CONCEPT

Polymer Technology and Plastics Extrusion: Grades, Processing and Troubleshooting

17 – 21 October 2027
Dammam - Eastern Province five-star



Polymer Technology and Plastics Extrusion: Grades, Processing and Troubleshooting

Ref: 400_13640 **Date:** 17 – 21 October 2027 **Location:** Dammam - Eastern Province five-star **Fees:** 19500 SAR

Introduction:

Polymer technology gaps between resin producers and plastics converters show up as gels in film, brittle pipe, warped mouldings and complaints that bounce between the reactor lot and the extrusion line. This Core Concept course links polymer structure, catalyst and reactor routes, compounding, plastics extrusion and moulding practice to grade selection, defect diagnosis and laboratory testing for polyethylene, polypropylene, polystyrene and PVC. Participants work through converter and plant case data and compile a Polymer Grade and Processing Troubleshooting File for a product line they support.

Course Objectives:

- Relate molecular weight, molecular weight distribution, branching and crystallinity to the melt flow, stiffness and toughness of a polymer grade
- Explain how Ziegler-Natta, metallocene and free-radical routes and reactor type shape the grades made for polyethylene, polypropylene, polystyrene and PVC
- Specify compounding conditions and additive packages that protect a resin through processing and service
- Set up single-screw extrusion for blown film, pipe and sheet and adjust injection and blow moulding settings to a target part
- Diagnose extrusion and moulding defects by separating resin, additive, machine and operating causes
- Test resin lots for melt flow rate, density, thermal behaviour and mechanical properties and assemble a Polymer Grade and Processing Troubleshooting File

Target Audience:

- Process engineering staff running polyethylene, polypropylene, polystyrene or PVC production units
- Technical service staff who support converters with grade advice and complaint investigation
- Converting and production staff who operate film, pipe, sheet, injection or blow moulding lines
- Quality control laboratory staff who test resin lots and release certificates of analysis
- Product development staff who adapt grades and additive recipes to new applications

Course Outline:

Day 1: Polymer Structure, Molecular Weight and Crystallinity

- Monomer, Repeat Unit and Chain Architecture: Linear, Short-Chain and Long-Chain Branched Polyethylene
- Number-Average and Weight-Average Molecular Weight and Molecular Weight Distribution
- Tacticity and Crystallinity: Isotactic, Syndiotactic and Atactic Chains
- Glass Transition, Melting Point and Thermoplastic Versus Thermoset Behaviour
- Density Classes of Polyethylene: LDPE, LLDPE and HDPE Property Map

Day 2: Polymerisation Routes, Catalysts and Reactor Technology

- Ziegler-Natta Catalyst Systems: Titanium on Magnesium Chloride with Aluminium Alkyl Cocatalyst
- Metallocene Single-Site Catalysts and Narrow Molecular Weight Distribution Grades
- High-Pressure Tubular and Autoclave, Gas-Phase, Slurry and Bulk Loop Reactors for PE and PP
- Polystyrene and PVC Routes: Free-Radical Bulk, Suspension and Emulsion Polymerisation
- Unsaturated Polyester, Epoxy and Phenolic Thermoset Resins: Curing Chemistry at Overview

Day 3: Compounding, Additives and Extrusion Lines

- Twin-Screw Compounding: Masterbatch, Filler Dispersion and Underwater Pelletising
- Additive Packages: Antioxidants, UV Stabilisers, Slip, Antiblock, Nucleating Agents and PVC Heat Stabilisers
- Single-Screw Geometry: Feed, Compression and Metering Zones, L/D Ratio and Compression Ratio
- Blown Film Line Set-Up: Spiral Mandrel Die, Blow-Up Ratio, Frost Line Height and Draw-Down
- Pipe and Sheet Extrusion: Vacuum Sizing Calibration, Coat-Hanger Die and Chill Roll Stack

Day 4: Moulding Processes, Grade Selection and Defect Troubleshooting

- Injection Moulding Cycle Settings: Plasticising, Injection Speed, Hold Pressure, Cooling and Ejection
- Extrusion and Injection Stretch Blow Moulding: Parison Programming and Preform Stretch Ratio
- Grade Selection Matrix by Melt Flow Rate, Density and Molecular Weight Distribution for Film, Pipe and Moulding
- Extrusion Defect Diagnosis: Melt Fracture, Sharkskin, Gels, Die Lines and Gauge Variation
- Moulding Defect Diagnosis: Short Shots, Flash, Sink Marks, Weld Lines, Warpage and Burn Marks

Day 5: Polymer Testing, Resin QC and the Troubleshooting Case File

- Melt Mass-Flow Rate Testing to ASTM D1238 and ISO 1133: Test Conditions for PE and PP
- Density Gradient Column, DSC Melting and Crystallinity Scans and Tensile and Impact Test Methods
- Certificate of Analysis Review, Lot-to-Lot Variation and SPC Charts for Resin Release
- Case Study: Blown Film Gel Complaint Traced from Converter Line Back to Reactor Lot
- Polymer Grade and Processing Troubleshooting File Drafting and Peer Review

Skills You Will Gain:

- Structure-Property Interpretation
- Catalyst and Reactor Route Awareness
- Additive Package Specification
- Extruder Screw and Die Set-Up
- Moulding Process Adjustment
- Processing Defect Diagnosis
- Resin Quality Testing
- Converter Technical Support

Why Attend This Course:

- Return with a Polymer Grade and Processing Troubleshooting File built on a product line and customer base you support
- Settle converter complaints faster by tracing a defect to the resin, the recipe or the machine with evidence both sides accept
- Recommend grades to converters in terms of melt flow, density and distribution rather than trade names alone
- Compare practice with producers, compounders and converters working on film, pipe, packaging and moulded parts

Conclusion:

Polymer performance on the converter's line is decided long before the pellets arrive: in chain structure, catalyst choice, reactor conditions and the additive package. The week moves from molecular weight and crystallinity through polymerisation routes and compounding to extrusion screws and dies, blown film, pipe, sheet and moulding settings, then to grade selection and defect diagnosis. The final day applies melt flow, density, thermal and mechanical testing to a real complaint and closes with a Polymer Grade and Processing Troubleshooting File for each participant.