

Supplier roundtable: Maintenance of machine clothing

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The experts offer advice on solving problems with forming, pressing, and drying fabrics.

Forming, pressing, and drying fabrics are an essential part of the papermaking process. Maintaining and keeping track of fabric life can make the process more efficient. Moreover, proper maintenance of machine clothing can extend the life of the fabrics.

Mills regularly perform minor maintenance on machine clothing. *Tappi Journal* surveyed 16 machine clothing professionals from nine clothing suppliers to find areas of concern in machine clothing maintenance for mills. The survey is divided into three parts, one each for forming, pressing, and drying fabrics. Respondents are listed at the top of each section.

Forming fabrics

Respondents: Jim Lee, technical service manager, JWI Group—Atlanta Wire, Jonesboro, GA; King Essawy, mill manager, Forming Fabrics, Tamfelt Inc., Canton, MA; Samuel H. Herring, product manager, Asten Forming Fabrics Inc., Appleton, WI; Bob Gallo, VP—technical, Scapa Forming Fabrics, Shreveport, LA; Volker Ostermayer, VP—technology, Wangner Systems, Greenville, SC; David J. Pretty, marketing director, Weavexx Corp., Wake Forest, NC; and Shelly Sybeldon, technical marketing coordinator, Appleton Mills, Appleton, WI.

1. What are the most important actions a mill can take to prevent damage to forming fabrics during installation and operation?

LEE: A thorough wash-up of former and surrounding areas. Cover sharp objects that the fabric contacts during installation. Keep fabric in container until ready to install. Install so that no creases are put in the fabric. Square fabric on the machine before applying tension. Monitor guiding systems to make certain tracking is good before bringing up to speed. Fabric tension should be monitored and maintained during the first few hours of operation as growth is the greatest at this time.

HERRING: Good housekeeping and crew training. Check foils and forming board edges for rough or chipped areas and for proper alignment. Check table rolls and return rolls for

tight bearings, burrs, and proper alignment. Do not smoke around fabrics during installation on shutdowns, and be careful when welding near a fabric.

ESSAWY: The fabric package must be handled carefully. The box must not deflect when moved from the warehouse to the machine. Before opening of the box, one should make sure that the fabric is packed as the installation requires. When the fabric is installed, it should be tightened to 60–70% of the normal running tension.

Before starting the former, the guiding system must be checked. The cleaning showers, except high-pressure showers, must be switched on. The former is started at crawl and the fabric is tightened to its normal tension. After that, the speed can be increased.

OSTERMAYER: Proper packaging from the supplier to match the installation techniques of the particular machine configuration is essential. Crew training in installation techniques and awareness of potential damage areas (unprotected machine edges, etc.). Actual installation of fabrics can be videotaped for review of potential problem areas and effectiveness of techniques.

2. What steps can mills take that will help the operations of forming fabrics on the machine?

GALLO: Forming fabric performance is expected to be relatively constant throughout life. Maintaining relatively constant forming section performance requires minimizing variation of the system including fiber, freeness, temperature, pH, consistency, and additives. Maintaining fairly constant fabric tension is important. Watch for and try to prevent fabric skewing, bowing, stretching, or narrowing.

ESSAWY: High-pressure showers should be used only when the fabric is running with normal speed. If there is a lot of fiber carryback and a former gets very dirty, the fabric design should be changed. Also, continuous follow-up of the condition of

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Deschene



Gallo



Herring



Lee



Lemerande



Luoto

dewatering elements as well as controlled drainage over the whole forming section will help the operation of the fabrics.

SYBELDON: Keep the machine well maintained, train crews extensively in forming fabric care, and emphasize good house-keeping. We recommend checking the condition of drainage elements, rolls, and showers periodically and monitoring fabric tension regularly.

3. What are some major machine (component) problems that affect forming fabric performance?

ESSAWY: Headbox jet delivery geometry and forming board positioning have an essential role in initial sheet formation. Poor condition of drainage elements shortens the fabric life dramatically. Unsuitable power split between drive rolls can result in runnability problems.

PRETTY: The following equipment maintenance is required to ensure the proper functioning of machine clothing:

- Uhle boxes require replacement of wear strips and shower nozzles.
- All shower pressure regulators should be checked for accuracy.
- Roll bearings and lubrication oil pressures are to be monitored.

