EXPERTIP

Category	PRESS
Keywords	Press fabric, press fabric filling, press fabric cleaning, press fabric conditioning, showers, HP showers, lubrication showers, sheet-side showers, chemical showers, uhle box, specific vacuum, dwell time

Tips for Conditioning your Press Fabrics: 8 Common Mistakes

The press section is the most demanding section in terms of fabric performance on your machine. This is because it is not only the paper web that is squeezed in the press section, but also the fabric. To survive and succeed in the press section, the fabric must be able to withstand tremendous crushing forces and still take large amounts of water away from the paper sheet.

Good press fabric cleaning and conditioning systems use hydraulic forces from high-pressure (HP) and low-pressure (LP) showers to loosen and flush contaminants from the press fabric through a Uhle box. A typical system (Figure 1) consists of an HP needle shower, a lubricating shower, and a Uhle box and vacuum system. Chemical showers are sometimes used to facilitate the cleaning process.

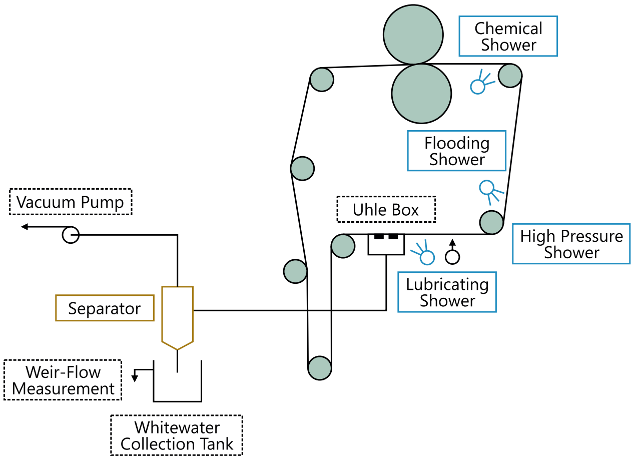

FIGURE 1.

Press fabric conditioning is a hot topic of discussion and training at our AstenJohnson University events. In those classes we spend more than two hours teaching how to optimize every bit of conditioning equipment to ensure press fabrics deliver consistent maximum performance. This ExperTip highlights some of the most commonly missed best practices in hope that you can gain at least one meaningful nugget to improve your paper machine operation.

Mistake 1: Misunderstanding why fabrics are removed

One common misconception is that felts are removed because they lose their porosity. This could not possibly be more wrong!

Figure 2 depicts the average residual permeability of 382 used samples from packaging fabrics returned to AJ Labs. As you can see... Almost all of them still had more than 20 cfm left. And when we look at contamination data, we always yawn because felts rarely come back with more than 5% filler. Felts are rarely contaminated!

So if the felts aren't plugged or compacted to death, what is it?

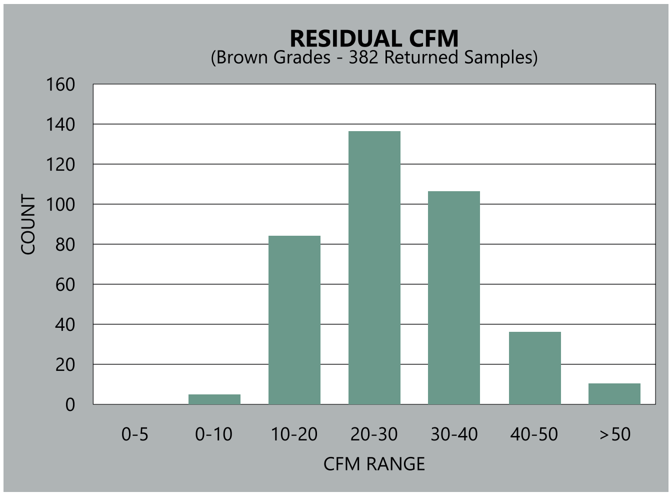

FIGURE 2.

When we look at returned samples, the one thing they DO have in common is: They have lost their uniformity.

Figure 3 shows the new caliper of a press fabric compared to the used caliper after removal. As you can see that caliper was providing great sheet support when it was installed. But gradually, this support got degraded until the fabric was pressing the sheet much less consistently, usually resulting in less pressing efficiency.

