white cycle

STRATEGIC INTELLIGENCE BULLETIN N°15

The industrialisation of Textile-to-Textile recycling: from pilot projects to industrial-scale production

November 2026

TABLE OF CONTENT

News & EU regulations *5*

Borouge International – Expanding Mechanical Recycling Capacity in Germany and Austria (October 7, 2026) 5

TotalEnergies Polyblend – €4 Million Investment to Increase Recycled Plastic Compounds Production (September 1, 2026) 5

PROSPER Project – Successful Sorting Trials for Bio-Based Plastics Recycling (August 21, 2026) 5

European Commission JRC – Chemical Recycling of Plastics Still Not Cost-Competitive (August 19, 2026) 5

INEOS and Recuro – New Chemical Recycling Plant Planned in Norway (July 9, 2026) 6

European Commission – New Rules for Chemically Recycled Content in Plastic Bottles (June 30, 2026) 6

ReBioCycle – EU-Funded Project Demonstrates Chemical Recycling of Mixed Plastic Waste into Virgin-Quality PLA (September 2, 2026) 6

European Commission – New Package of Measures to Strengthen Europe's Plastic Recycling Industry (January 7, 2026) 6

Plastics Recyclers Europe – Mapping of Plastics Recycling Processes & Technologies (February 3, 2026) 7

Focus of the startegic bulletin n°14: The industrialisation of Textile-to-Textile recycling: from pilot projects to industrial-scale production *8*

1. Introduction *9*

2. Technological Pathways to Industrialisation *9*

2.1 Mechanical Recycling: Efficiency and Material Retention 9

2.2 Chemical Recycling: Scaling High-Purity Pathways 9

2.3 Enzymatic and Biological Innovations 10

2.4 The Critical Role of Automated Sorting 10

3. The New Industrial Landscape: Players and Models *10*

3.1 Leading Industrial Players and Hyperscale Projects 10

3.2 Emerging Business Models and Strategic Alignments 11

3.3 Regional Perspectives 11

4. Economic, Strategic, and Technical Challenges *11*

4.1 Capital Expenditure (CAPEX) and Financing Hurdles 11

4.2 The "Feedstock-Demand" Paradox: Lessons from Renewcell 11

4.3 Logistical Gaps and Infrastructure Requirements 11

5. Policy Frameworks as Industrial Accelerators *12*

5.1 The EU Strategy for Sustainable and Circular Textiles 12

5.2 Extended Producer Responsibility (EPR) and Mandatory Collection 12

5.3 Digital Product Passports and Traceability 12

6. Conclusion *12*

7. References *13*

Scientific publications *14*

White Cycle project has received funding from the European Union's Horizon 2020 research and innovation program under Grant agreement no.101036908.

Recent Advances in Recycling Polyester–Cotton Blended Textiles: Review, Aravin Prince Periyasamy, et al. (2026) – MDPI – Textiles **14**

Improving Valorization of Waste Textiles: Assessing Separation Efficiency of Cotton–PET Blends via Alkaline and Enzymatic Hydrolysis, Pablo Kählig et al. (2026) – MDPI – Recycling **14**

Advancing Secondary Raw Material Flows Through Cleaner Production: Integrating Mechanical Recycling and Eco-Design of Post-Industrial Textile Waste, Duarte Brás et al. (2026) – Elsevier – Journal of Cleaner Production **14**

Mechanical Recycling and Industrial Reintegration of Post-Industrial Stretch Textile Waste, Ana Catarina Silva et al. (2026) – Elsevier – Journal of Cleaner Production **15**

A Review of Closed-Loop Recycling of Synthetic Textile Waste: Technical Advances, Industrial Applications, and Future Prospects, Xinyu Xu et al. (2026) – Springer – Journal of Material Cycles and Waste Management **15**

Process Strategies Enabling Selective Polymer Valorization from Textile Fiber Blends, 2026 – MDPI – Materials **16**

Mild Acid-Assisted Separation and Closed-Loop Monomer-Level Regeneration of Polyamide 6 from Waste Wool/PA6 Carpet Blends, Guohu Wang et al. (2026) – MDPI – Polymers **16**

Deep Eutectic Solvents for Polyester–Cotton–Elastane Textile Waste: Component-Selective Separation and a Proposed Sequential Recycling Framework, Akashleena Ghosh et al. (2026) – MDPI – Textiles **16**

Selective Textile Recycling with Deep Eutectic Solvents: A Mechanistic Framework, Roderik Plavec et al. (2026) – MDPI – Polymers **17**

Toward Sustainable Recycling of Natural and Synthetic Polymers from Textile Articles Using Bicyclic Guanidine Salts, 2026 – ACS – ACS Sustainable Resource Management **17**

An Innovative Synergistic Separation Method for Waste Polyester/Cotton Blended Fabrics Under a Hydrothermal System, 2026 – Elsevier – Results in Engineering **18**

Circularity in Polyamide Textiles: Enhancing Recycled Polymer Molar Mass with Carbodiimide Linear Coupling, Graziela S. Baccarin et al. (2026) – ACS – ACS Omega **18**

A Comprehensive Review of PET Chemical Depolymerization: Mechanisms, Catalyst Design, and Process Intensification Toward Closed-Loop Recycling, Kaige Gao et al. (2026) – Wiley – ChemSusChem **19**

Chemical Recycling of Poly(ethylene Terephthalate) to Functional Glycolysates: Overcoming Phase Instability and Secondary Crystallization, 2026 – Scientific Review **19**

Developments in Chemical Depolymerization Techniques for Circular Recycling of Polyesters: Emphasis on Hydrolysis, Methanolysis, and Ethanolysis, 2026 – Elsevier – Next Energy **19**

Enzymatic PET Depolymerization: A Review of Engineering Biocatalysts and Systems for Efficient Plastic Deconstruction, Fei Liu et al. (2026) – Elsevier – Journal of Environmental Management **20**

Understanding Depolymerization and Repolymerization Toward Repurposing Polymer Waste into Valuable Chemicals & Materials, Galan et al. (2026) – Wiley – Advanced Materials Technologies **20**

Chemical Recycling of Post-Consumer Plastics: Phosphine-Free Manganese-Catalysed Hydrogenative Depolymerisation of Polyesters, Polycarbonates, and Polyurethanes, 2026 – Elsevier – Journal of Catalysis **21**

Events *22*

Advanced Recycling Conference - 17-18 November 2026 Cologne Germany **22**

Future of Chemical Recycling Europe – 3–4 February 2027 – Wiesbaden, Germany **22**

9th European Recycling Conference (ERC 2027) – 18 March 2027 – Brussels, Belgium **22**

Textiles Recycling Expo Europe – 16–17 June 2027 – Brussels, Belgium **22**

Plastics Recycling Show Europe (PRSE) – 29–30 June 2027 – Amsterdam, Netherlands **23**

White Cycle project has received funding from the European Union's Horizon 2020 research and innovation program under Grant agreement no.101036908.

