SESSION 1A

TESTING TOUGH TECHNOLOGIES

Moderator: Patrick M. McCarthy, Lockheed Martin

PAPERS:

Are there Savings in Demand-Controlled Ventilation?
Anne West, The Cadmus Group, Inc., Portland, Oregon
Howard Reichmuth, PE, JJAI Mitchell & Associates, Portland, Oregon
Dave Korn, The Cadmus Group, Inc., Watertown, MA

HVAC Airflow Measurement Issues for Programs and Evaluators
Jarred Metoyer, KEMA, Inc., Oakland, CA
Eric Swan, KEMA, Inc., Oakland, CA
Jennifer McWilliams, Itron, Inc., Oakland, CA

Are They Cool(ing)?: Quantifying the Energy Savings from Installing / Repairing Strip Curtains
Taghi Alereza, ADM Associates, Inc, Sacramento, CA
Sasha Baroiant, ADM Associates, Inc, Sacramento, CA
Donald R. Dohrmann, ADM Associates, Inc, Sacramento, CA
Daniel Mort, ADM Associates, Inc, Sacramento, CA

Field Performance Assessment of Package HVAC Equipment to Quantify Benefits of Proper Service
S. Thamilseran, ADM Associates, Inc., Sacramento, CA
D. Mort, ADM Associates, Inc., Sacramento, CA
T. Alereza, ADM Associates, Inc., Sacramento, CA
S. Samiullah, Southern California Edison Company, Irwindale, CA

SESSION SUMMARY:

This session will focus on engineering measurements and studies which shed light on the energy savings from some key program classes and technology classes.

Demand Controlled Ventilation (DCV) refers to ventilation controls that modulate the outside air intake in the HVAC system based on carbon dioxide it the return air stream. It is one of the many classes of feedback-based automatic control technologies that are introducing significant efficiencies into numerous physical systems. In the paper, West and her co-authors provide a methodology to assess the savings associated with this technology, implement their method to make empirical measurements in a small number of cases, use that data to offer a theoretical model to predict savings in additional applications of this technology. For the cases studies, the savings results are impressive, and their methodological and theoretical paradigms will be very useful to future investigators working on this class of control technologies.

Very large budgets have been allocated to HVAC tune up programs across the nation and particularly in the west. The next two papers in this session address important details about those programs.

Metoyer and his co-authors challenge conventional thinking regarding the efficacy of the Temperature Split Method (TSM) as a diagnostic tool for identifying low air flow (underflow) as a cause for poor performance of packaged HVAC units in residential and small commercial applications. They cite empirical work by other authors, and use apparatus and methods of their own design to make independent field studies, to demonstrate that TSM as a diagnostic tool has failed to diagnose underflow when it existed, and has concluded underflow when it did not exist. In most program designs, corrective measures are applied according to the outcome of diagnostic procedures like TSM. Flawed diagnosis can therefore result in non-application of corrective measures where they should be applied, mis-application of corrective measures, and application of corrections that are not needed. All of these undermine the cost effectiveness of the programs. The incidence of these errors, in both their own measurements and those of their referent authors, is cause for concern in cases where this method is used exclusively. The paper also describes apparatus and procedures shown to provide considerably more reliable results.

Thamilseran and his co-authors explore the ways to diagnose faults in packaged HVAC equipment, and the effectiveness of corrective actions taken based on these diagnoses. While many HVAC servicing programs are performed with proprietary equipment or software, they introduce open-source equipment configurations and analytical approaches, and show that these are effective in identifying faults, classifying the faults and assigning corrective action. They further describe apparatus and procedures for measuring the performance of packaged systems before and after application of corrective measures, and reliably quantify the effect of the corrective actions. Their methodology for assessing the effectiveness of corrective actions holds the promise of sharpening the allocation of resources in such programs by indicating which corrections have the greatest impact.

Savings from refrigeration system measures, such as strip curtains, in small and mid-size commercial facilities such as supermarkets, convenience stores, restaurants, etc. are frequently stipulated and are often subject to wide variation from program to program. Empirical work to demonstrate the savings of these measures is relatively rare. In this paper, Alereza and his co-authors review the fundamental thermodynamic and fluid mechanics principles of how refrigeration measures perform. They explore the computational methods used to compute impacts of such measures. They instrument a sample of reach-in/walk-in cooler and freezers with a very comprehensive instrumentation package that captures all parameters relevant to the computations, and then they analyze the effectiveness of the computational formulae and suggest areas of uncertainty in the procedures. This is a rigorous look at how estimates are made which we often take for granted, and it provides good insight into improving estimates for strip curtains and for providing reliable estimates for other refrigeration measures.