Log Scanning
- State of the Art in Sweden

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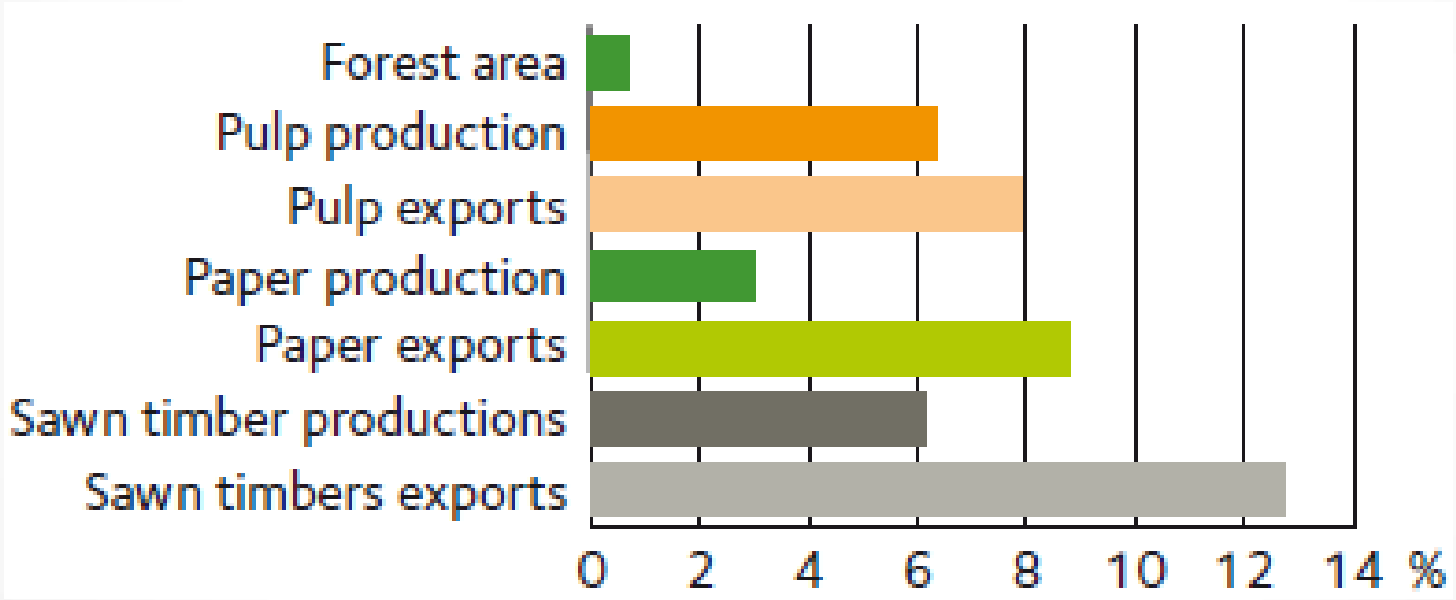
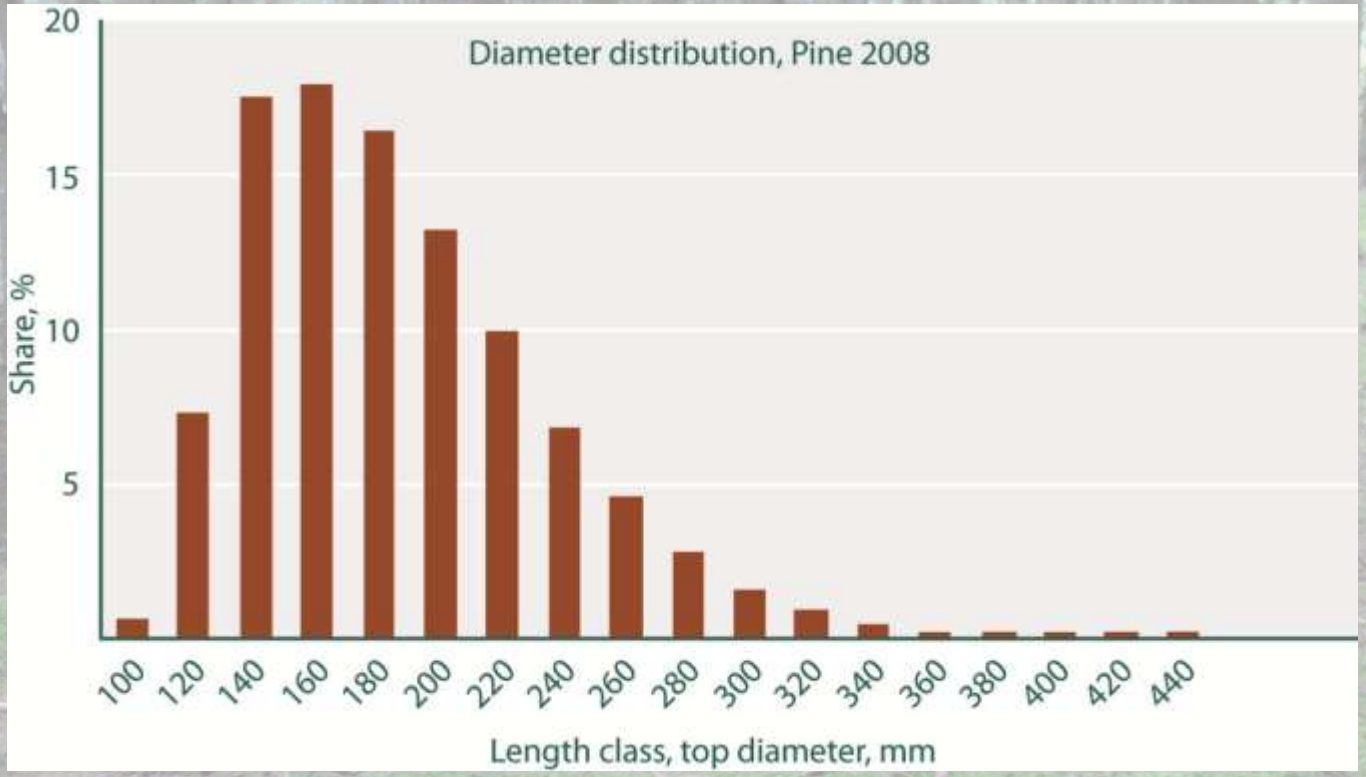
April 11, Coeur d'Alene


