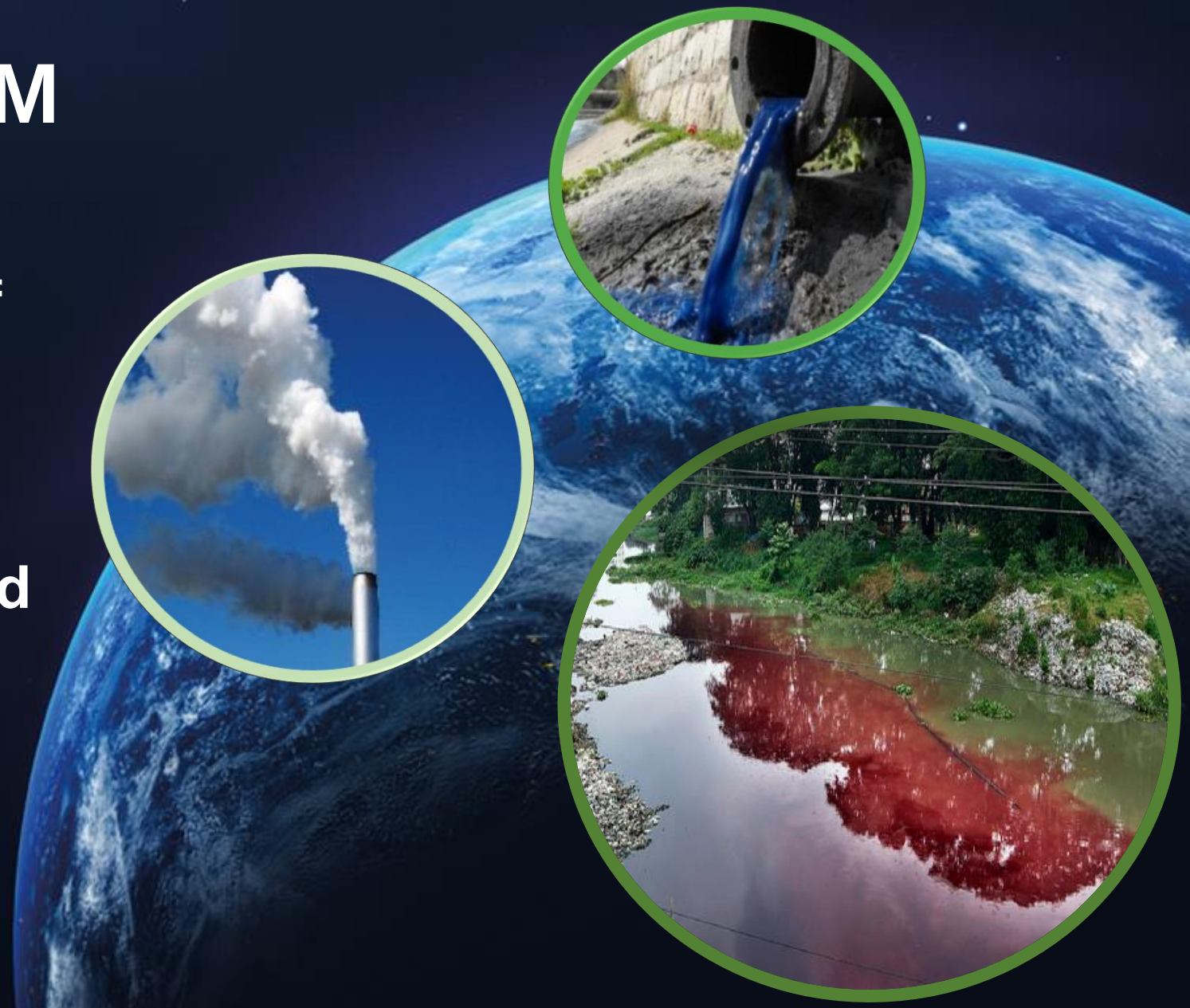
Alchemie Technology, waterless dyeing and finishing processes

Dee Roche
Chief Marketing Officer

The PROBLEM

Textile dyeing accounts for 3% of global CO_2 emissions…

…and is the second largest cause of global water pollution.



