Space ‘eye’ for textiles

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An artificial eye developed for Earth observation is now being employed to recognise colour variations in dyed fabrics: a critical element of textile production. This could significantly reduce the 160 million metres of dyed fabrics discarded annually in Europe with high environmental costs.

"Today most of Europe's more than 40,000 textile companies rely on human quality control. Specialised personnel monitor fabrics as they are produced, but this is an expensive and technically not a very reliable method," says Stefano Carosio, a Project Manager at Italian company D'Appolonia, part of ESA's Technology Transfer Programme's network.

Ideally textile manufacturers would prefer automated systems to control colours while producing the fabrics, but until now it has been impossible to manufacture a machine capable of even matching the capabilities of the human eye, which can recognise more than 30 000 different colours.

Space technology developed for Earth observation has now come to the rescue, in the form of a spectrographic system developed by Finnish company SPECIM. Originally this was applied to remote sensing for checking the effects of agrochemicals used by farmers, to increase efficiency and reduce ecological damage. This system also proved capable of recognizing colour variation in textiles.

From space to textiles

In collaboration with D'Appolonia and a group of local fabric dyeing

companies in northern Italy, the Italian University of Como built a prototype of an optical system capable of accurately comparing the colours in textiles. It works by checking a line across the material and measuring the spectrum of several areas along this line. This scans the fabric as it moves along the production chain even at high speeds.

To reduce any complex maintenance the system is designed to be mechanically fairly simple with no complicated scanning mechanisms: it is the fabric that moves under the fixed eye of the scanner.

"The system created a lot of interest among Italian textile manufacturers at a demonstration in Como organised by the Italian Textile and Silk Association in December 2000", says Stefano Carosio. "It was clear that such a system could cut costs and improve competitiveness for European textile companies." Backed by ESA's Technology Transfer Programme, the project now receives financial support from the European Commission under its CRAFT initiative.

"It is one thing, however, to demonstrate the concept and another to adapt the technology for industrial production," explains Stefano Carosio. "We needed an automatic system that could perform online textile inspection during production without interrupting the work. To make it interesting for industry, it had to operate at production speeds of up to 100 metres of textiles per minute – not at all an easy requirement."

As prime contractor the Italian company IRIS DP headed a consortium of five European companies to develop the first system. Called Coltex, this was presented for the first time at the 2003 Techtextile Fair in Frankfurt.

"We received so many requests from companies for the machine that we were sure that producing such a machine would be good business and solve a major problem for Europe’s textile industry," says Stefano

Carosio.

The first industrial machine was ready by the end of 2003. In 2004 five machines were sold to textile companies in Italy. An additional five machines are now scheduled for production in 2005, three for Italian companies and two for non-Italian textile manufacturers.

A Coltex machine has also been installed at the showroom of CITEVE, the Technological Centre for the textile and garment industries of Portugal, in Vila Nova de Famalicão in the Costa Verde region, where many Portuguese textile companies are situated.

The results

Using the space 'eye' for textile manufacture has improved the quality of textile production and lowered costs, as the amount of yearly waste is significantly lower. The 160 million metres of dyed fabrics discarded yearly in Europe correspond to a loss of €800 million and 8000 tonnes of dyeing agents and solvents that have to be 'cleaned', using costly procedures, to prevent environmental pollution.

"This new system allows textile manufacturers to control production much better. They can detect colour irregularities immediately, right during production, and take the necessary corrective action to avoid sending out faulty fabrics," says Denis Cardella, IRIS DP Project Manager for the Coltex machine.

"Textiles are produced in huge rolls, typically 35 metres for silk and up to 2000 metres for cotton. Previously only the most severe colour defects could be identified during manufacture, the majority were found only when the fabric was utilised. This meant high extra costs, unnecessary work and more material being discarded," explains Denis Cardella.

"Our Coltex machine raises the quality product assurance and specifies more precisely the colour differences in a roll. Knowing this, cloth manufacturers find it easier to optimise the use of material and discard less."

"It's amazing how well the camera, the artificial 'eye' originally developed for space observation, can distinguish colours, spot mistakes in the dyeing and even identify changes in colour shades. We are now looking into other areas where novel technologies, such as those developed for space, can improve textile production in Europe," he adds.

Pierre Brisson, Head of ESA's Technology Transfer and Promotion Office, says, "we are delighted that technology developed for space is being applied to reduce waste and increase quality in the textile industry. This will make the European textile industry more competitive: a must if we want to save jobs in an industrial sector that is under threat in Europe".