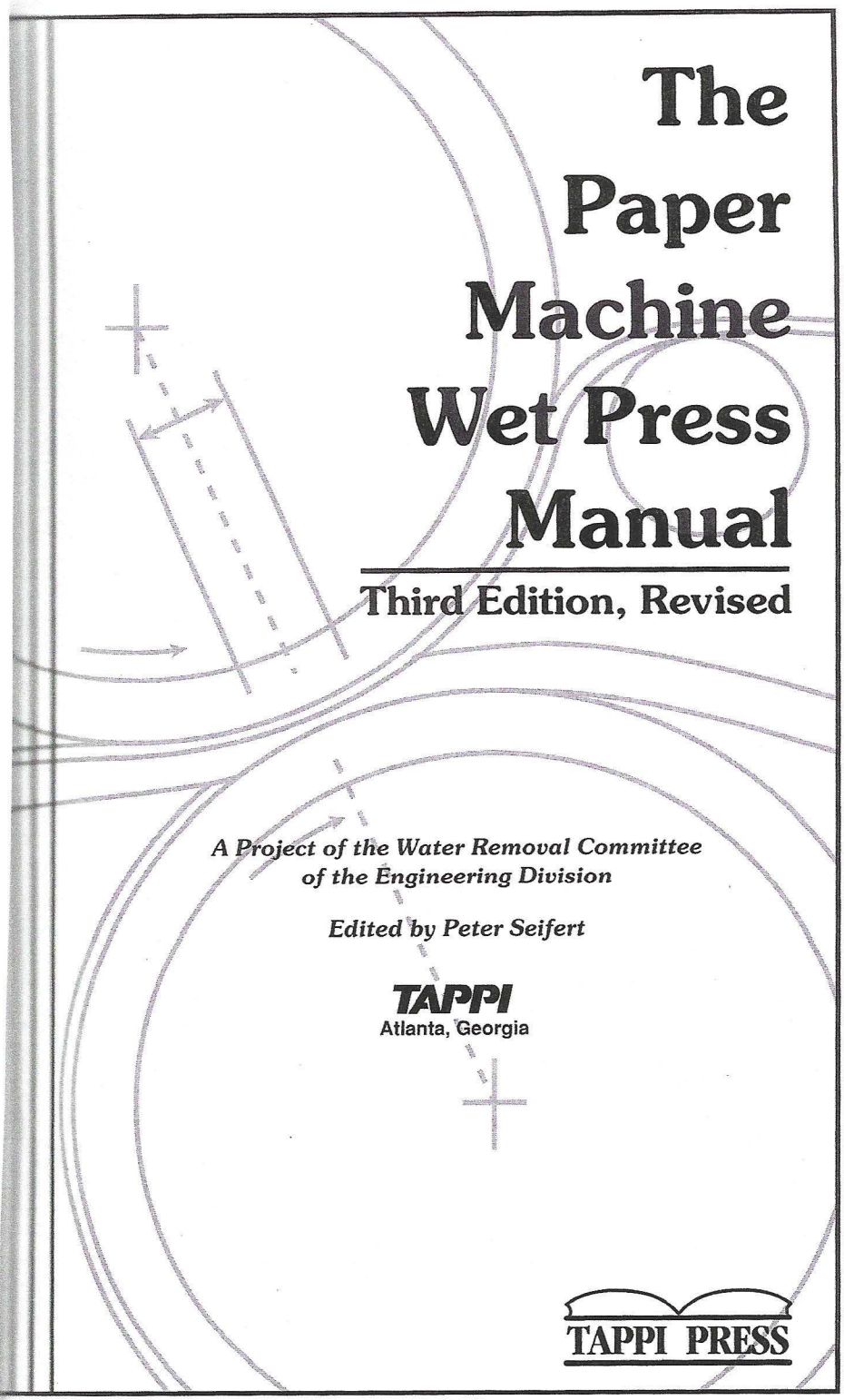


The Paper Machine Wet Press Manual


TAPPI PRESS

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THRIFTBOOKS

The Paper Machine Wet Press Manual

Third Edition, Revised

*A Project of the Water Removal Committee
of the Engineering Division*

Edited by Peter Seifert

TAPPI
Atlanta, Georgia


TAPPI PRESS

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ISBN: 0-89852-056-8

3rd Edition, Revised

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Atlanta, GA 30348-5113 USA

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Library of Congress Cataloging-in-Publication Data

The Paper machine wet press manual / a project of the Water Removal Committee of the Engineering Division; edited by Peter Seifert. — 3rd ed., rev.

p. cm.