White Cycle project has received funding from the European Union's Horizon 2020 research and innovation program under Grant agreement no.101036908.

News & EU regulations

Borouge International – Expanding Mechanical Recycling Capacity in Germany and Austria (October 7, 2026)

Borouge International has announced investments to expand its mechanical recycling operations in Germany and Austria. The projects will increase annual production capacity by approximately 9,000 tonnes of recycled mixed polyolefins (rPO) at Niedergebra, Germany, and up to 5,000 tonnes of recycled polyethylene (rPE) at Wildon, Austria. The new production lines are expected to become operational in 2027, strengthening the European supply of recycled polymers for rigid and flexible packaging applications.

Link: ***Read the full article – Plastics Technology***

TotalEnergies Polyblend – €4 Million Investment to Increase Recycled Plastic Compounds Production (September 1, 2026)

TotalEnergies Polyblend has confirmed a €4 million investment to convert an existing production line at its Bad Sobernheim site in Germany. The project will increase the production of polymer compounds incorporating mechanically recycled plastics. The investment responds to growing demand for recycled-content materials, particularly in the automotive sector, where future European end-of-life vehicle regulations are expected to introduce mandatory recycled-content targets.

Link: ***Read the full article – TotalEnergies***

PROSPER Project – Successful Sorting Trials for Bio-Based Plastics Recycling (August 21, 2026)

The European PROSPER project has demonstrated that bio-based plastics, including PLA, starch blends and biopolyesters, can be identified and separated from conventional plastic packaging waste using near-infrared (NIR) optical sorting technologies. Industrially relevant trials achieved a 93% yield for rigid biopolyester plastics and 93% purity for the PLA stream. The results could enable dedicated recycling streams for bio-based polymers and improve their integration into Europe's mechanical and chemical recycling infrastructure.

Link: ***Read the full article – CBE JU***

European Commission JRC – Chemical Recycling of Plastics Still Not Cost-Competitive (August 19, 2026)

A report from the European Commission's Joint Research Centre (JRC) highlights the economic challenges facing chemical recycling technologies in Europe. According to the study, chemical recycling remains significantly more expensive than virgin plastic production and conventional mechanical recycling. Nevertheless, these technologies could play an important complementary role in processing complex plastic waste streams and helping manufacturers meet future European recycled-content requirements.

Link: ***Read the full article – Food Packaging Forum***

White Cycle project has received funding from the European Union's Horizon 2020 research and innovation program under Grant agreement no.101036908.

INEOS and Recuro – New Chemical Recycling Plant Planned in Norway (July 9, 2026)

INEOS and Norwegian technology company Recuro have signed a memorandum of understanding to develop a pyrolysis-based chemical recycling facility at INEOS's Bamble polymer site in Norway. The proposed facility will process up to 33,000 tonnes of plastic waste annually. The resulting pyrolysis products will be used to manufacture chemically recycled ethylene and polyethylene, creating a new pathway for converting plastic waste into recycled polymers.

Link: ***Read the full article – ICIS***

European Commission – New Rules for Chemically Recycled Content in Plastic Bottles (June 30, 2026)

The European Commission has adopted new rules establishing a methodology to calculate, verify and report chemically recycled content in single-use PET beverage bottles. The framework aims to improve transparency and traceability across the plastics recycling value chain while providing greater regulatory certainty for investments in chemical recycling. It also clarifies how chemically recycled materials can contribute to European recycled-content targets.

Link: ***Read the full article – European Commission***

ReBioCycle – EU-Funded Project Demonstrates Chemical Recycling of Mixed Plastic Waste into Virgin-Quality PLA (September 2, 2026)

The EU-funded ReBioCycle project has demonstrated the potential to chemically recycle mixed plastic waste into virgin-quality polylactic acid (PLA). The pilot results highlight new opportunities for recovering value from complex plastic waste streams that are difficult to process through conventional mechanical recycling. The project could contribute to the development of more circular production pathways for bio-based polymers and sustainable packaging materials.

Link: ***Read the article – Packaging Europe***

European Commission – New Package of Measures to Strengthen Europe's Plastic Recycling Industry (January 7, 2026)

The European Commission has introduced a package of measures to support the competitiveness and development of Europe's plastic recycling industry. Key initiatives include harmonised EU-wide end-of-waste criteria for plastics, new rules on recycled PET content in beverage bottles, stronger cooperation through the Circular Plastics Alliance and improved monitoring of recycled and virgin plastic markets. The package also aims to encourage investment in recycling infrastructure and cross-border circular economy projects.

Link: ***Read the full article – European Circular Economy Stakeholder Platform***

White Cycle project has received funding from the European Union's Horizon 2020 research and innovation program under Grant agreement no.101036908.

Plastics Recyclers Europe – Mapping of Plastics Recycling Processes & Technologies (February 3, 2026)

An overview of European recycling technologies, covering sorting, mechanical recycling, dissolution and chemical recycling, with a focus on industrial maturity and installed capacities.

Link: ***Read more***

White Cycle project has received funding from the European Union's Horizon 2020 research and innovation program under Grant agreement no.101036908.

Focus of the startegic bulletin n°14: The industrialisation of Textile-to-Textile recycling: from pilot projects to industrial-scale production

Executive Summary

The textile recycling industry is currently at a critical inflection point, transitioning from fragmented pilot initiatives to robust, industrial-scale production. As of late 2026, the global textile recycling market is valued at $6.68 billion, with a projected compound annual growth rate (CAGR) of 4.309.23 billion by 2034 [10]. This shift is necessitated by an escalating global waste crisis; 92 million metric tons of textile waste are produced annually, a figure expected to surge to 134 million tons by 2030 [10].