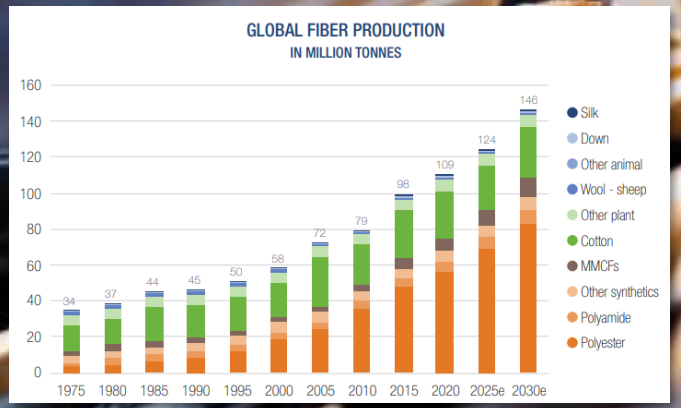
THE SCALE OF THE ISSUE

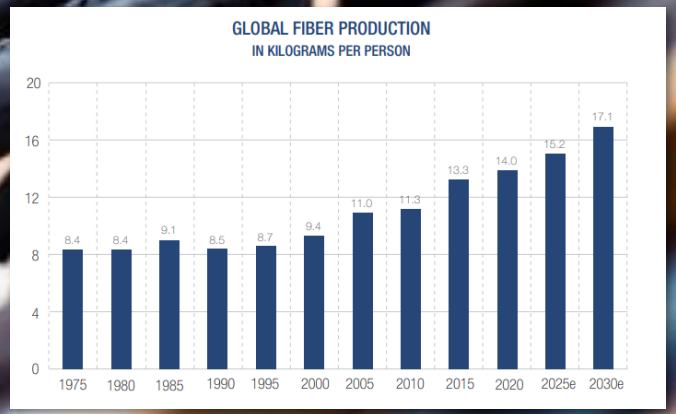
The amount of clothes we buy globally creates 553 billion tonnes of CO2 and

8.3 trillion tonnes of dye-polluted wastewater each year.

IF NOTHING CHANGES – CO_2 emissions from textile dyeing set to reach 2.5 Gigatonnes by 2050, making it one of the most polluting industries on the planet

- Increasing global population
- Increasing use of synthetics (polyester)
- Increased consumption per person:
  - Fast fashion
  - Increased affluence
  - US consumption ~ 35 kg/person
    https://fiberjournal.com/textiles-2025/
  - EU ~ 26 kg/person
    https://www.eea.europa.eu/publications/textiles-in-europes-circular-economy
- By 2050 the carbon emissions from dyeing/finishing >3X today to >2.5 G Tonnes CO_2





2050

Textile Dyeing >300 million tonnes

CO2 >2.5 Gtonnes

Textile-Exchange_Preferred-Fiber-and-Materials-Market-Report_2021.pdf (textileexchange.org



The impact of the dyeing industry today



Water scarcity is threatening human and business survival

- The fashion industry has a colossal water footprint – more than 1.5 trillion litres of water annually
- 30 tonnes of water are used to dye one tonne of fabric
- By 2030 global water demand will exceed supply by 40%*

*World bank

Textile Finishing

OUR SOLUTION.

