Docket Optical System - Rulemaking Docket #12-BSTD-01: Overridable Communicating Thermostats

From: Wilkins Robert <RobertWilkins@Danfoss.com>
To: <docket@energy.ca.gov>
Date: 4/11/2012 10:16 AM
Subject: Rulemaking Docket #12-BSTD-01: Overridable Communicating Thermostats

Dear Madam or Sir:

I am writing to comment and provide recommendations on the proposed standards covering "Overridable Communicating Thermostats" dated March 30, 2012.

Danfoss is a leading global manufacturer of compressors, controls, heat exchangers and variable frequency drives for high efficiency HVAC and other building systems. We operate in over 100 countries, and have 12 manufacturing facilities in the USA, including one in California. Our customers include the leading manufacturers of HVAC equipment. As such we have a stake in the issue of standards for controls for HVAC systems.

Discussion of Issues

- "Section 110.2.(c) Thermostats" on page three states, "All unitary heating or cooling systems, including heat pumps, not controlled by a central energy management control system (EMCS) **shall have a setback thermostat.** [bold font added]

  Danfoss Comment: While the intent is probably appropriate and correct, the word "thermostat" implies a device that cycles the cooling and heating system on and off to maintain space temperature within the intended range. This is appropriate for traditional on-off cooling systems that have been used in the USA for almost a century.

  However, modern system designs are now sold, which utilize variable speed compressors, fans and blowers that do not cycle on or off to control temperature, but rather slightly modulate their speed and output to maintain desired space temperature, while providing annual energy savings of around 30% compared to traditional on-off systems. These modern variable speed systems do not utilize a traditional thermostat, but rather a control module with a temperature sensor, which communicates directly with the controls of the variable speed system to precisely control the unit's speed and output. That results in the substantial energy savings of such equipment.

  Requiring a thermostat, which is an on-off device, would frustrate the energy saving capabilities of modern variable speed systems. Rather, the specification should say, "shall have a setback thermostat, or in the case of variable speed systems, a setback control module." The rest of the document should be written to refer only to traditional on-off systems that utilize thermostats. A separate section or document should be prepared for controlling modern variable speed systems, as further explained below.

- Section headed "OCT Event Response" on Page 9 states, "OCTs, with communications enabled, shall be capable of receiving and automatically responding to the Demand Response Signals as follows:" Several situations are described, including,
  - "Upon initial installations…the OCT shall default to offsets of +4 [degrees] F for cooling

> and -4 [degrees] F for heating relative to the current set point in response to price signals or Demand Response Signals…."

Danfoss Comment: The demand-response or price response control scheme implied by this specification is to adjust the thermostat set point in response to Demand Response (DR) events. This is one of two commonly used demand response control schemes used in traditional on-off heating or cooling systems. The other common control scheme is to cycle compressors repeatedly on and off during the DR event, by a communicating relay in the compressor power circuit. Neither of these control schemes are appropriate for modern variable speed heating and cooling systems now being introduced in the US market, since they frustrate the energy-saving capabilities of modern variable speed systems.

Variable speed heating and cooling systems effectively save approximately 30% of the annual energy used by traditional systems, by precisely controlling the speed of the compressor, fans and blowers to match the exact load conditions. Only the optimum amount of energy is used at any point in time, so there is no need to cycle the units on and off, which is inherently inefficient for the compressor, fan, blower and heat exchangers. Setting the thermostat or control module back 4 degrees would cause the system to turn off until the space temperature changed by 4 degrees. Then the heating and cooling unit would resume operations. Energy would be wasted.

The preferred and most energy efficient demand response strategy for modern variable systems is to unload the system by a designated percentage, by slowing the compressor, fans and blowers. When this occurs, the cooling or heating output is reduced for the duration of the demand response event. But most importantly, such unloading results in increased energy efficiency of the compressor, fans, blowers and heat exchangers, since power is reduced more greatly than is output reduced. Inefficient on-off cycling is avoided. Thus, a modern variable speed cooling and heating system provides greater demand response benefits than traditional on-off systems.

In short, thermostat setback strategies for Demand Response events sub-optimize the superior energy efficiency and demand response benefits of modern variable speed cooling and heating systems, and thus should be avoided.

Recommendations:

- The entire proposed section or standard covering "Overridable Communicating Thermostats" should be clearly designated to cover only thermostats controlling traditional on-off cooling and heating systems.
- A parallel section or standard should be developed to cover demand-response and price-response control of modern heating and cooling systems now being marketed with variable speed compressors, fans and blowers. For these variable speed systems, the best control scheme during demand response or price response events is to reduce the speed and output of the system, while avoiding inefficient on-off cycling. Having a separate standard would ensure the enhanced energy efficiency and demand response capabilities of these modern systems are fully captured and utilized in California.

Thank you for the opportunity to provide comments. Please let me know if further information is required.

Respectfully,

Robert Wilkins

Vice President Public Affairs

Danfoss
11655 Crossroads Circle
Baltimore, MD 21220-2863

email: robertwilkins@danfoss.com
phone: 410-513-1153