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Analysis of cooling load calculations using AHU in swimming pools (indoor pools)

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Abstract: AC or Air Conditioner is one of the most widely used mechanical devices in Indonesia. A machine device that functions as an air conditioner so that the indoor air temperature is comfortable, healthy, and has the humidity required by the occupants. Air freshening systems or ACs are increasingly becoming a necessity for urban communities, whether in homes, office buildings, apartments, hotels, swimming pools, hospitals, and even in lecture rooms. The indoor swimming pool measuring 40 x 11 x 3.5 m is located in the apartment So it is uncomfortable for swimmers. Thus, it is necessary to design using an AC system so that the temperature in the swimming pool is cool and comfortable for swimmers. The planning methodology starts by determining data on the indoor swimming pool in apartment AC used. From the analysis results, the cooling load was obtained at 411.5 kW, including a sensible load of 397.66 kW and a Latin load of 13.85 kW, the refrigerant used by the engine was R134a, the compressor power was 81 HP, while the COP was 6.8. So that the indoor air is evenly distributed comfortably, the indoor cold air distribution system uses an AHU (Air Handling Unit) system, capacity of 1900 m^3/hour. 2 AHU Units, Blower Power 3 kW.

Keywords: Air Conditioner; indoor swimming pool; cooling load

1. INTRODUCTION

Air conditioning is air processing to regulate temperature, humidity, cleanliness, and distribution simultaneously to achieve the comfortable conditions necessary for people indoors [1]. Apart from that, air conditioning can be defined as a process of cooling the air so that it reaches the ideal temperature and humidity. To be able to produce air with the desired conditions, the equipment installed must have a capacity that is appropriate to the cooling load of the room [2].

Humans need to have a comfortable indoor air environment (thermal comfort) so they can carry out activities optimally [3]. With clean and cool air, humans can carry out activities in peace and health. The weather in the room is hot and stuffy, people who are carrying out activities in it will feel very disturbed and will not be able to carry out their activities properly and will feel uncomfortable. The human body is like a heat engine that continuously produces heat. Thermal comfort is directly related to the fact that humans always release excess heat through their bodies [4].

Refrigeration is the removal of heat from a room and then maintaining its condition in such a way that the temperature is lower than the ambient temperature. In principle, refrigeration is an application of heat transfer theory and thermodynamics, the working principle of AC (Air Conditioner) is the same as refrigeration [5]. However, an Air Conditioner (AC) does not only function as a cooler but must be able to produce comfortable air [6]. AC (Air Conditioner) absorbs air from the outside and releases air to the outside, from this the indoor air that has been produced will gradually convert so that it can make the room a cool temperature [7]. Currently, AC (Air Conditioner) is widely used to meet daily needs and has become a need that must be met, one of which is a swimming pool (Indoor Pool). In Apartment In installation and use, the air conditioning system requires quite a bit of money, using air conditioning that is not appropriate to its needs causes waste, both energy and costs incurred [8].

The problem that occurs in the swimming pool is that the apartment room (indoor) is still not cold enough even though an air conditioning system or AC (Air Conditioner) has been installed. This is because the temperature in the area around the apartment building is 32°C, which causes the temperature in the room to be less cool and less comfortable for swimmers. For this reason, it is necessary to redesign the air conditioning system in the swimming pool so that the temperature is cool and can make swimmers feel comfortable.

To determine the specifications and cooling system, it is necessary to first calculate the cooling load requirements. Accurate cooling load calculations have a big impact on energy and fuel savings [9]. Cooling load is the energy required to regulate room temperature and humidity conditions depending on the condition of the room and the people active in it [10]. With the considerations and reasons above, the author carried out calculations for the indoor pool in Apartment X.

This research aims to determine the amount of cooling load on the AC (Air Conditioner) in the indoor pool room in the apartment.

2. METODE

A flow diagram is a basic overview to simplify the research stages. The following is Figure 1 on the sequence of research implementation.

