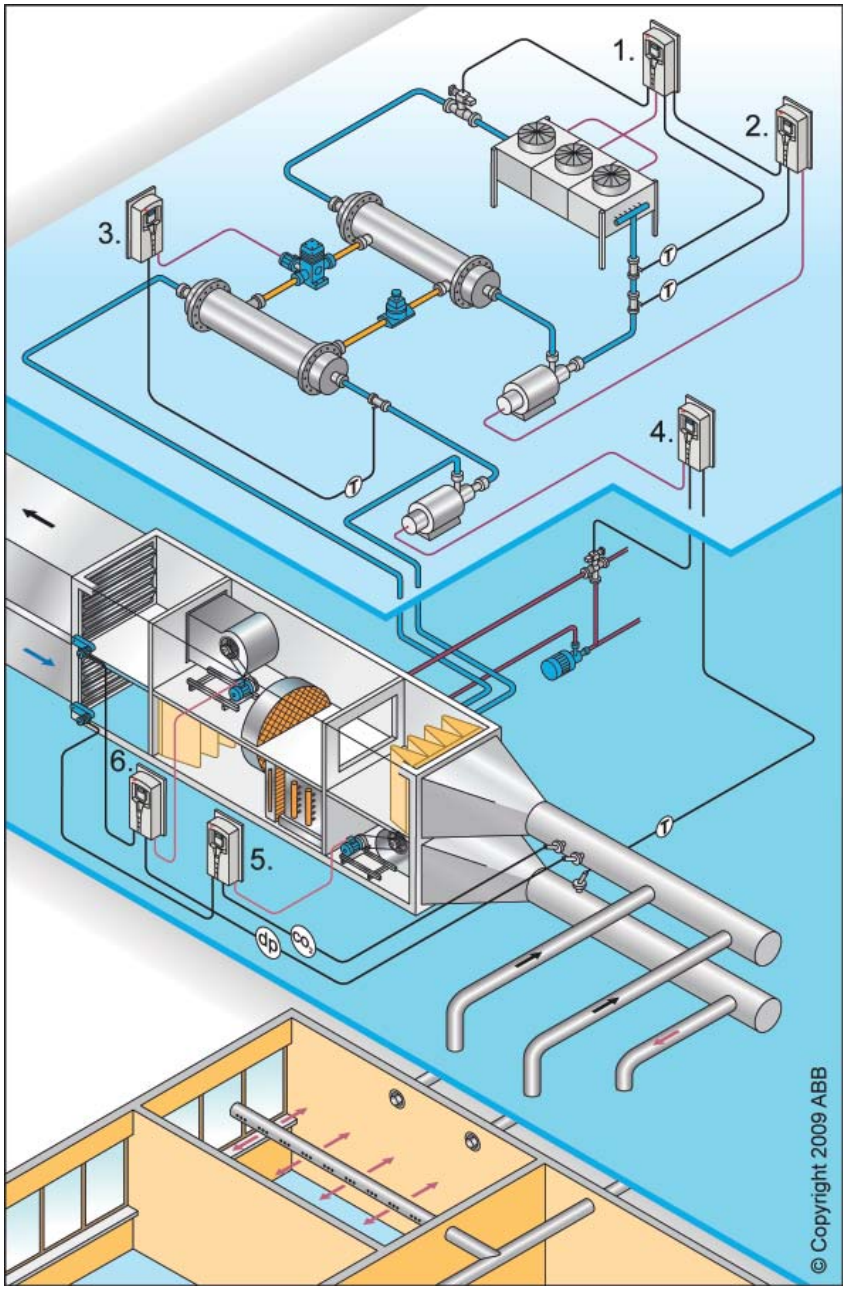
Application note
AC drives improve air quality and optimize energy usage in HVAC applications



1. Liquid cooler fans
2. Condenser water pump
3. Chiller compressor
4. Chilled water pump
5. Supply fan
6. Return fan

Application description

For residential, commercial and industrial buildings, a heating, ventilation and air conditioning (HVAC) system maintains the desired air quality by controlling temperature, pressure, humidity, air change and carbon dioxide (CO_2) content. These properties are effectively controlled by an air handling unit (AHU).

AHUs feature supply and return air fans that are used to feed air into, and extract it from, the building. Air quality is measured using appropriate sensors located within the air ducts and throughout the building. Measurements from these sensors determine the required fresh air flow.

Within the AHU there are cooling and heating coils. These coils are connected to a cooling or a heating system, which use a combination of pumps, fans and compressors. The incoming fresh air passes over these coils and is warmed or cooled depending on the room air quality needs.

Using AC drives for speed control of pumps, fans and compressors provides an effective way to improve air quality and optimize energy use. Using ABB standard drives for HVAC provides users with ready-made macros for the most common HVAC applications such as pumps, fans and condensers. These macros can be accessed via a detachable, intuitive control panel that is included with every ABB standard drive for HVAC.

Embedded within the drives, as standard, are communication protocols such as BACnet which ease the integration into all leading building management systems (BMS). Alternatively the drives can be used independently of a BMS.

Supply and return fans

The supply and return fans can be run at a constant speed providing a desired static amount of fresh air flowing into the building. They can also be run at a varying speed keeping, for instance, the pressure in the building constant or providing a certain flow of fresh air into the building depending on a measured air property inside. Sensors measuring various air properties inside the building can be connected directly to the I/O of the ABB standard drive for HVAC.

Liquid cooler fans

Liquid cooler fans are used to cool down condenser water. Water temperature is measured and the temperature sensor signal fed directly to the ABB standard drive for HVAC which controls the fan speed according to the water temperature. Higher demand for cooling leads to higher liquid cooler fan speeds.

Condenser water pumps

Condenser water is circulated between the condenser and liquid cooler fans by condenser water pumps. ABB standard drive for HVAC can adjust the pump speed according to condenser water temperature or pressure. Higher demand for cooling leads to higher pump speeds. Temperature and pressure sensors can be connected directly to the ABB standard drive for HVAC.

Chiller compressors

An AC drive optimizes compressor motor speed to meet actual cooling demand. The compressor speed can be controlled according to the compressor suction pressure. This enables the compressor to run at a speed meeting the actual cooling demand and optimizes the use of energy. By using an AC drive, the compressor can also be run at a higher frequency than the supply network frequency, which leads to a broader compressor operating range.

Chilled water pumps

Chilled water is circulated between the evaporator and cooling coil in the AHU by a chilled water pump. Speed of the pump is determined by inside air temperature requirement and the temperature of chilled water. The ABB standard drive for HVAC provides chilled water with optimal temperature to the cooling coil by adjusting the chilled water pump speed.

Benefits

- Running motors at reduced speed lowers energy usage
- Precise control of air quality leads to a healthier and more comfortable environment
- Smooth control reduces mechanical stress on pumps, fans and compressors and leads to reduced maintenance costs
- Reduced motor speeds lead to lower noise levels
- Serial communications and systems integration provide increased level of diagnostics and control
- Intuitive control panel and ready made HVAC application macros provide easy commissioning of ABB standard drive for HVAC
- Extensive inputs and outputs and application software provide independent control of HVAC application which leads to lower installation costs

For more information please contact:

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AD8 EN REVF 2010 #15313