

COURSE OVERVIEW PE0240
Chemical Handling and Injection System Startup, Shutdown, Normal Operations and Troubleshooting

Course Title

Chemical Handling and Injection System Startup, Shutdown, Normal Operations and Troubleshooting

Course Date/Venue

Session 1: May 11-15, 2025/Boardroom 1, Elite Byblos Hotel Al Barsha, Sheikh Zayed Road, Dubai, UAE
Session 2: October 13-17, 2025/Fujairah Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE



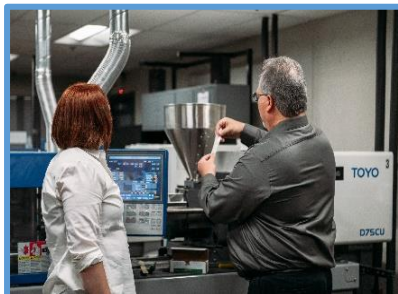
Course Reference

PE0240

Course Duration/Credits

Five days/3.0 CEUs/30 PDHs

Course Description



This practical and highly-interactive course includes real-life case studies and exercises 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 Chemical Handling and Injection System Startup, Shutdown, Normal Operations and Troubleshooting. It covers the purpose and significance in industrial processes and the types of chemicals commonly used in injection systems; the chemical properties and compatibility as well as system components and equipment; the process safety and chemical handling; and the regulatory and compliance framework.

Further, the course will also discuss how to inspect system components for integrity, verify chemical inventory and storage conditions and review startup procedure documentation; the priming and preparing the injection system; the initial system calibration, chemical transfer procedures and monitoring during startup; the common hazards during startup operations and mitigating overpressurization and thermal expansion risks; the system performance monitoring, chemical inventory management and routine maintenance; the use of PPE, continuous gas detection and monitoring for leaks; and managing and mitigating fatigue or operator errors.

During this interactive course, participants will learn the data recording and reporting, managing change in process conditions and planning pre-shutdown procedures; the system depressurization, draining and cleaning the system and deactivating pumps and controls; the post-shutdown safety measures and shutdown documentation; the common issues in chemical injection systems and systematic troubleshooting approach; and the advanced monitoring techniques and preventive maintenance best practices

Course Objectives

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

- Apply and gain an in-depth knowledge on chemical handling and injection system startup, shutdown, normal operations and troubleshooting
- Discuss the purpose and significance in industrial processes and the types of chemicals commonly used in injection systems
- Identify the chemical properties and compatibility as well as system components and equipment
- Apply process safety and chemical handling as well as discuss the regulatory and compliance framework
- Inspect system components for integrity, verify chemical inventory and storage conditions and review startup procedure documentation
- Recognize priming and prepare the injection system as well as carryout initial system calibration
- Employ chemical transfer procedures and monitor during startup through early detection of system leaks or irregularities and checking for pump cavitation and suction issues
- Identify the common hazards during startup operations and mitigate overpressurization and thermal expansion risks
- Carryout system performance monitoring, chemical inventory management and routine maintenance
- Reinforce the use of PPE, apply continuous gas detection and monitoring for leaks and manage and mitigate fatigue or operator errors
- Apply data recording and reporting, manage change in process conditions and plan pre-shutdown procedures
- Recognize system depressurization, draining and cleaning the system and deactivating pumps and controls
- Employ post-shutdown safety measures and shutdown documentation
- Identify the common issues in chemical injection systems and apply systematic troubleshooting approach
- Carryout advanced monitoring techniques and preventive maintenance best practices

Exclusive Smart Training Kit - H-STK®



Participants of this course will receive the exclusive “Howard 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 a basic overview of all significant aspects and considerations of chemical handling and injection system startup, shutdown, normal operations and troubleshooting for operations personnel, maintenance technicians, process engineers, safety officers, plant managers, control room operators, technicians/engineers involved in troubleshooting, quality control/assurance personnel, health, safety, and environment (HSE) personnel and other technical staff.

