fine-tuning for tailor-made properties in fibrous webs by innovative technologies

papermorphosis®

highly engineered paper

by gruppo x di x gruppo, Via delle Industrie 25-8, 30175 Venice-Italy, +39 041 5093431, www.gruppox.it

what does the system consist in?

CROSS DIRECTION &
MACHINE DIRECTION
tuning system: 2 units for
customizing elongations
1 CD-unit – 1 MD-unit

for

and

Increased use
of sustainable
raw materials

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where do we need symmetry in paper?

either in paper stretch

% CD = % MD

% of elongation in CD and MD,
it can be symmetric if desired

a way for separately adjusting CD-stretch was needed.
this system for CD-elongation could then be combined
to traditional but also new systems of MD-elongation

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where do we need symmetry in paper?

Or in mechanical properties as

TEA**CD** = TEA**MD**

Tensile energy absorption in CD and MD,
maybe not symmetric but more balanced

by customizing the relative values of paper stretch, ideal or better balanced values for TEA and/or elongations can be tuned

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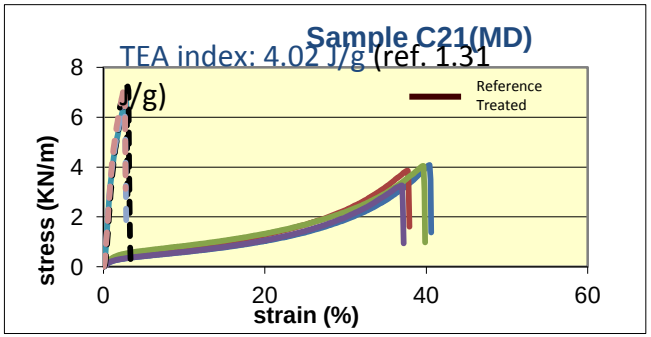
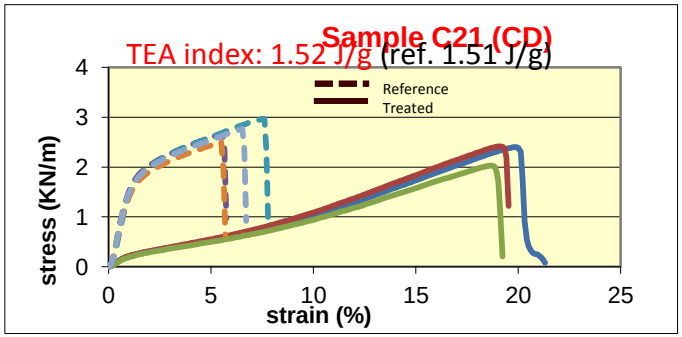
challenging paper elongation and TEA

preliminary trials were of course aiming to exasperate the system and to reach as much as possible on high elongations/TEA in order to show where we can arrive. Paper with 20% or more stretch in each direction is probably too much for most applications.





