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Optimizing Energy Extraction and Water Conservation of Geothermal Heating Systems, Part II

The single-pass geothermal heating system of the Villa Mall in Alamosa, CO consumes an average 68,090 gallons of water per day throughout the winter months. Data from *Optimizing Energy Extraction and Water Conservation of Geothermal Heating Systems* strongly suggested that changing to a semi-recirculation system would decrease water consumption by at least half while still maintaining the current 120,168 Btu/h heat historically supplied to the building. This project's goal was to build the semi-recirculation heating system and then compare the energy extraction and water conservation to that of the original system. Licensed plumbers constructed the semi-recirculation system in early March 2010 adding a pressure tank, pressure switch, circulation pump, 3-way mixing valve, mixing controller, flow meters, and temperature gauges to the existing geothermal heating system. Based on the building's heat demand, the mixing valve adjusts automatically to modulate the warm geothermal well water entering the main system loop, which then mixes with the cooler water returning from the fan-coil heating units maintaining a target water temperature. Excess cool water is discharged out the building. Multiple assessments of the new system prove that the consumption rate can be reduced by at least 50% while still adequately heating the building. The data reveals an average consumption rate of 23.8 gallons per minute (50% of maximum) will transfer 120,515 Btu/h into the building (347 Btu/h greater than the heat input from the old system). The highest water savings rate observed was 68.2%. The system functioned better than expected and should more than pay for itself in the long run.