The Strength, Cost, and Sustainability Solution

Optimizing Kraft Paper and Fluting Media with PVAm Chemistry

			
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Transforming Kraft Paper & Fluting Media with PVAm

PVAM: A BREAKTHROUGH IN SYNTHETIC STRENGTH FOR PAPER GRADES.

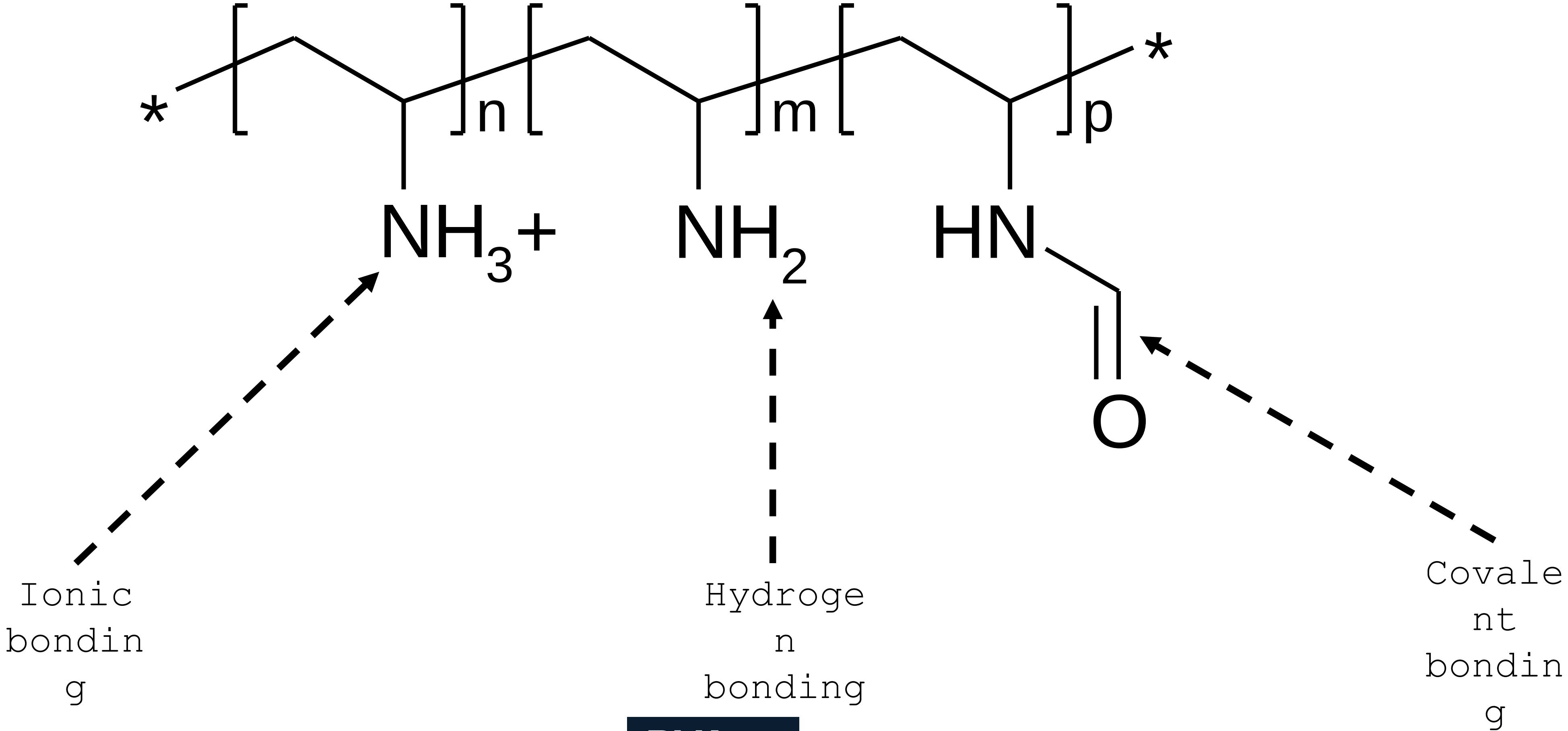
ENHANCED BONDING, COST EFFICIENCY, AND ENVIRONMENTAL SUSTAINABILITY.

PROVEN APPLICATIONS IN KRAFT PAPER AND FLUTING MEDIA.

