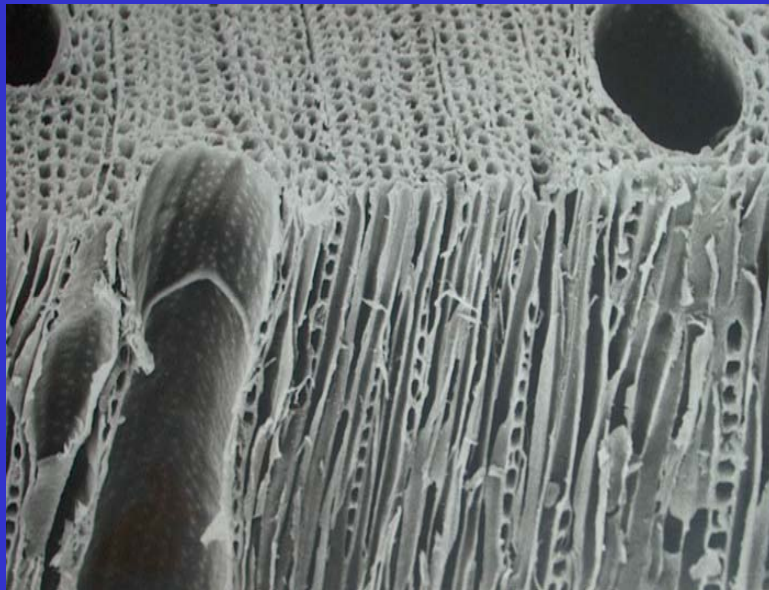
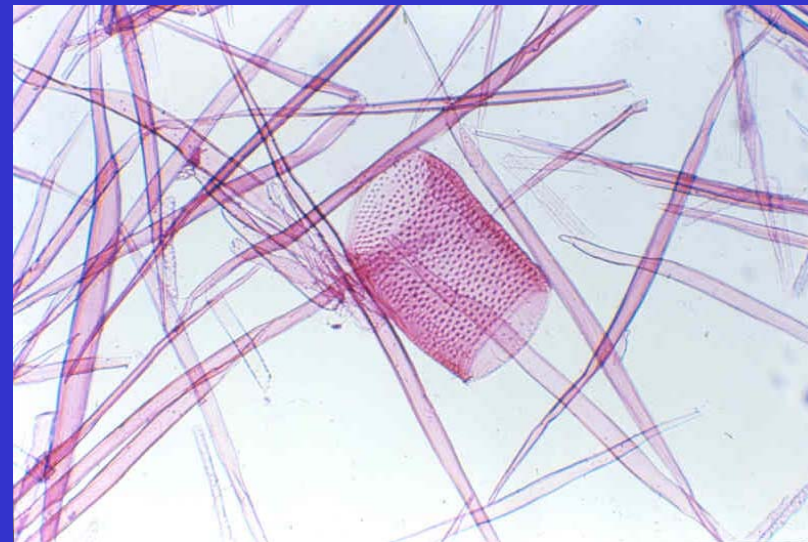


Differentiation in market pulp products: Is market pulp a commodity product?



Celso Foelkel





When you look
at your
raw materials,
products
and customers ...



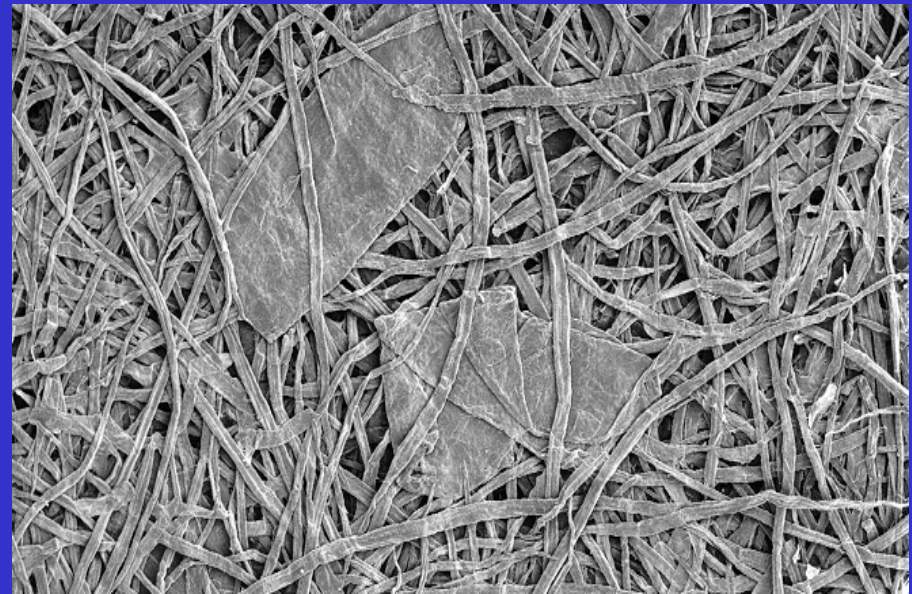
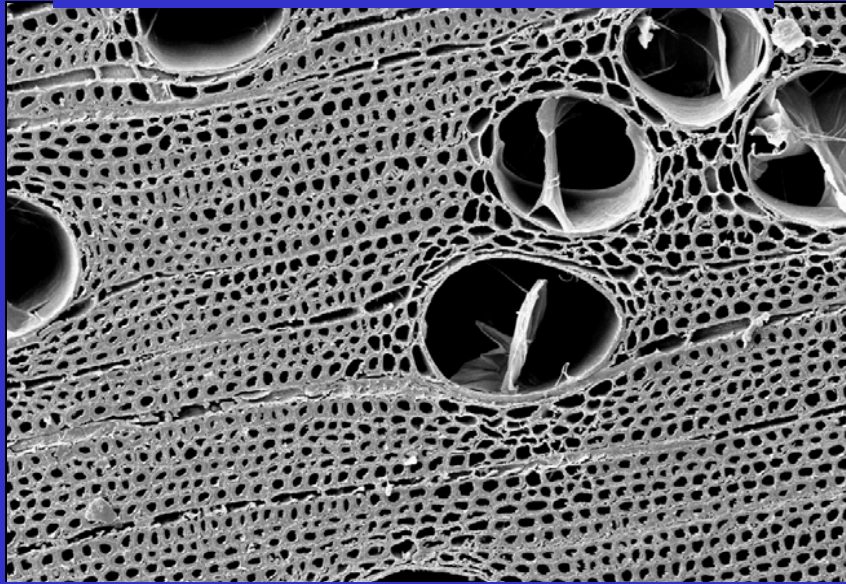
What do you see?



What do you see?



What do you see?



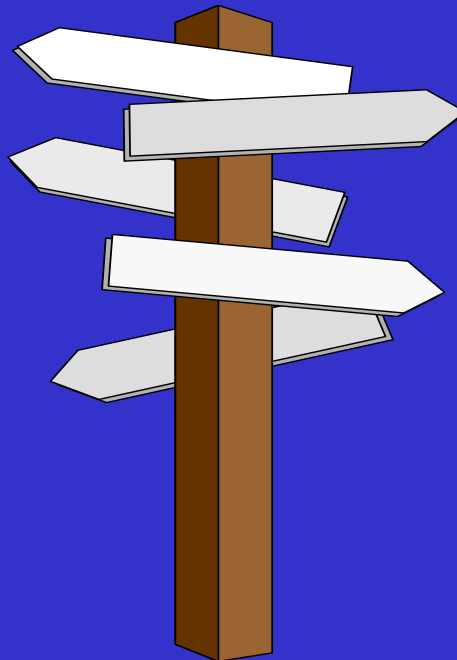
What do you see?

\$
\$
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\$
\$
\$
\$



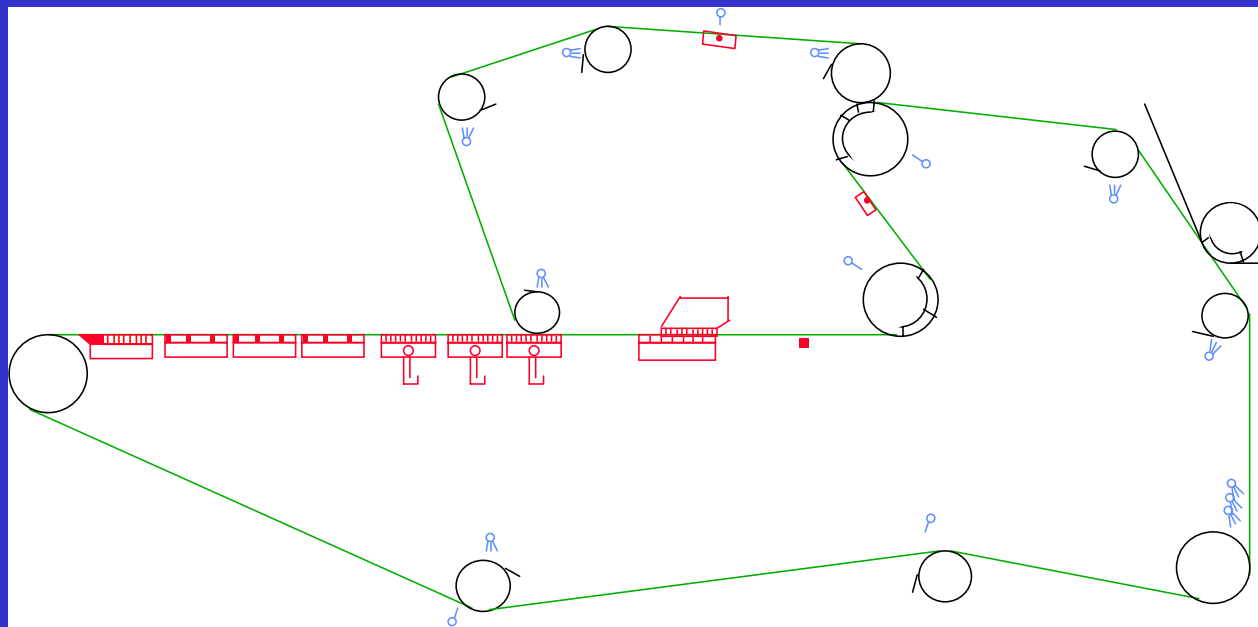


Is there a single and most correct way
to see our mills, products and
customers ?





"Each paper-machine, each pulp mill, any pulp & paper process, any fibrous raw material although similar are specific and unique.
They all have own key-factors to be controlled and optimized"





Thus:

- Why are some fibers different from others ?
- Why are some fibers preferred by customers ?
- Why some pulps, even when offered by lower prices, are not attractive to the papermakers ?



Thus:

- What makes a market pulp more suitable or attractive than the competitor one ?
- How to work our processes to give uniqueness to our product ?
- Do I need to be unique on quality?
- Do I have more or less power when competing by volume and price?



What makes a pulp special?

“Best fitness to the papermaker”

- End product specifications ?
- Paper-machine runnability ?
- Easy-life to the papermaker?
- Overall cost reductions ?

This means that we are not focusing only the pulp price, but the paper operational production cost.



What key factors shall be considered to give a distinct advantage to our customers ?

- Are our fibers far distinct than the others?
- Are they oriented to specific products?
- Do they perform better at customer machines?
- Do they provide a special combination in terms of ?
 - end-product quality ?
 - paper-machine efficiency ?
 - Ideal cost/benefit ratio ?



Today:

- very competitive arena;
- lots of newcomers in the market;
- differences in paper-machines, and in paper manufacturing technologies;
- differences in fibrous raw materials;
- substantial differences in market pulp operational production costs.



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:

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:

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?



The world today:

- over 100 different brands of market pulps
- close to this numbers are the pulp quality categories

WHY?

- different raw materials;
 - pulpwood blends;
- different pulp-making processes.



The real world:

Lots of variability everywhere

- How to tame variability?
- How to cope with variability?
- How to live together with variability?
- How to use it in our favor?



