

Energy Star Dehumidifier product specification  
Draft 1 Version 3.0 comments

- 1) **Definitions:** Below are the definitions of the relevant terms in this document.
- A. **Dehumidifier:** A self-contained, electrically operated, and mechanically encased assembly consisting of: (a) a refrigerated surface (evaporator) that condenses moisture from the atmosphere; (b) a refrigerating system, including an electric motor; (c) an air-circulating fan; and (d) means for collecting and/or disposing of the condensate.
- a. **Stand Alone:** Portable unit designed to provide dehumidification within the confined living space where it is placed and plugged into an electrical outlet.
- b. **Whole House:** Unit designed to be incorporated into the home's HVAC system to provide dehumidification for all living spaces.

If a house does not have a forced air system in place or utilizes a high pressure forced air system, the whole house dehumidifier may be installed with its own separate ducting system. In this case the dehumidifier is not incorporated into the home's HVAC system.

Often there are living spaces that are not within the conditioned enclosure of a house. Porches and patios are examples of living spaces that are not typically conditioned.

In some cases there are conditioned spaces that may not be considered "living spaces" where dehumidification is required. An encapsulated crawl space is an example; it is not considered a "living space", but it is within the conditioned building enclosure.

Revise definition to something like:

**Whole House:** Unit designed to be incorporated into the home's HVAC system or installed with its own duct system to provide dehumidification for all conditioned spaces within the building enclosure.

- D. **Idle Mode:** The dehumidifier is not actively removing moisture but monitoring room humidity levels.

I believe the DOE is intending to define this as an "Off-cycle mode" which is considered a standby mode. Is "Idle Mode" intended to define something other than the DOE definition below?

– *Off-cycle mode is defined as a mode in which a dehumidifier has cycled off its main function by humidistat or humidity sensor, does not have its fan or blower operating, and will reactivate the main function according to the humidistat or humidity sensor signal.*

[http://www1.eere.energy.gov/buildings/appliance\\_standards/residential/pdfs/dw\\_dehum\\_cc\\_p\\_tp\\_nopr\\_presentation.pdf](http://www1.eere.energy.gov/buildings/appliance_standards/residential/pdfs/dw_dehum_cc_p_tp_nopr_presentation.pdf)

See page 25 of the pdf file for the proposed DOE mode definitions.

**Table 1: Performance Criteria for ENERGY STAR Qualified Dehumidifiers**

| <b>Product Capacity<br/>(Pints/Day)</b> | <b>Energy Factor Under Test<br/>Conditions (L/kWh)</b> |
|---|--|
| < 75                                    | ≥ 1.90   |
| 75 ≤ 185                                | ≥ 2.80   |

I support the decision to consolidate all of the dehumidifier capacities rated <75 pts/day into a single group requiring an EF ≥1.90 as well as the EF ≥2.80 requirement for dehumidifiers with capacities ranging from 75≤185 pts/day. I believe that the proposed EF levels will provide suitable efficiency differentiation from standard efficiency dehumidifiers for residential applications.

**B. Other Requirements:**

- a. Qualifying units shall be equipped with an adjustable humidistat control.

Some whole-house dehumidifiers do not incorporate an adjustable humidistat control within the dehumidifier itself. In some applications the whole-house dehumidifier is installed outside of the conditioned space. The whole-house dehumidifier is controlled by a humidistat that is installed at a suitable location within the conditioned space. This is similar to the use of remote thermostats to control space heating and air conditioning HVAC units. Therma-Stor whole-house dehumidifiers are intended to be controlled by remote humidistat controls.

Revise: Qualifying units shall be equipped with an adjustable humidistat control or equipped to accommodate a remote humidistat control.

- b. During idle mode, the main fan within the qualifying unit shall not exceed the runtime frequency of operating every 20 seconds within a 5 minute period to check humidity levels. Units using a smaller auxiliary fan to perform this function shall not consume more than 7% of the main fan power,

Another operating mode commonly known as defrost has the main fan engaged while the refrigerant compressor is off. This mode is necessary for operation in some low ambient temperature conditions when the evaporator coil temperature is below the freezing point of water. The refrigerant compressor will run until a thermostat indicates that there is frost/ice on the evaporator which will cause the compressor to shut off. The main fan will then continue to run moving ambient air across the evaporator to melt the frost/ice. The humidity control is calling for dehumidification in this mode.

