

Welcome to Södra Innovation





Södra's arenas— Development of new and existing business



Forest



Sawn timber



Paper



Textiles



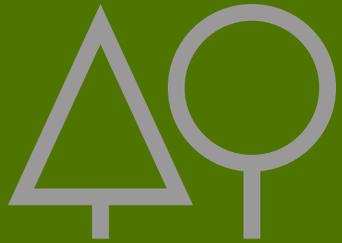
Chemicals



Energy
and fuel



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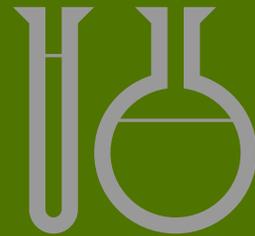
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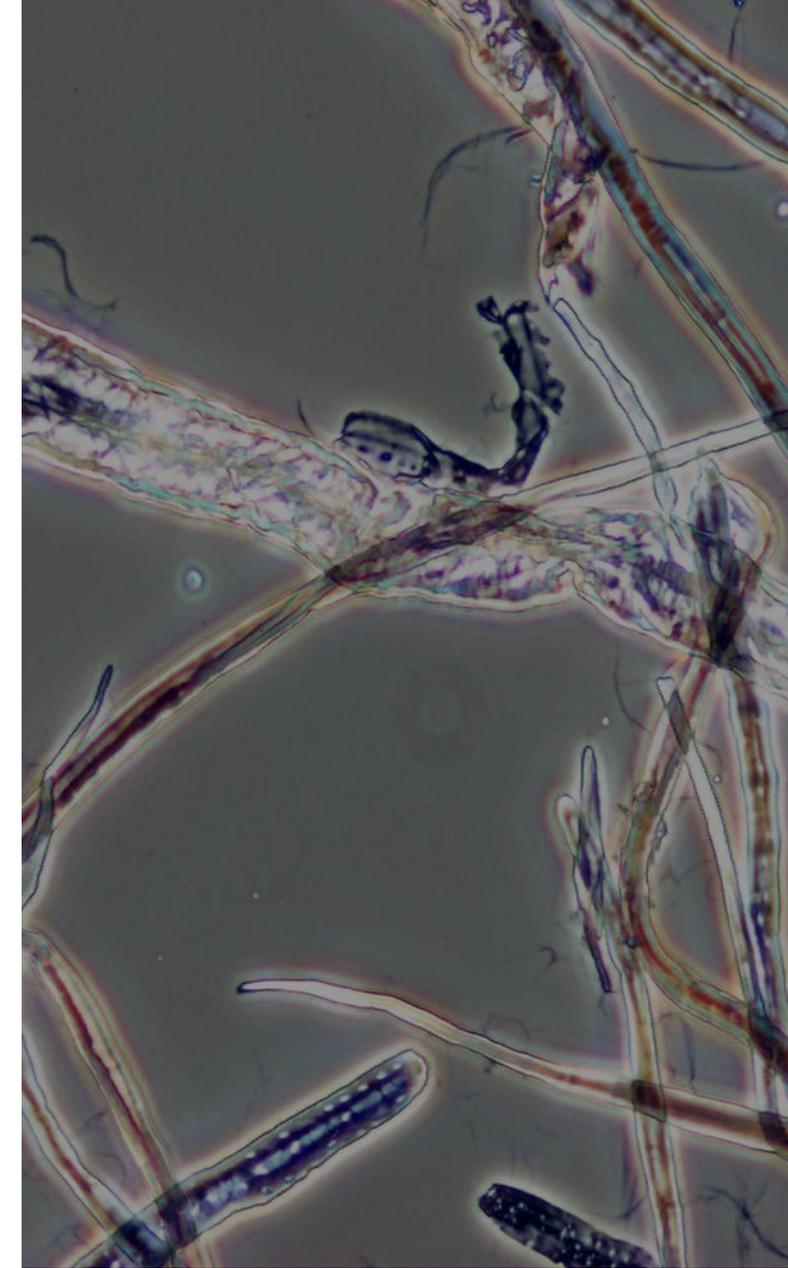


Energy
and fuel

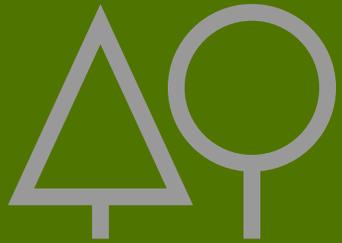


Paper – focus areas

- Optimized processes and reduced costs
 - Possibilities for increased yield
- Improved product performance and customer satisfaction
 - Possibilities for pulp with higher tensile strength
 - Customer specific projects
- New business opportunities
 - Semi-bleached pulps
 - Recycled feedstock



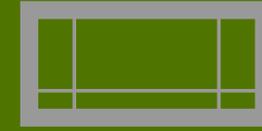
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Biomethanol – Climate Friendly Bio Fuel



Location: Södra Cell Mönsterås

Production: 5 500 tonnes of purified methanol from residue in pulp production (raw methanol)

