TECHNICAL BULLETIN

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BARRÉ

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INTRODUCTION

In textile production, one of the most common and often perplexing quality control problems is barré - repetitive yarn direction streaks. The factors that can cause or contribute to barré are varied and diverse. For this reason, when a barré problem is detected, the skills of a sleuth may be required to track down and eliminate its cause.

This technical bulletin was written to help dispel some of the mystery surrounding barré by providing a general outline of possible causes and their identification. Once a cause is identified, steps can be taken to minimize or eliminate barré problems, and better quality fabrics can be produced.

DEFINITION OF BARRÉ

The noun "BARRÉ" is defined by ASTM* as an unintentional, repetitive visual pattern of continuous bars and stripes usually parallel to the filling of woven fabric or to the courses of circular knit fabric. In a warp knit, barré normally runs in the length direction, following the direction of yarn flow. Barré can be caused by physical, optical, or dye differences in the yarns, geometric differences in the fabric structure, or by any combination of these differences. A barré streak can be one course or end wide or it can be several - a "shadow band".

Barré should not be confused with "warp streaks", which in woven fabric are narrow bands running lengthwise and are characterized by apparent differences in color from adjoining ends. Nor should it be confused with filling", a condition in which a filling yarn differing from the normal filling was accidentally inserted in the fabric.

VISUAL BARRÉ ANALYSIS

Naturally, the first step in a barré investigation is to observe and define the problem. Barré can be the result of physical causes that can usually be detected, or it can be caused by dyeability differences, which may be nearly impossible to isolate in fabric. Barré analysis methods that help to discriminate between physical barré and barré caused by dyeability differences include Flat Table Examination, Light Source Observation, and the Atlas Streak Analyzer.

Flat Table Examination

For a visual barré analysis, the first step is to lay a full width fabric sample out on a table and view both sides from various angles. Generally, if the streaky lines run in the yarn direction, color differences can be seen by looking down at the fabric in a direct visual line with the yarn direction, and the defect can be positively identified as a barré defect. Viewing the fabric with a light source in the background will show if the barré is physical.

*American Society for Testing and Materials

Light Source Observation

After completing an initial Flat Table Examination, a Light Source Examination may provide further useful information. Full width fabric samples should be examined under two light conditions, fluorescent and ultraviolet (UV) light. Observations that should be made while viewing under lights are:

1. frequency and direction of the barré,
2. whether streaks are dark or light, and
3. total length of pattern repeat.

Ultraviolet light, commonly referred to as "black light", allows the presence of mineral oils to be more easily detected, due to their radiant energy (glow). When observed under UV light, fabrics with streaks that exhibit glow suggest improper preparation. A change in composition or content of oil/wax by the spinner or knitter without appropriate adjustments in scouring can create this problem.

Atlas Streak Analyzer

The function of the Atlas Streak Analyzer is to isolate barré caused by physical differences. A fabric swatch is combined with polystyrene sheet film, and the Atlas Streak Analyzer produces a plastic impression of a fabric surface by incorporating specific conditions of pressure and heat. The absence of color on the plastic impression insures that only physical streak effects will be seen. The plastic impression is examined to determine whether the streak alignment matches the streaks observed on the fabric. However, impressions made from spun yarn can be difficult to read due to the inherent yarn variation characteristic of spun yarns. Also, a too rapid cooling of the test specimen can produce a moiré pattern. From a valid plastic impression, the barré source can be identified as:

1. physical- all streaks show on the impression;
2. dyeability variations- none of the color streaks are aligned on the impression;
3. a combination of physical and dyeability differences- some streaks align with those on the impression, some do not.

Fabrics with combination causes present the greatest challenge for analysis.

PHYSICAL BARRÉ ANALYSIS

When the cause of barré is determined or presumed to be physical in nature, physical fabric analysis should be done. Physical barré causes are generally considered to be those which can be linked to yarn or machine differences. Methods of physical barré analysis include fabric dissection, microscopy, and the Roselon Knit Extension Tester.

Fabric Dissection

To perform accurate fabric dissection analysis, a fabric sample that contains several barré repetitions is required. First, the barré streak boundaries are marked by the placement of straight pins and/or felt markers. Individual yarns are removed from light and dark streak sections, and twist level, twist direction, and cut length weight determinations are made and recorded. For reliable mean values to be established, data should be collected from at least two light/dark repeats. After compilation of yarn information, the numbers can be compared individually to adjacent yarns as well as by groupings of light and dark shades.

Microscopy

Microscopic examination is useful for verifying yarn spinning systems. Yarns from different spinning systems can have different light reflectance and dye absorption properties. Ring spinning produces yarn that is smooth. Open end spinning produces yarn with wrapper fibers at irregular intervals. Air jet spinning produces yarn with more wrapper fibers than open end and inner fibers that are more parallel. Microscopy can also reveal a shift in loop formation in knitted fabrics when twist direction (S and Z) differences are present.

