

## Choosing a Dehumidifier

Dehumidifiers are used to remove moisture from indoor air. They are typically used to address moisture problems such as window condensation and comfort problems associated with high relative humidity. Dehumidifiers can also help keep a damp basement dry.

However dehumidifiers can be expensive to purchase and operate, and must be maintained to prevent other problems from developing.

This *About Your House* provides useful information that can be used to help you decide if you need a dehumidifier and how to choose one that meets your needs.

### WHAT IS HUMIDITY?

Water comes in three forms: ice, liquid and vapour. Water vapour is a gas that easily mingles with air. Humidity is the amount of water vapour in the air. It is normally measured as relative humidity (RH). RH is a percentage that indicates the amount of moisture in the air relative to the maximum amount the air can hold at that temperature. For instance, when air at a given temperature contains all the

water vapour it can hold at that temperature, it has a RH of 100 per cent. If the humidity exceeds 100 per cent, moisture will begin to condense from the air. If the air contains only half the water it can hold at that temperature, the RH is 50 per cent.

### HOW DO I MEASURE RELATIVE HUMIDITY?

An instrument called a “hygrometer” can measure the RH in your house. See *Measuring Humidity in Your Home* from CMHC’s *About Your House* series for more information about hygrometers, how to choose them and details on how to easily calibrate them to get readings you can use with confidence. Measuring the humidity in your home is an important first step in deciding if you need a dehumidifier.

Note that the relative humidity in your house varies from location to location. For example, the RH will be higher near a cold window than near a central wall, and even lower near a hot surface. If the relative humidity of the air next to the window is 100 per cent, you will see condensation on its

surface. In areas like damp or wet basements, where moisture evaporates into the air, you will find a higher RH—even if the temperature is the same as elsewhere in the house.

See *Measuring Humidity in Your Home* for the recommended range of indoor relative humidity levels in your house. The fact sheet also explains where moisture comes from so that you can reduce moisture sources, especially when the use of a dehumidifier is not enough to adequately control indoor relative humidity.

### DO I NEED A DEHUMIDIFIER?

If you usually keep your house closed up in the summer and keep your air conditioner and ventilation system operating, check the indoor RH in various rooms throughout your house with a calibrated hygrometer.

If the relative humidity reads above 50 per cent, running a dehumidifier can take away the excess moisture. The highest RH will often be in the basement and, if that is the case, that is where you should put your dehumidifier.

If you open windows for ventilation in the spring, summer and fall, you will likely find the indoor RH on the upper floors of your house to be higher than 50 per cent. This will not cause problems such as dampness and comfort problems in the warmer parts of the year, but the house will accumulate moisture through the summer. That retained moisture can cause significant problems in the fall when you close the house up. You will have to reduce humidity aggressively during the few short weeks of dry fall weather through dehumidifier use and increased ventilation to avoid these problems.

For houses with no air conditioning, a basement dehumidifier can usually keep basement RH below 60 per cent preventing moisture and comfort problems.

### WHEN IS A DEHUMIDIFIER NOT ENOUGH?

If you have leaks through your basement or crawl space walls and floors or your basement is damp, then you have to correct the moisture problem first. If your windows show condensation even when all room RH levels are kept below 35 per cent, consider upgrading your windows to more energy efficient units as they are more condensation resistant. Using a dehumidifier may not be enough to solve such problems.

### HOW DO DEHUMIDIFIERS WORK?

There are a number of different ways that dehumidifiers remove water from the air. Some of the most common are listed below, along with their limitations.

#### Heat-pump dehumidifiers

Heat-pump dehumidifiers are the most common. They are relatively complex machines that have a heat pump; two sets of coils; a motor-fan that moves air through it; a control system and panel; and a water bucket and drain system.

They cool incoming air to close to freezing, so that moisture in the incoming air is chilled to the point where massive condensation occurs on the first set of coils which dries the air passing through the dehumidifier. The condensation is collected in the bucket or automatically drained away.

The heat from the compressor is then transferred back into the air, making it somewhat warmer than when it came into the dehumidifier. If the dried air from the dehumidifier is mixed well within the room, the air throughout the room is dried out—that is, its relative humidity is lowered. If air from the room with the dehumidifier is circulated to all the rooms in the house, the air in the whole house will be somewhat dried. Over time this can significantly reduce the moisture content of the house and its materials.

Heat pump dehumidifiers can be relatively expensive if they are well built. They use a significant amount of electricity and they can be noisy. Having said that, heat pump

dehumidifiers are the preferred way to remove moisture from indoor air. Air conditioners also remove some moisture from the air, but newer units are not as effective in that role as older models since they focus on reducing air temperature, not removing water.

