

Merino

Wool

Knitwear Innovations

MERINO INNOVATIONS



This is a booklet of fact sheets about Merino wool innovations which have been developed by AWI, The Woolmark Company & its partners over recent years.

The driving force behind Merino wool innovations are the trends in consumer needs and attitudes because these needs and attitudes justify the extra cost of innovations. The key consumer trends associated with Merino wool knitwear in the second decade of the 21st century are:

VALUE

(luxury for less),
ie. Merino Touch

CARE FOR THE ENVIRONMENT

(reduced environmental footprint by using less energy, chemicals and water) ie. Merino Care

CASUALISATION

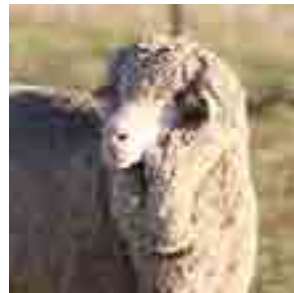
(less formal looks and textures) ie Merino Visual

Innovations can take many forms; for Merino wool wovenwear the focus is on adding value to the fibre, the yarn or the end product through innovation. Innovations can be introduced into Merino wool at any one of its stages in the manufacturing pipeline and indeed some of the innovations presented in this booklet can work at several places in the pipeline. Innovations take several forms, some can be thought of as mistakes or problems that have been transformed into a virtue or feature; other innovations take the form of an improvement in performance during use and permit Merino wool to be used in new products. The innovations in this booklet confirm that Merino wool

is versatile, at the cutting edge of fashion and a clever alternative to other fibres.

The information in the fact sheets is a brief introduction which explains the concept and the technology in simple terms. For more detailed information about each innovation, technical manuals are available which give step-by-step instructions on how to achieve the innovations industrially.

At the end of the booklet is a list of the partners who contributed to making the samples. A comprehensive list of Woolmark licensees who can offer innovative Merino wool garments is also available from The Woolmark Company.



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MERCERISED MERINO

The mercerisation process for Merino wool is a chemical based process normally applied to wool top or scoured loose wool before yarn spinning. The mercerisation process in simple terms, when applied to wool, renders it with a “Cashmere like” feel, and a “Silk like” appearance.

THE TECHNOLOGY

The mercerisation of wool involves the removal of the scale structure from the surface of the wool fibre which creates a smoother fibre surface, the effect of which is to increase the sheen. The second part of the process involves the application of a very fine layer of silicone polymer which is grafted permanently onto the fibres' surface. The application of the silicone polymer brings about significant improvement in the hand feel. Although as a result of the treatment, the actual diameter (Micron) of the fibre does not change, the perceived improvement in hand feel is the equivalent of using wool 2 – 3 microns finer.

FEATURES

- Improved hand-feel for worsted-spun and woollen-spun knitwear.
- Brighter shades.
- Machine washable.
- More compatible for blending with noble fibres.
- Improved drape/fluidity.
- Improved comfort especially in next to skin products.
- Starting to become established in the area of coatings and accessories.



SOFT CLASSIC MERINO

Soft Classic Merino is fine Merino wool yarns and knitwear with a natural softness and brightness.

THE TECHNOLOGY

The Soft Classic process is carried out on wool tops prior to spinning in a modified backwasher system using Basolan 88, a special chemical which modifies the internal structure of the wool fibre to make it less rigid, therefore softer to the touch; additionally the treated fibre is more receptive to reactive dyes. The true handle and brightness are created during the dyeing and subsequent softener application.

FEATURES

- The yarns are widely available from worsted spinners and some woollen spinners.
- The process creates bulkier and softer yarns.
- Brighter shades due to the dyestuffs being well absorbed by the treated fibre.
- The process imparts a degree of anti-felting which renders knitted garments easily hand-washable and in some cases even machine washable.

