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Study on the Influence of Different Garment Washes on the Fabric Physical Properties and Color Value

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Abstract - *Garment washing is a significant part of garment industries and it is mainly applied on denim garments and any other casual garments. In the primary stage garment does not inherit customer's desired properties but after washing it become most widely used due to its new appearance, softness, comfort, strength and low cost, which create customer's absolute satisfaction. Garment washing process is provided with a lucrative and glassy outlook by chemical or wet washing process and mechanical or dry washing process. The most widely used dry washing processes for garment are scraping, spraying, whiskering, damages, spots, rubbing and tacking contrariwise wet washing processes for garment to develop new a look and effect are normal wash or rinse wash, pigment wash, caustic wash, silicon wash, enzyme wash, stone wash, stone enzyme wash, bleach wash and acid wash. Four different knitted fabric structures are selected and subjected to four different washes. The results are analyzed and it shows that after washing, weight of each garments has increased from 5% to 10%; stitch length of the constituted fabric has decreased from 1% to 10% approximately; dimensional property both for lengthwise and widthwise, changes and fabric spirality has almost unchanged. Fabric color has been influenced by the wash type in some cases.*

Key Words: Bio Wash, Stone wash, Knitted fabrics, Dimensional Stability, colour difference, fabric GSM

1. INTRODUCTION

Industrial garments washing is one of the major processes followed in the textile sector. By industrial garments washing, dust, dirt and infectious materials can be removed from garments. For improving special look on garments as per fashion requirement, a variety of wash techniques can be followed. For washing of denim garments, a range of treatment methods such as enzymatic treatment, bleaching treatment, acid treatment, and Silicone treatment, are used widely. They all are aimed at new possible effects of fabric appearance, particularly the dry finishing creates many effects on denim fabric; it will stimulate the customers to buy, and also it increases the market potential of the denim market. Nowadays along with denim washing knit garments such as Fabric, Polo shirt, and trouser, is washed by using different techniques as follows: enzymes wash; softener wash, Silicone wash, tie dye wash, pigment wash, caustic wash, etc. are used to create or enhance the physical and mechanical property changes.

2. METHODOLOGY

In this project work an attempt is made to study the effects of four different types of washes on fabric properties of various fabric structures. Four different fabrics are selected for the study, namely 100% cotton Single Jersey Fabric, Slub Single Jersey Fabric, Lycra jersey fabric, Loop Knit Fabrics. The samples are subjected to various washes such as stone wash, hot wash, Silicone wash & bio wash. Typical industrial washing procedures and techniques are followed and then physico-mechanical properties of fabrics before and after washing are studied under standard testing conditions.

2.1 PROCESS FLOW:

Selection of fabric for the study
↓
Testing of samples for geometrical & Physical properties
↓
Washing
↓
Testing of samples for geometrical & Physical properties
↓
Comparative Analysis

In this project, the following fabric types have been used for the study

- Single Jersey 100% cotton grey fabric
- Cotton Lycra Jersey Dyed (95% cotton ,5% lycra)
- 100% cotton Slub Jersey dyed
- 100% cotton Loop knit dyed

In the chosen fabrics, the following washes are done to study the effect of washes study

- Bio Wash
- Silicone Wash
- Hot Wash
- Stone Wash

The following fabric Parameters are tested before and after wash

- Course Per Inch (CPI)
- Wales Per Inch (WPI)
- Fabric GSM
- Dimensional stability
- Color value

The details of the process conditions for various washes are described below.

Table 1: Process conditions

Wash Type / Process condition	Quantity of Water	Temperature	Chemical Weight
Bio Wash	10 lit	240°C	½ kg
Silicone Wash	10 lit	240°C	1 kg
Bio Wash	10 lit	260°C	½ kg
Stone Wash	10 lit	250°C	1kg

3. RESULTS & DISCUSSIONS

The samples are tested for various geometrical such as courses per inch, Wales per inch, GSM, Dimensional stability. Color difference, before and after wash, is also measured.

