Sustainable Polymers and Plastics Recycling: Chemical Routes and Recycled Grades

21 – 25 June 2027
Paris - Right Bank business hotel



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Ref: 790_19937 **Date:** 21 – 25 June 2027 **Location:** Paris - Right Bank business hotel **Fees:** 23500 SAR

Introduction:

Sustainable polymers and plastics recycling now shape resin demand: brand owners ask producers for recycled content, packaging fees reward recyclable design and investors question the carbon footprint of virgin polyolefins. Yet many petrochemical and converter teams cannot say which recycling route suits which waste stream, what quality a recyclate can reach or how a mass-balance claim is verified. This Core Concept course links mechanical and chemical recycling, bio-based feedstocks, chain-of-custody bookkeeping, eco-design and footprint data to commercial decisions. Participants build a Circular Polymer Product Strategy for a case producer.

Course Objectives:

- Map the plastics value chain from monomer to post-consumer bale and locate where material and value leak out of the loop
- Assess mechanical recycling steps and the quality limits of recyclate for food-contact, film and rigid applications
- Compare pyrolysis, depolymerisation, solvolysis and gasification routes by feedstock tolerance, yield, product use and cost
- Specify recycled-content and bio-based polyolefin grades and verify content claims under mass-balance chain-of-custody rules
- Evaluate packaging designs for recyclability, producer-fee exposure and life cycle carbon footprint
- Build a Circular Polymer Product Strategy with feedstock sourcing, grade portfolio, economics and claims plan

Target Audience:

- Commercial and product-management staff at polyolefin and PET producers who shape recycled and bio-attributed grade offers
- Technical service and application development staff who qualify recyclate grades with converters and brand owners
- Converter and packaging development staff who redesign films, bottles and rigid packs for recyclability
- Sustainability and product stewardship staff who compile footprint data and substantiate recycled-content claims
- Feedstock, procurement and business development staff who source bales, pyrolysis oil or bio-based inputs

Course Outline:

Day 1: Plastics Value Chain, Circularity Drivers and Material Leakage

- Polymer Value Chain Map: Monomer, Resin, Converter, Brand Owner and Post-Consumer Bale
- Linear Versus Circular Plastics Flows and Material Leakage Points
- Brand-Owner Recycled-Content Pledges and Resin Buyer Specifications
- Recycling Rate, Closed-Loop and Downcycling Definitions for Polymers
- Circular Polymer Readiness Scan for a Producer Portfolio

Day 2: Mechanical Recycling Steps and Chemical Recycling Routes

- Mechanical Recycling Sequence: Sorting by Polymer and Colour, Washing, Melt Filtration and Re-Pelletising
- Recyclate Quality Limits: Chain Scission, Odour, Colour, Gels and Mixed-Polymer Phase Separation
- Pyrolysis of Polyolefin Waste: Oil Yield, Chlorine and Nitrogen Pretreatment and Steam Cracker Co-Feed
- Depolymerisation and Solvolysis for PET and Polyamide: Glycolysis, Methanolysis and Enzymatic Hydrolysis
- Gasification to Syngas and Dissolution Purification: Route Selection Matrix

Day 3: Recycled-Content Grades, Bio-Based Polymers and Chain of Custody

- Post-Consumer Recycled Polyolefin Grade Sheets: Melt Flow Window, Contamination Limits and Odour Class
- Food-Contact Suitability Assessment for Recycled Resin: Challenge Testing and Decontamination Efficiency
- Bio-Based Versus Biodegradable Polymers: Bio-PE, PLA and PHA Property and End-of-Life Comparison
- Compostability Claims Against EN 13432 and ASTM D6400 Test Criteria
- Mass-Balance Bookkeeping: Credit Allocation, Chain-of-Custody Audit Trail and Claim Wording

Day 4: Design for Recyclability, Producer Fees and Footprint Trade-Offs

- Design-for-Recyclability Checklist: Mono-Material Films, Label, Ink, Barrier Layer and Closure Choices
- Extended Producer Responsibility Concepts and Eco-Modulated Fee Exposure for Packaging
- Plastics Life Cycle Assessment: Cradle-to-Gate Scope, Recycled Feedstock Credits and Allocation Choices
- Carbon Footprint Comparison of Virgin, Mechanically Recycled, Pyrolysis-Based and Bio-Attributed Resin
- Greenwashing Risk in Recycled and Biodegradable Claims: Substantiation Evidence File

Day 5: Case Study: Circular Polymer Product Strategy

- Circular Polymer Economics: Bale Price, Virgin-Recyclate Spread and Green Premium Scenarios
- Case Producer Data Pack Review: Grade Mix, Customer Demand and Feedstock Access
- Feedstock Sourcing Plan: Bale Offtake, Pyrolysis Oil Contracts and Bio-Based Inputs
- Circular Polymer Product Strategy Drafting: Grade Portfolio, Investment Options and Claims Plan
- Management Panel Defence and Strategy Refinement

Skills You Will Gain:

- Polymer Value Chain Mapping
- Recyclate Quality Assessment
- Recycling Route Selection
- Recycled Grade Specification
- Chain-of-Custody Verification
- Recyclability Design Review
- Polymer Footprint Comparison
- Circular Polymer Business Case Building

Why Attend This Course:

- Return with a Circular Polymer Product Strategy built on case producer data and tested before a management panel
- Answer customer requests for recycled or bio-attributed grades with specifications and claims you can substantiate
- Judge vendor promises on pyrolysis, depolymerisation and bioplastics against feedstock, yield and footprint evidence
- Compare circular polymer practice with peers from petrochemicals, converting, packaging and consumer goods

Conclusion:

Circular polymers depend on matching each waste stream to a recycling route, turning recyclate or attributed feedstock into grades customers can use and backing every claim with bookkeeping and footprint data. The week moves from the plastics value chain and material leakage, through mechanical and chemical recycling routes, to recycled-content and bio-based grades and mass balance, then to recyclable design, producer fees and life cycle carbon. The final day turns a case producer's data into a Circular Polymer Product Strategy ready for management review.