Start-up: Q4 2019

Södra first with commercial scale in the world



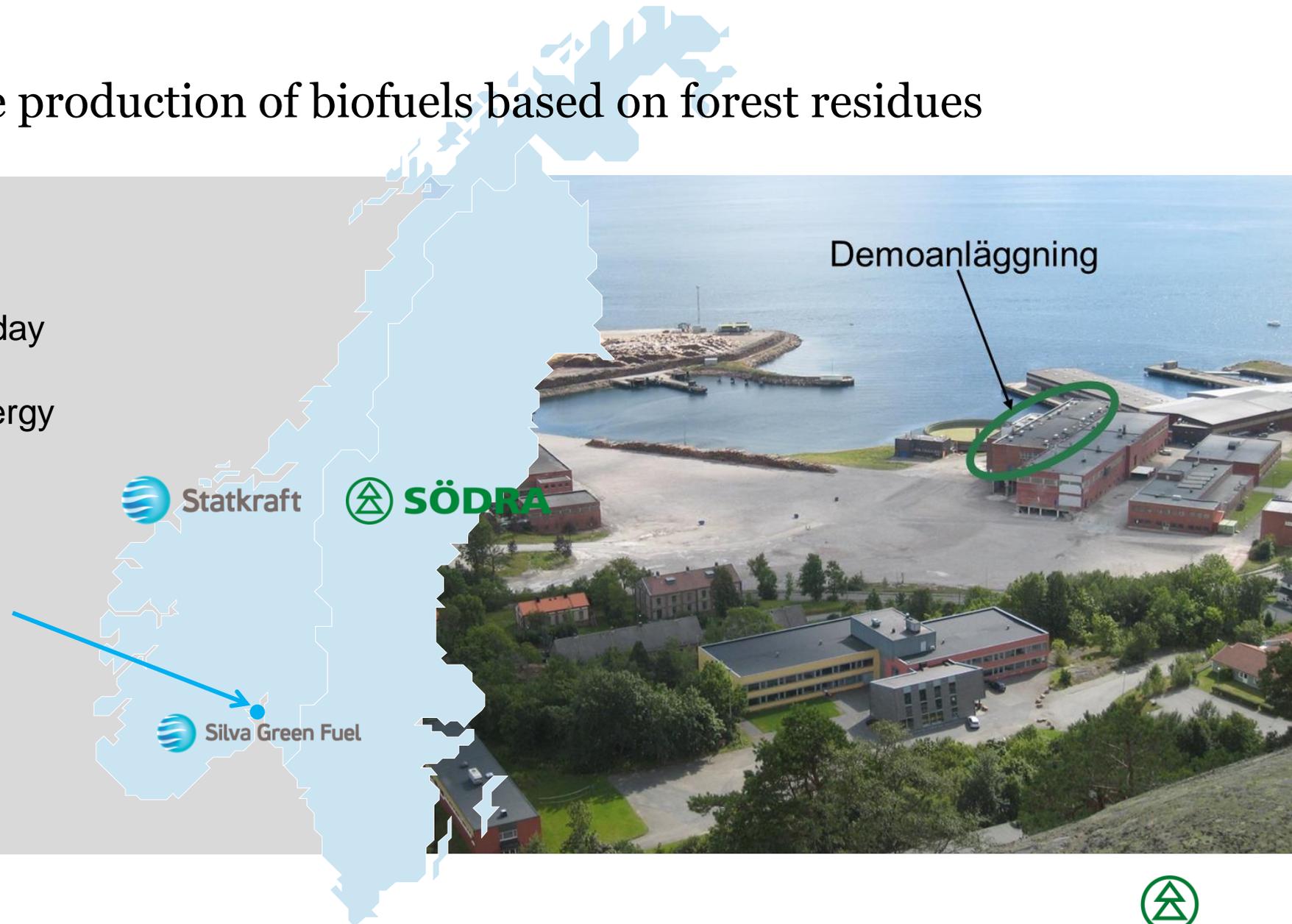
Silva Green Fuel

New technology for the production of biofuels based on forest residues

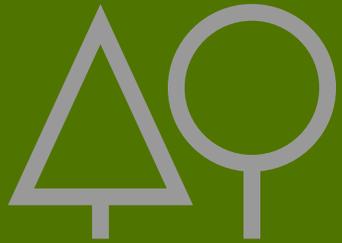
Location: Tofte, Norway

Capacity demo-plant: 4 000 liters/day

Technology Supplier : Steeper Energy
(HTL – Hydrothermal liquefaction)



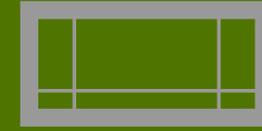
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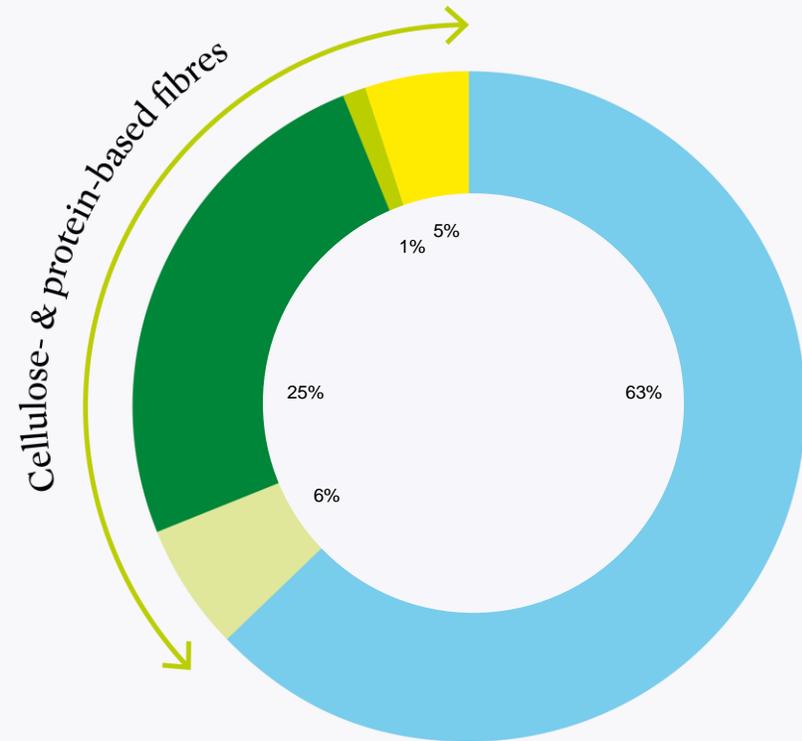


Energy
and fuel



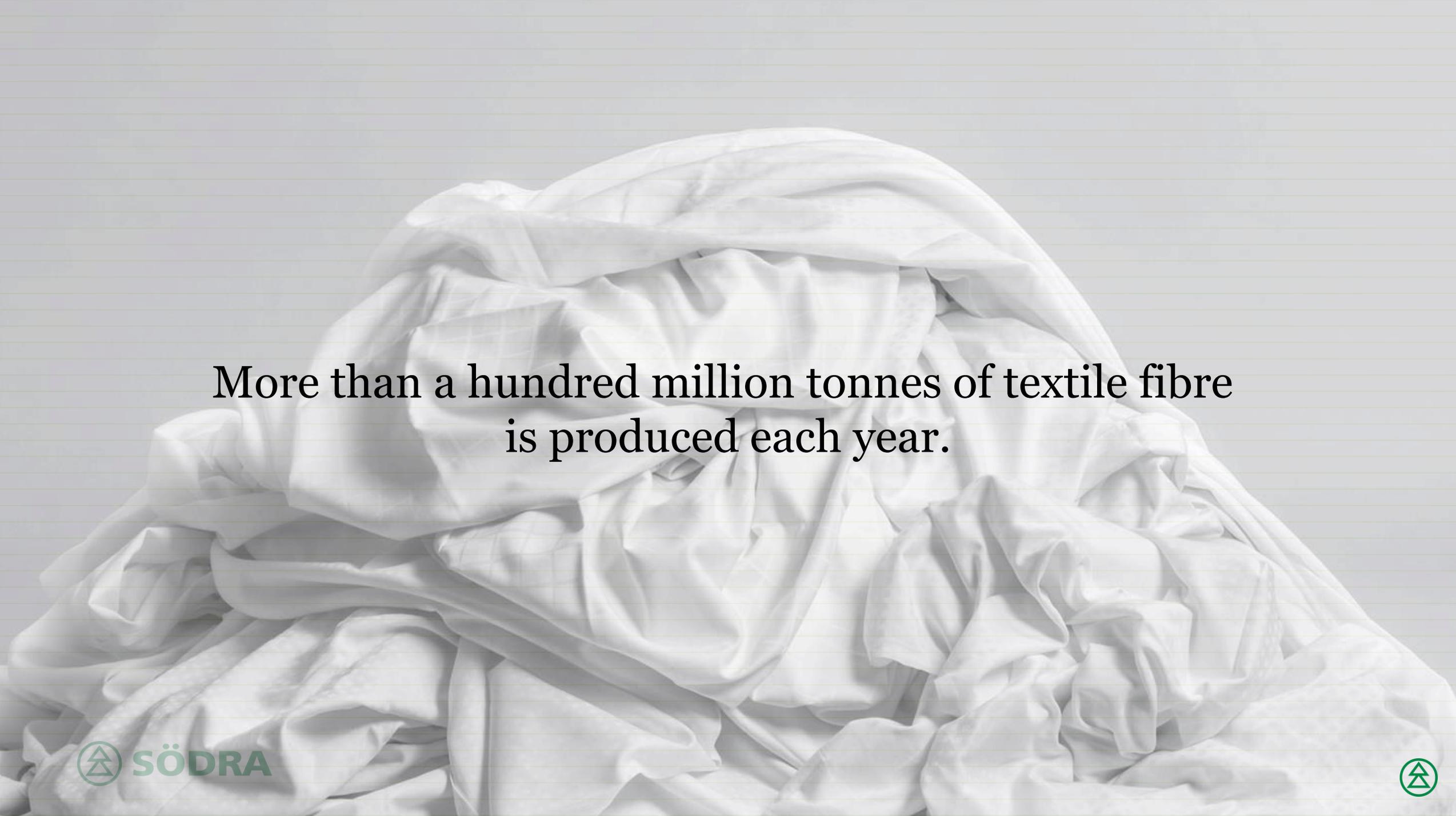
Global consumption av textile fibre

- Synthetic fibres
- Cotton
- Wood-based cellulose fibres
- Other natural fibres
- Wool