The industrialisation of "textile-to-textile" (T2T) recycling is shaped by two primary technological pathways: mature mechanical processes that offer low capital entry but face quality limitations, and emerging chemical processes that promise virgin-equivalent quality but require massive capital investment [7, 17, 22]. The landscape is defined by the rise of "hyperscale" projects such as Syre's multi-plant global strategy and Circ's $500 million industrial facility in France [117, 119]. However, the industry remains volatile, as evidenced by the high-profile bankruptcy of early pioneer Renewcell, which highlighted the "chicken-and-egg" dilemma of securing both consistent feedstock and guaranteed brand demand [134, 136].

Key enablers for this industrial shift include AI-driven automated sorting systems (e.g., Fibersort, TOMRA) and the implementation of the EU's Digital Product Passport (DPP), which provide the technical and data infrastructure necessary for high-purity recycling [10, 15, 120]. Strategically, the industry is moving toward "circular ecosystems" based on closed-loop partnerships and long-term offtake agreements between retailers (e.g., H&M, Inditex) and technology providers (e.g., Circ, Syre, Reju) [117, 119, 145].

Table of Contents

1. Introduction
2. Technological Pathways to Industrialisation
   - ✓ 2.1 Mechanical Recycling: Efficiency and Material Retention
   - ✓ 2.2 Chemical Recycling: Scaling High-Purity Pathways
   - ✓ 2.3 Enzymatic and Biological Innovations
   - ✓ 2.4 The Critical Role of Automated Sorting
3. The New Industrial Landscape: Players and Models
   - ✓ 3.1 Leading Industrial Players and Hyperscale Projects
   - ✓ 3.2 Emerging Business Models and Strategic Alignments
   - ✓ 3.3 Regional Perspectives: Brazil, Nordic Countries, and India
4. Economic, Strategic, and Technical Challenges

White Cycle project has received funding from the European Union's Horizon 2020 research and innovation program under Grant agreement no.101036908.

- ✓ 4.1 Capital Expenditure (CAPEX) and Financing Hurdles
- ✓ 4.2 The "Feedstock-Demand" Paradox: Lessons from Renewcell
- ✓ 4.3 Logistical Gaps and Infrastructure Requirements

5. Policy Frameworks as Industrial Accelerators
   - ✓ 5.1 The EU Strategy for Sustainable and Circular Textiles
   - ✓ 5.2 Extended Producer Responsibility (EPR) and Mandatory Collection
   - ✓ 5.3 Digital Product Passports and Traceability
6. Limitations of the Evidence
7. Research Gaps and Future Directions
8. Conclusion

1. Introduction

The global textile industry produces over 100 million tons of fiber annually, yet less than 1% of the material in clothing is recycled back into new garments. Historically, "recycling" in textiles has primarily meant "downcycling" into industrial rags or insulation [20, 30]. However, the 2024–2026 period has seen a dramatic shift toward true textile-to-textile (T2T) circularity at scale.

Industrialisation is driven by a convergence of technological breakthroughs in chemical depolymerization, the maturation of AI-based sorting, and a seismic shift in the regulatory landscape, particularly in the European Union. As of 2026, the industry is moving beyond the "shaky" pilot phase into a "second wind" characterized by multibillion-dollar investments and the construction of facilities capable of processing tens of thousands of tons per year. This report investigates the technologies, players, and strategic challenges defining this industrial evolution.

2. Technological Pathways to Industrialisation

2.1 Mechanical Recycling: Efficiency and Material Retention

Mechanical recycling is the most mature industrial pathway, involving the physical shredding and carding of textiles into fibers.

- Industrial Scale: Mechanical systems are currently operating at significant volumes. Shredding units can handle between 50 and 3,000 kg/hour [1]. In Brazil, 21 companies utilize mechanical shredding to process industrial waste into corporate gifts and new yarn [9, 27].
- Advantages: It features lower CAPEX requirements and is economically viable for pre-consumer waste, which is cleaner and more homogeneous [17, 27]. It is highly efficient in terms of energy consumption compared to chemical routes [2].
- Limitations: The primary barrier to T2T scaling is fiber degradation. The mechanical process shortens fibers, reducing their spinning quality and necessitating the addition of virgin fiber (often up to 70–80%) to produce new garments [20, 24, 27]. Furthermore, mechanical recycling yields of 60–80% are common due to variable feedstock quality [6].

2.2 Chemical Recycling: Scaling High-Purity Pathways

Chemical recycling (tertiary recycling) involves breaking down textile polymers into their molecular building blocks (monomers) or dissolving them into a pulp for regeneration.

White Cycle project has received funding from the European Union's Horizon 2020 research and innovation program under Grant agreement no.101036908.

Pathways:

- Depolymerization: Processes such as hydrolysis or solvolysis break down polyester (PET) or nylon into monomers that can be repolymerized into virgin-equivalent fibers [11]. Reju uses a proprietary catalyst to depolymerize polyester into powder, which is then melted and extruded into thread [13].
- Dissolution: Solvent-based methods dissolve cellulose (cotton) into a pulp. Infinited Fiber uses a process similar to viscose production to turn cotton-rich waste into "Infinna" fiber.
- Industrial Scale: New projects are reaching "hyperscale." Circ's plant in France targets 70,000 tons/year by 2028 [7]. Syre plans to have 12 plants worldwide by 2034, aiming for 3 million tons of recycled polyester annually [8].
- Barriers: High CAPEX, energy-intensive processes, and the cost of specialized solvents are significant hurdles [15, 20, 21].

2.3 Enzymatic and Biological Innovations

Biological recycling uses enzymes or microorganisms to break down fibers.

- Carbios: This French firm is a leader in enzymatic depolymerization, using specialized enzymes to break down PET into its monomers at lower temperatures than traditional chemical routes [3].
- Benefits: Enzymatic treatments can improve the breakdown of natural fibers and significantly lower energy consumption [11, 29]. However, high enzyme costs and complex pretreatment needs remain barriers to full industrial scaling [4].