Whole-house dehumidifiers provide operation modes (such as fresh air ventilation mode) that may cause the fan to exceed this runtime frequency. Please ensure that this requirement is applied only to the fan operation **required** by dehumidification modes and not to other operational modes/features.

It has been brought to EPA's attention that some stand alone dehumidifiers operate with their fans running continuously to bring air past the humidity sensor in the unit. EPA views this as another opportunity to further reduce total unit energy consumption and reward those manufacturers who have already incorporated energy-efficient components to address energy use in this mode.

The Integrated Energy Factor (IEF) metric currently being developed by DOE addresses the energy consumed in standby, off, and active modes but not idle mode as defined in Section 1. To address energy consumption in idle mode, EPA is proposing a requirement in Section 3.B that limits the continuous running of the main fan during this mode of operation. Manufacturers also have the option to use a smaller auxiliary fan to perform this function as long as the total power does not exceed 7% of the main fan power, or to use a remote sensor so that no fan operation is needed.

This prescriptive requirement is meant to ensure that ENERGY STAR dehumidifiers employ widely available efficient fan technologies, without burdening manufacturers with an additional test. EPA is interested in stakeholder feedback on the prescriptive approach for reducing energy consumption in idle mode.

I agree that the energy consumed while not actively dehumidifying but monitoring the humidity level in the conditioned space should be considered in the efficiency calculation of a dehumidifier. Dehumidifiers that require their fans to operate in order to "actively" sense the humidity level of the air passing through the unit should be penalized for the energy consumed by the fan during this mode of operation.

Speaking as a manufacturer, I would appreciate the DOE and EPA working together to synchronize their definitions and test requirements. I believe that consumers will be better served if all available products are defined and tested to the same criteria as it allows for a "level playing field" comparison for the consumer. Synchronizing the DOE and EPA definitions and test requirements will reduce the overhead for manufacturers and certification bodies (test agencies) by streamlining product definitions and tests.

**Q 1:** Do manufacturers test for part load conditions? If yes, how? And do units perform as efficiently at part load conditions as at full load?

**Q 2:** Do manufacturers test at additional environmental conditions? If yes, do units perform as efficiently at part load conditions as at full load?

Residential dehumidifiers are small heat pumps that operate on the same principles as household refrigerators and air conditioners. We design our products to operate across a range of conditions that we believe are germane to the intended application of the dehumidifier. We do pay particular attention to the AHAM DH-1 test condition since this is the condition used to measure and compare residential dehumidifier capacity and efficiency. We use environmental test chambers to control the entering air conditions when testing our products.

The capacity and efficiency of refrigerant dehumidifiers are dependant on the temperature and relative humidity of the air entering the dehumidifier; changing the condition of the

entering air can increase or decrease the measured capacity and efficiency of a refrigerant dehumidifier. Varying the entering air conditions away from the AHAM test condition will change the capacity and efficiency of a refrigerant dehumidifier.

**Q 3:** Why are some units designed to use the main fan this way?

**Q 4:** What are the other methods used by the unit to monitor humidity levels? How common is the usage of small auxiliary fans to monitor humidity levels and what is the typical energy usage?

**Q 5:** Does a prescriptive requirement make sense? Is there a better way to do a prescriptive requirement?

**Q 6:** Is this indeed rare enough not to limit availability?

I believe that the best designs sense humidity in the space where humidity is to be controlled rather than inside the dehumidifier. A free-standing dehumidifier is placed into the space to be dehumidified and a humidity sensor can be integrated into the exterior of the dehumidifier (which is exposed to the space) to sense the humidity level in that space and control the dehumidifier.

Whole-house dehumidifiers are often installed outside of the space where humidity is controlled, so an integrated humidity sensor will not accurately sense the humidity level in the desired space. Therma-Stor whole-house dehumidifiers accommodate (and are intended to be used with) remote humidity controllers that effectively and accurately sense the humidity level in the conditioned space.