Causes for pulp quality variability:

- wood differences
- chip quality management
- pulping processes
 - bleaching line
 - washing presses
- drying (flakt, drums, flash)



Some causes for pulp quality variability:

- pH
 - fiber charges
 - fiber population
- individual fiber strength
- water retention value
 - fiber flexibility
- cell wall thickness



Because of these wide variations in different pulp qualities:

The papermaker develops a recipe or a secret potion and he is resistant to change (very understandable)

He has as objectives:

- costs savings
- fewer breaks
- less broke
- better runnability
- end product requirements



The truth is that :

The fiber cost is by far the most
important cost for most of paper
grades



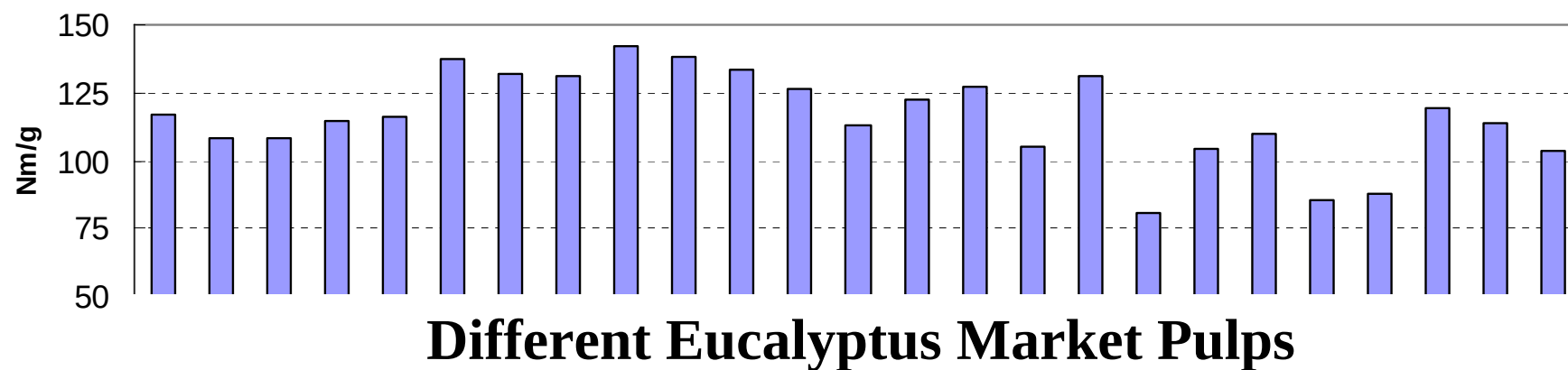
The papermaker is always squeezed by:

- Commercial demands
- Cost reduction demands

• He hates variability, but
he is always obliged to look for better process conditions, and less expensive manufacturing
(new fillers, new refiner discs, new retention aids, new brighteners agents, new quality demands from the customers, etc)

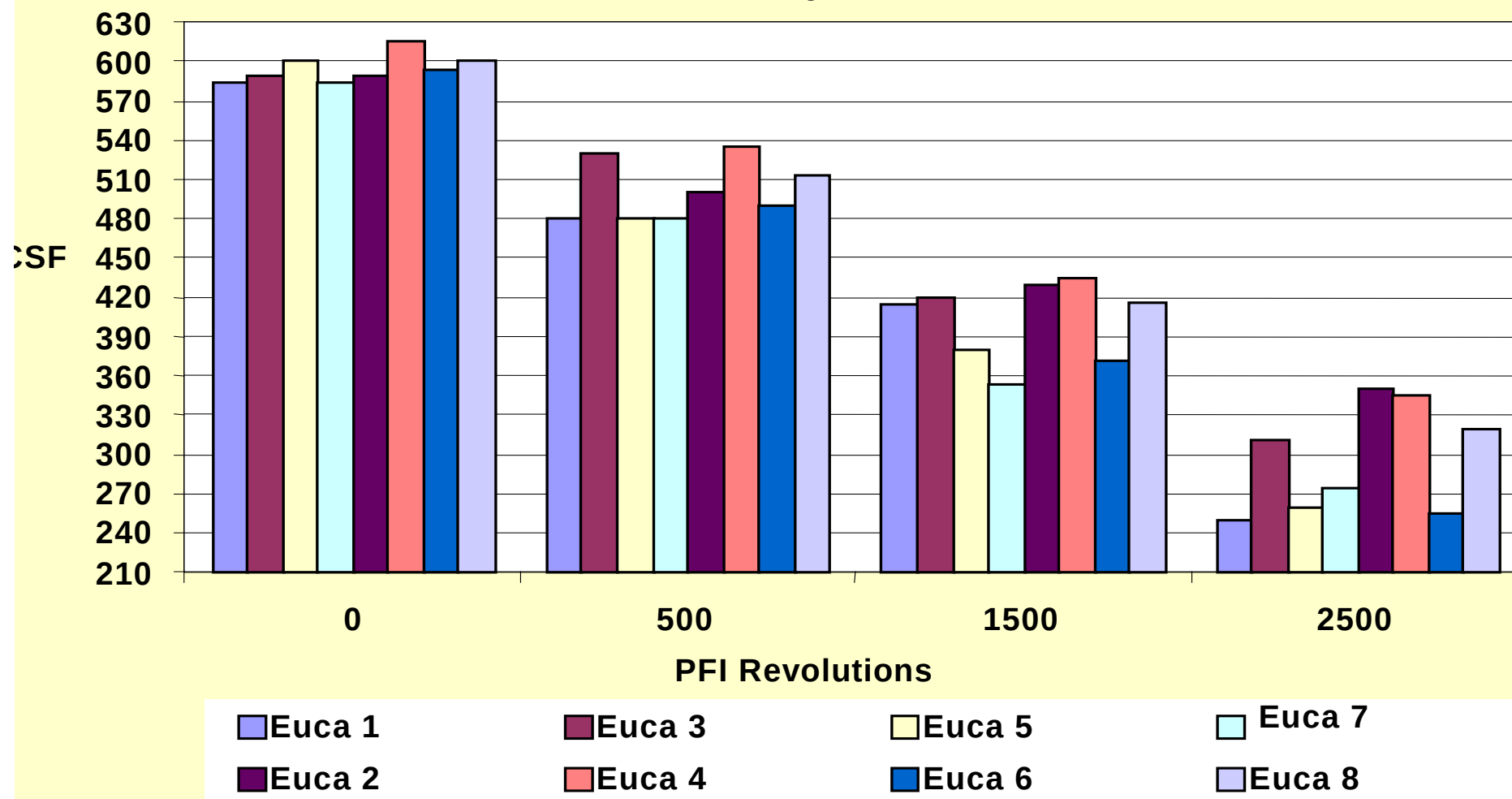


Wet Zero Span - Fiber Intrinsic Strength



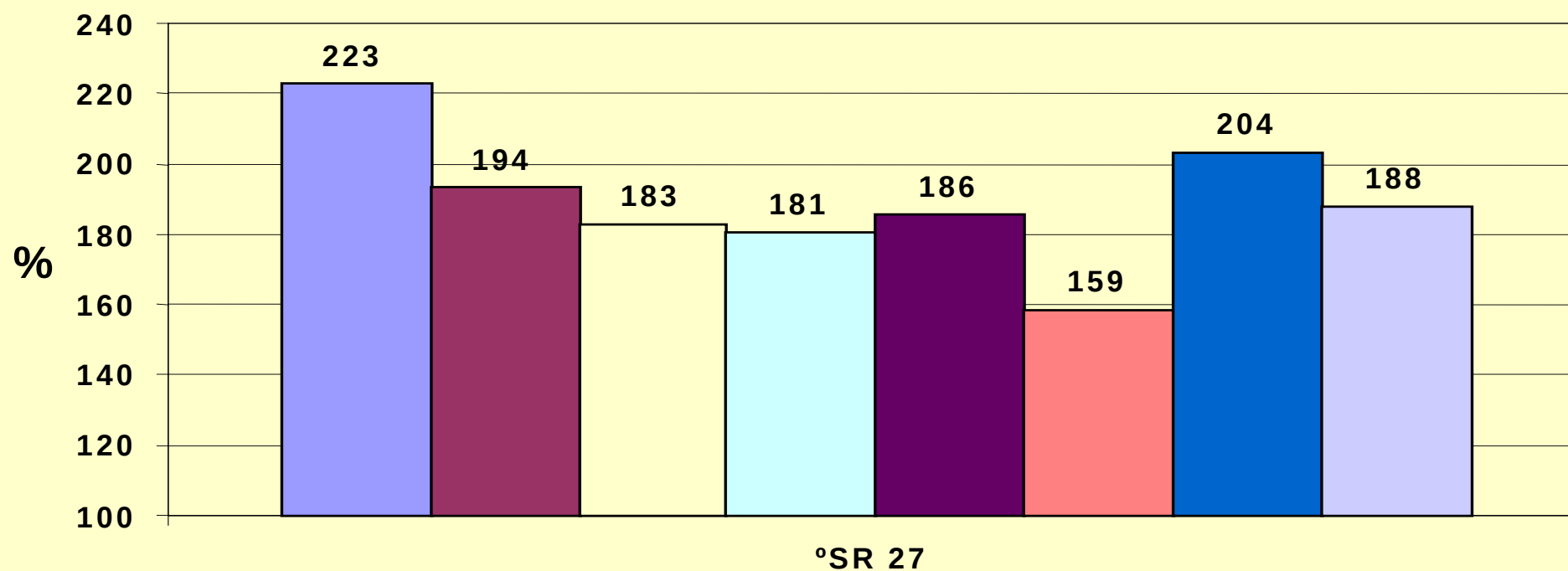


Drainability - Freeness





Water Retention Value



Euca 1

Euca 3

Euca 5

Euca 7

Euca 2

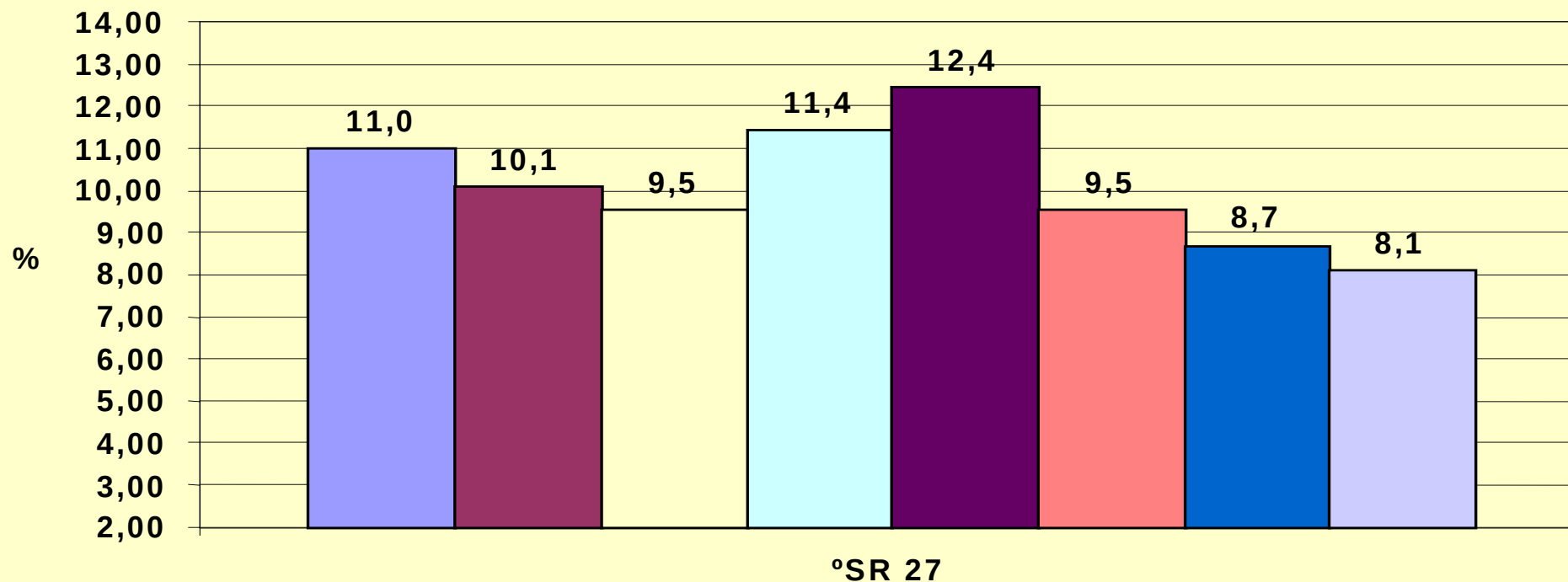
Euca 4

Euca 6

Euca 8



Fines content (%)



Euca 1

Euca 3

Euca 5

Euca 7

Euca 2

Euca 4

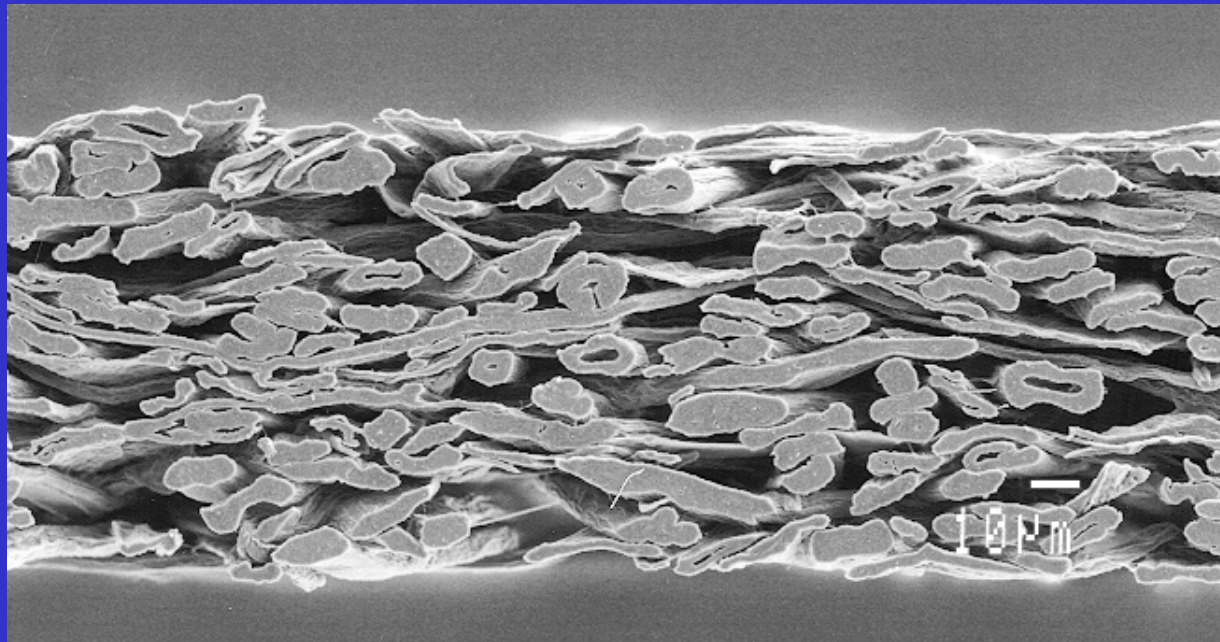
Euca 6

Euca 8



The papermaker is always squeezed :

“Please, give me a stable quality
pulp or one I may predict
behavior”





What papermakers most dislike:

- breaks, breaks, breaks
 - energy consumption
 - chemical consumption
 - drainage
 - machine speed
 - broke
- second class quality (below standards)

All representing HIGHER COSTS & PRESSURES



Papermakers want to have:

- a predictable pulp
- a “saving cost” pulp (I’m not making reference only to the market pulp price)
- a pulp recipe that allow them to reach the paper specifications 100% of the time



In case we provide these gifts to them, do they consider to pay a premium for ?

