

Beyond expectations

CEPI Two Team Project

Marco Mensink
Deputy Director General
Confederation of European Paper Industries



25 Years of INGEDE
23rd INGEDE Symposium
12 February 2014

Breaking through to 2050

With our 2050 Roadmap to a low-carbon bio-economy, we outlined how the forest fibre industry is uniquely placed to contribute to a resource-efficient world.

Consumer trends, industrial integration and the impact of policymakers were all discussed. But the fact remained; breakthrough technologies are required in order to be future fit.

This is why we launched the Two Team Project. To generate and develop new ideas together with an element of competition.

So join us as we unfold the future. Take a glimpse of how the pulp and paper industry will look in 2050...

First we made the roadmap



- 80 %
CO₂

+ 50%
value

... It showed the way to the forest fibre sector
The Bioeconomy



We learned

In our technology assessment,
the CO₂ reduction pathway to
2050 depends on

**breakthrough
technologies.**

This is two investment cycles,
or a maximum of two paper machines
or boilers away. Breakthrough
technologies have to become

**available
by 2030**

to be on time for 2050.



We started a competition



With great, but very different minds



They met in new inspiring places

Atomium in Brussels



Lenzing in Austria



Tata in Holland



Repsol in Madrid



Fortum in Helsinki



BASF in Ludwigshafen



Finding inspiration “out of the box”



Textile



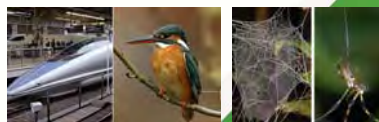
Food



Non woven



Steel



Nature



Others

The teams performed

Beyond Expectations



Breakthrough technologies for the 2050 world

unfold the future

<p>Deep Eutectic Solvents</p> <p>WINNER</p> <p>A ground-breaking discovery: Deep Eutectic Solvents (DES), produced by plants, open the way to produce pulp at low temperatures and at atmospheric pressure. Doing DES, any type of biomass could be dissolved into lignin, cellulose and hemicellulose with minimal energy, emissions and residues. They could also be used to recover cellulose from waste and dissolve ink residues in recycled paper.</p>	<p>Flash condensing with Steam</p> <p>WINNER</p> <p>Revamp paper production? Very simply. Large dry fibres would be soaked into a forming zone with updated design and cardboard into vinyl using one-thirtieth the quantity of water used today.</p>	<p>Steam</p> <p>WINNER</p> <p>Using more energy to use less? You read it right. Using the full power of pure steam for superheated steam drying would save energy as most heat would be recovered and recycled. Steam will then be used as the carrier for washing and forming paper.</p>	<p>DryPulp for cure-formed paper</p> <p>WINNER</p> <p>Imagine a papermaking process that uses no water. This is it. Fibres are treated by pulsed steam from heat, and then suspended in a vacuum solution of up to 40% concentration. The solution is then pressed out and the fibre dried, coated with a choice of additives to deliver the end-product required.</p>
<p>Supercritical CO₂</p> <p>WINNER</p> <p>Neither gas nor liquid but somewhere in between, Supercritical CO₂ (scCO₂) is widely used in many applications or dry vegetable, fruits and flowers, extract essential oils, etc. Supports the HFC, ARI and MEA use of Air Jet. Unlike and has never been fluorinated with scCO₂ since the early 1980s. We could use it for dry pulp and paper without the need for heat, hot steam, and why not dry paper or remove contaminants too, why not at all?</p>	<p>100% electricity</p> <p>WINNER</p> <p>Switching pulp and paper production to energy-efficient technologies using electricity rather than heat had previously generated heat with 100% efficiency for the energy sector with no renewable energy. The new sector also provides a further and storage capacity for the grid, storing energy as hydrogen or pulp.</p>	<p>Functional Surface</p> <p>WINNER</p> <p>The key to attaining greater added value from lower resources depends on a shift to producing more lightweight products, and adding surface area and functionality rather than weight. Advances in sheet formation and new look-ups of the substrate will lead the way to the lightweight future.</p>	<p>The Toolbox to replicate</p> <p>WINNER</p> <p>What about the great show that never ends? Put together a combination of process, material and equipment through a toolbox of key technologies to 2050 and the pathway involves close working sector and research centres.</p>

