Yarn texturing technology

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Preface

In 1946, when I started my career in textiles, nylon, which had come to the market less than ten years before, was virtually synonymous with parachute fabrics and 'nylons', the ladies' stockings first brought to Europe by American servicemen. Polyester was being explored in laboratories for competitive uses. Both were flat, continuous yarns, densely packed in fabrics. Over the next few years, nylon and polyester appeared in other markets. Wash-and-wear was an attraction and so, when I went on a Fellowship to South Carolina in 1953, I bought nylon and polyester shirts, socks and underwear – all made of fabrics that would be unacceptable today, because of their poor comfort and appearance.

It was in South Carolina that I first came across texturing. Hugh Brown, a highly inventive physicist, who had become Dean of Textiles at Clemson, was exploring texturing by running nylon yarn over a hot wire. A few miles away Deering-Milliken researchers were developing edge-crimping, and from Switzerland we heard of the long process for twist texturing. When I returned to Manchester, I introduced textured yarns into my lectures, and, with Malcolm Burnip and Gordon Wray started research into the relation between process conditions and yarn structure and performance in false-twist texturing. This research continued in various ways until I retired from UMIST in 1985.

Like many of the major advances in textile manufacturing, starting with Arkwright and cotton spinning 200 years ago, texturing has led to fierce patent litigation. I learnt a great deal from tests and studies in my role as an expert witness. I wrote thousands of pages of affidavits, but never went on the witness stand in person. Apart from opposition proceedings on a variety of patents, I was active in three phases of law-suits. First, on a Stoddart and Seem patent, which applied to single-heater false texturing for stretch yarns. This started with a threats action against Fluflon Ltd and continued with infringement actions until it petered out. Second, on another Stoddart and Seem patent, which covered double-heater, false-twist texturing for set polyester yarns. This led to a re-examination of the patent by

the US Patent office, almost 20 years after its priority date, and eventually to two trials in Florida. Third on the DuPont Petrille patent for POY yarns, the feed-stock for draw-texturing: a case in India died for want of prosecution after running for a few months, first with oral evidence and then with affidavits, and DuPont versus ICI was settled just before it was due to open in the High Court in London. There were other cases, with which I was not involved, notably a trial in Canada in the1950s on stretch yarns and one in USA in the 1970s on set yarns with Milliken and Burlington as the main opposing protagonists.

My co-author, Keith Wilson, as a student in the Faculty of Technology of the University of Manchester, was introduced to textured yarn technology by my lectures. He then went on to a career in the fibre and textile machinery industries, which progressively took him closer first to false-twist texturing and then to air-jet texturing. Our other co-author, Les Hollick, has a great depth of experience in the manufacture of textured yarns.

For physicists, like myself, working in an academic environment, there is a great temptation to concentrate research on problems that are interesting – and amenable to mathematical theorising or neat experiments – but in industrially related departments, it is important that even basic research should add useful insights to commercial operations, either current or with future potential. Les Hollick makes a similar comment about the place of technologists in business in the following words:

> The aim of any manufacturing organisation, no matter what business they are engaged in, is to secure a positive return on investment. A healthy balance sheet benefits the owners, the shareholders or, in the case of a co-operative, the workers themselves. If any organisation is to have sufficient funds to secure full employment and to provide for future investment in plant and equipment, concentration on running a viable business is required. It is very tempting for the technologist to pursue work purely because it is exciting or interesting. If time permits this is fine, but first and foremost continual concentration on product and process improvement is required. This does not mean that such work cannot be fun; far from it, if the work itself becomes mundane and tedious then it is time to find alternative employment.
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> It is the function of the technologist to examine every detail of the process, the design of the machine itself, the quality and suitability of machine components and ancillaries that are employed, as well as obviously, the quality of the feedstock and the process conditions employed. These must be carefully evaluated to ensure that they are the best available at economic cost. The elimination of sub-standard product and the maximisation of yield of first quality product, which can be sold at a competitive price and still be viable, is of paramount importance.

Communication between the technologist and those directly involved with the manufacture of the product, at all levels, must be simple and clear. The temptation to escape into jargon must be avoided. It used to be sufficient to 'speed up the traverse system to cure some overthrows'; now unfortunately it's all to easy to 'realise an increase in the angle of wind in order to secure optimum packaging conditions'. These statements may be impressive, but no one else in the room will have any idea what you are talking about. Clear and concise communication and the ability to motivate others to strive towards a common goal is a skill every bit as important as technical prowess.

Finally, it must never be forgotten that the contribution by well trained and well motivated operatives, who understand the importance of correct yarn handling and operating procedures, is one of the greatest assets that any company involved in the manufacture of yarn can have. Constantly keeping the workforce up to date with the current situation and what improvements are to be implemented is one aspect of the technologist's work that cannot be ignored.

In this book, we hope that the combination of authors, who range from the detached academic to the involved technologist, has enabled us to provide for students, teachers and the yarn texturing industry, both an explanation of relevant scientific and engineering principles and a wealth of information on industrial practice.

John Hearle

About the authors

J W S Hearle

John Hearle graduated in physics from the University of Cambridge. His course was interrupted for three years from 1945 to 1948, during which he became a research officer at the Shirley Institute – British Cotton Industry Research Association. In 1949, he joined the Manchester College of Technology (now UMIST) as an Assistant Lecturer. He remained on the Faculty until he retired in 1985, having been Professor of Textile Technology and Head of the Department of Textiles since 1974. Professor Hearle is still active in consulting, writing and lecturing, with the occasional contribution to original research. He has been a Smith-Mundt Fellow at Clemson, South Carolina, a Visiting Associate Professor at MIT, and a Distinguished Visiting Professor of Mechanical Engineering at the University of Delaware. John Hearle is an Honorary Fellow and Honorary Life Member of the Textile Institute, and a former Chairman of Council, and a Fellow of the Institute of Physics.

L Hollick

The only justification that is held for contributing to this book is experience; Les Hollick has worked in several different aspects of the textile industry. He started work in Courtauld's Synthetic Fibres Laboratory in 1969 and worked there for a period of ten years. Several different aspects of the textile trade including spin finish development, wet spun modacrylic fibres, draw twisting, stuffer-box texturing and false-twist texturing of nylon and polyester fibres for both carpet and apparel end uses were covered. After leaving Courtaulds Les Hollick worked for a brief period of time with Snia Viscosa, now Nylstar, in the spinning, draw twisting and beaming of nylon 6. Since leaving Snia, he has been employed with Unifi on the development of yarn products and machinery for nylon and polyester draw-texturing, air-jet textured yarns and two-for-one twisting.

D K Wilson

After graduating from UMIST in textile technology, Keith Wilson worked initially for ICI Fibres both in the UK and USA. During this time he was employed variously as a maintenance, project and services engineer in plants producing nylon, polyester and polypropylene filament yarns, and as an R & D Engineer engaged in the development of polyester tyrecord. A transition to yarn texturing with Viyella International was followed by a move to the textile machine industry, at first with with Platt Saco Lowell. He then moved to Switzerland and a position as Head of Sales with Heberlein. Here the Management Team, of which he was a member, took the decision to diversify the company's product range by adding air-jet texturing to the existing and well established false-twist texturing technology. In 1979 Keith Wilson returned to the UK to start his own business which was (and still is) engaged with the sale, service and development of key modules for the fibre and yarn processing industries. More recently test instruments for yarns; fibres and polymers were added to the product range.

Contents