

Stickies: Control Methods

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Control and Removal Methods for Stickies

- Use of environmentally benign adhesive (recyclable adhesive)
- Avoidance: Control of recovered paper quality
- Mechanical removal: screening and water clarification
- Chemical control: polymers surfactants, others
- Passivation with inorganics
- Enzyme hydrolysis
- Physical adsorption to paper fibers: retention
- Dispersion
- Protection: treatment of equipment to limit deposits
- Mill shut down for clean-up

Governmental efforts to promote benign adhesives

- US Postal Service, USPS P1238-F, qualifies products,
 - all stamps are EBA
- Document E.O. 13148, “Greening the Government Through Leadership in Environmental Management”, was signed on April 21, 2000.
 - Mandates use of EBA’s for government purchases
 - Not all tapes and labels are EBA
- Cost circa \$100,000,000 in United States

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Recovered Paper Quality Control

•Stickies

- Dirt

-Groundwood

-Strength

-Coated

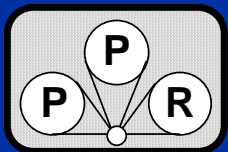
- Plastic films

- Brightness

- Glass, Metal

-Municipal trash

- Uniformity



What to measure in bales if stickies are the concern?

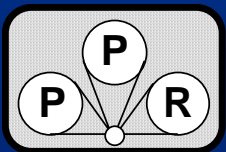
- 1. Visually inspect outside of bales for stickers....**
- 2. Visually inspect bale after opening.**
- 3. Can supplier/location/grade be identified with high stickies content: keep track?**
- 4. Reject bales with justification or simply discuss needs with supplier.**

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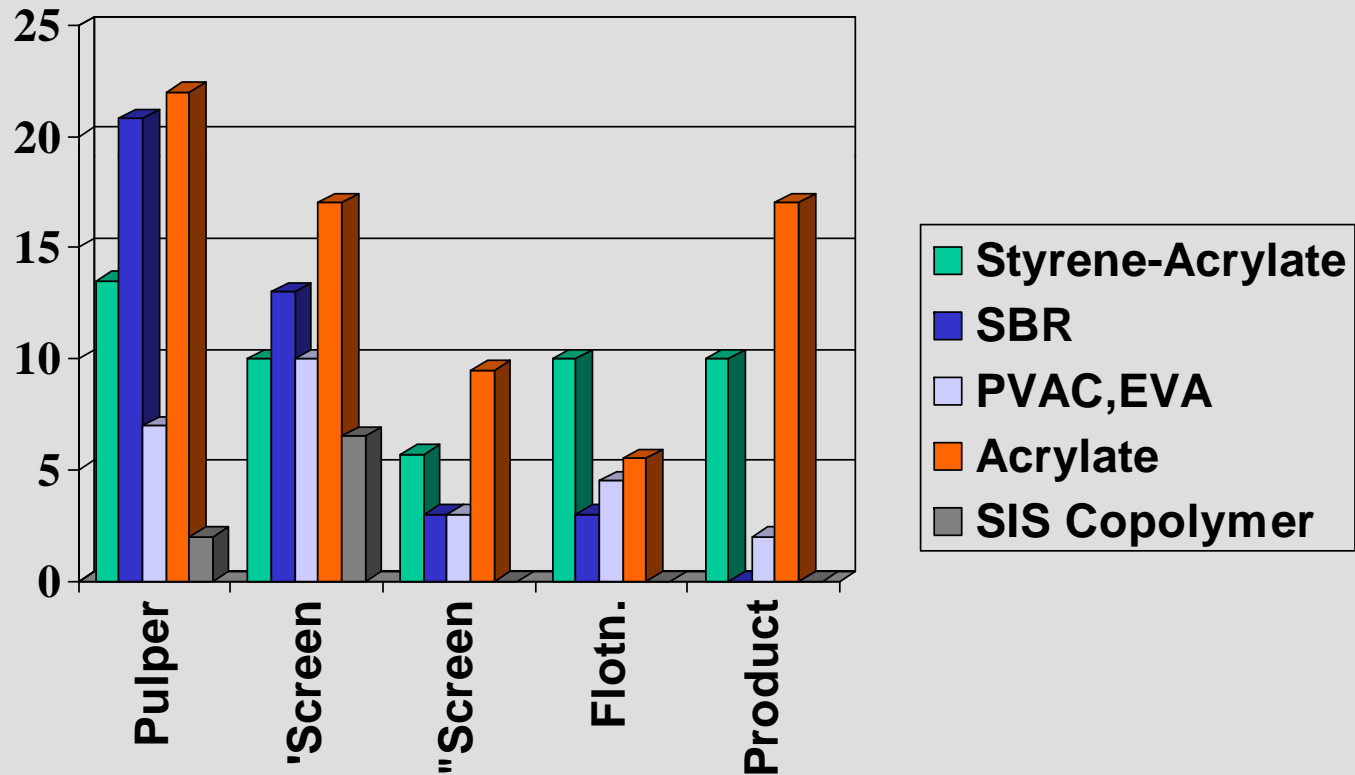
Pulper Performance