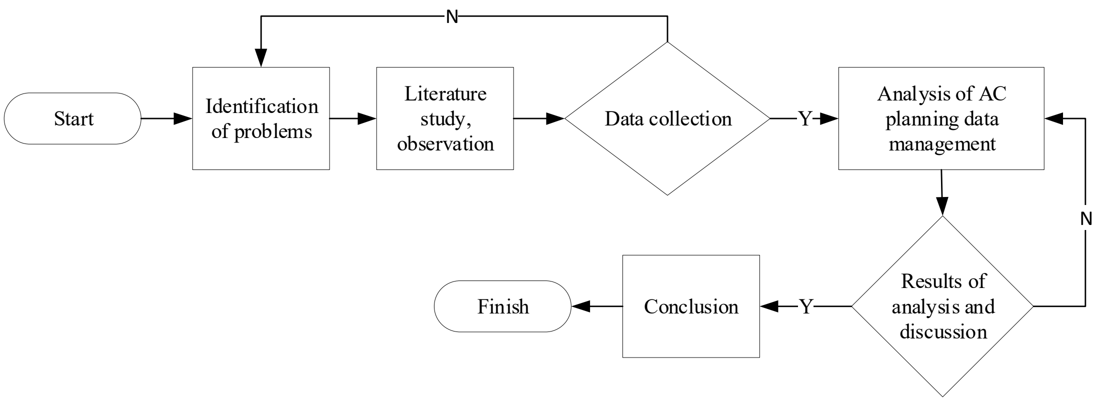

Figure 1. Research flow diagram.

This research method was carried out using a quantitative research approach. The quantitative approach aims to test theories, establish facts, show relationships between variables, provide statistical descriptions, and estimate and predict results. Research designs that use a quantitative approach must be structured, standard, formal, and designed as thoroughly as possible beforehand. The design is specific and detailed because the design is a research plan that will be carried out. The following are the steps taken in the research.

Literature study and observation: "Searching for theoretical basis and calculation methods" for the preparation of the thesis. The theoretical basis is obtained from various sources, lecture reference books, articles, and journals. Data Collection: Collecting related data that will be carried out such as room data, glass data, wall data, light data, occupant data, and water evaporation data.

Data processing analysis: Data processing analysis is carried out after the required data is obtained and grouped according to the identification of the problem objectives so that a solution analysis can be achieved. The analysis carried out is 1) Analysis of climate and geographic data. 2) Analysis of room architecture, 3) Analysis of room population data, 4) Analysis of room operations. Planning Stage: Analyze data by making determinations for cooling loads.

This data collection was carried out to obtain the information needed to achieve the research objectives. The data collection method used for air conditioning analysis is: 1) Literature Study Method: This method is carried out by studying literature and reference books. The reference books used come from several author sources, in the form of books, archives, articles, journals, or documents that are relevant to the problem being studied. 2) Observation Method: This method is used to find the data needed during this research task and can be used to carry out calculations and analysis in calculations. As well as conducting a survey directly in the field so that you can find out the actual conditions so that you can get a picture of the indoor swimming pool that will be planned for more accurate considerations.

Data analysis method: The object to be designed is the swimming pool room, at the Axia Apartment, Cikarang Bekasi with an area of (40x11x3.5m). The place to conduct research is

Apartment X, South Cikarang, Bekasi, West Java. The location of this apartment is in Bekasi with coordinates 60 South Latitude and 1070 East Latitude, the direction of the building faces west and the research time starts from March 1 to April 31, 2023. Based on data obtained from research by the association of experts in the field of American air conditioning, the weather in Bekasi City can be seen in Table 1.

Table 1. Air temperature conditions in Bekasi.

No.	Overview	Value
1	Temperature	22- 32ºC
2	Relative Humidity	50 -90%
3	Air Speed	10-20 km/hour
4	Latitude	6.12º LS

3. RESULTS AND DISCUSSION

Conditioned space data: Indoor Swimming Pool space design specifications are as follows: 1) Room size (40x11x3.5 m), 2) Adult Swimming Pool (25x6x1.4 m), 3) Children's Swimming Pool (4.8 x3.2x0.3 m), 4) Location of the swimming pool room on the 1st floor. Planning indoor conditions: 1) Dry temperature 18°C-24°C, 2) Relative Humidity 50%-70%. Outdoor Air Conditions: 1) Outdoor Air Conditions DB 32°C, WB 27 °C, 2) Relative Humidity 50%-90%.

