

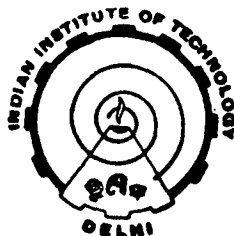
MECHANICS OF SINGLE JERSEY LOOP FORMATION

by

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A thesis submitted
in fulfilment of the requirements
for the award of the degree of
DOCTOR OF PHILOSOPHY



to the

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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.



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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 relevant 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 relevant 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 relevant 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 quick 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

	Page
A LIST OF NOTATIONS	viii
CHAPTER I : GENERAL INTRODUCTION	1
CHAPTER II: LITERATURE REVIEW	4
CHAPTER III : PRELIMINARY EXPERIMENTAL INVESTIGATIONS	
3.1 Introduction	24
3.2 Modified expression of theoretical loop length.	25
3.2.1 Derivation for sinker body machine	27
3.2.2 Derivation for verge type of machine	28
3.3 Relation between robbing back and knitting zone geometry	30
3.4 Experiments for identifying machine and process parameters affecting loop length	32
3.4.1 Machine	32
3.4.2 Yarn	34
3.4.3 Experimental Details	34
3.5 Experiments for investigating into loop formation process beyond knitting point	34
3.5.1 Machine	34
3.5.2 Yarn	35

3.5.3 Measuring equipments	35
3.5.4 Experimental Details	36
3.6 Results and discussion	36
3.6.1 Machine and process parameters affecting loop length and robbing back	36
3.6.2 Effect of knitting zone geometry on robbing back	38
3.6.3 Loop formation process beyond knitting point.	30
3.6.3.1 Upthrow Cam operative	39
3.6.3.2 Upthrow Cam inoperative	40
3.6.3.3 Loop forming point	41
3.7 Conclusions	42

CHAPTER IV: MATHEMATICAL MODEL OF THE LOOP FORMATION PROCESS

4.1 Introduction	44
4.2 Assumptions and Abbreviations	44
4.3 Initial system of knitting elements & yarn	46
4.3.1 Ignoring yarn, needle and sinker dimensions	46
4.3.1.1 The Stages	46
4.3.1.2 Initial yarn-needle contact point	48
4.3.1.3 Initial yarn-sinker contact point	49
4.3.2 Considering yarn, needle and sinker dimensions	51
4.3.2.1 The stages	51

4.3.2.2	Initial yarn-needle contact point	51
4.3.2.3	Initial yarn-sinker contact point	54
4.3.3	Angle of Wrap	55
4.4	Role of the cast-off loop	58
4.4.1	Expression of force components q_1 and q_n	58
4.4.2	Contribution of forces q_1 and q_n towards tension in leading & trailing arms	64
4.5	Forces opposing needle movement beyond knitting point	66
4.6	Formulation of the model	67
4.6.1	Determination of yarn tension and yarn length due to change in coordinate of needle.	67
4.6.1.1	Coordinate of needle after displacement	68
4.6.1.2	New geometrical length	69
4.6.1.3	Change in tension in yarn due to change in geometrical length	69
4.6.1.4	Change in tension in yarn segment due to flow of yarn	70
4.6.2	Method of determination of final loop length and tension profile	71
4.6.2.1	Generalised formulae	71
4.6.2.2	The approach	72
4.6.2.2.1	Needle locus along cam profile beyond knitting point	75
4.6.2.2.2	Indeterminate needle locus beyond knitting point	78

CHAPTER V:	VALIDATION OF THE MODEL	
5.1	Qualitative validation	80
5.1.1	Approach	80
5.1.2	Effect of relevent parameters on loop length	82
5.1.3	Effect of relevent parameters on needle force in knitting zone	84
5.2	Quantitative validation	86
5.2.1	Approach	86
5.2.2	Measurement techniques	87
5.2.2.1	Measurement of Q	87
5.2.2.2	Measurement of coefficient of metal to yarn friction	88
5.2.2.3	Measurement of coefficient of yarn to yarn friction	89
5.2.3	Discussion of results	89
5.3	Conclusions	92
CHAPTER VI:	ANALYSIS OF THE MODELLED SYSTEM	
6.1	Introduction	93
6.2	Dependence of control variable on input parameters	93
6.3	Effect of Cam shape in selective combination with cam setting and input tension	96
6.4	Effect of Cam seting and input tension in selective combination with Cam shapes	96
6.5	Sensitivity of system	98

6.6	Needle movement beyond knitting point	98
6.7	Conclusions	100

CHAPTER VII: GEOMETRICAL TOOL FOR ESTIMATION OF
LOOP LENGTH

7.1	Introduction	102
7.2	Geometrical band of loop forming point	102
7.2.1	The Background	102
7.2.2	The tool	106
7.2.3	Experimental verification of the tool	108
7.2.4	Theoretical validation of the tool	109
7.3	Conclusions	110

CHAPTER VIII:	SUMMARY AND CONCLUSIONS	111
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REFERENCES