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NOVEMBER 2007

ADVANCED ADHESIVES REPORT

Your corrugating newsletter from Harper/Love Adhesives Corporation

Troubleshooting board crush

The sources of board crush are many and varied but systematic detective work will reveal the cause and the cure

By Wayne Porell

Low-caliper or uneven-caliper board caused by crush on the corrugator can cause a host of problems in downstream operations, none of which make customers happy.

It's an especially serious problem for operations using automatic box setup equipment. The nightmare scenario is jammed machines, downtime, and chargebacks to the box plant.

Other problems which can be caused by crushed board:

- Score-bend testing can give false readings.
- Printed bar codes can be unreadable.
- Poor compression strength can cause box failures in the field.

Sometimes, board crush can be misdiagnosed as soft, wet board or some other quality problem. Once you've identified the problem correctly, you need to set about solving it. A good place to start is to ask yourself what changed prior to the crush. It could be as simple as a repair over the weekend, an air gauge not being turned back on, or a new roll out of parallel.

What can cause crush on the corrugator and how to find it

The best way to find the cause of crush on the corrugator is to shut the machine down and start at the wet end.

First check your raw materials, the paper. The caliper of paper from mill to mill can vary as much as .0015". Check the caliper of both liners and add the thickness to the flute height of the corrugator rolls. Cut samples across the web to check for consistency.

Then cut a sample of combined board from the single facer on the operator side, the center of the web, and the drive side of the machine. Add a sample of liner from the double backer, again from the operator side, center, and drive side. The reason for this sampling is to eliminate the paper as a cause and determine what the caliper should be prior to corrugating.

Some other possible causes:

- Worn corrugator rolls will cause a difference in caliper across the web. It is a good practice to check the flute heights quarterly and keep a record.
- A pressure roll or corrugator roll out of parallel will cause crush.
- Too much loading pressure on the corrugator roll will cause crush by fracturing the flute tips.
- Fractured flute tips can occur if the medium preconditioner is not turning at the correct overspeed, or not turning at all.
- Running without a steam shower can fracture flute tips and cause board crush.
- If the glue roll gap to the bottom corrugator roll is too tight it will cause fractured flutes.

Next cut a sample *before* the web guides to check if the incline belts, or a roll or wheel on the bridge, are causing

Uneven stacking is evidence of a board crush problem.

Next page, please

crush. Cut a sample *after* the web guides, prior to entering the double backer glue station. Some parts of the web guides can wear (e.g., side guides, lagging) which can cause crush.

Cut a sample after the glue station, again from all three areas (operator side, center, and drive side). Crush here can be caused by a rider roll or contact bar that is out of parallel, if the T.I.R. is out of range, or if one of the rolls has a bad bearing. Check the glue roll for the same possibilities.

Next check the hot plate section

Several components in the hot plate section of the machine can crush your board. To isolate the problem, begin by cutting a sample directly after the combined board exits the head pulley. If you find crush exiting the head pulley, you will need to cut samples from the outer edges of the web in the hot plates. (Be careful to wear gloves to protect from burns from the hot plates or from cutting the belt while taking the sample.)

- Hot plates that have a high leading edge in the paper travel direction can cause crush and delamination issues.
- Dried starch on the hot plates can cause crush and will generally cause delamination, as well.
- Weight rolls can cause crush if the bearings are worn, allowing the rolls to bounce.
- Check to see if the weight roll arm gets hung up on one side. This puts all the weight of the roll on one side of the sheet instead of distributing it evenly across the sheet.
- If you're using shoes and one of the shoes malfunctions and stays down, especially on an angle, it will crush the board. This is why it is important to keep the shoe system's moving parts working correctly and keep them clean.

The belt can cause crush if there is a caliper variation across the belt when used with a weight roll system. If your top corrugator belt has greater caliper on the edges than in the center, more weight is put on the edges of the belt, rather than being evenly dispersed. This can show up as a weaker bond in the center of the sheet because you won't have as much pressure there to hold the web and bottom liner together.

