Supercritical Waterless Fabric Dyeing Production System Establishment Plan

Presenter: Jack Lien

Henan Hydration Technology Co., LTD x Henan Supercritical Dyeing Technology Co., LTD

Background of the Inventor

Current Position:
HYDRAKNIGHT INNOVATION CO., LTD(Taiwan)

Main Companies in Mainland China:
- Himalaya Outdoor Production (Zhongshan, Guangdong)
- Zhongshan Geely Intelligent Equipment Inc. (Zhongshan)
- Henan HydraKnight Outdoor Production (Henan)
- Henan Hydration Technology Co., LTD (Henan)
- Henan Supercritical Dyeing Technology Co., LTD (Henan) – General Manager & Company person in charge

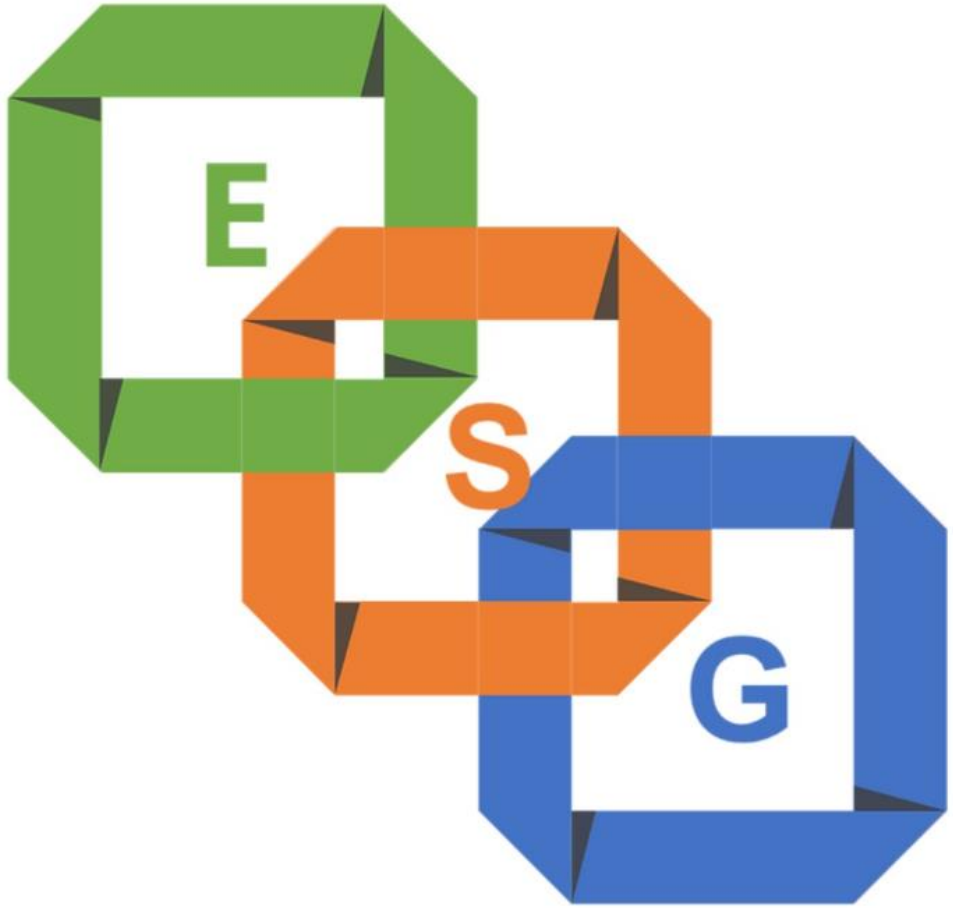
Expertise:
Over 30 years of experience in engineering plastics, precision outdoor water equipment, and waterproof products. Expertise in patented product development, group operations, and supply chain management.

