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## EFFECTS OF LAUNDERING ON SEAM EFFICIENCY OF NIGERIAN WAX-PRINT FABRICS

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### ABSTRACT

*This study investigated the effects of laundering (washing, starching and ironing) on the seam efficiency of plain seam made of Nigerian cotton wax-print fabrics. One specific objective, research question and Null hypothesis were raised. The objective of the study is to determine the effects of laundering on the efficiency of the plain seam made of Nigerian wax-print fabrics. Experimental research design was adopted using practical laboratory method. The population of the study was made up of five Nigerian wax-print fabrics. The sample size used for the study was also five Nigerian wax-print fabrics. A total of 800 seamed specimens were used for this study. 100 seamed specimens each were used for unwashed, washed, starched and ironed from warp and weft directions respectively. Stitch density 10 was used to stitch the specimens, polyester sewing thread was used for sewing. Laundering was assessed using washing, starching and ironing processes. Data collected were analysed and tested using mean, standard deviation and ANOVA at 0.05 alpha level of significance. The results also showed that laundering does not have any significant effect on the efficiency of plain seam. Based on the findings, the researcher concluded that laundering reduces the efficiency of seam. Some recommendations were made. Among them are laundering education training, seminars and workshops should be included in the curriculum and organized regularly for garment making students, tailors and home makers.*

### INTRODUCTION

A seam is the joint between two parts of a garment. Seams in garments are to work efficiently by holding pieces of fabric firmly in place for the garment to be able to function properly to meet its required uses. In cut and sewn apparel, seams are formed when two or more pieces of fabric are held together by stitches (Mandel, 2008). Efficiency is one attribute that most consumers look out for in an apparel product, though it varies from individual to individual. Efficient seams in sewn garments contribute to the overall performance of the garment in use. Inefficient seam makes a garment unusable even if the fabric may be in good condition. As indicated by Mehta and Bhardwaj (1998), if a product

bought has a deficiency, it cannot be used, and inefficient seams is a deficiency mostly encountered in the life of sewn garments.

Seam efficiency has great significance in apparel product because it determines durability, performance and customers' satisfaction with sewn garment. Performance features are based on the visual and the functional requirement of the apparel. Functional requirements are more related to the stability of the apparel during wear and care. Consumers can easily judge the physical aesthetic as it refers to attractiveness of the garment but can only identify garment that meet or fail the functional performance standard, after wear and care. Such failure in

performance by inefficient seam can lead to dissonance and loss of patronage to the garment maker.

Seam efficiency can be accessed after the seam has undergone wear and care through rubbing and laundering. Seam Efficiency is the percentage representation of the ratio between the seam strength and the fabric strength. It is the function of compatibility between fabric properties and sewing parameters that determines quality (Chowhary and Poynor, 2006).

In the life of a garment; both the cloth and the seam undergo laundering. As they undergo laundering, efficiency and performance of sewn products might change. Seam performance after laundering is important to adjudge the suitability of the sewn product. Anyakoha and Eluwa (2010) asserted that laundering involves washing and some other finishing treatments such as starching and ironing. Garments do not only go through wear in the course of use, but also care. Fabric care includes washing and finishing treatment such as starching, ironing and storage among others. Fabric care involves washing, drying, pressing, and mending, folding, and putting your clothes and household fabrics away. To maintain good appearance and obtain the most wear out of a garment, it is essential to take good day to day care of the garment and fabric.

Anyakoha and Eluwa (2010) averred laundering of articles involves washing them so that they look new again. It involves keeping clothes clean and ready to wear. Stains have to be removed and articles may be stiffened if necessary. Finishing by ironing or pressing gives the articles a smooth appearance and helps it stay clean longer. Anyakoha and Eluwa (2010) also observed that laundering is important for good health and hygiene, to look clean and to make it last long. Laundering agents according to Anyakoha and Eluwa (2010) are substances which aid the removal of dirt during laundry. They include solvents, detergents, alkalis, acids, bleaches etc.

