Fabric cleaning: a logical approach*

Richard Pitt

Sheet and trim removal

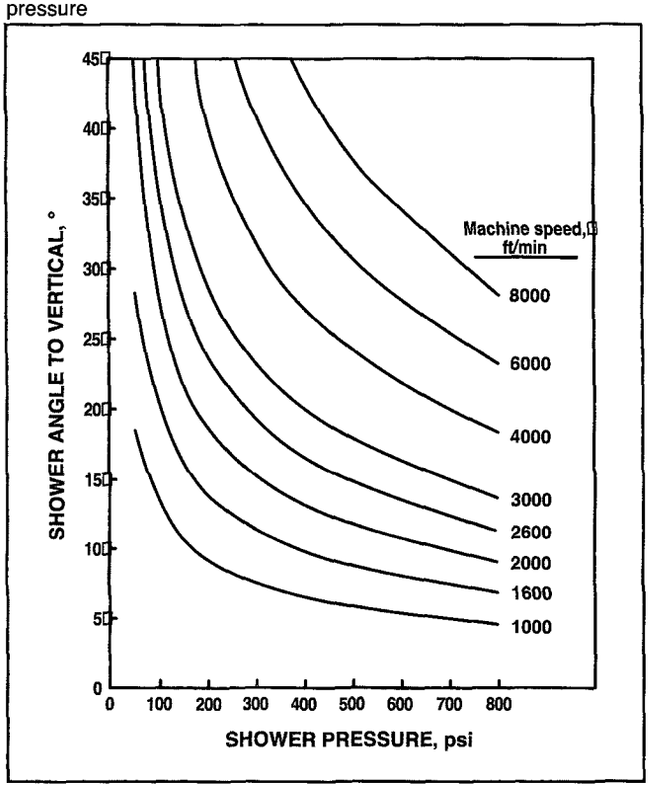
Trim removal is a problem similar to sheet removal, with the additional need to first cut the trim from the main sheet. This cut is frequently made with a needle jet, which is convenient but poses the risk of a wet edge that can be stapled into the fabric mesh or lick up on the pickup felt.

The trim jet should first be correctly angled in the direction of run according to machine speed and jet pressure, as shown in **Fig. 1**, so that after the cut the water passes through the fabric. This has the added advantage that any splashback will not block the nozzle with fiber. If it is a multilayer fabric with an angular "see-through," then the jet should also be angled in the cross-machine direction toward the outside edges for maximum effect.

When correctly cut, the trim can be removed by the same techniques used for the full sheet, such as an outside wash roll, an inside knock-off shower, or a flooding-nip shower.

In light of what is known today, it is interesting to reflect back on the initial sheet knock-off problems caused by the early double-layer fabrics. With a conventional knock-off shower, the double-layer fabric immediately reduced the knock-off momentum at the sheet to about 50%, due to the combined effect of angular "see-through" and the low permeability typical of the early double-layer fabrics. Hence, any machine that did not have double the knock-off shower capacity required for good single-layer operation was in immediate trouble with the new double-layer fabrics.

1. Correction to shower angle according to machine speed and water pressure



Fiber and fines

Fiber and fines are left on the fabric surface after the sheet transfers to the presses, and they should be removed before they make their way *into* the fabric mesh.

The cleaning methods are similar to sheet removal, such as inside full-width showers, flooding-nip showers, or showered outside wash rolls with doctors. The use of sheet-side showers before the fiber has been removed poses a severe risk of plugging the fabric with fiber, especially in multilayer fabrics.

Stickies

This generic term covers a host of materials, such as pitch, latexes, adhesives, and inks, which have an affinity for hydrophobic (nonwetting) materials such as polyethylene foils and forming fabrics. They stick to the sheet-side strand surfaces, particularly at the protected crossing points in the weave. They then attract more stickies to these anchor points, gradually coating the sheet side of the fabric. Since these contaminated strand surfaces face away from the inside fabric surface, there is little point to showering from the inside except when mesh blockage has occurred.

Tests on deinked newsprint fabrics have shown clearly that sheet-side showering is better than inside-to-out and that very close showering distances clean these contaminated fabrics far better than conventional distances. Tests also showed that the best cleaning of these fabrics was achieved with perpendicular showering, not "chasing" or "chiselling."

