Australian Wool Innovations (AWI) innovations

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Australian wool innovation

Innovations with Merino

Australian Wool Innovation

Australian Wool Innovation (AWI) is a semi-government, 'not for profit' organisation. It is, in effect, owned by 33,000 Australian wool growers who pay a two per cent levy on every bale of wool produced on their farms to provide money for research and development in both agricultural research and textile research.

AWI invests around $60,000,000 annually and focuses its key research programs on increasing the demand for Merino wool and improving the productivity and, therefore, the profitability of the Australian wool growing industry.

AWI has around 78 staff at offices in Australia (in Sydney, Melbourne and Geelong), China (in Shanghai) and the United States (in New York). It is currently undergoing a major restructure to put more people on the ground to deliver more products to retail. Staff have recently been appointed to offices in Italy, Hong Kong and India, and additional staff have been appointed in the United States.

Partnerships

To more effectively take the results of research and development to the market AWI is rapidly developing business-to-business partnerships with major brand marks and retail outlets around the world. The focus of AWI's research and development (R&D) programs is on the attributes of wool that are wanted by the modern consumer. AWI's R&D programs target the needs highlighted by surveys of the modern consumer. The results will be innovations that improve the brightness and whiteness, softness to touch, drape and cool-to-touch aspects of wool products.

In 2005–2006 AWI will spend more than $20,000,000 in textile research and this will be increased in coming years with a growing emphasis on textile product development.

Information about the work of AWI and outcomes of its research can be accessed online at www.woolontheweb.com.au. The website includes a section where you can ask questions about wool and the processing of wool – from very basic questions right through to specific technical aspects of wool fibre and its behavior in wool products or issues relating to the processing of the fibre.

Recent trends

In considering R&D needs for Australian Merino fibre it is useful to reflect on some of the trends that have occurred over the past decade.

- Wool has been replaced at the lower middle price points of the markets in which it was originally sold by products such as cotton and acrylic and polyester–viscose blends.
- The manufacturing of textiles has moved from the traditional base in Europe, Italy, Germany and France to the powerhouses of China, Turkey and North Africa.
- Not only has manufacturing moved into these new areas, but the knowledge and skills that underpinned the manufacture of wool fibre have largely been lost from Europe. This is something that AWI has been addressing over the past few years, and on which it will place a major emphasis in the future. Education and training remains a major theme of AWI's R&D portfolio.

- Wool's position in the men's suiting market remains a strong area, but wool has lost a lot of market share in women's wear and the knitwear sector due to strong competition, particularly from cotton.

If we examine some of the current trends and their impact on the wool textile theatre, we find there have been significant changes in the last decade or two in the behavior of consumers in the Western world. People are looking now to a more carefree lifestyle. They float between air-conditioned environments. They have home entertainment and spend more time at home, where they want comfort, not only in their apparel, but in the textiles that make up the interior of their homes.

Similarly, in Asia and China lifestyles are changing rapidly and following Western trends, including a growth in the 'cult of the individual'.

If wool is to have a future, it must begin to target younger age groups, which have different behavioral psychologies to the 50-and-over group.

We also know that there is a lot of interest in wool. People are becoming tired of cotton jersey and polyester and synthetic fibres, so there exists a window of opportunity over the next two to three years to generate new interest in the Merino fibre.

Of course, there remains considerable scope for growth in the domestic markets of China and India.

If one believes the linear modules that some people espouse, it will not be long before the wool industry disappears altogether. One is reminded of a similar panic situation in the 1970s and 1980s with the 'energy crisis'. It was predicted that by the year 1995, there would be insufficient oil for the number of cars and transportation that used oil as an energy source. Simple linear models don't allow for man's ability to innovate under various pressures. We have since seen the development of cost-effective and energy-effective cars that have made a lie of the predicted outcomes of the 1970s. Wool is in a similar position at this moment in that innovation can drive a new and revised attraction to the Merino fibre. We are limited only by our imagination and our ability to take risks to reinvigorate the fibre's reputation and market appeal.

Responding to trends – AWI's role

So, how does AWI see its role in influencing these new and developing trends? Of course, we're just a small player in a very big market and global trends and pressures can have major impacts and influences on trading of commodities in terms of contracts written in US dollars and energy impacts, all of which are much larger than anything AWI can do. Nevertheless, we can bring to the new textile scenarios in today's markets a new knowledge and understanding of the Merino wool fibre.