Includes bibliographical references.

ISBN 0-89852-056-8

1. Paper-Drying. 2. Papermaking machinery. I. Seifert, Peter, 1936 —. II. Technical Association of the Pulp and Paper Industry. Water Removal Committee.

TS1118.D7P38 1991

676'.232—dc20

91-27204

CIP

Printed in the United States of America

B-042

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Chapter 6

Press Fabrics

A. FUNCTION

The cost of dewatering the sheet in the press section is significantly lower than that of dewatering in the dryer section. For this reason, the value of efficient press fabric performance cannot be overemphasized. The primary function of a press fabric is to provide resilient, permeable support for the sheet in the nip to maximize water removal. The press fabric provides the necessary cushion and void volume to receive water expressed from the sheet. The fabric also conveys the wet sheet through the press section and provides power transmission to turn rolls in the fabric run.

In serving these functions, the fabric must not have an adverse effect on sheet properties. The fabric must provide pressure uniformity to prevent sheet marking from the press roll, base fabric, and fabric surface. To provide economical operation, the fabric must have adequate water handling characteristics over its life span. It must be durable and resistant to compaction, chemical degradation, and the tendency to fill up with furnish particles. It also must provide good machine runnability with freedom from sheet transfer, fabric guiding, vibration, and other problems that reduce efficiency. To satisfy these requirements, the fabric manufacturers provide a wide variety of design constructions. This custom engineering is necessary due to the various combinations of paper grades, machine speeds, press section arrangements, fabric conditioning equipment, and so forth found in the paper industry.

B. MANUFACTURE AND DESIGN CONSTRUCTION

Materials

The primary materials used in the manufacture of press fabrics are polyamides; nylon is a common tradename. Polyamide fibers and yarns are purchased in various sizes and with different specifications for properties such as tensile strength and degree of preshrinkage. The specifications chosen depend upon the end use. Polyamide fiber is durable, strong, and resistant to wear. For these reasons, it rapidly replaced wool in most press fabric applications.

Some applications utilize wool or high-melting-point synthetic fibers in the paper-side surface to minimize localized surface melting (wad burning), which occurs when the sheet breaks and builds up in front of a press nip. A few isolated applications utilize polyester for its superior resistance to stretch.

A press fabric is made from yarn used in weaving and batt fiber used in needling. Typical yarns fall into four categories:

PRESS FABRICS

1. Spun yarns made by twisting short staple fibers together
2. Multifilament yarns made by twisting continuous filaments together
3. Treated yarns which are typically chemically treated multifilaments altered by heat curing
4. Monofilament yarns which can be used singularly or in a cabled, or plied arrangement.

Needle batt fiber is short staple fiber typically about 3 in. in length and is available in a variety of sizes, degrees of preshrinkage, degrees of crimp, and so forth. The most common term associated with needle batt is *denier*, which is the weight in grams of 9000 meters of fiber length. The metric unit *decitex* is the weight in grams of 10,000 meters of fiber length. Typical denier sizes used in press fabrics range from 1.5 to 80 corresponding to fiber diameters from 0.014 mm to 0.100 mm, as shown in Table 6.1.

Major Processing Stages

Figure 6.1 shows the major processing stages of press fabric manufacturing. Yarns are woven together to form a base fabric. This woven base fabric can be made in a variety of weaving patterns; can use different yarns; can be single layer, multilayer, or a combination of two or more independently formed base fabrics; and can be formed either as an endless loop or as a flat piece. Flat woven base fabrics can be seamed and made endless prior to needling, or they can be made with loops on each end that will be pin-seamed (joined) together at time of installation on the paper machine.

Table 6.1 Polyamide batt fiber

Denier	Decitex	Diameter
1.5	1.7	0.014
3	3.3	0.019
6	6.7	0.027
15	16.7	0.043
25	27.8	0.056
40	44.4	0.070
80	88.9	0.100

Denier is a textile term equal to grams per 9000 meters of fiber length.

Decitex is grams per 10,000 meters of length.

Diameter of the fiber, for a round cross-section, is shown in millimeters.

