Extension Division
Virginia Polytechnic Institute and State University
Blacksburg, Virginia 24061

TN - 8

Community Education Model for Energy Conservation

CEMEC

The Electric Heat Pump

Source: Tennessee Valley Authority, Division of Power Utilization

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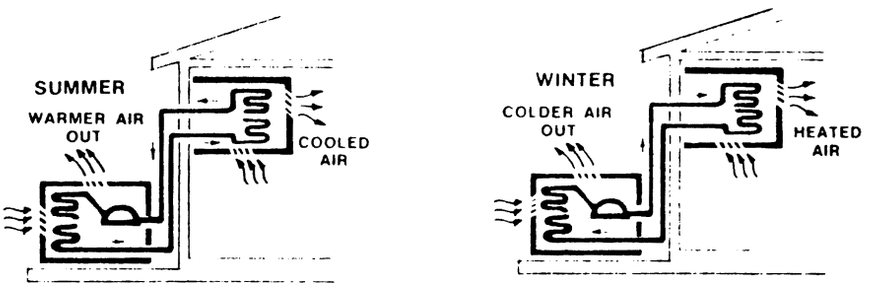
CONSERVES ENERGY LIKE NOTHING ELSE

The heat pump is a central heating and cooling system. It cools like any other central air-conditioning system, but it also is the most efficient heating system you can buy.

In order to understand why it is such an efficient heating system you must remember that there is some heat in even the coldest outside air. The heat pump, as its name implies, extracts this heat and pumps it into your home. During the heating season in the TVA area, one unit of electrical energy used to power the heat pump will provide approximately two units of energy in the form of heat. The heat pump itself doesn't really produce heat, but moves it from the outside to the inside of your home. During the summer it reverses the cycle and removes the heat from inside your home just like a conventional air conditioner.

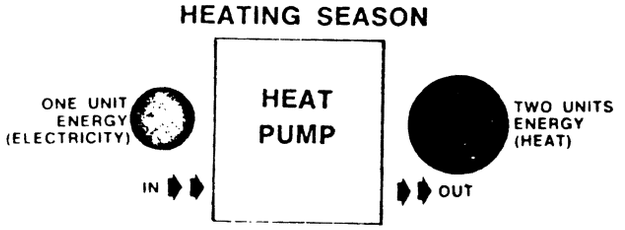


ONE BAD APPLE DOESN'T MEAN ALL APPLES ARE BAD

Although some heat pumps have unfortunately had a poor performance record in the past, there are good heat pumps being manufactured today which will give many years of reliable, economical service, if they are properly installed and serviced. Your power distributor can offer useful information in selecting a heat pump.

SAVES ON YOUR HEATING BILL

Heat pumps in the TVA area will average a seasonal performance factor of about two. This means that during the winter the heat pump has an efficiency of about 200 percent. For example, if one home has a central electric furnace and the heating cost is $200, an identical home next door using a heat pump would probably have a heating bill of about $100. As you can see, savings on the heat bill alone can pay for a heat pump.



SAVES NATURAL RESOURCES, TOO

Since the heat pump operates so efficiently, it greatly reduces the number of kilowatt-hours needed for heating your home. This, in turn, means that less coal or other fuel will be burned at the generating plant where the electricity is produced. An average 1,500-square-foot home using a heat pump would save the equivalent of more than three tons of coal each season.

IT HAS SOME UNIQUE FEATURES

If you are buying a heat pump for the first time, you should be aware of some of its features that are somewhat different from the conventional central system.

1. The Balance Point
   The heat pump compressor itself will provide all the heat your home needs until the outdoor temperature drops down to what is known as the "balance point." This is usually about 30 degrees. Below this point auxiliary resistance heat will automatically switch on, supplementing the heat from the compressor and maintaining the comfort level in your home.
2. Lower Supply Air Temperature
   During the heating season, the heat pump circulates a larger quantity of lower temperature air than you may have been accustomed to in a home with a conventional central furnace. But don't be concerned about this lower temperature air coming from your registers. Your heat pump will provide pleasant heating.
3. The Defrost Cycle
   During the heating season, your outdoor coil will occasionally collect frost and ice. The rate of collection depends upon the outdoor temperature and relative humidity. In order to maintain proper air flow over the coil, the unit will automatically "defrost" itself. Most of the time you will never realize this is taking place. But on rare occasions the unit will appear to smoke or steam. This is a normal operating condition, so don't let it alarm you.

