GJBK-78-779-243

Solar Energy Demonstration Project

MASTER

United States
Department of Energy
Grand Junction Office
Grand Junction, Colorado

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Introduction

Use of solar energy as a source of heat for homes and commercial buildings in Western Colorado and throughout the United States is increasing daily. The sun is used to provide domestic hot water as well as to heat and cool buildings. This energy source becomes more important as fossil fuel supplies are depleted. Common solar collectors, flat plate and concentrating, are now produced throughout the country.

Bendix Field Engineering Corporation personnel designed a solar system which was installed as a demonstration project on the Department of Energy's

new cafeteria building at Grand Junction, Colorado. The system, installed in 1977, provides hot water for building heat and for domestic use.

The solar system will supply an estimated 40 percent of the energy required for domestic hot water and building heat. This will save 38.3 million BTU's yearly, or the equivalent of

7,000 standard cubic feet of natural gas or 2,156 KWH of electricity monthly.

Cost of this project, \$44,663, included instrumentation to measure BTU's collected and delivered to the building. Non-solar costs included building structural changes required to support the solar collectors and the associated design fees. Cost of instrumentation, design fees, and structural changes was approximately \$16,000 making the net cost of the solar system \$28,663.

The graph (above) shows DOE Cafeteria calculated energy requirements vs. calculated solar energy supplied.

About the System

Major components include 24 collectors, a 750 gallon storage tank, the solar collector loop, the storage tank loop, and the heating system. Domestic hot water and water used for building heat are combined into a single, low-cost system.

Collectors, 2 feet by 12 feet and manifolded into 6 banks of 4 collectors each, are placed in a single row on the cafeteria roof. The collectors, with a usable area of 496 square feet, are inclined at an angle of 60° from horizontal, facing south. Solar-loop working fluid is a mixture of propylene glycol and

water, with a freezing point of -10°F . Using propylene glycol, a non-toxic antifreeze, permitted use of a single heat exchanger between the solar loop and storage tank loop.

Solar loop fluid flow is from the bottom to the top of the panels. Flow to each bank is

equalized by use of balancing valves in the supply header. The collectors take energy from the sun and convert it into stored energy in the form of hot water using the solar heat exchanger to transfer heat from the solar loop to the storage loop. From storage the heat is distributed to the building for use.

CAFETERIA SOLAR HEATING SCHEMATIC

The cafeteria solar heating schematic (above) illustrates the major solar system components, fluid flows, and instrumentation.

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In Conclusion

With the ever-increasing cost of energy, use of the sun as an energy source is becoming more and more attractive. Like any new, undeveloped energy source, much has to be learned before solar energy will attain wide use. The Grand Junction Department of Energy and the operating contractor, Bendix Field Engineering Corporation, have installed this solar demonstration system on the new cafeteria building at the Grand Junction facility to expand the knowledge of and prove the feasibility of using the sun as an energy source.

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