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The impact of doublebacker hot plate level on board quality and how to measure it

Scope

This TIP describes a simple method for checking the “level” of the hot plates or steam chests in the doublebacker section. The word “level” as used in this TIP refers to the relationship of one plate’s trailing edge to another plate’s leading edge.

Significance

Hot plates in the doublebacker (DB) section must be maintained so that the leading edge of any plate is level with or slightly lower than the trailing edge of the preceding plate. The consequences of a leading edge that is higher than the previous plate’s trailing edge can be that:

- Flutes crush as the hot board “runs into” and rides over a high lead edge. This can negatively affect caliper and box compression.
- Disturbance of the DB glue line can occur, especially if the high leading edge is early in the hot plate section when the glue line is still in the early stages of bonding. This can cause weakened bond and delamination.
- Flutes may lean in severe cases.
- Liner may scuff or peel and preprinted liner may scratch or smear.
- Drive motor amperage increases due to the increased drag or friction which can result in reduced production speeds.

A low lead edge is one that is 0.010 in. (0.025 cm) or more lower than the preceding plate’s trailing edge. In most hot plate sections, it is desirable that the lead edge drop no more than 0.010 in. (0.025 cm). If a ballast roll is located where the plates meet, it is critical that the drop not exceed this amount. Consequences of a low leading edge can result in:

- Board creasing caused by the abrupt drop of green, wet board from one plate to the next;
- Board bending caused by ballast rolls at the junction of two such plates, and possible caliper loss;
- Disturbance of the DB glue line, especially if the low leading edge is early in the hot plate section when the glue line is still in the early stages of bonding.
- Decreased heat transfer where the plate is not in contact with the double face liner.
- Reduced heat transfer, poor bond, and slower production speeds.

Skewed or “twisted” hot plates have a high lead edge on one side and low lead edge on the other. This situation can result in twist warp due to uneven tension being placed on the web. Skewed plates can also lead to all of the “high lead edge” and “low lead edge” problems mentioned above.

It is easy to see that maintaining hot plate level is important to the quality of corrugated board. A simple method to determine hot plate levelness will be described.

Safety precautions

Ensure that the machine is “de-energized” in accordance with “Lock Out and Tag Out (LOTO)” procedures. LOTO procedures require that potential energy from air, steam, and hydraulic pressure also be eliminated. Simply turning the power off may not be adequate. The steam system will still be under pressure though since the plates must be checked hot because cast iron and steel plates will expand and possibly distort as they are heated. When working on hot machines, care must be taken to avoid burns. Follow your plants OSHA compliant safety program requirements. Long sleeves and protective gloves are recommended. The safest and most accurate way to check for plate level while hot is to use a transit and remove the top DB belt. However, if the belt, weight rollers, or similar devices such as shoe presses must be raised in order to access the edges of the plates, then the raised sections should be blocked so that a section can not drop and cause injury. Making the simple tool discussed below is a very safe method since the handle eliminates any need to have hands near the hot plates.

Procedure

A simple tool (Fig. 1) can be fabricated to safely check for high and low hot plate leading edges. A piece steel, 2 in. $\times$ 1/4 in. $\times$ 12 in (5.08 cm. $\times$ 0.64 cm. $\times$ 30 cm) was used as a straight edge to check the “level” of the lead and trail edges of the plates. A hole was drilled in the center of the straight edge to accommodate the handle made with a 1/2 in. $\times$ 17 in. (1.27 cm. $\times$ 43.2 cm) threaded rod. One half inch (1.27 cm) nut was used to secure the handle to the straight edge. A piece of PVC pipe was used to cover the threaded rod handle for added protection. The PVC pipe was secured with a couple of flat washers and two more nuts. A fourth nut is used to secure the forward handle nut and keep it from turning. To extend the handle, a 1/2 in. $\times$ 13/4 in. (1.27 cm $\times$ 4.45 cm) rod coupling nut could be used. The dimensions are not “etched in stone.” The tool is shown in Fig. 1 with the steel straight edge removed from the handle.

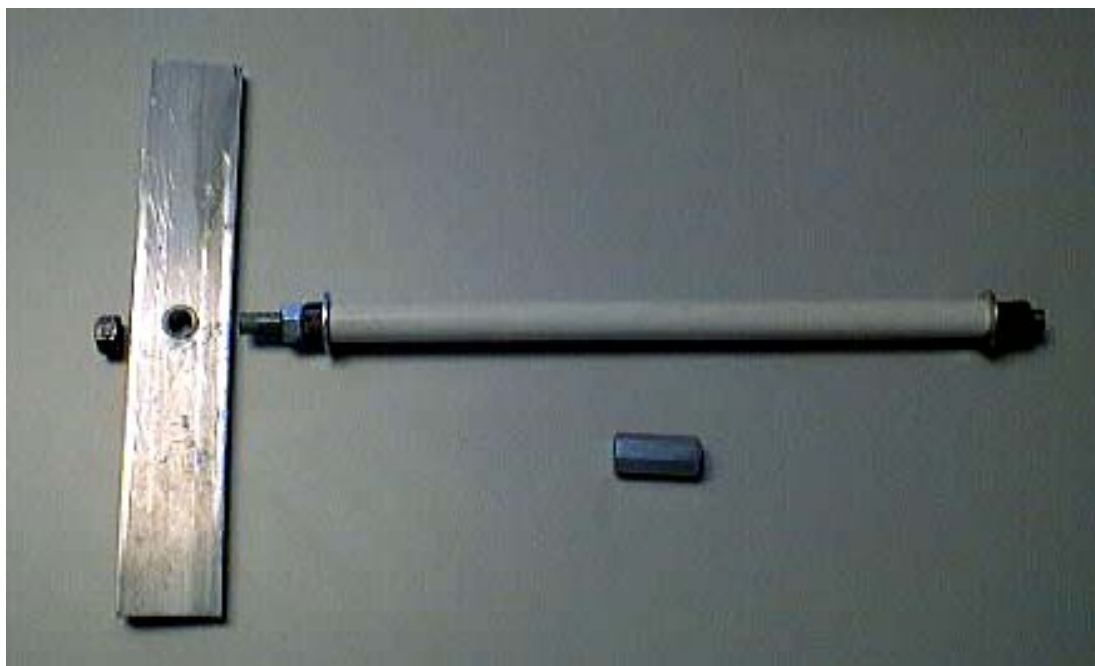


Fig. 1. Straight edge tool components.

1. Place the straight edge flat on the first level hot plate, which is at the tail pulley or glue machine end of the DB approximately 6–12 in. (15–30 cm) from the operator edge
2. Slowly drag the straight edge in the machine direction toward the leading edge of the second hot plate, letting the straight edge pass completely over the gap between the plates. If the straight edge bumps into or is stopped by the leading edge of the second plate, then the leading edge is too high as shown in Fig. 2. If the straight edge can be easily pushed