Batt fiber is carded, or combed, in order to orient the fibers in the same direction and to make the mass distribution uniform. Different methods are available for carding and subsequent preparation of the fiber for needling. The two major methods are cross-lapping (conventional needling) and spiraling. In cross-lapping, the batt fibers are layered back and forth in order to form the desired batt weight. As shown in Fig. 6.2, when the batt is needled to the base a batt splice is formed where the start and end points meet. The fibers are oriented predominately in the cross-machine direction (CD). In spiraling, the fibers are oriented predominately in the machine direction (MD). The endless spiral is formed either directly on the base fabric or in a separate process.

In the needling process, the batt fibers are driven mechanically into the base fabric through the use of specially designed felting needles. These barbed needles are mounted in reciprocating plates that alternately drive batt fiber down into the base fabric and then retract, leaving the fiber in place. An infinite number of needling techniques can be designed to customize the process.

In the finishing stage, the press fabric, which is now a base fabric with needle batt fiber applied to the paper side or both sides, is washed, dried, chemically treated if desired, and heat stabilized. Heatsetting stabilizes the fabric by altering the orientation of the polymer structure.

Base Fabric

Base fabric constructions are extremely varied. When discussing base fabrics it is common to talk about the number of layers, which refers to the "layers" of machine-direction yarns in the weave pattern. For example, when looking at a cross-section of the felt, a double layer would have two sets of machine-direction yarns, one set stacked on top of the other. Figure 6.3 shows schematics for some typical base fabrics. The base fabric provides void volume within the structure to accept water expressed from the sheet. It also provides resistance to compaction. An endless woven base is actually woven as a tube. Each edge of the tube is under high tension and must be carefully controlled so that its characteristics are uniform with the rest of the fabric (Fig. 6.4). A too-open or too-closed loom edge (sometimes called turnaround) could cause water handling problems in that area.

Presently in the United States about 90% of press fabric bases are made in endless form, although the use of pin seams has grown in specific applications. The current developments in pin-seamed fabrics are directed toward making the seam area more uniform with the body of the fabric and more durable.

PRESS FABRICS

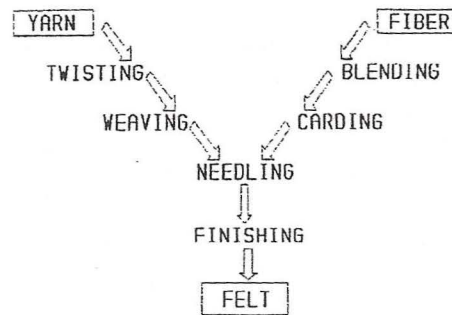


Fig. 6.1: Major processes in press fabric manufacturing

Needled Batt

Batt fiber prevents marking of the sheet by the coarse base fabric, provides more uniform pressure and surface density characteristics to the sheet, provides compressibility in the structure, affects the flow of water from the sheet into the fabric, and protects the base fabric from wear. Customized designs encompass combinations of batt weight, fiber type, and distribution. The fiber can also be oriented to enhance certain properties.

Treatment

Chemical treatments can improve certain fabric properties. They consist essentially of two types: (1) those that internally modify the molecular structure of the materials, and (2) those that supply an external coating on the fibers to protect them and bond them together. Various treatments may be used alone or in combination, thus providing benefits such as reduced fiber shedding, improved resistance to bacterial or chemical degradation, increased resilience, reduced tendency to fill up, increased wear resistance, improved start-up performance, and improved stability. Precompaction treatments make use of pressure and temperature to reduce the bulk of the fabric so that break-in time is reduced. They can be applied with or without chemicals. Precompaction reduces both caliper and permeability, and it has a smoothing effect on the surface of the press fabric.

C. GENERAL PROPERTIES

A number of properties are measured in order to determine a fabric's suitability for a particular application. While fabric manufacturers do not use a standardized set of test techniques, most do some type of testing of the properties that follow.

Unit Weight

The unit weight of the felt, usually expressed in ounces per square foot (oz/ft²) or grams per square meter (g/m²) is an important design consideration. The weight influences water handling capabilities as well as compressibility.

Stiffness

A measurement of stiffness is important for assessing the difficulty of installation on machines with small clearances or particularly difficult fabric runs for draping the fabric into the press section. Newer machines are designed to accommodate stiffer fabrics but machines with poor alignment or poor guiding systems often have difficulty guiding very stiff fabrics. Stiffness is measured in the MD and CD; values typically range from 5 g to 50 g (Gurley Stiffness Tester).