They noted that the consumer must be acquainted with the proper method for washing each type of garment and fabric. Anyakoha and Eluwa (2010), enumerated that laundering process is made up of sorting the articles to be washed, mending the articles, removing all stains from the articles, steeping or soaking white cotton or colour fast article, washing articles according to fabric types, rinsing the washed articles, boiling articles if necessary, applying blue and or starch if necessary, drying the articles, ironing or finishing of laundered article, airing of finished articles and finally and storing of laundered articles.

Anyakoha and Eluwa (2010), also noted that methods of washing clothe includes rubbing or friction, kneading and squeezing, squeezing alone and kneading. Optional finishing treatment such as blueing, stiffening or softening can be applied to the fabric after rinsing. Anyakoha and Eluwa (2010) noted that stiffening agents includes different types of laundry starch, such as hot water starch, cold water starch, and spray or aerosol starches: gum Arabic, glue and so on. They stated that stiffening agents are used in laundry to stiffen cotton and linen fabrics, to give the fabrics a smooth surface, to give the fabrics a fresh look, and to make fabrics keep clean for longer period

When articles are washed and dried, they become clean. But they have a rough appearance with creases and wrinkles. Ironing involves finishing a fabric by moving the iron to and fro on the material. Nkeonye (2009) stated that before ironing, the iron must be at the correct setting for the types of fabric to be ironed. The material must be of the right degree of dampness. The iron must be at the correct setting. Always iron in the direction of the selvedge. Iron double parts first if the material is thick. Iron double part last if the material is thin. If a shiny finish is desired, iron material on the

right side. For dull finish, iron on the wrong side. Iron until dry

Some articles such as those made of Nigerian wax print fabrics require washing by hand in order to safeguard the fibre, colour or special finish applied to it. Nkeonye (2009), noted that articles with loose colour should be cared for in the following ways. Wash before the articles get very dirty, do not steep, wash very quickly and gently using a lightly built detergent, squeeze the article, but do not rub, rinse thoroughly. A tablespoon of vinegar in the last rinsing water may help to brighten the colour. Put through the wringer or dab dry in an old towel. Hang up to dry at once, away from strong heat and sunlight. Keep away from other articles, Iron as soon as possible (protect ironing-sheet or ironing board cover with an old piece of materials)

Nigerian wax print fabric is a general term employed by Nigerians to include wax print fabrics that are woven, printed in Nigeria using resins, dye and wax processes to achieve a distinctive indigenous design commonly referred to as wax print. Nigerian wax print fabrics are normally made of hundred percent cotton fibre yarns Nigerian wax print fabrics are commonly used in Nigeria for different purposes because of their cooling effect and other advantages of cotton fibres as well as easy evaporation of heat and sweat facilitated by plain woven construction process (Obiana, 2011). Mehta and Bhardwaj (1998) opined that quality apparel must perform satisfactorily in normal use; this shows that garment must be able to withstand normal wearing and care without seams coming apart, or tearing. As Nigerian wax print apparel naturally go through their cycle of use, they are exposed to conditions such as friction caused by rubbing and laundering to remove soil and dirt. These exposed conditions affect the performance of the seam. It will help actual and

intending garment makers, clothing constructors, seamstresses, tailors, teachers and students who sew Nigerian cotton wax – print fabrics to evaluate seam quality more effectively when sewing Nigerian wax print fabrics. In turn, it will facilitate garment makers in production, planning and quality control.

## OBJECTIVE OF THE STUDY

The main objective of this study was to determine the effect of laundering on the efficiency of plain seam.

## Research Question

What is the effect of laundering on the efficiency of plain seam?

## Research Hypothesis

H<sub>0j</sub>. There is no significant effect of laundering on the efficiency of plain seam.

## METHODOLOGY

Experimental research design using laboratory method was employed. The target population for this study was made up of all five Nigerian cotton wax-print fabrics. The sample size for this study is five Nigerian cotton wax print fabrics, with a total of eight hundred (800) seamed specimens. The sample size was drawn using purposive sampling.

