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Checking the flute depth of corrugating rolls

Scope

This TIP will address the measurement of chordal flute depth defined as the perpendicular distance from the lowest point of a flute valley to an imaginary line tangent to two adjacent flute tips (Fig. 1.). The base of the depth gage used to measure flute depth, which rests on the two adjacent flute tips, forms this line.

Significance

The flute depth of corrugating rolls is important to know for several reasons. Coupled with the roll coating wear checks (TIPs 0304-54 and 73), it is a maintenance indicator for determining when to change out the rolls with new or reconditioned rolls. Typically, as rolls wear, flute depth decreases and this negatively impacts board caliper. In turn, lower board caliper can decrease ECT test values (TIP 0304-20) and therefore stacking strength. For this reason, board caliper is very important to box-makers and caliper is typically measured for quality control (QC) purposes throughout the corrugating and finishing processes. Though there are many places board can be crushed in the corrugating and container making processes, the initial board caliper is dependent on the flute depth of the corrugating rolls. QC cannot accurately create board grade caliper charts which are frequently posted at the corrugator without knowing the flute depth of the corrugating rolls.

Safety precautions

Flute depth should be checked when the rolls are cold and if possible, out of the machine. If rolls must be checked in the single facer, then ensure that the machine is “de-energized” in accordance with “Lock- Out and Tag-Out (LOTO)” procedures. LOTO procedures require that potential energy from electricity, air, steam, and hydraulic pressure also be eliminated. Simply turning the power off may not be adequate. In addition to safety considerations, heated rolls may affect the accuracy of your measurements depending on the type of gage used.

Procedure

As always, make sure the rolls are clean before taking flute height measurements as it can negatively impact accuracy. Rolls can be cleaned with electrical contact spray and a brass wire brush to remove any contaminates.

A depth gage is typically used to measure flute depth. The most commonly has either a digital or dial indicated display. Select one that can measure between 0.000 in. and 0.2000 in. (0.0000 mm and 5.0800 mm). This will cover mini-flutes (E, F, N, etc.) as well as A, B, and C flutes. Note that you will not be able to check mini-flutes unless

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your gage has an extremely thin tip. Most depth gages have threaded tips which can be easily exchanged. Check the availability of tip sizes for a given gage before buying it so that you can check all rolls used in your plant.

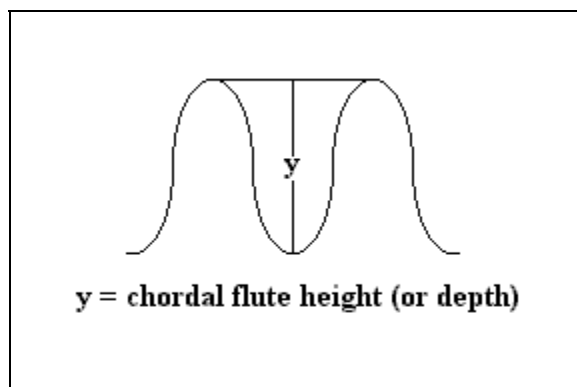


Fig. 1. Chordal flute depth.

Before taking readings, check the calibration of the depth gage you are using. Follow the instructions for the type of gage used. In any case, it is recommended that you have a certified gage block for the range of depth being measured. For example, a gage block with a thickness of 0.100 in. (2.54 mm) is ideal when check B flute rolls which typically have a flute depth somewhere around 0.098 in. or 2.49 mm. A gage block thickness of 0.143 in. (3.63 mm) is ideal for checking C flute rolls which tend to be somewhere in the 0.139 to 0.148 in. (3.53 mm to 3.76 mm) range. The gage will either be set to zero, if placed on a hard smooth surface, or calibrated to the certified dimension of the gage block.

Figs. 2 and 3 show depth gages with dial indicators in use. It is better to hold the gage with both hands when measuring flute depth. Fig. 2 shows only one hand so that the gage can be seen. The base is placed over two flute tips and the dial indicator tip sets in the valley between the two flute tips. The dial shaft is spring loaded making it easier to find the lowest point in the valley. Slowly move the gage so the tip moves across the valley bottom from one side to the other. Watching the dial indicator while doing this will enable you to find the largest reading which is the depth of the lowest point in the valley between the flutes.

Note the difference in the orientation of the base in Figs. 2 and 3. In Fig. 2, the gage base is placed on the roll roughly parallel to the flutes. In Fig. 3, the base is placed across the flute tips with its base oriented perpendicular to the flutes. The latter offers a higher degree of accuracy because if the gage base were one-half inch (1.27 cm.) wide and 2 inches (5.08 cm.) long, then the base only covers a half inch (1.27 cm.) of the flute tips. As shown in Fig. 2, the base would cover two inches (5.08 cm.) of the flute tips. Worn rolls typically have a number of dings or small bumps. Often the material around flute tip damage can be higher than the surrounding material. The same can be true for roll slot edges. At the outer edges of the corrugating roll, slots are closer together which often makes the orientation shown in Fig. 3 a necessity.

The number of readings taken varies. Taking five readings across the top of each corrugating roll (from the operator side roll edge to the drive side edge of the roll) will give a quick indication of the wear pattern. A more thorough check would be to take five or more readings across the roll width at four locations around the circumference of the roll. To do this, mark the top of the roll (twelve o'clock position) and take five (or more) readings from operator to drive side. Then, the rolls are rotated to the three o'clock position (one quarter turn) and take the readings across the roll again. This is repeated at the six and nine o'clock positions.