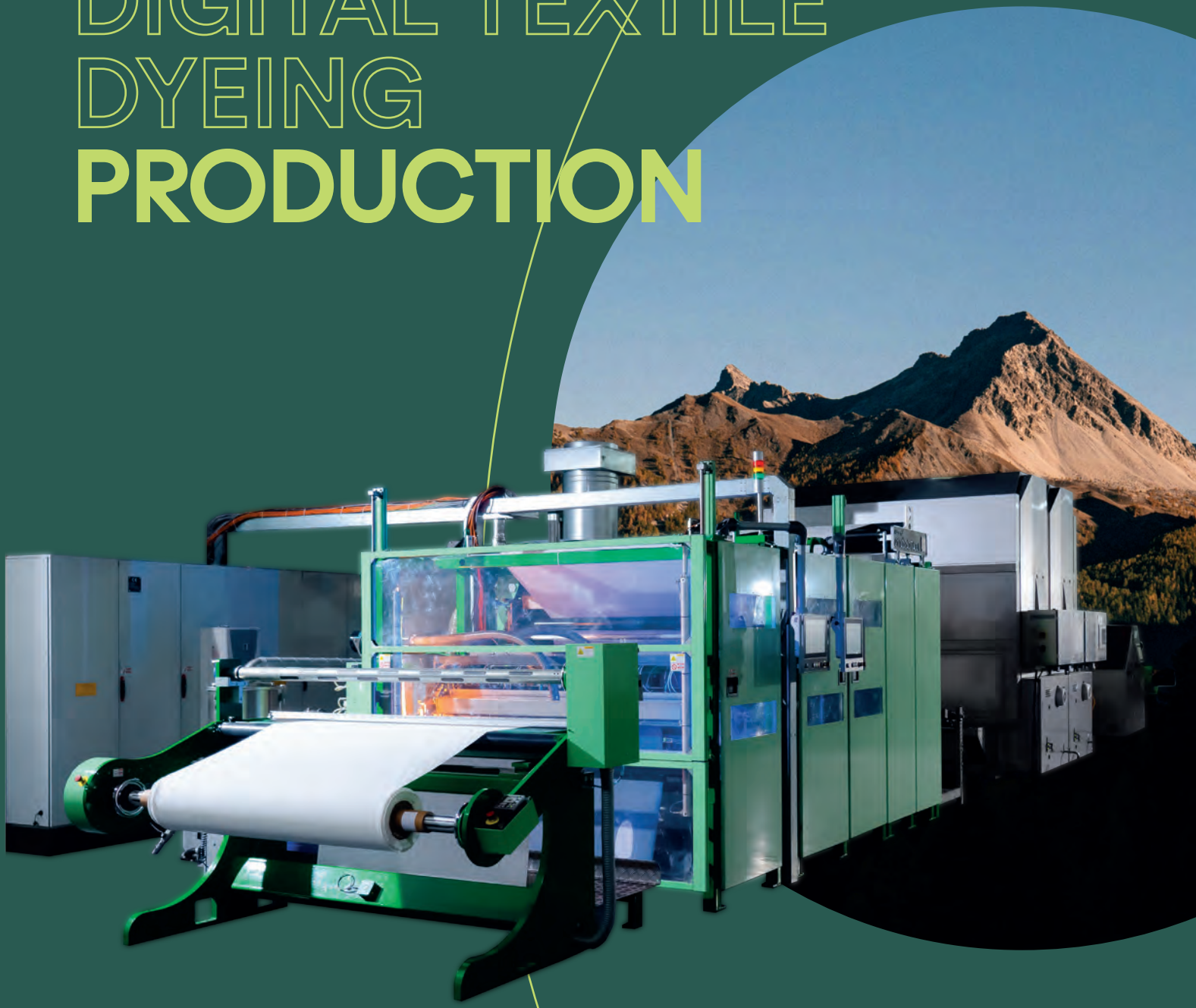
endeavour

LOW CARBON DIGITAL TEXTILE DYEING PRODUCTION



Alchemie

ABOUT ALCHEMIE

REIMAGINING THE TEXTILE INDUSTRY

– Based in Cambridge, UK's foremost innovation hub.

