

IUFRO World Congress 2019

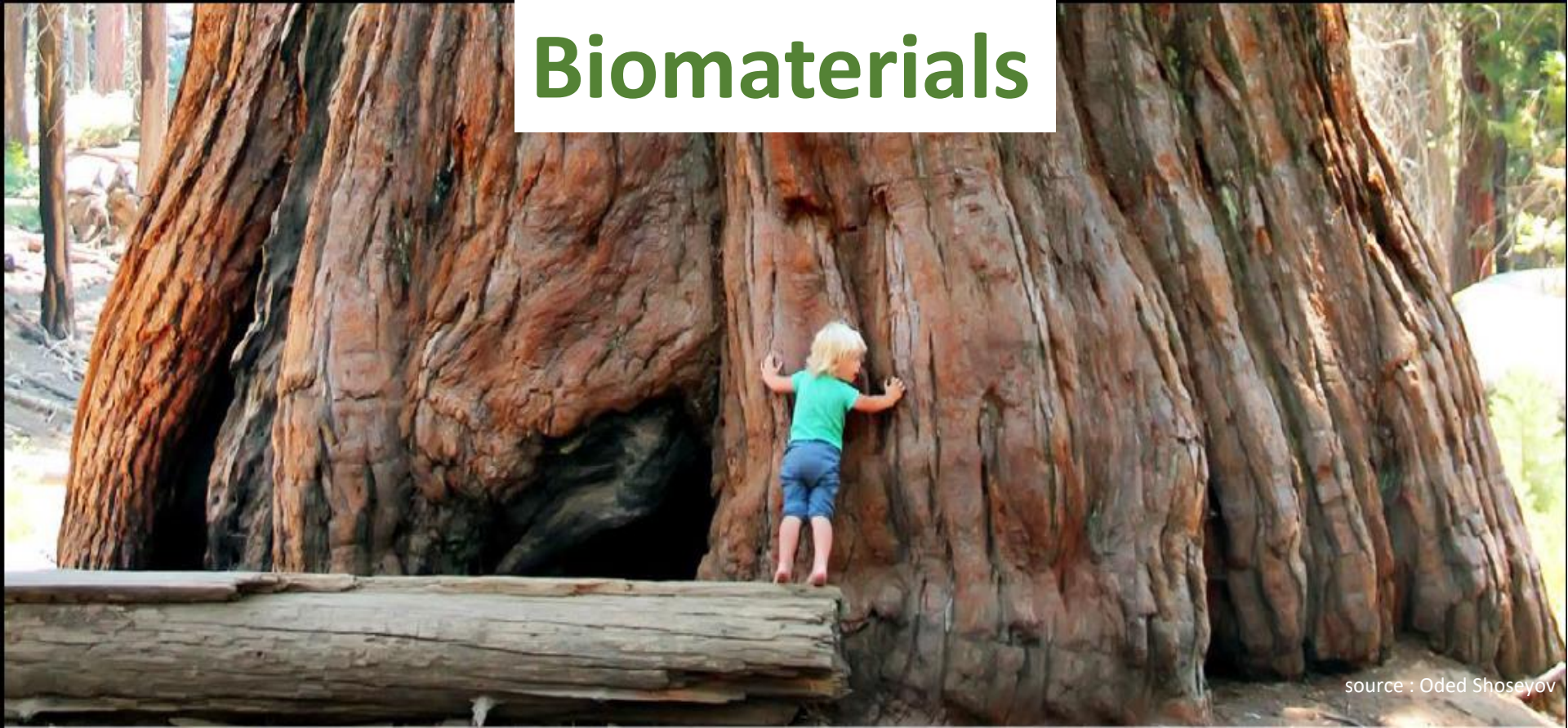
Forests and Forest-based Products for a Greener Future

Using Forests and Trees for a Greener Future

Francisco Razzolini
C T O - Klabin S A



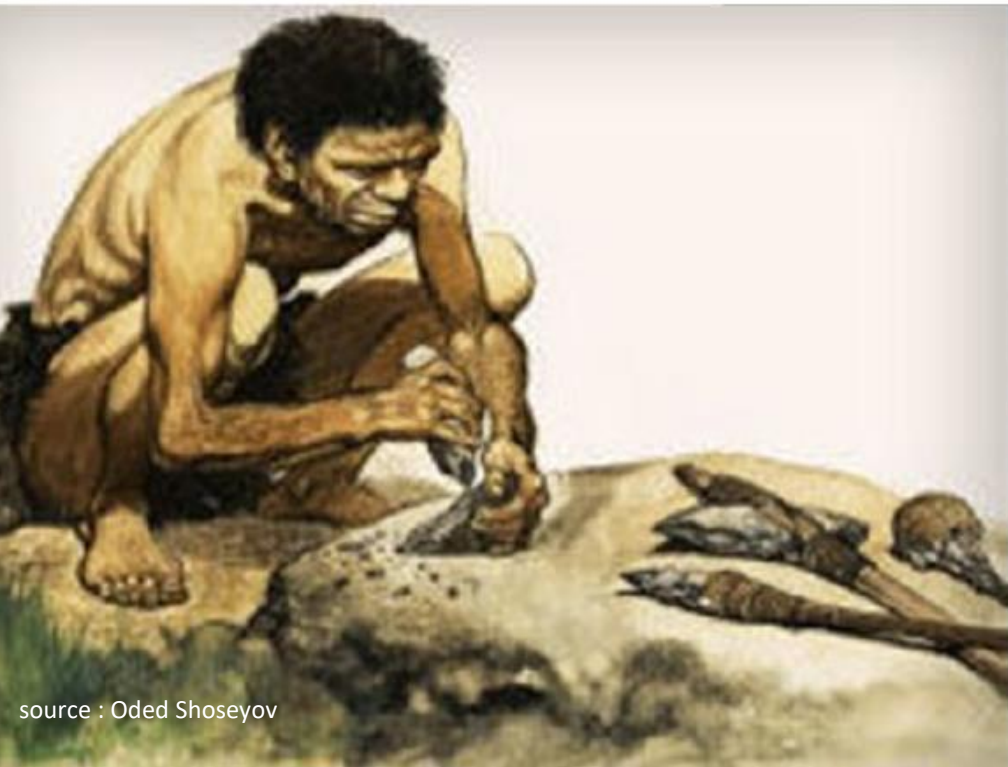
Biomaterials



source : Oded Shoseyov

Trees,
hundreds of years of evolution resulted in super materials

**The stone age didn't end for lack of stone.
The oil age will end long before the world runs out
of oil** "Sheik Ahmed Zaki Yamani"





