

COURSE OVERVIEW PE0450-4D
Plastic Additives Selection, Application & Troubleshooting

Course Title

Plastic Additives Selection, Application & Troubleshooting

Course Reference

PE0450-4D

Course Duration/Credits

Four days/2.4 CEUs/24 PDHs

Course Date/Venue

Session(s)	Date	Venue
1	February 19-22, 2024	Boardroom 1, Elite Byblos Hotel Al Barsha, Sheikh Zayed Road, Dubai, UAE
2	May 20-23, 2024	Boardroom, Warwick Hotel Doha, Doha, Qatar
3	August 12-15, 2024	Ajman Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE
4	November 18-21, 2024	Jubail Hall, Signature Al Khobar Hotel, Al Khobar, KSA



Course Description



This practical and highly-interactive course includes various practical sessions and exercises. Theory learnt will be applied using our state-of-the-art simulators.



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 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.

Course Objectives

Upon the successful completion of this course, each participant 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.)

Exclusive Smart Training Kit - H-STK®



Participants of this course will receive the exclusive “Haward Smart Training Kit” (H-STK®). The H-STK® consists of a comprehensive set of technical content which includes **electronic version** of the course materials, sample video clips of the instructor’s actual lectures & practical sessions during the course conveniently saved in a **Tablet PC**.

Who Should Attend

This course provides an overview of all significant aspects and considerations of plastic additives 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 Methodology

All our Courses are including **Hands-on Practical Sessions** using equipment, State-of-the-Art Simulators, Drawings, Case Studies, Videos and Exercises. The courses include the following training methodologies as a percentage of the total tuition hours:-

- 30% Lectures
- 20% Practical Workshops & Work Presentations
- 30% Hands-on Practical Exercises & Case Studies
- 20% Simulators (Hardware & Software) & Videos

In an unlikely event, the course instructor may modify the above training methodology before or during the course for technical reasons.

Course Fee

Dubai	US\$ 4,500 per Delegate + VAT . This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.
Doha	US\$ 5,500 per Delegate. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.
Abu Dhabi	US\$ 4,500 per Delegate + VAT . This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day
Al Khobar	US\$ 4,500 per Delegate + VAT . This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Course Certificate(s)

Internationally recognized certificates will be issued to all participants of the course who completed a minimum of 80% of the total tuition hours.

Certificate Accreditations

Certificates are accredited by the following international accreditation organizations:-


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The International Accreditors for Continuing Education and Training (IACET - USA)

Haward Technology is an Authorized Training Provider by the International Accreditors for Continuing Education and Training (IACET), 2201 Cooperative Way, Suite 600, Herndon, VA 20171, USA. In obtaining this authority, Haward Technology has demonstrated that it complies with the **ANSI/IACET 2018-1 Standard** which is widely recognized as the standard of good practice internationally. As a result of our Authorized Provider membership status, Haward Technology is authorized to offer IACET CEUs for its programs that qualify under the **ANSI/IACET 2018-1 Standard**.

Haward Technology's courses meet the professional certification and continuing education requirements for participants seeking **Continuing Education Units (CEUs)** in accordance with the rules & regulations of the International Accreditors for Continuing Education & Training (IACET). IACET is an international authority that evaluates programs according to strict, research-based criteria and guidelines. The CEU is an internationally accepted uniform unit of measurement in qualified courses of continuing education.

Haward Technology Middle East will award **2.4 CEUs** (Continuing Education Units) or **24 PDHs** (Professional Development Hours) for participants who completed the total tuition hours of this program. One CEU is equivalent to ten Professional Development Hours (PDHs) or ten contact hours of the participation in and completion of Haward Technology programs. A permanent record of a participant's involvement and awarding of CEU will be maintained by Haward Technology. Haward Technology will provide a copy of the participant's CEU and PDH Transcript of Records upon request.

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British Accreditation Council (BAC)

Haward Technology is accredited by the **British Accreditation Council** for **Independent Further and Higher Education** as an **International Centre**. BAC is the British accrediting body responsible for setting standards within independent further and higher education sector in the UK and overseas. As a BAC-accredited international centre, Haward Technology meets all of the international higher education criteria and standards set by BAC.