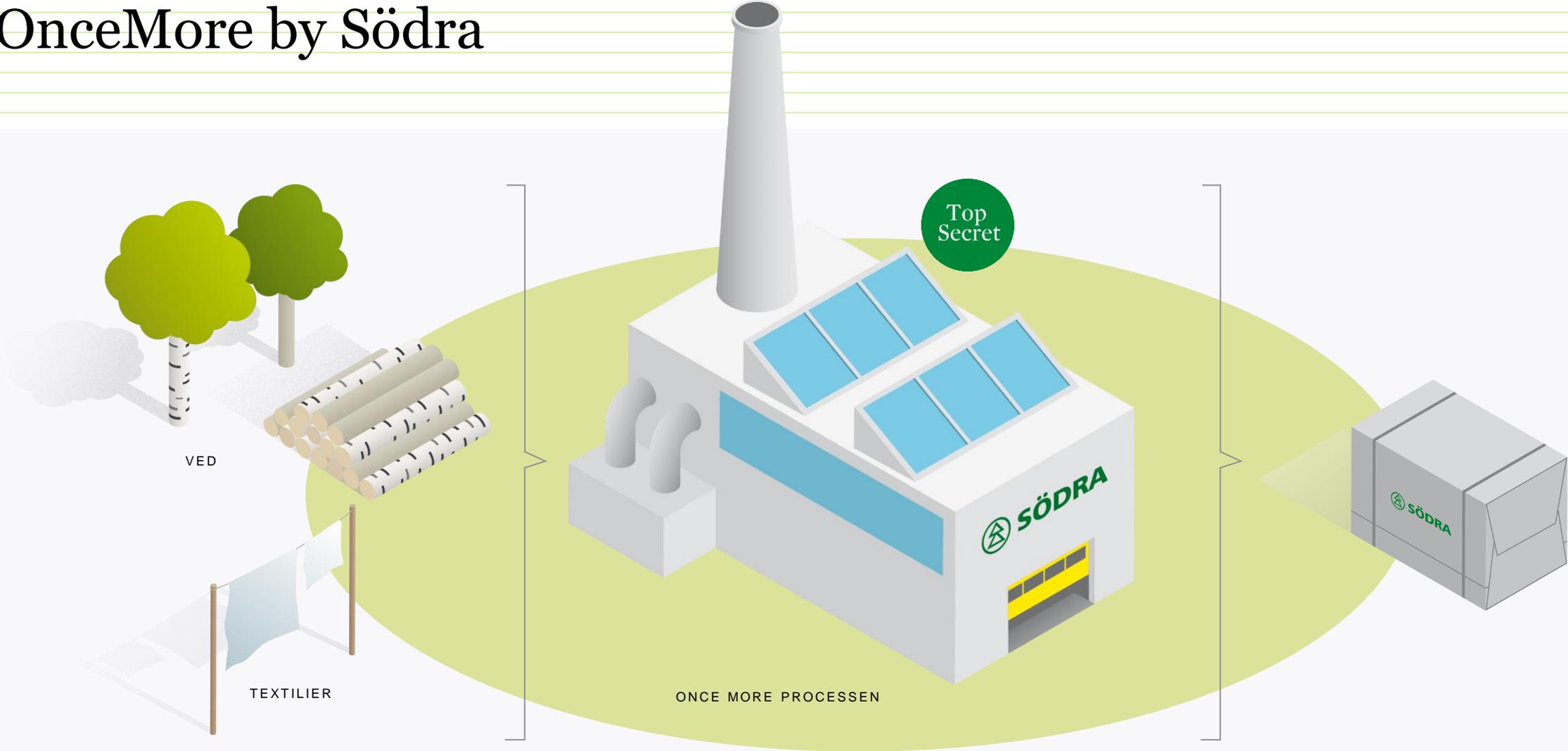
Source: The Outlook for Dissolving Pulp – September 2019, Hawkins Wright





More than a hundred million tonnes of textile fibre
is produced each year.

OnceMore by Södra



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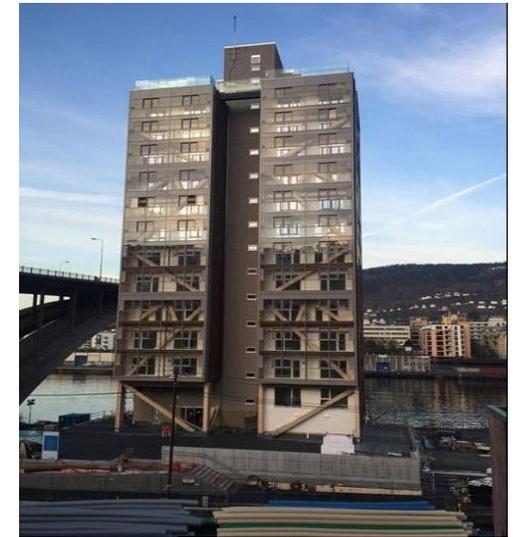
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CLT - Cross Laminated Timber



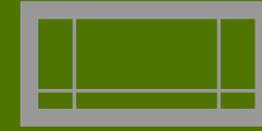
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SweTree Technologies and the forest industry invest 50 million in pilot plant for the future forest plants

Together with the leading forest companies Stora Enso, Sveaskog, Södra and Holmen, the Swedish innovation and technology development company SweTree Technologies invests SEK 50 million in a pilot plant for automated and large-scale production of refined forest plants.

SweTree Technologies and the forest industry invest 50 million in pilot plant for the future forest plants



SweTree Technologies has for several years developed a technology for automated production of forest plants based on somatic embryogenesis. With this technology leap, it is possible to quickly and efficiently produce more plants of the best material from forest breeding. This is positive for both the forest economy and for the bioeconomy, but also for the environment by the fact that the trees capture more carbon dioxide from the atmosphere as they grow faster and thus more fossil products can be replaced with renewable raw material. It will also enable development of qualitative properties of the trees such as resistance to diseases and pests.

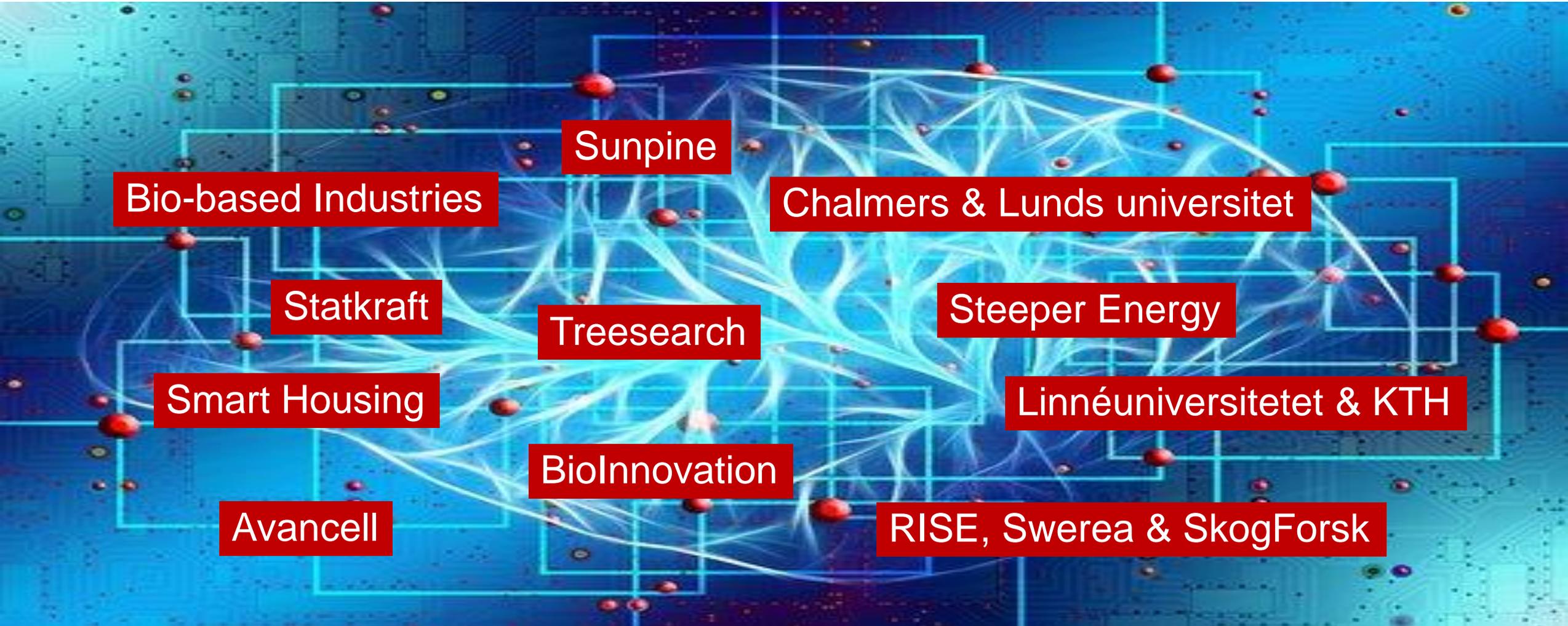
“We have now started the design of the pilot plant. It will be built in close proximity to SweTree Technologies' existing premises in Umeå, Sweden, and completed in a year. The following year, it is envisaged that the pilot plant will be run and used for verification of the technology. The goal of the pilot plant is to have a decision basis for a first full-scale commercial plant with a capacity of 20 million spruce plants per year”, says Christofer Rhén, CEO of SweTree Technologies.

