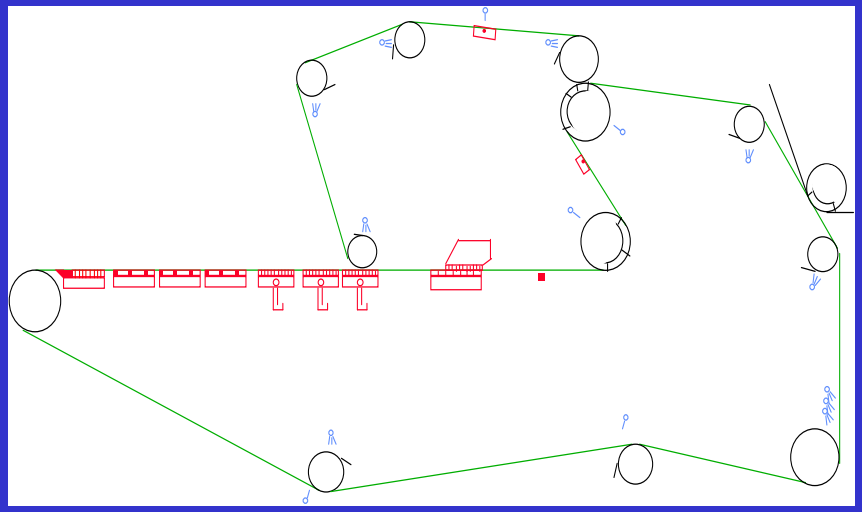
Celsius Degree / Grau Celsius

Making Value from Different Pulp Qualities



Celso Foelkel

www.celso-foelkel.com.br
www.eucalyptus.com.br

In some countries and in some mills:

Cash costs are so low that may eventually allow some flexibility for quality improvements or differentiation in the final product...

Why ?

Example 1:

Celsius Degree / Grau Celsius

Improvements on pulp softness via tensile reduction due to more severe cooking conditions to extract more hemicelluloses

This may lead to 2 situations:

1. Losses in daily production due to bottlenecks in pulpwood feeding to digesters, or in the recovery boiler area (**UNACCEPTABLE**, surely)

2. Higher consumption of wood, and increasing operational costs in the pulp mill (for each 1% of pulp yield reduction, it means 2% on more wood, in tonnage)

Example 1:

Celsius Degree / Grau Celsius

Improvements on pulp softness via tensile reduction due to more severe cooking conditions to extract more hemicelluloses

Decision surely depends on:

- Are there other valuable losses (transition pulp, operational disadvantages, etc)?
- Is there available wood?
- What is final cost increase?
- Is there a premium price?
- Is it sustainable?

Example 2:

Modifications in the fibrous raw material supply

- different wood species (sorting and blending);
- single pulpwood quality material (high density or low density; or just one species of Eucalyptus, example *E.globulus*)

Example 2:

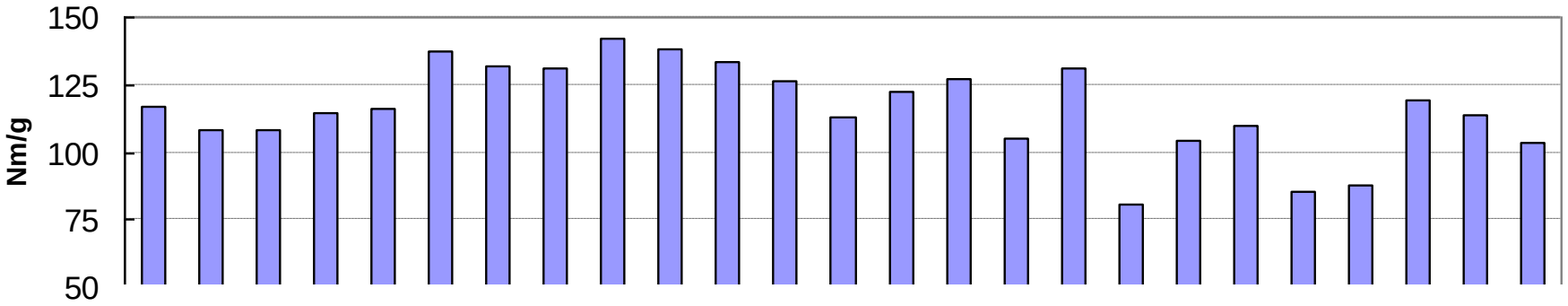
Modifications in the fibrous raw material supply

Decision surely depends on:

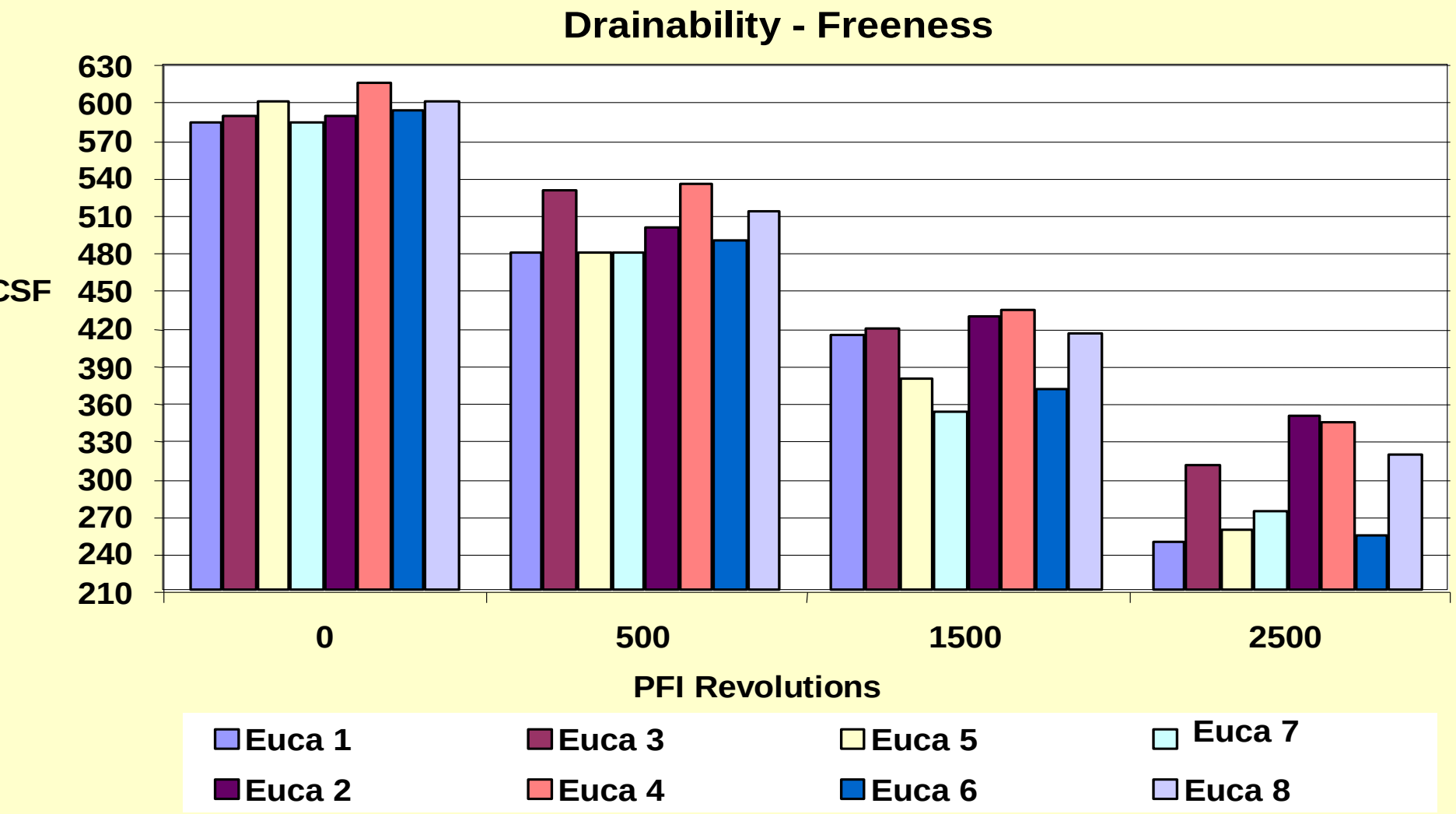
- At what new production costs?
  - Does it pay?
- Is there a premium price?
  - Is it sustainable?

