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ADVANCED ADHESIVES REPORT
Your corrugating newsletter from Harper/Love Adhesives Corporation

Your corrugator's speed curve

What it is and how to make it work for you

By Chris Polster

Running a corrugator at high speed means something different today than it did just a few years ago. In the very recent past, if your corrugator was running 750 lineal feet per minute throughout most of your order mix—averaging over 30,000 lineal feet per hour—your machine was running in the very top percentile across the country. Today machines are pushing beyond 40,000 feet per hour.

Studying these machines has produced an enormous amount of data concerning operating corrugators at very high speeds. Here I'd like to address a phenomenon that is rarely talked about and often overlooked: what happens to the single face web through the speed curve of the machine.

Target temperatures the key to quality

We know there are key areas throughout the corrugating process that require a target temperature in order to produce a quality bond at high speed. Maintaining these target temperatures is often the speed-limiting factor when pushing a machine. One of the most important areas for a target temperature is between the glue machine and entrance of the double backer. Here, crews need to achieve a flute tip temperature that is at or above the gel temperature of the adhesive (usually between 142°F and 148°F).

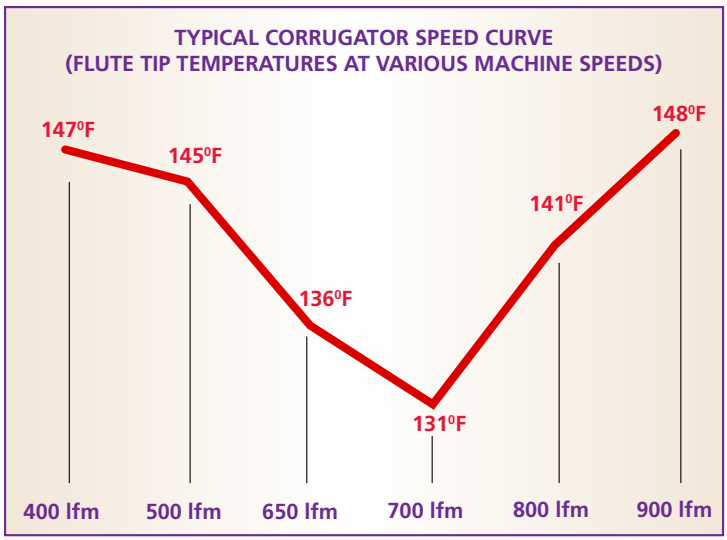
At medium speeds, say about 500 lfm, crews routinely achieve a good flute tip temperature and produce an excellent bond. However, as they begin to increase machine speeds, to perhaps 650 or 700 lfm, the flute tip temperature begins to drop because the web spends less time on the preheater. While the bond is more than sufficient at this speed, crew members see a definite difference from when they checked it at the start of the order when the machine was running at about 500 lfm. Not wanting to risk a poor bond, crews will often hold the machine speed where they start to see a change in the bond.

Temperatures sag in the middle of the curve

Although the exact numbers may differ depending on machine type and configuration, here's what happens: At about 500 lfm the web exits the elevator belts up to the bridge at about 200°F and starts down the bridge to the double backer. On its way to the double backer, the web loses a great deal of its heat energy because it is exposed to the atmosphere. As the web passes over the preheater of the triple stack at this speed, enough heat is transferred back into the web so that the target temperature is achieved for a good bond. Then, as machine speed is increased, the crews hit a spot in the speed curve where the amount of heat energy lost on the bridge cannot be replaced by the preheater, because the web is spending less time in contact with the preheater as the speed increases.

The faster it runs, the better it runs

However, as we continue to push machine speeds beyond this point, we discover that the flute tip temperatures stop falling and begin to increase with the speed of the machine



(as does bond quality). This is because, at very high speeds, the web spends very little time on the bridge, losing very little of its heat energy, therefore needing very little time on the preheater to replace lost energy. The accompanying graph demonstrates this phenomenon.

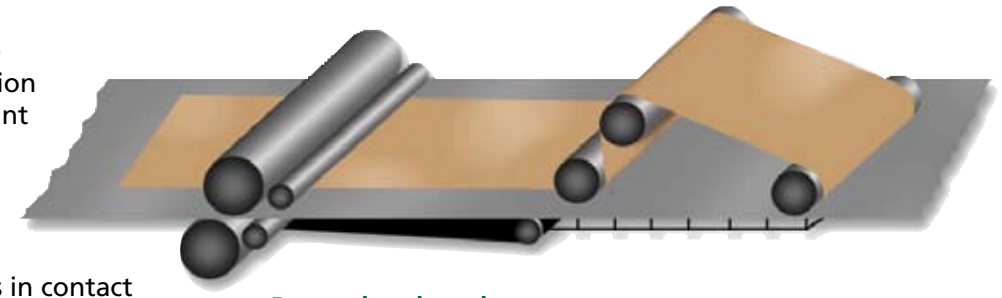
This is one reason it is often true that "the faster it runs, the better it runs." The ability to store and hold heat energy in the web at very high speed not only means that the preheater has less work to do, but also that the burden of heat transfer from the hot plates through the double backer is reduced.