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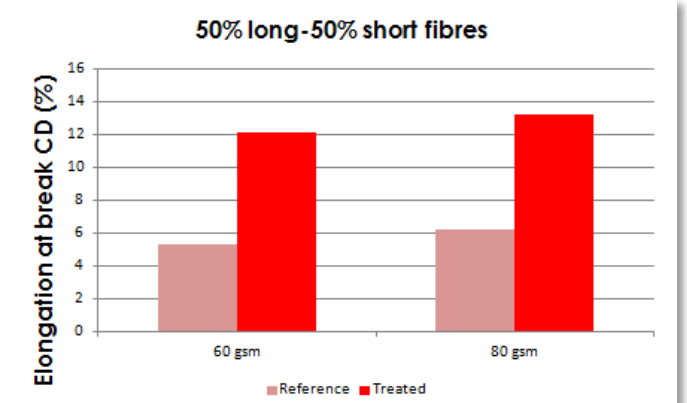
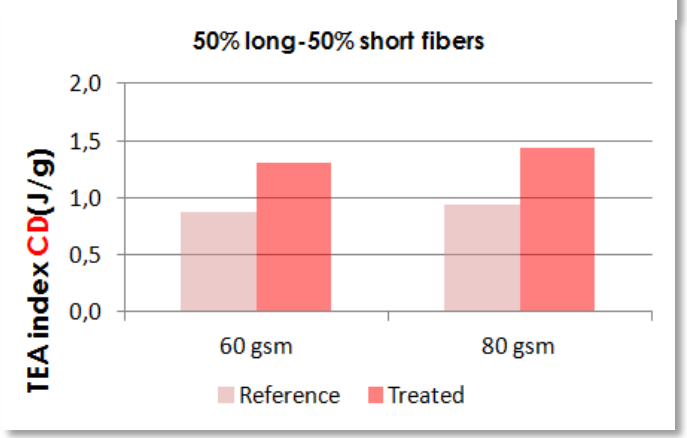
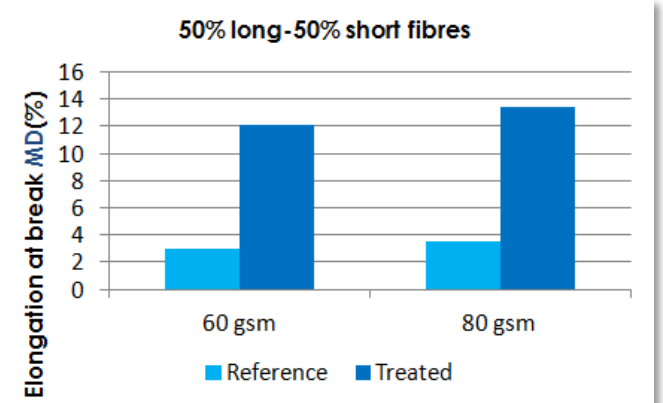
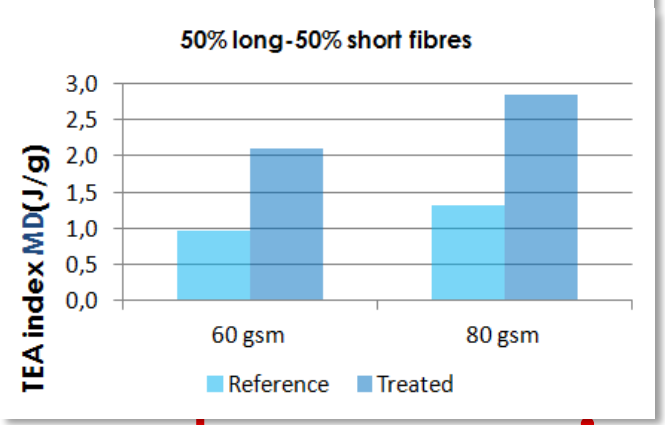
pre-trials:effects of symmetric stretch on TEA









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goals for fine tuning trials

concept:

"TEA(work) **= AVERAGE LOAD**(force) **x ELONGATION** (distance)**"**

The results from a trial with a furnish of 50% long fiber, 50% short fiber, refining 30° SR in terms of elongations and TEA in CD and MD were encouraging.
but what happens to a less costly refined furnish….?
… and can we do a fine-tuning "on demand", or just add an extra 2% or 3% or 4% CD-stretch (in absolute terms) to what a paper already has?

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goals for “ideal” sack paper

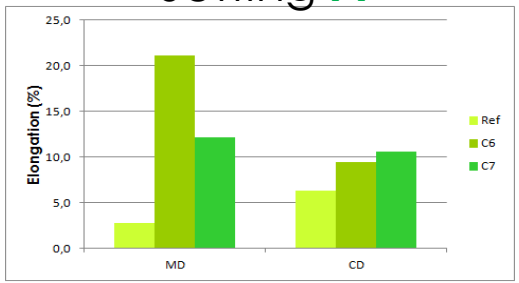
In vision of a focused customer trial on sack paper with the cusomer’s furnish, we were looking into potential fields of interest for such a material:

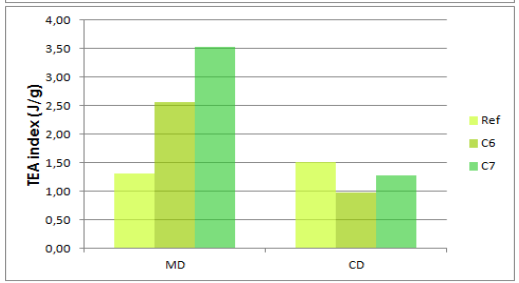
- Improved stretch as 9%/9%, 10%/10%?
- Improved TEA CD/MD?
- Standard stretch 8%/8% with less refining?
- Standard TEA CD/MD with less refining?
- No loss of Gurley

improved stretch and/or TEA ?

