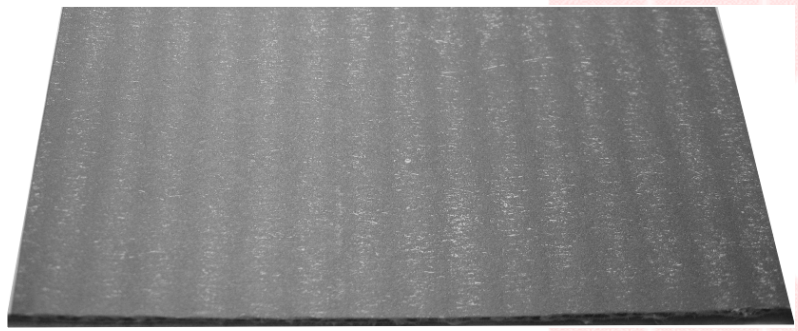
Washboard effect:
undulating surface of corrugated card board



The Washboard is an undesired effect resulting from the corrugated cardboard manufacturing process.

Dipl. Ing. Lukas Pescoller

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Why it is important to control the washboarding

How will a box perform under load?

- Edge crush test (ECT) performance is strongly correlated to washboarding depth and paper grammage. *)

How will a corrugated board perform in printing?

- Stripyness (fluting) is a summary result of print density and gloss deviations, of surface structure and washboarding

*) 'Washboarding of Corrugated Board', Sven D. Wendler, RMIT March 2006

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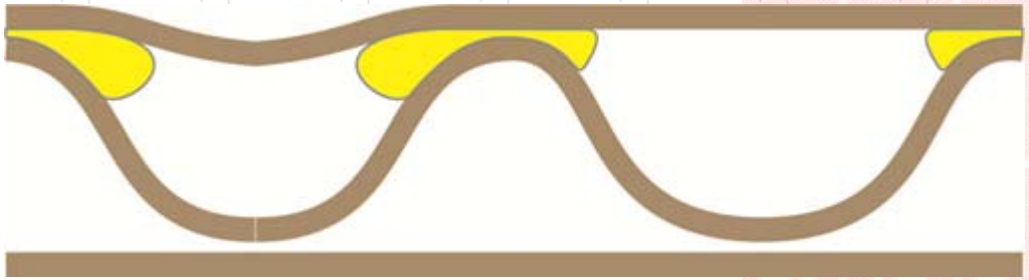
Washboarding of Corrugated Cardboard



- Washboarding is formed by the shrinkage of the glue in between of the liner and the fluting of the corrugated board during drying
- Washboarding depth is linearly related to the amount of glue applied*)

*) 'Washboarding of Corrugated Board', Sven D. Wendler, RMIT March 2006

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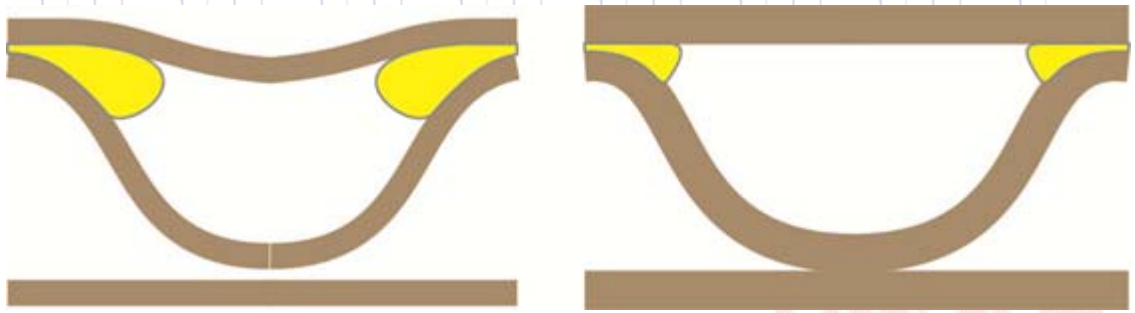
Washboarding of Corrugated Cardboard



- Washboarding depth is highly dependent on the relative humidity of the environment
- Higher relative humidity leads to higher moisture content, more elastic and thicker paper. As a consequence less glue is applied
- Washboarding decreases linearly with increase of relative humidity*)

