



## 2022 Webinar Series

**Our Mission is to assist our members with the deployment of leading-edge advanced biofuels, biochemicals, and bioproducts technologies that do not require any long-term subsidy making them more profitable and sustainable. Our current membership includes the forest products industry, chemical industry, service and technology providers, government and academic institutions.**

**FiberLean – December 13, 2022**

*Please remember to mute your computer and/or phone during the presentation today. Thank you!*



**FiberLean**<sup>®</sup>  
Technologies



**Enrico de Landerstet**  
CEO

FiberLean Technologies



**Danny Ingle**  
COO

FiberLean Technologies

# FiberLean® MFC – Ready for Your Disruptive Biomaterials Take Off? Tens of Millions of CapEx savings & New Profits

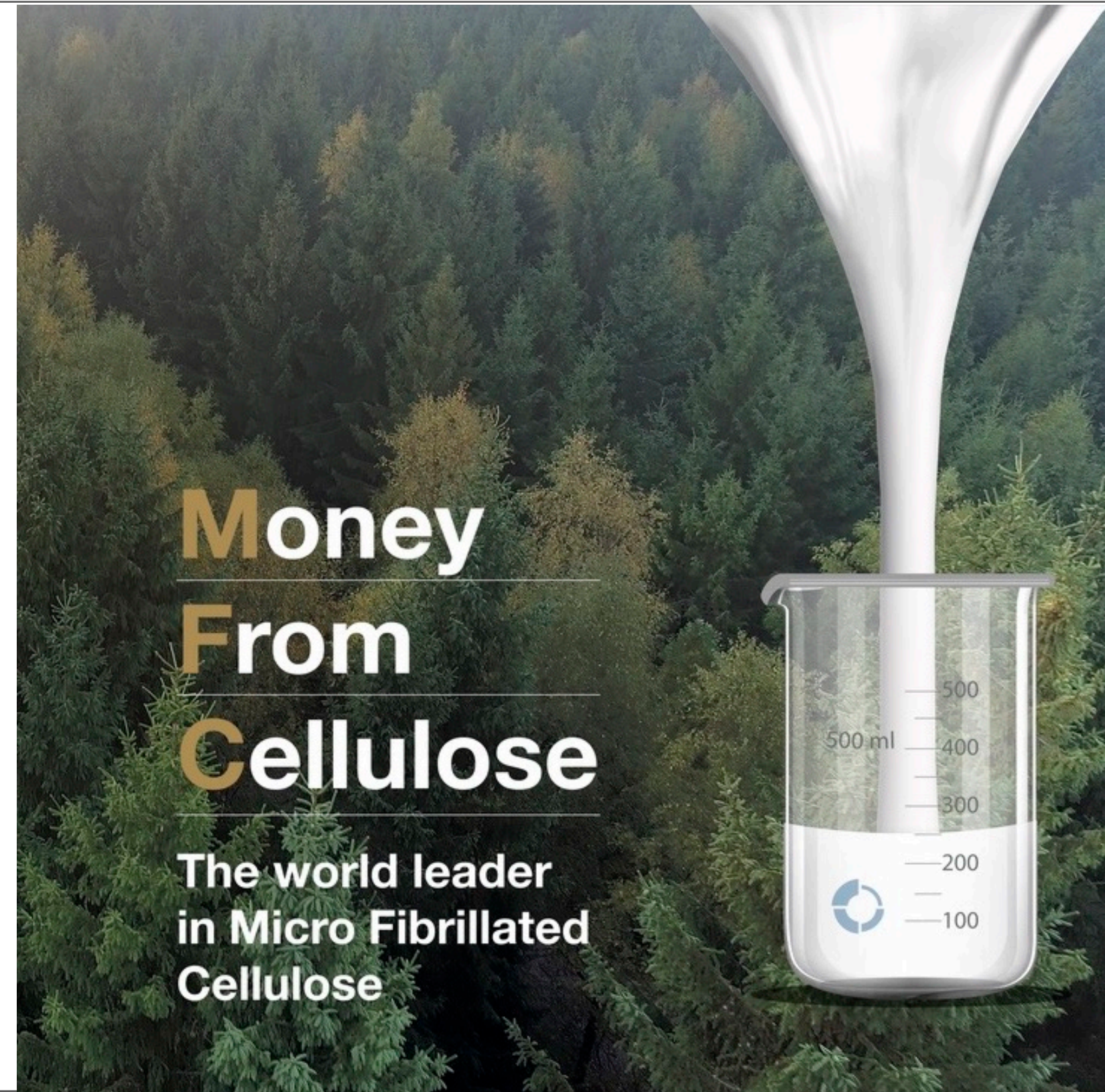


Ready for up to 100 million EUR in CapEx savings...and millions annually for higher value grades? Join our BDC FiberLean MFC webinar on December 13, 9 AM EST to learn more.

Meet Enrico de Landerset, CEO, and Danny Ingle, COO of FiberLean Technologies, to find your role in the MFC revolution—already well underway for paper and board producers

You will learn the latest about FiberLean MFC (micro-fibrillated cellulose) products and know-how to deliver millions from cellulose to producers—providing proven economic and ecological advances onsite and with ease.

<https://docs.google.com/forms/d/e/1FAIpQLSfWS8d0-Z5x0LeRR9dgc4BMkKbLRv7rj9LDtlQptiDqq24u5g/viewform>



**10s of millions CapEx rebuild  
value for \$0**

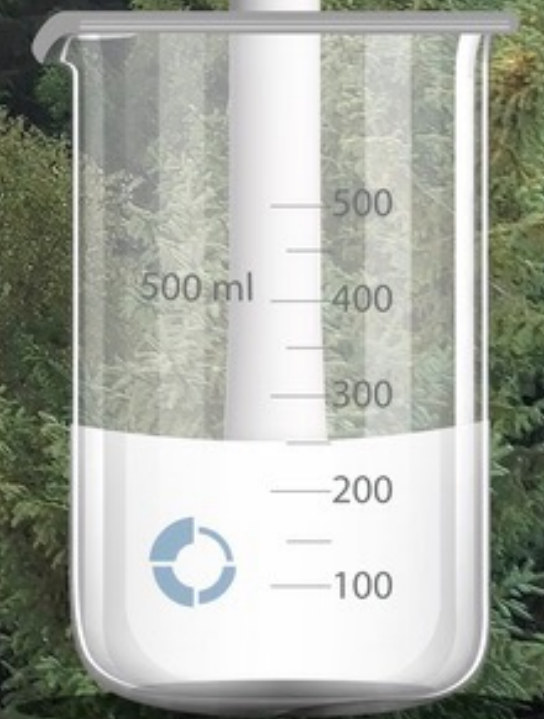
**2-10 million annual cost  
reduction**

**Entering new grades**

**Biomaterial sustainability**

**Money  
From  
Cellulose**

**The world leader  
in Micro Fibrillated  
Cellulose**





TOGETHER,  
PAPER & BOARDMAKERS CAN  
STOP OCEANS OF WASTE AT THE  
SOURCE. HOW?

- ✓ Better wet & tear strength for stronger paper bags over plastic
- ✓ New bio barriers to replace plastics



# What is MFC (Micro-Fibrillated Cellulose)

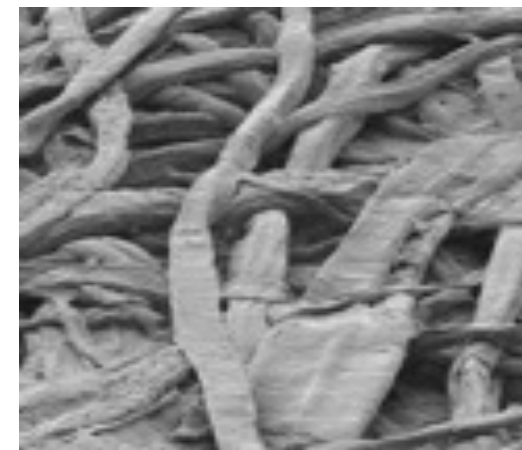
Cellulosic fibres engineered with our patented technology into small networks of high performing fibrils.