This problem will reveal itself in a soak test. You will see a good solid glue line on the edges of the web and a spotty glue line in the center. (Don't confuse this as a tight top corrugator belt.)

Moving downstream

The traction section can cause crush if the ballast rolls have bad bearings or the arms holding the rolls get hung up, as the weight rolls can.

The knife can crush the combined web by either the entrance roll or exit roll being out of parallel or having too much loading pressure on it. The no-crush wheels, if put on in the wrong direction, can cause crush. The fins in the middle of the wheels must be able to flex when the board comes in contact with them. When they are put on in the wrong direction they are not allowed to flex and will crush the board.

The stacker can cause crush if the no-crush rolls are put on in reverse or if too much pressure is put on the gong roll entering the stacker bed.

Quality control starts with incoming materials and parts

Quality problems, such as board crush, are sometimes caused by out-of-spec materials and machine parts. This source of problems can be eliminated by making it a policy to inspect these items as they are received, before use or installation.

The vernier adjustment: friend or foe?

By Rex Woodville-Price

Most single facers have two operational adjustments that affect adhesive application. The first is the adjustment of the gap between the metering roll and the glue roll. The second is the vernier adjustment.

The metering roll is usually mounted on a set of eccentrics that move it away from or toward the glue roll. Closing this gap decreases the thickness of the glue film on the applicator roll. This is the adjustment that operators should

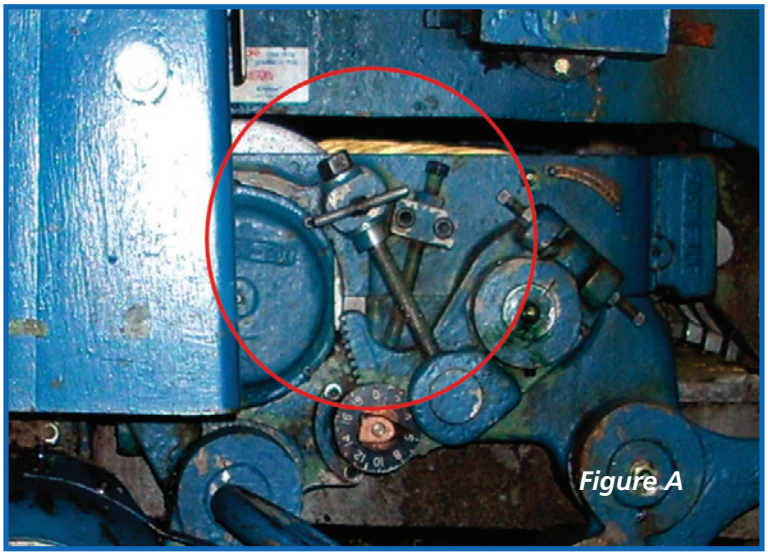

Figure A

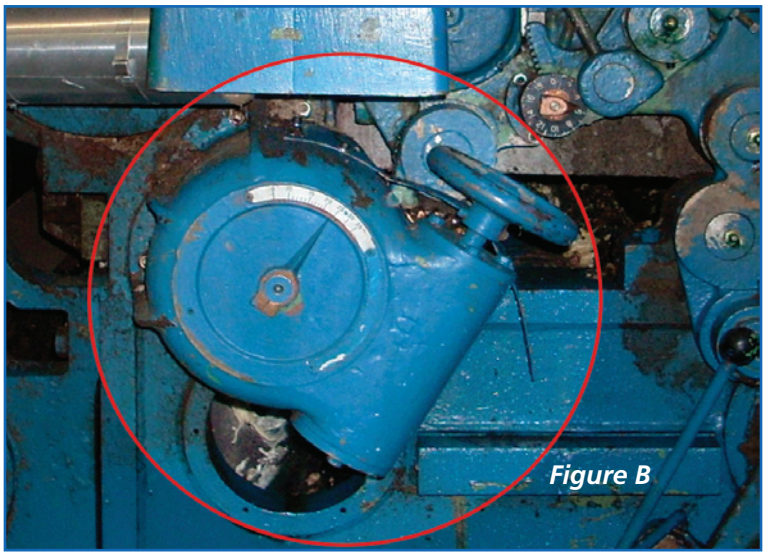
Figure B

make to control the adhesive application. Figure A shows this adjustment on a Langston XD