#### Chemical adsorbent dehumidifiers

This type of dehumidifier is designed for hot, humid climates and is not really suited for use in most of Canada.

Chemical adsorbent dehumidifiers absorb moisture from the air with a “desiccant”—a drying agent such as silica gel. The desiccant is on a heat exchange wheel. A separate air loop dries the desiccant in the wheel and exhausts the hot, damp air outdoors through special ducting.

#### Dehumidifying ventilators

This type of dehumidifier has an exhaust fan and sensor-controller. The sensor-controller is set to run when humidity rises to a programmed level. A dehumidifying ventilator is effective if installed in a basement or another room with a large moisture source.

Dehumidifying ventilators don't recover heat but they use less electricity than most heat pump dehumidifiers. They are not effective in hot, muggy weather, as they bring more humid outside air into the house and increase indoor humidity levels. They can be effective in cold weather. They may not be effective in lowering humidity in the spring and fall.

Caution: A dehumidifying ventilator depressurizes the basement, which can cause combustion gas spillage from fuel-fired furnaces and domestic hot water tanks. Make sure your heating contractor checks that your gas or oil furnace, water heater and wood-burning appliances can vent properly when the dehumidifying ventilator is operating. Consider using a carbon monoxide warning device if you install a dehumidifying ventilator. For more information, consult CMHC's *About Your House* fact sheets *Combustion Gases in Your Home* and *Carbon Monoxide*.

## CHOOSING A DEHUMIDIFIER

### Total costs of humidity control

The purchase price of your dehumidifier is only one of the many costs that you should consider when buying a unit for your house. For instance, the operating costs associated with the electricity

consumed by dehumidifiers over the life of the unit can be the same as, or more expensive than, the purchase price. With the rising cost of electricity, operating costs are important to consider when making your decision.

However, if you do not get excessive indoor moisture under control, the costs of resulting damage and adverse health effects can be much higher than the costs of dehumidification.

Over the life of the unit you may also have to pay shipping costs while your unit is under warranty and all repair costs after the warranty has run out. Be sure that you know where warranty work will be done before you buy any appliance, especially one that uses a compressor. Choosing a unit with a low initial cost but a poor energy factor and short warranty could cost you considerably more in the long run.

### Sizing your dehumidifier

Dehumidifiers are usually sized by floor area and the level of dampness of your home. Assuming that you have corrected the most serious moisture source problems, Table 1 can be used to size your dehumidifier.

When you choose a dehumidifier, however, always round up in size as the larger units are more efficient and can deal with your moisture problem more quickly. For example, for a 186 m<sup>2</sup> house with “damp” conditions, you would choose a dehumidifier with a minimum moisture removal capacity of 12 litres per day.

### Energy costs—the energy factor

It takes electricity to run both the compressor and the air circulation fan of a dehumidifier. The ENERGY STAR® standard for the performance of dehumidifiers defines the energy factor, EF, as the number of litres

Table 1 Sizing a dehumidifier

Floor area m <sup>2</sup>	Floor area Square feet	Damp conditions	Wet conditions
		Litres per day capacity	Litres per day capacity
46	500	6	7
93	1,000	8	9
139	1,500	10	12
186	2,000	12	15
232	2,500	15	18
279	3,000	18	22

Source: Natural Resources Canada. (2008). Major Appliance Requirements: ENERGY STAR® Qualified Major Appliances—Dehumidifiers. Retrieved February 2009 from <http://oee.nrcan.gc.ca/residential/business/manufacturers/appliance.cfm?attr=4#dehumidifiers>

of water removed from the air for each kilowatt-hour (kWh) of electricity used under the test conditions—air temperature of 27°C (80°F) and RH of 60 per cent. The higher the EF, the less you pay to remove water from humid air. However, it costs more to remove water from air if either the temperature or relative humidity in your home is lower than the test conditions.

If you pay 12 cents per kilowatt-hour for electricity and are using a dehumidifier with an EF of 1.2, you can remove 10 L (2.2 gal.) for each dollar spent for electricity. An advanced, energy efficient unit with an EF of 2.4 L/kWh would remove 20 L (4.4 gal.) for every dollar spent. The higher the EF the greater the savings; usually it pays to buy a dehumidifier with a higher EF.

Because the process of condensation gives off heat, a dehumidifier acts as a heat source. This can be useful in the spring and fall, especially in a basement that is a bit cool, but in mid-summer the added heat is not desirable. A high EF unit is preferable because it adds less heat for the same amount of water removed.

