Module Marker Evaluation Study

Cotton Incorporated

Updated August 2015

Executive Summary

Many cotton modules are marked with an identification code in the field by spraying the code directly on the seed cotton. The ideal marker must be resistant to water so it is not removed by rainfall, but not so permanent that it cannot be removed during normal textile processing. The use of permanent inks on cotton represents a significant contamination risk for many textile products, particularly those that will only be bleached and not dyed.

Cotton Incorporated has evaluated four spray-on inks to determine the ease of removal in typical scouring and bleaching processes used by textile mills. The four markers tested were:

1. BRAND-A-BALE®, Cotton Incorporated (no longer commercially available);
2. ECONO-MARK, Seymour®;
3. STA-MARK®, Indeco Products Inc.;
4. GIN MARK™, Langston Companies®.

The first three products were evaluated in a single study conducted in 2007, and GIN MARK™ was evaluated in a separate study using similar methods in 2012. In 2015, STA-MARK®, was reevaluated to determine if a new nozzle design improved the ability to write clearly on the module.

Of the four products evaluated, only ECONO-MARK was not sufficiently removed after scouring and bleaching. The other three products were completely removed after finish white bleach and pose little contamination risk. These results are expected, as all but ECONO-MARK were designed for use on cotton modules. **ECONO-MARK is clearly labeled as a "permanent water base paint" and should not be used on cotton modules or bales**.

It was determined that the new nozzle design used by STA-MARK®, greatly improved the ability to write clearly, especially when the can was held closer to the surface treated (1 to 3 inches).

Additional details on the 2007, 2012 and 2015 evaluations are appended to this summary.

Cotton Incorporated

Bale Marker Evaluation Study

Agricultural & Dyeing Research
Cotton Incorporated
November 2007

Background:

After cotton is formed into a bale module in the field, the module is given an identification mark. The bale marker must be resistant to water in the event of rain. The cotton is then transported to a gin and the marked cotton is separated and mixed. Mixing spreads small specs of the bale marker throughout many bales of cotton. These bales are taken to a mill and are further blended and mixed before spun into yarn and manufactured into fabric.

Mills are dissatisfied with a new product, currently promoted for bale marking, that is not removable from cotton in the scour/bleach processes, creating a permanent contaminant in cotton fabric.

Objective:

In this study, three different types of bale markers will be evaluated to determine which markers are removable during scour and bleach processes. These markers are:

1. BRAND-A-BALE®
2. ECONO-MARK
3. STA-MARK®

Experimental Approach:

Greige 100% cotton single jersey fabric was cut and sprayed with one of the bale markers. Five pieces of greige fabric were sprayed with one of the bale markers to create a good size dot of each marker. The sprayed fabrics were dried at 250°F for ten minutes in a Despatch oven. The color of each spot was measured using a spectrophotometer and photographed with a digital camera.

To determine if the mark could be removed, a sample of all three sprayed fabrics was subjected to the following preparation baths:

1. Mild Scour using Soda Ash
2. Caustic Scour using Sodium Hydroxide
3. Dye Base Bleach
4. Finish White Bleach

After each procedure, the sprayed fabrics were measured and photographed again for comparison.

Spray Evaluation

All of the bale markers sprayed differently onto the fabric. The ECONO-MARK and STA-MARK® were aerosol spray cans and the BRAND-A-BALE® was poured into a water spray bottle. Each fabric was sprayed flat on a table covered with plastic. The marker was sprayed at least 12 inches above the fabric and held in place for about three seconds to create a large spot in the middle of the greige fabric.

BRAND-A-BALE®

- Difficult to spray because marker was not in an aerosol container
- High overspray
- Sprayed very finely like a mist
- Wide area of coverage made it impossible for writing
- High penetration through the fabric
- Much dripping when hung to dry
- Sprayed area resembled black ink
- Sprayed area was blotted and allowed extra time to dry

ECONO-MARK

- Easiest marker to spray
- Less overspray
- Concentrated spray stream
- Easy to use for writing
- Low penetration through the fabric
- Did not drip when hung to dry
- Sprayed area resembled black charcoal

STA-MARK®

- Easy to spray
- Medium Overspray
- Sprayed very finely
- Wide area of coverage made it impossible for writing [Greatly improved based on an evaluation in 2015 – see last page of this document.]
- Medium penetration through fabric
- Some drip occurred when hung to dry
- Sprayed area resembled gray charcoal

Drying

All sprayed fabrics were placed in a Despatch oven to dry at 250°F for ten minutes. No more than three fabrics were placed in the oven to prevent fabrics from adhering to one another. The sprayed area of all the dried fabrics was very stiff. Some fabrics were coarse to the touch due to surface fibers coated with the marker.

