HDTC Training Center

Provide

Technical proposal of the Training program

Advanced HVAC Systems

Package Units Operation, Maintenance & Troubleshooting

Introduction

HVAC systems are among the most critical building services that directly impact occupant comfort, operational continuity, indoor air quality, and energy efficiency. Among these systems, Package Units remain one of the most widely used air conditioning solutions in commercial, healthcare, industrial, and institutional facilities due to their reliability, ease of installation, and operational flexibility.

To ensure optimum performance and reduce downtime, maintenance personnel must possess advanced practical skills in operating, inspecting, troubleshooting, and maintaining Package Units and their associated electrical, mechanical, and control components.

This intensive hands-on training program has been specifically designed to provide participants with practical knowledge and field-oriented maintenance techniques for Package Units, focusing on preventive maintenance, troubleshooting methodologies, electrical and mechanical diagnostics, airflow optimization, control systems, and energy efficiency improvement through real-world case studies and practical exercises.

Program Objectives:

General Objective:

To enhance participants' practical competencies in operating, inspecting, maintaining, and troubleshooting Package Units and associated HVAC components in order to improve system reliability, reduce downtime, optimize performance, and increase energy efficiency according to industry best practices.

Key Learning Objectives:

By the end of this program, participants will be able to:

- Understand Package Unit operating principles and refrigeration cycles.
- Identify all major electrical, mechanical, and control components.
- Conduct comprehensive Package Unit inspections.
- Diagnose electrical and mechanical failures systematically.
- Perform preventive and corrective maintenance activities.
- Inspect and maintain compressors, condenser fans, evaporator fans, belts, motors, filters, and control systems.
- Analyse airflow and air distribution problems.
- Optimize Package Unit performance and energy consumption.
- Apply advanced troubleshooting techniques using real operational scenarios.
- Implement safety procedures during maintenance activities

Program Outlines:

★ Day 1 –

- **Module 1: Package Units Fundamentals and Operating Principles**
  - Overview of HVAC Systems
  - Applications of Package Units in Commercial and Industrial Facilities
  - Package Unit Types and Configurations
  - Refrigeration Cycle Fundamentals
  - Heat Transfer Principles
  - Airflow and Ventilation Fundamentals
  - Package Unit Operational Sequence

  Practical Applications
  - Refrigeration Cycle Analysis Workshop
  - Package Unit Component Identification Exercise
  - Airflow Path Tracing Exercise
  - System Operation Sequence Demonstration

- **Module 2: Mechanical Components and Maintenance Requirements**
  - Compressors:
    - Scroll Compressors
    - Reciprocating Compressors
    - Common Compressor Failures
    - Lubrication Requirements
  - Evaporator Coils
  - Condenser Coils
  - Fan Motors
  - Blower Assemblies
  - Belt Drives and Pulley Systems
  - Dampers and Air Distribution Components
  - Drainage Systems

  Practical Applications
  - Compressor Inspection Procedures
  - Fan Alignment and Belt Tension Adjustment
  - Coil Inspection and Cleaning Workshop

- Drainage System Maintenance Exercise
- Vibration Detection Exercise

- **Module 3: Electrical Components and Control Systems**
  - Power Distribution Components
  - Contactors
  - Relays
  - Capacitors
  - Circuit Breakers
  - Overload Protection Devices
  - Thermostats
  - Sensors and Controllers
  - Electrical Wiring and Control Circuits
  - Safety Interlocks

Practical Applications

- Electrical Testing Using Multimeters
- Capacitor Testing Procedures
- Control Circuit Troubleshooting
- Diagnosing High Current Draw Conditions
- Electrical

★ Day 2 –

- **Module 4: Advanced Troubleshooting of Package Units**
  - Professional Troubleshooting Methodology
  - Troubleshooting Flowcharts
  - Compressor Failures
  - Fan Motor Failures
  - Low Cooling Performance
  - High Head Pressure Problems
  - Low Suction Pressure Problems
  - Refrigerant Charge Problems
  - Airflow Restrictions
  - Thermostat and Sensor Failures

Practical Applications

- Real Fault Diagnosis Scenarios
- Refrigeration System Fault Analysis
- Root Cause Analysis Workshop
- Team-Based Troubleshooting Challenges

- **Module 5: Preventive and Predictive Maintenance Techniques**
  - Preventive Maintenance Programs
  - Maintenance Scheduling
  - Inspection Frequencies
  - Predictive Maintenance Principles
  - Vibration Monitoring
  - Temperature Monitoring
  - Electrical Load Analysis
  - Maintenance Documentation
  - Maintenance KPIs

  Practical Applications
  - Building a Preventive Maintenance Program
  - Developing Inspection Checklists
  - Equipment Condition Assessment
  - Maintenance Planning Workshop

- **Module 6: Performance Optimization, Energy Efficiency & Field Applications**
  - Package Unit Performance Assessment
  - Airflow Balancing Techniques
  - Coil Efficiency Optimization
  - Energy Consumption Analysis
  - Operational Load Monitoring
  - Improving Cooling Capacity
  - Indoor Air Quality Considerations
  - Safety Procedures During Maintenance
  - Refrigerant Handling Best Practices

  Practical Applications
  - Package Unit Performance Evaluation

- Energy Efficiency Assessment Exercise
- Airflow Measurement Workshop
- Maintenance Risk Assessment
- Comprehensive Package Unit Inspection and Troubleshooting Case Study

Target Audience:

- ✓ HVAC Engineers
- ✓ HVAC Technicians
- ✓ Maintenance and Operations Supervisors
- ✓ Facility Management Engineers
- ✓ Central Cooling System Technicians
- ✓ Operations & Maintenance Personnel
- ✓ Facility and Building Maintenance Teams

Training Methodology:

- ✓ Interactive Lectures
- ✓ Technical Demonstrations
- ✓ Real-Life Case Studies
- ✓ Practical Workshops
- ✓ Fault Analysis Exercises
- ✓ Operational Simulations
- ✓ Group Exercises
- ✓ Guided Technical Discussions
- ✓ Hands-on HVAC System Applications

Targeted Competencies:

Technical Competencies

- ❖ Package Unit Operation
- ❖ Package Unit Troubleshooting
- ❖ HVAC Preventive Maintenance
- ❖ Electrical Diagnostics
- ❖ Mechanical Diagnostics
- ❖ Airflow Analysis
- ❖ Energy Efficiency Optimization
- ❖ HVAC Safety Compliance

Behavioral Competencies

- ❖ Problem Solving
- ❖ Working Under Pressure
- ❖ Safety Compliance
- ❖ Technical Decision-Making
- ❖ Operational Accuracy