pro's	Con's
Standard mechanical recycling (Fibre Recycling)	Natural fibres (Cotton fabrics)	• Mechanical tearing of fibres, unravelling, grinding, defibrating and cutting • Developed process (e.g. SOEX with H&M) • Currently less than 0.1% of recycled amounts textiles is recycled into yarn and new textiles	• Reduction in use of new fibres • Substitution of raw material production (cotton farming)	• Max 30 % recycled fibres • Reduction of Fibre quality → Downcycling • Ecologically questionable
Standard chemical recycling	Synthetic fibres (synthetic polyester as mostly used fibre)	• Textile materials are roughly cut up and decomposed into individual monomers by the addition of various chemicals → Feedstock to produce monomers of virgin quality • Developed process (e.g. Teijin, Parley for the Ocean) • Concerning natural fibres neither technologically nor economically mature	• Recycling without affecting quality • Same price as conventional fibres	• In currently developed processes restricted to single-origin articles • High energy consumption • High capital investment
Chemical Recycling: ECO CIRCLE™ FIBERS by Teijin	In principle, recycling of a mixed-fibre product is feasible but the end-product is restricted to mono-fibre articles like functional sports shirts from polyester →most recycled fibres are not made from post-consumer garments but from other sources of used plastics, such as PET bottles	• Recycling of polyester from used-clothing, PET bottles & production waste PET 1. Material is cut and washed 2. Compounding / Solving in ethylene glycol 3. Reaction with methanol	• Commercially available process • Similar quality as oil-based virgin materials • Reduction in energy consumption by 84%	• System does not accept all polyester products • 10 to 20% more expensive than using virgin materials • No closed loop recycling as input is mostly no textile waste
Fabric recycling of Pre-Consumer-Waste	Natural and synthetic fibres	• Re-manufacturing: Pieces of complete fabric mostly from factory offcuts and leftover materials are re-sewed to create new garment • Developed process not requiring advanced technologies • Networking of companies in order to coordinate supply and demand of "preconsumer-waste"	• Environmental-friendly • 20-90% share of recycling content is possible	• Limited application (inconsistent and too-small supply of fabrics) • Labour-intensive
Refibra	Pre-consumer cotton waste (cutting waste from garment making)	• Lenzing (e.g. patagonia) • Replaces part of wood as raw material used in pulp fibre production • Commercially available • Research on increasing recycling content and use of post-consumer waste	• Same quality as raw material from wood • LCA-proofed environmental advantages	• Up to now just 20% recycling content possible • Just possible for undyed, homogenous pre-consumer waste

re:newcell pulp	Cotton, viscose & other cellulosic fibres	• Post-consumer textiles are shredded, buttons removed, discoloured, etc. • Separation of cellulose fibres • Chemical solvent → Molecular level → Dissolving pulp → Viscose fibre • Drying → re:newcell pulp → packaged into bales → fed into the textile production cycle • Demonstration plant in Sweden producing 7,000 tons per year • Full scale plants with 30,000 tons planned	• Cost-effective environmentally friendly chemicals • Low energy consumption (exception: drying)	• Quality problems with high non-cellulose content • Broad spectrum of pollutants and dyes in the raw material • Small scale leads to high costs in initial stage
Innovative chemical polymer recycling: Worn Again	Recycling of synthetic (polyester) and natural fibres (cotton)	• Polyester is not depolymerized to monomers, but directly recovered • Small scale • Establishment of Recycling plants (Upscaling) planned	• Broad range of inputs → Pure as well as blended materials can be used • 20% of impurities can be filtered out • Polyester of same quality as virgin equivalent	• High energy consumption • Higher costs than virgin materials
Innovative chemical polymer recycling: Evrnu Regenerative Fiber	Natural fibres (cotton fabrics)	• Prototype status • Pulping and breaking down cotton to fibre molecules • Removement of dyes / contaminates	• High quality fibres • 98% less water than virgin cotton	• High energy consumption • Higher costs than virgin materials
Relooping Fashion Initiative, Infinited Fiber	Natural fibres (cotton rich textile waste and other biomaterials, like wood)	• VTT Technical Research Center of Finland, Infinited Fiber Company • Unique cotton dissolving technology 1. Activation 2. Carbamate cellulose dissolution technique 3. Fractioning • Currently test-base on industrial scale, development towards industrial production	• No downgrading of fibres • Environmental-friendly	• Requires raw material in large quantities • Reliability is an issue
Innovative hydro-thermal (chemical) recycling	Polyester and Cotton	• Hong Kong Research Institute of Textiles and Apparel (Partner: H&M) • Hydrothermal process with heat, water and less than 5% biodegradable green chemical • Pre-industrial size facility opened in September 2018 in Hong Kong	• Recycling of cotton and polyester blends • Self separation without the need of prior high-quality sorting	• High energy consumption • No direct textile-to-textile recycling for cotton