Void Volume

Void volume is that space formed in the weave pattern and within the batt fiber structure that can accept water removed from the sheet. In most press nips, water is seen exiting the nip, indicating that the fabric is saturated at midnip. At this point, all of the voids are filled. Sufficient void volume is particularly important when water loads are very high or when hydraulic-related problems such as sheet crushing, shadow marking, and vibration are present. Void volume changes as the felt compacts with age and becomes filled with contaminants.

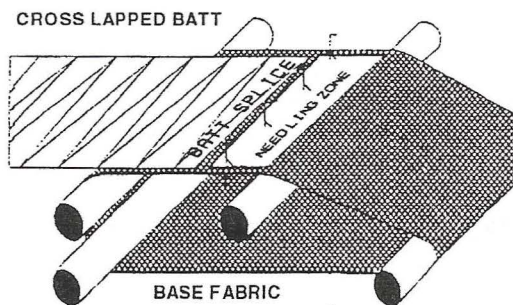


Fig. 6.2: Conventional needling

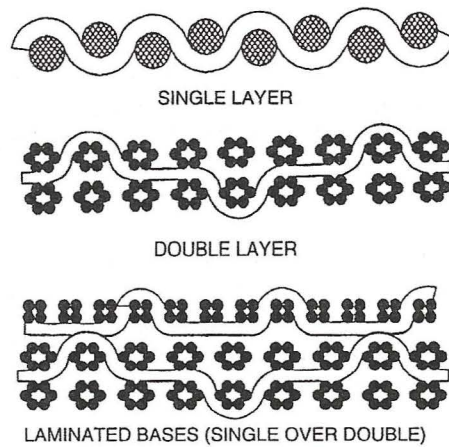


Fig. 6.3: Schematics for typical base fabrics

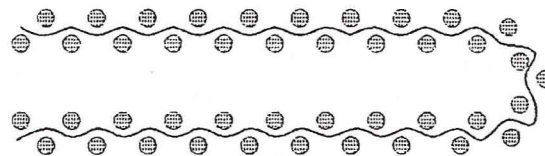


Fig. 6.4: Portion of endless weaving showing right-side loom edge

Compressibility, Hardness

A more compressible fabric has a dampening effect on vibration and will also drive more water into the roll system, provided it is not at its limit. This may be desirable if fabric suction box capacity is inadequate. A more compressible fabric has less hardness which on pressure controlled grades, typically lighter-weight sheets, lowers the effective pressure in the nip and has an adverse effect on dewatering. Measurement of compressibility is not standardized within the industry.

Permeability

Much emphasis has been placed on air permeability measurements taken on new, uncompressed fabrics. This is unfortunate because air permeability measurements were designed to be a quality control tool in the fabric mill. There is no correlation between air permeability values and machine performance. Similar measurements can be obtained on drastically different design constructions. This is best exemplified by the fact that a fabric used inside out is likely to fail although the air permeability is identical to that of the fabric used properly. A more meaningful

assessment is that of water permeability measured under load, as this more accurately considers the function of the fabric and the operating conditions. Even this property must be considered in combination with others to determine a design's suitability for a given application. TAPPI Technical Information (TI) Sheet "Characterization of Wet Felts" provides details on air permeability measurement technique.

Permeability measurement of a press fabric in operation can give valuable insight as to how the fabric changes over time. Historical data on a particular design can provide guidelines for scheduling fabric cleaning or removal. TAPPI TI Sheet "Porosity Measurement of Press Felts on the Paper Machine (HSPT)" provides details of this technique.

Caliper

Caliper is easily measured both in the fabric mill and on the paper machine. These thickness measurements give a general indication of the amount of void volume present and how it changes over time. Precompaction treatments reduce caliper. Many mills plot caliper readings versus time to determine when to schedule a fabric change. Two TI Sheets issued by TAPPI address these measurements: "Method for Evaluating Thickness of Wet Press Fabrics" and "Press Section Monitoring".

Tensile and Elongation

The tensile strength of a fabric is substantially greater than the operating tension. The measurement of tensile strength can be of interest when degradation is suspected and both new and previous values can be compared. Elongation characteristics are significant when stretch roll capability is limited or when a fabric goes through two presses and could be subject to stretching due to drive differentials.