Controls

Figure 1: Sprayed fabric controls after drying
(Left to Right: BRAND-A-BALE®, ECONO-MARK, STA-MARK®)

Mild Scour Results

Figure 2: Sprayed fabric after mild scour using soda ash
(Left to Right: BRAND-A-BALE®, ECONO-MARK, STA-MARK®)

Caustic Scour Results

Figure 3: Sprayed fabric after caustic scour
(Left to Right: BRAND-A-BALE®, ECONO-MARK, STA-MARK®)

Dye Bleach

Figure 4: Sprayed fabric after dye based bleach
(Left to Right: BRAND-A-BALE®, ECONO-MARK, STA-MARK®)

Finish White Bleach

Figure 5: Sprayed fabric after finish white bleach
(Left to Right: BRAND-A-BALE®, ECONO-MARK, STA-MARK®)

Conclusions

After subjecting sprayed fabric pieces of each bale marker to mild scour, caustic scour, dye based bleach, and finish white bleach, the only bale marker that could not be removed by either process was ECONO-MARK. BRAND-A-BALE® marker was effectively removed by only the bleaching processes. STA-MARK® was the easiest bale marker to remove because the majority of the stain was removed with scouring and was completely removed with bleaching.

Evaluation of GIN MARK™ Brand Module Marking Ink

Testing Conducted by:
Tony Evans, Supervisor, Color Services Lab

Date: 10 September 2012

Cotton Incorporated

Test Overview

An untreated cotton knit fabric (greige fabric) was sprayed with GIN MARK™ brand module marking ink and then subject to four wet processes:

1. **Bleach Procedure #1**
   Preparation for dyeing – A bleach process similar to this is typically used before dyeing most cotton (dye shades) colors;

2. **Bleach Procedure #2**
   Fluorescent whitening bleach – used for white finished fabrics;

3. **Scour Procedure #3**
   Mild scour with soda ash – low energy procedure sometime used to remove sizing and waxes (intermediate treatment);

4. **Scour Procedure #2**
   Caustic scour for dark shades – another low energy procedure that can be used to prepare cotton fabric for dark shaded dyes.

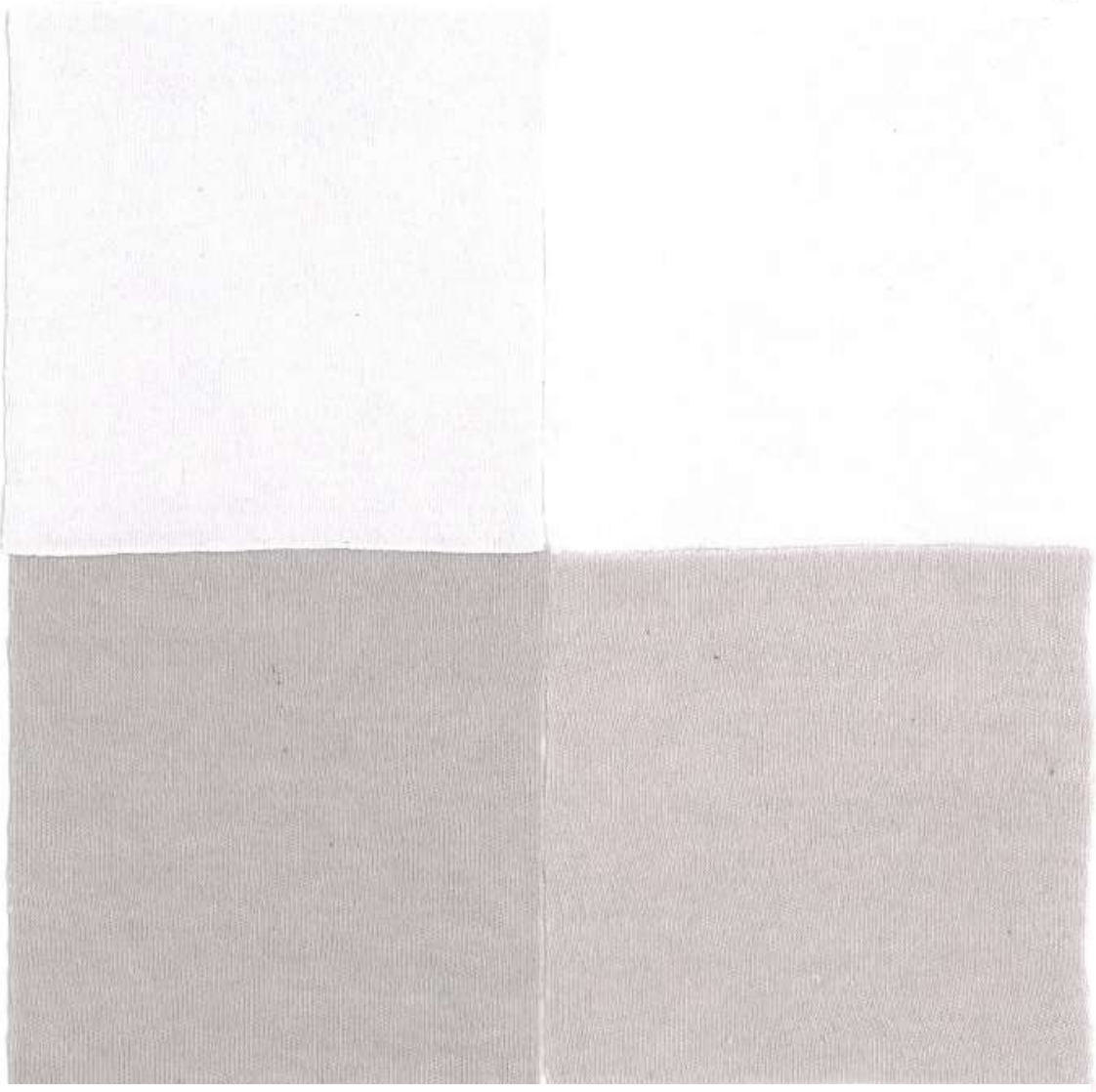
The next page shows the results of the fabric before any treatment and then the results of the four textile treatments of the fabric after being sprayed with GIN MARK™. The incomplete removal of the scour treatments (3 & 4) is an indicator the ink will not be too easily removed (e.g., some indication it will withstand rainfall events), while the bleaching treatments (1 & 2) do indicate the ink will be removed prior to final textile processing and thus does not indicate a significant contamination concern.

