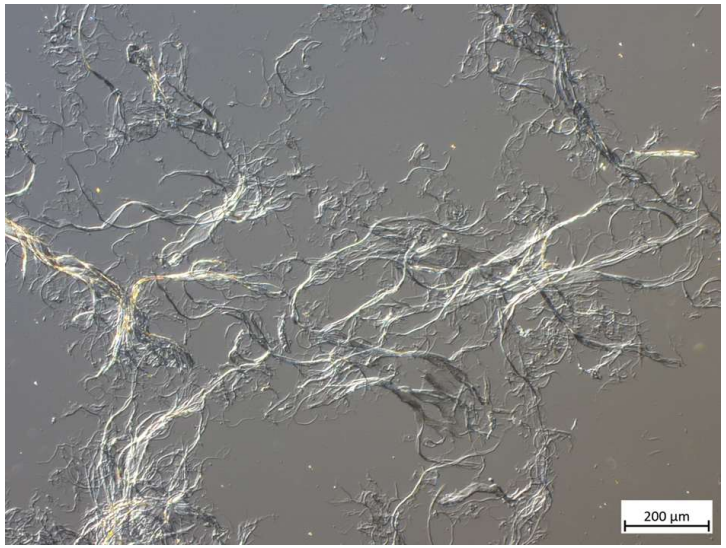
TAPPICON®

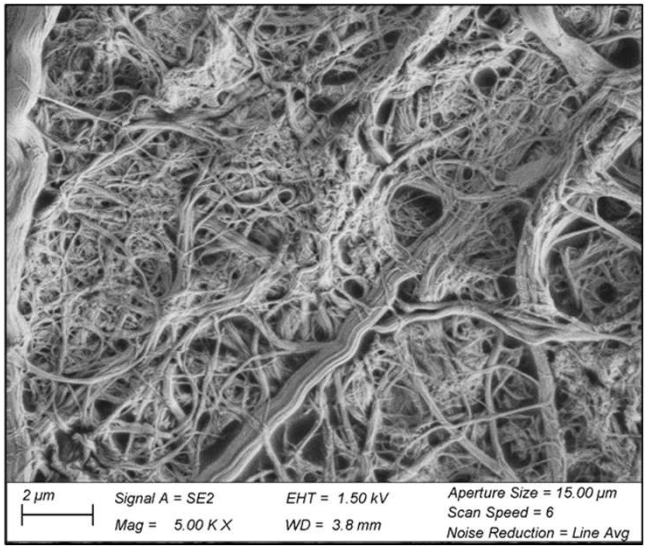
FiberLean
Strength by Design

New Technology Showcase: FiberLean G175 and G125 MFC Grinders

David Skuse – Managing Director, FiberLean Technologies Ltd.

- ***Vertical Wet Stirred Media Mill Grinders are used*** for the production of microfibrillated cellulose.
- ***Entirely mechanical process***, no chemical or enzymatic pre-treatment.
- ***Flexible operating conditions*** enable tailoring product characteristics and optimising for a wide variety of fibre feedstocks.





Established Products

Large MFC Grinder

Capacity ~ 1200 dry metric tonnes of MFC per grinder per year. Appropriate size for most paper and board applications.