Surface Uniformity

The desire for improved sheet surface quality and increased water removal has led to greater concern for fabric surface uniformity. A number of visual tests using gels or other pressure sensitive materials exist; they are subjective in nature and usually rely on comparisons to filed standards. More recently, advanced image analysis techniques have come into use to scan impressions made of fabric surfaces under prescribed loads. The data are then analyzed by computer applications so that values can be assigned that indicate the degree of contact. Surface uniformity affects sheet dewatering and sheet rewet, as well as sheet quality with respect to coating holdout, sheet two-sidedness and so forth. Also, use of higher nip pressures has increased the attention given to this important fabric characteristic.

Fiber Locking, Abrasion Resistance

The ability of a fabric to withstand wear is important for maintaining uniform performance over its life. In some grades, particularly coated ones, loss of batt fiber from the fabric into the sheet can cause operating and quality problems. To test for resistance to fiber shedding and overall resistance to wear, various techniques have been designed to measure the batt loss when the fabric is exposed to a wear condition.

D. APPLICATION

The proper application of a press fabric is critical to sheet quality and to the efficient runnability of the paper machine. Predictable, repeatable performance is important because it allows for maintenance to be planned for times when the machine is scheduled to be down for a fabric change.

Design Considerations

Every fabric position has unique requirements, so there are numerous considerations in selection of the proper design. The broad concerns are for finish, water handling, durability, and runnability. Specific information is necessary for such items as grades produced, furnish, machine type, press loadings, press roll size and type, fabric conditioning equipment, speed, and any particular operating concerns. To achieve optimum performance, the designer must satisfy the requirements by selecting the proper combination of yarn type, weave pattern, batt fiber type, batt distribution, batt orientation, weight of components, needling technique, treatment applications, and heatsetting procedures. After a trial has been evaluated, an analysis of a returned sample can provide additional information for further design refinement.

Effect on Paper Properties

Press fabrics play a major role in machine efficiency and in sheet quality. Uniform pressing with adequate flow characteristics can eliminate negative hydraulic effects such as shadow marking from the roll or press fabric, barring in the sheet due to vibration, and isolated crushing. Sheet surface uniformity can be improved through more uniform pressure imparted by the press fabric in the nip. While two-sidedness is controlled primarily by press geometry, the degree of sheet dewatering in a particular direction is partially influenced by the fabric design used, thereby affecting two-sidedness. Greater sheet strength can be developed through more intensive pressing. This can be influenced by the hardness of the fabric design, which contributes to the psi developed in the nip.

Economics

Press fabrics represent a very small percentage of the overall cost to produce paper but have a large effect on machine performance and, therefore, profitability. Improved press fabric performance can reduce steam usage, thereby providing large energy savings. Alternately, machine speed can be increased, thereby providing incremental tonnage for sale. Incremental tonnage can also be gained by reducing breaks due to poor press performance. Studies show that relatively small increases in speed or small reductions in downtime that result from breaks can add significantly to profits. These gains are often multiples of the cost of the press fabric. Because fabrics have an effect on sheet quality, better performance in this area can also lead to increased paper sales through greater customer satisfaction.

The old measure of life in number of days no longer adequately describes fabric economics. Many mills now schedule fabrics off while they are still performing well. In this way, maintenance activities can be scheduled, risk of machine damage is minimized, poor quality paper is avoided, and operating costs (e.g., steam) are kept in control. For these reasons, fabric cost per ton by itself is an incomplete measure of performance.

2. OPERATION

Press fabric and press section performance can be improved by following certain guidelines and by understanding the causes of and typical solutions to operating problems.

Installation and Start-up

Before a new fabric is unwrapped, the machine position should be thoroughly cleaned. All suction boxes, showers, roll faces, and conditioning equipment should be checked for proper operating conditions and cleanliness. All journals, bearing housings, or other greasy or oily areas that may come into contact with the fabric should be cleaned, and all sharp surfaces should be covered to minimize the possibility of snagging or tearing the fabric.

When the fabric is being installed, the paper side must be oriented properly and the trademark lines should be correct for the direction of travel. The fabric should be carefully worked over the rolls of the fabric run, and it should not be overstretched. When the fabric is in position, it should be spread out to its full width on the rolls. Seamed fabrics are usually equipped with a leader to tie into ropes or into the old fabric so that the new fabric can be pulled through the run. Various types of seam assists are used to hold the seam in place so that the pintle can be put through the loops in order to join the ends. Any grease or oil that gets on the fabric should be removed before the fabric is wet up.

The tradeline should be straight before wetting the fabric. The stretch roll should be adjusted to give sufficient tension to turn all rolls. The press rolls should be very lightly loaded and the fabric rotated slowly for several revolutions. The fabric should be uniformly wet up across its width, which is best accomplished with a full-width shower. During this wetting process, the fabric guide also should be checked for proper operation.

