

EXPERTIP

Category	FORMING
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Tips on Forming Fabric Guiding

If not properly guided, a forming fabric may move off the machine during operation. In the most severe cases, the fabric can make contact with the machine frame, destroy itself and/or part of the machinery, and possibly cause harm to machine operators in the vicinity.

That makes guiding an important operational and safety issue.

The guiding principle

The root causes for fabric guiding issues are either misalignment of machine components, poor guide roll set up, issues with guide assembly, or the forming fabric design itself.

The guide roll on a paper machine has the task of keeping the forming fabric running straight. One end of the guide roll (usually the tending side) can be moved in the running direction of the machine. When the roll pivots in one direction, the fabric will either move to the front or the back and visa versa depending on the orientation of the machine and the fabric direction of run. The fabric will guide toward the side of the guide roll that it touches first (Figures 1 and 2).

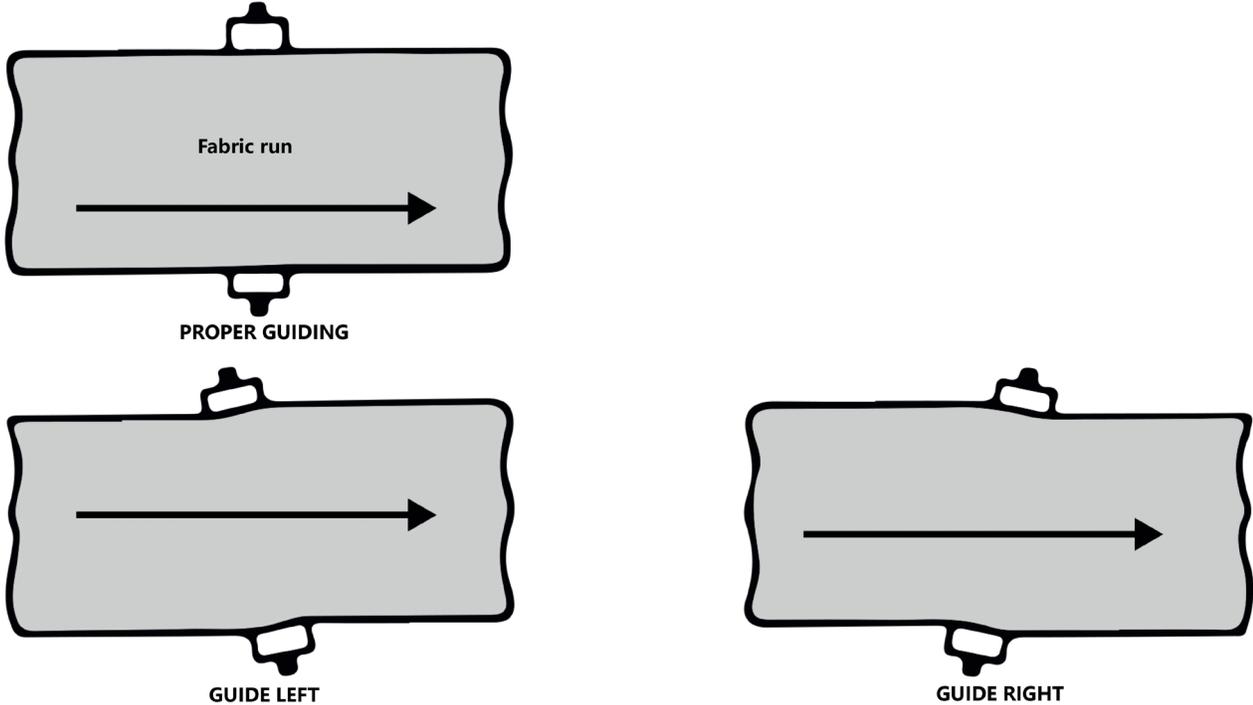


FIGURE 1. Schematic of guiding.