Norwegian Sea
Iceland
Sverige
(Sweden)
Suomi
(Finland)
Norge
(Norway)
Danmark
(Denmark)
United Kingdom
Ireland
Éire
Беларусь
(Belarus)
Polska
(Poland)
Deutschland
(Germany)
Україна
(Ukraine)
Österreich
(Austria)
Kazakhstan
France
Bay of Biscay
România
(Romania)
Italia
(Italy)
España
(Spain)
Uzbekistan
Kyrgyzstan
Ελλάς
(Greece)
Türkiye
(Turkey)
Portugal
Turkmenistan
Mediterranean Sea
Syria
Tunisia
Afghanistan
Iraq
Iran
Morocco
Pakistan
Algeria
Libya

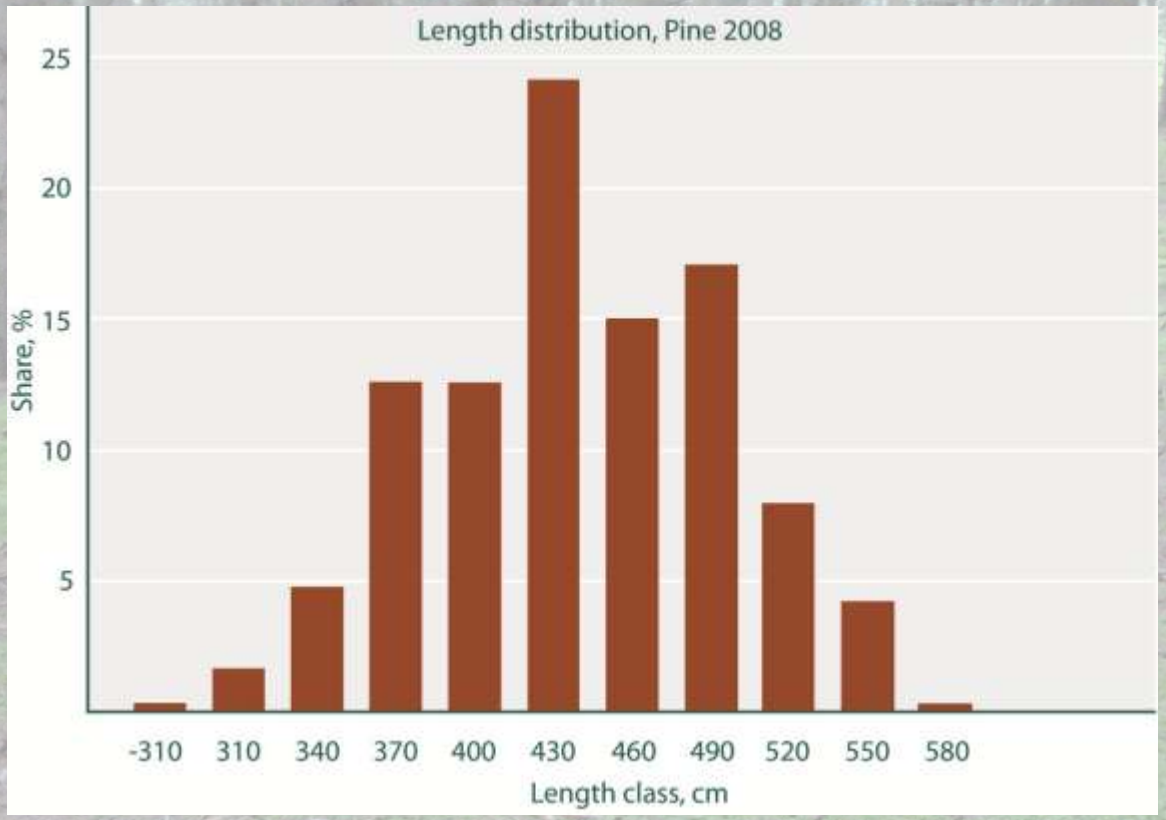
Sweden's share of the world's:



Log diameter



Log lenght


Length distribution, Pine 2008
Share, %
25
20
15
10
5
-310
310
340
370
400
430
460
490
520
550
580
Length class, cm

100% shortwood

Year	1990	2000	2005	**2010**
Number of mills prod >10 000 m^3/year	260	207	175	**150**
Average production per mill, 1 000 m^3	45	80	100	**110**
Total production, million m^3	11,7	16,3	17,6	**17,0**
Export, million m^3	6,5	11,1	12,2	**11,5**