As the fabric is wet up, the stretch roll should be adjusted to maintain uniform tension and prevent wrinkling. The tradeline should be kept straight and the fabric should be operated near the recommended running length provided by the supplier. The fabric should not be trimmed until it has been rotated under full running tension with the press loaded, and the width has stabilized. A sharp knife should be used to trim the edge opposite the fabric guide.

Shutdown Procedures

During brief shutdowns, the fabric should be kept flat under uniform tension. Tension should be relieved during extended shutdowns. When a machine is scheduled for a shutdown exceeding a few hours, it is important to remove contaminants from the fabric with a thorough washing. The fabric should not be roped up for washing. If allowed to remain in the felt, contaminants harden and become difficult to remove later, thereby affecting start-up and subsequent operation. Some mills find it advantageous to apply fabric softener to the press fabric before shutting down. The softener is then rinsed out during wetting up at restart. The fabric, all rolls, and all fabric conditioning equipment should be examined, cleaned, and repaired while the machine is down. At restart, the same start-up procedure should be followed. It is most important to keep the fabric flat, wet it uniformly, and apply the proper tension in order to avoid wrinkling or roping on start-up.

Guiding, Tradeline Distortion

The basic principle for guiding is that when a flat material, such as a fabric under tension, contacts a rotating cylindrical roller, the material will move at a right angle to the roller axis. To be effective, pressure is needed to prevent slippage. This pressure is provided by fabric tension and by the angle of wrap on the guide roll. The wrap is typically 25-35°, divided as evenly as possible on each side of the roll. It is not necessary to have a fixed roll relatively close to the guide roll so that the fabric contacts this roll while it is in its guided position. The wrap on this lead-out roll is normally at least 25° in order to hold the fabric movement. The guide is usually positioned between two fabric rolls so that two-thirds of the distance is from the lead-in fabric roll to the guide roll and one-third of the distance is from the guide roll to the lead-out fabric roll. In no case should the lead-in or lead-out draws be less than one-third the face width of the fabric-carrying roll. Guiding can appear to be confusing

particularly with different degrees of wrap. One simple rule holds true under all conditions: A fabric will travel toward the end of the roll it contacts first.

A well-designed and efficient press should have a fabric guided with a straight tradeline. A tradeline that is not straight will produce distortion in the weave pattern which will result in nonuniformity across the width. This can negatively affect performance.

A tradeline that tends to run ahead at one edge is an indication that the fabric run is shorter at that end. This is corrected by tightening the stretch roll at that end to equalize the length of run. By doing so, the fabric may tend to run off the machine. The machine tender must watch this tendency and, if necessary, must correct it by repositioning the hand guide.

If the fabric wraps a concave or convex (crowned) fabric roll, the center of the fabric will tend to lag or to run ahead, respectively. This is caused by the difference in circumferential speed of the roll's center in respect to its ends. A fabric passing straight through the nip of two press rolls properly crowned for uniform nip contact without wrapping either of the rolls will maintain a straight tradeline. If, however, the crowns are excessive for the applied load so that the nip contact is greater at the midpoint of the roll face, the fabric will lead at its center. If the crowns are insufficient for the applied load so that nip contact is greater at the roll ends, the fabric will lag at its center.

If the fabric wraps one of the press rolls and the roll is crowned, the arc of fabric wrap will be greater at midface than at the ends. The rotational speed is the same across the face of the roll, so the fabric will run ahead at its center. The amount the fabric will advance at its center is proportional to the angle of wrap; this amount increases with increased wrap.

The tradeline position is generally the net effect of more than one cause of distortion. Knowing the above causes enables the papermaker to take corrective action by adjusting rolls to either remove the cause or to counteract it. Occasionally, fabrics from different suppliers may react differently on a given position due to stiffness and resistance to distortion characteristics inherent in different designs.

E TROUBLESHOOTING

To obtain optimum press performance, considerable attention should be given to proper fabric operation. Following is a brief listing of some common operating problems which may interfere with pressing efficiency, along with suggestions for correcting them.

Dimensional Stability

If the fabric is too narrow, wide, long, or short, the first question is whether it started that way or became that way after running. Check to see if the operating

tension is correct, as this will affect fabric size. Check records to see if previous fabrics exhibited a similar problem. See if the operating temperature has changed (e.g., steam box on). Check bowed roll applications. Examine the fabric for excessive wear. Look at tradeline distortion that may be present and make roll adjustments as needed.