Klabin

INTRODUCTION

KLABIN

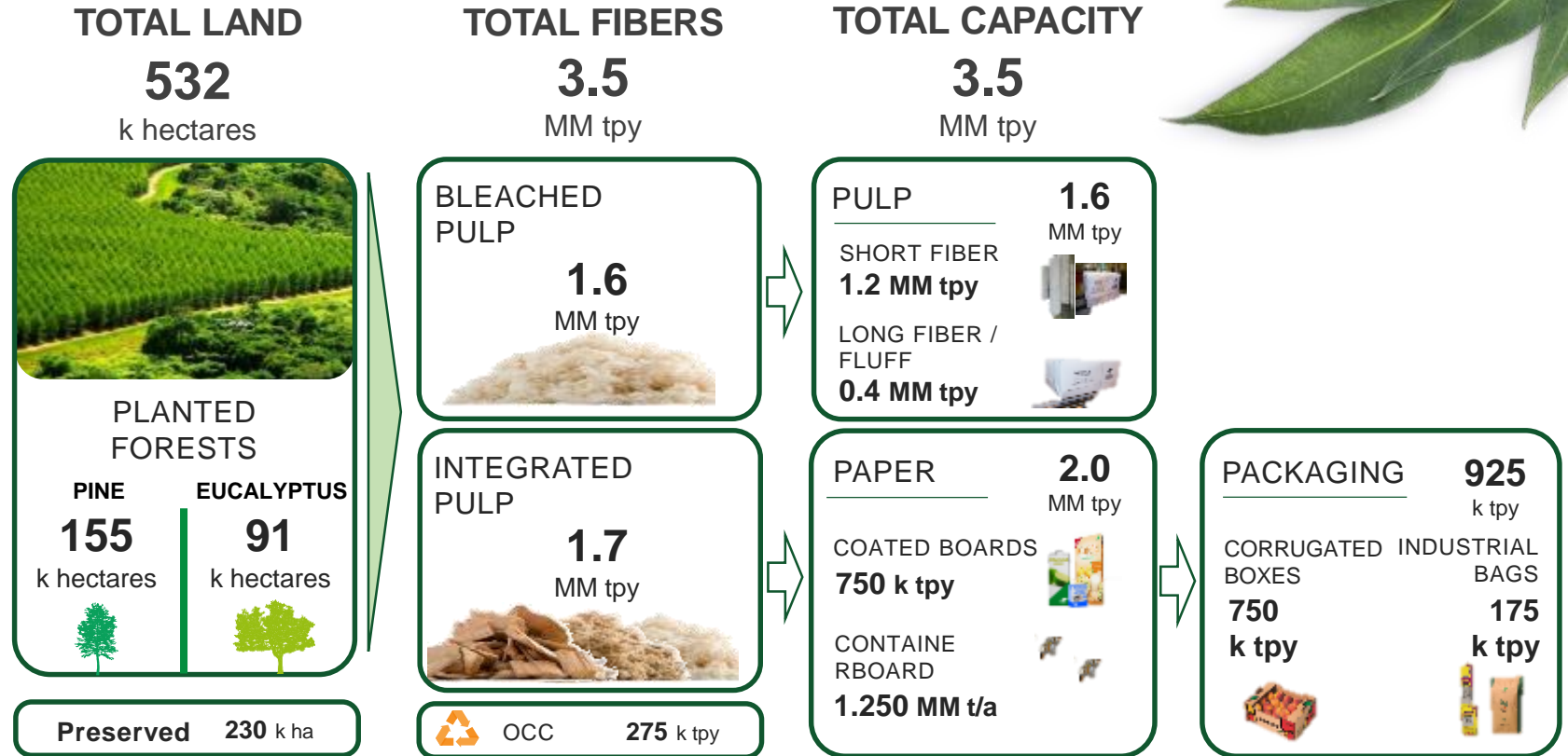
was founded
in 1899



120 yrs making history in Brazil

Integrated business model

Diversification and flexibility

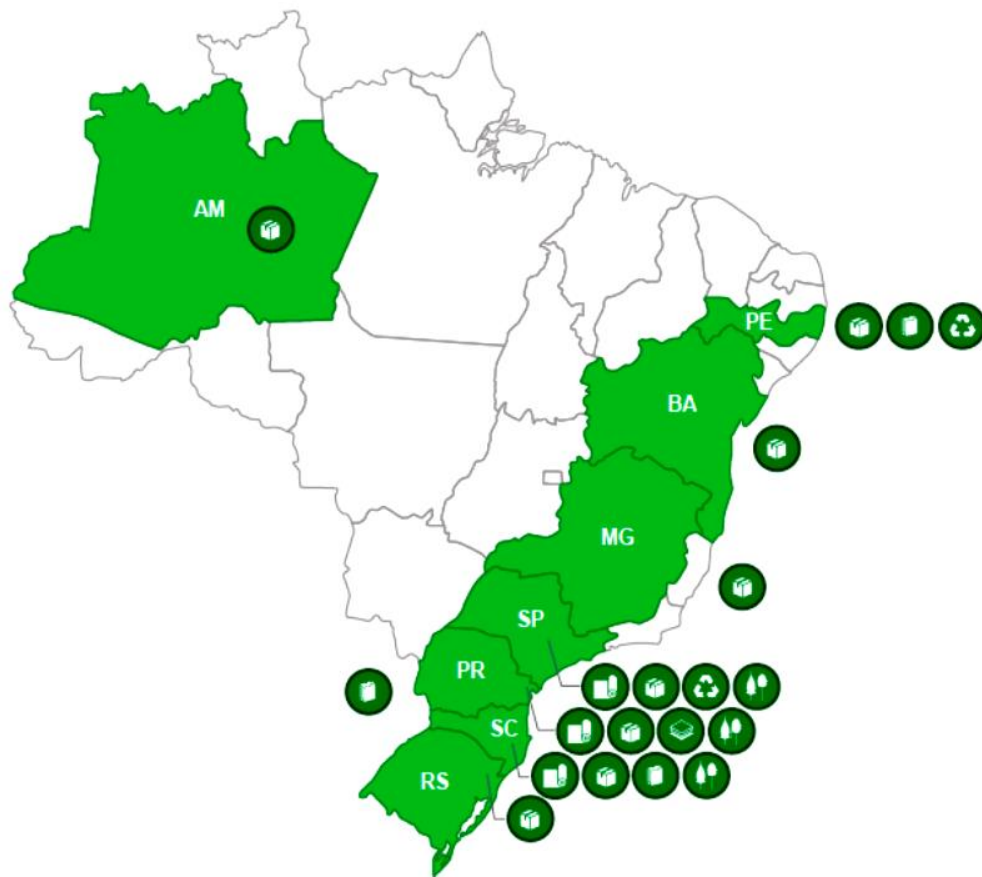


Operations map

Klabin has 18 industrial units distributed across 8 states in Brazil and 1 in Argentina



Klabin



Pulp

PR Ortigueira



Recycled Paper

PE Goiana
SP Piracicaba



Packaging Paper

SP Angatuba
PR Monte Alegre
SC Correia Pinto
SC Otacílio Costa



Industrial Bags

PE Goiana
SC Lages
ARG Pilar



Corrugated Boards and Boxes

MG Betim
BA Feira de Santana
PE Goiana
SC Itajaí
SP Jundiá
AM Manaus
SP Piracicaba
PR Rio Negro
RS São Leopoldo



Forestry

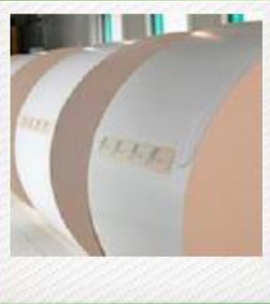
SP Alto do Paranapanema
PR Planalto Guarapuava
PR Campos Gerais
PR Vale do Corisco
SC Alto Vale do Itajaí
SC Planalto Catarinense

paper and packaging

LEADERSHIP IN RESILIENT MARKETS



Kraftliner



Coated Boards



Industrial Bags



Corrugated boxes

Market destination (%)





Klabin

PULP MARKETS

DIFFERENT FIBERS, DIFFERENT MARKETS



LyptusCel™
100% Planted Eucalyptus

EUCALYPTUS PULP
BEKP IN BALES



PineCel™
100% Planted Pine

PINE PULP
BSKP IN BALES



PineFluff™
A genuine fluff pulp

LONG FIBER FLUFF IN REELS



Klabin

SUSTAINABILITY

Biodiversity

Conservation and growth

FAUNA

883 SPECIES

identified**



FLORA

1,872 SPECIES

identified**

Puma, pygmy brocket and howler monkey are some of the endangered species, protected in areas owned by Klabin



43%

of native forests conserved

Private Natural Heritage Reserve (RPPN) from Klabin

PARANÁ + SANTA CATARINA

8.839 HECTARES

holding a High Conservation Value Area (HCVA) and a newly inaugurated Nature Interpretation Center

Impacts

Low environmental impact with renewable and clean energy sources



ATMOSPHERIC EMISSIONS



tons of CO_2 eq
represents Klabin's
positive carbon
balance

SOLID WASTE



92%
reuse and recycling
of solid waste in
2018

More than **98%** of
the materials used by
Klabin in its
production are from
renewable origin

