MECHANICS OF SINGLE JERSEY LOOP FORMATION

by

SUBRATA GHOSH

Department of Textile Technology

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CERTIFICATE

This is to certify that the thesis entitled 'Mechanics of single jersey loop formation', being submitted by Mr.Subrata Ghosh to the Indian Institute of Technology,Delhi, for the award of the degree of DOCTOR OF PHILOSOPHY in Textile Technology, is a record of bonafide research work carried out by him. Mr.Subrata Ghosh has worked under my guidance and supervision and has fulfilled all the requirements for the submission of this thesis, which to my knowledge has reached the requisite standard.

The results contained in this thesis have not been submitted, in part or full, to any other University or Institute for the award of any degree or diploma.

Dr.P.K.Banerjee
Assistant Professor
Department of Textile Technology
Indian Institute of Technology,Delhi
Hauz Khas,New Delhi-110016.

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Subrata Ghosh

-SUBRATA GHOSH

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ABSTRACT

The study of mechanics of loop formation process is a subject matter of fundamental importance aimed at understanding the complex interaction of various parameters in determining length of loop as well as knitting tension. Preliminary investigations, carried out at the outset to identify the relevent critical parameters affecting loop formation process, have revealed the necessity of establishing relation between force determined dynamic geometry and some yarn, machine and process variables.

A mathematical model of single jersey loop formation has been subsequently formulated based on the knowledge gathered from foregoing observations as well as report of research work published in literature. The initial geometry of knitting zone, contribution of take down load and force required to move the needle have been incorporated in this model. This model is based on the principle that loop length is decided by the height beneath the sinker/verge line to which a needle is pulled up by the tension in yarns of the loop.

A computer programme, based on the model of single jersey loop formation process has been developed for predicting the effect of some relevent yarn, machine and process variables on loop length as well as the resulting yarn tension profile inside knitting zone. The developed model has been validated qualitatively (by generating 231 data for different

combinations of relevent variables) in terms of loop length and yarn tension profile inside knitting zone and quantitatively (72 experimental data) in terms of loop length. A very good correspondence suggests both qualitative and quantitative validity of the model.

The analysis of loop forming system has thrown some interesting light on the relationship between some yarn, machine and process variables and the output of the loop forming system.

In order to enable a quicker and easier but approximate estimation of loop length a geometrical tool has been developed. A satisfactory predictive power of the tool is observed in so far as the limited set of experimental and theoretical data could be put to test accuracy of the same.

C O N T E N T S