Table 3.1 Course per Inch (CPI) & Wales per Inch (WPI)

Description	**Single Jersey**		**Lycra Jersey.**		**Slub Jersey.**		**Loop Knit**	
	CPI	**WPI**	**CPI**	**WPI**	**CPI**	**WPI**	**CPI**	**WPI**
Before Wash	54	38	70	42	40	34	48	35
After Bio Wash	66	39	66	47	50	38	48	32
After Silicon Wash	56	40	72	40	44	36	48	31
After Hot Wash	58	38	68	44	46	34	46	34
After Stone Wash	62	42	64	43	44	35	46	33

Table 3.2 Fabric GSM and % Increase

Description	Single Jersey	Lycra Jersey	Slub Jersey	Loop Knit
Before Wash	162	190	154	240
After Bio Wash	168	200	161	240
	3.70 %	5.2 %	4.54 %	0%
After Silicon Wash	169	200	164	243
	3.70 %	5.2 %	6.49 %	1.25 %
After Hot Wash	167	198	165	243
	3.09 %	4.2 %	6.49 %	1.25 %
After Stone Wash	185	200	160	260
	14.19%	5.2%	3.89%	8.33%

Table 3.3 Dimensional stability

Description	Single Jersey		Lycra Jersey.		Slub Jersey.		Loop Knit	
	Lengthwise	Widthwise	Lengthwise	Widthwise	Lengthwise	Widthwise	Lengthwise	Widthwise
After Bio Wash	-3%	-1%	-1%	-5%	-7%	-1%	-4%	-1%
After Silicon Wash	-3%	-4%	-1%	-4%	-4%	-2%	-3%	0%
After Hot Wash	-2%	-2%	-0.2%	-3%	-6%	0%	-4%	1%
After Stone Wash	-4%	0%	-0.4%	-3%	-7%	0%	-4%	1%

Table 3.4 Color Difference

Description	Illuminant	Single Jersey		Lycra Jersey.		Slub Jersey.		Loop Knit	
		dE	Result	dE	Result	dE	Result	dE	Result
Stone Wash	D65	1.932	FAIL	1.922	FAIL	1.644	FAIL	1.652	FAIL
	TL84	1.898	FAIL	1.969	FAIL	1.274	FAIL	1.503	FAIL
	CWF	1.896	FAIL	1.964	FAIL	1.307	FAIL	1.51	FAIL
Bio Wash	D65	1.22	FAIL	1.143	FAIL	2.6	FAIL	3.183	FAIL
	TL84	1.206	FAIL	0.878	PASS	2.492	FAIL	3.092	FAIL
	CWF	1.202	FAIL	0.726	PASS	2.407	FAIL	2.72	FAIL
Silicon Wash	D65	0.691	PASS	1.41	FAIL	2.086	FAIL	0.922	PASS
	TL84	0.696	PASS	1.49	FAIL	1.806	FAIL	0.75	PASS
	CWF	0.689	PASS	1.407	FAIL	1.781	FAIL	0.784	PASS
Hot Wash	D65	0.972	PASS	0.725	PASS	1.5	FAIL	0.405	PASS
	TL84	0.969	PASS	0.837	PASS	1.44	FAIL	0.395	PASS
	CWF	0.967	PASS	0.786	PASS	1.338	FAIL	0.301	PASS

4. CONCLUSIONS

Due to washing, the fabric GSM has increased from 0% to 8% in all fabrics. In single jersey fabrics, GSM increases by 14% for stone washed fabrics whereas the increase is only 3% for other washes. In Lycra jersey fabrics, GSM increases by around 5% for all the washes. In slub jersey fabrics, GSM increases by 4 to 6.5 % for different washes. In loop knit fabrics, Increase in GSM is negligible for all the washes except for Stone wash where increase is by 8%.

Due to washing, the fabric dimensional stability is affected and it is observed that all the samples undergo only contraction, both in length and width direction, for all the washes. Lycra jersey samples show the least contraction percentage whereas highest contraction is noticed in slub jersey samples among all.

Different types of washes have significant influence on the color of most of the samples**.** From the results, it is observed that, In slub jersey structure, all the four types of washes have significantly influenced the color of the samples i.e $dE^* > 1$. In Loop knit structure and single jersey structure, except silicone and Hot wash, other types of washes has influenced the color of the samples significantly. In lycra jersey knit structure, except Hot wash, other types of washes has influenced the color of the samples significantly

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