– The company was founded in 2013 to target a growing need for clean digital technologies in the textile industry.

– Developing landmark disruptive patent-protected core technologies that enable low energy, low carbon textile dyeing and finishing processes.

– Our unique Jetronica nozzles are manufactured to medical device quality and utilise a piezoceramic element to accurately apply nanolitre droplets of dye onto the fabric.

– Alchemie is reimagining the textile industry by partnering with major brands and their high capability, innovative suppliers.

OUR BREAKTHROUGH PROPRIETARY TECHNOLOGY

Born out of inkjet and developed to be the industry-leading digital liquid application solution, Alchemie combines a large droplet size and high droplet velocity to deliver unrivalled penetration into the textile.

INKJET

- Picolitre (1×10^{-12} litre) drops
- Loses velocity and momentum rapidly
- Can only print onto a surface
- Unable to penetrate a fabric
- Too expensive

ALCHEMIE

- Nanolitre (1×10^{-9} litre) drops
- Maintains velocity and momentum
- High precision
- Penetrates the fabric
- Low cost
- 1.2 billion droplets per linear metre of fabric

SPRAY

- Wide range of drop sizes
- Range of velocity and direction with variable momentum
- Little control
- Penetrates the fabric
- Limited applications

SUSTAINABILITY

Enable the acceleration of progress on achieving ESG targets – by dramatically reducing energy, water and chemical consumption throughout the process of fabric dyeing.

Alchemie's proprietary low carbon Endeavour™ digital dyeing process delivers significant sustainability benefits when compared to traditional dyeing processes, such as jet exhaust and CPB (cotton only) dyeing.

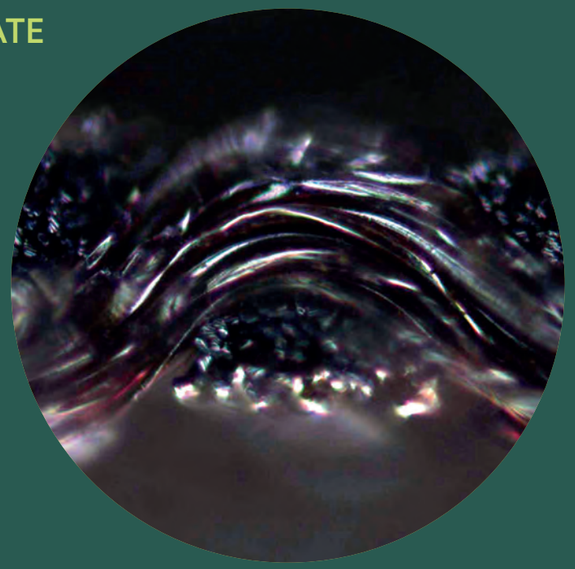
ENERGY REDUCTION UP TO 85%

WASTE WATER REDUCTION UP TO 95%

CHEMISTRY REDUCTION UP TO 30%

UNIQUE AND PRECISE 10-MICRON DROPLETS DESIGNED TO PENETRATE THE FABRIC

- Does not require access to water and energy.
- Clean-technology solution for a modern working environment.
- Supports the move to electrification.
- No restriction of colours and dyestuffs – a wide range of dyestuffs supported.
- Unique and precise 10-micron droplets designed to penetrate the fabric.
- Designed as a highly sophisticated medical device set to revolutionise textile dyeing and finishing.



Electron microscopy image of Endeavour™ dyed polyester textile

PAVING THE WAY FOR A SUSTAINABLE FUTURE

ENDEAVOUR™, OUR PRODUCTION SYSTEM

Endeavour™ is our full width, production-scale system, combining digital dye application with in-line drying, fixation, and softening to deliver low carbon, waste water-free textile dyeing.