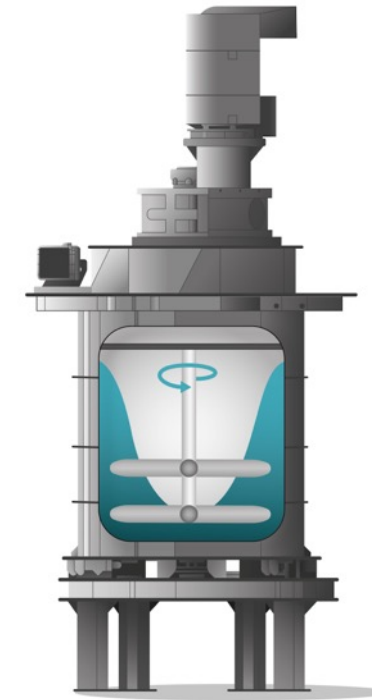
Trees



Wood chips



Cellulosic fibers



FiberLean  
gentle  
precise  
grinding  
process



Waste paper bales



Recycled fibres

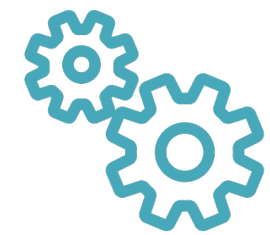
# Why Micro-Fibrillated Cellulose From us?



We can bridge the gap, towards a stronger, cheaper, and greener future.



Reduced raw materials usage



Improved properties



Enhanced quality and new products



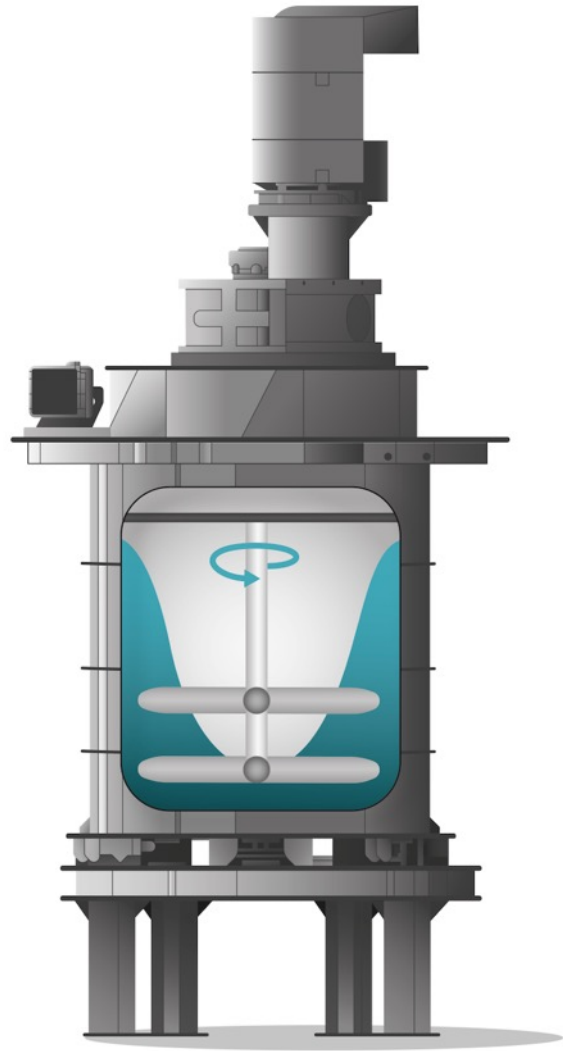
Improved process

**MASSIVE SAVINGS**



# 14 years, 650 patents to make success simple

“We gently grind cellulose with finesse vs. over-refining... gaining twice the commercial value at lower cost”



MFC Modules: custom recipes for efficiency & value creation



Scalable industrial onsite know-how



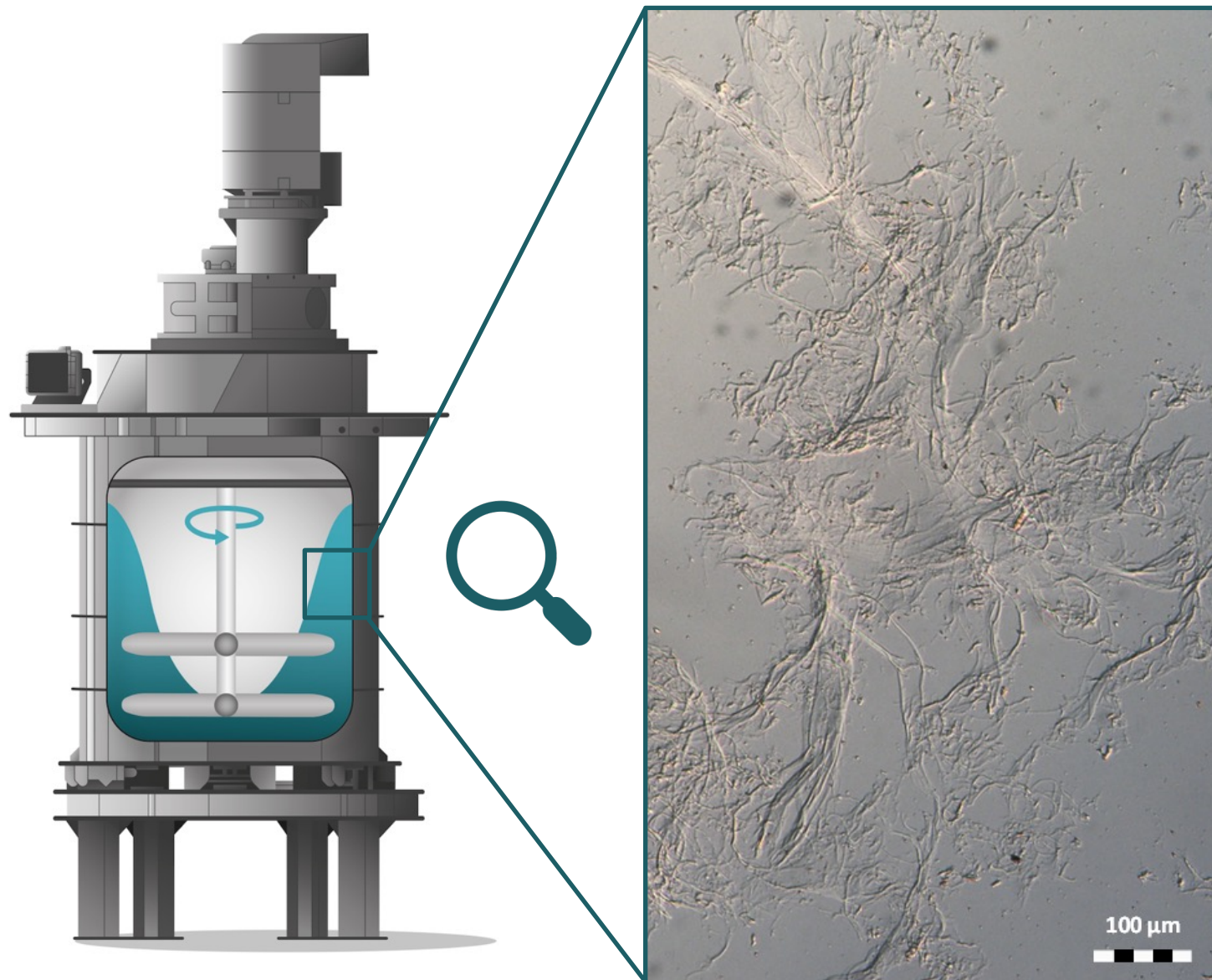
MFC FLoT JET Applicator  
Your 50– 100 million EUR self financing  
“white top liner” revolution