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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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.
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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 **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:



Mr. Robert Harvey, MSc (Cum Laude), BSc is a **Senior Chemical Engineer** with over **45 years** of in-depth industrial experience within the **Oil & Gas, Refinery, Petrochemical, Mining** and **Power** industries. His expertise widely covers in the areas of **Fertilizer Manufacturing** Process Technology, **Fertilizer Storage** Management (Ammonia & Urea), **Petrochemical & Fertilizer** Plants, **Nitrogen Fertilizer** Production, **Petroleum Industry** Process Engineering, **Process Equipment** Design &

Troubleshooting, **Process Equipment & Piping Systems**, **Fertilizer Manufacturing** Process Technology, **Production** Management, **Process Plant** Optimization & Continuous Improvement, **Revamping & Debottlenecking**, **Pressure Vessel** Operation, **Heat Mass Balance**, **Distillation-Column** Operation, & Troubleshooting, **Production Process** Optimization, **Debottlenecking**, **Unit Performance** Optimization, **Process Analyzers**, Real Time Online Optimization, **Operations Planning** Optimization, **Engineering Problem Solving**, **Bag Filters** Operation & Maintenance, **Process Equipment** Design, Chemical Reaction Engineering Application, **Phosphatic Industry**, **Diammonium Phosphate**, **Monoammonium Phosphate**, **NPK**, Troubleshooting Improvement, **Production** Management, **Distillation-Column** Operation & Troubleshooting, Vinyl Chloride Monomer (**VCM**) Manufacturing & Process Troubleshooting, **Monomer** Handling Safety, **Cement** Manufacturing Process Technology & Standards, Complex Operational Troubleshooting, Incident **Root Cause Analysis** & Corrective Action, **Process Equipment & Piping** System, **Fertilizer Manufacturing**, **Process Plant** Optimization & Continuous Improvement, **Process Plant** Performance & Efficiency, Continuous Improvement & Benchmarking, **Energy Efficiency** for Process Plants, **Pressure Vessel** Operation, **Reactors & Storage Tanks**, Dehydrating Columns, Heat & Material Balance, **Troubleshooting Process Operations**, Modern **Aluminium Production Processes**, **Cement Kiln Process**, **Process Engineer Calculations**, Steel Making Process, **P&ID** Reading & Interpretation, **Detailed Engineering Design**, **Process Diagrams** Review, Process Hazard Analysis (**PHA**), **HAZOP** Leadership, Project HSE Review (**PHSER**), Safe Handling of **Propylene Oxide & Ethylene Oxide**, Safety in **Process & Industrial Plants**, Environmental Impact Assessment (**EIA**) and Effective **Risk Assessment & HAZOP** Studies. Further, he is also well versed in Feasibility Studies Analysis & Evaluation, Project Gate System Procedures, Process Mapping, Change Management Skills, Change Management Strategy, Strategical Process Control in Process Industry, Developing Commercial Contracts, Project Management Skills, Project Scheduling & Cost Control, FIDIC & Other Model Contracts, EPC & EPCM Contracts, Knowledge Management, Job Evaluation, Creative Problems Solving & Innovation Skills, Problem Solving & Decision Making, Strategic Planning & Creative Thinking and Mind Mapping.

During his career life, Mr. Harvey has gained his practical and field experience through his various significant positions and dedication as the **Commercial Director**, **Manufacturing Director**, **Chief Operating Officer**, **Head Projects Division**, **Project Leader**, **Lead Technical Advisor/Consultant** and **Project Consultant** to various international companies such as the Trade and Industrial Policy Strategies (TIPS), PGBI Johannesburg, IDC Green Industries SBU/Arango 316 Pty Ltd, Ferrum Crescent Limited, CEF Limited, Rio Tinto Alcan, Industrial Development Corporation of SA (IDC) and AECI Limited.

Mr. Harvey has **Master's (Cum Laude)** and **Bachelor's** degrees in **Chemical Engineering**. Further, he is a **Certified Instructor/Trainer**, a **Certified Internal Verifier/Assessor/Trainer** by the **Institute of Leadership & Management (ILM)** and has delivered various trainings, seminars, conferences, workshops and courses globally.