SYBELDON: Fabric wear caused by machine conditions is still a common problem that affects clothing performance. Edge deckles, foils, roll covers, and cleaning are the major causes of inadequate performance.

4. What machine equipment maintenance is important to ensure the proper function of forming fabrics?

HERRING:

- Replace worn rolls.
- Lubricate/replace worn roll bearings.
- Replace shower nozzles.

- Replace worn table elements.
- Clean headbox.
- Check stretch and guide systems.
- Level table elements.

GALLO: Periodically, the forming section should be optically aligned and any misalignment should be corrected. All elements must be square and level within very tight tolerances. Also, all pumps, motors, bearings, screens, valves, refiner plates, roll covers, doctors, and shower oscillators require periodic maintenance. The internal assembly of the couch roll and the position of the vacuum box within the shell are also critical and require periodic attention.

ESSAWY: Condition of dewatering elements must be continuously followed. Wear profiles of used fabrics can give useful information to the machine operators in this matter. Proper operation of the drives as well as vacuum pumps must be secured. Poor tensioning or tension control may cause an unsatisfactory result in the forming process.

PRETTY: The parameters which the mill should monitor to ensure clothing is performing are as follows:

- Sheet moisture leaving the following position
- Drive load in the forming section
- Location of the wet line in the forming section (fourdrinier only).

5. What parameters can the mill monitor to be sure that the forming fabrics are performing?

LEE: The parameters that the mill can monitor to be sure that the clothing is performing are machine speeds, formation, retention, drainage, and drive loads.

GALLO: Most mills do an excellent job of maintaining records of sheet quality tests for all grades; but, it would be helpful to correlate these results with documented, specific standard operation procedures.



Norris



Ostermayer



Pretty



Sassaman



Sheppard



Sybeldon

With regard to fabric conditioning and performance, periodically check and record stretch roll position, tension, guide roll position, edge condition, fabric caliper, drainage element surfaces, vacuum levels, and drive load data and review recent drainage rate and stock turbulence measurements. If the forming fabric is a trial, periodically review its anticipated performance plan and expected results with the supplier.

SYBELDON: Although fabric life is one parameter frequently looked at, items for consideration are drainage, formation, first-pass retention, solids off the couch, and physical properties. Drainage profiles of the wet end can indicate performance; on the other hand, drive load can be influenced by fabric design and physical condition.

6. What are major problems associated with forming fabric wear? What are the early clues that fabrics should be cleaned, serviced, or repaired?

HERRING:

- Slippage
- Wet streaks
- Ridging
- Edge curl
- Stretching
- Sheet marking.

GALLO: Increased frequency of wet-end sheet breaks, difficult edge and sheet release, and increased drive load are all easily identifiable warning signs that the fabric requires a thorough cleaning or replacement. The fabric should be replaced if either pronounced sheet side wear (this is cause for further investigation!) or total fabric wear at either edge reaches or is very close to the 100% theoretically worn point. This point of safe wear should be supplied to the mill by the supplier.

OSTERMAYER: Uneven sheet profile; shortened fabric life; sheet marking; seam integrity concerns; increased wet-end sheet breaks.

SYBELDON: Major problems include retarded drainage, increased drive load, and problems with fabric stability. Worn fabrics are more likely to stretch or ridge than are new fabrics.

7. What kind of forming fabric problems can be handled by mill personnel and which should warrant a service call to the clothing supplier?

ESSAWY: Mill personnel can follow the fabric wear by measuring fabric thickness in regular intervals. Worsened formation or dewatering and general runnability problems are good reasons to ask for a service call.

Mill personnel can also be trained by the clothing supplier to take care of fabric patching and trimming of worn edges as well as sealing of the edges. It is, however, recommended to leave fabric trimming and edge sealing to the supplier.

GALLO: Forming section and suspected forming fabric problems, once identified, should be discussed openly between the mill and supplier personnel. Although the final decision rests with the mill, both parties should identify and agree to key parameters, to mutual and periodically collect data, and to review correlations and conclusions.