For further information contact:

Christofer Rhén, CEO of SweTree Technologies, phone: +46 90 695 8901



Partnerships & Networks



Modern Quality Control



Södra customer surveys

- Every second year
- More than 50 completed interviews
- Validation of
 - Relationship and personal contacts
 - Ordering and delivery service
 - **Product quality and performance**
 - Technical advice and support
 - R&D and Innovation
 - Environmental
 - Marketing communication

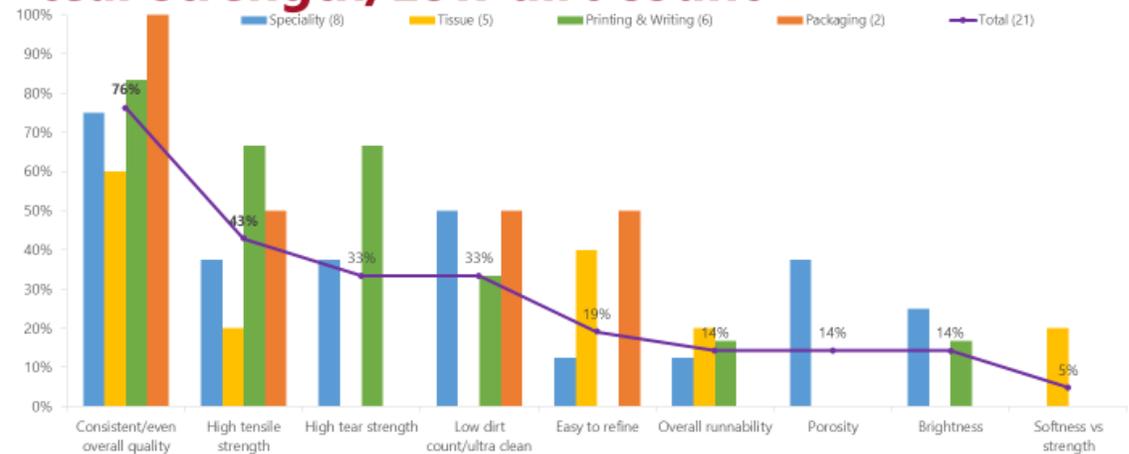


Result of the customer surveys in product quality

- Top 3 rank (latest survey);
 1. **Consistent quality**
 2. High tensile strength
 3. High tear strength

Södra's customer surveys rank consistent pulp quality as the most important characteristic

Top 3 product quality characteristics: Consistency, High tensile strength & High tear strength/Low dirt count

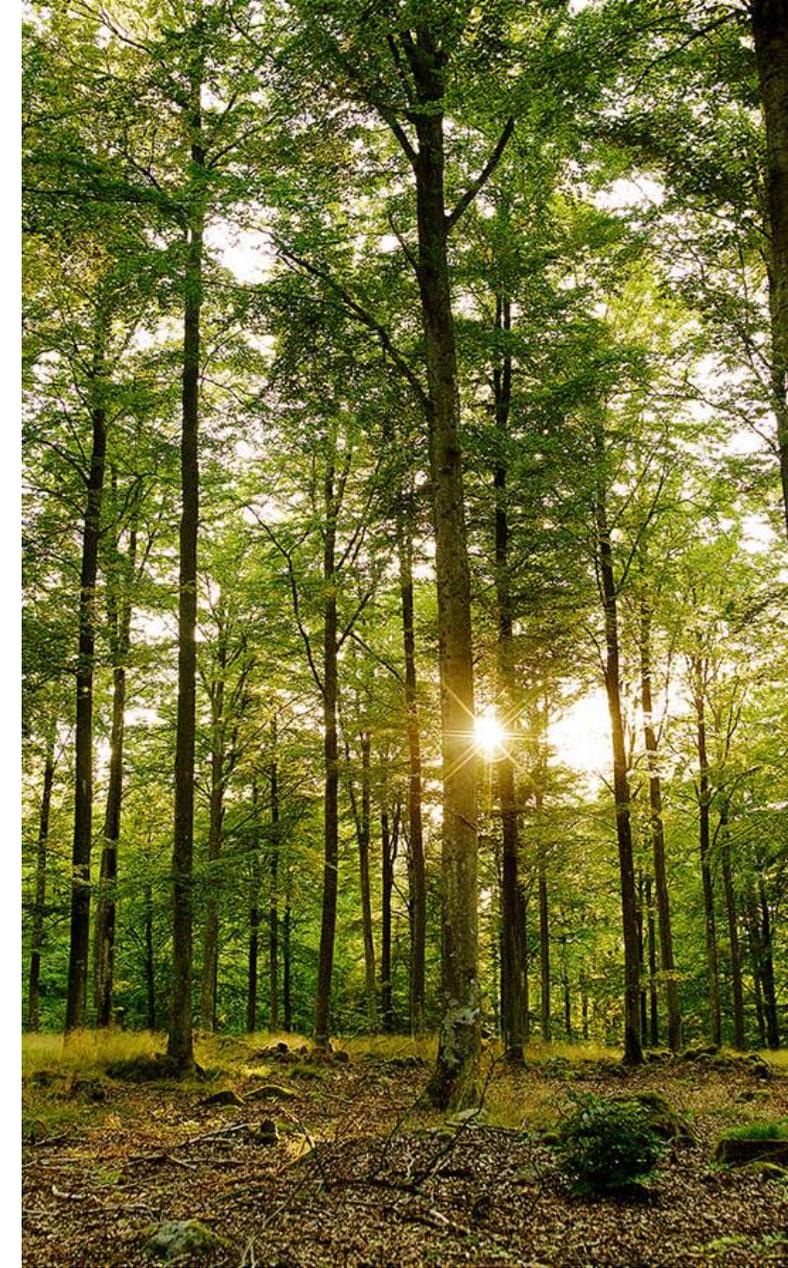


Base: 21. Single answer. Don't know: 2. No answer: 0.
(Web) Which of the following pulp product quality characteristics do you consider to be the most important for your mill (choose top 3)?
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Södra's way to secure consistent product quality

- Wood segregation and a recipe for each product
- Modern equipment
- Large buffer storage between different process departments
- As long production runs as possible of each product
- **On-line instruments, to make decisions directly at production**



Online fibre measurements



PulpTester

Södra Cell have online fibre analysis instruments in all its pulp mills

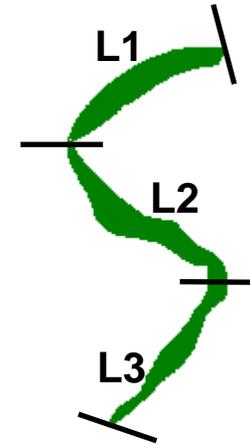


Fibre properties – analysed every 6 min

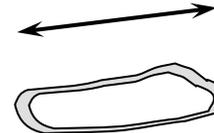
Online measurements, PulpTester

- Fibre length (mm)
- Fibre width (μm)
- Fines (%)
- Shape factor (%)
- Coarseness ($\mu\text{g}/\text{m}$)