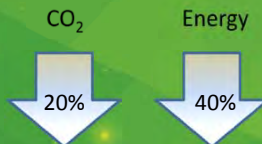
Deep Eutectic Solvents



A ground-breaking discovery: Deep Eutectic Solvents (DES), produced by plants, open the way to produce pulp at low temperatures and at atmospheric pressure. Using DES, any type of biomass could be dissolved into lignin, cellulose and hemicellulose with minimal energy, emissions and residues. They could also be used to recover cellulose from waste and dissolve ink residues in recovered paper.



The CEPI
TWO TEAM
PROJECT



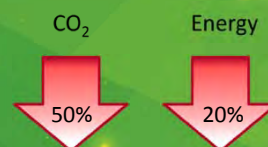
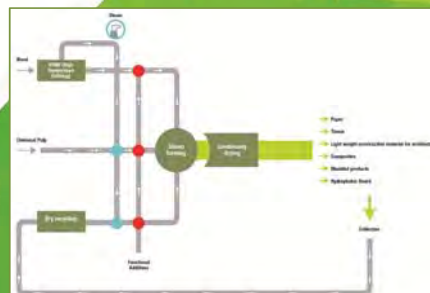
Flash condensing with Steam



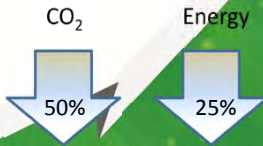
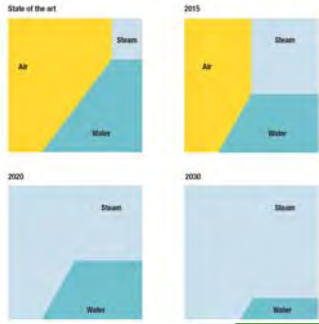
Waterless paper production? Very nearly. Largely dry fibres would be blasted into a forming zone with agitated steam and condensed into a web using one-thousandth the volume of water used today.



The CEPI
TWO TEAM
PROJECT



The CEPI
**TWO
TEAM
PROJECT**



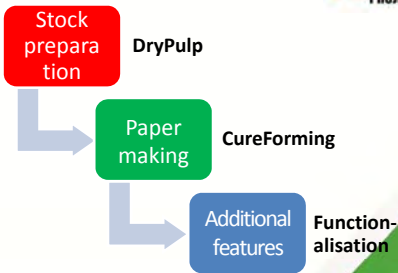
Steam



Using more energy to use less?
You read it right. Using the full power of pure steam for superheated steam drying would save energy as most heat could be recovered and recycled. Steam will then be used as fibre carrier for making and forming paper.



The CEPI
**TWO
TEAM
PROJECT**



DryPulp for cure-formed paper



Imagine a papermaking process that uses no water. This is it. Fibres are treated to protect them from shear, and then suspended in a viscous solution at up to 40% concentration. The solution is then pressed out and the thin sheet cured with a choice of additives to deliver the end-product required.



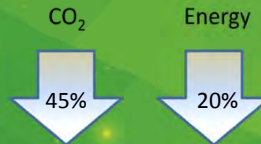
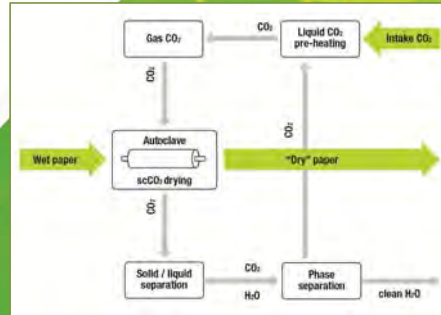


Supercritical CO₂

Neither gas nor liquid but somewhere in between, Supercritical CO₂ (scCO₂) is widely used in many applications, to dry vegetable, fruits and flowers, extract essential oils or spices. Suppliers for NIKE, Adidas and IKEA use it to dye textile. Coffee and tea have been decaffeinated with scCO₂ since the early 80s. We could use it to dry pulp and paper without the need for heat and steam, and why not dye paper or remove contaminants too, while we're at it?



