RESULT 355

CADDET energy efficiency IEA OECD

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Air-to-air heat-recovery system

University of Ottawa installs new type of heat-recovery system

Summary

University of Ottawa is the first organisation in North America to install a new type of air-to-air heat-recovery system in their De Celles auditorium. The Regent Eco system reduces energy costs and maintenance time and guarantees at least 85% heat efficiency. This particular unit achieves efficiency levels of over 90%. Heat-recovery equipment is now considered for all new construction and renovation projects in view of the excellent performance of the De Celles installation. Since this first installation, the university has installed six other units in four of its buildings.

Highlights

- **Heating energy savings over 85%**
- **Average payback period of 3 years**
- **Reduced energy costs and maintenance time**

Air-to-air heat-recovery system installed on the rooftop unit (Thomas Moore building).

Aim of the Project

University of Ottawa's underlying motivation for its many energy-efficiency initiatives is primarily one of fiscal responsibility and the wise use of energy resources. Some efficiency measures undertaken by the university include HVAC projects consisting of a campus-wide computer-based monitoring and control system. Others are building envelope projects, which entail:

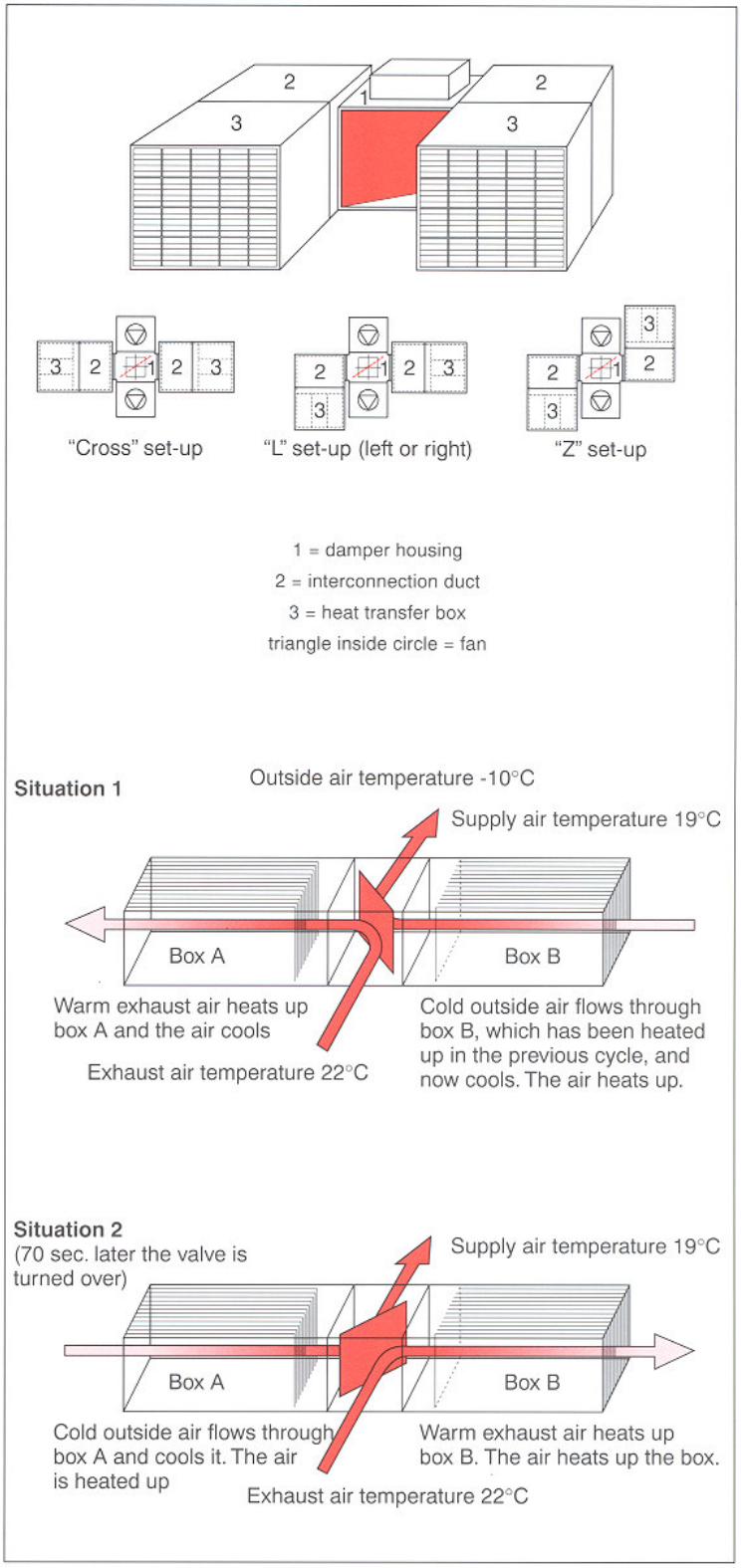
- roof and wall insulation, new vestibules and replacing windows;
- lighting projects, such as T-8 conversion;
- peak demand management, fume hood optimisation and water efficiency.

The Principle

The Regent Eco method was invented and patented in Sweden, and is now distributed in North America by Regent Eco Canada. The operating principle is very simple. The outgoing air is used to heat up a set of aluminium plates and a few seconds later the incoming air reclaims the heat from these plates and reintroduces heated air into the building. The unit can reclaim over 85% of the heat from the plates. Energy is saved, as the incoming air requires less additional heating before being reintroduced into the building.