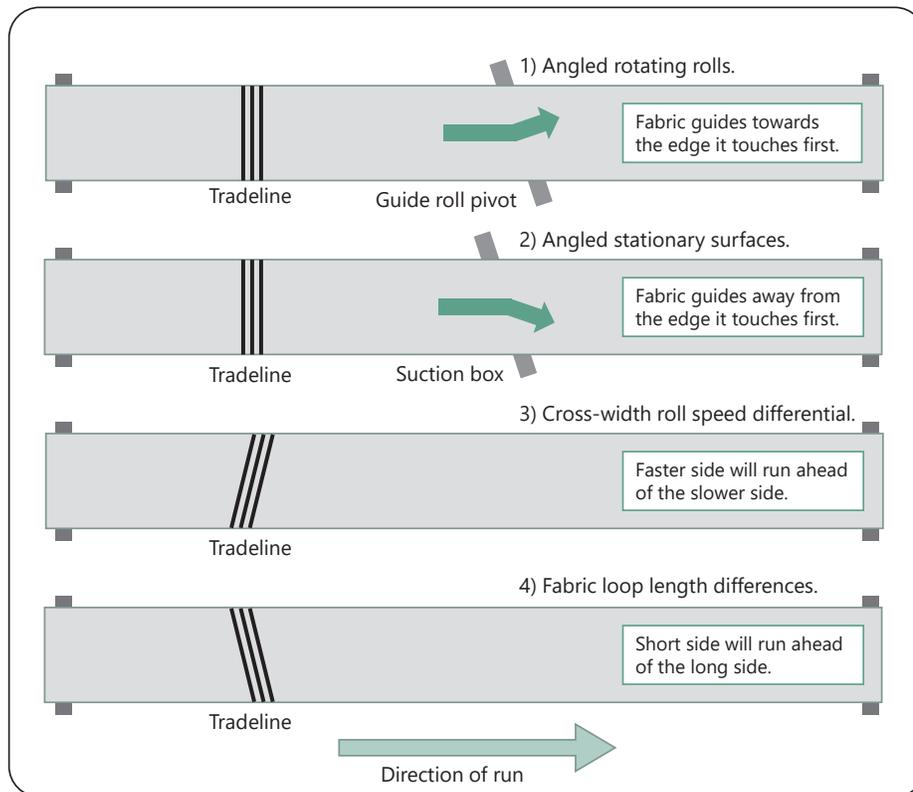


FIGURE 2. Machine factors affecting guiding.

Solving guiding problems

Even for machines that automatically control guiding, a series of continuous strong guiding corrections can lead to excessive fabric wear, which results in a shorter life and therefore higher costs. Guiding problems and possible solutions are discussed below:

Problem: incorrect position of the guide roll on the machine. The location of the guide roll on some (older) machines can contribute to guiding problems. If the guide roll is adjacent to a stretch roll, either on the ingoing or outgoing side, the wrap angle will change when the stretch roll moves and this can cause guiding issues. When a relatively short fabric is installed, the wrap angle will decrease and guiding problems may occur (modified after [1]).

Solution: Ideally, position the guide roll between two stationary rolls, or ensure the stretch roll is positioned to ensure enough wrap.

Problem: guide roll misalignment. The fabric will guide to the side of the roll it touches first.

Solution: Ensure that the guide roll is properly aligned to the machine.

Problem: low or non-uniform tension. When the fabric tension is too low, the guide palm will not pick up movement and/or the fabric slips over the guide roll due to insufficient friction. This drastically reduces the influence of the guide roll. If the fabric tension is not uniform, that lack of uniform tension across the fabric width may cause a fabric to “walk” off the machine.

Solution: The higher the fabric tension, the more surface friction, which results in a more responsive guiding system. Always verify the correct operating tension for your forming fabric and then check the tension on both the drive and tending sides at the same position (e.g. before the guide roll). Tension differences between the two sides can be caused by a problem in the manufacture of the fabric (i.e., one side is longer than the other) or a machine misalignment.

Problem: low friction. Friction and tension are closely related. Friction issues can be related to the mechanics of the machine or the materials of construction in the forming fabric itself. In a forming fabric, the yarns in the CD are usually made of polyester and/or polyamide. While polyamide is more wear-resistant, which increases fabric life, the friction coefficient between polyamide and the guide roll is about 30% less than with polyester yarns. The guidance on tension and wrap angle are even more important for forming fabrics with high polyamide content.

Solution: If the friction is too low, it can be increased by increasing the angle of wrap on the guide roll, increasing the diameter of the guide roll to increase the contact area, or increasing roll softness.

Since water reduces friction, another critical consideration in maintaining friction is the amount of water on and around the guide roll. Water trapped between the roll and the fabric drastically reduces the guide system's effectiveness.

Problem: insufficient wrap on the guide roll. The lead-in, lead-out, and wrap angle are critical for proper guide roll operation. The larger the angle of wrap around the guide roll, the higher the effectiveness of the guiding system. The minimum wrap angle varies with the length of the fabric [1].

Solution: For longer fabrics, such as those used on Fourdrinier machines, a wrap angle of at least 25° (Figure 3) is needed to adequately guide a fabric. For shorter fabrics, such as those used on top formers or gap formers, the wrap angle can be a little less to avoid a hyper-sensitive control system [1]. Figure 4 shows the recommended lead-in and lead-out setup.

Problem: improper guide palm sensitivity. If the guide palm is too sensitive, it may pick up normal oscillation of a fabric and transfer this to the guide roll. This would cause the fabric to shift unnecessarily. If the guide palm is not sensitive enough, it will not make the necessary corrections if the fabric "walks" on the machine.

