2.1 Introduction

The introduction of man-made textile fibres has brought out many significant changes in the tastes and preferences of the ultimate consumers. The consumption of blended fabrics has increased during the last three decades. Agnihotri [1] has estimated that the growth in the production of synthetic fabrics in the world during 1990 would be around 20 million tonnes.

The rapid developments and introduction of newer synthetic fibres in the market have revitalized the scope of blending by providing innumerable blend compositions to the textile technologists who are engaged in producing a variety of textiles to cater to the needs of the consumer. The ideal combination consists in blending hydrophobic materials with hydrophilic materials, for they tend to neutralize each other's negative traits and characteristics, thereby bringing about a blend composition that is perfect in all respects. The aim of blending is to incorporate the desirable features of constituent fibres.

Blends of synthetic fibres, especially with polyesters, were technological solutions as these fabrics in 100 per cent were not too comfortable for Indian and
tropical climate [2,3]. Thus, it is imperative that different types of fibres are blended to ensure, to some extent possible, maximum satisfaction to the consumers [4-6]. The advantages of blending are improved functionality, durability, better fabric structure, hand and aesthetic property [7-12]. The gains obtained in certain desirable features are, however, always accompanied by loss or reduction in others [11,13-16]. As rightly pointed out by Piramal [17], in a country like India, where majority of the people live below the poverty line, the aim should be firstly to provide cheap but durable cloth to the masses.

The proper selection of blend proportion is necessary to obtain an optimum balance of fabric properties for a particular end use. Although the benefits in fabric performance to be derived from blending are many, proper fabric design and suitable finishing procedures are no less important with the fabric composed. The proper selection of blend proportions as well as blend components are essential prerequisites to the design of a superior fabric. It is recognized that many of the functional and aesthetic characteristics of a fabric made from any single fibre or a combination of fibres can be altered to an appreciable extent by changing both the fabric construction and the operations employed in fabric finishing.
Fibre blending has been the subject of a great number of modern studies by technologists for improved functionality, aesthetic and physical properties [18-23].

2.2 Polyester/cotton blends

Blending of cotton with polyester is mainly aimed at improving strength, durability and other functional properties. Characteristics of polyester fibres which are of particular value in apparel wear are high resiliency, durability and excellent shape retention. These attributes predominate when polyester is blended in suitable proportions with cellulosic fibres. It was found that a blend of 65% polyester with 35% cotton is a good combination [12,24]. This blend provides some of the handle and character associated with fine cottons, and there is enough polyester present to offer good wrinkle recovery, crease retention and dimensional stability. Other blend ratios available in the market are 80p/20c, 50p/50c, 25p/75c, 40p/52c and 15p/85c. Functional properties of polyester/cotton blends have been studied extensively by different research workers to get optimum advantage out of them [25-38]. It has been found that low percentage of polyester in a cellulosic blend does not provide adequate strength. It is only at the 50 per cent level that the value of polyester begins to manifest itself.
2.3 Blends of polyester with viscose and polynosic

Blends of polyester with rayon are outstanding among the highly complementary combinations. Excellent results have been found with a blend of 70 % polyester and 30 % rayon in which both fibres contribute to a balance of properties giving optimum wear performance [12]. Due to the shortage and high price of cotton, coupled with easy availability of polynosic fibre, there is an increased use of polynosic fibre for blending with cotton, viscose and polyester. A number of research papers have been published on blends of polynosic with cotton [39-59].

2.3 Textile as an Engineering material

The purpose of research into the mechanics of fabrics is to obtain the principle from which it would be possible to predict the behaviour of fabrics before they are made, in other words, to engineer a fabric. Any consideration of engineering design of apparel fabrics may therefore be divided into two parts: a) the prediction of the basic mechanical properties of the fabric, b) the correlation of these properties with the end use characteristics of woven fabrics [60]. To succeed commercially, a fabric must have aesthetic appeal and serviceability at a price that is acceptable for the markets it fulfils. It has been accepted that both the aesthetic appeal of a
fabric and its serviceability can be controlled by the way in which these raw materials are converted into the final fabric or garment [61]. Considerable work has been reported on engineering fabric parameters for its optimum end uses [62-82].