Pressing fabrics

Respondents: Terry Sheppard, sales and service manager, JWI Group—Atlanta Felt, Jonesboro, GA; Steve Sassaman, product manager—tissue, Albany International Press Fabrics, Albany, NY; William Summer, design and application manager, Asten Dryer Fabrics, Clinton, SC; Robert L. Crook, VP—design/manufacturing, Scapa Press Fabrics, Wilson, NC; Frank Norris, VP—engineering, Orr Felt Co., Piqua, OH; Ian K. Booth, VP—marketing, Tamfelt, Inc., Canton, MA; Volker Ostermayer, VP—technology, Wangner Systems, Greenville, SC; David J. Pretty, marketing director, Weavexx Corp., Wake Forest, NC; and Shelly Sybeldon, technical marketing coordinator, Appleton Mills, Appleton, WI.

1. What are the most important actions a mill can take to prevent damage to press fabrics during installation and operation?

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SHEPPARD: Clean the press and other machine parts thoroughly. Check all machine parts including alignment of suction boxes, showers for plugged nozzles, suction rolls or blind-drilled rolls for plugged holes, and grooved rolls for plugged or filled grooves. Check automatic guide for face movement, boots for pliability, air pressure, and guide paddle for cuts. If the tradeline has been running crooked or skewed, then the press section should be taped for misalignment while the machine is down and before a new wet felt is installed.

CROOK: Make sure seam felts have no missed loops and that the pintle is not damaged. Maintain proper tension on the felt at all times; being made from nylon, felts will change tension from the wet to dry state (build tension when dry, relax when wet). High-pressure needle showers are always a potential source of damage to fabrics surface; controlling pressure below 400 psi is generally recommended. Finally, forces generated in the press nip may cause premature failure if the load is not evenly applied across the roll face.

PRETTY: Areas of lubrication should be covered to prevent the deposition of grease and oil. The felt should be pulled out before tension is applied and wetting down is complete. The take-up mechanism should be thoroughly checked before startup. An alignment of all rolls and the correct press loading for the crown specification will ensure the felt remains square with the machine direction and lessen the tendency toward distortion.

OSTERMAYER: The amount of cleaning required is dependent on felt construction and felt running time. A common measurement used to measure effectiveness of cleaning is to monitor uhle box vacuum levels. Inspection of uhle box lube showers and condition of uhle box covers is essential to avoid batt fiber damage and batt fiber shedding.

2. What steps can mills take that will help the operations of press felts on the machine?

SASSAMAN: The first step after fabric installation is to be sure that the press fabric is operating at the correct length. Most press fabric manufacturers include a recommended run length for each fabric on the package or in the packaging material. When the fabric is run at this recommended length, it will have sufficient tension to guide and dewater properly and the tension on the fabric will be the same from fabric-to-fabric. Performing this simple task properly can lead to very consistent press section operation over long periods.

SUMMER: There are several practices a mill can adopt that will improve felt performance and machine runnability. The major practice is to have proper operating showering and conditioning systems on each press felt. It is recommended that each felt be conditioned by a full-width oscillating high-pressure cleaning shower, a full-width lubrication shower, and

then followed by a vacuum box delivering 15–18 ft³/min/in.² of open area. All shower nozzles must be free from debris and plugging or streaks will be formed in the felt.

NORRIS: The key to maintenance of press fabrics is maintenance of conditioning devices. Any static device which comes in contact with the felt (uhle boxes and blow boxes) must be in good condition and properly lubricated to prevent excessive wear. It is also important to not wrap these, but rather to provide enough clearance so that actual contact only occurs when the vacuum is applied.

BOOTH: Thorough conditioning of the press fabrics will enhance and optimize the performance of the press clothing. Correct cleaning and dewatering equipment will maintain permeability and caliper of the clothing to ensure a satisfactory performance.

SYBELDON: Steps can be taken by crews to help prevent damage during operation. Shower nozzles, doctor blades and roll covers, grooves, and blind-drilled and suction holes should be kept as clean as possible. Proper tensions and loadings should be maintained on the machines.

3. What are some major machine (component) problems that affect clothing performance?

SASSAMAN: Press roll load/crown match is a key to forming a uniform press nip and allowing the press fabric to help dewater the sheet uniformly across the entire width of the paper machine. Keeping detailed records of in-crowns and out-crowns, grind records, and performing nip impressions and roll cover maintenance on a regular schedule helps to ensure a uniform mechanical condition for uniform pressing and uniform sheet dewatering.