# FiberLean Grinding Technology: The most efficient and effective way of making MFC at scale



## Ultra-fine grinding in FiberLean mills



### The unique FiberLean® process:

Creates interconnecting fibre

### Networks

that are highly-fibrillated for

### Strength

maximising MFC product

### Performance

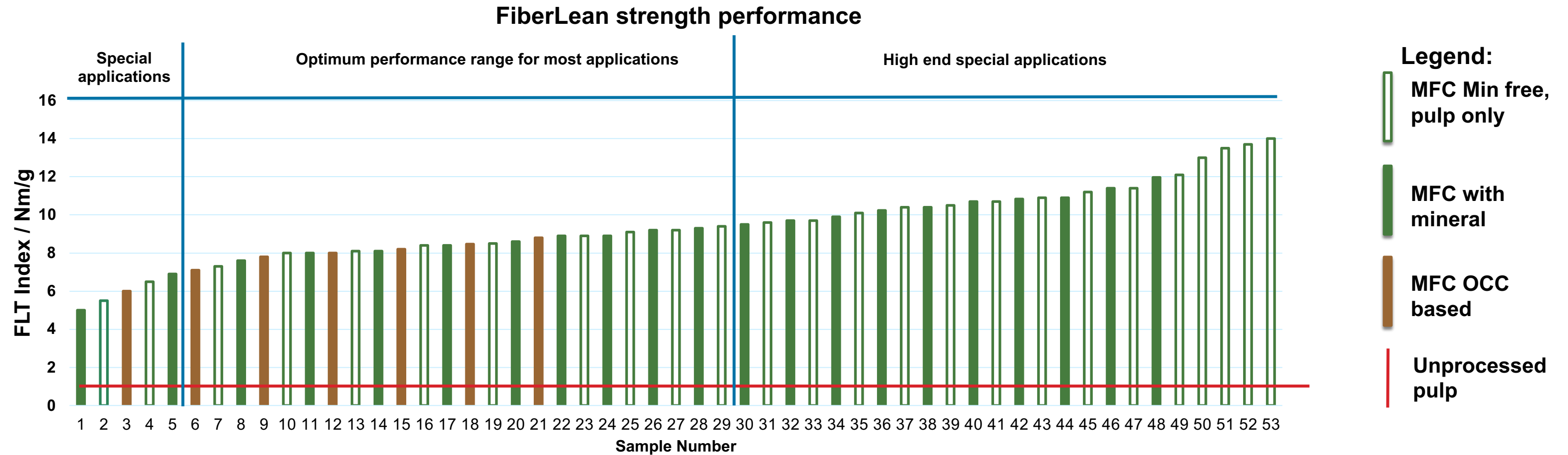
Our **robust grinding** process transforms fibres through **milling** with carefully **controlled intensity**, liberating an **optimal "micro fibrillated" network** structure.

## High-performance MFC produced onsite

- ✓ High-throughput continuous operation.
- ✓ Low maintenance costs and high uptime (>95% plant availability).
- ✓ 100% mechanical process, Chemical-free process.
- ✓ Highly-automated modular plant design with online monitoring.
- ✓ Top performance reached in one single stage
- ✓ Low energy consumption and low operating costs



# FiberLean offers a wide range of MFC tailoring the quality to fit the performance customer needs

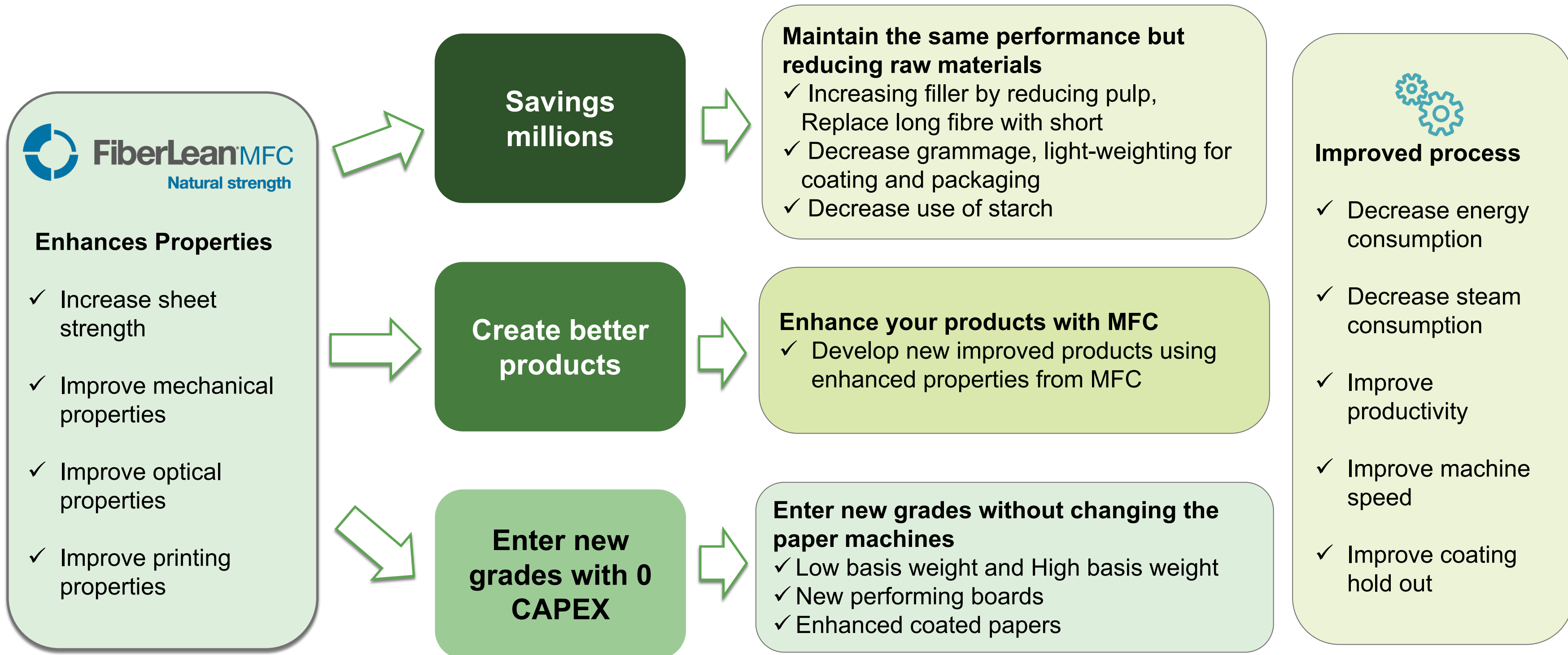


- FiberLean® MFC “Mineral free” is made with “Pulp only” at varying levels of fibrillation reaching the highest performance
- FiberLean® MFC can be tailored to fit the specific customers’ application needs with several fibre types and with mineral;
- FiberLean® MFC can be produced from recycled fibres also (e.g. OCC, Office Waste, etc...)

**MFC and Composite formulations to meet customer performance need!**  
**The only limitation is your imagination**

FiberLean uses a “MFC tensile index” to measure the performance since 2012, when we validated the correlation with product performance. Fines used from other actors in the market does not directly measure the fibrillation, but the size reduction.

# FiberLean® MFC modules: unique cost-saving platform... a premium quality foundation—a runway for new grades





# Your path for millions gained and sustainability



Folding box board



Coated recycled board

20 to 80 EUR/ton  
in raw material cost  
reductions and  
efficiency gains.  
Saving Millions of  
EUR/year.