ENERGY

89% ENERGY
MATRIX

deriving from
clean and renewable sources



65% Black
liquor

34% BIOMASS

1% OTHER SOURCES

ISO 50001

Puma Unit certification,
demonstrating good
practices in energy
management



SUSTAINABLE DEVELOPMENT GOALS



KLABIN 2030 GROWTH STRATEGY

Define goals and projects up to **2030**

Strategic Directions to assure **Klabin's sustainability for the future**



KLABIN'S TECHNOLOGY CENTER

5 Development Routes



Environmental and
Sustainability



New Technologies on Wood
Based Products



Packaging
Paper



Pulp



Wood

ENVIRONMENTAL FRIENDLY PRODUCTS

Introduce renewable,
biodegradable and
repulpable materials





Klabin

**FOREST BASED
OPPORTUNITIES
FOR
GREENER
FUTURE**

GLOBAL FIBER CONSUMPTION - PAPER

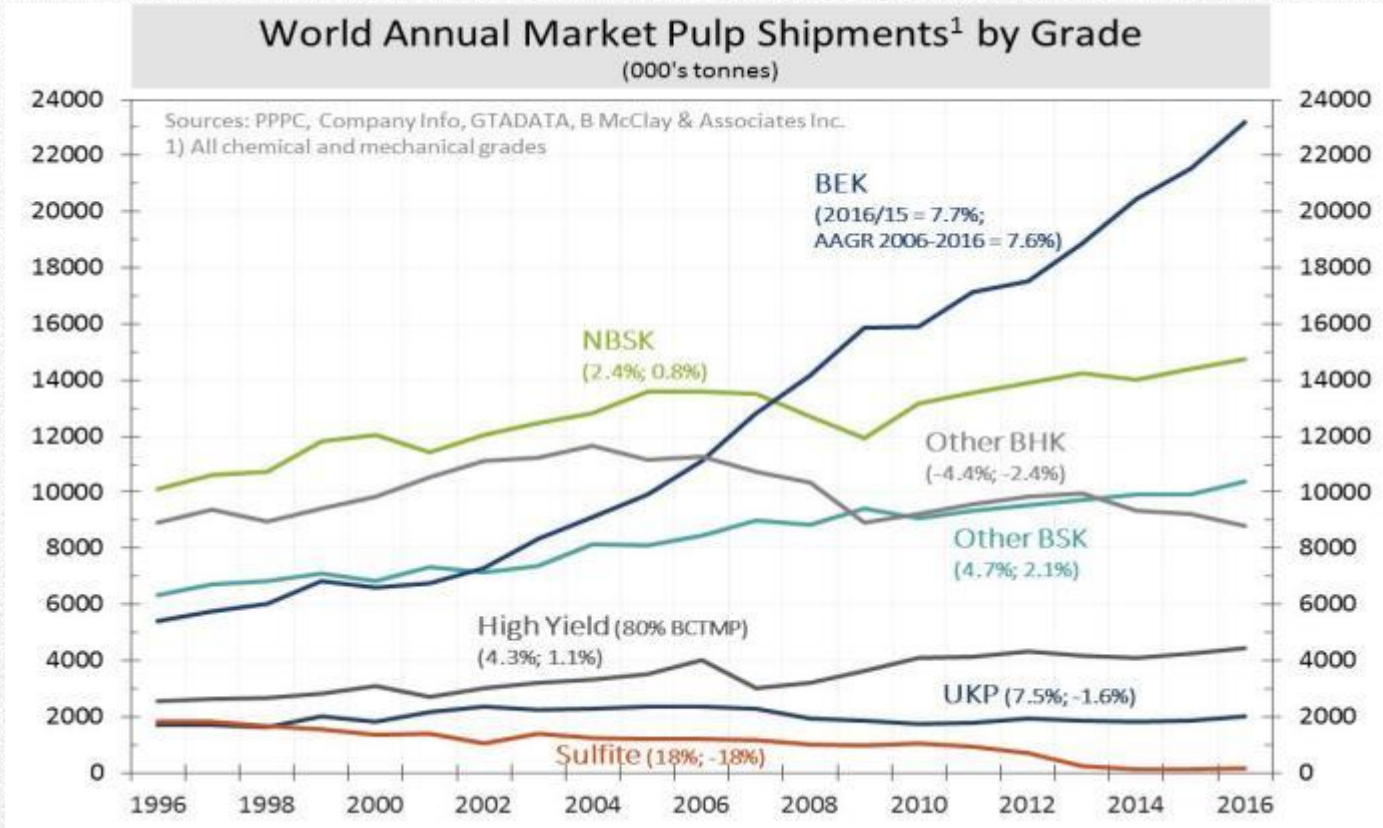


*MM tonnes

Source: Pöyry, Hawkins Wright, PPPC.

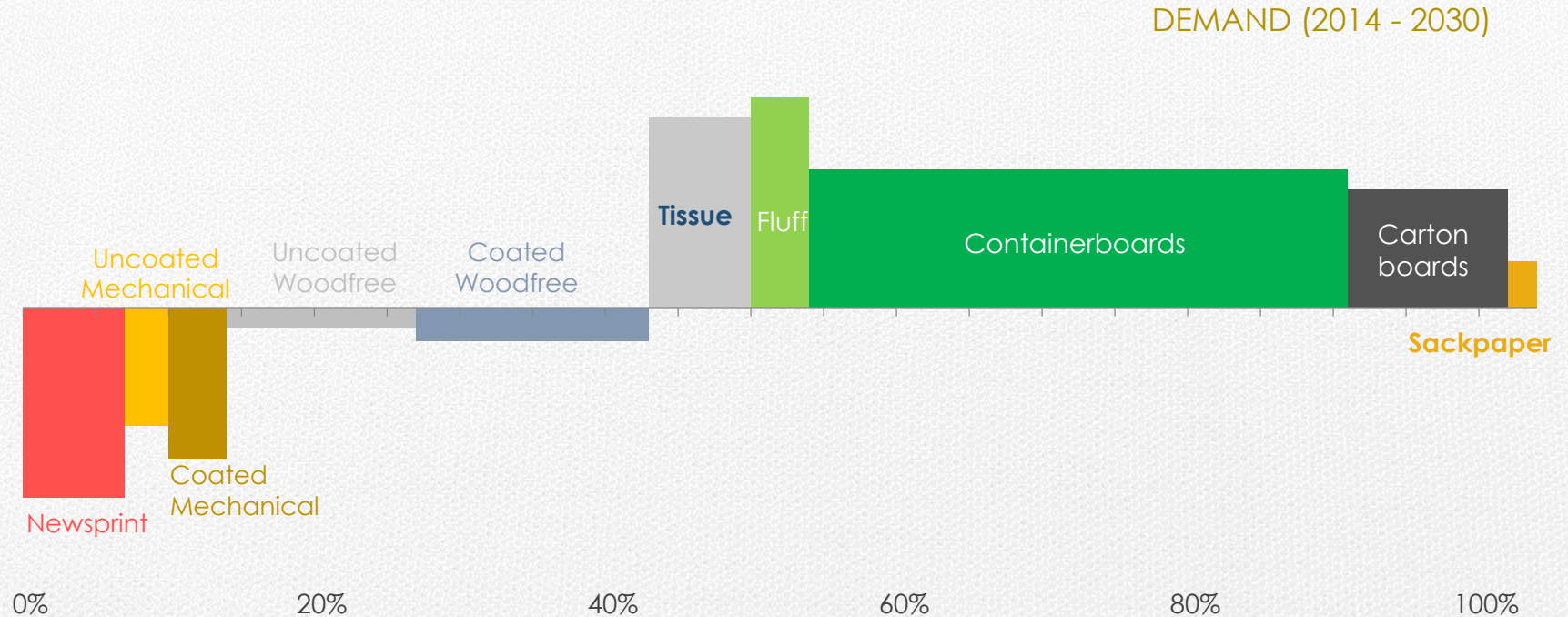


WORLD PULP HISTORICAL GROWTH



Source: Brian McClay

DEMAND – PAPER PRODUCTS GROWTH PER YEAR





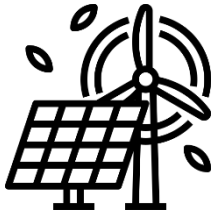
NEW OPPORTUNITIES FOR A GREENER FUTURE



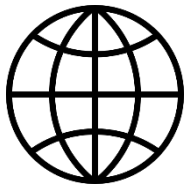
NEW LIFESTYLES



GROWING MIDDLE CLASS



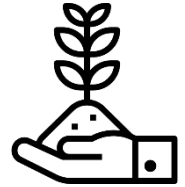
CLIMATE CHANGES



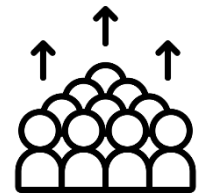
DIGITAL ERA



URBAN POPULATION



ENVIRO AWARENESS



**GROWING / AGING
POPULATION**

WHAT CAN COME FROM A TREE ?