Dry strength resins : benefits

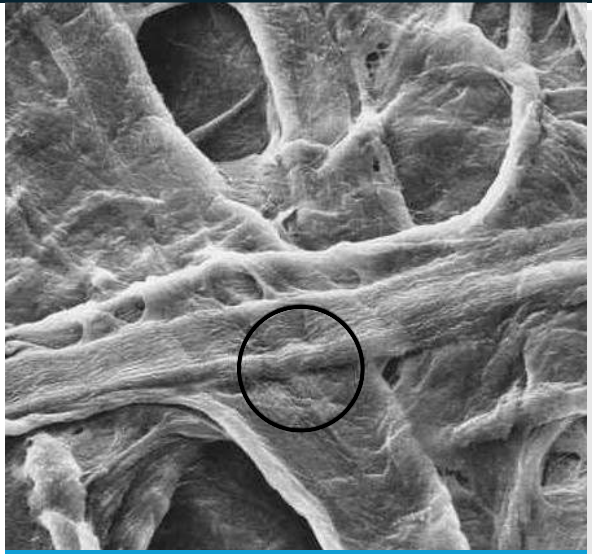
gPAM Glyoxalated PAM	Retention	Drainage	Fixation	Strength	
PVAm	Retention	Drainage	Fixation	Strength	Runnability
C PAM Cat Polyacrylamide	Retention	Drainage		Strength	
APAM An Polyacrylamide	Retention	Drainage		Strength	
Am PAM Am Polyacrylamide	Retention	Drainage		Strength	

PVAm: Chemistry

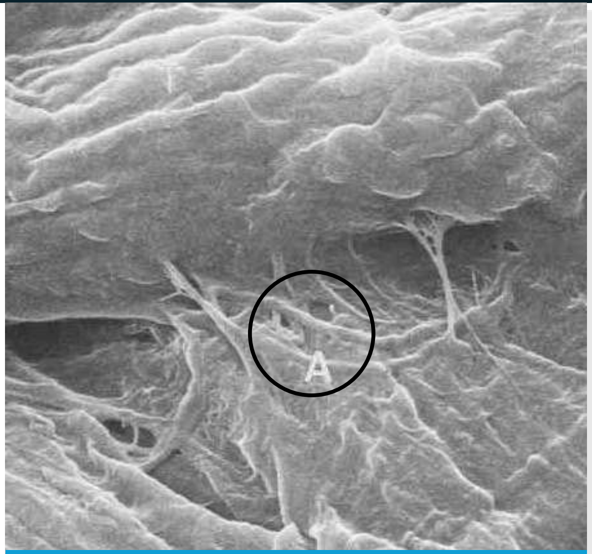


PVAm

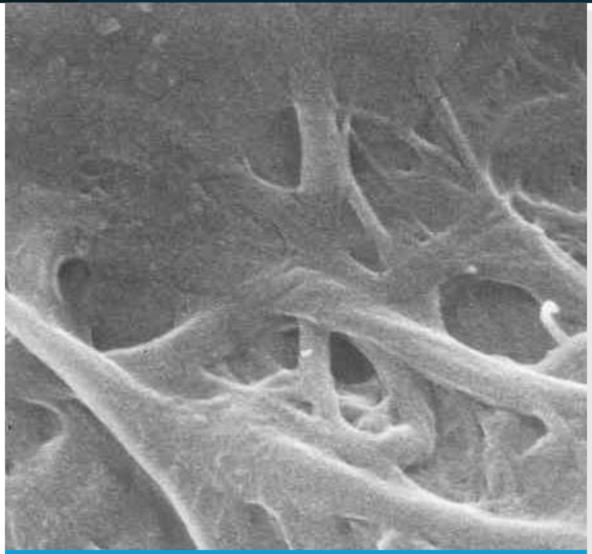
General Interaction mechanism of PVAm : Fiber crossing with fibrils



Fiber crossing – 50 000:



Fiber crossing – 1 000 000:1



Fibrils – 2 000 000:1

Average dimensions:	
Fiber length	2,000 µm
Fiber diameter	25 µm
Fibril diameter	0.1 µm

Strength Resins : Chemistries/Function

Product	Dry Strength	Wet Strength Permanent	Wet Strength Temporary	Initial Wet Web Strength
Polyacrylamides	Yes	No	No	No
Glyoxalated Polyacryamides	Yes	Yes, at high amount	Yes	No
Polyvinylamine	Yes	Yes, at high amount	Yes	Yes
Urea/Melamine Formaldehyde	Some	Yes	No	No
Starch	Yes	No	No	No

Dry Strength Additives Overview

- Dry strength is a critical paper/board parameter for many grades.
- It is due primarily to **fiber-fiber bonds** formed during sheet consolidation and drying.
- Sheet strength is dependent on:
  - individual fiber strength
  - strength of fiber-fiber bonds
  - number of bonds (bonded area)
  - fiber and bond distribution (Sheet formation)

Interaction of dry strength agents : Chemical bonds with cellulose

Interaction	**Hydrogen Bonding**	**Ionic Bonding**	**Covalent Bonding**
Energy	4-6 kcal/mole	10-30 kcal/mole	60-80 kcal/mole
Chemicals	Cellulose, Starch, CMC, **PVAm**, gPAM, Hofmann …	**PVAm**, dual Polymer Systems, amphoteric Copolymers (i.e., amphoPAM),	Glyoxalated Polyacrylamide (gPAM), **PVAm**

PVAm Resins: Key Benefits

PVAm resins are more than just dry strength adds. They are at the center of a whole concept to improve the profitability of the papermaking system and the quality of the produced paper,

Increased Strength Properties, Maintain Bulk,

Fiber Substitution Refiner Reductions Maintain Porosity

Runnability, Sheet formation, Cleaner White Water,

Easier Drying, Lower Energy Costs, Higher Machine Speed,

All translates to: Improved PM runnability, Higher product quality, Lower production cost

PVAm's Key Advantages for Kraft & Fluting Media

- Enhanced Strength: Improves tensile strength and durability.
- Better Drainage: Accelerates water removal, reducing drying time.
- Cost Efficiency: Cuts energy costs and raw material reliance.
- Environmental Compliance: Reduces BOD levels by lowering starch use.

