

The S-Test

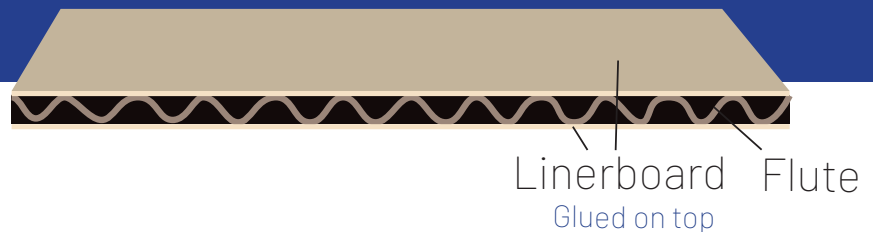
The alternative for CMT flute testing



**Taking care
of quality**

The S-Test

The alternative for CMT flute testing



Testing reduces costs

Manufacturers of corrugated board continuously strive to balance box strength versus material and manufacturing costs. In order to monitor the quality, at different production stages quality tests are performed. For example, the Linerboard and Fluting are both tested before the flute is made and the corrugated board is glued together. Underperforming paper can be replaced before finishing production.

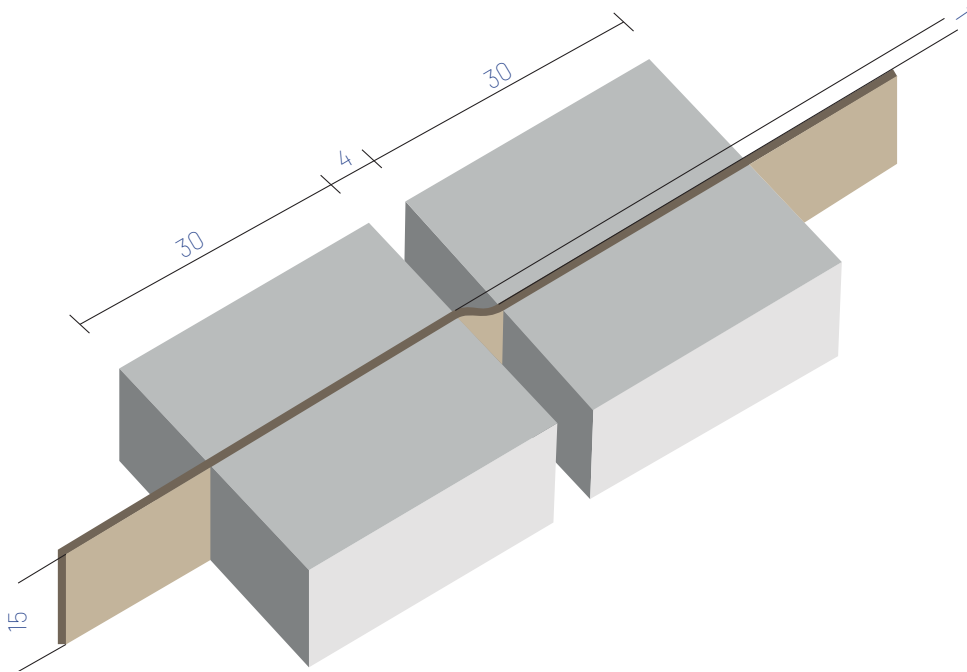
The most used test for the fluting material is the Corrugating Medium Test (CMT). The CMT is important, but difficult to perform. The sample preparation is time consuming, and can be influenced by the operator and the used tape, increasing the variation of the results. This makes it more difficult to adjust productions and predict the performance of the corrugated board. Therefore, a new and better type of test has been developed: The S-test

S-Test

An unfluted 15mm wide flute is placed between two clamps. The span between the clamps is 4mm and the clamps have an offset of 1mm. The offset of 1mm pushes the flute into the same shape as corrugated board. The test is finished in a few seconds and directly gives you the peak value of the measurement. The S-Test can be correlated to the first plateau of the CMT.

CMT-test

A CMT test is performed with 10 pieces of paper with dimensions of 12.7 mm x 150 mm (½ x 6 inches). These are cut in the MD direction. The sample is then fluted in the laboratory fluter set to 177 °C (±8 °C). Using the rack and comb the flute is pressed against double sided tape. The comb helps the right geometry of the flutes and is manually fixated to a piece of self-adhering pressure sensitive tape. After carefully removing the sample from the comb, the sample is ready to be either crushed in a crush tester immediately (for the CMT0 value) or crushed after 30 minutes conditioning in 23 °C and 50 % RH (for the CMT30 value).



