



Troubleshooting warp

Methodical analysis will locate the problem and reveal the solution

By Wayne Porell

Warp is a familiar challenge in most corrugating plants. Understanding what causes warp can go a long way in helping us correct it.

Fundamentally, warp is caused by only three conditions:

1. An imbalance in moisture between the top and the bottom of the sheet. This shows up as warp in the cross-machine direction.
2. A difference in tension between the top and the bottom of the sheet. This manifests itself as warp in the machine direction.
3. Uneven stresses in the paper caused by fiber distribution or some mechanical stress to the paper (e.g., a belt lift bar rubbing on the bottom liner). This appears as twist warp.

Moisture imbalance

Adhesive application can have a huge impact on moisture imbalance that causes warp in the cross-machine direction, so it is a good place to start. A soak tank is an invaluable tool for troubleshooting application-related warp issues. When you soak the board apart it is important to look at the medium, as well as the liners (after all, the medium is where we actually apply the adhesive). By soaking the board and then staining the glue lines with iodine we can determine several things:

- If the machine is set up properly.
- If you have a damaged glue roll (excess adhesive will be applied in this area).
- If the glue roll is running at the correct speed.
- If the wiper blade is wiping the metering roll correctly.
- If the application rate is correct (by measuring the glue line width).
- If the adhesive is where it belongs: on the flute tips rather than on the flanks or in the valleys.



Glue lines should be measured with a glue line measurement tool. This will tell us how much adhesive we are applying to the web.



Excess adhesive increases the probability of running warped board. If all the applied adhesive is not completely gelled through the corrugating process, post-warp will occur as the board dries.

At least 90 percent of the adhesive applied at the double facer should transfer from the medium to the liner. This shows that the double backer hold-down devices on your machine are functioning correctly. At the single facer it is quite common to transfer 100 percent.

All machines are not the same. A machine with a 25 quad glue roll and one with a 35 quad will not apply the same amount of adhesive when running a .006 gap. Comparing the glue lines from the operator side to those of the drive side of the sheet will tell you if the glue roll and metering roll are out of parallel. How much adhesive you apply should be determined by soak test and pin adhesion test. Remember that excess adhesive is undesirable and generally leads to warp.

Up-warp or down-warp can be caused by any of the following reasons:

- Excessive adhesive application.
- Run speeds not consistent with the adhesive gap.
- Incorrect wrap adjustments can lead to overheating the liners. In some cases

operators will add excess adhesive to eliminate zipper board instead of taking heat off the liner.

- A glue roll that is running slower than paper speed will apply adhesive to the front side of the flute. Conversely,

Warp, continued

a glue roll running faster than paper speed will apply adhesive to the back side of the flute. Both issues will cause warp because the machine can only gel the adhesive that's on the flute tip.

When adjusting for up-warp, an operator might add wrap to the single face web to correct the warp issue, but he really should be lessening the wrap on the double face liner. A heat gun is very useful in making these adjustments.

Sometimes increasing corrugator speed will flatten out the board because this helps bring the liner to the optimum running temperature and moisture content.

Remember, the faster the corrugator runs the less adhesive you should apply to make a good bond. A moisture difference greater than 1.5 percent from the single face liner to the double face liner can cause warp. It's best to match rolls by supplier, if possible, to maintain consistent moisture levels.

Tension issues

End-to-end up-warp or end-to-end down-warp is usually created by tension issues. These can include:

- Preheaters not turning.
- Mill roll stand brakes not functioning properly.
- Splicers not set up to control the braking correctly on smaller diameter rolls.
- Rolls that do not turn freely.
- Web guides maintained improperly.
- Excessive drag in the hotplate section.

Recycled liners don't always create enough drag on the preheater drums to turn them. When this happens, the condensate accumulates in the bottom of the preheater and creates a temperature differential between the surface at the bottom of the drum and the surface at the top of the drum. You may have to adjust the wrap to obtain proper heat.

Splicers should be set up on a quarterly preventive maintenance program to ensure the bearings and rolls move freely, thus creating no drag. Automatic splicers control the braking process as the roll gets smaller. If this is not working correctly, added tension to the liner will cause problems. If the brakes wear down or the calipers are not working freely they will not apply enough braking resistance or could apply excessive braking, which also creates tension problems.

Web guides need to be cleaned and inspected weekly. When using vacuum guides, the vacuum holes will become clogged with dust, creating less vacuum and therefore less tension. In systems with a tension roll, the cover on the roll needs to be inspected for wear. When the covers become

smooth they need to be recovered with a semirough-surface tape to add enough drag to the web.

Drag in the hot plates will create tension warp. Older, worn plates are particularly prone to this. To avoid the cost of purchasing new hot plates some plants install an automatic lubricating system at the mouth of the double backer. It is set up to respond to an increased amperage load on the drive motor. When the amps increase due to drag, the system sprays lubricant on the bottom liner, which is then transferred to the hot plates, reducing drag.