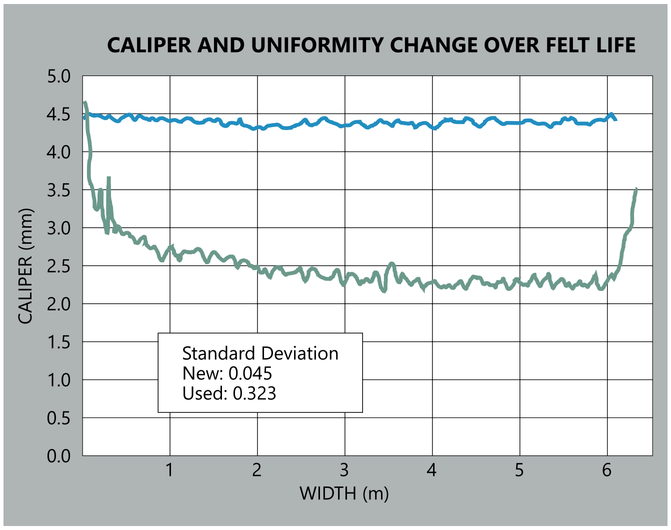

FIGURE 3.

Especially now that we take water perm tests, we know fabrics reach steady-state permeability hours after start-up. We know the caliper and density are also immediately stabilized.

But all this field data tells us is: the minute you install a press felt, the non-uniformity from your press rolls, your showers, your uhle boxes and that pesky sheet web thing conspire to create non-uniformities in your press felt. These non-uniformities accumulate over time to change the support provided in the nip by your press fabric, and without support, you gradually lose pressing efficiency.

When filling does occur, it is generally observed as localized, and thus contributes to the non-uniformity of pressure application. In some cases, it can also lead to non-uniform or spotty hydraulic wear.

Bottom line is: Cleaning your felts uniformly is more effective than keeping the uhle box vacuum down by creating random wear areas.

Mistake 2: Uhle Box Setup

The uhle box is a critical piece of the conditioning system, and often overlooked. The uhle box is basically a big brake pad trying to stop your fabric. That creates the opportunity for a lot of drag and friction wear.

We analyze a lot of returned press fabrics, and the positions that don't run a uhle box stick out like a sore thumb for their lack of wear.

Here is a list of six important set-ups that can reduce friction drag wear.

1. Keep your vacuum level as low as possible. This is the force that creates the wear in the first place. Vacuum level is in fact a measurement of the pressure applied! Above 20"Hg (68kPa), wear is almost always reported as an issue.
2. Position the uhle box below the fabric, approximately 1/8" (3 mm) is enough to make sure you're not bringing an extra edge into play, or limiting lube water effectiveness.
3. Aim your lube where it can do the job.
4. Align the uhle box so that tip #2 is implemented properly. In the MD and CD.
5. Watch the slot edges. They can help with doctoring water, but any roughness can mean premature wear.
6. Keep the slot widths below ¾" (19 mm) to minimize the damage of the fabric deflecting into the box.

See Figure 4 Uhle Box Setup below.

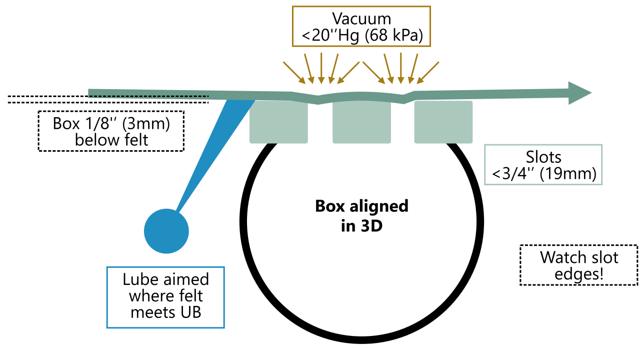

FIGURE 4.

Mistake 3: Liquid Ring Pump Efficiency vs. Seal Water

It isn't that widely understood that on liquid ring pumps, commonly used for uhle boxes, the temperature of the seal water has a significant effect on the efficiency of the pump.

The table shows the efficiency loss at various temperatures above 80°F (27°C).

Pump Model: CL-6000								
Speed: 300 RPM								
	Estimated Capacity Loss at Seal Water Temperature							
Inlet Vacuum (in. HgV)	80°F Baseline	90°F	100°F	110°F	120°F	130°F	140°F	150°F
10	0%	2%	5%	9%	14%	20%	24%	32%
15	0%	3%	7%	12%	19%	27%	37%	49%
20	0%	5%	10%	17%	27%	38%	54%	73%

TABLE 1

- Hot seal water caused significant vacuum efficiency loss
- A variation of 20°F (11.1°C) can cost from 5-35% efficiency.

