MOLDED FIBER WET-END DRY STRENGTH ADDITIVE COMPARISON

Amphoteric • Cationic Polymer • Cationic Starch-Replacement and GPAM

IMPORTANT NOTE ON STRENGTH IN MOLDED FIBER:

In molded fiber products, strength performance is driven primarily by compression strength, not tensile strength as in traditional paper. Part geometry, wall thickness, ribbing, and overall mold design have a major impact on final strength. Fiber blend (virgin vs. recycled, fiber length, fines content) also plays a significant role. Wet-end additives enhance bonding and structural integrity, but they cannot replace good part design or proper furnish selection.

This document provides a concise comparison of common wet-end additive technologies used in molded fiber systems, including sizing chemistries and dry-strength additives, with a focus on how each contributes to compression strength, runnability, and process stability.

Amphoteric Technology Dry Strengths

Summary: Amphoteric dry-strength and drainage aid effective across pH 5–8; strengthens sheet, improves drainage and fines retention.

ADVANTAGES:

+ Broad pH range for recycled and alum-containing systems.
+ Improves drainage and retention in slow-turnover molded fiber lines.
+ Enhances dry strength and sizing efficiency.
+ FDA compliant for food-contact applications.

DISADVANTAGES:

– Can reduce freeness early as fines are captured.
– Requires controlled introduction in dirty or unisolated systems.
– Drainage improvement may lag in high-trash environments.

Cationic Polymer Technology – Dry Strengths

Summary: High-cationic vinylamine polymer offering strong bonding, retention, and drainage—ideal in neutral to alkaline conditions.

ADVANTAGES:

+ Strong ionic bonding provides high dry-strength gains.
+ Improves drainage and retention efficiency.
+ Supports lightweighting and basis-weight reduction.
+ Low viscosity allows flexible dilution and addition.

DISADVANTAGES:

– Best performance at pH 6.5–7.5; less ideal in acidic systems.
– High charge may interact with anionic trash in dirty systems.
– Can overdry sheet if not balanced in the program.

Cationic Starch-Replacement – Dry Strength Starch Based

Summary: High-charge cationic additive designed for dirty, recycled fiber systems; improves strength, dewatering, and cleanliness.

ADVANTAGES:

+ Excellent performance in high-trash molded fiber furnishes.
+ Improves wet-end cleanliness by capturing colloidal materials.
+ Reduces/eliminates need for wet-end starch.
+ Boosts drainage and overall runnability.

DISADVANTAGES:

– High viscosity requires proper pumping and handling.
– Must be stored above 45°F.
– High charge may cause over-flocculation if overdosed.

GPAM (Glyoxylated Polyacrylamide) Dry-Strength Additives

Summary: GPAMs are reactive dry-strength resins that form covalent bonds with cellulose upon drying. They are widely used to improve dry strength and compression resistance in molded fiber products, especially where stiffness and stacking strength are critical.

ADVANTAGES:

+ Provides significant dry and compression strength improvements.
+ Reactive bonding delivers strength gains at relatively low dosages.
+ Effective across a broad pH range (typically 4.5–8.0).
+ Works synergistically with sizing chemistries (AKD, ASA, or rosin).
+ Helps improve part integrity and reduce breakage during handling.

DISADVANTAGES:

– Limited impact on wet strength or drainage by itself.
– Requires adequate drying to fully develop strength.
– Overuse may lead to brittleness or reduced recyclability.
– Higher cost compared to simple starch-based programs.

COMPARISON SUMMARY TABLE

TECHNOLOGY	STRENGTHS	BEST USE	LIMITATIONS
(Amphoteric)	Balanced retention + drainage; broad pH; effective in mixed recycled.	Systems requiring moderate drainage & strength; slow-turnover lines.	Temporary freeness drop; sensitive to system cleanliness.
(Cationic Polymer)	High strength gains; strong bonding; good drainage.	Neutral/alkaline systems; mills targeting lightweighting.	Less ideal in acidic or very dirty systems.
(Cationic Starch Replacement)	Excellent for dirty furnishes; improves cleanliness; strong dewatering.	High-trash molded fiber systems; replacing wet-end starch.	High viscosity; handling/ storage requirements.
GPAM	High dry & compression strength	Structural molded fiber parts	Cost; requires drying