Roselon Knit Extension Tester*

Barré produced by knitting machinery is relatively uncommon, although uneven yarn tension during knitting may be a cause. To test for uneven tension, the Roselon Knit Extension Tester can be used. For this test, a fabric sample is cut and raveled to yield yarn samples from light and dark streak areas. The yarn ends are taped and clamped to the tester. As each yarn is stretched to the maximum extension point, the points are plotted on graph paper. Comparisons are usually made visually rather than mathematically.

CAUSES OF BARRÉ

The varied and diverse causes of barré can generally be summed up in one word - INCONSISTENCY. An inconsistency that leads to barré can originate in one or more of the following categories -raw material (fiber), yarn formation/supply, and fabric formation. Within these three categories, factors which may cause or contribute to barré are listed as follows:

Raw Material - Fiber

1. Failure to control fiber diameter (micronaire or denier) from laydown to laydown.
2. Too high a C.V. of micronaire in the laydown for a given mill's opening line blending efficiency.
3. Failure to control the fiber color in the mix (grayness Rd, yellowness +b).
4. Most, if not all, fiber barré can be controlled by the above three items; however, under certain unusual circumstances it may be beneficial to select mixes using ultraviolet reflectance information for each bale of cotton.

*Source: Spinlon Industries Incorporated, 18 S. Fifth Street, Quakertown, Pennsylvania 18951

Yarn Formation/Supply

1. Variations in carding; i.e., different amounts of non-lint content removal from card to card.
2. Poor blending of fiber in opening through finisher drawing.
3. Running different types of spindle tapes on ring spinning frame.
4. All cots running on a given set of ring frames producing yarn for the same end use should be exactly the same.
5. Mixing yarns of different counts.
6. Mixing yarns from different spinning systems.
7. Mixing yarns with different blend levels.
8. Mixing yarns from different suppliers.
9. Mixing yarns with different twist level/twist direction.
10. Mixing yarns with different degrees of hairiness.
11. Mixing yarns with different amounts of wax.
12. Mercerization differences.
13. Excessive backwinding or abrasion during this process.
14. If yarns are conditioned, then each lot must be uniformly conditioned.

Fabric Formation

Knitting Machine

1. Improper stitch length at a feed.
2. Improper tension at a feed.
3. Variation in fabric take-up from loose to tight.
4. Excessive lint build-up.
5. Variation in oil content.
6. Worn needles, which generally produce length direction streaks.
7. Uneven cylinder height needles (wavy barré).
8. Double feed end.

Loom

1. Uneven warping tension.
2. Uneven take-up motion.
3. Uneven let-off motion.
4. Uneven tension on filling.
5. Scuffing of filling yarn on the loom.
6. Bent beam gudgeons.

PREVENTION OF BARRÉ

As outlined on the previous page, barré is caused by inconsistencies in materials, equipment, or processing. To prevent barré from occurring, consistency must be maintained through all phases of textile production. Stock yarns should be properly and carefully labeled to avoid mix-ups. Fugitive tints can be useful for accurate yarn segregation. Inventory should be controlled on a First In/First Out basis. All equipment should be properly maintained and periodically checked. Before beginning full scale production, sample dyeings can be done to check for barré.

Salvaging a fabric lot with a barré problem may be possible through careful dye selection. Color differences can be masked by using shades with very low light reflectance (navy blue, black), or high light reflectance (light yellow, orange, or finished white). Dye suppliers should be able to offer assistance in this area. Also, if the cause of the barré is an uneven distribution of oil or wax, a more thorough preparation of the fabric prior to dyeing may result in more uniform dye coverage.

With close cooperation between production and quality control personnel, barré problems can be successfully analyzed and solved.

RESEARCH AND TECHNICAL SERVICES

Cotton Incorporated is a research and promotion company representing cotton worldwide. Through research and technical services, our company has the capability to develop, evaluate, and then commercialize the latest technology to benefit cotton.

- Agricultural research leads to improved agronomic practices, pest control and fiber variants with properties required by the most modern textile processes and consumer preferences. Ginning development provides efficient and effective machines for preservation of fiber characteristics. Cottonseed value is enhanced with biotechnology research to improve nutritional qualities and expand the animal food market.
- Research in fiber quality leads to improved fiber testing methodology and seasonal fiber analyses to bring better value both to growers and then mill customers.
- Computerized fiber management techniques result from in-depth fiber processing research.
- Product Development and Implementation operates programs leading to the commercialization of new finishes and improved energy and water conserving dyeing and finishing systems. New cotton fabrics are engineered -- wovens, circular knits, warp knits, and nonwovens -- that meet today's standards for performance.
- Technology Implementation provides comprehensive and customized professional assistance to the cotton industry and its customers -- textile mills and manufacturers.
- A fiber to yarn pilot spinning center allows full exploration of alternative methods of producing yarn for various products from cotton with specific fiber profiles.
- The Company operates its own dyeing and finishing laboratory, knitting laboratory, and a laboratory for physical testing of yarn, fabric, and fiber properties including High Volume Instrument testing capable of measuring micronaire, staple length, strength, uniformity, color, and trash content.

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