Endeavour.
Waterless, low energy textile dyeing

Novara.
Energy saving non-contact finishing

Water reduction 95%

Energy reduction 85%

Chemistry reduction 50%

Cost reduction 50%

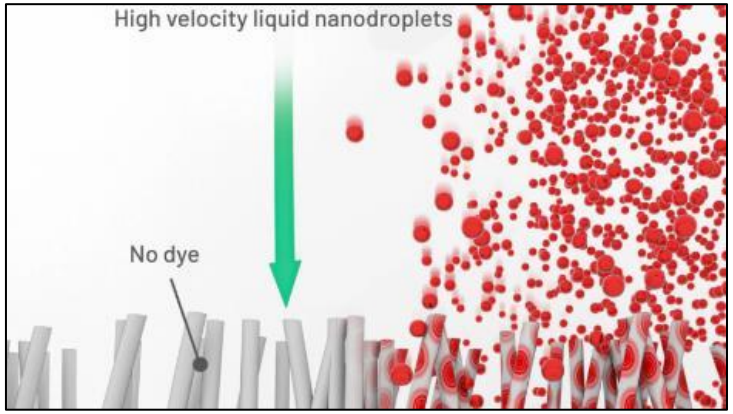
It’s the (sustainable) future

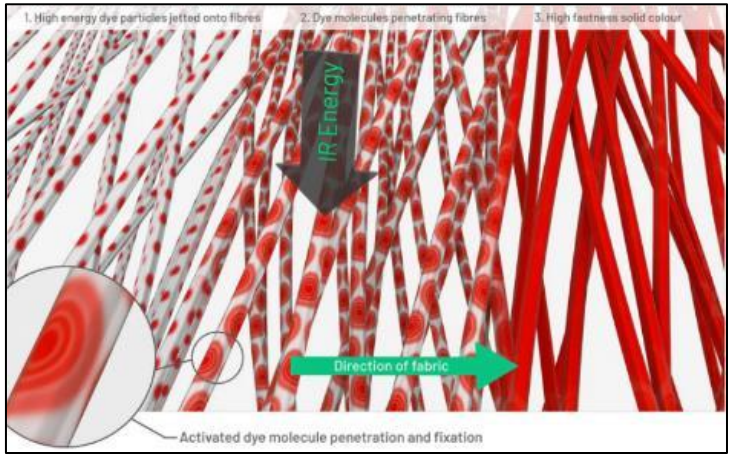
Endeavour jets the exact amount of dye for 100% penetration of fibres.

No excess dye is used in the dyeing process.

Eliminates the industry practice of high temperature BATH IMMERSION reducing the energy required to dye and finish fabric up to 85%