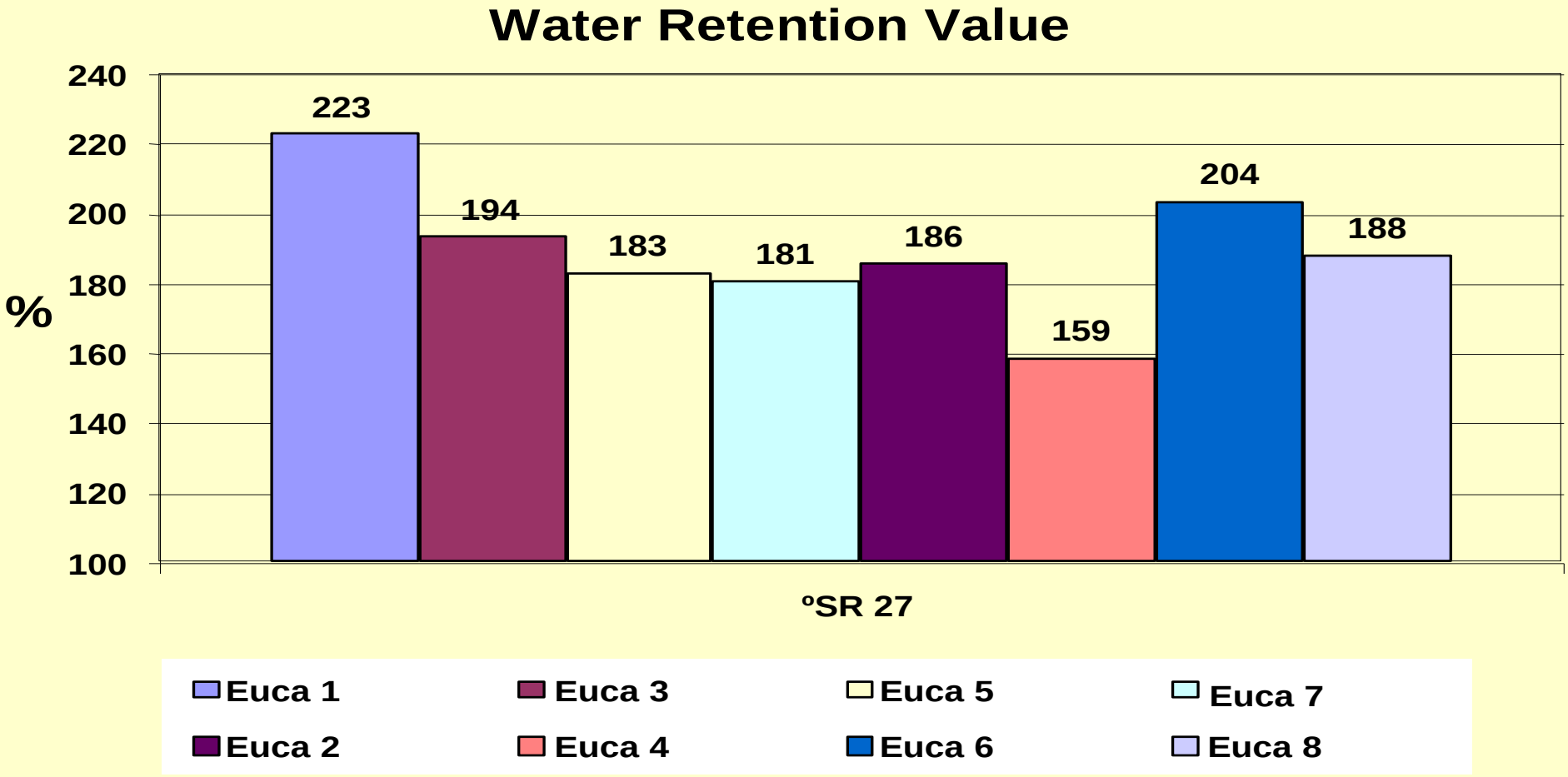
Valuing variability:

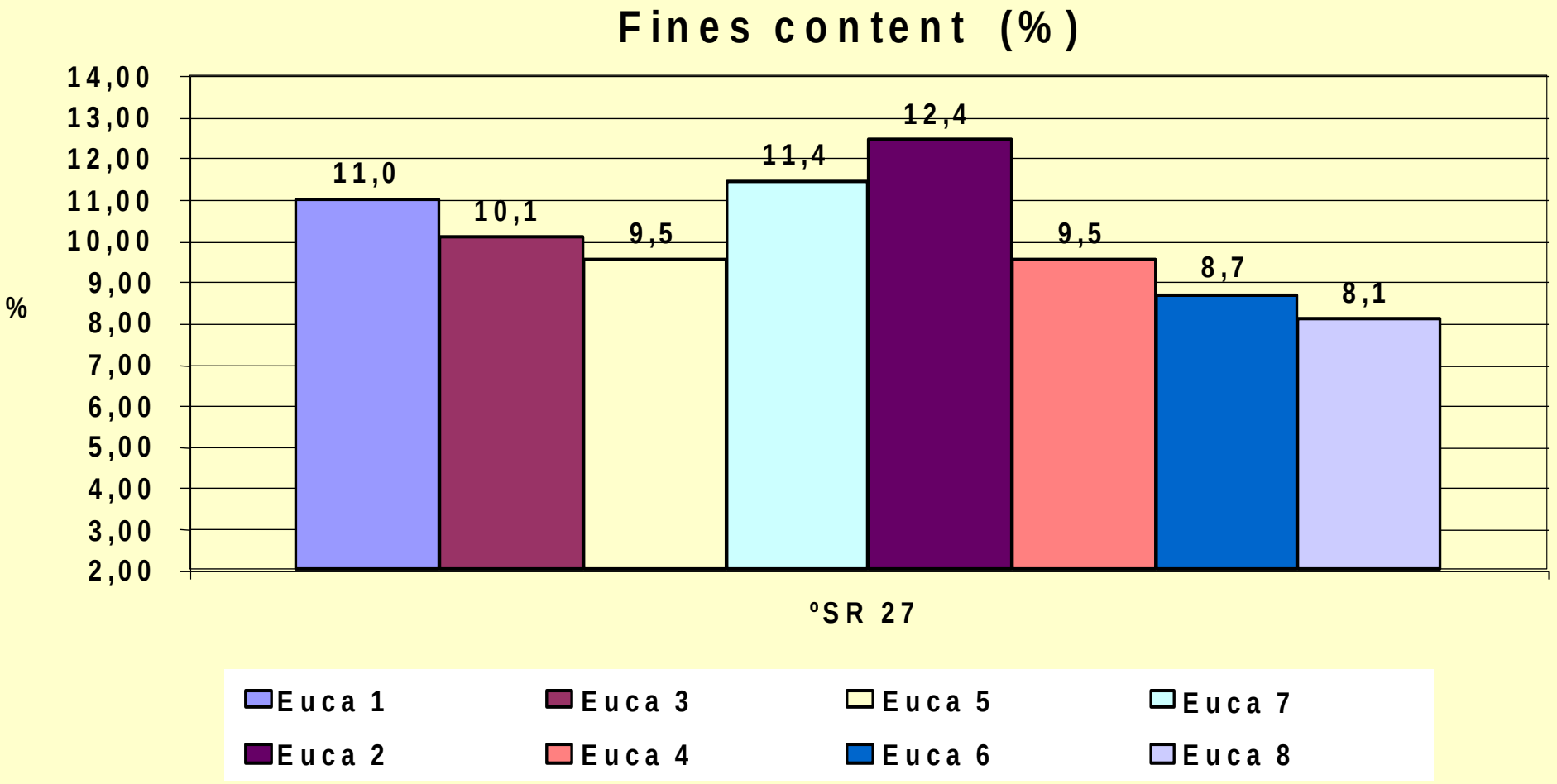
Wet Zero Span - Fiber Intrinsic Strength



Different *Eucalyptus* Market Pulps


Drainability - Freeness
630
600
570
540
510
480
450
420
390
360
330
300
270
240
210
CSF
0
500
1500
2500
PFI Revolutions
Euca 1
Euca 3
Euca 5
Euca 7
Euca 2
Euca 4
Euca 6
Euca 8


Water Retention Value
240
220
200
180
160
140
120
100
%
223
194
183
181
186
159
204
188
ºSR 27
Euca 1
Euca 3
Euca 5
Euca 7
Euca 2
Euca 4
Euca 6
Euca 8


Fines content (%)
14,00
13,00
12,00
11,00
10,00
9,00
8,00
7,00
6,00
5,00
4,00
3,00
2,00
%
11,0
10,1
9,5
11,4
12,4
9,5
8,7
8,1
ºSR 27
Euca 1
Euca 3
Euca 5
Euca 7
Euca 2
Euca 4
Euca 6
Euca 8

In pulp making, when things are going wrong:

The cause is..... The WOOD

In paper making, when things are going wrong:

The cause is..... The PULP

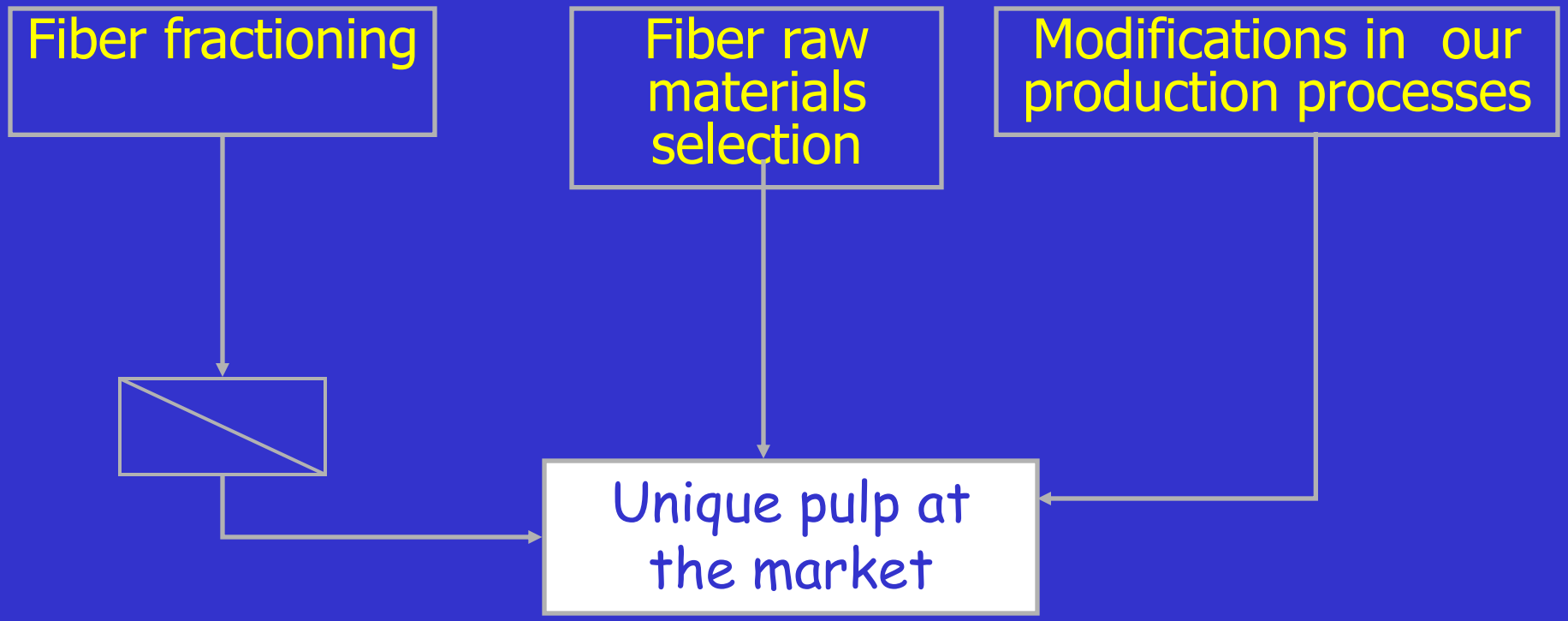
and, when we have a blend of pulps ?

