

## TEST PROCEDURE GUIDELINES

<b>TEST METHODS: COEFFICIENT OF FRICTION OF IN-MOLD LABELS</b>
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### *PURPOSE OF PROCEDURE:*

Measuring the COF involves dragging a carriage of known weight on a sample at a constant speed and monitoring the force required with a load cell. The carriage is wrapped with a piece of the sample to be tested and is placed on another piece of the sample taped to a flat, smooth surface. The carriage is attached to a constant speed drive system such as the crosshead of a universal testing machine or a constant speed chain drive system. The drive mechanism is equipped with a strain gage load cell or other load sensing device to measure the force required to move the carriage.

Commercial COF testers that incorporate the above requirements are available.

### *DEFINITION OF TERMS:*

**Friction:** Friction is defined as the force that resists relative motion between two surfaces in contact.

**Coefficient of Friction (COF):** Coefficient of friction is defined as the ratio of the frictional force to the force acting perpendicular to the direction of motion.

**Static COF:** The static COF is the ratio of the force needed to *start* the motion between two surfaces in contact, to the force acting perpendicular to the direction of motion.

**Kinetic COF:** The kinetic COF is the ratio of the force needed to *sustain* the motion between two surfaces in contact, to the force acting perpendicular to the direction of motion.

**Slip:** Slip is a term commonly used in the opposite sense of COF. A high slip normally refers to low COF and a low slip refers to high COF.

### *EQUIPMENT/MATERIALS NEEDED:*

### *TEST PROCEDURE:*

#### **Measurement:**

The coefficient of friction in labels can be measured in three ways:

## *COEFFICIENT OF FRICTION OF IN-MOLD LABELS (cont'd)*

1. Print side of one label to print side of a second label (P-P cof).
2. Adhesive side of one label to adhesive side of a second label (A-A cof).
3. Print side of one label to adhesive side of a second label (P-A cof).

Obviously, case three (3) above is the one that comes into play in a real life case during stacking, jogging and dispensing of labels. However, it is a good idea to measure the other two as well, since COF related problems can then be identified as being print-layer related or adhesive-layer related.

Note: For clear films that are reverse printed and then an adhesive is applied covering the ink, **A**Print Side@ should be interpreted as the **A**correct reading side@ or the side that would be exposed once the label is applied to a container.

### ***Precautions:***

1. Standardize the method of taping the sample to the flat surface, for example, always adhesive side up.
2. Standardize the method of wrapping the sample around the carriage, for example, always print side out.
3. If the material to be tested has a grain direction or an orientation direction, standardize the method of positioning the stationary sample and wrapping the sample around the carriage. It is recommended that orientation representing the interaction of labels during actual stacking, jogging and dispensing be adopted.
4. The samples must be without wrinkles.
5. The surfaces of the samples to be tested must not be affected; cleaning the surface might actually add dirt to the surface or induce static.
6. The carriage with the sample wrapped around must be placed carefully and gently on the fixed sample.

### ***Test Procedure:***

1. Set the speed of the carriage to 6" per minute within an error of " 1" per minute. According to ASTM guidelines, the carriage must travel at least one minute, that is, cover at least 6 inches, for reliable data.
2. Set the distance of motion to be well within the available label dimensions, i.e., the movement of the carriage must begin and end within a label sample.
3. Measure at least five sets of label samples for statistical accuracy.
4. In cases where the label size does not allow 6" of carriage movement, perform more tests to

get better accuracy.

*COEFFICIENT OF FRICTION OF IN-MOLD LABELS (cont'd)*

5. Do not reuse labels; if a test needs to be aborted, obtain fresh samples and start over.
6. Depending on the substrate being tested, gloves may or may not be worn while testing. Some substrates will develop static when handled with gloves; if the gloves are powdered, the powder might affect the results.

*DOCUMENTATION:*

The allowable tolerance that is agreed upon by the customer should be in written specifications provided by the customer.

The frequency of the test to be performed must also be agreed upon by the customer. That is to say that the customer should provide in the specification how often the test is to be done and by what form of sampling method, (random or non-random). These will be used to record results.

Many customers will require representative samples and/or data to be kept in inventory to reference in the event that the customer finds a defect in the provided order. This frequency of these retains should also be specified to ensure compliance.

*REFERENCES:*

ASTM D 1894-87