



Module Outline

Welcome to the AIRAH 'Pumps in HVAC&R Part 1 – Selection and performance' course

The purpose of this course is to provide participants with the information required to assist in understanding the appropriate selection and design requirements when applying pumps in an HVAC&R system.

Some prior knowledge and/or experience in HVAC&R systems and their components will help ensure participants gain optimum benefit from the course.

How to Work Through this Course:

You can navigate through the course content by using the navigational arrows in the course content or the table of contents in the side bar. You can return to the main menu at any time by using the link provided in the table of contents

Activities / Assessment overview etc

For every one of the Topics in this course, there is a self-assessment section. You need to complete this assessment (which may entail reading articles, visiting websites or referring to one of the reference texts), to demonstrate your knowledge and competency. There are multiple self-assessments methods used including:

- Multiple choice questions
- Drop and Drag to diagram
- Labelling diagrams and other images
- Performing calculations
- Matching statements with answers

Introduction

This course looks at the information required to identify different types and characteristics of pumps. It looks at how a pumps works, the materials and components used and the fundamental considerations for selection of a pumps for the appropriate duty.

This module covers the following topics.

Topic 1: Types of pumps in HVAC&R

- What is a pump used for
- Rotodynamic pumps
- Positive displacement pumps
- Pumps in HVAC&R
- Types of centrifugal pumps

Topic 2: Centrifugal pumps

- How a centrifugal pump works
- Major components
- Centrifugal pump types and configurations
- Pump classifications and motors

Topic 3: Pumping Fundamentals

- Pressure and head
- Pump laws
- Predicting changed performance
- Measuring total pressure across pumps
- Cavitation – predicting and preventing

Topic 4: Pumps and energy

- Centrifugal pumps and energy
- Controlling pumps
- Pump performance and energy
- Optimising pumps in new and existing designs
- Analysing existing systems

Topic 5: Factors affecting pump selection

- Pump characteristic curve
- System resistance curve
- Required flow and system head
- Interpreting pump manufacturer data
- Life cycle analysis

Learning Outcomes

The purpose of this course is to provide participants with the information required to assist in the selection and installation of fans for heating, ventilation, and air conditioning systems as well as industrial ventilation applications. This module defines fan types and characteristics within an air system and the considerations and calculations necessary for fan selection. It also looks at how deficient fan/system performance is created and discusses ways to prevent and/or rectify this.

At the completion of this course participants will be able to:

- describe why pumps are used in HVAC&R
- distinguish the different types of pumps available commercially
- describe the how a rotodynamic pump works and their characteristics
- describe the how a positive displacement pump works and their uses
- identify the type of pump most commonly used in HVAC&R
- Describe how a centrifugal pump works.
- Identify the main components of a centrifugal pump.
- Identify the main types of centrifugal pumps and their common configurations.
- Outline the common centrifugal pump options, variations and classifications.
- Distinguish between the different types of motors available commercially.
- Identify the types of centrifugal pump accessories available, and their uses.
- Describe why pumps are used to create pressure in HVAC&R fluid flow systems.
- Explain and distinguish between the terms pressure and head.
- Describe the pump (affinity) laws and how they can be used to predict pump performance.
- Identify how the pressure across a pump can be measured.
- Explain and calculate net positive suction head (NPSH) – required and available.
- Describe the fundamentals of pump suction, cavitation and operating efficiency.
- Identify the links between system design, centrifugal pump selection, and energy efficiency.
- Distinguish between the different areas of energy loss in pumps, motors and drives.
- Describe the different pump control methods available.
- Describe the energy benefits of variable speed control.
- Identify the issues that impact pump operational performance and efficiency.
- Describe strategies for optimising pumps in new designs.
- Describe strategies for optimising pumps in existing systems.
- Describe a pump characteristic curve.
- Describe a system resistance curve.
- Identify the required system total head and flow.
- locate the pumping duty point.
- Interpret manufacturers data for pump selection purposes.
- Amend manufacturers data for pump selection purposes.
- Identify other pump selection considerations.
- Identify the stakeholders to inform once a pumping system is selected.
- Describe the role of Life Cycle Analysis in pump selection.