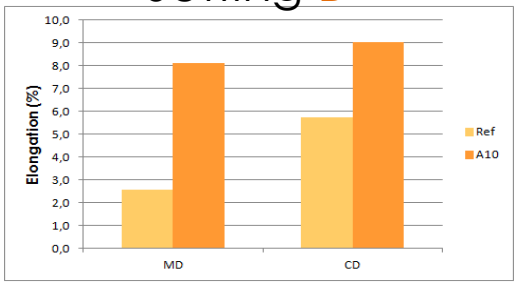
Pre-trials on 100% virgin pulp, **refining 30°SR,** varying machine settings

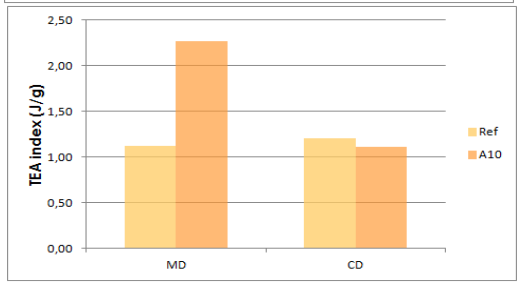
Setting A



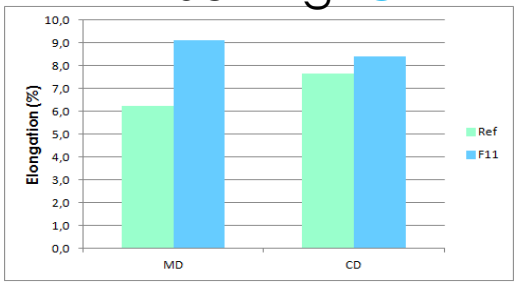


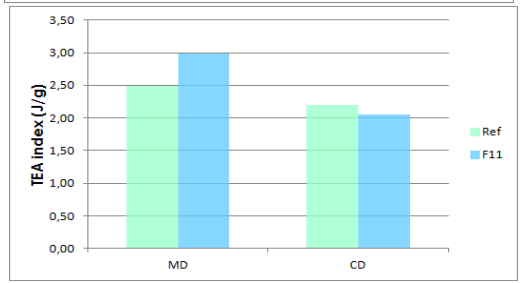
Setting B





Setting C





A: improved stretch + improved but also worse TEA

B: improved stretch + improved or quite unvaried TEA

C: improved stretch + improved or quite unvaried TEA

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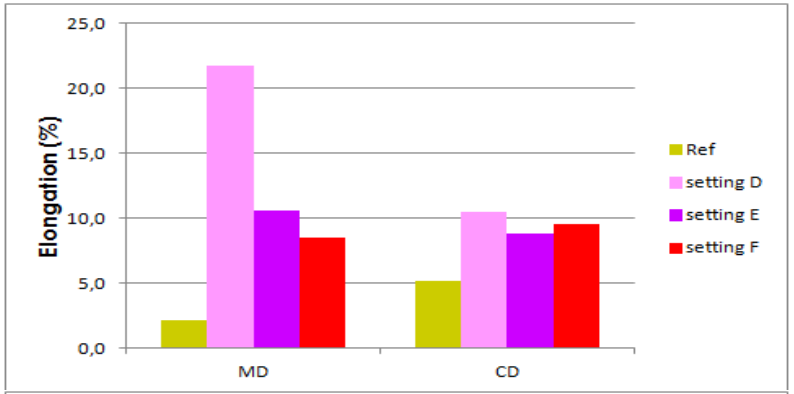
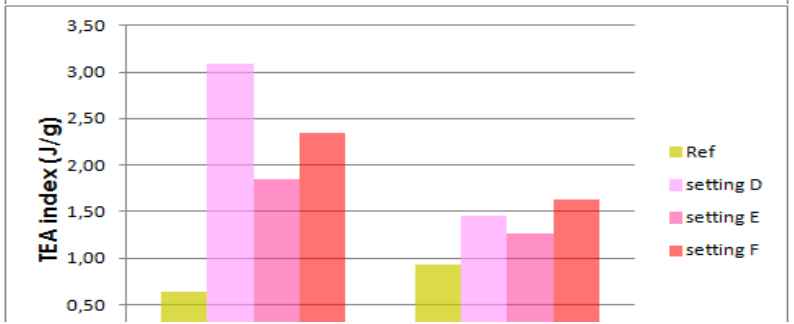
standard stretch and/or TEA by less refining?

