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An Approach to Evaluate Different Properties of Printed Cotton Fabric by using Polyethylene and Silicon Softener

By Tanjim Hossain, Faisal Rahman, Md. Shafiqul Islam Chowdhury, Md. Tareq Rahman & Md. Lutfor Rahman

Northern University Bangladesh

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Md. Tanjim Hossain [α], Faisal Rahman [σ], Md. Shafiqul Islam Chowdhury [ρ], Md.Tareq Rahman [ω], & Md. Lutfor Rahman [¥]

Abstract- This study shows the different effects of silicon softener and polyethylene softener on cotton printed fabric. The samples were treated with both softeners, and different tests have been examined like color fastness to washing, color fastness to water, color fastness to perspiration, pH. These tests results are all the same but color fastness to rubbing with polyethylene softener (Dry: 4/5, Wet: 2/3) is better than the silicon softener (Dry: 4, Wet: 2). Also, tensile & tear strength of fabric with polyethylene softener (Tensile Strength in Warp: 209N, Tensile Strength in Weft: 214N and Tear Strength in Warp: 12.41N, Tear Strength in Weft: 14.17N) is better than the silicon softener (Tensile Strength in Warp: 177N, Tensile Strength in Weft: 158N and Tear Strength in Warp: 9.81N, Tear Strength in Weft: 10.67N). On the other hand, hand feel of the sample finished with silicon softener is better than the fabric treated with polyethylene softener. In overall context, this study shows that, if better hand feel is required then silicon softener can be used but, if hand feel as well as other test requirements(tensile, tear, etc.)which is required by buyer, polyethylene softener is appropriate to use.

I. Introduction

Softener is a completing operator that connected to material enhances its handle giving satisfying touch. When in doubt, the softening specialists connected are greasing up operators, which encourage the fiber sliding inside the texture structure, along these lines allowing simpler twisting and wrinkling of the texture. By and large, the term of the impact is constrained since the items connected amid the treatment are disposed of by ensuing washing; hence, they should be connected in the last phase of the treatment. [1]

Cleanser (likewise called texture conditioner) is utilized to anticipate static stick and make texture milder, i.e. Softening operators are connected to materials to enhance their hand, wrap, cutting and sewing characteristics. It is accessible as a fluid or as dryer sheets. Cleansing agents work by covering the surface of the material filaments with a thin layer of synthetic concoctions; these synthetic substances have ointment properties and are electrically conductive, consequently making the strands feel smoother and averting development of friction-based electricity. As the material goes under different mechanical and compound procedures that make the surface of the material cruel.For instance, Removal of normal oil and waxes by scouring and fading. Pitch completing of material additionally grants some level of brutality. Soaping of material likewise adds brutal inclination to the material. As buyers are significantly more thinking about the dash of material. This is an additional explanation behind utilizing conditioner. [2]

Author α: Assistant Professor, Northern University Bangladesh
Author αρ: Lecturer, Northern University Bangladesh.
e-mail: faisalabir9@gmail.com
Author ω: Northern University Bangladesh.
Author ¥: Lecturer, AITVET of AUST.