$100\ \text{Mbft} \approx 160\ 000\ m^3$

Sorting by dimension and quality

Log Scanning

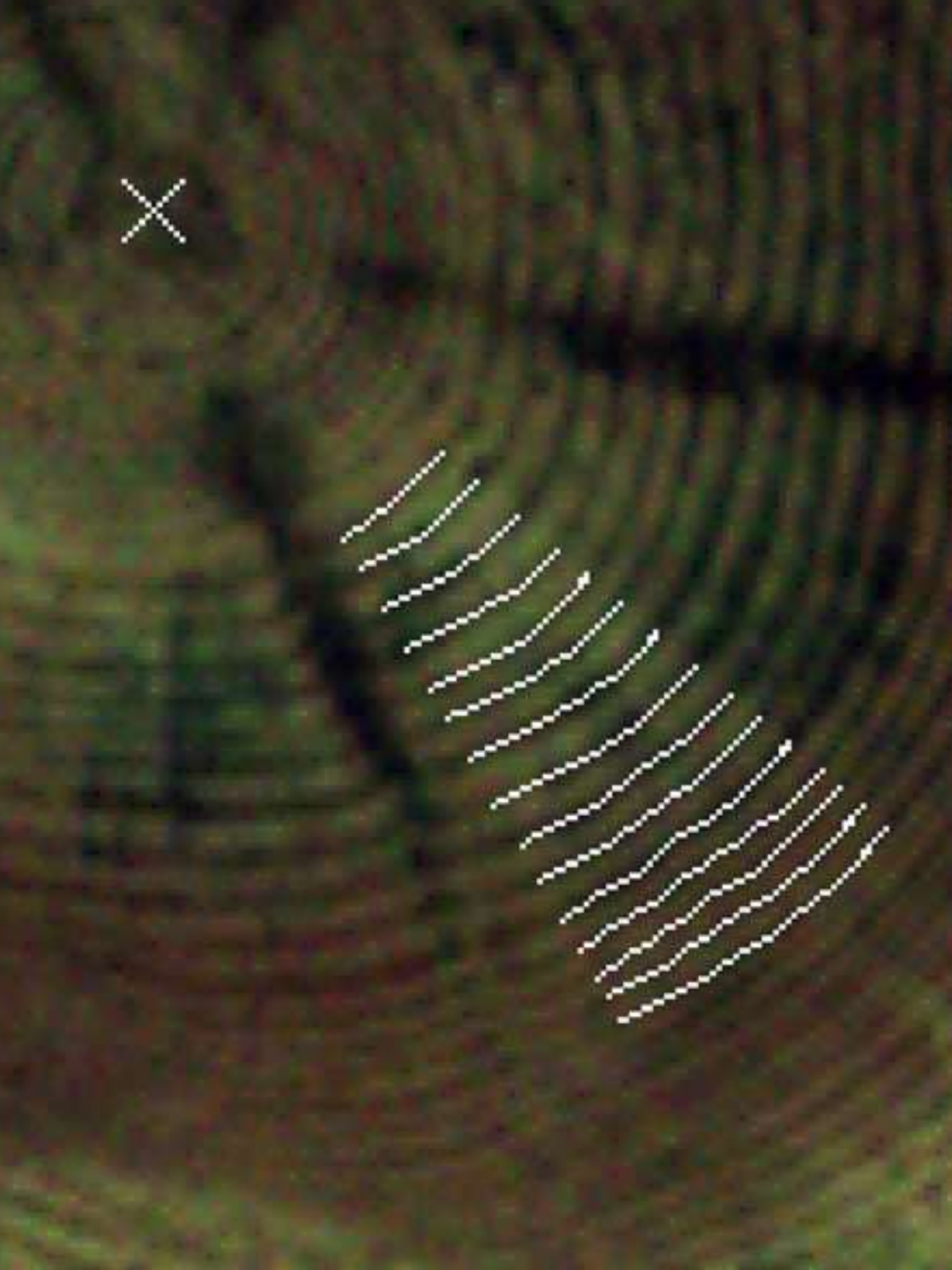
Basis for payment & for optimizing the process

Spruce grades

	Grade	
	1	2
Knots, whole mantle surface	Max 60 mm regardless of knot type	Spike knot max 120 cm. Other knots unlimited.
Growth rings	Min 12	
Straightness	Max 20 cm loss of saw yield	Max 120 cm loss of saw yield
Indication of top rupture	Not allowed	Allowed
Blue stain	Not allowed	Allowed
Open scar	Scar which affects the scaling cylinder is not allowed	Depth of scar max 20 % of scaling cylinder diameter.
Bark-encased scar	Length max 2 x top end diameter	Allowed
Forest rot	Not allowed	Max 5 % of log end surface

Pine grades

	Grade			
	1	2	3	4
Log type	Butt log	Not butt log	All log types	All log types
Knots, whole mantle surface	Max 20 mm, all knot types. Max 5 knots	Sound knots max 120 mm. Other knots max 60 mm.	Sound knots max 120 mm. Other knots max 60 mm	Spike knot max 120 mm. Other knots unlimited.
Knot within 15 dm from butt end		A minimum of two distinct whorls or one sound knot		
Knot swelling	Max 5			
Growth rings 2-8 cm from pith	Minimum 20		Minimum 12	
Straightness	Max. 20 cm loss of saw yield			Max. 120 cm loss of saw yield
Indication of top rupture	Not allowed			Allowed
Blue stain	Not allowed			Allowed
Forest rot	Not allowed			Max 5 % of end surface