The “convict” is exactly the one added to provide the quality is not being reached.

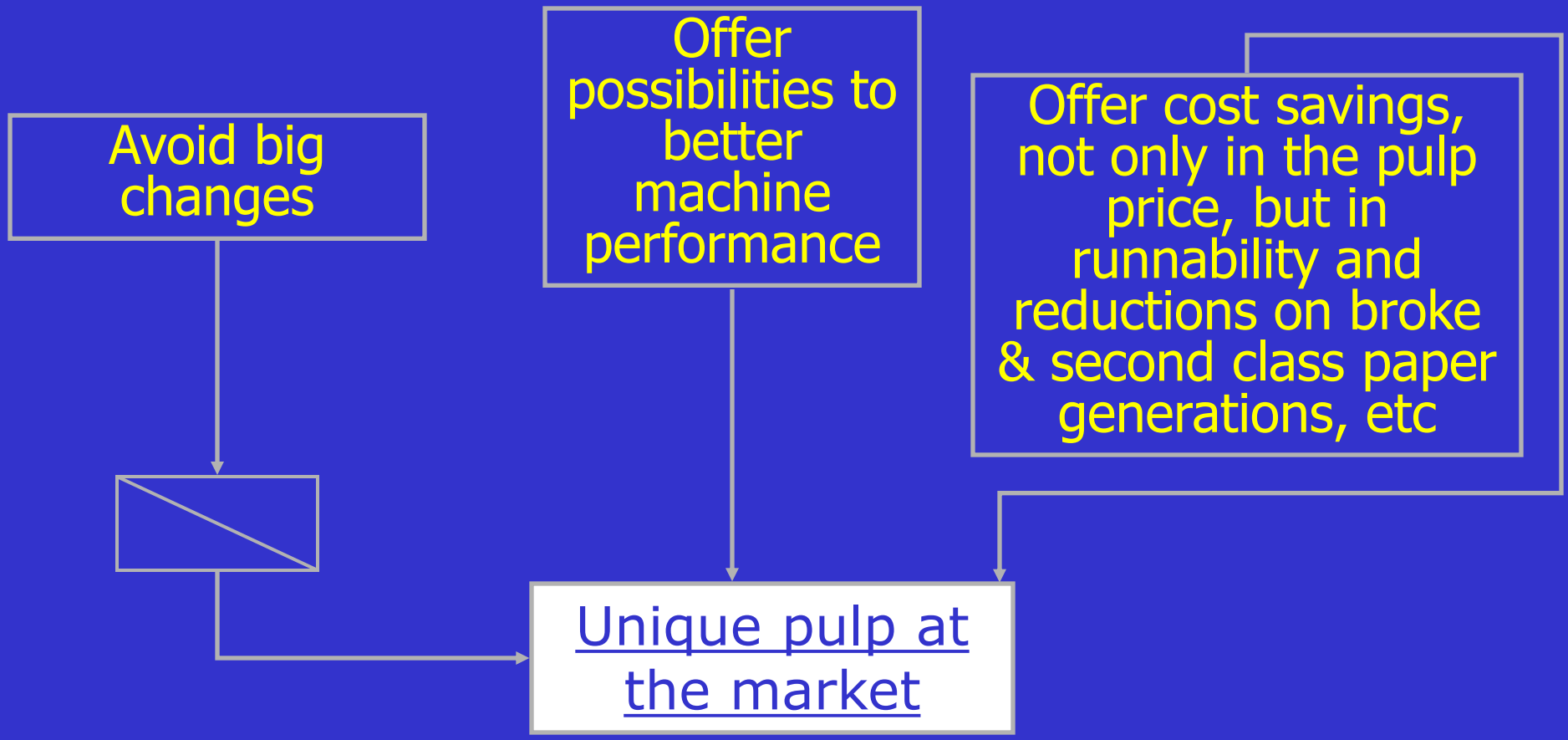
or the weaker pulp, if the problem is wet web strength;

or the short fibered pulp if the problem is wet end drainage.

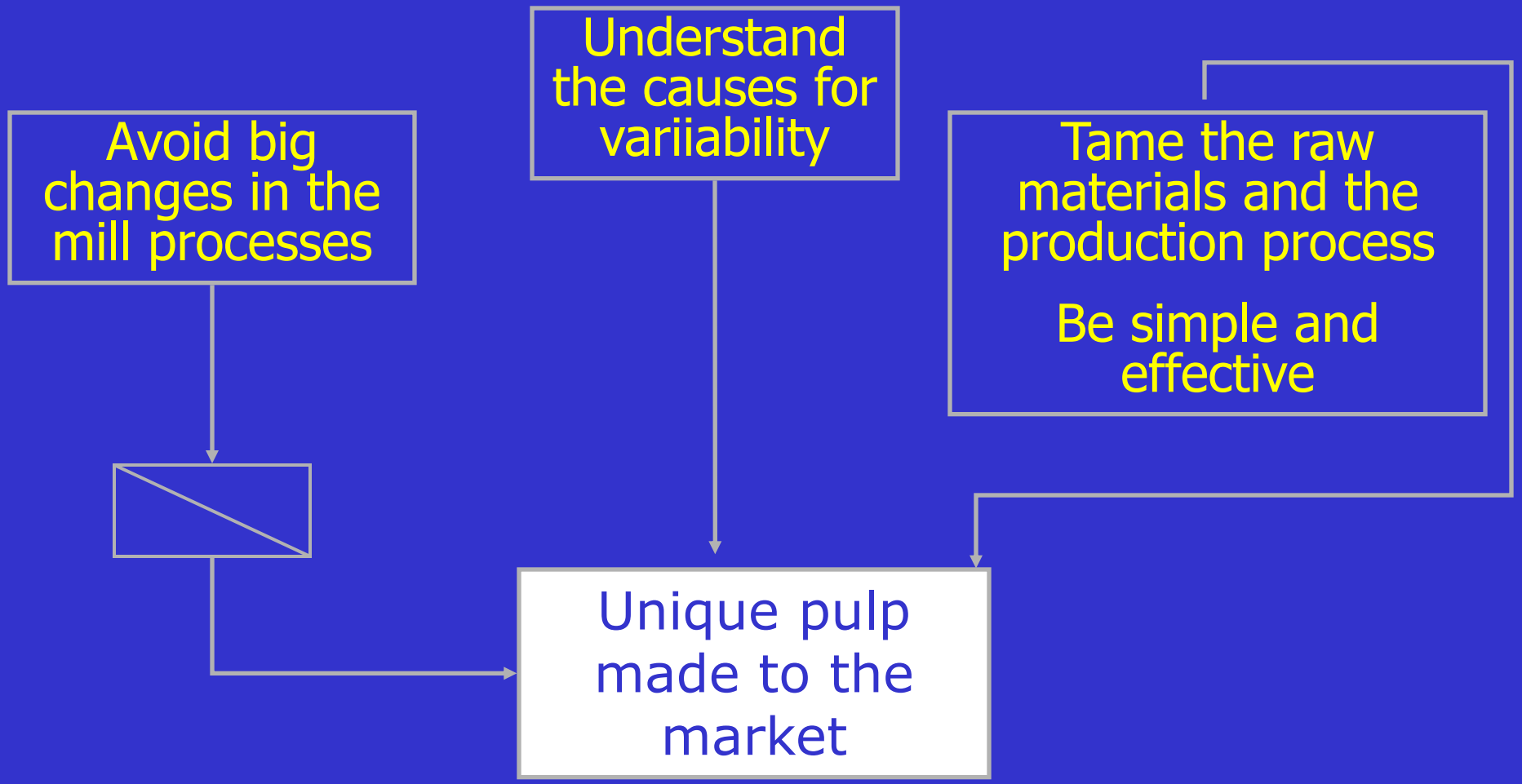
Are there ways to build differentiation?



Differentiation is not that simple, and it has to be sustainable to the papermaker



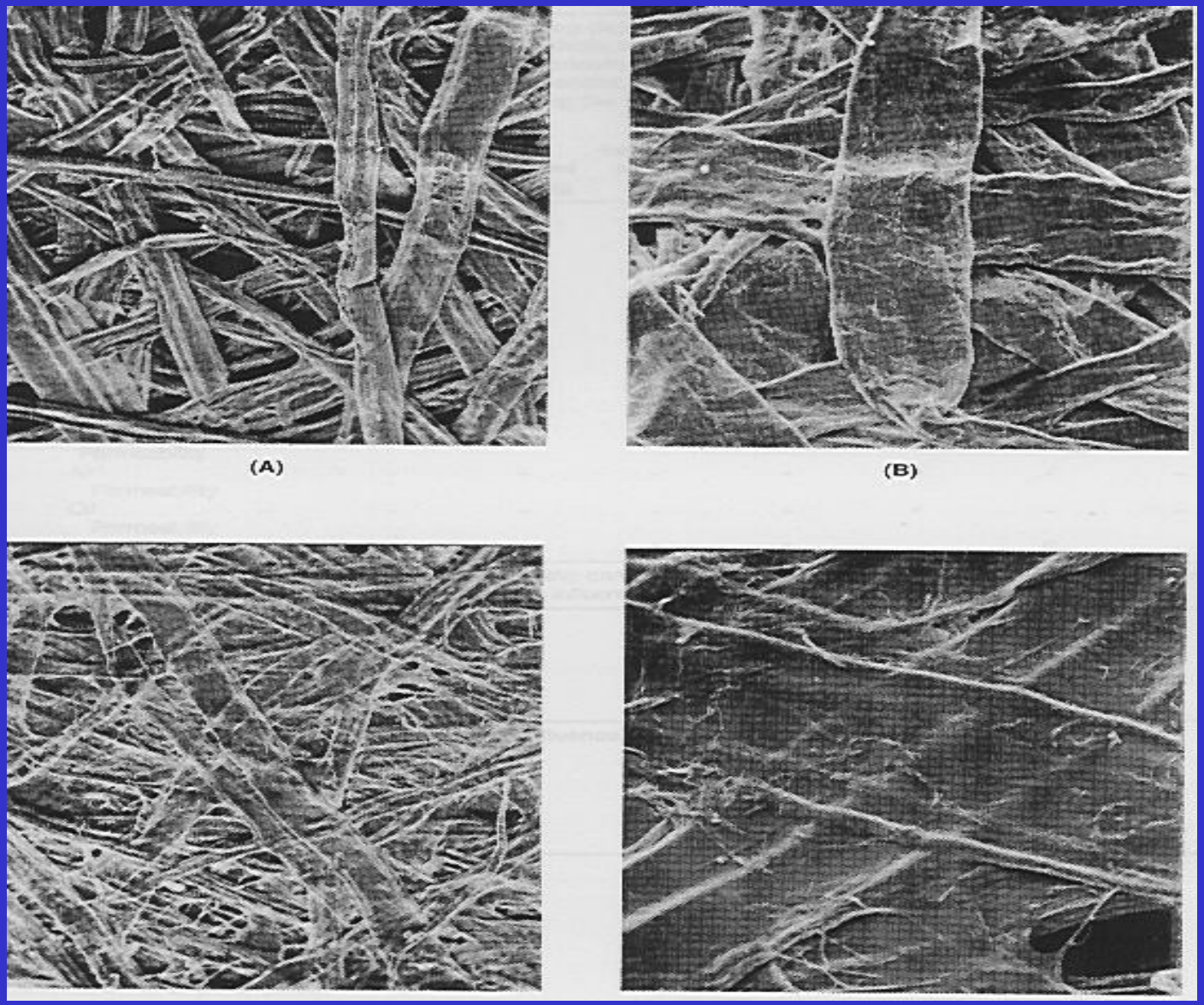
Differentiation is not that simple and it has to be built at the pulp mill



