

INSTALLATION OF AIR HANDLING UNIT(AHU) ALONG WITH VRV SYSTEM IN OPERATION THEATRE & ICCU OF MULTISPECIALITY HOSPITAL

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Abstract: A study was carried out to investigate the feasibility of achieving highly filtered air for respiration purpose of patients in multispecialty hospital i.e. in operation theatre & intensive care unit (ICU) sections. without any major or no modification in the existing air conditioning & ventilation system i.e. (in VRV system) by enhancing dust particles removal efficiency of existing air conditioning system. done By using air handling unit (AHU) which includes 4 types of filters to perform this operation i.e. pre-filter, cartridge filter ,bag filter and the most important one i.e. high efficiency particulate air filter (HEPA FILTER).

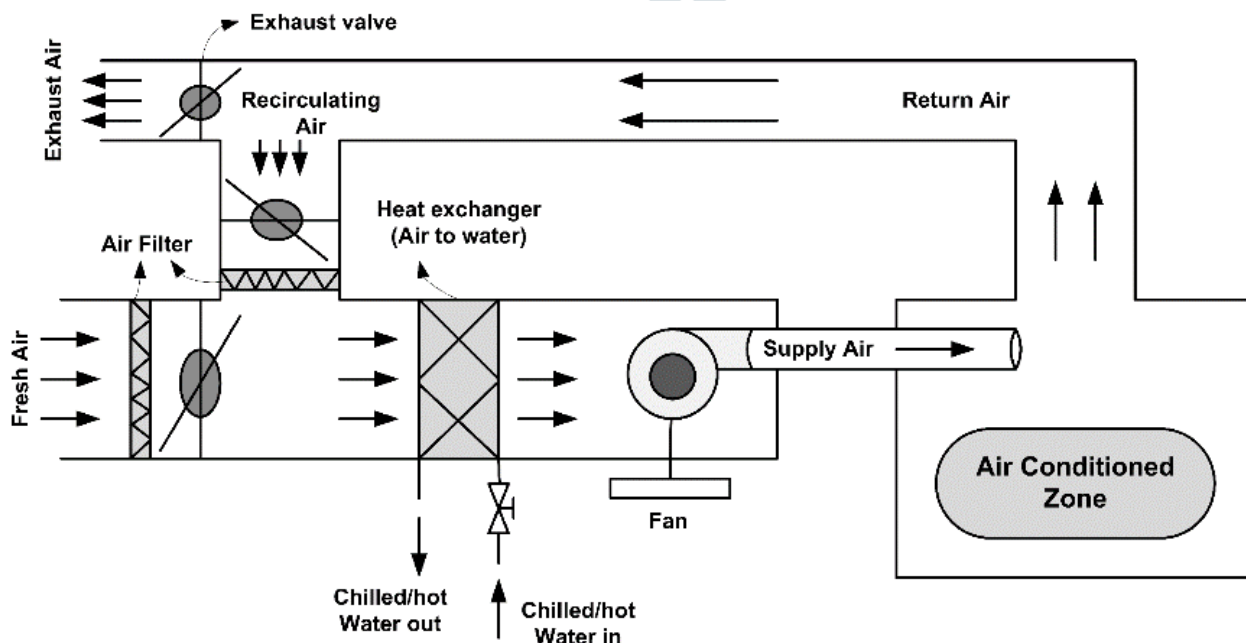
Index Terms – Working, Mechanism, Components.