Top diameter (cm)	Length (dm)										
	28-30	31-33	34-36	37-39	40-42	43-45	46-48	49-51	52-54	55-57	58+
10-11	1,15	1,31	1,32	1,33	1,34	1,34	1,35	1,36	1,37	1,38	1,39
12-13	1,25	1,25	1,26	1,27	1,28	1,29	1,30	1,30	1,31	1,32	1,33
14-15	1,21	1,22	1,22	1,23	1,24	1,25	1,26	1,27	1,27	1,28	1,29
16-17	1,18	1,19	1,20	1,20	1,21	1,22	1,23	1,24	1,25	1,26	1,26
18-19	1,16	1,17	1,18	1,19	1,19	1,20	1,21	1,22	1,23	1,24	1,25
20-21	1,15	1,15	1,16	1,17	1,18	1,19	1,20	1,21	1,21	1,22	1,23
22-23	1,13	1,14	1,15	1,16	1,17	1,18	1,19	1,19	1,20	1,21	1,22
24-25	1,13	1,14	1,14	1,15	1,16	1,17	1,18	1,19	1,20	1,20	1,21
26-27	1,13	1,13	1,14	1,15	1,16	1,16	1,17	1,18	1,19	1,20	1,20
28+	1,13	1,13	1,13	1,14	1,15	1,16	1,17	1,18	1,19	1,19	1,20

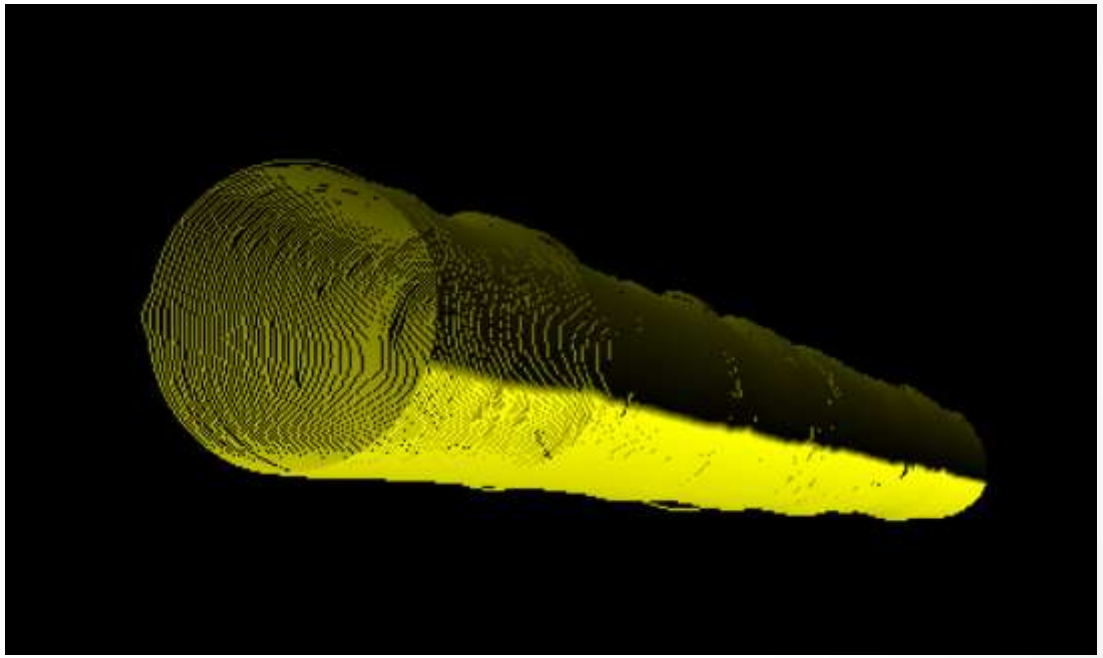
Volume is measured under the bark

Bark thickness can be measured:

