

Energy Efficiency in  
Municipal Water  
and Wastewater  
Treatment

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**Iowa  
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## **Geothermal Heating and Cooling Using Municipal Water**

### **City of Denver, IA**

Larry Farley, City Administrator

Population: 1,627 (2000 census)

### **Background**

In 1999, Denver city residents, participating in a citywide survey, indicated the need for a new community center and public library. The city then proceeded to work with a consultant to get donations for these city buildings, which were designed by engineering and architect firms.

### **Energy Efficiency System Profile**

The interest in using geothermal heating and cooling developed when the energy requirements of the building were evaluated. Larry Farley, City Administrator, states that their goal was, "to be self sufficient and maximize the assets of the local residents."

Due to site size limitations, using standard geothermal well nests, with 45-50 wells, was not feasible. The city learned that a neighboring community had installed a geothermal system for their new library that utilized the constant temperature of municipal water and, thus, decided to move the project in that direction. According to Farley, "costs of the geothermal systems were estimated at \$5,000 more than a standard furnace system." This translated into a 7-8 year payoff period for the additional cost of the system.

Today Denver uses municipal water to lower the cost of heating and cooling their new city center and public library. The heating and cooling system consists of a geothermal heat pump with energy recovery ventilators to provide heating, cooling, and ventilation throughout the year. Heat pumps are designed to inject heat into the heat pump loop, or absorb heat from the loop, depending on the operational mode of the pump. Through this process, energy is transferred through the heat pump loop to allow the heat pumps to heat and cool at the same time without the use of municipal water. Storage tanks are used as a buffer to minimize the use of municipal water.

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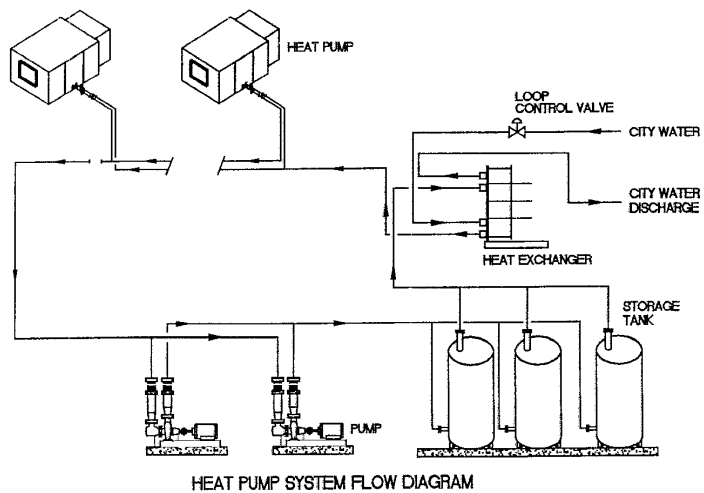
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Operationally, once the maximum heat pump loop heating or cooling temperature is reached, the heat pump loop temperature is maintained by transferring energy between the heat pump loop and the municipal water using a double wall plate and frame heat exchanger. Municipal city water that passes through the heat exchanger is then discharged to a creek.



Larry Farley showing geothermal heat pump system.

**Acknowledgements**

We are grateful to Larry Farley, City Administrator, for providing us with the information needed for this case study.