2.4 The Critical Role of Automated Sorting

Effective T2T recycling at scale is impossible without high-purity feedstock. Manual sorting is too slow and inaccurate to support chemical recycling [2, 27].

- AI and NIR Sorting: Near-infrared (NIR) spectroscopy and AI-driven systems (e.g., Fibersort, TOMRA's AUTOSORT, PICVISA) allow for the precise identification of fiber composition, color, and finish [10, 15, 21].
- Current Hurdles: High sensor array costs and the difficulty of identifying complex coatings or dark-colored fabrics slow the rollout of these systems [15, 21, 27].

3. The New Industrial Landscape: Players and Models

3.1 Leading Industrial Players and Hyperscale Projects

The industry has moved from research labs to the hands of major engineering and fashion conglomerates:

- Circ (USA/France): Developing the world's first industrial-scale polycotton recycling plant in France, backed by Inditex and Patagonia [7].
- Syre (Sweden): A high-impact venture between H&M Group, Vargas, and TPG Rise Climate, aiming for global decarbonization of polyester [8].
- Reju (Technip Energies): A French engineering giant's venture into polyester recycling, utilizing proprietary depolymerization technology.
- Infinited Fiber (Finland): Scaling a cellulose-to-fiber process with backing from global retailers.

White Cycle project has received funding from the European Union's Horizon 2020 research and innovation program under Grant agreement no.101036908.

- Renewcell (Circulose): Despite a 2024 bankruptcy, the firm has restarted commercial-scale production in Sweden, focusing on refined shredding to improve pulp quality.

3.2 Emerging Business Models and Strategic Alignments

Scaling T2T recycling requires a radical departure from traditional "vendor-customer" relationships:

- Closed-Loop Partnerships: Brands like Patagonia, H&M, and Inditex are taking direct equity stakes in recyclers to secure future supply [21].
- Offtake Agreements: H&M has committed to buying $600 million of recycled polyester from Syre over 7 years [8]. Such "demand pull" is essential for securing project financing.
- Hub-and-Spoke Systems: Emerging models utilize centralized "scaling-up hubs" that aggregate waste from regional sorting centers and distribute it to specialized chemical recycling plants [15, 25].
- Licensing and Franchising: Technology providers like Worn Again or Sulzer Chemtech license their IP to local plant operators to accelerate global expansion [5].

3.3 Regional Perspectives

- Brazil: Characterized by traditional mechanical recyclers (Adami Textil, Benefibras) partnering with garment factories, but currently lacks large-scale chemical recycling or automated NIR sorting [9, 27].
- Nordic Countries: A leader in cellulose recycling (Renewcell, Infinited Fiber), but recently faced a "cautionary period" after Renewcell's financial struggles.
- Europe/EU: The center of regulatory innovation, with high TRL (Technology Readiness Level) assessments for mechanical and chemical pathways in Spain and the Netherlands [7, 18].

4. Economic, Strategic, and Technical Challenges

4.1 Capital Expenditure (CAPEX) and Financing Hurdles

Building a commercial-scale chemical recycling plant requires between $100 million and 500 million. In the current financing environment, lenders demand proven scalability and consistent quality before committing capital [127, 128]. This has led many firms to adopt an "incremental" scale-up strategy, starting with 200 t/year units to refine processes [11].

4.2 The "Feedstock-Demand" Paradox: Lessons from Renewcell

Renewcell's bankruptcy highlighted a systemic gap: the firm could produce 60,000 tons of recycled pulp, but only sold 18,000 tons because fashion brands did not put in sufficient orders with the fiber manufacturers (spinning mills) [134, 136]. This "chicken-and-egg" situation—where recyclers have the supply but brands fail to bridge the "middle-of-the-chain" gap—remains a major strategic risk.

4.3 Logistical Gaps and Infrastructure Requirements

Post-consumer waste collection is fragmented. There is a lack of specialized infrastructure, such as warehouses near sorting centers and standardized quality management systems for waste [15, 16, 26]. In regions like the US or Brazil, high transport costs and the absence of tax incentives for recycled materials hinder the formation of efficient loops [9, 27, 32].

White Cycle project has received funding from the European Union's Horizon 2020 research and innovation program under Grant agreement no.101036908.

5. Policy Frameworks as Industrial Accelerators

5.1 The EU Strategy for Sustainable and Circular Textiles

The EU's 2030 vision mandates that all textile products on the market be durable, repairable, and made largely of recycled fibers [9]. The strategy includes a ban on destroying unsold textiles for large enterprises as of July 2026 [9].

5.2 Extended Producer Responsibility (EPR) and Mandatory Collection

Effective beginning of 2025, the separate collection of textiles is mandatory in the EU [12]. EPR schemes will require brands to contribute to the cost of recycling, providing the financial "stick" to complement the "carrot" of market demand.

5.3 Digital Product Passports and Traceability

The Digital Product Passport (DPP) registry, live as of July 20, 2026, enables full traceability of fabric composition and chemical history [9]. This data is critical for recyclers to ensure feedstock purity and for brands to verify their green claims [10, 14].

Limitations of the Evidence

- Long-term Viability: Many of the largest facilities (Syre, Circ France) are in the construction or "re-boot" phase, meaning empirical data on long-term industrial profitability is still limited.
- Geographic Concentration: The sources focus heavily on European and US-based players; the industrialization strategies of major garment manufacturers in China, Vietnam, and Bangladesh are less represented [15].
- Proprietary Technology: Detailed catalyst compositions and exact energy-use breakdowns for proprietary processes (e.g., Reju or Circ) are commercially sensitive and not fully disclosed.
- Research Gaps and Future Directions
- Mixed Blend Separation: While Circ and Syre are making progress, the industrial-scale separation of complex blends like elastane-polyester-cotton remains technically challenging [10].
- Middle-Chain Integration: Further research is needed on how to incentivize spinning mills and fiber manufacturers to switch from virgin to recycled inputs without disrupting global supply chains [47].
- Standardization of Feedstock: There is an urgent need for global standards for textile waste quality to facilitate international trade in "recycling-ready" materials [16, 78].