Achievements:
- Holder of 148 invention and utility model patents
- Since 2018, invested in R&D of supercritical waterless dyeing technology
- Granted a China invention patent on August 1, 2023
- Won first prize in the Start-up Category at the 12th China Innovation & Entrepreneurship Competition (Nov. 2023) for nylon fiber supercritical dyeing mass-production technology
- Currently focused on building and promoting production systems and technology transfer of supercritical waterless dyeing

台灣今品創辦人 連建平

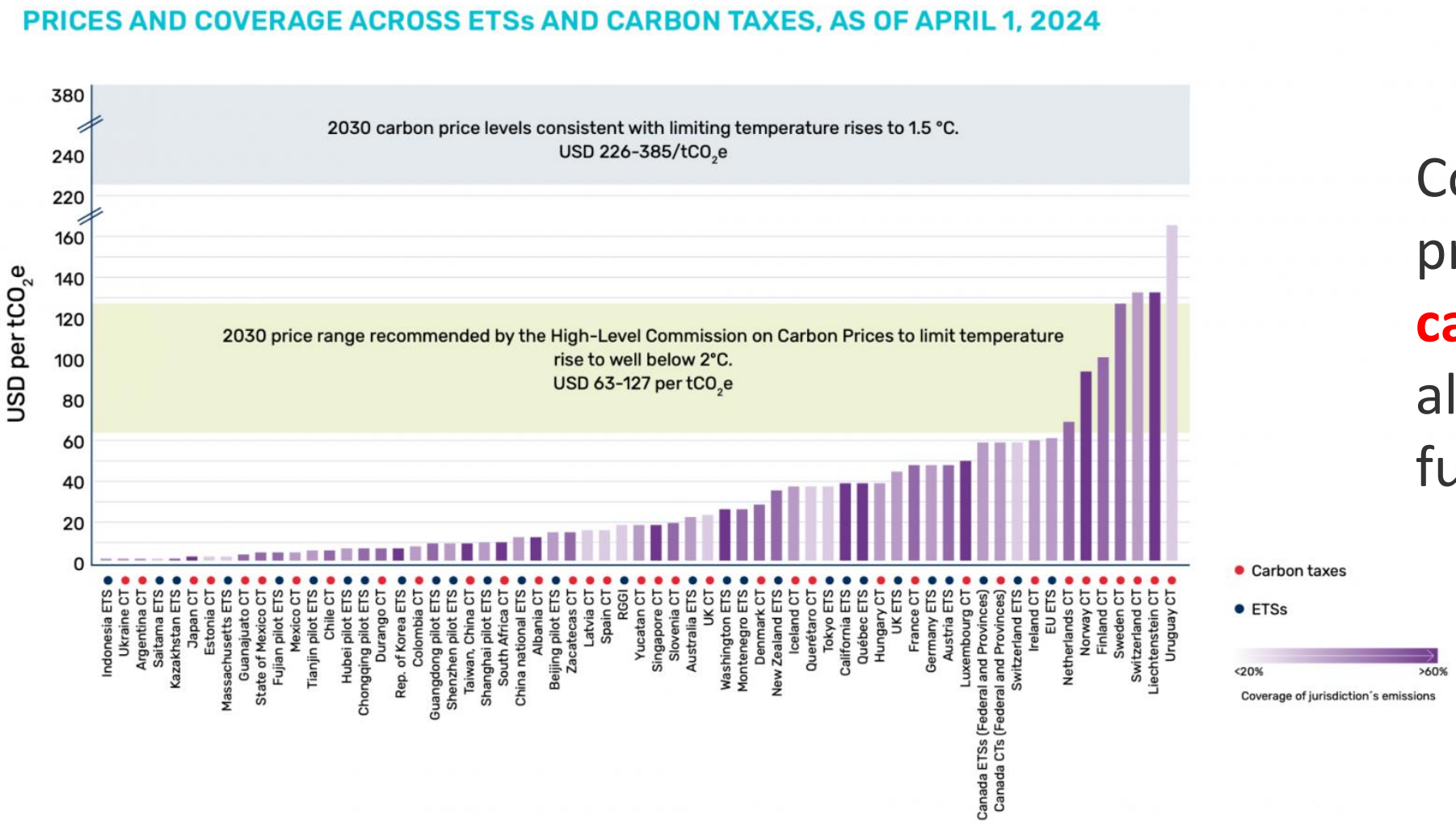
Necessity and Benefits of Waterless Dyeing

Five Key ESG Directions:
1. Sustainable business operations and environmental harmony
2. Knowledge inheritance across workforce generations
3. Long-term investment and ROI
4. Market monopoly opportunities
5. Realization of intelligent AI-based manufacturing



Necessity and Benefits of Waterless Dyeing

Most fall between $10–$20/ton (USD), including China.



