Testing the behaviour of woven and knitted fabric used for seat covers

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Abstract
This paper is about testing a sample of fabric to observe the behaviour in different properties. Tests like resistance, moisture content, colour fastness, breaking and tearing strength etc. will be judged. Based upon the results, we will carry out comparison between woven fabric and knitted fabric.

Keywords: *Resistance, Woven Fabric, Knitted Fabric.*

I. INTRODUCTION

An automobile company uses fabric to make different parts in vehicles, one of which is seat covers. The fabric used in making seat covers can be Woven fabric jacquard, Woven fabric with loom of dobby woven (velvets), Weft needle fabric done in circular knitting machine (generally with pile), Weft needle fabric for warp knitting machine. Partially Oriented Yarns of polyester used for preparation of experimental fabric samples are procured from Welspun Fibre Ltd. and Alok industries.

II. LITERATURE SURVEY

The seat can be divided into two main parts, a frame and a covering. The covering of the frame is divided into two parts, usually a polyurethane foam cushioning and a cap. The three layers composing the "complex" are a surface polyester fabric (weaving or knitting, etc.), thin polyurethane foam and a polyamide knitting or nonwoven that improve cap slip on the cushioning [2].
Abrasion is the physical destruction of fibres, yarns, and fabrics, resulting from the rubbing of a textile surface over another surface [3].
Abrasion ultimately results in the loss of performance characteristics, such as strength, but it also affects the appearance of the fabric [4].
Abrasion resistance of the textile materials is very complex phenomenon and affected by many factors, mainly classified as follows: Fibre, yarn, fabric properties and finishing processes [5].
Textile materials can be unserviceable because of several different factors and one of the most important causes is abrasion. Abrasion occurs during wearing, using, cleaning or washing process and this may distort the fabric, cause fibres or yarns to be pulled out or remove fibre ends from the surface [6].
The seat constitutes the most important part of the interior decoration. Its security and comfort are studied by automobile manufacturers, seat makers, fabric producers, and textile research centres and universities. Polyester is the most widely used material in car seat coverings. Woven, weft knitted (circular machine), and warp knitted fabrics (tricot and double needle bar machine) are the most used fabric structures High abrasion resistance is needed in seat covers nowadays. The study in abrasion properties of fabrics discussed by [7], here behaviour of seat covers after 10,000 rubs of abrasion is determined. Various samples have been judged to find out the change in thickness and other properties of fabric after abrasion.
An experimental study of the abrasion resistance properties of a various warp-knitted constructions which are specially developed for automotive application as car seat covers is discussed in [8].
Predominant role of knitting in technical textile is discussed in [9].
General fibre survey, fabric structures, processing and testing of automotive textiles is discussed in [10].

III. PARAMETERS OF YARN

Theoretical assumptions made in [1] will be carried out practically. Experimental fabric samples are prepared in RSWM, Banswara for 126, 130, 145 and 150 denier filaments of 48, 68, 72 and, 100 filaments in cross-section respectively. The details of the weaving machine given below in table no. 3.1, 3.2, 3.3 and 3.4

Name of Machine	Cimmco Dornier Loom
Type	Dobby – Loom
Speed, rpm	400
Reed width in cm	190
Weft insertion rate, mpm	760
No of heald frames	8

Table no. 3.1

Name of Machine	Cimmco Dornier Loom
Type	Jacquard weaving
Speed	450 RPM
Reed width	190 cm
No of heald frames	12

Table no. 3.2

Name of Machine	Fukuhara m/c
Type	Circular knit m/c
Model no.	V-8ME-42
No of feeder	32
Dia of m/c	30”
Guage of m/c	22

Table no. 3.3

Name of Machine	Karl mayer m/c
Type	Warp knit m/c
Model	GSTL 59/1F
Working width, in inches	134
Power, KW	5.5

Table no. 3.4

IV. METHOD OF TESTING

Prior to the testing, the fabric samples were conditioned in standard atmosphere, ($27 \pm 2°C$) temperature and (65 ± 2 %) Relative Humidity for 48 hours according to I.S.I. , source SP **: 6359-1971**.

1 Abrasion resistance test:

The abrasion resistance of experimental fabric samples was determined as per source no. **ISO-12947** on **Martindale abrasion tester.** Specimen of diameter 38 mm, was kept along with circular temple disc and abraded fabric of 140 mm along with a force between 9 kpa to 12 kpa.

2 Water Repellency

The water repellency can be determined by source **ISO-4920** with the help of **WATER REPELLENCY SPRAY TESTER .** Spray test requires a board which is inclined at an angle of 45. The fabric is kept on the board and distilled water is sprayed on the fabric with the help of 19 holes having the diameter of holes 9 mm each . Size of 18 cm is taken into consideration along length and width of the fabric.

