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Score bend test

1. Introduction

When folding cartons fail to perform properly in a production operation it is difficult to understand the source of the problem. This procedure provides useful information to the carton manufacturer, converter, printer or product filling operation to evaluate the performance of a paper carton on a package filling and sealing line.

2. Scope

This procedure is used to determine the score bend resistance of a scored and unscored sample of a paperboard carton. Score bend resistance of a score on a paper carton is an important parameter to determine the force required to close a carton flap during a product filling operation on a packaging machine.

3. Significance

3.1 Score quality of paperboard cartons affects product performance in end use applications, such as a die-cutting or filling operation on a packaging line.

3.2 Score bend resistance can be used to determine the effects of carton aging and moisture when a finished carton product is used on a packaging line.

3.3 The determination of score bend resistance is not only important for quality control of the manufactured product, but also for configuring machinery that controls cartons on form, fill and seal lines.

4. Definitions

4.1 *Score* is defined as an impression or partial cut in a flat material for the purpose of facilitating bending, creasing, or folding.

4.2 *Score ratio* is defined as the ratio of two score bend measurements expressed as a percentage. The calculation is based on the force required to bend a scored paperboard carton to the force required to bend an unscored paperboard sample.

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4.3 *Score bend resistance* is defined as the peak force required to bend a scored or unscored sample to 90°.

5. Apparatus¹

5.1 A bending fixture capable of applying bending force at a constant speed of $12.0^\circ/\text{s} \pm 0.5^\circ/\text{s}$ and allowing sufficient travel to ensure a maximum of 90° bend of the sample (see Figure 1).

5.2 Bending fixture designed to bend the sample 90.0°. The bending fixture must be balanced so that during a test cycle with no sample in place, the fixture produces a reading less than 20.0 g.

5.2.1 Moveable bending plate to bend the sample at the score line.

5.2.2 Angle gage to accurately record and indicate sample angle to a maximum of 90° to within 0.5° or better.

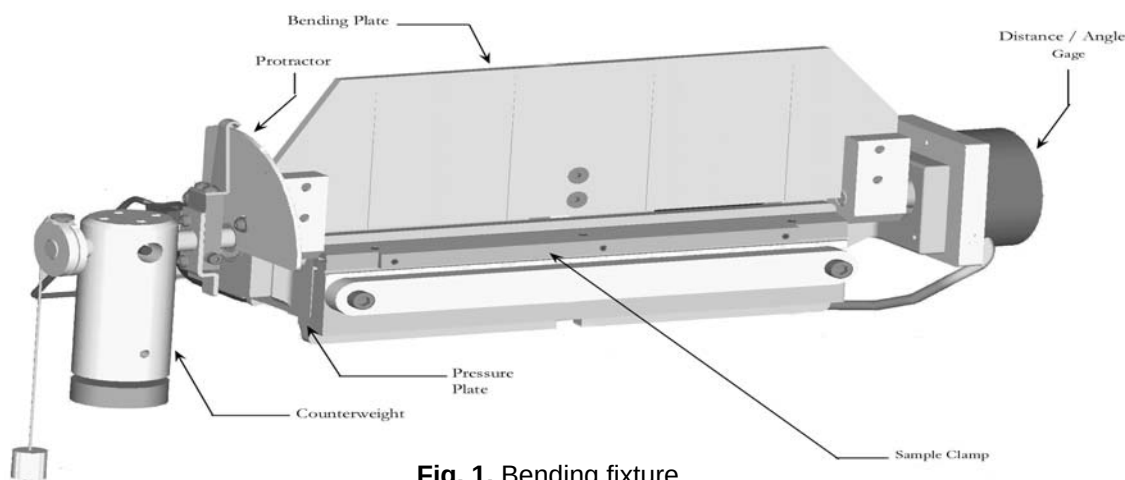


Fig. 1. Bending fixture

5.2.3 Sample clamp to firmly affix sample in place. The sample must be clamped along the entire width of the sample. An air-operated clamp is recommended.

5.3 A force indicator capable of measuring and recording the applied force to within 1.0% of the full-scale range of the load indicator. Instruments equipped with a 20 N (4.4 lbf) load cell are usually sufficient for paperboard material. It may be necessary to use a 50 N (11 lbf) or 100 N (22 lbf) load cell for materials which exhibit a higher score bend resistance.

6. Test specimens

6.1 From each test unit of a sample obtained in accordance with TAPPI T 400 "Sampling and Accepting a Single Lot of Paper, Paperboard, Containerboard, or Related Products," test specimens should be flat with no bends at the scored or unscored area and free of defects or delaminations. Test specimens can be from the roll stock or a converted or finished product sample which will be used during a product filling operation on a packaging machine.

6.2 Prepare a scored and unscored test sample with dimensions of at least 25.4 mm (1.0 inch) and of sufficient length to allow a measurement of a scored and unscored section on the same sample (Figure 2). The length of unscored board above the score line must be between 50.8 mm (2.0 inches) and 152.4 mm (6.0 inches). If there is insufficient sample length to test scored and unscored area on the same specimen, cut an unscored sample to the same dimensions as the scored sample from an unused section of the same board as the scored sample.

¹ Names of suppliers of testing equipment and materials for this method may be found on the Test Equipment Suppliers list, available as part of the CD or printed set of Standards, or on the TAPPI website general Standards page.