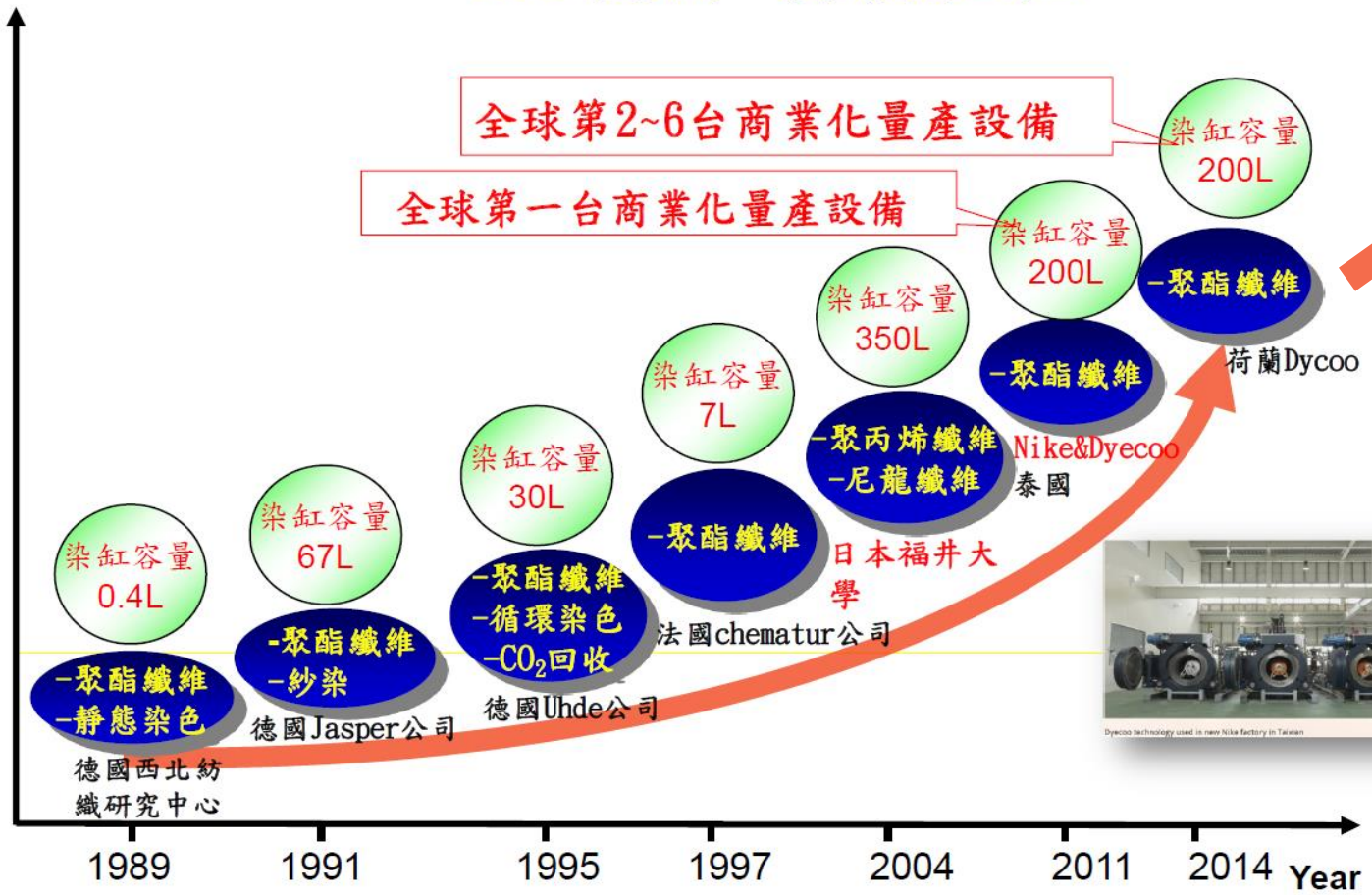
Companies should preemptively manage **carbon credit** allocations to avoid future cost surges!

