# AL154:
# Polymer Analysis & Testing

## Training Description:

AThis course is designed to provide participants with a detailed and up-to-date overview of polymer analysis and testing. It covers the basic polymer structure and terms; the use of SQC charts and collaborative testing; analyzing test ASTM organization and developing test; the use of data sheets, the mechanical properties testing according to Instron, dimensions, density measurements, comprehensive, tensile, bending, shear strength, tear strength, impact, hardness and static load; the friction coefficient, chemical resistance, thickness, tensile strength, CBR and puncture for geotextile; the use of melt flow index and rheological testing for processing control.

Further, this course will also discuss the physical testing, specific gravity, density, optical-scanning electron microscopes, water absorption, surface roughness-atomic force microscopy (AFM); the chemical testing, Fourier Transform Infrared spectroscopy (FTIR), Energy Dispersive X-ray spectroscopy (EDS), melt viscosity and molecular weight; and the ageing, weathering, QUV ageing, Q-sun xenon ARC ageing, salt spray corrosion chamber and hot ageing.

During this interactive course, participants will learn the thermal analysis, ash content, glass transition temperature, melting point, heat of crystallization, thermal conductivity, melt mass-flow rate, heat deflection temperature, and Vicat softening temperature; the electrical properties testing, volume resistivity test, resistance voltage test, dielectric strength, dielectric breakdown voltage and voltage resistance, electrical treeing and water treeing as examples of polymer aging caused by partial discharges. Chemiluminescence will be included as well as microcalorimetry which performs better than Differential Scanning Calorimetry (DSC). Moreover, the application of analytical and mechanical methods, additives, foreign materials in plastics, polymer residuals and polymer; and the flammability combusting testing including flame spread, heat release, smoke, toxicity and corrosion.

## Training Objectives:

By the end of the training, participants will be able to:

- ✓ Apply and gain an in-depth knowledge on polymer analysis and testing
- ✓ Identify the basic polymer structure and data and terms as well as the use of SQC charts, collaborative testing, analyzing test data and ASTM organization and developing test ASTM standards and the use of data sheets
- ✓ Carryout mechanical properties testing according to Instron and discuss dimensions and density measurements, comprehensive, tensile, bending, shear strength, tear strength, impact, hardness and static load
- ✓ Explain the friction coefficient, chemical resistance, thickness, tensile strength, CBR, puncture for geotextile and the properties of paints, coatings and sealants properties
- ✓ Discuss Melt Flow Index (MFI) and rheological testing
- ✓ Employ physical testing and discuss the specific gravity, density, optical-scanning electron microscopes, water absorption, surface roughness-atomic force microscopy (AFM)
- ✓ Illustrate chemical testing and describe Fourier Transform Infrared spectroscopy (FTIR), energy dispersive x-ray spectroscopy (EDS), melt viscosity and molecular weight and Molecular Weight Distribution (MWD)
- ✓ Accelerate ageing and weathering and illustrate QUV ageing, Q-sun xenon ARC ageing, salt spray corrosion chamber and hot ageing

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- ✓ Carryout thermal analysis and identify ash content, glass transition temperature, melting point, heat of crystallization, thermal conductivity, melt mass-flow rate, heat deflection temperature, and Vicat softening temperature
- ✓ Recognize corona and partial discharges, apply electrical properties testing covering volume resistivity test and resistance voltage test
- ✓ Discuss dielectric strength, dielectric breakdown voltage, voltage resistance, electrical treeing and water treeing
- ✓ Apply analytical and mechanical methods and recognize the additives, foreign materials in plastics including tools for trouble-shooting plastic extrusion and injection molding
- ✓ Implement flammability combusting testing and describe flame spread, heat release, smoke, toxicity and corrosion

## Training Designed for:

This course is designed for laboratory managers, supervisors, process engineers, shop foremen, technical liaisons, technicians, professionals new to testing of plastics and those who needs knowledge of test methods.

## Training Requirement:

"Hand's on practical sessions, equipment and software will be applied during the course if required and as per the client's request."

