Types Of Air Conditioning System Exits In The Markets Of The Kingdom Of Saudi Arabia

1. Introduction

The Kingdom of Saudi Arabia (KSA) suffers from a desert climate with high heat during the day. The air ambient temperature rapidly increases after sunrise and the hot weather climate stay so until sunset. Every year, the summer ambient temperature could reach up to 50 ?C [1]. Therefore, the electricity sector in KSA facing a great challenge to meet the human demand. This demand is much affected by the energy consumption in the air conditioning systems. Around 50% of total electricity production is supplied to the residential sector. Moreover, the annual energy consumption growth is about 7% annually, and about 60% to 70% of the generated energy is consumed by the residential sector due to the air-conditioning systems during the whole year in the summer months [2]. In KSA, there are many types of air conditioning system exits in the markets.

2. Types of air conditioners

There are several types of air conditioning systems that can be applied for building cooling, heating through whole the year.

2.1. Central air conditioning

It is commonly used for cooling and favorable for larger homes. This type of air conditioner circulates cold air through supply and return ducts. Supply ducts carry the cold air into the home from air handling units. Then, once the air warms it circulated back to the air conditioner. A mixing ratio is used to save the energy and attain the indoor human comfort at the same time. For hospital buildings, a high percentage of fresh air must be used specially in the surgery rooms.

2.2. Mini-split air conditioner

These are most common air conditioner for home applications. This system has an outdoor compressor/condenser and an indoor evaporator with fan or air handling unit. It is an efficient way to cool individual rooms for easier retrofitting. Mini-split systems can have four indoor handling units, and all these indoor units are connected to the outdoor unit. In addition, each zone has its own temperature controlling thermostat, allowing us to control the operation conditions for each room separately. This advantage allows the user to cool a certain part of the house see Fig.1.

2.3. Window air conditioner

A window air conditioner is a compact unit, used for cooling only one room. It is known as a “unitary unit,” and installed in the window of a room. This unit Window units cools the room by taking the hot air from the room and cooling it in the air conditioner and blowing the cold air into

the room. But still suffer from the general appearance and the associated noise.

2.4. Portable air conditioner

Portable air conditioners are the next generation of the window units. This type of air conditioning unit takes in air from the room and cools it, then directs it back into the room. The unit then vents any warm air outside by means of an exhaust hose that is installed in a window. They also were designed to cool only one room. They are versatile, and easy to install.

2.5. Hybrid air conditioners

It alternates between using electricity and burning fuels to attain winter heating to save money and energy. In the summer, it extracts heat from the indoor and releasing it outdoors. In the summer season, it works as the conventional portable type works. While in winter, the heat pump system works in reverse mode, pulling heat from the outside ambient air and releasing it to indoor. And this heat can be supplied by the heat pump of by burning fossil fuel.

2.6. Geothermal heating & cooling

Geothermal energy and known as ground source heat pump systems are sustainable, energy-efficient, and has a very long lifespan. Since the ground temperature remains at constant temperature no matter how hot or cold it is in the atmosphere, geothermal technology extract the heat from ground and transfer it into building for the heating purposes [3]. In the winter, heat is extracted from the ground; in the summer, heat is extracted from the indoor air and released back into the ground [4]. This system is a new system, but it is not comprehensively used in KSA. See Fig. 2.

3. Energy saving in air conditioning

There are several ways to save energy consumption by the AC in the hot arid areas such as Al-Qassim region. These methods can be briefly mentioned as follows: -

1. Plant trees around the house to make external shading
2. Clothe and tight the windows
3. Flip a switch and use AC thermostat
4. Run some fans if possible.
5. Chill in the basement
6. Eliminate using the indoor stove and oven without vents
7. Regular checkup the AC components
8. Effect of duct on the air conditioning

Dust and sand effect significantly on the performance of the AC and consequently increases the energy consumption. The massive dust storms cause plugging filters. So, without proper replacing and fixing this problem, it ceases less cold air flow. Further, depending on the intensity of the storm your ducts may have worked themselves loose. Even the tiniest opening in your ducts is too big and can eventually compromise the efficiency of your AC unit if left unchecked. Furthermore, it could affect on the performance of the outdoor unit. Therefore, cleaning the outdoor unit must done after the sandstorm to enhance the heat dissipation rate from the

condenser to the atmosphere.

5. New types of non-conventional air conditioning (AC) systems

1- Adsorption AC system

An adsorption AC system is proposed to provide cooling domestic applications. This AC systems is powered by waste heat or solar energy. It uses an environmentally friendly refrigerant such as zeolite-water working pair [1].

2- Absorption AC system

The absorption AC is driven by heat energy too. This thermal energy can be attained from the waste heat or from the solar energy natural gas, and liquefied petroleum too. The used refrigerant in this system is water and ammonia or lithium bromide.

References

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