Brush cleaning

The test program on deinked newsprint fabrics also clearly demonstrated that the cleanest fabric was obtained by adding a cleaning brush to the close-in sheet-side showering, to brush

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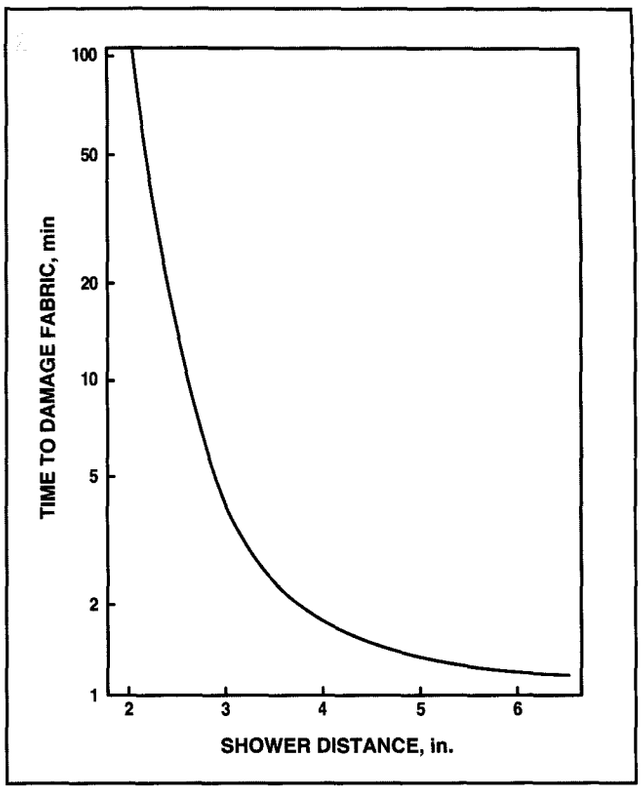
2. Typical shower damage causing mesh blockage by fibrillated fabric strands

3. Effect of shower distance from fabric on fabric damage



off the loosened ink particles.

Extensive experience with a brush has shown that loose fiber must be removed from the fabric ahead of the brush to avoid brush plugging problems. The dual-indexing brush unit reduces the brush cleaning problem by alternately rotating each brush away from the fabric for cleaning the stickies off.

An important benefit of the brush collection method for stickies is that the stickies can be removed from the papermaking loop, rather than just being added back to the white water system by conventional shower methods.

Fabric damage

Fine-mesh fabrics are particularly prone to damage from excessive showering.[1] The mesh blockage by the fibrillation of the fabric strands (**Fig. 2**) reduces drainage, impairs sheet release, and sometimes marks the sheet.

Machine-direction lines of damage indicate a showering nonuniformity depending on spacing. Regular bands of damage across the full width of the machine at the spacing of the shower nozzles indicate a failed reciprocator or one that hesitates at the ends of the stroke. Random bands that relate to the nozzle centers can mean that several nozzles are worn, oversize, or that some fan nozzles are behaving like needle jets due to contamination.

Uniform fabric damage is a sign of excessive showering, and the water pressure and nozzle distance from the fabric should be checked.

As shown in **Fig. 3**, the damage can be reduced tenfold by moving the shower from 4 in. to only 2 1/2 in. from the fabric.

Fabric damage also can be reduced by lower pressures; therefore, the showers should always be run at the lowest pressure that gives adequate cleaning.

If damage is still occurring under normal showering conditions, a more damage-resistant seam design can often be supplied, and the fabric can also be woven from special damage-resistant strand materials.

Recommendations

Fiber contamination

1. High FSI/DI fabric design
2. Full-width inside fan shower
3. Nozzles can be angled at 60° to weft axis for double-layer fabrics
4. Shower angled with run according to velocity
5. 0.125-in. nozzles with <10 ppm clarified white water or 0.055 in. with filtered fresh water
6. Oscillated shower pipe in case of blocked nozzle

[1] Pitt, R., Paper Trade J., (1): 25(1976).

7. Doctored and showered outside roll.

Deinking or stickies removal

1. Sheet-side high-pressure nozzle showers, 0.040-in. nozzles on 3–6-in. centers at <3 in. to fabric with >300 psi pressure perpendicular to the fabric plane
2. Oscillator traverse <0.040 in. per fabric revolution with a stroke length that is an exact multiple of nozzle centers
3. Brush can be tried if there is no fiber problem.

Trim squirt

1. Angle with the run according to velocity.
2. Two in-line orifices sized at 0.015–0.025 in. at >150 psi. Reduce size to increase pressure.
3. Close to fabric over open span (hole, slot, or free space).
4. Double-layer may require 60° angle to weft (i.e., to outside edges).

Flooding nip shower

1. 0.156-in. x 40° nozzles on 3-in. centers at 100–175 psi at 11–14 in. from nip for sheet knock-off
2. Nozzles on 1.5-in. centers for trim knock-off on separate pipe or on main pipe run at 40–60 psi for trim knock-off and general cleaning. □

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