Suggestions for Low Corseness Fibers (Light Fibers)

- Base paper for coating
- Label papers
- Release papers
- Glassine papers
- Thermal papers
- Highly bonded papers
- Some P&W

However, this is very much dependent on the customers limitations (Machine speed, porosity and bulk specs, etc.)

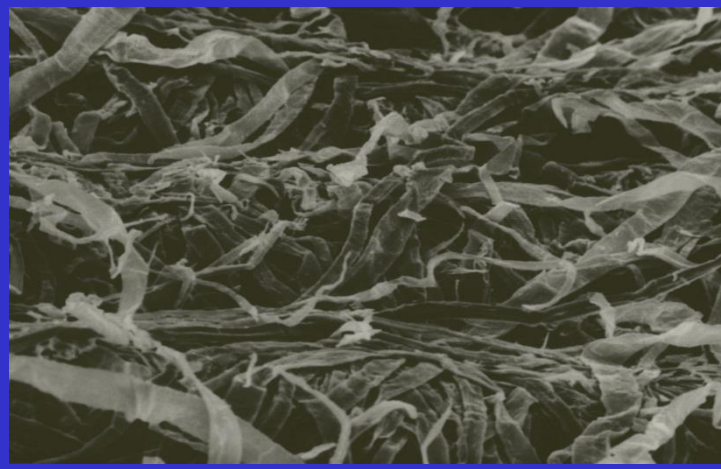


(A)

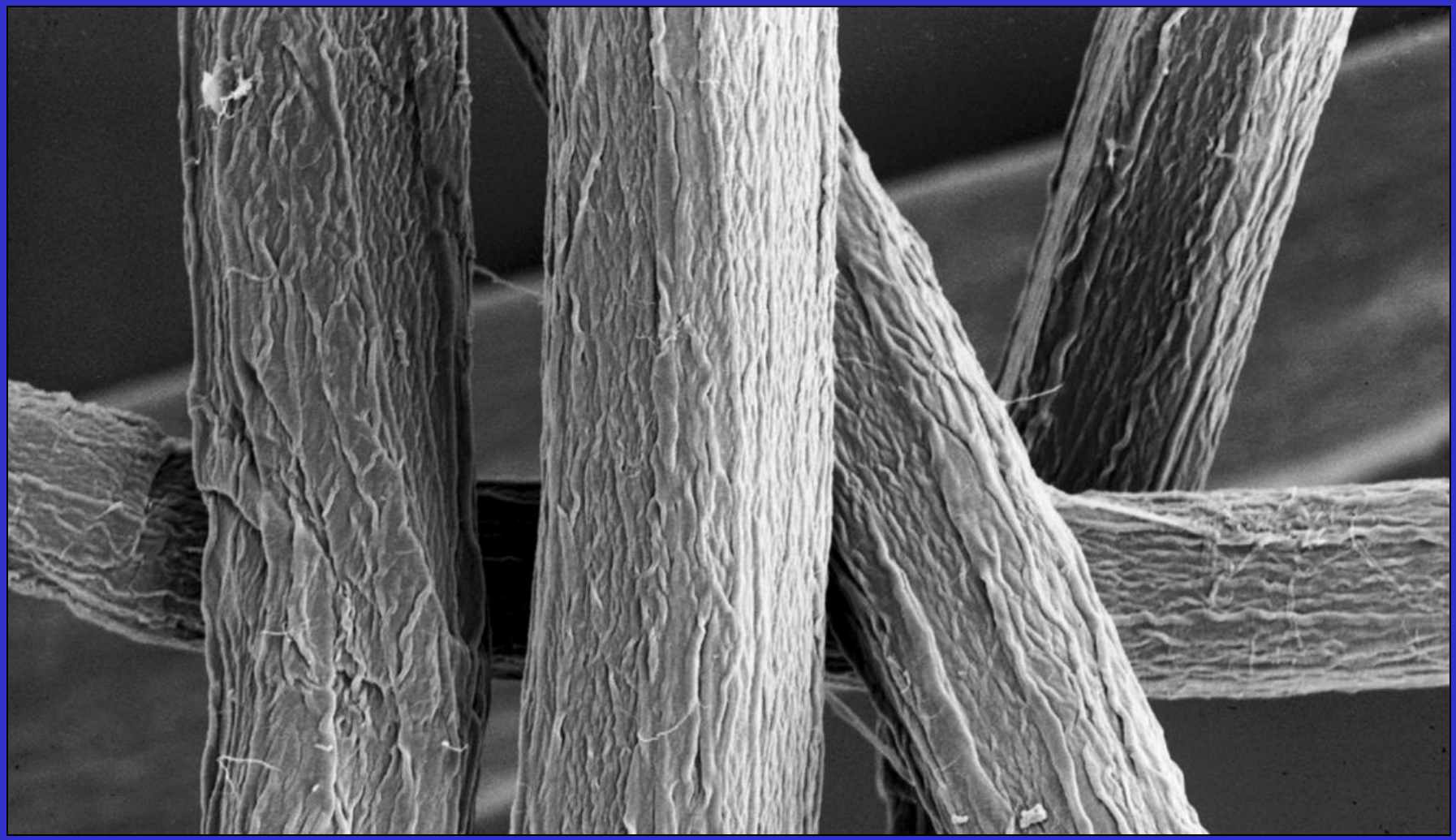
(B)

Suggestions for High Corseness Fibers (Heavy Fibers)

- Decor papers
- Filter papers
- Tissue papers
- Cigarette papers



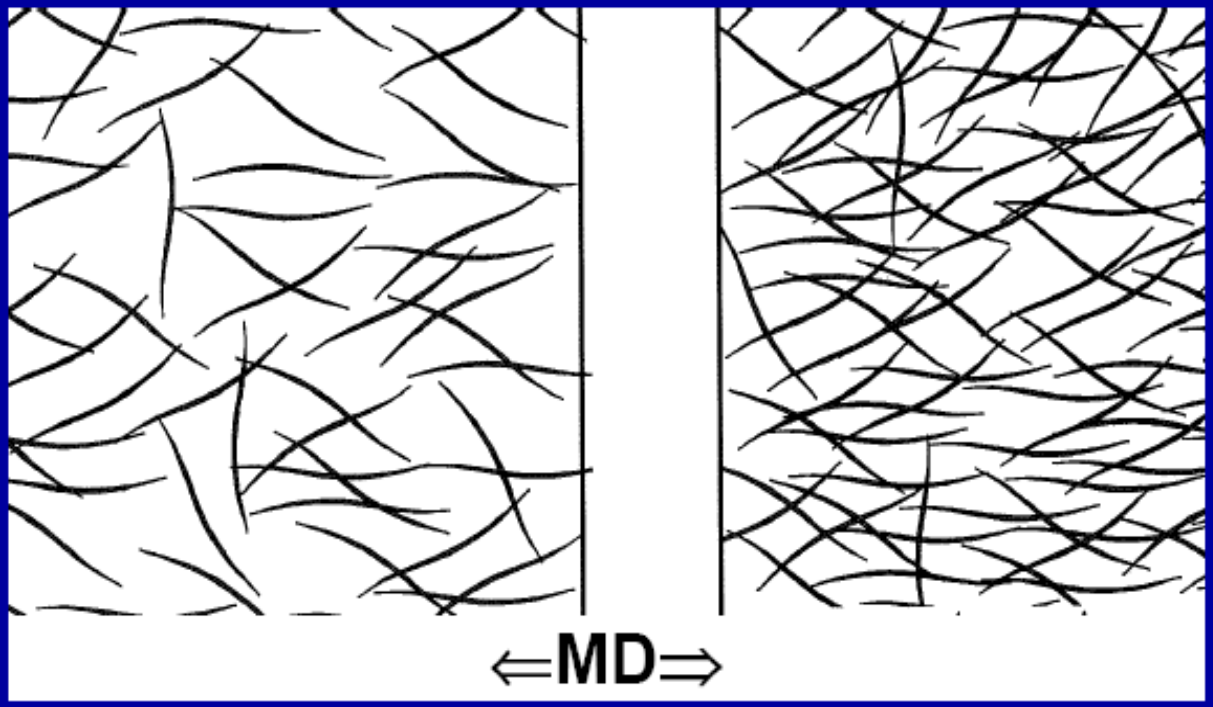
Chemical Pulp Fibers



Its is more than obvious the importance of the Wood Density on Fiber Quality

Wood Density g/cm³	Fiber Coarseness mg/100m	Fiber Population Nº/g
0,43	5,8	25,4
0,46	6,4	21,6
0,51	7,4	19,7
0,54	9,3	17,5
0,60	11,8	13,0

