

Agenda

Presented by Bart Bales, PE, MSME

Overview of Systems to be Covered

Air-source heat pumps Ground-source heat pumps
Condensing boilers & furnaces Pellet-fired boilers
Solar-assisted space heating & domestic hot water

Heat Pumps Overview

How they work: heat pump process cycle, terminology, measures of performance
COP (coefficient of performance)
Performance in cold climates
Air-source and ground-source heat pumps; water-to-air, and water-to-water systems

Air-Source Heat Pump Performance Information & Case Studies

Split systems, mini-splits, and ducted systems
Cold-climate heat pumps Capacity as a function of outside air temperature
Variable refrigerant flow (VRF) heat pumps
Air-to-air, air-to-water Outdoor condenser
Indoor terminal equipment Examples & case studies
Proposed improvements to rating metrics for air-source heat pumps
Regional cold climate system specifications
Results from air-source heat pump performance studies
Air-source heat pumps in commercial use

Ground-Source Heat Pump Performance Information & Case Studies

Ground-source & ground water heat pump configurations
Closed loop, open loop, and standing column heat pump systems
High-performance equipment options and recent developments
Water-to-air and water-to-water heat pumps
Commercial examples and studies
The importance of controls and control strategies on optimized energy performance

Combustion-Based Heating Systems

Boiler technology fundamentals & operations information
How to optimize heating performance -Different rules for different boiler technologies
The importance of resetting water temperatures based upon load
The importance of right-sizing boiler stages for optimal operation

Biomass Boilers Performance Information & Case Studies

Equipment examples
Log-fired boilers equipment & case studies - commercial & residential
Wood-chip equipment & case studies; Wood-pellet boilers equipment & case studies
Vacuum and augur-fed pellet systems
Ash management and disposal systems
Inside the pellet boiler
Efficiency and the effects of ratings based on higher or lower heating values of fuel
Case studies and examples for institutional facilities

Solar-Assisted Space Heating & Domestic Hot Water Performance Information/Case Studies

New construction - residential solar thermal space heating systems
Rooftop solar thermal panels, hot water storage & radiant floor heat delivery systems
Solar domestic hot water systems:
Closed loop, drain-back, and steam-back solar thermal system configurations

Round-Up and Review

**Renewable Thermal Heating Systems for
Commercial and Residential Buildings**
Portland, ME - Friday, February 21, 2020

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Learning Objectives

You'll be able to:

Explore air-source and ground-source heat pump principles, technology, performance, and applications, so project owners are aware of the advantages and can make informed HVAC decisions,

Explain combustion-based heat system principles, technology, performance, and applications.

Describe solar-assisted domestic hot water and space heating principles, technology, performance, and applications, so clients can evaluate the advantages and drawbacks of these systems.

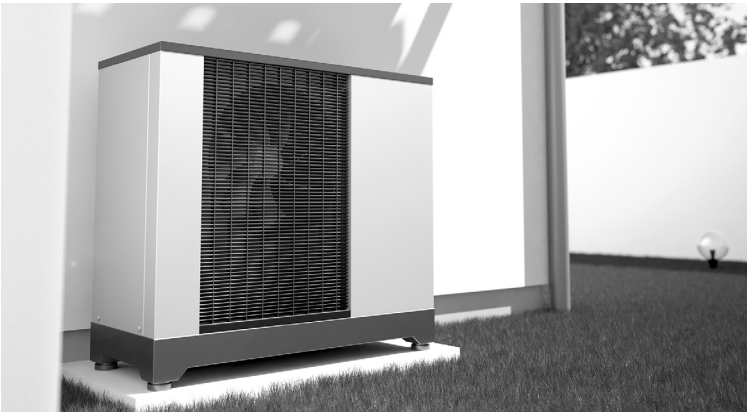
Explain biomass boiler principles, technology, performance, and applications.



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Renewable Thermal Heating Systems for Commercial and Residential Buildings

Portland, ME - Friday, February 21, 2020



Examine the basics of air-source and ground-source heat pump systems

Explore heat pump performance for air-to-air, water-to-water, air-to-water, and water-to-air systems

Discuss boiler technology and operation

Evaluate biomass boiler performance

Learn about solar-assisted hot water and solar space heating systems

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Faculty

Bart Bales, PE MSME *Principal, Professional Consulting Engineer at Bales Energy Associates in Massachusetts*
Bales Energy Associates provides energy analysis, design, and implementation of high- performance, energy-efficient and renewable energy systems for buildings and facilities with an emphasis on a “whole-systems,” building science-based approach. Mr. Bales’ studies include detailed investigations and recommendations for temperature controls and building automation system optimization and improvement.