Copy paper /  
uncoated



Coated paper



Containerboard



White top liner

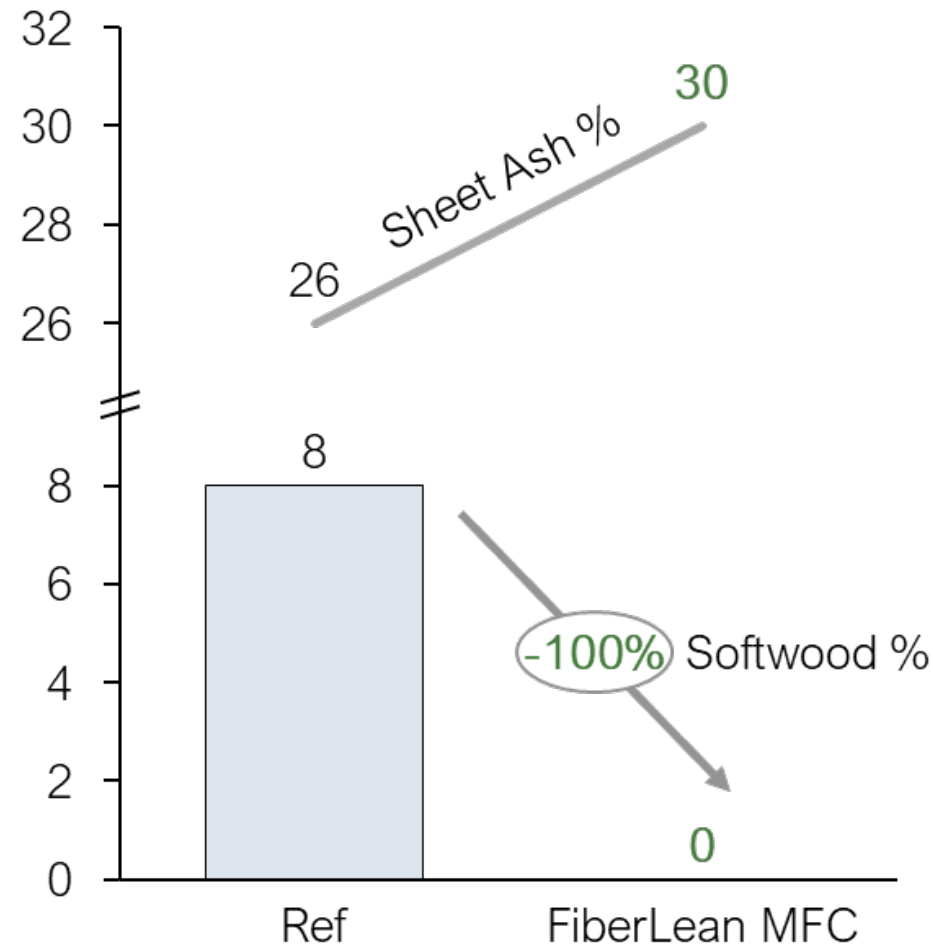


Specialty  
paper

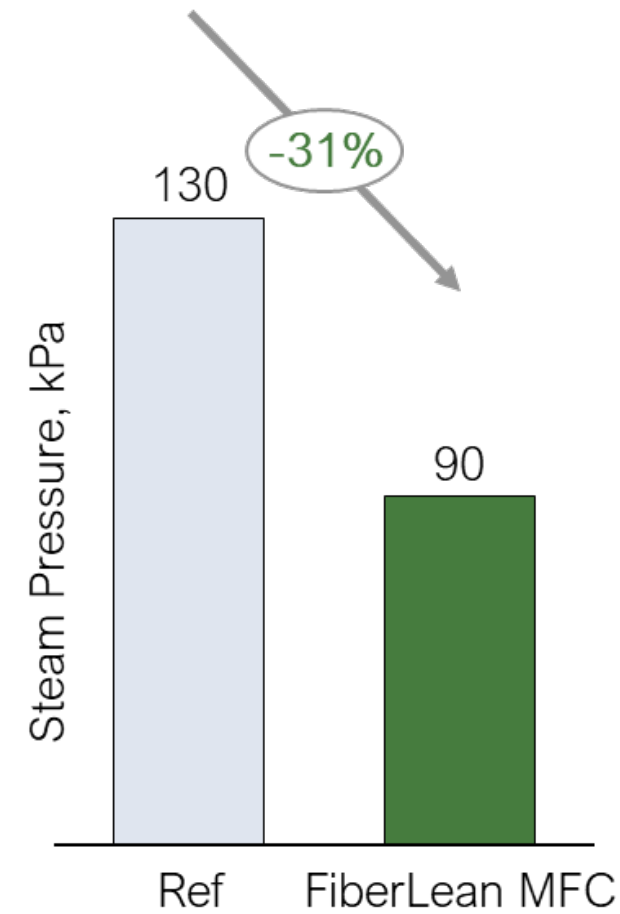


Tissue

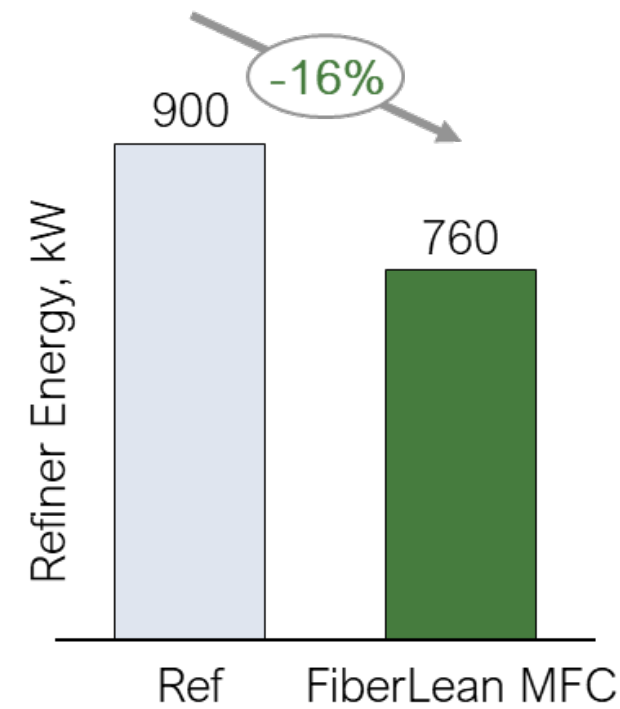
# FiberLean® MFC in Printing & Writing Paper: One example of filler increase & softwood elimination from our customer



