TEXTILE + DESIGN LAB

Case study number: 04/2013

Project Title: Digital Printing on Wool Fabrics

Researcher: Peter Heslop, Manager Textile and Design Lab

Project Period: On-going research

Project Background:

Being based in a country that has a rich heritage of wool production and industry prompted the Textile and Design Lab (TDL) to pursue the idea of digitally printed wool with more vigour than most, in an effort to prove or disprove its viability. Whilst the lab has been successfully digitally printing cellulose fibres for over 7 years, there has been a growing increase in demand for digitally printed merino wool and merino blended knitwear, as well as single jersey merino fabrics.

However, a multiplicity of challenges has been encountered whilst developing digital printed wool, and this project outlines some of the strategies and processes that the TDL has developed to overcome these. Staff at the lab were concerned about three specific issues that continued to manifest themselves when digitally printing wool fabrics and garments: firstly, the degree of variation in dye up-take between the raw materials it was printing; secondly, the tendency for solid colours to appear mottled; and finally, the degree of cross-staining that occurred no matter how thorough the wash-off process.

Project Process:

The Textile and Design Lab's initial experience with digitally printed merino fabric was in 2007 when Icebreaker, a NZ based global outdoor and performance apparel brand, approached the lab to help develop some prototype prints for a new range of base-layer garments. The issues and challenges of printing their wool fabric became apparent and led to further experimentation and processes.

When digitally printing clients' knitwear, the lab has little control over where the yarn is sourced, so routine test printing of each lot has become standard practice. Fabrics, on the other hand, are sourced directly by the lab and, after extensive trials, it has settled on locally produced chlorinated shrink-resist and whitened knitted merino wool fabrics from Levana Textiles and Designer Textiles, and natural woven merino fabrics that were developed in New Zealand and now manufactured globally.

The bleaching process applied to the knit fabrics increases the affinity for the reactive dye applied by the lab's Shima Seiki flatbed printer, thereby reducing the amount of residual dye in the wash bath. According to a consultant dyeing-and-finishing expert who has worked with the lab, the wash fastness of reactive dyes on shrink-resist merino fabrics is superior to that of acid dyes. The whitening process is also more conducive to achieving more vibrant colours.

The woven wool fabrics that have been adopted are lightweight worsted spun merino fabrics that have been mechanically finished to allow machine washability. In spite of the natural colour of these substrates, strong vibrant colours can still be attained.

In 2010 the lab acquired some internal R&D funding that enabled it to contract an experienced wool-textile chemist to advise and help formulate new wet-finishing recipes to overcome the problem of cross-staining. At the same time, it acquired a larger commercial-sized washing machine that facilitated increased water to fabric ratio, a major contributory factor in overcoming colour transfer problems. Achieving the right wash-bath conditions for wet finishing wool fabrics and garments was accomplished by trial and error until the optimum pH level was attained. The lab introduced a 2-stage gentle-action wash cycle, which involved increasing the pH level in the first wash cycle, which

significantly reduced the propensity for loose dye to adhere to the fabric.

Tumble-drying the fabric was deemed partially responsible for disturbing the surface fibres, thereby contributing to the mottling effect, and was eliminated from the lab's finishing process in favour of open-width tunnel drying.

Insights:

Sourcing stock merino fabrics from local mills has helped the lab to achieve more consistent results. Being able to utilise R&D funding to research finishing processes has enabled the TDL to refine its methods for digitally printing wool. Adjusting both the wash-bath and drying processes has resulted in a cleaner finish and minimal disruption to the fabric surface.

Conclusion:

This research and development has had success with both AUT students and external designers utilising merino and coarser wool fabrics in digitally printed garments and products. As the lab continually looks to improve its own processing techniques, it is also keen to collaborate with commercial partners on design and technical print related projects.

Publications:

Digital Textile Magazine, "Why not Wool?" Issue 4 2013

Contact:

Email: peter.heslop@aut.ac.nz
More information at: www.tdl.aut.ac.nz

Images:

Figure 1: Digitally printed merino lampshade by former AUT Textile Design student, Pow Kusolchan

Figure 2: Digitally printed merino wool knitwear designed by designer, Kylee Davis