Shop Talk

Improving press and dryer section performance by maintaining clean fabrics with specialty chemical programs

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A lot of effort goes into researching and developing new fabric materials and weave configurations to bring the papermaker an ideal fabric to meet production goals. Machine clothing for the press and dryer sections can cost between US$ 20,000 and US$ 50,000 each. An effective cleaning program can help you get the most out of your machine-clothing investments.

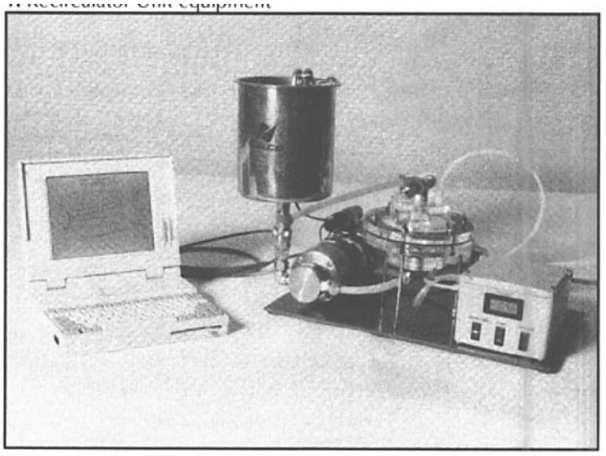
The economics exist to maintain clean machine clothing. Mill personnel must consider the cost of fabrics and their installation, the expense of taking extensive downtime to clean or change felts, any incremental profit from additional production, and the value of steam. These figures must be weighed against the expense of a chemical cleaning program.

A preliminary step in identifying the cause of fabric problems is to determine if fabric deposits are interfering with the machine's runnability or the final product's quality by monitoring the following parameters:

- Press loadings
- Sheet moisture profiles
- Machine speeds
- Number of breaks in press or dryer sections
- Fabric features (moisture, porosity, permeability, caliper)
- Press vacuum sources (uhle/suction box, suction pipes)
- Visual inspection of rolls, dryer cans, and doctor blades
- Sheet dirt counts

The second step is a complete analysis of the soiled machine fabric, including a physical profile (caliper, permeability, and basis weight) and a chemical profile (percentage of material extractable with specific solutions). Identifying the nature of the fabric contaminant can help locate the source of the problem such as furnish materials, wet-end chemistry imbalance, or poor retention. This information can also determine what chemistry will solubilize or remove the contaminant, allowing for accurate cleaning-program selection.

1. Recirculator Unit equipment



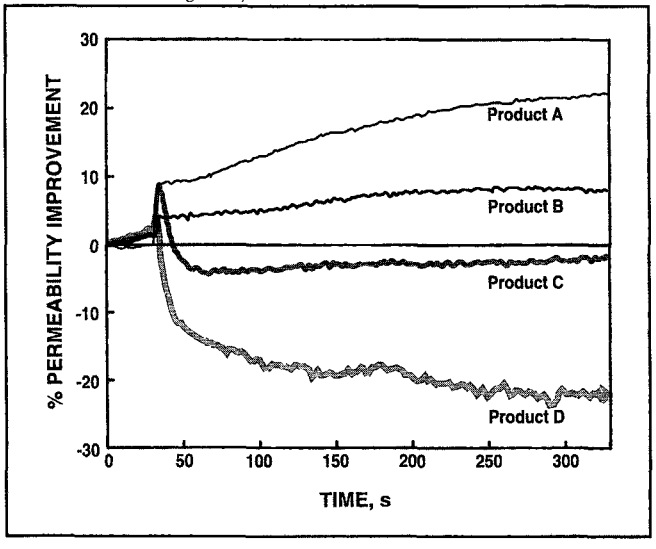
For example, a mill introducing secondary fiber to its system for the production of uncoated fine paper experienced runnability problems. Upon further investigation, mill personnel realized the number of breaks in the press section had increased dramatically since the addition of recycle furnish, and press rolls appeared coated with stickies and fines. An analysis of a soiled press felt revealed high levels of waxes, adhesives, and fines present in the fabric structure. It was then determined that higher mesh screens in the secondary fiber plant were necessary to remove more stickies, and improvements were made to retain more wood fines with the machine's retention program.

A recent advancement in program selection is the Recirculator Unit (**Fig. 1**), a product screening system that uses soiled fabric samples from the paper machine. The sample is exposed to various chemical solutions for 5-min periods as pressure differential is monitored. Data generated by the unit (**Fig. 2**) reveals the percentage improvement in the permeability of the fabric sample. In this case, product A allowed water to flow more easily through the fabric as indicated by improved permeability

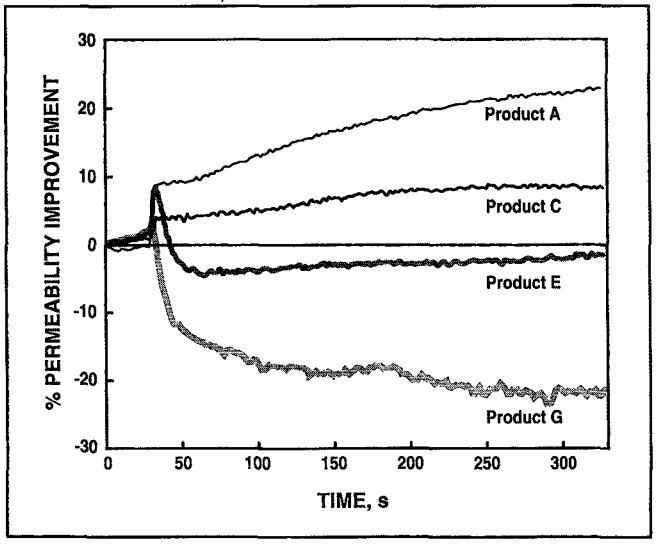
I. Representative chemical cleaning situations