Solution: The spring tension and pneumatic tuning may be required to eliminate this issue. The diameter of the vent orifice also effects reaction time. The paddle should be diverting air from one boot to the other and venting excess air to control both reaction speed and the amount of roll movement. The springs are designed in different tensions to apply the needed pressure to the fabric edge and not cause wear to the fabric. Most suppliers of springs color code the springs to determine the tension each spring has. The system air pressure must also be monitored and controlled to the manufacturer design.

Problem: fabric construction. A strong twill pattern in the fabric may also cause guiding problems. On conventional forming fabrics, there is an imbalance in the twill angles of the yarns creating the wear surface on the bottom side. Normally, this imbalance is small and has only a minor effect on guiding. But on certain machines, the unbalanced twill angles are enough to cause guiding issues when stock is put on the wire, due to the downward forces on the drainage components.

Solution: Break the twill pattern and even out the protruding knuckles. AJ has a patented innovation called TruTrac™ where the twill pattern on the machine side of the fabric is modified. TruTrac creates a perfect balance, with the same number of CD yarn floats going in both directions. TruTrac ensures that when stock is put on or taken off, the forces generated by each set of twills will cancel each other out -- allowing the fabric to guide straight on even the most guide-challenged machines. See Figure 5.

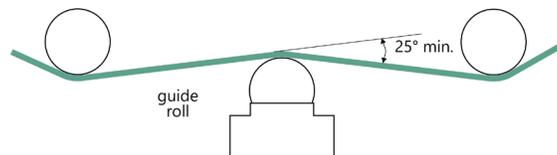


FIGURE 3. Guide roll angle of wrap.

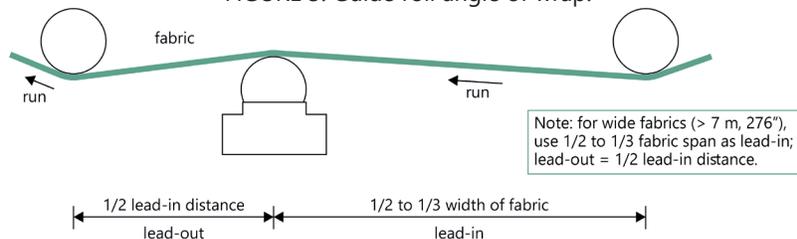


FIGURE 4. Fabric Lead-in and lead-out ratio.

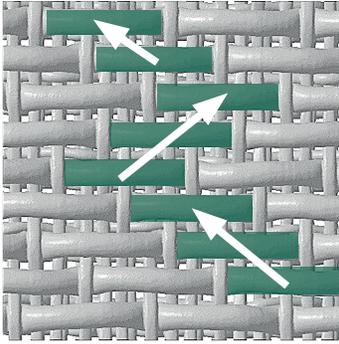


FIGURE 5. TruTrac: Balancing the twills

Problem: flatbox misalignment. A forming fabric will guide away from the side of a stationary surface it touches first. With the stock off, a misaligned vacuum element will cause the fabric to guide towards its leading edge. When stock is applied and the vacuum becomes effective, the fabric tends to guide in the other direction. This usually demands a severe and fast adjustment by the guiding system to keep the fabric running properly.

Solution: Always check for proper alignment of the vacuum elements when this phenomenon occurs. If there is no misalignment and the machine has suction boxes with drilled covers, then the latter in combination with the fabric design may be causing the guiding problem.

Problem: suction boxes with drilled covers. There is a twill pattern in every woven forming fabric. This is the diagonal pattern caused by the cross-over points in the weaving process. When a fabric's twill pattern and the pattern of holes in a drilled suction box cover match, the fabric will have a tendency to guide in a certain direction when vacuum is applied.

Solution: To eliminate this, the best option is to replace drilled suction box covers with slotted ones. This not only reduces guiding problems, but it also reduces fabric wear and improves the dewatering capacity of the suction box. If replacing the covers is not possible, another option is to alternate the drill pattern angle in successive suction boxes. The last suction box in the running direction should have the drill angle opposite to the twill angle of the fabric. [1]

Summary checklist

Determine if the guiding issue is a long term issue

- ◇ Check the pattern of drilled suction box covers against the twill pattern of the fabric
- ◇ Check guide roll location, wrap and alignment
- ◇ Reduce lubrication showers near the guide roll

Determine if the guiding issue just started

- ◇ Check the position and functioning of the guide palm
- ◇ Check the response and ensure proper stroke of guide assembly.
- ◇ Ensure proper wire tension.
- ◇ Check the alignment of all rolls and suction boxes.

Determine if the guiding issue is a stock on/stock off phenomenon.

- ◇ Choose a fabric design to eliminate issue

References

1. Solving guiding problems on forming fabrics. www.feltest.com, 2019.

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