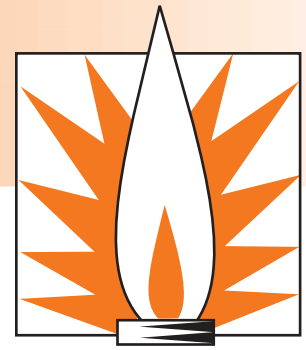


# COMBUSTION

## Success Story



## SOLARWALL<sup>®</sup> AIR PREHEATING SYSTEM

### Elegantly Simple System Uses Solar Energy to Heat Ventilation Air or Preheat Combustion Air

#### Benefits

- ◆ Has saved over 36 billion Btu cumulatively through 2000 in the U.S. and international savings would be ten times larger
- ◆ Captures as much as 80% of available solar energy
- ◆ Has saved \$230,000 in U.S. energy purchases through 2000
- ◆ Is virtually maintenance free, uses no liquids, and has no moving parts other than the system fans
- ◆ Improves indoor air quality and worker comfort, increasing productivity
- ◆ Has avoided 2,200 tons of CO<sub>2</sub> emission through 2000

#### Applications

Manufacturing plant and industrial facility heating and ventilation systems, preheating combustion air for furnaces, or industrial and agricultural drying.

"I had what I thought was a great-but largely intuitively developed-energy-saving invention. National Renewable Energy Laboratory scientists had the theoretical and computer analysis expertise to make it even better. The I&I grant allowed us to take full advantage of that expertise and increase the effective solar energy capture of the Solarwall to a phenomenal 80 percent."

— John Hollick  
Solarwall Inventor and President  
Conserval Systems, Inc.

One of the largest uses of energy is space heating of residential and commercial buildings, accounting for about 9% of energy use in the United States; industrial processes account for an additional 10%. Adding to the energy demand are concerns for improving indoor air quality and avoiding temperature stratification and sick-building syndrome; these concerns require increased intake of fresh, outside air. Industrial building operators face the difficulty of maintaining combustion heating requirements with rising fuel prices. Using cold outside air for combustion generally increases energy use for central heating plants and industrial furnaces.

Agricultural operations in warm and humid climates present a different heating/ventilation challenge. In agricultural operations, domestic crops are often sun dried. Sun drying avoids costly energy bills, but insects, mold, and rain can destroy much of the crop.



SOLARWALL Air Heating System



To take advantage of solar energy, Conserval Systems developed the Solarwall system. Solarwall systems capture solar energy to save money and energy while heating ventilation air, heating air for crop drying, and preheating industrial combustion air. The key to the system are its holes.

## Technology Description

The dark-colored and perforated facade is installed on the south-facing wall of the building. Sunlight heats the facade. The combustion system draws outside air into the building through the holes in the facade and the space between the facade and the building, heating that air in the process. At the same time the facade captures heat loss through the building wall and shields the building from solar gain when heating is not needed. Solarwall can capture as much as 80% of available solar energy, reduce annual heating costs by \$10 to \$50 per square meter of wall installed, and pay for themselves quickly.

An Inventions and Innovation grant, along with additional funding provided by the Department of Energy's Office of Power Technologies and the Office of Building Technology State and Community Programs, allowed Conserval to improve the efficiency of Solarwall systems substantially, to develop design tools to predict and optimize energy savings, and to verify that the system could be installed on roofs for space heating and crop drying. Efficiency gains were made with a header duct, optimizing hole size/spacing, air flow rates, and coatings. This system can also be used with thermal storage. For example, as glass plants convert to oxy-fuel, the regenerators are normally removed. This system could store thermal energy for nighttime use in air combustion forehearths to reduce the outside air temperature variation, which impacts productivity.

## Energy Savings and System Economics

Conserval has installed more than 200 systems since completing the project. Cumulative energy saving through the year 2000 have surpassed 36 billion Btu. The associated reduction in CO<sub>2</sub> emissions is estimated to be 2,200 tons, and avoided energy purchases total \$230,000. Conserval and the National Renewable Energy Laboratory were awarded an R&D 100 award in 1994 for the Solarwall. Conserval recently opened its own production plant in Buffalo, New York.

Conserval's Solarwall heating can cost-effectively save energy wherever large amounts of outside air must be heated. It is ideal for manufacturing plants and other commercial and institutional buildings with large air heating or combustion requirements. Ventilation preheating installations have included schools, apartment buildings, and manufacturing plants. Combustion air heating uses include central-heating plants and industrial furnaces. Solarwall crop drying installations thus far include coffee, cocoa beans, and chilies.



The Inventions and Innovation Program works with inventors of energy-related technologies to establish technical performance and to conduct early development. Ideas that have significant energy-savings impact and market potential are chosen for financial assistance through a competitive solicitation process. Technical guidance and commercialization support are also extended to successful applicants.

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