(Source: World Bank’s Carbon Pricing Status and Trends 2024 report)

Milestones in Waterless Dyeing Development

工業技術研究院
Industrial Technology Research Institute

SFD技術-發展歷程

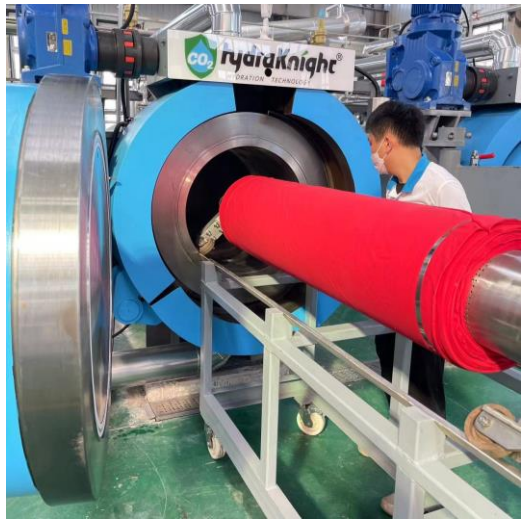


hydraKnight® HYDRATION TECHNOLOGY

染缸容量750L

中國第一套
自製尼龍無水
染商轉生產線

2023年



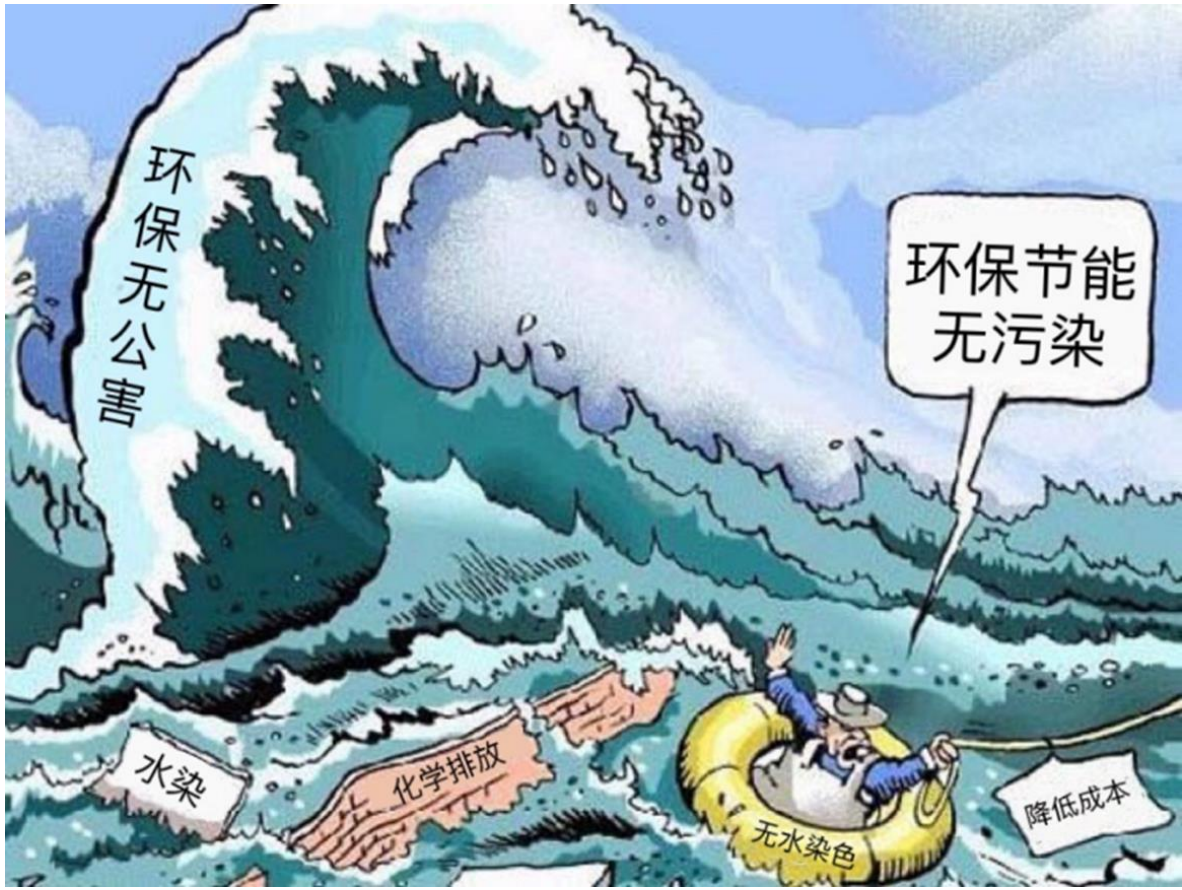
資料來源：刑彥軍等，超臨界CO2流體染色設備的研發進展，染整及紡織化學品(2011)
工業技術研究院-田錦衡 超臨界流體染色技術(2015)

