CHAPTER - 8

AFTERCARE PRACTICES AND FLAMMABILITY OF FABRICS

8.1 INTRODUCTION

Most garments have quite longer life and serviceability due to the use of durable fabric. The garments are designed for repeated usage during their entire life.

Limited fire accidents occur in case of new garments or fabric during the storage but the chances of fire accidents are more during the use of these garments. Hence the studies of thermal properties of the textiles also have been examined considering the aftercare practices and related factors. The studies of thermal properties of textiles have been conducted using the fabrics subjected to washes, ironing, exposure to light and blueing. These factors can influence the fabric physical properties such as mass, thickness, air permeability etc. Hence burning behaviour of these fabrics can be different than that of the newly sewn garments. This study is carried out on polyester, cotton and polyester:cotton blended fabrics. The details of the experiment and its results are discussed in the following sections.

8.2 MATERIALS AND METHODS

To study the influence of aftercare practices on thermal properties of fabrics, three types of fabrics have been used viz. cotton, polyester and polyester-:cotton blend is used. The specifications of these fabric samples are given in Table 8.1. These samples are exposed to various aftercare practices like washing, ironing, light exposure and blueing in the laboratory as per the standard methods using appropriate equipments.

For testing the effect of various aftercare practices on the fabrics mentioned in Table 8.1a numerous specimen have been prepared using different combinations of the after care practices as mentioned in Table 8.1b. To determine the effect of washing practice, five different washing cycles were

used with three different fabric samples (3 type of fabric X 5 different washing cycles = 15) making around fifteen specimens. Similarly to determine the effect of washing and ironing practices, five different washing and ironing process were used with three different fabric samples (3 type of fabric X 5 different washing and ironing process = 15) making around fifteen specimens. Also, the effect of several hours of exposure of lights on the three different fabric samples (3 type of fabric X 5 different exposures hours = 15) making another 15 specimens and the effect of blueing is studied only on cotton fabric (cotton fabric X 2 different concentrations = 2) making around 15 specimens. Altogether around 47 specimens types were prepared for the flammability tests and the average of 10 replicates of each specimen have been considered for analysis.

8.2.1 Washing

The washing of the entire fabric sample was carried out as per the standard laboratory 1991 practice for home laundering fabrics prior to flammability test developed by AATCC committee RA88.

All the samples of fabric were washed dried and conditioned before the test. The thermal properties have been measured at different wash cycles i.e. after 5,10,15,20 and 25 washes.

8.2.2 Washing and Ironing

All the samples of fabrics were first washed dried and then ironed. All the samples of fabrics were first washed dried and then ironed. The fabric samples have been ironed as per the AATCC Test method 133-1994 for color fastness to heat (hot pressing). The thermal properties have been measured for all the fabric samples after washing and ironing and are tested only after 5,10,15,20 and 25 washing and ironing process.

8.2.3 Exposure to Light

The exposures of light to the fabric specimen have been carried as per the standard AATCC Test method 16-1993, Color fastness test with Test option E- Water Cooled Xenon Arc lamp. (Continuous light, blue wool standard and

Table 8.1a Specification of Fabrics Used for Thermal Tests on Exposure to Various Aftercare Practices

Sr. No.	Fabric Type	Fabric Mass (gsm)	Ends Per inch	Picks Per inch
1	Polyester	42.21	22	89
2	Cotton	64.50	36	74
3	Polyester:Cotton Blend (30:70)	74.20	90	72

Table 8.1b Various Types of Specimen Prepared Using Different Combinations of Aftercare Practices

Sr. No.	Fabric Type	Aftercare Treatment	Number of Cycles/Process				
			Number of washing cycles				
1	Polyester	Washing	5	10	15	20	25
2	Cotton		5	10	15	20	25
3	Polyester: Cotton Blend (30:70)		5	10	15	20	25
			Number of washing and ironing process				
1	Polyester	Washing and Ironing	5	10	15	20	25
2	Cotton		5	10	15	20	25
3	Polyester:Cotton Blend (30:70)		5	10	15	20	25
			Number of hours of light exposure				
1	Polyester	Exposure to Light	5	10	15	20	25
2	Cotton		5	10	15	20	25
3	Polyester:Cotton Blend (30:70)		5	10	15	20	25
			Concentration of Blueing				
1	Cotton	Blueing	Low con.			High con.	