New Products

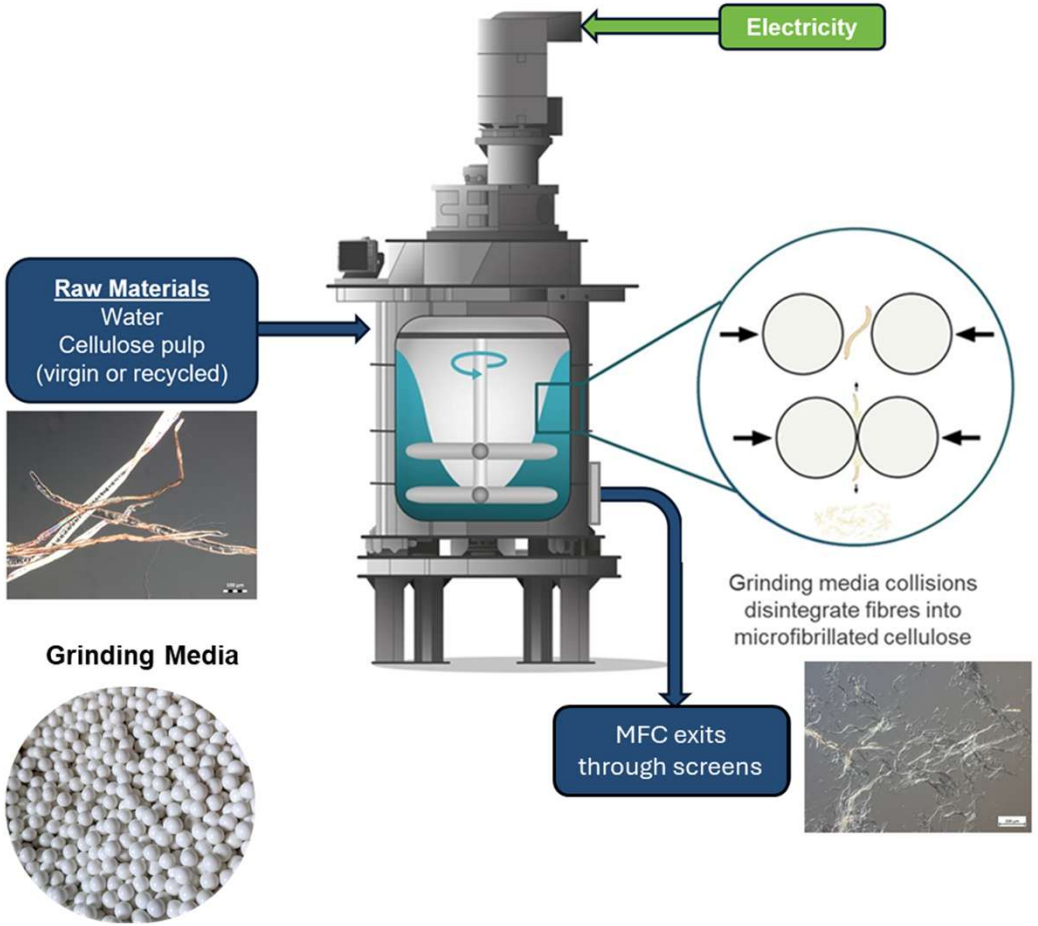
Medium MFC Grinder

Capacity ~ 400 dry metric tonnes of MFC per grinder per year. Small paper mills, tissue mills.

Small MFC Grinder

Capacity ~ 100 dry metric tonnes of MFC per grinder per year. Speciality applications, moulded fibre etc.

Stirred Media Mill Grinder Working Principles



Stirred vessel, charged with water, pulp and ***ceramic grinding media***.

Mechanical method, no chemical / enzyme pretreatment needed.

Fibrillation occurs when fibres gets trapped between colliding grinding media particles.

Grinding media are the 'working surfaces' for fibrillation; very high active surface area; permits high throughput and efficient production of MFC.

Continuous, single pass operation; energy input controlled by flow rate and motor power.

Production solids ~ 1-2% - on-site production

MFC Applications

The medium and small MFC grinders allow use of MFC in several new applications:

- **Graphic Paper** – filler increase / softwood reduction.
- **Folding box board** – chemical pulp reduction in outer layers.
- **White top liner** – fibre reduction, improved optical properties from formation improvement and filler increase.

Established applications

- **3D Moulded Objects** – fibre reduction by light-weighting, improved formation, reduced porosity.
- **Tissue** – fibre reduction by light-weighting.
- **Barriers** – MFC can form a layer which greatly improves oil and grease resistance and oxygen barrier properties for food packaging. MFC can also form a suitably smooth surface for water barrier application.
- **Specialty papers** – various (e.g. low porosity improves coating holdout; significant increases in wet web strength enables low GSM papers on machines configured for much higher GSM).

New applications

Grinder-Produced MFC: Regulatory, End-of-life, ESG

- BfR, FDA, Canadian and Chinese **food contact paper clearance**.
  - FDA FCN 002413, BfR Recommendations XXXVI, XXXVI/1, XXXVI/2 & XXXVI/3
- **Not a nano-material** according to US EPA and EU definitions*.
- **No negative health effects** found. https://pmc.ncbi.nlm.nih.gov/articles/PMC6994281/; https://pmc.ncbi.nlm.nih.gov/articles/PMC7329166/; https://pmc.ncbi.nlm.nih.gov/articles/PMC6474143/
- MFC not a final product but we have carried out the following testing to confirm MFC has no negative impact on end of life:
  - **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.
- Allows lighter products, reducing transport related emissions.
- Supports recyclability / circular economy by enabling plastic replacement in packaging.

Series Summary

Parameter	Small	Medium	Large
Body Height	125cm	175cm	250cm
Overall Height (note 1)	3.8m	4.9m	7.5m
Footprint (grinder only)	1.1m x 1.1m	2m x 2m	2.6m x 2.6m
Grinding Media Mass	480kg	2250kg	5600kg
Rated Motor Power	37kW	160kW	355kW
Typical MFC Output Tonnes per year (note 2)	100	600	1200
MFC Capacity kg/h (note 2)	12	70	140

Conclusions

- Stirred media mill grinders are an efficient and high throughput way of mechanically producing MFC.
- The new medium and small MFC grinders allow use of MFC in several new lower volume, higher value applications – 3D Moulded objects, tissue, barriers and specialty papers.

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Thank you for your attention

david.skuse@fiberlean.com info@fiberlean.com

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