Five Nigerian cotton wax-print fabrics, were purposively selected. One 100% polyester sewing thread was also selected from the commercially available sewing threads in the market. One stitch density (IOSPI) was selected. Three laundering processes (washing, starching and ironing) and four cycles of washing from the numerous cycles of laundering, apparel are expected to pass through during wear and care.

Experimental and laboratory equipments such as Butterfly treadle sewing machine with needle size 16 and Material Tensile Tester (Ziwick) were used as instrument for data collection. The instruments were validated using content and face validity by lecturers in the Department of Textile Science and Technology and Home-economics Section of vocational and Technical Education Department, Ahamadu Bello University, Zaria.

### ***Procedure for Data Collection***

#### **Step I: Sewing of specimens.**

All stitch works were done on an industrial butterfly lock stitch sewing machine to produce a balance seam. The same sewing thread was used on needle and bobbin thread. The stitch-density (10 stitches/inch) and the fabric samples were sewn using lock stitch.

#### **Step II**

Canoe soap produced by PZ Cussons Nigeria limited was purchased from the market and used for washing the specimens. Specimens were prepared from both warp and weft directions of the fabrics and stitched with plain seam with a seam allowance of 20mm (5/8 of an inch). A total of 800 seamed specimens were obtained. The same sewing thread was used at both needle and bobbin thread in the stitching. Eight hundred (800) seamed specimens were used to analyze laundering. Laundering involves washing, starching and ironing.

A stock/soap solution of the Canoe soap was prepared for washing the test specimens. The sewn specimens were subjected to washing according to ISO 8230-1-2008 and BN-EN-ISO 10472-2-2008 standard in the Standard Launder-O-meter (Gyrowash 315) with the solution made from the Canoe soap. Ten steel balls were placed in each cylinder for agitation. The washing was done in warm water at 40°C temperature for 30 minutes

and followed by rinsing and sun drying in the open space in each cycle of washing. Four cycles of washing were done, but the analysis was done based on washed and unwashed specimens. The washed specimens were taken out of the sun immediately they dried. After drying, specimens were tested for seam strength and elongation and the data obtained were used to calculate seam efficiency.

#### **Step III: Starching.**

After the specimens have been washed and rinsed, temporary finishing treatment in the form of starch was applied to the starched specimens at a concentration of 2% (2g of starch to 1 litre of water). The specimens were dipped, Squeezed, kneaded and turned in the starch solution to make sure that, the starch gets evenly into the fabric, then spread in the open air to dry. When the specimens dried up, they were tested for seam strength and elongation. Seam efficiency was calculated.

#### **Step IV: Ironing.**

Specimens used to test the effect of ironing on the seam efficiency were washed and dried and then subjected to ironing using Philip brand at the temperature of 200°C rated as hot according to the Home Laundry Consultative Council (HLCC) and ISO 3758: 2012 textiles – care code, which states that cotton and linen fabrics should be ironed at 200°C hot temperature. After ironing, specimens were tested for seam strength and elongation and the data obtained were used to calculate seam efficiency.

The Material Tensile Testing Machine (Ziwick) was used to carry out all the tests. Five readings each were taken from both warp and weft directions of the fabrics and the mean value taken. The differences in the tensile strength were measured and recorded. Maximum forces at rupture were recorded in Norton (N). Seam efficiency was calculated using the formula adopted from Chowdhary and Poynor (2006) and LaPere (2006):

$$\text{Seam efficiency} = \frac{\text{seam strength}}{\text{Fabric strength}} \times 100$$

The data obtained from the experiments were subjected to statistical analysis using mean, standard deviation; to analyze the fabric's characteristics and answer the research question while Analysis of Variance was used

to test the research hypothesis all at 0.05 alpha levels of significance.

Research Question: What are the effects of laundering on the efficiency of plain seam made of Nigerian wax-print fabrics?

