

New Double Jersey Machine Applications And Fabrics For Other End-Uses

BY F. STRASSER (Nova Jersey Knit), V. KARMOS and K. LAZAR (Habselyem Knitting Mills, Budapest)

ONE PRESUMES there are still several of us who remember the knitting boom of the Fifties and Sixties. This period was a golden age not only for weft knitting machines and knitwear but also for warp knitting as well. By this time the English-made FNF Superline tricot machine had reached 1,000 r.p.m. and the fashion for nylon shirts and nylon underwear was sweeping the market.

Little did we know of the problems to come! At the beginning of the seventies warp knitters were worried not only by the constantly increasing interest of customers in fabrics produced from textured or spun yarns and by the simultaneous reduction, and even cessation of demand for certain formerly fashionable warp knitted goods but by a new competitor — fine gauge circular knitted fabrics.

This was really a natural consequence of the fact that consumers abandoned not only the warp knitted nylon shirt but also the formerly very popular double jersey products produced on 18-20 gauge circular knitting machines. To sell their circular knitting machines the machine builders were forced into action. Circular machines of 28 gauge and even finer were introduced to process spun yarns more simply and easily than warp knitting machines. Thus a new generation of fine gauge circular knit fabrics, equally suitable for underwear and outerwear, appeared on the market.

So much for knitted fabric history over the past few decades, but a few words might be said of the effect of this trend on Hungarian production. Hungary is a small country having no more than 10 million inhabitants, with no knitting machine building and with a small man-made fibres industry. The knitting industry is nevertheless highly developed and centralised with 10 companies producing 80-90 per cent of Hungarian-made knitted goods.

One of the largest Hungarian knitting companies, presently employing about 4,500 people against a few hundred formerly, with a yearly production of about 20 million garment pieces is

Habselyem Knitting Mill. It was originally founded in 1923 by the Holitscher family and its products and brand name "Excellent" were already well known in the Thirties in Britain as well as other countries. Having its knitting and finishing works in Budapest and garment-making plants in 12 Hungarian centres the company was, until the mid-seventies, a typical warp knitting mill. Using modern tricot and raschel lace machines it produced around 10 tons of fabric a day from viscose rayon and polyamide filament yarns. From these fabrics men's shirts and women's lingerie were made in the garment-making units.

As a result of the warp knitting crisis the company transformed its manufacturing programme. It maintained its traditional warp knitting profile but was resolved to equip itself as well to produce fine gauge jersey fabrics. To this end a close co-operation was developed between Nova Jersey plc and Habselyem Knitting Mill.

The first contract of co-operation, valid for 5 years, was — with foreign trade companies intervening — signed in 1976 and prolonged for a further 5 years in 1981. The contract includes three basic arrangements, as follows:

Nova Jersey Knit plc sells 28 gauge second-hand circular knitting machines to Habselyem Knitting Mill and assists in setting them up and in starting the new production line.

Habselyem purchases the know-how for the production of fine gauge branded fabrics developed by Nova Jersey together with the license for producing them and in addition buys a certain quantity of these fabrics from Nova Jersey.

Nova Jersey, having no garment-making facilities, re-purchases a part of the readymade garment production manufactured at Habselyem from its own fabrics according to valid import possibilities.

This collaboration has proved successful. The circular knitting section founded with British help produces excellent goods and the co-operation of the

two companies has resulted in the constant development of new product ranges.

Establishment of the co-operation between the British and Hungarian companies was made possible because Nova Jersey recognised at the right time the possibilities inherent in 28 gauge circular knitting machines. This company had previously produced 18-20 gauge jersey fabrics on more than a hundred such machines. In the mid-seventies it introduced a computerised pattern preparation system and exchanged a number of its machines for 28 gauge types. After much development work Nova Jersey began production of their well-known fabrics Novaslim, Novagab, Novalure, Nova-T etc. At this time, however, there still remained nearly a hundred of the 18-20 gauge Wildt Mellor Bromley 14 RJ type jacquard knitting machines in their possession. They could not have sold these economically because of the low prices and slack market. The task was then that these machines should be converted into 28 gauge units.

