FUNDAMENTALS *of* SPUN YARN TECHNOLOGY

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Dedication

to Mary

Preface

The fundamentals of spun-yarn technology are concerned with the production of yarns from fibers of discrete lengths and the structure-property relation of the spun yarns. Ever since humans moved from using the skins of hunted animals for clothing to farming and using farmed animal hairs and fibers from nonfood crops, and eventually to the manufacture of synthetic fibers, the spinning of yarns has been of importance to (initially) the craft and (subsequently) the science, design, and engineering of textiles.

This book is aimed at giving the reader a good background on the subject of the conversion of fibers into yarns, and an in-depth understanding of the principles of the various processes involved. It has become popular among some textile technologists to view the subject area as *yarn engineering,* since there are various yarn structures that, with the blending of different fiber types, enable yarns to be constructed to meet specific end uses. It is therefore necessary for the yarn engineer to have knowledge of the principal routes of material preparation and of the various modern spinning techniques. These topics are covered in this book. A distinction is made between the terms *spinning method* and *spinning technique* by referring to a technique as an implementation of a method, and thereby classifying the many techniques according to methods. The purpose is to try to get the reader to identify commonality between spinning systems, something that the author has found useful in carrying out research into new spinning techniques.

With any mass-produced product, one essential requirement is consistency of properties. For yarns, this starts with the chosen fiber to be spun. The yarn technologist has to understand the importance of the various fiber properties used in specifying raw materials, not just with regard to the relation of fiber properties to yarn properties, but especially with respect to the effect of fiber properties on processing performance and yarn quality. These aspects are given careful consideration in various chapters throughout the book. An understanding of the meaning *yarn quality* is seen to be essential; therefore, some effort is devoted to explaining the factors that govern the concept of yarn quality.

Textile designers prefer to use the term *yarn design* rather than *yarn engineering,* since the emphasis is often on the aesthetics imparted to the end fabric as opposed to any technical function. Fancy or effect yarns, blends of dyed fibers of different colors, and the plying together of yarns are important topics in yarn design, and the principles and processes employed are described in this book.

The material presented is largely that delivered over many years of lecturing and is arranged to be suitable for readers who are new to the subject as well as those who are familiar with the technology and may wish to use this book as a reference source. A basic knowledge of physics and mathematics will be helpful to the reader, but is not essential, since a largely descriptive approach has been taken for the

majority of the chapters. The few chapters that may be considered more mathematically inclined present a more detailed consideration to a particular topic and should be easily understood by anyone who has studied physics and mathematics at the intermediate level.

Chapter 1 gives a suitable introduction to the subject area by outlining much of the basic concepts and discussing what technically constitutes a spun yarn. Chapters 2, 3, 5, 6, 7, and 9 should cover most topics studied by technology students up to graduate level, and Chapter 9 collates material that has been delivered as a module component largely to design students. Chapters 4 and 8, and some areas of Chapter 6 that deal with yarn structure-property relation, have been used as topics within a Masters-level module. Although, at the advanced level of study, programs are mainly based on current research findings, some areas of the earlier chapters may prove useful for conversion candidates.

Throughout the book, definitions are used, where appropriate, in an attempt to give the reader a snapshot of a particular technical point or topic, which is then explained in greater detail. It is said that a picture is worth a thousand words, and in dealing with technical concepts, this is a truism. The reader will find, therefore, that effort has been given to fully illustrating the substance of each chapter, and the author hopes that this makes the book a pleasant read for you.

Author

Carl Lawrence, B.Sc. (Applied Physics), Ph.D., is Professor of Textile Engineering at the University of Leeds and was previously a Senior Lecturer at the University of Manchester Institute of Science and Technology. Before joining academia in 1981, he worked for 11 years in industrial R&D. Many of these years were with the former Shirley Institute, now the British Textile Technology Group (BTTG). In 2002, he was awarded The Textile Institute's Warner Memorial Medal for his contributions to investigations in textile technology — in particular, unconventional spinning systems. He is the author of many research papers in the field of yarn manufacture and has several patents in the area of open-end spinning.

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