It has been recognized that many of the functional and aesthetic characteristics of a fabric, made from any single fibre or combination of fibres, can be altered to an appreciable extent by changes in both fabric construction and the sequence of fabric finishing. Although functionality axiomatically must be combined with aesthetics to produce satisfactory fabrics, the results of blending studies have greatly facilitated the design of fabrics possessing new and unique properties [12].

The introduction of a third component to two component blends adds scope to the concept of engineered blends. Fabric characteristics may be modified through further refinements in the application of complementary characteristics of individual fibres.

Since it has been found that the magnitude of some fabric properties varies non-linearly with the changes in blend level, the best selection of relative quantities of the fibres to be used in the blend is not always readily
apparent. Consequently, knowledge of the properties of each fibre and some appreciation of their composite effect upon the fabric properties when blended together, can be of material benefit in the design of superior blended fabrics.

2.5 Uniform fabrics

A uniform is a specified attire consisting of coat, trousers, shirt and trousers or a combination of these worn by persons in the same service order [10]. Larson [10] classified the garments made by uniform manufacturers into a number of distinctive groups. These are: (a) Military including the four services, military schools and reserve officers, (b) Transportation, including motor freight carriers, bus drivers, airline pilots, stewardesses, and railroad trainmen, (c) Industrial, including service station attendants, delivery men, bottlers, plant operators, waiters, elevator operators, porters and messengers and (d) Protection, including policemen, firemen, guards, watchmen and inspectors.

Although cotton fabrics have been accepted as standards in uniforms and work clothing, the advent of man-made fibres has provided a means for making more durable and functional fabrics. Larson [10] defines work clothing as a composite term applied to the many unspecified items
of apparel worn by workers on manual jobs. The main criteria for choice of uniforms are appearance and serviceability. In other words, a uniform is distinctive and expected to have and maintain good appearance under severe and rigorous conditions of wear. It must also have good durability, be comfortable and should have reasonable maintenance and upkeep costs. Finally, the uniforms' value will be determined by a combination of its initial cost, durability, comfort, maintenance cost and ability to fulfil the appearance requirements of work clothing [10]. On the other hand, must provide long wear, acceptable appearance and comfort at a low initial cost and low maintenance cost.

The end use requirements govern the type of fabric used in uniforms. The basic cotton fabrics for shirts and trousers are twills. Washability with minimum care is the new concept for uniform dresses. Although cotton uniforms are washable, ironing is required. When a good percentage of polyester is used, the uniforms can be washed either by hand or home type automatic washing machine, drip dried and reworn with no ironing or at best touch up pressing. This new concept is extremely practical because of the reduced maintenance expense for the consumer. In industrial uniforms, the primary emphasis is on durability with economy, but there is a growing trend
toward a more dressed up appearance. In occupations where a garment is subjected to unusual or severe conditions of wear, as when service station attendants and mechanics encounter battery acid, cotton has been the predominant fibre. In other types of occupation where uniform is used to gain recognition polyester blended fabrics are used.

A blend of polyester cotton/viscose is popular for many types of uniforms. This provides strength, durability, better appearance, wrinkle resistance and ease of maintenance. Rayon is used to lower the cost and to provide static protection. A fabric containing 65% polyester, 35% cotton is the optimum blend level to realize the best performance ratio for minimum care uniforms. (Various specifications for uniforms are given in Appendix 2.1).

2.6 Conclusion

It is apparent that if textile end use products are to be evaluated and tested, it must be primarily for the purpose of gauging their satisfactory use in the hands of the consumer. New fabrics for uniforms should be developed through a joint effort between technical personnel of various research and development departments of leading mills.
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