- better machine performance
 - higher productivity
- lower energy, chemicals, etc
 - better quality
- fewer broke generation
 - no complaints
 - better sleep at night
- no problems with the wife (or spouse) due to machine running problems at night



Are we able to find such “enjoyable pulps”
in the market ?

- Are all market pulps stable in quality?
- Are they really a commodity in quality?



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.

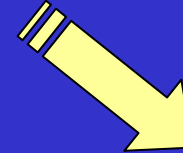
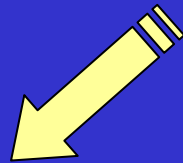
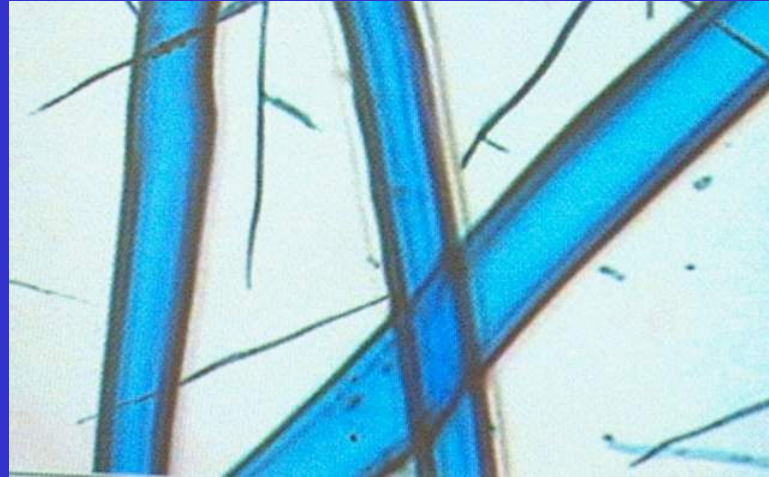
or the weaker pulp, if the problem is wet web strength;

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

Most important quality properties to papermakers

Fiber properties:

- fiber population
- coarseness
- curl index
- wet zero-span breaking length
- hemicellulose content
- fiber charges
- fiber flexibility
- fiber rigidity
- fine content,
- etc.

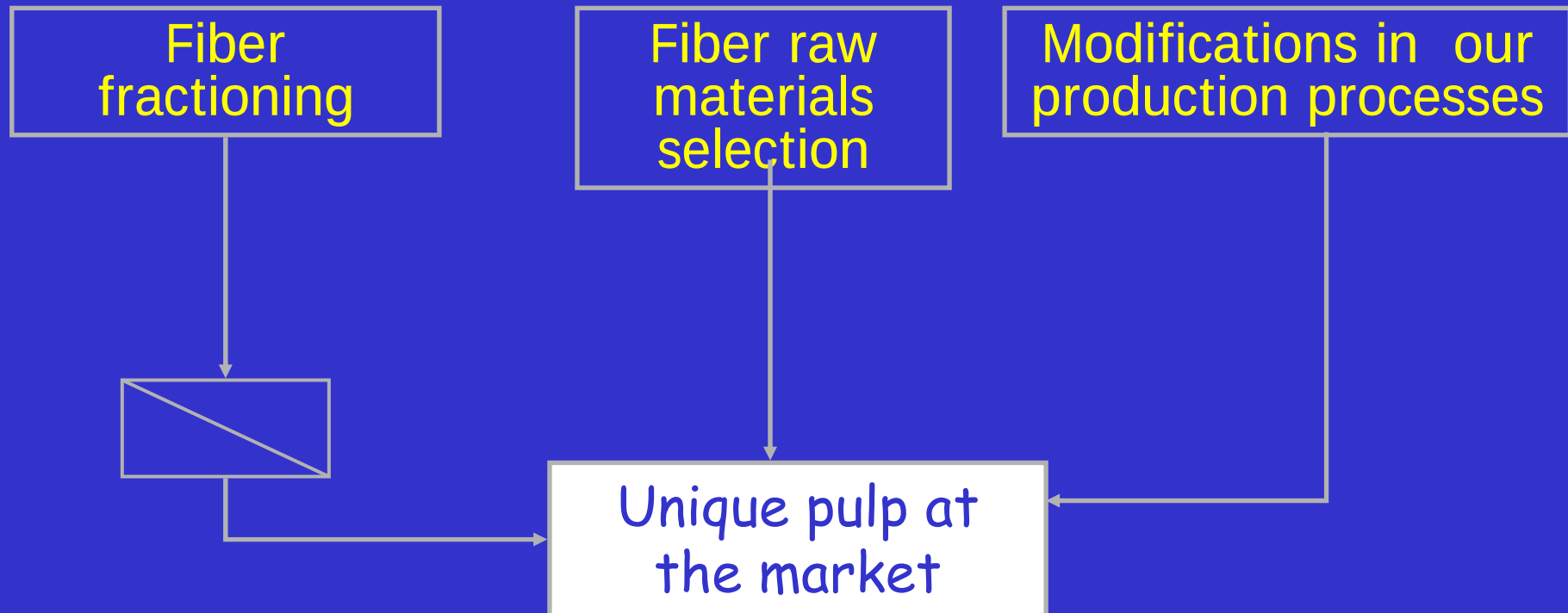


Paper-machine

- drainage speed
- refining ability
- WRV
- swelling ability
- formation
- wet web strength
- pH
- dry handsheet properties:
 - bulk;
 - porosity;
 - opacity;
 - stiffness;
 - tensile; etc.

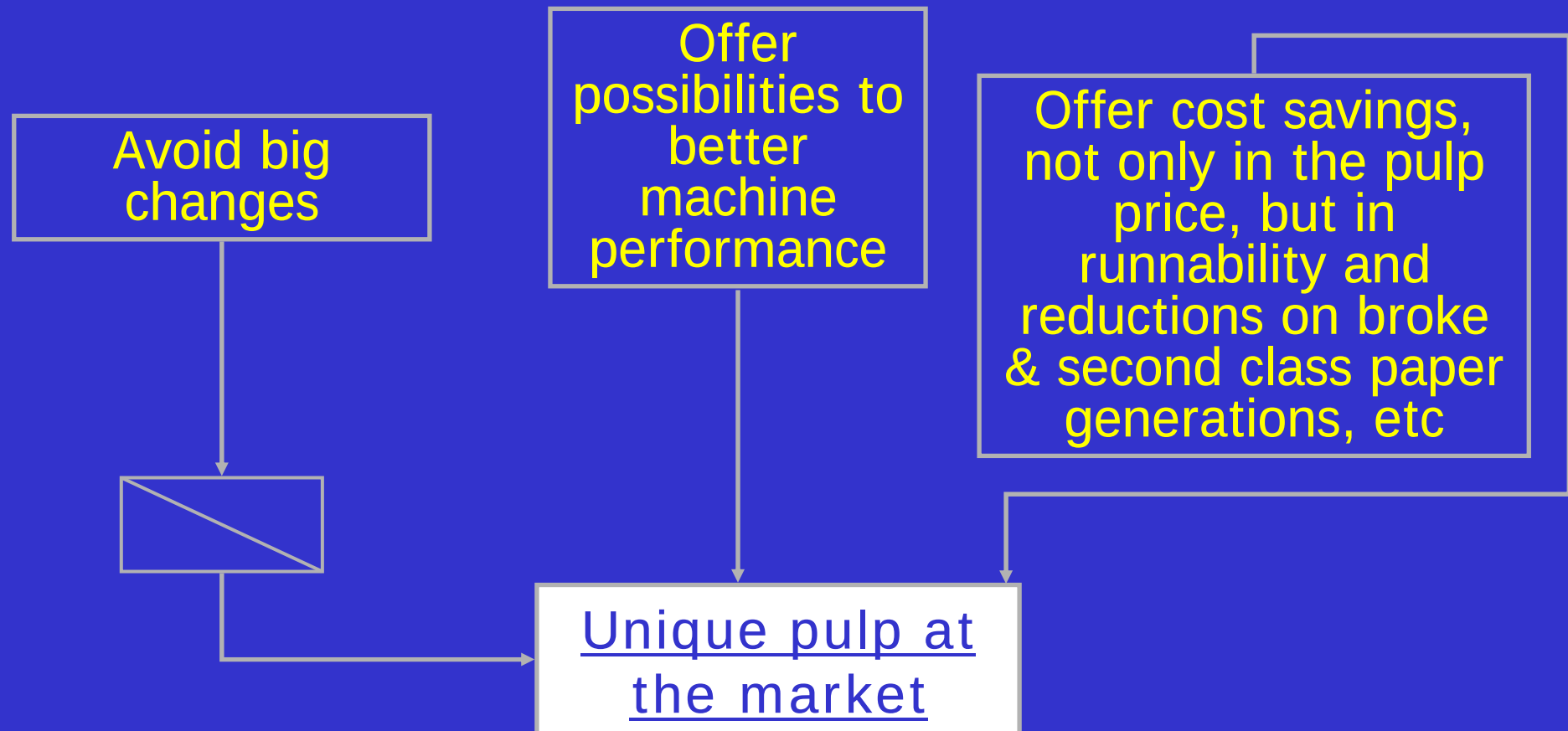


Are there ways to build differentiation?



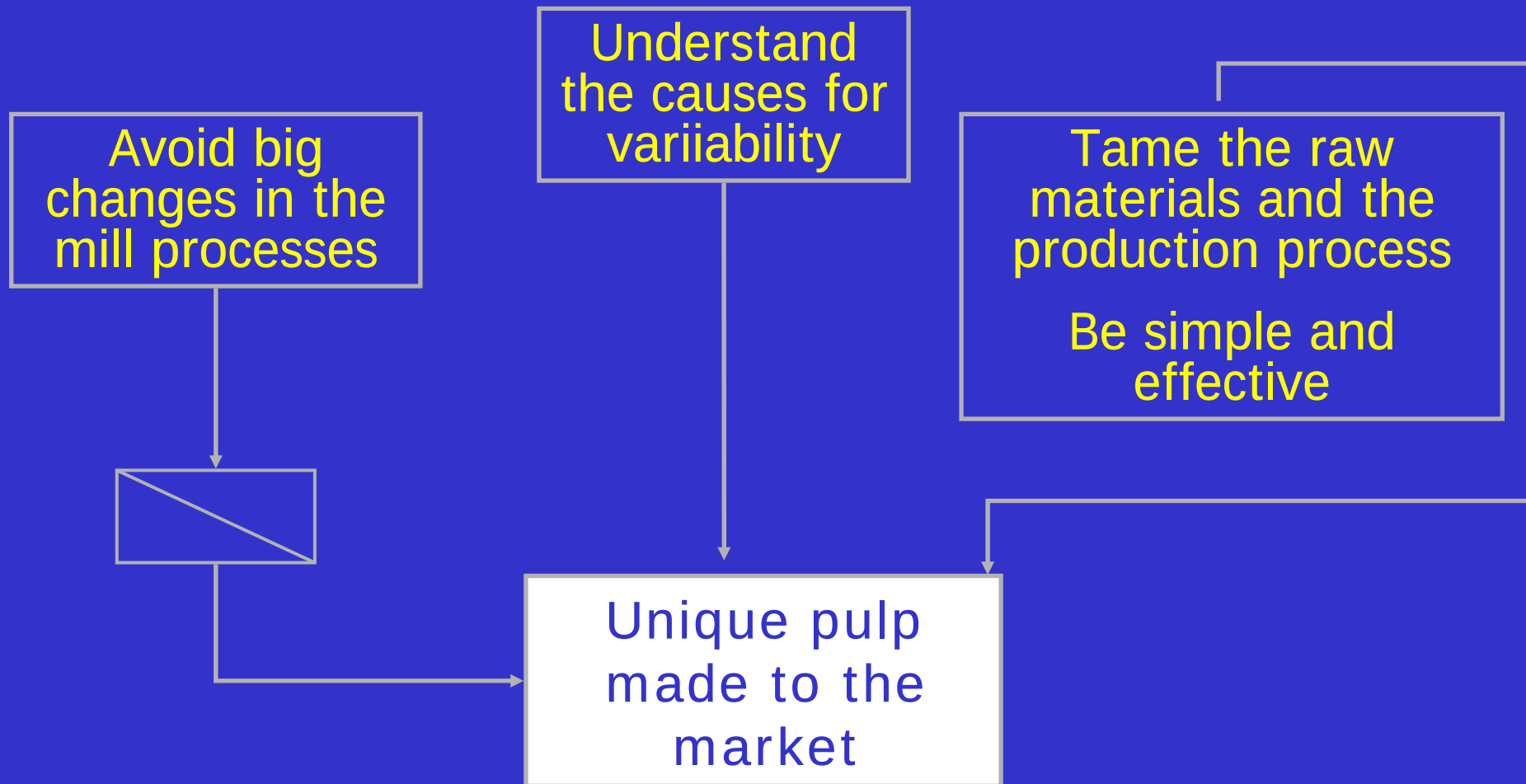


Differentiation is not that simple, and it has to be sustainable to the papermaker