We look to study lifestyle trends and how they impact on consumer preferences for the wool fibre, in bringing Merino fibre back to people who have largely remained ignorant of the positive attributes of the fibre.

We need to develop strong marketing stories based around product differentiation and the differentiation of our particular fibre. We need to create attractive marketing stories that generate excitement about the fibre and generate that excitement with brand managers who know about what wool fibre is and what it can do. This means working at the interface between manufacturers and retailers, developing relationships and building partnerships with major design and brand names and continuing to be of service and interest to those people in time – in short, turning from an R&D organisation into a consumer-led research development and market support group.

Partnerships for research and development

In the past, the process of R&D funding has involved the direct flow of money to science partners, after which, if a product happened to emerge from the development stage, a commercial partner would be sought.

AWI is not necessarily fixed on funding science partners; in fact, we believe that a potentially quicker way to market may be through the direct funding of a commercial partner, and having them commission the science partner to assist them.

We know commercial businesses are focused on their bottom line and are driven to achieve returns or face the possibility of becoming non-competitive in their particular field. By harnessing this energy we are seeing project objectives achieved extremely quickly. I will show the results of one of these cases a little later on.

I've mentioned that we work directly with major brand partners. This is something reasonably new for AWI; we're developing a rapidly increasing number of relationships with major brand partners. We do this at the beginning of any project by talking directly with the people who take the product to the market. This ensures we can test the value of the project. We can gain feedback about how best to take a product to market and ensure the right price point is targeted from the very start of the project, rather than getting to the end of a project and finding we have a nice technology but are coming in at the wrong price.

AWI works with its partners in developing commercialisation so we can work with a science partner, industry partner or brand partner who will help direct us to market. Of course, we can also work directly with industry if it is decided a science partner is not required.

AWI becomes a funding partner to both of these bodies and brings together the science or industry development partner and the brand partner or retail outlet.

It is important to involve the retail commercialisation partner for the following reasons:

- **to test the value of the project –** AWI aims to invest in projects that can be commercialised. If the commercial partner believes it's not possible to commercialise a development, we certainly shouldn't be investing our shareholders' money in such a project
- **to take guidance –** We should not presume to know what the fashion world might require. This is not our field of expertise and we shouldn't presume that we know what is needed

  We must also achieve the price points that the retail commercial partner requires. AWI is unwilling to develop products that have price points the marketplace is unwilling to accept
- **to give the project the best opportunity of success –** To have the commitment of a commercial partner in the early stages of a project gives the project the drive of bottom-line driven individuals who will only reap a reward if the project reaches commercial fruition.

Let's look at some of the innovations AWI has been a part of in the last few years and some of the products that have come on to the market in that time, and some of the products on which a major emphasis will be placed in AWI's product marketing campaign over the next 12 months.

In adopting these strategies we have identified a number of areas where we believe wool has the ability to have a major influence in particular market segments. We look at the

requirements of each market sector. We look at developing products such as lightweight, softer, cooler, sports or active products. In each of these we develop a product map, and behind each of these product maps is a number of functional requirements that need to be addressed to ensure we develop a quality and peak performing product.

A major sector of the market in which wool struggles is in the spring and summer market. Wool is perceived as a cold climate product. AWI has several strategies to address this issue. The use of exotic fibres in blends with wool is one approach. The modification of wool's properties, as in Arcana fibre, is another approach.

As each innovation comes along, it can join earlier innovations to create a synergy and generate a completely new and interesting product.

By identifying the progression in a particular product map we can identify gaps in the next generation of products and ensure that the R&D is targeted at solving problems related to these gaps. At the same time, we seek feedback from the collaborative partner so that new products in time can be identified from their perspective and, again, the gaps in the technology can be addressed by the R&D providers. Alternatively, we can work directly with the supply chain to the brand manager in identifying technical issues to overcome any limitations encountered; this might be done within the industrial supply chain rather than the traditional supply chain.

Recent innovations

The first new product I want to discuss is the machine washable suit. Whether you would want to throw a suit into a washing machine is a moot point, but for those who do, there is a fine, lightweight, high quality, worsted suit that can now be put in a washing machine, tumble dried and taken out wrinkle-free with no need for ironing.