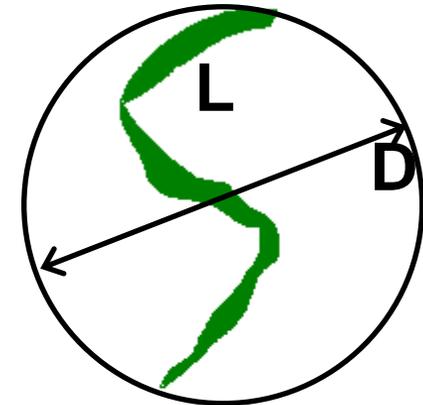
Length



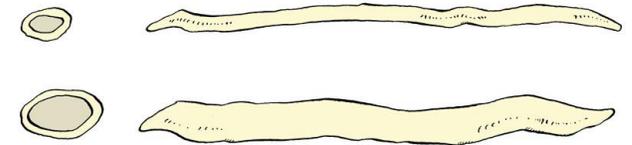
Width



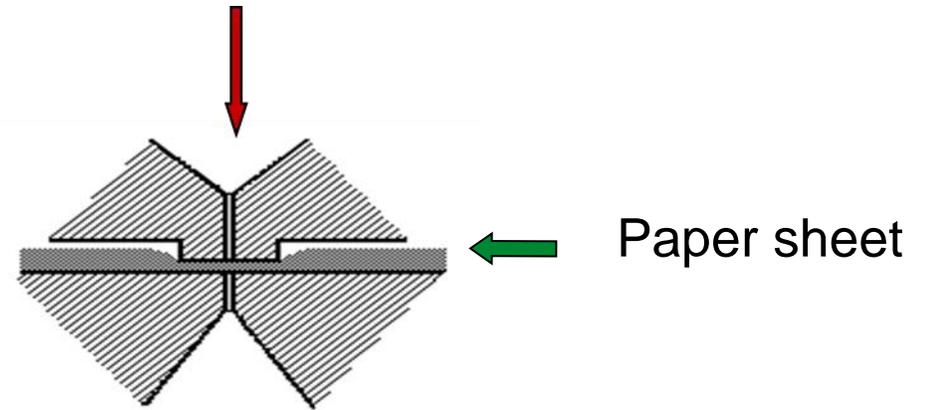
Shape factor = D/L



Low & high Coarseness



Fibre properties - ZeroSpan



Zero Span
(no gap WZS)

