Washboard effect: undulating surface of corrugated cardboard

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

Dipl. Ing. Lukas Pescoller
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
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
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
How to measure the Washboard Effect WBE?
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

WASHBOARDING UNCOATED E FLUTE

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

![Diagram of FLUTE Profil](image-url)
Measure the FLUTE Profil
Incorrect flute profiles are one of the key parameters for STRIPYNESS in flexo post print.
Creasing and Scoring

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

See what happens
Understand why it happens
Take corrective actions