COURSE OVERVIEW PE0515(QA1)
PVC Manufacturing & Process Troubleshooting

Course Title
PVC Manufacturing & Process Troubleshooting

Course Date/Venue
Please see page 3

Course Reference
PE0515(QA1)

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

Course Description

This practical and highly-interactive course includes practical sessions where participants will visit the PVC manufacturing plant. Practical sessions will be performed in order to apply the theory learnt in the class.

This course is designed to provide participants with a detailed and up-to-date overview of PVC Manufacturing and Process Troubleshooting. It covers the PVC and its significance in the petrochemical industry; the chemical structure and properties of PVC; the grades and applications of PVC; the thermal and mechanical behavior of PVC, the role and types of additives in modifying PVC properties and the influence of additives on processing and mechanical properties; the PVC polymerization techniques and suspension polymerization process for PVC; the controlling key reaction parameters; and the impact of reaction kinetics on molecular weight distribution and product consistency.

Further, the course will also discuss the reactor technologies for suspension PVC production; the advanced monitoring of polymerization conditions for process efficiency and troubleshooting common issues like reactor fouling, scaling and heat management; the challenges and solutions in suspension PVC production and processing methods for PVC including rheology and processability of PVC; and the testing standards, industry specifications and the mechanical testing, thermal testing and chemical resistance testing of PVC.

During this interactive course, participants will learn the industry environmental standards and compliance needs in PVC manufacturing; the compounding techniques specific to suspension PVC; mapping PVC grades to applications, focusing on impact and performance for customer-specific needs; addressing typical customer inquiries related to quality, application suitability and processability; the techniques for resolving common claims, especially regarding handling, packaging, and quality discrepancies; conducting trials to optimize processing parameters and addressing transformation issues; and the innovations in PVC manufacturing, emerging technologies, future market trends and sustainable practices

Course Objectives

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

- Apply and gain an in-depth knowledge on PVC manufacturing and process troubleshooting
- Discuss PVC and its significance in the petrochemical industry
- Identify the chemical structure and properties of PVC including the grades and applications of PVC
- Recognize thermal and mechanical behavior of PVC, the role and types of additives in modifying PVC properties and the influence of additives on processing and mechanical properties
- Apply PVC polymerization techniques and suspension polymerization process for PVC
- Identify controlling key reaction parameters and the impact of reaction kinetics on molecular weight distribution and product consistency
- Describe reactor technologies for suspension PVC production, apply advanced monitoring of polymerization conditions for process efficiency and troubleshoot common issues like reactor fouling, scaling and heat management
- Explain the challenges and solutions in suspension PVC production and illustrate processing methods for PVC including rheology and processability of PVC
- Review testing standards, industry specifications as well as carryout mechanical testing, thermal testing and chemical resistance testing of PVC
- Discuss the industry environmental standards and compliance needs in PVC manufacturing
- Apply compounding techniques specific to suspension PVC and map PVC grades to applications, focusing on impact and performance for customer-specific needs
- Address typical customer inquiries related to quality, application suitability and processability and apply techniques for resolving common claims, especially regarding handling, packaging, and quality discrepancies
- Conduct trials to optimize processing parameters and address transformation issues
- Discuss the innovations in PVC manufacturing, emerging technologies, future market trends and sustainable practices

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 covers systematic techniques and methodologies on PVC manufacturing and process troubleshooting for lab supervisors and managers, laboratory technicians, quality control analysts, chemical analysts, R&D personnel, process engineers and technical staff who are working in PVC manufacturing industries. Further, the course is suitable for those who are involved with PVC industries such as contracts, purchasing and sales individuals and marketing staff who are interested to know the PVC manufacturing process.

Course Date/Venue

Session(s)	Date	Venue
1	May 18-22, 2025	Meeting Plus 9, City Centre Rotana, Doha, Qatar
2	August 10-14, 2025	
3	October 19-23, 2025	
4	December 14-18, 2025	

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

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.

Accommodation

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

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: -

- 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.

- 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 **PVC** Pipe Production, **PVC** Manufacturing, **Polymerization** Process Control & Optimization, **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 the **PVC Pipe Production Manager** of **Cresline Plastic Pipe Co.**, **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 a **Certified Instructor/Trainer** and 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.