- Manually, (most common)
- With laser triangulation
- With X-ray

3D lazer scanners


benima



9 X-ray scanners in Sweden

SCA Bollsta Såg, Microtech

SCA Munksunds, Rema

SCA Tunadals Sågverk, Microtech

Martinssons AB, Rema

Holmen Iggesunds sågverk, Rema

Setra Kastets sågverk, Rema

Setra Skinnskattebergs Trä, Rema

StoraEnso Ala sågverk, Rema

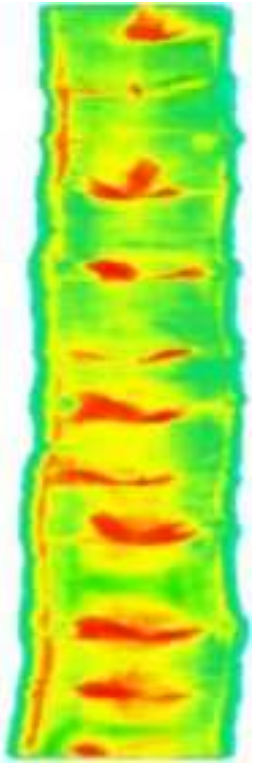
Moelven Valåsens Sågverk, Rema

X-ray scanner RemaContol

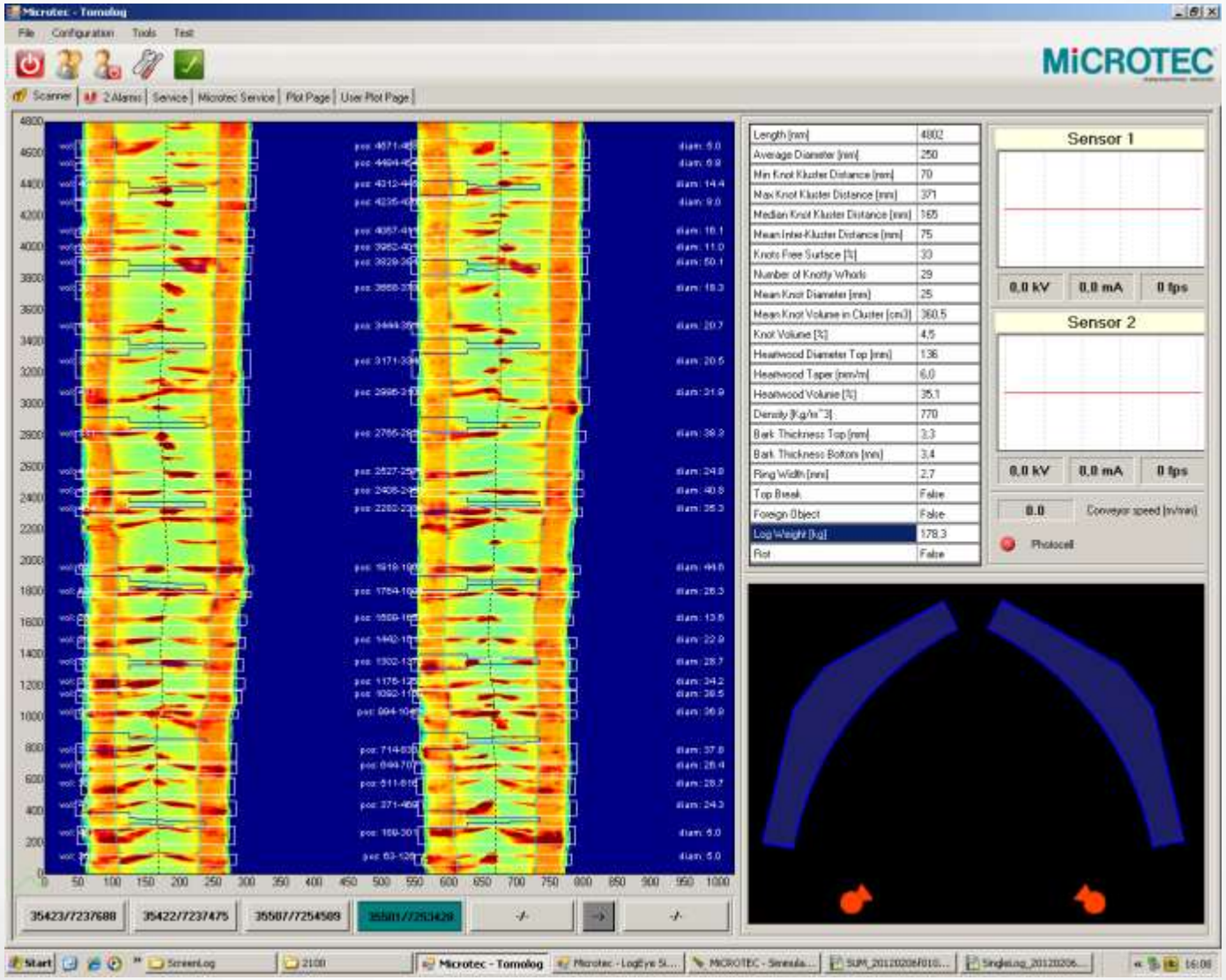
7 units in Sweden, 5 in Finland and one in Estonia.

