Use at tissue mills cuts high VOC solvent cleaning demand and allows higher percentages of post-consumer recycled furnish, reducing downtime and costs.

— BY PIERRE MOUYAL

Paper mills using recycled furnish attempt to control stickies by various mechanical and chemical means. However, because most mills have not been able to substantially reduce these contaminants using conventional technologies, production problems associated with stickies deposition continue, increasing manufacturing costs and reducing quality at the same time.

One family of stickies that has been especially difficult to control is latex and pressure sensitive adhesives (PSAs). Several approaches are currently being used to reduce or eliminate these types of contaminants, with varying degrees of success. The approach discussed in this article employs a patented polyacrylamide copolymer to very effectively control these difficult stickies, as well as other types of contaminants such as pitch. This program is being successfully used in several tissue-making applications, as outlined below.

**Stickies Sources, Problems**

Stickies formed during the repulping of recovered paper come primarily from man-made polymers used as adhesives and coatings, but may also comprise residual wood resins, internal sizing agents, plastic films, and polystyrene packing material. Especially in recycling/deinking systems using high intensity agitation and high temperature processing, these contaminants can be reduced to very small sizes, with the resultant stickies being widely dispersed throughout the furnish rather than removed via screening and cleaning.

The most commonly identified chemical components of stickies deposits include:

- Polyvinyl acetate
- Ethylene vinyl acetate
- Styrene butadiene
- Polystyrene
- Alkyl acrylates
- Polyethylene

Once they enter the papermaking process, stickies particles can form deposits on paper machine forming fabrics, felts, press rolls, dryers, etc., as well as on converting equipment. The deposits create holes and cause an excessive number of sheet breaks. When these occur, on-the-fly cleaning with large quantities of high VOC solvents is required at best. At worst, downtime is required for the solvent cleaning or premature removal and replacement of the affected machine clothing.

Although some wire and felt treatments have been successfully used to reduce stickies deposits in the papermaking process, they usually do not sufficiently reduce or eliminate problems caused by latex and adhesives. With these types of contaminants, new approaches such as Vulcan Performance Chemicals’ solution utilizing a polyacrylamide copolymer have proved to be highly effective. Application of this new solution is specific to pulps containing coating latexes, PSAs, and hot melt adhesives.

**Process Mechanism**

As depicted in Figure 1, the mechanism for the polyacrylamide copolymer process can be summarized as follows:

- The stickies control product adsorbs on the surface of the hydrophobic particle in the pulp furnish.
- It produces a hydrated, encapsulating film, which renders the stickies contaminant less tacky and less apt to deposit. Unlike localized fixation with coagulants, it will adsorb onto and help to control the largest stickies particles as well as the smaller coating latex and pitch particles.
Intimate mixing in the thick stock is important to maximize product distribution and adsorption on the hydrophobic particles.

The most desirable point of addition for the polyacrylamide copolymer is a location that remains in intimate contact with the furnish fiber for a relatively long period of time. The time element is necessary to promote encapsulation of the contaminants. Temperatures higher than ambient accelerate the chemical reaction. Contact time, temperature, and size of contaminants are key factors in the success of this program.

Case Histories

In the following case applications, a thorough survey was conducted of each mill’s conditions to determine temperatures, system pHs, incumbent additives, and additive benefits. A program was recommended for each mill, with the objective of solving existing deposit problems and their negative effects. All parameters were further analyzed and a specific solution was designed for each mill.

Mill A was experiencing the following problems:

- Incumbent stickies passivator, wire treatment, and felt passivator applications on a Crescent Former and Fourdrinier machine were not adequately controlling the mill’s stickies problem.
- Typically, downtime was taken two to three times a week for forming fabric and felt cleaning to remove stickies, significantly impairing productivity.
- 8,200 gal of solvent cleaning was being used each month for the forming fabric and felt cleaning, adding significantly to the mill’s effluent BOD loading.
- Stickies pick-outs from the sheet were also causing problems with the embossing rolls on converting equipment.

Analysis of the forming fabric and felt revealed that they contained pressure sensitive adhesives and fillers. The program at Mill A was conducted as follows:

**Conditions**

- 30 min contact time
- 120°F temperature
- Addition point—hydrosulfite bleach towers outlet pumps just before refiners and machine chests

**Solution**

- Patented stickies passivator stock additive
- Wire passivator (added on tissue machine No 1, but not added on tissue machine No. 2)
- Felt passivator/conditioner

**Results**

- 87% reduction in lost production hours per month for clothing cleaning
- 32% reduction of solvent cleaner usage
- Fewer sheet holes
- Elimination of embossing roll pick-outs

Mill B was unable to replace 25% of its standard pulp furnish with low-grade recycled pulp. Analysis of forming fabric and roll deposits confirmed that pressure sensitive adhesives were the problem. The following program was conducted at this mill:

**Conditions**

- 30 min contact time
- 100°F temperature
- Addition point—blend chest pump (before machine chest).

**Solution**

- Patented stickies passivator stock additive

**Results**

- Mill was able to use 100% low-grade recycled furnish for napkin grade, with furnish savings of $75/ton

Figure 1: Hydrated, encapsulating film makes the largest and smallest of stickies particles less tacky and thus less likely to deposit.
Mill C was experiencing the following problems:

- Excessive sheet holes.
- Downtime for solvent cleaning.
- Excessive use of high VOC solvent.
- Limited use of low cost, low-grade, post-consumer recycled furnish.

Analysis of forming fabric samples showed that deposits contained latex, PSAs, fillers, and solvent residue.

The program at Mill C was conducted as follows:

**Conditions**
- 30 min contact time
- 115°F temperature
- Addition point—outlet of blend chest

**Solution**
- Patented stock additive
- Eliminated incumbent dispersant addition to thick stock
- Eliminated high charge fixative fed on machine
- Left incumbent wire program in place
- Left incumbent felt passivator in place

**Results**
- 75% reduction in solvent usage
- Allowed use of 35%-50% low-grade, post-consumer recycled content in tissue and napkin grades

**Program Benefits**

Based on mill case studies and other application data, benefits of the polyacrylamide copolymer stock additive include:

- Reduced downtime from solvent cleaning of former fabrics
- Reduced cleaning of rolls and uhle box covers
- Reduced usage of high VOC solvents
- Cost savings through the use of lower grade furnish
- Reduced use of cationic polymers that can interfere with wet strength adsorption
- Improved tissue converting operations

**About the Author:**

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**Note:** Callaway Chemical Company, which operates under the name Vulcan Performance Chemicals, has entered into an agreement to sell its industrial water treatment and pulp and paper businesses to Kemira Oy, of Finland.

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