IHRDC’s Competency-Based e-Learning Pathways for Petrochemicals Technicians

COMPETENCY-BASED TRAINING PATHWAYS FOR PETROCHEMICALS TECHNICIANS

Our highly regarded competency-based e-Learning Pathways have been designed to meet the competency development needs of petroleum technicians in the four traditional O&M specialties: Mechanical, Electrical, Instrumentation and Controls Technicians, and Plant Operators, who work in a variety of petroleum sectors: Refining, Petrochemicals, Midstream Gas, Upstream Oil, and Upstream Gas. This guide has been prepared for the training of technicians in Petrochemical plants.

The Training Pathways are divided into three progressively more challenging Stages, as shown below.

- Stage I: Foundation Training provides the background learning required for all new O&M personnel.
- Stage II: Functional Training Pathways are divided into four paths, one for each functional area.
- Stage III: Industry Sector Training Pathways provide the specific training in each industry sector; in this guide, Petrochemicals Technicians.

Sequential lists of e-Learning courses for each of the three Stages are shown on the following pages. The content of each course may be found in our online catalog, www.ihrdc.com/e-learningsolutions.
## Stage I
### Foundation Training

### OIL & GAS BUSINESS

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### HEALTH, SAFETY, & ENVIRONMENT

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### CORE 1: MATH, SCIENCE, & DIAGRAMS

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### CORE 2: FUNDAMENTALS

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## Stage II
### Functional Training Pathways

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<tr>
<td>MECHANICAL III</td>
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### Mechanical I
- **Chemistry**
  - Gases and Flowing Liquids
  - Heat
  - Heat Transfer
  - Solids and Liquids
- **Electrical**
  - Basic Electrical Circuits
  - Basic Electrical Principles
- **Lubrication & Bearings**
  - Lubricants and Bearings
  - Lubrication - Using Lubricants
- **Materials Handling & Storage**
  - Tank Trucks
- **Physics**
  - Basic Principles [Basic Physics]
  - Fluid Systems
  - Forces and Machines
- **Pipes, Piping, & Auxiliaries**
  - Pipes and Pipe Fittings
  - Piping - Basic Components and Functions
  - Piping - System Components and Operation
- **Process Control**
  - Process Dynamics and Measurement
- **Pumps and Seals**
  - Seals - Gaskets and Packing
  - Seals - Mechanical
- **Turbines & Steam Systems**
  - Steam Traps
- **Valves**
  - Safety Valves
  - Valve Types and Operation

### Mechanical II
- **Actuator, Valve, & Motor Controllers**
  - Electric and Hydraulic Actuators
  - Hydraulic Valves
  - Introduction of Actuators
  - Motor Operators
- **Heat Exchangers**
  - Condensers and Reboilers
  - Cooling Towers
  - Introduction to Heat Exchangers
  - Operation of Shell and Tube Types
- **Hydraulic Systems**
  - Hydraulic Actuators
  - Hydraulic Component Inspection and Replacement
  - Hydraulic Diagrams
  - Hydraulic Fluid and Reservoirs
  - Hydraulic Principles and Circuits
  - Hydraulic Pumps
  - Hydraulic Valves
  - Routine Maintenance of Hydraulic Systems
  - Troubleshooting of Hydraulic Systems
- **Valves**
  - Basic Valve Types and Operation 1
  - Basic Valve Types and Operation 2
  - Safety Valves 1
  - Safety Valves II
  - Valve Maintenance

### Mechanical III
- **Compressors**
  - Centrifugal Compressors
  - Introduction to Compressors
  - Operation of Centrifugal and Axial Compressors
  - Positive Displacement Compressors
  - Reciprocating Compressors
  - Types of Compressors - Centrifugal and Axial
- **Gears, Equipment Drive**
  - Components, & Shaft Alignment
    - Couplings
    - Gear, Belt, and Chain Drives
    - Gears - Overhauls
    - Gears - Types and Characteristics
    - Shaft Alignment - Reverse Dial and Laser
    - Shaft Alignment - Rim and Face
- **Lubrication & Bearings**
  - Bearings - Rolling Contact
  - Bearings - Sliding Surface
- **Other Systems & Equipment**
  - Fans
- **Pumps**
  - Basic Types and Operation of Pumps
  - Fundamentals of Centrifugal Pumps
  - Operation of Centrifugal Pumps
  - Performance and Inspection of Pumps
  - Reciprocating Positive Displacement Pumps
  - Rotary Positive Displacement Pumps
- **Pumps & Seals**
  - Centrifugal Pump Basics and Troubleshooting
  - Centrifugal Pump Overhaul
  - Multistage Centrifugal Pumps
  - Positive Displacement Pumps
Learning Summary: Stage II

