Quantifying the Energy Savings from Installing / Repairing Strip Curtains

Taghi Alereza, ADM Associates, Inc., Sacramento, CA Dan Mort, ADM Associates, Inc., Sacramento, CA Charles Ehrlich, ADM Associates, Inc., Sacramento, CA Sasha Baroiant, ADM Associates, Inc., Sacramento, CA

Introduction

In certain applications, infiltration barriers for commercial refrigeration can be more cost effective than CFLs. In other applications, infiltration barriers may not generate any appreciable energy savings. The issue addresses the energy savings that result from using strip curtains as energy efficiency measures for walk-in coolers and freezers. The methodology related to this study was presented at IEPEC 2009. This paper now presents the results of short term metering and direct tracer gas measurements on approximately 100 walk-in freezers and coolers. The testing and monitoring data have been analyzed to produce simple equations that can estimate the energy savings that may result from the application of infiltration barriers. In particular (1) the equations from the ASHRAE refrigeration handbook (e.g. ASHRAE 13.4-12) are be cast into simpler forms (2) a formulation and measurement of the *discharge coefficient*, an empirical scale factor akin to ASHRAE 27-11.30, is presented, and (3) typical temperatures, door-open and close patterns, and strip curtain efficacies are presented for walk-in coolers and freezers in restaurants, supermarkets, convenience stores, and in refrigerated warehouses. These results indicate that the expected energy savings per square foot of strip curtain installed can vary by an order of magnitude depending on the specific application.

Methodology

The research conducted for the study discussed in this paper involves using CO₂ tracer gas measurement and analysis to determine the changes in infiltration that result from installing and/or repairing strip curtains for the doors of walk-in coolers and freezers. The tracer gas measurements are being made in the field at a total sample of about 230 facilities, distributed among supermarkets, convenience stores, restaurants, and refrigerated warehouses that are located in different climate areas. Short-term monitoring is being used at many of the facilities to collect data on door opening behavior for coolers and freezers and on kWh usage patterns. These various data thus collected on changes in infiltration and door opening behavior are being used as inputs for analyses of energy use reductions, either through application of ASHRAE refrigeration algorithms or simulations with DOE 2.2R.

Conclusions

The results of the study reported here provide empirical evidence based on measured data on the actual performance of strip curtains as refrigeration energy efficiency measures when used under real-world conditions.