enVerid Data Sheet

Energy Modeling

A Guide to Modeling Energy Performance with HLR® Technology

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Energy savings. Air quality.

Introduction

Energy simulation software tools can be used to assess the impact of different energy efficiency measures on whole building energy consumption. This guide provides insight on how HVAC Load Reduction® (HLR®) technology saves energy in different applications while providing criteria for use of modeling software (e.g. eQUEST, EnergyPlus, HAP, TRACE, etc.) to calculate energy savings in accordance with *ASHRAE 90.1 – Appendix G.*

Energy Savings Overview

Prior to modeling HLR system energy savings, the energy modeler and engineer must understand how the HLR system integrates into the proposed building's HVAC design. The cases provided below represent common HLR system configurations and outline how these scenarios yield energy savings. In each example, the minimum outside air flow calculated per ASHRAE 62.1 Indoor Air Quality Procedure (IAQP) is significantly less than the minimum outside air flow calculated per ASHRAE 62.1 Ventilation Rate Procedure (VRP) when the air handling unit (AHU)/dedicated outdoor air system (DOAS) is not economizing.

For more information on how to design the HLR system into an MEP design and sample integration schematics, refer to the *HLR Technology Design Guide.*

Case 1A: Central System Supplying Cold Air Serving VAV Boxes	
Definition	HLR module(s) are integrated with an AHU equipped with a cooling coil operating to maintain a supply discharge air temperature (DAT) of 55° - 65°F mixed air to downstream variable air volume (VAV)/fan power boxes (FPB) with or without heating elements.
Savings	Occur when there is a demand for cooling and the AHU is not economizing.

Case 1B: Central System Equipped with Heating Coil Supplying Cold Air Serving VAV Boxes	
Definition	In colder climate zones, the AHU in Case 1A is likely to be equipped with a cooling coil and a heating coil to maintain the supply DAT of 55° - 65°F.
Savings	1. Occurs when there is a demand for cooling and the AHU is not economizing.
	2. Occurs when there is a demand for heating and the AHU is not economizing.

Case 2: Central System Supplying Cold or Hot Air	
Definition	HLR module(s) are integrated with an AHU equipped with a cooling coil and a heating coil that serves the space directly (e.g. AHU serving perimeter zones). These systems typically operate in "cooling mode" (DAT 55° - 65°F) or "heating mode" (DAT 85° - 95°F) until the space temperature meets the established temperature setpoint.
Savings	1. Occurs when there is a demand for cooling and the AHU is not economizing.
	2. Occurs when there is a demand for heating and the AHU is not economizing.

Case 3: 100% Outside Air System	
Definition	HLR module(s) are integrated with a DOAS that operates to maintain a specified DAT (e.g. 70°F) and dew point.
Savings	1. Heating/cooling savings occur when DOAS is mechanically heating or cooling.
	2. Fan savings occur year-round when DOAS is energized.

Modeling Methodology

To assess the energy reduction potential, the modeler/engineer must derive models for their Proposed Case, Proposed Case + HLR System, and the Baseline Case. The Proposed Case and Baseline Case models will have inputs for minimum outside air flow per ASHRAE 62.1 VRP. The Proposed Case + HLR System energy model will have inputs for minimum outside air flow per ASHRAE 62.1 IAQP. The table below summarizes the modeling methodology associated with each case.

	ASHRAE 90.1 Baseline	Proposed Case	Proposed Case + HLR System
Economizer Operation	Per ASHRAE 90.1 – Appendix G	Per Proposed Design	Same as Proposed Case
Energy Recovery	Per ASHRAE 90.1 – Appendix G	Per Proposed Design	Same as Proposed Case, ERV eliminated *if code allows*
Minimum Outside Air	Same as "Proposed Case"	ASHRAE 62.1 VRP	ASHRAE 62.1 IAQP[1]
Supply Air Fan Capacity	Per ASHRAE 90.1 – Appendix G	Per Proposed Design[2]	Same as Proposed Case, DOAS downsized *if applicable*
Return Air Fan Capacity	Per ASHRAE 90.1 – Appendix G	Per Proposed Design[3]	Supply airflow rate minus minimum outside air per IAQP

[1]USGBC & ASHRAE approved energy efficiency measure to model IAQP with HLR system minimum outside air and receive points for energy savings.

[2]If design information is not available, supply air value to be calculated based on supply-air-to-room-air temperature difference of 20°F for the minimum outside airflow rate, or the airflow rate required to comply with applicable codes or accreditation standards, whichever is greater.

[3]If design information is not available, value to be calculated based on the supply fan air quantity less the minimum outside air, or 90% of the supply fan air quantity, whichever is larger.

Sample Energy Models

enVerid has populated Baseline and Proposed Case + HLR System eQUEST energy models for the following cases:

- Case 1A: Baseline & Proposed Energy Models | Location: Houston, TX (Climate Zone 2A)
- Case 1B: Baseline & Proposed Energy Models | Location: Boston, MA (Climate Zone 5A)
- Case 2: Baseline & Proposed Energy Models | Location: Boston, MA (Climate Zone 5A)
- Case 3: Baseline & Proposed Energy Models | Location: Boston, MA (Climate Zone 5A)

The proposed energy models do not include any other energy efficiency measures. Where required in the baseline case, economizer and energy recovery are also included in the proposed case.

The energy models can be requested by sending email to BuildingSolutions@enverid.com.

Note: It is the energy modeler's and designer's responsibility to assess all proposed control sequences, setpoints, etc., and apply sound engineering judgement when performing any energy model. Refer to *ASHRAE 90.1 – Appendix G* for comprehensive energy modeling guidelines.

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enVerid Systems, Inc. is committed to improving energy efficiency and indoor air quality in buildings worldwide through its innovative HVAC Load Reduction® (HLR®) solutions. Awarded the prestigious 2016 R&D 100 Award, enVerid is the only solution that helps commercial, education and government buildings remove carbon dioxide (CO_2), aldehydes, volatile organic compounds (VOCs) and particulate matter ($PM_{2.5}$) from indoor air, reducing the outside air intake required for ventilation. enVerid's HLR technology is ASHRAE-compliant and has been recognized by the U.S. Department of Energy, the U.S. General Services Administration's Green Proving Ground Program, and the U.S. Green Building Council. For more information, please visit www.enverid.com.

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