- Often can not change parameters
- Gentle pulping
- Drum pulping
- Pre soaking
- Short pulping time
- Low temperature
- Low pH

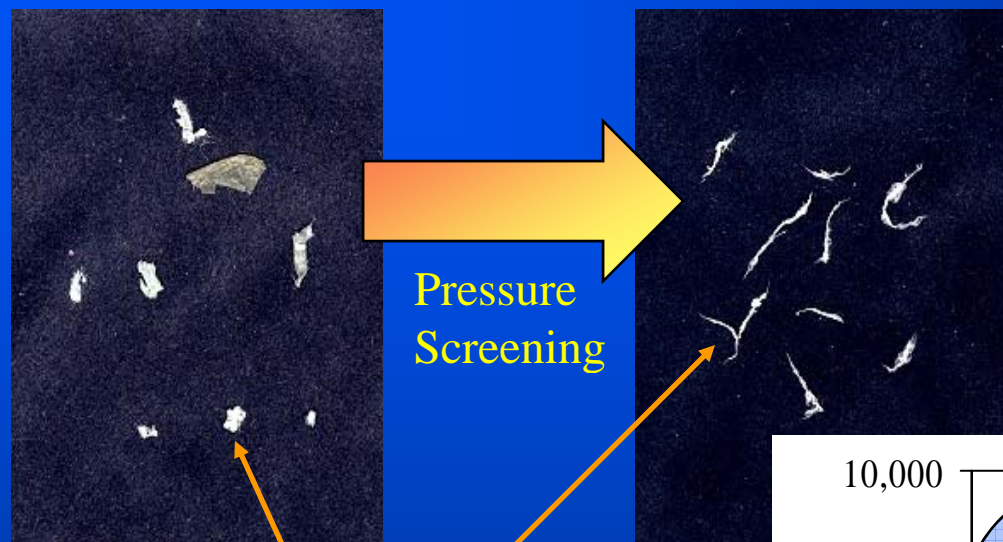


Analysis of Macro Stickies - SOW

M. A. Pikulin, AF&PA and USPS Joint Conference to Address
PSA Issues, June 1996

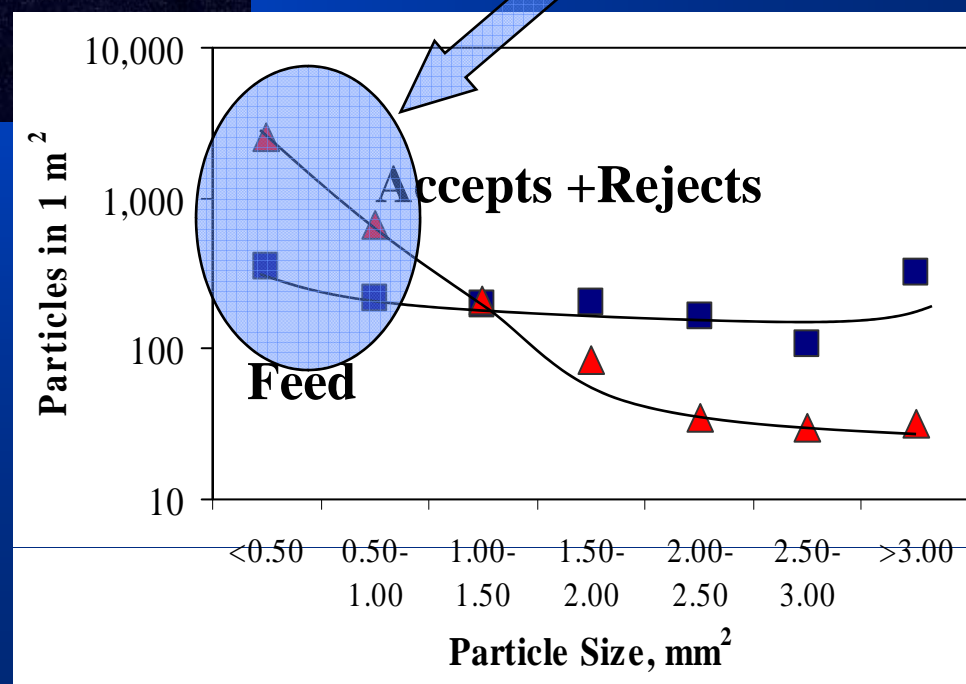


Intense Forces in a Pressure Screen Break/Deform Adhesives: Decreases Screening Efficiency



Shredding
makes
particles more
1-dimensional

“Thousands of small
particles generated”



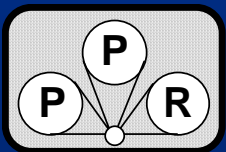
Improved screening efficiency:

- Lower consistency
- Lower pressure drop
- Lower temperature
- Lower passing velocity
- Feed forward versus cascade arrangement

SCREENING SYSTEM

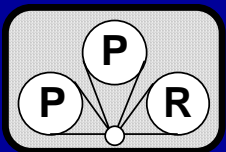
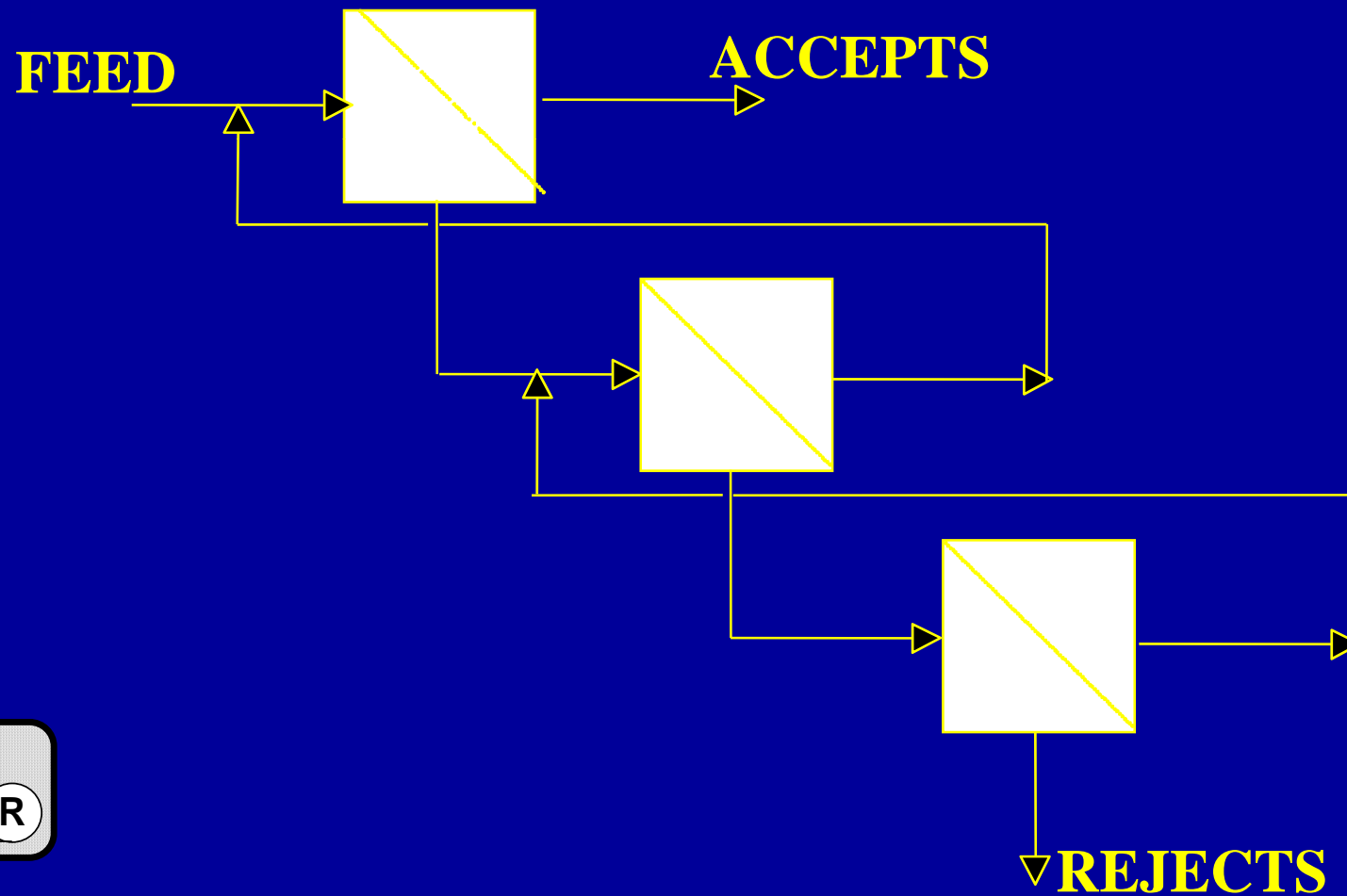
Simple Common Sense Principles

- 1. Do not mix a clean stream with a dirty stream.**
- 2. Avoid recirculation of contaminants.**

