Course ID
PLAST-MS

Course Title
Plastic Materials Selection

Course Duration
4 days

Related Courses

- Plastic Parts Failure Analysis (PLAST-FA, 3days)
- Plastics: Design for Producibility, Molds, and Molding (PLST-DES, 3 days)
- Materials and Methods: Designing for Plastics vs. Other Materials (PLST-OTHER, 2 days)
- Poka-Yoke: A Comprehensive Workshop for Improving Product and Process Quality By Preventing Defects (POKAYOKE, 2 days)
- Geometric Dimensioning and Tolerancing (GDT, 2 days)
- Statistical Tolerance Analysis: A Comprehensive Workshop (S-TOL-ANAL, 2 days)
- Statistical Process Control (SPCON, 3 days)
- Root Cause Failure Analysis and Experiment Design Techniques (RCFA3D, 3 days)
- Cost Reduction: Opportunities and Strategies (COSTRED, 2 days)
- Quality Management (QUALMGT, 3 days)

Aimed At

Those whose work requires a good understanding of plastic material performance vis-à-vis application requirements.

Prerequisites

While there are no formal prerequisites, the course does assume a basic knowledge of polymer properties and some familiarity with primary fabrication processes such as injection molding and extrusion.

Group Size

5-25

Course in a Nutshell

With an ever increasing plastic parts content of products across a variety of industries, there is a critical need for a course on plastic material selection, the object of this course.

In this course, we will approach plastic material selection process from a fundamental perspective. We will undertake a more in-depth treatment of the polymer science than is covered in a typical introductory plastics course. While the course content will be technical, it will also be focused on practical application. It will seek to impart knowledge of material performance that corresponds to various application requirements and provide techniques for developing property data that is generally not provided to the industry by material suppliers. The course also includes case studies that will examine the reasons for success or failure of an application.

Customize It!

We can customize this course to your team's technical needs, usually at little to no added cost. A less in-depth, three-day version of this course, along with a very basic two-day version, is also available. Schedule post-class follow-up consultation for continuing in-house implementation of the principles and techniques discussed in this course.

Course Outline

- Defining the Fundamentals That Determine Plastic Properties
  - Molecular Weight and Molecular Weight Distribution, The Foundation of Polymer Technology
    - The Relationship to Viscosity
    - The Relationship to Properties
    - Methods of Measurement
  - Methods of Polymerization: Addition and Condensation Polymers
    - Effect on Properties
    - Effect on Processing
  - Polarity: Effects on Solvation and Chemical Compatibility
  - Amorphous and Semi-Crystalline Polymers
    - Detecting the Presence of Crystalline Structure
    - Effects on Processing
    - Effects on Properties
- Structure Property Relationships in the Molten State
  - Rheology
  - Thermal Stability
  - Oxidative Stability
  - Hydrolysis
- Structure Property Relationships in the Solid State
  - Effects of Temperature
    - Reduction in Strength and Stiffness at Elevated Temperatures
    - Dimensional Stability
    - Structural Changes Due to Thermal Aging
    - Thermal Degradation and Oxidation
    - Loss of Ductility at Reduced Temperatures
  - Chemical Resistance: Effects of Temperature and Time
  - Creep Resistance, Stress Relaxation, and Fatigue
    - Defining the Mechanisms
    - Data Presentation
    - Accelerated Testing Methods: Advantages and Pitfalls
  - The Fundamental Equivalence of Temperature and Time
  - Environmental Stress Crack Resistance: The Differences from Chemical Attack
  - Radiation Resistance: Weathering, Ultraviolet, Sterilization
- Tailoring the Properties of the Base Polymer
  - Fillers and Reinforcements

- Long and Short Fibers
- Minerals: Talc, Mica, Calcium Carbonate and the New Nanocomposites
- High Performance Fibers: Aramid, Carbon, Ceramic, Stainless Steel

  - Impact Modifiers
  - Colorants
  - Stabilizers: Importance to Processing and Part Performance

- Establishing the Cost/Performance Profile
  - Defining Application Requirements
  - Matching Requirements to A Cost-Effective Material Family
  - Design Properties versus Inherent Properties
  - Designing for Manufacturing: Wall Thickness, Viscosity, and Process Selection
  - The Role of Simulation
- Case Studies: Successes and Failures
- Course Wrap-up: Recap, Q/A, and Evaluations

How You Will Learn

- A highly experienced plastics engineer with a life-time of hands-on design, consulting, and training experience will present this course in an interactive lecture format.
- Along with the lecture, we use interesting group activities and case studies to engage the participants and help them apply the course content to on-the-job application.
- You will receive a Participant Handbook that includes all materials presented in class, which will serve as a useful reference back on the job.
- You will learn key plastics engineering concepts and techniques from a theoretical and practical perspective

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