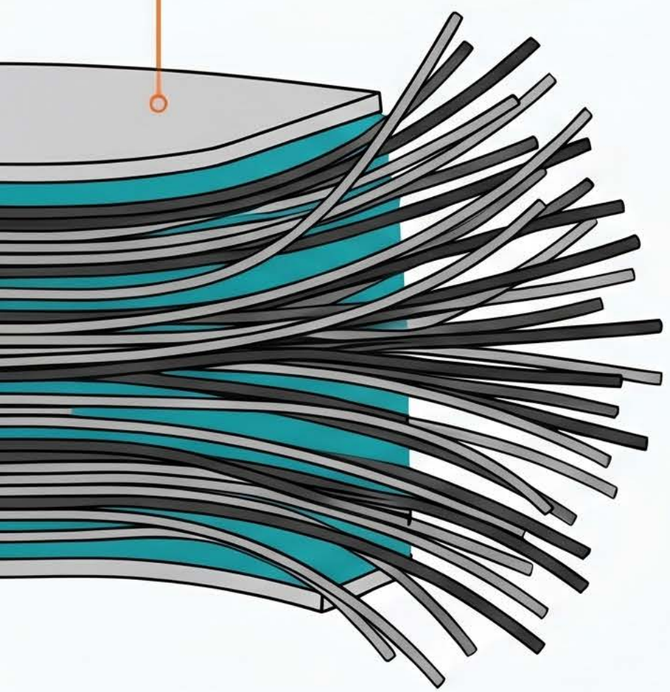
Recycled Carbon Fiber Composites: Bridging the Performance Gap

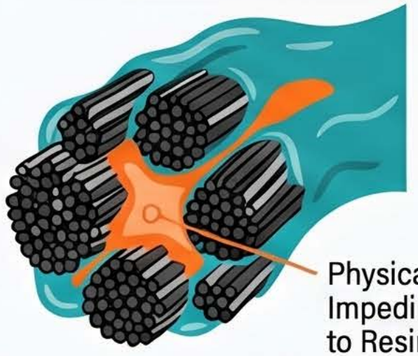
Root Causes & Process Obstacles

Undamaged but Underperforming:
Fibers remain clean and 7.0–7.5 µm in diameter, yet structural strength remains below expectations.



Non-uniform fiber distribution creates dense clusters; poor impregnation leads to irregular "shrinkage cavities" and spherical bubbles trapped during injection.

Dense Bundles Block Resin

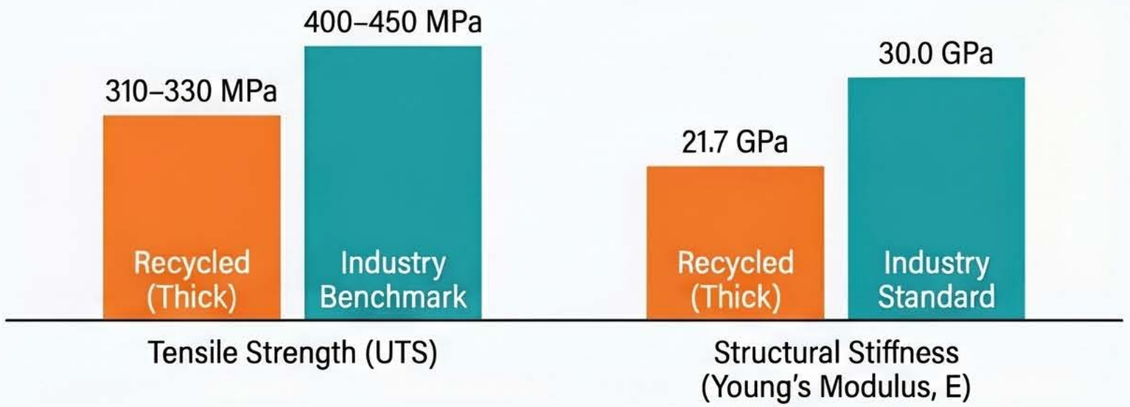


Jagged Voids vs. Air Bubbles

Shrinkage Cavities (Poor Impregnation)

Air Bubbles (Injection Traps)

The Performance Deficit



Property	Thin Laminate (0.8 mm)	Thick Laminate (2.0 mm)
Ultimate Tensile Strength	250 - 260 MPa 6	310 - 330 MPa
Young's Modulus (E)	19.5 - 21.0 GPa	21.3 - 21.7 GPa
Elongation at Break	1.20 - 1.30%	1.40 - 1.50%

Despite clean fibers, recycled panels achieved significantly lower UTS and Young's Modulus compared to industry benchmarks.

The Path to Circularity

Use High-Vacuum Injection

Increase Mat Homogeneity

Increasing mat homogeneity and using high-vacuum injection are essential to eliminate internal defects and bridge the performance gap.