Tests on 100% virgin pulp, **refining 20 ° SR**, fine tuning machine settings





Setting **E** and **F** gave the most promising results in terms of stretch (CD and MD), TEA values (CD and MD) were significantly improved

Our system is flexible and we still have possibilities of varying and combining process parameters of our treatments

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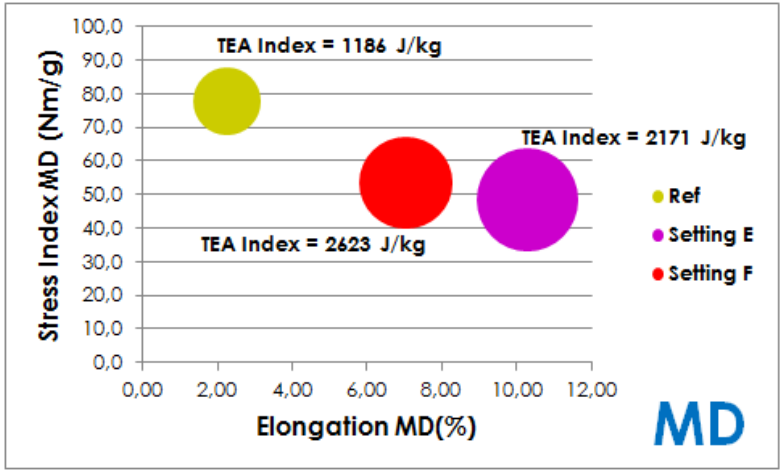
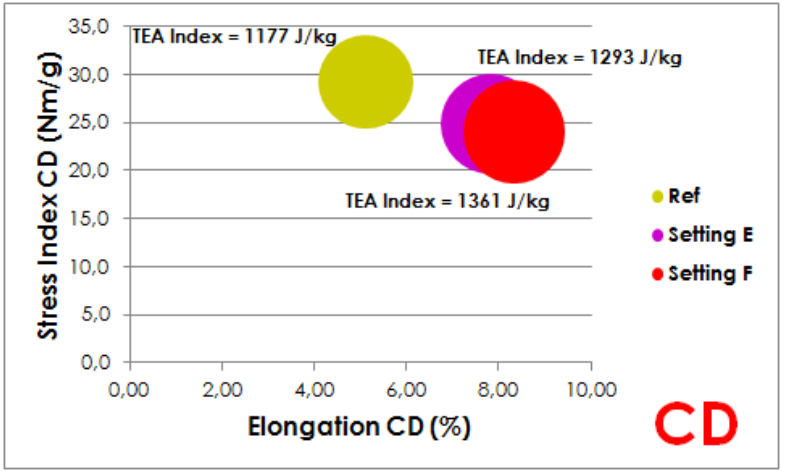
standard stretch and/or TEA by less refining?

