

**UEE07 Electrotechnology
Training Package**

UEENEEJ007B

**Install refrigeration and air
conditioning systems, major
components and associated
equipment**

**Learner Workbook
Version 1**

**Training and Education Support
Industry Skills Unit
Meadowbank**



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Section 1 Fans and air distribution

Topics

- **Fans**
 - ⇒ Functions
 - ⇒ Types
 - ⇒ Operation
 - ⇒ Applications
- **Air distribution**
 - ⇒ Introduction
 - ⇒ Ducting types
 - ⇒ Components and control devices
 - ⇒ Duct sizing methods
- **Air flow**
 - ⇒ Measurement
 - ⇒ Adjustment – air balancing
- **Air filtration**
 - ⇒ Functions
 - ⇒ Types
 - ⇒ Operation
 - ⇒ Applications

Fans

Functions

In any refrigeration or air conditioning system a medium is required to be cooled (or heated) to allow heat energy to be transferred to the refrigerant. The most common medium used is air. To enable this to occur, air needs to move over the heat exchanger. Some (smaller) systems simply rely on natural convection but most use fans to move the air.

Fans work simply by creating a pressure difference between the inlet and the outlet which causes air movement.

There are a variety of fan types used in the refrigeration and air conditioning industry used for a mixture of different requirements, such as:

- Moving air across an evaporator coil
- Moving air across a condenser coil
- Circulating air through ducting
- Exhausting air from a space
- Supplying air into a space.

The type of fan chosen for a particular application will greatly depend upon the type of system (supply, exhaust, etc.) and the actual installation (restraints, access, available power supply and location, etc.).

Types

In most refrigeration or air conditioning system fan types may be one of the following three (3) types:

1. Propeller fans
2. Axial fans
3. Centrifugal fans.

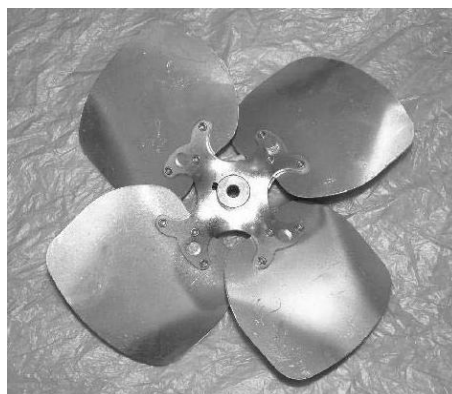
Not all of the above fans are able to be used for the same type of application. Some fans are capable of moving large volumes of air but against relatively low resistance whilst other can move against significantly high resistance.

Note: Resistance is considered to be the amount of 'static pressure' (Pascals – Pa) a fan is able to work against. Noise is also a factor in the type of fan used for an application.

The following discusses the features of the fans listed above, suitable applications and the installation requirements for each.

Propeller fans

These fan types are the simplest fan type in design and operation.



They consist of a 'boss' or 'hub' with a number of paddles attached. The diameter of propeller fans can be up to 500 mm. The pitch (angle) the paddles are set at determines the amount of air these fans are able to move. Can be made from a steel hub with aluminium paddles attached, completely pressed in one piece from steel or aluminium or even from plastic.

Although they are capable of moving reasonable volume amounts of air, they are only capable of doing so against a relatively small amount of static pressure – up to a maximum of 100 Pa.

Essentially, propeller fans are not designed to be connected to ducting. The resistance or static pressure is too high. They are essentially designed to move air from 'one side of the fan to the other'.

Ideal applications for them are:

- Condenser fans
- Evaporator fans (induced or forced draught coolers)
- Residential and light commercial exhaust fans (window and ceiling).

Activity 1



Activity

Using a supplier's catalogue (such as Actrol Parts or Heatcraft), research the different 'pitch' angles propeller fan blades are available in.

When installing propeller fans, care should be taken that no restrictions or blockages are created that will affect airflow, other than those that a manufacturer has fitted. The least amount of resistance for airflow for these fans will ensure they are working to their maximum efficiency.

Axial fans

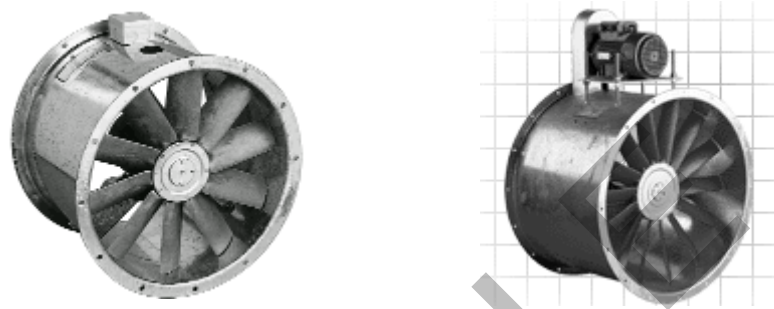
These fan types are similar in design to propeller fans having a centre boss or hub with blades attached. The main difference is in the design of the actual blades. Whilst the blades on propeller fans are shaped like 'paddles', axial fan blades are shaped in a more aerofoil design allowing them to cut through the air more smoothly. The design of the impeller of an axial fan is adjustable allowing blade angles to be adjusted to any required changes.

Axial fans are suitable for moving large quantities of air, although still at relatively low static pressures compared to the air volumes they are capable of moving.

Because of their design, they are ideally installed directly in round or square ducting saving on space. The impeller has adjustable blades which make it possible to adapt the fan to the requirement changes.

Belt driven axial fans are used in situations where it is important that the motor is kept out of the airstream due to high temperature or the corrosive nature of the gases/fumes involved.

Although they efficient in moving air, axial fans can generate higher noise levels than other types. The choice of application s for these fans must be carefully considered. Silencers or attenuators can be installed to minimise the noise.



Common applications for axial fans include:

- Exhaust and supply air systems
- Smoke spill and stair pressurisation
- Carpark exhaust
- Tunnel ventilation.

Centrifugal fans

These fan types are possibly the most widely used fan type in the HVAC (heating ventilation and air conditioning) industry. They are relatively simple in their design and operation.

Centrifugal fans consist of a fan wheel made up of a centre 'hub' with a number of blades mounted around the outside of the hub (see figure below). Air is drawn into the centre of the fan from the side (both sides if fan is double width) and is forced out at 90° due to 'centrifugal force' leaving the fan housing.