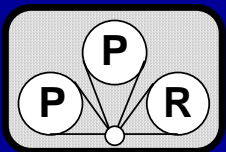
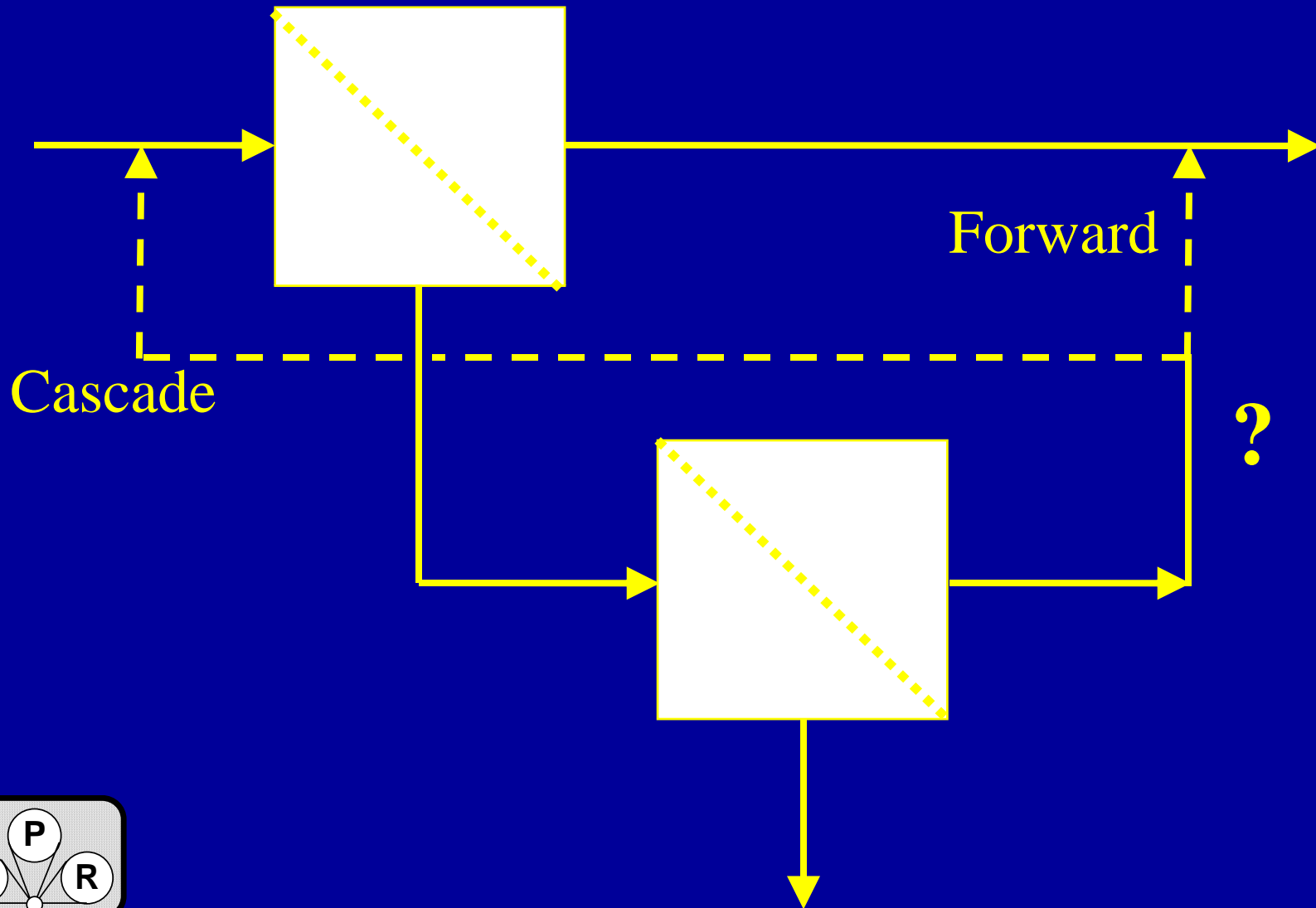


