Innovative by nature

The key role of biorefineries in the sustainability strategy of the Lenzing Group

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Lenzing’s biorefinery concept is at the core of our strategy

Sustainability positioning

- As a key corporate value
- Innovation and growth driver
- As a key brand value
- Cornerstone of employee engagement
- An enabler to drive change through partnerships

Lenzing’s mission statement

“Lenzing is a performance materials company that turns CO₂ and sunlight into highly functional, emotional and aesthetic products across the globe”
Mega trend - Sustainability is gaining importance

Less than 1% of global water resources is available as fresh water for people

- But water consumption is rising due to population growth and changing consumption habits

Arable land is decreasing due to erosion and urbanization

- With a growing global population, this intensifies the competition for farm land

Oil is a finite resource causing negative externalities

- Sooner or later “peak oil” will be reached
- New sources can only be tapped by taking high ecological risks
Textile industry has serious issues

Source: A new Textiles Economy: Redesigning Fashion Future: Ellen MacArthur Foundation

www.lenzing.com
Fiber demand growing at 3-4 % p.a.

Expected growth of global fiber demand until 2020

**CAGR (2015e – 2020p²)**

- **Wood-based fibers¹** (6%)
  - 5-6% p.a.
- **Synthetic fibers (64%)**
  - 3-4% p.a.
- **Cotton (25%)**
  - 1-2% p.a.

**Total fiber market**

- 3-4% p.a.

¹ Wood-based and cotton linter-based cellulose fibers - Viscose, Modal, Lyocell and other (acetate, cupro) both staple fiber and filament
² Projected

Sources: ICAC, The Fiber Year 2018, Lenzing data
Lenzing’s Sustainability Strategy
Naturally Positive

**Focus areas:**
- Sustainable Innovations
- Water Stewardship
- Raw material security
- Decarbonization

**Circularity**

**Greening the value chain**

**Partnering for Change**

**Focus areas:**
- Partnering for systemic change
- Empowering people
- Community wellbeing
Lenzing’s Sustainability Strategy
and how it relates to the UN Sustainable Development Goals

Focus areas:
Sustainable Innovations
Water Stewardship
Raw material security
Decarbonization

Circularity

Greening the value chain

Partnering for Change

Focus areas:
Partnering for systemic change, Empowering people, Community wellbeing

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Lenzing’s Sustainability Strategy and Biorefineries

- Water saving by integration
- Renewable energy
- Integration pulp+fiber
- Industrial symbiosis
- Transparency
- Innovation in biorefinery products

- Sustainable wood sourcing
- Backward integration
- Conservation solutions

- Partnering for systemic change
- Wood stewardship
- Decarbonization
- Enhancing community wellbeing
- Wood security
- Sustainable innovations
- Profit
- People
- Planet
Renewable raw material wood

- The raw material for Lenzing fibers is dissolving wood pulp from beech, spruce, eucalyptus and several other types of wood.
- 2–3% of industrial pulp produced worldwide is used by the fiber industry.
- Dissolving wood pulp has specific requirements compared to paper pulp.
Responsible wood and pulp sourcing

- Lenzing has a strict wood and pulp sourcing policy in place.
- Lenzing does not source any wood or dissolving wood pulp from ancient and endangered forests as well as high conservation value areas.
- Lenzing is committed to sourcing wood and dissolving wood pulp exclusively from non-controversial sources.
- All Lenzing production sites are FSC® (Chain of Custody) certified.
- The wood processed in Lenzing (Austria) and Paskov (Czech Republic) is procured by a team of experts who are educated and well-trained foresters with reliable long-term relationships to the suppliers.
The biorefinery concept in Lenzing, Austria

Sustainable forests → Wood → Biorefinery factory

Dissolving wood pulp →
- Lenzing™ Viscose fibers
- Lenzing™ Modal fibers
- Lenzing™ Lyocell fibers & filaments

Biorefinery products:
- Lenzing™ Acetic Acid Biobased
- Lenzing™ Furfural Biobased
- Lenzing™ Magnesium-Lignosulphonate Biobased
- Lenzing™ Soda Ash
- Lenzing™ Hemite
- Lenzing™ Mother Liquor
- Xylose*

Black liquor → Bioenergy plant
- Bioenergy
  - Electricity
  - Heat

*(purified/marketed by a partner company)
**Lenzing Group: 50% renewable energy**

Energy sources of the world, Lenzing Group & Lenzing site*

![Energy Sources Chart]

- **Renewables (biomass, wind, solar, hydro, waste etc.)**
- **Nuclear**
- **Crude oil**
- **Natural gas**
- **Coal**

* incl. RVL

Sources: IEA 2017, Lenzing AG
Includes own energy generation and from energy providers, excluding grid power which is a minor fraction of total Scope 1 and 2 energy consumption of the Lenzing Group. The production sites in Paskov, Grimsby, Mobile and Haidenkreuz do not use coal as a fuel source in their own operations whereas the Asian sites, i.e. Nanjing and Purwakarta, predominantly use coal.

www.lenzing.com
LENZING™ fibers are best-in-class

Higg MSI Total score by Sustainable Apparel Coalition

Source: Higg MSI Scores/own calculation

Developed by the Sustainable Apparel Coalition, the Higg Index is a suite of tools that enables brands, retailers, and facilities of all sizes — at every stage in their sustainability journey — to accurately measure and score a company or product’s sustainability performance. The Higg Index delivers a holistic overview that empowers businesses to make meaningful improvements that protect the well-being of factory workers, local communities, and the environment.
Circular economy – a systemic change

Wood: biological origin
Agriculture or forest
Pulp making
Wood biorefinery: Extraction of biorefinery products
Fiber making
Closed-loop processes: Recover & reuse chemicals
Recovered energy
Recovering energy
Fabric production
Garment making
Final product
Composting
Compostable fibers*

*All standard fibers from Lenzing are compostable and biodegradable in marine and soil conditions. However, the compostability of textile and nonwoven products depends on the material composition (fiber blend) and processing in the value chain steps.
Biorefineries at the core of Lenzing Group’s sustainability

**Circularity**
- Renewable raw material base – wood from sustainable forests and plantations
- Products from the biodegradable polymer cellulose replacing plastics

**Greening the value chain**
- Energy integration and biorefinery product utilization leads to low footprint of products compared to alternatives

**Partnering for systemic change**
- Industrial symbiosis – waste of one company is raw material for another company
- Transparency
- Willingness to co-operate. Only joint effort brings progress and success
- What are the needs in terms of financing and capital to address the technological and business challenges related with developing biorefinery further?
Thank you for your attention!