EXPERTIP

Category	DRYING
Keywords	Dryer fabric, dryer fabric guiding, misalignment, guide roll

Dryer Fabric Guiding

When dryer fabric guiding problems are encountered, the first step should be examination of the seam. The seam usually will provide a key to the underlying causes of guiding problems.

Seams and Misalignment

Close attention should be given to front-to-back misalignment. Is one edge of the seam running ahead of the other edge? If so, there is a high likelihood of misalignment somewhere in the section. Misaligned roll(s) affect guiding of the fabric. Before any other changes are attempted, the section should be realigned and front-to-back seam misalignment should be minimized. Methods of aligning the dryer section will be discussed in another issue of EXPERTIPS.

A symmetrical seam bow, with the edges roughly even and the middle leading, is evidence of other problems that do not affect guiding. The rest of this discussion on guiding will be based on the assumption that misalignment (if any existed) has been corrected.

Friction – The Key

Guiding of dryer fabrics is dependent upon friction between the guide roll and the fabric. Anything that increases the coefficient of friction between fabric and roll will improve the guiding action of the roll.

Increasing the diameter of the roll, or covering it with rubber or resin type cover, will increase the friction coefficient and guiding effectiveness. Contact your roll supplier for proper cover types.

However, these solutions require capital outlays and downtime, which may make them impractical. In most cases, the papermaker must work with the equipment available and try to get the best performance from it.

Increased fabric tension provides more friction and can help guiding, but there is a limit. Gains in guiding effectiveness reach their maximum at approximately 8 to 10 pli (1.4-1.8 kN/m). Fabric tensions above 10 pli can cause other problems especially on older dyer sections if the rolls were not designed to support such higher loads.

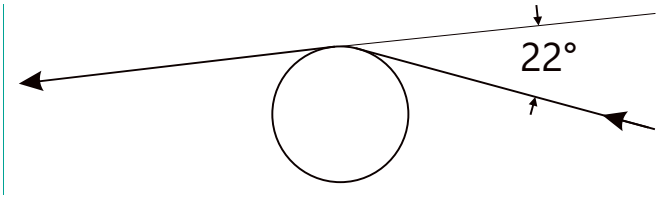

FIGURE 1.

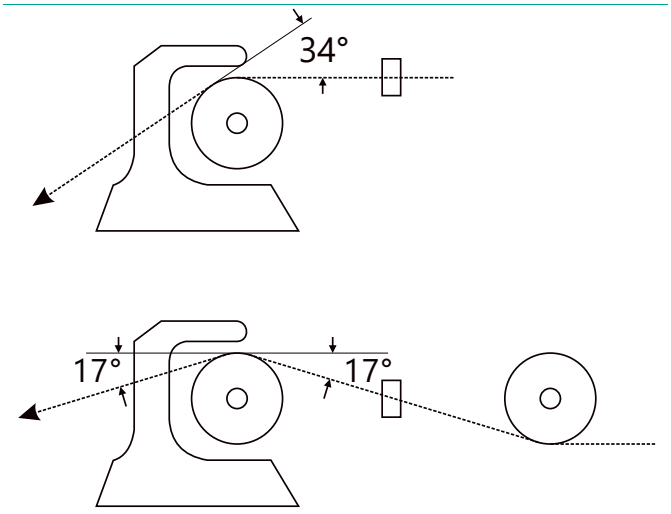

FIGURE 2.

Angle of Wrap

Friction is directly proportional to the amount of fabric surface in contact with the guide roll. As shown in **Figure 1**, increasing the angle of wrap increases friction and guiding effectiveness.

The minimum acceptable angle of wrap is 30°. This wrap should be equally divided on each side of the roll; i.e., 15° into the guide roll and 15° on the outgoing side. Experience has shown that 17° into the guide roll and 17° on the outgoing side, as shown in **Figure 2**, will give significantly better performance.

Lead-In/Lead-Out Ratio

The lead-in and lead-out distances between the guide roll and rolls just ahead and just following also have a dramatic effect. These distances must be correctly interrelated with angle of wrap for good guiding.