*) 'Washboarding of Corrugated Board', Sven D. Wendler, RMIT March 2006

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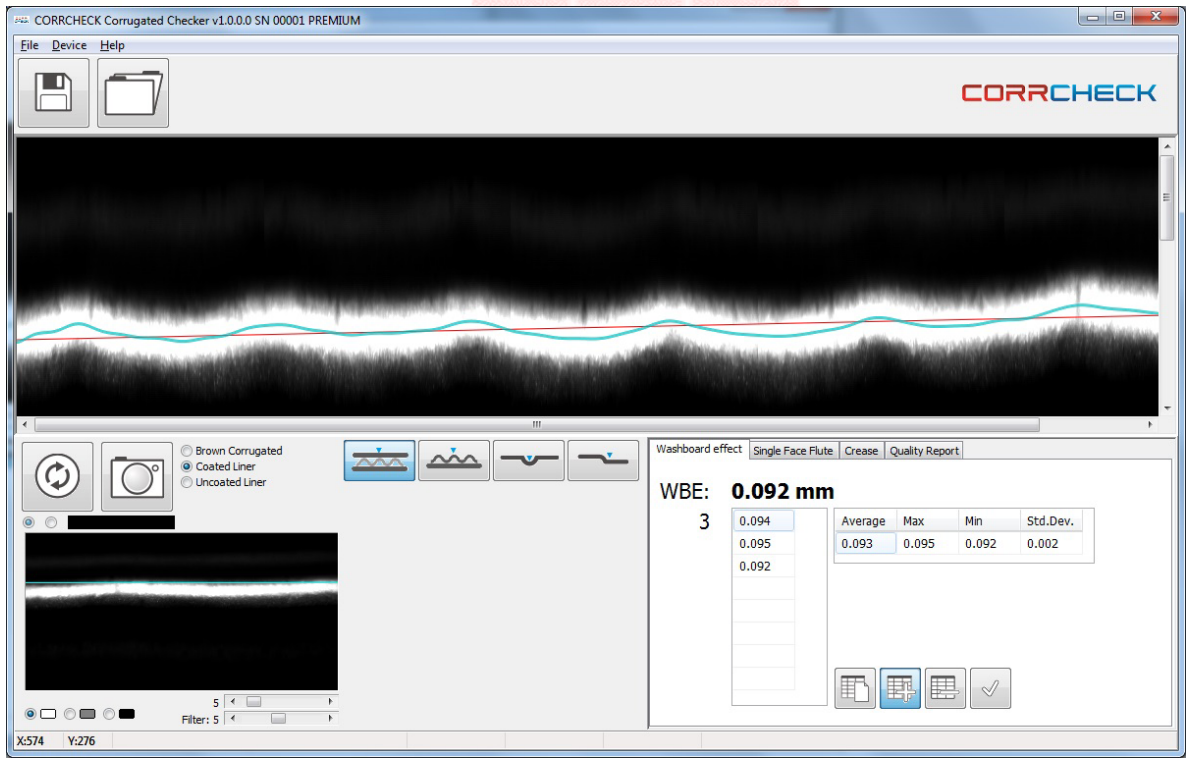
How to measure the Washboard Effect WBE?



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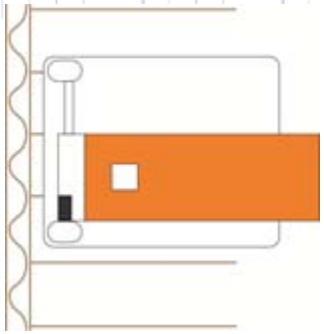
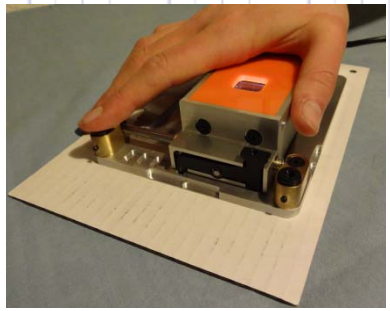
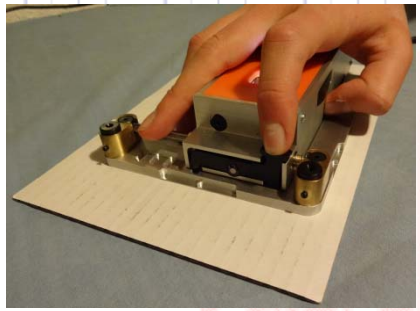
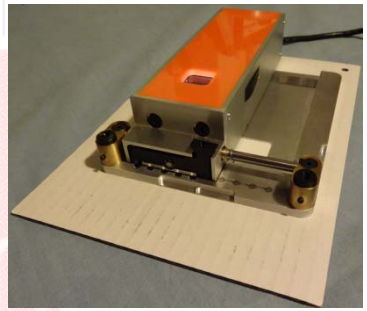
WBE measurement procedure