The disruptive technology



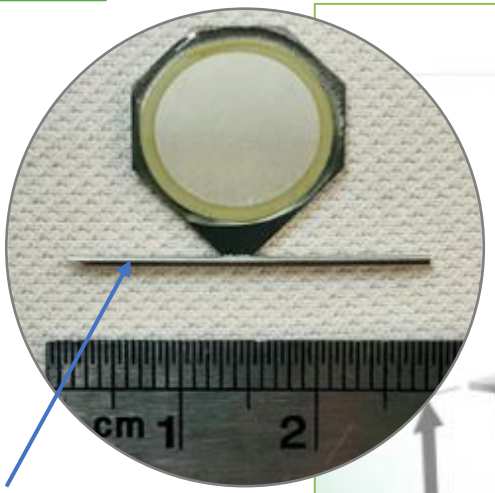


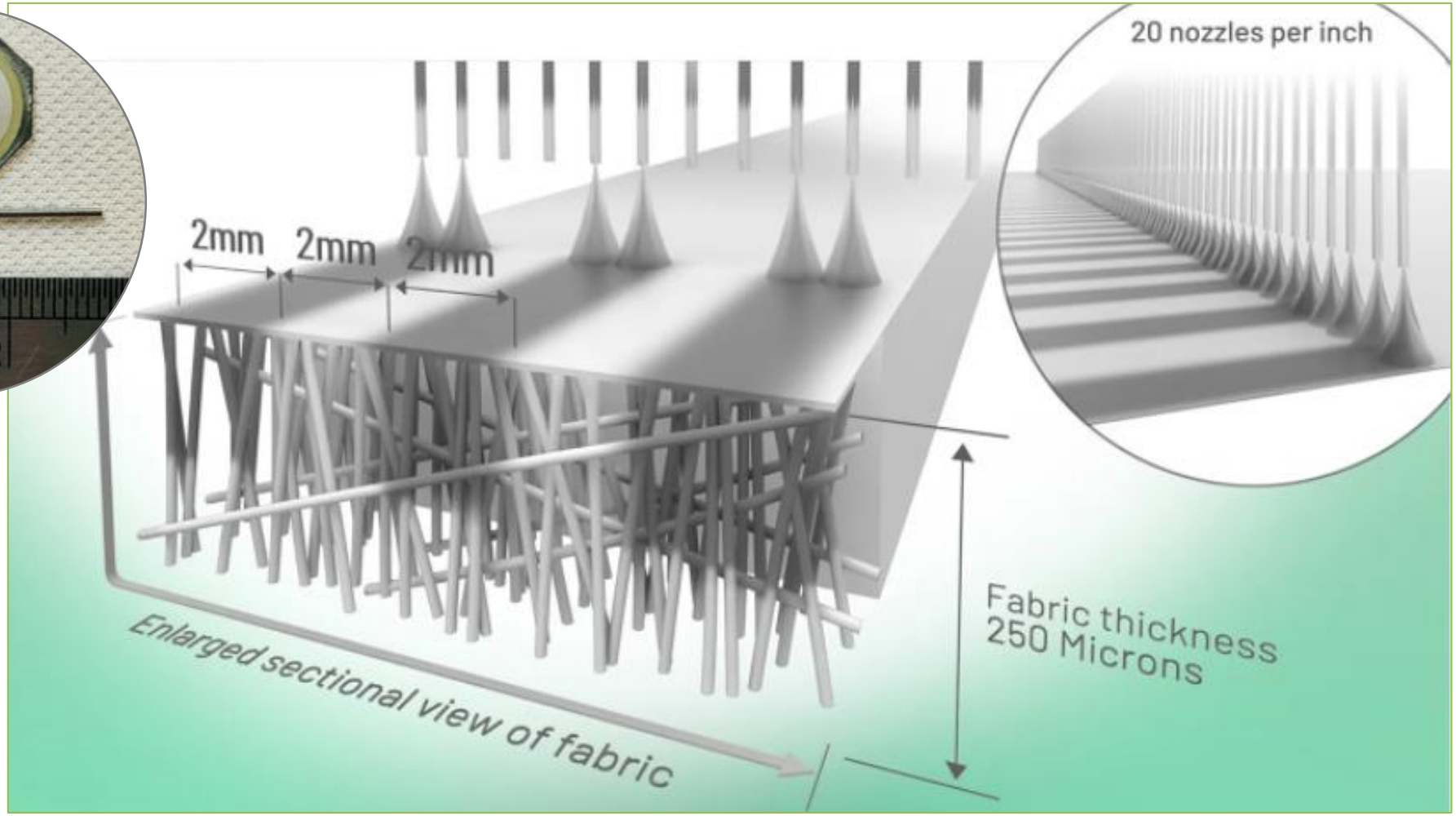
12 filed/granted patents

HOW DOES IT WORK?

Breakthrough proprietary digital liquid application technology

7+ years of R&D to develop core technology and develop the clean-tech textile dyeing process





- Precision engineered piezo jetting nozzle manufactured to medical device quality
- Dispensing 270 million 10 micron drops per second
- 1.2 billion digitally defined drops per linear metre of fabric

