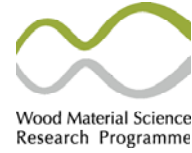


Innovate wood



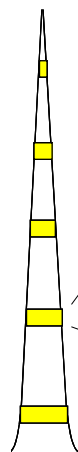
Properties of wood, fibres, pulps ...

*Örjan Hedenberg, Thomas Grahn,
Sven-Olof Lundqvist, STFI-Packforsk*

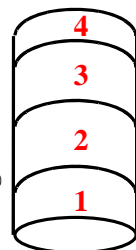
Innovood Seminar, STFI-Packforsk
Stockholm, March 21, 2007



Sample discs at different heights




length ca 20 cm



Sample discs:

- 4** Chemical composition (Södra)
- 3** Microscopy (METLA)
- 2** FiberMaster (STFI-Packforsk)
- 1** SilviScan (STFI-Packforsk)



Samples for radial variation in cross-sections


SilviScan measurement
Wood density, fibre dimensions, etc from pith to bark

FiberMaster measurements
Fibre length, etc

Chemical composition
for groups of growth rings (ring 1-15, 16-30, >30)

Microscopy analyses
Fibre dimensions for a selection of rings

Innovood Seminar 2007-03-21 © STFI-Packforsk *turning science into reality*



SilviScan

A: Image analysis
video microscope
translation

B: X-ray absorption
detectors
x-ray source
translation
rotation

C: X-ray diffraction
diffraction pattern
x-ray beam
radial dimension

Robert Evans, CSIRO

Innovood Seminar 2007-03-21 © STFI-Packforsk *turning science into reality*



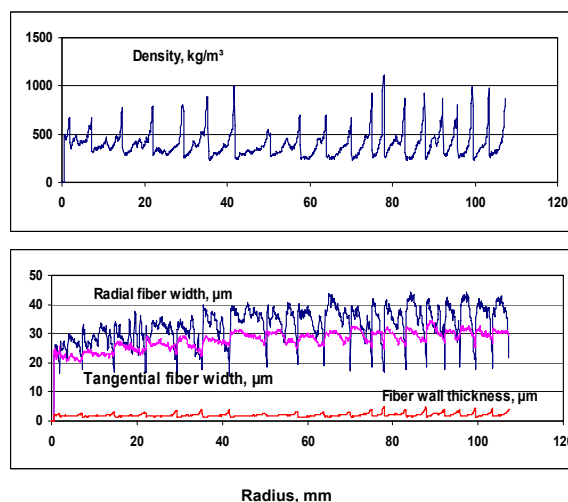
Properties measured with SilviScan

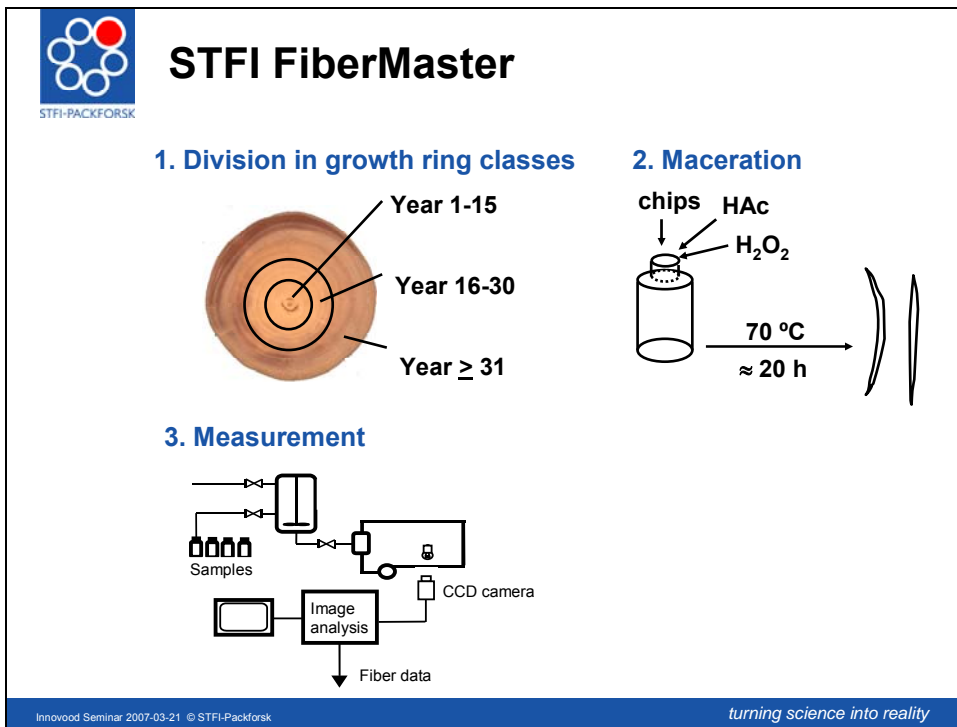
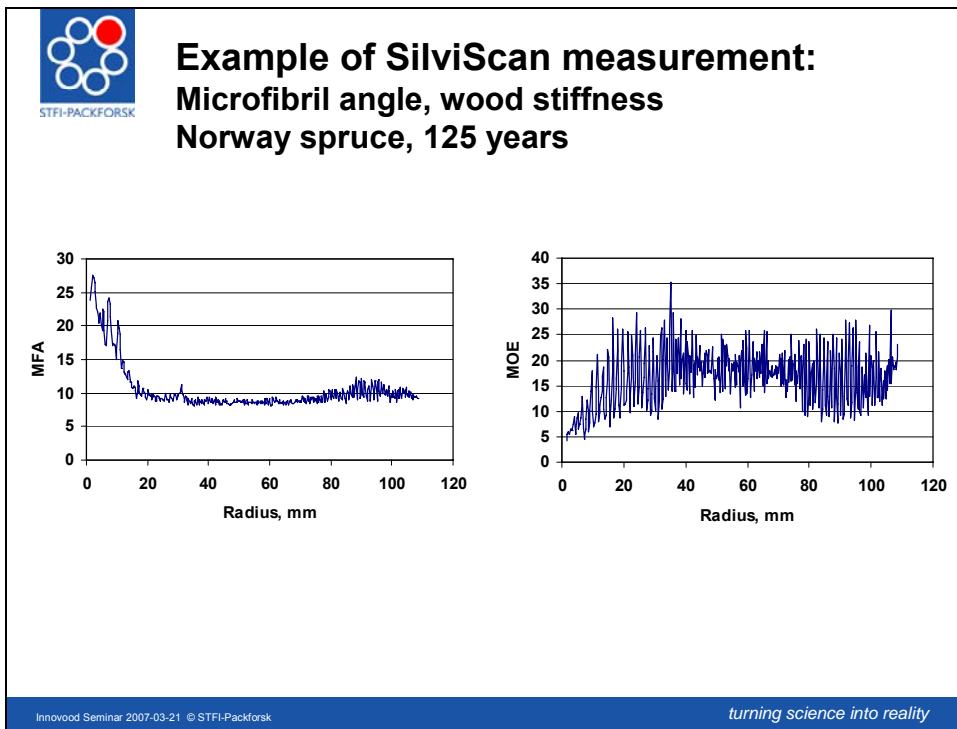
Radial variations from pith to bark for:


- Wood density
- Fibre width (radial and tangential)
- Fibre wall thickness
- Microfibril angle (MFA)
- Fibre coarseness
- Specific fibre surface area
- Wood stiffness (estimated acoustic MOE)
- ...and more...



Example of SilviScan measurement: Wood density, radial and tangential fiber width and fiber wall thickness. Norway spruce, 20 years