6. Conclusion

The industrialisation of textile-to-textile recycling is transitioning from a period of "shaky" pilot projects to a new era of hyperscale production. The emergence of players like Circ, Syre, and Reju, backed by unprecedented brand commitments and mandatory EU regulations, provides a credible path toward true circularity. However, the success of this industrial shift depends on solving the systemic "demand-pull" gaps and building the global sorting infrastructure required to handle 100+ million tons of waste annually. The "Renewcell lesson" has taught the industry that technology alone is not enough; true circularity requires an integrated ecosystem where policy, finance, and industrial engineering move in lockstep.

White Cycle project has received funding from the European Union's Horizon 2020 research and innovation program under Grant agreement no.101036908.

7. References

[1] M. C. do Amaral, W. F. Zonatti, K. L. da Silva, D. K. Junior, J. A. Neto, and J. Baruque-Ramos, "Industrial textile recycling and reuse in Brazil: case study and considerations concerning the circular economy," vol. 25, no. 3, pp. 431–443, Apr. 2018, doi: 10.1590/0104-530X3305.

[2] G. Thilagavathi, S. Neelakrishnan, R. Rajkhowa, and M. J. Bharathi, "Recent Advances in Recycling Technologies," pp. 89–105, May 2026, doi: 10.1201/9781003503835-5.

[3] N. Arunraaj, "Circular Fashion: Creating a Sustainable Clothing Economy," vol. 13, no. 2, pp. 1–1, May 2026, doi: 10.64151/psgcare-21.

[4] P. B. Salunkhe, R. Ramakrishnan, and A. Athayle, "Evolving Textile Recycling: A Review on Technologies, Challenges and Future Outlook," vol. 2, no. 1, pp. 23–35, May 2026, doi: 10.65773/gwv.2.1.128.

[5] A. Hetherington *et al.*, "The circular fashion ecosystem: a blueprint for the future," Jan. 2021, doi: 10.36399/GLA.PUBS.253310.

[6] G. A. Kairalla and J. A. Neto, "Economia circular em recicladoras do setor têxtil, análise e desafios," Jan. 2025, doi: 10.11606/003283726.

[7] "Circ to build $500 million cotton, polyester recycling plant in France." https://circ.earth/press/circ-to-build-500-million-cotton-polyester-recycling-plant-in-france/

[8] "Chemical recycling of textiles advances, shakily." https://cen.acs.org/environment/green-chemistry/Chemical-recycling-textiles-advances-shakily/102/web/2024/03

[9] "Sustainable and Circular Textiles Strategy." https://environment.ec.europa.eu/strategy/textiles-strategy_en

[10] "Textile recycling tries to gain a second wind." https://cen.acs.org/business/start-ups/Textile-recycling-tries-gain-second/104/web/2026/04

[11] According to CEO Sahil Kaushik., "But rather than jumping straight into a large facility as it [planned back in 2022] (https://cen.acs.org/materials/polymers/Infinited-picks-Lapland-textile-recycling/100/i23?ref=search_results)

[12] In September, "The EU made the [separate collection of used textiles](https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:32018L0851)

[13] "Reju's process uses a proprietary catalyst to depolymerize polyester into bis(2-hydroxyethyl) terephthalate and ethylene glycol. The resulting powder is repolymerized into pellets that can be melted and extruded into polyester thread." https://cen.acs.org/business/start-ups/Textile-recycling-tries-gain-second/104/web/2026/04

White Cycle project has received funding from the European Union's Horizon 2020 research and innovation program under Grant agreement no.101036908.

Scientific publications

Recent Advances in Recycling Polyester–Cotton Blended Textiles: Review, Aravin Prince Periyasamy, et al. (2026) – MDPI – Textiles

Keywords: *polyester–cotton blends; textile recycling; fibre separation; chemical recycling; mechanical recycling; cellulose; polyester; circular economy.*

Abstract:

This review examines the technical challenges associated with recycling polyester–cotton (PES/CO) blended textiles, one of the most widely used textile material combinations. The chemical differences between polyester and cotton make fibre-to-fibre recycling particularly challenging. The study analyses existing separation and recycling technologies, focusing on methods for selectively recovering polyester and cellulose fractions. It discusses chemical separation processes, recovered material quality, and the industrial maturity of different recycling approaches. Particular attention is given to the potential for improving the quality of recovered fibres and polymers while reducing material losses. The review highlights the importance of developing efficient separation technologies to enable the recycling of blended textile waste into valuable secondary raw materials.

More information here.

Improving Valorization of Waste Textiles: Assessing Separation Efficiency of Cotton–PET Blends via Alkaline and Enzymatic Hydrolysis, Pablo Kählig et al. (2026) – MDPI – Recycling

Keywords: textile recycling; cotton–PET blends; alkaline hydrolysis; enzymatic hydrolysis; polyester recovery; cellulose; fibre separation; material valorization.

Abstract:

This study investigates the separation of cotton–polyester textile waste through alkaline and enzymatic hydrolysis. The research compares different treatment conditions to evaluate their effectiveness in separating the cellulose and polyester components of blended fabrics. The authors address the difficulty of comparing existing recycling processes because of differences in feedstock composition and operating parameters. The study evaluates separation efficiency across a broader range of experimental conditions, with the objective of improving the recovery of valuable textile fractions. The findings contribute to the development of more efficient recycling processes for mixed textile waste and the recovery of secondary raw materials suitable for further industrial applications.

More information here.

Advancing Secondary Raw Material Flows Through Cleaner Production: Integrating Mechanical Recycling and Eco-Design of Post-Industrial Textile Waste, Duarte Brás et al. (2026) – Elsevier – Journal of Cleaner Production

Keywords: *mechanical recycling; textile waste; polyester–cotton blends; eco-design; circular economy; secondary raw materials; fibre recovery; sustainable production.*

Abstract:

White Cycle project has received funding from the European Union's Horizon 2020 research and innovation program under Grant agreement no.101036908.

This study proposes an integrated engineering and design methodology combining mechanical recycling of post-industrial polyester–cotton textile waste with eco-design strategies. The research addresses the need to connect material recovery processes with product design decisions to improve the circularity of textile manufacturing. Using industrially relevant textile cutting waste, the authors investigate mechanical recycling routes and the reintegration of recovered fibres into new textile products. The approach considers material recovery, product durability and recyclability as interconnected factors. The study demonstrates how combining recycling process optimisation with eco-design can improve secondary raw material flows and support more resource-efficient garment production.