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Electrical I

- **Electrical Components**
  - SCRs and TRIACs

Electrical II

- **Actuator, Valve, & Motor Controllers**
  - AC Motor Controllers 1 [Basic Functions]
  - AC Motor Controllers 2 [Troubleshooting]
  - Motor Controllers and Operation

Electrical III

- **Electrical Components**
  - Inductors, Part 1
  - Inductors, Part 2
  - Capacitors, Part 1
  - Capacitors, Part 2
  - Specialized Electronic Devices, Part 1
  - Specialized Electronic Devices, Part 2
  - Transistor Configurations

Electrical Safety

- Electrostatic Discharge Precautions

Electrical Theory

- Kirchhoff’s Law
- Magnets and Magnetic Fields
- Ohm’s Law

Electrical Wiring

- Cables and Conductors
- Conduit Installation
- Introduction to the NEC

Electrical Theory

- Variable Speed Drives
  - Applications of VSDs
  - Controllers and Troubleshooting
  - Production to VSDs
  - Programming Controllers
  - System Troubleshooting of VSDs
  - Systems and Integration of VSDs

Electrical Wiring

- Digital and Analog Oscilloscope

Electrical Generation & Storage

- Battery Systems
INSTRUMENTATION & CONTROLS TECHNICIAN

Instrument I

Circuits
- Parallel Circuits
- Series Circuits
- Series-Parallel Circuits
- Use of Ohm’s and Kirchhoff’s Laws in DC Circuits

Electrical
- AC Circuits
- Basic Electrical Circuits
- Basic Electrical Principles
- Basic Electrical Test Equipment
- Basic Electricity Review
- Voltage and Current Principles

Electrical Generation & Storage
- Battery Systems

Electrical Safety
- Electrostatic Discharge Precautions

Electrical Theory
- Kirchhoff’s Law
- Magnets and Magnetic Fields
- Ohm’s Law

Electrical Wiring
- Cables and Conductors
- Conduit Installation
- Introduction to the NEC

Measurement Devices
- Digital and Analog Oscilloscopes

Instrument II

Actuator, Valve, & Motor Controllers
- AC Motor Controllers 1 [Basic Functions]
- AC Motor Controllers 2 [Troubleshooting]
- Motor Controllers and Operation

Electrical Generation & Storage
- Power Supplies

Electrical Wiring
- Splices and Terminations

Motors
- AC and DC Motors
- DC Motors
- Motor Branch Circuit Protection
- Three Phase Motors

Transformers, Breakers, & Switches
- Fuses

Variable Speed Drives
- Applications
- Controllers and Troubleshooting
- Introduction to VSDs
- Programming Controllers
- System Troubleshooting
- Systems and Integration

Instrument III

Circuits
- Troubleshooting Electrical Circuits

Electrical Components
- Capacitors, Part 1
- Inductors, Part 1
- Electrical Generation and Storage
- AC Generator Maintenance
- Electrical Production and Distribution

Electrical Wiring
- Grounding

Transformers, Breakers, & Switches
- Introduction to Transformers
- Breakers, and Switches
- Breakers and Switchgear 2 [High Voltage]
- Electromagnetic Relays
- Ground Fault Interrupters
- Maintenance of Low-Voltage
- Circuit Breakers
- Relays 1
- Relays 2
- Transformers

Learning Summary: Stage II

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Learning Summary: Stage II

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**PLANT OPERATOR**

**Operations I**
19 hr

- **Chemistry**
  - Gases and Flowing Liquids
  - Heat
  - Heat Transfer
  - Solids and Liquids

- **Electrical**
  - Basic Electrical Circuits
  - Basic Electrical Principles

- **Materials Handling and Storage**
  - Tank Trucks

- **Operations Fundamentals**
  - Communication
  - Introduction to Operation Fundamentals
  - Plant Production and Safety
  - Trends, Maintenance, and Emergencies

- **Other Systems & Equipment**
  - Auxiliary Vessels

- **Physics**
  - Basic Principles [Basic Physics]
  - Fluid Systems
  - Forces and Machines

- **Pipes, Piping, & Auxiliaries**
  - Piping - Basic Components and Functions
  - Piping - System Components and Operation

- **Process Control**
  - Process Dynamics and Measurement

- **Storage Tank Operations**
  - Above Ground Storage Tanks, Part 1

**Operations II**
25 hr

- **Compressors**
  - Introduction to Compressors
  - Types of Compressors - Centrifugal and Axial
  - Operation of Centrifugal and Axial Compressors
  - Positive Displacement Compressors