Half coarseness = Double number



Pulp Blends

Eucalypt fibre component

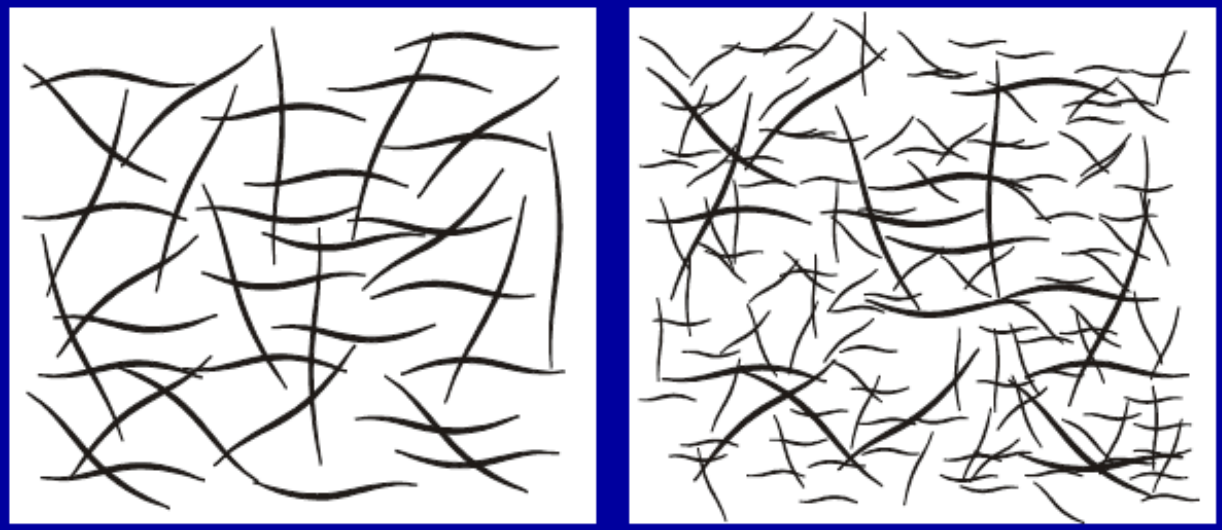
- Bulk
- Bulk softness

Softwood fibre component

- Strength and runnability

Pulp Blends

Softwood : Eucalypt mixture



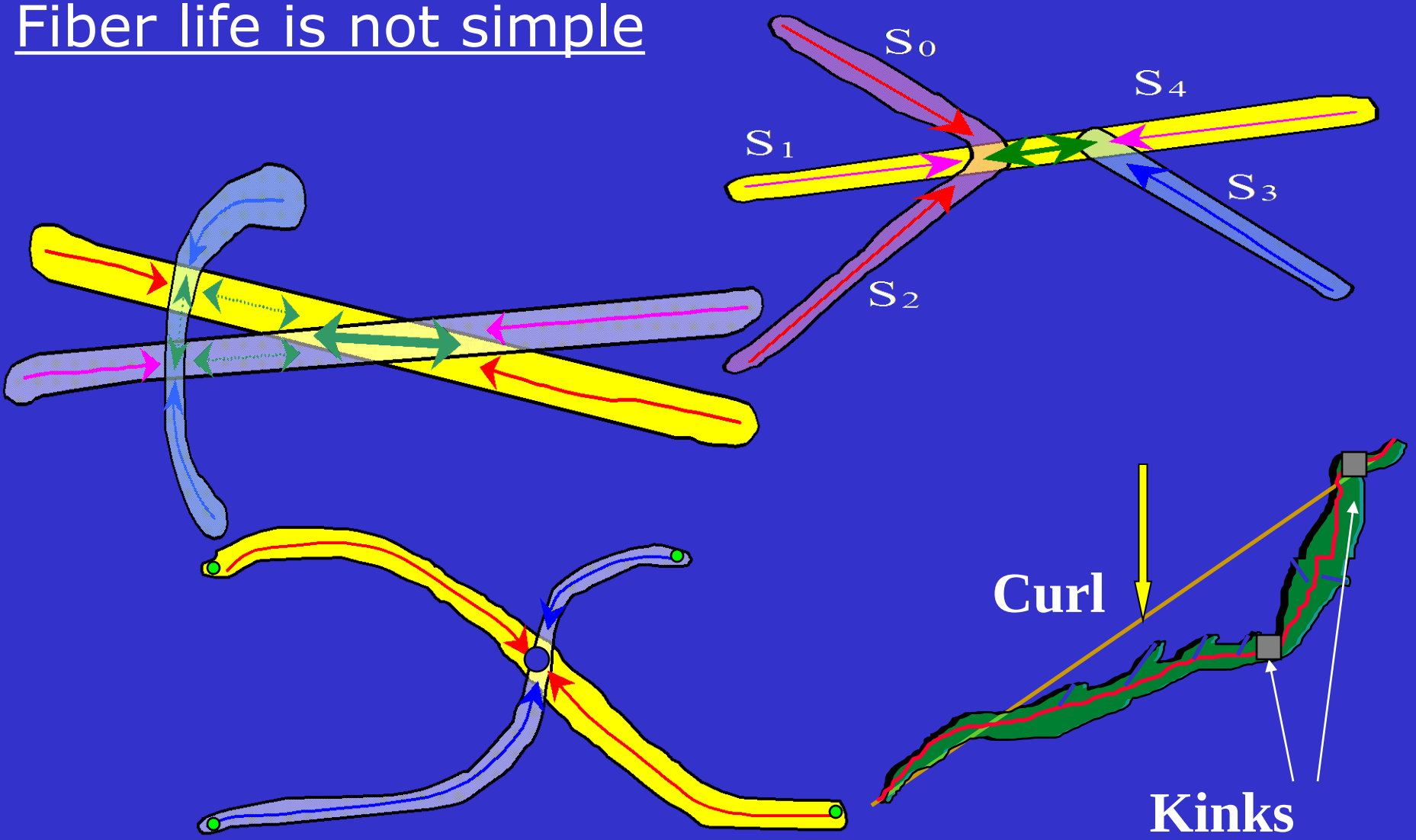
100 : 0 ⇐ MD ⇒ 50 : 50

Pulp Blends

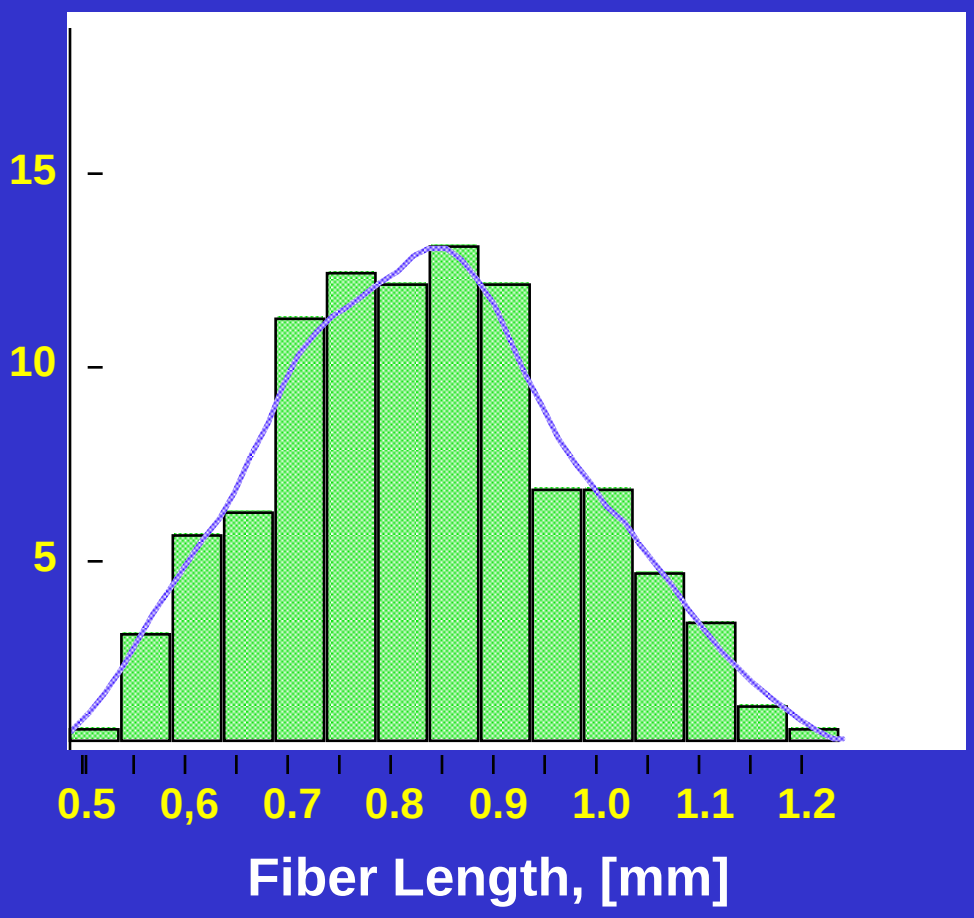
Softwood : Eucalypt (20 : 80)