Twin Problems

When considering re-equipping, Nova Jersey was faced with two twin problems:

1. The need for a larger pattern area than that available on mechanical jacquard machines.

2. The need to re-equip with 28 gauge machines, following a trend towards these very versatile machines.

As an added bonus and indeed only by hindsight we discovered that by being participants in the design, building and conversion of these machines we learned an enormous amount about fine gauge double jersey fabrics since we were, if you like, at the same time machine builders as well as machine users.

To achieve our objective we looked at our options at the time and decided on converting 18 gauge Bentley machines to 28 gauge, partly because we had the equipment and, not least of all because having been Bentley machine users literally for decades we wished to stay within the

Bentley "double jersey camp".

We discovered that, by using the existing Mark I pattern sleeves, albeit with some considerable refinements to the tolerance required on the 18 gauge sleeves, we could achieve a pattern width of 216 needles against the usual 144. From this starting point one of our endeavours, as mentioned previously, was that we needed sleeves which fitted the original Mark I spindles but had a much finer tolerance. We also had arranged to have specially made for us discs with 108 "bits" on top as well as bottom discs to achieve our required pattern area when using 28 gauge cylinders and dials.

We realised early on that we had to see that all operating parts of the re-gauged machines worked to a tolerance acceptable in 28 gauge and therefore replaced all the drive shafts and actual thrust washers.

Fortunately the same size jacks and pressers can be used as in an 18 gauge Mark I machine whilst the needles for 28 gauge had naturally to be slightly redesigned for our purpose.

We fitted spring loaded clearing cams in the cylinder in addition to the existing cams and fitted jack selection rings which, unlike those on the Mark I's we were converting, allowed the jacks to travel down independently of the needles thus ensuring that there were no "sticking jacks".

All drum spindles on the pattern selection units were rebushed to allow the fine tolerances required from a 28 gauge machine. New thread guides had to be designed which, after some experimentation, proved to be very efficient. The dial blister cams had also to be redesigned to allow the use of 28 gauge needles.

All machines were equipped with 10 jet electrostatic vapourising oilers worked from a central compressor. Indeed the amount of oil and the correct application of oil is, if anything, the real secret of running these converted machines. Special attention had to be given to recalibrating all existing camboxes to an extremely fine tolerance.

Without wishing to bore you entirely but nevertheless to show that, beyond getting the right shape and well-made 28 gauge dials and cylinders and attending to all the problems both foreseen and unforeseen as previously outlined the following is a short summary of what the assembly of such a machine entails. From this it will be seen how we learned so much about knitting machines during our rebuilding or re-gauging of the Bentley Mark I machines.

In essence we simply put together all the ideas and problems which we had to solve in the design stage. This resulted in a 28 gauge machine which has the largest pattern area of any mechanical machine made.

There are 21 major steps during re-gauging which include the removal of camboxes, camplate sections, knitting elements and sighting shafts. Whilst also on the "removal" side, removing complete dial housing, central pattern units, presser retaining rings, jack retaining

rings, cambox support ring and, last but not least, the old cylinder. Subsequently there is cleaning of the cylinder head wheel assembly and replacing, if needed, plus refitting this as well as the new cylinder. It is necessary to clock the cylinder to 0.003", maximum concentricity, replace the cambox support plate, and centralise the cylinder.

We then carry on reassembling the machine, not forgetting to check the large gear on the dial hub assembly before replacing same. Once all is checked and refitted the machine reassembler or "builder" now becomes the knitter who, by gradually knit-testing the machine will discover and re-adjust all the complex, and to you well known parts of a double jersey knitting machine which can cause problems.

It is at this point that a good knitting mechanic becomes a really exceptional knitting mechanic as he gradually comes to understand in practice what each of the parts individually and jointly has to contribute before this extremely complex piece of machinery — at the same time to we knitters a simple piece of machinery — runs correctly.