The last four pages of this document provide the technical details of the four wet processing treatments.

Untreated Fabric

1 - Bleach Procedure #1

2 - Bleach Procedure #2



3- Scour Procedure #3

4 - Scour Procedure #2

BLEACH PROCEDURE #1
Prepare for Dye – 100% Cotton

Liquor Ratio: 10:1 to 15:1

Procedure:

1. Fill machine at 100°F:
2. Add: Sultafon D 1.0 g/l
   Marlube CMN 1.0 g/l
   Marquest PB 0.40 g/l
3. Load fabric into bath containing the above chemicals.
4. Start the machine
5. Add: Sodium Hydroxide (NaOH 50% Liquid) 4.0 g/l
6. Circulate 5 min
7. Add: Hydrogen Peroxide 35% 4.0 g/l
8. Heat to 205°F at maximum rate
9. Run 25 minutes.
10. Cool to 160°F @ 5°F/ min.
11. Rinse @ 120°F for 3 min
12. Drop and fill @ 100°F
13. Add: sodium thiosulfate 1.0 g/l
14. Heat to 100°F @ max rate
15. Hold 6 min.
16. Drop and fill @ 120°F
17. Add: Acetic Acid, 56% 0.5 g/l
18. Drop and fill @ 90°F
19. Check fabric pH (6-7) and residual peroxide
20. Unload or proceed to dyeing.

Supplier/Chemical Information:

- Sultafon D – Bozzetto – nonionic scouring agent
- Marlube CMN – Marlin Co. - polyacrylamide, non-ionic
- Marquest PB – Marlin Co. - polyphosphonate – not as much stabilization no mag for extra stabilization

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BLEACH PROCEDURE #2
100% Cotton Optical White

Method: Exhaust
Liquor Ratio: 10:1 to 15:1

Procedure:

1. Fill machine at 100°F:
2. Add: Sultafon D 1.0 g/l
   Marlube CMN 1.0 g/l
   Marquest PB 0.40 g/l
3. Load fabric into bath containing the above chemicals.
4. Start the machine
5. Add (in order): Sodium Silicate 42 Be' 1.0 g/l
   Sodium Hydroxide (NaOH 50% Liquid) 4.0 g/l
6. Circulate 5 min
7. Add: Hydrogen Peroxide 35% 12.0 g/l
   Uvitex® BNB* 1.0% (owf)
8. Heat to 225°F at maximum rate
9. Run 35 minutes.
10. Cool to 160°F @ 5°F/ min.
11. Rinse @ 120°F for 3 min
12. Heat to 160°F at maximum rate
13. Hold 6 minutes
14. Drop and fill @ 120°F
15. Add: Citric Acid, 50% Liquid 0.375 g/l
16. Heat to 140°F @ max rate
17. Hold 10 min.
18. Drop and fill @ 90°F
19. Check fabric pH (6-7) and residual peroxide
20. Unload or proceed to dyeing.

