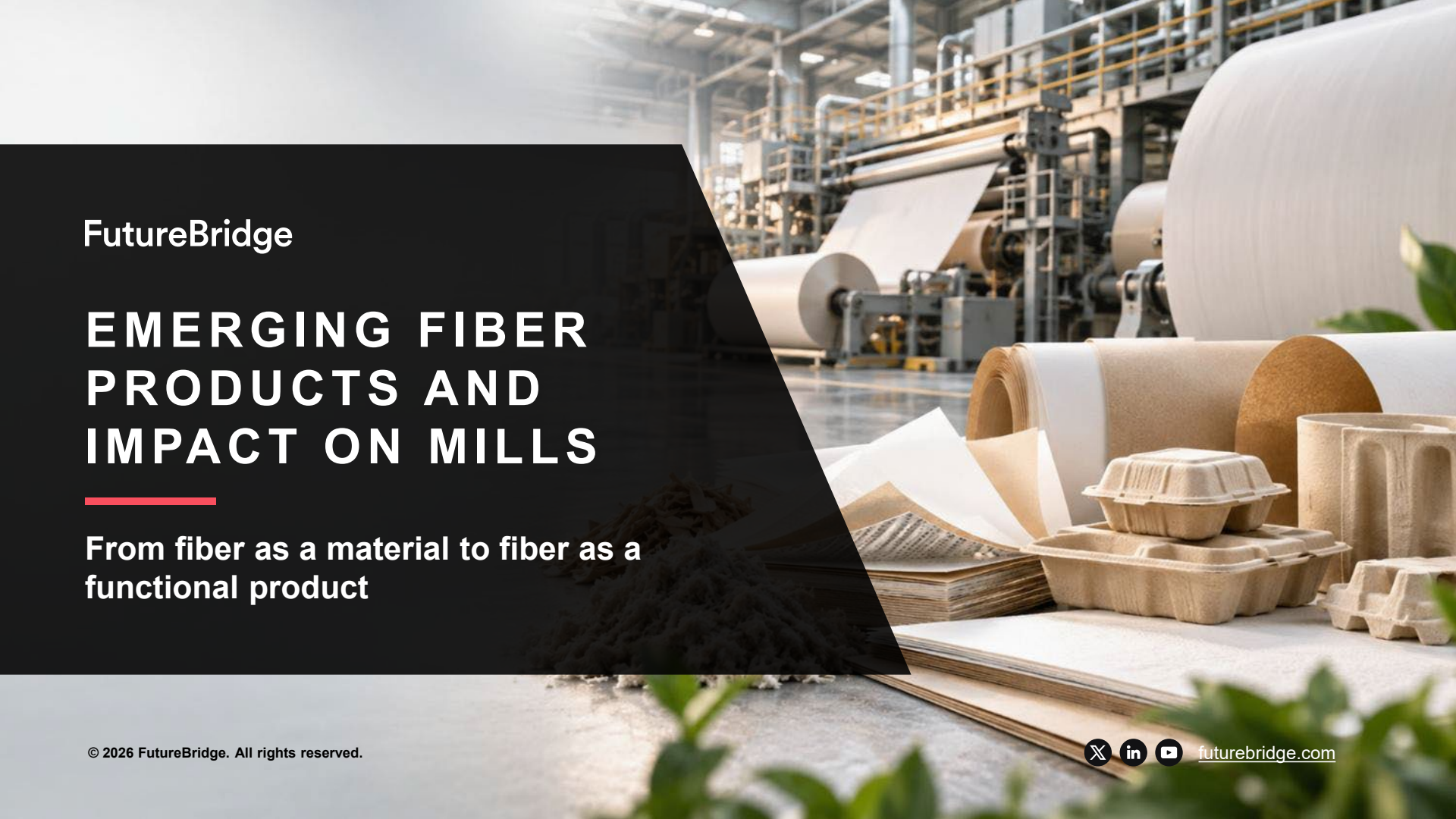




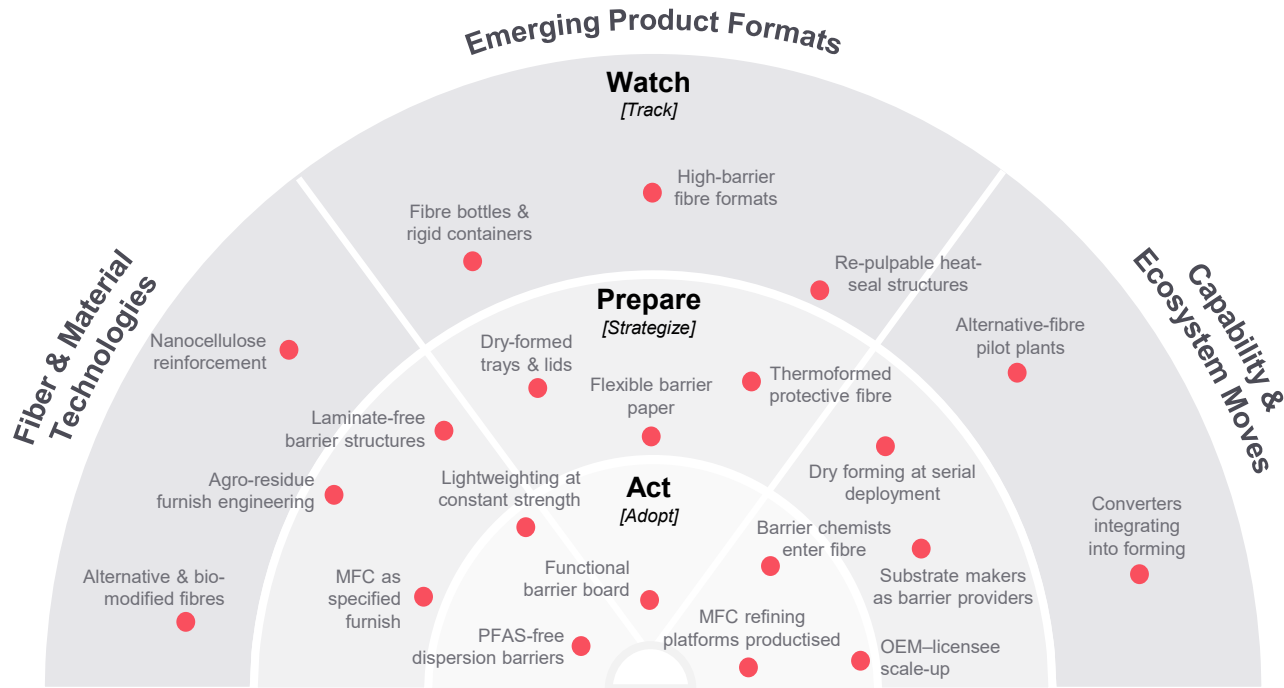
FutureBridge

EMERGING FIBER PRODUCTS AND IMPACT ON MILLS

From fiber as a material to fiber as a
functional product

Trend Radar: Emerging Fiber Products

Providing a consolidated view of emerging fiber product trends across materials, product formats and ecosystem capability



KEY TAKEAWAYS

- ▶ **Regulations are defining what mills can sell**
The EU's PFAS restriction took effect in August 2026, and thousands of food-contact paper and board products are moving to fluorine-free barriers.
- ▶ **Barrier chemistry is enabling fluorine-free coatings**
Aqueous dispersions apply through standard size presses and off-machine coaters, so the constraint sits in drying capacity and coat-weight consistency rather than in new applicator hardware.
- ▶ **Mills are starting to engineer fibre instead of just buying it**
MFC - Microfibrillated Cellulose is becoming a specified ingredient, bagasse and straw are being worked up to barrier grade.
- ▶ **Dry forming is putting a new machine inside the mill**
Dry forming makes 3D packs straight from fibre in 4 to 6 seconds, against 30 to 60 for wet molding. It is running commercially today, but at converter sites, not mills.

Emerging Product Landscape: Pulp Line and Fibre Processing

Pulp is designed around a performance target: barrier, strength, cleanliness and softness, rather than bought as a commodity input

Wet-molded fibre reformulated for food contact

Wet-formed fibre packs: trays, clamshells, from fluorochemical grease barriers to PFAS-free coatings.