The lead-in distance from the roll just ahead to the guide roll should be between one-third and one-half of the width of the fabric. Machine width is also a factor. On narrow machines, the lead-in distance should be one-half the width of the fabric. As machine width increases, the relative lead-in distance may be decreased, and one-third of the fabric width is adequate on the widest machines.

A common rule of thumb among papermakers (“the 2:1 ratio”) is that the lead-in distance should be twice the lead-out distance. This longer lead-in distance allows the guide roll to work with the fabric and steer it. The lead-out roll is located closer to the guide roll to take hold of the correction and maintain it. This is illustrated in **Figure 3**.

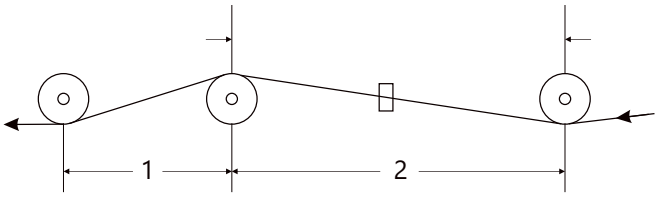

FIGURE 3.
Not less than one third of the width of felt.

Today's dryer fabrics are constructed to provide a lot of internal resistance to bowing and narrowing. This internal resistance causes the fabric to try and return to its natural path of travel before it is guided. A single lead-out roll may be incapable of holding the correction. To overcome this problem, a third roll is located after the lead-out roll – preferably no further after the lead-out roll than the lead-out distance from the guide roll. This 2:1:1 configuration is shown in **Figure 4**.

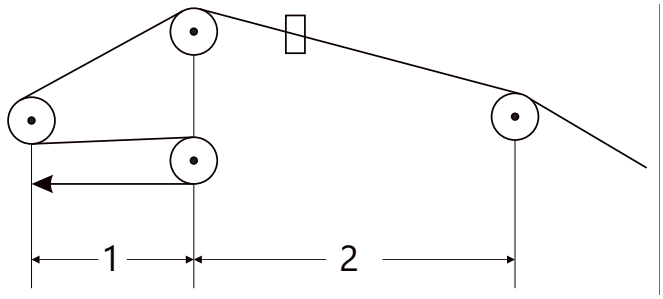

FIGURE 4.

The first lead-out roll should have at least 25° to 30° wrap. The roll following the lead-out roll should have as much wrap as is practical; 180° wrap on this third roll has proven the most effective.

Examination of a particular case study of an actual application will show how the above theories can be put to practical use.

The example is a 240-inch (6.1 meters) wide kraft machine, which had a long history of guiding problems on one dryer section. These problems were magnified when the mill bypassed a felt dryer in the return run near the guide roll.

Following the traditional rules of thumb, rolls were moved to give a 2:1 lead-in/lead-out ratio and a 30° total guide roll wrap, 15° ingoing and 15° ongoing. These changes made only a slight improvement in guiding. The machine continued to be plagued by guiding problems and consequent damage to fabrics.

Figure 5 shows this position after the initial changes. A more detailed analysis will not only show why the mill continued to experience guiding problems but also how these problems could be solved.

The problems on this position were made worse by a common issue that plagues many of today's older machines – lack of space.

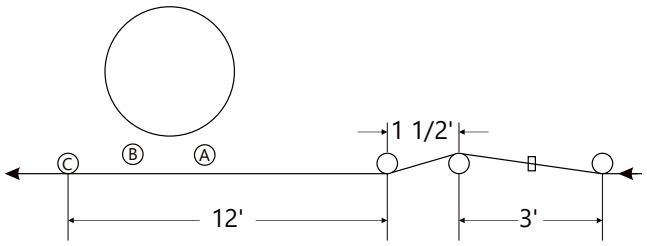

FIGURE 5.
Before – (30° wrap) (15' IN – 15' OUT).

The lead-in roll, guide roll, and lead-out roll were all mounted on a common I-beam. This I-beam was so close to the floor that rolls could not be mounted on its underside. Additional difficulty was presented by another machine support I-beam located just above the guide roll.