Field data: indoor swimming pools are built to provide protection and a comfortable indoor environment so that the occupants are protected from the influence of changing external conditions. A room with good indoor conditions and low maintenance costs is one of the important conditions for the success of a building design. With the air conditioning system in the room, it can be controlled so that it is stable and comfortable as needed. To design an indoor cooling system, what is needed and known are the properties of the walls, roof windows, and the influence of outside air, indoor equipment, and occupants which determine the required working energy capacity. For this reason, design data is needed from both indoors and outdoors:

Data on air conditions outside the indoor swimming pool, based on observations by the Bekasi district statistics center is; 1) Dry bulb temperature: 22-32 ºC, relative humidity: 50-90%, Air Speed: 10-20 km/h, Water vapor content: 0.021 kg/kg dry air. Latitude (latitude): 6,120 South Latitude

Indoor swimming pool design data: Dry ball temperature: 22-24 ºC, Relative Humidity: 50-60 %, Water vapor content: 0.011 kg/kg dry air, Swimming pool room construction data: 1) Indoor Swimming Pool room design specifications as follows: 2) Room size (40x11x3.5) m, 3) Adult swimming pool size (25x6x1.4) m, Water volume = 210 m^3, Children's swimming pool size (4.8x3.2x0.3) m, Water volume = 4.6 m3. Location of the swimming pool on the 1st floor.

The heat source is from inside the swimming pool, the heat source is the heat load that must be cooled and taken into account which comes from inside the swimming pool, namely: The number of people in the swimming pool is: 50 people (capacity of people and swimming pool staff), 1) Vacuum Machine: 1 Unit, Motor power = 450 Watts, 2) Water circulation pump = 2 units working 1 unit. Motor power = 1.5 kW. 3) Dispenser machine = 1 Unit of power = 200 Watts. 5) Room lights = 20 TL Units power: 40 Watts.

Calculation of perimeter (exterior) cooling heat load:

Calculation of the cooling load is the rate of heat entering the room which will be maintained in the condition of the room which will be conditioned at the planned temperature [11]. Several factors and variables from heat sources are erratic and do not coincide at peak load times which sometimes arise suddenly from continuous and periodic sources stored in the room. Thus, we must estimate the cooling load caused by changes in indoor conditions and need to carefully and deeply calculate the load originating from indoors and outdoors. Room loads are usually classified into two, namely Perimeter loads which come from outside the room, and Internal loads which come from inside the room itself. Indoor loads are classified into two, namely: Sensible loads, namely loads that can change the room air temperature, and latent loads are loads contained in the human body or the burden of strengthening an item [12].

Cooling heat load through the west side glass window and east side door (Q_j)

Swimming pool building data: a). Window glass facing west (receiving sunlight) Size: 1 x 3 m, Quantity: 40 pieces. Type: Regulator plate, Thickness: 6 mm, b). Door: facing east, Size: 1.6 x 2.5 m, Quantity: 2 Pieces, Door material: aluminum and glass. Thickness: 1.5 cm, Color: Light. On the west side of the glass window, it receives sunlight (Q_j), according to the construction data on the west side of the wall which is a glass window, to calculate the heat load using equation (1).

$$Q_j = A.SHFG.SC \tag{1}$$

The heat load passes through the window:

$$Q_j = 120 \times 782{,}4 \times 0{,}82$$
$$= 76.988\ W\ atau\ 77kW$$

Heat load through the door (Q_p)
To calculate the heat load through the door, the equation is used (2).

$$Q_p = U \times A \times \Delta t \tag{2}$$

The heat load passes through the door:

$$Q_p = 0{,}23 \times 8 \times (303 - 297) = 11\ Watt = 0{,}011\ kW$$

The heat load of windows and doors:

$$Q_{jp} = Q_j + Q_p \tag{3}$$
$$= 77.000\ W + 11\ Watt$$
$$= 77011\ Watt$$

Calculation of cooling load through the wall equation (2):