A FEW THINGS YOU SHOULD KNOW

1. Failure to Operate - If your heat pump fails to operate, check the fuses or circuit breakers to make sure that power is on.
2. The Thermostat - If you are having a heat pump installed or you are moving into a home equipped with a heat pump, be certain to read the operating manual. If you didn't receive this booklet, contact the dealer who installed the equipment. Ask him to show you how to operate the thermostat. While he is there, practice the procedure until you are familiar with the function of each switch. If he can't come to your home, get the operating instructions from him and read them carefully before operating any of the thermostat's switches. Once you have found a temperature setting at which you and your family are comfortable (about 78 degrees in summer and 68 degrees in winter), try to avoid changing it. Each degree above 68 in winter and each degree below 78 in summer means a substantial increase in your bill.

   Finally, the thermostat is a delicate instrument and should be treated carefully. Avoid bumping it and don't let the children play with it.
3. The Heat Switch - Some heat pumps are equipped with a manually operated switch inside the thermostat cover which allows you to disconnect the compressor and heat your home with the supplemental heaters alone. This way you can maintain a desirable temperature should the compressor fail. Ask your dealer to show you the location of the heat switch and how to operate it

If your unit doesn't have this switch, we recommend that you have one installed. Do not, however, use the supplementary heat unless necessary. It costs more to operate than the heat pump.

4. Restarting After Power Outage - Most heat pumps employ some method of applying heat to the compressor crankcase to evaporate any liquid refrigerant which may have collected. If your power goes off, this crankcase heater goes off and the refrigerant begins to condense. In winter, if the compressor is started after the power has been off for several hours, serious damage to the compressor may result. If your power has been off for as long as 10 or 12 hours, you should perform the following steps:
    a. Turn the thermostat to the "off" position.
    b. When the power comes back on, leave the thermostat in the "off" position for three hours to allow time for the crankcase heater to evaporate all the liquid refrigerant.
    c. After the three-hour delay, reset the thermostat switch to the "on" position.
    d. If your unit has a heat switch, you can have heat from your resistance heaters during the three-hour waiting period. But be sure to turn the heat switch "off" at the end of three hours and let the compressor start operating.
5. Outdoor Thermostat - Your heating cost will be lower when the compressor alone is supplying as much of your heating requirements as possible. But when the outdoor temperature drops to the point where the compressor alone cannot keep your home comfortable, your thermostats will bring on some supplemental resistance heat. The best way to control this heat is with the use of a two-stage indoor and one or more outdoor thermostats. This combination of thermostatic control avoids any unnecessary "on" time of supplemental heat, increasing the overall efficiency of your heating system. If your heat pump doesn't already have an outdoor thermostat, your dealer can and should install at least one.
6. Supply Air Registers - It is important that nothing be done to reduce the flow of air through the ducts. Any reduction in indoor air flow will affect the operation of the system and could damage the compressor. Therefore, you should not close more than one register in your home at any one time. Also, be sure to not block the air register with furniture or drapes.

TIMES WHEN YOU CAN BE THE SERVICE MAN

Your heat pump, like your automobile, requires regular maintenance to perform well without costly breakdowns. Most maintenance should be done by a qualified serviceman. But there are certain things you can do.

1. Always cut off the power at the fuse or breaker box before you start.
2. Filters - It is very important that you keep the filters clean. The filters may be of the permanent or semi-permanent type which can be washed. Most heat pumps, however, use a throw-away type filter which must be replaced when dirty.