Mistake 4: Specific Vacuum vs. Dwell time

Everyone wants to know: What is better? More dwell time over the uhle box? Or more specific vacuum?

First you have to figure out where you are vs. standards.

Use these 2 charts, Figures 5 and 6 (taken from our 2017 PMC Clothing book) to compare yourself (Figure 5)

With respect to specific vacuum. TAPPI recommends 15-25 CFM/in² (660 - 1100 m³/(m².min))

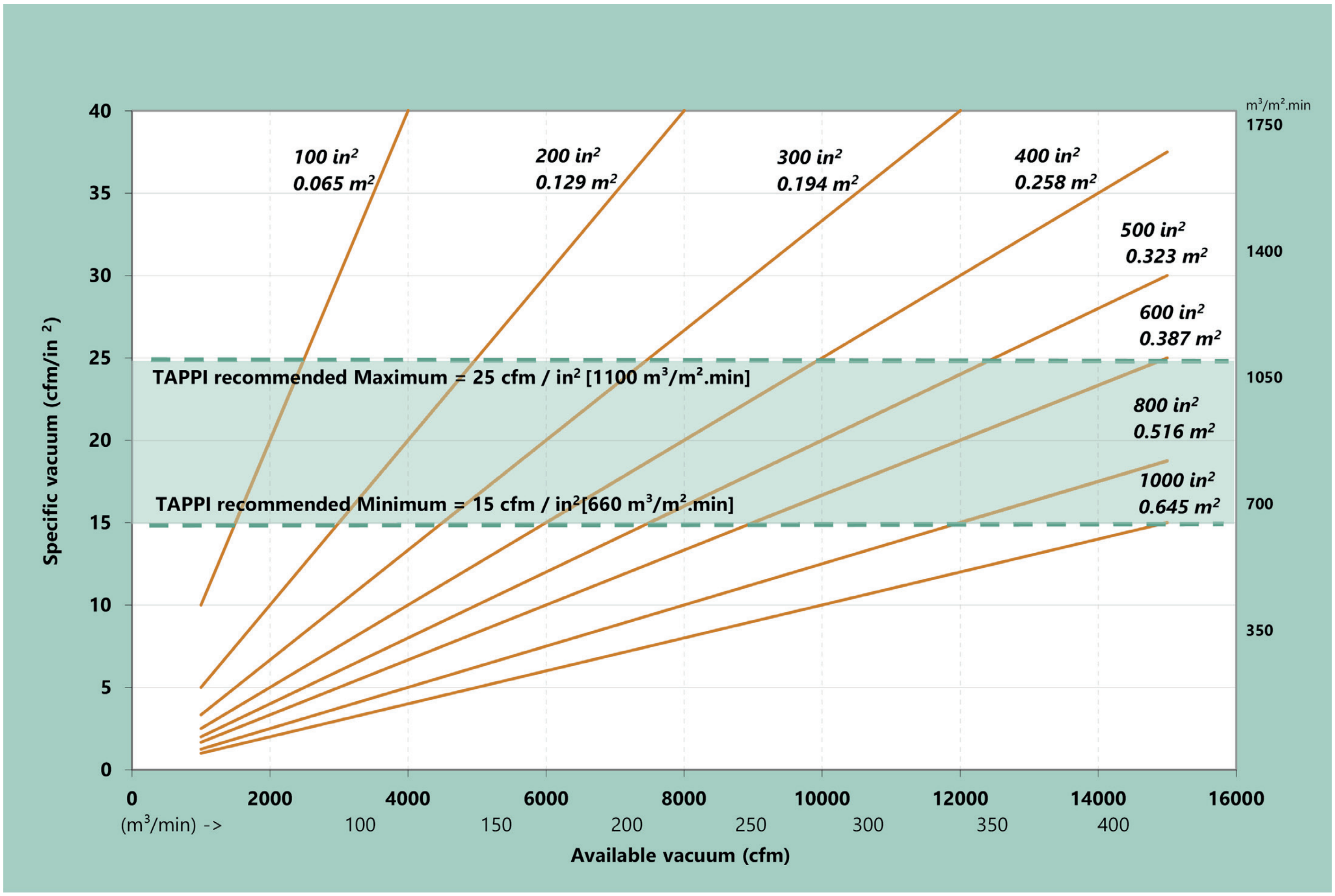

FIGURE 5. TAPPI guidelines for Uhle box vacuum density [modified after 1].

Then use this equation in Figure 6 to compare yourself on dwell time.