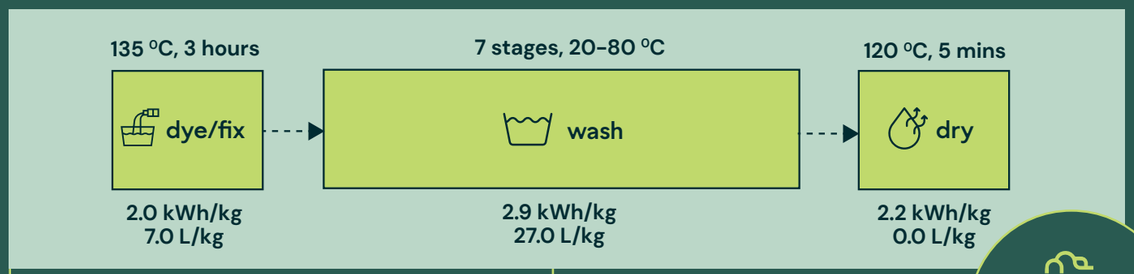
SEAMLESS END-TO-END PROCESS

The Endeavour™ process utilises Alchemie's specifically designed, patented, digital dye application technology to apply dye only where it is needed.

The Endeavour™ process uses less chemistry compared to traditional processes. The liquor ratio is minimised through non-contact application, working to the saturation point of the fabric. In regions using traditional processes, with poor waste water treatment facilities, large quantities of effluent are released, damaging the environment and people's health. Reducing chemistry use eliminating waste water through the adoption of clean, digital technology is crucial to mitigating the current environmental impact.

THE TRADITIONAL EXHAUST POLYESTER DYEING PROCESS

A traditional jet exhaust process uses large volumes of hot water, at temperatures of up to 135 °C, for both dyeing and washing, requiring a large amount of energy, often generated by burning fossil fuels to create steam.

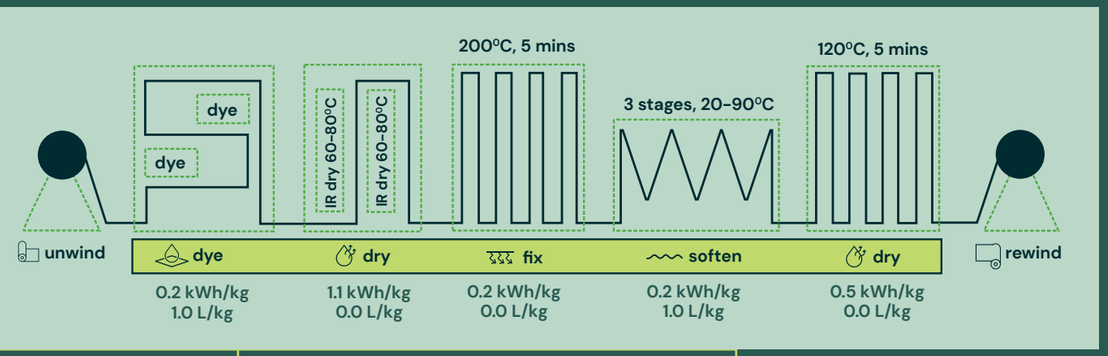


Total input water*	34.0 L/kg
Total energy	7.1 kWh/kg

*input water refers to the water that is added to the dye bath before the fabric is introduced at each stage

THE ENDEAVOUR™ POLYESTER DIGITAL DYEING PROCESS

Alchemie uses its proprietary low energy, low water Endeavour™ dyeing process to deliver significant sustainability benefits when compared to traditional dyeing processes.



