COURSE OVERVIEW PE1057
PVC Grades versus Product Application

Course Title
PVC Grades versus Product Application

Course Reference
PE1057

Course Duration/Credits
Five days/3.0 CEUs/30 PDHs

Course Date/Venue

Session(s)	Course Date	Venue
1	June 15-19, 2025	Meeting Plus 9, City Centre Rotana, Doha, Qatar
2	August 17-21, 2025	
3	November 02-06, 2025	

Course Description

This practical and highly-interactive course includes real-life case studies where participants will be engaged in a series of interactive small groups and class workshops.

This course is designed to provide participants with a detailed and up-to-date overview of PVC Grades versus Product Application. It covers the PVC (Polyvinyl Chloride), history and global market outlook, types and structure-property relationships; the PVC grades, resin manufacturing and quality parameters, thermal, mechanical and rheological properties, additive systems for PVC and PVC processing techniques; the properties of rigid PVC grades, PVC for pipes and fittings, window profiles, siding and building profiles and rigid PVC in bottles and containers; the sheets, films and thermoforming, rigid foam boards and WPC; the flexible PVC properties and applications; and the wire and cable insulation and jacketing.

Further, the course will also discuss the PVC for medical and pharmaceutical use, flexible PVC in flooring and wall coverings, artificial leather and automotive interiors and inflatable, sealing and dipping applications; the CPVC (Chlorinated PVC) grades, high-impact and weatherable PVC grades, transparent and high clarity PVC; and the PVC/NBR and PVC/PU blends.s

During this interactive course, participants will learn the flame retardant and smoke suppressed PVC, sustainable PVC and recycling techniques, PVC testing and quality control; the regulatory and environmental compliance and packaging industry applications; the automotive and transportation applications; and the building and infrastructure applications.

Course Objectives

Upon the successful completion of this course, each participant will be able to: -

- Apply and gain an in-depth knowledge on PVC grades versus product application
- Discuss PVC (Polyvinyl Chloride) and its history and global market outlook, types and structure-property relationships
- Classify PVC grades and explain resin manufacturing and quality parameters, thermal, mechanical and rheological properties, additive systems for PVC and PVC processing techniques
- Explain the properties of rigid PVC grades, PVC for pipes and fittings, window profiles, siding and building profiles and rigid PVC in bottles and containers
- Determine sheets, films and thermoforming, rigid foam boards and WPC, flexible PVC properties and applications and wire and cable insulation and jacketing
- Recognize PVC for medical and pharmaceutical use, flexible PVC in flooring and wall coverings, artificial leather and automotive interiors and inflatable, sealing and dipping applications
- Describe CPVC (Chlorinated PVC) grades, high-impact and weatherable PVC grades, transparent and high clarity PVC and PVC/NBR and PVC/PU blends
- Discuss flame retardant and smoke suppressed PVC, sustainable PVC and recycling techniques, PVC testing and quality control as well as the regulatory and environmental compliance and packaging industry applications
- Carryout automotive and transportation applications and building and infrastructure applications

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 conveniently saved in a **Tablet PC**.*

Who Should Attend

This course provides an overview of all significant aspects and considerations of PVC grades versus product application for product design and development engineers, materials and polymer engineers, manufacturing and process engineers, quality assurance and testing professionals, procurement and sourcing specialists, sales and application engineers (techno-commercial roles), product managers and R&D professionals, regulatory and compliance officers.

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

Haward's Certificates are accredited by the following international accreditation organizations:

- British Accreditation Council (BAC)

  Haward Technology is accredited by the **British Accreditation Council** for **Independent Further and Higher Education** as an **International Centre**. Haward's certificates are internationally recognized and accredited by the British Accreditation Council (BAC). 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.

- 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 **3.0 CEUs** (Continuing Education Units) or **30 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.

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. Pete Ludovice, PhD, BSc, is a **Senior Chemical Engineer** with over **25 years** of extensive experience in **Plastics/Rubber Additives**, **Thermoplastics Processing**, **Plastic Materials**, **Polymer Science** and **Polyolefin** (**Polyethylene & Polypropylene**) **Engineering**. Further, he is also well-versed in **Chemical & Biomolecular Engineering**, **Bioengineering**, **Water Distribution System**, **Water Injection Treatment** and **Water Treatment Technology**. He is currently the **Senior Professor** of **Chemical & Biomolecular Engineering** in **Georgia Institute of Technology**, **USA** wherein he has designed numerous courses on various aspects of **polymer science** and **chemical engineering** that include **Applied Molecular Modelling**, **Numerical Modelling** of **Process Engineering**, and **Chemical Processes** using **Molecular Modelling** to characterize **Polymer Behaviour** and **Methods** for **Technical Innovation.**

Dr. Ludovice's research interests include **structure-property relationships** in **polymer materials** including a variety of polymers from basic vinyl polymers to high performance polymer and biological polymers. His researches have been funded by various industries and the **United States National Science Foundation**, the **Department of Energy**, the **Whitaker Foundation** and the **Office of Naval Research**. Further, he has gained his extensive experience through his prior challenging positions such as a **Polymer Product Manager** of **Molecular Simulations Inc**., a **Senior Scientist** for **NASA – Ames Research Center** (**USA**) and the **IBM – Almaden Research Center** (**USA**), a **Research Associate** for the **Institut für Polymere** at the **Eidgenössische Technische Hochschule** in **Zürich**, **Switzerland** and a **Principal Investigator** for 40 diverse international agencies.

