CELLULOSE INTERNATIONAL SUMMIT 2026

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Co-organized by:

MFC in Moulded Fibre – Beyond Lightweighting

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FiberLean
Strength by Design

FiberLean Introduction

Leading independent supplier of MFC production equipment

- Wet grinding technology (stirred media mill) – **FiberLean MFC Grinders**
- Experienced project implementation and engineering team
- Expertise and experience in MFC production
- Industrial scale demo plant and pilot plant, operating since 2014
- Trials **worldwide**
- Process development and application support to customers

MFC for Moulded Fibre

- Added to the surface
  - Improved surface properties
  - Oil/grease barrier properties
  - Oxygen barrier properties
  - Barrier primer layer

- Added to the base furnish
  - Improved mechanicals
  - Reduced porosity
  - Increased density
  - Improved surface properties

Lightweighting

What is possible?

(**0%** MFC) KIT = 0 out of 12

(**10%** MFC) KIT = 0 out of 12

(**17%** MFC) KIT = 4 out of 12

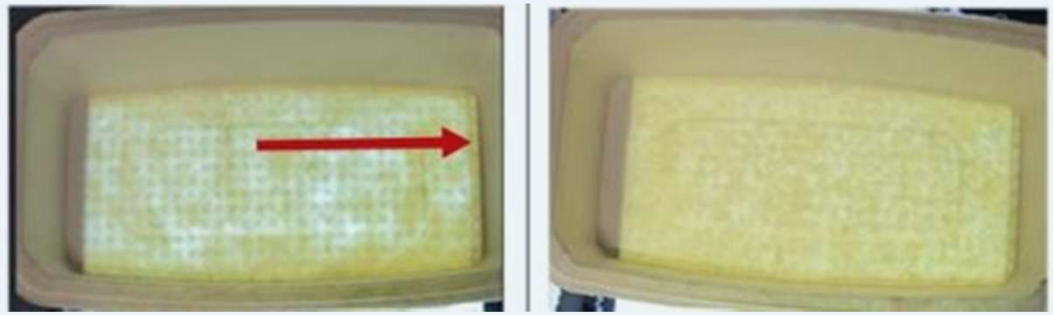
MFC Content (%)	Tray Basis Weight (g/m^2)	Tensile stiffness index (Nm/g)	Tensile strength index (Nm/g)	Tensile stiffness (N/m)	Tensile strength (N/m)	Bendtsen Porosity (ml/min)
0	480	2.63	21.2	1270	10.2	2750
10	**380**	**3.45**	**37.2**	**1300**	**14.0**	**160**
17	**280**	**5.04**	**53.0**	**1430**	**15.1**	**15**
25	**175**	**5.37**	**56.4**	930	**9.8**	**4**

Pilot scale study

- Up to **50% reduced object weight** whilst maintaining strength, stiffness and mouldability
- **Greatly improved smoothness**, and **reduced porosity**
- **Improved hold-out** of functional coatings and effectiveness of sizing
- Increased **density**
- Reduced **dusting**

Lightweighting

What is possible?



Improved Formation

- Commercial moulded fiber line
- **Most properties improved** with addition of MFC
- An increase in cycle time was observed with the addition of MFC at a constant article weight, but this was offset by lightweighting

Property	Performance
Article Weight	-15%
Density	+16%
Gurley Porosity	+1250%
PPS Roughness	-5.50%
Scott Bond	+120%
Tear Strength	+96%
Tensile Stiffness	+15%
SCT	+13%

Lightweighting

Why lightweight?

- Reduce fiber costs
  - Pulp prices are high and variable
- Sustainability
  - Reduced material usage
  - Reduced waste
  - Reduced transport emissions
- Reduced cycle time although likely offset by MFC addition

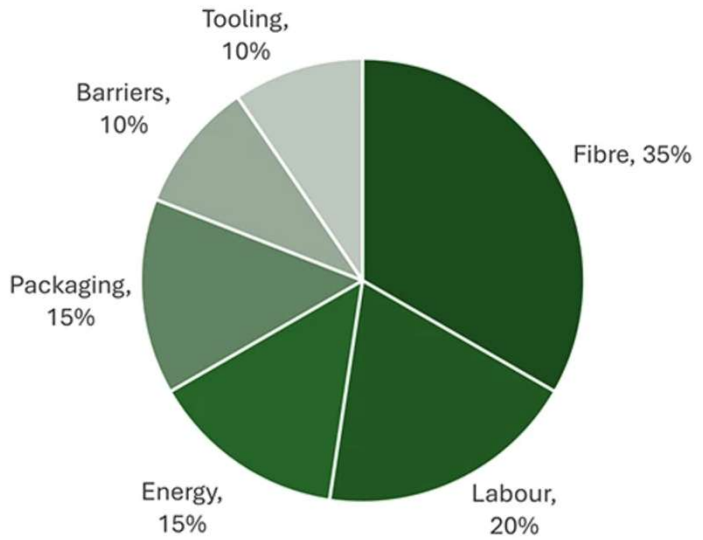


Figure 1: Variable cost of production for a typical Type III moulded fibre product.

https://afry.com/en/insight/unlocking-future-moulded-fibre-packaging-opportunities-and-challenges-in-rapidly-evolving