While you may not have the intestinal fortitude or courage to throw your valuable suit into the washing machine, the other advantage of this product is that the technology has in fact created a product that travels very well. So, for the business person who travels a lot or is wearing a suit in conditions that generate poor appearance in existing products, the new technology can produce a suit that retains its good appearance very effectively under stressful wear conditions.

AWI has also developed some interesting structural blends, both in wool/polyester and wool/cotton in bi-layer and intimate blend fabrics for particular end products. An example is the wool/polyester blend launched several years ago under the Woolmark brand, Sportwool.

Wool/cotton can provide a similar type of product with excellent applications for active wear and sportswear, but it is a completely natural blend. This makes it of considerable interest to a number of companies who can take this product forward in a variety of applications.

Non-apparel applications

Wool has a history of being an apparel product. We are seeking to expand non-apparel applications to ensure that some of the lower quality wools or the wools that are more difficult to convert to apparel have flexibility in their market applications, thus broadening the market and increasing the demand and price return for these wools.

One area that has been the subject of R&D for the past 18 to 24 months is the development of wool for use in electrostatic filters, making use of the electrostatic properties of wool and devising new and attractive filters for H VAC applications. This product is now very close to commercialisation.

The cost of the wool-based filter has been found to be more than competitive with alternative synthetic filters.

Another area has been application in the bedding market through the use of modern conductive polymer technology to generate socks that can control temperature. This is incorporated into the structure of the sock and improves comfort in adverse temperature conditions (for example, mountain climbing or skiing) and for medical textiles where circulation is a problem. These socks can be semi-automatically programmed to move the temperature to warmer conditions.

We are also ensuring that the cost of converting wool from a raw material to a final product is under attack. We continually exert pressure to drive the cost of conversion down.

One area has been the investigation of the Murata Vortex spinning system which is able to spin at extremely high speeds and therefore produce yarns at 30% lower cost than conventional processing. We have now developed techniques for processing wool on this system. It is particularly conducive to blends of wool/polyester and wool/cotton and we are working with four significant manufacturing companies to either manufacture wool blend yarns on their systems or sell these yarns to the fabricators, who can then place the products into the market. The significant advantage is the 30% reduction in cost compared with conventional manufacture.

Use in medical textiles is another strong opportunity for wool. Wool is a protein fibre and is therefore compatible with the skin of the human body. Consequently, there are medical applications where wool can be used in preventing agitation to the skin, for bandaging and in the repair of wounds. Trials in nursing homes are now underway and we await the results, which will indicate whether the claims made for wool can be substantiated.

Innovations in apparel

Merino Active is an attempt for wool to fight back against the inroads that Polar Fleece has made into the pullover market, and bring wool back into competition in a major area. The active sports/casual market is a major new target for wool.

We have now developed a wool blend product (65% wool / 35% polyester) that has excellent breathability and comfort properties and can be marketed at price points very similar to the major competitors of Polar Fleece in this area. This product has been manufactured and is being sold into the United States and target markets in Western Europe.

The market for minimum care textiles continues to grow, especially in the United States. Technologies have been developed that enable the production of easy-care wool garments, both woven and knitted. It is now possible to produce woollen garments that can be placed in a washing machine and tumble dryer then worn again without ironing.

These technologies have been commercialised and are widely available. AWI offices can provide information.

We have also worked with some major brands, such as Kookai Australia, to develop soft, next-to-the-skin jersey fabrics for ladies wear. This has been done by engineering the product from the selection of the wool, type of spinning system, geometry of the fabric and finishing to meet the requirements of the fashion designer, who was targeting young women's wear in the 16–25 year age bracket.

This product was launched in Australia in 2005 under the brand name Merino Posh. Kookai will now be moving to expand into European retails outlets.

Kookai is a leading fashion brand retailer, developing fashion lines that introduce wool to a younger market previously dominated by synthetics and cotton-based products.

Quick-dry

Quick-dry technologies have been developed and marketed for many fibres, including cotton, for example, 3XDRY, Quickdry Denim, quick-dry nylon and Dry-X-Treme.

Wool is perceived as slow drying and a difficult fibre to clean and maintain. A new technology package delivers quick drying wool garments and technical information to support quick-dry marketing. This will add another dimension to the easy care marketing program.

Results depend on pre-treatment and fabric preparation.