3 Moisture Content

The moisture content can be determined by source **IS:199** depends on principle of **oven dry method.** This method requires a saw, a scale, an oven, hot plate, field stove or the like suitable for drying moisture samples at a uniform temperature not exceeding 105° C. Select a representative quantity of the moist sample based on the maximum particle size of the sample. Sample should be 2-3 gm in weight and put it on oven for 15-20 min.

4 Color Fastness-

The colour fastness is determined by source number ISO-105 & IS:766 with the help of **colour fastness to washing and colour fastness to rubbing** tester.

5 Breaking strength

The breaking strength is determined as per source **IS:1969** on the **INSTRON** tensile strength tester by using 100 kgf load cell, 300 mm/min of sample size 300*60 mm .

6 Tearing Strength

The tearing strength is determined by as per source **ISO-13937-I** , on Elemendorf tearing strength tester by using 6400 gm tester capacity. The specimen of 100 mm in length and 65 mm in width is taken, from which 2 cm was kept free for insertion .

7 Crease Recovery -

The crease recovery is determined as per source no. IS:4681 on **CREASE RECOVERY TESTER.** Specimen size of 4 cm in length and 1.5 in width and a load of 500 gm is applied on the specimen for 5 min., hung on the jaws of crease recovery tester.

V. RESULTS

A. *Fabric abrasion resistance*

TYPE OF FABRIC	CODE OF FABRIC	Abrasion Resistance (GRADES)
WOVEN FABRIC	SODWFF	4.0
	SOJWFF	4.0
KNITTING FABRIC	SOWKFF	4.0
	SOCKFF	4.0

Table -5.1 Abrasion Resistances of Different Experimental Samples

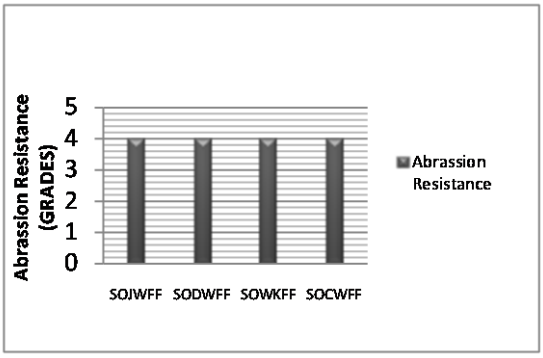

Fig 5.1- Abrasion Grading Of Seat Fabrics

B. *Fabric water repellence*

Table 5.2- Water Repellency of Woven & Knitted Fabrics

TYPES OF FABRICS	CODE OF FABRIC	Water repellency (Rating)
WOVEN FABRIC	SODWFF	100
	SOJWFF	100
KNITTING FABRIC	SOWKFF	100
	SOCKFF	100

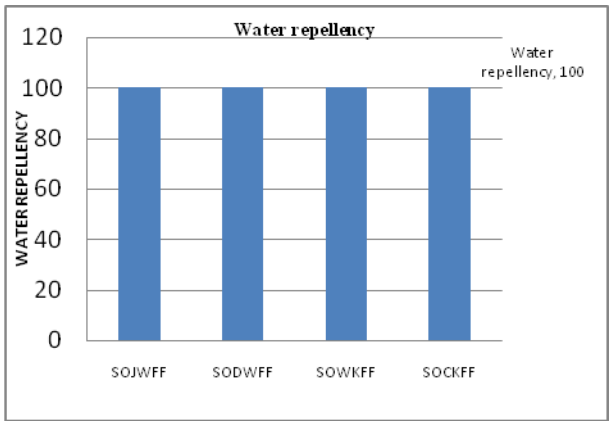

FIG 5.2- SHOWS WATER REPELLENCY RATINGS OF DIFFERENT SEAT COVER FABRICS

C. *FABRIC MOISTURE CONTENT*

TYPES OF FABRICS	CODE OF FABRIC	Moisture content(%)
DOBBY WOVEN FABRIC	SODWFF	0.89
JACQUARD WOVEN FABRIC	SOJWFF	1.06
WARP KNIT FABRIC	SOWKFF	1.44
CIRCULAR KNIT FABRIC	SOCKFF	1.05

TABLE -5.3 OBSERVATION OF MOISTURE CONTENT

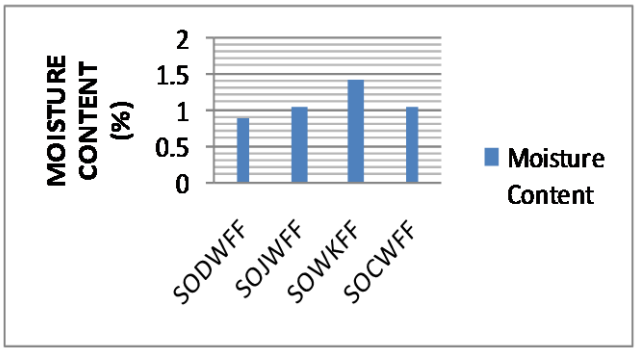

Fig 5.3- Moisture Content Of Different Seat Cover Fabrics

D. *FABRIC COLOUR FASTNESS*

Fabric sample code	Color fastness to rubbing	Color fastness to washing
SODWFF	4-5	4-5
SOJWFF	4-5	4-5
SOWKFF	4-5	4-5
SOCKFF	4-5	4-5