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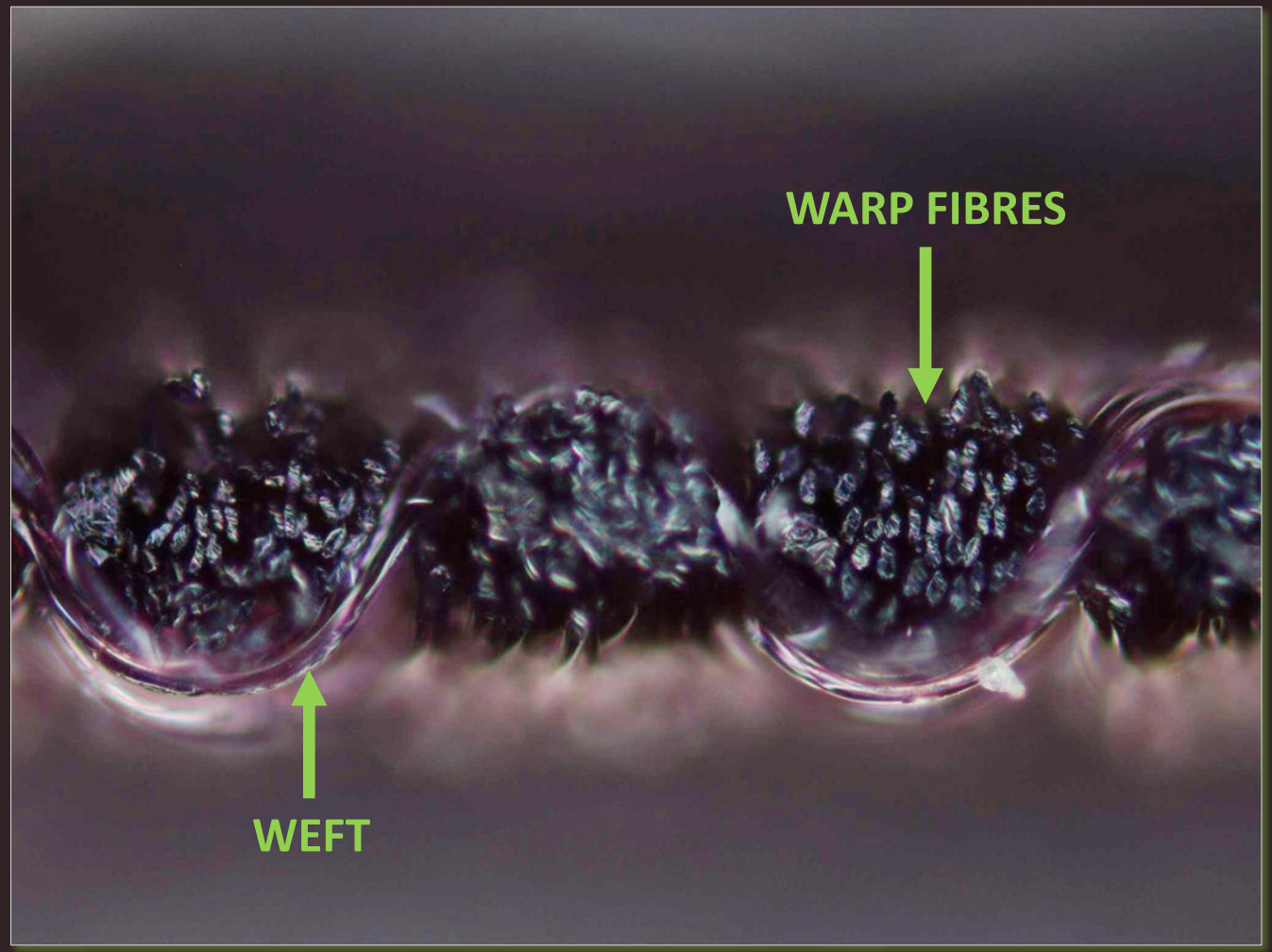
Electron microscopy image
Endeavour dyed polyester textile



Endeavour Polyester dyeing machine

- Warp Knit
- Weight: 152gsm
- Dye: Dianix Dystar XF2 Black

- Chiffon
- Weight: 78gsm
- Dye: K3 Black

Examples Endeavour dyed Polyester

Endeavour dyed fabric can meet industry quality specifications.