More information here.

Mechanical Recycling and Industrial Reintegration of Post-Industrial Stretch Textile Waste, Ana Catarina Silva et al. (2026) – Elsevier – Journal of Cleaner Production

Keywords: mechanical recycling; textile waste; polyester; viscose; elastane; fibre recovery; shredding; carding; industrial reintegration.

Abstract:

This study investigates mechanical recycling strategies for post-industrial stretch textile waste containing polyester, viscose and elastane. Elastane is particularly problematic during mechanical recycling because its residual elastic filaments can cause fibre entanglement, yarn fragments and heterogeneous fibre assemblies. Different shredding and carding configurations were evaluated to identify suitable processing conditions. The alternating shredding–carding–shredding–carding configuration achieved the best results among the evaluated configurations, with an average fibre length of 17.6 mm and approximately 68% usable fibrous material. The recovered fibres were also assessed for potential industrial reintegration. The findings provide practical insights into the mechanical recycling of complex textile waste streams containing elastomeric components.

More information here.

A Review of Closed-Loop Recycling of Synthetic Textile Waste: Technical Advances, Industrial Applications, and Future Prospects, Xinyu Xu et al. (2026) – Springer – Journal of Material Cycles and Waste Management

Keywords: synthetic textiles; closed-loop recycling; chemical recycling; mechanical recycling; textile sorting; polyester; polyamide; circular economy.

Abstract:

This review examines technologies and industrial developments supporting closed-loop recycling of synthetic textile waste. The authors analyse textile sorting technologies alongside mechanical and chemical recycling processes, focusing on the recovery of synthetic fibres and the production of recycled textile materials. The study discusses the technical limitations associated with mixed synthetic fabrics, material degradation and the quality of recovered polymers. It also considers industrial applications and the challenges associated with scaling up recycling technologies. The review provides an overview of current approaches to improving the circularity of synthetic textile materials and identifies opportunities for further development of textile-to-textile recycling systems.

White Cycle project has received funding from the European Union's Horizon 2020 research and innovation program under Grant agreement no.101036908.

More information here.

Process Strategies Enabling Selective Polymer Valorization from Textile Fiber Blends, 2026 – MDPI – Materials

Keywords: textile recycling; polymer blends; selective dissolution; acrylic fibres; nylon; polyester; cotton; chemical recycling; polymer valorization.

Abstract:

This study investigates selective chemical recycling strategies for complex textile fibre blends containing different polymer families. The research focuses on developing polymer-specific treatment processes to recover valuable components from mixed textile waste. Different separation strategies are explored to enable the recovery of acrylic, nylon, polyester and cotton fractions. The work addresses the challenge of processing textiles containing chemically dissimilar fibres, which often require different recycling conditions. By combining selective chemical treatments, the study proposes pathways for recovering individual polymer fractions while preserving their potential for subsequent material applications. The results contribute to the development of more selective and resource-efficient recycling processes for complex textile waste.

More information here.

Mild Acid-Assisted Separation and Closed-Loop Monomer-Level Regeneration of Polyamide 6 from Waste Wool/PA6 Carpet Blends, Guohu Wang et al. (2026) – MDPI – Polymers

Keywords: polyamide 6; PA6; wool; carpet recycling; acid-assisted separation; depolymerisation; monomer recovery; closed-loop recycling.

Abstract:

This study develops a two-stage recycling process for waste carpets containing wool and polyamide 6 (PA6). The first stage uses mild acid-assisted treatment to selectively separate wool from the synthetic polyamide fraction. The second stage focuses on the regeneration of PA6 at the monomer level, providing a potential route for closed-loop recycling. The process aims to overcome the difficulties associated with separating natural and synthetic fibres in carpet waste. By combining selective separation with chemical regeneration, the research demonstrates an approach to recovering valuable polyamide materials from complex textile products while avoiding the need for conventional mechanical downcycling.

More information here.

Deep Eutectic Solvents for Polyester–Cotton–Elastane Textile Waste: Component-Selective Separation and a Proposed Sequential Recycling Framework, Akashleena Ghosh et al. (2026) – MDPI – Textiles

Keywords: deep eutectic solvents; DES; polyester; cotton; elastane; textile recycling; selective dissolution; component separation; chemical recycling.

Abstract:

White Cycle project has received funding from the European Union's Horizon 2020 research and innovation program under Grant agreement no.101036908.

This study explores the use of deep eutectic solvents (DES) to selectively separate the components of complex polyester–cotton–elastane textile waste. The presence of elastane significantly complicates conventional textile recycling because it combines different polymer chemistries within the same material. The authors investigate the potential of tunable DES systems to interact selectively with polyester, cellulose and polyurethane-based elastane through dissolution, swelling and chemical depolymerisation mechanisms. The research proposes a sequential recycling framework designed to recover individual components and facilitate their subsequent valorization. The approach offers potential opportunities for processing blended textile waste while improving the recovery of valuable polymer and cellulose fractions.

More information here.

Selective Textile Recycling with Deep Eutectic Solvents: A Mechanistic Framework, Roderik Plavec et al. (2026) – MDPI – Polymers

Keywords: textile waste; deep eutectic solvents; selective dissolution; polymer separation; cellulose; synthetic fibres; solvent recycling; textile circularity.

Abstract:

This review examines the use of deep eutectic solvents as a potential solution for selectively recycling complex post-consumer textile waste. Modern textile waste contains combinations of natural and synthetic fibres, elastane, dyes, coatings and finishing additives, making conventional recycling processes difficult to implement. The authors analyse the mechanisms through which DES systems can interact with different textile components and enable selective dissolution or separation. Particular attention is given to solvent composition, polymer–solvent interactions and the preservation of recovered material quality. The review provides a mechanistic framework for understanding how DES-based technologies could improve the recycling of mixed textile waste and enable more selective recovery of valuable materials.

More information here.