I. INTRODUCTION

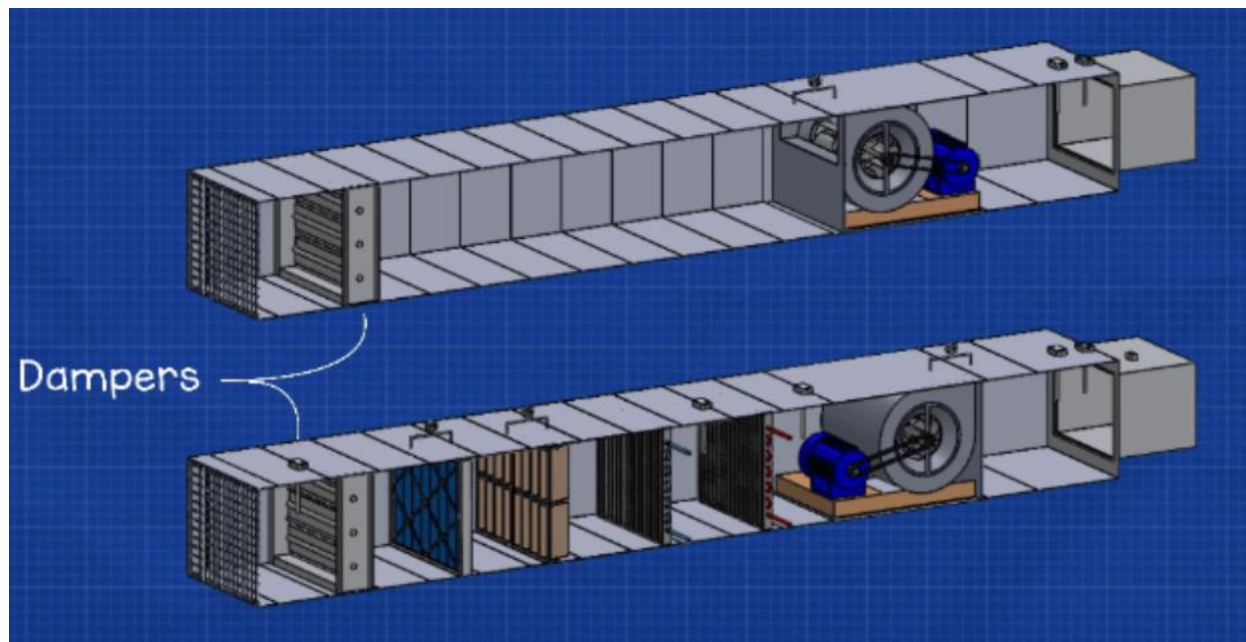
An Air Handling Unit (AHU) is used to re-condition and circulate air as part of a heating, ventilating and air-conditioning system. The AHU is a large metal box containing separate ventilators for supply and exhaust, heating coil, cooling coil, heating/cooling recovery system, air filter racks or chambers, sound attenuators, mixing chamber, and dampers. AHUs connect to ductwork that distributes the conditioned air through the AHU building heat/cooling recovery exchanger is normally fitted to the AHU for energy savings and increasing capacity. An AHU designed for outdoor use, typically on roofs, is also known as a rooftop unit (RTU) along with VRV System. Variable refrigerant Volume (VRV) systems vary the flow of refrigerant to AHU units. Variable refrigerant Volume (VRV) systems vary the flow of refrigerant to AHU units based on demand. This ability to control the amount of refrigerant that is provided to cooling coil units located inside the AHU makes the VRV technology ideal for applications with varying loads or where zoning is required. This paper is a review of the engineering basis and experiences that motivated some of the guidelines.

II, WORKING OF AHU WITH VRV

The basic function of the AHU is take in outside air, condition it and supply fresh air to a building. All exhaust air is discharged, which secures an acceptable indoor air quality. Depending on the required temperature of the conditioned air, the fresh air is either heated by a recovery unit or heating coil, or cooled by a cooling coil. In buildings, where the hygienic requirements for air quality are lower, some of the air from the rooms can be re-circulated by a mixing chamber, and result in significant energy savings. A mixing chamber has dampers for controlling the ratio between the return, outside, and exhaust air. Air handling units, which usually have the acronym of A.H.U are found in medium to large commercial and industrial buildings. They are usually located in the basement, on the roof or on the floors of a building. AHU's will serve a specified area or zone within a building such as the east side, or floors 1 – 10 or perhaps a single purpose such as just the buildings toilets. Therefore, it's very common to find multiple AHU's around a building. VRV systems with AHU enhanced versions of ductless multi-split systems.