Each machine is different and these numbers for speed or temperature may not be the same as yours, but each machine has its curve. The crew's knowledge and understanding of this curve can be an important tool for them to get the most out of the corrugator and improve throughput at downstream operations. ■

Give your corrugator belt a longer life

By Ronnie Littleton

Regular preventive maintenance will head off premature belt wear, as well as production and quality problems



The corrugator belt is a major machine component that affects both production and board quality. It is especially important to monitor belt condition when it has been in service a long time. With older belts, edge wear is the most common issue, with loss of caliper.

When running narrow webs, the belt is in contact with the plates and the cooling section belt. To prevent premature wear on the edges, good housekeeping and maintenance policies need to be in place. This starts when the decision is made to replace the belts.

Installing a new belt

When installing a new belt, all rolls in contact with the belts should be cleaned; ballast and cooling section roll bearings need checked and replaced if needed (shoes should be checked for proper setup); hot plates should be cleaned and leveled if needed; and belt lifter slots need to be clean, making sure they drop below the plates. When the belt is in operation, weekly procedures to check these areas will help prolong the life of your belts.

Once in production, check to make sure there is no speed variation between corrugator and cooling section belts. Top and bottom belt speeds should be within 1 percent of each other. Speed variations above 1 percent can cause premature belt wear and board quality issues.

Watch for starch and paper buildup

A major cause of excessive belt edge wear and damage is allowing starch and paper to buildup on the hot plates and belt edges. Keeping the top belt clean, especially the outside edges, will extend the belt's life and reliability. Starch and paper buildup should be removed as soon as it is noticed. Wrapping the take-up roll with 26-pound medium will remove most of the starch when it first comes in contact with the belt. (Liner is most commonly used but starch will adhere to medium better than liner. If liner is used, put the wire side towards the belt.) Use enough to wrap the roll 10 to 12 times. Running conditions will determine how often the outer wrap needs to be removed; keeping the outer wrap clean is your first line of defense in protecting the belt. Take care when wrapping the roll to prevent the medium or liner from wrinkling, so it goes onto the roll straight.

Technical Representative Ronnie Littleton has over 30 years of hands-on experience in corrugating, supervising, scheduling and quality assurance. He lives in Louisiana and serves customers primarily in his home state and Texas.

Rotary brush and steam systems

The rotary brush and steam shower system is also a great tool to keep starch buildup under control, but only if it is set up correctly. Without wet steam or water sprayers to add moisture to the starch or paper buildup, the brush will lose its effectiveness. The steam shower should be mounted before the brush and used only when needed. Applying steam or water to the belt increases belt moisture and can affect warp. Some feel that if the steam spray is mounted on the inside of the belt, more steam can be used without affecting board quality. Always consult your belt supplier for proper use of steam or water spray.

It can be debated whether the brush should actually touch the belt. If it does, it should have minimal contact to prevent excessive belt and brush wear. The distance can be set using a strip of 56- or 69-pound liner between the brush and belt. Set the brush to the point where the liner can't be removed without slight pressure but will not rotate the brush as it is removed. This will prevent the brush from actually touching the belt, yet be close enough to remove starch and paper buildup.

Belts are now available with coated edges to help reduce starch pickup and edge wear. This coating works very well and the use of the brush can be reduced.

Manual cleaning

Some deposits will not be removed with the brush or medium; these will have to be removed by hand and should be removed as soon as possible. This should never be done while machine is running; the machine should be stopped and locked out. Using long handled scrapers (which is most common) allows more leverage and pressure to be directed on the belt but this excessive pressure can scuff and cut belt fibers. Blunt putty knife blades with a spray bottle of water can be used to remove difficult deposits without damaging the belt. The spray bottle will prevent wetting large areas of the belt.

Other areas that can cause belt damage come from starch buildup on plates, belt lifters, or paper wedged under belt.

Taking care of the corrugator belt will extend its life and prevent premature production and quality issues due to worn or damaged edges. ■

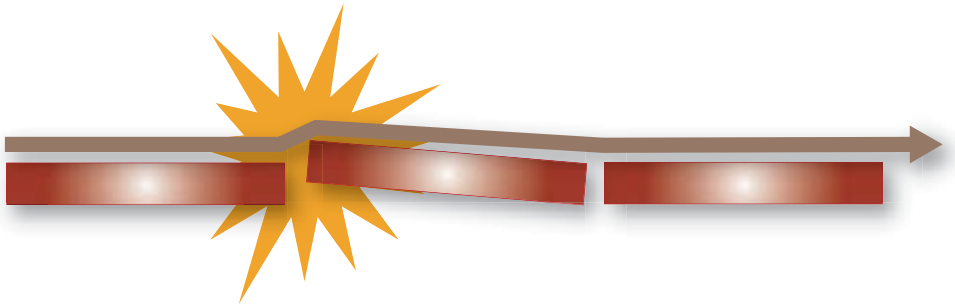
Check those hot plates for level

Even a small difference in height can accelerate belt wear and compromise quality

By Wayne Porell

Whether your corrugator has shoes, weight rolls or another style of hold down device, your hot plates need to be level in the paper direction to avoid crush or delamination issues and premature belt wear.

