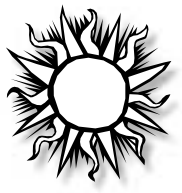
Wisconsin Energy Bureau
Department of Administration



RENEWABLE ENERGY FACT SHEET

Solar Collectors for Preheating Air

Introduction

Many commercial and industrial buildings need to have high ventilation rates to ensure adequate indoor air quality. However, heating all that fresh air can be very expensive. Now an elegantly simple technology is available to use solar energy to preheat ventilation air and dramatically reduce energy use and expenditures.

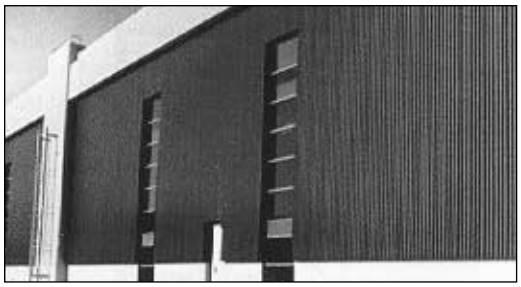
Preheat Solar Collectors on a Plane Hangar

Transpired solar air collector systems consist of a dark-colored, perforated facade installed on a building's south-facing wall. An added fan or the building's existing ventilation system draws ventilation air into the building through the perforations and the air space between the facade and the main building wall. Solar energy absorbed by the dark facade and transferred to the air flowing through it can preheat the intake air by as much as 40°F. Reduced heating costs can pay for the system in three to twelve years.

Advantages

Using transpired solar air collectors provides numerous advantages:

- Collectors are virtually maintenance free, with no liquids and no moving parts other than the ventilation system fans.
- At night the collector assists heating because heat lost through the main building wall behind the collector system facade is recaptured.
- Transpired solar air collectors respond to demands for improved indoor air quality because better ventilation is an integral part of the system.
- Collectors can be added or designed as part of a building's facade. Commercially available, collectors use attractive metal sheeting and are available in many colors. For new construction, the system will pay for itself even faster because of money saved on the building's facade.
- The cladding will assist summer cooling by shielding the main wall from normal solar heat gain. Hot air will be thermally siphoned up the wall and out of the top holes in the solar cladding, leaving the wall cooler.
- The system even works on cloudy days.



Preheat Solar Collectors on a Warehouse

Applications

Transpired solar air collectors are suitable for industrial and commercial buildings with large ventilation requirements. Common applications include manufacturing plants, vehicle maintenance facilities, hazardous waste storage buildings, gymnasiums, airplane hangars, schools and warehouses requiring ventilation. The collector can also preheat combustion air for central heating plants or industrial furnaces and for crop drying.

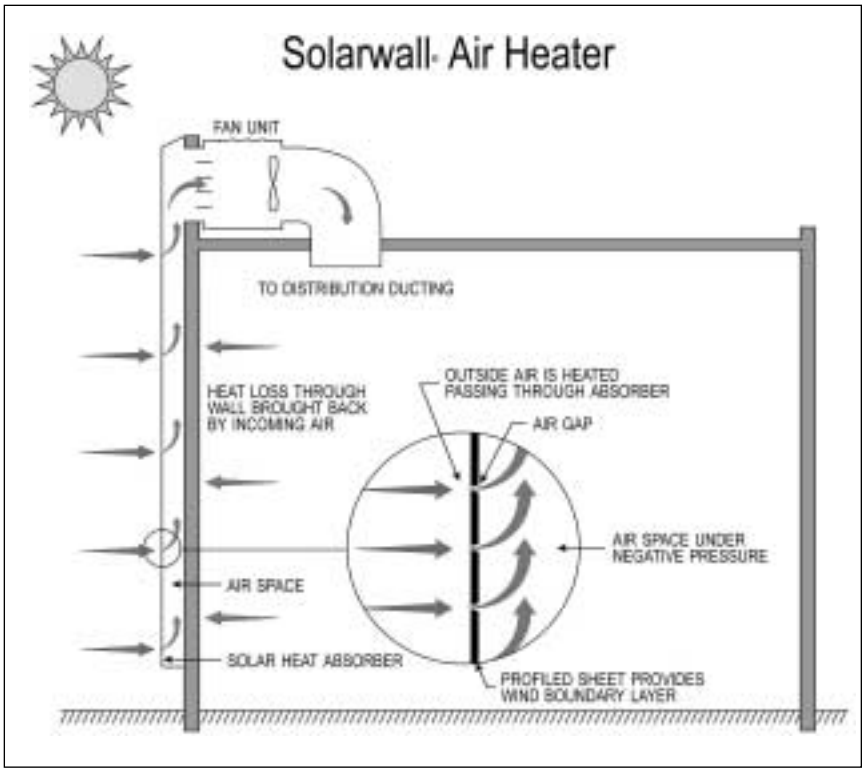
Where Transpired Solar Air Collectors Work Best

Favorable factors for a cost effective transpired collector installation include: appropriate south-facing wall; relatively high ventilation requirement; long heating season; and high costs for heating.

Transpired solar air collector systems may not be feasible for some multi-story buildings due to fire codes, or for buildings with existing heat recovery systems. But transpired collectors generally are applicable wherever large amounts of outside air must be heated.

System benefits

Space heating is a universal need in Wisconsin's cold climate. Preheating ventilation air reduces building operation costs, reliance on imported fossil fuels, pollution and greenhouse gas generation. In addition, transpired solar air collectors can be used in spaces with high ceilings to push the warm air down to the level of the occupants. Transpired solar air collectors can also help you meet your needs to improve the air quality of an existing building or to attain the higher requirements for outdoor air while keeping down the cost of heating that air.



System Costs

The typical incremental installation costs for new installations (above a standard wall) are $0 to $7 per square foot, depending on the type of facing material the transpired solar air collectors will be replacing. Cost for retrofit is about $10 per square foot. Based on analysis performed at the University of Wisconsin-Madison, these collectors are expected to have a 1.5 to 5 year payback for new construction and a 3 to 10 year payback for retrofit, depending on the heat source and installation details.

For more information

Demand-Side Applications of Renewable Energy
Wisconsin Energy Bureau
P.O. Box 7868
Madison, WI 53707-7868
800-762-7077
www.wifocusonenergy.com
Renewable Energy Yellow Pages: www.doa.state.wi.us/deir/yelpages.htm

Acknowledgements

Text and photos credited to U. S. Department of Energy and Conserval Systems, Inc. Web site: (www.solarwall.com).

References

Thermal Simulation and Economic Assessment of Unglazed Transpired Collector Systems, by David N. Summers, University of Wisconsin-Madison, 1996.
Available from the Wisconsin Energy Bureau.

More information is available from the U. S. Department of Energy's Solar Buildings Program website:
www.eren.doe.gov/solarbuildings/publications.html

WISCONSIN FOCUS ON ENERGY