SCREENING SYSTEMS

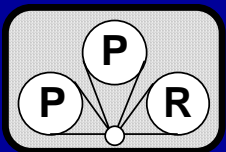
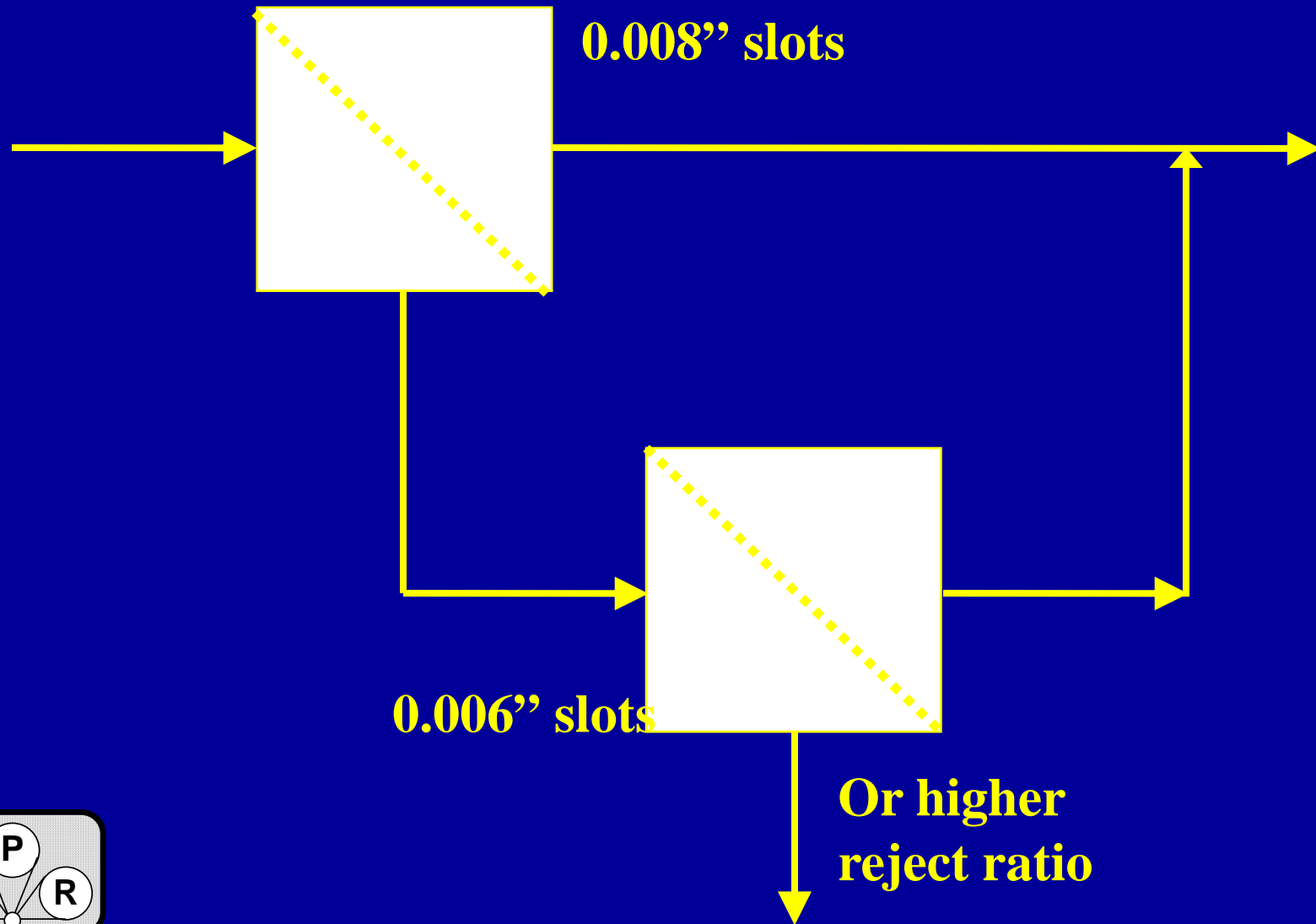
Conventional Cascade Arrangement



SCREENING SYSTEM

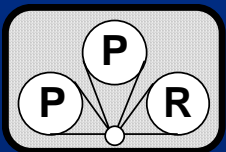
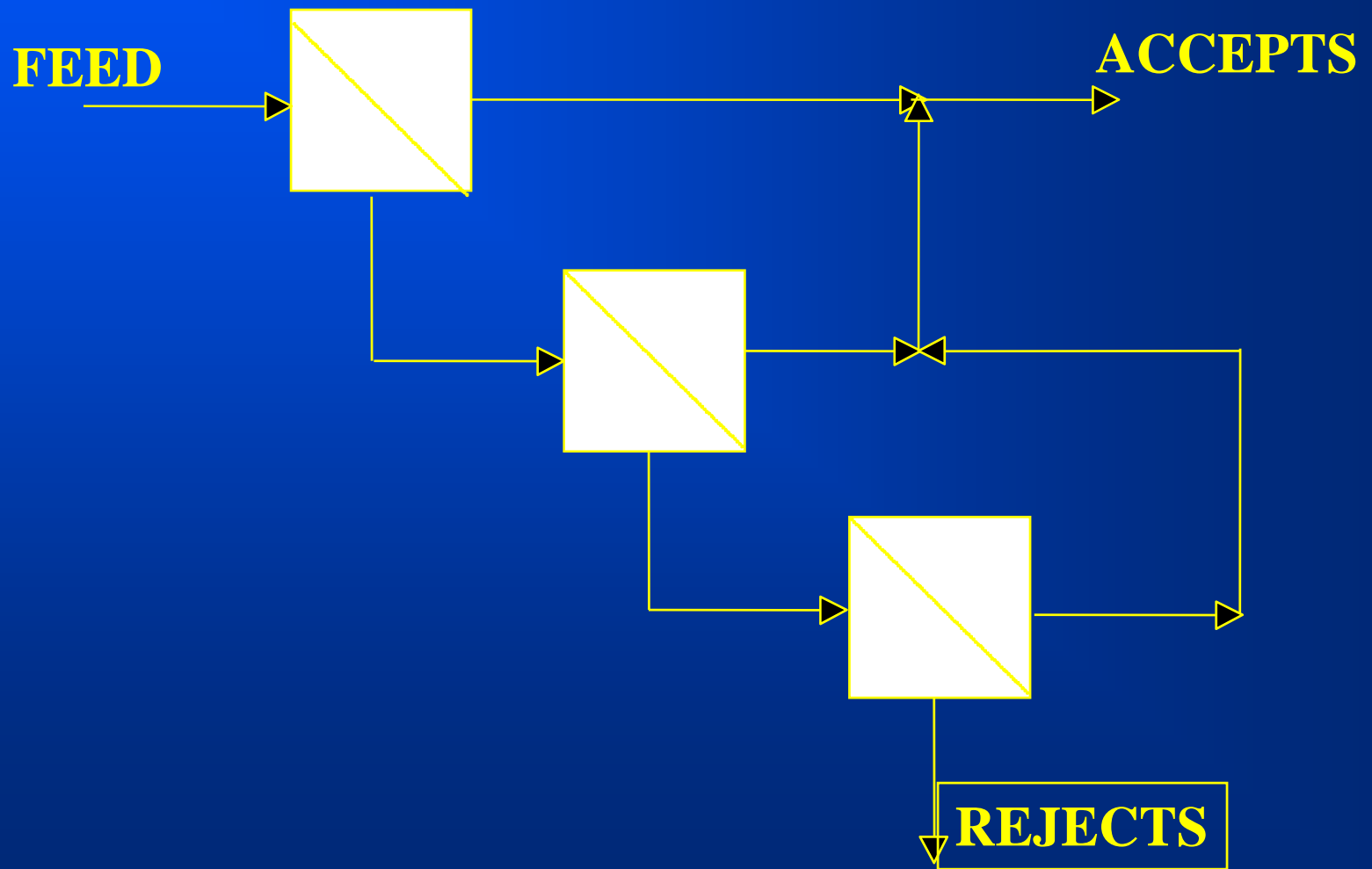


