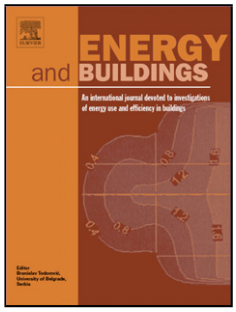

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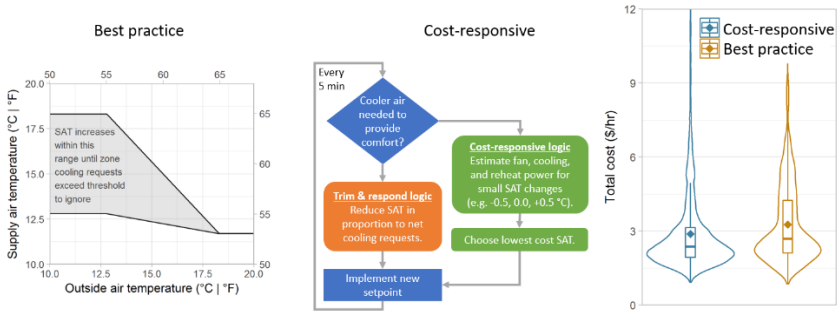
Evaluation of a cost-responsive supply air temperature reset strategy in an office building

Paul Raftery[1,*], Shuyang Li[2], Baihong Jin[3], Min Ting[2], Gwelen Paliaga[4], Hwakong Cheng[5]
(1) Center for the Built Environment, University of California Berkeley, CA 94720, USA
(2) Department of Mechanical Engineering, University of California Berkeley, CA 94720, USA
(3) Department of Electrical Engineering and Computer Sciences, University of California Berkeley, CA 94720, USA
(4) TRC, 436 14th Street, Suite 1020, Oakland, CA 94612, USA
(5) Taylor Engineering, 1080 Marina Village Parkway, Suite 501, Alameda, CA 94501, USA
* Corresponding author: p.raftery@berkeley.edu, research@paulraftery.com

Graphical abstract



Highlights:

- Estimate cooling, heating, and fan power for VAV systems
- Identifies the lowest cost setpoint for the supply air temperature
- Showed 29% HVAC savings in 6 month randomized controlled trial in office building
- Provides sequence of operations for implementation in building automation systems
- Widely applicable within HVAC industry today

Abstract

This paper describes a new supply air temperature control strategy for multi-zone variable air volume systems. We developed the strategy with the intent that it is simple enough to implement within existing building management systems. At 5-minute intervals, the strategy estimates the cost of fan, heating and cooling energy at three different supply air temperatures (current, higher, lower), and chooses the one with the lowest cost as the setpoint. We then implemented this strategy in a seven floor, 13,000 m^2 office building and compared the energy costs to the industry best practice control strategy in a randomized (daily) controlled trial over a 6-month period. We showed that the new control strategy reduced total HVAC energy costs by approximately 29%, when normalized to the typical annual climate data for this location and operating only during typical office hours. These findings indicate that the current industry best practice control strategy does not find the optimal energy cost point under most conditions. This