⇐MD⇒

Fiber life is not simple

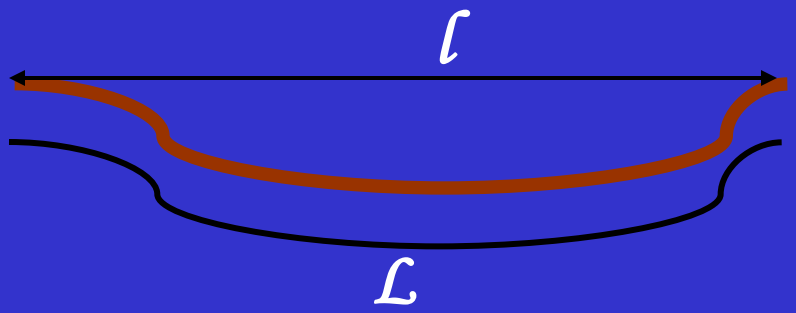


Fiber Length Variations

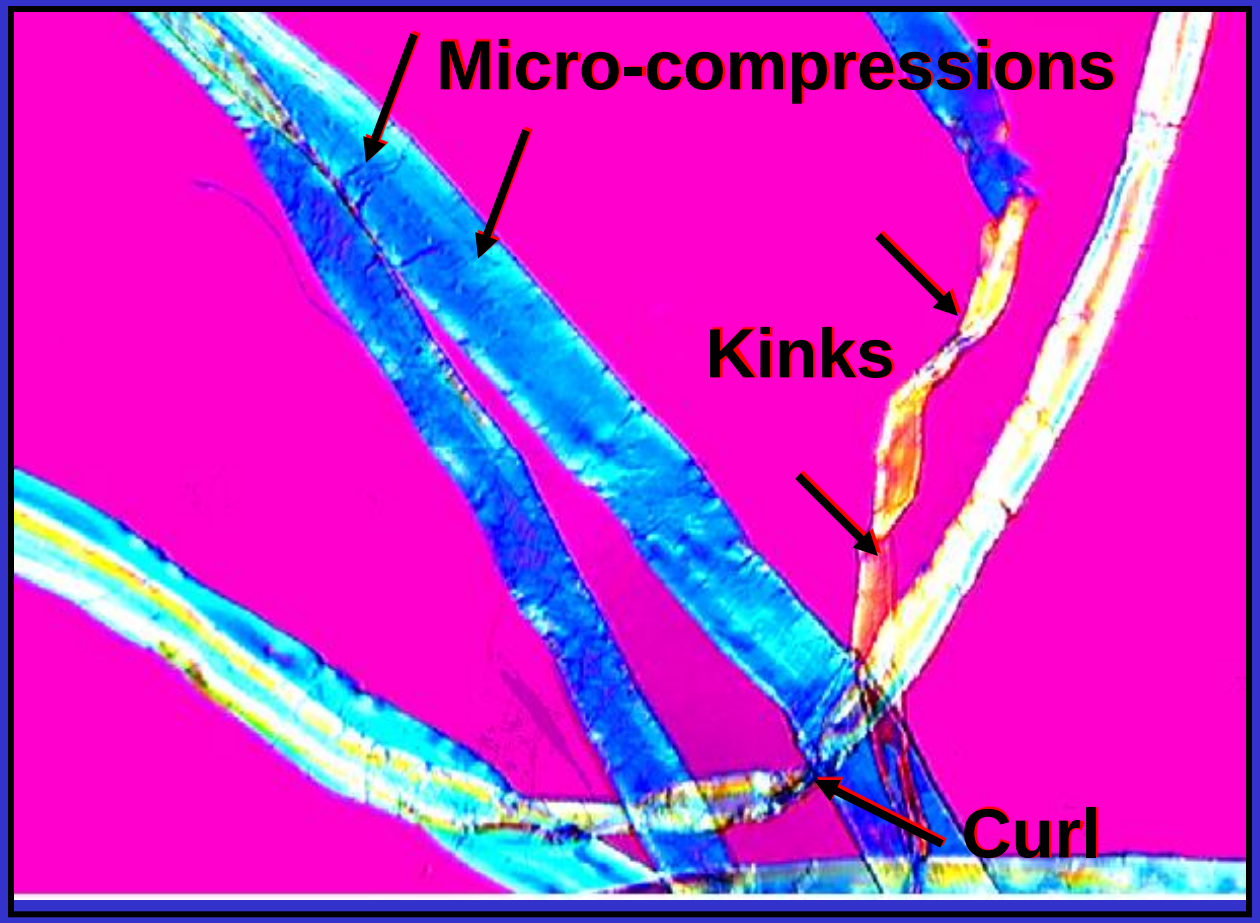


CURL

Form Factor of a Fiber = $100 \times \ell/L$

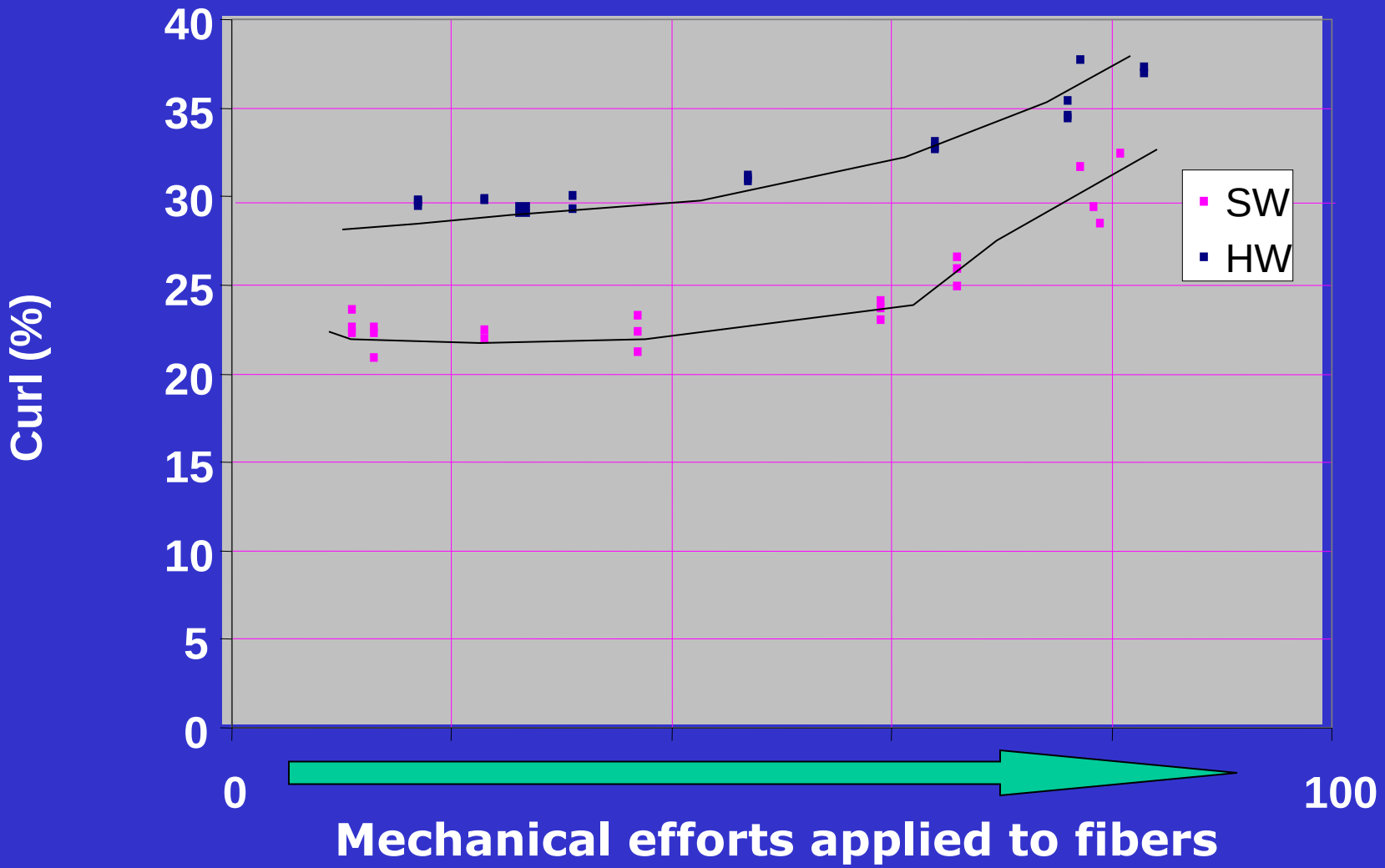


Fiber new attributes



How to add these attributes to a pulp?

Development of Curl



Does this really may happen in a foreseen future ?

Input:

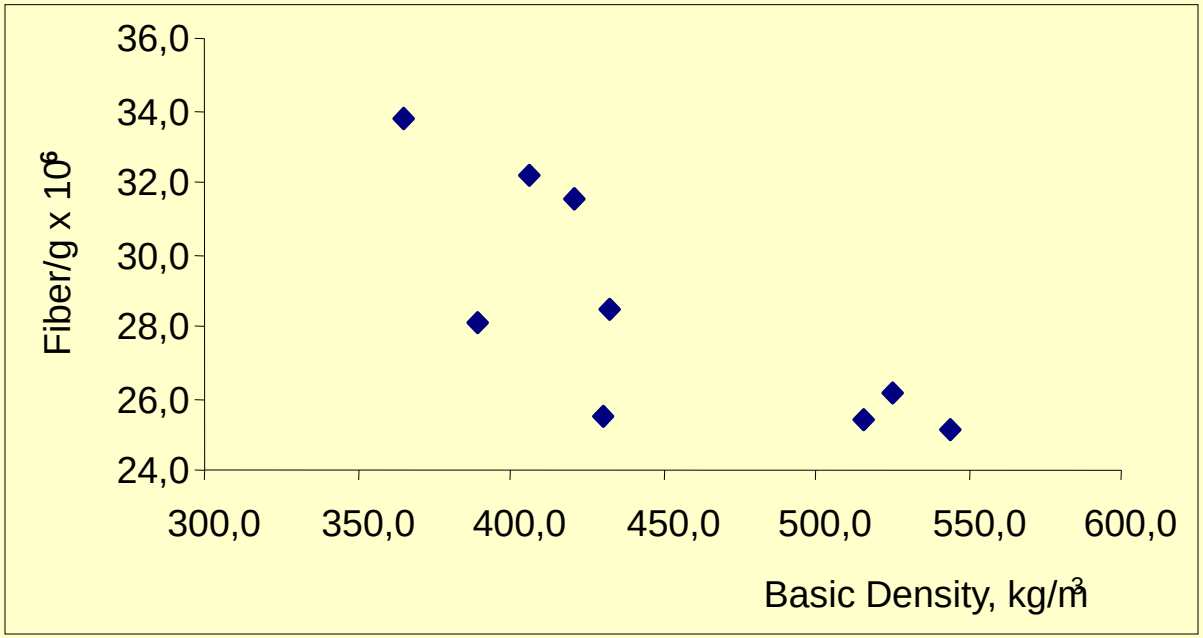
Fiber - length
- width
- population

Coarseness
Fiber Strength
Fiber Deformations

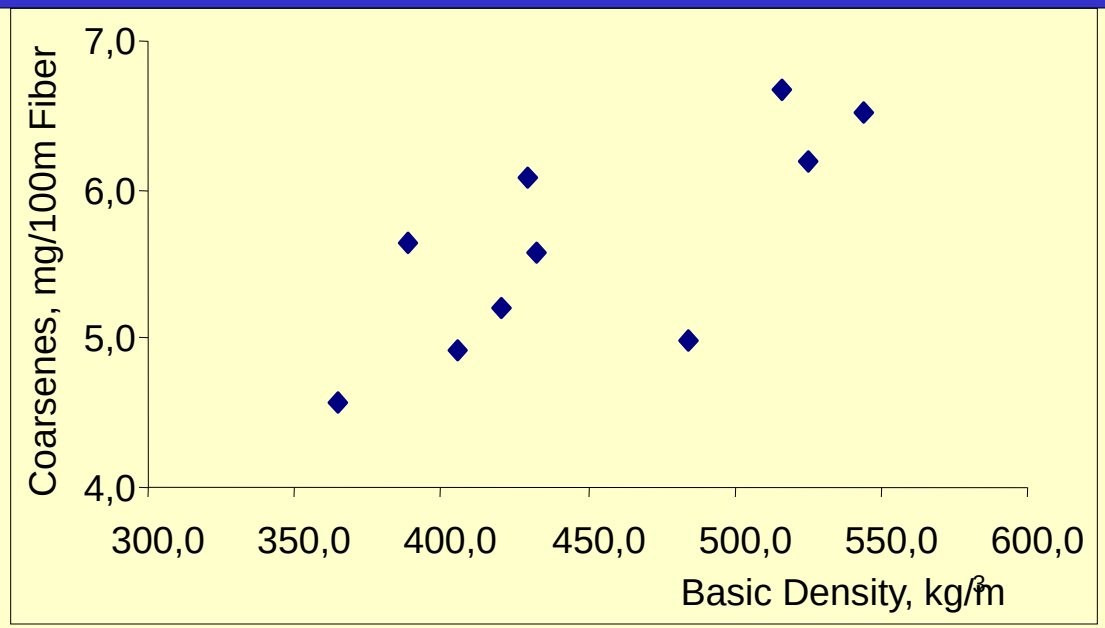
Predicted

Beatability
Pulp "Strength"
Paper characteristics

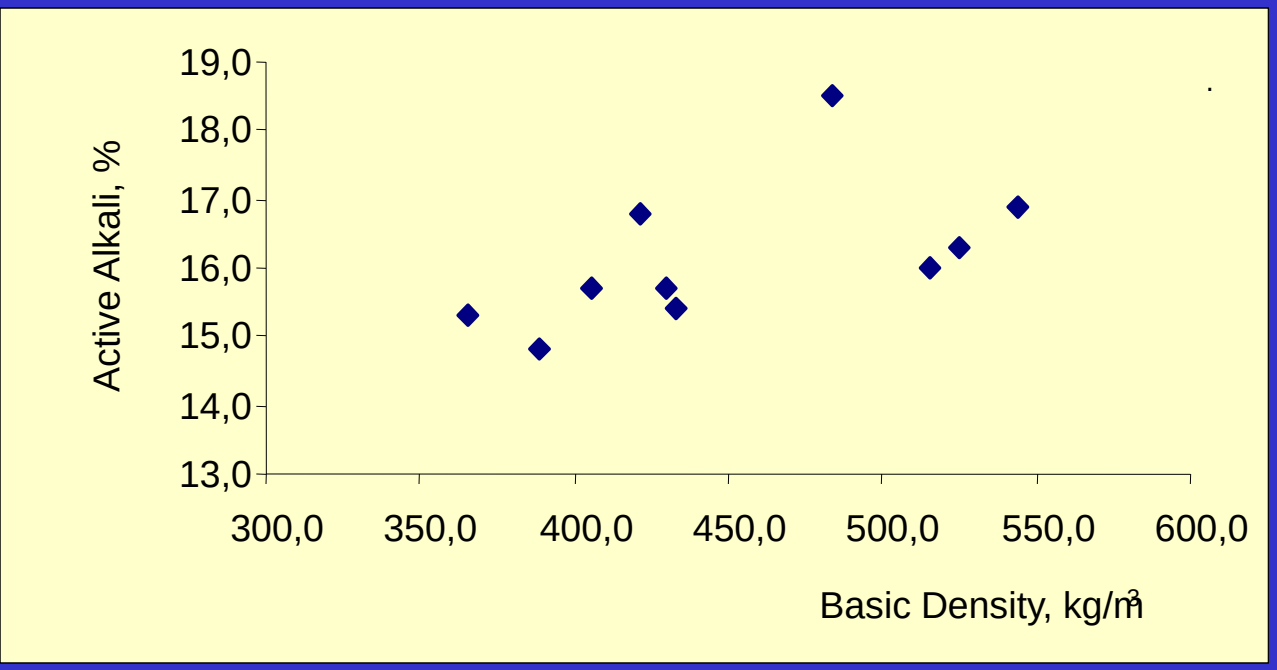
+ brigthness, cleanliness etc.



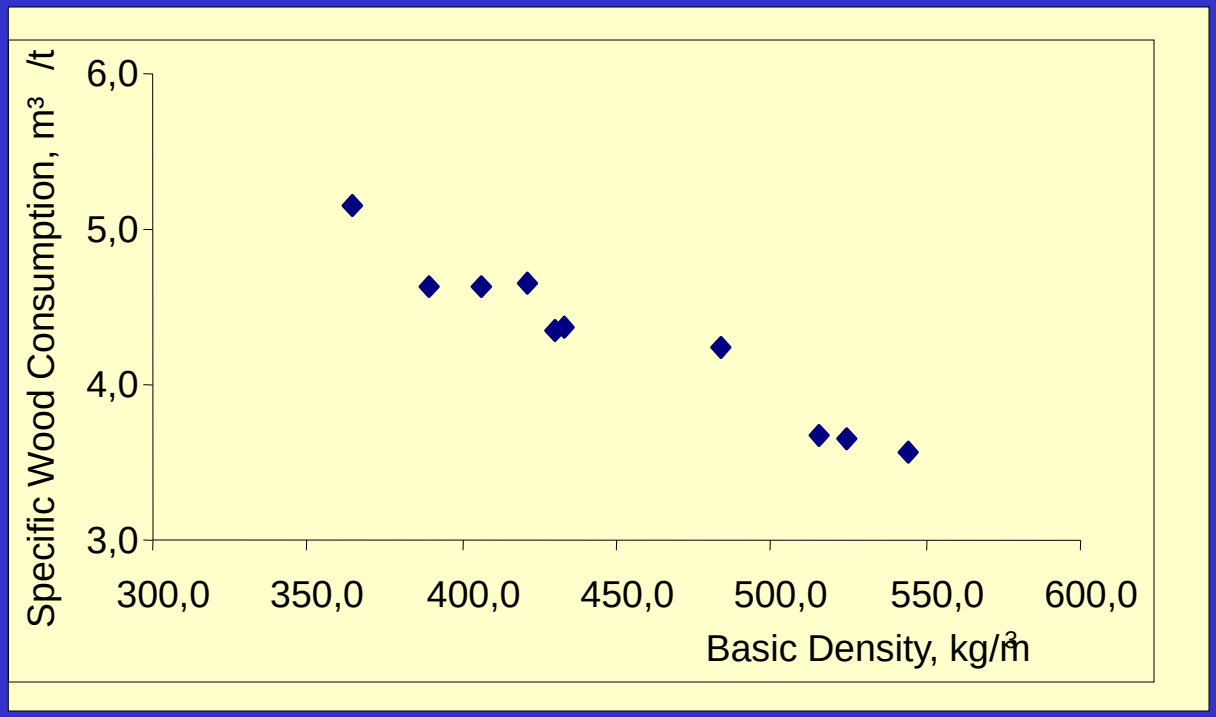
Fiber population correlates significantly and negatively with wood density



