

PP

The Next 50 Years

- *Le prochain demi-siècle*
- *Die nächsten 50 Jahre*
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ALTHOUGH polypropylene resin was produced for the first time by Professor Giulio Natta in 1954, commercial production of the material by the **Montecatini** concern (now trading as **Meraklon SpA**) in Italy first began in 1957. This article, therefore, marks the 50th anniversary of the fibre's arrival on the market.

❶ **BIEN QUE** le professeur Giulio Natta ait produit de la résine de polypropylène pour la première fois en 1954, la production commerciale en Italie de celle-ci par **Montecatini** (devenue entretemps la **Meraklon SpA**) n'a commencé qu'en 1957. Cet article célèbre donc le 50ème anniversaire de l'arrivée de la fibre sur le marché.

❷ **OBWOHL** Professor Giulio Natta zum ersten Mal 1954 das Polypropylenharz produziert hat, begann die kommerzielle Fabrikation dieses Materials erstmals 1957

durch den **Montecatini** Konzern (inzwischen zu **Meraklon SpA** geworden) in Italien. Dieser Artikel widmet sich daher dem 50. Jahrestag der Ankunft der Faser auf dem Markt.

❸ **SEBBENE** la resina di polipropilene sia stata prodotta per la prima volta dal Professor Giulio Natta nel 1954, la produzione commerciale del materiale dalla **Montecatini** (ora in attività con il nome di **Meraklon SpA**) in Italia iniziò solamente nel 1957. Quest'articolo, pertanto, celebra il 50° anniversario dell'introduzione della fibra sul mercato.



Sanpellegrino by CSP (I) and Dryarn by Aquafil (I)

DESPITE some refinements brought to the fibre over the years, polypropylene remained the poor relation in the family of polymer fibres used in the apparel industry. Its functional image was one of the characteristics that prevented it from being taken seriously in the world of fashion. The fact that the

yarn rejects dyestuffs and has to be spun dyed was another major handicap.

A New Beginning

The apparel textile industry started to take a second look at polypropylene when **Aquafil**, a subsidiary of the **Bonazzi Group** in Italy, developed and launched a microfibre version of the fibre. Branded **Dryarn**, this combined an impressive array of benefits as a fibre for clothing textiles, despite the fact that it is spun dyed. As yet, no other company produces a PP yarn of comparable fineness and softness. Some sock knitters are currently using a yarn labelled **Mythlan** but the **Mythlan** web site was not functioning at the time of writing and it was not possible to obtain more information. In time, other comparable product might come on the market but by then **Dryarn** is likely to have become a generic name for apparel quality PP rather than a brand, just as **Nylon** became a generic name for PA. It is for this reason that, in the context of this article which focuses on bodywear textiles and hosiery, we refer to **Dryarn** as often as we

do to polypropylene.

Several qualities make the fibre particularly attractive for bodywear applications:

1. Light weight: with a specific gravity of 0.91, it is lighter than any other fibres, whether natural or manmade and even floats on water. Consequently, a garment or fabric providing a given coverage is lighter and more comfortable when knitted or woven with **Dryarn** than when made with other fibres.
2. Water repellent: with a water absorption capacity of only 0.05%, a small fraction of that of other synthetics, and high surface tension **Dryarn** allows extremely fast wicking and evaporation of moisture, or its absorption by another fabric layer. For the same reason, it dries very rapidly after wetting and this prevents the formation of mildew as well as the proliferation of bacteria which cause unpleasant odours. Its hydrophobic quality makes the fibre naturally bacteriostatic for the life of a garment.
3. Stain resistance: the high surface tension of PP also makes the yarn resistant to stains and dust which, because they remain on the surface of the fibre, can be washed away easily.
4. Chemical resistance: the fibre can be exposed to sunlight for long periods; it resists organic solvents, acid and alkali and is self-extinguishing after exposure to an open flame. It also shows remarkably good colour fastness.
5. Mechanical resistance: **Dryarn** shows a resistance to abrasion comparable to that of polyamide and much higher than that of other synthetic or natural fibres. This effectively prevents pilling and promises durability. The fibre also shows great dimensional stability, with less than 2 per cent shrinkage even after many washes.
6. Thermal insulation: the high insulating properties of the fibre, higher than those of wool, help to maintain constant body

temperature in extremes of heat or cold. This reduces the need for multi-layer clothing in extreme cold conditions and maintains freshness in hot weather.

Taken together, these qualities give Dryarn many advantages in intimate apparel, functional underwear and hosiery applications as well as in swimwear and sportswear.

Drawbacks and possible solutions

Probably the most widespread criticism levelled at PP fibre is that it cannot be dyed. Because the fibre has to be spun dyed, it gives rise to many problems associated with colour as perceived in the world of fashion. These include a limited range of shades in producers' collections, the necessity for the fibre producer to hold large stocks of fibre in order to be able to deliver specific colours as required, high minimum quantities for special colours, and the impossibility of producing ecru fabrics or garments for dyeing in response to demand. A further disadvantage is that, since the extruded fibre has no affinity for dyestuffs, fabrics cannot be printed.

