Achieving Optimum Scientific Standards for Producing Fabrics Suitable for Car Safety Seat Belts

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Abstract

Technical textiles is the fast growing segment of the global textile market and its current growth rate is changing from 3 % to 5 % annually ,as we find hygiene products ,medical textiles ,geotextiles ,geonets ,flooring carpets ,roofing materials ,leather substances ,automotive textiles ,shoe materials ,decorative felts ,etc, adding value in our live style.

According to the Textile Institute in Manchester ,technical textiles are textile materials intended for end uses other than non–protective clothing ,household furnishing and floor covering ,where the fabric or fibrous components is selected principally but not exclusively for its performance properties as opposed to its aesthetic or decorative characteristics.

Automotive textiles is considered one of the most important markets in the technical textiles sector ,with the increasing scale of automobile production ,and consequently its worldwide stock ,the proportion of textiles in a motor car is rising in response to more stringent comfort and safety requirements

Approximately 50 square yards of textile materials is used in an average car ,nearly 75 % of them are used for tire cord fabrics and seat belts , the remainder goes into helmets ,air bags, body covers, roof liners ,interior fabrics and heat and sound insulation felts . Seat belts ,used as safety devices ,are one of the newest applications for textiles in automobiles and has spurred a huge market for technical textiles that is still experiencing considerable growth and development .

safety seat belts , safety seat belt is an energy absorbing device is designed to keep the load imposed on a victim's body during a crash down to survivable limits . Seat belts are an easy to use ,effective and inexpensive means of protection in an accident .

There are various types of seat belts depending on the vehicle. In passenger cars ,the seat belt fits across the lap and diagonally across the chest which is the most widely used type in the world .In passenger airplanes , the simple lap strap is used that does not restrain the upper part of the body .Racing drivers wear a full harness which consists of a strap over each shoulder and a lap belt

Seat belts are woven narrow fabrics in twill or satin construction .Nylon was used in some early seat belts , but because of its superb mechanical performance ,polyester is now exclusively used worldwide. Polyester also provides high dimensional stability ,good abrasion resistance ,excellent resistance to photo-oxidative degradation ,and high light fastness, which are considered the major requirements in a good seat belt .

A properly designed seat belt should provide non-recoverable extension or stretch during the collision to reduce the deceleration forces on the body (elastic stretch is not

wonted since it may cause whiplash damage) . An efficient seat belt will only allow its wearer to move forward a maximum of about 30 cm by controlled extension of the belt to avoid contact with any fixed part of the car. Seat belts need to be replaced after a major accident ,otherwise ,a seat belt should last as long as life of the car .

The experimental Work

This research concerns with producing fabrics suitable for Car safety seat belts. All samples in the research were produced with textured polyester yarns using three woven structures (regular hopsack 2/2 ,twill 2/2 and satin 4) .Three warp sets were also used (90,110 and 130 end /cm) , with three weft sets (80 ,100 and 120 pick/cm) using two different yarns counts (70 and 100 denier)

Results and Discussion

Results of experimental tests carried out on the produced samples were statistically analyzed and presented in the following tables and graphs.

It is clear from the diagrams and tables that regular hopsack2/2 has scored the highest rates of tensile strength , whereas satin 4 has scored the lowest rates, and this is for the sake of that regular hopsack2/2 structure has the advantage of being stronger than other structures which means it has higher tensile strength.

It was also found that the more yarns per unit area the more tensile strength the samples become, so samples with 130 end per cm and 120 pick per cm have recorded the highest rates of tensile strength, whereas samples with 90 end per cm and 80 pick per cm have recorded the lowest rates of tensile strength..

Elongation

It is obvious from the diagrams that satin has recorded the highest rates of elongation , whereas regular hopsack 2/2 has recorded the lowest rates . we can report that because regular hopsack 2/2 is stronger ,so its resistance to slippage under load will also increase leading to the decrease in fabric elongation.

It is also clear from the diagrams that there is an inverse relationship between number of ends and picks per cm and elongation. This is mainly due to that the increase in yarn set per unit area means that contact areas between yarns will increase and its resistance to slippage under load will also increase leading to the decrease in fabric elongation.

Abrasion resistance

It is obvious from the results that regular hopsack 2/2 has recorded the highest rates of abrasion resistance (lost weight and thickness ratio), followed by twill 2/2 whereas satin 4 has recorded the lowest rates, but the differences were insignificant.

It is also clear from the diagrams, that there is a direct relationship between number of picks per cm and abrasion resistance. This is for the sake of that the increase in number of picks/cm cause fabrics to be more compacted leading to the increase in fabric abrasion resistance .

We can also notice that samples made of 70 denier have obtained the lowest rates of abrasion resistance , whereas samples made of 100 denier have obtained the highest rates. This is probably due to that the more diameter the yarns get the more increased cover factor the fabric become which leads to a more compacted fabric and so its resistance to abrasion will be increased.