



AUDITING YOUR CORRUGATOR FOR MAXIMIZING COMBINED BOARD PROPERTIES

WHY DOES YOUR COMPANY NEED THIS?

- Sustainability doing more with less
- New lower grammage offerings
- Validate your value proposition
- E-commerce
- Competition- options to lower cost
- Demonstrate process controls to customers
- Qualify your suppliers



WHEN SHOULD ONE AUDIT?

- Whenever you change containerboard machines
- When starch changes are made
- When settings or machine recipes change
- When new corrugating rolls are installed
- When new glue applicator rolls are installed
- When you are experiencing warp
- When you are experiencing score cracking
- Upgrades are installed or being evaluated
- Temperature and moisture sensors replaced
- When a comprehensive evaluation is needed



JUST LIKE AN ANNUAL PHYSICAL

- This is **not** a maintenance audit or weekend service.
- This is all about defining the core properties of you combined board.
- Containerboards vary in properties, each machine has its own unique DNA profile and so does each corrugator.
- Testing provides results which should lead to corrective action- more on this latter.



PREPARING FOR THE AUDIT

- Obtain spreadsheets of Combined Board Expected Values from AICC
- Gather the team and explain rationale
- Make team assignments
- Allow thirty minutes for each combination
- Have control room record every setting



HOW TO PREPARE FOR THE AUDIT

- You should take the module on **Understanding Combined Board Combinations** so you can set your output target ranges.
- Set your expectations of what the outcomes should be.
- Have the specification of your containerboard properties from your mills so you can determine final results.
- Have written instructions for all participants



WHO SHOULD BE INVOLVED?

- Team members from all department including converting and office staff at least once
- Training essential: safety
- Rotate roles and assignments over time
- Will sensitize all of process control and process variation- a quality program



IDENTIFICATION OF LINER AND MEDIUM SAMPLES-STARCH



- Roll number of the containerboard used
- Optimum machine speed for the combination tested
- Date and time of sample collection
- Temperatures at various positions at the preheaters up to the entrance to the singlefacer
- Starch conditions: viscosity, gel temperatures, pH



TEMPERATURE SURVEY CD LOCATIONS

- Singleface liner exiting preheater
- Medium entering corrugating rolls
- Singleface web liner exiting corrugating rolls
- SF web flute tips exiting the corrugating rolls
- Doubleback liner entering the hot plates
- SF web liner entering the hot plates
- Doubleback liner exiting the hot plates
- Adhesive in the glue pan




WHERE TO GATHER BOARD SAMPLES

- Five Cross Directional positions-mark samples
- Machine Direction samples at 6 inch increments for circumstances of various rolls
- At the slitter or down stacker need about nine square feet each
- Testing for the following Big three:
 - Edge Crush Test
 - Flat Crush Test
 - Pin Adhesion Test
- DST Torsional Stiffness optional



TESTING EQUIPMENT REQUIRED



- Infrared moisture analyzer immediately after gather samples
 - Crush Tester
 - TAPPI approved caliper gauge-measuring springback caliper
 - Conditioned lab
 - Flute specific selective pin separation jigs
 - Optical pyrometer for temperature checks
 - Gloves
 - Utility knives
 - List of outside third party labs is available
- 