Molded fibre packs are being rebuilt without fluorochemical grease barriers, using PFAS-free coatings applied in the mould or after forming.

Barrier now has to survive the forming and drying cycle, which rules out several coating chemistries.

- Incoming pulp cleanliness matters, because contamination can arrive through recycled input.

MFC / micro-fibrillated cellulose

Fibrillated cellulose as reinforcement and plastic-free barrier



Mechanical fibrillation opens the fibre structure, creating roughly 100 times more hydroxyl bonding sites than conventionally refined pulp.

- MFC then delivers strength and barrier together.

MFC-coated paper has reached oxygen permeability as low as 2.3 cc/m²/day with oil and grease resistance.

Agro-residue barrier furnish

Bagasse and straw pulps engineered to barrier-grade consistency



Bagasse and wheat straw pulps are being engineered to barrier-grade consistency, moving agro-residue from low-cost filler to a specified furnish.

Non-wood fibre requires different cooking chemistry, different washing and silica handling.

- Equipment engineered for Nordic softwood does not transfer directly.

Alternative hygiene furnish

Non-conventional tissue fibres — hesperaloe selected from 70+ candidates



Tissue and hygiene furnish is being reformulated around non-conventional plant fibres, replacing hardwood and softwood pulp in part of the mix.

A new fibre requires a new extraction line, not a modified pulp line.

- Pilot scale comes first, and commercial adoption follows the pilot by years.

Huhtamaki

Sabert
"makes food look great"

FiberLean
Strength by Design

Borregaard

TNPL

PAKKA
Packaging with a Soul

essity

Kimberly-Clark

TEKNIPLEX

KADANT

NANI
PAPERS LIMITED

Emerging Product Landscape: Board and Paper Machine Outputs

Paper grades where barrier, sealability and formability are built into the sheet on the machine, replacing plastic layers previously added in converting

Flexible barrier paper

Paper engineered to replace multi-layer plastic laminate in pouches and wraps



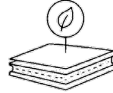
An aqueous dispersion coating applied on the paper machine now delivers grease and moisture barrier, replacing polyethylene extrusion and fluorochemical treatment.

Barrier shifts from converting to papermaking.

- The mill now owns barrier performance, and with it the drying load and coat-weight control.

Mono-material board structures

Barrier via surface engineering and coating chemistry, no laminate layer



Barrier is built into the board through surface engineering and coating chemistry, removing the laminate layer so the pack is one material.

The pack recycles without a separation step.

- Performance must now be delivered through sizing, surface treatment and calendering on the machine.

Re-pulpable heat-sealable laminates

Paper/board bulk layer with plant-based heat-seal coating, recoverable in standard streams



A plant-based heat-seal coating replaces the polyethylene layer.

- The pack seals on existing converting lines and is recovered in standard paper streams.

Sealed formats: pouches, sachets and wraps, become available to fibre without a recycling penalty.

- Coating capability decides who supplies them.

Formable / embossable paper

High-elongation paper, deep-drawn or embossed without cracking



High-elongation paper that is deep-drawn or embossed into 3D shapes without cracking, replacing thermoformed plastic in trays, blisters and cups.

3D forming enters the carton trade using existing print, die-cut and fold equipment.

- No new forming platform is needed to adopt it.