According to the contract of co-operation between the two companies Habselyem purchased its first 28 gauge mini-jacquard double jersey machines from Nova. Also the basic fabric structures were chosen so as to start utilisation of Nova Jersey's know-how in production.

The first fabrics were as follows:

Plain interlock structure from textured polyester set yarns (Novaslim).

Plain interlock structure from spun polyester yarns (Nova-T).

Relief-patterned gabardine imitation in blister stitch structures made of two types of textured polyester set yarns in two yarn combinations (Novagab, Supergab).

After some years further machines were taken over, this time not mini-jacquards but full jacquards, as the result of the conversion previously described. On these machines more complex patterns can be produced and Habselyem therefore equipped itself to manufacture the following articles in this genre:

Two fabric varieties patterned by the random distribution of needles remaining in the welt position slightly resembling a tree-bark pattern (Novalure and Novalyn).

A fabric with a crêpe surface also produced by the random distribution of welt positioned needles (Novacrêpe).

These fabrics proved most successful both in Britain and Hungary. They allowed for multiple end product use both in underwear and outerwear. As one of the first successes of co-operation we can mention the Grand Prix 1979 of the Budapest International Fair for men's suits made of Novagab fabrics by Habselyem. A similar success was recorded in 1981 with nightwear and dressing-gown items made in Novalure.

Shortly after this our designers at Habselyem began to develop different versions based on the fabrics taken over

from Nova Jersey. The most obvious route was to maintain the original fabric structure and produce novel effects by substantial alteration of the yarn combinations. Here the following products have proved most successful.

A fabric with longitudinal stripes, developed from Novaslim by alternately threading yarns of different colours;

Varieties of the Nova-T fabric patterned by transfer printing (utilising the 100% polyester content) and using this cotton-like fabric for producing popular leisurewear products.

A Supergab-based fabric made with covered elastane yarn for producing stretch trousers.

In addition to variations on the original Nova Knit fabrics, those produced on the machines purchased from Nova but developed with new knitted structure and pattern capability and, of course, the use of other yarns to give interesting effects are becoming more and more important.

By using Shantung-like textured polyester yarns a fabric range has been developed with a novel surface effect. This range is manufactured in several varieties: by missing needles; in combinations with conventional textured yarns; with cross-stripes and with metallic yarns etc.

By using air textured polyester yarns giving an effect similar to that of spun yarns a blister jacquard fabric has been designed, most suitable for women's dresses.

By the jacquard selection welt position of needles an underwear fabric has been developed from yarns spun with cotton content and with surface patterning.

We can consider some of the more interesting of these fabric types in more detail.

1. Supergab Elastane Modification

This Supergab version is a fabric with blister jacquard patterning and each course is a result of the co-operation of three knitting feeders. Habselyem's designers carried out experiments to find out which of the three feeders should most advantageously be threaded with covered elastane and which of the available elastane yarn types of different count and cover would allow the best stretch properties needed for trousers to be obtained.

According to the solution resulting from the experiments it proved successful to knit in the polyamide-covered elastane yarn together with Helanca-type textured polyamide 66 yarns. In a former experiment the elastane yarns had been knitted together with polyester yarns but the polyester and the polyamide content of the covered elastane yarn had been coloured differently, causing an aesthetic fault. Therefore the polyester content was also exchanged for polyamide. The finished fabric weighs 300 g/m². After five loading/deloading cycles, when the loading takes place under a power of 13N, the fabric has an elongation of 47.4%. In this construction the elastane content was 4.6%. According to wear tests such a fabric is suited for trousers

only when its residual elongation of 8-11% after stretching for 120 minutes can be reduced. For this purpose the amount of elastane yarns has been increased in further experiments.

This development trend fits well with Habselyem's development conception and opens up an interesting perspective for the company on the active sports outerwear market.