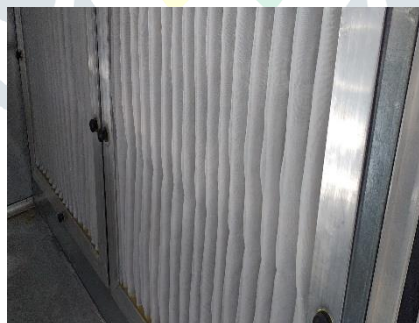
III. MECHANISM AND SUPPLY SYSTEM OF INLET AND OUTLET DUCT :



In this photo you can see that the AHU intake would have sucked in a whole bunch of trash if the grille wasn't there, that's why it's important. At the inlet of the fresh air housing and the discharge of the return air housing we have some dampers. The dampers are multiple sheets of metal which can rotate. They can close to prevent air from entering or exiting, they can open to fully allow air in or out, and it can also vary their position somewhere in between to restrict the amount of air that can enter or exit. After the dampers we'll have some filters. These are there to try and catch all the dirt and dust etc. from entering the AHU and the building. If we don't have these filters the dust is going to build up inside the ductwork and within the mechanical equipment, it's also going to enter the building and be breathed in by the occupants as well as make the building dirty. So, we want to remove as much of this as possible. Across each bank of filters, we'll have a pressure sensor. This will measure how dirty the filters are and warn the engineers when it's time to replace the filters. As the filters pickup dirt, the amount of air that can flow through is restricted and this causes a pressure drop across the filters. Typically, we have some panel filters or pre-filters to catch the largest dust particles. Then we have some bag filters to catch the smaller dust particles.

V. COMPONENTS USED IN INSTALLATION OF AHU:

5.1 AIR FILTERS



Air Handling Units require air filters to keep the blower/motor clean and to keep dust and dirt off the heating and cooling coils. Some of the older systems use roll filters, which is a very minimum duty air filter media that moves on a roll and maintains a clean air filter area continuously. Roll media filters are MERV 3 or less. In most air handlers today, a MERV 6 or 30% ASHRAE filter is used. These provide good air filtration to protect heating and cooling systems equipment without adding much in static pressure or pressure drop. Like all air moving devices, Air Handling Units are affected by static pressure as well. The ductwork (both supply and return) as well as the air filter.

5.2 Cooling coil



AHU Cooling coil used Refrigerant as direct expansion system. Refrigerant temperature at direct expansion system can be low as 2°C.

5.3 Humidifier



Humidifier adds moisture to the air to prevent dryness that can cause irritation in many parts of the body. Humidifiers can be particularly effective for treating dryness of the skin, nose, throat, and lips. They can also ease some of the symptoms caused by the flu or common cold.

5.4 Mixing Chamber



In order to maintain indoor air quality, air handlers commonly have provisions to allow the introduction of outside air into, and the exhausting of air from the building. In temperate climates, mixing the right amount of cooler outside air with warmer return air can be used to approach the desired supply air temperature. A mixing chamber is therefore used which has dampers controlling the ratio between the return, outside, and exhaust air.

5.5 Centrifugal blower:



The blower may operate at a single speed, offer a variety of set speeds, or be driven by a variable-frequency drive to allow a wide range of air flow rates. Flow rate may also be controlled by inlet vanes or outlet dampers on the fan. Some residential air handlers in USA (central "furnaces" or "air conditioners") use a brushless DC electric motor that has variable speed capabilities.

5.6 HIGH EFFICIENCY PARTICULATE AIR HANDLING UNIT :



- It is a filter which is used to remove fine particles and pollutants of air approx.99.95%
- Size of a filter more or equal to 0.3 microns.
- Flow of air in operation theatre is through laminar flow unit fitted with HEPA filter ensuring no unwanted micro elements enter there.

5.7 PLENUM



- A Plenum chamber is a pressurized housing containing a gas or fluid (typically air) at positive pressure
- One function of the plenum is to equalise pressure for more even distribution because of irregular supply or demand

VI. FUTURE SCOPE AND CONCLUION:

Now a day shortage of clean air is very big issue to eliminate this the demand of AHU will get increase in future. It is necessary to eliminate the dirt particle and give constant & laminar flow of condition air in OPERATION THEATRE & ICCU of hospital. Use of AHU along With VRV is beneficial and power saving.

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