Replace fibre with filler & eliminate Softwood



Reduce steam consumption



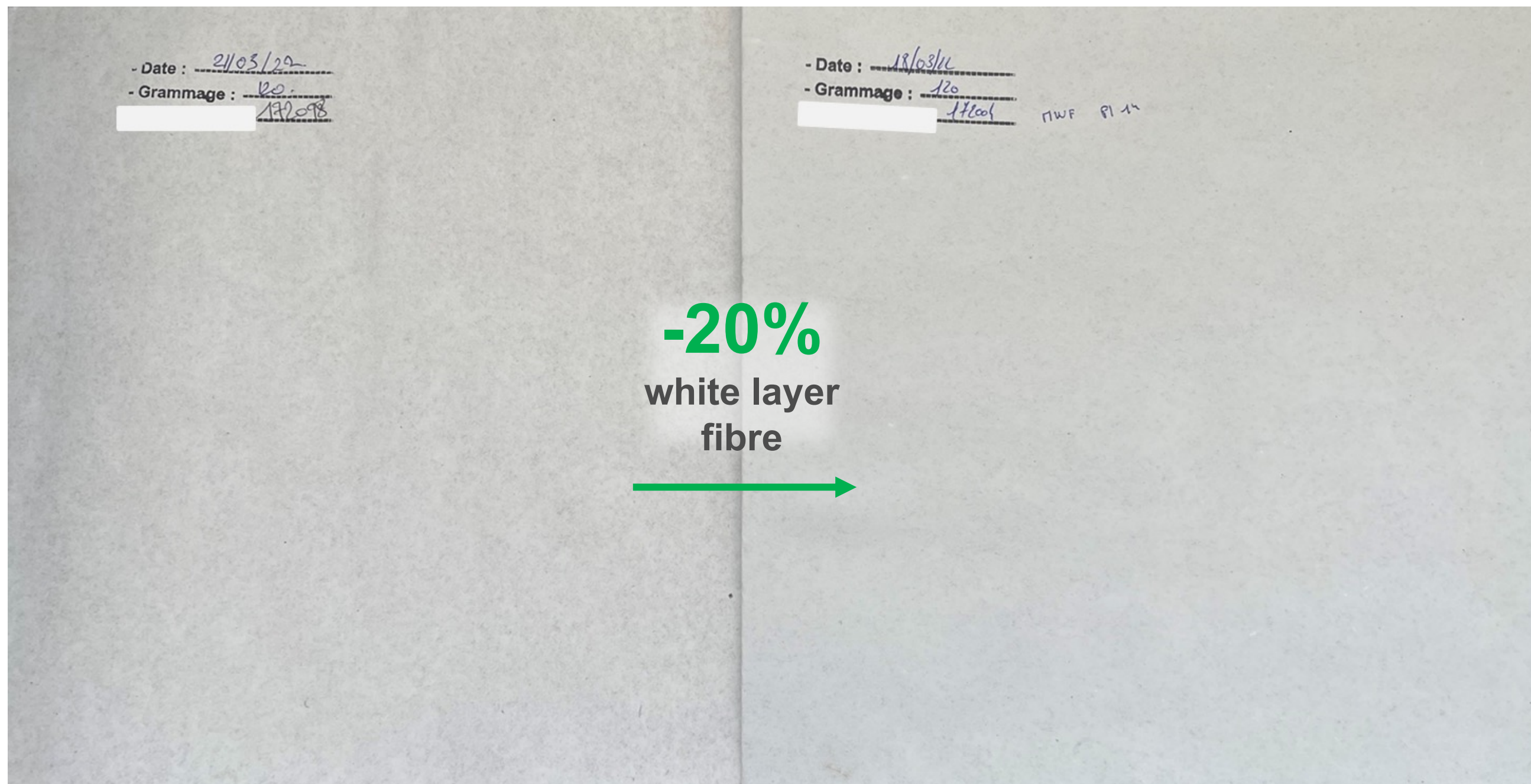
Reduce refining energy



Efficiency gains & Cost savings:

**25-35 EUR/t**  
of paper

# FiberLean® MFC in White Top Liner: An example of improved properties and lower costs for our customer



Reference

FiberLean® MFC

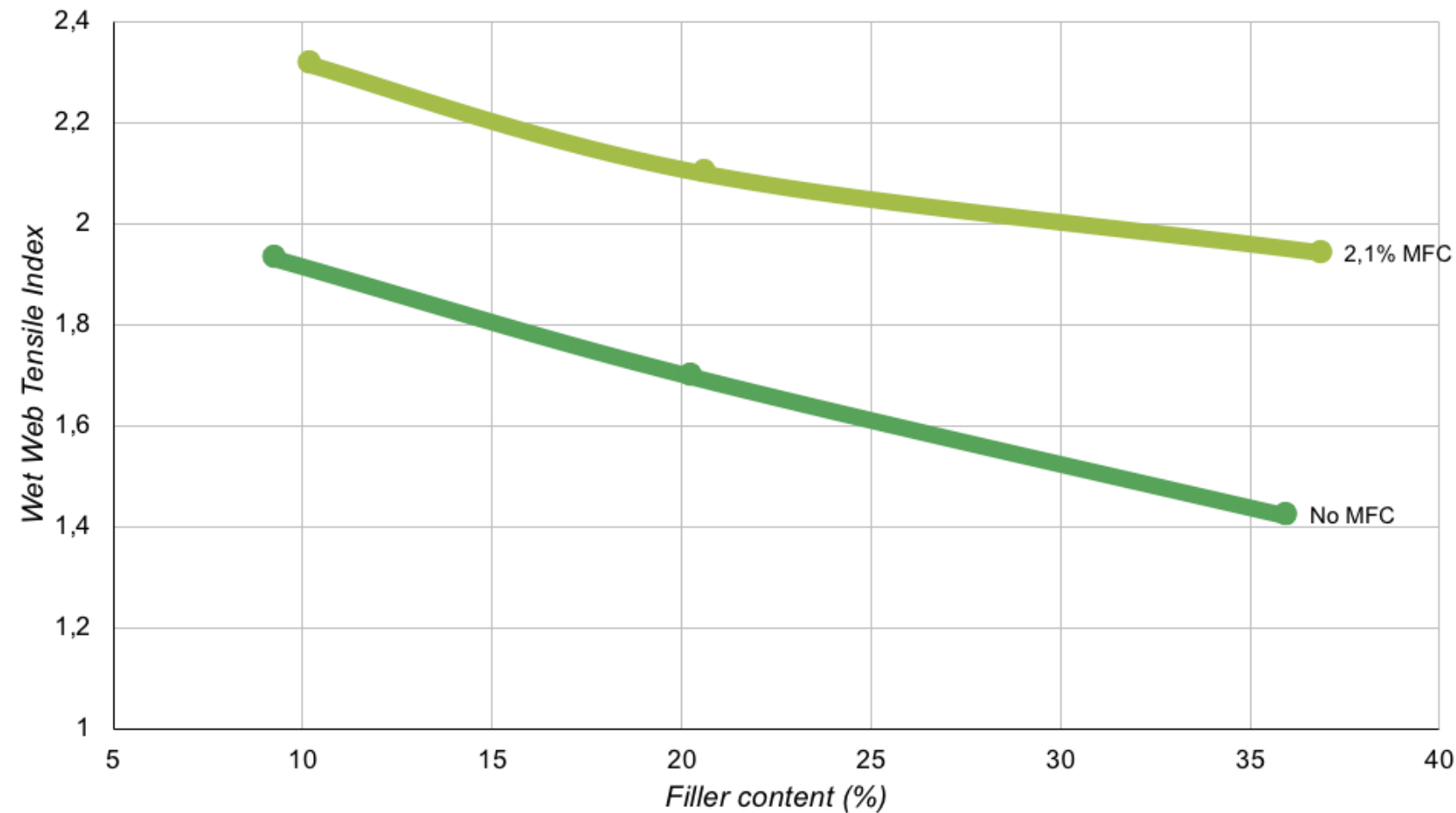


Combine improved quality and cost savings

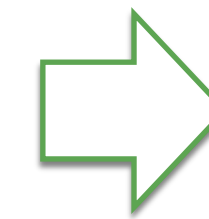
15-25  
EUR/t  
of paper



# FiberLean® MFC contribution for changing grades



Reference paper target



Paper made with MFC



Quality reached

Increase of wet web strength improves machine runnability and reduces web breaks

➔ Allows to change to new grades

- ✓ Improved mechanical paper properties
- ✓ Filler level maintained
- ✓ Machine runability kept