NORRIS: Uhle boxes are typically the largest single source for felt wear. The condition of the box surface should be checked during felt changes. It is also important to maintain uniform lube shower coverage. Inside wear from felt rolls is also of concern. Additional felt life can be gained by removing wormed rolls on positions running seamed felts.

4. What machine equipment maintenance is important to ensure the proper function of press felts?

SHEPPARD: Maintenance of all equipment in the press section is important to clothing performance. Guiding equipment should be properly maintained as well as felt roll becoming press roll bearing, crowns, alignment, uhle box lubrication systems, high-pressure cleaning showers and chemical cleaning showers, and vacuum systems.

CROOK: A regularly performed preventive maintenance program, involving all showers, press rolls, roll bearings, uhle box

covers, stretch mechanisms, and bowed rolls, can certainly help prevent problems before they occur. Calibration of control instrumentation—for example, shower pressure gauges, pressure and tension control load cells, vacuum gauges—is also an important part of maintenance.

PRETTY:

- Sheet moisture out of the press section into the dryers
- Cross-machine direction moisture profile variation
- Cross-machine direction basis weight variations.

5. What parameters can the mill monitor to be sure that the clothing is performing?

SASSAMAN: Developing a history of press fabric caliper for any given press position is easy to do and yields excellent information. Comparing caliper at any stage in fabric life vs. a trend line can give early indication of mechanical problems (*e.g.*, improper press load), or fabric problems (slow break-in or accelerated wear rate). In addition, caliper history can help to make decisions regarding scheduling maintenance shutdowns by assessing the fabric's ability to run the desired number of days to the proposed shutdown.

NORRIS: In addition to traditional measures such as uhle box separator flow and sheet consistency out of the press, monitoring uhle box vacuum levels (pressure drop) can provide an indication of potential problems with cleaning systems and vacuum pump efficiency.

BOOTH: In the continuing trend of optimization of sheet quality and printability, changes in press felt design and felt surface can have a drastic effect on sheet quality. Although sheet testing is done on a regular basis at most locations, any changes in felt design or trial work in the press section should warrant closer scrutiny for any adverse or positive effects.

6. What are major problems associated with felt wear? What are the early clues that felts should be cleaned, serviced, or replaced?

SUMMER: The servicing of press fabrics should occur on a regular basis to identify trends or changes in properties. These trends or changes should be correlated to machine performance to establish critical operating conditions. The clues that a fabric may need cleaning may be indicated by increases in uhle box vacuums, poor runnability, or poor moisture profile. If the fabric does not respond to cleaning, then the press fabric may need to be replaced.

CROOK: Uneven or excessive surface wear on a press fabric can cause premature batt removal, which in turn can reduce drying efficiency, increase profile variability, cause problems with sheet transfer, and may make sheet marking more likely.

BOOTH: With regard to the second part of the question, I believe that all machines have their own idiosyncrasies and a machine tender's intuition is normally the first sign that the fabric needs some attention. As a general rule, an indication of profile problem, drawer changes, numerous breaks in the press or first dryer section, or difficulty in maintaining sheet dryness should be viewed as a sign that one or more of the press felts have reached the end of their useful life or require some conditioning.

OSTERMAYER: Base fabric sheet mark; coater streaks caused by released batt fibers; poor sheet transfer capabilities; blowing concerns; poor moisture profile.

SYBELDON: Press fabric wear could lead to several problems on the machine level. The moisture profile of the sheet might fluctuate. The paper could develop an uneven color or streaking as a result of filling or wear. Shedding of felt fiber is also a concern.

7. What kind of press felt problems can be handled by mill personnel and which should warrant a service call to the clothing supplier?

SHEPPARD: Most machine clothing problems can be handled by mill personnel if they have been properly trained and have the necessary equipment to monitor felts. However, the clothing service representative should make regular service calls during the life of a felt to gather history on each felt position and confer with the felt designer to determine if a change in design is necessary.

SUMMER: Mill personnel can handle fabric distortion, trimming, or contamination problems. The problems that usually require a service call from a clothing supplier are press bounce/vibration, water removal, and sheet mark. These are usually applications or press-fabric-manufacturing-related issues; the clothing supplier will help isolate the cause.

