

Abrasion Resistance: Considerations for Textile Specifiers

The contract textile industry evaluates the predicted performance of a fabric in a number of ways. One of the assessment tools most commonly referenced by specifiers is the Wyzenbeek double rub abrasion test. While these test results may contribute to the overall evaluation of fabric durability and appearance retention, the focus on ever-increasing double rub ratings has also led to significant misconceptions. The purpose of this document is to clarify the various factors that should be considered when evaluating the suitability of a textile for a specific application.

Defining Abrasion Resistance

Abrasion resistance is the ability of a fabric to resist surface wear caused by flat rubbing contact with another material. There are two different test methods commonly used by the textile industry to assess abrasion resistance: Wyzenbeek and Martindale (described in detail below). Because both of these test methods are limited to measuring flat abrasion resistance of a textile, they do not consider edge abrasion or other types of surface wear that may occur in actual upholstered applications.

Assessing Fabric Durability and Appearance Retention

Double rub numbers are often over-specified in the faulty assumption that abrasion test results are the most significant considerations in predicting a product's overall durability and life span. In fact, a recent industry survey conducted by ACT indicated that for many end-use applications, issues other than surface abrasion are more likely to result in fabric failure and therefore should be considered when evaluating product durability and appearance retention. Such variables might include:

- Abuse (e.g., punishing environments, excessive rubbing against other objects)
- Inappropriate application for the specified fabric
- Pilling
- Seam Slippage
- Cleaning (lack of proper maintenance)
- Improper Upholstering Methods (insufficient seam allowance)
- UV Light Exposure
- Microbial Contamination

Interpreting Abrasion Test Results

Abrasion results are one of several means of comparing fabrics for a particular application. However, it is important to note that the results of multiple abrasion tests on the same fabric sample can vary by as much as 25,000 +/- Wyzenbeek double rubs or Martindale cycles. Additionally, the reliability of the testing process becomes more and more suspect as the abrasion cycles increase in number.

Abrasion testing alone cannot predict the expected appearance retention for a textile. However, the test results can contribute to the overall assessment of durability.

- Since abrasion results for a fabric design typically vary from test to test, the use of absolute numbers to compare abrasion performance is not recommended.
- Testing conditions such as changes or differences in humidity, temperature, testing abradata, testing machines and test evaluators can cause significant variations in the test results. Additionally, the environment of a testing laboratory cannot replicate the unique conditions of your application.
- Fabric construction variables including coatings, finishes, novelty yarns, pile height, patterns with long floats or patterns with large areas of different surface textures can adversely affect abrasion test performance without necessarily predicting the lifespan of a product.
- Specifying a fabric with double the abrasion cycles does not ensure double the service life of the material.

Test Methods

There are two different methods commonly used to test abrasion, referred to as Wyzenbeek and Martindale. There is no correlation between the Wyzenbeek and Martindale tests, so it is not possible to estimate the number of cycles that would be achieved on one test if the results from the other test are known.

Test Methods (Continued)

ASTM D4157-07* Wyzenbeek (Oscillatory Cylinder)

The Wyzenbeek testing process requires samples of the test fabric to be pulled taut in a frame and held stationary. Individual test specimens cut from the warp and weft directions are then rubbed back and forth using an ACT approved #10 cotton duck fabric as the abradant. The end point is reached when two yarn breaks occur or when appreciable wear is reached.

* For complete technical details about ASTM D4157-07: <http://www.astm.org>



On the Wyzenbeek machine the blue-gray strips of fabric are the test specimens held in place by the arms that will be lowered to oscillate over the cotton duck-covered cylinder below.

Photo: Courtesy BASF Corporation

ASTM D4966-98** Martindale

The Martindale testing process requires fabric samples to be mounted flat and rubbed in an enlarging elliptical T shape using a piece of worsted wool cloth as the abradant. The end point is reached when two yarn breaks occur or when there is an appreciable change in shade or appearance. Shade change is assessed as the AATCC gray scale rating of 3 or lower.

**For complete technical details about ASTM D4966-98: <http://www.astm.org>



BS 5690: 1991 (1997)

In this test, undertaken on a Martindale machine, the fabric is rubbed against a worsted fabric to simulate wear.

Considerations Before Specifying

Where do you start? Here are six key steps to help you in your selection process:

1. Consult with your supplier to confirm that the fabric you are considering can be expected to perform well in the on-site environment.
2. Review the results of the other ACT recommended physical property tests for durability (brush pill, breaking strength, seam slippage). Abrasion results alone do not predict a product's lifespan.
3. Consider the style and quality of the furniture the specified fabric will be used on; seat pans with a waterfall edge and upholstered arms of a chair are common areas of wear. Is there adequate padding to support the upholstery?
4. Take into account the amount of traffic in the environment and the wear the fabric is likely to receive. Keep in mind, the ACT recommended physical tests for durability do not indicate how a product will perform in an abusive environment.
5. Determine whether or not the fabric will receive regular and proper professional cleaning. Dirt is the enemy of fabric, but improper cleaning will also shorten the durability/lifespan of the product.
6. Evaluate whether or not the end use requires a fabric treatment. Applying treatments, finishes or backings to a fabric may enhance durability, but may also negatively affect flammability resistance, appearance or environmental properties.