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Computer Modeling VRF Heat Pumps in Commercial Buildings Using EnergyPlus Oct 21 2020 Variable Refrigerant Flow (VRF) heat pumps are increasingly used in commercial buildings in the United States. Monitored energy use of field installations have shown, in some cases, savings exceeding 30% compared to conventional heating, ventilating, and air-conditioning (HVAC) systems. A simulation study was conducted to identify the installation or operational characteristics that lead to energy savings for VRF systems. The study used the Department of Energy EnergyPlus[®] building simulation software and four reference building models. Computer simulations were performed in eight U.S. climate zones. The baseline reference HVAC system incorporated packaged single-zone direct-expansion cooling with gas heating (PSZ-AC) or variable-air-volume systems (VAV with reheat). An alternate baseline HVAC system using a heat pump (PSZ-HP) was included for some buildings to directly compare gas and electric heating results. These baseline systems were compared to a VRF heat pump model to identify differences in energy use. VRF systems combine multiple indoor units with one or more outdoor unit(s). These systems move refrigerant between the outdoor and indoor units which eliminates the need for duct work in most cases. Since many applications install duct work in unconditioned spaces, this leads to installation differences between VRF systems and conventional HVAC systems. To characterize installation differences, a duct heat gain model was included to identify the energy impacts of installing ducts in unconditioned spaces. The configuration of variable refrigerant

flow heat pumps will ultimately eliminate or significantly reduce energy use due to duct heat transfer. Fan energy is also studied to identify savings associated with non-ducted VRF terminal units. VRF systems incorporate a variable-speed compressor which may lead to operational differences compared to single-speed compression systems. To characterize operational differences, the computer model performance curves used to simulate cooling operation are also evaluated. The information in this paper is intended to provide a relative difference in system energy use and compare various installation practices that can impact performance. Comparative results of VRF versus conventional HVAC systems include energy use differences due to duct location, differences in fan energy when ducts are eliminated, and differences associated with electric versus fossil fuel type heating systems.

A Guidebook on Commercial Heat Pump and Heat Recovery Equipment for Domestic Water Heating Aug 19 2020

A Gas-engine-driven Heat Pump for Residential and Light Commercial Use Mar 26 2021

Heat Pump Water Heaters, Commercial Jun 28 2021

Heating and Cooling with Ground-Source Heat Pumps in Cold and Moderate Climates Feb 22 2021 Heating and Cooling with Ground-Source Heat Pumps in Cold and Moderate Climates: Design Principles, Potential Applications and Case Studies focuses on applications and cases studies of ground-source heat pumps in moderate and cold climates. It details technical aspects (such as materials, thermal fluid carriers and pumping, and drilling/trenching technologies), as well as the most common and uncommon application fields for basic system configurations. The principles of system integrations and applications in moderate and cold climates (such as hybrid, solar-assisted, thermo-syphon, foundation, mines, snow melting, district heating and cooling ground-source heat

pump systems, etc.) are also presented, each followed by case studies. Based on the author's more than 30 years of technical experience Discusses ground-source heat pump technologies that can be successfully applied in moderate and cold climates Presents several case studies, including successful energy results, as well as the main lessons learned This work is aimed at designers of HVAC systems, as well as geological, mechanical, and chemical engineers implementing environmentally-friendly heating and cooling technologies for buildings.

Economics of a Commercial Heat Pump Jul 22 2023

Commercial Ground Source Heat Pump Design Guide Jul 10 2022

Commercial Applications of the Heat Pump Jun 21 2023

Next Generation Commercial Heat Pumpwater Heater Using Carbon Dioxide Using Different Improvement Approaches Jul 18 2020

Heating and Cooling with Ground-Source Heat Pumps in Cold and Moderate Climates May 16 2020 Heating and Cooling with Ground-Source Heat Pumps in Cold and Moderate Climates:

Fundamentals and Basic Concepts covers fundamentals and design principles of vertical and horizontal indirect and direct expansion closed-loop, as well as ground and surface-water ground-source heat pump systems. It explains the thermodynamic aspects of mechanical and thermochemical compression cycles of geothermal heat pumps, and describes the energetic, economic, and environmental aspects associated with the use of ground-source heat pump systems for heating and cooling residential and commercial/institutional buildings in moderate and cold climates. Based on the author's more than 30 years of technical experience Focuses on ground-source heat pump technologies that can be successfully applied in moderate and cold climates Discusses technical aspects as well as the most common and uncommon

application fields of basic system configurations This work is aimed at designers of HVAC systems, as well as geological, mechanical, and chemical engineers implementing environmentally-friendly heating and cooling technologies for buildings.