Transformative Impact on the Textile Industry

Waterless dyeing is not just about reducing pollution and cost—it signifies industrial upgrading.
This clean, technology-driven method allows textile manufacturing to decentralize from China's coast, creating rural employment opportunities through technology repatriation.

Importance of Clean and Continuous Production

With technological growth and capacity expansion, early regional adopters will secure strategic advantages.
DyeMe adopts a distributor model for rapid deployment and adaptation.
The system is simplified for ease of use by older or less-educated workers. Two-week to one-month training enables independent operation. This reduces learning curve, risk, and seniority-based labor costs.

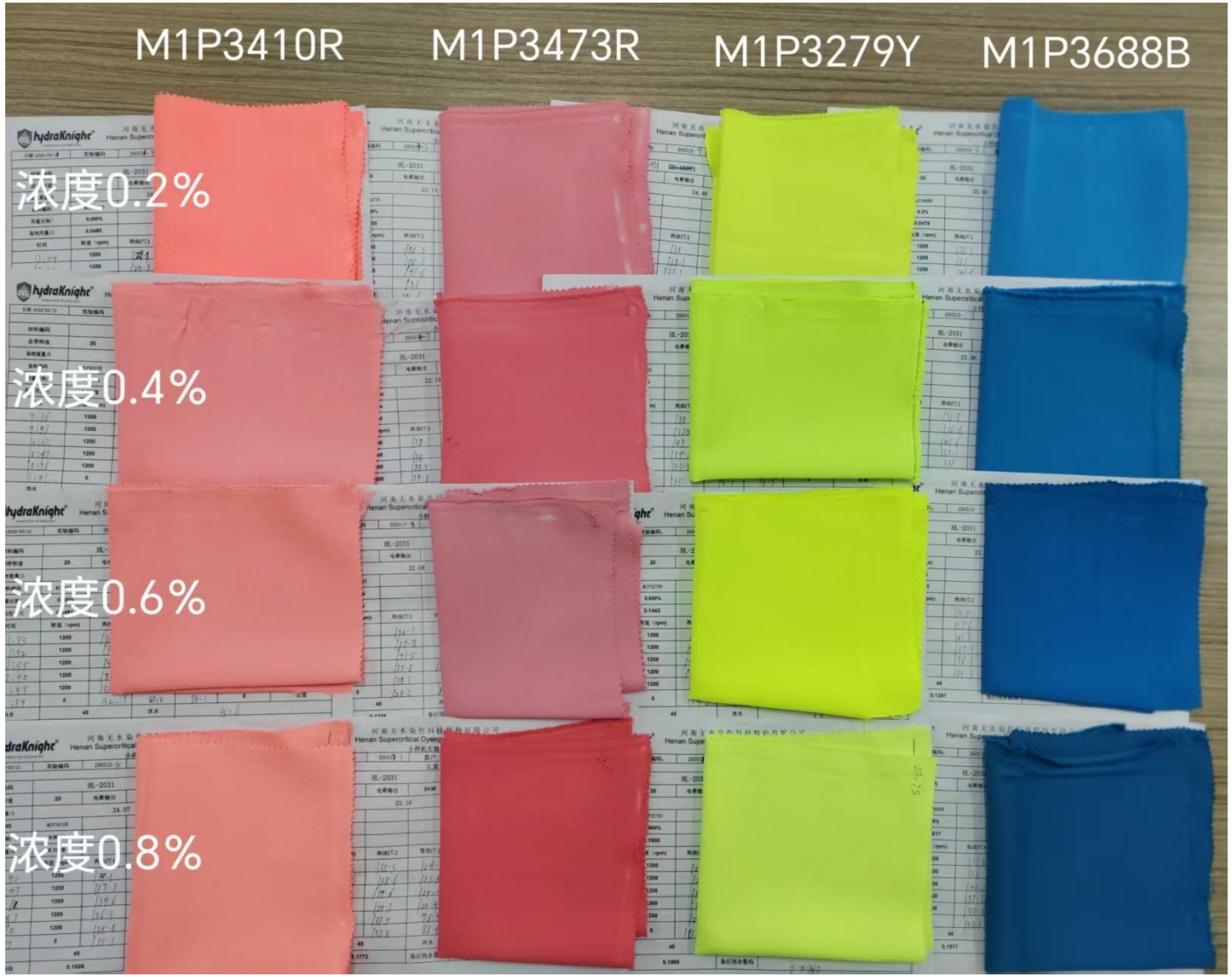


Achievements in Dyeing Fastness (Colorfastness)

1. PET 100%: Deep blacks exceed AATCC-61-2A level 4
2. PET + Spandex: Meets GB standards, level 3.5
3. Nylon 6 and Cotton: Level 3.5
4. Functional auxiliaries and dyes co-synthesized