Blowing

Blowing is caused by an accumulation of air between the sheet and fabric ahead of the press nip, and is greatly influenced by press section geometry. It can occur because air is entrained by the fabric surface, or because the fabric is too dense to permit air to evacuate, or because the felt is too open and air is being pumped through it. If a fabric blows when it is new but stops after it is broken in, it may be necessary to decrease the volume of the fabric by increasing density. A blow roll that raises the sheet above the fabric is one solution when it is practical. A suction lead-in roll or a suction box on the inside of the fabric just ahead of the nip is sometimes used.

Increasing the operating tension of a new fabric will sometimes alleviate blowing. Reduction in porosity as the fabric runs can cause blowing to develop. Consequently, cleaning of the fabric is helpful. If this condition persists regularly over the fabric's life, then a more open fabric construction is usually required.

Shankering and Shedding

If the needle batt fiber on the fabric surface is too long, it may tend to twist together and accumulate fiber stock. These accumulations are called pigtails or shankers and can result in sheet marking. The fabric maker can correct this by changing the needling procedure. As a temporary partial solution, the papermaker can stretch a rope across the fabric to drag over it to catch and remove some of the fiber accumulation. Occasionally, shedding will occur only on start-up due to stray loose fibers. If shedding continues, it is due to improper needling or operating conditions on the paper machine. Some machine conditions to check include worn fabric suction box covers, lack of lubrication, high-pressure shower wear, chemical degradation (including high chlorine residual), and hydraulic damage in the nip.

Shadow Marking

When hydraulic forces are not uniform on the sheet during press dewatering, the so-called shadow effect of the pressure differential can be seen in the sheet. These marks can be from grooves in grooved rolls, from holes in suction or blind drilled rolls, and from the fabric structure. The use of a heavier or more rigid fabric is usually needed to adequately bridge the grooves or holes in order to provide uniform pressure. If the mark is from the fabric it is usually necessary to change designs. Other solutions include using softer roll covers, smaller holes, or narrower grooves, and in some cases

recovering or regrounding a worn cover. Some of these solutions might reduce water handling capacity or sheet water removal. Also, filled fabrics and fabrics that are running too wet can contribute to shadow mark problems.

Marking-Yarn, Surface

When marking is more of a direct impression than a shadow effect, design changes are necessary. When base fabric yarns are marking, then yarn types, yarn density (count), and weave pattern may be changed to provide more uniform pressure to the sheet. Yarn marking can also be due to fabric wear. More paper side needle batt may be used to provide more coverage of the base. If the marking is from the fabric surface, finer fibers, different needling techniques, and precompaction treatments may be used to improve uniformity. Yarn marking can also occur when there are crown problems causing higher pressure in certain areas across the width.

For both shadow marking and fabric marking, it is necessary to determine which side of the sheet is being marked and the pattern of the mark. Knowing this can enable the papermaker to locate the cause. For example, closely spaced machine direction marks are likely associated with the fabric while wider spaced marks are typically groove roll marks.

Wrinkling, Roping

Taking care to operate the fabric at the proper tension across the entire width is the best way to avoid wrinkling and roping. Proper wet up procedures are particularly important to prevent uneven tension. On long unsupported draws, a supporting fabric carrying roll may be necessary. If wrinkling occurs, the press should be opened and the fabric spread out evenly. Steam or hot water may help to flatten the wrinkle. The press should then be lightly loaded and started up slowly.

Edge Flipping, Sheet Following

Problems with uniform sheet transfer can cause breaks and quality problems. The sheet tends to follow the smoother surface. Press geometry can also affect transfer, and sometimes changing the amount of wrap of the sheet or fabric on a roll will help. In some cases, a change of roll cover material is needed. The fabric may appear to be smoother because it has become filled, and in this case cleaning is effective. A wet running fabric surface will also create problems. Suction box and shower use can be modified to dry up the fabric. The fabric maker can modify the surface by using coarser batt fiber or by modifying the needling technique.