MERINO MOISTURE MANAGEMENT

Merino wool is known for its hygroscopic properties - its ability to absorb and release water vapour quickly. Moisture Management Merino builds on these properties and ensures the finished garment remains soft and comfortable to wear. The Merino fibre easily deals with moisture vapour by absorbing it into the internal fibre structure. Liquid moisture is less easy for the Merino fibre to manage. Moisture Management Merino technology is employed to enhance total water management by absorbing liquid sweat and moving it away from the body by evaporation, making the wearer feel more comfortable.

THE TECHNOLOGY

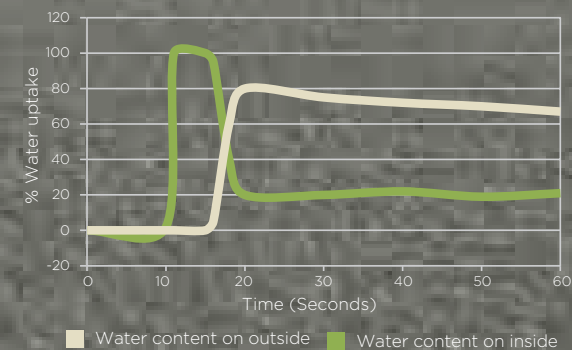
The Merino wool fibre is treated with a special hydrophilic softener after dyeing by padding or exhaustion. The success of the finish, in terms of wetting time and durability is dependent on the cleanliness of the fibre surface before treatment, so it is normal to remove contaminant such as silicone before treatment. The finish is rendered permanent by heat treatment and the higher the temperature the better the durability.

FEATURES

- The Moisture Management Merino fibre wets rapidly on contact with liquid water in less than 10 seconds.
- When used in a double jersey fabric in combination with a hydrophobic yarn, a high degree of liquid moisture transfer can be achieved (see diagram).



Uptake of liquid moisture according to AATCC 195





TOTAL EASY CARE

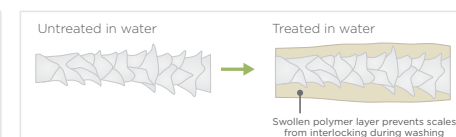
Total Easy Care (TEC) Merino apparel is designed for today's busy lifestyle. Total Easy Care Merino garments are all machine washable, and some are suitable for tumble drying. Even after frequent laundering they retain an 'as new' appearance. They won't shrink, lose their shape, fade or colour-bleed. They remain soft and comfortable for the life of the garment. Total Easy Care technology is available worldwide.

THE TECHNOLOGY

For fine gauge knitted garments, which are generally made from worsted-spun yarns, the Total Easy Care treatment is often applied at top stage prior to the spinning process. Most wool spinners offer Total Easy Care wool yarns in 100% Merino wool or blended with other fibres. For woollen-spun products such as lambswool sweaters, the Total Easy Care treatment is normally applied to the knitted garment during the final wet-finishing process, although some spinners do offer woollenspun yarns made from Total Easy Care treated fibre. The process consists of an oxidative pre-treatment followed by application of a special polymer which swells during washing and masks the scale edges responsible for felting (see diagram).

FEATURES

- Permanent treatment withstands multiple machine washes.
- Specified products can be tumble dried.
- Garment retains shape and 'as new' appearance.
- No colour change or colour bleeding during washing.
- Comfortable and luxurious handle.





EASY-IRON MERINO

Easy-iron Merino makes domestic ironing easier. In some cases it removes the need for ironing after laundering altogether! Easy-iron Merino uses a special TYCS setting technology which reduces the likelihood of creasing sometimes known as “crows footing” at the edges of fine gauge Merino wool knitwear. The finish can also include a silicone polymer which reduces friction between the iron and the fabric surface.

THE TECHNOLOGY

The Easy-iron Merino finish is applied to knitted garments or fabrics during finishing either by spraying, dip-hydro or padding.

FEATURES

- Easy-iron convenience.
- Less creasing during laundering.
- Safe and comfortable for the wearer.
- No effect on handle.
- Little or no effect on colour.