**Table 1:** Descriptive Statistics on the Mean Difference of the Effect of Laundering (Washed, Starched and Ironed) on the Efficiency of Plain Seam Made of Nigerian Wax-Print Fabrics.

Fabric direction	laundering processes	N	Mean seam Efficiency (%)	Std. Dev	Std. Error
Warp	Washed only	100	61.9663	31.68181	7.08427
	Starched	100	76.8295	41.41569	9.26083
	Ironed	100	64.4675	35.77127	7.99870
	Unwashed (control)	100	73.0156	41.33440	9.24265
	Total	400	69.0697	37.66557	4.21114
Weft	Washed only	100	32.7735	15.75284	3.52244
	Starched	100	38.1280	16.77659	3.75136
	Ironed	100	32.5730	15.75187	3.52222
	Unwashed (control)	100	37.0400	16.23480	3.63021
	Total	400	35.12862	16.02291	1.79142

Table 1 showed that from the warp direction, seam efficiencies are 61.9661, 76.8295, 64.4675 and 73.0156 for washed, starched, ironed and unwashed. This shows that laundering reduces the efficiency of plain seam. Further interpretation of the data from the weft direction also showed that the mean seam efficiencies are 32.7735, 38.1280, 32.5730 and 37.0400 by washed,

starched, ironed and unwashed. This finding also agreed with the findings in the warp direction that laundering reduces the efficiency of seams made of wax print fabrics.

**Null Hypothesis:** There is no significant effect of laundering on the efficiency of plain seam made of Nigerian cotton wax-print fabrics.

**Table 2:** F-value and p-value for Seam Efficiency by Laundering Processes (Washed, Starched and Ironed).

	Fabric direction /laundering factors	Sum square	of Df	Mean square	F-cal	f-crit	Sig (P)
Warp	Between groups	3641.795	3	1213.932	.851	2.62	.470
	With groups	108435.139	396	1426.778			
	Total	112076.934	399				
Weft	Between groups	497.321	3	165.774	.637	2.62	.594
	With groups	19784.627	396	260.324			
	Total	20281.948	399				

$P > 0.05$  ;  $F_{cal} < f_{crit}$  at df 3. Decision=Not Significant.

Table 2 showed that from the warp and weft direction, there were no significant differences between washed, starched and ironed on seam efficiency. This is because  $p = .470$  in warp and  $.594$  in weft direction. Both cases are greater than  $0.05$  level of significant. Likewise  $F$ -calculated is  $.851$  in the warp and  $.637$  in the weft direction, both also are less than the  $f$  critical value of  $2.62$ . Therefore the null hypothesis is retained.

#### DISCUSSION OF FINDINGS:

Table 1 revealed that laundering (washing, starching and ironing) had no significant effect on the efficiency of plain seam made with Nigeria wax – print fabrics. The result of the descriptive statistics in Table 2 indicated that the mean seam efficiency decreased with washing, decrease further with ironing but increases temporarily with starching. However, the differences observed in the statistical analysis were not significant in both warp and weft directions. This is in agreement with findings of Danquah (2010) who found that washing does not have any significant difference on the seam efficiency of plain seam made of Ghanaian Real wax cotton printed fabric. The findings were also consistent with the findings of Chowdhury and Poynor (2006).

#### CONCLUSION:

Findings of the study revealed that laundering (washed, starched and ironed) does not have any significant effects on seam efficiency of plain seam. The reduction in seam efficiency observed was not statistically significant. Based on the findings of the study, it was concluded that laundering (washing, starching and ironing) reduces the efficiency of plain seam. Therefore, less friction; agitation and starch concentration should be applied when laundering to reduce the effects on the seam efficiency.

#### RECOMMENDATIONS

1. Laundering of wax print sewn apparel should be done with less friction, agitation and concentration of starch to reduce the adverse effects of laundering on the seam efficiency.
2. Paper presentation, publication of works on this study and similar work on these findings will provide literature for students, educator, apparel manufacturer's solid foundations as basis for making informed decisions on laundering of plain seam made of Nigerian wax print fabrics.

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