NORRIS: Routine conditions that can be handled by mill personnel include felt cleaning and guiding (squaring tradeline). When problems occur that are related to the design of the product, such as CD moisture profile, abnormal uhle box vacuum, and sheet control, technical service should be requested. This allows us to gather facts and data so that our design function can accurately make any necessary changes.

Dryer fabrics

Respondents: Terry Lemerande, field technical service manager, Scapa Dryer Fabrics, Waupaca, WI; Paul F. Deschene, design and applications specialist, Asten Inc., Walterboro, SC; Kal Luoto, technical service engineer, Tamfelt Inc., Canton, MA; Volker Ostermayer, VP-technology, Wangner Systems, Greenville, SC; David J. Pretty, marketing director, Weavexx

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Corp., Wake Forest, NC; and Shelly Sybeldon, technical marketing coordinator, Appleton Mills, Appleton, WI.

1. What are the most important actions a mill can take to prevent damage to dryer section clothing during installation and operation?

DESCHENE: There are two types of installation situations: a dryer felt installed using a lead-on harness and a dryer felt installed using the old felt. In both cases, it's very important that the lead-on harness or old felt be tied onto the new felt's leader skirt evenly. If tied unevenly, then when the new fabric is pulled on, the felt could skew front to back, creating a snake or oscillation in the felt during startup. Similarly, the guide palm should be moved out of the way and tied off so the guide roll is centered for similar reasons.

PRETTY: The correct location of the fabric for installation is paramount and the key to an efficient dryer fabric installation. The location of the cutting of the old fabric, permitting the lead for the new fabric, is also important and consideration should also be given to the seaming location. This will reduce the downtime during the seaming operation. Sources of gearing grease and oil spatter near the edges should be examined and repaired; this prolongs fabric life.

OSTERMAYER: Palm guides can become grooved and adversely affect guiding capability. Stretch mechanisms should be routinely maintained to eliminate the potential for failure. Roll misalignment/deflection can quickly cause premature fabric wear, fabric skewing, seam damage, and fabric narrowing.

SYBELDON: The first step to ensuring a proper dryer fabric installation is a thorough inspection of the dryer fabric run. Any foreign materials or other obstructions that could damage the fabric should be removed. During operation crew members should periodically observe fabrics for tracking, condition of ropes, and the correct use of spear poles when removing broke from dryers.

2. What steps can mills take that will help the operations of dryer fabrics on the machine?

DESCHENE: Good installation techniques, proper startup procedures, a strong preventative maintenance program, and an effective dryer fabric cleaning program.

LEMERANDE: With the increase of machine computer systems to oversee all facets of the operation of the paper machine, the practice of the machine walk-around has seen decreasing use in monitoring machine condition day-to-day. As the fabric supplier service personnel typically service the dryer section during machine shutdowns, it is the responsibility of the machine crews to identify potential fabric damage due to fabric guides that are plugged with paper tails, hot roll bearings,

excessive fabric tension, and leaking oil; all of which could cause catastrophic damage to the fabric, dryer section, or both.

LUOTO: The roll surfaces should be kept clean from accumulation of stock, pitch, etc. If the dryer section is not provided with an automatic cleaning system, then the fabric should be manually cleaned during shutdowns to maintain the original permeability as well as possible.

OSTERMAYER: Routine machine alignment is necessary to optimize clothing performance. Monitor, maintain, and assure that machine control equipment is operating properly. Attention should be paid to used fabric analysis to prevent problem reoccurrence.

3. What are some major machine (component) problems that affect dryer fabric performance?

LEMERANDE: The major component that can have the most detrimental effect on fabric life is the dryer section drive. Older gear-driven dryer sections are frequently not using a dryer gear at each dryer can, as these are removed when they become damaged or defective. This causes the dryer fabric itself to carry some of the load of driving the rest of the dryer section. As more gears are removed, the greater the total drive load on the dryer fabric. This situation will cause an alternate stress and relaxation to the felt, which can shorten effective life in that position.

LUOTO: Fabric rolls or dryer cylinders which are out of alignment can cause severe damages. Good tension control and guiding systems secure safe runs. Unirun and press-run blow boxes must be installed to the correct distance from the fabric. Also, the air flow and pressure to the boxes must meet the operating instructions.