Accommodation

Accommodation is not included in the course fees. However, any accommodation required can be arranged at the time of booking.

Course Instructor(s)

This course will be conducted by the following instructor(s). However, we have the right to change the course instructor(s) prior to the course date and inform participants accordingly:



Dr. Lennart Johansson is currently the **Principal Consultant of Polymer Support Incorporation**, a company that provides **Analytical Services** to the **Plastics/Rubber Industry**. He is also the **Chairman of the European Colors & Additives Conference of Germany since 1995** and the **Board member of the Society of Plastics Engineers (SPE)**. Dr. Johansson is an **International Expert in Polymers and Plastics/Rubber additives** with over **25 years** of industrial experience in this area. Further, he is an **Authority** in the **processes leading to degradation and aging of polymers for different industrial applications like tubes, pipes, cables, capacitors, films generators, motors and transformers**.

During his career life, Dr. Johansson worked as the **Manager of Process/ Polymer, & Development Engineer for Dyno Nobel**; as the **Senior Scientist and Project Leader** within the area of **Degradation and Stabilization of plastics**, for **ABB Corporate** where he was in charge of researches of **Aging of polymers, Aging of insulation liquids, Aging of cables, Improved performance for capacitors, Electrical treeing, Water treeing, Corona resistance and New filler materials**. Further, he worked as a **Chemical Engineer** for different **Plastics and Rubber companies in Sweden, Germany, Italy and the UK**.

Dr. Johansson has **five patents in Plastic industry**, and he published **tremendous number of Papers and proceedings**. His qualifications include **Bachelor, Master and PhD Degrees in Chemical Engineering** from **Lund University, Sweden**. Further, he is a **Certified Instructor/Trainer**.

Course Program

The following program is planned for this course. However, the course instructor(s) may modify this program before or during the course for technical reasons with no prior notice to participants. Nevertheless, the course objectives will always be met:

Day 1

0730 – 0800	Registration & Coffee
0800 – 0815	Welcome & Introduction
0815 – 0830	PRE-TEST
0830 – 1000	Introduction to Plastics Structure of Polymers • Processing of Plastics • Some Physical Properties • Choice of Plastic Materials
1000 – 1015	Break
1015 – 1115	Plastic Materials and Additives What do Additives Add to Plastics? • Polyolefins
1115 – 1230	Material Handling Material Conveying • Effect of Water on Plastics • Drying of Material • Material Granulation and Grinding

1230– 1245	Break
1245 – 1345	Thermoplastics Processing Injection Molding & Blow Molding • Film and Profile Extrusion • Rotational Molding
1345 – 1420	Quality Control (QC) What can be Obtained by QC? • QC of Polyolefins
1420 – 1430	Recap
1430	Lunch & End of Day One

Day 2

0730 – 0900	Degradation of Plastics Materials Micro Degradation • Macro Degradation • Effect of Radicals
0900– 0915	Break
0915– 1000	Stabilization of Polyolefins Different Types of Additives
1000 – 1130	Plastic Additives: Antioxidants (AO) for Polyolefins Different Types of AO • Process Stabilization • Long Term Stabilization
1130 – 1145	Break
1145 – 1315	Plastic Additives: Light Stabilizers for Polyolefins UV-Absorbers • Hindered Amine Light Stabilizers • Other Types
1315 – 1420	Plastic Additives: Fillers for Polyolefins Impact Modifiers • Smart Fillers • Micac • Carbon Black
1420 – 1430	Recap
1430	Lunch & End of Day Two

Day 3

0730 – 0830	Plastic Additives: Pigments, Colorants & Dyes Pigments • Colorants • Dyes
0830 – 0900	Plastic Additives: Flame Retardants The Mechanism of Fire • Non-Halogen Flame Retardants • Smoke Suppressants
0900 – 0915	Break
0915 – 1100	Plastic Additives: Lubricants & other Additives Slip and Anti-Blocking Agents • Antacids & Stearates
1100 – 1200	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
1200 – 1215	Break
1215 – 1330	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?
1330 – 1420	Plastic Additives: Analysis & Spectrometric Methods Troubleshooting by Analysis • FTIR & DSC
1420 – 1430	Recap
1430	Lunch & End of Day Three

