mlse™

Synthesis Technology

Developing Functional Treatments for Textile Applications

01

BACKGROUND

Textile manufacturing has been a major part of the European industrial landscape since the industrial revolution and historically energy, water, labour and chemicals have been the resources that have underpinned the industry. Harnessing these resources skilfully and effectively has allowed European companies to lead the world in terms of quality to satisfy high end and specialist markets, where acceptable margins can be achieved. These companies remain competitive but are continually challenged to reduce costs and provide innovative products and processes while meeting increasingly demanding legislative requirements, particularly in terms of environmental impact and standards. The escalation of utility costs and a greater general awareness of environmental issues have increased demand for technologies that can reduce operating costs or provide products with a technical advantage. These factors suggest that the opportunities for new technologies that can address the challenges of the industry are significant.

THE CHALLENGE

A major challenge for the textile industry today is the introduction of more resource efficient processes to reduce or avoid the use of water, energy, chemicals and to minimise waste. This is because:

- The Market is Changing: Consumers and procurement agencies are becoming increasing conscious of the need for ‘ethical sourcing’ and the growing demand for environmentally friendly technologies will increasingly impact on the market share of individual producers.
- The Rules are Changing: The introduction and enforcement of Legislation on the use of chemicals in material processing will have a growing influence on processing operations and costs. The need for new production solutions is critical.
- The Problem is Growing: Traditional textile dyeing and finishing is one of the largest users of water, energy and chemicals and despite many resource efficiency efforts the industry still needs to find radical solutions to substantially reduce its environmental impact.
- The Rewards are Greater: Producers are increasingly aware that technologies with dramatically reduced resource consumption could also support more cost-effective production of high end products, with improved ecological footprint and operating margins.

02

THE SOLUTION

MLSE (Multiplexed Laser Surface Enhancement) technology is an example of technology transfer between industries, which has facilitated a leading edge development in both the processing and the performance of textiles. The use of photonics and plasma in a controlled vacuum environment of gases and sol-gels has long been established particularly for the production of electronic components and metallic and non-textile polymeric substrates. MTIX and the Textile Centre of Excellence have now developed this technology's capabilities for a broad spectrum of textile applications. The unique feature of MLSE technology is the combination of energy sources in a controlled atmospheric environment in the presence of a material substrate. The net result is conversion and material synthesis in, or optionally on, the surface of the substrate.

THE TECHNOLOGY HAS THREE APPLICATIONS:

CLEANING

Both Plasma and UV systems are currently used for cleaning and ablation of polymeric and metallic materials. The MLSE technology enhances these processes at a higher level. The laser intensifies the effective power of the plasma as well as acting on the substrate in its own right. The process has demonstrated cleaning of a woven fabric that had not been aqueous or solvent scoured.

PREPARATION (LOW TEMPERATURE DYEING)

Increasing treatment intensities ablates the surface of the fibres, thus preparing them for secondary processing e.g. dyeing. There are 2 elements to this process. In the first instance, the controlled ablation of the surface of the fibres increases greatly the hydrophilicity of the textile. This has been demonstrated and industrial testing has shown that increasing dye take-up has reduced dyeing cycle times and allowed the process to be effected at lower temperatures. Thus, the primary benefit of this element of the process is in reducing both operating costs and environmental impact. Another opportunity presented by the Preparation process involves introducing environmental gases into the process zone of the system, creating new chemistries at the surface of the fabric. The MLSE process enables the exploitation of dye chemistry to a further level creating a range of performance attributes, such as hydrophobicity and enhanced durability.

PERFORMANCE ENHANCEMENT

At the highest level, the MLSE process achieves material synthesis in the surface of the substrate. By altering the laser and plasma frequencies and the power intensities, and introducing other materials into the process environment, the system ablates the surface of the substrate and a series of chemical reactions between the substrate and the environmental gases synthesise new materials in the surface of the fibres in the textile substrate. This process produces significant results in level of performance, in the cost of processing and in the reduced environmental impact of the process. To date, that work has been focussed into three discrete areas:

- hydrophobicity, stain resistance and durability
- fire retardancy
- antimicrobial surfaces of textiles

Although the basic process is the same for each area, it is the recipe of laser/plasma intensities and frequencies and different environmental gases that change the performance enhancements of the process. In all cases, the development and prototyping work to date has demonstrated reliable and repeatable results in all three areas.

03

THE MLSE TEXTILES ECO-INNOVATION PROJECT

The MLSE Textiles Project, which is co-funded by the Eco-Innovation Initiative of the European Union, aims to bring about the successful commercialisation of this ground breaking technology. The project is a partnership between the Textile Centre of Excellence and W T Johnson & Sons, both based in Huddersfield, UK. Project activity has involved global market assessment, analysis of competitor technologies, formation of business and marketing plans and installation of the first commercial MLSE system at W T Johnson & Sons Ltd., the 'Primary Customer'. Learning from this initial commercial installation, the project has also identified and prioritised areas for commercial system implementation. The project has accelerated the commercialisation of this important new technology which promises a massive market advantage for EU based textile manufacturing and processing companies.