Tappi Standard for uhle box dwell time = 2-4 MS

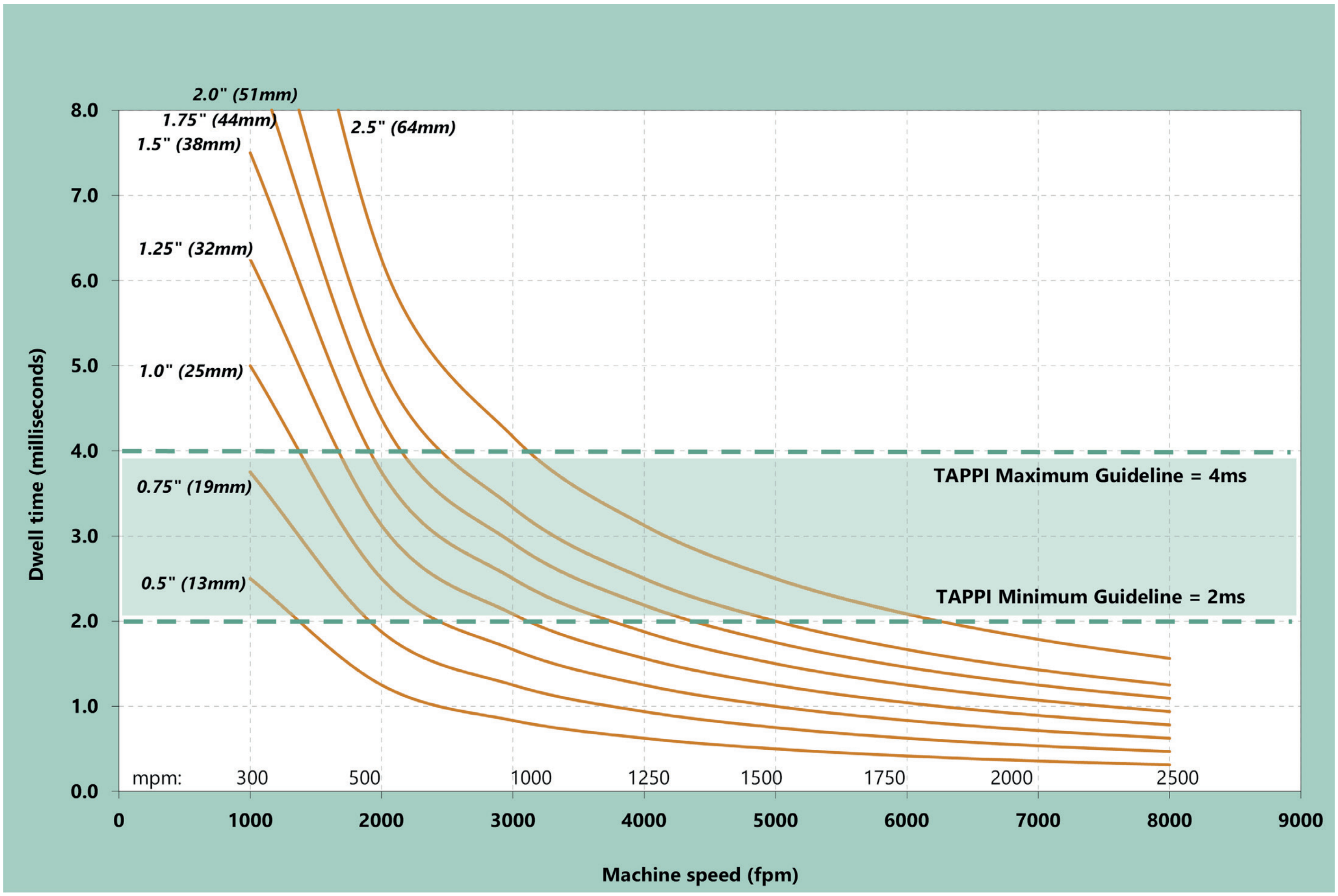

FIGURE 6. TAPPI standards for dwell time over Uhle box slots [modified after 1].

$$Dwell\ Time\ (ms) = \frac{Total\ slot\ width\ (in.) \times 5}{fabric\ speed\ (fpm)} = 1000$$

$$Dwell\ Time\ (ms) = \frac{Total\ slot\ width\ (mm) \times 5}{fabric\ speed\ (mpm)} = 60$$

Now you know where you are so you can figure which direction to go! Maybe you have dwell time to spare? Maybe you have specific vacuum to spare? Maybe you don't have enough vacuum? Then the best you can do is get closer to the goal. If you have TOO MUCH vacuum, you should watch for fabric wear. Maybe you need a bleed valve strategy.