    How often should filters be replaced or cleaned? Some manufacturers offer as an accessory, an indicator light which signals when the filter is dirty and needs cleaning or replacing. If your unit doesn't have this feature, you should change or clean the filters at least every three months. And never operate the unit without filters.
3. Fan Motors - If the fan motors are accessible and don't have permanently oiled bearings, you should oil them periodically. Oil strictly according to the manufacturer's or serviceman's instructions. A good 10 or 20-weight oil should be carefully applied; too little or too much can damage the motor.

4. Fan Belts - If the fan belts are accessible, you should inspect them at regular intervals. If a belt is frayed, worn, or seems too loose, replace it or call your serviceman to check it.
5. Outdoor Unit - Certain precautions should be taken to prevent damage to the outdoor unit.
    a. The passage of air through the outdoor unit should not be obstructed in any way. If the fan cannot pull air through the coil freely, the compressor may be damaged.
    b. Don't plant shrubs close to the air intake and outlet.
    c. Cut all weeds and tall grass around the unit.
    d. Be sure the lawnmower doesn't hit the fins on the coil. Be very careful to avoid running the mower into or over exposed refrigerant lines.
    e. Don't allow sticks or other objects to be poked into the fan or coil housing.
    f. If you live in an area where snow may drift up around the coil, keep it swept away to allow free air movement.

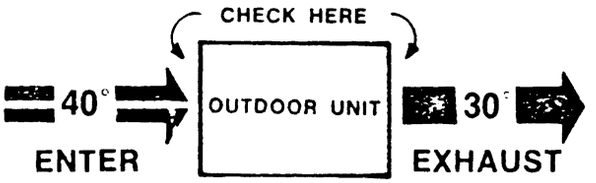
TIMES WHEN YOU SHOULDN'T BE THE SERVICE MAN

Except for the maintenance items listed above, you should have all other work done by a qualified serviceman. Don't trust the care of your valuable equipment to someone who "moonlights" and claims to be an expert repairman. Often these so-called "experts" know little more about the heat pump than you do.

We recommend that a good serviceman make a preventive maintenance inspection and service your unit once, or preferably twice, each year. By doing this, he can make all the necessary routine adjustments and servicing of the entire system and can often spot minor troubles which, if left uncorrected, may lead to major repair bills.

Your heat pump, if regularly serviced and maintained, should give you years of trouble-free comfort at low cost. If, however, you suspect that trouble is developing, call your serviceman right away. Here are some of the worning signals.

1. Unusual sound or noises in either the indoor or outdoor unit.
2. The outdoor coil becomes covered with ice and doesn't go into the "defrost" cycle as it should.
3. In the summer your heat pump operates just like an air conditioner. Therefore, if it fails to cool normally, call your serviceman.
4. During mild days in the heating season, here is a simple way you can check to see if the compressor is operating properly. Use a plain household thermometer to check the temperature of the air entering the heat pump. Then check the temperature of the exhaust air. The temperature of the air blowing out of the unit should be aboue 8-14 degrees cooler than the intake air. (The heat has been extracted.) If it isn't, the compressor is not functioning properly. Call the serviceman.



A PROPERLY FUNCTIONING HEAT PUMP

THE GUARANTEE IS FOR

Most manufacturers give a warranty which provides free parts for one year. The installing dealer usually provides free labor during this period. The compressor is warranted by the manufacturer for an additional four years, but labor charges are not included.

After these warranties expire, all service calls will be charged to you. Leading manufactureres offer service contracts of various types after the warranty expires, under which the installing dealer provides parts and labor. You may want to talk with your dealer about this contract. Whether you buy the contract or not is a matter of economics that only you can decide.

COMPLETELY AUTOMATIC

Operation of the heat pump can be completely automatic all year long. By setting the heating and cooling temperatures just once, your home will stay comfortably warm, or cool, regardless of the outside temperature changes.

Other desirable home comfort features can be added: An electronic air cleaner, which removes up to 95 percent of the airborne dirt particles. And an automatically controlled humidifier will maintain the proper relative humidity during the cold winter months.