Portland International Jetport’s Geothermal System Overview & Case Study

by:

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Presentation Outline

- PWM Informational Overview
- Terminal Expansion Project - Geothermal System
  - Terminal Expansion Project Overview
  - Geothermal System Information
  - System Benefits
- Questions?
Maine’s largest airport by passenger volume 1,675,221 passengers CY 2011

Occupies 840 acres in the cities of Portland and South Portland

Located approximately 3 miles west of downtown Portland

Direct access to the Maine Turnpike

The Jetport provides a total economic benefit of $868 million annually and supports 11,591 jobs (Direct $196 million, On-Airport $221 million, and visitors $450 million).
PWM Informational Overview

- PWM serves six airlines with 13 non-stop destinations.
Terminal Expansion Project Overview

- 137,000 square feet with 10,000 square feet of renovation to existing building
- 3 new gates for a total of 10
- 8 passenger screening lanes (initially 5 will open)
- New in-line Explosives Detection System (EDS) baggage handling system
- New terminal access roadway and replacement of surface parking lots
- Enclosed bridge connecting central parking to the terminal building
- Building is LEED Gold Certified an accomplishment achieved in part through the geothermal heating/cooling system
Terminal Expansion Project Overview

Existing Terminal & Site
Terminal Expansion Project Overview

Project Complete
Geothermal System Information

PWM Geothermal System

- 10” underground S&R piping
- Bore field 1.4 acres
- Closed loop system

Terminal

Gensler

amec

Haley & Aldrich
Geothermal System Information

90°F

50°F

Summer-cooling operation
Winter-heating operation
System is largest in Maine with 120 wells 500 feet deep and nearly 23 miles of high density polyethylene pipe. Wells are spaced 20 feet apart.
Manifold Vault
Geothermal System Information
Low-temp / low energy radiant floor
Low-temp / low energy radiant floor
Geothermal System Information

- System uses a total of 8 stacked heat pumps (up to 7 for cooling and all 8 for heating) to provide 100% of the terminal’s cooling requirements and 75% of the heating needs.
- System provides a maximum heating capacity of 6.87 million BTUH (572.5 Tons) and a maximum cooling capacity of 462.1 Tons.
VALE Grant funding

- Voluntary Airport Low Emission Program
- Administered through the FAA Airport Improvement Program (AIP)
- Portland Jetport received $2.59M grant
- Total cost $3.1M
  - $1.1M wells & piping
  - $1.5M mechanical equipment
  - $0.5M project management & design
Estimated annual fuel savings

100,000 gallons of oil x $3.36 per gallon (today’s price) $336,000

Minus net added electrical costs ($91,000)

Net savings $245,000

Simple payback without VALE grant = 12.7 years

Simple payback with VALE grant = 2.1 years

* Current evaluation would have to be against natural gas which is roughly half the cost of oil.
Actual equipment reductions

- Boiler capacity cut 52%
- Two cooling towers reduced to one
- Two chillers reduced to one
Estimated annual emissions reductions

PWM geothermal project saves 1,000 tons of CO₂ emissions per year (1.02 tons of NOₓ).

1 passenger car generates average of 5.5 tons of CO₂ per year.*

1,000 tons ÷ 5.5 tons/car = equivalent of 181 cars off the road every year

*Metric tons: Environmental Protection Agency 420-F-05-004 Feb 2005
40 years = +7,200 cars!
Questions?