When the top web and bottom liner enter the hot plates and travel to the head pulley, the web should not be disturbed by the lead edge of any hot plate being higher than the trail edge of the prior hot plate. Delamination issues and crush can result from a plate being as little as .010" higher on the leading edge. This creates a bump in the path which will disrupt the bonding process. It can also allow air flow between the hot plates and the bottom liner, which means cooler liner temperatures through the hot plates, which affects the gelling process.



Belt wear

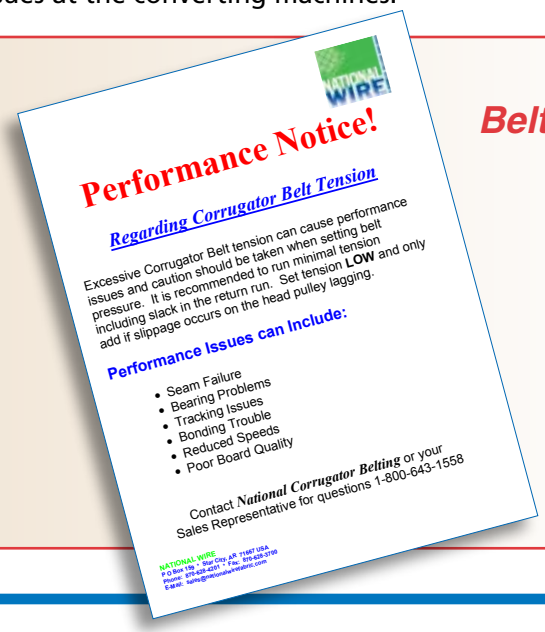
When running narrow widths, the belt rides on the outside edges of the hot plates. If the hot plates are uneven, the belt will wear on the edges. (Watch for dust buildup from the belt on the side frames.) Over time, the belt caliper at the edges can decrease as much as .080". Worn edges will cause reduced pressure on the outside edges of the combined board when running wider web widths, which means less heat transfer to the bottom liner.

Uneven pressure is a major concern when running heavyweight liners at high speeds because it can cause the edges of the sheet to delaminate. It can also cause loss of caliper on the outside edges of the sheet, which is generally noticeable when the stacks of combined board discharge from the stackers. Uneven caliper will in turn create printing issues at the converting machines.

What to do?

As with many machine issues, the best cure is prevention. Make sure the hot plates are included in your regular PM program.

The best way to level the hot plates is to use a transit or level, but it can also be accomplished easily with a simple 12" length of 1" key stock: With the hot plates cool (below 100^{0}F), start at the first hot plate at the tail pulley and slide the key stock along the hot plate surface in the paper direction. The transitions between hot plates should be smooth. If you hear or feel a bump you will know that the leading edge of the plate is high. You can hold the key stock so it hangs over the trailing edge and use feeler gauges to check the difference from the bottom of the key stock to the top of the hot plate. Check each hot plate going toward the head pulley on both the operator and drive side of the machine, and make the necessary adjustments. ■



Belt manufacturer warns against excessive belt tension

National Wire recommends running minimal tension on the corrugator belt, including slack in the return run. A recent performance notice advises setting the tension low, adding tension only if slippage occurs on the head pulley lagging.

Performance issues stemming from high tension can include:

- Seam failure
- Bearing problems
- Tracking issues
- Bonding trouble
- Reduced speeds
- Poor board quality

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In this issue:

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Aquaseal™ W-150 wet-strength resin

Aquaseal W-150 is Harper/Love's "workhorse" liquid thermosetting resin. It features less than 0.5% free formaldehyde and offers excellent pot life and low batch shock properties. Excellent water-resistant glue line protection. Promotes superior board quality, and efficient production.

Uses:

- Wet-strength corrugated board production
- Improve overall board quality for finishing

Operational benefits:

- Exceeds TAPPI 24-hour soak tests
- Convenient liquid form
- Safe and easy to use
- Compatible with automatic starch kitchens
- Distinctive red color provides visual assurance of use
- No resin shock to the adhesive
- Low free formaldehyde: complies with OSHA regulations

Use 100 pounds per 700-gallon batch. Available in 55-gallon drums, 275-gallon totes