Building data Wall: Type: Brick with cement plaster inside and out. 2) Thickness: 150 mm: 0.15 m, Plastered outside and inside. = 160 mm

East side wall cooling heat load (Q_{dt})

According to construction data, the east side wall is made of red stone plastered with a thickness of 150 mm. Equality (4):

$$Q = U \times A \times \Delta t \tag{4}$$

The cooling load on the east side wall:

$$Q_{dt} = 114m^2 \times 0{,}24\ W/m^2K \times (305 - 297)\ K$$
$$= 219\ Watt$$

South wall cooling heat load (Q_{ds})

According to construction data, the south side wall is made of red stone plastered with a thickness of 150 mm. Equation (5):

$$Q = U \times A \times \Delta t \tag{5}$$

The cooling load on the south wall:

$$Q_{ds} = 33m^2 \times 0{,}24\ W/m^2K \times (305 - 297)\ K$$
$$= 63\ Watt$$

Cooling heat load on the north wall (Q_{du})

According to the construction data, the north side wall is made of red stone plastered with a thickness of 150 mm. Equation (6):

$$Q = U \times A \times \Delta t \tag{6}$$

Then the cooling load of the south wall:

$$Q_{du} = 33m^2 \times 0{,}24\ W/m^2\ K \times (305 - 297)\ K$$
$$= 63\ Watt$$

The western cooling heat wall is almost entirely installed with window glass. So that $Q_{db} = 0$
Then the heat load of the coolant through the entire wall is:

$$Q_d = Q_{dt} + Q_{ds} + Q_{du} + Q_{db} \quad (7)$$
$$Q_d = 219 + 63 + 63 + 0$$
$$Q_d = 345\ Watt\ (0{,}35\ kW)$$

Calculation of cooling heat load through the roof and floor

a. Roof : Made of cast concrete, 15 cm thick with a ceiling above the floor 2 (not exposed to direct sunlight).
b. Ceiling : Made of Gypsum, 16 mm thick, with a light color.
c. Floor : Made from concrete casting, 16 cm thick with ceramic.

Calculation of heat through the roof (Q_a)

To calculate the heat load through the roof, the equation is used (8)

$$Q_a = U \times A \times (tr - to) \quad (8)$$

Where:

$$Q_a = 10{,}52\ W/m^2\ K \times 415m^2 \times (305 - 297)\ K$$
$$= 34.926\ W\ or\ 34{,}93\ kW$$

Calculation of cooling load heat through the floor (Q_l)

Calculate the heat load through the floor, the equation is used (9)

$$Q_l = U \times A \times (tr - to) \quad (9)$$

Where:

$$Q_l = 0{,}72\ W/m^2\ K \times 415m^2 \times (305 - 297)\ K$$
$$= 896{,}4\ W\ or\ 0{,}9\ kW$$

The amount of heat through the roof and floor is (Q_{al})

$$Q_{al} = Q_a + Q_l$$
$$= 34{,}93\ kW + 0{,}9\ kW$$
$$= 35{,}83\ kW$$

Swimming pool internal cooling heat load

The heat load released from indoor heat sources includes lamps (Internal Lights), equipment, and occupants. Data on equipment, lights, and people in the swimming pool room are 1) Room lights = 20 TL units, power: 40 Watts. 2) Vacuum Machine: 1 Unit. Motor power = 900 Watts. 3) Dispenser Machine = 1 Power Unit = 700 Watts. 4) Visitors and officers = 50 people, 5) Pool water.