Total input water*	2.0 L/kg (-94% vs. exhaust dyeing)
Total energy	2.2 kWh/kg (-69% vs. exhaust dyeing)

*input water refers to the water used across the entire process

Fixation unit

In-line dyeing

Softening unit

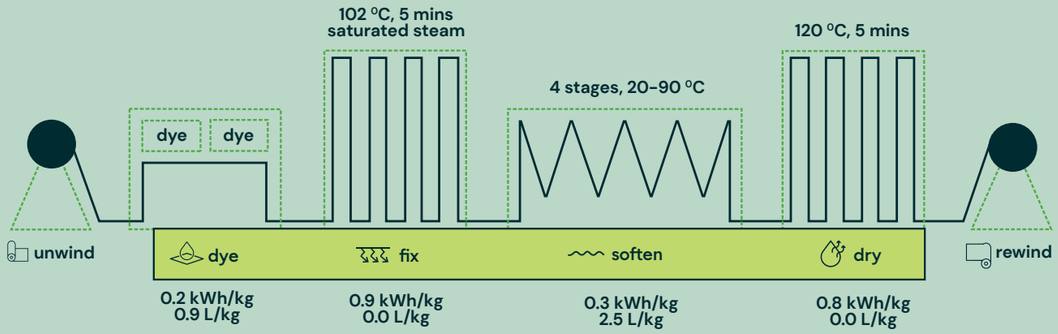
Rewinding

Unwinding

In-line drying

THE ENDEAVOUR™ COTTON DIGITAL DYEING PROCESS

A traditional jet exhaust process for dyeing cotton uses large volumes of hot water, at temperatures of up to 60 °C, for both dyeing and washing, requiring a large amount of energy. Alchemie will use its proprietary low carbon Endeavour™ digital dyeing process to deliver significant sustainability benefits when compared to traditional dyeing.



Total input water*	3.4 L/kg
Total energy	2.2 kWh/kg

*input water refers to the water used across the entire process

BENEFITS OF THE TECHNOLOGY

Endeavour™ offers significant benefits aligned with increasing industry regulation and policy, such as the EU Textiles Ecosystem Transition Pathway.

- Supports reduction of waste generation.
- Internet diagnostics give production traceability.
- Immediate positive impact to the local environment.
- Negative pressure airflow control process removes microfibres from the textile.
- Can support re-shoring.
- Supports the EU Textiles Ecosystem Transition Pathway.
- Instant savings.

DISCOVERY OUR BREAKTHROUGH LAB SYSTEM

Discovery is a low-cost lab system that replicates the production of Endeavour™ and provides a hands-on understanding of our digital liquid application solution.

Discovery generates dye recipes and fast colour matching, eliminating traditional lab dip processes enabling a hassle-free dye recipe-to-production.

