



HEATING YOUR BUILDING WITH SOLAR ENERGY



EFFICIENT, SIMPLE AND COST EFFECTIVE



Natural Resources
Canada

Ressources naturelles
Canada

Canada



SOLAR AIR HEATING

One of the inescapable realities of doing business in Canada is the cost of heating. Long, cold winters mean that for a good part of the year, Canadian businesses have to spend money to heat air brought into the workplace. That directly affects the bottom line.

A simple technology can dramatically reduce fuel consumption and heating costs, particularly for buildings with a high demand for fresh air. The concept: use solar energy to preheat outside air before it is introduced into a plant or other facility. The warmed air can be distributed as is, further heated in a building's primary heating system or used as combustion air for industrial furnaces.

Facilities that could benefit from this technology include warehouses, large institutions such as hospital and schools, industrial plants, garages, even apartment buildings.

IT SIMPLY WORKS

The simplest, most efficient – and least expensive – way to preheat outside air for industrial and commercial applications is through the use of a perforated-plate absorber or a solar air heating system, such as the Solarwall®.

"It's an easy way to bring fresh air in a building and save money at the same time," says Sylvain Roy of Beaulieu Canada, a company that installed solar air heating technology in 1998.

'Simple technology' is an understatement. Dark metal cladding, usually unglazed corrugated aluminum, is mounted over a south-facing wall. Sunlight hitting the cladding warms the air near its surface, which is then drawn through thousands of small perforations in the cladding into a narrow space between the wall and the building. The heated air rises to an overhanging canopy plenum, where it is drawn into the facility by fans and dampers.

A *preheat* solar air heating system directs warmed air to a building's primary heating system, which further raises its temperature. Because the air going into the system is already warm, less energy is needed to heat it further. That saves money for the company, and conserves natural resources for the community at large. A solar air heating system augments rather than replaces a conventional heating system.

A *stand-alone* solar air heating system delivers fresh air directly into a building, where it mixes with recirculating plant air. The introduction of a steady supply of fresh air helps to make up for building exhaust air, which in turn means fewer drafts, a more comfortable working environment and savings on energy lost through uneven heating and cooling.

Another advantage of a solar air heating system – and something no other technology can boast – is that it recaptures heat lost through exterior walls. Heat escaping through a plant's wall is picked up by the solar collector and brought back into the building. In recapturing this heat, a solar air heating system effectively doubles the R-value of the existing wall.



"IT'S AN EASY WAY TO BRING FRESH AIR IN A BUILDING AND SAVE MONEY AT THE SAME TIME"

SYLVAIN ROY
BEAULIEU CANADA



EFFICIENCY + SIMPLICITY = SAVINGS

A solar air heating system can be incorporated into the design of a new building with a minimum of additional capital costs, and can take as little as 2 years to pay back the initial investment.

Payback for a retrofit typically takes longer, but it is still measurably cost-effective.

Retrofitted systems are simply mounted over the existing building – the original wall serves as one side of the plenum space, while the new perforated solar cladding is the other.

“The solar wall technology is essentially an energy producing building cladding,” says Bill Hawkins of Enbridge Consumers Gas, a company that recently installed a retrofit solar air heating system. “If you’re going to put on an addition, instead of just putting on regular cladding, you put on solar wall cladding. The incremental cost is minimal, and the benefits are tremendous.”

A solar air heating system:

- preheats make-up air, thus reducing heating costs
- improves indoor air quality
- is relatively easy to install or retrofit
- increases the R-value of the existing wall and reduces insulation costs
- is virtually maintenance free, with no liquids or moving parts other than the ventilation system fans.

There are other, less obvious cost saving benefits; for instance, a business using a solar air heating system will need a smaller primary heating system, which reduces both original capital costs and fuel consumption.

Solarwall® technology is more efficient than older style glazed collectors. Contrary to common belief, it even works on cloudy days and at night, although at a much lower capacity.

ENBRIDGE CONSUMERS GAS

A solar air heating system installed at the Enbridge Consumers Gas vehicle repair facility in Toronto is providing all of the fresh air they need – and saving the company money at the same time.

“One of the important requirements in industrial facilities is providing make-up air to replace air that’s exhausted for process reasons,” says Enbridge Consumers Gas’ Bill Hawkins. “And this is a natural fit.”