Energy

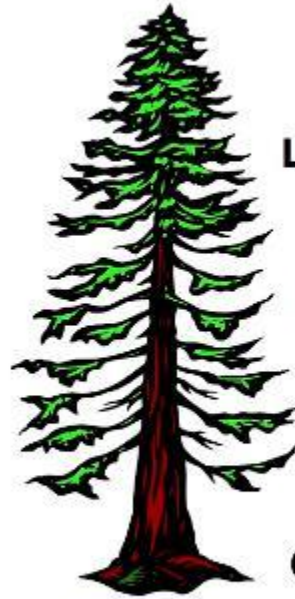
- Heat
- Electricity
- Pellets

- Biocoal
- Biooil
- Ethanol
- Methanol

- Biogasoline
- Biodiesel

Lignin

Forestry residues



Lignin

Hemi-cellulose

Extractives

Cellulose

Chemicals/materials

- Carbon fibre
- Binder
- Chemical intermediates

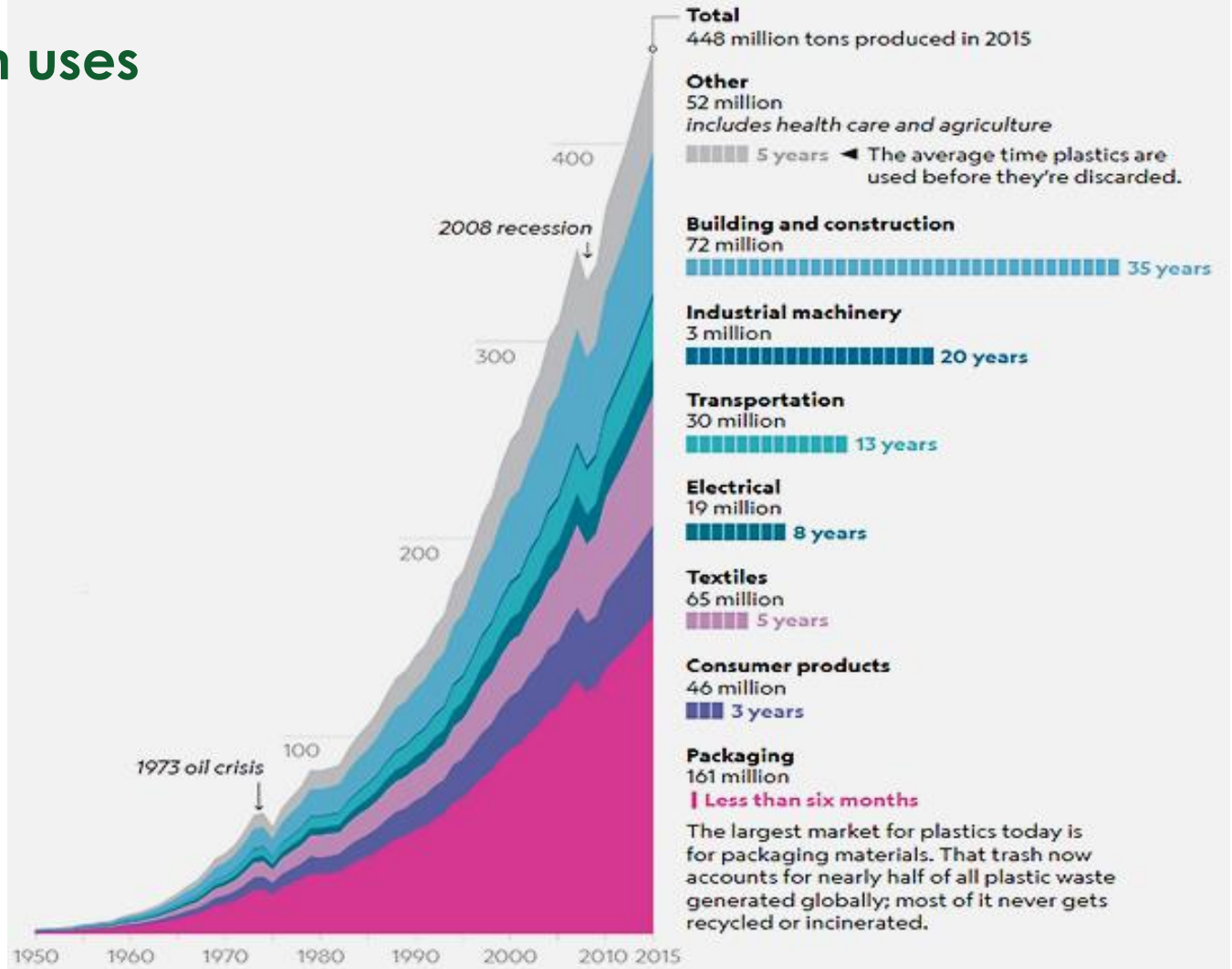
- Fiber additive
- Barriers
- Chem intermediates

