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TIP Category: Data and Calculations
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Obtaining combined board caliper off the corrugator for use in statistical process control procedures

Scope

Why is it important to measure and control corrugated board caliper? This answer was published in TAPPI TIP

0304-04 “Corrugated Caliper: Why Is It So Important?” and is reproduced in part as follows:

Corrugated is a very popular packaging material primarily because it has a high strength-to-weight ratio. What this means is

that corrugated is exceptionally strong considering its light weight. In fact, the primary job of a corrugated box is to protect

its contents (i.e., our customers’ products). As such, corrugated should be considered to be an engineered material.

It is amazing that we take several flexible pieces of paper and combine them into something very rigid. A 20 × 20

32 ECT (200-lb. Test) C-flute corrugated box can withstand almost 900 lbs. of weight before failing and yet it weighs

only 2.5 lbs. How can corrugated be that strong? There are two reasons.

One reason corrugated is so strong is that the fluted medium separates the two liners, and, when stood on end the

flutes act as columns. We all know that columns have been used for structural support for centuries. We know that a

large diameter column of concrete is stronger than a small diameter column of concrete. So the further apart the two

liners can be held by the medium columns, the stronger the corrugated structure will be for a given combination of liners

and mediums. In order to maintain the greatest possible strength, we must maintain the greatest possible thickness. In

our industry, we refer to thickness as caliper.

Caliper, then, is an indirect measure of the compression stacking strength of corrugated boxes. Low caliper is

usually the result of poorly formed flutes or crushed flutes and often results in poor corrugated box compression and performance.

Each grade of corrugated has a caliper target that is based on the depth of flutes in the corrugator rolls and on the

thickness of the liners and medium used. *Whenever the caliper of a given grade of board is less than the target value, we*

have failed to achieve the maximum strength potential of the materials we are processing.

There are only two things we can do to maximize caliper: form the flutes to the maximum potential of the corrugating rolls and avoid crushing the flutes after we have formed them.

There are lots of opportunities to crush flutes in a box plant. Any time corrugated board passes through a nip between two rolls, we have the opportunity for crushing. Nip points occur at many places in a corrugator and on box finishing equipment. Examples are the double backer rider roll, double backer weight rollers, printing press feed rolls, printing plates, etc.

Therefore, caliper control may be one of the most important quality control functions in a box plant. The above is a list of possible process variables that may influence combined board caliper. If any of these variables are suspected in causing variability or lack of control in the process, then that variable should be isolated and studied separately.