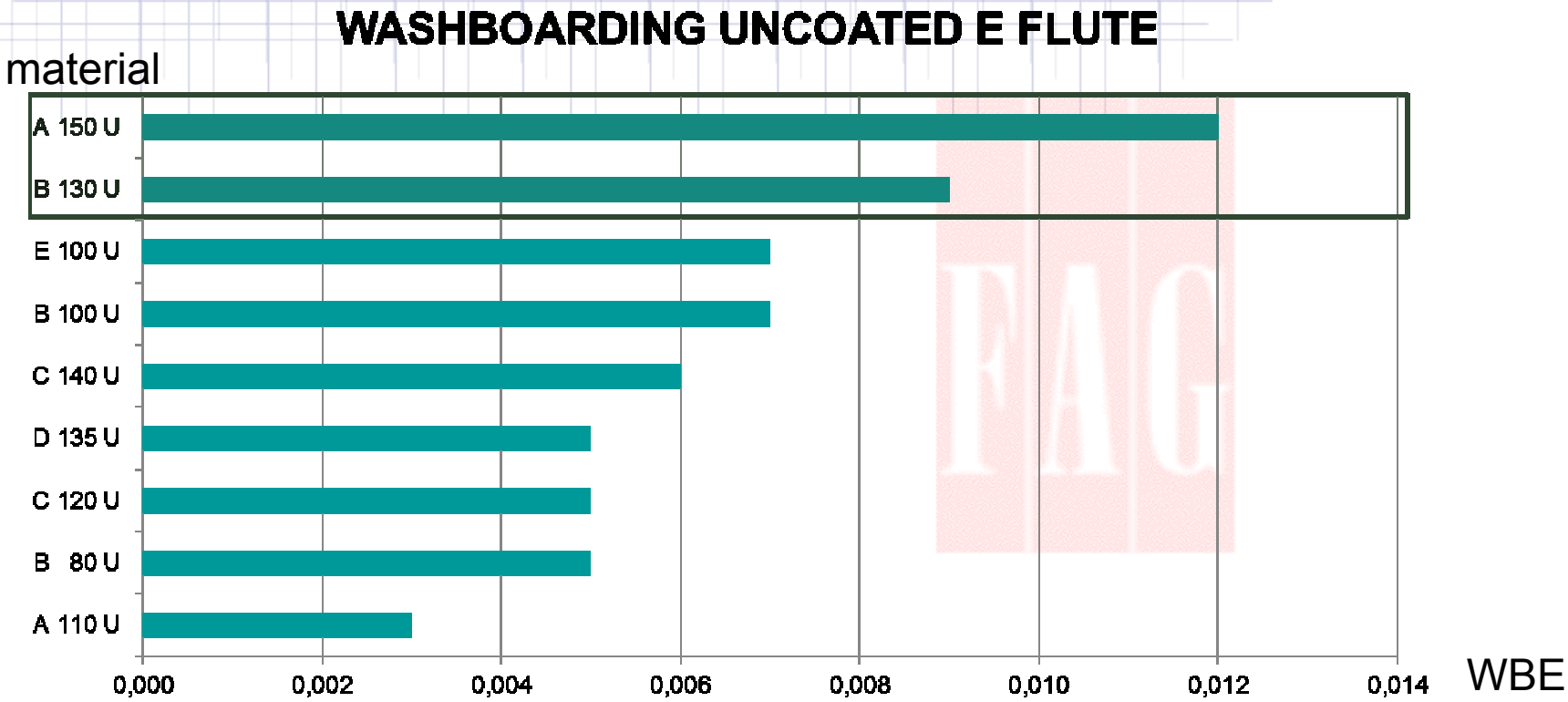






- Calculating WBE requires extremely sensitive height measurement while accurate measurements of flatness and flute pitch requires a large area to be measured. These conflicting requirements are solved by the use of sequential image capture and stitching. The CORRCHECK captures 5 high resolution images and creates a compound image over 1.5 inches wide.

