



PE043: Plastic Additives Selection, Application & Troubleshooting



Training Description:

Plastic additives are a diverse group of specialty chemicals that are either incorporated into the plastic product prior to or during processing or applied to the surface of the product when processing has been completed. These additives aid in the actual processing of the plastic end product (e.g., antioxidants, nucleating agents, mold release agents, lubricants) or improve the characteristics of the final product (antimicrobials, colorants, antistatic agents, impact modifiers, and UV stabilizers).

Plastics additives account for 15 to 20% by weight of the total volume of plastics products marketed. The growth in use of these additives is relatively strong and continuous. However, environmental constraints have imposed rigorous performance requirements on many products, adding expenses to the development costs of these materials. A new trend is the development of biobased additives for bioplastics. It is expected that bioplastics will grow 50% by 2021.

This intensive training course provides the basic and specific information needed to employ the best additives in manufacturing situations. The course starts with a presentation of the structures of polymers for a better understanding of the ways to stabilize a plastic material against degradation due to thermal, mechanical or UV-degradation or other detrimental mechanisms. A presentation of the most common plastic materials and how they should be handled during processing is included. This is important to obtain the desired properties for a product. However, the quality and the short as well as the long-term properties can be improved by the correct choice of additives. This will be highlighted during the extensive presentation of available additives on the market and the mechanisms for their function. Further, the course will cover the analytical tools (DSC, TGA and Mass Spectrometry) and many of other instrumental techniques for identification and structure elucidation of plastics additives, e.g., antioxidants, stabilizers, plasticizers, pigments, UV-stabilizers.

This state-of-the-art course is designed to provide an overview of many additives used to produce the huge array of today's commercial polymeric materials. However, the participants will also learn which tools are available for trouble-shooting. Discoloration and poor UV-resistance are only two examples of common problems, which are often encountered. The aid of statistical methods will also be presented as well as alternatives to additives. Environmental issues are dealt with due to detrimental migration of additives, health risks with halogenated additives as well as consequences of plastic recycling and the restabilization of polymers with additives. Discussions will include additive functionality and how to select additives to meet the desired end product properties and manufacturing process requirements.

Training Objectives:

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

- ✓ Apply systematic techniques in the selection, application and troubleshooting of plastic additives
- ✓ Select the best plastic additives for different manufacturing situations
- ✓ Distinguish the details of the most common plastics additives (Antioxidants; Light Stabilizers like UV-absorbers and Hindered Amine Light Stabilizers; Fillers like Micac and Carbon Black, Pigments/ Colorants/ Dyes; Flame retardants/Smoke Suppressants; Slip/Anti-Blocking Agents; Antacids; Stearates; Metal Deactivators; Plasticizers; Blowing and Foaming Agents; Antibacterials/Fungicides; Anti-Fogging Agents; Anti-Static Agents)
- ✓ Enumerate proper trademarked additives and their trade names



- ✓ Select additives to meet the desired end-product properties and manufacturing process requirements
- ✓ Apply FTIR, DSC and Mass Spectrometry and many other instrumental techniques for identification and structure elucidation of plastics additives, e.g., antioxidants, stabilizers, plasticizers and pigments
- ✓ Identify the best and updated references in the Plastics Additives Technology (manufacturers, books, software, databases, etc.)

Training Designed for:

This course is intended for process engineers, scientists, chemists and laboratory team who are involved in the selection, application and troubleshooting; practitioners in plastics production, plastics processing, plastics additives and researchers in the area of polymer degradation and spectroscopists. Further, the course is important for procurers, purchasers, sales & marketing engineers in the field of plastics and polymers. Management team in the manufacturing plants of plastics and polymers are encouraged to attend this comprehensive course which will give them invaluable technical information on plastics additives and polymers.

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”.

Please note that the below topics can be amended 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:

- ❖ Pre-Test
- ❖ Introduction to Plastics
 - Structure of Polymers, Processing of Plastics, Some Physical Properties, Choice of Plastic Materials
- ❖ **Plastic Materials and Additives**
 - What do Additives Add to Plastics? Polyolefins
- ❖ **Material Handling**
 - Material Conveying, Effect of Water on Plastics, Drying of Material, Material Granulation and Grinding
- ❖ **Thermoplastics Processing**
 - Injection Molding & Blow Molding, Film and Profile Extrusion, Rotational Molding
- ❖ **Quality Control (QC)**
 - What can be Obtained by QC? QC of Polyolefins

DAY TWO:

- ❖ **Degradation of Plastics Materials**
 - Micro Degradation
 - Macro Degradation



- Effect of Radicals
- ❖ **Stabilization of Polyolefins**
 - Different Types of Additives
- ❖ **Plastic Additives: Antioxidants (AO) for Polyolefins**
 - Different Types of AO
 - Process Stabilization
 - Long Term Stabilization
- ❖ **Plastic Additives: Light Stabilizers for Polyolefins**
 - UV-Absorbers
 - Hindered Amine Light Stabilizers
 - Other Types
- ❖ **Plastic Additives: Fillers for Polyolefins**
 - Impact Modifiers
 - Smart Fillers
 - Micas
 - Carbon Black

DAY THREE:

- ❖ **Plastic Additives: Pigments, Colorants & Dyes**
 - Pigments
 - Colorants
 - Dyes
- ❖ **Plastic Additives: Flame Retardants**
 - The Mechanism of Fire
 - Non-Halogen Flame Retardants
 - Smoke Suppressants
- ❖ **Plastic Additives: Lubricants & other Additives**
 - Slip and Anti-Blocking Agents
 - Antacids & Stearates
- ❖ **Plastic Additives: Some other Important Additives**
 - Metal Deactivators for Polyolefins
 - Plasticizers
 - Blowing and Foaming Agents for Polyolefins
 - Antibacterials/Fungicides
 - Anti-Fogging Agents & Anti-Static Agents

DAY FOUR:

- ❖ **Plastic Additives: Nucleating Agents and Clarifying Agents**
 - Difference between Nucleating and Clarifying Agents
 - Antagonism and Synergism with other Additives
 - Choice of Additives-Based on What?
- ❖ **Plastic Additives: Analysis & Spectrometric Methods**
 - Troubleshooting by Analysis
 - FTIR & DSC
 - OIT and TGA & Owen Aging
 - Rheology





- Chemiluminescence
- XPS or ESCA
- SIMS & Scanning Electron Microscopy (SEM)
- Mass Spectrometry (Advanced Method)
- Simple Analyses of AO and Hydrogen Peroxides in Resins

❖ **Practical Sessions**

- This hands-on, highly-interactive course includes real-life case studies and exercises

DAY FIVE:

❖ **Plastic Additives: Alternatives & Statistical Methods**

- Alternatives to Additives
- QC and Statistical Evaluation

❖ **Plastic Additives: Environmental Concerns**

- Re-Stabilization
- Biodegradation of Plastics
- The Environmental Impact of Plastic Wastes
- Migration of Additives

❖ **Plastic Additives: New Trends**

- Anti-Counterfeiting Additives
- Bioplastics vs Conventional Plastics
- Biobased Additives
- Antioxidant Polymers

❖ **Data of Additives in the Literature**

❖ **Course Conclusion**

❖ **Post-Test 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, Software & General Discussions
- Pre and Post Test

Training Certificate(s):

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

Training Fees:

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.





Training Timings:

Daily Timings:

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 - 13:30	Recess (Prayer Break & Lunch)
13:30 - 15:00	Last Session

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

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Training & Career Development Department

