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[ACT WHITE PAPER SERIES]

2. Wyzenbeek Performance Verification Fabric Study

Purpose

For some time the contract textile industry has been disconcerted by the variability of Wyzenbeek Performance test results. Results can and do vary significantly even when the same fabric is tested at different labs or on different machines.

The ACT technical committee decided to address this test variability by developing a fabric that would serve to verify the performance of a properly set-up Wyzenbeek test machine. The idea was that this fabric would be designed/manufactured in such a way as to fail within a consistent range of double rubs.

Such a fabric was engineered by Alan Dean and generously woven by True Textiles, and when tested in their own facilities, seemed to meet this goal.

The next step was to evaluate this fabric in a controlled study. Seven different industry laboratories conducted the controlled verification fabric study during the summer of 2009. It was hoped the study results would provide a scientific basis for recommending this fabric as a tool to verify performance of testing machines and therefore reduce the known variability of the test method.

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Conclusion

The technical committee was astonished by what the study revealed. Although the expected variation from lab to lab and machine to machine did occur, there was a wide and unexpected variation of results on the same arms of the same machines in repeated tests. The termination of the test was set at 50,000 double rubs, at which point many specimens did not fail. Note that the variation would most likely have been even higher if tests had been run to the first two yarn breaks. Each lab reconfirmed that their Wyzenbeek abrasion machines were set up according to the ASTM D 4157 protocol. While atmospheric conditions can be a source of variability, heat and humidity alone cannot be responsible for the wide variations seen within the same lab in this study. The technical committee concluded that the performance verification fabric would not be useful as a tool to reduce the amount of variability inherent in the test method, and suspended further research.

In light of this conclusion, the ACT technical committee and ACT board of directors recommends better education of the A&D community. This document is the second in a series of three white papers and is intended to be read in conjunction with the other two: Abrasion Resistance: The Full Story and ACT Industry Survey on Durability. Educating specifiers to evaluate all aspects of durability will enable them to be less dependent on Wyzenbeek testing and double-rub numbers.

The ACT Technical Committee
Wyzenbeek Performance Verification Fabric Study – July 2009

Industry Laboratory Participants

Applied Textiles
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True Textiles
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Wearbest Sil-Tex Mills
Jim O'Brien
Garfield, NJ

Test Method Used

ASTM D 4157 (link to ACT Website)

Study Fabric Specifications

Contents:

- 100% polyester filament yarn

General description (see scan below):

- Jacquard construction
- Fill-direction rib with ½-inch vertical repeat
- Warp-floats over the rib: 13 per inch (approx.)

In this construction, the rib warp-floats are the most vulnerable to abrasion and therefore breakage. Yarn breakage is easily discernible, resulting in consistent and unambiguous observer-to-observer pass/fail judgments.

Warp Direction

Fill / Test Direction

Test Procedures

1. All verification fabric specimens were pre-cut by one technician in the filling direction, ribs oriented parallel to the length of the specimen (see image above).

2. The ACT specified cotton duck abradant was pre-cut by one technician from the same roll.

3. The seven labs each received a package of eight pre-cut verification fabric specimens and two pre-cut abradant sheets produced by procedures 1 and 2.

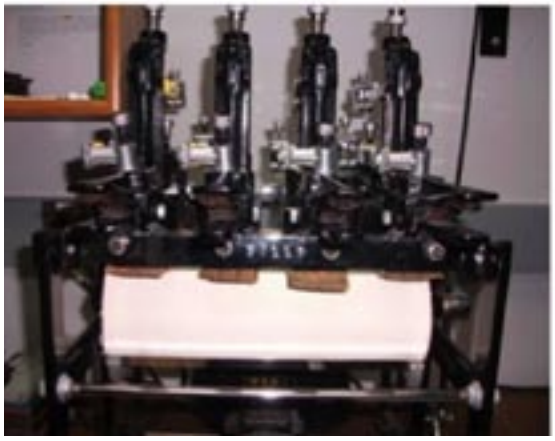
4. Each cotton duck sheet was numbered in the lower left corner and mounted with the number on the left front corner of the cylinder. Verification fabric specimens were labeled 1 through 4 and mounted respectively left-to-right on the four machine arms, and results were reported accordingly.

5. At each lab, the test was performed twice on the same machine to accommodate all eight verification fabric specimens. Each test included four verification fabric specimens (one per machine arm) and one larger abradant piece. Machines were set up with standard 3-lb. pad pressure and 4-lb. tension as directed by the test method ASTM D 4157.

6. Wyzenbeek test results are checked at 5,000 double-rub increments and are reported at the highest increment achieved before two yarn-breaks on each specimen.

7. For this study, all verification fabric specimens were to be tested to 50,000 double rubs and checked at 5,000 double-rub increments. Testing continued until each of the four specimens showed two or more yarn-breaks or achieved 50,000 double rubs without two yarn-breaks. (Note: 50,000 double rubs was the established stopping point – some labs actually went further.)

Wyzenbeek machine arms up.
Verification fabric not shown.



Wyzenbeek machine arms down.
Verification fabric not shown.

Test Results

Verification Fabric Test Results 9/30/2009

Lab	Atmospheric Conditions (1)	Sample	Arm 1	Arm 2	Arm 3	Arm 4
1	Yes	A	**50,000**	**50,000**	**50,000**	**50,000**
	Yes	B	**50,000**	**50,000**	**50,000**	**50,000**
2	Yes	A	40,000	40,000	40,000	40,000
	Yes	B	40,000	40,000	40,000	40,000
3	No	A	50,000	55,000	55,000	45,000
	No	B	40,000	30,000	**50,000**	**50,000**
4	No	A	*60,000*	*60,000*	*60,000*	*60,000*
	No	B	45,000	45,000	40,000	45,000
5	No	A	45,000	35,000	35,000	40,000
	No	B	**50,000**	35,000	40,000	40,000
6	Yes	A	**50,000**	45,000	40,000	40,000
	Yes	B	**50,000**	**50,000**	**50,000**	45,000
7	Yes	A	*25,000*	35,000	35,000	35,000
	Yes	B	**50,000**	45,000	30,000	40,000

Bold = did not achieve two yarn-breaks

Italics = significant variation (up to 35,000 double rubs) was seen across all seven labs – low of 25,000 double rubs and a high of 60,000 double rubs

Note: Labs are numbered for blind study.

(1) Lab controlled for temperature and humidity as specified in ASTM D 4157: 70°, ± 2° F and 65%, ± 2% relative humidity.