Grey scales methods were discarded) The thermal properties have been measured for the samples after the fabrics exposed to light for 5,10,15,20 and 25 hours.

8.2.4 Blueing

Fabric samples also have been prepared using the blueing of fabrics. Ultramarine Blue is used as Blueing agent. Two different concentration of blueing solution is prepared from distilled water i.e. 5 ml of ultramarine blue is added in 1 litre for low concentration and 10 ml in 1 litre for high concentration. The samples were soaked and continuously stirred for 2 minutes in the solution at room temperature 27 ± 2°C. All the cotton samples are blued with low and high concentration of blueing agent.

8.3 RESULTS AND DISCUSSIONS

8.3.1 Effect of Washing on Burning Behaviour of Fabrics

Polyester, cotton and polyester:cotton blended fabric samples have been prepared as mentioned and conditioned using BHPT. Number of washings on cotton fabric shows significant increase in gsm of the samples which can be attributed due to shrinkage of cotton yarns in the fabric there by increase in gsm, whereas polyester and polyester blended fabric did not show any significant change in gsm as polyester being hydrophobic in nature, does not swell and shrink the fabric after washings and shows no significant change in weight per unit area, which can be seen from the Table 8.2 and Fig. 8.1.

Washing is a physical and chemical process, due to which the fabric undergoes physical and chemical changes. The deposition of washing powder between the voids of the fabric structure and the reaction between fabric and detergents physical and chemical changes occur. Several washings lead to loss of surface fibres, swelling of yarns and thereby shrinkage of fabric. The AIHF- 60 values show significant increase in incident heat fluxes for cotton fabric after 5 washes, which may be attributed to more mass available for combustion in a given area, openness of fabric pores and more amount of

oxygen available for combustion. Polyester:cotton blend do not show and change in AIHF values for initial washings, it shows significant change only after 20 washes and polyester fabric samples show no significant changes in average incident heat fluxes due to number of washing process, as there is no physical and chemical change in the polyester fabric due to washing as seen in Fig. 8.5.

8.3.2 Combined Effect of Washing and Ironing

Polyester, cotton, and polyester:cotton blended fabric samples were prepared as mentioned in earlier section in sample preparation for testing at BHPT. All the samples are ironed up to 25 times to determine any effect of ironing on thermal properties, but as the actual ironing process takes place after washing and drying process, each fabric is washed before ironing to meet the reality. All the samples are washed, dried, ironed and are tested after every 5 wash and ironed process and such samples are studied up to 25 washes and ironing. Hence the results of these tests are the combined effect of washing and ironing. While comparing the results of washing and ironing, it is found that there is no significant change in gsm and AIHF values for all cotton, polyester and its blended fabric after several washing and ironing as ironing do not significantly change the mass in a unit area or thread spacing and the thermal energy supplied to all the samples do not bring a molecular change in the samples tested. The changes seen are due to the effect of washing and not due to the ironing, which can be observed from the Table 8.4 and Fig. 8.2 and also in Table 8.5 and Fig. 8.6.

8.3.3 Effect of Light Exposure

After every wash the fabrics are exposed to light for drying, thus this experiment was designed to determine the effect of light exposure on thermal properties of all sample fabrics. All the fabric samples are exposed to light up to 15 hours and after every three hours the fabric samples were tested for thermal properties.

It is observed that there is no change in gsm of all cotton, polyester and its blend fabric as seen in Table 8.6 and Fig. 8.3. Exposure to light does not

influence mass per unit area of all fabric samples. While burning these fabrics, polyester and its blend with cotton, shows significant increase in AIHF values only after 15 hours of light exposure as seen in Table 8.7 and Fig. 8.7. This change in incident heat flux may be due to thermoplastic behaviour of polyester fibres, which brings a change in molecular state due to constant light and heat application. Study on cotton fabric also revels that there exists no significant change in incident heat fluxes even after 15 hours of light exposure.