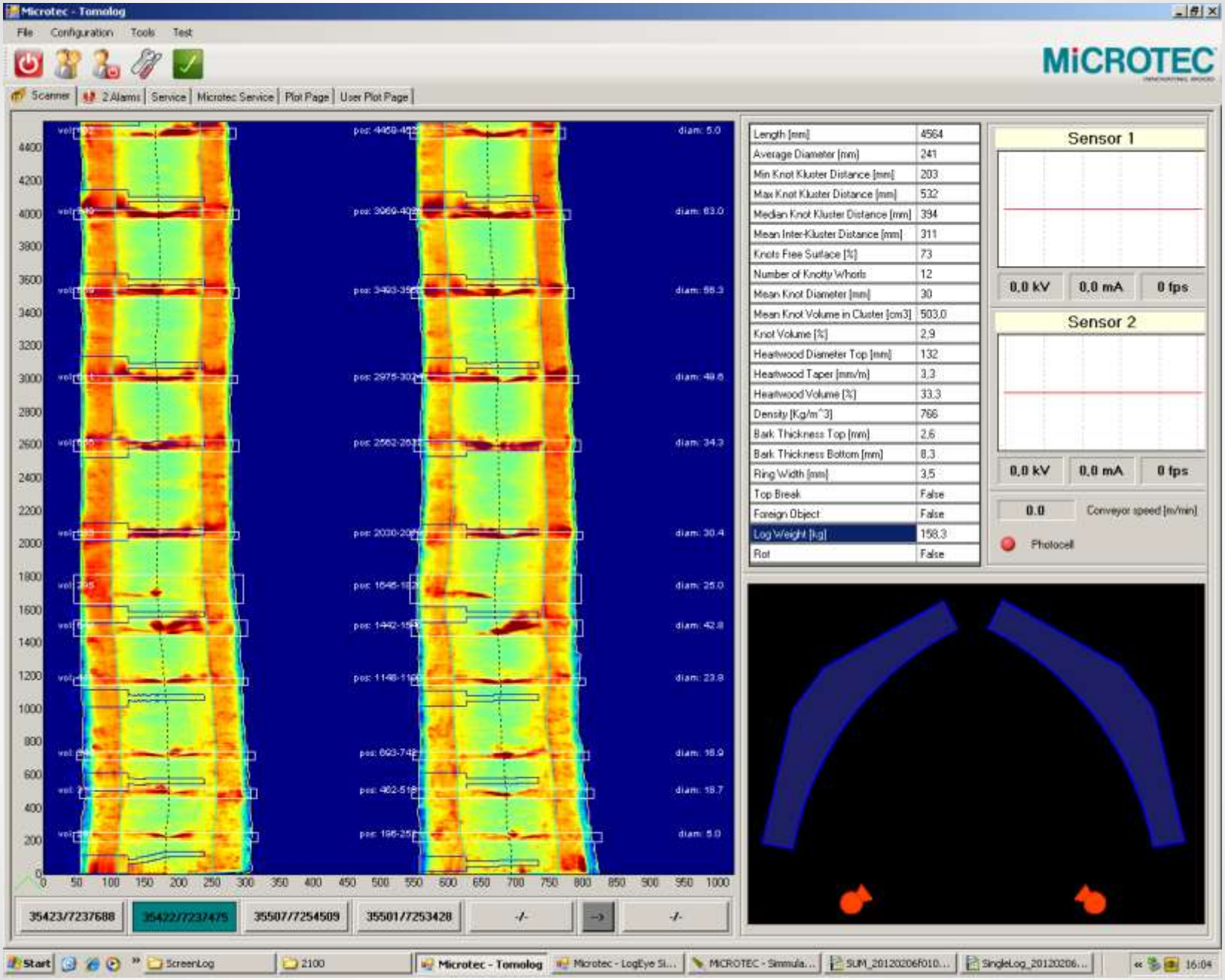
Property variabels from Rema X-ray scanner

- Bark thickness
- Volume
- Hartwood Diameter
- Ring Width
- Species (fir or pine)
- Stocktyp (root, intermediate, top)
- Density
- Distance between knotty worls
- Volume free from knots
- Rot
- Foreign objects (metal, stone)
- Strength



Microtech , 3 direction
Two units in Sweden




Microtec - Tomolog
File
Configuration
Tools
Test
MICROTEC
Scanner
2 Alarms
Service
Microtec Service
Plot Page
User Plot Page
Length [mm] 4564
Average Diameter [mm] 241
Min Knot Kluster Distance [mm] 203
Max Knot Kluster Distance [mm] 532
Median Knot Kluster Distance [mm] 394
Mean Inter-Kluster Distance [mm] 311
Knots Free Surface [%] 73
Number of Knotty Whorls 12
Mean Knot Diameter [mm] 30
Mean Knot Volume in Cluster [cm3] 503.0
Knot Volume [%] 2.9
Heartwood Diameter Top [mm] 132
Heartwood Taper [mm/m] 3.3
Heartwood Volume [%] 33.3
Density [Kg/m^3] 766
Bark Thickness Top [mm] 2.6
Bark Thickness Bottom [mm] 8.3
Ring Width [mm] 3.5
Top Break False
Foreign Object False
Log Weight [kg] 158.3
Rot False
Sensor 1
0.0 kV
0.0 mA
0 fps
Sensor 2
0.0 kV
0.0 mA
0 fps
0.0
Conveyor speed [m/min]
Photocell
35423/7237688
35422/7237475
35507/7254509
35501/7253428
-/-
-/-
Start
ScreenLog
2100
Microtec - Tomolog
Microtec - LogEye Si...
MICROTEC - Simmula...
SUM_20120206f010...
SingleLog_20120206...
16:04

Property variabels from microtec scanner

- 1 Min Knot Cluster Distance [mm]
- 2 Max Knot Cluster Distance [mm]
- 3 Mean Knot Cluster Distance [mm]
- 4 **Number of Knotty Whorls**
- 5 Mean Max Knot Diameter [mm]
- 6 Mean Knot Volume in Cluster [cm3]
- 7 Knotty whorls quality [1-10]
- 8 **Knot Volume [‰]**
- 9 Heartwood Top Diameter [mm]
- 10 **Heartwood Taper [(mm/10)/m]**
- 11 Heartwood Volume [‰]
- 12 Mean Density [Kg/m3]
- 13 Ring Width [mm/10]
- 14 Top break
- 15 Top break position [cm]
- 16 Foreign Object
- 17 Bark Thickness [mm/10]
- 18 Bark Thickness Top [mm/10]
- 19 Bark Thickness Middle [mm/10]
- 20 Bark Thickness Bottom [mm/10]
- 21 Rot
- 22 Top Break Peak Value [abs]
- 23 Mean Inter-Cluster Distance [mm]
- 24 Min Inter-Cluster Distance [mm]
- 25 Max Inter-Cluster Distance [mm]
- 26 Percentage of Knots Free Length [%]
- 27 taper butt/mid
- 28 volume m3fub
- 29 volume m3top
- 30 Metall
- 31 Bark Share