The vernier adjustment (Figure B) is not an adhesive adjustment but does affect adhesive application indirectly. Its primary purpose is to control the gap between the glue roll and the lower corrugator roll to accommodate the thickness of the medium being run. To achieve this, the entire glue mechanism is moved in and out of the single facer. Proper adjustment allows the flute tips to dip into the film of adhesive that covers the applicator roll, but without being deformed by the nip between the two rolls. If this gap is too large for the medium being run, operators tend to compensate by increasing the glue roll to metering roll gap (and thus the adhesive film thickness). This causes a loss of control of the application and generally wastes adhesive since the adhesive is not being placed accurately on the flute tips.

Handle with care; the vernier adjustment is not for controlling adhesive—and there may be a better way to accommodate different medium thicknesses

It is not unusual for this mechanism to wear out and not work properly, sometimes throwing the glue mechanism out of parallel with the corrugating rolls in the process. Because of this, operators sometimes resort to adjusting the machine at the paralleling mechanism using the mechanical stop bolts (Figure C). This adjustment point is also the mechanical stop. So although it is an effective alternative, there is a real risk of misadjusting them and having the glue roll crash into the lower corrugating roll, possibly damaging both.

It is possible to make a modification to the machine which addresses these problems. The basic concept is to place a moveable shim (Figure D) between the stop bolt and the arm. The machine is adjusted to run thin to regular medium (say 23 lbs to 26 lbs per MSF) without the shims in place. Then, when the crew needs to run heavy medium (say 40 lbs or Dual Arch), the shims are moved into place. This eliminates the need to move the paralleling adjustment at the mechanical stops and is much quicker and more accurate. The red arrow in the Figure C shows where these shims would be placed on an XD.

The second part of the modification involves simply removing or disabling the vernier adjustment and locking the mechanism so it can't move and throw the rolls out of parallel.

Below, modifying the machine for quick, convenient, and repeatable changes in the glue gap adjustment: A flat shim under the glue roll stop adjusting screw may drop out when the machine is stopped and the glue roll mechanism retracts. A shim formed into a channel shape can be clipped onto the lever arm and will stay in place.

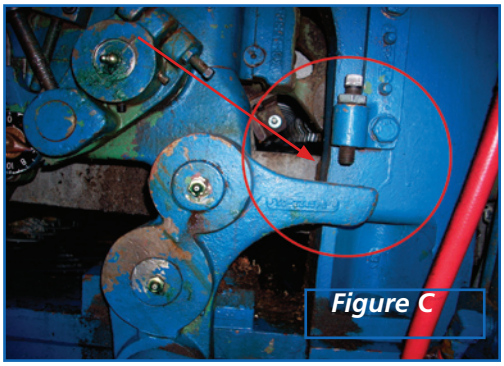
Figure C

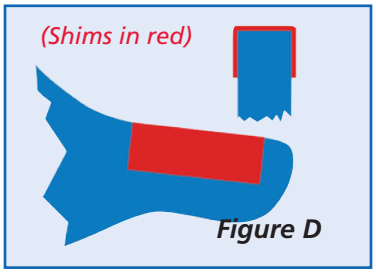

Figure D

Watch out for those glue roll top screws

On Langston XDs, the glue roll stop screws, which control the glue gap and roll parallelism, should be flat bottomed. If these screws have been replaced with dog-point set screws, they can cut into the lever arm (or the suggested shims, above), creating burrs and an unreliable stop. The burrs on the lever arm should be removed, and the screw replaced with a flat-bottom type, or simply reversed so the head bears on the lever arm.