WBE benchmark for uncoated E Flute



WBE above 0.007 is not acceptable for uncoated E flute corrugated card board

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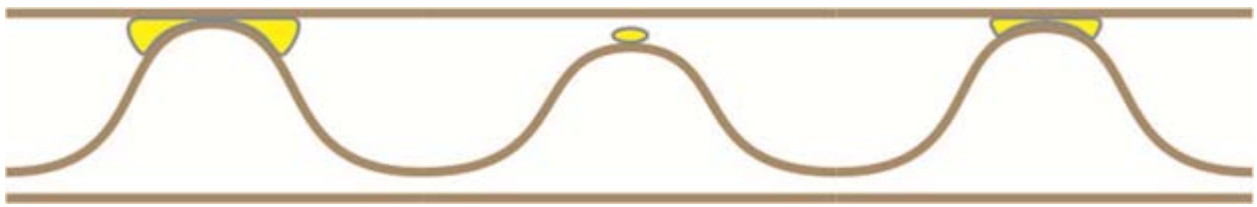
The FLUTE Profil

- Measure the FLUTE PROFILE on single faced material
- to check the mechanical wear of the corrugating rolls,
- comparing Operator side (OS), Distant side (DS) and middle
- and the correct formation of the flutes.
- It does not require a carbon print, the result is immediate
- as you measure the end result.



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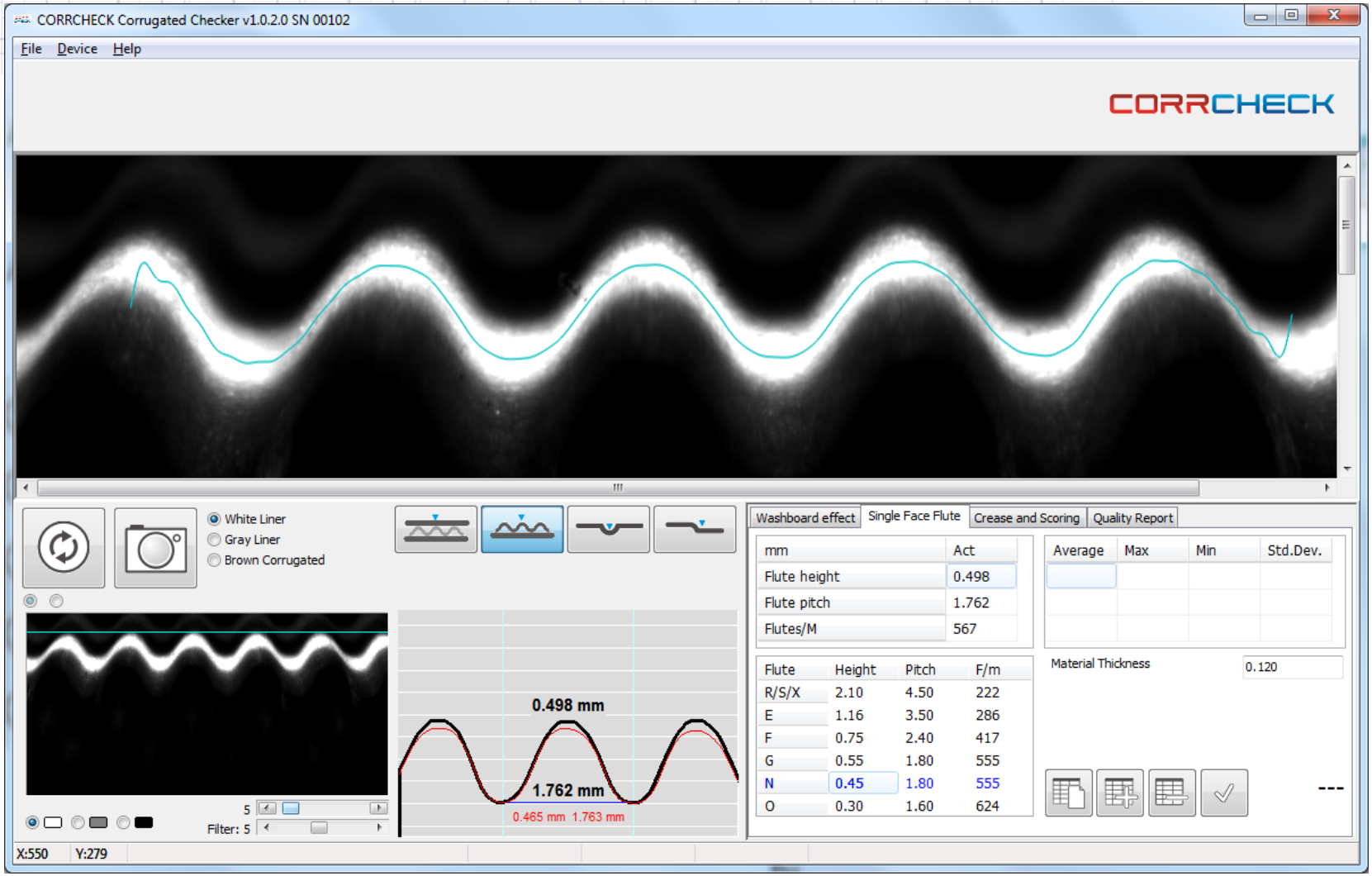
Measure the FLUTE Profil