EXCEPTIONAL VERSATILITY AND QUALITY

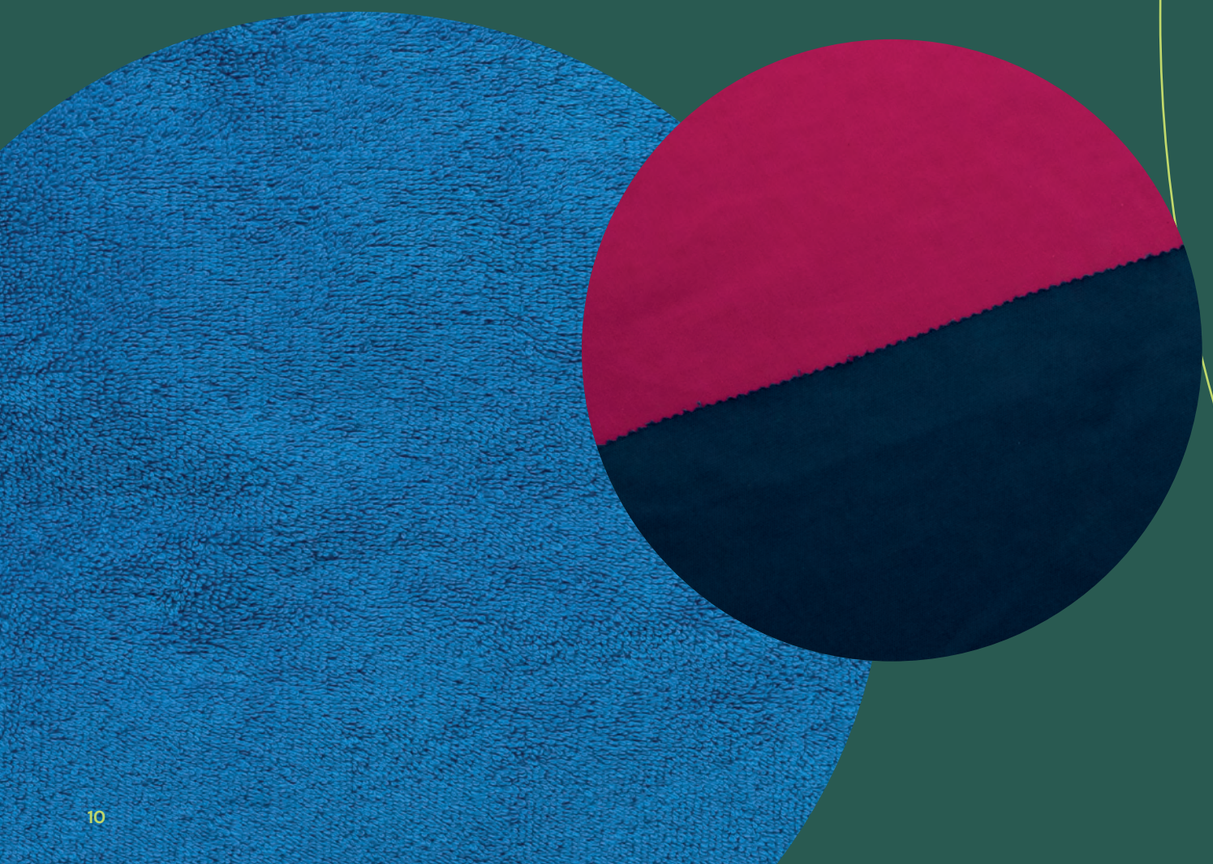
The versatility of our digital liquid application technology allows us to meet industry performance requirements using a wide range of commercially available colourants.

Exceptional quality levels are achieved, delivering excellent colour consistency (ΔE < 0.5). Colour fastness of ≥4/5 is achieved with a wide range of fabrics and colourant chemistries.

Composition: 100% cotton
Weight: 245 gsm

Composition: 100% cotton
Weight: 195 gsm

Composition: 100% cotton
Weight: 400 gsm



ENDEAVOUR™ TECHNICAL SPECIFICATION

Line speed	Up to 35 m/min	Fabric basis weight	50–500 gsm
Web width	1.4–1.8 m	Fibre types	Polyester Nylon Natural & man-made cellulosics (cotton, viscose, lyocell etc) Blends (including Elastane)
Side application	Single or double-sided (dependent on process)	Fabric types	Woven, non-woven, knit
Liquid flow rate	Up to 6 litres per minute	Dimensions	12.6 (L) x 6.3 (W) x 3.5 (H) m
In-line drying	Infra-red*	Power requirements	380–430 V 3-phase 50/60 Hz 450 A infra-red system* (FLC) 230 A Endeavour™ system (FLC)
Dye types	Reactive, Disperse, Acid and Pigment		

*N/A for cotton process

Alchemie

CREATING A WORLD WITH ZERO POLLUTION FROM TEXTILE DYEING AND FINISHING

The textile industry is one of the biggest polluters on the planet, generating over 3% of global CO2 emissions, and the second largest cause of industrial global waste water pollution. Alchemie's mission is to ignite change to eliminate the environmental impact of these polluting processes. At current consumption growth rates, textile dyeing could be responsible for 10% of global CO2 emissions by 2050.

To address this urgent issue Alchemie Technology developed breakthrough digital dyeing and finishing technologies that deliver a dramatic reduction in energy consumption and eliminate contaminated waste water emissions.

Contact our Product Specialist today
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