Setra

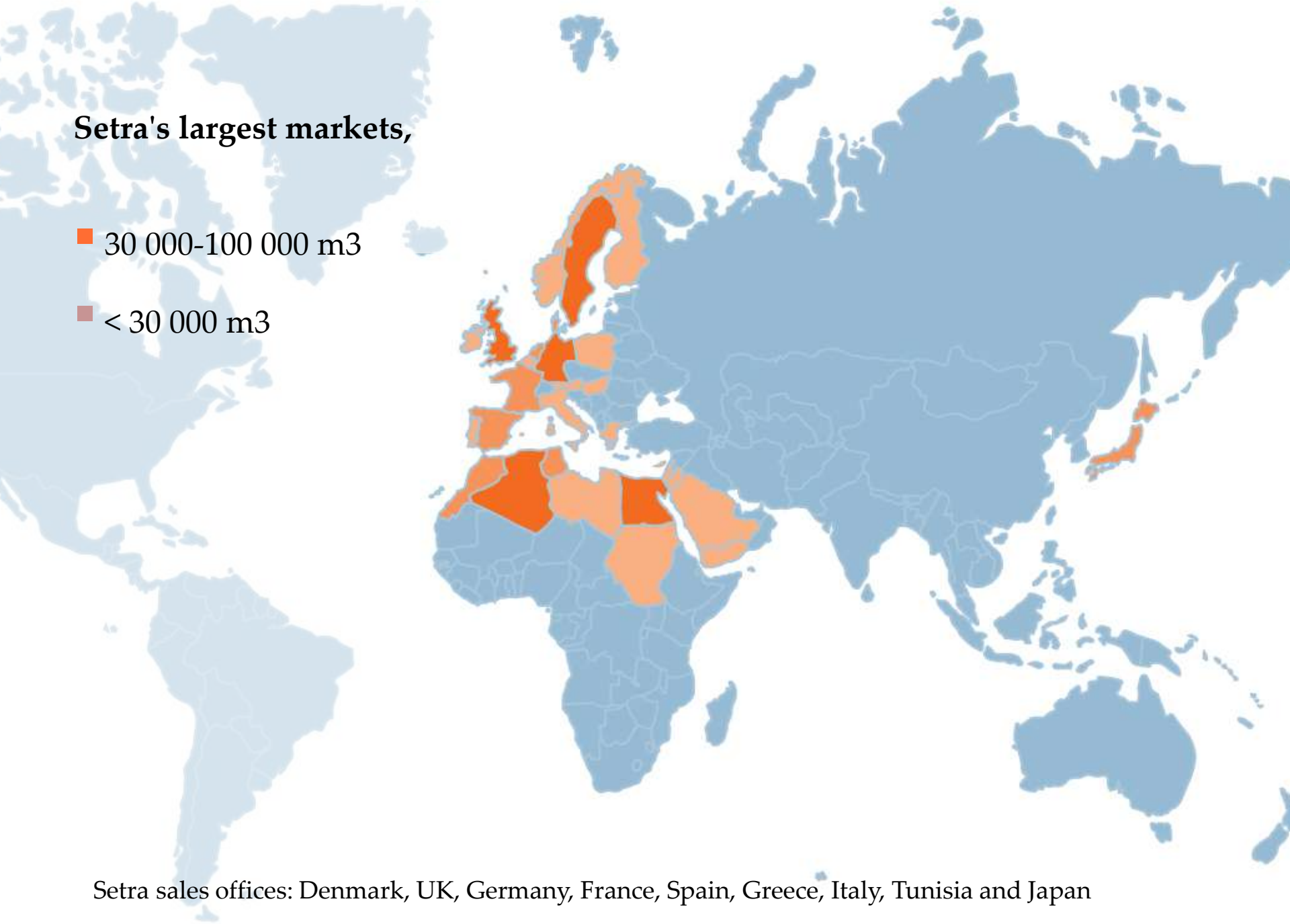
- One of Sweden's largest lumber product companies
- Leading player in Europe
- 1,100 employees
- Annual sales of 0,6 billion $
- Approx 60% is exported to Europe, North Africa, the Middle East and Japan

Setra's production units

- Sawmills, Spruce
- Sawmills, Pine
- Integrated production, sawmills and processing, Spruce & Pine
- Processing units
- Modular building factories

Setra's largest markets,

- 30 000-100 000 m3
- < 30 000 m3



Setra sales offices: Denmark, UK, Germany, France, Spain, Greece, Italy, Tunisia and Japan