- Dralon
- Weight: 530gsm
- Dye: Dianix Dystar XF2 Yellow

- Microfibre
- Weight: 145gsm
- Dye: Dianix Dystar XF2 Violet

- 100% Cotton
- Weight: 245gsm
- Dye: Dystar Levafix Red

Cotton and Cellulosic

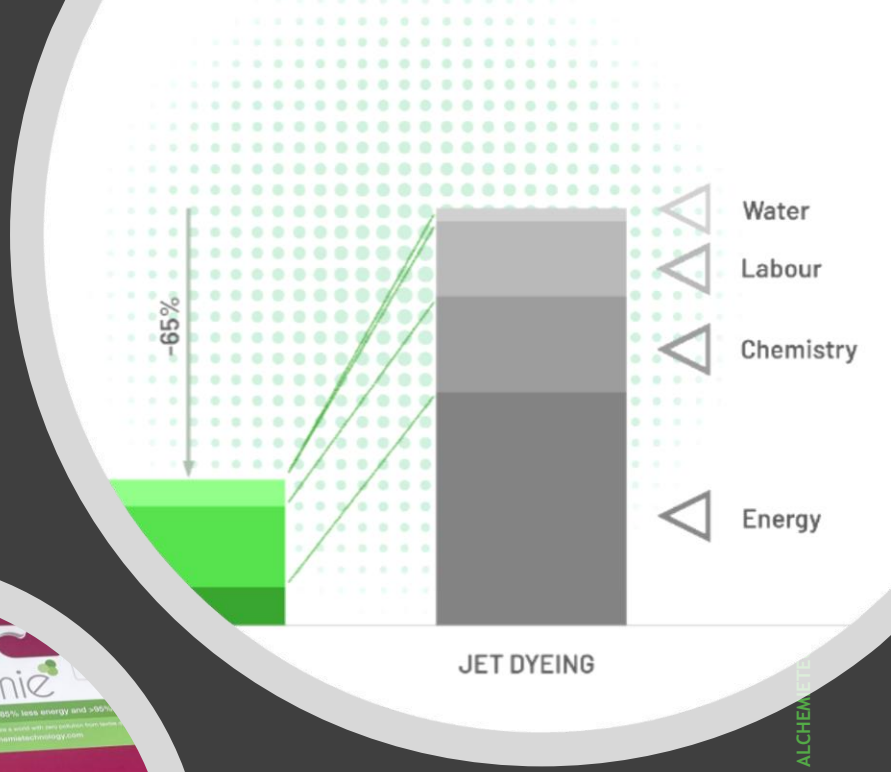
- Endeavour cotton dying vs. exhaust dyeing
  - 95% less waste water vs. exhaust
  - 70% less energy vs. exhaust
- Endeavour cotton dyeing vs. CPB
  - 85% less waste water
  - 40% less energy

- 62% Rayon 38% Viscose
- Weight: 90gsm
- Dye: Dystar Levafix Blue

- 100% Cotton Drill
- Weight: 245gsm
- Dye: Dystar Levafix Blue

Half the cost of traditional dyeing. Big increase in profit.

- Capital payback <18 months
- Op-ex cost reduction: $0.27/kg vs $0.80/kg of dyed fabric (China) due to significant labour, energy and chemistry saving
- 21 x profit per Endeavour dyeing system compared to jet dyeing - due to increase in productivity/lower cost



Alchemie Endeavour cotton dyeing vs Exhaust and CPB

Standard Endeavour Cotton process

Total waste water	2.6 L/kg* **(-95% vs. exhaust dyeing)**
Total energy	2.0 kWh/kg **(-70% vs. exhaust dyeing)**

Benchmarked versus Exhaust dyeing

Total waste water	59 L/kg
Total energy	6.9 kWh/kg (0.3 kWh/kg electricity, 6.6 kWh/kg steam)

Lowest energy Endeavour Cotton process

Total waste water	2.6 L/kg* **(-85% vs. CPB dyeing)**
Total energy	1.1 kWh/kg **(-40% vs. CPB dyeing)**

Benchmarked against Cold Pad Batch

Total waste water	15 L/kg
Total energy	1.9 kWh/kg (0.3 kWh/kg electricity, 1.6 kWh/kg steam)