New: The S-Test

Smurfit Kappa was the forerunner to develop a new test method. The goal was to find a test method that immediately gave a result, without difficult sample preparation, and correlates with the CMT first plateau. The Short Span Compression test was used as the basis for the new test. In order to resemble the flute, the clamps are widened to 4mm. To push the flute in its S-shape, the clamps have an offset of 1mm.

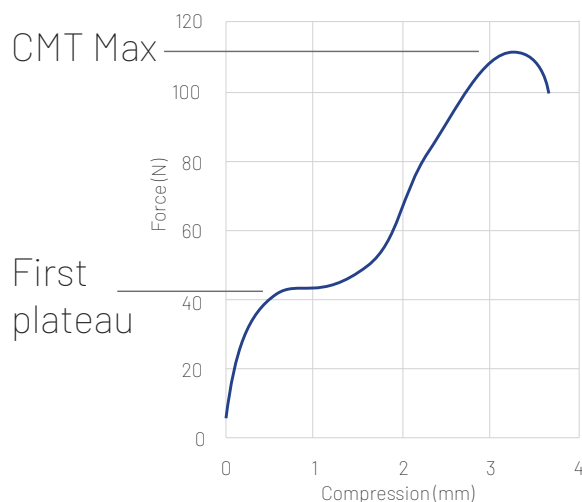
Validated by the industry and science

The S-test is a way to simulate CMT plateau measurement. To simulate the forces of the CMT test at the first plateau, this S-Test is introduced and further developed. The Cepi ContainerBoard (a European industry association of producers of corrugated case materials) investigated the measurements from 17 different European Mills. The tests were executed in cooperation with the Technical University Darmstadt (Germany) to verify the results. The results showed the validity of the S-Test. Since May 2015, the S-Test is running daily measurements at Smurfit Kappa mill in Germany to check the paper machine. Up to now, the S-Test has shown a correlation coefficient of 97.6% with the CMT first plateau value. Since then, further investigation is done confirming the correlation with the CMT first plateau and the relation with corrugated board performance. In order to internationally accept this method a draft DIN 5014 was published. In 2019 Smurfit Kappa will enroll the S-test in all their facilities in Europe.

Better results

The S-Test has proven to be a better test on all the important criteria. It saves time because no sample preparation is required and it has no operator variation. This enables the user to compare results with other instruments/ plants. Because of the reliable results, production can be optimized. This will reduce cost valuable production time and materials.

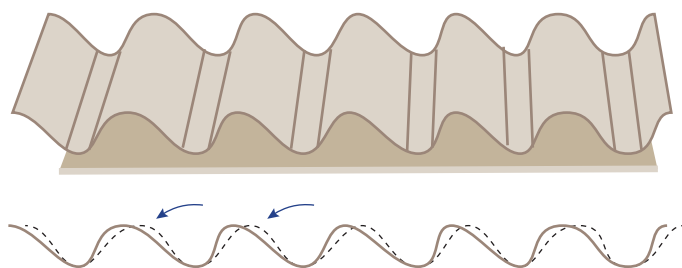
Corrugating Medium Test



First Plateau over CMT Max

The CMT gives you two values: the First Plateau and the max peak (CMT Max). First Plateau has two big advantages over the CMT max. At the CMT max, the sample is almost fully crushed. Just before the peak, the sample can delaminate. If this happens and the degree in which it happens will cause a variation in the result. Another problem is that thicker paper delaminates more and will therefore give a lower value at CMT max. The First Plateau does not have this problem and clearly shows that the heavier flute is also stronger.

Leaning Flutes



Why replace a test that is widely used?

- The tape used gives variations in results.
- The operator can influence the result by not pressing the flute properly onto the tape, compressing the flute upfront.
- Strong High Performance Papers often show leaning flutes (see figure).
- Time-consuming, because the sample preparation takes a lot of time.
- CMT is measured with A flute, and the market is producing lower flute types board, like B, C, E flute.

	S-test	CMT-test
Cutting sample	Yes, 15 mm	Yes, 1/2 inch
Sample preparation	No sample preparation	Yes, approx. 1 minute per sample (10 required)
Instruments required	S-Test & Cutter	Vertical Fluter & Cutter/ Crush Tester & Tape
Investment costs	\$ no consumables required	\$\$\$ plus consumables (tape)
Variation of operator	No operator variation	Yes, operator can influence test result
Compare results with other instruments	Yes, very limited operator and instrument influence	No, too many factors that can influence test result
Measuring parameter	First Plateau	First Plateau and CMT Max