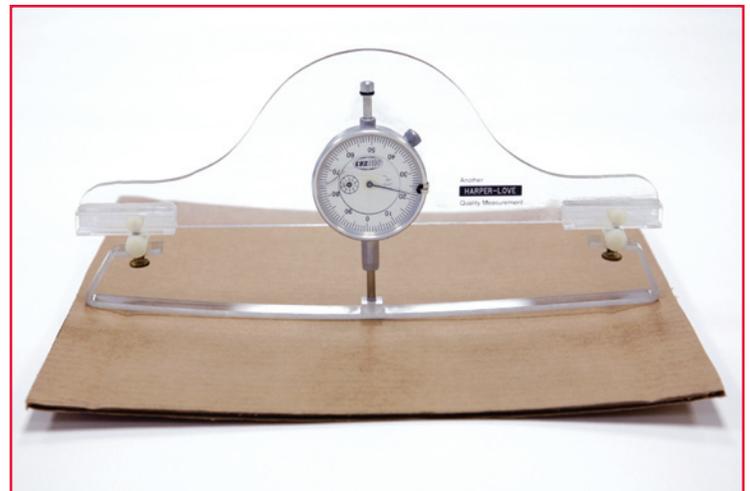
Uneven stresses in the paper

Twist warp can be caused by improper machine alignment. Machine alignment can be checked by tramming the individual components to each other. Web side guides should be square to the machine. As corrugator belt wear occurs, it may be necessary to make adjustments to the bridge tracking rollers to make sure the web tracks in the center of the belt. Wrap arms on older preheaters can be out of alignment due to wear in the gears from years of use. The use of self-aligning wrap-arm rolls can be less costly than replacing the gears or the preheater.

Paper with polar angle issues can also cause twist warp, although this is less common today than in the past

Be methodical

We'll probably never conquer warp completely; the goal is to reduce it to tolerable levels so it doesn't interfere with downstream operations. A systematic analysis of moisture content, tension issues, and uneven stresses on the paper will help you produce dryer, firmer, flatter board. Call us if you need help.



A precise measuring device can help you track and quantify warp as you take steps to identify and correct the cause.

Keep your adhesive lines healthy

Solve clogging with proper cleaners; avoid problems with regular maintenance

By Wayne Porell

The first sign you may have a problem with clogged adhesive lines is reduced supply or return, which probably indicates clogging because of dried starch buildup in the lines. This is serious, because restricted flow can strain pumps and motors. Pumps can overheat. Overloaded motors can increase amperage, trip a breaker or burn out.

imperative to flush the lines out during a weekly corrugator preventive maintenance shut down.

Water will remove soft wet starch out of the lines but it will not kill bacteria or clean out dried starch. Adding bleach will help reduce bacteria, but it won't affect starch buildup.

Trisodium Phosphate (TSP) is an effective cleaner and



Liquid starch adhesive is like a high-cholesterol diet for your pipes. It not only bonds the paper together, it also bonds itself, and any chemicals in it, to the inside of the distribution system's pipes.

Reduced flow to the adhesive pans can also wreak havoc with your production. You may have to run slower to avoid starving the adhesive pans. Running double- or triple-wall board with only one or two supply pumps may end up starving one of the single facers, resulting in waste and corrugator downtime.

The best cure is prevention. Lines that are not cleaned regularly will build up with dried starch, reducing the inside diameter dramatically. I have seen 2-inch ID pipes reduced to as little as 1-inch ID because of starch buildup. This can be prevented by flushing the lines out every day at the end of the last shift. For a three- or four-shift operation, it is

disinfectant, but it is outlawed in many states because the phosphates harm the environment and aquatic life in streams and rivers by promoting the growth of algae which use up the oxygen in the water.

Other cleaners are available that will dislodge dried starch and kill bacteria. Your Harper/Love adhesive representative can advise you.

When adhesive lines remain clean you can run the corrugator at maximum speeds without the worry of adhesive flow or return issues. Clean adhesive lines also protect your pumps and motors, and reduce the electricity needed to run your motor-driven pumps due to lower amperage draw.

Three decades of service
to the corrugating industry



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• Troubleshooting warp
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Use Calciban™ to keep your glue rolls clean and efficient

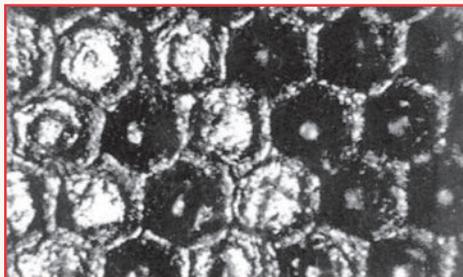
Calciban prevents calcium buildup that can cause adhesive transfer problems.

Inorganic compounds in your adhesive water can cause calcium buildup on your glue rolls. These deposits, which appear as a milky-white haze on the roll surface, clog cells and reduce the amount of adhesive the cells can carry. This creates a risk of bonding problems and increased waste.

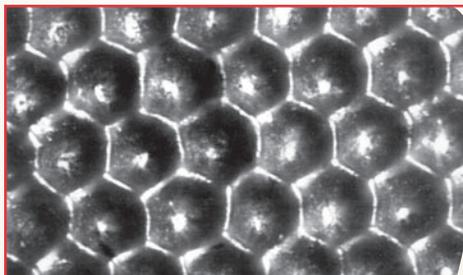
It also means lost productivity when you need to shut down for time-consuming cleaning operations.

Just 3 to 6 ounces of Calciban in a 700-gallon batch of adhesive can prevent this buildup and the problems it creates. It can be post-added to the batch, or to starch in a storage tank.

At an investment of only about \$1 per batch, Calciban is low-cost insurance against the problems of calcium buildup.



The problem: Inorganic compounds in adhesive mix water can clog cells in your glue transfer rolls.



The solution: Used regularly, Calciban keeps glue-roll cells clean and efficient, for proper adhesive transfer.

Other uses for Calciban:

- Add to cooling water in closed-loop systems
- Add to flexo wash water
- Add to boiler feed water

To order, contact your local Harper/Love representative or call us toll free at 800-438-3066.