Air quality is maximised because the units are able to provide 100% fresh air. Maintenance costs are reduced to practically zero because there are no rotating parts. The only moving part in the unit is

Figure 1: Schematic of air-to-air heat exchanger showing principle of operation.



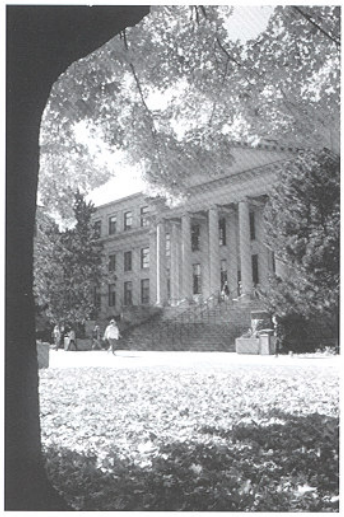


Figure 2: University of Ottawa at the time of its 150th year anniverary in 1998.

a damper that periodically switches the airstreams to alternate sets of aluminium plates.

The Situation

The first unit was such a success that six more units have been installed in four of the university's buildings. De Celles auditorium. An 8.5 million l/s unit was installed, replacing the auditorium's existing four-year-old system that was not very energy efficient. Tests carried out on this installation found that the unit maintained a heat recovery rate of over 85% during cold temperatures. At moderate temperatures, this was over 90%, peaking at 92%.

The heat-recovery rate was so high that the university implemented a control strategy to leave the fresh air dampers open a little, to dilute the preheated fresh air stream and prevent excess heat build-up when the outdoor air is warmer than -15°C. In addition to better energy recovery rates, maintenance costs were very low.

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In late 1995, a 34-million l/s rooftop unit was retrofitted with a Regent Eco system to improve air quality in the four-storey Thomas Moore building. This building featured an air-handling unit that was not supplying the minimum 50% fresh air needed and did not have much capacity to heat fresh air. Instead of upgrading the unit, the management opted for another heat exchanger.

Two more units were added to the university's new Arts building, which was completed in September 1996. The units have capacities of 5.1 million and 6.8 million l/s. Around the same time, two units (17 million l/s and 5.1 million l/s) were added to the Marion building, which includes the university's largest auditorium with 400 seats. The unit replaced an air-handling system that was nearly 30 years old. The most recent installation was the addition of a 5.1 million l/s unit in the McDonald building, a 150-seat auditorium. Like the unit in the Marion building, this system replaced one that was old and malfunctioning.

The installation of these seven heat-recovery systems has enabled the university to reduce total energy use by about two million equivalent kilowatt hours (EkWh). Overall energy consumption and costs for university operations continue in a downward trend with the help of these heat recovery projects and other measures. The university expects to continue installing these units whenever there are HVAC retrofits or new construction to be carried out on the campus. Figure 1 shows a schematic of an air-to-air heat exchanger.

The Company

University of Ottawa, initially called the College of Bytown, was founded in 1848. As the largest bilingual university in North America, the campus consists of 25 major buildings over a floor area of 350,118 m^2. Located in the heart of Canada's capital, the institution has emerged as a vibrant learning centre, with a total population (including students, teachers and support staff) of 30,000.

Economics

The costs of the first heat-recovery project at the university amounted to CAD 45,000. Half of this was subsidised by the Ontario Ministry of Environment and Energy. Annual energy savings gained from reduced heating demand are estimated at CAD 8,000, giving the project a payback period of 2.8 years, including the incentive.

To date, another six small to medium-sized units have been installed in four of the

university's buildings. The 34-million l/s rooftop air-handling system on the four-storey Thomas Moore building cost CAD 65,000 but the project is saving CAD 19,000 per year, which gives a payback period of 3.4 years. Four systems were installed in 1996: the 5.1 million l/s and 6.8 million l/s systems in the five-storey Arts building and the 5.1 million l/s and 17 million l/s systems in the four-storey Marion building. The total cost for these systems amounted to CAD 90,000, yielding savings of CAD 30,000 per year, and a payback period of 3 years. In 1997, a 5.1 million l/s system was installed in the McDonald building with expected annual savings of approximately CAD 5,000. Installing these seven units has provided an annual cash flow of around CAD 62,000. Overall, the university has saved at least CAD 3 million per annum from their energy-efficiency efforts.

Host Company

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* IEA: International Energy Agency
OECD: Organisation for Economic Co-operation and Development

IEA

The IEA was established in 1974 within the framework of the OECD to implement an International Energy Programme. A basic aim of the IEA is to foster co-operation among the 24 IEA Participating Countries to increase energy security through energy conservation, development of alternative energy sources, new energy technology, and research and development (R&D).

This is achieved, in part, through a programme of energy technology and R&D collaboration currently within the frame-work of 40 Implementing Agreements, containing a total of over 70 separate collaboration projects.

The Scheme

CADDET functions as the IEA Centre for Analysis and Dissemination of Demonstrated Energy Technologies. Currently, the Energy Efficiency programme is active in 12 member countries and the European Commission.

This project can now be repeated in CADDET Energy Efficiency member countries. Parties interested in adopting this process can contact their National Team or CADDET Energy Efficiency.

Demonstrations are a vital link between R&D or pilot studies and the end-use market. Projects are published as a CADDET Energy Efficiency 'Demo' or 'Result' respectively, for ongoing and finalised projects.

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