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: Foundations of PVC & Introduction to Polymerization

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Introduction to PVC*** *Definition, Significance in the Petrochemical industry, Historical Development and Market Trends • Key Applications in Construction, Automotive, Medical and other Sectors*
0930 – 0945	*Break*
0945 – 1030	***Chemical Structure & Properties of PVC*** *Monomer Characteristics and Polymerization Basics • Physical and Chemical Properties Relevant to Industrial Applications*
1030 – 1130	***Grades & Applications of PVC*** *Overview of PVC Types with a Focus on Suspension PVC • Application Mapping for Different PVC Grades, Emphasizing Suspension PVC Applications*
1130 – 1215	***Thermal & Mechanical Behavior of PVC*** *Heat Resistance, Tensile Strength and Flexibility Under Various Conditions • Impact of Thermal and Mechanical Properties on Product Performance*
1215 – 1230	*Break*
1230 – 1420	***Additives & Modifiers in PVC*** *Role and Types of Additives (Plasticizers, Stabilizers, Fillers, Pigments) in Modifying PVC Properties • Influence of Additives on Processing and Mechanical Properties*
1420 – 1430	***Recap***
1430	*End of Day One*

Day 2: Suspension PVC Polymerization Technology (Part 1)

0730 – 0930	***Overview of PVC Polymerization Techniques*** *Comparative Introduction to Suspension, Emulsion and Bulk Polymerization • Why Suspension Polymerization is Preferred for Certain Applications*
0930 – 0945	*Break*
0945 – 1100	***Suspension Polymerization Process for PVC*** *Detailed Breakdown of the Suspension Polymerization Steps • Raw Materials, Water Phase and Dispersing Agents in the Suspension Process*
1100 – 1215	***Polymerization Reaction Kinetics*** *Controlling Key Reaction Parameters: Temperature, Pressure, Initiator Concentrations • Impact of Reaction Kinetics on Molecular Weight Distribution and Product Consistency*
1215 – 1230	*Break*
1230 – 1420	***Reactor Technologies for Suspension PVC Production*** *Overview of Suspension Reactors, Focusing on Batch versus Continuous Processes • Innovations in Reactor Design for Optimized Production and End-Product Quality*
1420 – 1430	***Recap***
1430	*End of Day Two*

Day 3: Suspension PVC Polymerization Technology (Part 2) & Processing

0730 – 0930	***Polymerization Process Control & Optimization*** *Advanced Monitoring of Polymerization Conditions for Process Efficiency • Troubleshooting Common Issues Like Reactor Fouling, Scaling and Heat Management*
0930 – 0945	*Break*
0945 – 1100	***Challenges & Solutions in Suspension PVC Production*** *Common Issues in Suspension PVC Production and Preventive Measures • Solutions to Optimize Reactor Stability and Product Consistency*
1100 – 1215	***Processing Methods for PVC*** *Key Transformation Techniques for PVC, including Extrusion, Molding, Calendaring and Coating • Application of Each Processing Method for Specific PVC Products*
1215 – 1230	*Break*
1230 – 1420	***Rheology & Processability of PVC*** *Fundamentals of PVC Rheology: Melt Flow Index, Viscosity and their Impact on Processing • Influence of Rheological Properties on Extrusion, Molding and Calendaring*
1420 – 1430	***Recap***
1430	*End of Day Three*

Day 4: Quality Control in PVC Production & Testing Standards

0730 – 0930	***PVC Testing Standards & Industry Specifications*** *Key ASTM and ISO Standards Relevant to Suspension PVC Production • Importance of Quality Benchmarks in Ensuring Product Consistency*
0930 – 0945	*Break*
0945 – 1100	***Mechanical Testing of PVC*** *Tensile Strength, Elongation and Impact Resistance Testing and Relevance to Product Applications*
1100 – 1215	***Thermal Testing of PVC*** *Key Thermal Properties: Heat Distortion Temperature, Vicat Softening Point and Thermal Stability • Role of Thermal Properties in Product Selection and Application Performance*
1215 – 1230	*Break*
1230 – 1330	***Chemical Resistance Testing*** *PVC's Resistance to Chemicals and Environmental Stressors, Especially for Suspension PVC Products*
1330 – 1420	***Overview of Environmental Compliance*** *Overview of Industry Environmental Standards and Compliance Needs in PVC Manufacturing*
1420 – 1430	***Recap***
1430	*End of Day Four*