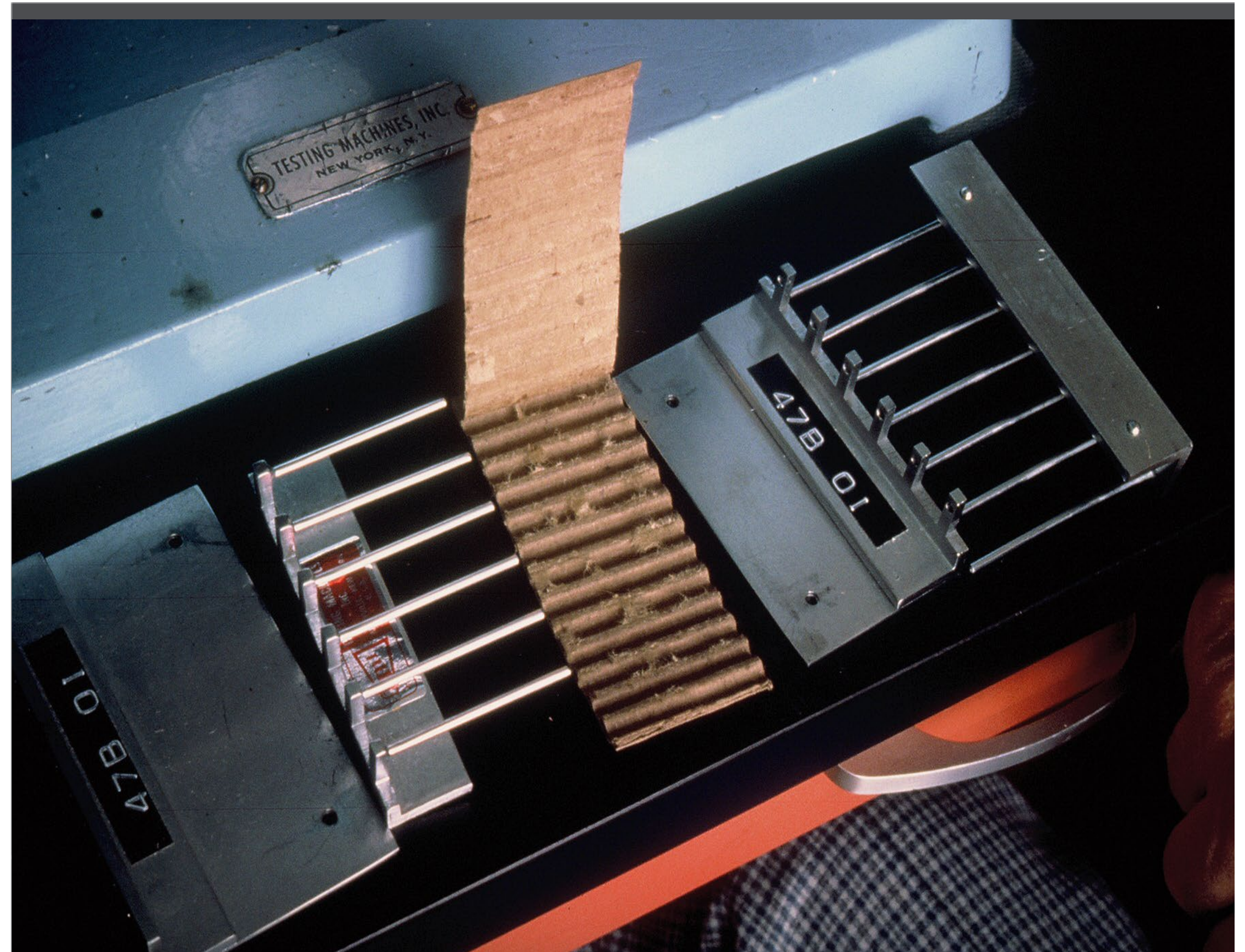
Glue Line Widths

- Image courtesy of Harper Love/Google Images
- Transparent plastic cards to measure widths obtained from starch supplier
- Relates to pin adhesion values and strength of bonds between liners and medium
- Should be normal process check of running the corrugator
- Includes warm water supply, soak tank and iodine sprayer



