

Background

The Smartcool ECO3 is an energy efficiency retrofit product that augments thermostatic controls by adding dynamic compressor optimization functionality to reduce cooling and heating systems' energy consumption. The product seamlessly integrates with thermostats controlling residential and commercial package units, heat pumps, and small refrigeration systems.

AESC performed a preliminary, small-scale pilot test on the ECO3 to assess the potential energy savings and comfort levels provided by this technology. After a short trial period, AESC found the reduction in energy use to be significant without a noticeable effect on comfort.



AESC's Smartcool ECO3 Implementation

Pilot Test

While AESC does not endorse any vendor, the AESC team continually investigates the most advanced technologies in the marketplace. Whenever possible, the technology is applied to AESC's own facilities to reduce the organization's

energy consumption and carbon footprint.

To assess the effectiveness of the ECO3 in reducing energy use, AESC tested it in our headquarters in Carlsbad, CA. The device was installed on a single thermostat which controls four separate offices served by a single water source heat pump and was manually switched daily between the on (active) and off (bypass) states. This ensured consistent weather conditions for both states to enable a fair comparison. For a three week period in November and December 2015, the team monitored the heat pump AC current through the breaker. Additionally, to measure temperature ranges and occupant comfort AESC relied on a temperature data logger and occupant self-reporting.

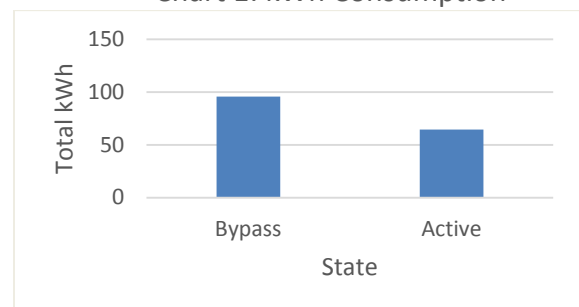
Logger data was downloaded, organized, and plotted for a visual and quantitative comparison of the system in seven days of bypass and ten days of active mode.

Project Results

Energy Savings

While Smartcool advertises that the ECO3 reduces kWh consumption by 20%, the AESC test environment realized a 33% reduction in kWh consumption. Results from the measurement period indicated that in the bypass state, normalized kWh consumption during the measurement period was 95 kWh versus 64 kWh in the active state, as shown in Chart 1.

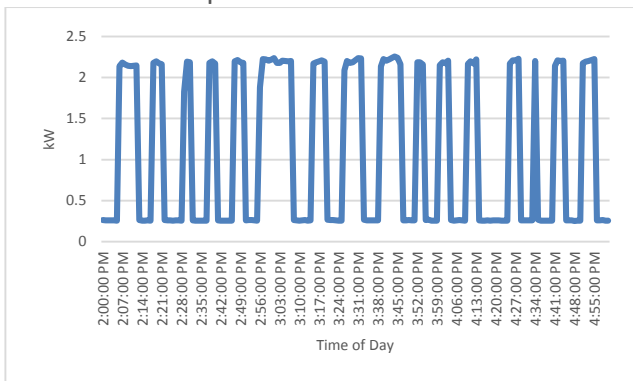
Chart 1: kWh Consumption



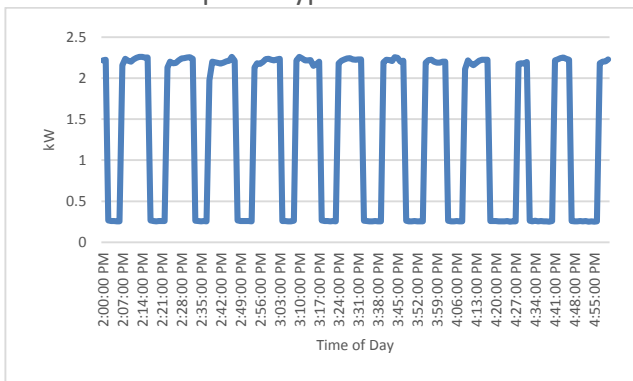
Demand Reduction

Without ECO3 the HVAC compressor is on a timer that turns on at 7 AM and turns off at 7PM on weekdays; with ECO3 the compressor is controlled dynamically based on the office environment. Graphs 1 and 2 compare demand (kW) between the active and bypass states in the test environment during peak hours (2 PM to 5 PM) for single, representative days. As the graphs illustrate, with ECO3 in the active state, there is a significant demand reduction over the course of the day due to shorter, but more frequent, intervals of compressor usage. Each peak on the graphs represents the compressor turning on. The graphs illustrate that the compressor stays on longer in the bypass state (Graph 2) than in the active state (Graph 1).

Graph 1: Active State kW



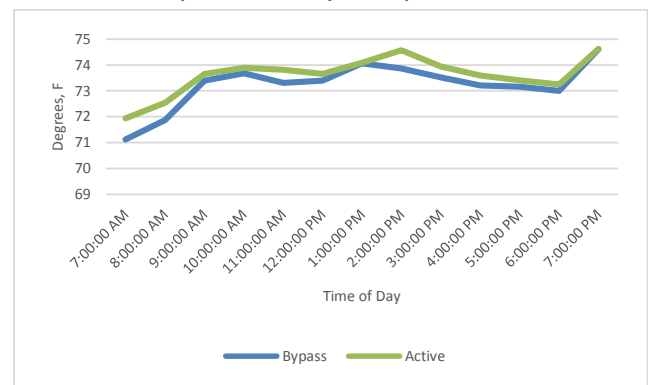
Graph 2: Bypass State kW



Comfort

With significant kWh savings of 33%, AESC anticipated that comfort could be compromised. However, based on occupant feedback and temperature measurements, comfort did not appear to be an issue. Graph 3 illustrates that the temperature between the two states stayed consistent with the ECO3 active and bypassed. This explains why there were not comfort issues for occupants and suggests the savings do not impact performance.

Graph 3: Hourly Temperatures



Next Steps

AESC performed this pilot test as a proof-of-concept. Based on these preliminary results, ECO3 may provide energy savings in commercial and residential applications.

To fully understand the savings potential and appropriate end use applications, a more comprehensive study should be conducted. AESC recommends that the study investigate best applications for customer types, savings and comfort impact, climate zones, and incentive program inclusion.

For more information:

www.aesc-inc.com

Carlsbad Corporate HQ
5927 Balfour Court
Suite 213