	Southern newsprint	*Recycled boxboard*	*Alkaline coated fine*
Problem:	Reduced runnability	Slower machine speed	Sheet defects and breaks
Deposits:	Wood pitch	Stickies and starch	Coating material
Program:	Neutral solvent—continuous	Alkaline/solvent—batch	Solvent/surfactant—batch
Water source:	Fresh water (pH 3.8)	Filtered process	Fresh water
Shower type:	Stationary lube and fan	Oscillating fan	Spray foaming unit
Benefits:	Production increase	Extended felt life	Higher sheet quality
	Reduced pitch buildup	Speed increase	Uniform moisture profile

2. Product screening analysis



3. Felt conditioner analysis



than products B, C, and D. Compatibility between the fabric material and chemicals must also be considered when recommending any cleaning program.

Chemical cleaning programs can be applied in three different methods: batch, intermittent, or continuous. The frequency and concentration of the chemical application is dependent upon the nature and degree of contamination, location of deposits and existing showering apparatus, and the maintenance schedule of the machine. Some degree of mechanical cleaning can be achieved through properly designed shower and vacuum systems. An industry trend is to install oscillating high-pressure fan showers to remove surface contaminants without damaging the felt material. Several companies manufacture and install high-quality shower systems.

Give careful attention to the source of shower water, also. Fresh water having low chlorine residuals and little suspended solids is preferred. The goal is to avoid damaging the nylon or wool material and introducing other contaminants into the felt. Enhance cleaning by warming shower water to at least 120°F.

Before beginning a chemical program to maintain clean fabrics, an agreement should be reached among mill management, the clothing supplier, and the chemical supplier on the benefits sought. This step allows all parties to accurately monitor the parameters and properly evaluate the program's success.

Many mills have benefitted by applying these techniques properly. The first example is a mill producing newsprint in the southern United States. Machine runnability was reduced by a buildup of pitch on the uhle box covers. Analyses of several wet press felts confirmed the presence of wood pitch as organic extractables. For example, the first press felt contained 4.2% organic extractable material with 2.8% nonextractable solids. Recirculator Unit screening revealed that an organic solvent chemistry dramatically improved felt permeability (**Fig. 3**).

The product was applied continuously through lube and oscillating fan showers at approximately 500 ppm. Shower water had been modified with muriatic acid to pH 3.8.

The chemical cleaning program improved machine operation by reducing pitch buildup on the uhle strips from 3.8 down to 0.4 oz per day. As a result, less than one hour was required daily to clean uhle strips compared with three hours before the chemical program. An additional 60 tons/day of newsprint was produced as the result of improved dewatering of the web through the press section and less downtime to clean uhle strips. After the fabrics were removed, chemical analyses identified organic content of 0.8% compared with 4.2% prior to the program.

A second example occurred in a recycle boxboard mill. The cylinder machine operated at reduced speeds because felts became less porous and filled prematurely. Contaminants were identified through chemical analysis as stickies from recycled OCC and starch from the coating formula. An alkaline/solvent blended product outperformed other products evaluated in the Recirculator Unit. Using filtered, warm process water, the product was applied every 15 min per shift through an oscillating fan shower. The alkaline/solvent product removed the contaminants and porosity—measured with a Huyck-Smyth Porosity Meter—improved 20%. Improved porosity translated into faster machine speeds (+150 ft/min) and a production increase of 3 tons/day. In addition, fabric analysis revealed a reduction in alkaline extractables from 78% to 14%, and felt life was extended by 12 days.

The final example involves a dryer fabric cleaning program in a mill producing coated sheet at alkaline pHs. The process control system identified sheet defects, holes, and uneven moisture profile in the final product at the reel. Close examination of the paper machine revealed a buildup on the dryer can surface to be the source of the sheet defects. Deposit analyses classified the buildup as coating material which had adhered to the dryer fabric. This material would accumulate and transfer to the can surface, which inhibits uniform heat transfer.

During an extended downtime, a blended product containing organic solvent and surfactants was sprayed onto the dryer fabric and cans. The dryer section operated at a crawl to ensure complete contact of the contaminants. After 15 min, the foam was rinsed off the cans and fresh water was sprayed onto the fabric to remove residual chemical. After the batch cleaning, sheet quality improved as hole counts and sheet defects reduced from 54 to 12 holes per day. Breaks in the dryer section were also reduced dramatically, from 10 down to two breaks daily. This was attributable to uniform sheet dryness from balanced can temperatures.

These illustrations have shown how papermaking operations have benefitted by maintaining clean machine clothing. There are several parameters to address when designing a cleaning program. It is also important to coordinate both chemical and mechanical cleaning tactics. Following these steps can improve your machine runnability and improve profitability, yielding a significant return on your chemical investment.

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