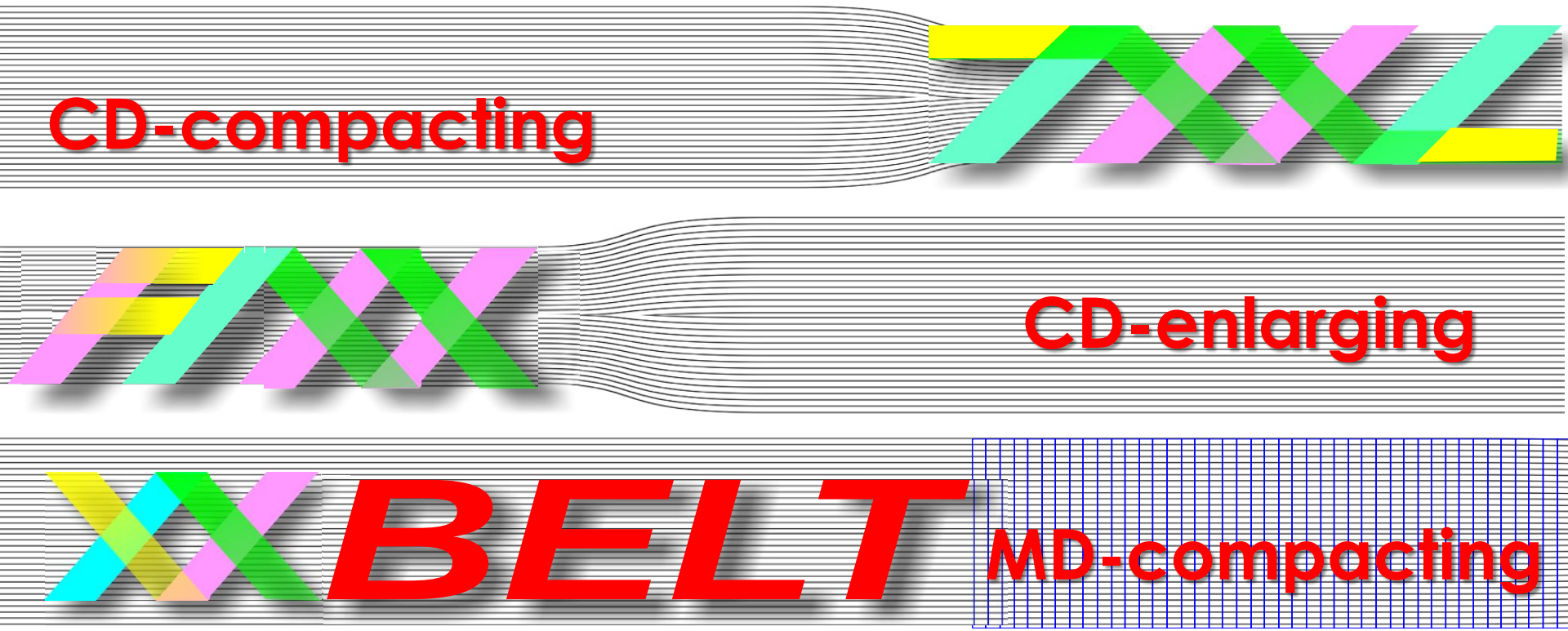
a look on the results of the most prosimising samples (setting **E** and **F**)





Outlook for the customer trial on real pulp for sack kraft paper :
Even though the material we will start from is going to be totally different from the one of the pre-trials above, there are still many "tools" for a re-fine-tuning.
To our experience of now there was no negative impact on Gurley up to now.

the UNITS



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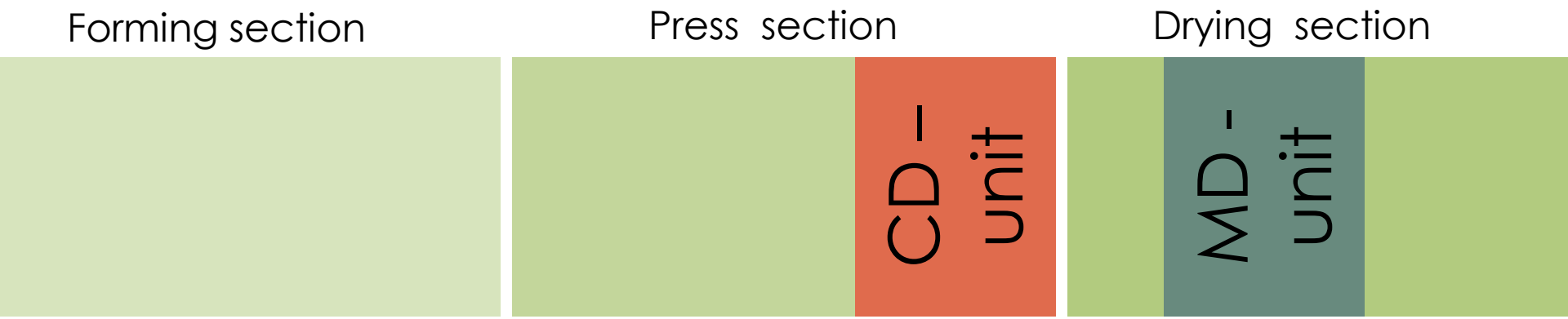
the units within a paper machine