- Bioactive chemicals
- Tall oil, turpentine

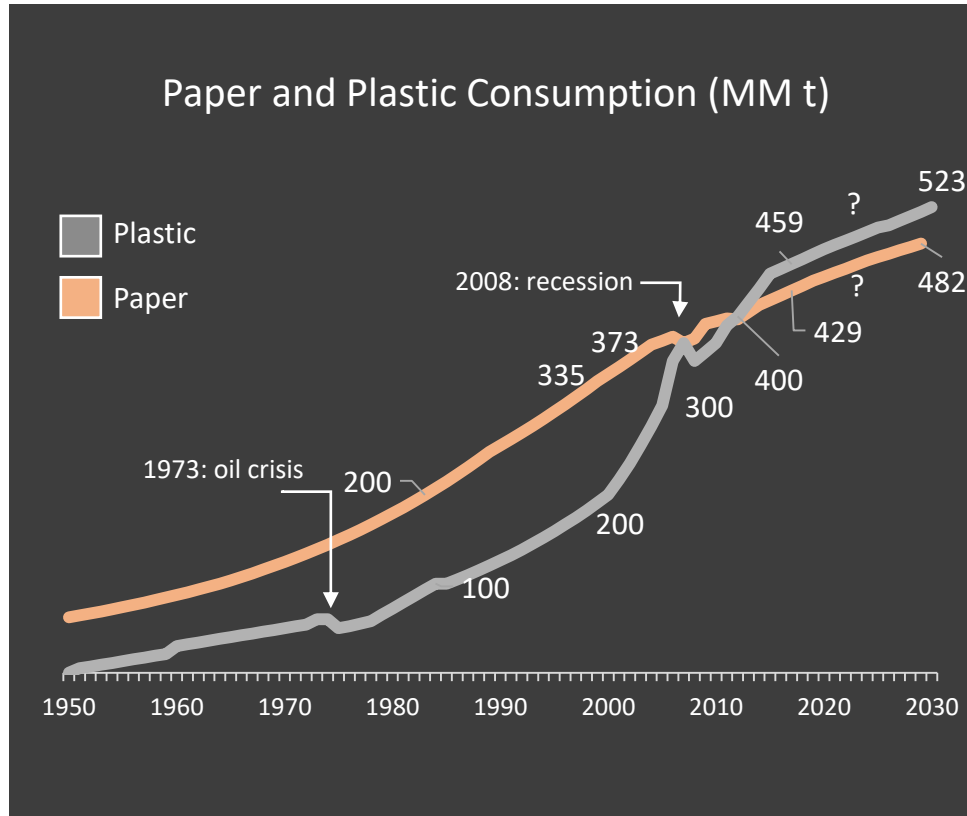
- Ethanol
- Lactic acid
- Acetic acid

Pulp fibers and cellulose

Plastic - main uses



Plastic x Paper - evolution



Unboxing: a silent revolution

Packaging has ceased to be a commodity and has become a factor that influences purchase decisions in the consumption chain



Packaging for a Sustainable Future



EUKALINER

The 100% eucalyptus based Klabin Kraftliner has been successfully produced in basis weights from 80 to 210 g/m²

Physical Properties, at same basis weight, better or similar to traditional Softwood kraftliners;

Compression Tests and Printability were found much better.

less forest area, energy and water

SUSTAINABILITY

500.000 ton/yr Eukaliner	Plantation Area Hectares
Eucalyptus	30.000
Pine S. Hemisphere	50.000
Pine South USA	90.000
Pine N. Hemisphere	350.000

Paper x Plastic - Sustainability



New Technologies

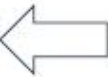


BARRIERS

Water



Insects



Oil & Grease



Odors & Fragrances

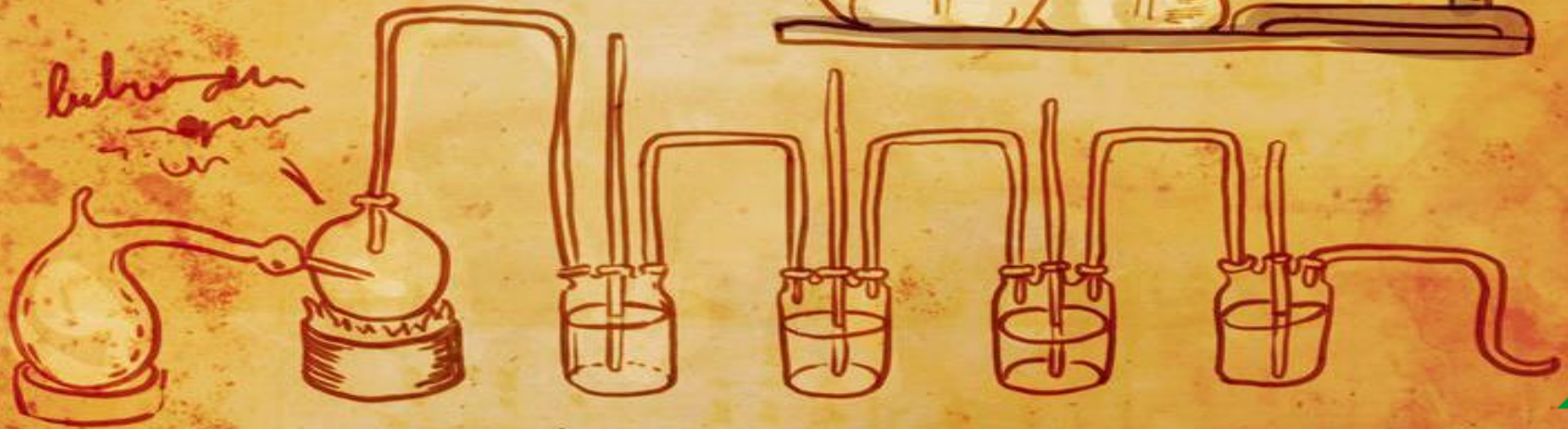
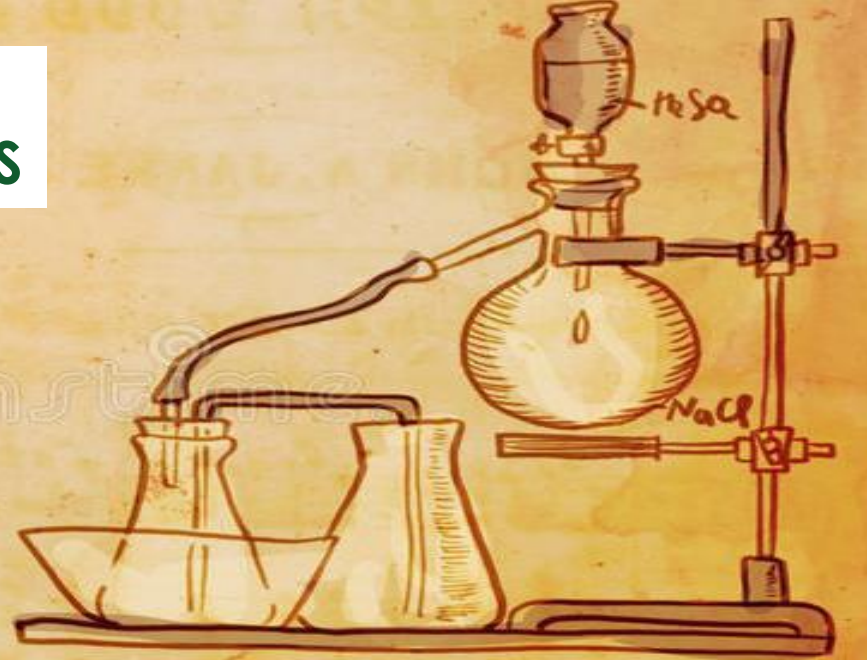