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\$ 5,500 per Delegate + **VAT**. 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 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 – 0930	Overview of Chemical Handling Systems Purpose & Significance in Industrial Processes • Types of Chemicals Commonly Used in Injection Systems • Applications in Various Industries (Oil & Gas, Petrochemicals, etc.) • Safety & Regulatory Compliance Requirements
0930 – 0945	Break
0945 – 1040	Chemical Properties & Compatibility Understanding Chemical Classifications (Corrosive, Flammable, etc.) • Material Compatibility with Chemicals • Chemical Stability & Storage Conditions • Chemical Interactions & Potential Risks
1040 – 1135	System Components & Equipment Overview of Injection Pumps (Diaphragm, Plunger, Gear) • Tanks, Vessels, & Piping for Chemical Storage & Transport • Flow Meters, Valves, & Monitoring Devices • Injection System Automation & Control Equipment
1135 – 1230	Basics of Process Safety Identifying Hazards in Chemical Handling • Hazard Communication Standards (e.g., SDS & Labeling) • Importance of Safety Barriers & Risk Assessments • Emergency Response Protocols
1230 – 1245	Break

1245 – 1335	Chemical Handling Basics Proper Chemical Storage & Inventory Management • Personal Protective Equipment (PPE) Selection & Usage • Chemical Handling Tools & Techniques • Containment & Spill Prevention Measures
1335 - 1420	Regulatory & Compliance Framework Overview of OSHA, EPA, & other Regulatory Standards • Key Documentation Requirements (Permits, SDS, Compliance Reports) • Environmental Concerns in Chemical Handling • Audit & Inspection Processes
1420 – 1430	Recap Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow
1430	Lunch & End of Day One

Day 2

0730 – 0830	Pre-Startup Checks Inspecting System Components for Integrity • Verifying Chemical Inventory & Storage Conditions • Ensuring PPE Availability & Calibration of Monitoring Equipment • Reviewing Startup Procedure Documentation
0830 - 0930	Priming & Preparing the Injection System Steps to Prime Injection Pumps & Remove Airlocks • Setting Initial Flow Rates & Injection Pressure • Aligning Valves & Opening Lines • Testing the Chemical Flow through the System
0930 – 0945	Break
0945 – 1040	Initial System Calibration Adjusting Dosing Rates According to Process Requirements • Using Flow Meters to Measure Accuracy • Monitoring Pressure Gauges & Troubleshooting Irregularities • Logging Calibration Data for Future Reference
1040 – 1135	Chemical Transfer Procedures Safe Transfer of Chemicals to Storage Tanks • Managing Temperature-Sensitive or Reactive Chemicals • Preventing Contamination During Chemical Transfer • Emergency Response for Spills or Overflows
1135 - 1230	Monitoring During Startup Early Detection of System Leaks or Irregularities • Checking for Pump Cavitation & Suction Issues • Ensuring Smooth Operation of Automation Controls • Documentation of Initial Startup Performance
1230 - 1245	Break
1245 - 1420	Startup Safety Considerations Common Hazards During Startup Operations • Mitigating Overpressurization & Thermal Expansion Risks • Communication Protocols During Startup • Immediate Response to Alarms or System Deviations
1420 – 1430	Recap Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow
1430	Lunch & End of Day Two

