

# Textile Futures

## Welcome to the Textile Futures Programme.

Yorkshire's textile manufacturers are set to become world leaders thanks to a £6million investment from Yorkshire Forward and the European Regional Development Fund.

Weaving aircraft components and providing guaranteed anti-counterfeiting protection for the fashion industry are just two elements of the Programme, which provides practical and financial backing for manufacturers to work with experts from universities and research organisations to create new high-value, 'high tech' products.

The Programme is being delivered by the Textile Centre of Excellence in Huddersfield working in partnership with the University of Leeds. In this Newsletter you can find out about:

- The feasibility studies that shaped the new Programme;
- How the Textile Futures Programme works;
- The support that is available for Yorkshire manufacturers;
- The latest developments in key technology areas;
- Opportunities to form new partnerships and collaborations.



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## The Textile Futures Programme

Thanks to the backing and support of our Regional Development Agency, Yorkshire Forward and the European Regional Development Fund the Centre of Excellence, working with our industry partners has created a new programme that will significantly increase the region's capacity to operate in the Advanced Materials sector.

The value of the technical textiles market, which covers a wide range of sectors including medical, engineering, construction, automotive and aerospace has grown to an estimated €36 billion.

New technologies, coupled with increasing environmental concerns are opening up major opportunities for companies that can create lighter, stronger components, and materials that can sense and adjust to their environment. Our feasibility studies have demonstrated that strong collaboration between industry and research partners can drive the development of new processes and the creation of new materials that will generate clear competitive advantage for our region's manufacturers.

Yorkshire's textile manufacturers produce the best quality fabrics for the world's most famous fashion houses. We are increasingly capitalising on that expertise by producing high performance fibres and fabrics for use in a wide variety of sectors. This programme will enable companies to work together to secure a higher share of this growing market, and to secure the future of this key part of our regional manufacturing industry.

Bill Macbeth, Managing Director of the Textile Centre of Excellence.



Bill Macbeth

## Company Support

The programme provides financial support for collaborative activity between companies, experts' fees and the development of new capital equipment. The programme subsidises company costs for 3 different types of project. The amount of funding support varies according to the type of project and the number of companies participating.

- **Feasibility Studies:** Initial research activity to identify the potential viability of a new product or process idea, the current state of the art, demand for or benefits of a new product or process, potential research or company partners, equipment requirements and project timescales.
- **Industrial Research:** Projects that help companies to acquire new knowledge in order to develop new products, processes or services or significantly improve existing ones. Includes the development of components for industrial research and generic technical validation, but excluding prototypes.
- **Experimental Development:** Projects that help companies to acquire and use existing scientific, technological, business and other relevant knowledge to design new, altered or improved products, processes or services. Includes the development of commercially usable prototypes for demonstration/validation purposes.



Support is available for up to 80% of costs including:

- Company management and technical staff costs;
- Modification of premises and manufacturing capabilities;
- Materials and consumables.

## Feasibility Studies & Programme Activity

The Textile Innovation Programme builds on a series of 4 feasibility studies that were completed in 2009. Those studies demonstrated:

- high levels of industry engagement;
- significant levels of innovation - working with research partners;
- clear commercial potential in specific industry areas.

The studies also provided opportunities to test delivery processes where manufacturers worked with research partners to deliver specific outcomes of real benefit to the region's manufacturing industry against industry timescales.

## Anti Counterfeiting with Botanical DNA

The study aimed to provide proof of principle for the impregnation of modified botanical DNA into woollen fibres to enable the authentication of high quality textiles produced in the region at all points of the supply chain through to the end user.

- Initial development included the creation of a unique DNA sequence combined with a 'rapid reporter' (UCP) to facilitate immediate detection of DNA;
- Yarn was successfully impregnated at the spinning stage using DNA mixed with lubricant;
- Yarn was woven as a pinstripe into cloth and samples tested;
- Cloth was mended and finished using 3 different industry treatments;
- Forensic laboratory tests confirmed that DNA was detected following all finishing treatments;
- Additional development work was completed successfully using DNA in woven labels.

The study proved that the forensic technology offered by encrypted DNA security markers could be integrated with inks, lubricants, threads and varnishes, enabling manufacturers to protect their brands and intellectual property that could otherwise be eroded by counterfeiting and fraud.

NOW: The first DNA protected fabrics will be launched in Spring 2010. Facilities for yarn and fabric impregnation and forensic testing are now being established in the Region. DNA protection will be made available for a wide range of products including chemicals, electronics and pharmaceuticals at affordable prices.

## 3D Production of Components for Aerospace and Other Industries

The study aimed to provide proof of principle that a replacement part, previously produced in titanium, could be made from silicon carbide yarn using 3D weaving techniques.

- New mechanics of layering projection and tensioning techniques were developed for complex weaves.
- Sample infusions with aerospace clients demonstrated the success of the prototypes.

A design was developed for a machine capable of larger scale production.

NOW: A new machine is now under development, capable of producing small, complex, sculptured components, brackets and fittings for use in a variety of sectors using carbon and silicon carbide yarns.