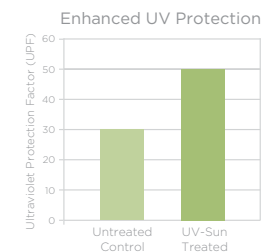


UV-CONTROL MERINO

It is recommended by medical professionals to limit exposure to UV radiation. Merino wool is naturally UV absorbing but as with all textiles its efficacy is limited by fabric density and colour. Where additional UV absorption is required a special finish can be applied to create UV-Control Merino.

THE TECHNOLOGY

A UV absorbing finish is applied to the Merino wool product during dyeing or bleaching at either yarn stage, fabric stage or during knitted garment finishing. The finish can also be applied after dyeing either by exhaustion or by padding. After treatment the finish is fixed by drying at the highest temperature that is consistent with the colour and handle of the fabric.



FEATURES

- Can increase the Sun Protection factor by up to 20UPF units (see diagram).
- Durable to dry cleaning and machine washing.
- Prevents yellowing due to UV light.
- Reduces fibre degradation due to UV exposure.
- Maintains handle and moisture management properties of the Merino fibre.

MERINO RETRACT (PURE WOOL)

Boiled wool is a term given to knitwear that has been pre-shrunk to the extent that it has felted and lost most of the resilience and softness associated with wool. Boiled wool is popular for casualwear because it gives a casual look to garments and an alternative texture. Boiled wool does however suffer from pilling, stiffness, and is limited to hand wash or dry-clean-only care claims. The lack of resilience means that garment styling has to be loose fitting rather than next to skin. Merino Retract knitwear looks like boiled wool but has the resilience and pilling performance of normal wool.

THE TECHNOLOGY

Easy care Merino wool yarns are combined with untreated wool yarns during knitting so that during finishing the untreated yarns retract and the knit structure contracts during wet finishing. The garment is knitted 15% to 20% looser than normal so that the retracted garment does not end up too dense after finishing. Several trials are normally needed to determine the optimum stitch length and finishing routine especially if fully fashioned garments are being made. The technique works best in coarse to medium knit gauges, ie <10gg.

FEATURES

- Contemporary boiled wool looks.
- Resilience of normal Merino knitwear.
- Machine washable option possible.
- Tighter fitting and fully fashioned garments possible.

MERINO RETRACT (ELASTANE)

Boiled wool is a term given to knitwear that has been pre-shrunk to the extent that it has felted and lost most of the resilience and softness associated with wool. Boiled wool is popular for casualwear because it gives a casual look to garments and an alternative texture. Boiled wool does however suffer from pilling, stiffness, and is limited to hand wash or dry-clean-only care claims. The lack of resilience means that garment styling has to be loose fitting rather than next to skin. Merino Retract knitwear looks like boiled wool but has the resilience and pilling performance of normal wool. Machine washable versions are feasible.

THE TECHNOLOGY

Easy care or Soft Classic Merino wool yarns are combined with high-power elastane yarns before or during knitting so that in wet- finishing the elastane retracts and the knit structure contracts. The garment is knitted 25% to 40% looser than normal so that the retracted garment does not end up too dense after finishing. Several trials are normally needed to determine the optimum stitch length and finishing routine especially if fully fashioned garments are being made. The technique works best in coarse to medium knit gauges, ie <10gg.

FEATURES

- Contemporary boiled wool looks.
- Resilience of normal Merino knitwear.
- Machine washable option possible.
- Tighter fitting and fully fashioned garments possible.



3-D MERINO KNITS

3-D Merino is an extra dimension for Merino wool knitwear caused by milling or felting being limited to specific areas creating a subtle pattern. The felted and non-felted areas vary in thickness giving a 3-Dimensional aspect.

