CHAPTER I

INTRODUCTION

1. INTRODUCTION:

The Advent of Texturising process in the textile field, has moved the world into a new era of Texturising technology. It has made continuing efforts made towards acquiring spun yarn like characteristics successful. Thus synthetic yarn has overcome from their limitations and along with their favourable characteristics got an excellent place in the field of various textile applications. The present development phase in texturising therefore does not aim for greater production volumes but for access to new applications. This demands development of newer concept of texturising, versatile in terms of raw-material and capable of producing yarn with desirable texturising characteristics to suit the need of various end users.

False-twist texturising remains the most important process when one considers both the tonnage and the number of installed spindles. The superb stretch properties that can be obtained by using polyamide continuous-filament yarns and the excellent performance properties, including those of 'ease of care', that textured polyester continuous filament yarn imparts have ensured the process a major role in the textile industry. But the greater mobility of the zero-twist but twist-lively structure of this textured yarn make it suitable for weaving only after plying or intermingling. When the continued dynamic development of synthetic fibers demands that more attention to be paid to the use of textured yarn in weaving, such delay is undesirable. As it is prone to add up variations as well as cost to the product. Even limitations are imposed in terms of raw material utilization due to thermodynamic mode of the process.

The air jet texturising process, known since 1951, also produces yarns whose morphology predestines them primarily for weaving. This special structure with close resemblances to preferable spun yarn characteristics make it versatile for wider domain of application. Mechanical mode of manufacturing has also lifted up the binding of use of thermoplastic feeder yarns. But the use of costlier compressed air in the manufacturing process has adversely affected economy of product due to increased maintenance and storage.

Preferable performance properties and economy of false-twist textured yarn as well as special structure and characteristics of air jet textured yarn has directed the interest in the development of innovative concept of mechanical crimp texturising. The good combination of favourable features of both the well established production principles is used in this new concept of texturising. False-twisting media is used to impart crimpy configuration to flat multifilament yarn but unlike to false-twist texturising in the absence of heat. Such newly attained configuration of flat pre-twisted feeder yarn is retained by real twist and intermingling of curls, similar to air jet texturising. Since purely mechanical means are utilized for imparting crimpiness to flat feeder yarn and locking it, nomenclature of 'Mechanical Crimp Texturising' is given to this innovative concept of texturising, so established.

On the basis of the postulated bulking mechanism, suitable machine components were identified after passing through number of experimental trials in the first phase of the study. Ultimately desired mechanical crimp texturising apparatus was designed.

The expected product yarns structure can be identified on the basis of production principle utilized. This presumption has been verified by conducting pilot trial on such established lab apparatus in the second phase of experimentation. On the basis of analysis of product yarn structural characteristics obtained, test procedures for the measure of important texturising and mechanical quality parameters were identified.

The relationships between the technological parameters of newly designed texturising and the yarn properties have not yet been clarified. So, it was set up as the aim of the third phase of research activity to clarify the obscure details. Effect of various process variables, viz; false-twist level, pre-twist level, bulking zone length and texturising speed on the performance of the product was studied. Preferable bulking zone length and texturising speed values for the laboratory module were precluded experimentally.

Magnitude of false-twist plays an important role in deciding the size and intensity of curls. They have direct impact on the texturising properties of new product. This finding of the experiments had initiated the efforts made for the development of empirical formula for the evaluation of optimum false-twist value for newly engineered textured -yarn. Heberlein Advanced formula developed for false-twist texturising was first modified experimentally during this course. On the basis of the same experimental results new empirical formula has also been designed by using mathematical programming.

Chemical constitution and basic characteristics of the raw material has a greater influence on the bulking process. Thereby in the later stage response of various material variables to the texturising qualities were analyzed. Optimised process variables for lab apparatus were adopted during this study to avoid undue overlapping of effect.

Looking at the need of throwsters for defining targeted group of end users, newly engineered yarn was checked for its performance during weaving and finishing by using them as weft. Comparative evaluation was carried out between fabrics woven and dyed under identical condition with equivalent flat, false-twist textured and newly textured weft-yarns. In order to study the effect of post heat setting on the performance of newly designed yarn, selected textured yarns were also post heat set before inserting as weft. In inclusion to tube knitting and dyeing test knitted hoses of parent as well as textured yarn were checked for their constructional parameters. Even for the confirmation of pre-twist level on the bulk of the optimally false-twisted yarn, the respective knitted hoses were also checked for their bulk value.

Cost-structure of newly developed product along with its quality performance has been diagnosed with respect to commercially adopted systems in the respective field. However in the present study new concept of texturising was restricted up to lab apparatus only. So it's quite worthy to give due considerations to all the changes took place in the cost-structure of various contributing factors when lab apparatus will be launched as full-flange shop floor production unit. Mechanical mode of texturising became a barrier for attaining higher production rates as if true today for air jet texturising. But while determining feasibility of its commercial success its versatility in terms of raw materials should not be ignored.