Interior Slide Title

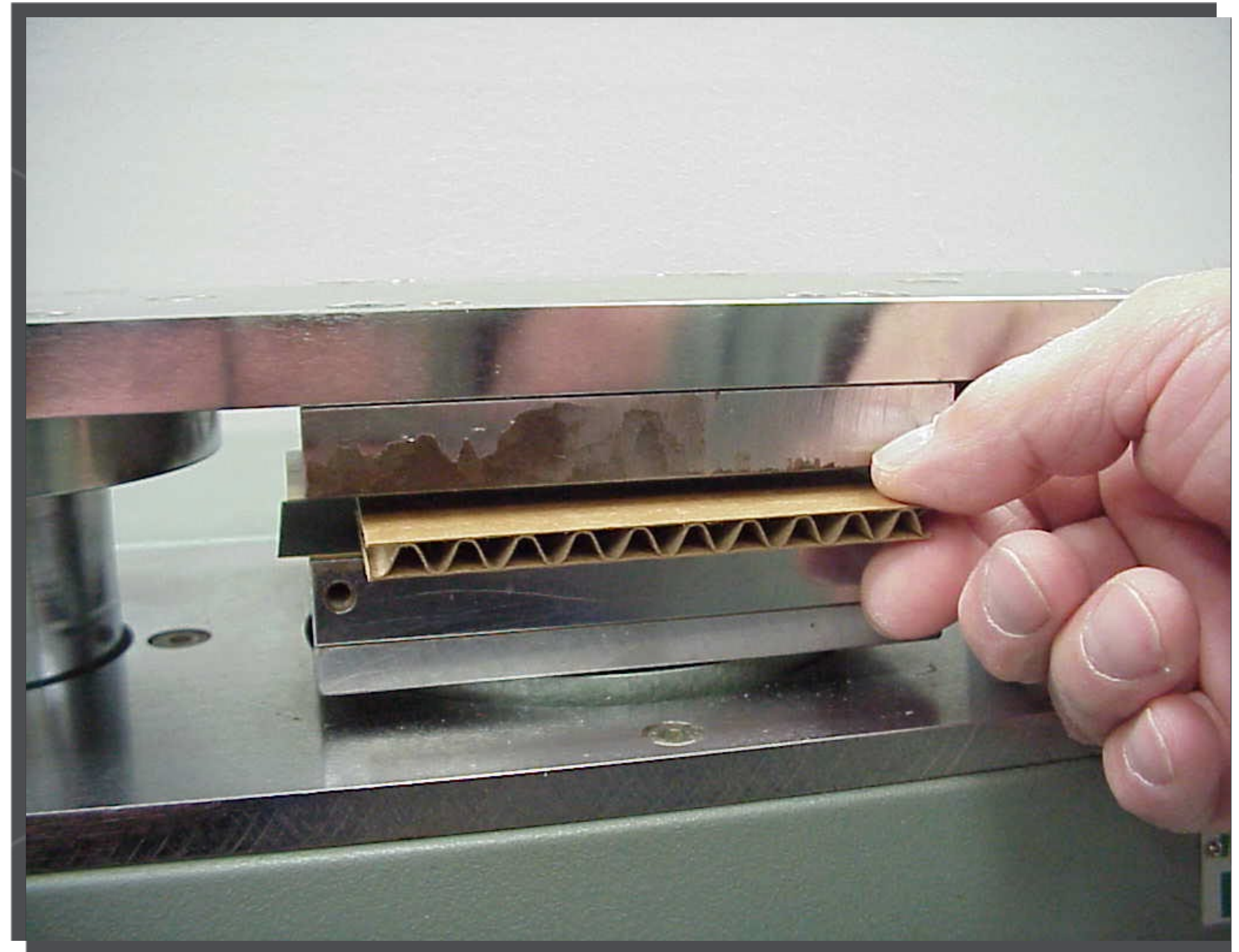
- TAPPI TM 821
- Measures strength of bond on both the singleface and doublebacker sides of the combined board.
- Doublebacker bond usually stronger
- This testing protocol is not reliable when using linerboards below 35#/MSF. Check back with the ACC to ascertain our latest recommendations.