Dry content 50%
or less for CD-compacting

Dry content about 65%
for MD-compacting

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the MD-unit

MD-units are today available on the market and might potentially be combined to our CD-unit.
Nevertheless we have developped a new MD- unit ourselves, improving traditional devices with:

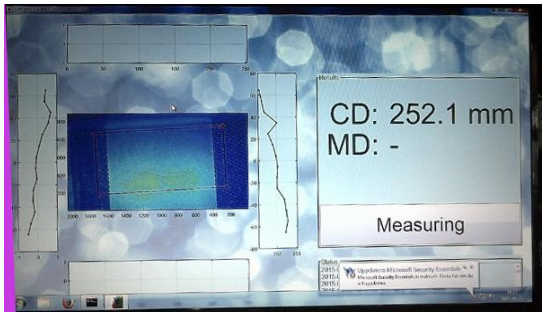
- adjustable nip size and paper contact area
- runnablility in different modes
- uniformity of treatment over whole width
- less outwearing effects for spare parts
- no need of chemicals or lubrification

the CD-unit

XXL_mode (CD compacting):
On the only CD-unit we can today compact a fibrous web from standard values up to around 15%

compacting from 240 mm to 211,8mm

FIXX-mode (CD enlarging):
The CD-unit can instead be used also the other way round and we can increase width in a fibrous web (2%, 3%,) in order to compensate some of the shrinkage due to drying in a paper process. The result is an increased width of the final iumbo roll.



enlarging from 240mm to 252,1mm

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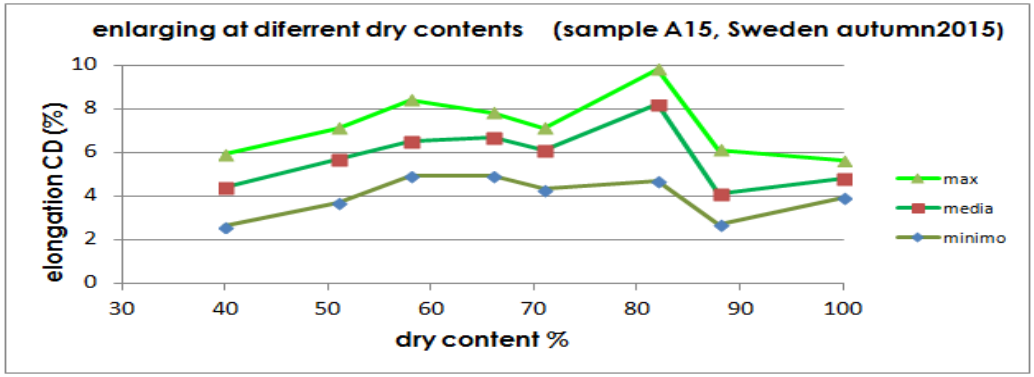
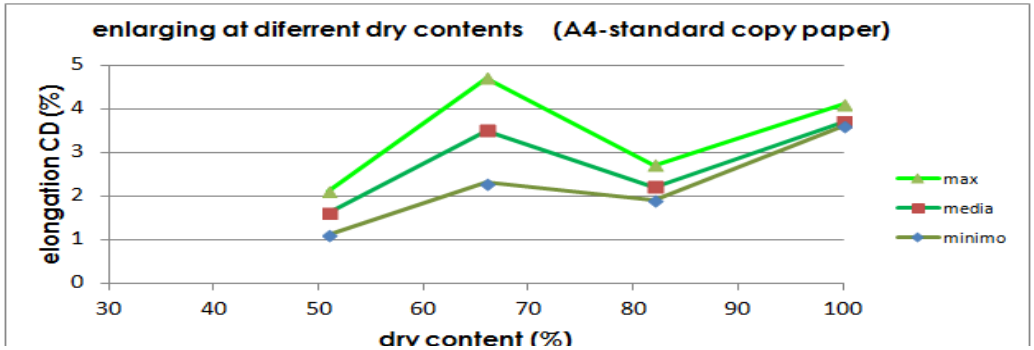
CD behaviour at different dry contents





The CD-unit today works at a dry content of about 40%. Using the FIXX-mode we were interested to see whether the pre-stretching of a web might work even better at higher dry contents.