Contents can be adapted to your specific wishes. It is therefore possible to focus on specific modules of the training course as per client's learning needs and objectives. Further, it should be forwarded to us a month prior to the course dates.

## Training Program:

*DAY ONE:*

- ❖ Introduction
  - Basic Polymer Structure & Explanation of Terms
  - Use of SQC Charts, Collaborative Testing & Analyzing Test Data
  - ASTM Organization & Developing ASTM Standards
- ❖ Mechanical Properties Testing
  - Data sheet, Density Measurements
  - Tensile
  - Compression
  - Flexural
  - Fatigue
  - Impact Loading by Instron
  - Tear Strength
  - Hardness
  - Multi-axial Loading
  - Friction Coefficient
  - Chemical Resistance

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- Thickness, Tensile Strength, CBR Puncture for Geotextile

❖ Rheological Testing
- Melt Flow Index (MFI)
- Rheology of Plastics

*DAY TWO:*

❖ Physical Testing
- Specific Gravity
- Density
- Optical – Scanning Electron Microscopes
- Water Absorption
- Surface Roughness – Atomic Force Microscopy (AFM)

❖ Chemical Testing
- Fourier Transform Infrared Spectroscopy – FTIR
- Energy Dispersive X-ray Spectroscopy – EDS
- Molecular Weight
- Molecular Weight Distribution

*DAY THREE:*

❖ Accelerating Ageing/Weathering
- QUV Ageing
- Q-Sun Xenon ARC Ageing
- Salt Spray Corrosion Chamber
- Hot Ageing

❖ Thermal Analysis
- Ash Content
- Glass Transition Temperature
- Melting Point
- Heat of Crystallization
- Thermal Conductivity
- Melt Mass-Flow Rate
- Heat Deflection Temperature
- Vicat Softening Temperature

*DAY FOUR:*

❖ Electrical Properties Testing
- Corona & Partial Discharges
- Volume Resistivity Test
- Resistance to Voltage Test
- Dielectric Strength
- Dielectric Breakdown Voltage
- Voltage Resistance
- Static Decay Time
- Water Treeing
- Electrical Treeing

- New Analytical Techniques
  - Chemiluminescence
  - Microcalorimetry Vs. DSC
- Troubleshooting
  - Extrusion
  - Injection Molding
- Practical Sessions
  - This hands-on, highly-interactive course includes real-life case studies and exercises

*DAY FIVE:*

- Application of Analytical & Mechanical Methods
  - Additives: Types, Sample Preparation, Methods of Analysis
  - Foreign Materials in Plastics
  - Polymer Residuals: Headspace Analysis by GC, LC
  - Polymer: Spectroscopy, Molecular Characterization
  - Literature and Instructor's Examples Related to Product Failure; Use of Multiple Analytical and/or Mechanical Tests
- Flammability/Combustibility Testing
  - Flame Spread: Small, Medium & Large-Scale Tests
  - Heat Release; Smoke; Toxicity; Corrosion
- Course Conclusion
- POST-ASSESSMENT and EVALUATION

## Training Methodology:

This interactive training course includes the following training methodologies as a percentage of the total tuition hours:

- 30% Lectures, Concepts, Role Play
- 70% Workshops & Work Presentations, Techniques, Based on Case Studies & Practical Exercises, Gamification, Software & General Discussions
- Pre and Post Test

## Training Certificate(s):

CMCT Internationally recognized certificate(s) will be issued to each participant who completed the course.

## Training Fees:

TBA as per the course location - This rate includes participant's manual, hand-outs, buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Note: The 5% VAT (Value Added Tax), will be effective starting 01st of January 2018 as per the new regulation from the UAE Government. The VAT applies for all quotation both for local and abroad.

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## Training Timings:

**Daily Timings:**

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|---|---|
| 07:45 - 08:00 | Morning Coffee / Tea |
| 08:00 - 10:00 | First Session |
| 10:00 - 10:20 | Recess (Coffee/Tea/Snacks) |
| 10:20 - 12:20 | Second Session |
| 12:20 - 13:00 | Recess (Prayer Break & Lunch) |
| 13:00 - 14:00 | Last Session |

**For training registrations or in-house enquiries, please contact:**

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