- Some softeners used with chlorine/Hercosett are difficult to remove and influence drying times of the untreated fabrics.
- Drying times depend only on the amount of water held in the fabric between fibres and yarns.
- Wool fabrics are considered dry at a regain of approximately 20%, where a change in drying rate is observed.
- Polyester fabric construction and yarns were matched to wool fabric construction and yarns.

The cost of this treatment is dependent on the processing route within any particular company. Both exhaust and pad-cure treatments are possible and can be applied to yarn, fabric and garments. Typical costs are 35–85 Australian cents per kilogram.

Colour

Speciality colouration effects and extremely bright shades are widely available in garments derived from synthetic fibres. The dyestuffs are typically disperse or cationic dyes, which have excellent brightness and fastness, but only on cellulosic and synthetic fibres.

Wool is also subject to accelerated photo-yellowing when treated with fluorescent whitening agents. This inhibits the use of wool in sports wear and ladies wear. This problem can be tackled in number of different ways. AWI, in conjunction with CSIRO, has developed a technology package for the production and marketing of Superbright shades with wool blends. This technology is now being transferred to industry.

A second approach is to improve the chemistry for bleaching the wool base. Working with Rohm Haas and CSIRO, a technology package which describes the processing detail and advantage of using an alternative chemical approach, Colourclear, is now available through AWI.

Merino for active sportswear

Moisture transport

During sport activity the air above the skin becomes saturated with vapour, creating higher humidity, which is uncomfortable and potentially debilitating for the athlete. With its amazing ability to absorb moisture vapour (up to 35% of its dry weight), Merino is far better at dissipating these vapours than synthetics, a fact which has been confirmed by CSIRO tests.

Temperature reduction

Merino not only helps remove sweat, it actually helps to lower the body temperature. The process by which Merino transforms sweat into vapour is ‘evaporation’. Evaporation produces a drop in temperature. So, Merino helps the athlete keep cool in the heat of competition.

Wearer performance

Trials at the University of Graz in Austria showed that athletes performed better in Merino than in synthetic garments. During aerobic exercise on bikes the body temperature of those wearing Merino was 13% lower than those wearing polypropylene. And, as volunteers were pushed to their anaerobic limits, Merino again proved superior to polypropylene with a 9% lower lactate build-up.

Wearer comfort

During vigorous exercise, sweat is produced faster than it can evaporate, so sports clothing must feel comfortable even when soaked in perspiration. In tests at the Hohenstein Institute in Germany, ‘aquaduct’ fabrics with Merino on the inner face and a treated Merino on the outer face outperformed other fabrics in this respect. The bi-layer Merino fabric had a lower temperature rise than other combinations and also came out ahead in the overall comfort ranking.

Moisture movement (wicking)

Wicking measures the manner in which moisture spreads through a textile. A CSIRO study has shown that the wicking properties of Merino make it an ideal choice for sports socks, and Merino now has 60% of the active wear sock market.

Odour resistance

Bacteria prefer smooth surfaces with a positive charge, as is provided by synthetics, whereas the neutral scales of a Merino fibre hold no attraction. Since sport and sweat have a close association, Merino's odour resistance is welcome news for team-mates.

UV protection

A study by Gambichler found that Merino provided superior UV protection to cotton, making it a better choice for sportspeople with prolonged exposure to the sun.

Revisiting previous research

While we are focusing on innovation, it is important to remember that old research should always be looked at again to see whether it can be exploited more fully in current circumstances. There may be lessons to be learnt and the time may be right to re-launch previously developed products.

A number of products are being re-examined in the light of current trends and consumer requirements and demands; for example, we are looking at shrink-resist treatment of very fine wools. This presents particular technical issues, but development is necessary if wool is to find markets in sport and next-to-skin wear.

Sportwool was a technically excellent product that suffered for various reasons in marketing. We are looking again at that product and working it up into new applications. Similarly, we want to reinvigorate technologies such as weavable singles and the stretch wool fibre Optim (Arcana as it is known commercially) to ensure they are well recognised and understood globally.

What's next?

We also have in the pipeline a number of new projects such as blends with micro fibres, that is, fibres of around 0.9 to 1.2 denier. We are looking at splitting fibres using 'islands in the sea' technology and developing the technology to be compatible with Merino. We are looking at engineering products that have a much cooler touch. Wool has a reputation of being warm and perhaps itchy next to the skin. We are involved in some new spinning developments that should be ready for industry assessment in 2007.

We are currently packaging the outcomes of these projects in a form that people can utilise readily.