Refrigeration

The New Commercial Standards

In the atmosphere of rapidly increasing regulation of HVACR equipment to achieve improved levels of efficiency, recent U.S. Department of Energy (DOE) proposed regulations have extended into the commercial refrigeration sector. Previous legislative and regulatory efforts directed most of their focus to the residential and light commercial heating and air conditioning sectors. Although the relatively constant nature of refrigeration electricity demand does not necessarily contribute to peak demand periods so widely publicized during summer heat waves, the sheer volume of electricity necessary to power commercial reach-in and walk-in refrigeration logically drives a quest to make this equipment as energy-efficient as possible.

In July 2007, DOE published its Advanced Notice of Proposed Regulation (ANOPR) concerning certain commercial refrigerators, freezers and combined refrigerator-freezers. The final rulemaking is due Jan. 1, 2009, for equipment manufactured on or after Jan. 1, 2012, and covers equipment never previously regulated. While the public comment period for the ANOPR ended in October 2007, some of the underlying premises of the proposed regulation merit dissemination.

Further, while it is primarily a regulation governing the efficiency standards to which manufacturers must design their equipment, there are aspects to it directly impacted by the installation and service community.

Based on the Air-Conditioning and Refrigeration Institute's (ARI) ANSI-approved Standard 1200-2006 "Performance Rating of Commercial Refrigerated Display Merchandisers and Storage Cabinets," the proposed regulation seeks to determine standards which drive a reduction in overall energy consumption. It requires offsetting any "initial cost" of higher-efficiency equipment by reducing operating costs within three years.

The beginning of the DOE July 2007 ANOPR spells out a reasonably complex set of variable describing categories of equipment, current levels of equipment energy efficiency, payback periods, etc. The factors dealing directly with the technology and service practices are summarized below:

i. DOE classified commercial equipment based on 3 characteristics:

a. Temperature – medium-temp (38), low-temp (0) and ice cream (-15). DOE modified ANSI/ARI Std.1200-2006 for rating ice cream freezers as -15 degrees Fahrenheit instead of -5.

b. Air Curtain/Door configuration (vertical-open, semi-vertical open, horizontal-open; vertical closed-transparent, vertical closed-solid; horizontal closed-transparent, horizontal closed-solid).

c. Remote condenser vs. self-contained condenser unit within the cabinet itself.

ii. "Application-temperature" equipment designed to operate at temperatures other than three defined above won't have separate standards; not enough equipment shipping AND most application-temperature equipment can be adjusted to one of three standard levels for testing.

iii. Even though some ice cream freezers are designed for -5 instead of -15, DOE is including them in rule coverage.

iv. Ice-cream dipping cabinets and floral display merchandisers ONLY excluded from standards if they do not meet EPACT 2005 definition of a "commercial refrigerator, freezer or refrigerator-freezer."

v. Equipment that "stores OR displays merchandise" IS included, while equipment used to process, manufacture or transport chilled or frozen food is NOT covered. But any equipment used to STORE chilled or frozen equipment IS covered. Walk-ins could technically be covered, because they STORE merchandise, but since the ANSI-ARI standard specifically excludes walk-ins, DOE will too.

vi. Base definition of commercial refrigerators/freezers indicates "The term 'remote condensing unit' means a factory-made assembly of refrigerating components designed to compress and liquefy a specific refrigerant that is remotely located from the refrigerated equipment and consists of one or more refrigerant compressors, refrigerant condensers, condenser fans and motors, and factory-supplied accessories." DOE is only regulating the display case portion of these systems, NOT the remote condensing unit (although it may govern them later).

vii. Secondary-loop systems are not covered under initial rules; maybe later.

viii. DOE concluded 10 years is the typical lifetime for commercial equipment.

ix. Estimates $156 per piece of equipment annual maintenance cost.

x. Does include cost of installation in initial increased cost of higher-efficiency equipment.

xi. Screening criteria for technologies to achieve energy savings: technical feasibility, practicability to manufacture/install/service, adverse impacts on equipment usability and availability, adverse impacts on health or safety.

xii. Technologies NOT used include: remote lighting ballast location, evaporator motor controllers, higher-efficiency evaporator and condenser blades, insulation increases or improvements, low-pressure differential evaporators, defrost cycle controls and defrost mechanisms.

Additionally, the ANOPR also includes lengthy calculations for payback periods, cost of energy, net present value of future savings, and other pertinent economic factors. However, our focus will remain on these factors directly tied to HVACR technologies and industry.

With these 12 tenets guiding the process to determine current and future levels of energy efficiency in certain types of commercial refrigeration equipment, one hopes the public commentary period brings several foundational premises to light for the DOE. These include the assumption of equipment lifecycle, the average annual maintenance cost, exclusion of remote condensing system components beyond the cabinet itself and the exclusion of certain technologies.

