

HOW TO BUILD THE MOST COST EFFECTIVE EDGE CRUSH COMBINED BOARDS

Just last month an AICC member contacted ASK Ralph! regarding a box failure at a new customer. The converter had secured the account with both an understanding and promise that a new corrugated board combination utilizing a high strength 47# linerboard could replace the 52# linerboard in the original construction.

While this is a possibility it is not by any means certain without a complete knowledge of the competitor's box, the user's real needs and testing of the new and old corrugated design. Let's take a look at the elements in this case.

Our needs as an industry to reduce waste, fibre, labor, energy, environmental dangers, costs, work place risks, and equipment inefficiencies has never been heavier upon our shoulders. Therefore, having a more comprehensive knowledge of the user's supply chain, our converting efficiencies, the combined board strength at the end of the corrugator and the characteristics of the containerboard being converted have never been more critical.

In this case, I have never experienced a 47# linerboard that has the same ring crush strength as a 52-56# linerboard. And both the US mill offerings of 26# mediums and 23# mediums vary by 67% in their Cross Direction Ring Crush strengths. It all comes back to the simple principle that [basis weights](#)

by themselves are very poor predictors of ECT, BCT and performance of the package through the distribution system.

Any medium must proceed through the corrugating labyrinth and there are more than 15-20 physical properties to describe its ability to be fluted successfully. The most important criteria have been caliper, MD tensile, MD stretch, and coefficient of friction. If you are buying the medium, caliper is usually the only one of these four properties you will receive.

While the unique attributes of semichemical or recycled or one ply, or two ply mediums are not discussed here, there are differences. Combining and converting efficiencies vary and therefore there are differences in the ECT outputs. One needs to weight carefully the real cost of the achieved ECT in light of the containerboard costs, corrugator efficiencies and converting degradation factors.

With the research that was done though Owens Illinois in the 70's we learned that under the best conditions the vertical compressive load sharing in the corrugated structure should be 50% supported by the mediums and 50% supported by the liners. This is not the way we generally combine or design our sheets of boxes today. When engineered to this design principal just the fibre cost savings alone over conventional models can be substantial.

Knowing the minimum ring crush levels in the containerboards we need to achieve a minimum ECT, one can begin to source the right containerboards as raw materials for the corrugated box. Along with the raw materials we need to know the efficiency levels of the corrugator to combine these elements and also the degradation factors of each piece of converting equipment that we use to process the sheets.

Both historical data and recent studies by the AICC have demonstrated that corrugators can vary by almost 40% in their ability to maximize ECT from the containerboards. And we have also seen that converting plants can destroy up to 35% of the ECT strength in the corrugated structure because of process variations.

Predicting ECT targets or values from the strength of the components by using CD ring crush or STFI can be determined with long standing and proven formulas. (Contact me outside of this article for more details.) These formulas should be used to provide your own set of Expected Values when you know the corrugator efficiency and the degradation factors in your own operations. This should be part of any quality, sustainability, or lean manufacturing program.

To achieve any given minimum ECT value we need to select the linerboard and mediums that will deliver the needed outcome in the most cost effective manner. To design to a minimum 32 ECT requires 150# of total ring crush

from the two liners and the fluted medium. From a theoretical point of view this could lead us in the direction of selecting liners with a minimum of 38# of CD ring crush each and a medium with 53# of CD ring crush. This is not the way we build this very common structure today in the US. But you might find this type of combination in Europe.

We will share more on this subject with the next issue.

You are always welcome to contact me at anytime to discuss any technical concerns at ASKRalph@aiccbox.org or thru my consulting company, Alternative Paper solutions, at youngralph1@bellsouth.net