A smart, natural fibre

Packaging design expert Angela Morris speaks about her discovery that wool can be used as a sustainable, cost effective and high performance replacement to synthetic materials such as polystyrene and polyethylene in packaging.

What first drew you to investigate insulated packaging using sheep’s wool in 2002?

I’ve worked in package design throughout my professional career and absolutely love the challenges it presents. I was engaged as a packaging consultant by the National Trust, who, after the foot and mouth crisis, created a scheme to help tenant farmers diversify and aid their recovery. Many of these farmers had products such as meat that could be marketed direct to consumers at home. They required suitable packing to transport it, and it had to arrive with the consumer in under 24 hours and remain under 5 °C. At that time, the only available materials were polystyrene and polyethylene, but these did not fit the National Trust’s ethics, as they are not sustainable or environmentally responsible. We had to find an alternative, and that’s when we considered wool.

How did you discover that wool could be used as an alternative to polystyrene and polyethylene?

I developed a solution by lining the inside of a corrugated cardboard box with needle felted wool, and then I conducted scientific trials with the wool-lined box against polystyrene and polyethylene. The result was that wool significantly outperformed them. Even at this early stage of development, wool was outperforming polystyrene by five or six hours. As a packaging consultant, I have used natural materials including wood and cork, but I had never worked with wool. In 2002, the mail order fresh food sector was in its infancy. Since then e-commerce has grown rapidly. Consumers have become more confident buying fresh produce online; I realised there was a gap in the market and that wool insulated packaging could fill it. In 2008, the Woolcool project began.

Did it prove difficult to manufacture sheep’s wool insulated packaging on a commercial scale?

The simple answer is yes. This was an entirely new concept. There was no previous experience at producing wool liners for boxes. Manufacturing pure wool felt was unusual, the closest product was insulation produced for the construction industry, but this is manufactured using heat bonding where polyester is used as a bonding material. This process doesn’t tick the environmental boxes. I was looking for something compostable and sustainable. The sharp decline in the UK textile industry meant there were few traditional needle felting manufacturers left in the UK who could manufacture wool without the polyester bond. By luck, the production director of a non-woven textile manufacturer saw an article about Woolcool and contacted me to see if they could manufacture it.

Does your other role as Chair of the Natural Materials Association (NMA) provide opportunities for increasing collaborative endeavours between academia and industry?

The NMA is a new organisation, and we are still in the early stages of development. I am responsible for building an association that will provide a resource and educate people about natural materials, creating a link between academia, industry and the general public – especially from an innovation and design perspective. I am surprised that when talking with design students, especially product designers, that they rarely consider the full life cycle of the product. When they do want to explore natural material options, they are frustrated because they have difficulty finding information about them. My vision is that the NMA could become a resource of information.

Will this novel research provide crucial insights for new natural, sustainable and effective materials?

There are a number of companies working with natural materials in the construction industry, but currently, many are still at the R&D stage. Academics in labs are seeing amazing results with natural materials, but they lack the commercialisation strategy to bring the products to market. Woolcool is an example of how this can be achieved. It is one of the first companies to take a sustainable, natural material and commercialise it effectively. I’m hoping we can encourage others to do the same. I am promoting this in my role at the NMA and inspiring collaboration between designers and academics.

We must have the confidence to question the belief that human-engineered materials must be superior simply because they appear highly technical and complex. Wool is a highly technical, complex fibre in its natural form. At Woolcool we are committed to discovering the science behind this amazing fibre and gaining a real understanding of how to harness its properties to develop and produce game-changing insulation for transporting temperature-sensitive products, including life-saving vaccines and medicines.
Unravelling wool’s potential

Woolcool is a leading insulated packaging solutions company specialising in the use of sustainable, natural materials to benefit many industries, including temperature-controlled food and pharmaceutical distribution.

FROM WEAVING BASKETS out of grasses and reeds, to creating metal containers from ores and compounds, the use of natural materials in the packaging industry has stood the test of time. From an ecological perspective, such materials are advantageous as they require little energy to manufacture and transport, thus reducing cost, the generation of greenhouse gas emissions and fossil fuel consumption.

In recent years, however, seemingly superior human-made polymer-based alternatives such as polystyrene and polyethylene have replaced natural materials in use in packaging. However, these materials are not sustainable or biodegradable and they have long been criticised by scientists and environmental organisations for the risks they pose to human and ecosystem health. With increasing pressures on industry, businesses and governments to go ‘green’, the spotlight is now on natural materials to make a much needed comeback. A number of laws, initiatives and directives have been developed across the globe to make sure packaging is used responsibly, increasing its eco-friendliness and ensuring companies are acting socially responsible.