The Heat Pump and Its Commercial Applications in the Philadelphia Area Apr 07 2022

Commercial Ground-Source Heat Pump Systems Nov 14 2022

Development and Demonstration of a High Temperature Heat Pump for Commercial Water Heating Jun 09 2022

Residential and Commercial Heat Pump Subprogram Dec 03 2021

Transcritical CO2 Heat Pump Apr 19 2023 A timely and comprehensive introduction to CO2 heat pump theory and usage A comprehensive introduction of CO2 application in heat pump, authored by leading scientists in the field CO2 is a hot topic due to concerns over global warming and the 'greenhouse effect'. Its disposal and application has attracted considerable research and governmental interest Explores the basic theories, devices, systems and cycles and real application designs for varying applications, ensuring comprehensive coverage of a current topic CO2 heat transfer has everyday applications including water heaters, air-conditioning systems, residential and commercial heating systems, and cooling systems

Toward Market Transformation Aug 11 2022

A Review of Commercial Heat Pump Installations for Southeastern Electric Exchange Mar 06 2022

Standard for commercial and industrial unitary heat pump equipment Apr 14 2020

S-Series (TUMY) Catalog Jun 16 2020 When it comes to providing personalized comfort in every room of every building Trane/Mitsubishi Electric is here to help. The S-Series (TUMY) offers an air-source heat pump lineup that can be tailored to any

application's requirements.

The Heat Pump, Commercial Forecasts Sep 12 2022

The Commercial and Industrial Electric Heat Pump Option Oct 01 2021

Commercial Heat Pump Water Heaters Mar 18 2023

Commercial Heat Pump Water Heater Marketing Guide Dec 15 2022

Ground-source Heat Pump Systems for Residential and Commercial Applications Aug 31 2021

Performance Improvements in Commercial Heat Pump Water Heaters Using Carbon Dioxide Apr 26 2021

Operating Experiences with Commercial Ground-source Heat Pump Systems Nov 21 2020

Heat Pump Applications in Residential and Commercial Buildings Nov 02 2021

Heat Pumps for Sustainable Heating and Cooling Jan 04 2022

This book highlights the significance of using sustainable energy to prevent the deterioration of our planet using heat pumps. Energy sustainability can be achieved through improved energy efficiency. In this regard, heat pumps offer an energy-efficient alternative for heating and cooling. To drive the adoption of heat pumps as a key component of sustainable buildings, the authors focus on examining sustainable practices in heat pump operations and innovative system design. In view of the growing desire to use sustainable energy to meet heating and cooling demands and improve indoor air quality, this book offers a valuable reference guide to the available options in HVAC (heating, ventilation, and air-conditioning) system design. To begin with, the authors define sustainable energy and discuss the trend of “thinking green” in building design. They then discuss sustainable practices and heat pump applications in mapping out HVAC systems. In turn, they examine the use of green operations to promote sustainable

practices and, in order to highlight the importance of innovative design, discuss the configuration options and precision control aspects. In closing, the authors illustrate innovative sustainable design on the basis of several energy-efficient cases. The book's main goal is to drive the adoption of sustainable energy solutions. Heat pumps, it argues, represent the most efficient system for meeting commercial/recreational/residential heating and cooling demands. The book not only examines industrial practices in heat pump application, but also discusses advanced heat pump technologies and innovative heat pump designs.

Commissioning, Preventive Maintenance, and Troubleshooting Guide for Commercial Ground-source Heat Pump Systems May 20 2023 This book covers the project implementation stage and reviews the necessary technical information for geothermal or geoexchange heat pump systems. Commissioning, maintenance requirements, and troubleshooting for these energy-efficient systems are covered in detail. This guide is a valuable reference for those involved in the design, installation, and operation and maintenance of commercial building ground-source heat pump systems. ASHRAE Research Project 94 (SP-94). I-P units.

Hybrid Ground Source Heat Pump Systems for Commercial Applications Dec 23 2020

Heat Pumps and Electric Heating Feb 05 2022

Energy Audits and Improvements for Commercial Buildings Sep 19 2020 The Intuitive Guide to Energy Efficiency and Building Improvements Energy Audits and Improvements for Commercial Buildings provides a comprehensive guide to delivering deep and measurable energy savings and carbon emission reductions in buildings. Author Ian M. Shapiro has prepared, supervised, and reviewed over 1,000 energy audits in all types of commercial facilities, and led energy improvement projects for many more. In this book, he merges real-world experience with the latest

standards and practices to help energy managers and energy auditors transform energy use in the buildings they serve, and indeed to transform their buildings. Set and reach energy reduction goals, carbon reduction goals, and sustainability goals Dramatically improve efficiency of heating, cooling, lighting, ventilation, water and other building systems Include the building envelope as a major factor in energy use and improvements Use the latest tools for more thorough analysis and reporting, while avoiding common mistakes Get up to date on current improvements and best practices, including management of energy improvements, from single buildings to large building portfolios, as well as government and utility programs Photographs and drawings throughout illustrate essential procedures and improvement opportunities. For any professional interested in efficient commercial buildings large and small, Energy Audits and Improvements for Commercial Buildings provides an accessible, complete, improvement-focused reference.

Meeting the Electric Heat Pump Competition in Commercial Buildings Jan 24 2021

Operating Experiences with Commercial Ground Source Heat Pump Systems Oct 13 2022

An Evaluation of the Heat Pump for Commercial Heating Aug 23 2023

The Heat Pump Jan 16 2023

Commercial Heat Pump Water Heaters May 28 2021

Domestic Hot Water Heat Pumps for Residential and Commercial Buildings Feb 17 2023

Commercial Heat Pump Water Heaters Jul 30 2021

Ground Source Heat Pump Residential and Light Commercial Design and Installation Guide May 08 2022

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