

Air Conditioning Based Cooling System for Rooms

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Abstract

This study examines the design, modeling, and practical use of a 2.2-ton air conditioning (AC) system, which is intended to cool bigger areas, usually between 220 and 275 square feet. In order to guarantee effective operation under demanding circumstances, these systems frequently come with characteristics like strong compressors and larger fans in addition to their strong cooling capacity. Energy-saving features like inverter compressors may also be included in contemporary 2.2-ton air conditioners to control electricity usage while preserving cooling capability.

Keywords: Air conditioning system, 2.2-ton air conditioner, thermal comfort, residential and commercial cooling, vapour compression cycle.

1. Introduction

By eliminating heat and moisture, an air conditioning (AC) system creates a comfortable atmosphere within buildings. It absorbs heat and transfers it outdoors through a refrigeration cycle in which refrigerant changes states from liquid to gas and back again.. explains the increasing demand for cooling technologies, particularly in hotter regions, and presents the idea of air conditioning systems as a way to keep interior temperatures tolerable[1].

The following is the project's goal.

1. To chill, dehumidify, and move air around in a closed area.
2. To keep the interior atmosphere cozy and hygienic.
3. Try to filter out dust and other particles in order to purify the air.[2]

1.1 Air cooling system design of 2.2 ton.

Design of a 2.2 ton air cooling system. Particularly in areas with consistently high temperatures, air conditioning has emerged as a basic requirement in the residential, commercial, and industrial sectors. Because of their affordability, dependability, and ease of use, fixed speed air conditioners stand out among the many other types of air conditioning systems on the market[3]. The 2.2 Ton Heavy Duty Fixed Speed Air Conditioner is one item that best represents performance in this category. Southeast Asia, the Middle East, the Indian subcontinent, and other areas with harsh weather patterns. The 2.2 Ton Heavy Duty Fixed Speed model stands out among its commercial and semi-industrial products due to its

This particular type meets cooling requirements in settings where inverter air conditioners might not be the best option because of financial limitations, erratic voltage, or the requirement for high uptime in demanding applications. It is perfect for commercial spaces like shops, banks, and workshops because it is designed to provide steady cooling without the unpredictability of speed adjustments. The need for reliable yet efficient cooling systems has increased dramatically as business infrastructure and urbanization pick up speed. Although inverter technology, which enables variable compressor speed and increased energy efficiency, has gained popularity, fixed speed air conditioners continue to hold a sizable market share in tier-2 and tier-3 cities as well as semi-urban areas.[5]

The diagram illustrates the architecture of a smart air conditioner system, divided into an Outdoor Unit and an Indoor Unit.

Outdoor Unit: Contains a Fan Motor and a Compressor Motor, both represented by circular icons with an 'M' inside.

Indoor Unit: Contains a Fan Motor, a Temperature sensor, a Speed sensor, a microcontroller (μC), a Power Block, an IR receiver, and a remote control.

Power and Control Flow:

- The system is powered by 220V AC, which is converted to 12VDC and 12V/5VDC by the Power Block.
- The microcontroller (μC) receives input from the Temperature sensor and the Speed sensor.
- The microcontroller (μC) sends control signals to the Fan Motor and the Compressor Motor.
- The IR receiver receives commands from the remote control and sends them to the microcontroller (μC).
- The Power Block provides 12VDC to the Compressor Motor and 12V/5VDC to the microcontroller (μC).

The refrigeration cycle is started by this compression. Usually found in the outdoor unit, compressors come in a variety of forms, such as reciprocating, rotary, scroll, or screw.

2. The condenser coil

It is located at the outdoor unit, it plays a very important role in the cooling process by releasing heat from refrigerant.

3. Evaporator coil

The coil of the evaporator Heat absorption happens within the evaporator coil, which is housed in the interior unit. This low-pressure refrigerant absorbs heat from the indoor air as it enters the evaporator and evaporates. The general degree of indoor comfort is directly impacted by the evaporator coil's performance.[4]

4. Air filter

A filter for air The air filter, which is mounted at the interior unit's air intake, improves indoor air quality and keeps the evaporator coil from clogging .

5. The thermostat

In order to maintain the appropriate thermal conditions, it keeps an eye on the room temperature and initiates system operation. Modern thermostats can be smart or programmable, which increases energy efficiency.

6. A outdoor fan.

It improves the process of heat dissipation by drawing air from the atmosphere across the condenser fins.

Conclusion

For high-capacity cooling needs in both domestic and light commercial settings, the 2.2 Ton Heavy Duty Fixed Speed Air Conditioner is a reliable option. This system provides dependable thermal comfort and consistent performance under harsh weather conditions by integrating fixed-speed compressor technology. Its fixed speed operation guarantees operational simplicity, cheaper startup costs, and ease of maintenance, even if it lacks the variable speed efficiency of inverter-based systems. This type is designed for heavy-duty applications and includes long-lasting parts like a copper condenser coil, The system works best in tropical and semi-arid areas since it is designed to withstand high ambient temperatures, which frequently approach 52°C. Although the 2.2 Ton Fixed Speed AC uses a little more energy than inverter models[7]

All things considered, it is a trustworthy, high-quality air conditioner that can sustain indoor thermal comfort even under demanding load circumstances.

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