Best Technology Soultions **(BTS)**

Training Program

HVAC Chiller Systems Control

Training Program

Introduction:

A chiller is a machine that removes heat from a liquid via a vapor-compression or absorption refrigeration cycle. This liquid can then be circulated through a heat exchanger to cool air or equipment as required. As a necessary byproduct, refrigeration creates waste heat that must be exhausted to ambient or, for greater efficiency, recovered for heating purposes. Concerns in design and selection of chillers include performance, efficiency, maintenance and product life cycle environmental impact. A chiller can be generally classified as a refrigeration system that uses either a vapor compression or absorption cycle to cool. Both the absorption and the mechanical compression systems have the evaporation and condensation of a refrigerant in common. In both systems, the refrigerant evaporates at low pressure to absorb heat and then condenses at higher pressure to reject heat to the atmosphere. Both systems require energy to raise the temperature of the refrigerant for the heat rejection process.

Heating, ventilation, and air conditioning – HVAC – chillers are industrial and commercial grade refrigerating systems used in cooling applications (i.e. buildings, raw materials, chemicals, medical equipment and industrial equipment). The system includes a compressor, evaporator, condenser, reservoir, and thermal expansion valve and stabilization assembly. HVAC chillers use water, oils and other liquid compounds as refrigerants.

This course is an overview of heating, ventilation and air conditioning (HVAC), including basic design, equipment characteristics, venting, the refrigeration cycle, system control, basic heat transfer, basic airflow principles, air quality, product quality and comfort principles. This course will cover chiller control equipment and devices that control HVAC commercial equipment, pneumatics and Direct Digital Controls. You will find out the answers for:

- How the mechanical compression cycle operates
- What are the different types of mechanical compressors?

- What is vapor absorption refrigeration cycle, its components and applications?
- What do the terms efficiency and coefficient of performance mean
- What are the functions of the different components of a chiller system?
- How is heat rejection achieved through contact and non-contact type cooling towers?
- What are the different types of refrigerants and their effects on environment?
- What are the principle guidelines in sizing, costing and selecting an appropriate chiller?
- Why is water treatment important in closed and open systems?
- What are the basic methods and procedures for testing, adjusting and balancing (TAB) of chiller systems

Who Should Attend?

Electrical Engineers, Mechanical Engineers, Design Engineers, Project Engineers, A/C Supervisor, HVAC Maintenance Technicians, HVAC Operators

Course Objectives:

By the end of this course delegates will be able to:

- Start, operate and stop machine according to factory-prescribed instructions and procedures
- Interpret data and compare machine performance to design specs
- Identify proper maintenance schedules according to factory recommendations and communicate maintenance requirement
- Know about the fundamentals and concepts of HVAC system
- Learn about how central air-conditioning system works
- Learn about chiller plant design and control.
- Learn what parameters are controlled
- Identify HVAC control strategies
- Understand the Where HVAC controls required are
- Learn benefits of a control system

- Learn elements of a control system
- Learn temperature, pressure, flow rate and relative humidity sensors types
- HVAC plant control takes place through control valves regulating steam or hot/chilled water
- Learn about controller's types and system tuning
- Understand the benefits of using DDC HVAC control systems

Course Outline:

Introduction

- HVAC systems basics
- Central air conditioning work
- Parameters controlled temperature
- Ventilation
- Humidity
- Pressure
- Control Strategies

Chillers Plant Design and Control

- Typical piping design concepts
- Single chiller loop
- Parallel chiller
- Water side free cooling
- Hybrid plants
- Variable flow design

Control Basics

- Elements of control system

- Theory of control
- Type of control system

Sensors

- Types of sensors
- Temperature sensor
- Pressure sensor
- Air flow sensor
- Relative humidity sensor
- Dew point measurement

Controller

- Direct and reverse action
- Controller types
- Reset controller
- Controller devices
- Coil characteristics
- Valve characteristics
- Damper characteristics
- Actuators characteristics
- Pumps and fan control

Control Responses

- Two position control
- Floating DDC control
- Proportional control
- Proportional plus integral control
- Proportional plus integral plus derivative control

- Stability of control system

DDC HVAC Systems

- DDC terminology and theory of operation
- Data types
- DDC hardware
- Control network
- Energy saving features
- Electric demand limitation