The load removed from the lamp

Calculate the load released from lamps or lighting, the equation is used (10):
Room Lights = 20 TL Units Power = 40 Watts.

$$Q_{lt} = Input\ (W) \times F_u \times F_b \times CLF \quad (10)$$

$$= 856{,}7\ W\ or\ 0{,}86\ kW$$

Calculation of the heat load of vacuum cleaner equipment.
Calculate the heat load of the equipment used:

$$Q_{L3} = n \times HG \times CLF = 756\, W\ atau\ 0{,}77\ kW$$

Dispenser heat load (*water heater/cooler*)

Calculate the heat load of the equipment used:

$$Q_{l4} = n \times HG \times CLF \quad (11)$$
$$Q_{l4} = 1 \times 700 \times 0.85$$
$$= 595\ W\ or\ 0{,}6\ kW$$

Total load of equipment and lights

$$Q_{lt} = Q11 + Q12 + Q13 + Q14$$
$$= 0{,}86\ kW + 0{,}77\ kW + 0{,}6\ kW = 2{,}23\ kW$$

The heat load of swimming pool water cooling

Location of the swimming pool on the 1st floor

- Adult swimming pool size:
  Adult Pool (25 x 6 x 1,4) m
  Water volume = 210 m^3.
- Size of children's swimming pool:
  Children's swimming pool (4,8 x 3,2 x 0,3) m
  Water volume = 4,6 m^3.
  The total volume of pool water = 210 + 4,6 = 214,6 m^3.

Great heat for cooling swimming pool water

$$Q_a = c.V.p.\Delta t\ (kW) \quad (12)$$

Where:

$$Q_a = C \times V \times p \times (t_1 - t_2)$$
$$= (4{,}19\ kj/\ kg.K) \times (0{,}015\ m^3/dt) \times (1000\ kg/m^3) \times (301 - 297)\ K$$
$$= 251{,}4\ kJ/dt(kW)$$

Calculation of heat for occupants in a swimming pool

The number of people in the swimming pool is 1) Maintenance workers and pool guards: 5 people. 2) Beverage waiter (Bartender), swimming pool: 3 people. 3) Security and Administration = 2 people, 4) Visitors = 40 people. 4) The total number of people in the swimming pool is 50 people.

Calculation of the sensible heat load of people or production and administrative work in the swimming pool space

$$Q_{os} = n \times SHG \times CLF \quad (13)$$

Where:

n = The number of indoor occupants who are conditioned to sit for light work in the office: 50 Person

SHG = Sensible heat factor emitted by humans
= Worker/road Sports: (35 % % of 305 Watt)
= 106.75 Watts)

CLF = The cooling load factor that is affected when the time for entering the room is 8 hours and the occupants are in the room (8 hours)/0.84

Where:

$$Q_{os} = 50 \times 106{,}75 \times 0{,}84$$
$$= 448\ W\ or\ 4{,}48\ kW$$

Calculation of latent heat for people in a swimming pool

$$Q_{ol} = n \times LHG \times CLF \quad (14)$$

Where:
LHG = Latent heat factor emitted by humans
$= 100\% - 35 = 65\%$
$= 0{,}65 \times 305 = 198{,}3$
CLF = Latent heat for people = 1

$$Q_{ol} = 50 \times 198{,}3 \times 1 = 9915\ W\ or\ 9{,}9\ kW$$

Table 2. Heat gain from occupants.

Activity	Heat Gain, (W)	Sensible heat gain, (%)
Sleep	70	75
Sit down, calm down	100	60
Stand	150	50
Walking (Working)	305	35
Work (office)	150	55
Discussion	175	50

Analysis of heat load of ventilation cooling air

Table 2 ventilation functions to channel air from outside into the room and vice versa so that there is a change in air that is healthy to breathe [13]. Along with the release of air from inside, ventilation also becomes a channel for pollution to escape from inside the house. The amount of ventilation air is determined based on the number of people or the floor area of the room to be conditioned, while the amount of infiltration air is determined based on the outside air that enters through window gaps and open doors [14]. Ventilation and infiltration loads are divided into two, namely 1) sensible heat load and 2) latent heat load.