Measurement for "single" fibre strength



Focus on wood and process

Wood related input

- Fibre length
- Fibre width
- Coarseness

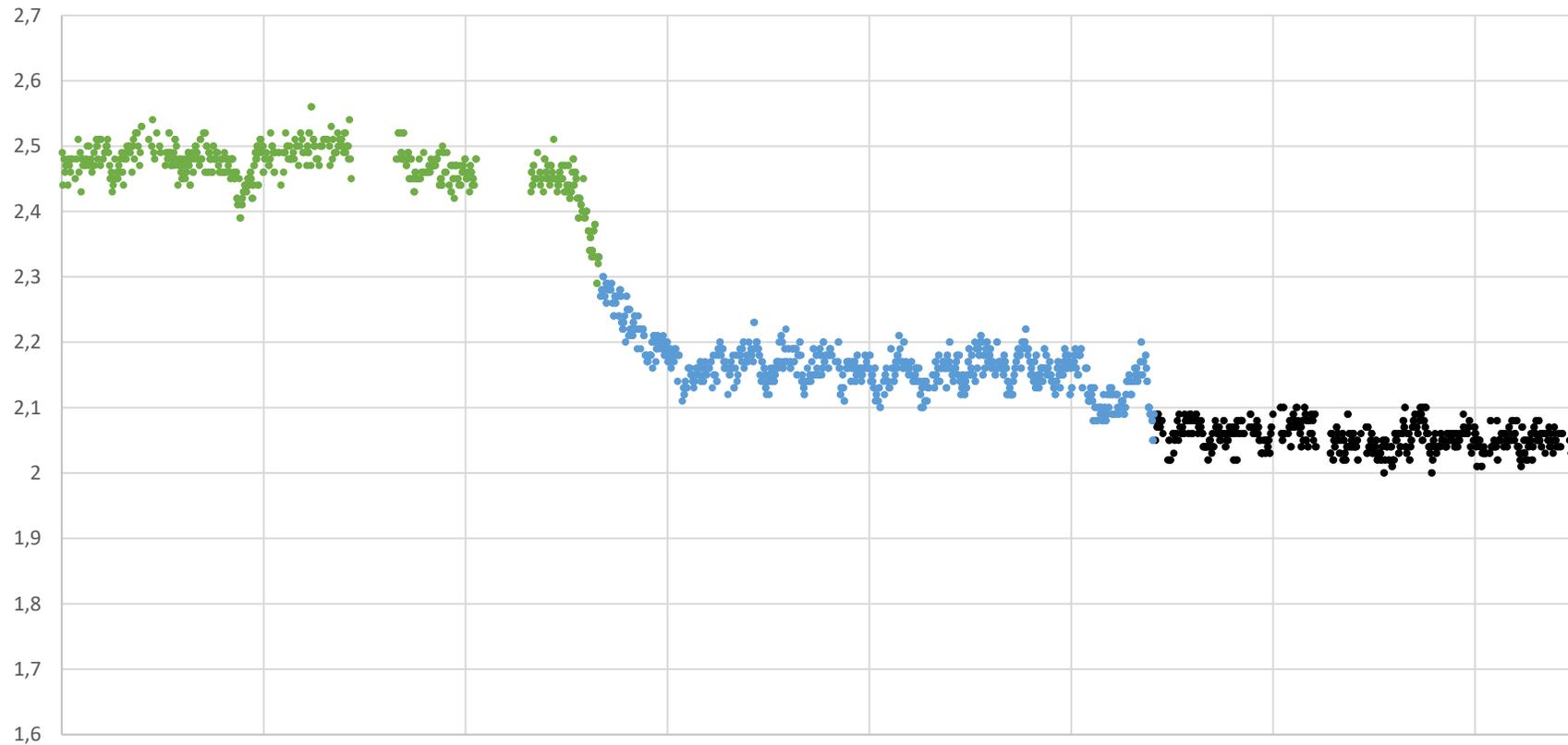
Process related input

- Kinks
- Fibre strength
- Shape factor



Product changes on the drying machine

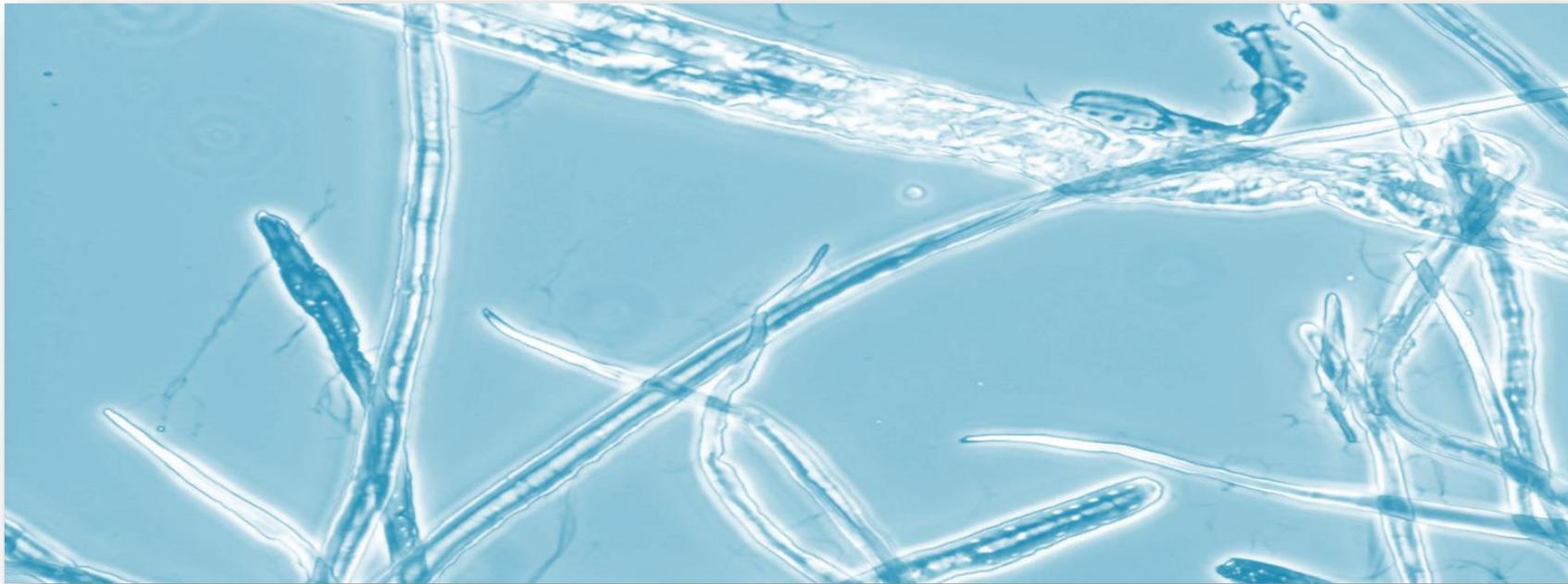
Fibre length



Paper prediction model

Södra focuses on fibre properties but papermakers use paper properties.

Södra has developed a prediction model which translates fibre properties to paper properties



Model for predicted properties

Fibre length

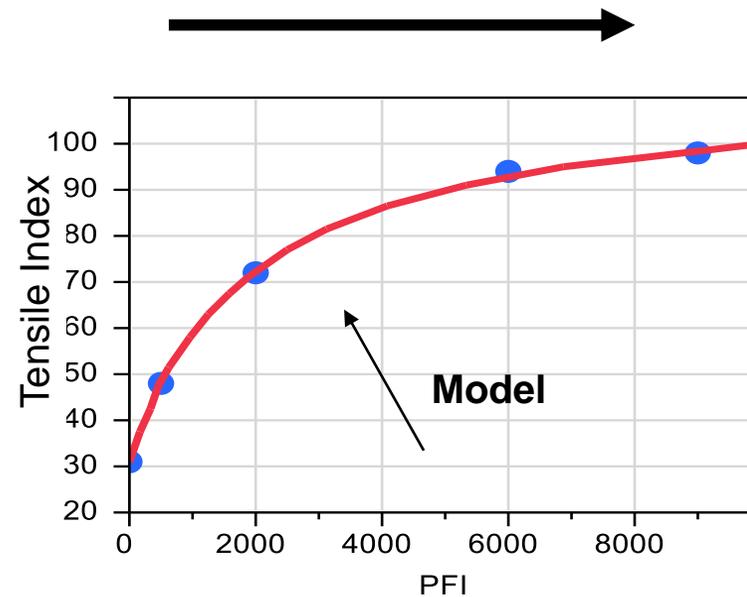
Fibre width

Shape factor

Fibre strength

Coarseness

Fines



PFI

- Tensile index
- Density
- Tear index
- Light scattering
- Air permeance
- SR
- Tear @ tensile 85
- TEA
- Tensile stiffness
- Stretch



The frequency has changed

Before online instrument

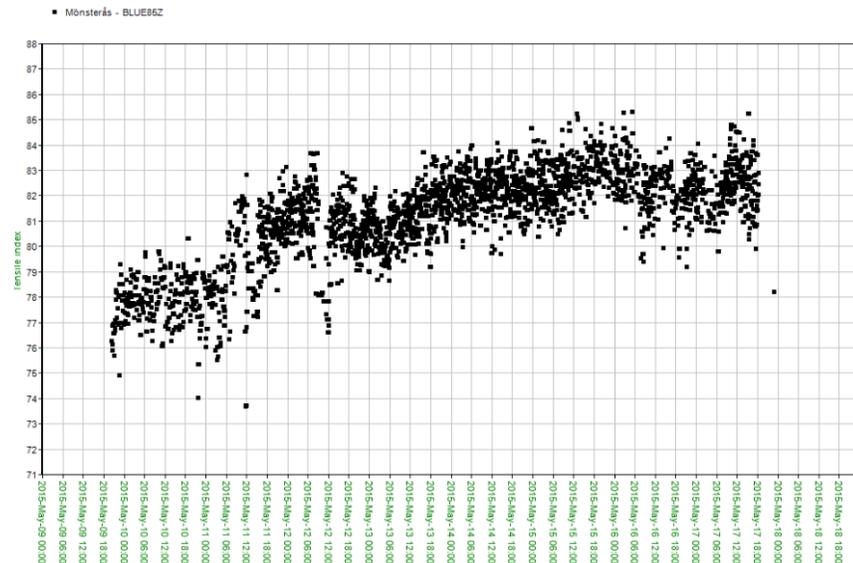
Traditional paper testing

- Time consuming
- Response time about 1,5 week
- Few quality data
 - about 2 PFI tests per product runs

With online instruments

Prediction models

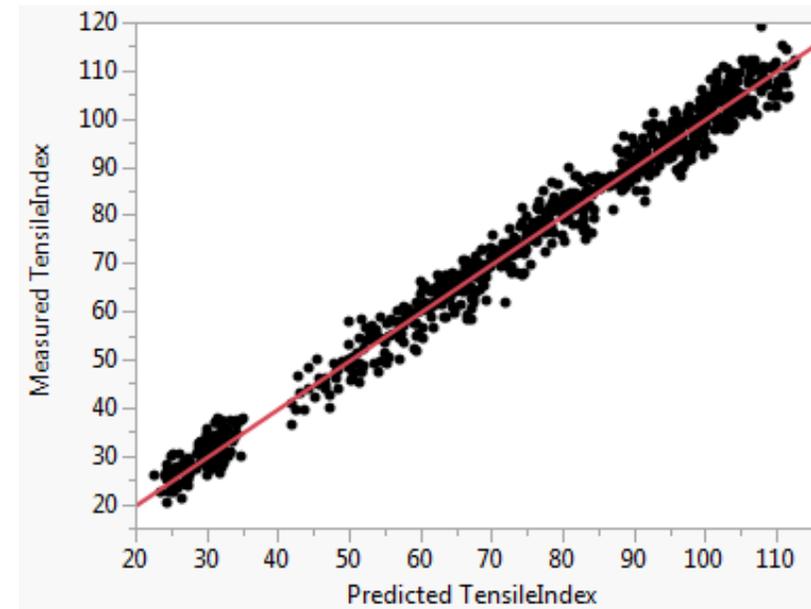
- Directly response
- Many measurements
 - About 1600 test points per week



Prediction model

Example: Tensile index

- Explained well by
 - Coarseness
 - Fibre strength
 - Shape factor
 - Fibre length
 - Fibre width
- Total R^2 : 98,5 % for all refining levels
- RMSE: 3,19