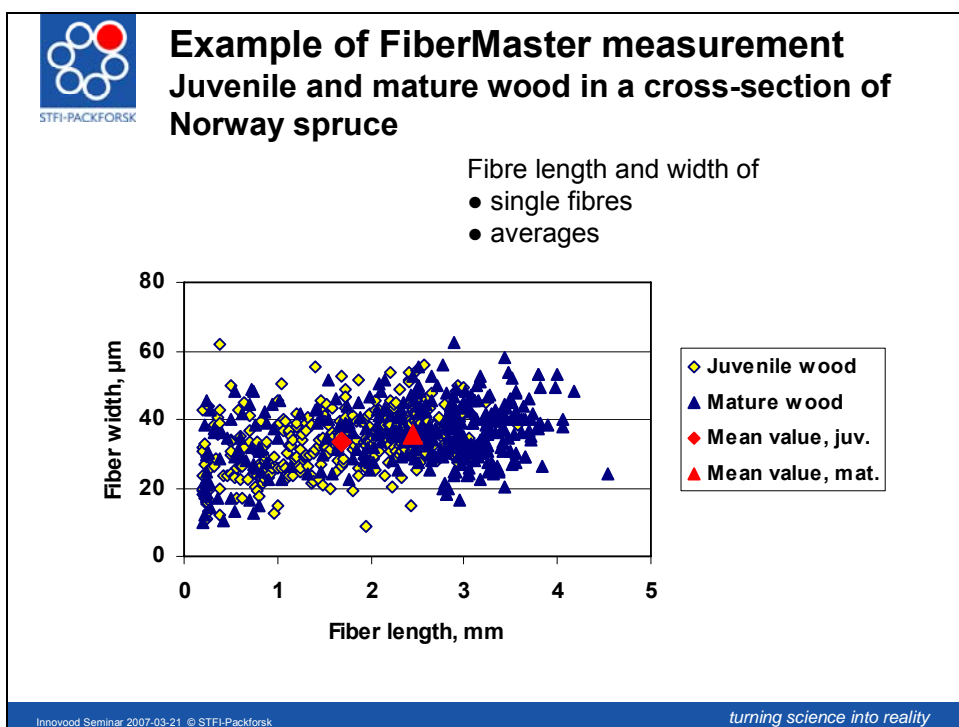
STFI-PACKFORSK


Results from FiberMaster

- Fibre length
- Fibre width
- Fibre shape factor

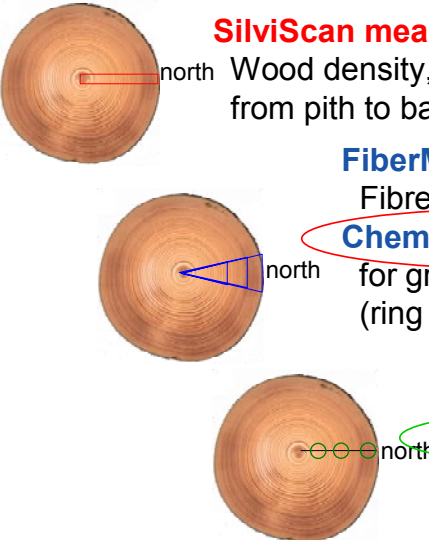
Innovood Seminar 2007-03-21 © STFI-Packforsk

turning science into reality





Samples for radial variation in cross-sections




SilviScan measurement
Wood density, fibre dimensions, etc from pith to bark

FiberMaster measurements
Fibre length, etc

Chemical composition
for groups of growth rings (ring 1-15, 16-30, >30)

Microscopy analyses
Fibre dimensions for selected rings

Innovood Seminar 2007-03-21 © STFI-Packforsk *turning science into reality*



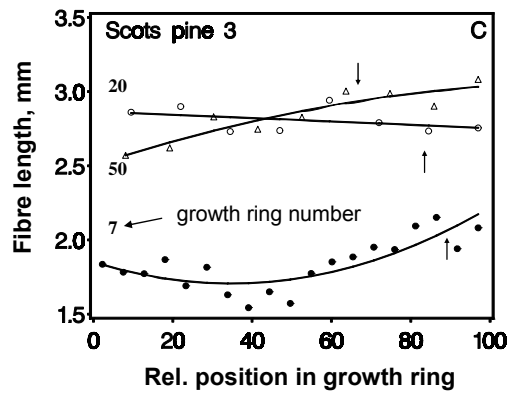
Chemical composition of wood

- Ash
- Extractives
- Lignin
- Cellulose
- Glucomannan
- Xylan

Södra Cell

Innovood Seminar 2007-03-21 © STFI-Packforsk *turning science into reality*

Fibre length within growth rings



Innovate
wood

METLA
METSÄNTUTKIMUSLAITOS
SKOGSFORSKNINGSINSTITUTET
FINNISH FOREST RESEARCH INSTITUTE
www.metla.fi



STFI-PACKFORSK

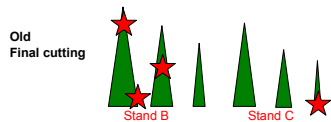
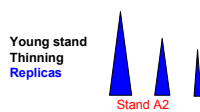
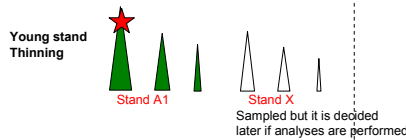
Sweden

High SI Low SI

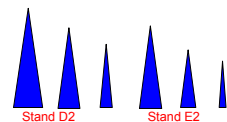
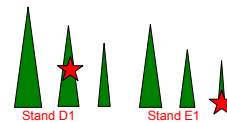
Finland

High SI Low SI

Samples
for pulping



Old Final cutting Replicas



Thinning

Final cutting

Applied on both spruce and pine in Sweden, only pine in Finland



STFI-PACKFORSK



Pulp properties

- Unbleached kraft pulp produced in laboratory
- Unrefined and refined pulps were tested
- Analysis of:
 - + strength properties
 - + WRV
 - + air permeability
 - + ...



... and all data structured in the
Innovood Database