CHAPTER 3

ANALYSIS OF DESIGN OPTIONS

For any air conditioner works then the analysis of design options is urgently needed. Each option has advantages and disadvantages. So we need to consider thoroughly to thereby have the choice of designs to match.

Here are some of our common approach:

- Air conditioning chiller system.
- VRV air conditioner

3.1 AIR CONDITIONING CHILLER SYSTEM:

The central air conditioning system uses 7^0C cold water to cool the air through the AHU and FCU heat exchangers. Central air-conditioning system includes:

- *Cold water machine.*
- *Cold water pipe system.*
- *Water cooling system.*
- *AHU and FCU heat exchangers.*
- *Wind system, wind flow, air and distribution.*

Advantages:

- *Circulation is water so do not fear poisoning or accidents due to leakage of refrigerant, because the water is completely non-toxic.*
- *It is possible to control the humidity of the air space separately for each room, stabilize and maintain the best microclimate conditions.*
- *Suitable for buildings such as hotels, offices of all height and all types of architecture, do not break the landscape.*
- *Less maintenance.*
- *Cold capacity is almost unlimited.*

Compared to the VRV air conditioning system, the refrigerant circuit is much simpler to control. Defect:

- *Because water is a cold substance, thermodynamically, the energy loss is greater ...*
- *Fresh air intake system for FCUs should be arranged.*

- *The problem of cold water pipes and condensate trays is quite complicated especially due to humidity due to humidity in Vietnam.*
- *Installation difficult, requiring skilled operators.*
- *Regular maintenance of air conditioner maintenance and FCU.*

Clean air system for operating rooms, sterile corridors, recovery rooms ... including AHU (Air handling unit) for heat treatment, heating resistance, air distribution system and filter system to advance Air conditioning, such as cooling, heating, dehumidification, cleaning, pressure differential ... to create a comfortable micro climate for doctors and patients.

The air circulation in the room follows a closed sequence. First, the air in the room is drawn to the AHU through the air intakes on the triangles at the corner of the room. From the retina triangle, air through the air duct with zinc plated sheet is fed into the AHU. Here, the air is blended with outdoor air and performs processes such as cooling, moisture separation and pre- filtration in primary filters (G4 25-30% filter efficiency) and Secondary (F8 filter efficiency 80- 85%). The volume of air to be treated will then be centrifugal blower into the air supply pipe with zinc coated iron. On the wind pipe, the air will pass through the resistor to raise the required temperature. This volume of air is purified to 99.95% efficiency (or 95% depending on the cleanliness level) at the Hepa filter outlet and in the operating room. In this room, the volume of air will exchange heat, humidity and dust with the air in the room, becoming dirty air and is again absorbed by the AHU through the door system.

In addition to the wind and wind systems, the system also has fresh air outlets to provide room. Taking fresh air is of great importance in air handling systems. The fresh air has the task of supplying oxygen to the doctor and the patient to create a positive pressure to prevent the air from getting into the room. Outdoor air with high temperature and humidity will be drawn into the AHU through fresh air intake. At AHU, the fresh wind is heat treated, humidified in the room and centrifugal blowers blow into the room through the air supply pipes, HEPA filters and the wind gates. This volume of fresh air after entering the room will overflow to other areas creating pressure differential.

The calculation and selection of AHU must be consistent with the function of the rooms and save investment costs as well as operation for the University, as follows:

- *Use AHU to heat, treat, cool and circulate air, creating a positive pressure against the surrounding area.*
- *Using AHU Coil, each AHU using coil cooler is connected to separate heater so high efficiency, maintenance and operation cost lowest to bring long term effect to the owner invest.*
- *Each operating room uses an AHU to save operating costs and control the cross-contamination.*

3.2 VRV AIR CONDITIONER:

VRV air conditioners are mainly used in air conditioners and have the following features:

- *Condensate units have two compressors which have an on-off refrigerant capacity regulator and a level regulator according to the inverter, so the number of steps is adjustable from 0 to 100%, which includes 21 steps The savings are very effective.*
- *VRV has well solved the problem of compressor oil due to the outdoor unit can be placed higher than the indoor unit to 50 m and the indoor unit can be placed up to 15 m apart, the refrigerant pipe from the cluster The outdoor unit is up to 150 meters in width, which facilitates the easy installation of tall buildings, offices and hotels that previously had only central water systems.*

Centralized central air conditioning system for each site, controlled precisely to the conditions of each area, makes the system more economical and efficient. The system is controlled separately in each area, so the incident does not affect the entire system. The central air conditioning system is connected between the indoor unit and the copper bushing using R410A gas. This air- conditioning system is called VRV

Each VRF system includes:

- *01 unit of Outdoor Unit (CU)*
- *Indoor Unit (FCU)*
- *Wall-mounted on-site control devices. Each FCU is equipped with one controller.*
- *The refrigerant co-duct system connects the CU to all FCUs of the same system.*
- *Condensate drainage system.*
- *Power supply and control system.*

For remote control of the air conditioner, it is equipped with wired or wireless remote control.

The CU complexes here (01 module) are a unified block. Each module from 10 HP to 12 HP has two Hermectic type Rotary DC type compressors and one axial fan. All compressors and blowers of all modules are driven by high performance DC inverters.

The use of 02/03 inverter compressor in 01 module to reduce consumption power consumption, because then 02/03 compressor in 01 module automatically switch positions to each other. This is one of the measures to ensure the highest level of safety and longevity of the compressor. Must use the modular inverter to bring high efficiency:

- *When the actual heat load in the air-conditioning units decreases, the modules in each CU assembly will operate the alternating rotation between the compressors.*
- *Switching between compressors in the same module will reduce the number of shutdowns of each compressor, increasing the life of the compressor and increasing reliability by balancing the number of starts of each compressor. compressed.*
- *Fans of CU units are also driven by inverter DC (DC) inverter for high thermal efficiency. The fan also has automatic noise reduction function when the heat is low.*
- *The use of Hermetic type DC compressors and the drive of all compressors and blowers of CU assemblies by DC inverters provides high efficiency.*

The heat exchangers selected here are of two types:

- *Cassette Type 04 directional blower with cooling capacity from 9.0kW, 11.2kW, 14kW, 16Kw*

Wall type with cooling capacity of 2.2kW, 2.8kW, 3.6kW, 4.5kW, 5.6kW, 7.1kW

The center-type controller has a touch screen that can control up to 512 indoor units, connected to a computer and has the function of calculating power consumption for the indoor unit

All controllers, gas separators are supplied by the manufacturer and are imported simultaneously with the CU and FCU assemblies.

3.3 SELECTION OF THE AIR-CONDITIONING SYSTEM FOR CONTRUCTION.

Through the analysis of the advantages and disadvantages of the two air-conditioning systems in accordance with the selected project. We see that:

- VRV air-conditioning system meets more basic requirements of the project than Water Chiller water cooling system. However, to make a reasonable choice, we need to consider some practical issues later:

+ In scale 2 areas buildings with cold load is calculated **4460.29 kW**, the use of Water Chiller air conditioning system will be more optimal.

+ The project is mainly a classroom space with the purpose of studying and relaxing for students, so the requirements for humidity and clean air are also raised. For pump storage areas and systems with very high heat, it is necessary to balance the amount of stable heat to ensure comfort during operation and maintenance. In terms of stability, cleanliness and not much customization for each space, Chiller air conditioning system is the best choice.

From these conclusions we choose the design for the project is the system air-conditioning central chilled water (Water-cooled water chiller) to the engine room is located at the first floor of the building, the cooling tower is set at the roof of the building.