Room air conditioner is an appliance used especially for lowering temperature and humidity of air in a room. Its purpose is to provide cooling comfort during hot weather. It removes heat from the enclosed space and discharges it to the outside. Air conditioner (AC), once considered a luxury, is now gradually becoming an essential requirement in many households. Popularity of a room air conditioner has increased enormously despite consuming a large amount of electricity. Typically, one AC of 1.5 T capacity may consume electricity equivalent to the running of about 25 ceiling fans, and thus can increase electricity bill in a household substantially. In real practice, electricity cost of running an AC depends upon its energy efficiency as designed by its manufacturer, number of operating hours and how efficiently we operate and maintain it.

**Air Conditioning System Basics**

Basic components of the system include an evaporator, compressor, condenser (air-cooled or water cooled), Room ACs are air cooled, and an expansion device, similar to that of a domestic refrigerator. A refrigerant circulates in these components. It vaporizes in the evaporator absorbing the heat from the warm room air drawn across the evaporator coil. This cooled and dehumidified air. The compressor raises the pressure and temperature of the refrigerant vapors. The condenser condenses the refrigerant and transforms the high pressure refrigerant into high pressure liquid. Heat is rejected via outside air drawn across the condenser. The expansion device transforms the high pressure high temperature liquid refrigerant to low pressure low temperature mixture of refrigerant liquid and vapor. The refrigerant goes to the evaporator, and the cooling cycle continues.

**Energy Efficiency of Air Conditioner**

Efficiency of a room air conditioner is normally measured as Energy Efficiency Ratio (EER), which is the ratio of the cooling output, measured in British thermal units (Btu) per hour, to the power input (in Watts). The output capacity of a room air conditioner is thus 4 times the input capacity. Thus, the higher the EER, the more efficient the air conditioner is. At times, EER is defined a little differently. The cooling capacity instead of being denoted in Btu/hr is also denoted in Watts (1Btu/hr = 0.293 Watts). Thus EER is represented as Watts/ Watts or as a number without any units.

Two types of Room Air Conditioners are typically available in market. These are:

**Window air conditioner:** This is normally used for cooling individual room. Room air conditioner houses all the components of an air conditioning system (discussed in Box 1) in one casing.

**Split system air conditioner:** This consists of an outdoor metal cabinet that contains the condenser, condenser fan, and compressor, and an indoor cabinet that contains the evaporator and air handler.

**BEE Star Rating and Labelling of Air Conditioners**

In May 2006, Bureau of Energy Efficiency (BEE), a statutory body under Ministry of Power launched Standard and Labeling Program of electrical home appliances including air conditioners. Under this program, for the benefit of general public, the appliance manufacturers could voluntarily affix a Star Label on their products showing the level of energy consumption by the appliance both in terms of absolute values as well as equivalent number of stars varying from one to five, in accordance with BEE stipulation. The greater the number of stars on the label, higher the appliance energy efficiency and lower its electricity consumption (Refer Box 2 and Box 3). Affixing BEE star label has been mandatory for Room ACs from January 2010.

While selecting the air conditioner, do refer to the BEE Star Rated Label affixed on AC and also refer to the Star Rating analysis promoted by BEE from time to time through its web site (www.bee-india.nic.in) and advertisements.

**Energy and Cost Saving for 1.5 Ton Window or Split Air Conditioner at Different Star Ratings**

<table>
<thead>
<tr>
<th>Star Rating</th>
<th>EER</th>
<th>Cooling Capacity (Watts)</th>
<th>8 Hours Operation Cost (Rs/Day)</th>
<th>5 Months Operation Cost (Rs/Year)</th>
</tr>
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<tbody>
<tr>
<td>No Star</td>
<td>2.20</td>
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Note: Assuming 8 hours operation per day for five months in a year.

**Choosing the Right Size**

Room air conditioners generally available in the market have cooling capacities that range from 0.7 to 2 Tons. The required cooling capacity for a room air conditioner mainly depends on the size of the room being cooled, apart from several other factors. An air conditioner that is too small may not do a good job of cooling a room at the desired temperature range. An oversized unit costs more and may cool the room quickly but it may lead to poor humidity removal due to excessive on-off cycling.

**Table 1: Energy and Cost saving for 1.5 Ton Window or Split Air Conditioner at Different Star Ratings**

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Energy Saving Tips

- Use ceiling or table fan as first line of defence against summer heat, as running cost of a fan is much lower than an air conditioner.
- Keep windows and doors of air-conditioned rooms closed as often as possible.
- Avoid outside air intake: Since outdoor air is warmer and contains more heat and moisture than the conditioned air, it increases electricity consumption. Keep in mind that natural leakage through windows and doors will generally supply sufficient outdoor air for assuring comfort conditions, and especially when layers of dirt and mud are evident.
- Make sure upon installation and routine maintenance that the unit is well-sealed from the outdoors. Air leakage around AC can compromise both comfort and efficiency.
- Clean the air-conditioner filter regularly: A dirty air filter reduces airflow and may damage the unit. Clean filters enable the unit to cool down quickly and use lesser energy.
- Give the annual maintenance contract of AC directly to the manufacturer or its authorized company which has trained and well-qualified technical staff.
- Always insist that the maintenance technician measures total current drawn (in Amperes) by AC. Higher the current value greater is the electricity consumption.
- Experience shows a small unit running for an extended period operates more efficiently and is more effective than a large unit that cycles on and off too frequently. Important factors to consider when selecting the size of an air conditioner are room area, room height, location of room, number of persons likely to use the room, other electric equipment being used in room, window size, orientation of windows and walls, shading, local climate, etc. Though AC manufacturers do provide certain guidelines but it is advisable to seek expert advice as well, before selecting the size of AC.

Installing the Unit

- A little planning before installing air conditioner can save energy and money.
- The unit should be levelled when installed, so that the inside drainage system and other mechanisms operate efficiently. If possible, the unit should be installed in a shaded spot on your home’s north or east side. Direct sunshine on the unit’s outdoor heat exchanger decreases operating efficiency by as much as 10%. You can plant trees and shrubs to shade the air conditioner, but do not block the airflow. Make sure, upon installation and routine maintenance, that the unit is well-sealed from the outdoors.
- Air leakage around AC can compromise both comfort and efficiency. "Caulk (special sealants)" can be applied to seal the area around the unit is well-sealed from the outdoors. Air leakage around AC can compromise both comfort and efficiency. "Caulk (special sealants)" can be applied to seal the area around the unit.

Benefits of Installing an Energy-Efficient Room Air Conditioner

- Lower energy consumption.
- More efficient operation.
- Reduced operating cost.
- Improves indoor air quality.
- Greater comfort.
- Increases the value of your home.

Carbon Credits

- For every kilowatt-hour saved, a corresponding amount of carbon dioxide (CO₂) is reduced from the atmosphere. This reduction can help to mitigate the effects of climate change.

Additional Information

- Energy efficiency of the unit depends on various factors such as indoor and outdoor temperature, the size of the room, number of occupants, etc.

For any suggestions and additional information, please contact:

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