WHERE THERE’S WOOL, THERE’S A WAY

It is for this reason, Natural Materials Association (NMA) Chair Angela Morris has been focusing her expertise – spanning three decades – in the packaging design arena on wool, a material that she praises for being sustainable and cost effective. It was when she was working as a packaging consultant for the National Trust that Morris saw an opportunity to revaluate the packaging used by farmers and food producers who were beginning to mail their fresh produce directly to consumers and needed to meet strict UK food safety standards: “The first thing I identified about wool, apart from its sustainability, was that it was superior in its performance compared to materials such as polystyrene and polyethylene,” she enthuses. “With the same product and the same ambient temperature profile, I found wool kept the product under 5 °C for longer.” During the design stage, Morris also revealed another benefit to using wool: its ability to be fully flat-packed, allowing for more boxes per pallet that conventional polystyrene. “Wool was nearly five times more favourable in terms of decreasing logistical and storage costs. It ticks all the proverbial boxes; it is not just green, but superior in every aspect,” Morris adds.

FROM FOOD TO PHARMA

Morris is also CEO of Woolcool, the only sheep’s wool insulated packaging company to exist on a commercial scale. It launched in 2008, and with its range of innovative, sustainable designs – many of which have won awards in the packaging, business and environmental domains – the company has already seen a number of successes. The team is working with universities and relevant industry members. Moreover, Woolcool has a strong relationship with Innovate UK, to whom it is particularly grateful for its combined £491,651 of SMART Award funding. “The SMART funding has given us the opportunity to explore the science behind this amazing highly technical fibre,” Morris enthuses. “It has many other incredible properties – it absorbs 40 per cent of its own weight in moisture without feeling wet, absorbs and locks in toxins, has inherent antibacterial properties and locks carbon out of the atmosphere – to name but a few.” Indeed, the product’s versatility enables the team to fulfil bespoke briefs. For example, in the food industry, Woolcool insulated packaging provides a method of delivering fresh produce in perfect condition.

Furthermore, the team has identified significant potential for Woolcool in developing sustainable packaging and distribution solutions for pharmaceutical products. In 2005, the World Health Organization (WHO) reported that up to 50 per cent of vaccines arrive at their destination unfit for use. This has massively impacted the global pharmaceutical industry, which is now facing pressure to adhere to new, stricter EU guidelines and directives. These demand that there is recorded proof that the storage temperature of vaccines and medications are met at every stage of the ‘Cold Chain’.

In response to this massive social and environmental issue the Woolcool team has...
INTELLIGENCE

WOOLCOOL

OBJECTIVE
To develop innovative, sustainable, passive, insulated packaging for temperature-sensitive pharmaceutical products that allows extended, controlled temperature management, without the need for additional (external) temperature control facilities.

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ANGELA MORRIS is CEO of The Wool Packaging Company and founder of the Woolcool® brand. Her packaging experience covers a variety of different sectors, including major UK retail high street stores such as BHS, global confectionery companies such as Nestlé and Cadbury’s, water filtration systems for Fairey Industrial Ceramics and automotive components for Rolls-Royce. Morris has lectured and supervised postgraduate students and given talks on Design Management, Innovation and Green Entrepreneurship at several universities across the UK. In 2013, due to her the vision, dedication and experience within the The Wool Packaging Company, the Institute of Mining, Minerals and Materials organisation invited her to launch and Chair the new Natural Materials Association.

stepped up to the challenge and developed Woolcool PharmaPack, which substantially exceeds new EU temperature control performance criteria – using sustainable materials, it keeps medication between 2-8 °C for more than 72 hours. At the same time, the more compact PharmaPack is in line with the growing trend towards online prescriptions, as evidenced by the UK National Health Service’s Electronic Prescription Service and growth of pharmacies delivering medication directly to the patient via mail order. Morris explains: “If you are diabetic, for example, and you require insulin for the next two to three months, it is vitally important that it arrives at the right temperature”.

A HOPEFUL FUTURE
Having already sold around 3.5 million units of their wool liners – which equates to the fleece of nearly 1 million sheep – and set to double last year’s turnover during this financial year, Morris and her colleagues are immensely proud of their achievements to date. They are particularly proud of their efforts to educate industry and academia about their innovative products. To promote long-term development and support for sustainable packaging materials in Cold Chain, the team are planning to establish a Woolcool R&D and Test Centre.

Woolcool continues to develop and design sustainable packaging to benefit consumers and end users. “We are always developing and are led by design and innovation. We are always looking at new avenues,” Morris emphasises. “We are not content with what we currently have and are pushing the boundaries to develop innovative products that continually raise the performance bar.”

While the Woolcool team is keen to branch out and develop a number of innovative projects, its main focus is to work more closely with the pharmaceutical sector on a global scale. Specifically, Morris is investigating the use of ice packs in transporting medication and vaccines: “A typical 100 litre polystyrene container can require more than 12 kg of phase change materials – such as icepacks – to maintain product temperature between 2-8 °C for 72 hours, thus reducing the product space to only 15 litres. A Woolcool PharmaPack box giving 15 litres of product space is half the size and uses less than half the weight of icepacks. However, we want to research the possibilities of even further reducing the amount of ice needed. I hope by 2020 we will have developed a natural alternative to conventional phase change materials that uses substantially less energy,” she concludes.