Bales Energy Associates provides study services for whole building energy analyses, high-performance mechanical design, and solar energy and wind energy systems analysis, and design services. Mr. Bales is the principal of Bales Energy Associates, and he has effectively delivered energy engineering and HVAC design services for 30 years.

In recognition of the critical importance of heating systems in high-performance, energy-efficient, green buildings, Mr. Bales developed the following workshops:

- High-Performance, Energy-Efficient ‘Green Heating’ Systems*
- Cold-Climate Heat Pumps, Pellet Boilers, & Other Renewable Thermal Heating Systems*
- Air-Source Heat Pumps, Mini-Splits and Heat Pump Water Heaters*

Mr. Bales is a registered professional mechanical engineer in Massachusetts, Connecticut, New York, Rhode Island, and Vermont. His energy analysis experience and expertise includes comprehensive facility energy audits and feasibility studies for energy efficiency measures; combined heat and power (cogeneration) systems; and solar electric, solar thermal, and windpower systems.

Seminar Information

Doubletree by Hilton
363 Maine Mall Road
Portland, ME 04106
(207) 775-6161

Tuition
\$289 for individual registration
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Included with your registration: Complimentary continental breakfast and printed seminar manual.

How to Register

- Visit us online at www.halfmoonseminars.org
- Mail-in or fax the attached form to 715-835-6066
- Call customer service at 715-835-5900

Registration
8:00 - 8:30 am

Morning Session
8:30 - 11:45 am

Lunch (on your own)
11:45 am - 12:45 pm

Afternoon Session
12:45 - 4:00 pm

Cancellations: Cancel at least 48 hours before the start of the seminar, and receive a full tuition refund, minus a \$39 service charge for each registrant. Cancellations within 48 hours will receive a credit toward another seminar or the self-study package. You may also send another person to take your place.

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Additional Learning

Webinar Series
Pavement Design

- **Principles of Pavement Design**
Wed., Feb. 12, 2020, 11:00 AM - 12:00 PM CST
- **Flexible Pavement Design**
Wed., Feb. 12, 2020, 12:30 - 2:30 PM CST
- **Rigid Pavement Design**
Thurs., Feb. 13, 2020, 11:00 AM - 1:00 PM CST
- **Maintenance, Rehabilitation and Sustainability of Pavements**
Thurs., Feb. 13, 2020, 1:30 - 3:30 PM CST

Ethical Issues for Engineers

- **Complying with Rules of Professional Conduct**
Fri., Feb. 14, 2020, 12:00 - 1:00 PM CST

Foundations in Cold Regions

- **Introduction to Foundations in Cold Regions**
Thurs., Feb. 20, 2020, 11:00 AM - 12:30 PM CST
- **Shallow Foundation Design in Cold Regions**
Thurs., Feb. 20, 2020, 1:00 - 2:30 PM CST
- **Deep Foundation Design in Cold Regions**
Fri., Feb. 21, 2020, 11:00 AM - 12:30 PM CST
- **Foundation Construction in Cold Regions**
Fri., Feb. 21, 2020, 1:00 - 2:00 PM CST

Soil Mechanics and Slope Stability

- **Soil Investigation and Classification**
Tues., Feb. 25, 2020, 11:00 AM - 1:00 PM CST
- **Reviewing Hydraulic and Mechanical Properties of Soils**
Tues., Feb. 25, 2020, 1:30 - 3:00 PM CST
- **Determining and Increasing Bearing Capacity**
Wed., Feb. 26, 2020, 11:00 AM - 1:00 PM CST
- **Determining and Increasing Slope Stability**
Wed., Feb. 26, 2020, 1:30 - 3:00 PM CST

For more information and other online learning opportunities visit:
www.halfmoonseminars.org/webinars/

Can’t Attend? Order the Manual and Audio from the Live Seminar as a Self-Study Package!
Audio recordings of this seminar are available for purchase starting at \$269. See registration panel for more information and please refer to specific state licensing rules or certification requirements to determine if this learning method is eligible for continuing education credit.

Registration

Renewable Thermal Heating Systems for Commercial and Residential Buildings

- Portland, ME - Friday, February 21, 2020

How to Register	Registrant Information Name: _____ Company/Firm: _____ Address: _____ City:_____State: _____ Zip_____ Occupation: _____ Email: _____ Phone: _____ Additional Registrants: Name: _____ Occupation: _____ Email: _____ Phone: _____ Name: _____ Occupation: _____ Email: _____ Phone: _____ Email address is required for credit card receipt, program changes, and notification of upcoming seminars and products. Your email will not be sold or transferred. () I need special accommodations. Please contact me.	
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Tuition
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() **I am not attending.** Please send me the self-study package:

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- ☐ CD/Manual Package for **\$289.00**. ☐ USB/Manual Package **\$289.00**. (S&H included. Please allow five weeks from seminar date for delivery)

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