Skinnskatterberg mill

210 000m3

Sound knots

Heart wood

Horndal mill

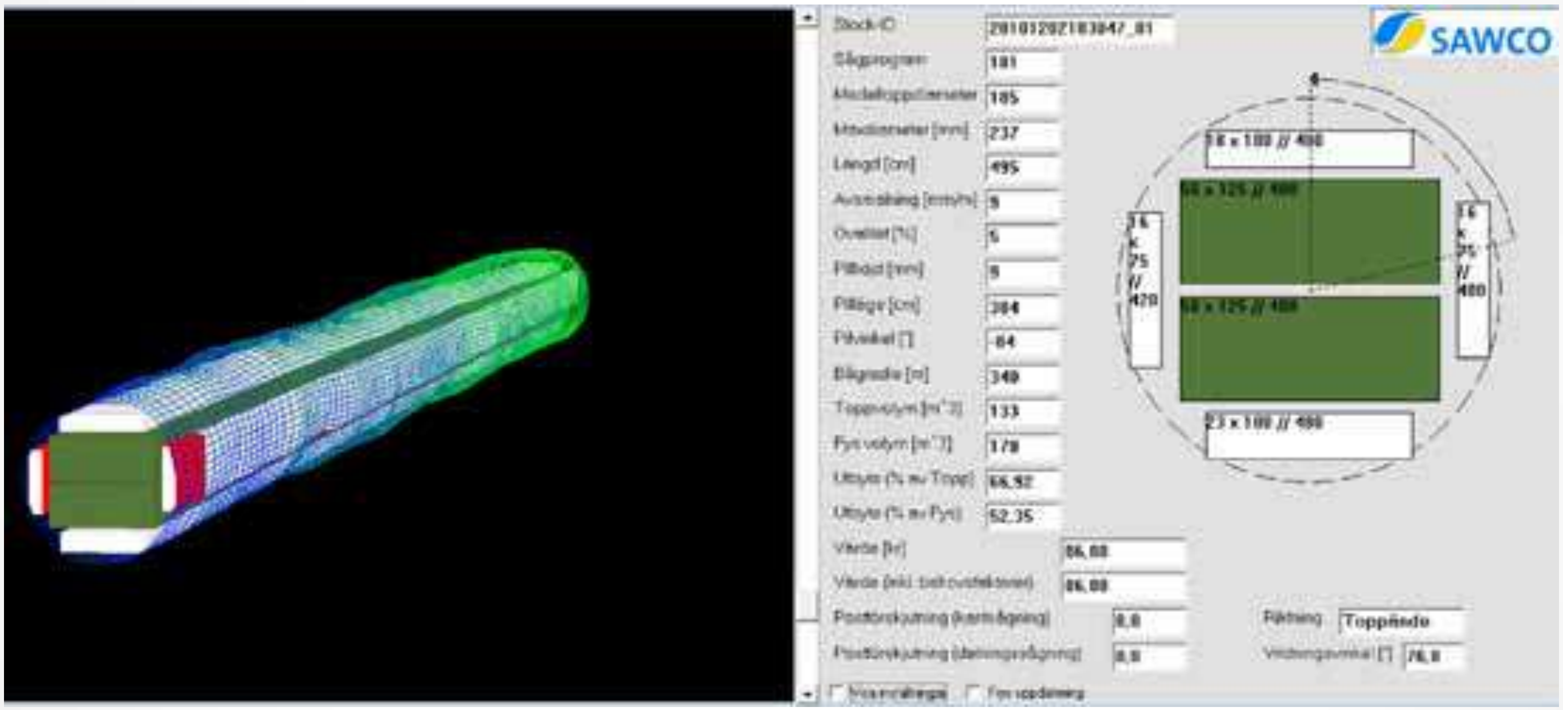
30 000m3

Clear wood

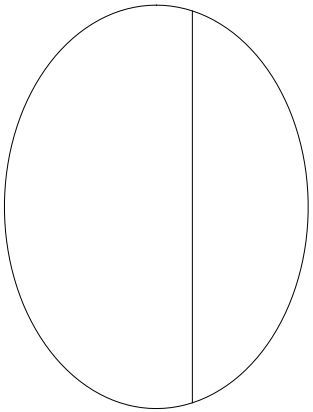
- Logs are measured and divided into sawclasses depending on diameter, lenght, and quality
- Measurment is also preformed as a foundation for payment by the Swedish Timber Measurement Council

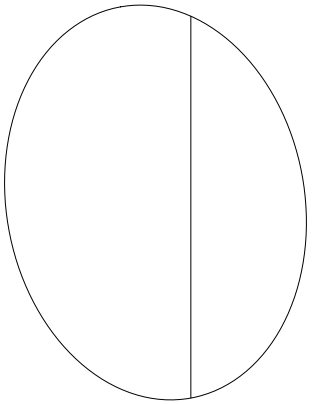
Turning logs – top end first

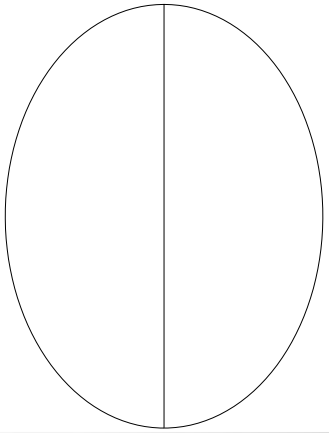
Optimizing

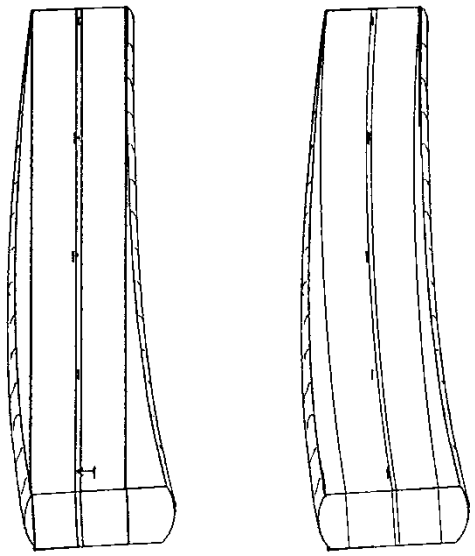


Centering & circular rotation









Thank You!

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