Underlying all these questions is a basic premise – for any equipment to achieve its designed energy-efficiency level, it requires not only proper installation but regular maintenance throughout its entire useful life.

Obviously, useful lifespan of equipment is a basic premise for calculating payback periods. The DOE has chosen a 10-year span as "useful life" definition, which is probably a good average. According to Robert Smith, CMS, past international president of RSES and, particularly pertinent to this discussion, manager of refrigeration service at Schnuck's Supermarket chain, "at least in the self-contained category, we typically get 12 to 14 years" for a given commercial refrigerator or freezer.

However, under Smith's watch, preventive maintenance is not just a good idea but a guiding principle. That means his experience with equipment lifespan is perhaps better than some who do not invest as regularly in care, cleaning and upkeep of equipment to keep it in peak operating condition. So if 10 years is the average, clearly a good portion of the marketplace is only using a piece of equipment six to eight years – not unlikely if proper care is not given.

Quality maintenance, though, is not only not guaranteed, it is not without real financial cost. It requires routine cleaning of evaporator and condenser coils, testing of components and more. In Smith's experience, this adds up: "For self-contained equipment, we schedule four thorough system cleanings per year, at $75 each, plus we average two service calls per year at $150 each." This adds up to $600 annually, or four times the average used in DOE calculations.

Steve Wright, CMS, longtime RSES member and president of Wright Brothers Inc., a commercial refrigeration contracting firm in Atlanta, GA, echoes a similar higher cost for remote condensing units under regular maintenance. "Last year, our cost to a store with 92 cases and three racks averaged about $224 per case. This year, the same store is averaging $369 per case," Wright says.

Perhaps the $156 annual average used by DOE is reflective of the current state of service overall in the industry – which would seem to imply virtually no service is taking place in many cases – but it would further seem that the future of the energy efficiency doctrine ought to reflect best practices, not the current state.

This basic presumption of preserving the status quo seems to have reached into the realm of determining which technology advancements the ANOPR will be considering in pursuing optimally efficient equipment standards. For example, the ANOPR states it will not consider improved defrost cycle controls because neither uses an optical sensor to detect the presence of frost nor sensing the temperature differential across the evaporator coil, which are unreliable "due to problems with fouling of the coil due to dust and other surface contaminants." A regular cleaning schedule should mitigate such adverse conditions.

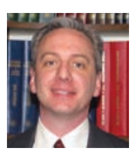
Whatever adopting technologies we embrace to achieve higher efficiency performance, the necessity of improved maintenance standards is that much more evident. As has been the case in the air conditioning and heating markets, increases in equipment efficiency tend to come from increasingly sophisticated controls. These controls, while perhaps providing less user intervention on a regular basis, generally require an even more vigilant maintenance schedule than less-efficient, less-"controlled" equipment. As Smith puts it, such advances demand "more maintenance because of more sophisticated controls." Further, he indicates there tends to be a "higher cost for these kinds of parts, and it also takes a better technician to troubleshoot" the system when it is not performing properly.

Curiously, the payback period calculations outlined in the ANOPR do not factor in higher maintenance costs for higher-efficiency equipment. In fact, the DOE states that changes to equipment operating expenses driven by efficiency standards are "usually lower." If the maintenance portion of operating expenses actually rises with efficiency, the energy cost portion must be dropping significantly. Further, the ANOPR indicates that "only the first year's operating expenses are considered in the calculation of the payback period." Typically a piece of equipment will have its lowest possible maintenance and repair costs during its first year of use, so it would seem that such financial calculations are inherently skewed.

Yet another area of interest in the ANOPR is the exclusion of the components beyond the display case for remote condensing unit systems. While granted the level of complexity in establishing an efficiency standard for systems designed beyond the manufacturer's doors is difficult, the opportunity for energy savings will hopefully keep the possibility of the DOE regulating these systems as a strong priority. Perhaps insight from Wright lends itself to this issue: "Commissioning and validation of performance are critical. For the most part, tune-ups are necessary because someone gets various settings wrong. Servicing practices are the biggest issue."

Clearly, the DOE is aware of numerous issues on which it needed further input to make its final ruling. Included toward the end of the ANOPR as "Issues on Which DOE Seeks Comment," there were 15 areas in which the DOE sought additional information. In particular, the area titled "Operation and Maintenance Practices" hopefully generated sufficient response to help develop actual cost figures associated with quality service.

While certainly making the equipment as energy efficient as is economically feasible is a good start, further exploration of ensuring quality service practices is worth consideration as well. No small order, to be sure, but demonstrating system performance through some sort of validation process could go a long way toward more completely achieving the desired goals of improved energy efficiencies.



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