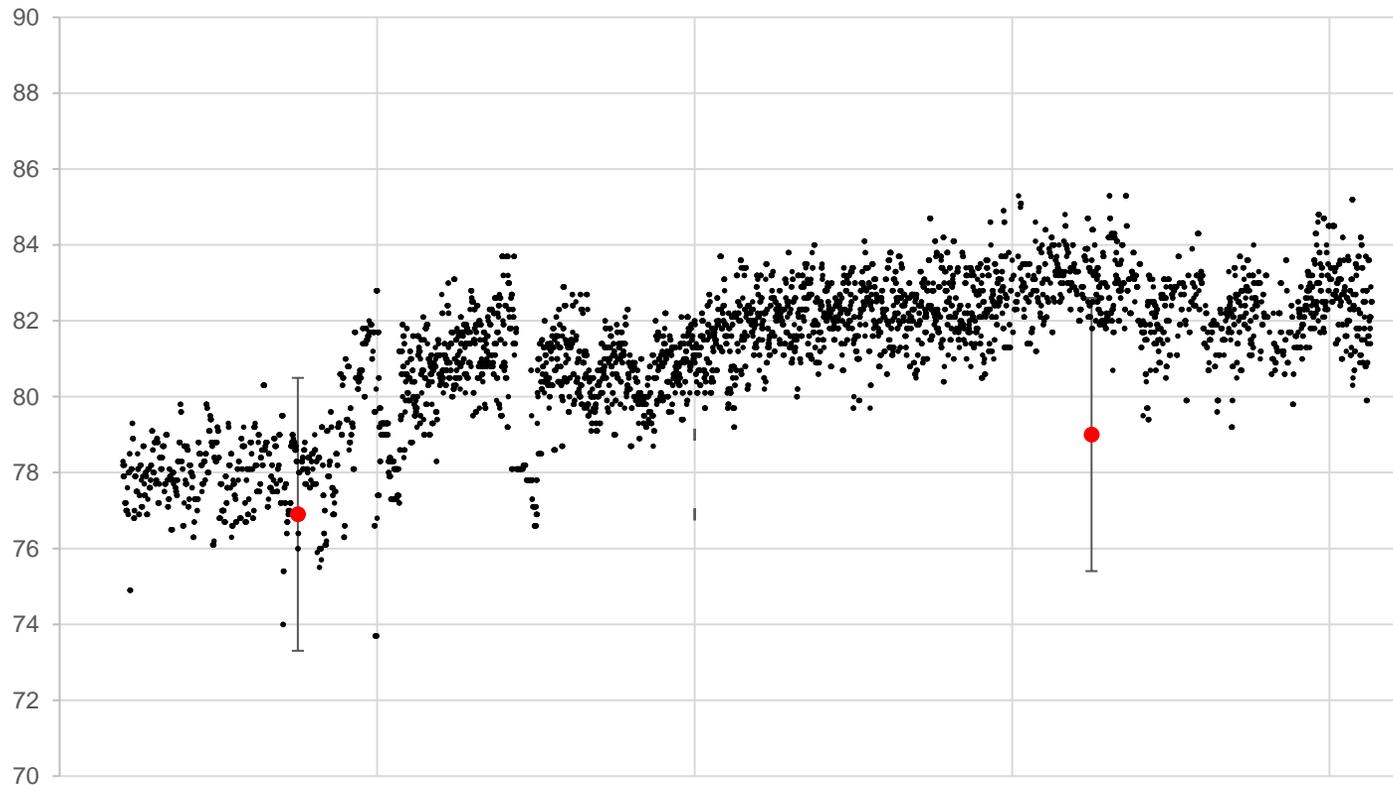
Summary of Fit

RSquare	0,985425
RSquare Adj	0,985409
Root Mean Square Error	3,192772
Mean of Response	71,94715
Observations (or Sum Wgts)	914



Prediction vs PFI refining

Tensile index (PFI 2000)



PFI (tensile index)

Measurement uncertainty is relatively big in a individual PFI level

Std.dev. (one refining level) 1,97

Std.dev. (interpolated) 1,77

Prediction data

The uncertainty in a individual prediction is also big but decrease with amount of predictions

RMSE decrease as;

$$\sqrt{1/n} ; \text{ there } n \text{ is amount of measurements}$$

Standard deviation in a PFI level (tensile index);

Std.dev. (one measurement) 3,19*

Std.dev. (10 measurement, ca 1 h) 1,43*

Std.dev. (240 measurements, ca 24 h) 1,10*

* Provided that the Pulptester and Zerospan equipment is under statistical control



More parameters are monitored

On-line control at the drying machines

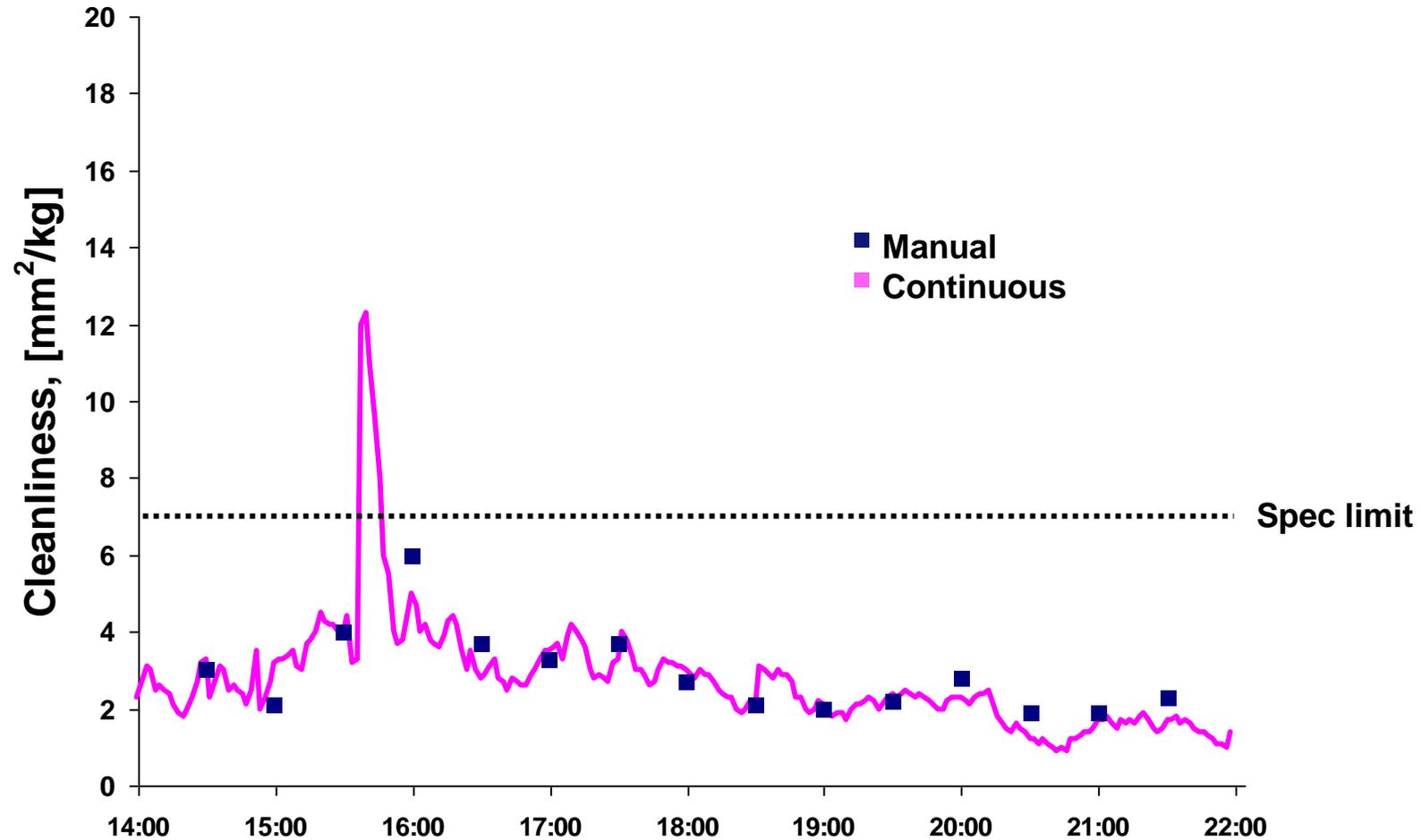
Brightness



Dirt



Example of short time variations – dirt (mm²/kg)



New equipments - reinvestments

- **Dirt measurement**

- ongoing project
- first implementation at SC Mörrum, spring 2022
- full web-width detection

