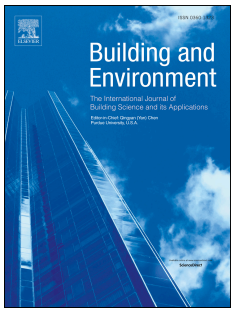
Accepted Manuscript



Improving HVAC operational efficiency in small-and medium-size commercial buildings

Woohyun Kim, Srinivas Katipamula, Robert Lutes

PII: S0360-1323(17)30192-0

DOI: 10.1016/j.buildenv.2017.05.010

Reference: BAE 4900

To appear in: *Building and Environment*

Received Date: 11 February 2017

Revised Date: 19 April 2017

Accepted Date: 8 May 2017

Please cite this article as: Kim W, Katipamula S, Lutes R, Improving HVAC operational efficiency in small-and medium-size commercial buildings, *Building and Environment* (2017), doi: 10.1016/j.buildenv.2017.05.010.

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

ACCEPTED MANUSCRIPT

Improving HVAC Operational Efficiency in Small- and Medium-Size Commercial Buildings

Woohyun Kim, Srinivas Katipamula,* and Robert Lutes

Pacific Northwest National Laboratory, Richland, WA 99352 USA

Abstract

Studies have shown that managing the setpoints and schedules of rooftop units (RTUs; air-conditioners and heat pumps) will result in up to 20% energy and cost savings. Another problem associated with RTUs is short cycling, i.e., when an RTU goes through ON and OFF cycles too frequently. Excessive cycling can result in decreased average efficiency (up to 10%), even if there are no physical failures in the equipment. Many small- and medium-size commercial buildings (SMBs) use rudimentary controls that are mostly manual and have limited scheduling capability and no monitoring or failure management. Therefore, many of these buildings are operated inefficiently and unnecessarily consume excess energy. SMBs typically use packaged RTUs that are controlled by individual thermostats. Ensuring the correct use of the zone setpoint and eliminating too frequent cycling of RTUs, thereby leading to persistent building operations, can significantly increase the operational efficiency of the SMBs. The work reported in this paper describes two algorithms for detecting the zone setpoint temperature and RTU cycling rate that can be deployed on low-cost infrastructure. These algorithms only require zone temperature data for detection without any additional sensor installation or supervised learning. The algorithms have been tested and validated using field data from 24 RTUs from six buildings in different climate locations. Overall, the algorithms were successful in accurately detecting the setpoints and ON/OFF cycles.

Keywords: Rooftop unit, Setpoint, Cycling, Zone temperature, Signal processing, and Peak detection.

* Corresponding author: Tel.: +1 509 372 4281; E-mail: Srinivas.Katipamula@pnnl.gov.

Download English Version:

https://daneshyari.com/en/article/4911489

Download Persian Version:

https://daneshyari.com/article/4911489

Daneshyari.com