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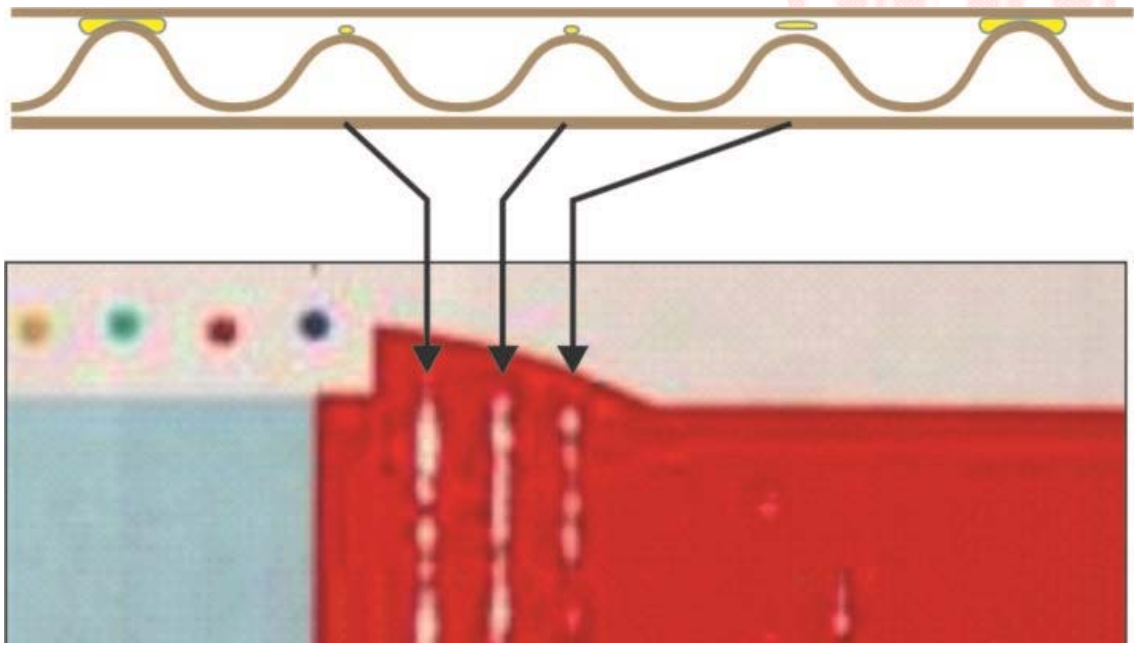
The FLUTE Profile

- Incorrect flute profiles are one of the key parameters for STRIPYNESS in flexo post print.