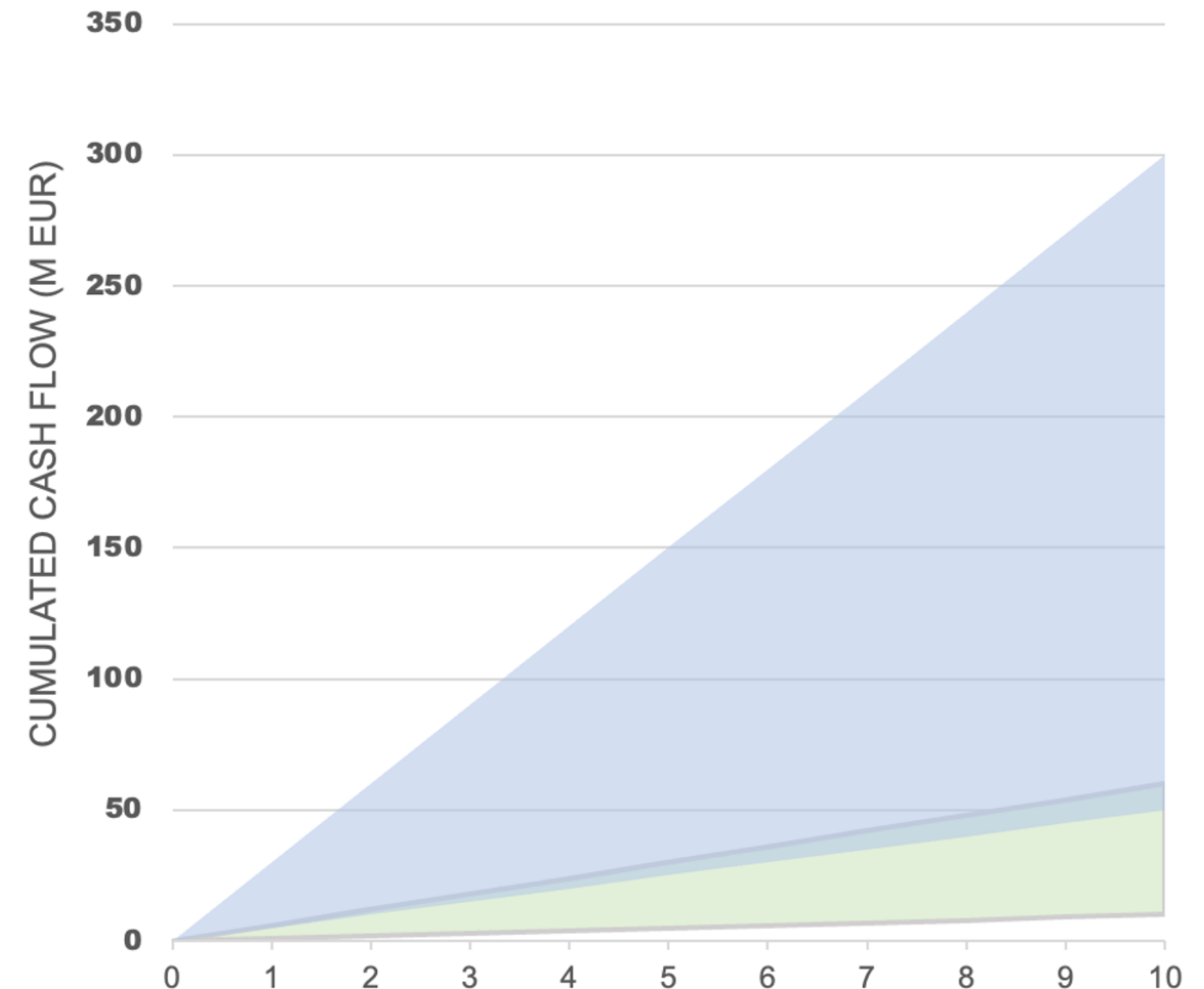
# Our solution – your savings

## Your savings coming from onsite FiberLean production unit

- In paper and board applications, FiberLean is able to generate savings from 10 to 60 USD (depending on mill specific variables and performance requirements)
- The savings for the customer for a FiberLean plant addressing 100,000 paper tons may vary from 1 to 6 millions USD per year
- The savings for the customer for a FiberLean plant addressing 500,000 paper tons may vary from 5 to 30 millions USD per year

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## Cumulated potential savings



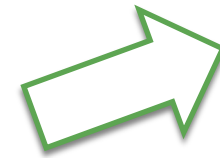


# Surface applications to up to \$100 million CapEx and produce equal or better quality grades for less...or entirely new biomaterial grades

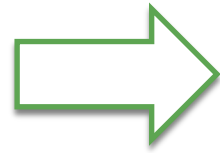


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**Our Surface applicator technology will save you millions in CAPEX**



**Apply our sustainable MFC based barrier just using an applicator**



**Produce White Top Liner just applying a MFC based coating on top of your brown layer**



**Reduce dependency of starch by replacing it with MFC and improve ply-bond**

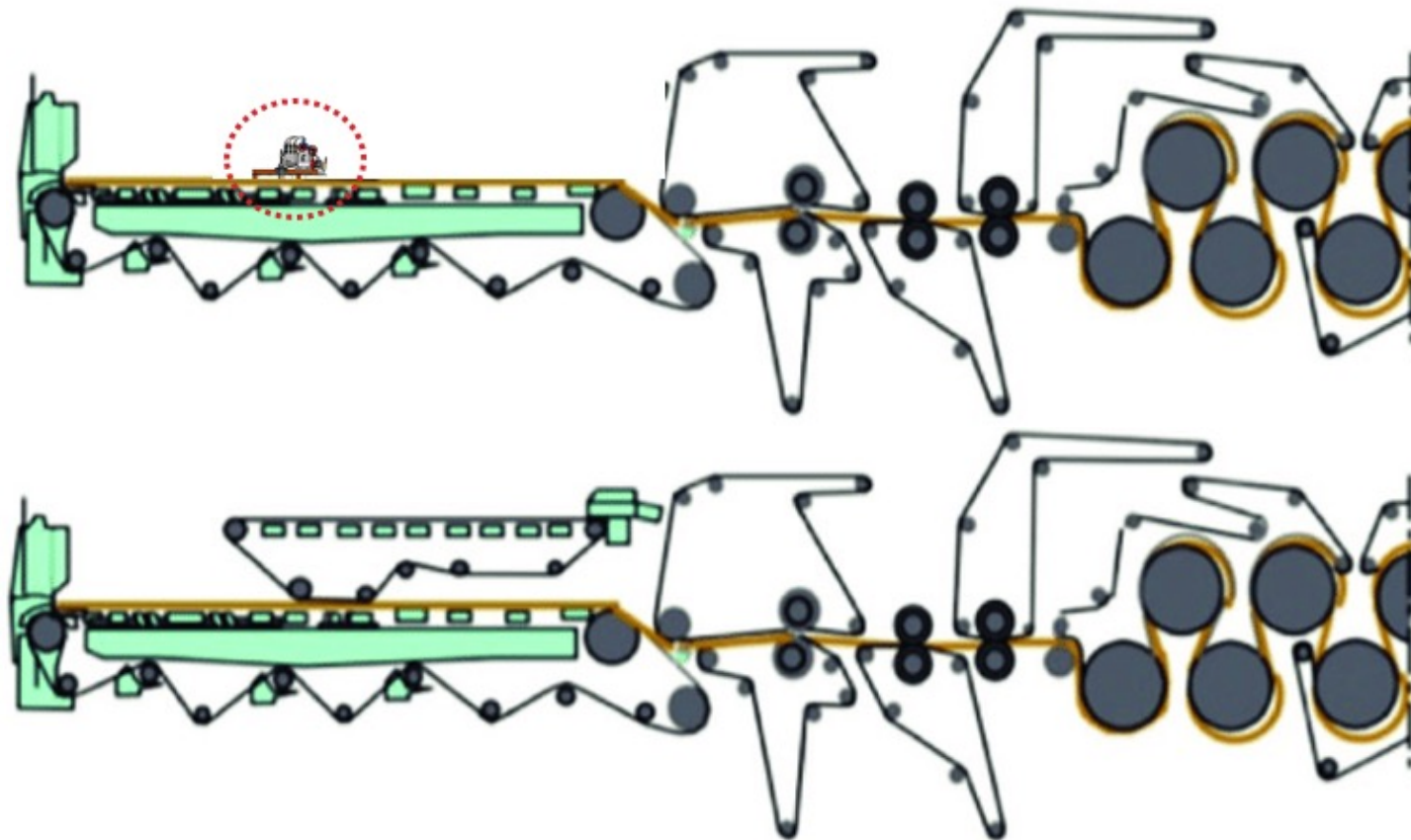


**Surface applications to tens of million CapEx**  
produce equal or better quality grades for less...  
or entirely new biomaterial grades