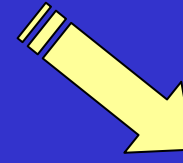
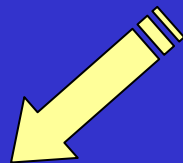
Differentiation is not that simple and it has to be built at the pulp mill



Most important quality properties to pulpmakers

Wood quality:

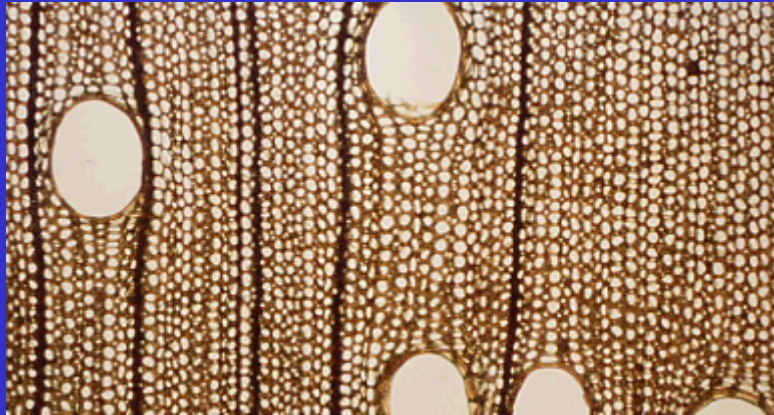
- wood density
- wood cost
- wood availability
- lignin content
- extractives content
- wood deterioration
- wood cleanliness,
- etc.



Process parameters:

- wood specific consumption
- pulp yield
- alkali charge
- total solids to recovery boiler
- pulp viscosity
- bleaching ability
- pitch content
- pulp cleanliness
- “one week pulp beating evaluation”

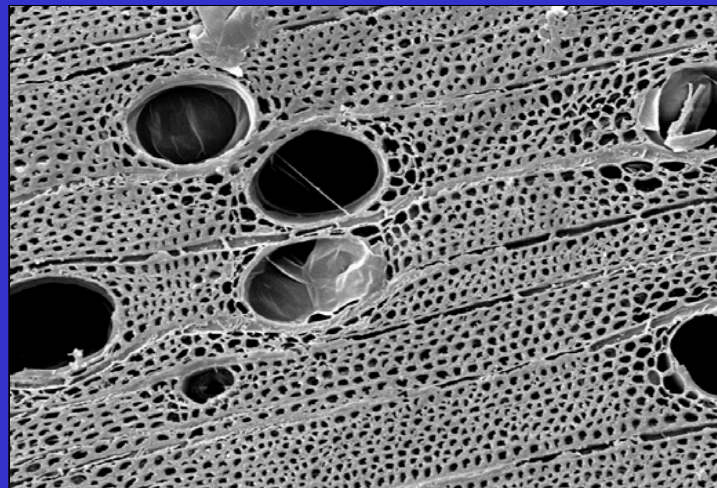
Today's attractions in the hardwood pulp business



Acacia mangium



Eucalyptus globulus



Eucalyptus urograndis



Morphological Differences : are they important ?

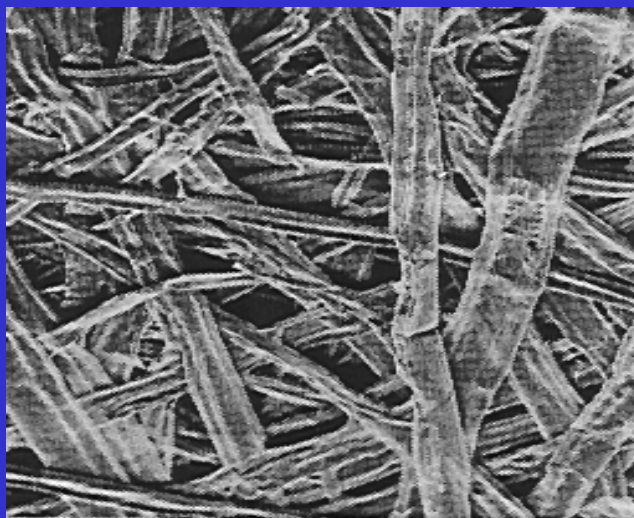
<u>Species</u>	<u>Coarseness</u>	<u>Fiber Population</u>	<u>Fiber Length</u>	<u>Pentosan Content</u>	<u>Fines DPCJ</u>	<u>WRV</u>	<u>Cell Wall Thickness</u>
<u>Unity</u>	mg/100m	Million	mm	%	%	%	micra
<i>E. urograndis</i>	6 - 8	20 - 23	0,70 – 0,75	15 - 18	8 - 9	120 - 130	3,5 - 4,2
<i>E. globulus</i>	8 - 9,5	17 - 22	0,7 – 0,8	19 - 22	7 - 8	110 - 115	4,0 - 5,0
<i>E. nitens</i>	5,5 - 6,5	23 - 24	0,65 – 0,75	15 - 17	8,0 – 9,5	125 - 130	3,0 - 3,5
<i>Acacia mangium</i>	6,5 - 8	26 - 28	0,6 – 0,65	14 - 16	9 - 10	125 - 135	3,4 - 3,6
<i>A. mearnsii</i>	8,5 - 10	16 – 19	0,65 – 0,75	19 - 22	7 - 8	100 - 105	4,5 - 5,5



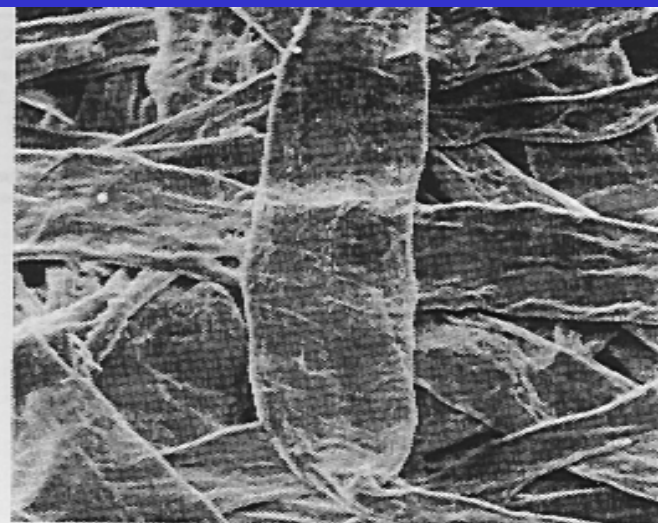
Suggestions for Low Corrosiveness Fibers (Light Fibers)

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

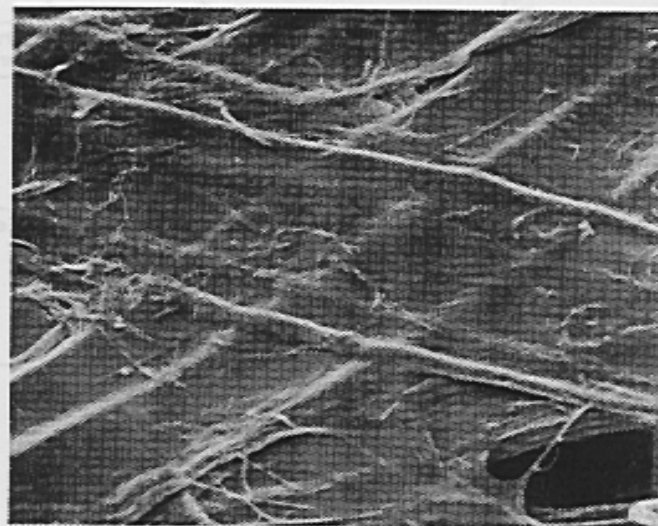
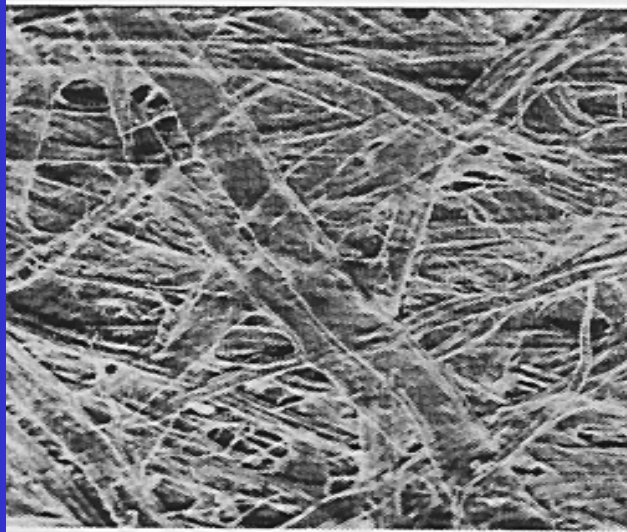
However, this is very much dependent on the customers limitations (Machine speed, porosity and bulk specs, etc.)



(A)



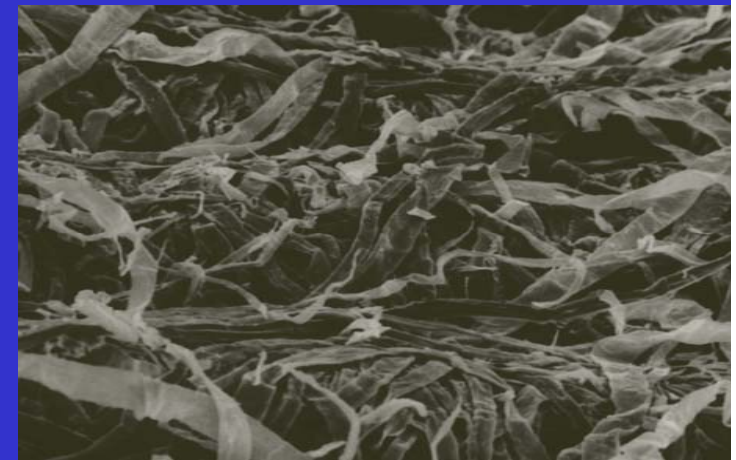
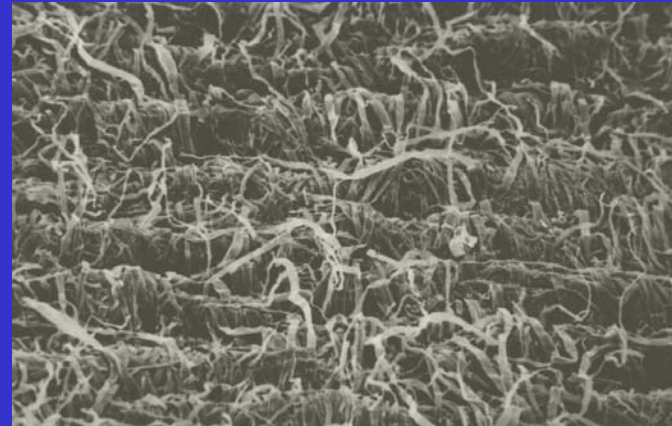
(B)