What advice do we have for **blower system** users? Their specific vacuum is not constant, it actually decreases with time while the vacuum level is constant. In our experience, you have to run more open felts as these are generally low vacuum positions.

If your vacuum is on **a common header**, keep in mind that air will go to the point of less resistance. This could be a problem for the most closed felt in your press.

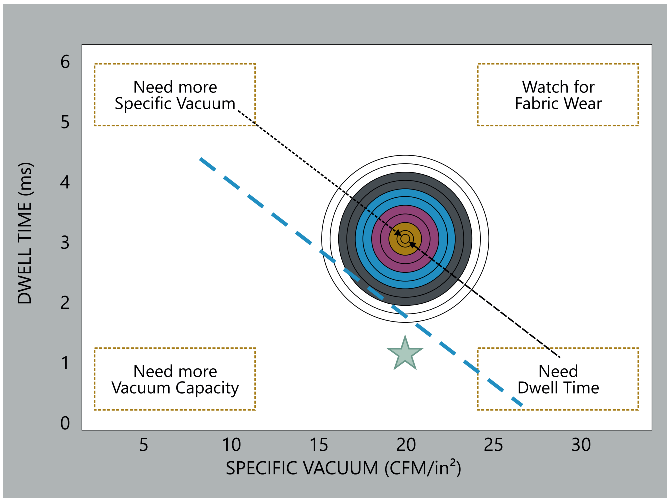

FIGURE 7. The trade-off and the sweet spot.

Mistake 5: Shower distance versus shower pressure

People are always asking for shower pressure recommendations. The correct answer should include a discussion on the distance from the fabric to the shower nozzle. If that shower is within 4 inches (10 cm) of the fabric, the jet is less likely to break-up and damage the fabric. Similarly, a shower that is 8 inches (20 cm) away from the fabric can cause damage at relatively low pressure due to turbulent water flow.

The reason is that turbulent flow includes air droplets which prevent proper penetration of the jet into the fabric structure. Vacuum will drop giving the illusion of fabric cleaning, but in fact, the fabric is being damaged.

Turbulent flow occurs between 4 and 8 inches (10-20 cm) depending on:

- Pressure
- Nozzle condition

Safest distance is <= 4 inches (10 cm).

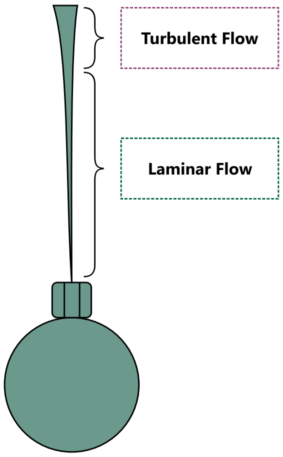

FIGURE 8.

Mistake 6: High Pressure Shower Oscillation Rate can make streaks

The basic idea of a high pressure shower is to keep the fabric clean, but as we discussed earlier, uniformity is just as important to good dewatering as openness. So if you don't shower uniformly, you may be accelerating performance loss.

The shower should move at one nozzle width per fabric resolution and ideally travel twice the distance between nozzles (Figure 9). Bonus tip: The edge of the sheet is prone to losing fiber and contaminating the edge of fabrics. It's a good idea to pay special attention in cleaning those areas, especially on pick-up felts, by having extra shower nozzles in that area. So, double the nozzle frequency on the edges. Some people add showers and even uhle boxes.

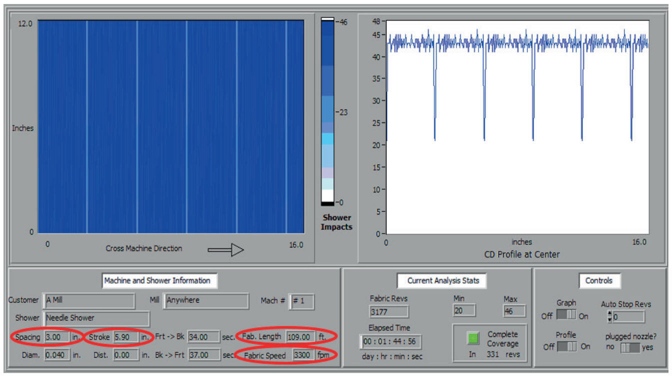

FIGURE 9.