From our lab trials on wet and rewetted samples we saw that 60-70% dry content should allow extension of more than 2-3%

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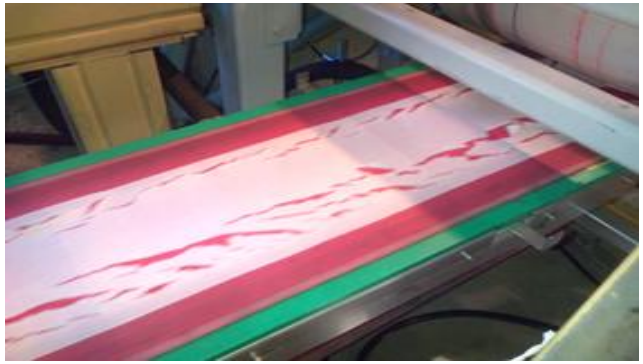
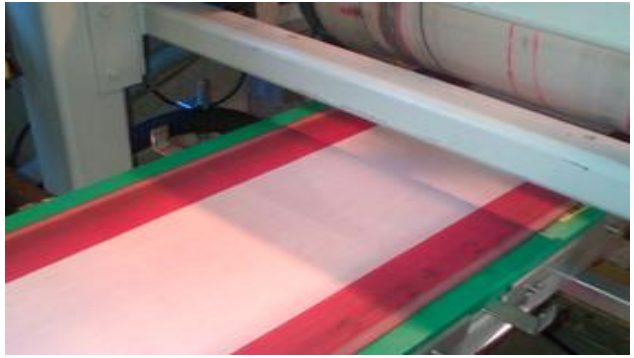
CD stretching at different dry contents

Pre-strechting a web of about 5%



At about 40% dry content generation of breaks in the web

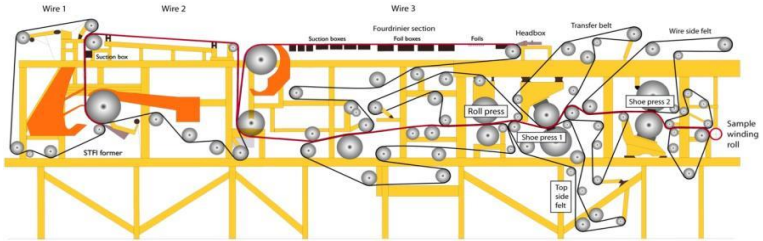


At about 65% dry content the web is resisting

Outlook for the **FIXX**-mode:

After the prove of concept: further equipment of the CD-unit based on new dry contents, and more focused trials on both the concept but also different furnishes and refinings

where are the units today installed ?



Both units are today installed at the FEX paper pilot line c/o the paper research institute INNVENTIA AB Stockholm/Sweden where it is possible to test different pulps, refinings, furnishes and dry contents. The pilot line is split between press and drying section. There we are processing the standard available machine width (240 mm).

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our starting point for the new technologies

In the past we had developped a technology based on a pure mechanical treatment and using only 100% fibre material with no particular additives for the production of a paper with up to 20% stretch in MD and up to 16% stretch in CD, combined to a very high breaking load deriving from pure vergin pulp.

"Mould Paper", as we called it, should have been a sustainable and cost saving alternative to plastics in 3D packaging.

It was industrially produced at the Cariolaro mill/Italy on a 2,40m wide paper machine.

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some examples of

mould paper

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market presence

The before mentioned technology has been licensed on an exclusive basis for Europe to Billerudkorsnas AB. The product is on the market under the tradename FiberForm

paper can

trays

isolation cups

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who we are

gruppo X di X gruppo srl, based in Venice/Italy is a company which

- generates patents on innovations mainly on paper
- develops them with industrial partners, and

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outlook

"Our goal is to make to the best possible paper out of the poorest fiber"

Under this respect, with our units, we are continuously progessing on new paper grades. We would like to improve different papers, even where super-stretch is not needed, where small but significant adjustments are not even visible to a final customer, but of help for many paper makers.

The next trials will show what happens to recycling paper

Many thanks for your attention!

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