THE TECHNOLOGY

Knitted fabrics or garments are screen printed using a transparent polymer instead of dyestuff. The polymer is a polyurethane which is capable of preventing wool knitwear from milling or felting. The polymer is applied from a thickened print paste which prevents spreading and loss of definition and is fixed by heat curing or batching for 10 to 12 hours at room temperature. Subsequent washing causes felting or milling in the non-printed areas which creates a subtle pattern on the fabric. If felting is taken to the limit then seersucker effects can be created.

FEATURES

- Felt-no-felt patterns for worsted knitwear.
- Milled-non-milled patterning for woollen-spun knitwear.
- Effect is durable to hand-washing.
- Can be applied to the whole garment or specific areas for accent.



VINTAGE MERINO KNITS

Faded and washed out effects are popular in casual garments but are a surprisingly difficult to create in Merino wool which is renowned for its vivid and vibrant and durable colours. The classic approach to creating this look is to simply use pigments which can be bonded to the fibre with binders. Such garments are characterised by poor handle and poor rubbing fastness. When garments fade during washing they do so unevenly, especially on seams and raised areas, and it is this effect that is reproduced in Vintage Merino knits.

THE TECHNOLOGY

The unlevelness of washed garments can be created by unlevel dyeing associated with applying the dyes too quickly. By using less levelling agent and allowing reactive dyes to exhaust onto easy care or mercerised Merino knitwear within 10 to 15 minutes, the dye tends to exhaust more deeply in easily accessible regions of low yarn twist or fabric density. This effect can be rendered uniform over the whole garment by using the correct combination of processing speed and machine loading. Once the dyes are exhausted, the dyes can be fixed using normal boiling times and if the correct clearing cycle is used normal levels of washing and rubbing fastness can be obtained.

FEATURES

- Vintage/washed effects in by garment dyeing.
- Woolmark standards of washing and rubbing fastness are possible.
- Works best on heavily textured structures such as ribs and cables.
- Works for both worsted-spun and woollen-spun piece-dyed garments.
- Each garment is unique within a defined range.



SCULPTURED MERINO

There are two types of crease in textiles, accidental and deliberate. Accidental creases are usually a problem but deliberate creases in a garment can create contemporary and casual aesthetics. These effects are unusual for Merino wool knitwear because it so readily sheds creases. The approach of using special and expensive memory crease yarns suffers from poor handle and high cost. A technique has been developed which creates natural creases all over a garment giving a unique look to worsted-spun easy care knitwear.

THE TECHNOLOGY

The sculptured effect can be created by permitting a garment to cockle (normally random and unsightly creasing) in the most severe and complete way. The technique involves breaking many of the rules of knitting fine gauge worsted spun knitwear. By using a combination of a wider than normal range of fibre diameters in the blend, yarn steam-setting, loose knit-density and overloaded wet-finishing machines consistent cockling in worsted-spun knitwear can be created.

FEATURES

- Contemporary creased garments.
- Each garment is unique.
- Creases are durable to machine washing.
- Soft handle of pure Merino wool.



SPECTRUM MERINO

Lead times in manufacturing depend on many factors but the point at which colour is added has one of the biggest impacts. Top or loose wool dyeing is fine if colour decisions can be made months in advance but if a quicker response is needed then dyeing at the garment stage is best. Garment dyeing does however limit colours to just one shade - melange and marl effects not being possible because these are normally created at the fibre or the yarn stages. An alternative approach has been developed which permits melange and marl effects to be created during yarn, piece or garment dyeing.

THE TECHNOLOGY

Fibre or yarn can be dyed with a colourless or white dye that blocks the normal dye sites in the wool fibre and significantly reduces the uptake of dyes compared to normal wool - dye-resist. By combining dye resist fibres or yarns with normal types in a fabric or garment then during yarn or piece-dyeing there will be two shades of dye absorbed. If the yarn is made from a blend of coloured fibres, each of which has been dye-resist treated then a multi-coloured melange effect can be created during dyeing. Spectrum Merino works best with pale or medium depths of over-dyeing and usually needs reduced amounts of levelling agents in the dye recipe.