## Plasma and Laser Technologies

Plasma treatments use ionised gases passed through high energy electromagnetic fields. According to the gas used, plasma can etch the surface of a fibre to improve dye take-up, oxidise the surface making it more absorbent or form a deposited layer, making a fibre more resistant to heat, water or other elements. The study aimed to develop proof of principle for a range of cost effective plasma based treatments offering wide market penetration and improved competitiveness with great potential for reducing the environmental impact of manufacturing processes. The study demonstrated:

- Improved dyeing properties including depth of shade and colour-fastness;
- Self cleaning and dirt/aqueous staining improvement;
- Plasma polymer deposition;
- Bleaching properties.

NOW: A series of detailed product and performance specifications are being developed for a new process combining plasma and **multiple laser technologies** including shrink resist treatments, dry scouring, hydrophobic and microbial properties and improved dyeing.

## Developing Nano Composite Filament Yarns for 'Smart' textiles

The study aimed to provide proof of principle for the production of a new range of high (mechanical) performance yarns to manufacture smart materials and clothing. The particular functionalities included in the study were conductivity, antibacterial properties, flame retardancy and enhanced colouration.

- 5 different nano-particulates were tested, carbon black, carbon nano-tubes, milled carbon fibres, nanoclay and nano silver;
- Milled, recycled carbon fibres gave very encouraging results with good conductivity levels;
- Spun fibres with nanoclay additives gave encouraging results for enhanced dyeing properties for polypropylene;
- Biocomponent spinning produced enhanced colouration with a 50% reduction in added pigmentation.

NOW: Specific areas are being investigated for applications in melt spun fibres with significant commercial potential. These include flame retardancy in furnishing fabrics, improved UV resistance, improved colour fastness, dry pre-preg processes with thermoplastics and improved strength in medical sutures and devices.

## Workshops

The Programme features a 'rolling' series of workshops where companies learn about the 'state of the art' applications from technology experts and identify areas where new approaches can add value to their products

and processes. The Workshops also provide a forum where companies discuss potential applications and form partnerships leading to collaborative project activities.

of Attiger Ltd. Turchan and Attiger had collaborated in the application of plasma technologies in a number of sectors using various materials where lasers had been used to activate gas plasma fields with some excellent results. Turchan's achievements were further demonstrated using components that had been treated, often with diamond-based components to improve their functionality and surface characteristics.

Laser-generated plasma activity has now been identified as a 'breakthrough technology' for textile treatments where it can be incorporated into a manufacturing environment at an acceptable cost.

## Plasma and Laser Technologies

Friday 9th October 2009. The workshop covered innovations in the field of Plasma Technology. Professor Carl Lawrence from the University of Leeds presented findings from the feasibility study and outlined the performance advantages and environmental benefits that could be realised by the use of plasma technologies.

The workshop was also addressed by Pravin Mistry of Turchan Technology Ltd. (Detroit) and Graham Downhill



## Anti-Counterfeit Technology



Tuesday 3rd November 2009. The workshop considered the results of the feasibility study where DNA had been applied to material to ensure authenticity and traceability of Yorkshire made products. Martin Jenkins illustrated the process of adding DNA and a UCP (Up Converting Phosphor) to a pinstripe worsted material.

Dr James Hayward of Applied DNA Science at Stony Brook University New York described the development of introducing DNA as an anti counterfeit measure particularly in relation to cotton but also highlighting the many other areas for its potential use including:

- Secure printing
- Wine and Food
- Textiles
- Electronics
- Labels
- Chemicals and adhesives
- Military components
- Security Integrators
- Cash and Valuables in transit

Dr. Hayward explained that Botanical DNA provided a means for forensic authentication that could not be compromised or copied whilst the use of UCP provided a facility for a rapid field test using a scanner or laser pen to give green light and audible signal when the presence of UCP was detected. The system had been extensively tested with UK Police Forces for Cash in Transit and protection which would lead to several criminal prosecutions. The big advantage for use in textiles was that DNA could be incorporated directly into the product at any stage and could not be removed or altered, unlike alternative methods including holograms, barcodes and other identification devices.

## Nano Technology



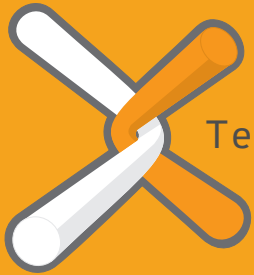
Tuesday 10th November 2009: The workshop featured presentations from Professor Carl Lawrence of Leeds University, Richard Slack of Fibre Extrusion Technology and Dr Barry Park GBP Consulting Ltd.

Professor Lawrence presented the results of feasibility studies carried out in the field of nano particulates whilst Richard Slack and Dr Park focussed on the potential applications for using this technology particularly in relation to such functional aspects as fire retardancy, UV stabilisation and a large number of potential medical applications.

The inclusion of nano materials provides opportunities for producing synthetic yarns with enhanced functionality - significantly improving yarn, fibre and fabric performance. Nano materials can also increase the range of functions of a product and introduce multi functional properties, facilitating new product development and supporting business growth.

The Workshop identified the stages of development for projects using nano structured functional yarns:

1. Product concept identification
2. Characterisation of polymers and the effects of additives
3. Materials preparation
4. Melt spinning
5. Yarn characterisation – test and measure yarn properties
6. Product conversion, sampling, exploitation



**Textile Futures** The Textile Futures Programme team is keen to collaborate with partners, experts and potential service/materials suppliers. Please contact us for more information.

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Supported by



The Region's  
Development Agency

**Solutions  
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Funded by  
government



Project Part-Financed  
by the European Union  
European Regional  
Development Fund