- **Environmental Protection**
  - Air Pollution
  - Pollution Control in Plants
  - Water Pollution and Waste Disposal

- **Operations Fundamentals**
  - Obtaining Samples
  - Testing Samples

- **Other Systems and Equipment**
  - Filtration and Screening Unit Operations
  - Fundamentals of Process Solubility

- **Physics**
  - Power and Energy

- **Power & Steam Systems**
  - Power Generation [and Hydrogen Cooling]

- **Power Plant Operation**
  - Basic Principles of Power Plant Operations

- **Pumps**
  - Fundamentals of Centrifugal Types
  - Operation of Centrifugal Types
  - Performance and Inspection of Pumps
  - Reciprocating Positive Displacement Pumps
  - Rotary Positive Displacement Pumps

- **Refining Process Technologies**
  - Typical Process Reactions, Part 1
  - Typical Process Reactions, Part 2

- **Refrigeration System**
  - Basic Concepts of Refrigeration Systems
  - Operations of Refrigeration Systems
  - Refrigeration Systems, Part 1

**Operations III**
17 hr

- **Actuator, Valve, & Motor Controllers**
  - Introduction of Actuators
  - Electric and Hydraulic Actuators

- **Boilers**
  - Boilers - Basic Principles and Types
  - Boilers - Combustion, Water, and Steam

- **Distillation**
  - Basic System Components and Operation
  - Control Systems in Distillation
  - Operating Problems in Distillation

- **Furnaces**
  - Operating Conditions

- **Operations Fundamentals**
  - Process Examples

- **Process Control**
  - Introduction to Statistical Process Control
  - Basic Control Charts
  - Process Variations

- **Valves**
  - Basic Types and Operation 1
  - Basic Types and Operation 2

- **Water Treatment**
  - Wastewater 2
  - Water for Plant Systems 2
Stage III
Petrochemicals Training Pathways

## PLANT OPERATIONS

**Boilers**
- Abnormal Conditions and Emergencies
- Combustion and Operation
- Normal Operations
- Startup and Shutdown
- Water and Steam
- Condensate and Feedwater Systems
- Condenser and Circulating Water

**Furnaces**
- Introduction to Furnaces
- Startup and Shutdown of Furnaces

**Operations Fundamentals**
- Basic Concepts of Operations
- Operator Responsibilities: Basic Operator Responsibilities
- Operator Responsibilities: Advanced Operator Responsibilities

**Other Systems & Equipment**
- Material Handling of Bulk Liquids
- Portable and Emergency Equipment
- Flaring, Venting, and Purging

**Refrigeration System**
- Refrigeration Systems, Part 2

**Storage Tank Operations**
- Above Ground Storage Tanks, Part 2
- Above Ground Storage Tanks, Part 3

**Turbines & Steam Systems**
- Boiler and Turbine Protection
- Steam Systems
- Bearings and Operation
- Steam Flow [Steam Turbines]

## PETROCHEMICALS

**Process Technologies**
- Process Reactor Fundamentals
- Typical Process Reactions, Part 1
- Typical Process Reactions, Part 2
- Azeotropic, Extractive, and Vacuum Columns
- Crude Distillation Operations
- Hydrotreating and Catalytic Reforming 1
- Hydrotreating and Catalytic Reforming 2
- Treating and Sulfur Recovery Operations

**Distillation**
- Basic Principles of Distillation
- System Startup and Shutdown in Distillation
- Towers, Reboilers, and Condensers
- Basic System Components and Operation in Distillation
- Control Systems in Distillation
- Operating Problems in Distillation

**Refinery Fundamentals**
- Refining Basics

**Refinery Operations**
- Emission Controls

### LICENSING BY STAGES

Clients may license these e-Learning Pathways on a Stage basis or as a complete three Stage package. The courses may be installed on a client’s server or hosted on IHRDC’s LMS.

IHRDC can aggregate our e-Learning courses to meet your training needs: entry level or advanced.

### ESTIMATED TIME FOR COMPLETION

The time that it takes to complete the Petrochemicals Training Pathway depends on the learner’s pace and the amount of time devoted to training each day or week. The complete Petrochemicals e-Learning Pathway includes 158-167 courses, that consist of approximately 167 hours of learning.
Be sure to contact us today to discuss this outstanding e-Learning resource, view several typical courses, or obtain a quotation. Please visit www.ihrdc.com or contact a Sales Representative in your area (see below) by telephone or e-mail. We welcome the opportunity to share this innovative e-Learning system with you.

IHRDC

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