Toward Sustainable Recycling of Natural and Synthetic Polymers from Textile Articles Using Bicyclic Guanidine Salts, 2026 – ACS – ACS Sustainable Resource Management

Keywords: textile waste; polymer recycling; ionic liquids; dissolution; regeneration; wool; silk; cotton; polyamide; polyurethane; polyacrylic.

Abstract:

This research investigates the use of cellulose-dissolving superbase ionic liquids based on bicyclic guanidine salts for recycling complex textile waste. The solvents are capable of dissolving a wide range of natural fibres, including wool, silk, linen, viscose and cotton, as well as synthetic polymers such as polyamide, polyurethane and polyacrylic materials. The study also examines blended textiles containing combinations of different fibre types. The authors demonstrate that the selectivity of the solvents can be adjusted through the choice of anion, enabling different textile materials to be processed according to their composition. The solvents remain stable across multiple dissolution and regeneration cycles, without apparent polymer degradation. This approach offers a promising alternative for the recycling of heterogeneous post-consumer textile materials.

White Cycle project has received funding from the European Union's Horizon 2020 research and innovation program under Grant agreement no.101036908.

More information here.

An Innovative Synergistic Separation Method for Waste Polyester/Cotton Blended Fabrics Under a Hydrothermal System, 2026 – Elsevier – Results in Engineering

Keywords: polyester–cotton recycling; hydrothermal treatment; textile waste; terephthalic acid; carbon microspheres; cotton recovery; chemical recycling.

Abstract:

This research develops a hydrothermal process for the simultaneous valorization of polyester and cotton from blended textile waste. The proposed method exploits the interaction between polyester hydrolysis products and the carbonisation behaviour of cotton fibres. Experimental results demonstrate that polyester–cotton fabrics can be converted into terephthalic acid (TPA) and carbon microspheres through a synergistic hydrothermal process. At 240 °C and a reaction time of 12 hours, the process achieved a TPA yield of 83.97% and produced carbon microspheres with diameters between 1 and 2 µm. The study also investigates the influence of textile dyes, showing that fabrics containing 0.5–4 wt% dyes can be processed without prior decolourisation. The approach provides an alternative pathway for the simultaneous recovery of valuable chemical products from mixed textile waste.

More information here.

Circularity in Polyamide Textiles: Enhancing Recycled Polymer Molar Mass with Carbodiimide Linear Coupling, Graziela S. Baccarin et al. (2026) – ACS – ACS Omega

Keywords: polyamide; textile recycling; polymer chain extension; carbodiimide; molecular weight; recycled polymers; nylon; mechanical properties.

Abstract:

This study investigates the improvement of recycled polyamide materials through carbodiimide-based linear coupling. Mechanical recycling of polyamide textiles can lead to polymer chain degradation and a reduction in molecular weight, negatively affecting the mechanical properties of the resulting recycled material. The authors explore the use of carbodiimide chemistry to reconnect polymer chains and increase the molar mass of recycled polyamide. The approach aims to improve the performance of recycled polymers and facilitate their reintegration into textile applications. The research contributes to the development of higher-value recycling routes for polyamide textile waste and demonstrates the potential of reactive processing to address polymer degradation during recycling.

More information here.

White Cycle project has received funding from the European Union's Horizon 2020 research and innovation program under Grant agreement no.101036908.

A Comprehensive Review of PET Chemical Depolymerization: Mechanisms, Catalyst Design, and Process Intensification Toward Closed-Loop Recycling, Kaige Gao et al. (2026) – Wiley – ChemSusChem

Keywords: PET; chemical recycling; depolymerisation; glycolysis; hydrolysis; methanolysis; aminolysis; catalysis; process intensification; closed-loop recycling.

Abstract:

This review provides a comprehensive overview of recent advances in the chemical depolymerisation of polyethylene terephthalate (PET). It examines the main chemical recycling pathways, including hydrolysis, methanolysis, glycolysis and aminolysis, with particular attention to reaction mechanisms and catalyst design. Different homogeneous and heterogeneous catalytic systems are analysed, including ionic liquids, metal-organic frameworks and zeolites. The review also discusses emerging catalytic strategies based on Brønsted and Lewis acid sites, bimetallic active centres and defect-engineered materials. Particular emphasis is placed on process intensification techniques such as interfacial catalysis, microwave-assisted reactions and tandem one-pot processes. The study identifies key opportunities for improving conversion efficiency, selectivity and industrial scalability to support closed-loop PET recycling.

More information here.

Chemical Recycling of Poly(ethylene Terephthalate) to Functional Glycolysates: Overcoming Phase Instability and Secondary Crystallization, 2026 – Scientific Review

Keywords: PET; chemical recycling; glycolysis; depolymerisation; glycolysates; phase stability; secondary crystallisation; polyester polyols.

Abstract:

This review examines the challenges associated with PET glycolysis, particularly the phase instability and secondary crystallisation of glycolysates during storage. The authors identify a significant limitation in conventional glycolysis processes: the difficulty of maintaining stable reaction mixtures when high concentrations of PET-derived oligomers are produced. The study highlights how the molecular-weight distribution of the oligomers and the crystallisation of aromatic segments can affect the stability of the resulting glycolysates. It also discusses the limitations of using large quantities of glycolysing agents and the additional costs associated with stabilising additives. Alternative approaches, including the removal of released ethylene glycol during the reaction, are proposed as potential solutions. The review identifies opportunities to develop more industrially relevant PET glycolysis processes for producing functional polyester polyols.

More information here.

Developments in Chemical Depolymerization Techniques for Circular Recycling of Polyesters: Emphasis on Hydrolysis, Methanolysis, and Ethanolysis, 2026 – Elsevier – Next Energy

Keywords: polyester recycling; PET; chemical depolymerisation; hydrolysis; methanolysis; ethanolysis; catalysis; circular economy; monomer recovery.

White Cycle project has received funding from the European Union's Horizon 2020 research and innovation program under Grant agreement no.101036908.

Abstract:

This review examines the development of chemical depolymerisation technologies for polyester recycling, with a focus on hydrolysis, methanolysis and ethanolysis. It compares the performance of different depolymerisation processes using common technical indicators and evaluates the influence of catalyst design, reaction conditions and process configuration. The study highlights the importance of reliable mass balances, catalyst stability, impurity tolerance and separation efficiency when assessing the industrial potential of chemical recycling. It also discusses the challenges associated with transferring laboratory-scale results to real post-consumer polymer waste streams. The review provides guidance for selecting and optimising chemical recycling processes to improve the circularity of polyester materials.

