

Air Conditioners: Increasing Efficiency With Smaller Units

The gentle roar of air conditioning units is common and comforting to anyone coming in from the hot outdoors. However, the low rumble generally heard in homes and offices can mean that the air conditioning unit is over sized for the cooling load. If it's properly sized, an air conditioner that's running should not be audible.

The cooling load of any house or office varies based on inside and outside conditions, the result of which indicates the properly sized air conditioner needed to maximize efficiency and cost. Unfortunately, many air conditioning companies over size their units, causing problems with efficiency and costing the customer a lot more money than necessary. Simply because an air conditioning unit is large does not mean it is cooling more air more rapidly. In fact, it could be cooling less.

The Truth about Short Run Cycles

Isn't it a good idea to get a unit that's a little bigger than needed, so it will really cool the air down faster? No, not at all. An air-conditioning unit that is too large is inefficient because it runs shorter cycles, and shorter cycles cause less efficiency in cost and cooling.

Why is that? Because as an air conditioner first starts up, its energy and cooling is very wasteful. In fact, large units send out strong cold blasts of air designed for very large cooling loads. However, if the cooling load for the home or office is smaller than the unit is designed for, the cold blasts of air can "trick" the thermostat into thinking the entire cooling load has been cooled. So, the thermostat turns the air conditioner off. Generally, air conditioners reach peak efficiency after about ten minutes of constant running. For typical air conditioners, the production efficiency increases the longer it runs, so if an over sized unit is getting shut off and on constantly, then the power needed to start it up each time is more than the power it would take to keep a smaller unit running constantly.

Since the strong cold air designed for large cooling loads confuses the smaller cooling load designed thermostat, over-sized air conditioners are turned off before they can even run for ten minutes.

Because right sized units put out streams of air appropriately matched to the cooling load, the air in the space will be mixed slowly and more evenly. The frigid blasts of cold air from large units into undersized cooling spaces create drafts and uneven cooling, which can never be fixed since the thermostat will continually shut the unit off. Right sized air conditioning units, on the other hand, will cool slowly, mix air evenly, and eliminate drafts around air registers, thus allowing the air conditioner to run longer, reach peak efficiency, and lower energy costs.

Uneven Cooling Temperatures- Discomfort at its Worst

Uneven cooling can cause great discomfort, high energy bills, and inferior mixing of house air. The homeowner complains about living in a cave-like atmosphere, cold and damp. So when old units need to be replaced, many air conditioning contractors will purposely over size the new unit, aiming to provide the customer quickly with cool air. Then the customer is even more unhappy than before!

Sometimes though, the air conditioner can be correctly sized and still produce uneven cooling and air mixture. The contractor should check to see if the cooling distribution system (air ducts, grilles, filters, etc) will run efficiently with the new system. If the cooling distribution system is too small for even a correctly sized air unit, then the air will be pushed out quickly and perhaps cause the thermostat to shut off. On the other hand, if the cooling distribution system is too large for the new unit, the air flow may not reach to all rooms or may even fail to cool the areas around the registers.

When the air conditioner and cooling distribution systems do not match in size, then large amounts of air can be pushed through and over the air conditioning grilles, creating uncomfortably sharp blasts of cold air to come from the air vents. Thus, smaller rooms will become chilly while larger rooms may be still warm. It is important to figure the cooling load of the overall house or office, as well as the individual rooms, and match up a properly sized air conditioner with a cooling distribution system that can handle the airflow evenly.

Uneven cooling can also be caused by the over sizing of air units. Air conditioners that are too large for the cooling load put out air that is frigid very quickly, making the thermostat shut off as soon as the local area reaches the correct temperature. The right temperature may be found around the thermostat within 5 minutes or less, however, since the thermostat shuts off when the right temperature is reached, the rest of the house is still hot, while the room with the thermostat could be glacial. By matching the air distribution system with an efficiently sized air conditioner based on cooling loads, energy costs will be kept at a minimum while personal comfort will be at a maximum.