Day 3

0730 – 0830	System Performance Monitoring Key Performance Indicators (Flow Rate, Pressure, Chemical Concentration) • Interpreting Flow Meter & Analyzer Data • Identifying Deviations from Normal Operating Conditions • Maintaining System Logs
0830 – 0930	Chemical Inventory Management Tracking Consumption & Reorder Schedules • Managing Storage Levels to Prevent Stockouts or Overstocking • Conducting Regular Inspections for Chemical Degradation • Using Inventory Management Software
0930 – 0945	Break
0945 – 1040	Routine Maintenance Activities Cleaning Injection Nozzles & Pump Filters • Lubrication & Inspection of Moving Parts • Calibration of Flow Meters & Analyzers • Replacing Worn-Out Components (Seals, Valves, etc.)
1040 – 1135	Operational Safety Reinforcing the Use of PPE • Continuous Gas Detection & Monitoring for Leaks • Managing & Mitigating Fatigue or Operator Errors • Conducting Regular Safety Briefings
1135 – 1230	Data Recording & Reporting Proper Documentation of Operational Metrics • Analyzing Historical Data for Performance Trends • Preparing Reports for Compliance & Audits • Communicating Findings to Stakeholders
1230 – 1245	Break
1245 – 1420	Managing Change in Process Conditions Adjusting Flow Rates or Chemical Concentration • Responding to Upstream or Downstream Process Changes • Coordination with other Process Units • Documentation & Approval of Process Modifications
1420 – 1430	Recap Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow
1430	Lunch & End of Day Three

Day 4

0730 – 0830	Pre-Shutdown Planning Reviewing Shutdown Procedures & Checklist • Informing Stakeholders About Shutdown Activities • Preparing System for Chemical Draining • Safety Planning for the Shutdown Process
0830 – 0930	System Depressurization Safe Depressurization of Lines & Equipment • Preventing Vacuum Formation in Tanks or Pipelines • Monitoring for Residual Pressure During Shutdown • Steps to Prevent Environmental Release of Chemicals
0930 – 0945	Break
0945 – 1040	Draining & Cleaning the System Draining Chemicals from Lines, Tanks, & Pumps • Proper Disposal or Storage of Drained Chemicals • Cleaning Equipment to Prevent Corrosion or Fouling • Using Cleaning Agents Safely & Effectively



1040 - 1135	Deactivating Pumps & Controls Safely Shutting Down Injection Pumps & Automation Systems • Isolating Electrical Circuits to Prevent Accidental Startups • Lockout/Tagout (LOTO) Procedures for Critical Equipment • Final Inspection of Deactivated Systems
1135 - 1230	Post-Shutdown Safety Measures Managing Residual Chemicals & Vapors • Conducting Gas Monitoring in Confined Spaces • Ensuring Proper Ventilation in Storage Areas • Reviewing Safety Protocols with the Team
1230 - 1245	Break
1245 - 1420	Shutdown Documentation Recording Shutdown Activities & Deviations • Preparing Reports for Management & Regulatory Bodies • Updating System Logs & Maintenance Records • Lessons Learned & Improvements for Future Shutdowns
1420 - 1430	Recap Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow
1430	Lunch & End of Day Four

Day 5

0730 - 0830	Common Issues in Chemical Injection Systems Pump Cavitation & Flow Irregularities • Leaks & Blockages in Piping Systems • Chemical Degradation or Contamination • Sensor & Instrumentation Failures
0830 - 0930	Systematic Troubleshooting Approach Identifying Root Causes of Operational Issues • Using Diagnostic Tools & Techniques • Applying Cause-&-Effect Analysis (e.g., Fishbone Diagrams) • Documenting Troubleshooting Efforts
0930 - 0945	Break
0945 - 1030	Advanced Monitoring Techniques Implementing Real-Time Monitoring Systems • Using Predictive Analytics for Maintenance • Optimizing Dosing Rates Based on Process Data • Integrating Advanced Sensors for Accuracy
1030 - 1230	Case Studies & Problem-Solving Exercises Analyzing Real-World Incidents in Chemical Handling • Group Exercises on Troubleshooting Scenarios • Developing Action Plans for Similar Issues • Presenting Solutions to Peers for Feedback
1230 - 1245	Break
1245 - 1345	Preventive Maintenance Best Practices Scheduling Regular Inspections & Tune-Ups • Using Condition-Based Maintenance Techniques • Training Personnel on Early Detection of Issues • Maintaining a Robust Spare Parts Inventory
1345 - 1400	Course Conclusion Using this Course Overview, the Instructor(s) will Brief Participants about the Course Topics that were Covered During the Course
1400 - 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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