RENEWABLE ENERGY

Heating with solar air collectors

FACT SHEET

BIOMASS

SOLAR

WIND

Glazed solar air collectors mounted on the south wall help heat the building for Advantage Plumbing in Cottage Grove.

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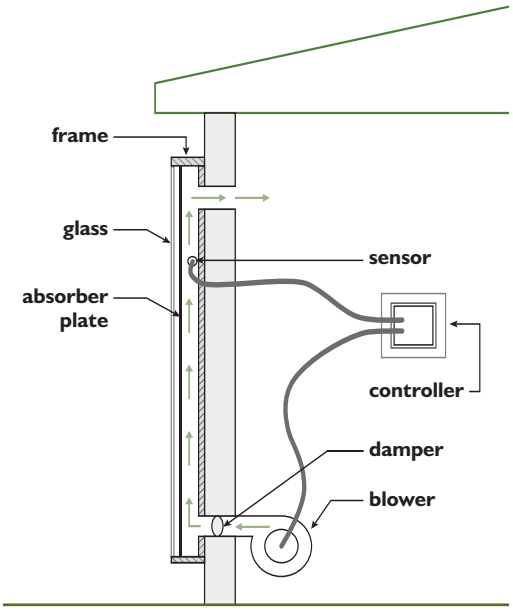
Space heating is needed everywhere in Wisconsin's cold climate. Solar air collectors can be used to reduce energy costs for space heating, or for preheating outdoor ventilation air in buildings that must meet high indoor air-quality standards. Using solar air collectors for space heating can also help stabilize future energy costs, as well as reduce carbon emissions. Both glazed and unglazed solar air collectors transfer the sun's heat into a building by warming the air that is ducted through the collectors.

Glazed collectors for space heating

Glazed collectors work particularly well for heating buildings that can accept variable temperatures, such as warehouses and garages. Glazed collectors use a metal absorber plate inside an insulated box, four to six inches deep, with a glass cover. These collectors are usually mounted on a south-facing wall to collect the low winter sun. Air is drawn from within the building using a blower and circulated through the collector whenever solar energy is available. The air is heated as it passes across the absorber plate and is ducted back into the building. Common applications of glazed solar air collectors include warehouses, shops, maintenance facilities, manufacturing facilities, garages, and sports facilities.

A GLAZED AIR SYSTEM



A glazed air system works in the daytime via a controller and the damper, pushing cooler indoor air into the bottom of the collector. As the air passes over the absorber plate, it heats, rises, and is pushed back into the building by the blower.

Unglazed collectors for ventilation air

Unglazed collectors work best in facilities that have relatively high ventilation requirements that require an equal volume of heated make-up air. One type, called transpired solar air collectors, uses solar energy to preheat ventilation air and can reduce energy costs dramatically. Transpired air systems use dark-colored, perforated metal panels installed a few inches away from a south-facing wall. Solar energy absorbed by this

EDUCATING SCHOOL DISTRICTS ON SOLAR AIR HEATING

This SolarDuct® installation, the first in Wisconsin, augments the building's natural gas-fired heating system, saving energy costs.

Focus on Energy recently supported a unique demonstration of solar air heating at the Cooperative Educational Service Agency (CESA 10) building in Chippewa Falls, the agency that provides energy management services to 30 school districts in northwest Wisconsin. This is Wisconsin's first installation of SolarDuct®, an unglazed, modular rooftop system that augments space heating for this building rather than ventilation air. The corrugated collectors on the roof connect to the building's air-handling system. The dark-colored panels, pierced with ventilation holes, are heated by the sun, warming the air that passes through the holes. Ductwork draws the preheated air from the panels into the building. CESA 10's SolarDuct unit is designed to supplement, not replace, the building's natural gas furnaces. About two hours' worth of direct sunlight can produce a 25-degree difference between outside air and the preheated air feeding into the air-handling units. The system is equipped with bypass dampers that activate whenever the interior temperatures reach a preprogrammed level.

The panels are not bolted into the roof, but anchored by heavy, concrete patio tiles. The entire installation and commissioning process took contractors about a month. Once metering equipment is installed, CESA 10 will begin posting real-time performance data online at http://www.cesa10.k12.wi.us, under the Facilities Management link. CESA 10's energy manager, Todd Wanous, is optimistic that the rooftop demonstration will inspire many school districts to follow CESA 10's example. Representatives from area school districts flocked to CESA 10's open house to see the solar systems for themselves.

dark facade heats the air flowing through the perforations. The building ventilation system draws the heated air into the building from the air space between the façade and the main building wall. These systems can preheat the intake air by as much as 40 degrees Fahrenheit.

Common applications of unglazed systems include make-up air heating for manufacturing plants, vehicle maintenance facilities, hazardous-waste storage buildings, gymnasiums, airplane hangars, hospitals, schools, and warehouses. The collector can also preheat combustion air for crop drying, central heating plants, and industrial furnaces. These systems are particularly economical when incorporated into new construction.

SYSTEM COSTS

System costs vary depending on many factors, including type of collector, complexity of installation, cost of materials, engineering requirements, permitting costs, and facility location. If designed simply, these systems will last long after they have paid for themselves in energy cost savings. Solar air collectors are expected to have a 10- to 15-year payback for new construction and a 20- to 25-year payback for retrofit, depending on the heat source and installation details.

Unglazed, transpired air collectors installed on the south wall of a hangar at the Stevens Point Municipal Airport.

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