Fancoil Systems

System Description

Fancoils have a fan and one coil (two-pipe) or two coils (four-pipe) in small units distributed throughout the building. Fancoils are dedicated to each zone and are matched to the zone design load. Four-pipe fancoil systems allow some zones to be heated while other zones are being cooled. Two-pipe fancoil systems cost less, but are less flexible.

The supply air temperature varies to meet the heating or cooling needs of the zone.

Chiller Plants

Any type of chiller system can be used to provide chilled water for the fancoils. The chiller can be sized for the block load rather than the connected. This means the air conditioning system can typically be designed to have significantly less installed capacity than systems where the air conditioning is decentralized.

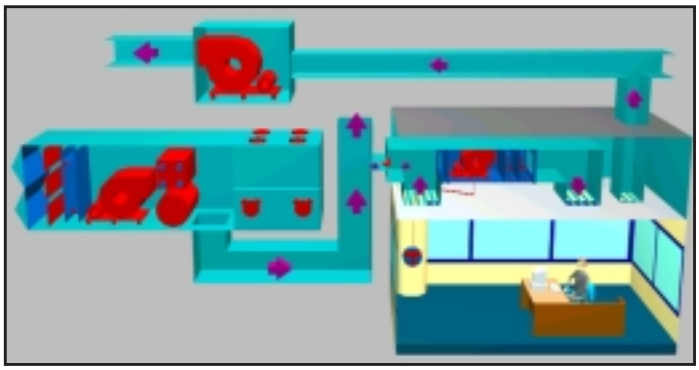
If two-way valve control is used, then chilled water flow can be varied. Three-way valve control is used for constant flow systems.

Heating Plants

Heating can be provided by either steam or (more commonly) hot water. In locations where heating is not a major load, two-pipe fancoils with electric heat are common. While electric heat can be more expensive to operate, there are large installed cost savings because only one set of insulated piping is supplied throughout the building.

Stacking Units

Stacking-type fancoils are often used in high-rise residential and hospitality applications. They are supplied from the manufacturer complete with risers and are installed floor-by-floor on top of each other.



This application lowers the installation cost and provides a quiet system that can be in heating or cooling at any time.

IAQ Considerations

Fancoil systems usually need a dedicated ventilation system to supply each zone with ventilation air. ASHRAE Standard 62.1-1999 provides procedures for calculating ventilation rates to maintain minimum acceptable indoor air quality.

For cooler climates, the ventilation air must be tempered. It is possible not to condition the ventilation air and add the ventilation cooling load to the fancoil load. This can reduce the capital cost; however, when a two-position valve cycles off in the fancoil, unconditioned air enters directly into the zone and can create a humidity problem.

Precooling the ventilation air in the ventilation unit reduces the load on the fancoil and helps avoid dehumidification problems.

Ventilation systems are often ducted directly to the return air connection of the fancoils. By balancing the ventilation system during commissioning, proper ventilation rate to each zone is provided.

Adding energy recovery in the ventilation unit can greatly improve overall efficiency of the building.

System Pros

- Very energy efficient since there is very little fan work.
- Ventilation air can enter directly to the zone.
- Easy to design and control. Four-pipe systems offer individual zone control.
- Decentralized approach allows one unit to be serviced without affecting any other zone.
- Easy to add energy recovery to the ventilation system.
- Chiller plant is sized based on block load, not connected load.

System Cons

- Units are in occupied space. Service may interrupt the occupants.
- Fans directly in the space may cause sound concerns.
- A dedicated ventilation system is usually required.

Energy Considerations

Fancoil systems are energy efficient because they use little fan power. The system selected for ventilation has a major impact on the overall efficiency of the building, particularly when ventilation is a significant portion of the cooling load. The following are some considerations outlined in ASHRAE Std 90.1-1999. The numbers in brackets refer to Std. 90.1-1999 sections.

- Energy efficiency tables for HVAC equipment (6.2.1).
- Equipment must be scheduled off automatically during unoccupied hours (6.2.3.1).
- Demand Controlled Ventilation is required for systems with at least 3,000 cfm of outdoor air and occupant density greater than 100 people per 1,000 ft^2 (6.2.3.9).
- Energy recovery is required for systems with at least 5,000 cfm supply air and a minimum of 70% outdoor air. This is specifically aimed at schools and labs (6.3.6.1).
- Hydronic systems with a system pump power that exceeds 10 hp must employ variable flow and isolation valves at each terminal device. The system must be able to operate down to at least 50% of design flow. Individual pumps over 50 hp and 100 ft. head must have VFDs and consume no more than 30% design power at 50% design flow (6.3.4.1).
- Fan motors larger than 7½ hp on cooling towers must either have VFDs or be two speed. A control system is required to minimize power usage (6.3.5).

A thorough explanation of the Standard is beyond the scope of this document. The designer should have access to the Standard and a complete understanding of its contents. The ASHRAE 90.1-1999 Users Manual is also very helpful. ASHRAE considers Standard 90.1-1999 a high-profile standard and continuously updates it.

Typical Applications

Fancoil systems are very flexible and can be used for a wide variety of buildings.

Common applications include:

- Schools
- Office Buildings
- Medical Offices