5. Color spectrum database:
   - Over 5,000 dyeing tests
   - Built with scientific computing
   - Spectrophotometer-assisted formulation and process optimization

Use your own commonly used fabrics + dyes to build a basic color matching database

Special dyes are added at different concentrations to create a color gradation database.

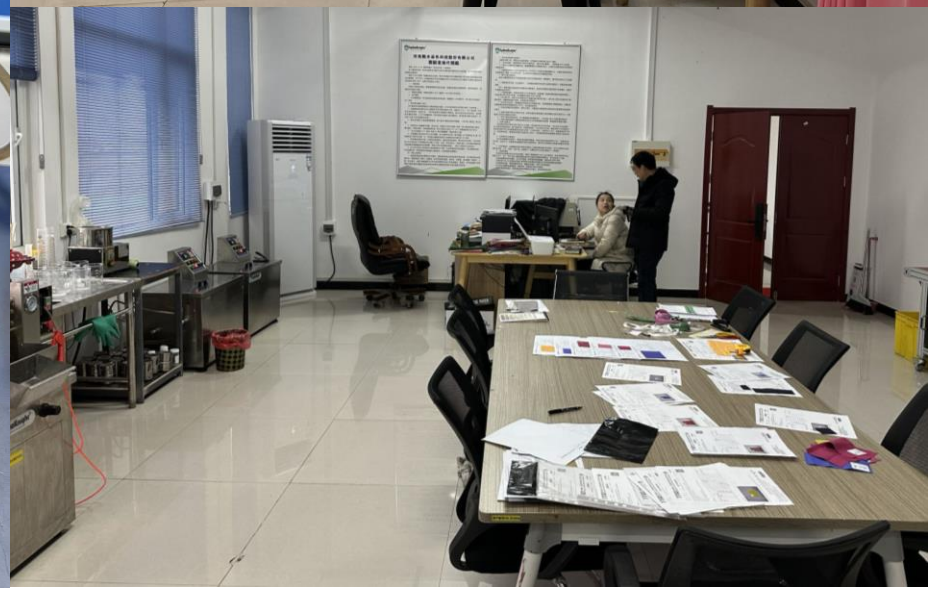


Research on Physical Dyes and Auxiliaries

Dye types:
- Chemical fibers:
  - PET 100% and blends with ≤10% spandex: water fastness ≥ level 4
  - PET + 10–15% spandex: level 3.5 (level 4 achievable with post-finishing)
  - Nylon (N6) 100% and with 8% spandex: level 4
  - N6 + 8–15% spandex: level 3–3.5 (requires finishing for level 4)

- Natural fibers:
  - Cotton 100% or Lycra cotton (cotton + 5% spandex): level 4 achievable
  - Linen and viscose: ongoing testing

Database built from 10kg customer fabric trials



Shared Platform and Dye Database Accumulation

Quarterly data sharing among DyeMe clients enhances formulation efficiency!