2. Shangung-Like Double Jersey

An obvious variation for double jersey fabric, which is constructionally simple, is to use fancy yarns. This possibility has been utilized by Habselyem's designers in applying Shangung-like textured polyester yarns in different varieties. Fabrics have been produced using this yarn alternately with conventional textured yarns, as well as combined with metallic yarns for lightweight dresses.

In one of the most successful varieties an interlock structure, combined with courses knitted on the cylinder only was used and the Shangung-like yarns and conventional textured yarns were threaded alternately. Knots in the fancy-yarn made knitting difficult and the 28 gauge knitting machine had to be set to maintain thread breakages within tolerable limits. The handle of the fabric is most agreeable, it has a beautiful drape and appearance, in all a quite special aesthetic effect.

In a further variety a metallic yarn was added to the fabric above. This item is produced undyed only as the metallic yarn used can not withstand the condition of polyester dyeing. The fabric as such is suitable for dresses of exclusive appearance.

In another variety the interlock structure combined with courses knitted only on the cylinder needles is retained as a basic fabric structure and combined with a needle set-out. Together with the Shangung-like yarns spun polyester yarns were used as well. The effect of the spun yarn makes himself strongly felt: the fabric has a soft handle and no longer has a synthetic character.

3. Air-Textured Yarns

Recently, textured polyester yarn types with protruding filament loops on their surface as a result of air-texturing, have attracted attention. Their appearance and properties derive from the extremely fine filaments and show some resemblance to spun yarns. Also at Habselyem we have been developed double jersey fabrics from such yarns and in two different directions: partly this yarn was used by itself to produce fabrics similar to those made of spun polyester yarns in appearance and properties. Partly they are being used instead of spun polyester yarns in fabrics made of a combination of conventional textured yarn and spun yarn e.g. in Novalure fabrics.

Experiments with the first variety showed that full replacement is not totally valuable. Although the handle, drape, physical and physiological properties of the fabric were very advantageous, they still differed from those of a fabric made

of only spun yarns. More successful was the spun yarn replacement in the second group of fabrics. Though the proportion of spun yarns was not more than 24 per cent, the appearance, handle and other properties remained practically unaltered when the spun polyester yarn was replaced by air-textured yarn. Consequently the replaceability is settled by the price of both kinds of yarn. In the calculation it is expedient to consider the fibre fly generated inevitably in knitting spun yarns, the air pollution and cleaning. This drawback does not occur with air-textured yarns and the knitting machine can be run at higher efficiency.

The air-textured yarn contains very fine filaments of 1.7 dtex compared with the 2.3-3.3 dtex filaments of the usual polyester yarns. This alone results in special handling properties. The effect has been used in a jacquard-patterned fabric to produce soft lightweight dresses with an extremely fine handle.

4. Miss Selection Patterning

Surface effects are popular in the circular-knit underwear range. Therefore a jacquard-patterned knitted structure has also been practically applied by Habselyem with patterning via the miss-positioning of needles. For these fabrics a cotton-type spun yarn was used for satisfying the physiological requirements so important with underwear.

Such a listing of the fabric types developed at Habselyem and partly based on the know-how taken over from Nova Jersey is far from being complete. Since 1976, i.e. since the existence of the co-operation, almost 160 fabrics have been developed at the Hungarian company and applied in their products. A considerable number of them are not however of the double jersey type. The machines are often used as single jersey types working only with the cylinder needles. The interlock needle setting remains unaltered and fabrics with dimensional stability can be produced. The appearance of the fabric is — as a consequence of the fine loops of the fine gauge machines — misleadingly similar to that of a true single jersey fabric. At the same time, however, independently of the co-operation with Nova Jersey, but using its experience, single cylinder machines have been installed as well.

Our aim with this article has been to give an account of how high level knitting technology established in Great Britain is being utilised in a Hungarian knitting mill. As a result the British knitting industry has been able to mobilise the imagination and talents of our Hungarian fabric designers. In turn the exercise has stimulated them to do excellent work. This interchange of ideas is all the more meaningful since in this way Habselyem, a warp knitting company by tradition, has been converted to a company producing circular knitted fabrics.

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