Dr. Ludovice holds **PhD** and **Bachelor** degrees in **Chemical Engineering** from the **Massachusetts Institute of Technology**, **USA** and the **University of Illinois**, **USA** respectively. Further, he is an active member of the American Institute of Chemical Engineers (**AIChE**), Society of Plastics Engineers (**SPE**), Materials Research Society and the American Chemical Society. Moreover, he has published **numerous books** and **papers** circulated **internationally** and **delivered technical presentations** and **seminars** in several **international conferences**. He was also one of the inventors of the "**Self-Expanding Intraluminal Composite Prosthesis**" and the "**Pore-Forming Agents to Enhance Transdermal Delivery of Biological Agents**". Amongst all these achievements, he was **honoured** with **various awards** such as the "**Outstanding PhD Thesis Award**" by Georgia Institute of Technology, the "**Outstanding Professor of the Year**" by AIChE and the "**Sherwin Williams Award in Polymer Science**" by the American Chemical Society.

Accommodation

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

Course Fee

US$ 6,000 per Delegate. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

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 Program

The following program is planned for this course. However, the course instructor(s) may modify this program before or during the workshop 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 – 0930	***Introduction to PVC (Polyvinyl Chloride)*** *History & Global Market Outlook • Types: Suspension, Emulsion, Mass, Bulk Polymerization • Structure-Property Relationships • Comparison with other Thermoplastics*
0930 – 0945	*Break*
0945 – 1030	***Classification of PVC Grades*** *Rigid (uPVC) versus Flexible (Plasticized PVC) • K-Value & Molecular Weight • General-Purpose versus Specialty Grades • Suspension versus Paste versus Copolymer Grades*
1030 – 1130	***Resin Manufacturing & Quality Parameters*** *Polymerization Process & Reactor Types • Key Quality Metrics (Bulk Density, VCM Residue, Porosity) • Resin Particle Morphology & Flow Properties • Role of Additives in Compound Performance*
1130 – 1215	***Thermal, Mechanical & Rheological Properties*** *Glass Transition & Decomposition Temperatures • Tensile Strength, Impact Resistance & Elongation • Rheology & Melt Viscosity • PVC Behavior Under Different Shear Rates*
1215 – 1230	*Break*

1230 – 1330	***Additive Systems for PVC*** *Heat Stabilizers (Ca/Zn, Pb, Sn Types) • Plasticizers (DOP, DOTP, Phthalate-Free) • Lubricants, Impact Modifiers, Fillers • Flame Retardants, Pigments & UV Stabilizers*
1330 – 1420	***PVC Processing Techniques Overview*** *Extrusion, Injection Molding, Blow Molding • Calendaring, Dip Molding, Slush Molding • Thermoforming & Compression Molding • Processing Equipment & Compounding Strategies*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today & Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day One*

Day 2

0730 – 0830	***Properties of Rigid PVC Grades*** *Typical K-Value Range & Tensile Strength • Thermal Stability & Rigidity • UV Resistance & Weatherability • Fire Resistance Characteristics*
0830 - 0930	***PVC for Pipes & Fittings*** *Pressure & Non-Pressure Pipe Grades • Specification Standards (ASTM, ISO, EN) • Formulation for Impact & Hydrostatic Performance • Common Defects & Troubleshooting*
0930 – 0945	*Break*
0945 – 1100	***Window Profiles, Siding & Building Profiles*** *Gloss, Color Stability & Outdoor Durability • Formulation for Co-Extrusion & Mono-Layer Profiles • Weathering Tests & Impact Modification • Profiles for Doors, Windows & Cladding*
1100 – 1215	***Rigid PVC in Bottles & Containers*** *Blow Molding Grades (Clarity, Impact Resistance) • Processing Window & Mold Design • Food-Contact Compliance • Use in Pharma & Agrochemical Packaging*
1215 – 1230	*Break*
1230 – 1330	***Sheets, Films & Thermoforming*** *Rigid PVC Sheets for Signage & Construction • Multi-Layer Sheet Extrusion • Vacuum Forming & Pressure Forming • Compatibility with other Polymers (e.g., PETG)*
1330 – 1420	***Rigid Foam Boards & WPC*** *PVC/Wood Composites & Cellular Foam • Blowing Agents & Process Control • Lightweight versus Structural Grades • Applications in Signage, Interiors, Furniture*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today & Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Two*

