Supervisor's opinion on PhD thesis of Muhammad Zubair, M.Sc.

Date: 02-02-2017

Thesis title: Tensile Behavior of Staple Spun Yarns

Doctoral scholar: Muhammad Zubair

The thesis titled "Tensile Behavior of Staple Spun Yarns" submitted by Muhammad Zubair, M.Sc., fulfills the objectives mentioned in his thesis. The work is comprehensive and shows the analytical ability of Mr. Muhammad Zubair in evaluating the theoretical and experimental results obtained. He has numerous publications regarding his dissertation theme in impact factor journals.

The work includes the analysis of stress-strain curves of fiber and staple spun yarns. The study of staple spun yarns is somehow difficult because of discontinuities in such yarns. Many experiments for different types of natural, regenerated and synthetic fiber yarns were performed to produce mean curves from fibers and yarns. In this study, the different types of viscose, cotton, polyester, wool and acrylic yarns were used. Viscose, cotton and polyester spun yarns were used from ring and rotor technologies and these yarns have many applications in woven and knitted fabrics. The wool and acrylic yarns were produced from only ring technology because of limitations.

The focus of study is the evaluation of experimental coefficient of fiber stress utilization for the mentioned yarns. Four types of models: Gegauff, single integral, k time single integral and double integral were used for prediction of coefficient of fiber stress utilization. Results reveal that coefficient of fiber stress utilization considering real fiber stress-strain function and fiber orientation are in good agreement with the experimental results. From the concept of theoretical coefficient of fiber stress utilization, the yarn specific stress-strain curves were also predicted which were in reasonable agreement with the experimental yarn specific stress-strain curves. Only for polyester yarn a very small value of parameter C and empirical constant k have to be used which might be the result of slippage among the fibers and the problem might be studied up to microscopic level in future. The effect of slippage was not considered in the model so coefficient of fiber stress utilization can be predicted before the breaking process of yarns. In future the mathematical model can be modified for prediction up to the point of break in staple spun yarns.

The thesis is written in clear English and the quality of graphs and tables is very good and they were well analyzed. The overall quality of thesis is very good and I recommend it for defense.

Prof. Ing. Bohuslav Neckář, DrSc.
Supervisor