Oscillation Rate Synchronized with Machine Section Speed:

R = (S x D)/L
- R = oscillation rate (in/min)
- S = felt speed (ft/min)
- D = nozzle dia. (in)
- L = felt length (ft)

Example: S = 3000 ft/min
D = 0.040'' L = 85 feet
R = 1.4 in/min

Mistake 7: Consideration for Chemical Cleaning Economics

Justifying the costs for cleaning chemicals is really fairly easy. Keeping fabrics clean can improve many aspects of paper machine runnability:

Reduce:

Wet Streaks/Crushing/Sheet Drop-off / Stealing/Edge Flipping/ Blowing

Increase:

Felt Surface Uniformity/Sheet Profile Uniformity/Useful Operating Life/Water Removal = Machine Speed

Figure 10 illustrates the impact of the different cleaning and conditioning approaches on fabric permeability over time. The rate of permeability loss when the fabric is untreated, and the impact on runnability will dictate the most economical approach.

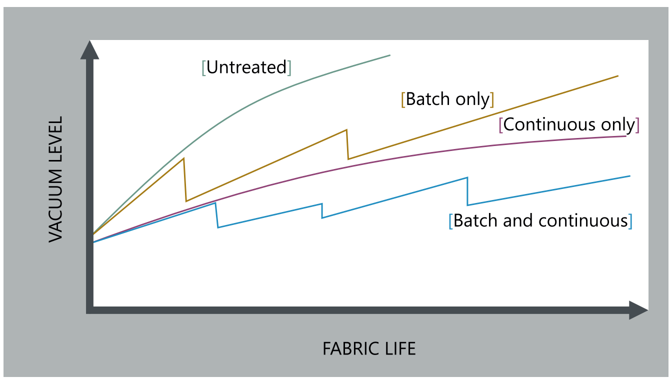

FIGURE 10.

One must understand the chemistry used for prevention is very different than the approach for cleaning:

- Cleaning chemicals rely on dissolving or breaking-up some of the contaminants. Often, extreme pH levels or dangerous solvents have to be used. For that reason, they tend to be dangerous and must be handled with the appropriate care.
- Contamination prevention chemistry tends to rely on less dangerous dispersants, polymers and surfactants which is why this chemistry can be used continuously.

Unfortunately, the decision on which approach to select is one based on trial and error. It should be a financial decision based on measured improvements yielded by the chemical expense.

Mistake 8: Non-Uniform Showering can lead to Wet or Dry Streaks

Good elements could make things worse. If your cleaning chemicals or HP showering are excellent, then when they aren't applied uniformly they will highlight the parts of the fabric which are NOT receiving the good treatment. This is amplified by the fact that the uhle box will work very well on the clean parts, but air will flow around the dirty areas creating a vicious cycle.

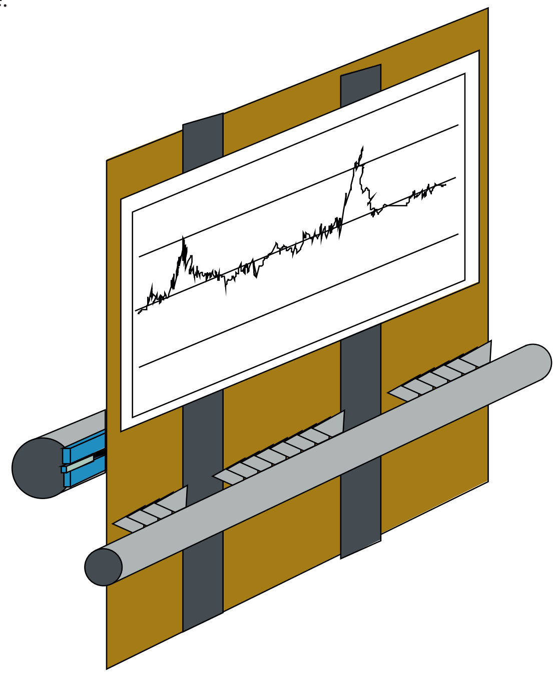

FIGURE 11.

- Non Uniform Showering can lead to Wet or Dry Streaks
- Plugged Nozzle/Dry Streak accepts less water at nip, gives up less at uhle box
- Chemical Showers can increase this effect
- Air Flows **around** closed Streaks and **through** open Streaks

References

1. Technical Association of the Pulp and Paper Industry (TAPPI), Peachtree Corners, GA, www.tappi.org, 2017.

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!