II. Literature Review

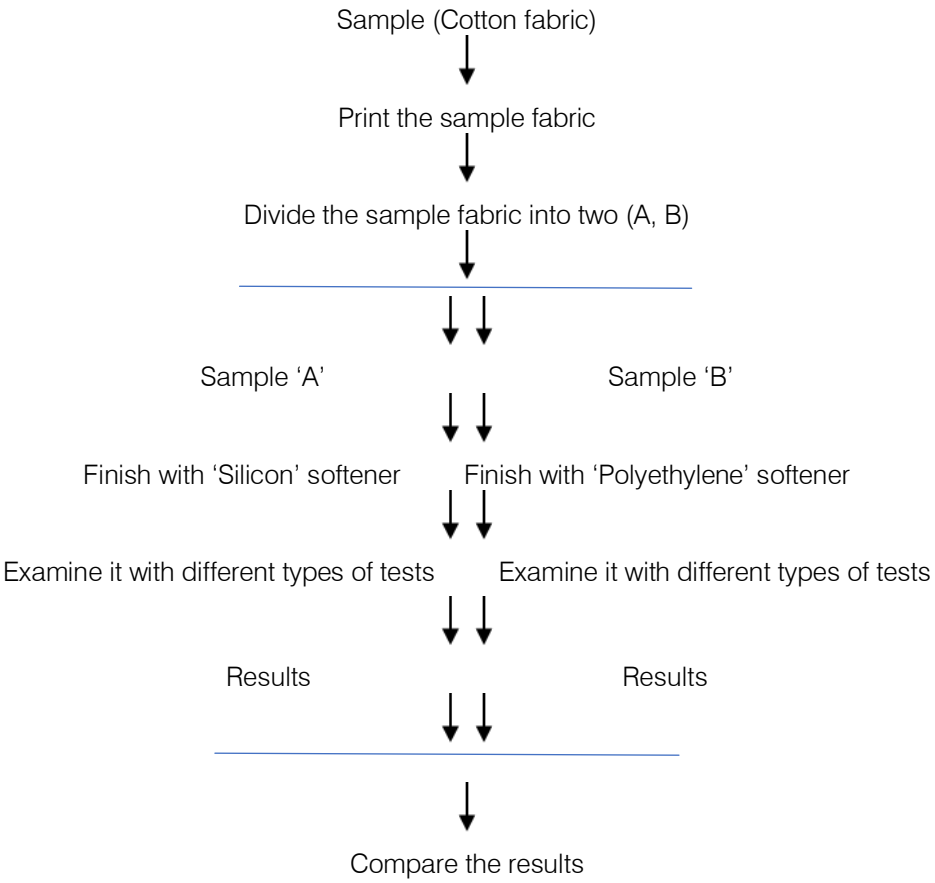
Polyethylene can be modified by air oxidation in the melt at high pressure to add hydrophilic character (mainly carboxylic acid group). Emulsification in the presence of alkali provides higher quality and more stable products. They show high lubricity that is not durable to dry cleaning. They are stable to extreme pH conditions and heat at normal textile processing condition, and compatible with resins and fluorescent brightening agents. They impart lubricity especially required for yarns. Matsoft PE emulsion and Matsoft PEW emulsion belongs to this category.

Silicones are macromolecules comprised of a polymer backbone of alternating Silicon and Oxygen atoms with organic groups attached to silicon. Silicone's softening capability comes from the siloxane backbone's flexibility and its freedom of rotation along the Si-O bonds.

They are insoluble in water, and therefore must be applied on fabrics after emulsification or dissolution in organic solvents. They feature quite a good fastness to washing. They create a lubricating and moderately waterproof film on the surface and give fabrics a silky hand. They show good temperature stability and durability, with a high degree of permanence for those products that form cross-linked films and a range of properties from hydrophobic to hydrophilic. According to requirements, the required properties the organ reactive group is modified and the results are achieved. A complete range of silicone softeners were developed

by Matex, like Diamino silicone (DAS), Reactive amino silicone (RAS), Amino functional silicone (AFS), Organofunctional silicone (OFS), Premium amino functional silicone (PAS), polyether silicone (HYS) and epoxy silicone (NYS). [1]

III. Methodology



IV. Materials and Methods

a) Materials

Fabric: (20×10/40×36, 100% BCI Cotton)

Pigment & Chemicals

Yellow KR	Crenovo International Limited
Red TN	Crenovo International Limited
Black KBN	Cabot Corporation
Violet RLE	Crenovo International Limited
Urea	Huntsman
Binder PD SF	Huntsman
Liquor Ammonia	Huntsman
Wacker SD 97	Wacker
BL- 100	Huntsman
PT 7000	Huntsman
Polyethylene softener	Local

b) Method

Printing: Screen printing was done by using Rotary Screen-Printing machine as per the recipe.