Light & Temperature

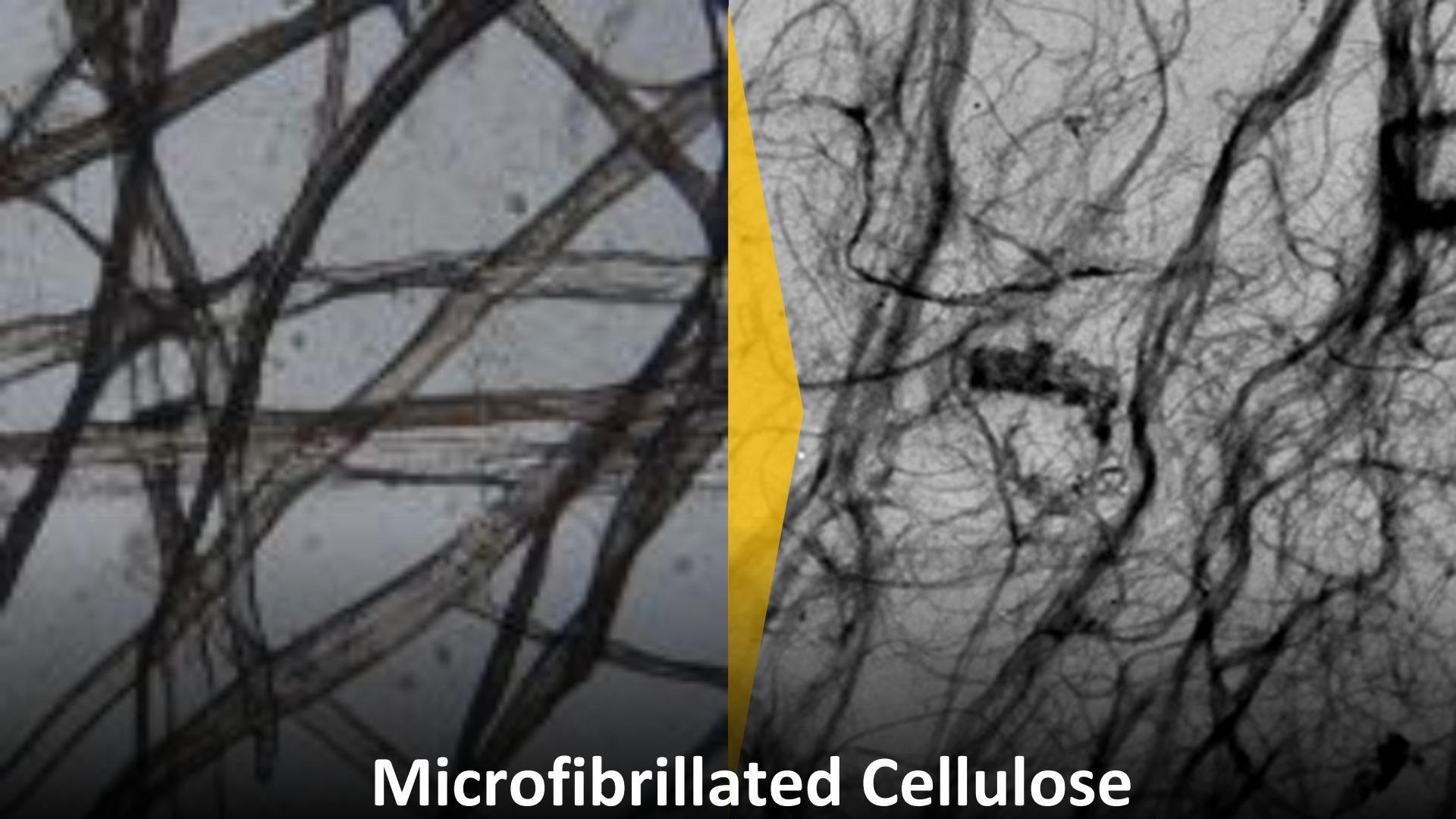


Gases
Water Vapor
O₂

NEW TECHNOLOGIES WOOD BASED PRODUCTS

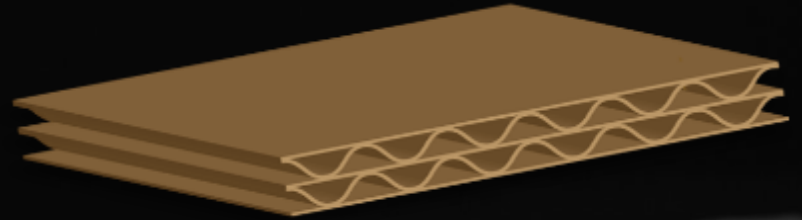


MFC

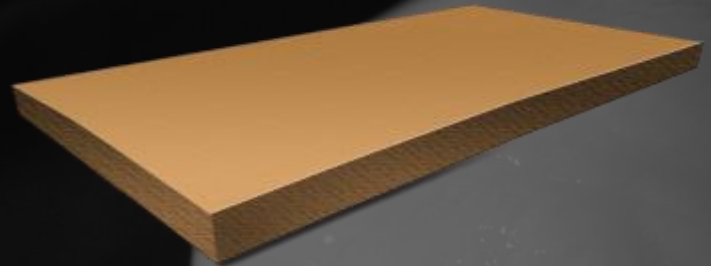


Microfibrillated Cellulose

Strong Papers



Internal Bonding



Ply Bonding



Surface

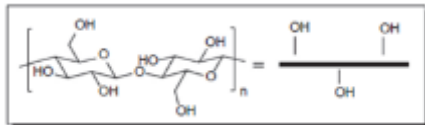
CNC

The image displays the letters 'CNC' in a bold, sans-serif font. Each letter is filled with a detailed wood grain texture, showing various shades of brown and tan with prominent, irregular lines representing the natural grain of the wood. The letters are centered horizontally on a plain white background.