Calculation of ventilation cooling heat load and sensible infiltration (Q_{vs})

$$Q_{vs} = (1{,}23).(Q').(t_0 - t_1) \quad (15)$$

Where:

$$Q_{vs} = 1{,}23(125)(32 - 24) = 1230\ Watt\ (1{,}23\ kW)$$

Latent seepage and ventilation loads (Q_{vl})

$$Q_{vl} = 30\ Q'(w_0 - w_1)`$$

Where:

$$Q_{vl} = 30\ Q'(w_0 - w_1)$$
$$= 30(125\ lt/dt)(0{,}8 - 0{,}6)$$
$$= 750\ W\ or\ 0{,}75\ kW$$

Recapitulation of total heat load for cooling swimming pool rooms

The following is a recapitulation of the results of the analysis of the heat load calculation for cooling the indoor swimming pool in apartment X in Table 3:

Table 3. Recapitulation of swimming pool space cooling heat load.

No	Load type	Load	
		Sensible (kW)	Laten (kW)
I	**Perimeter Load:**		
1	Heat load of window glass	77,00	-
2	Door heat load	0,011	-
3	Partition wall heat load	0,35	
4	Roof heat load	34,93	
5	Floor heat load	0,9	

No	Load type	Load	
		Sensible (kW)	Laten (kW)
	Total perimeter load	113,29	
II	**Interior Load**		
6	Heat load of lamps and equipment	2,23	
7	Swimming pool water heat load	251,4	
8	Load of people	4,48	9,9
	Total interior load	258,11	
III	Ventilation load		
9	Ventilation heat load	1,23	0,75
10	TotalI+II+III	372,63	10,65
	Addition 3 %	11,18	3,2
11	Total cooling heat load	383,81	13,85
	The sum of sensible and latent loads	= 397,66 kW	

Total sensible cooling load (Tsh) = 397,66 kW
Total latent cooling load (Tlt) = 13,85 kW
Total cooling load (Gth)

$$G_{th} = T_{sh} + T_{lt}$$
$$= 397{,}66\ kW + 13{,}85\ kW$$
$$G_{th} = O_e = 411{,}51\ kW (411.510\ Watt)$$

Selection of cooling system type

Determine the type of cooling system to be used, it is based on the results of the cooling load analysis as follows: 1) Cooling Load 1 – 4 TR Type of room air freshener, namely: Split or Cassette type. 2) The load is 2-10 TR Type Air Conditioning (AC) Package. 10 -30 TR Split Duct AC Type, 3) Medium 50 – 1000 TR Central AC. From the calculation results of the load in TR (Tons of Refrigerant (Qtr): If 1 TR = 12000 Btu/hr or = 3517 Watt

Where:

$$Q_{tr} = \frac{Q_e}{3517}(TR) = \frac{411.510}{3517}(TR)$$
$$= 117\ TR$$

According to the article above, the AC system chosen is Central AC, which is between 50 TR to 1000 TR.

Refrigeration engine compressor power analysis

The indoor air conditioning temperature is 24°C, while the outdoor temperature is 32°C. The temperature on the evaporator side is 24-8 = 16°C. Condenser temperature 32+8 = 40°C. The machine uses Heat Exchange so there is a 5°C Sub cooler and sub heater. So that the refrigerant temperature is obtained, the temperature of the refrigerant leaving the evaporator is T1 = 16 +5 = 21°C. Compressor outlet temperature T2 = 40+5 = 45°C. Condenser outlet temperature T3 40-5 = 35°C. Cooling Machine uses 134 A Refrigerant.

Determining refrigerant flow rate (m)

$$Q_e = m\ (H1 - H4) \tag{16}$$

Where:

$$411{,}51\ kW = m\ (415\ kJ/kg - 245\ kJ/kg)$$
$$m = 2{,}42\ kg/dt$$

Determining the compressor power (Wk)

Wk = m (H2-H1)

Wk = 60,5 kJ/dt = 60,5 kW

Compressor power in HP = 60,5 x 1000/745

Wk = 81 HP.

Determining the COP (coefficient of performance) price

COP (Coefficient of Performance) is the ratio of the energy produced by the engine to the energy required to move the compressor engine [15]. As the efficiency of heat engines is usually below one, the work performance (COP) of cooling engines is above. To calculate the planned COP of the AC machine, it is as follows.

$$COP = \frac{Refrigerant\ Effect}{Compressor\ Work} = \frac{m\ (H1-H4)}{m\ (H2-H1)} = \frac{Q}{W} \quad (17)$$

$$COP_{ac} = 6{,}8$$

From the results of calculating the COP (Coefficient of Performance) of Refrigerant R 134 A, it is found that 6.8 is good because above 4.0 it almost matches the COP of Refrigerant R.12, R.22, which is above 4.0.