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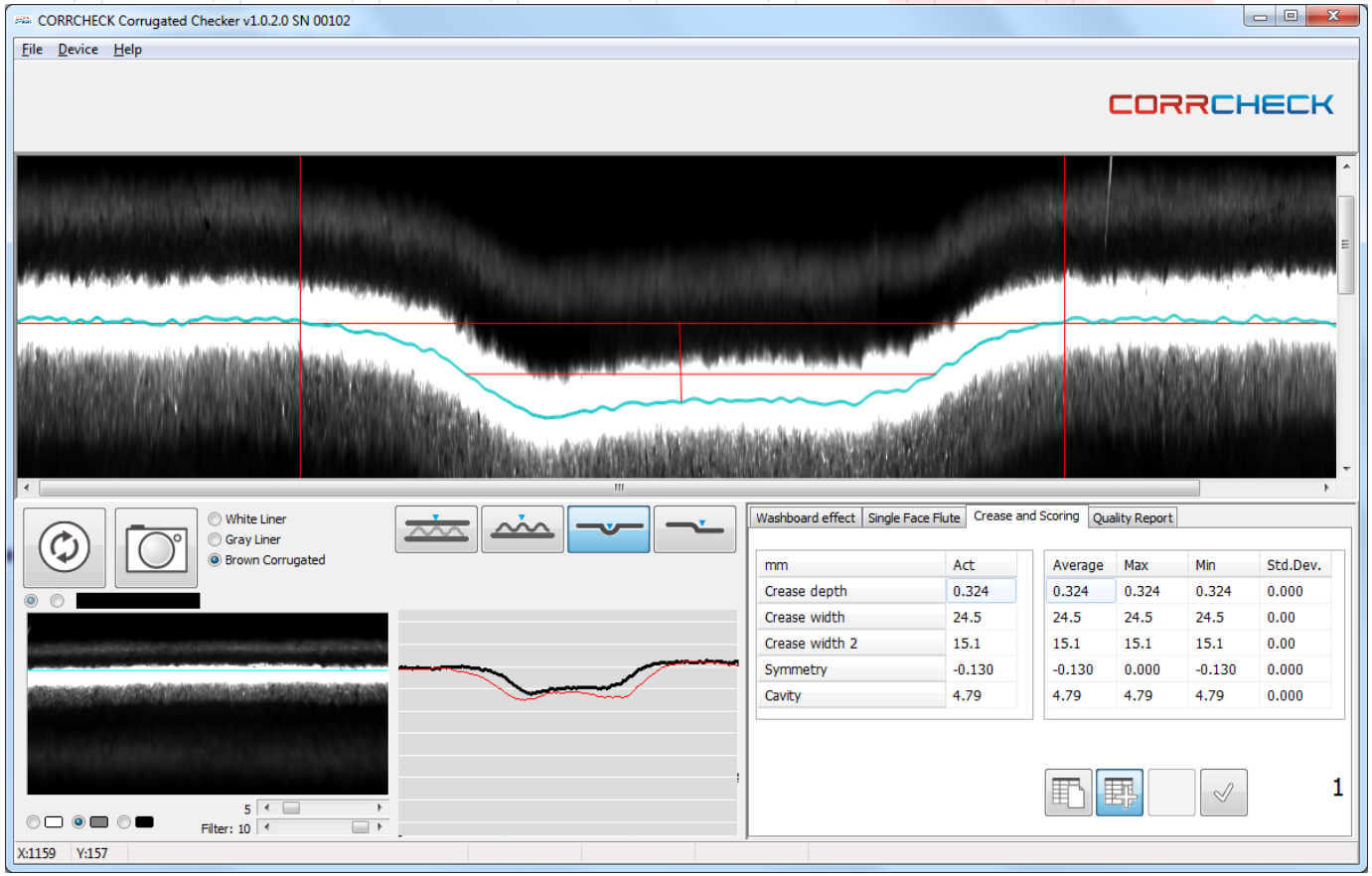
Creasing and Scoring

- Creasing and scoring are critical steps in the box forming process.



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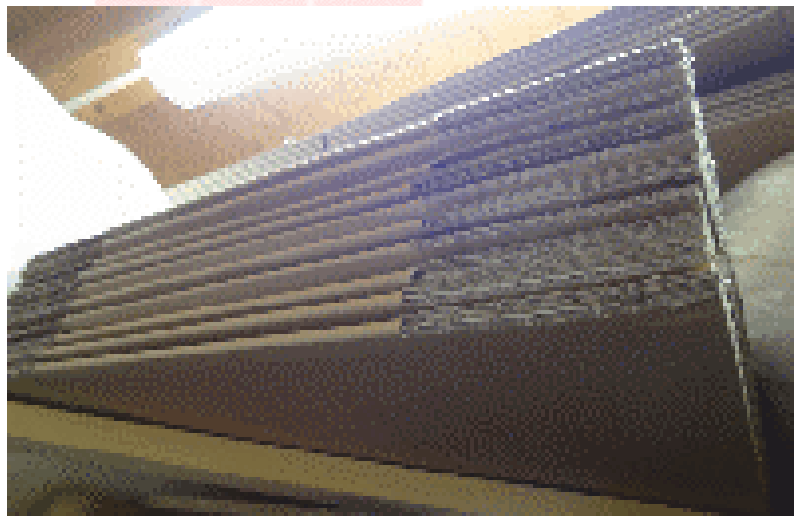
Creasing and Scoring