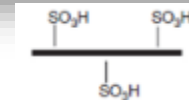
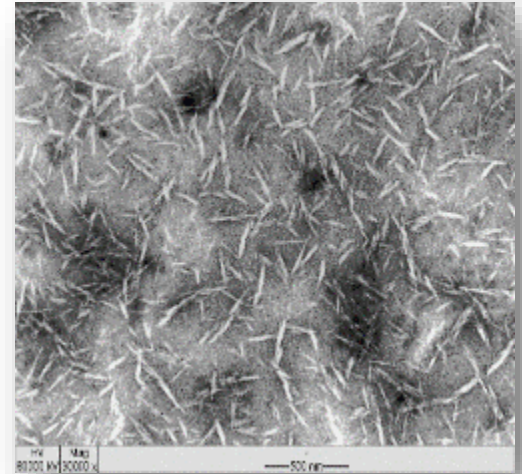
CNC - Cellulose Nano Crystals

CNC - nano crystals, extracted from cellulose at strong acid conditions.

This Crystals have impressive resistance and can form translucent films . A new path for renewable barrier applications.



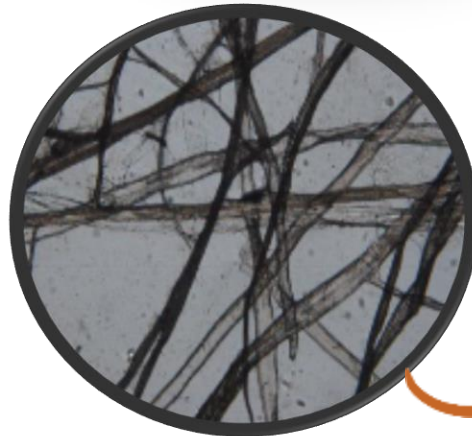
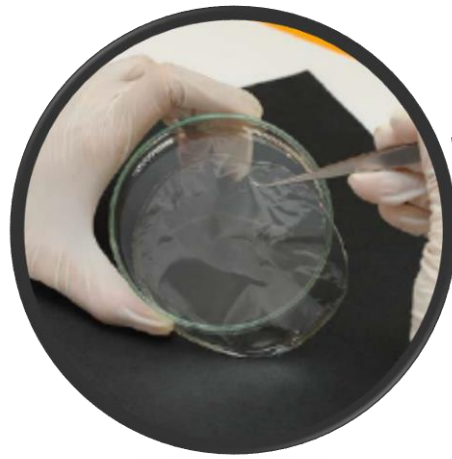
Acid Hydrolysis



Application

A film can be
formed...

Barriers!!



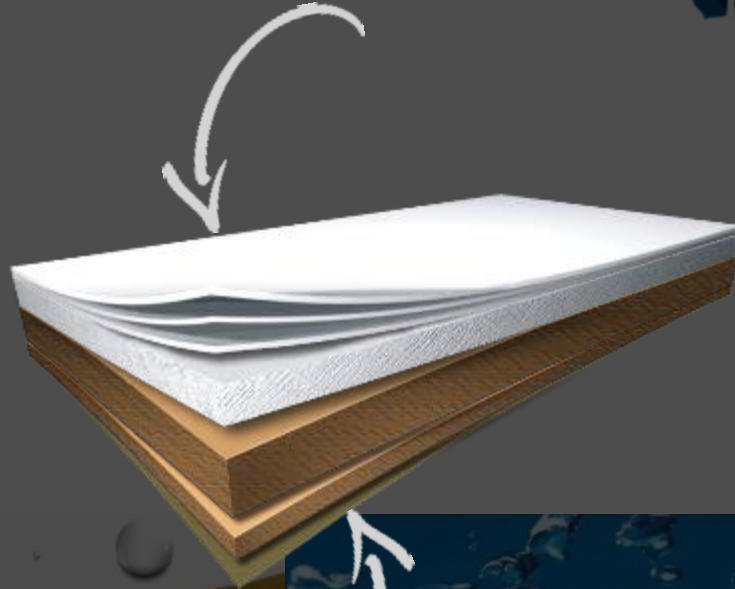
cnc



Focus in different barrier formulations



Oil
&
Grease



Oxygen

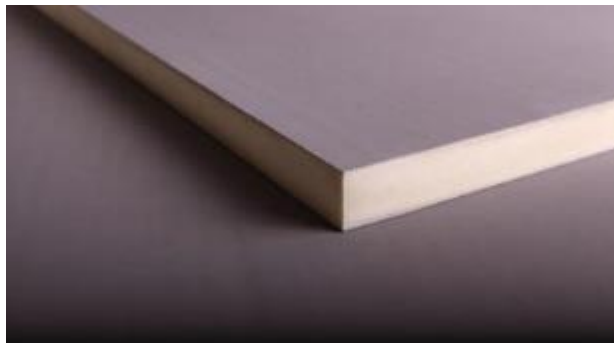
O₂

LIGNIN

LIGNIN BARRIERS



Lignin



Application

Phenolic Resins and Urea – Formadehyde Substitution

Polyurethane Foams

Thermoplastics

Market

Wood Panels
industri

Isolation in civil
construction and
car industry

Car Industry
Furnitures
Civil Construction

Lignin

Composites



Lignin + Polypropylene

Lignin



Application

Polymers
PP, PE, PVC, OS,
ABS, PLA, others

Market

Polymers and
plastics
Industry



“Carbon Fiber”

Car Industry,
Aerospace,
Sports,
Construction

Summary



The environmental concern is clearly growing

Consumers know non-renewables are damaging to the environment

A great opportunity for forest-based materials - renewable and sustainable solutions

But still challenges.....

A hand is shown watering a small green seedling in soil. The background is a bright sun with rays, suggesting a natural, outdoor setting. The overall theme is environmental care and sustainability.

60% of consumers consider our forests a scarce and decreasing resource

Many don't see fiber-based materials as renewable

Most consumers don't think that our forests are managed sustainably

There's still a strong need **to better communicate our sustainability story**



Join us in this journey to make a better world with forest-based products



Klabin

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