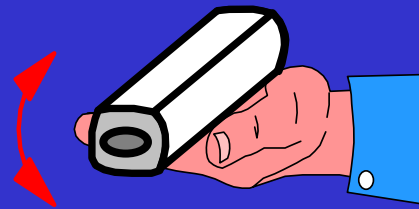
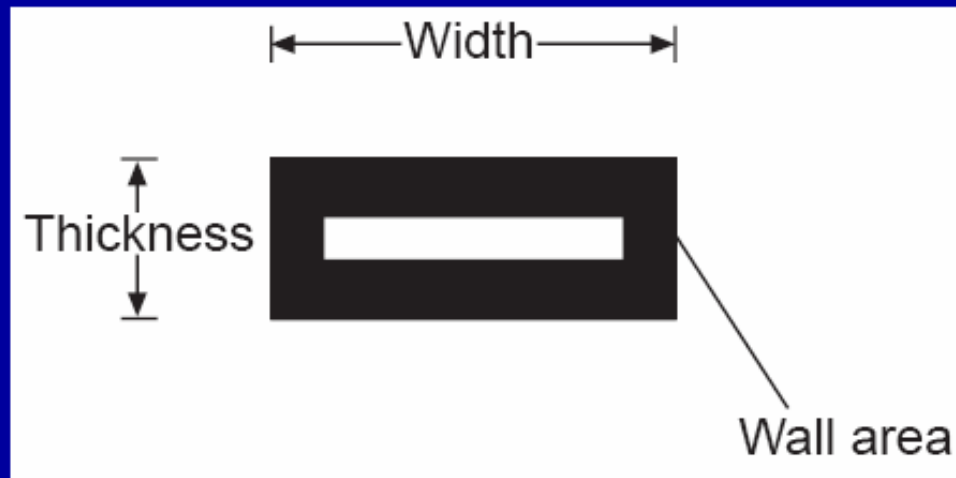
Suggestions for High Corsseness Fibers (Heavy Fibers)

