

Summer Reading List

I don't know about you, but I hated to hear those words during the last week of school. This article is only, at your leisure, to give you a preview of three major educational resources that will be available no later than the Fall CorrPak meeting. They are an e learning segment, **Warp: Its Causes and Remedies**, and then two white papers, **Fluted and Paperboard** and **Score Cracking: Its Causes and Remedies**.

So to tease you a bit regarding two of these new resources from your association and to let you know there has been extensive time invested in these offerings we are giving you a peek inside the offerings before their release.

Here are the questions that will be asked and answered from the section on Warp.

Quiz #1

1. Can containerboard moistures change over time?
2. Am I all alone, or are there resources and people to help us? What is the maximum amount of moisture variation in liners for good bonding and minimum warp potential?
3. Does linerboard expand and contract with moisture changes? What specific data should I seek from my suppliers?
4. Can there be differences between virgin and recycled fibres?

Quiz #2

1. Are corrugator temperatures critical to bonding and warp? Is moisture added or subtracted during the corrugating process?
2. What does wash boarding indicate usually?
3. Yes or No. Older corrugators with more heat are better at flatten warp in the combining process? Name some corrugator conditions that can lead to warp.

Quiz #3

1. What is the most common type of warp in your plant? What are the major causes?
2. What are the major remedies? What elements of starch and its application have on warp?
3. Where is parallelism most critical in the corrugating operation? Will you contact us if you have more questions or suggestions?

Here is a section from the white paper on Score Cracking.

Paper Physics:

Containerboard as we know it here is a wood based product made from cellulose fibres just like cotton. Most of the other portion, hemicellulose which acts as a natural paper strength additive, is lost in pulping. The first generation of newly pulped wood chips

produces virgin long length fibre with many bonding sites that allow the individual fibre to “stick together” both physically and chemically. Paper is a viscoelastic material with properties much like elastic binding or rubber bands. It is ductile which means it is able to form around itself up to a point! It can be stretch and returns to its original shape and size unless it is broken or ruptured in the process. This is the stretch-to-break value. Virgin fibres are generally more pliable than recycled fibres and white tops and clay coated boards. The formability of linerboard is also impacted by the applications of starch coatings and the low freeness of the pulp in the top ply.

To the extent that paper properties are responsible for score cracking, the key factor is stretch. Any factor that reduces paper stretch adversely affects score cracking. Stretch is a function of fibre length, width, degree of fibre entanglement, fibre to fibre bonding and moisture content.

Score cracking can be caused by high density paper making and the use of recycled fibres. Highly pressed wet fibre mats of fibres, when dried, have less room to flex and bend.

We use the word tension stress to describe the ultimate strength that the containerboard sheet (strip) contains when it is pulled end-to-end, both MD and CD; and its elongation (strain) is the percent it will stretch until to point of failure. Both these properties should be obtained from your linerboard suppliers, although sometimes not easily, but they are very good predictors of score cracking potential. The MD/CD strength ratios most mill have adjusted over the years, but MD than the CD while the CD has about twice the elongation to failure as the MD.

The key factors related to paper cracking are stretch and moisture. Paper properties and corrugator temperatures are the most important elements to address to minimize score cracking.

Those 140 paper machines out there have an average chronological age of over 40 years, but a technology age of under 25 years. One again these are averages and every printer and converter need to ascertain as much about possible of the unique paper properties each machine imparts to its products.

Of course under TAPPI testing methodology all labs operates at 72 degrees F and 50% RH. Both combined board moistures below 5.8% and RH below 50% create conditions for score cracking.

Paper making processes include fourdrinier vs gap formers, single ply vs dual, or multiple ply, recycled vs virgin, and brown vs white which under scoring pressure ply separation can occur. Traceability of cracking issues must be specific to a mill and then to an individual machine. There are 140 of them out there! Suppliers can also provide certificates of analysis comparing actual physical properties to agree upon specifications. A plant needs to know any changes that the doubleback liner supplier

makes to its processes. There has to be open and constant communications. All participate in the end result.

What happens with increasing moisture is that papers swell, expand and relax.

I am a large proponent of the use of heavy weight and stronger mediums to build cost effective structural combined board. However, they can add to score cracking if they contribute too much rigidity to the board construction and score profiles have not been changed. Dual arch constructions can be converted without fracturing so it can be done.

Please get your hands around all the variables we have discussed in this paper. As we recycle more and more, additional types of fibres both domestic and foreign enter our “recovery” stream making it more challenging to produce a uniform and consistent linerboard and therefore combined board sheet for laminating or direct converting. Score cracking will morph going forward.

You are always welcome to contact me at any time to discuss any technical concerns at ASKRalph@aiccbox.org or through my consulting company, Alternative Paper Solutions at youngralph1@bellsouth.net, or just call 404.915.2792. Please visit the blog and sign up to follow us for instant updates.