# FiberLean on Top is aimed at making White Top Liner for printed white corrugated boxes



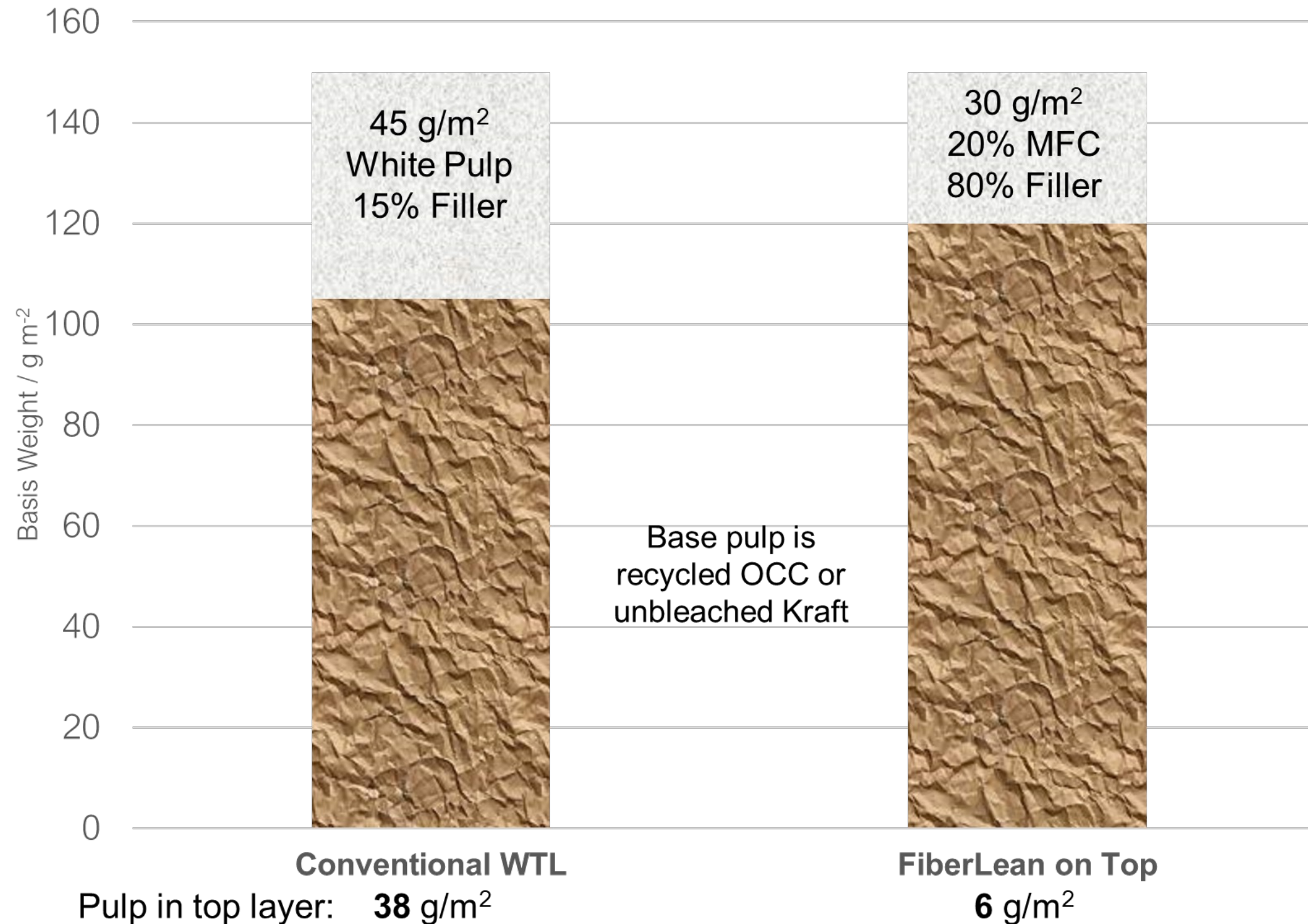
- The #1 papermaking segment.
- Continues to grow.
- Packaging increasingly used for advertising.



Converting linerboard to WTL, using an applicator on top of the wet-end and existing paper machine equipment for water removal.

Instead of having to add a complete forming unit with need for a separate pulp preparation line and water recirculation system. **A major investment to be avoided.**

# Conventional White Top Liner and the new “FiberLean on Top”



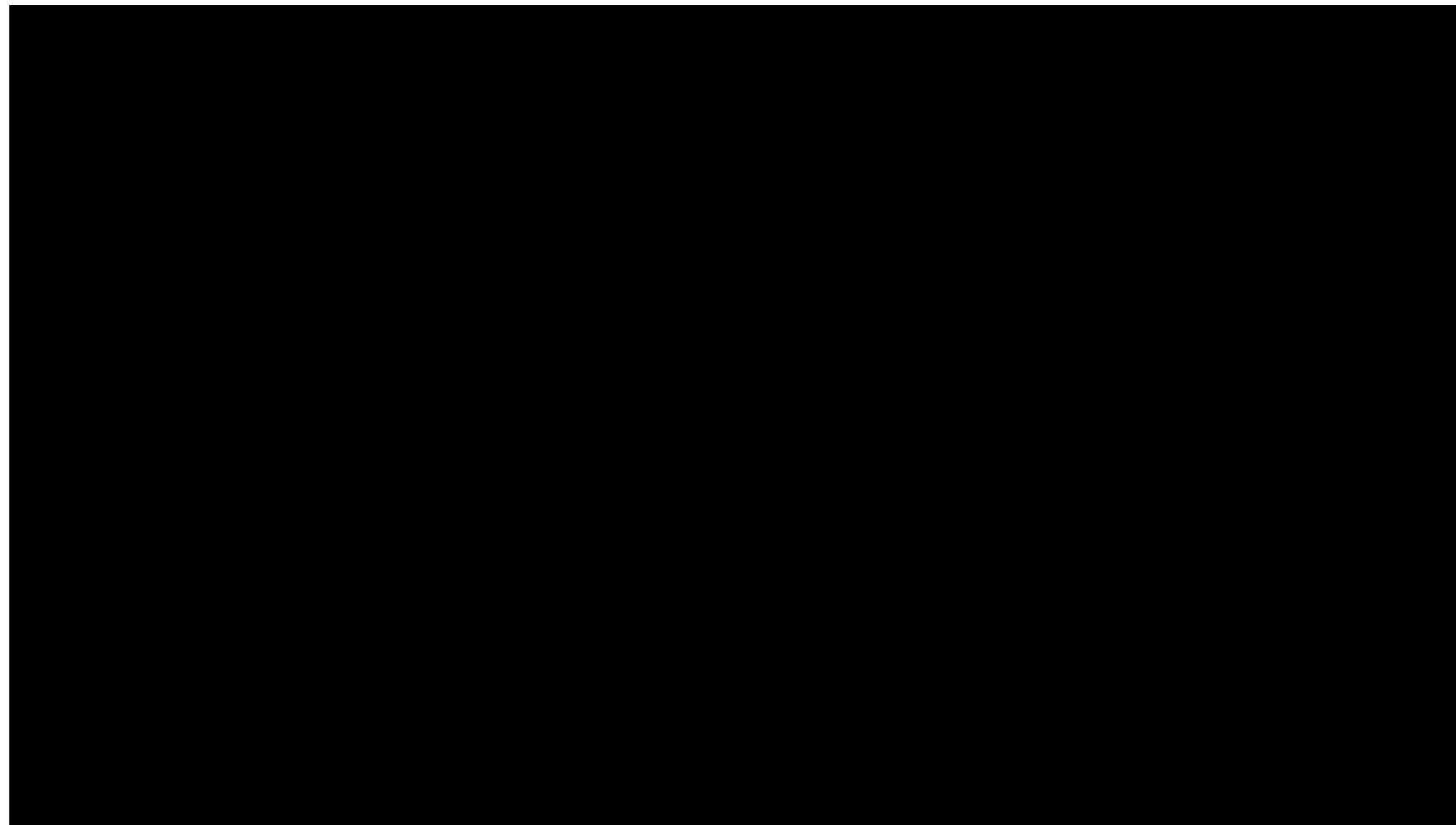
The 6 g/m<sup>2</sup> of pulp in top ply is upgraded to MFC in the FiberLean process and used as the binder to give strength to the high mineral content coating.

No other additives required, except for sizing agent.