The facility needed large volumes of fresh air to dispel fumes from trucks and other vehicles under repair. Enbridge Consumers Gas installed a Solarwall® ventilation heating system, which has been fully operational since January of 1999. A study done for the company estimates that the system will save the company from having to purchase over 11,000 cubic meters of natural gas annually. That translates into carbon dioxide emission reductions of more than 20 tonnes a year. It also translates into cash: Hawkins estimates that the Solarwall® will save Enbridge Consumers Gas between \$5000 and \$6000 in its first year of operation.

**“THE SOLAR
WALL TECH-
NOLOGY IS
ESSENTIALLY
AN ENERGY
PRODUCING
BUILDING
CLADDING”**

BILL HAWKINS
ENBRIDGE
CONSUMERS GAS



Energy cost savings were part of the reason Enbridge Consumers Gas installed a solar air heating system; environmental considerations were another. “One of our very important mandates is to help be a catalyst to introduce solar technologies into the market place”, says Hawkins. By using the technology, Enbridge Consumers Gas is setting an example in the use of solar and alternative energy sources.

Solar air heating raised the average temperature of the air brought into the Enbridge facility by 9°C., which meant much less energy was expended heating it to a useful temperature. The system also solved a problem that had been plaguing the facility for years: “If a building has a very high level of temperature stratification, this technology is a great way to destratify that building,” says Hawkins. “We had offices in the upper mezzanine level of the building where it was installed, and even in the wintertime we would often get into a situation where we’d have to turn on the air conditioning because the heat would stratify so much it made working uncomfortable. All of those issues have been resolved. It’s a much more comfortable working environment.”

Comfort, savings, environmental concerns – all covered by the most abundant energy source of all.

PUTTING SOLAR AIR TO WORK

Solar air heating uses proven technology, and recent improvements have made it even more cost-effective. In addition to Beaulieu Canada and Enbridge Consumers Gas, other large Canadian companies have installed solar air heating systems, including Bombardier, at the Canadair facilities in St. Laurent, Quebec, GM of Canada, at the Battery Plant in Oshawa, Ontario, and Ford Canada at their automotive assembly plant in Oakville, Ontario.

Solar air heating systems are designed primarily to preheat ventilation or combustion air for commercial and industrial facilities such as factories, warehouses, and hangers, but the technology can benefit any facility needing large volumes of fresh air:

- hospitals, school and gymnasiums
- government and military buildings
- vehicle maintenance shops and hazardous waste storage buildings
- multi-story residential buildings
- crop drying facilities
- central heating plants

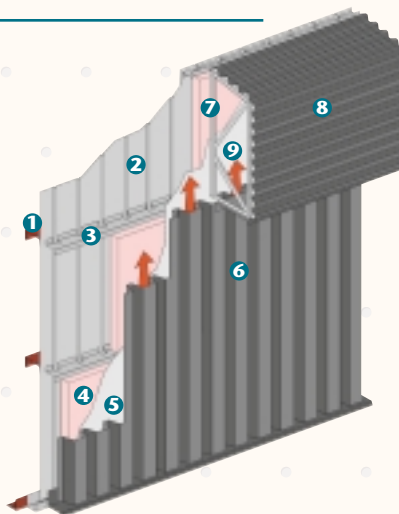
“ONE OF THE IMPORTANT REQUIREMENTS IN INDUSTRIAL FACILITIES IS PROVIDING MAKE-UP AIR TO REPLACE AIR THAT’S EXHAUSTED FOR PROCESS REASONS”

BILL HAWKINS
ENBRIDGE
CONSUMERS GAS



Solar Cladding on Metal Wall

1. Building Steel Girt
2. Interior Liner Sheet
3. Notched Z-bar Subgirt
4. Insulation
5. Exterior Liner Sheet
6. Perforated Solar Cladding
7. Canopy Frame
8. Canopy Cladding
9. Heated Air to Fan



“AN ADDED BONUS IS THAT THE FEDERAL GOVERNMENT, THROUGH THE RENEWABLE ENERGY DEPLOYMENT INITIATIVE (REDI), PROVIDES AN INCENTIVE FOR BUSINESSES THAT PURCHASE AND INSTALL SOLAR AIR HEATING SYSTEMS ON THEIR FACILITIES”

A perforated wall cladding facing within 20 degrees of due south is optimally oriented, but virtually any wall that gets sunlight is suitable. An east-facing wall will generate heat in the morning, while a west wall is more effective in the afternoon. There are different colours of wall cladding available to suit aesthetic considerations, although the darker the colour – black or brown, for instance – the more solar energy is captured.