Mold and Mildew

Over sized air conditioning units will cause a problem bigger than costly energy bills and temperature discrepancies. The bigger problem is moisture. Over sized air conditioning units will inadequately circulate house air, and leave moisture in the air making it feel cold and clammy. The beginning of the air conditioning cycle is when its ability to remove moisture, also called latent capacity, is lowest, which is why over sized units will cause a moisture problem. The short running cycles of over sized air conditioners will fail to remove excess moisture, leading to wet, dank, as well as humid conditions that mold and mildew relish. In appropriately sized units, the indoor coil temperature is below the air dew-point temperature so moisture will condense on the coils, and be removed through the condensate drain after enough moisture has condensed. However, in over sized air conditioners, the coil is unable to operate at the low temperatures and since over sized units run short cycles, the moisture on the coils does not have time to build up an adequate amount of water before the air conditioner shuts off again. Consequently, the little bit of moisture that did build up on the coils simply evaporates back into the air instead of getting removed through the condensate drain.

Along with the cold and clammy feeling large units can cause, the moisture in the air can cause mold and mildew to grow on walls, in carpets, and even clothes. Mold and mildew, besides looking nasty and smelling awful, can pose health risks particularly for people with immune system deficiencies or breathing problems.

What is that Noise?

The reassuring noise of your air conditioner is not a good thing. Sure, it seems nice to hear your air conditioning when coming in from a hot, sweaty day; however, all you are hearing is the noise of wasted energy bill money. When an over sized air conditioning unit is used, the problem can be easily detected from the loud hum of fast moving air shooting through the air ducts and getting sucked back up

the return grill. Usually the vents, ducts, and grills will be too small to quietly handle the massive blasts from over sized air conditioners. By using an accurately sized unit it is easier to have sufficiently sized vent, duct, and grill areas that will keep noise at a bear minimum.

Saving Energy and Money

To begin with, money will be saved when buying a suitably sized air conditioner because it will be significantly cheaper than one with added tons of cooling. It will also save money in the long run because to keep a constantly running temperature it will not need as much power as a larger one that would shut on and off after short cycles. There is more wear and tear on the machine and cooling distribution system when an over sized air conditioning unit is used because the machine will be shutting on and off as well as forcing large blasts of air through small vents, ducts, and grills. Also, with an over sized machine, since it will noise problems within the system or unit may not be detected until it is too late to fix them and you have to buy a new air conditioner. It is very important to always check vents, ducts, grills, and filters for wear and tear often as well as getting the installing contractor to measure and correct the air flow over the inside coil.

Also, when investing in an air conditioning system, make sure your contractor calculates the cooling load of the rooms and over all space as well as using the Air Conditioning contractors of America (ACCA) developed Manual J to estimate the load as well as Manual D for duct design and manual S for selecting equipment. It is important to remember that Manual J already includes slight over estimating in their air conditioning size computation in order to cover any human error, so it is unnecessary to again round up to even a slightly larger sized unit, in fact, it would be better to round down slightly. In addition, you want to check the SEER, the Seasonal Energy Efficiency Ratio, as the standard method of rating air conditioners and the EER, the Energy Efficiency Ratio, as the efficiency of the air conditioner overall. The SEER uses three tests: one with humid indoor conditions, the second with dry indoor conditions and the third with dry conditions cycling the air conditioner on for six minutes and off for 24 minutes, all three using 80 degrees Fahrenheit inside and 82 degrees Fahrenheit outside. Overall the SEER gives a seasonal average idea of the efficiency of your air conditioning unit. The EER changes with the inside and outside conditions, falling as the temperature difference between inside and outside gets larger. As you shop for an air conditioning unit make sure you also take into account your window, wall, and floor instillation factors, as most modern buildings have much better instillation than older ones and therefore would require smaller air conditioners. Keep in mind that the most energy and money will be saved when the air conditioning

unit runs nearly constantly, given there are no leaks anywhere in the system.

Even if you have a correctly sized system and there are no leaks in the ducts, you can still lose energy efficiency if the air vents and return grills are not properly zoned. It is very important that you do not have two air vents or two return grills beside each other, as that will lead to extremely cold or hot temperatures from room to room. Additionally, you do not want an air vent right next to a return grill; otherwise all the cool air coming in the room will be sucked right back out through the grill. In the side-by-side vent and grill situation, the room will never become cool even if the unit is running constantly, and your power bill will be through the roof!