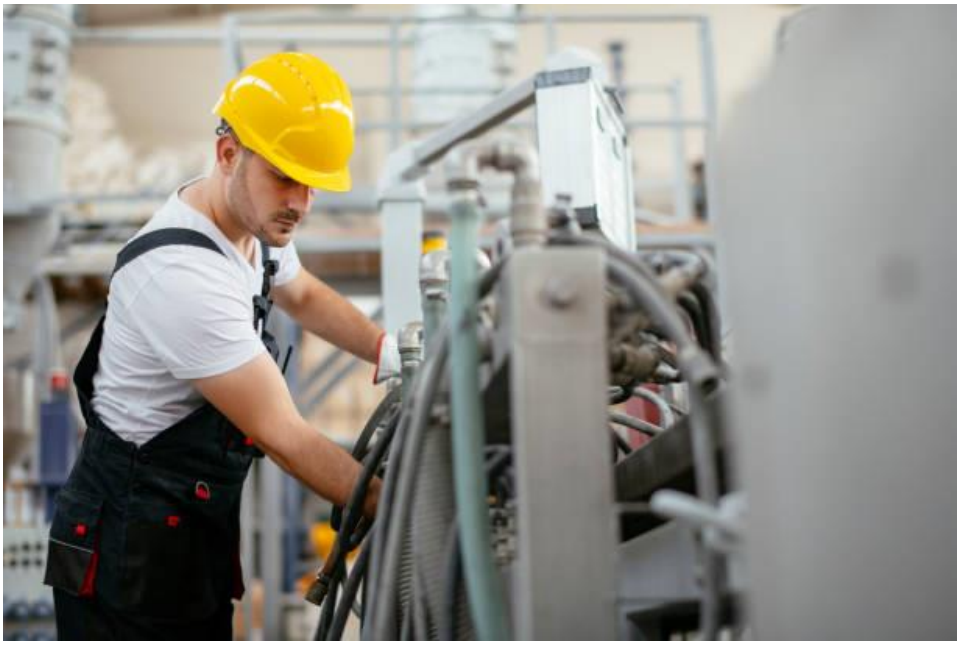
Day 5: Customer Technical Support & Industry Trends

0730 – 0830	***PVC Compounding & Application Mapping*** *Overview of Compounding Techniques Specific to Suspension PVC • Mapping PVC Grades to Applications, Focusing on Impact and Performance for Customer-Specific Needs*
0830 – 0930	***Common Customer Enquiries & Claim Resolution*** *Addressing Typical Customer Inquiries Related to Quality, Application Suitability and Processability • Techniques for Resolving Common Claims, Especially Regarding Handling, Packaging and Quality Discrepancies*

0930 – 0945	*Break*
0945 – 1100	***Machine Trials & Troubleshooting for Customer Applications*** *Conducting Trials to Optimize Processing Parameters and Address Transformation Issues • Hands-on Troubleshooting Techniques for Common Application Issues*
1100 – 1230	***Innovations in PVC Manufacturing & Emerging Technologies*** *Advancements in PVC Production and Processing Technology, with a Focus on Suspension PVC • Introduction to Emerging Technologies, including Automation, AI and Smart Materials*
1230 – 1245	*Break*
1245 – 1345	***Future Market Trends & Sustainable Practices*** *Anticipated Growth in Demand for PVC, Especially Suspension PVC • Industry Trends Toward Sustainability and Recycling in PVC Production*
1345 – 1400	***Course Conclusion***
1400 – 1415	***POST-TEST***
1415 – 1430	*Presentation of Course Certificates*
1430	*End of Course*

Practical Sessions/Site Visit

Site visit will be organized during the course for delegates to practice the theory learnt:-



Course Coordinator

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