Curing: Curing was done by using 150°C temperature for 4-5 minutes

Finishing: Then we divide the fabric into half. Each half has one meter of fabric. We finish one half of the fabric with 'Silicon' softener &another half of the fabric with 'Polyethylene' softener by the 'Monforts' stenter machine

Table 4: Finishing Recipe of Polyethylene Softener

Polyethylene Softener	3 kg
Acetic Acid	0.05 kg
Temperature	150°C
Speed	20 m/min

Finishing recipe of silicon softener for 100 Liter of liquor for 1 meter of sample fabric-

Table 5: Finishing Recipe of Silicon Softener

Silicon Softener	3 kg
Acetic Acid	0.05 kg
Temperature	150°C
Speed	20 m/min

c) *Test Method*

Nature of test	Testing Standard/ method
Color Fastness to Water	EN ISO 105-E01
Color Fastness to Washing	ISO 105 C06
Color Fastness to Rubbing	ISO 105 X12
Color Fastness to Perspiration	EN ISO 105-E04
pH	ISO 3071-1980
Thread in EPI & PPI	ISO 7211-2
GSM (g/m^2)	ISO 3801
Tensile Strength	ISO 13934 (Part 1)
Tear Strength	ISO 13937 (Part 2)
Hand feel	

V. Result and Discussion

Table 6: Results

Nature of Test	Testing Standard/ method	Silicon Softener	Polyethylene Softener
Color Fastness to Water	EN ISO 105-E01	Change in color 4 Cross Staining 4/5	Change in color 4 Cross Staining 4/5
Color Fastness to Washing	ISO 105 C06	Shade Change 4	Shade Change 4
Color Fastness to Rubbing	ISO 105 X12	Dry 4 Wet 2	Dry 4/5 Wet 2/3
Color Fastness to Perspiration	EN ISO 105-E04	Change in Color Acid 4 Alkaline 4 Cross Staining Acid 4/5 Alkaline 4/5	Change in Color Acid 4 Alkaline 4 Cross Staining Acid 4/5 Alkaline 4/5
pH	ISO 3071-1980	5.8	5.3
Thread in EPI & PPI	ISO 7211-2	Warp (EPI)-41 Weft (PPI)-35	Warp (EPI)-41 Weft (PPI)-34
GSM (g/m^2)	ISO 3801	132.8	126.92
Tensile Strength	ISO 13934 (Part 1)	Warp-177N Weft-158N	Warp-209N Weft-214N
Tear Strength	ISO 13937 (Part 2)	Warp-9.81N Weft-10.67N	Warp-12.41N Weft-14.17N
Hand feel		Excellent	Good

VI. Discussion

As we can see from this table, we can compare these two softeners by the following-

1. Thread in PPI (Pick per Inch) of fabric treated with silicon softener is a little bit higher than the fabric treated with polyethylene softener.
2. GSM of fabric treated with silicon softener is a little bit lower than the fabric treated with polyethylene softener.
3. Tensile strength of fabric treated with polyethylene softener is better than the fabric treated with silicon softener.
4. The same way tearing strength of fabric treated with polyethylene softener is better than the fabric treated with silicon softener.
5. Also, color fastness to rubbing is more improved of fabric treated with polyethylene softener than the fabric treated with silicon softener.
6. But we can see that the color fastness to Washing, Water, Perspiration are equally the same for both fabrics which individually treated with silicon & polyethylene softener.
7. The pH of fabric treated with silicon softener is a little bit higher than the fabric treated with polyethylene softener.
8. The hand feel of fabric treated with silicon softener is better than the fabric treated with polyethylene softener.

After observing all the above topics, we can conclude that the polyethylene softener is more appropriate to finish the fabric than with silicon softener.

VII. Conclusion

This report shows that, for getting a better hand feel, silicon softener is preferable, but the required strength cannot be achieved by it.

This report also shows that to get required strength and color fastness to rubbing polyethylene softener is preferable, though hand feel is not as good as silicon softener.

This report demonstrates the comparison between the effects of silicon and polyethylene softener on printed cotton fabric, and it has been observed that polyethylene softener is more appropriable than silicon softener for printed cotton fabric.

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