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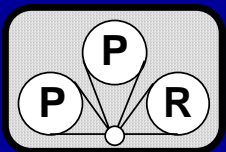
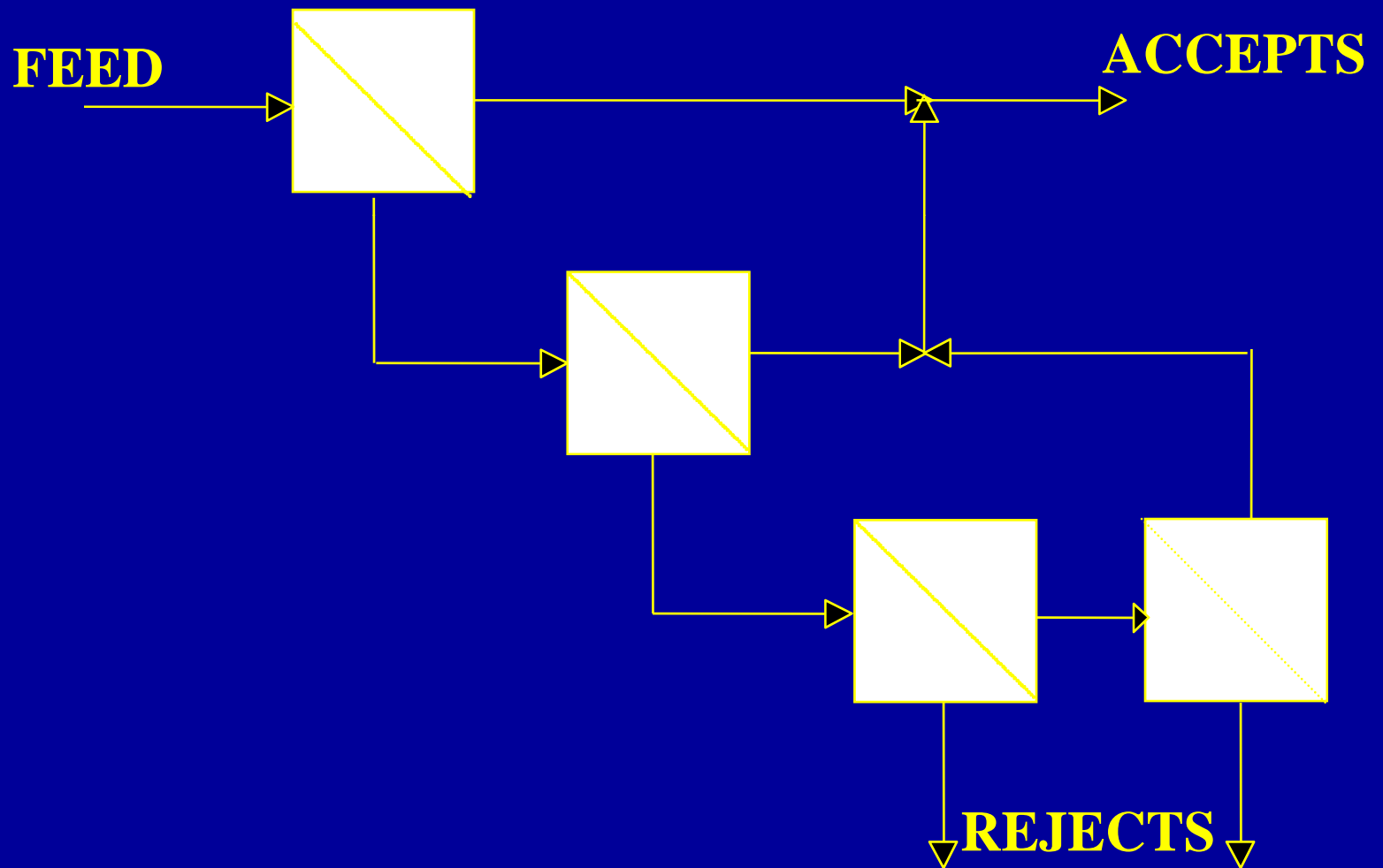
SCREENING SYSTEMS