FEATURES

- Late-stage melange or marl effects.
- Multi-colour melanges.
- Tone-on-tone yarn, garment or piece-dyeing.
- Quick-response colouration.



3-D MERINO COLOUR

3-D Merino colour is an extra dimension for Merino wool knitwear caused by milling or felting being limited to specific areas creating a subtle pattern. The felted and non-felted areas vary in thickness giving a 3-Dimensional aspect. A wide range of colours can be overlaid on the 3-D fabric by the same process of screen printing.

THE TECHNOLOGY

Knitted fabrics or garments are screen printed using a colourless polymer along with acid or reactive dyestuff. The polymer is a polyurethane which is capable of preventing wool knitwear from milling or felting. The polymer is applied from a thickened print paste which prevents spreading and loss of definition and is fixed by heat curing or batching for 10 to 12 hours at room temperature. Subsequent washing causes felting or milling in the non-printed areas which creates a subtle pattern on the fabric. If felting is taken to the limit then seersucker effects can be created.

FEATURES

- Felt-no-felt patterns for worsted knitwear.
- Milled-non-milled patterning for woollen-spun knitwear.
- Effect is durable to hand-washing.
- Additional coloured patterns can be added to create subtle or dramatic effects.
- Late-stage design options for fully fashioned and jersey knitwear.
- Can be applied to the whole garment or specific areas for accent.

MERINO DEVORÉ

Using the same technology as 3-D Merino this innovation creates, on loose open knit structures made from worsted yarns, a mock devoré which does not require any fibres to be dissolved.

THE TECHNOLOGY

Knitted fabrics or garments are knitted from untreated yarns to a relatively loose stitch-density then screen printed using a transparent polymer instead of dyestuff. The polymer is polyurethane which is capable of preventing wool knitwear from milling or felting. The polymer is applied from a thickened print paste which prevents spreading and loss of definition and is fixed by heat curing or batching for 10 to 12 hours at room temperature. The devoré pattern is created during subsequent washing of the garment when the non-printed areas felt and consolidate to become opaque relative to the printed areas.

FEATURES

- Burn-out or devoré effects without need for fibre dissolution.
- Effect is durable to hand-washing.
- Can be applied to the whole garment, or specific areas for accent.



KNITTED WOVENS

Woven fabrics, by nature of their relatively rigid structure are limited to more formal construction techniques requiring multiple panels of fabric to be sewn and molded into the required three-dimensional shape, eg a jacket. Knitted fabrics which look like wovens free the fabric from conventional jacket construction techniques.

THE TECHNOLOGY

Double jersey fabrics using pure new wool yarns are constructed using a 2 or 3 colour jacquard design in fine worsted yarns. The fabric is rendered easy care using Synthaprett BAP application by padding and heat curing.

FEATURES

- Woven appearance with the elasticity of knits.
- Two sided/reversible fabrics.
- Milled finish imparts wind-resistance.



AROMATHERAPY MERINO

Natural aromatic plant extracts and essential oils – used in aromatherapy – are renowned for their healing, well-being benefits and insect repellency. A range of aromatherapy treatments can be applied to Merino wool knitted fabrics to create Aromatherapy Merino garments. During wear, the micro-encapsulated essential oil is slowly released and, depending on the type of oil used, may assist in relaxing, revitalising or energising the wearer.

THE TECHNOLOGY

A variety of essential oils have been microencapsulated (a process in which tiny particles or droplets are surrounded by a coating to make small capsules), and then bound to the fibre (with a special MCP binder normally used in the cosmetic industry) during processing. The micro-encapsulated oils slowly and continuously release during wear.

FEATURES

- Variety of aromatherapy well-being effects.
- Natural and sustainable.
- Safe for wearer.
- No effect on handle.
- No effect on colour.
- Product applications particularly suitable for womenswear, Pilates/yoga wear, and loungewear.

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The following companies gave invaluable assistance in creating the technical collection of innovative fabrics.

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