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

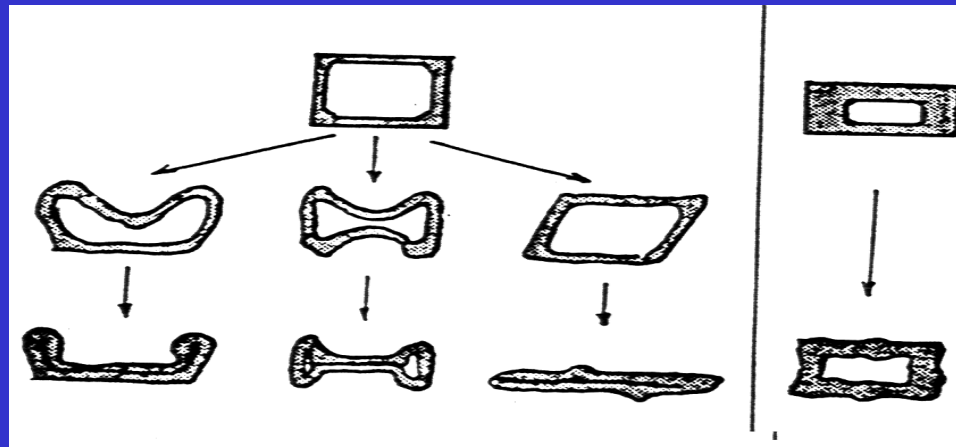




Fibre property interrelationships



Collapsible and collapse resistant fibers





**Thick-walled
relative to perimeter**



**Collapse
resistance**



**Less bonding
Bulk
Bulk softness**



Thin-walled



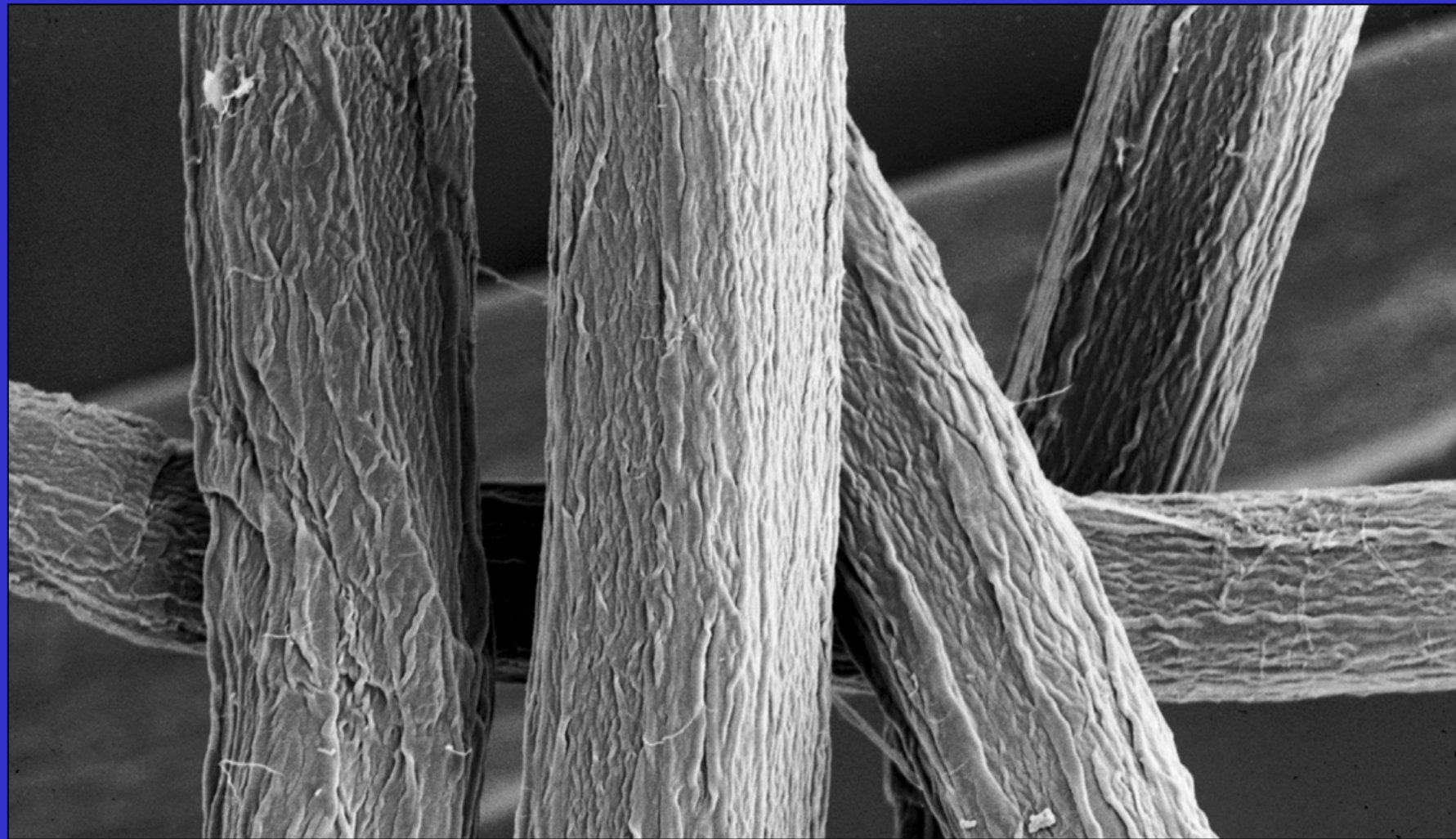
**Collapse
susceptibility**



**More bonding
Adhesion to dryer
Surface softness**

Chemical Pulp Fibers

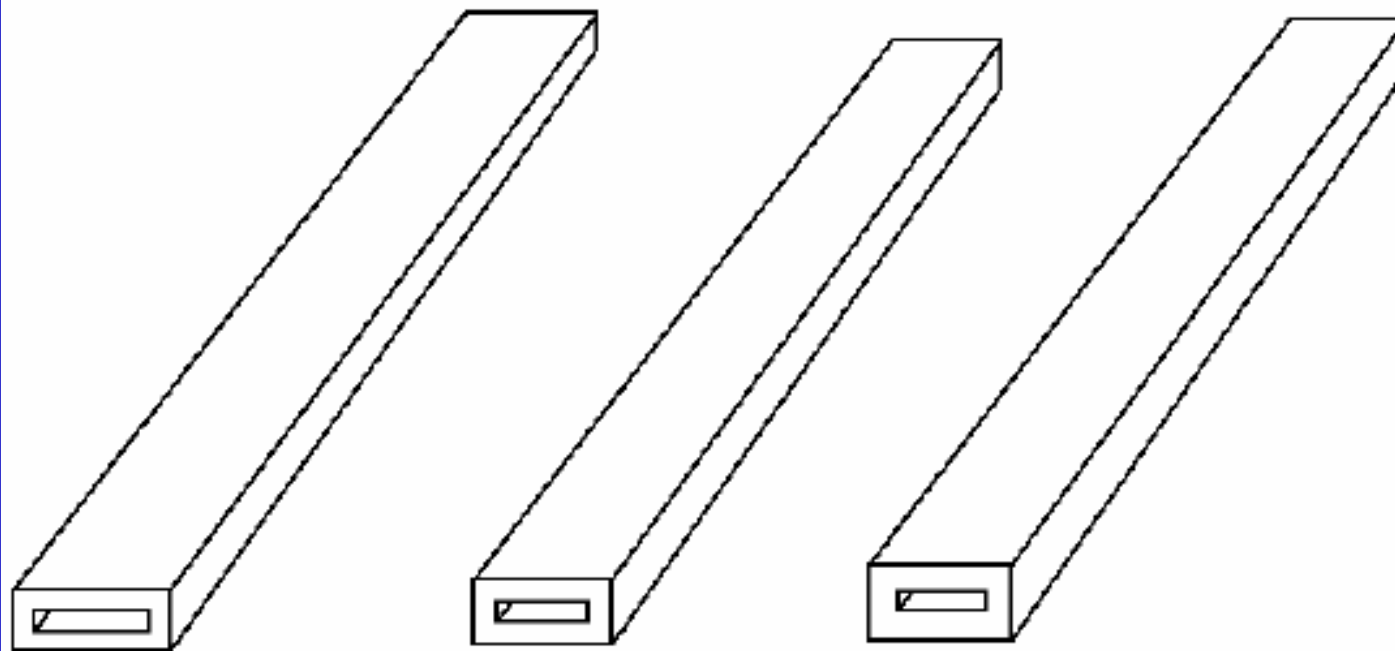
 ° Celsius Degree / Grau Celsius





^o Celsius Degree / Grau Celsius

Eucalypt Fibres





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

**Wood
Density**
g/cm³

**Fiber
Coarseness**
mg/100m

**Fiber
Population**
N^o/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

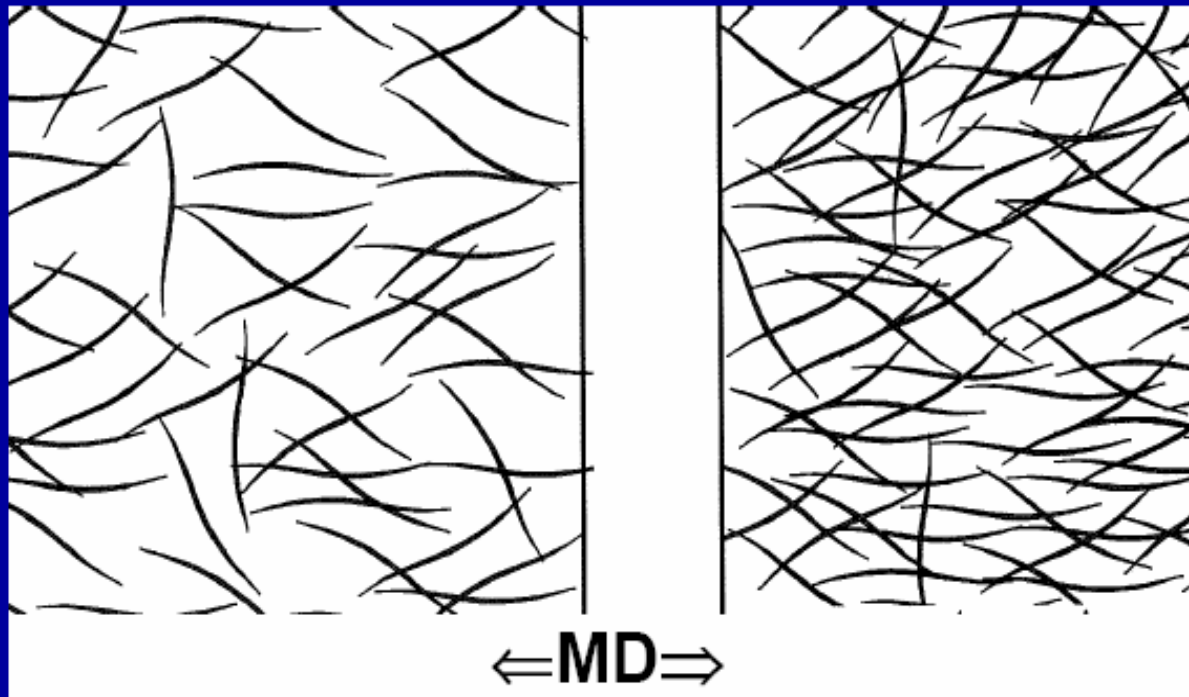
0,60

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

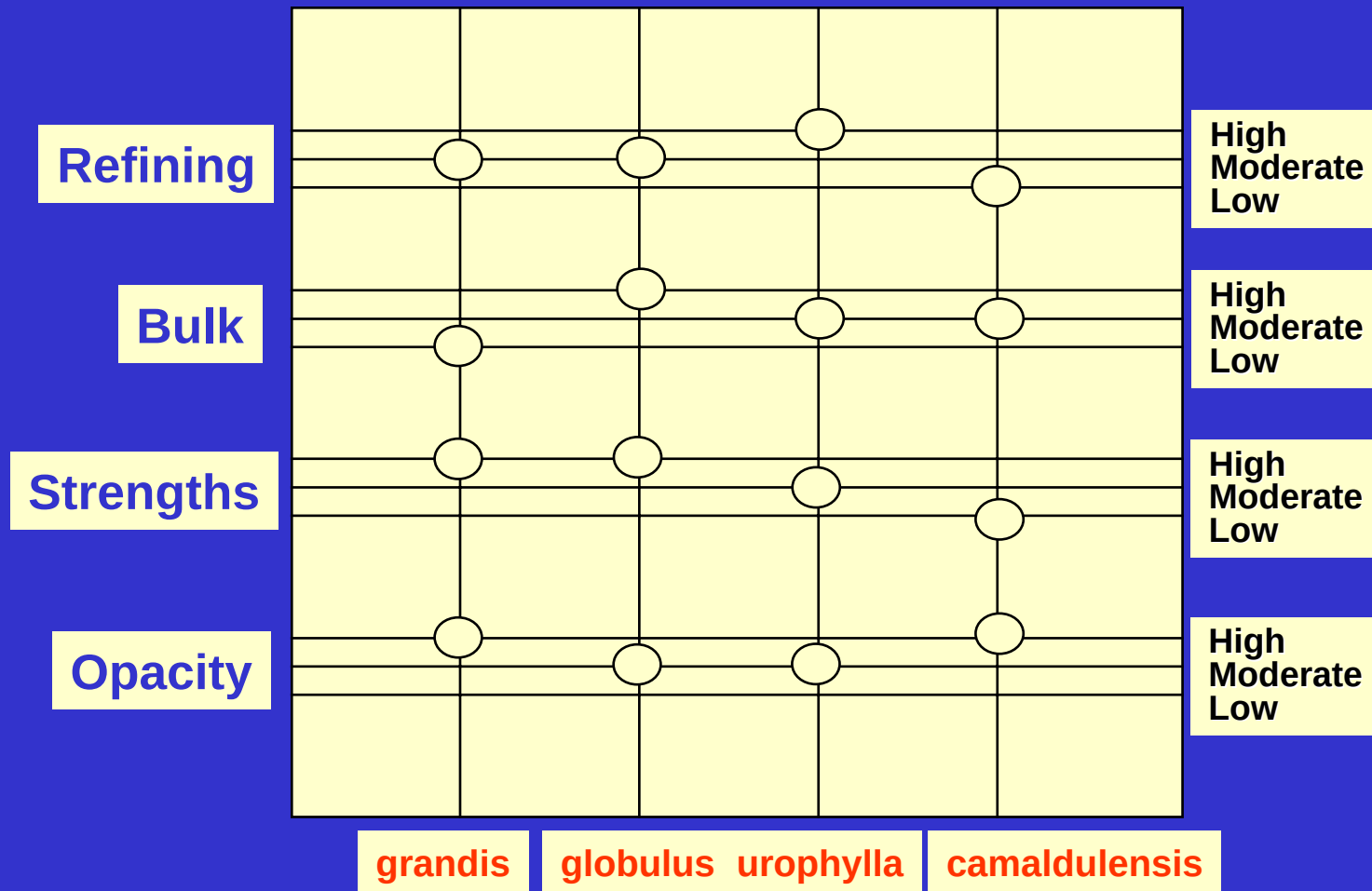
Pulp Blends

Softwood : Eucalypt (20 : 80)