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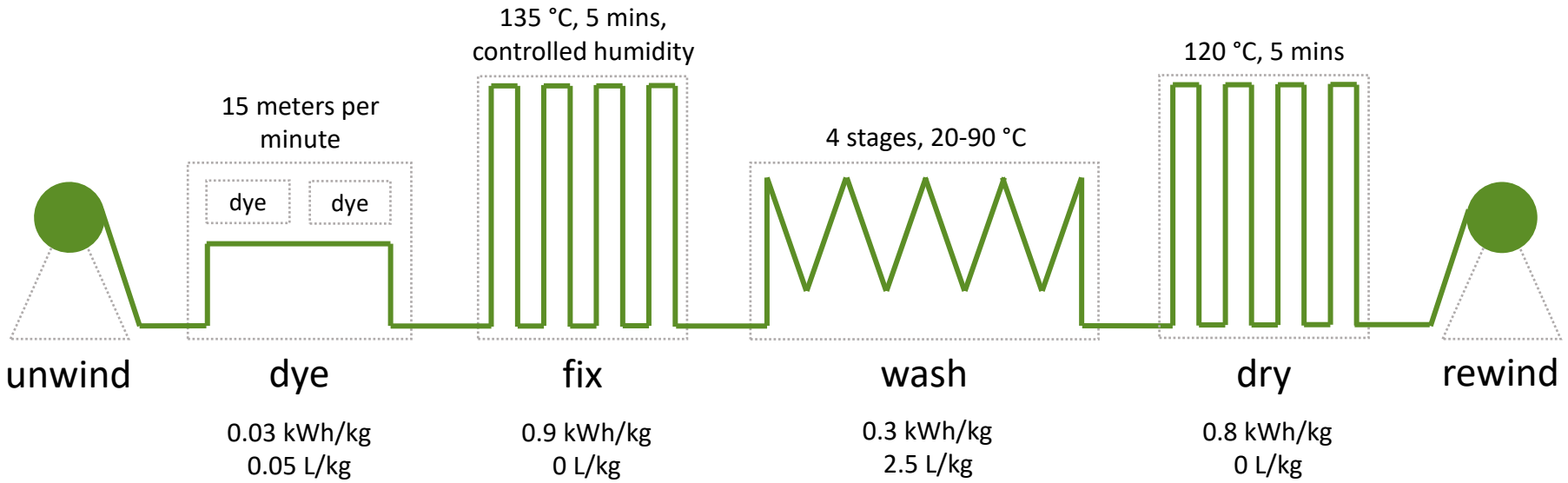
Standard Endeavour cotton:

Process overview



Parameter	Specification
Performance	ΔE ≤ 0.5, fastness ≥ 3/4
Total waste water	2.6 L/kg* **(-95% vs. exhaust dyeing)**
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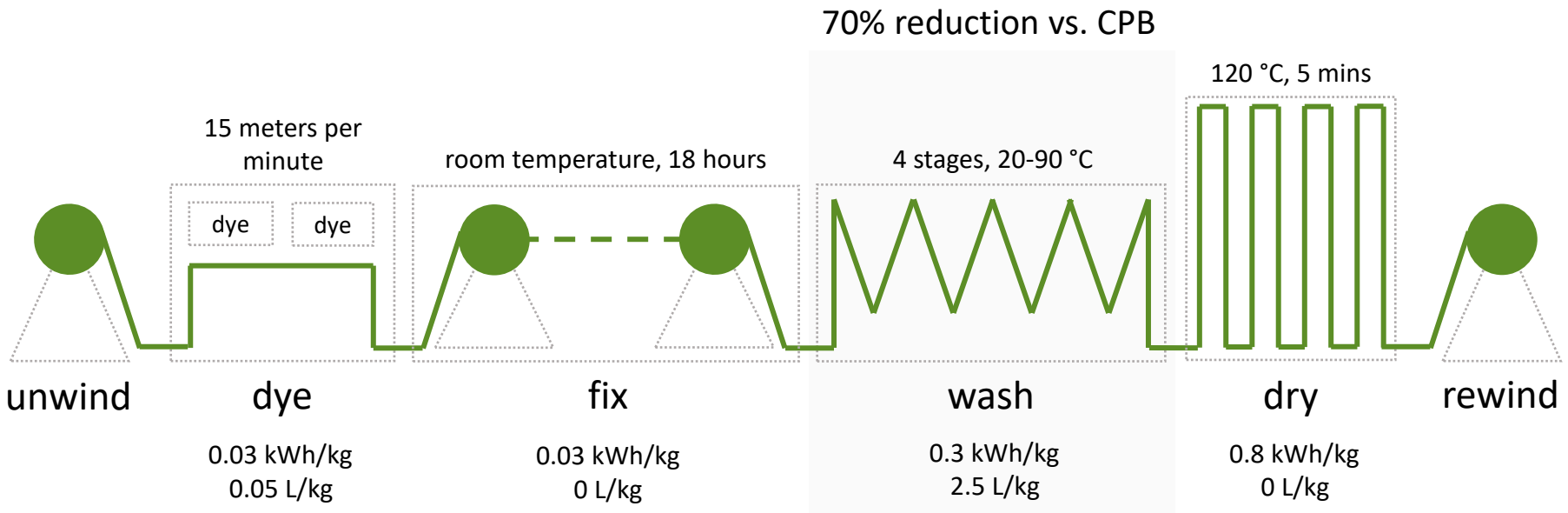
Lowest energy Endeavour cotton:

