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GROUND SOURCE HEAT PUMPS (GSHPs) UNEARTH SIGNIFICANT ENERGY SAVINGS

GSHPs ARE ADAPTABLE TO A VARIETY OF MONTANA BUILDING TYPES AND APPLICATIONS

A ground source heat pump (GSHP) is a central heating and/or cooling system that transfers heat to or from the ground. As ground temperatures in Montana tend to be stable at 55F, there is almost always a temperature difference between the ground and the air. GSHPs exploit this natural differential for heating and cooling purposes to provide energy savings in the range of 20–45% for typical efficiency GSHPs and 45–60% for high efficiency GSHPs.[1]

GSHPs are available in both open-loop (in which groundwater is pumped at ground temperature and passed through a heat pump) and closed-loop systems (which consist of a network of heat pumps that are linked to a buried, closed heat exchanger). Both system types can be tailored to fit residential, commercial and industrial applications.

Closed-loop systems are particularly cost-effective in certain scenarios including new construction; climates with high daily temperature swings; climates with cold winters and hot summers; areas with higher electricity costs; and areas where gas costs more than electricity.[2] In general, open-loop systems are more efficient due to lower resistance to heat transfer between piping and water,[3] but they rely on a large, accessible aquifer or other water source and an appropriate location to discharge the water they bring in.

[1]Goetzler, W. et al. 2009. Ground-Source Heat Pumps: Overview of Market Status, Barriers to Adoption, and Options for Overcoming Barriers. Navigant Consulting, Inc.
[2]Sarbu and Sebarchievici, 2013.
[3]Roth, K., et al. 2002. Energy Consumption Characteristics of Commercial Building HVAC Systems Volume III: Energy Savings Potential. TIAX Reference No. 68370-00. TIAX LLC, Cambridge, MA.

GSHP AT-A-GLANCE

BUILDING SET-UP
Not ideal for buildings with large heating and cooling loads

BUILDING TYPE
Offices, retail, schools

BUILDING SIZE
Small- to mid-sized buildings

CODE READINESS
Near term

CASE STUDY: Jabs Hall, Montana State University

Built using a $25 million gift from MSU alumnus Jake Jabs, Jabs Hall at Montana State University was designed with efficiency in mind. Using a GSHP, Jabs Hall conditions its space using 52 geothermal bores that provide thermal storage at a ground temperature of nearly 54F. These pumps move water through closed loops that reach 500 feet in depth and then through a plate and frame heat exchanger connected to the heat pump system.

Jabs Hall, Montana State University. Photo credit: henneberyeddy.com

CASE STUDY: Orange Crush CTA Office

The 10,000 sq. ft. Orange Crush CTA Office building in Great Falls, Montana, underwent a retrofit project to install a 675-foot water-source withdrawal well to capture energy from the earth's water. Using high-efficiency heat pumps, their open-loop GSHP system extracts energy from the near-constant 53F underground water and distributes it to the building's custom-designed conductive radiant floor system. By running the 53F water through the radiant floor panels installed throughout the building, the system provides space cooling without requiring compressors.

CTA Office, Orange Crush Building, Great Falls, Montana. Photo credit: ctagroup.com

To learn more about this and other high-efficiency commercial technologies, visit **betterbricks.com.**