SYBELDON: Machine problems that typically affect clothing performance in the dryer section are inadequate tensions, misaligned rolls or dryer cans, seized bearings, inadequate air supply to guide, grooved guide palms, and improperly maintained guide diaphragms.

4. What machine equipment maintenance is important to ensure the proper function of the dryer fabrics?

DESCHENE: Scheduled maintenance of the auto guide system on the paper machine (*i.e.*, scheduled changeout of auto guide diaphragms and yearly overhaul of guide palm assemblies) along with a strong preventative maintenance program will minimize auto guide failures which lead to clothing damage.

LEMERANDE: In dryer sections where humidity levels are high, it is very likely that the steel sheet felt rolls in these sections will develop corrosion on the surface that contacts the

dryer fabric. This corrosion progresses slowly and is sometimes difficult to blame for shortened fabric life at first. Eventually, it progresses to a point that fabric life can be reduced to 10% of normal in the worst cases.

PRETTY:

- Moisture variation or streaking out of the dryer section
- Increased tray water consistency
- Evacuation of wire, felt mark in the sheet, or both.

SYBELDON: Crews should prevent oil from leaking on the fabric. The guide system can be checked for proper movement, condition of diaphragms, and paddle. On a quarterly or semi-annual basis, all felt rolls should be examined for condition of the surface. Pitting, rust, etc., can cause the fabric to wear. Bearings should be routinely checked to prevent a “frozen” roll can, which can lead to premature fabric wear.

5. What parameters can the mill monitor to be sure that the fabrics are performing?

DESCHENE: Sheet threading and general runnability and sheet quality will illustrate whether dryer fabric clothing is performing from a papermaker’s perspective. On the clothing performance side, seam distortion, wear, hydrolysis resistance, and fabric cleanliness should be monitored.

LEMERANDE: Increase in the average number of “cockles” or “blisters” in the sheet at the reel may mean a reduction in the fabric tension in one or more of the dryer sections. This could also be an indication of filling or contamination of the fabric edges on one or more of the fabrics.

LUOTO: An average production rate of sellable paper can be calculated during the running time of a fabric. Steam consumption is also a very essential factor to be followed. On the Unirun section, the possible sheet detachment from the fabric surface on the bottom cylinders gives a good indication of fabric performance. Also sheet flutter and instability, as well as draw between different groups, are useful things to be monitored.

6. What are major problems associated with fabric wear? What are the early clues that fabrics should be cleaned, serviced, or replaced?

DESCHENE: Any visual inspection should also be looking for the detection of hydrolysis in a dryer fabric. Early detection and inspection of the severity and location of hydrolysis in a dryer fabric can be the difference between scheduling the fabric to be changed and having it fall off the machine. Some mills have the crews save a seam sample of dryer fabrics coming off the machine (the dryer fabric seam and about 12 in. on both sides of the seam) which the supplier takes back to the lab for testing to characterize a fabric’s useful life history.

LEMERANDE: The dryer fabric seam should be inspected at each machine shutdown for seam wear. This should be done with a magnifying glass as well as with the naked eye. The portion of the fabric that runs outside of the sheet run through the section should be inspected for heat and moisture degradation. If curling the edges of the fabric in your hands results in a brittle (or snapping) noise (or feel), then the fabric is in danger of tearing in the near future.

OSTERMAYER: Generally, caliper loss and localized wear should be closely monitored to avoid the risk of catastrophic failure of the clothing leading to potential costly machine damage and downtime.

7. What kind of machine clothing problems can be handled by mill personnel and which should warrant a service call to the clothing supplier?

LEMERANDE: Utilizing the training seminars and classes available from the dryer fabric suppliers, mill personnel should be able to perform fabric installations, periodic inspections, and minor fabric repairs without the direct assistance from the clothing service person. However, these activities are almost always done during scheduled shutdowns when the mill personnel have many more items on the machine that need to be addressed. The clothing serviceman is then very helpful in assisting fabric installations, repair, etc.

The inspection of the mechanical components on the machine is usually done more efficiently by the fabric supplier; as he has a much wider base of experience to draw upon when deciding the condition of component parts of the dryer section.

Process problems concerning dryer fabrics—moisture streaks, seam distortion, sheet marking, increased steam use, etc.—are areas in which the mill personnel and the fabric supplier must “pool” their investigative resources to help resolve them. 

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