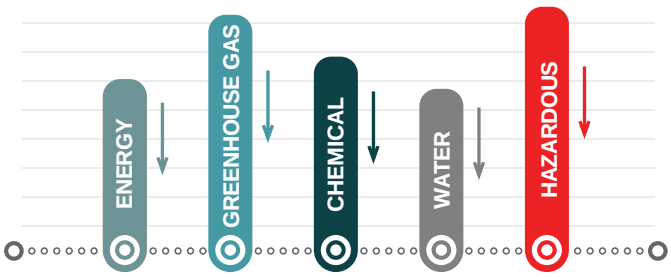
The project objectives include:

- Orders for 6 MLSE systems during the project
- A clear business development strategy to steer the commercialisation of the technology
- A Europe wide technology validation exercise identifying the range of potential applications
- Partnership agreements for future component supply, system assembly and sector implementation
- Quantification of environmental savings (tonnes per year in chemicals, dyes, CO2e, water)

Early results have demonstrated that the MLSE process is an environmental alternative that eliminates the use of hazardous chemicals and persisting ecological toxicity.

An independent expert study has verified:

- Energy consumption reduction of 99.6%
- Greenhouse gas reduction over baseline of 90.9%
- Resource (chemical) use reduction of 94.8%
- Water consumption reduction of >75.5%
- Use of Hazardous resource (irritant/corrosive and bio-accumulative) eliminated completely



04

SPECIFICATION

THE MLSE SYSTEM HAS 5 ELEMENTS:

- UV Laser
- Custom Atmospheric Plasma System
- Fabric Handling System
- Process Control System
- Ancillary devices

THE SYSTEM:

- Is robust - to work in an industrial environment
- Processes fabric presented in different formats
- Has an operator interface that makes operation user friendly and logical

FUNCTIONALITIES

The MLSE process has the potential to work with synthetic and natural woven textiles through the spectrum of performance characteristics including:

- Water repellency
- Stain resistance
- Oleophobicity
- Wrinkle resistance
- Abrasion resistance
- Fire and flame retardancy
- Breathability
- Enhanced adhesion
- Enhanced printability
- Improved colour fastness
- Wash cycle durability
- Texture & feel
- Dry scouring and cleaning
- Impact dissemination
- Fibre strength
- Dielectric properties
- Anti-bacterial/microbial
- Surface topography management

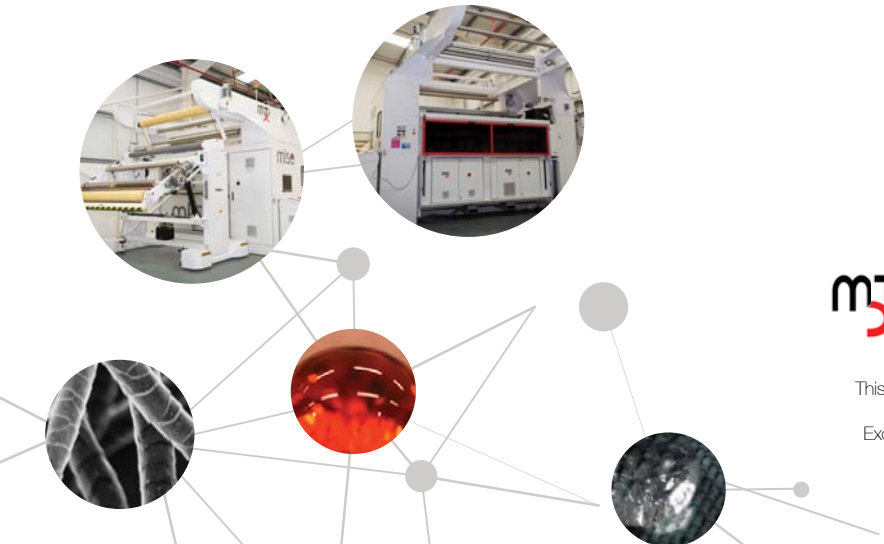
The MLSE system can also deliver multi-functional treatments.

05

THE MARKET

A detailed analysis of current and potential alternative technologies has identified potential competitors and clearly indicated the environmental and economic advantages of MLSE technology. With a minimum of promotion, MLSE technology is now stimulating global interest and attracting the attention of key environmental groups. The discussions that are now underway are likely to have a major impact on the potential for future system sales.

The partners believe that the environmental improvements and economic benefits offered by the MLSE system will generate a high level of interest from EU companies. The MLSE system will offer opportunities for EU companies to increase their market share and to process products which have previously been processed offshore (notably in China) due to the restrictions operating across the EU regarding chemical usage. The clean MLSE technology has the potential to 'repatriate' a large proportion of processing for the EU market with consequent logistics savings in both economic and environmental terms.



mlse

MTiX LTD
Industry Innovation Centre
Textile Centre of Excellence
Red Doles Lane, Huddersfield
West Yorkshire HD2 1YF

Bill Macbeth
Tel: +44 (0)1484 346500
Email: bill.macbeth@textile-training.com
Web: www.textilehouse.co.uk

Co-funded by the Eco-innovation Initiative of the European Union

This publication has been produced with the assistance of the European Union. The contents of this publication are the sole responsibility of the Textile Centre of Excellence and can in no way be taken to reflect the views of the European Union.