More information here.

Enzymatic PET Depolymerization: A Review of Engineering Biocatalysts and Systems for Efficient Plastic Deconstruction, Fei Liu et al. (2026) – Elsevier – Journal of Environmental Management

Keywords: enzymatic recycling; PET; biocatalysis; PET hydrolase; enzyme engineering; microbial conversion; biological upcycling; circular economy.

Abstract:

This review examines recent developments in the biological recycling and upcycling of PET, focusing on enzymatic depolymerisation and the conversion of recovered monomers into higher-value products. The authors discuss the discovery and engineering of PET-degrading enzymes, highlighting the influence of substrate crystallinity, glass transition temperature, enzyme stability and product inhibition on recycling efficiency. Different strategies for improving biocatalyst performance are reviewed, including protein engineering, enzyme immobilisation, surface display and multi-enzyme systems. The study also explores microbial conversion of PET-derived terephthalic acid and ethylene glycol into valuable chemicals, biopolymers and other products. Remaining challenges include process economics, industrial scale-up and the integration of enzymatic depolymerisation with downstream bioconversion.

More information here.

Understanding Depolymerization and Repolymerization Toward Repurposing Polymer Waste into Valuable Chemicals & Materials, Galan et al. (2026) – Wiley – Advanced Materials Technologies

Keywords: polymer waste; chemical recycling; depolymerisation; repolymerisation; polymer upcycling; monomer recovery; circular materials.

Abstract:

This review investigates chemical recycling strategies that convert polymer waste into monomers, tailored oligomers and new polymeric materials. It explores how depolymerisation and subsequent repolymerisation can create alternative pathways for recovering value from post-consumer plastics beyond conventional mechanical recycling. The study discusses the mechanisms governing polymer breakdown and reconstruction, with an emphasis on developing processes that can handle mixed and contaminated plastic waste. It also highlights the potential to produce higher-value chemicals and

White Cycle project has received funding from the European Union's Horizon 2020 research and innovation program under Grant agreement no.101036908.

materials from recovered polymer feedstocks. The work provides a perspective on how chemical recycling can contribute to more flexible material recovery systems and improved circularity across polymer value chains.

More information here.

Chemical Recycling of Post-Consumer Plastics: Phosphine-Free Manganese-Catalysed Hydrogenative Depolymerisation of Polyesters, Polycarbonates, and Polyurethanes, 2026 – Elsevier – Journal of Catalysis

Keywords: chemical recycling; manganese catalysis; hydrogenation; polyester; PET; polycarbonate; polyurethane; depolymerisation; post-consumer plastics.

Abstract:

This research presents a phosphine-free manganese-based catalytic system for the hydrogenative depolymerisation of post-consumer plastics. The process is applicable to several polymer families, including polyesters, polycarbonates and polyurethanes. The authors demonstrate the conversion of different polymers into monomeric diols using an earth-abundant manganese catalyst. The process operates at 150 °C under 60 bar of hydrogen, with catalyst loadings between 0.5 and 3 mol%. Importantly, the approach can process real post-consumer materials, including bottles, packaging, textiles and compact discs, without requiring prior treatment. The study demonstrates the potential of manganese catalysis as an alternative to conventional chemical recycling systems relying on more expensive metals or complex catalytic formulations.

More information here.

White Cycle project has received funding from the European Union's Horizon 2020 research and innovation program under Grant agreement no.101036908.

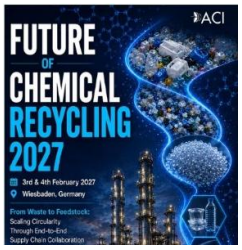
Events



Advanced Recycling Conference - 17-18 November 2026 Cologne Germany

The unique concept of presenting all advanced recycling solutions and related topics at one event will guarantee a comprehensive and exciting conference experience, including technologies such as extrusion, dissolution, solvolysis, enzymolysis, pyrolysis, thermal depolymerisation, gasification, and incineration with Carbon Capture and Utilisation (CCU).

More information here



Future of Chemical Recycling Europe – 3–4 February 2027 – Wiesbaden, Germany

The 4th edition of Future of Chemical Recycling Europe will bring together senior stakeholders from the plastics, petrochemical, waste management and recycling industries. The conference will focus on the commercialisation and scaling of chemical recycling technologies, addressing investment, regulation, technological developments and the transition towards a circular plastics economy.

More information here



9th European Recycling Conference (ERC 2027) – 18 March 2027 – Brussels, Belgium

The European Recycling Conference will bring together recyclers, policymakers, manufacturers and circular economy experts. The 2027 edition will feature dedicated discussions on plastics and textiles, alongside other recycling sectors. Topics will include recycled material markets, competitiveness, investment, regulatory developments and the implementation of circular economy policies across Europe.

More information here

TEXTILES RECYCLING EXPO

Textiles Recycling Expo Europe – 16–17 June 2027 – Brussels, Belgium

This exhibition and conference is dedicated specifically to textile waste recycling. It will bring together textile recyclers, waste managers, manufacturers, fibre producers, clothing brands and technology providers.

The event will showcase innovative technologies for textile sorting, shredding, fibre regeneration and recycling, as well as new solutions for recovering materials from fabrics, clothing, footwear and non-woven textiles.

More information here

White Cycle project has received funding from the European Union's Horizon 2020 research and innovation program under Grant agreement no.101036908.

white cycle



Plastics Recycling Show Europe (PRSE) – 29–30 June 2027 – Amsterdam, Netherlands

Plastics Recycling Show Europe is a major European exhibition and conference dedicated to the plastics recycling industry. The event brings together plastic recyclers, polymer manufacturers, material suppliers, machinery producers, brand owners and recycling technology providers.

The exhibition will showcase innovations in mechanical and chemical recycling, plastic waste collection, sorting, processing, extrusion, washing, pelletising and the production of high-quality recycled polymers.

More information here

White Cycle project has received funding from the European Union's Horizon 2020 research and innovation program under Grant agreement no.101036908.