Industry 4.0 & Environmental Footprint Monitoring

Beyond fabric:
- PET woven zippers dyed simultaneously with main fabric, achieving level 4

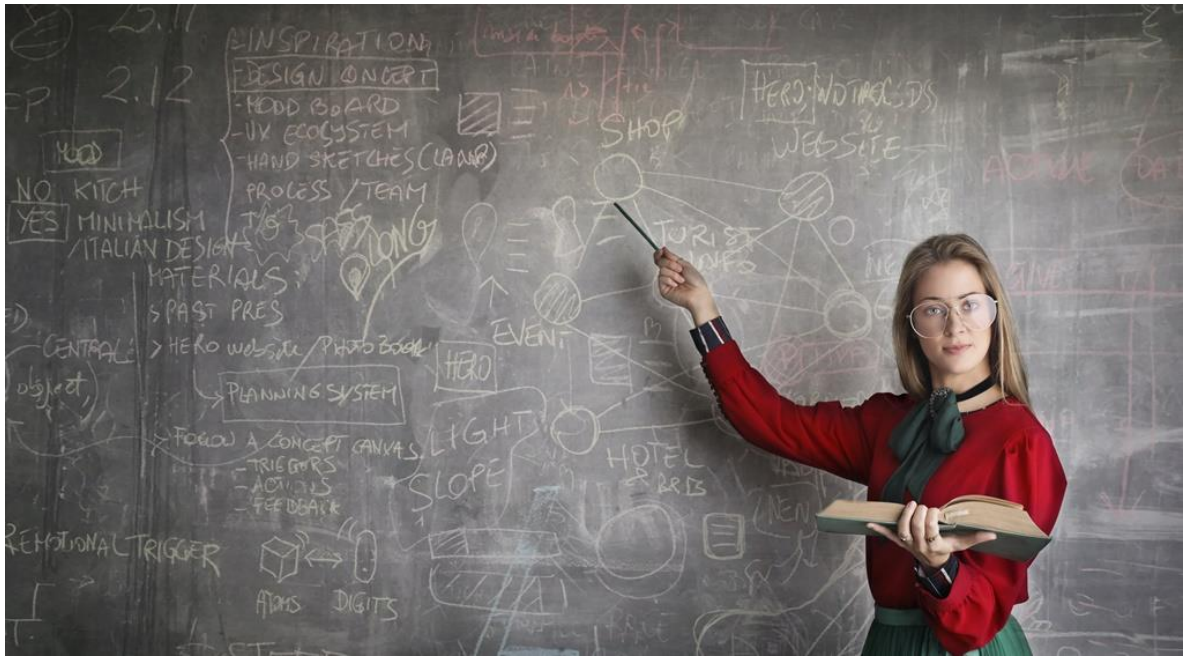
Industry 4.0 & Environmental Footprint Monitoring
All machines equipped for:
- ISO14067 product carbon footprint verification
- EU PEF certification
- Monitoring of water, electricity, compressed air, gas, and CO_2 usage
- Digital environmental management support (optional)

Example Production Line Configuration

Standard: 4 autoclaves (750L each), 1.8m fabric width (customizable to 2.3–2.8m)
Daily capacity: 30,000–40,000 meters Dye cycle: 150–180 minutes
Factory Requirements:

场地	3200平方米，理想:100米长、32米宽、高度6米以上 三级压力容器寿命10-15年，安装后受监督列管，不宜随意迁厂 自购或常租十年以上普通工业用厂房 不需要落地染整专区或污水处理厂旁
电力	同步开机配置380V*1250Kva,量产以60%耗用功率
用水量	24用水量在15-20吨/天 布料清洗及去浆仍以使用水为经济，以超声波清洗机； 搭配门幅式定型机耗用水量600-800公斤/小时 清洗机水槽容量4T,电解过滤还原循环使用，每小时过滤回水1T,对外不排水
CO2供应源	无水染色工序完全不使用水，使用液态的二氧化碳为溶解介质，可以95%循环使用。 外购化工业产级纯度99.9%液态二氧化碳 储存槽装置在无水染厂房外， 占地3*3米，高12米立式不锈钢储存槽
空压机	使用20HP空压机
水冷却塔	60m³/H冷却塔，10T水池