Fiber coarseness correlates significantly and positively with wood density



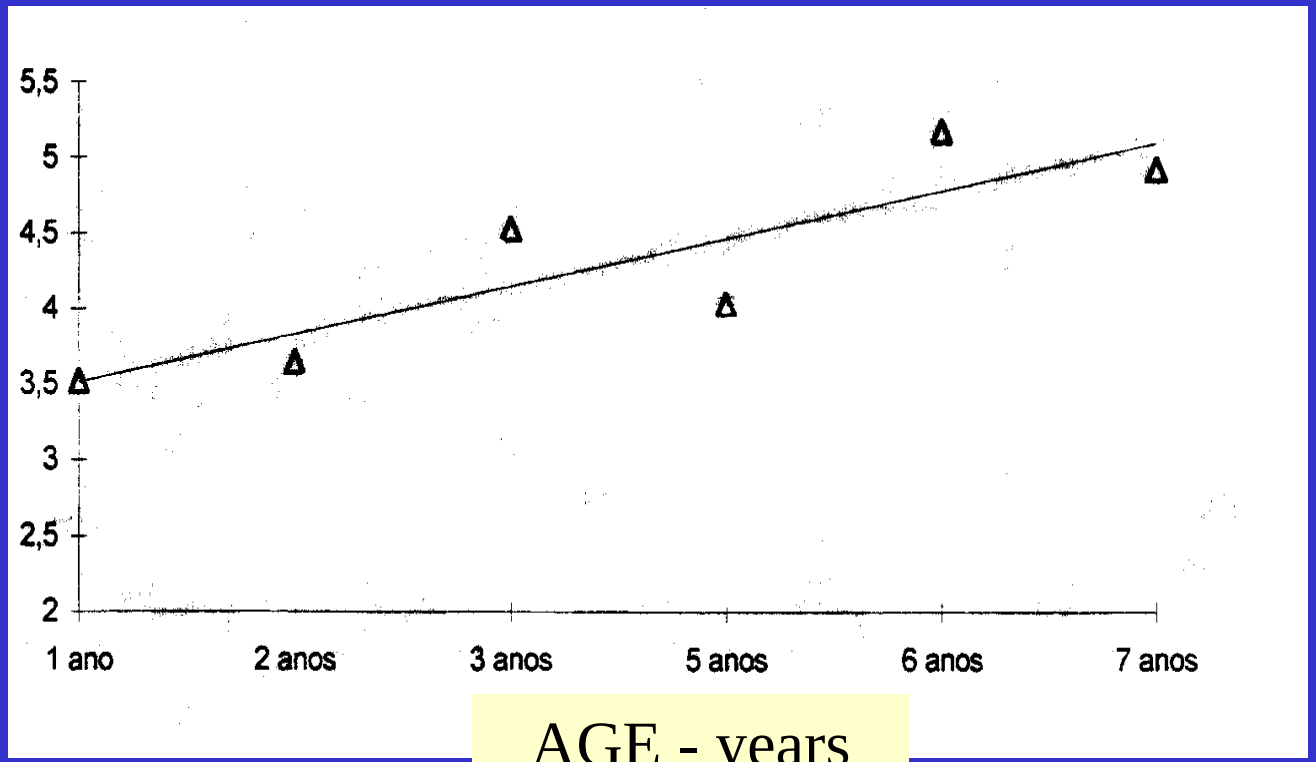
Active Alkali demand correlates positively with wood density



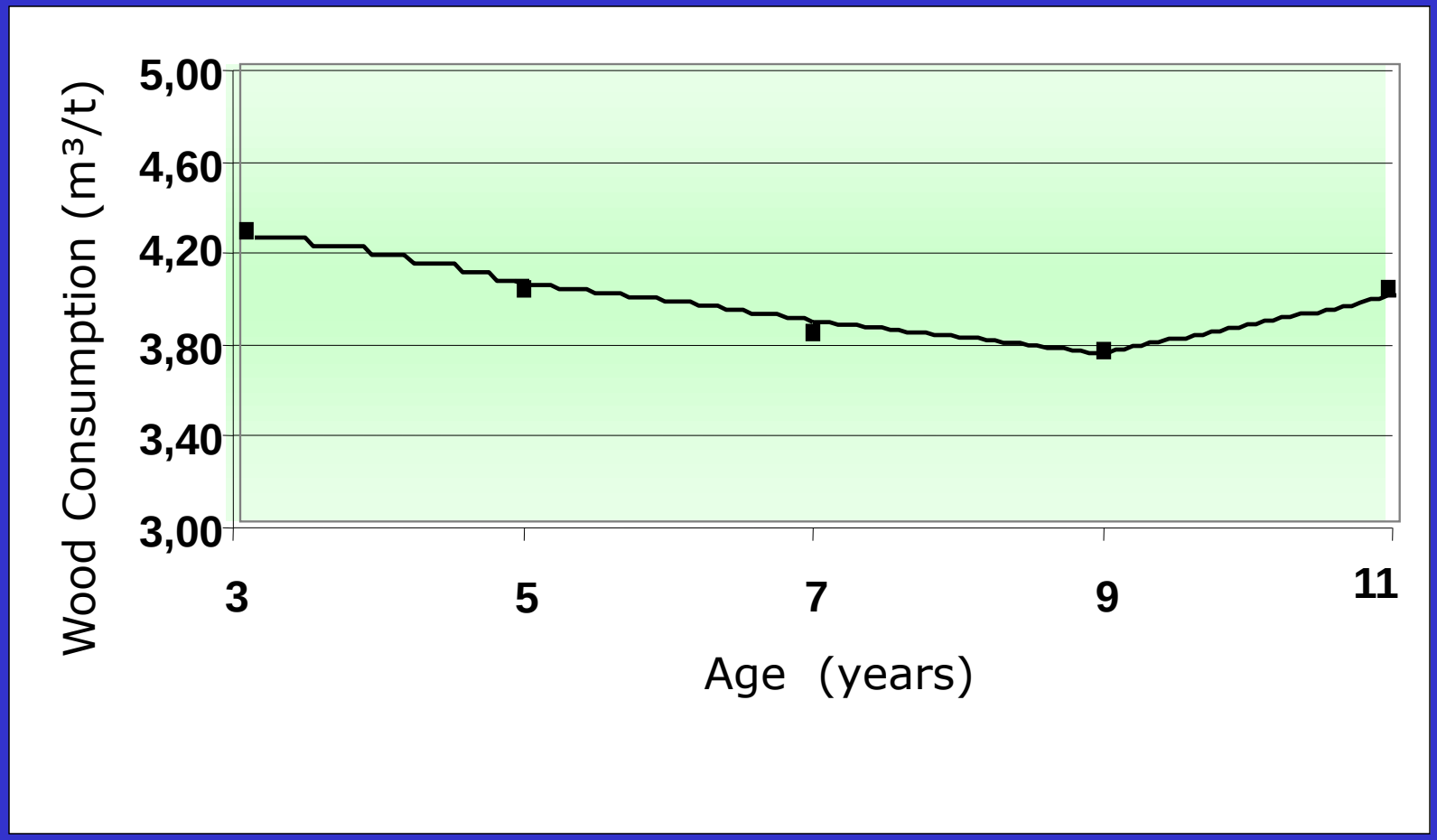
Specific wood consumption correlates negatively with wood density

Fiber wall thickness

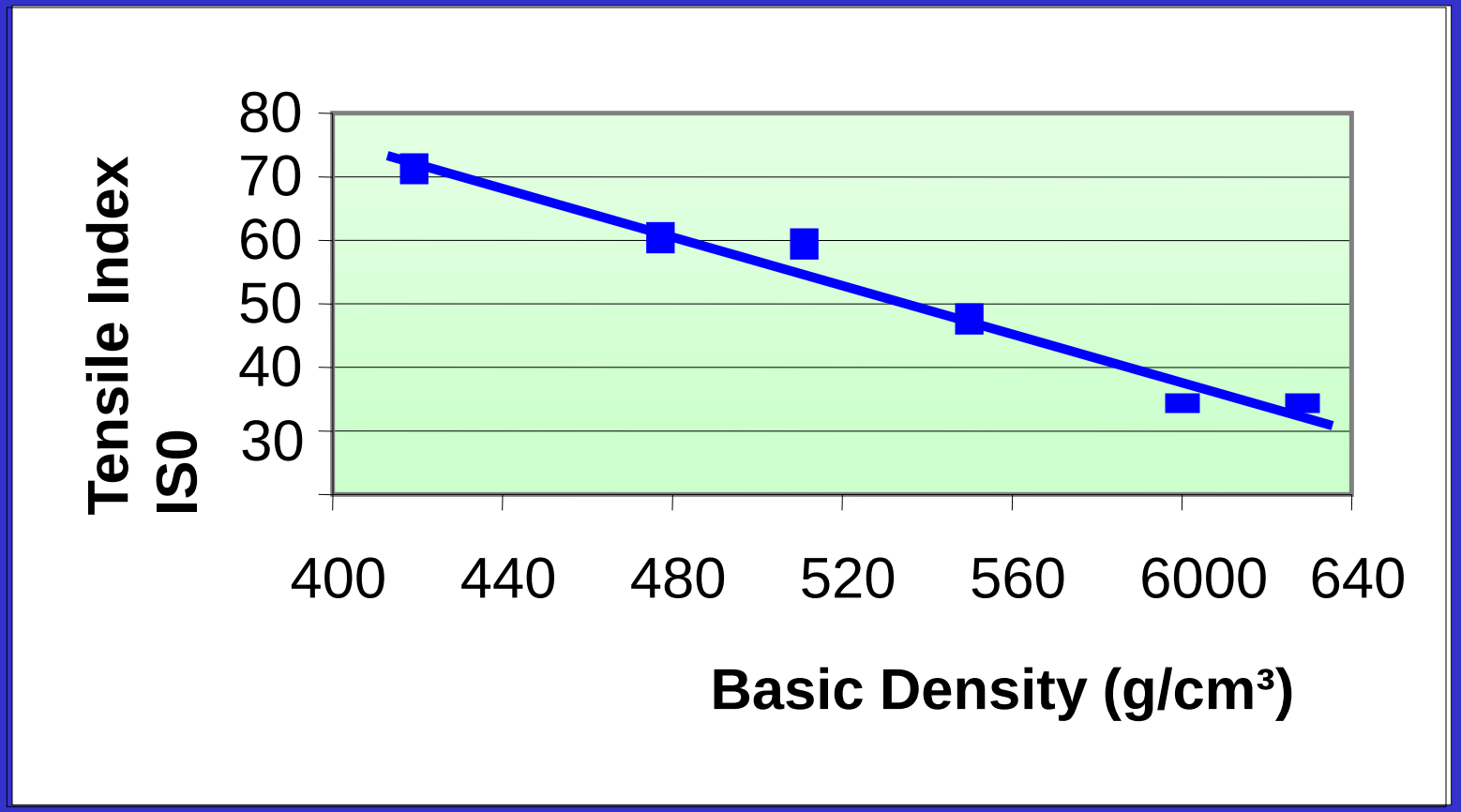
Wall thickness



Forest Age and Wood Specific Consumption



Tensile Index vs. Wood Basic Density



- Today's world

. lots of opportunities to creative work

. pulp suppliers are in most cases "old fashioned" commodity manufacturers

focus on tonnage's
focus on production costs
focus on distribution
focus in single product

Today's world

What can we do to bring a unique reference to our pulp products in the competitive market?

Coarseness & Fiber population
Curl
Pulpwood recipes
Brightness & cleanliness
Individual fiber strength
Paper-machine drainage & speed
Strengths

"and associated paper properties"