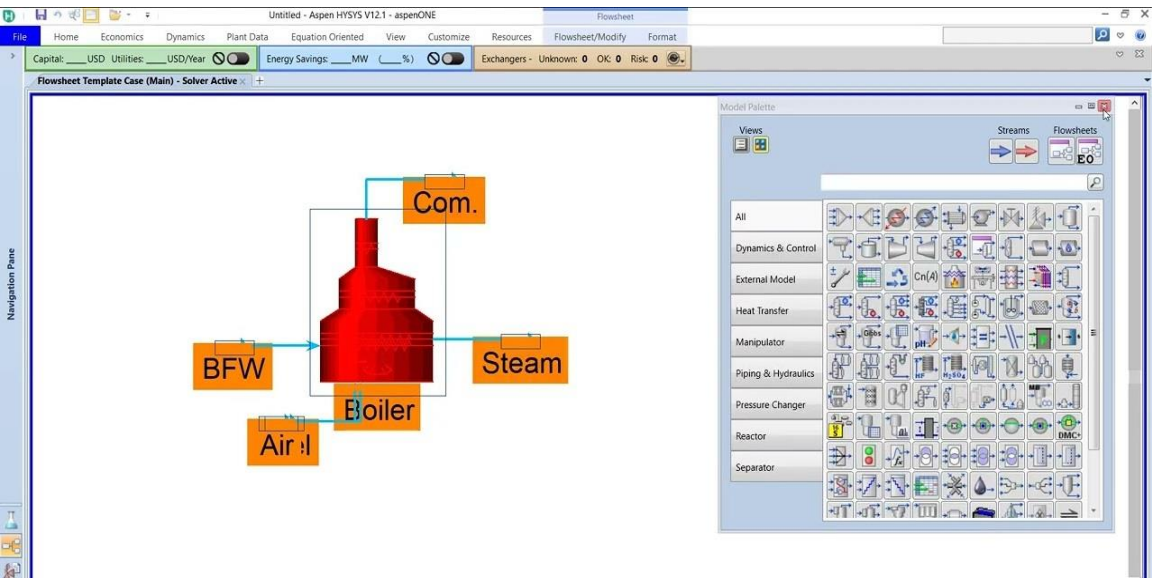
Day 4

0730 – 0800	Plastic Additives: Surface Analysis & Spectrometric Methods 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
0800 – 0900	Plastic Additives: Alternatives & Statistical Methods Alternatives to Additives • QC and Statistical Evaluation

0900 – 0915	Break
0915 – 1100	Plastic Additives: Environmental Concerns Re-Stabilization • Biodegradation of Plastics • The Environmental Impact of Plastic Wastes • Migration of Additives
1100 – 1230	Plastic Additives: New Trends Anti-Counterfeiting Additives • Bioplastics vs Conventional Plastics • Biobased Additives • Antioxidant Polymers
1230 – 1245	Break
1245 – 1345	Summary & Open Forum Data of Additives in the Literature and Summary & Open Forum
1345 – 1400	Course Conclusion
1400 – 1415	POST-TEST
1415 – 1430	Presentation of Course Certificates
1430	Lunch & End of Course

Simulator (Hands-on Practical Sessions)

Practical sessions will be organized during the course for delegates to practice the theory learnt. Delegates will be provided with an opportunity to carryout various exercises using the “ASPEN HYSYS” simulator.



The screenshot displays the ASPEN HYSYS V12.1 simulator interface. The main window shows a process flow diagram with a central red boiler unit. It is connected to a compressor (Com.) at the top, a steam generator (Steam) on the right, and a boiler feedwater (BFW) inlet on the left. An air inlet (Air) is also shown at the bottom. The interface includes a menu bar at the top, a navigation pane on the left, and a model palette on the right containing various process units like Dynamics & Control, External Model, Heat Transfer, Manipulator, Piping & Hydraulics, Pressure Changer, Reactor, and Separator.

ASPEN HYSYS V12.1 Simulator

Course Coordinator

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