Forward Flow Arrangement



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Forward Flow Arrangement



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Improved **micro** stickies removal efficiency:

- **Improvement to the water clarification process.**
- Maximum air addition and retention time.
- Proper type/dosage/mixing of chemicals.
- Routine testing of suspended solids removal.
- Additional clarifier capacity

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Additives to Combat Stickies

- **Solids/Slurry**
 - Inorganic (Talc)
- **Liquids/Emulsions**
 - Inorganic (Zirconium Compounds)
 - Organic
 - Cationic fixatives to fibers
 - Anionic (Negative Charge)
 - Nonionic (Surfactant)—stabilize adhesive particles
 - Starch or cyclodextrins
- **Enzymes: hydrolyze ester groups making stickies more stable**

U.S. Pat. No. 3,992,249, Farley, November 1976 teaches using an aqueous solution of an anionic polymer containing hydrophobic-oleophilic linkages and hydrophilic acid linkages in pulp making system. These polymers are used to inhibit pitch deposition in these systems.

U.S. Pat. No. 4,190,491, Drennan et al., February 1980 teaches controlling pitch using a water-soluble linear cationic polymer. The polymers can contain vinyl acetate groups.

U.S. Pat. No. 4,765,867 Dreisbach et al., August 1988 teaches using a water-soluble quaternized polyamine ionene polymer to inhibit pitch deposition from pulp.

U.S. Pat. No. 4,846,933, Dreisbach et al., July 1989 teaches pitch control using a polymer containing polymerized units of methyl vinyl ether having methyl ether groups.

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Physical adsorption to paper fibers: retention

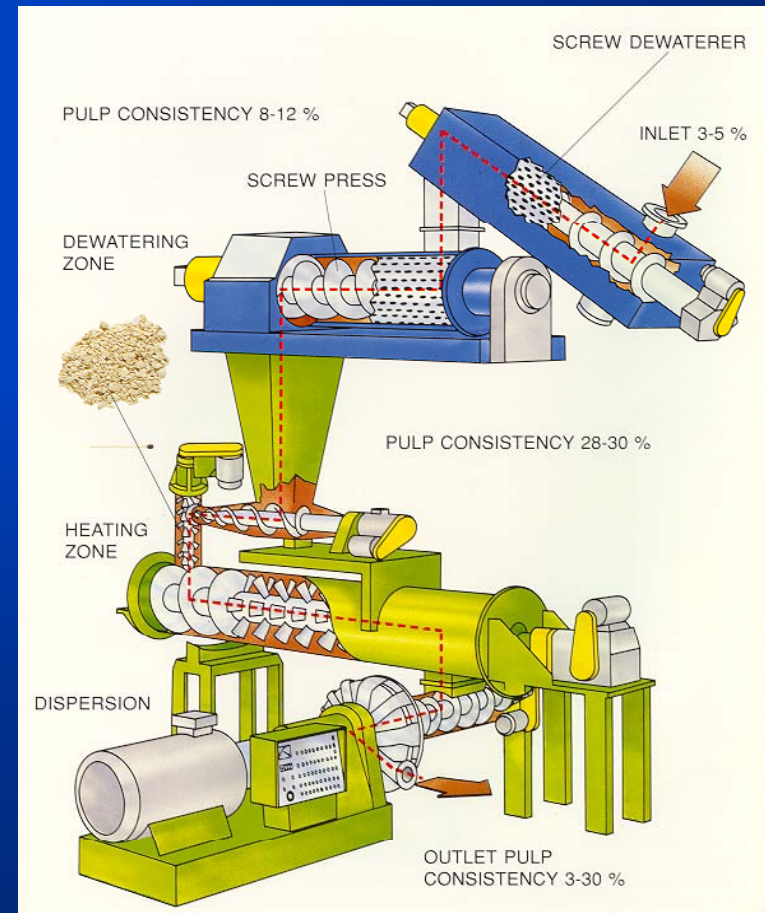
- Cationic polymers with high charge density and low MW to fix anionic stickies to anionic fibers
- Possibility to use starch, proteins, alum and others...
- Needs good mixing in stock prep area
- Requires passivation of papermaking equipment