*This optical has limited acid stability-Check shade change if resin finishing is needed.

Supplier/Chemical Information:

- Sultafon D – Bozzetto – nonionic scouring agent
- Marlube CMN – Marlin Co. - polyacrylamide, non-ionic
- Marquest PB – Marlin Co. - polyphosphonate – not as much stabilization no mag for extra stabilization
- Uvitex® BNB – Huntsman - optical brightener

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SCOUR PROCEDURE #3
Mild Scour with Soda Ash

Method: Exhaust
Fibers: 100% cotton and cotton blends
Liquor Ratio: 10:1 to 15:1
Machines: Brazzoli, TSI TurboJet, Fong's and Sclavos

Procedure:

1. Fill machine at 100°F
2. Add: Marsperse 6000 2.0 g/l
   Sultafon D 1.0 g/l
   Marlube CMN 1.0 g/l
3. Load fabric into bath containing the above chemicals.
4. Start the machine
5. Heat to 120°F at maximum rate
6. Add: Soda ash 2.0 g/l
7. Heat to 180°F at maximum rate
8. Circulate 20 minutes
9. Cool to 160°F
10. Overflow rinse at 120°F for 3 minutes. Drain machine.
11. Fill machine at 120°F
12. Heat to 140°F at maximum rate
13. Circulate 10 minutes. Drain machine
14. Fill machine at 120°F
15. Add: Acetic acid, 56% 0. 5 g/l
16. Heat to 140°F at maximum rate
17. Run 10 minutes. Drain machine.
18. Fill machine at 90°F
19. Check fabric pH (6-7)
20. Unload or proceed to dyeing.

Supplier/Chemical Information:

- Marsperse 6000 – Marlin Co. - polyacrylate dispersion
- Sultafon D – Bozzetto – non-ionic scouring agent
- Marlube CMN – Marlin Co. – polyacrylamide, non-ionic

SCOUR PROCEDURE #2
Caustic Scour for Dark Shades

Method: Exhaust
Fibers: 100% cotton and cotton blends
Liquor Ratio: 10:1 to 15:1
Machines: Brazzoli, TSI TurboJet, Fong's and Sclavos

Procedure:

1. Fill machine at 100°F
2. Add: Marsperse 6000 2.0 g/l
   Sultafon D 1.0 g/l
   Marlube CMN 1.0 g/l
3. Load fabric into bath containing the above chemicals.
4. Start the machine
5. Heat to 120°F at maximum rate
6. Add: Sodium Hydroxide (NaOH 50% Liquid) 2.0 g/l
7. Heat to 180°F at maximum rate
8. Circulate 20 min
9. Cool to 160°F
10. Overflow rinse at 120°F for 3 minutes. Drain machine.
11. Fill machine at 120°F
12. Heat to 140°F at maximum rate
13. Circulate 10 minutes. Drain machine
14. Fill machine at 120°F
15. Add: Acetic acid, 56% 0.5 g/l
16. Heat to 140°F at maximum rate
17. Run 10 minutes. Drain machine.
18. Fill machine at 90°F
19. Check fabric pH (6-7)
20. Unload or proceed to dyeing.

Supplier/Chemical Information:

- Marsperse 6000 – Marlin Co. – polyacrylate dispersion
- Sultafon D – Bozzetto – non-ionic scouring agent
- Marlube CMN – Marlin Co. – polyacrylamide, non-ionic

Review of STA-MARK® Nozzle Performance

August 21, 2015

In the 2007 evaluation of STA-MARK®, it was noted that the "wide area of coverage" created problems in writing with the spray. Since that time Indeco Products Inc. has developed a new nozzle. The new nozzle was tested at Cotton Incorporated by spraying a bleached fabric.

The new nozzle was found to be a significant improvement from the one evaluated in 2007. It had very little off target spray, particularly when held close to the surface (1 to 3 inches). It is possible to write clearly with the current product. In the photo to the left, the line on the left was drawn with the new nozzle and the one on the right with the old. Note there is very little splatter around the edges of the line on the left.