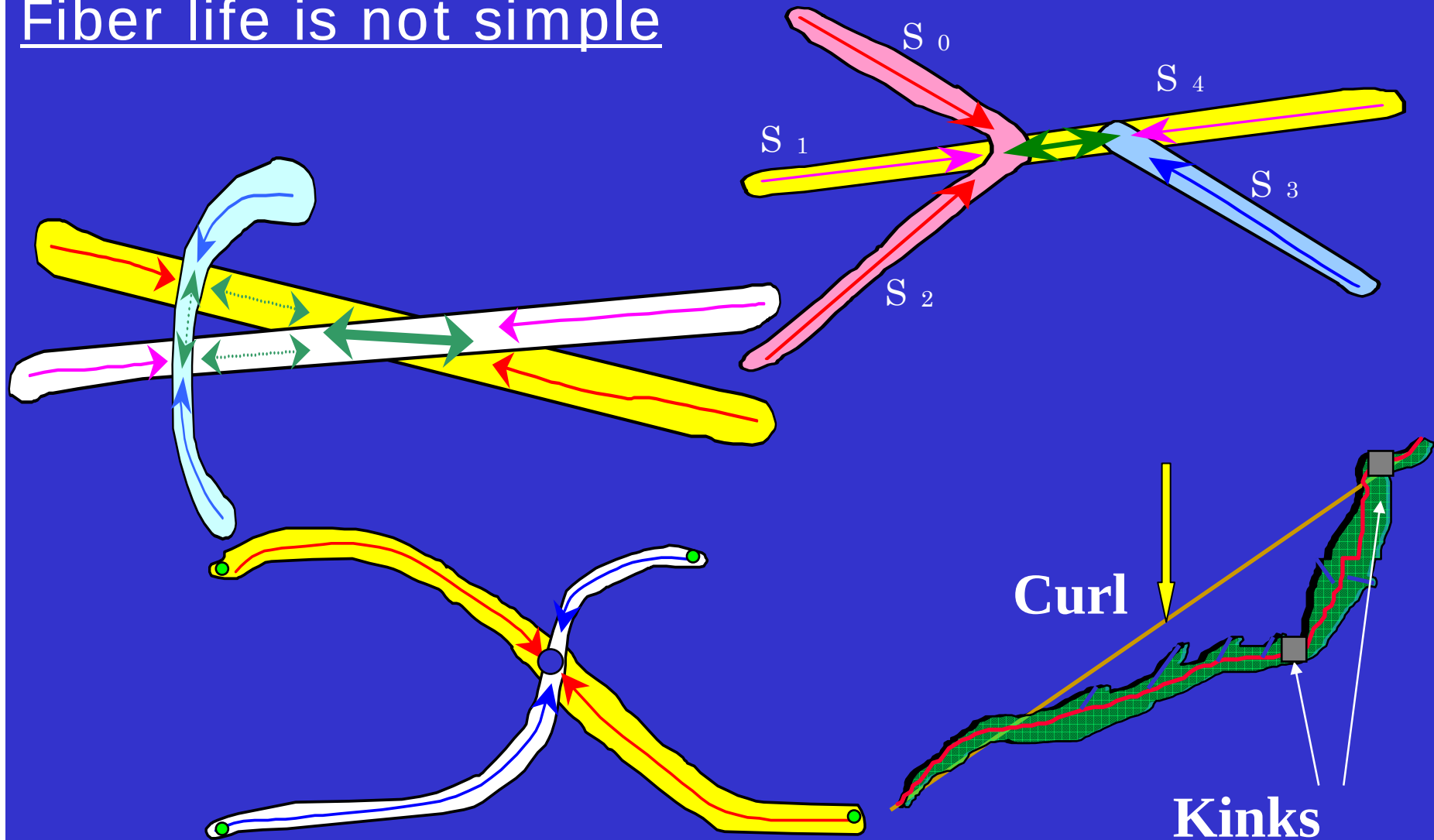


←MD→

PAPERMAKING PERFORMANCE OF *Eucalyptus*



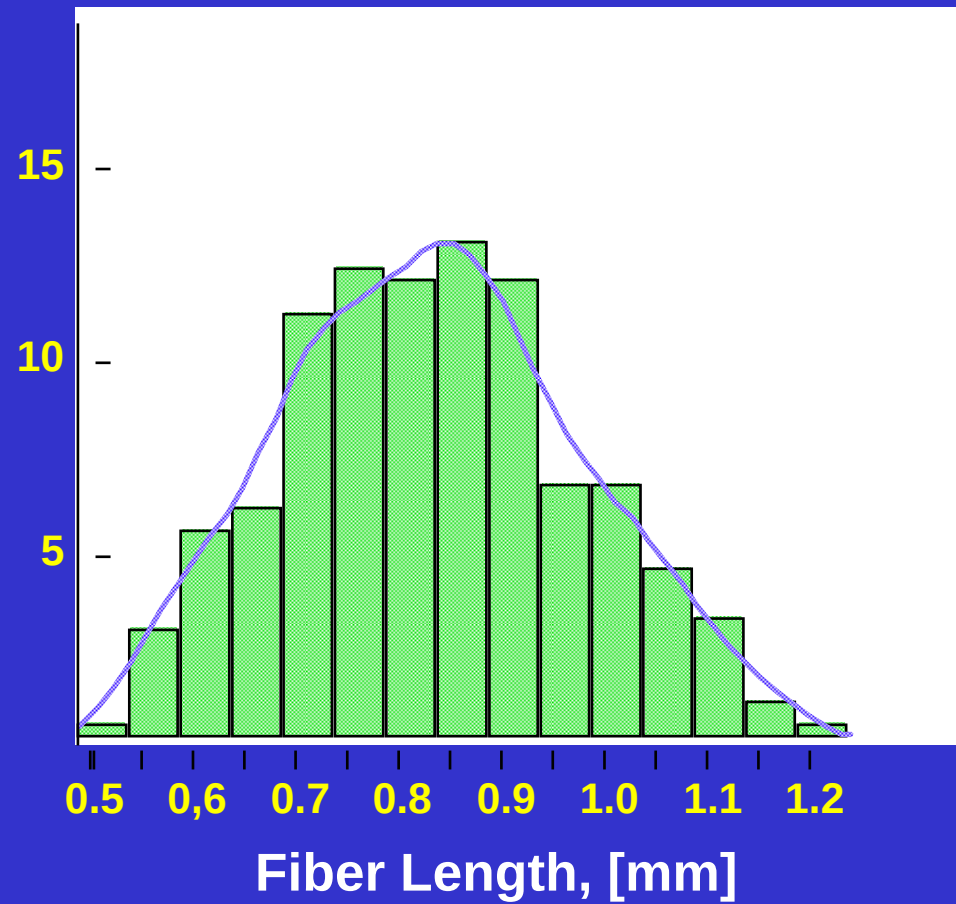
Fiber life is not simple





Fiber Length Variations

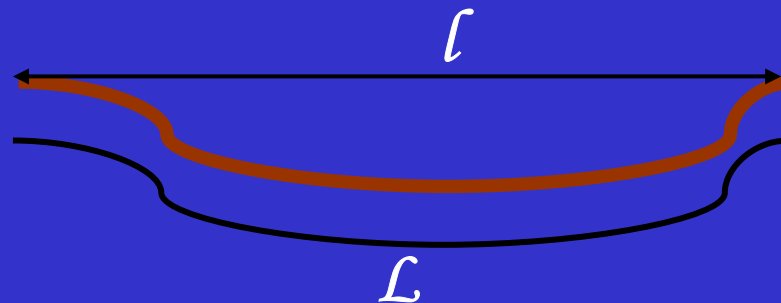
Frequency ,%



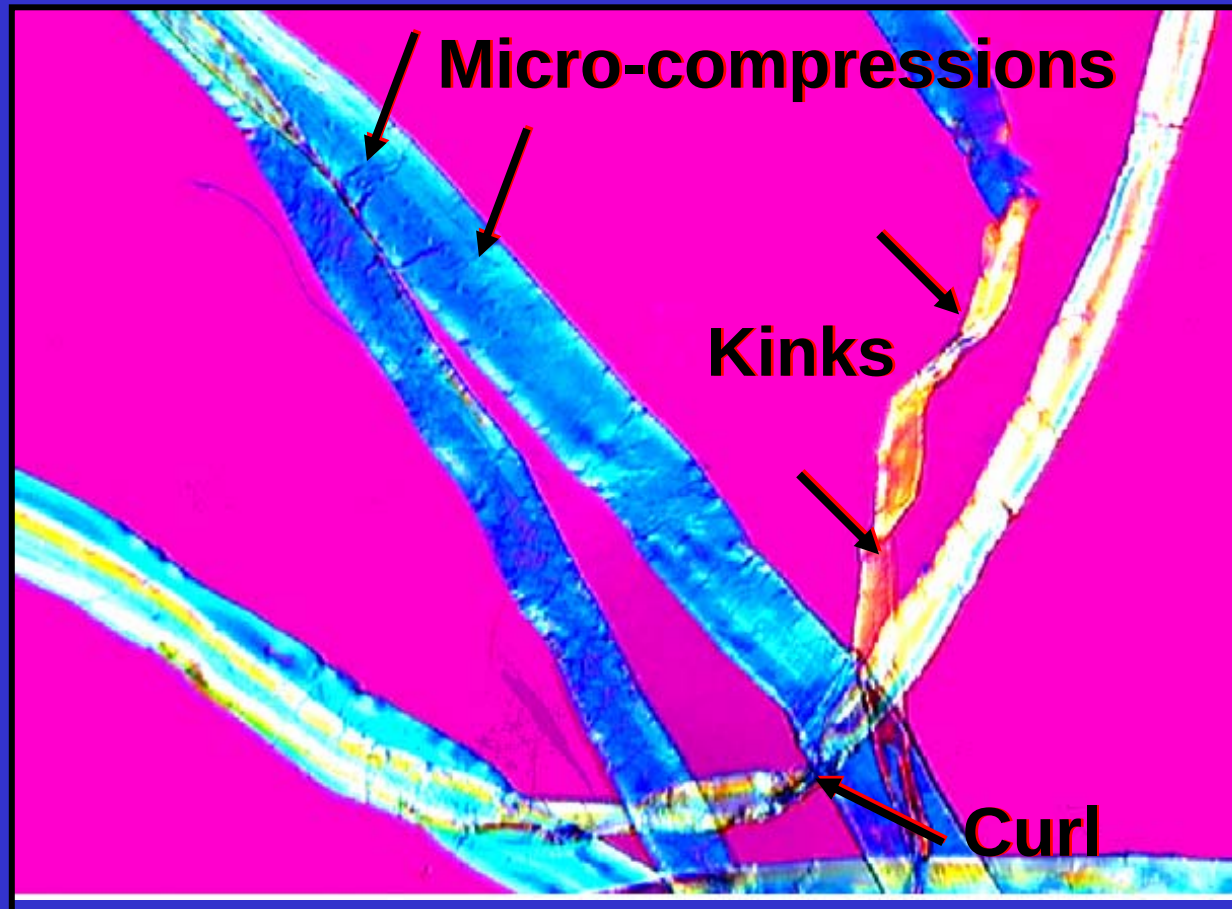


CURL

$$\text{Form Factor of a Fiber} = 100 \times \ell / \mathcal{L}$$

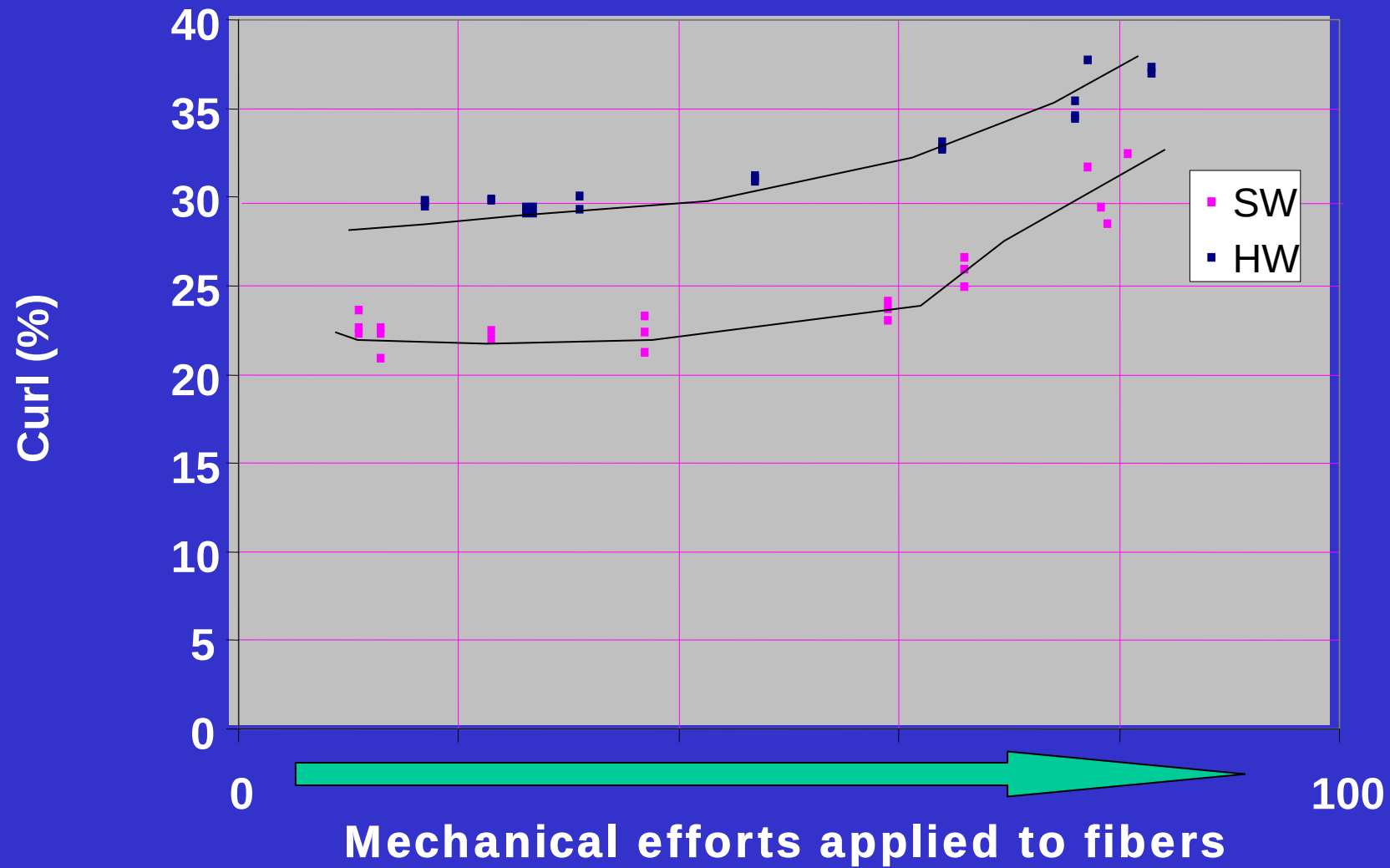


Fiber new attributes



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

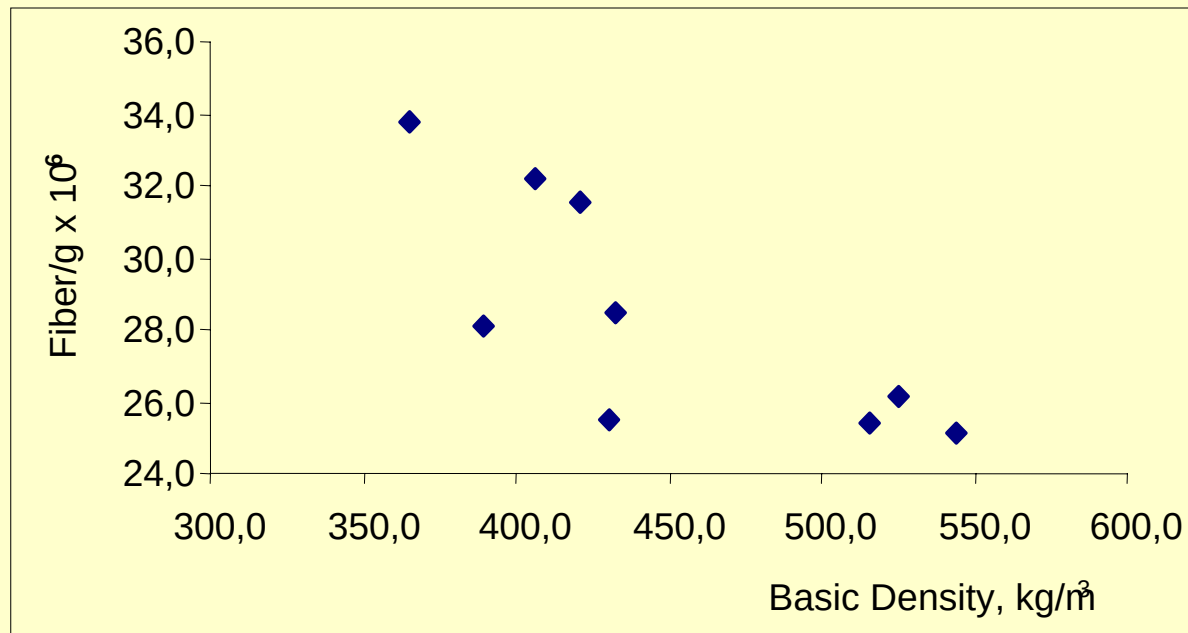
Predicted

Beatability
Pulp "Strength"
Paper characteristics

+ brightness, cleanliness etc.