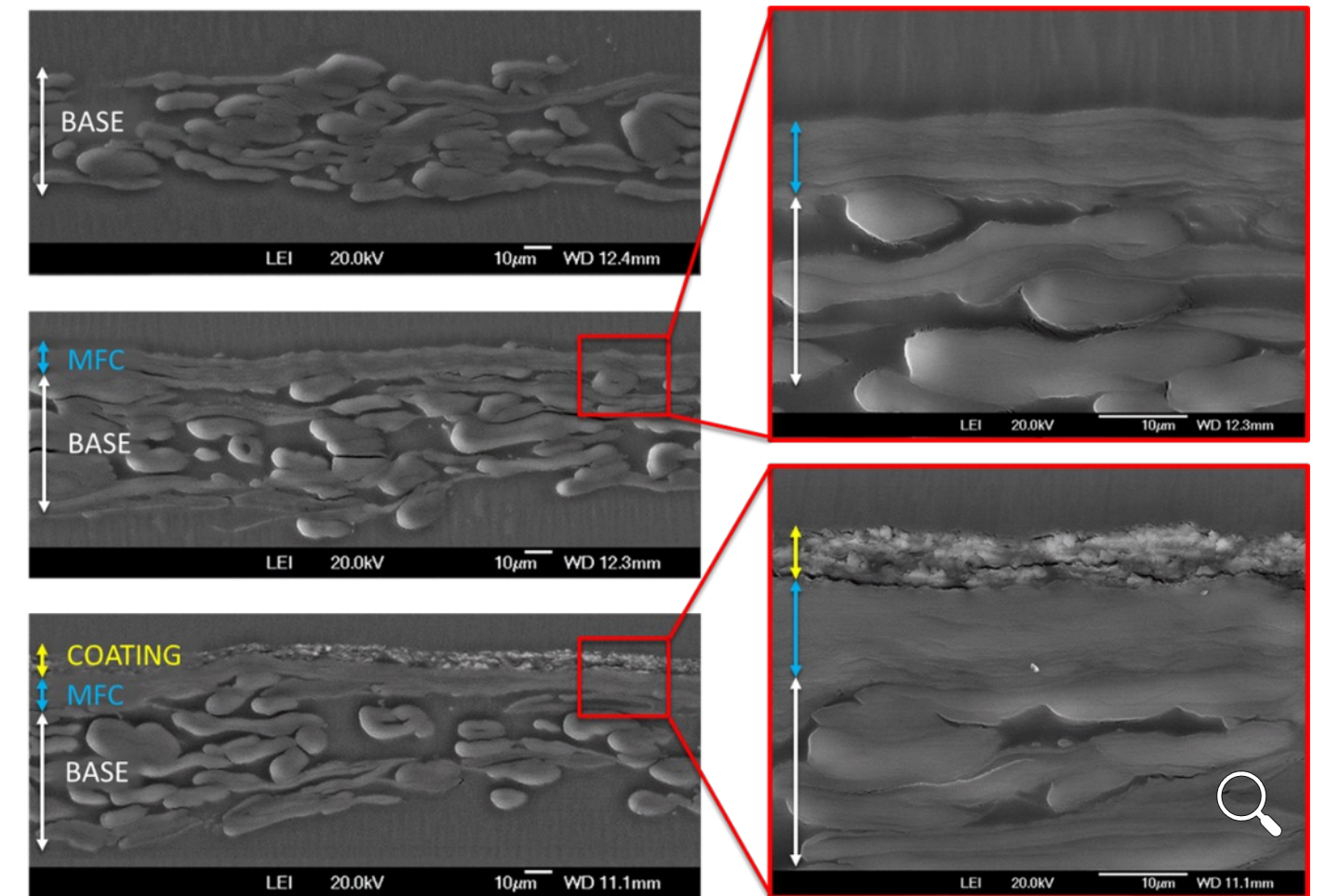
# Surface application for barrier in action



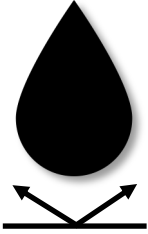
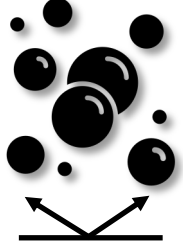
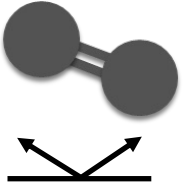
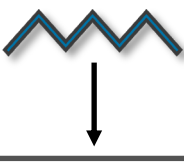
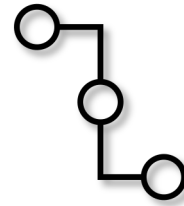
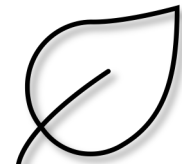

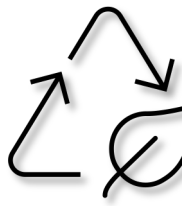
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KIT 12 oil solution being applied to paper surfaces.



Cross-section Imaging: Scanning Electron Microscopy (SEM)

-   
**Oil & Grease**
-   
**Mineral Oils  
(MOSH & MOAH)**
-   
**Oxygen**
-   
**Smooth & Closed  
Surface**
-   
**High Strength &  
Durability**
-   
**>99% Bio-based**
-   
**Recyclable**
-   
**Biodegradable**



It takes experience and great skills to run at 2000m/min  
No matter your machine speed we can provide full-scale trial support

**Ready to explore MFC? We are ready to take you there as fast as you like**

# Having the capability to run extensive mill trials is key to evaluation of MFC



**MFC trial make-down unit, re-dispersing granulate FiberLean MFC to slurry for use on paper machine.**



**FiberLean**<sup>®</sup>  
Technologies

# Ready for your **Disruptive**, productive biomaterials takeoff?





# Many thanks for your attention Q&A



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# Frequently asked questions

**What is the main advantage of using FiberLean® MFC solution?**

The MFC generated from the FiberLean process provides higher performance with low variable costs, half dosage of FiberLean MFC compared to other MFC solutions to reach same performance

**What are the main advantages of the FiberLean® MFC modules?**

Our MFC facility is based on modules that are easily scalable; an MFC plant requires smaller footprint and Lower CAPEX than other solution for the same performance.

**How does Fibrillation process works?**

Tailored force distribution in the grinder efficiently fibrillates the fibres whilst minimising damage to liberated MFC particles

**How effective is an MFC module?**

It produces a very high performance MFC continuously in a single stage; the performance can be tailored, FiberLean can deliver more than 250 recipes using different pulp and performance

**Do I need a separate cooling system ?**

No, the FiberLean module doesn't overheat; the mechanical process doesn't involve any abrasion of metal components

**What is the energy consumption compared to existing technologies?**

The total energy consumption is lower compared to other technologies;

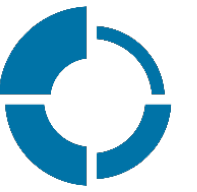
**Do I need to replace parts frequently?**

No, the module requires low maintenance level and minimal spare part replacement

**Why shall we choose FiberLean business model?**

FiberLean has more than 14 years experience in MFC, and 10 on full industrial scale. FiberLean delivers at the customer site a high performing MFC and can tailor the process to fit the customer needs. FiberLean solution is a plug and play "MFC program" without needing to set up a very expensive organization to support, requiring know how, facilities or relevant hidden costs for services.

FiberLean and the customers interests are always aligned



# BACK UP

# Printing with aqueous industrial inkjet have shown spectacular results



## Images scanned from printed prototype



- No need for pre-treatment.
- Reduced ink demand.
- Minimized ink smearing.

**”Tests performed on pilot samples strongly suggest that inkjet printing onto FiberLean surfaces result in significantly higher colour density compared to paper surfaces. The reduction of ink requirement would have great benefits, directly and indirectly, on the economics of inkjet printing.”**

*(quote from our inkjet printing press manufacturer partner)*

# Innovation with fibre-based barrier packaging to replace plastics is critical for a more sustainable future



## Drivers:

- Consumer awareness
- Single-use plastics directive (SUPD)
- Reduction of petroleum-derived materials use
- PFAS bans
- Demand for sustainability (recyclable, biodegradable and compostable bio-based packaging)
- Natural-themed packaging is on trend



“As governments and brands increasingly look for alternatives to plastic packaging and food service formats, the paper and board sub-segment will assume an increasingly critical role.”

Smithers, 2019

‘The Future of Functional & Barrier Coatings for Paper & Board to 2024’