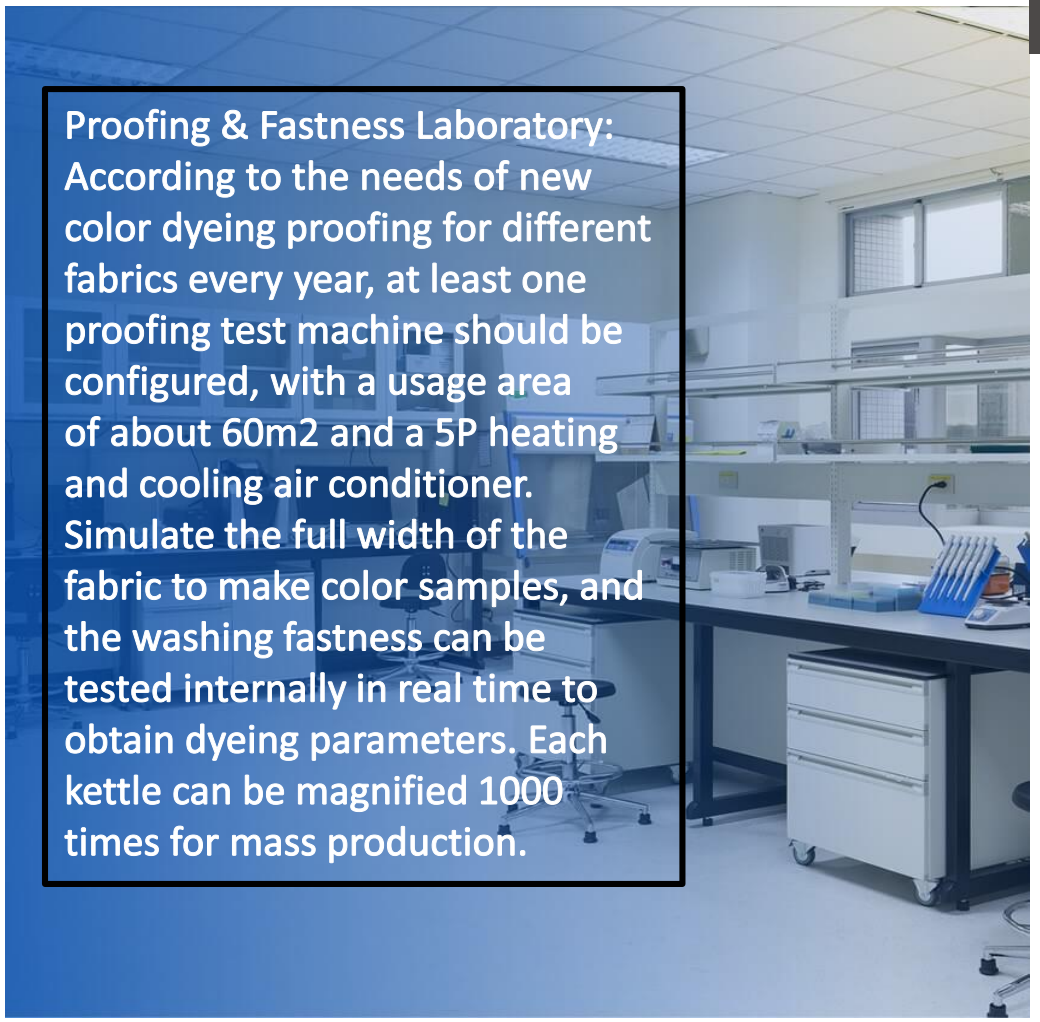
Dyeing cycle 150-180 minutes



Production line and laboratory

Factory Requirements:
1. Floor load ≥ 1000 kg/m², epoxy or hardened coating
2. Basic lighting + enhanced inspection lighting
3. Ventilation: maintain 10–30°C, clean and dry, no need for AC
4. Layout (approx. 90–100m length):
   - Feeding zone (6m)
   - Ultrasonic desizing/oil removal (8m)
   - Stenter (7–10 chambers, 27–36m)
   - Fabric surface treatment (10m)
   - Waterless dyeing zone (32m)
   - Inspection area (8–12m)

5. Waste gas and wastewater recovery system:
   - 120m² platform (4m x 30m), chimney height 15m



Service Model

Includes:
- Full layout of production line + lab
- Equipment, exhaust/water recovery
- Personnel training
- Hands-on technical training
- Technology and dye database transfer

Thank you for your participation

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