**Table 2** Minimum energy factor for ENERGY STAR® dehumidifiers (June 2008)

Capacity in L/day	Minimum EF L/kWh	Maximum EF Found L/kWh
<11.8	1.2*	1.38
11.9-16.6	1.4*	1.61
16.7-21.3	1.5	1.74
21.4-25.5	1.6	2.02
25.6-35.5	1.8	2.20
35.6-87.5	2.5	3.56

\* Many ENERGY STAR® units in these ranges were rated before June 2008 when minimum EF levels were lower and do not meet current minimum performance levels. Shop with care!

Source: Natural Resources Canada. (2008). Major Appliance Requirements: ENERGY STAR® Qualified Major Appliances—Dehumidifiers. Retrieved February 2009 from <http://oee.nrcan.gc.ca/residential/business/manufacturers/appliance.cfm?attr=4#dehumidifiers>

**ENERGY STAR® appliances**

The ENERGY STAR® program specifies minimum EF performance for dehumidifiers in relation to their capacity, as shown in Table 2.

You can find actual EF values for many models on the market by visiting ENERGY STAR® Canada’s website at:

<http://oee.nrcan.gc.ca/residential/business/manufacturers/search/dehumidifiers-search.cfm?attr=4> (Retrieved February 2009.)

Note that there is a considerable range of EF values for each capacity; the higher EF units will cost less to operate but may cost more to buy. Since better design is needed to get a better EF, a higher EF model may also be of better quality and result in fewer hassles for service requirements.

**Choosing the “right” dehumidifier for you**

A dehumidifier can be an important appliance for a healthy home and should be chosen with many questions in mind:

- Is it big enough? Units that are too small can let humidity get out of control and usually have higher operating cost.
- Does it have a high EF?
- Does it have a long warranty period?
- Does it have a frost-free feature?
- Does it reset to your preset conditions after a power interruption?
- Can you get local service if needed?
- Can you drain it into a sump or laundry tub, etc.?

The unit that you choose should meet all of your needs, not just a minimum purchase price that leads to more expenses in the long run. Choose a seller who can answer most of these questions for you, then go on line to get the rest of your questions answered.

## USING YOUR DEHUMIDIFIER

### Placing your dehumidifier

If your house has a forced-air furnace you can place your dehumidifier in any room or space that is heated or cooled by the furnace ducting. The forced air system will circulate air to and from the dehumidifier to help control humidity throughout the house. However if you have a room or basement with a moisture problem, it is usually more effective to locate your dehumidifier there. If you use radiators for heating, you should place the dehumidifier in the room or space with the highest relative humidity levels; something that can be determined by moving a calibrated hygrometer around your house.

If at all possible, drain the dehumidifier to a sump pit or floor drain, so that you do not have to empty the tank. A full tank shuts off the dehumidifier and when this happens, it is not doing its essential job. A connection can be made into the drain serving a nearby sink or tub so that connecting the dehumidifier to drainage is simple and permanent. This connection

should be above the P trap in the drain, to prevent exposure to sewer gases.

Placing the dehumidifier on a strong shelf makes drainage easier and allows you to easily see the controls, if the height is right. Take measures to prevent the dehumidifier from falling from the shelf as the units vibrate when operating. The laundry or utility room is the most common location for dehumidifiers, but if your utility room gets quite cool in wintertime, be sure that the dehumidifier model that you choose is rated for cooler conditions.

### Maintaining your dehumidifier

Modern dehumidifiers require and allow little consumer maintenance other than keeping the air filter clean and checking that the settings are what you want them to be. Since a dirty air filter can dramatically increase operating costs and reduce moisture removal rates, the filter should be checked once a month. The filter check and cleaning should only take a minute or so.

### Warranties and service

Choose units that have a long warranty period (five years is common) and be sure to send in the warranty card or register your new unit online. Note: Do this promptly as there is often a maximum length of time allowed for sending in the warranty paperwork after the date of purchase. Your dehumidifier paperwork will include all of that

information. Save the paperwork in a safe place after you read it carefully, as you may need it in the future.

While reading, note the local service facilities and highlight them so that they are easier to find when you need them. Record the dehumidifier's model and serial number on the warranty paper or on the operating manual for future reference. Mechanical equipment does fail and the cost of getting service, in travel time and expense, is usually less than the cost of buying a new unit, especially if you can find your warranty paperwork and have registered your unit after buying it.

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Printed in Canada  
Produced by CMHC 24-02-09  
Revised 2001, 2004, 2005, 2007, 2009

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