Process overview



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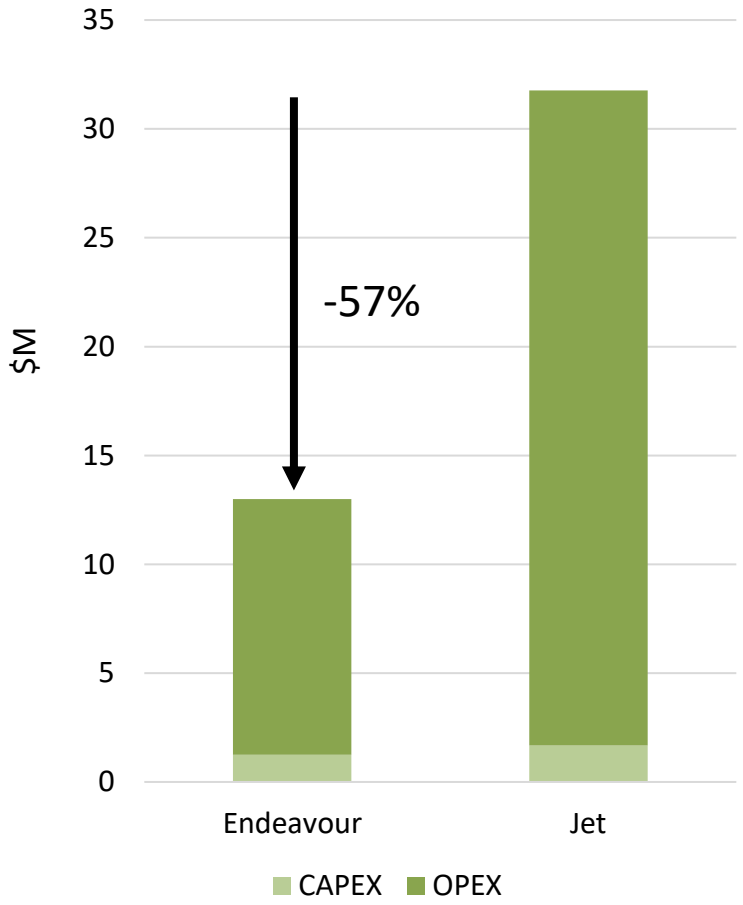
Endeavour TCO (production parity)



	Endeavour	Jet
Production / kg/year/machine	1,702,944	437,562
Machine cost / $/machine	1,500,000	350,000
# machines (production parity)	1	~4
Total CAPEX* / $	1,512,131	1,604,773
Dyeing cost / $/kg	0.35	0.88
Lifetime / years	20	20
Total OPEX** / $	11,917,900	29,949,681
TCO / $	**13,430,031**	**31,554,455**

Endeavour™ HF

- Reduces TCO by 57% versus jet dyeing
- 21X increase in profitability
- 4X increase in productivity

*ASSUMES AVERAGE WASTE WATER TREATMENT CAPEX COST OF $2,600/($m^3$/day)
**EXCLUDES SERVICE AND MAINTENANCE COSTS

Benefit summary

- Improved working environment for dye house staff
- Profit advantages through lower operating costs/higher throughput
- Shorter on-demand production runs
- Competitive advantage of enabling brands to meet sustainability goals

Transforming the textile industry with a clean-tech digital manufacturing revolution

Alchemie

"Our goal is to stop the fashion industry producing over 500 million tonnes of CO_2"