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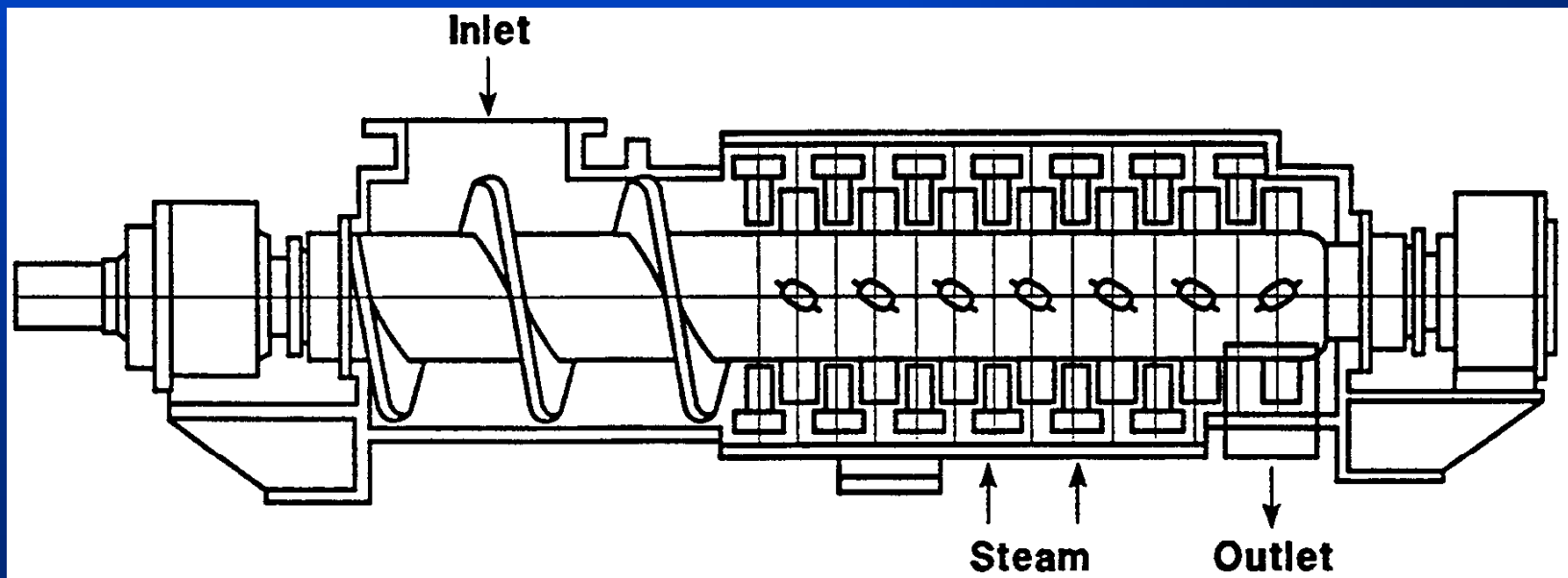
Dispersion

- **Dispersing System:**
 - Process stock is dewatered to 30%K
 - Clods of stock are broken in the breaker screw
 - Steam introduced into a heating screw to increase temperature to 185-245 C
 - Stock fed to dispersing unit
 - Stock is diluted and agitated for further processing



Single Shaft Kneader

- Process stock is dewatered to 30% K
- Stock enters a feed screw, steam or bleaching chemical may be added
- Stock is kneaded
- Stock is discharged, diluted and agitated for further processing



Kneading vs. Dispersion

Methods to decrease contaminant size.

Effect	Dispersion	Kneading
Tappi Dirt Reduct.	75%	85%
Toner Reduct.	yes	better
Stickies Reduct.	better	no effect
Fiber Cutting	substantial	none
Fines Generation	yes	no

Dispersion

- Must have excellent washing and water clarification directly after dispersion
- Should use an additive to pacify the particles
- Otherwise, the problem will worsen for papermachine
- Not recommended, energy intensive and harm to the fibers

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Prevention of pitch and stickies deposition on paper-forming wires via adsorption of a cationic polymer associated with anionic species

- Deposition of colloiddally dispersed pitch and stickies on papermachine wires etc is due to hydrophobic-hydrophobic interaction. “like dissolves like”
- Machine deposition is decreased if the hydrophobicity of the forming wires and/or the hydrophobicity and tackiness of the stickies are reduced.
- Cationic polymers associated with anionic species and these complexes subsequently adsorbed onto polyester forming fabric materials, rendering them hydrophilic and preventing deposition.
- Tappi journal, 1998, vol. 81(6), pp. 143-151.

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