Of course, individual cost effectiveness also depends on fuel costs, fuel types and local utility rates.

An added bonus is that the federal government provides an incentive for businesses that purchase and install solar air heating systems on their facilities.



BEAULIEU CANADA

Beaulieu Canada is one of Canada's largest manufacturers of rugs, carpets and yarn. Four hundred and fifty employees work at its Coronet Carpets plant in Farnham, Quebec. In 1998, Beaulieu installed a solar air heating system in a new warehouse at Farnham. The warehouse has 15 large docking bays and a 10.5 metre ceiling, and the company was looking for a system that could heat large volumes of incoming air and destratify heat build-up near the roof.

“We are always looking for the opportunity to install new technology that will help us save money and energy”, says Sylvain Roy of Beaulieu Canada. “We saw several proposals; this was an easy way to bring air in with simple technology.”

The “simple technology” is the solar air heating system called Solarwall®, developed by Conserval Engineering Ltd. of Downsview, Ontario, with funding from Natural Resources Canada.

The capital cost for the system at Farnham was \$175,000, of which 25% was contributed by Natural Resources Canada (NRCan). After the first complete winter of using the technology, Roy estimates that the company saved between \$35,000 and \$50,000 on annual heating costs – while reducing carbon dioxide emissions by 200 tonnes annually.

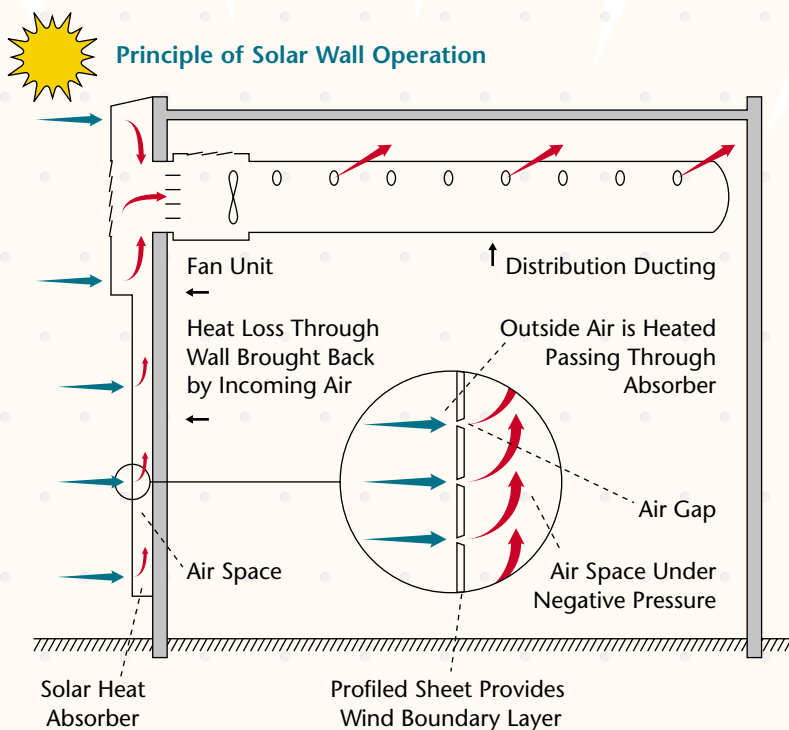
“The environmental considerations are important for us, for Beaulieu Canada, and for Beaulieu of America,” says Roy.

The success of Beaulieu’s solar air heating system means that the company continues to explore other energy-efficient projects that offer both capital savings and environmental benefits.

Solar air heating systems make use of simple, proven technologies to harness the sun’s energy. Business saves by reducing fuel costs. The community benefits by conserving Canada’s natural resources and reducing greenhouse gas emissions.



“REDI FOR BUSINESS WILL SUPPLY 25% OF THE PURCHASE AND INSTALLATION COSTS OF A QUALIFYING SOLAR AIR HEATING SYSTEM, TO A MAXIMUM CONTRIBUTION OF \$50,000”



**Heating your Building with Solar Energy –
Efficient, Simple and Cost Effective**

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