- Creasing and scoring are critical steps in the box forming process.
- Creasing and scoring lines are stressed due to folding by 180° for transportation purpose.
- Creasing and scoring lines are defining the symmetry and size of the box
- Measure the CREASING and SCORING on corrugated board to predict the performance in folding and box stability



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Creasing and Scoring

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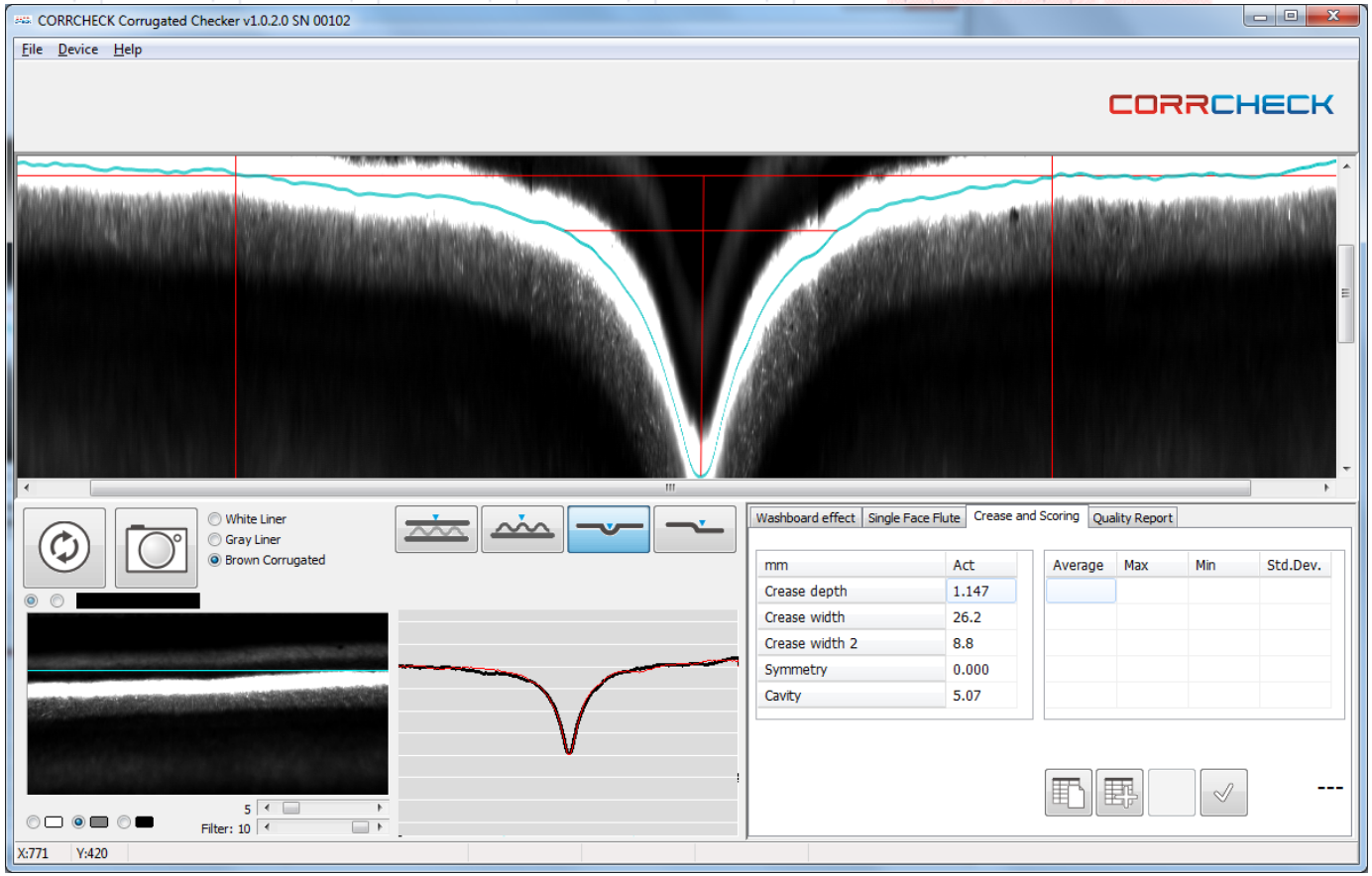

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Thank you…

See what happens

Understand why it happens

Take corrective actions

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