TABLE 5.4- Colour fastness of different experimental sample

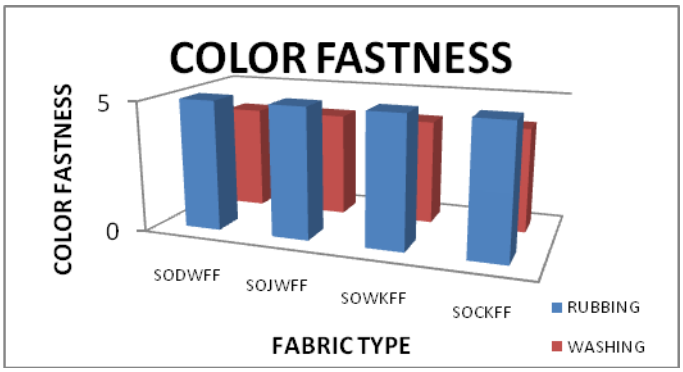

Fig 5.4- Colour fastness of woven and knitted fabric

E. *FABRIC BREAKING STRENGTH*

Fabric Sample Code	Breaking strength (Kgf)	
	Warp	Weft
SODWFF	125.67	121.7
SOJWFF	146.67	162.6
	Wales	Course
SOWKFF	29.36	68.98
SOCKFF	60.09	61.74

Table 5.5- Breaking strength of woven and knitted fabrics

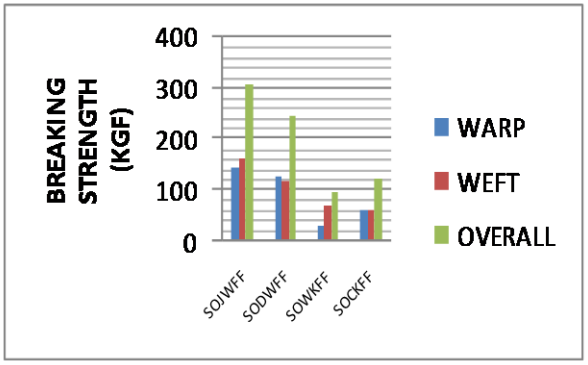

FIG 5.5- GRAPH BETWEEN BREAKING STRENGTH OF SEAT COVER FABRIC

F. *FABRIC TEARING STRENGTH*

Fabric Sample Code	Tearing strength (Kgf)	
	Warp	Weft
SODWFF	11.70	11.12
SOJWFF	11.32	13.41
	Wales	Course
SOWKFF	07.92	07.78
SOCKFF	11.29	20.70

TABLE -5.6- TEARING STRENGTH DIFFERENT SEAT COVER FABRIC

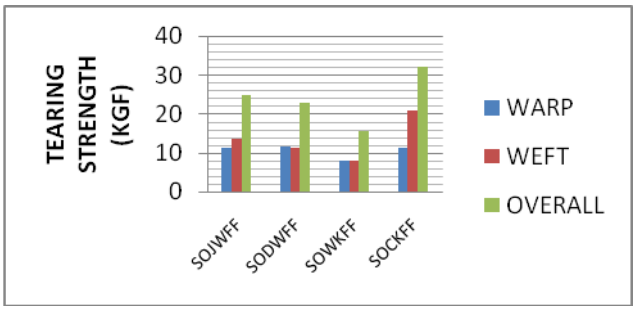

Fig 5.6- Tearing Behaviour of Woven and Knitted Fabric

G. *FABRIC CREASE RECOVERY ANGLE*

TYPES OF FABRICS	CODE OF FABRIC	Crease recovery angles
WOVEN FABRIC	SODWFF	335
	SOJWFF	322
KNITTING FABRIC	SOWKFF	325
	SOCKFF	338

Table 5.7- Crease resistance for different experimental samples

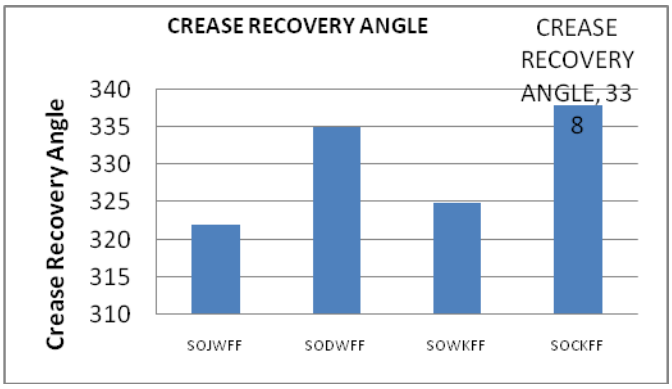

Fig 5.7- Crease Recovery Angles OF Different Seat Cover Fabrics

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