8.3.4 Effect of Blueing

When cotton fabric sample is blued with two different concentrations, It is observed that due to blueing process, the hydrophilic cotton yarns swells and in turn shrinks the fabric, there by increasing the weight per unit area of the sample as seen in the Table 8.8 and Fig. 8.4. This increase in gsm of fabric samples does not influence the incident heat flux for low concentration but influences at high concentration blued samples, as seen in the Table 8.8 and Fig. 8.8. This increase in AIHF60 can be due to deposition of blueing agent particles on the fabric, supporting the combustion and burning process

Table 8.2 Fabric Mass (gsm) of Finished Fabrics and After Wash Cycles

Fabric Sample	Finished Fabric	After 5 wash	After 10 wash	After 15 wash	After 20 wash	After 25 wash
Polyester	42.20	42.60	42.60	42.30	42.80	43.00
Cotton	64.50	70.00	70.40	72.10	73.20	74.00
Poly:cot 30:70	74.60	74.20	74.40	74.80	75.20	75.40

Table 8.3 Effect of Washing Cycles on AIHF values

Fabric Sample	Finished Fabric	After 5 wash	After 10 wash	After 15 wash	After 20 wash	After 25 wash
Polyester	0.81	0.82	0.80	0.81	0.86	0.92
Cotton	0.58	0.66	0.67	0.68	0.72	0.76
Poly:cot 30:70	1.44	1.38	1.43	1.50	2.10	2.22

Table 8.4 Combined Effect of Washing Cycles and Ironing on Fabric Mass

Fabric Sample	Finished Fabric	After 5 wash	After 10 wash	After 15 wash	After 20 wash	After 25 wash
Polyester	42.20	42.60	42.60	42.60	42.60	42.60
Cotton	64.50	68.40	69.20	70.60	71.40	71.20
Poly:cot 30:70	74.60	74.20	74.20	75.20	75.40	75.40

Table 8.5 Combined Effect of Number of Washing and Ironing on Incident Heat Flux Values

Fabric Sample	Finished Fabric	After 5 wash	After 10 wash	After 15 wash	After 20 wash	After 25 wash
Polyester	0.81	0.82	0.82	0.81	0.84	0.88
Cotton	0.58	0.61	0.62	0.68	0.71	0.70
Poly:cot 30:70	1.44	1.38	1.43	2.05	2.2	2.2

Table 8.6 Effect of Number of Hours of Light Exposure on Fabric Mass

Fabric Sample	Finished Fabric	After 3hours	After 6hours	After 9 hours	After 12 hours	After 15 hours
Polyester	42.20	42.40	42.40	42.40	42.40	42.40
Cotton	64.50	64.20	64.00	64.00	63.60	63.20
Poly:cot 30:70	74.60	75.00	75.00	74.80	74.60	74.40

Table 8.7 Effect of Number of Hours of Light Exposure on AIHF

Fabric Sample	Finished Fabric	After 3hours	After 6hours	After 9 hours	After 12 hours	After 15 hours
Polyester	0.58	0.59	0.59	0.59	0.59	0.6
Cotton	0.81	0.8	0.8	0.81	0.86	0.92
Poly:cot 30:70	1.44	1.45	1.43	1.46	1.45	1.7

Table 8.8 Effect of Low and High concentration Blueing on Cotton Fabric

Sample specification	Finished Fabric	Low Concentration	High Concentration
Mass(gsm)	64.5	65.20	65.4
Time for Ignition (T_{ig})	19.00	12.55	12.58
AIHF	0.58	0.55	0.50