Interior Slide Title

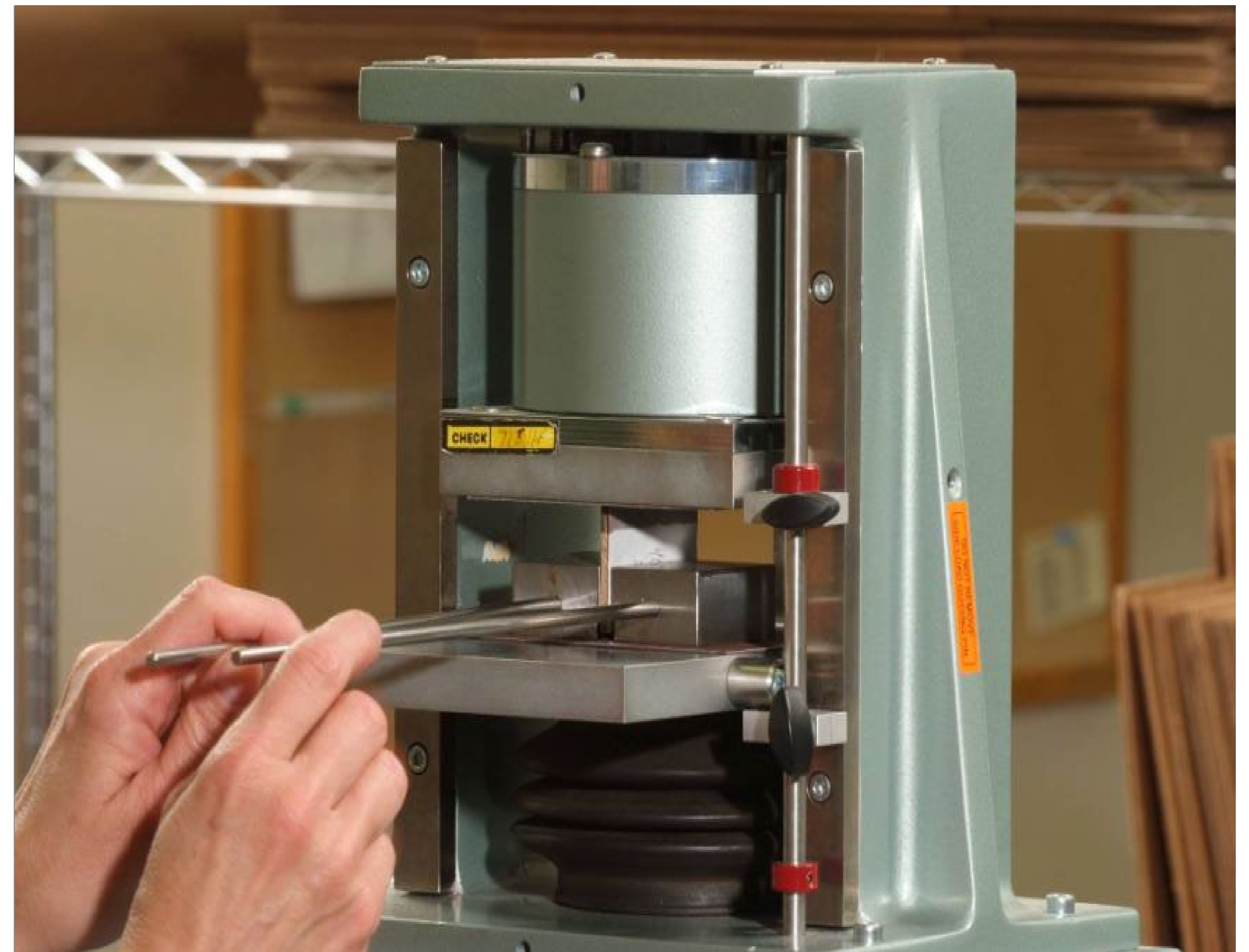
TAPPI TM 825 Body Copy Body Copy Body Copy Body
Copy Body Copy Body Copy Body Copy Body Copy Body
Copy Body Copy Body Copy Body Copy Body Copy Body
Copy Body Copy Body Copy Body Copy Body Copy Body
Copy Body Copy Body Copy Body Copy Body Copy Body
Copy Body Copy





Interior Slide Title

- Universal crush tester for ECT, PA, FCT, corrugated crush test for medium, Concora test for medium, and ring crush for liner
- More accurate methodology is with a fixed clamp apparatus described in TAPPI TM 839
- Current clamping deiBody Copy Body Copy Body Copy Body Copy Body Copy Body Copy Body Copy Body Copy Body Copy Body Copy Body Copy Body Copy Body Copy Body Copy Body Copy Body Copy Body Copy Body Copy Body Copy



Chalmer's DST

- A quick test for MD torsional stiffness
- Can be beside the corrugator no need for a conditional lab and 48 hours to wait for flexural stiffness results
- Gives an instant read on possible flute fracturing and combined board crush in less than 15 seconds.
- Alerts crew so machine adjustments can be made immediately
- There is no TAPPI/ASTM/FEFCO procedure



WHAT TO DO WITH THE FINDINGS

- Consult with your containerboard suppliers
- Share efficiency ratings and concerns
- Meetings with supervisors and maintenance
- Establish procedures to perform corrective actions
- Ratings should be above the 90% targeted achievement levels
- Reaudit again soon



OTHERS THAT CONDUCT AUDITS

- Adhesive suppliers like Harper Love, ect.
- Containerboard suppliers
- Equipment manufacturers
- Contact AICC about third party outside testing labs that can perform evaluations of both containerboards and combined board



ADDITIONAL RESOURCES:

- TAPPI Test Methods
- **Understanding Key Characteristics...** e brochure
- **Rightweighing...** e learning module
- **How to Audit Your Corrugator...** AICC presentation 2/14/2013
- **Corrugating Medium: its influence on Box Plant Operations and Combined Board Properties and Packaging Performance...**TAPPI
- Warp: Its Causes and Remedies... AICC white paper
- Score Cracking...AICC white paper



CONTACT US


 ryoung@aiccbox.org or
youngralph1@bellsouth.net or
askralph@aiccbox.org

 www.AICCbox.org

 (703) 836-AICC (2422)

 113 S. West St., 3rd Floor
Alexandria, VA 22314





THANK YOU

Auditing Your Corrugator for Maximize Combined Board Properties