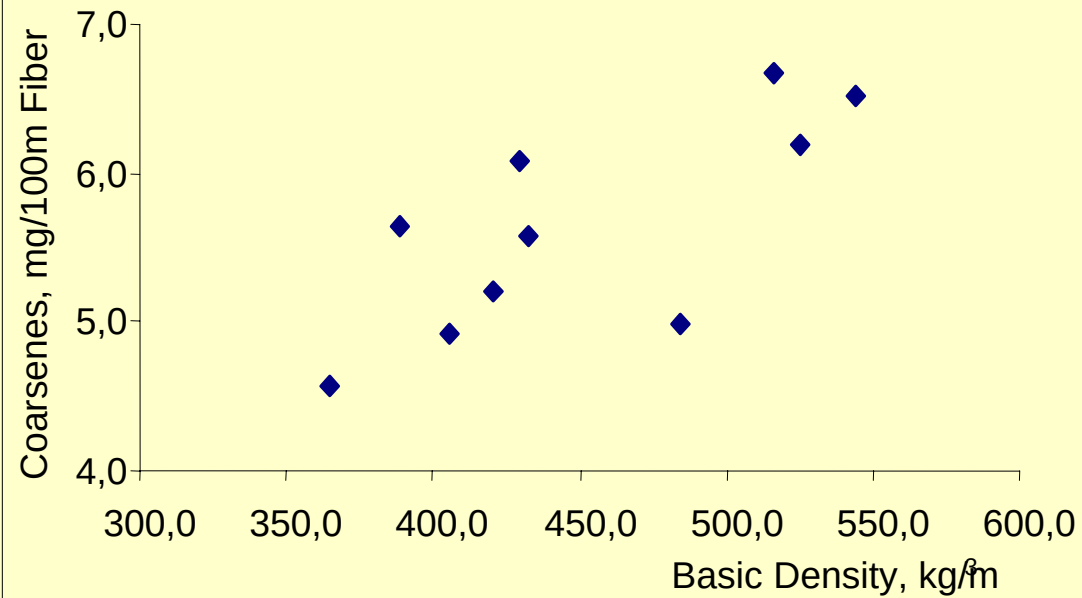
^o Celsius Degree / Grau Celsius



**Fiber
population
correlates
significantly
and
negatively
with
wood density**



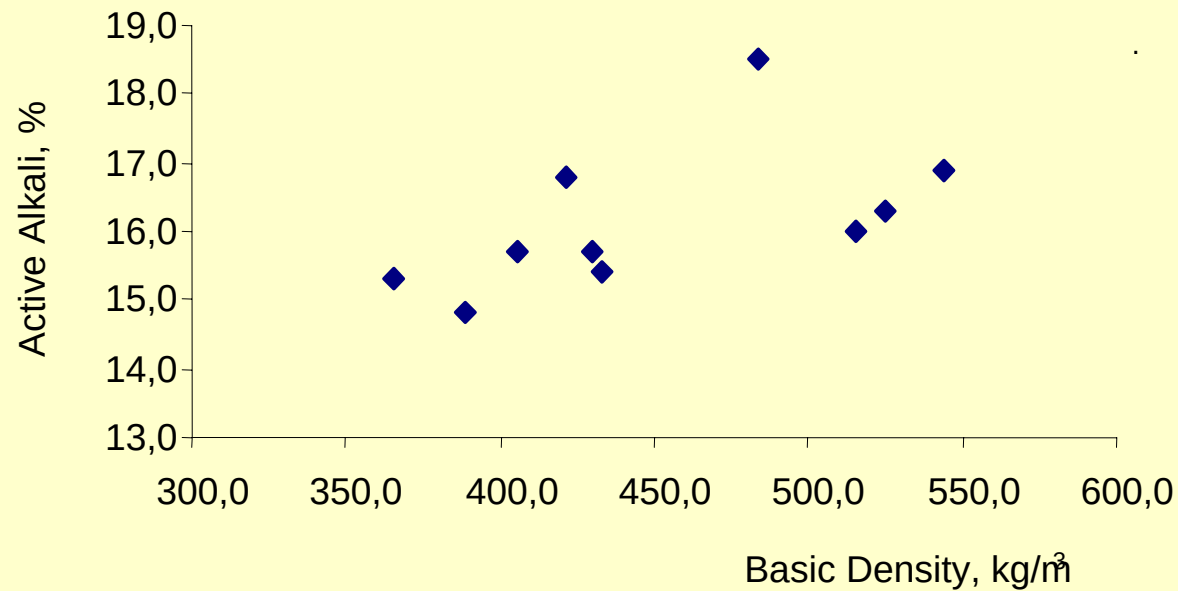
^o Celsius Degree / Grau Celsius



**Fiber
coarseness
correlates
significantly
and positively
with
wood density**



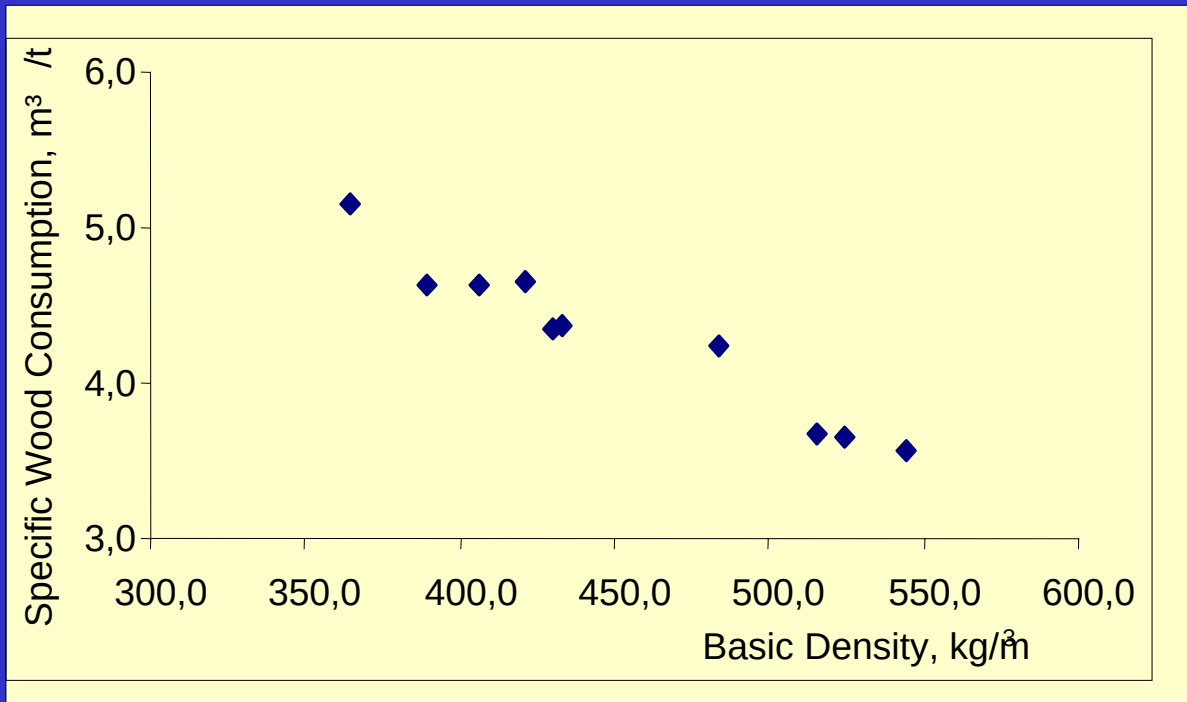
^o Celsius Degree / Grau Celsius



**Active Alkali
demand
correlates
positively
with
wood density**



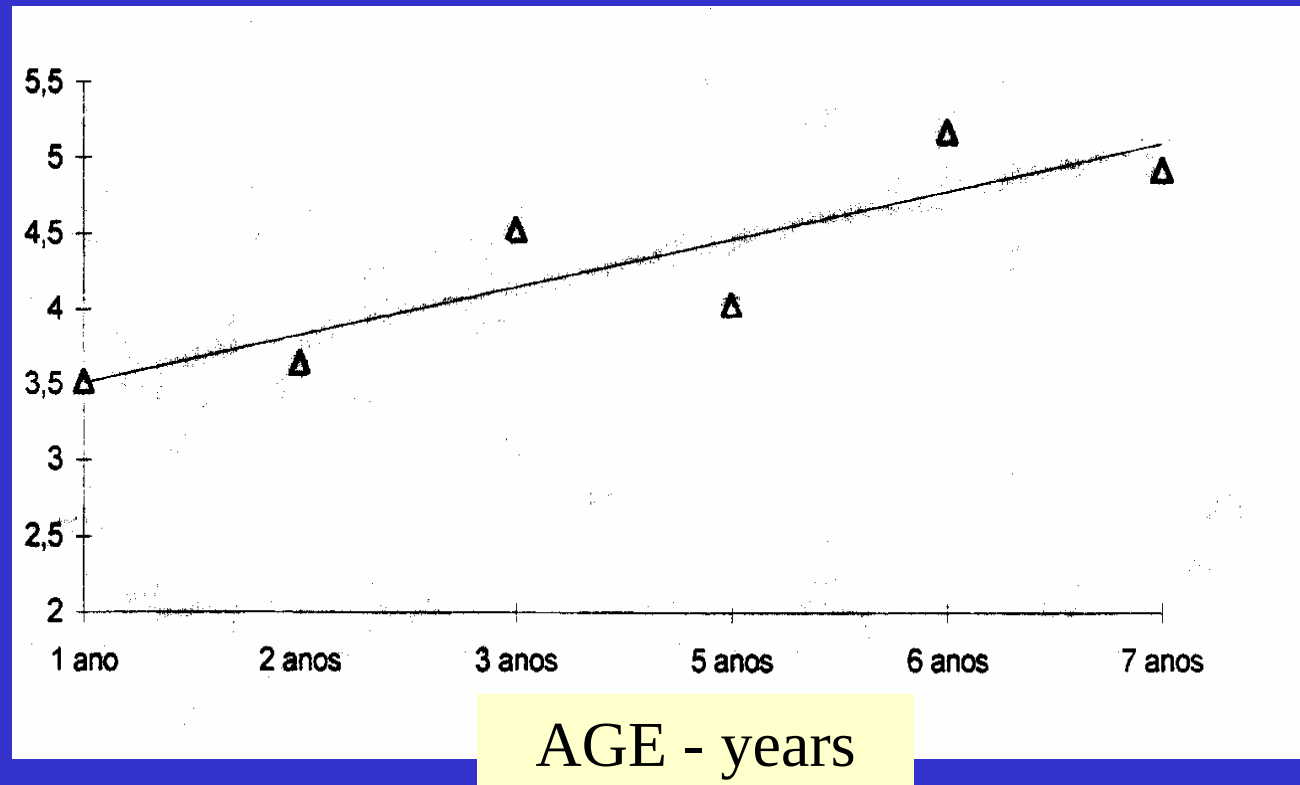
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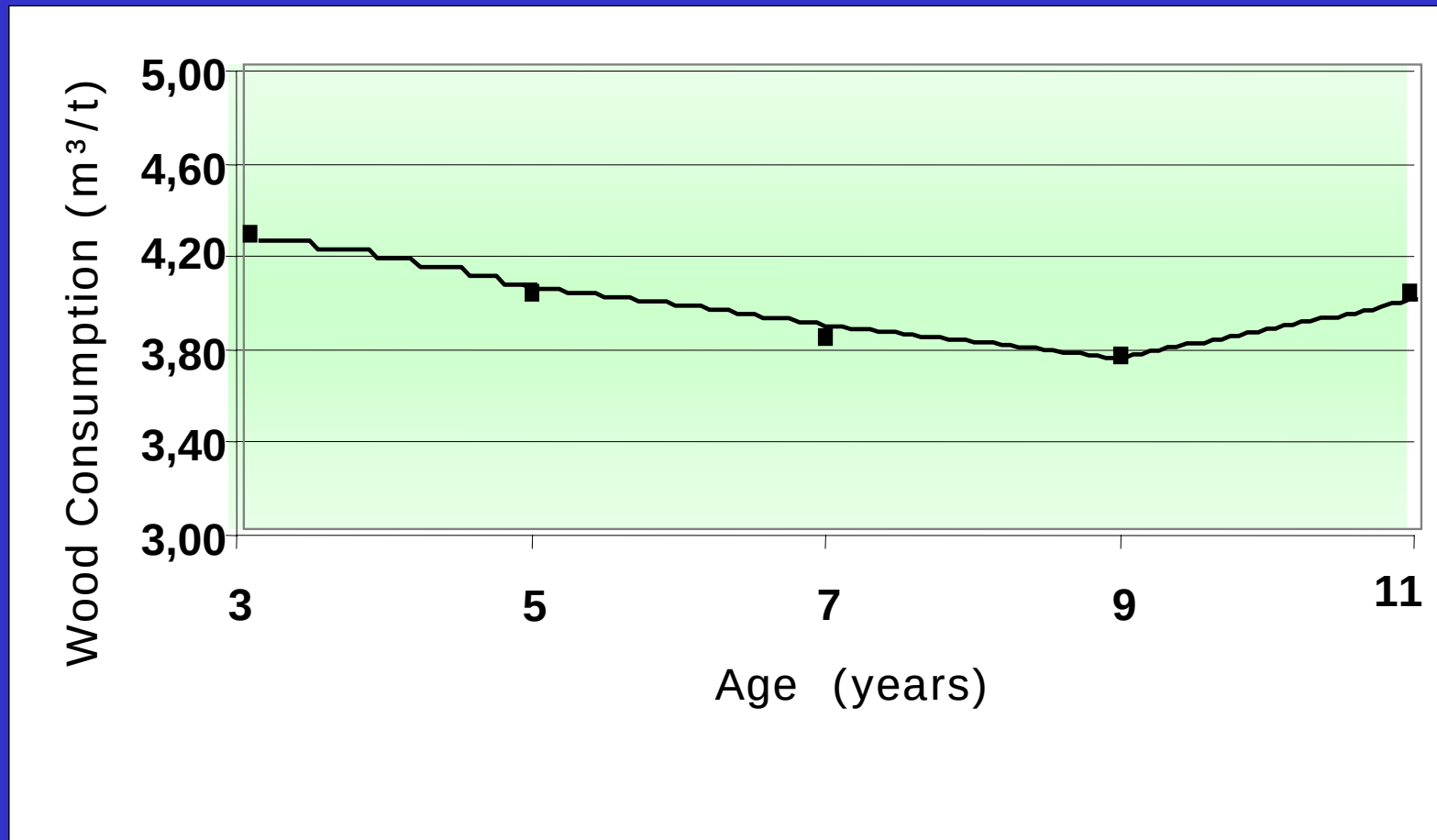
**Specific wood
consumption
correlates
negatively
with
wood density**

Fiber wall thickness

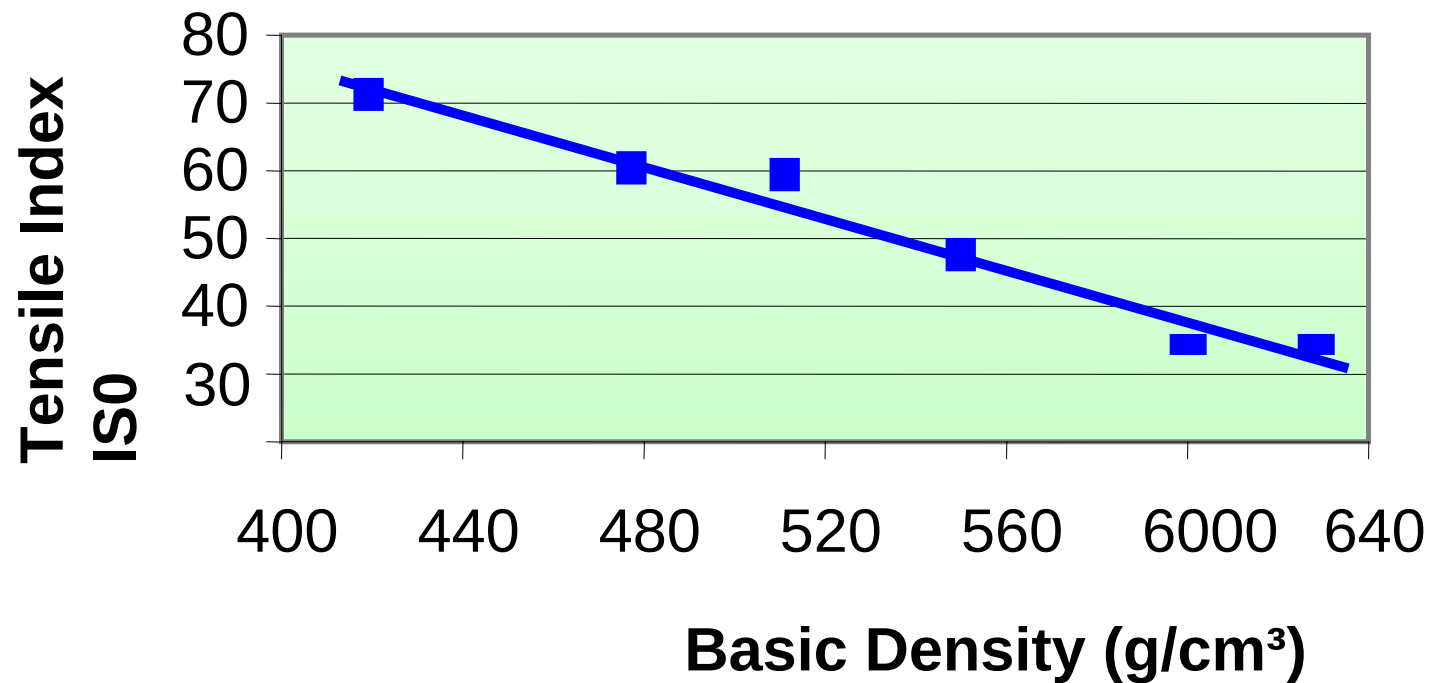
Wall
thickness



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

Market pulp suppliers would like to be able to sell their products to any paper segment, the same product with “universal utilization”

Which one of the paper segments is your pulp more suitable for? Does anybody have any idea?



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”



**Well, this is all friends.
Thank you very much.
Good luck with the
goal to bring
differentiation to your
fibers.**

www.eucalyptus.com.br