Ventilation system analysis using AHU (air handling unit)

The air handling unit (AHU) is the heart of a central AC. It collects outdoor air and indoor air, removes dust and other particles from the collected air, adjusts temperature and humidity, and then supplies comfortable and refreshing air-conditioned air into the room through ducts. AHU is a heat exchange machine between cold water and air.

Determining the AHU (air volume capacity)

The capacity of the air volume circulated by the AHU device is the volume of replacement air entered into the room called primary air plus the volume of room air that is circulated. From the reference, the air circulated by the AHU is around 2 to 6 times per hour.

Determining the amount of ventilation air (Primary Air):(Vp)

The number of people in the room is 50 people. Each person in the room needs 18 m^3/hour ltr/sec (non-smoking), while smokers need 30 m^3/hour.

$$V_p = 50\ orang \times 18\ m^3/hour = 900\ m^3$$
$$= 531\ CFM$$

Determining the volume capacity of circulated room air (Vs)

$$V = V \times 2\ (m^3/hour)$$

$$= 1452{,}5\ m^3$$

Air is circulated as much as possible 1 s/d 2 times per hour.

$$V_k = 1452{,}5 \times 2 = 2905\ m^3/hour$$

$$= 5810\ CFM$$

AHU machine capacity required for swimming pools (Vt):

$$V_t = V_p + V_k$$

$$= 2905 \frac{m^3}{hour} + 900 m^3/hour = 3805\ m^3/hour$$
$$= 2245\ \text{CFM}$$

Determining AHU machine specifications

To provide an even distribution of air, 2 AHU units are used. so that each AHU has a volume rate capacity.

$$V_{AHU} = \frac{Vt}{2} = \frac{3805}{2}$$

$$= 1903 \frac{m^3}{hour} or = 3225\, CFM$$

Discussion

The results of the analysis of cooling load calculations and AHU analysis, namely: 1) From the results of calculations of heat load analysis in a swimming pool measuring 40 x 1 x 3.5 meters, namely: 2) Total sensible cooling load (Tsh) = 397.66 kW, total load latent cooling (Tlt) = 13.85 kW, total cooling load (Gth) = 411.5 kW. (including safety factor 3%). 3) The compressor power used by the AHU machine is 60.5 kW. Using R 134A Refrigerant. 4) The cooling engine's Coefficient of Performance (COP) is 6.8. 5) The amount of primary air as replacement is 900 m^3/hour for 50 people, while the circulating room air is 2905 m^3/h. 5) To provide even air distribution, 2 AHU units with a capacity of 1900 m^3/h are used, 6) The machine uses the carrier brand with type 39CQM AHU, with a blower power of 3 kW.

4. CONCLUSION

Based on the research that has been carried out, it can be concluded that the characteristics of brake With the completion of the analysis of the cooling load and AHU machine used in a swimming pool measuring 40x11x3.5 meters in Cikarang, it can be concluded: 1) Analysis of the results of the cooling load calculation, namely sensible cooling heat load (Qsh) = 397.66 kW, total load latent cooling (Qlt) = 13.85 kW, total cooling load (Gth) = 411.5 kW. (including safety factor 3%) or = 927 Watt/m^2. 2) From the analysis, the compressor power of a refrigeration machine using R 134 A is 60.5 kW or 81 HP. Huge COP. 6,8. 3) The cooling machine uses the Air Handling Unit (AHU) or Split Duct type with R 134A. uses 2 AHU units. Blower power 3 kW, rotation 2636 rpm to max 4000 rpm, with rotation regulation or Variable Speed Drive (VSD), 4) The capacity of the circulating air and replacement air is 2905 m^3/h. using 2 AHUs. with a capacity of 1900 m^3/hour.

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