- **Fibre analyser**

- pre-project under start-up
- Implementation 2023/24



Conclusions quality control

- Latest customer surveys find consistent quality as the most important quality criteria
- Södra have modern online instruments – fiber properties, brightness, dirt, pH, moisture and bale weight
 - For continuous and direct response
- Prediction models for paper properties
- Other parameters as Extractives, TOC, Ash etc. are also measured but less frequent (good stability)



Quality data



Quality data

Data access – 24/7

Access to all quality data connected to the delivered pulp

- Fibre properties
- Paper properties

Subscriptions

Possible to create subscriptions - by E-mail



MyPulp+ Q-data - Start page / Dashboard



To sodra.com  

MyPulp+ > Q-data > 01/07/2021 - 31/07/2021 Logged in as:

Q-data

Order, delivery, unit or invoice number

01/07/2021 - 31/07/2021 | All products | Brightness



60 deliveries

<input type="checkbox"/>	Delivery	Your reference	Södra order ID	Product(s)	Volume	Number of units	Shipped	Destination
<input type="checkbox"/>	02SE-0195057	10029706/07.2021 (c) wk 30.2021	2010061130	Södra blue	26 t	13	29/07/2021	<input type="text"/>
<input type="checkbox"/>	02SE-0194928	10029706/07.2021 (c) wk 30.2021	2010061130	Södra blue	26 t	13	28/07/2021	<input type="text"/>
<input type="checkbox"/>	02SE-0194927	10029706/07.2021 (c) wk 30.2021	2010061130	Södra blue	26 t	13	28/07/2021	<input type="text"/>



Overview of delivery data



[To sodra.com](#)



MyPulp+ > Q-data > 01/07/2021 - 31/07/2021 > Delivery 02SE-0195057
Logged in as: ▾

Q-data

Delivery **02SE-0195057** 01/07/2021 - 31/07/2021: Delivery 1 of 60 < >

Your reference: 10029706/07.2021 (c)
wk 30.2021

Södra order ID: 2010061130

Invoice number(s): 2011034042

Product(s): Södra blue

Units: 13

Volume: 26 t

Destination:

From: Södra Cell, Värö

Shipped: 29/07/2021

Download Excel-data

 Brightness ISO 2470-1:2018 90.4 % ISO	 Dirt Based on ISO 5350-2:1998 1.0 mm²/kg						
 Fibre length ISO 2470-1:2018 2.12 mm	<table style="width: 100%; border-collapse: collapse;"> <tr><td>Fibre width</td><td style="text-align: right;">30.27 µm</td></tr> <tr><td>pH</td><td style="text-align: right;">4.8</td></tr> <tr><td>Coarseness</td><td style="text-align: right;">136 µg/m</td></tr> </table>	Fibre width	30.27 µm	pH	4.8	Coarseness	136 µg/m
Fibre width	30.27 µm						
pH	4.8						
Coarseness	136 µg/m						

PFI Refining

Beating revolution 2000 ▾

	Your delivery	Typical value
Tear index, mNm²/g	14.6	13.5
Sheet density, kg/m³	706	710
Light scat. coeff., m²/kg	20.8	20.5
Air permeance, µm/Pa*s	57.5	45
Slowness, SR	13.5	16
Tensile index, Nm/g	77	76

13 units in this delivery

Unit ID	Product	Brightness (%)	Fibre length (mm)	Dirt (mm ² /kg)	Fibre width (µm)	Coarseness (µg/m)	pH
21072522801806	Södra blue	90.3	2.10	0.9	30.20	136	4.8
21072522901806	Södra blue	90.3	2.10	0.8	30.20	136	4.8



Quality data per units



To sodra.com



MyPulp+ > Q-data > Unit search

Logged in as: _____

Unit search

Order, delivery, unit or invoice number

Unit search

21072522901806

Search units

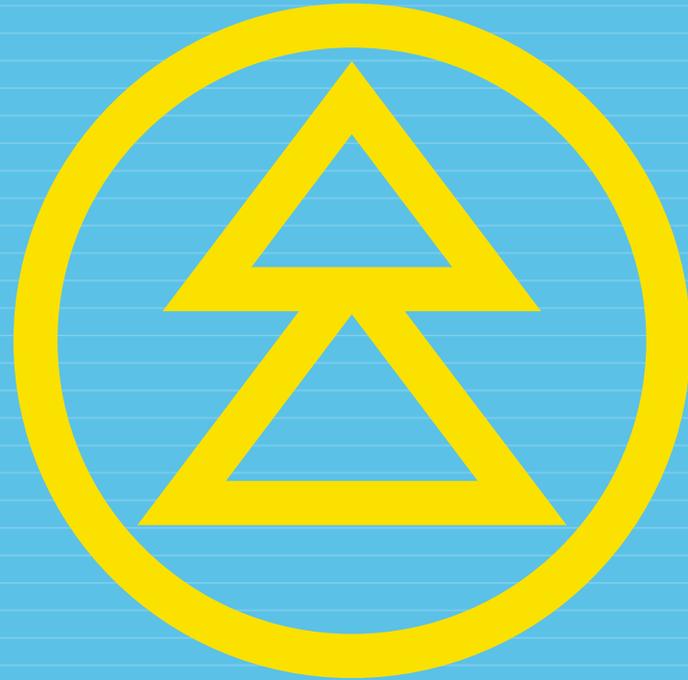
Clear

1 hit

Unit ID	Product	Brightness (%)	Fibre length (mm)	Dirt (mm2/kg)	Fibre width (um)	Coarseness (ug/m)	pH	Delivery
21072522901806	Södra blue	90.3	2.10	0.8	30.20	136	4.8	02SE-0195057
Average values of units		90.3	2.10	0.8	30.20	136	4.8	

Download Excel-data





Södra Innovation Laboratory

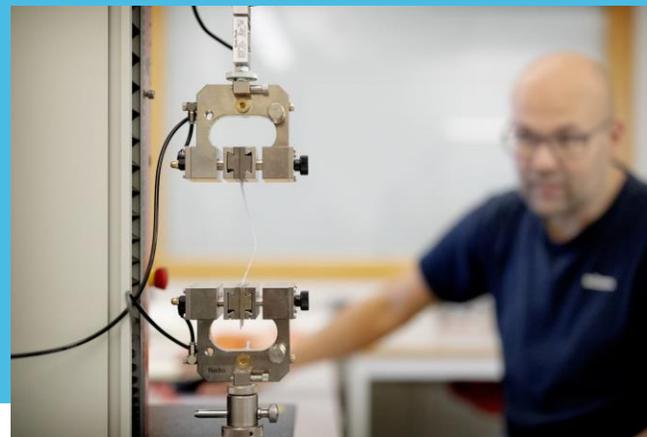
From log to pulp

- Pilot trials and process development
- Fiber properties and Mechanical testing
- Chemical Analysis



Support to

- Customer projects
- Process and product development
- Innovation projects



Pilot trials and process development



Chipping/grinding
Cooking
Oxygen delignification
Bleaching



Fiber properties and mechanical testing

Fiber properties

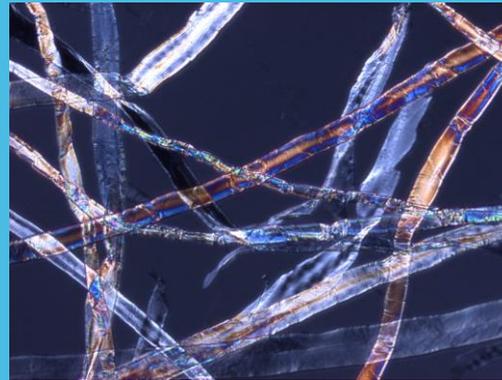
- FiberTester, WRV, viscosity

Refining

- Voith LR40 pilot refiner
- PFI refiners

Paper properties

Microscopy



Chemical analysis

Chemical Analysis

- Hemicellulose
- Lignin
- Extractives
- AOX, TOC
- Surface charge, total charge
- Molecular weight distribution