Sheet Pickup Problems

Poor pickup or drop-off may be caused by a number of problems including stock changes, condition of the forming fabric, condition of the press fabric, speed differential between the press fabric and forming fabric, incorrect suction pickup roll operation, and incorrect fabric conditioning equipment operation. Design of the pickup fabric is critical. The fabric must be open enough to allow vacuum in the suction roll to pull the sheet to it but it must have a closed surface that is smooth enough to hold the sheet to the transfer point. The surface characteristics are particularly critical in tissue applications. The moisture level in the fabric also influences sheet adhesion. If the pickup fabric appears filled or closed up, it should be cleaned. A plugged suction roll or improperly positioned deckles can cause problems, also. When problems are caused by poor edge cut by the trim squirts, running double squirts and adjusting the angle of cut is helpful.

Wear

The causes of excessive fabric wear can be divided into fabric design, mechanical, chemical, and hydraulic categories. A poorly designed fabric can experience wear even under normal operating conditions. Mechanical causes that should be investigated include:

- Press rolls - crowns, bearings, misalignment, rough or worn surfaces
- Fabric conditioning equipment - worn suction box covers, excessive shower pressures, oscillator operation, even coverage of lubricating showers, filled fabrics causing higher suction box vacuum and more drag
- Stock system - sand or abrasives in the furnish.

Wear in isolated streaks usually indicates a mechanical cause. When the wear is overall, chemical causes are suspect. These could include damage from chlorine residual in the system or from improperly applied fabric cleaning chemicals. Hydraulic damage can occur when the fabric/roll system cannot handle the existing water load. These hydraulic forces can literally blow the fabric apart. The press fabric roll holes, and grooves should be checked for filling.

Crushing

The hydraulic forces discussed above can also disrupt the sheet. This crushing causes breaks and quality problems. On a new fabric, the problem may be that the fabric is too dense with insufficient void volume. A dirty, worn, or compacted fabric would have reduced void volume and could contribute to crushing. Isolated high pressure points increase the amount of water flow in that area. If the flow becomes

excessive, crushing will occur. Crushing can also result from an excessive rate of pressure application within the sheet. Roll crowns and press loadings should be checked for uniform application of pressure. Filled streaks in the fabric or roll can also cause a problem.

Press Bounce

Press bounce and vibration can be caused by mechanical problems on the machine, nonuniformities in the fabric, and hydraulic forces. Checking the frequency is the first step in isolating the cause. Also, checking to see when the bounce started, whether it is getting better or worse, whether any rolls or fabrics have been changed recently, and whether the condition existed prior to these changes are all important questions to answer. Typical roll causes include improper balance, bad bearings, worn rolls, corrugated or flat areas in the cover, or insufficient void volume. Fabric causes are typically nonuniformities such as loom edges or batt splices. If the fabric is suspected to be the problem, deliberate cocking of the tradeline sometimes can temporarily alleviate the problem. Many mills regularly alternate the cocking. If the fabric or roll is filled or if the fabric design does not have adequate void volume, excessive hydraulic forces can cause bounce or vibration.

Wad Burning

Wad burning occurs when the sheet breaks and paper gets caught on the in-going side of the nip, where it spins and causes friction on the fabric. This friction creates heat which melts the fabric's surface fibers. The surface can also become plugged with fiber. Wool and some high-melting-point synthetics are more resistant to melt damage; however, these fibers do not offer the general wear and compaction resistance properties of polyamide. Press geometry must be changed or break detectors must be installed so that the press is quickly unloaded in order to eliminate wad burning. Poorly designed or misaligned roll doctors also contribute to wad burning problems. A wad burned area of the fabric sometimes can be cleaned by the use of chemicals and high-pressure showering. In extreme cases, a spiked wheel can be used to break up the fused surface. The wad burned area typically causes wet streaks in the paper because water cannot be pushed through the closed fabric surface.

Poor Water Removal

Press water removal that is less than normal can result in slow speeds, increased steam use, increased draws, crushing, marking problems, vibration, and increased breaks. Many of these problems have been discussed earlier. Analysis of a water removal problem can be very complicated due to a myriad of causes that can be stock, machine, or clothing related. Finding a solution starts with isolating the point when

the water handling problems started along with any changes that had been made in the process or equipment around that time. It is important to determine if the problem is localized. The following areas should be checked: stock and wet end conditions, proper press loading, nip conditions (dry or wet, uniform or uneven), doctors and showers, all fabric conditioning equipment, and condition of the press fabrics. Moisture tests of the sheet at various points can help isolate the problem area.

G. SUMMARY

Whenever press fabric operating problems are encountered, it is recommended that you work closely with your suppliers. In addition to assisting in solving operating problems, suppliers may also observe conditions that necessitate a change in fabric design in order to improve performance.