Another, albeit less restrictive, weakness of polypropylene is that it has relatively low melting and softening points, respectively at 167°C and 145°C. and thus appreciably lower than PA, PE and EA. This reduces opportunities for blending. It also precludes ironing but this is of no importance as garments drip-dry perfectly for easy care. Further, because of the low melt point of the fibre, PP fabrics cannot be moulded when blended with standard elasthane. This forbids their use in seamless bra production when containing elasthane but the fibre can still be used to produce seamless garments and circular knit fabrics with differentiated modulus areas. Also, when blended with *Dow XLA*, a chlorine resistant stretch fibre that also features a low melt point, Dryarn can be moulded at the adequate low temperatures.

While nothing can be done to overcome the relatively low melt point, the limitations imposed by stock dyeing can be got around in many ways. In plain knitting, using two yarns of different colours can broaden considerably the range of shades found in finished fabrics or garments while producing a marled effect. At the same time, such technologies as Jacquard or intarsia knitting or dobby weaving can produce an adequately broad range of patterns. As an alternative to printed motifs, it is also possible to flock plain PP fabrics. Even though none of these solutions can provide the look of an all-over print, they can serve to broaden considerably the fashion potential of PP fabrics.

Past and Current Applications

One of the first applications of PP in the apparel field was for fast drying thermal underwear, often used by yachtsmen and divers. When Dryarn first appeared on the market in 2001, it was being demonstrated in the form of T-shirts and other items of underwear as well as men's socks. Swimwear was also suggested as a promising end-use, thanks to the fibre's rapid drying property. Since then, Aquafil has focused its Dryarn promotion mainly in the active sportswear and functional underwear sectors but individual knitters and manufacturers have continued to develop a broad range of products.

In the swimwear field, knitters **Vartes** in Italy have specialised in the production of seamless swimwear in Dryarn, mainly for the private label sector. For cut and sewn swimwear as well as sports underwear and other items of bodywear, **Piave Maitex**, also in Italy, have developed and recently improved their *Top Tex Dry* quality, a 95 g/m² fabric with excellent covering power knitted in 73% Dryarn blended with 27% Dow XLA. This fabric is also totally resistant to UV rays, chlorine and other chemical agents with which it is likely to come into contact and has proved very suitable for competition swimwear.

Still in Italy, **Maglificio Ripa** has produced a 130 gr/m² corsetry fabric using 78% Dryarn with 22% EA as well as a double face fabric for sports underwear with Dryarn on the inside and cotton on the outside; this exploits very effectively the highly effective moisture transport provided by PP. Maglificio Ripa's 44-gauge *Light® Dryskin* swimwear fabrics incorporating PP come in three weights, ranging from 105 to 250 gr/m² with up to 22% elastomer. Other Italian knitters using Dryarn include **Jersey Lomellina** with its *JL Respiro* fabric in 100% PP, **Brugnoli** with its *H2O* quality and **Borgini Jersey** with several articles incorporating the fibre.

In Switzerland, knitting specialists **Greuter Jersey** also use PP on the inner side of a double face fabric with cotton on the exterior and describes the fibre as ideal for functional underwear. Many other fabric suppliers elsewhere in Europe include Dryarn in one or more of their products.

As regards finished products, most leading manufacturers of functional underwear propose at least part of their collection made with PP, and the fibre has been particularly successful in the sports socks sector. Earlier this year, **CSP International** launched under the *Sanpellegrino Impact* label a range of men's underwear and hosiery in Dryarn and this launch could well mark the start of the fibre's expansion outside the sportswear sector. Meanwhile, Dryarn is also found in many collections of active sports outerwear

The Way Ahead

Its intrinsic qualities make PP a natural fibre for swimwear applications, especially when blended with an inherently chlorine resistant stretch fibre such as Dow XLA or PBT. Consequently, it can be expected to make considerable advances in the competition swimwear sector as well as more modest progress in the recreational swimsuit field.

The currently growing acceptance of PP in the sports underwear sector is likely to motivate consumers to seek the same comfort and wellbeing in everyday underwear. The same applies to socks; there is little doubt that when offered city socks in PP, consumers who have worn and appreciated sports socks made with that fibre will have no hesitation in choosing it in preference to all others. As regards lingerie and corsetry, the arrival on the market of the low-melt stretch fibre Dow XLA makes it possible to mould fabrics incorporating Dryarn. This opens up very promising opportunities because printing is of less importance in the lingerie sector than it is in the swimwear field. The growing concern about ecology also works in favour of PP which is totally biodegradable. Its main advantages, however, are its extreme light weight, its extraordinary moisture transport capacity, which favours wellness and comfort, its inherent bacteriostatic qualities that eliminate the risk of body odour and its thermoregulating capacity that make a major contribution to comfort. All these qualities, except for the strength of the wicking action and the lightness, can be obtained with other fibres when suitably treated or blended but are inherent in PP. This reduces costs and guarantees performance.

In the final analysis, however, it is consumers' experience and appreciation of the fibre's qualities that will determine the level of demand. The rapid and still growing acceptance of PP in the functional underwear field is largely due to very positive reactions on the part of consumers. On another level, and to explain the enthusiasm for PP shown by this writer, is his reaction five years ago when he first wore city socks knitted in Dryarn: since then, he has aimed to wear no others. Multiply this experience a few thousand times, spread reactions on the grapevine, and the exponential growth could prove most impressive. Of course, PP cannot possibly hope to displace all other fibres in the bodywear field, but its growth potential within this sector remains very considerable. ➔