When mill personnel began to work on the guiding problem, their first thought was to shim the guide roll to obtain the necessary amount of wrap. They found, however, that the guide roll could be shimmed only two inches (5 cm) because of the other I-beam above it.

In order to get the desired minimum 30° wrap on the guide roll, they were forced to move the lead-in and lead-out rolls close to the guide roll. They maintained the 2:1 ratio and wound up with a three-foot (91 cm) lead-in distance and a 1-1/2-foot (45 cm) lead-out distance. The three-foot lead-in distance was less than one-sixth of the 240-inch width of fabric.

Another change was made to this run when the felt dryer was bypassed. Roll "C" was shimmed down to provide clearance of the felt return rolls, "A" and "B".

Application of some of the principles discussed earlier will provide an understanding of why guiding problems continued to occur.

The 30° guide roll wrap is minimally adequate, and it is also equally divided 15° on each side. The basic problems on this position are the lead-in and lead-out distances. The lead-in distance is too short to allow the guide roll to move the fabric. There is also insufficient wrap on the lead-out roll. How could these deficiencies be remedied?

Even though the vertical distances on this position were tight, there was plenty of room for lateral movement. The problem was redefined as, "How can the lead-in and lead-out distances be increased while simultaneously obtaining an acceptable angle of wrap on the guide roll?"

The solution was to go under the guide roll instead of over it. The potential problem with this solution is a loss of guiding effectiveness if fabric tension decreases. The fabric would tend to fall away from the guide roll. Mill personnel agreed that it would be easier to maintain proper tension than to continue to live with guiding problems.

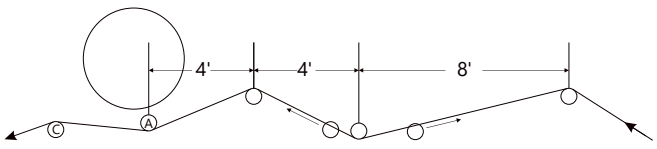

FIGURE 6.
After – (34′ wrap) (17° IN – 17° OUT).

Figure 6 shows the steps taken to solve the problem. The lead-in roll was moved eight feet (2.4 meters) from the guide roll and fitted with a 14-inch (36 cm) shim to give 17° wrap going into the guide roll. The lead-out roll was moved four feet (12 meters) from the guide roll and shimmed 10-inches (25 cm) to provide 17° wrap outgoing from the guide. Felt Return Roll "B" was removed from the machine. The fabric run was changed to under Roll "A" and over Roll "C". Note that these changes not only provided an increase in guide roll wrap from 30° to 34° but also the desirable 2:1:1 ratio. The lead-in distance was also increased to the acceptable range of one-third to one-half the width of the fabric.

These changes have been in effect for more than one year, and the superintendent said they have eliminated the guiding problem that formerly existed.

Summary

Examine the seam of the fabric currently on the machine to look for front-to-back misalignment.

Correct misalignment before attempting any changes to improve guiding.

Guide roll wrap angle should be at least 30° evenly divided between the ingoing and outgoing sides. Increasing total wrap angle to 34° will further improve guiding.

The lead-in distance should be between one-third and one-half the width of the fabric. As machine width increases, relative lead-in distance may be decreased from one-half to one-third.

The ratio between lead-in and lead-out distance should be 2:1.

Better guiding of modern fabrics may be obtained by adding a second lead-out roll to provide a 2:1:1 ratio.

The lead-out roll should have at least 25° wrap with as much as possible up to 180°.

When analyzing a position, take into account the constraints presented by machine framing.

Consider the changes in wrap angle that may be achieved by passing either over or under a roll.

Shim rolls as necessary to get the desired relationships between distance and wrap angle.

Questions?

We are here to help. We distribute **ExperTips** to help you improve the performance of your paper machine. Not just fabric performance, but the overall efficiency, reliability, and productivity of your mill.

If you have questions about anything you see here, please contact us by emailing **expertip@astenjohnson.com** or visiting our website **www.astenjohnson.com/expertips**.

And, if you have suggestions about other topics you would like to receive an ExperTip on, we would love to hear from you!