Fig. 8.1 Effect of Washings on GSM

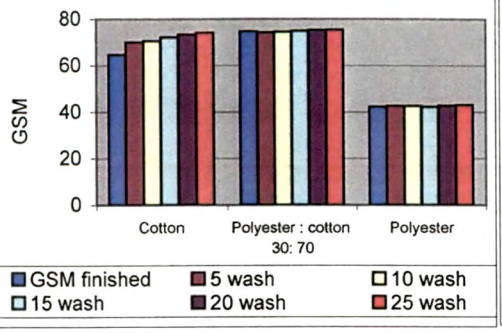

Fig. 8.5 Effect of Washings on AIHF60

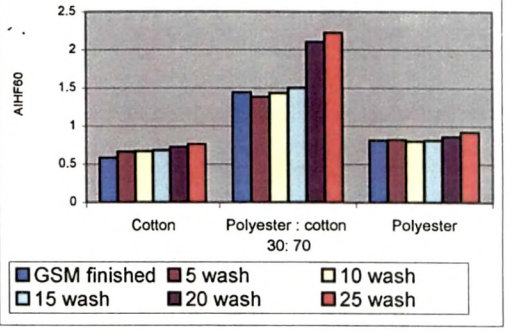

Fig. 8.2 Effect of Washings & Ironing on GSM

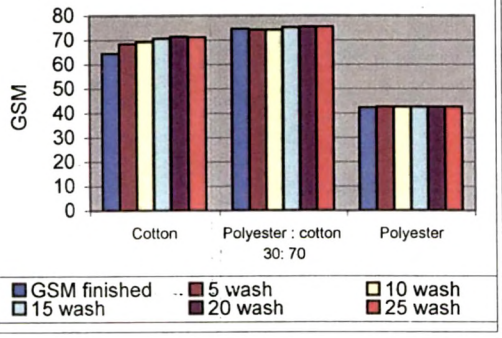

Fig. 8.6 Effect of Washings & Ironing on AIHF60

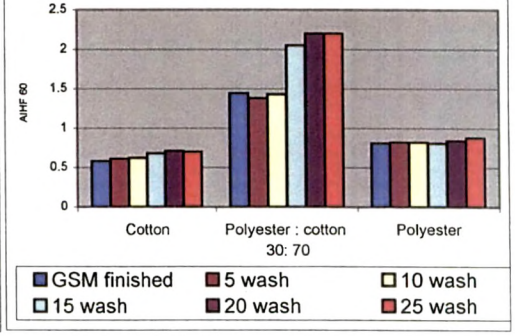

Fig. 8.3 Effect of Light Exposure on GSM

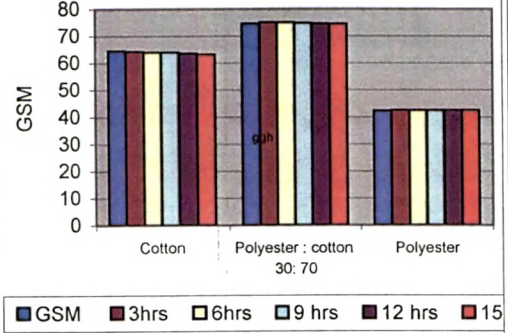

Fig. 8.7 Effect ofLight Exposure on AIHF60

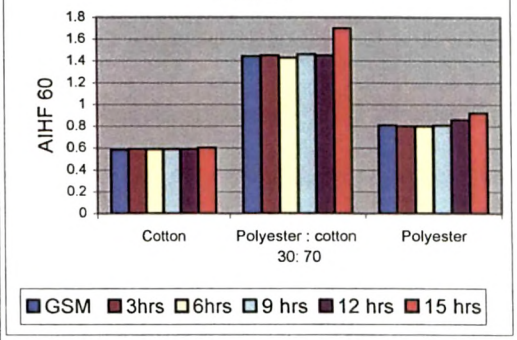

Fig. 8.4 Effect of Bluenings on GSM

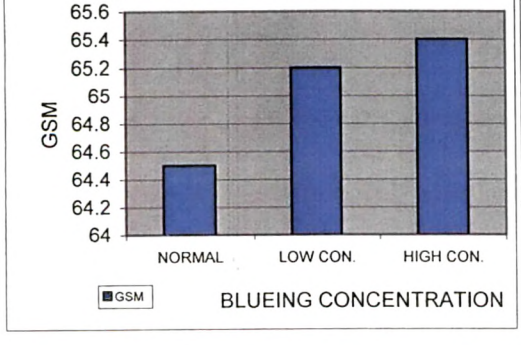

Fig. 8.8 Effect of Blueings on AIHF60