Strength Improvements in Kraft Paper

Strengthens fiber bonds, enhancing durability in packaging.

Key in producing high-stress, industrial-grade Kraft products.

Crush resistance improvements for fluting media.

Optimized Drainage for Faster Production

PVAm promotes better retention of fines and fibers.

Enhances machine efficiency by reducing water content faster.

Supports high-speed production without quality compromise.

Cost Efficiency and Environmental Sustainability

Increases recycled fiber usage, reducing virgin material needs.

Lowers starch reliance—reducing effluent BOD levels.

Energy savings due to faster drying times.

PVAm Chemistry at High Machine Speeds

Ideal for high-speed Kraft and fluting media machines.

Cationization stabilizes the wet-end, minimizing downtimes.

Increases productivity by promoting consistent sheet formation.

PVAm Benefits

The customers are usually looking for a solution to:

- Fix a strength problem
- and/or
- Reduce costs

To fix an issue, a clear understanding of both points (the problem itself and the system) are required.

Reducing costs comes typically through:

- Substitution of cheaper fiber (recycled)
- Reduction of the energy cost
- Increase PM speed.
- Improve the PM runnability,

Or, Improve the Paper/Board quality

- Improve paper strength
- Maintain bulk properties
- Maintain porosity

Case study 1 : Strength improvement

Overview

Grades: Coated Board
Furnish: 100% RCF
Ash: None
Filler: No fresh filler
pH: Neutral
Production: 40 T/h
Basis weight: 250 – 550 g/m^2
PM: Fourdrinier, 4 plies
PM_V: 200 - 500 m/min

Current Wet-End

Conductivity: 1400µS/cm
Wet End chemicals: PAC, CPAM, APAM
Dry Strength: Cationic starch, spray starch

Objectives

1. Increase the scott bond
2. Reduce wet-end chemicals consumption

SNF Approach

1. Application of 6kg/T of PVAm in the machine chest of Under, Top and Center layer
2. Keep stable the Wet End conditions and optimize PAC and CPAM consumption according to Cat. Demand and retention levels

Results

1. +30% of scott bond
2. PAC switched off
3. Reduction of 50% on CPAM consumption

Case study 2 : Strength improvement

Overview

Grades: Testliner
Furnish: RCF, 1.02 / 1.04
Ash: None
Filler: No fresh filler
pH: Neutral
Production: 18 T/h
Basis weight: 90 – 180 g/m^2
PM: Fourdrinier, 2 plies and No Size Press
PM_V: 700 - 1050 m/min

Current Wet-End

Conductivity: 3000µS/cm
Wet End chemicals: TOP : PAC, Polyamine, CPAM, Bentonite
BOTTOM : PAC, Polyamine, CPAM
Sizing agent: ASA

Objectives

1. To reach TL3 burst Index
2. To optimize the Wet End chemistry

Approach

1. Application of PVAm out of the machine chest and APAM in the fan pump

Results

1. +40% of burst Index increase : TL3 level reached
2. PAC switched off
3. 25% reduction in ASA consumption

Case study 3: Dewatering & machine speed

CASE STUDY

Overview

Grades: Core Base Paper
Furnish: RCF, 1.02 / 1.04
Ash: None
Filler: No fresh filler
pH: Alkaline
Production: 6 – 8 T/h
Basis weight: 400 – 500 g/m²
PM: Fourdrinier
PM_V: 60 m/min

Current Wet-End

Dry strength: Cationic starch in Wet End, Native starch starch in size press

Objectives

1. Increase productivity
2. Reduce wet-end and spray starch

Approach

1. Application of 20 kg/T of PVAm
2. Elimination of wet-end starch
3. Eliminate refining

Results

1. Production increase by 8 %
2. Better dewatering
3. Wet-end starch on some grades eliminated, on other grades reduced by 40 %
4. Reduction in Native starch approx. 20 %
5. Save refining energy

Conclusion

- **PVAm: A Sustainable Future for Kraft & Fluting Media**

- Superior strength, cost savings, and sustainability.
- Essential for high-performance, environmentally responsible production.
- Proven technology to meet industry challenges in strength and cost efficiency.

"Let's work together to transform Kraft and fluting media with PVAm Chemistry—delivering strength, efficiency, and sustainable innovation."

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