Beyond Lightweighting

- Improved mechanical properties – upgrade existing products
- Some machines have limited flexibility with object weight
  - MFC can improve strength without needing to add weight
  - Some weight increase possible due to densification
- Switch to recycled pulp or increase recycled pulp content – MFC can also be made from recycled pulp
- Mineral filler addition
- Wet tensile and elasticity improvements – improved mouldability and more extreme shapes possible
- Surface properties
  - Improved surface finish – increased smoothness, higher quality products
  - Upgrade products from older or less sophisticated machines
  - Improved surface for barrier coatings – lower porosity, improved hold-out, reduced fiber uplift
- MFC on the surface gives oil and grease barrier – 100% cellulose barrier

MFC for Moulded Fibre

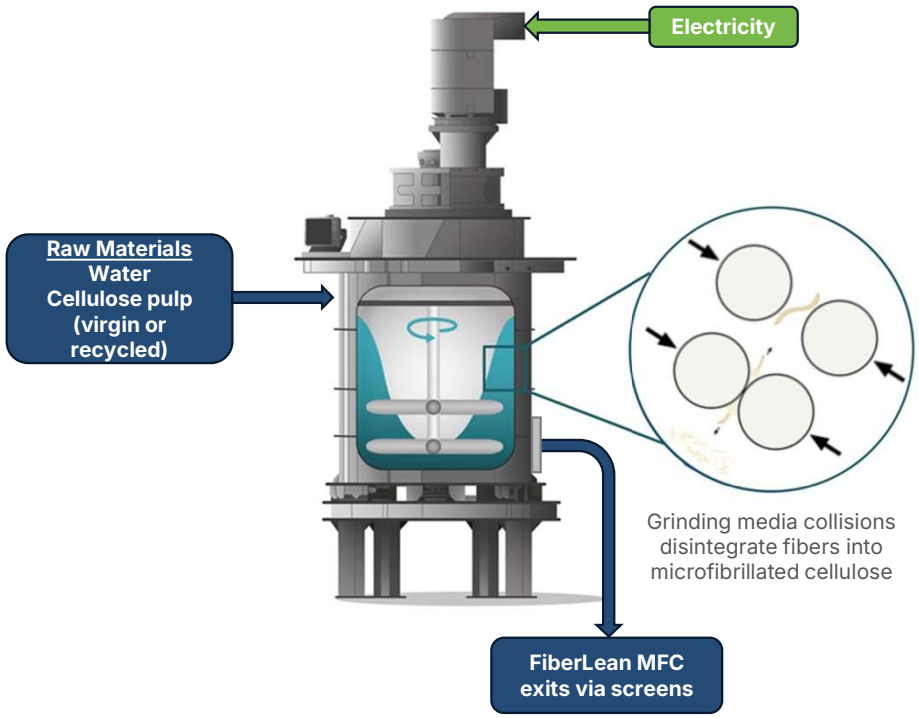
- Merchant supply – buy in MFC
  - Very expensive
  - No flexibility
  - No control over MFC or fiber source

- On-site MFC production
- FiberLean MFC grinders integrated into pulp preparation area
- G125 grinder sized to suit moulded fiber production
- Full control of MFC properties
- Capable of producing MFC from any chemical pulp and recycled pulp

		G125 Grinder
Typical use case		Moulded fiber producers
Footprint (m)		1.1 × 1.1
Max. height (m)		3.8
Capacity	kg/h	12
	tpa	100

FiberLean MFC Grinders

Wet Stirred Media Mill Grinders



How it works

- Mechanical, additive-free process
- Stirred vessel, charged with water, pulp and ceramic grinding media
- Production solids ~ 1-2%
- Fibrillation occurs when pulp gets trapped between colliding grinding media particles
- Product exits continuously through screens near bottom of mill
- Energy input is controlled with outlet flow rate and motor power
- Robust, reliable, simple, cost-effective, energy efficient design

Food Contact Clearance and Recyclability

- **BfR, FDA, ANVISA**, Canadian and Chinese food contact paper clearance
  - FDA FCN 002413
  - BfR Recommendations XXXVI, XXXVI/1, XXXVI/2 & XXXVI/3
  - FiberLean grinder produced MFC falls within these clearances
- **End-of-life**
  - MFC coated paper has been demonstrated to be:
  - **Recyclable** – PTS-RH 021:2012 – bleached and unbleached MFC coated papers passed
  - **Biodegradable** – OECD 301B – MFC suspensions with and without biocide were biodegradable
  - **Compostable** – ISO 14855 – bleached and unbleached MFC coated papers were biodegradable under industrial composting conditions
- **Not a nano-material** according to US EPA and EU definitions*
- **No negative health** effects found
  - Dietary Study
  - Physical, chemical, and toxicological characterisation
  - Inhalation risk analysis

*EU nano or not nano: An unbiased approach t classifying FiberLean microfibrillated cellulose, D. Hewson et al, Cellulose, Issue 10/2024

Summary

- Lightweighting is an important advantage for MFC use in moulded fiber
- Particularly useful to offset the impact MFC has on drainage and therefore cycle time
- There are many other impacts MFC has on moulded fiber production
- Where MFC can add value will depend on:
  - Moulded fiber products
  - The moulded fiber equipment available
  - New installation vs. retrofit
  - Limitations of existing equipment
  - Barrier performance requirements

Thank you for your attention

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FiberLean Technologies