Day 3

0730 – 0830	***Flexible PVC Properties & Applications*** *Role of Plasticizers in Flexibility • Shore A Hardness & Elongation Range • Rebound Resilience & Tear Strength • Low-Temperature Performance*
0830 – 0930	***Wire & Cable Insulation & Jacketing*** *Electrical & Thermal Properties • Flame Retardancy & Oil Resistance • Compounding for Insulation versus Sheathing • Certifications (UL, VDE, RoHS, REACH)*
0930 – 0945	*Break*
0945 – 1100	***PVC for Medical & Pharmaceutical Use*** *Biocompatibility & USP Class VI Compliance • DEHP & Non-DEHP Alternatives • Clarity, Weldability & Sterilization Compatibility • Uses: Blood Bags, IV Tubes, Catheters*
1100 – 1215	***Flexible PVC in Flooring & Wall Coverings*** *Anti-Slip, Abrasion Resistance & Printability • Foam-Backed versus Solid Flooring Formulations • Indoor Air Quality & VOC Considerations • Calendaring versus Extrusion Methods*
1215 – 1230	*Break*
1230 – 1330	***Artificial Leather & Automotive Interiors*** *Paste-Grade PVC for Coated Fabrics • Surface Aesthetics & Durability • Foam Lamination & Backing Materials • Colorfastness & Scratch Resistance*
1330 – 1420	***Inflatable, Sealing & Dipping Applications*** *Slush Molding for Toys & Dashboards • Dip Coating for Gloves & Grips • Airtight & Waterproof Sealants • Formulations for Flexible Tanks & Inflatable Structures*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today & Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Three*

Day 4

0730 – 0830	***CPVC (Chlorinated PVC) Grades*** *Chlorination Level & Thermal Resistance • CPVC for Hot Water Pipes & Fire Sprinkler Systems • Chemical Resistance & Installation Techniques • CPVC Compounding Differences From PVC*
0830 – 0930	***High-Impact & Weatherable PVC Grades*** *Acrylic & MBS Impact Modifiers • Formulation for Cold Climate Installations • UV Stabilizers & Pigment Systems • Outdoor Weathering Tests (QUV, Xenon Arc)*
0930 – 0945	*Break*
0945 – 1100	***Transparent & High Clarity PVC*** *Optical Properties & Resin Selection • Calendared versus Extruded Clarity Films • Impact of Plasticizers & Stabilizers • Applications: Blister Packs, Display Films*
1100 – 1215	***PVC/NBR & PVC/PU Blends*** *Oil & Fuel Resistance • Flexibility at Low & High Temperatures • Processing Considerations in Blending • Use in Industrial Hoses & Seals*

1215 – 1230	*Break*
1230 – 1330	***Flame Retardant & Smoke Suppressed PVC*** *Formulation with ATH, Sb2O3, Phosphates • Low-Smoke Zero-Halogen (LSZH) Trends • Fire Performance Testing (LOI, UL94, Cone Calorimeter) • Application in Public Infrastructure & Tunnels*
1330 – 1420	***Sustainable PVC & Recycling Techniques*** *Mechanical Recycling of Rigid & Flexible PVC • Contamination & Sorting Challenges • Bio-Based PVC & Non-Phthalate Developments • Lifecycle Assessment (LCA) & Circular Economy*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today & Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Four*

Day 5

0730 – 0830	***PVC Testing & Quality Control*** *Tensile, Impact & Elongation Testing (ASTM D638) • Shore Hardness & Gelation Tests • Thermal Analysis (DSC, Vicat Softening) • Weathering, Aging & Color Stability Testing*
0830 – 0930	***Regulatory & Environmental Compliance*** *REACH, RoHS, FDA, NSF Standards • Heavy Metal & Phthalate Restrictions • Food Contact & Potable Water Certifications • Environmental Product Declarations (EPDs)*
0930 – 0945	*Break*
0945 – 1100	***Packaging Industry Applications*** *Flexible Films for Shrink Wrap & Stretch Wrap • Rigid PVC for Blister Packs & Clamshells • Barrier Properties & Sealing Behavior • Form-Fill-Seal (FFS) Equipment Compatibility*
1100 – 1215	***Automotive & Transportation Applications*** *PVC for Door Seals, Dashboards, Underbody Coatings • Noise, Vibration & Harshness (NVH) Considerations • Fuel System Compatibility • Co-Extruded Trim & Edge Protection*
1215 – 1230	*Break*
1230 – 1330	***Building & Infrastructure Applications*** *Conduit, Trunking & Cable Ducts • Rain Gutters, Fencing, Wall Panels • Compliance with Local & International Codes • Weatherable Formulations for Exterior Use*
1330 – 1345	***Course Conclusion*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Course Topics that were Covered During the Course*
1345 – 1415	***POST-TEST***
1415 – 1430	*Presentation of Course Certificates*
1430	*Lunch & End of Course*

Practical Sessions

This practical and highly-interactive course includes real-life case studies and exercises:-

Course Coordinator

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