sappi



PAPTIC®



Koehler
PAPER



sappi

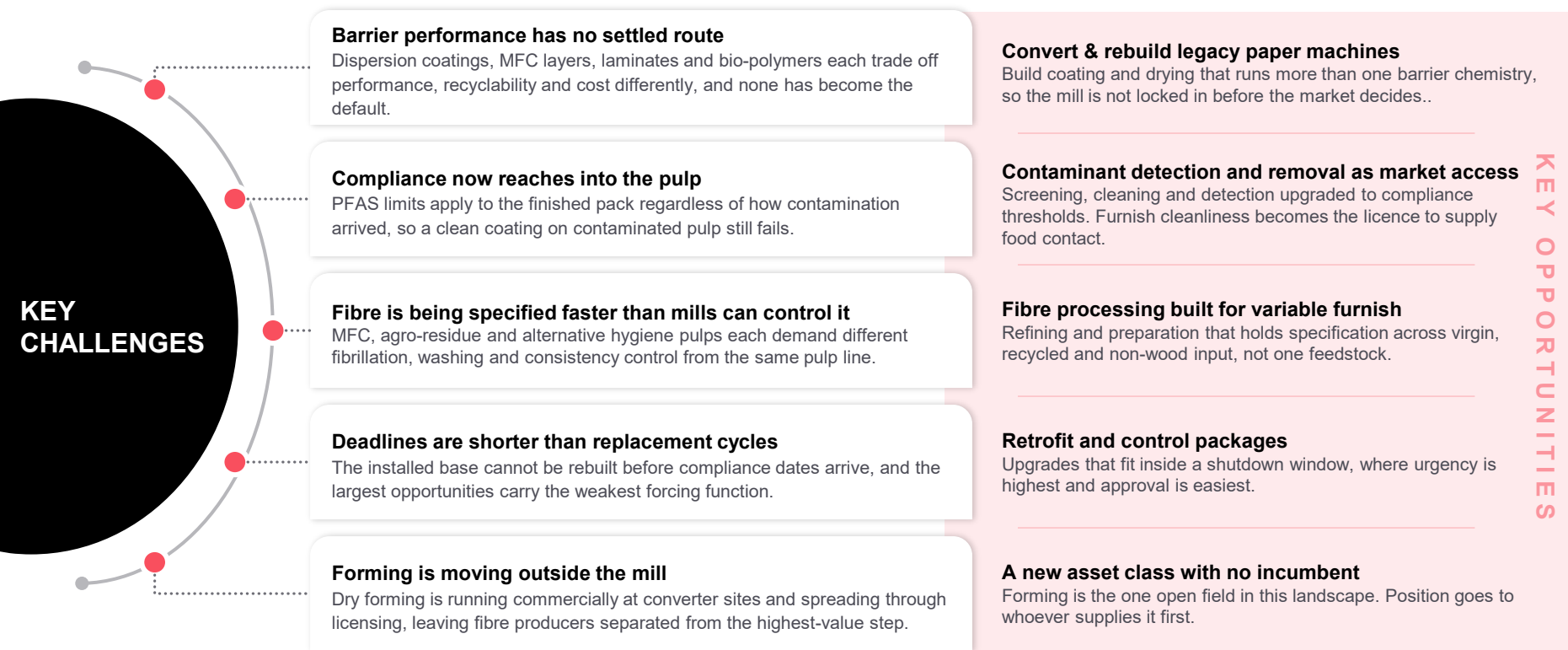


FLEXTRUS



Challenges and Opportunities

New fiber products are creating capability gaps inside the mill, and each gap is a defined scope of work for machinery suppliers.



Implications for Pulp And Paper Machinery Suppliers

Four shifts in how suppliers compete: the performance measure, the buyer's experience level, the structure of capability, and the scope a specification now covers.

1 Value per tonne is joining tonnes per hour  ▪ Mills are being judged on what the fibre can be made to do, not only on output. ▪ Capital approval criteria are starting to reflect it.	2 The buyer is changing, not just the geography  ▪ Papermakers integrating backwards are buying their first fibre line. ▪ They need commissioning depth and operator development, so the sale is capability transfer rather than an equipment transaction.	3 Partnership is the prevailing structure  ▪ No company holds the full stack from fibre through barrier to formed product. ▪ Consortium and licensing models are how capability is being assembled.	4 Barrier scope spans two process stages  ▪ PFAS limits apply to the finished pack, however contamination arrived, so the coating and the incoming pulp both have to meet the limit. ▪ A supplier covering only the coater cannot guarantee the result
--	---	--	---

Regulation, new materials and new formats all arrive at the same place: the process line. The machinery suppliers who build that line hold the capability that resolves them.



FutureBridge is a techno-commercial consulting and advisory company. We track and advise on the future of industries from a 1-to-25-year perspective.



www.futurebridge.com