The CEPI
**TWO
TEAM**
PROJECT

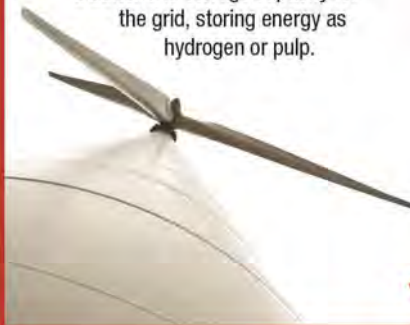


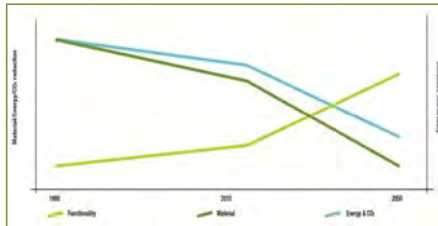
The CEPI
**TWO
TEAM**
PROJECT



100% electricity

Shifting pulp and paper production to energy-efficient technologies using electricity rather than fossil fuel power to generate heat will cut all CO₂ emissions as the power sector shifts to renewable energy. The sector would also provide a buffer and storage capacity for the grid, storing energy as hydrogen or pulp.





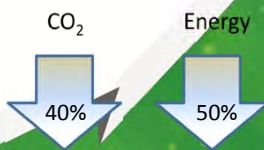
Functional Surface

FINALIST

The key to unlocking greater added value from fewer resources depends on a shift to producing more lightweight products, and selling surface area and functionality rather than weight. Advances in sheet formation and new cocktails of raw materials will lead the way to the lightweight future.



Year	New Library - Objectives	Enables	Enables - Milestones	Enables
2025	<ul style="list-style-type: none"> Process innovation Steel composition Energy efficient steel manufacturing scaling 	<ul style="list-style-type: none"> Production Scale-up Structure adaptation Scalability 	<ul style="list-style-type: none"> Light weight Standard design Product Customization (new base product) / emerging products 	<ul style="list-style-type: none"> Extreme customer TfL 4-4
2030	<ul style="list-style-type: none"> Production process innovation and optimization Advanced coating Steel joining innovation 	<ul style="list-style-type: none"> Production Advanced coating Advanced steelmaking 	<ul style="list-style-type: none"> Thinner gauges Minimization of green steel usage "low" and high-strength Customization (new to part of green production) / new part of steel will proceed to customer preferences (personalization) 	<ul style="list-style-type: none"> Master Client TfL 3-4
2050	<ul style="list-style-type: none"> Process innovation - new materials 	<ul style="list-style-type: none"> Production 	<ul style="list-style-type: none"> Advanced steel 	<ul style="list-style-type: none"> TfL 1-2



The Toolbox to replicate

FINALIST

What about the great ideas that never make it? Put together a combination of process, material and equipment innovations as a toolbox of stepping stones to 2050 and the pathway becomes clearer, boosting sector and investor confidence.



But more food for thought

The teams therefore propose that the sector reflects on the way it conducts measurements and statistics **and report in square metres as well as tonnes.**



Thank you!



Marco Mensink
Deputy Director General
Confederation of European Paper Industries
Avenue Louise 250 | Box 80 | B-1050 Brussels
m.mensink@cepi.org | www.cepi.org | www.paperonline.org
Direct +32 (0) 2 627 49 28 | **Mobile** +32 (0) 475 769 388
Fax +32 (0) 2 646 81 37 | **Twitter** @EuropeanPaper
Videos [youtube.com/cepi250](https://www.youtube.com/cepi250)