

## Good Practice Case Study

### Heat Recovery at Cascades Leisure Centre, Craigavon



Leisure Centres with swimming pools are large energy consumers and, with rising energy costs, ensuring that the heating and ventilation systems are as energy efficient as possible is imperative. At the Cascades Leisure Centre, the benefits resulting from the installation of a heat recovery system include:

- **Annual Cost Savings of £40,570 or 44%**
- **Carbon dioxide savings of over 538 tonnes/annum**
- **A payback period of about 5.1 years**

### Cascades Leisure Centre

The Cascades Leisure Centre in Portadown was built in the 1960s and is typical of many pools built in Northern Ireland at the time. The complex includes a 33m pool with large flumes (water slides) and diving boards, a children's/learner pool, a jacuzzi and a sauna. The complex has a modern fitness suite including a selection of cardiovascular and resistance machines. Organised activities in the Complex include aerobics, aquabics (a work out in the pool), life saving, sub-aqua, Karate and Taekwondo. For young children, there is a Tumbletown soft play area.



### The Project

This project involved the installation of an extract air heat recovery system in the Cascades Leisure Centre. The system included inverter control of the supply and extract fans, variable diffusers for supply air, air-to-air plate heat exchangers, variable recirculation dampers, and modulating control of heater batteries.

This project received 100% funding from the public sector Central Energy Efficiency Fund in Northern Ireland in April 1998 and was installed and commissioned in April 1999.

### Heat Recovery in Leisure Centres

Heat recovery can save up to 30% of the energy required for heating a wet leisure centre, or approximately 10% of the total energy bill. There are five potential heat recovery technologies that could be considered: run-around-coils; plate heat exchangers; gas-fired desiccant wheels; heat pump dehumidifiers; and air-source heat pumps.

Run-around-coils could be used to recover up to 50-60% of the heat from the AHU exhaust air by installing an air-water coil (heat exchanger) in the exhaust and another coil on the air inlet. Run-around coils have relatively small diameter pipework and can be used to interconnect heat exchangers that could be some distance apart.

Plate heat exchangers could recover up to 70-80% of the heat from a warm airstream and inject it into a cooler air stream; however, inlet and exhaust ducts have to be adjacent for this type of technology. Plate heat exchanger technology is proven reliable and popular because of relatively low maintenance costs.

Gas-fired desiccant wheels consist of a rotating disc shaped matrix that absorbs moisture from warm and wet air streams, usually pool hall exhaust. When the wheel exits the exhaust air stream it enters a gas-heated stream that evaporates the moisture and dries the wheel and discharges it to the atmosphere. Heat from this process could be recovered and injected into a cooler air stream. However, this type of system (known as a thermal wheel) is very complicated.

Air-source heat pumps are devices that remove heat from an airstream and re-inject it, at a higher temperature, into another air stream. They are characterised by their coefficient of performance (COP), which is the ratio of the amount of heat produced on the supply air side divided by their electricity consumption. This means that a heat pump with a COP of 4 will produce four times as much heat energy as the electrical energy it consumes.

Air-source heat pumps must not be confused with heat pump dehumidifiers (often referred to as refrigerant dryers), which recover heat from an airstream, dehumidify that airstream, and then re-inject the recovered heat into the same airstream post dehumidification.

## Energy and Cost Savings

Before the heat recovery system installation, the annual gas oil and electricity energy consumption for the Cascades Leisure Centre was metered at 4,271MWh, with a total annual cost of £78,800. Table 1 summarises the project benefits.

**Table 1 - Project Benefits**

	Predicted	Post Project Evaluation
Overall Energy Consumption	1,795 MWh	2,392 MWh
CO <sub>2</sub> Savings	702 tonnes/yr	538 tonnes/yr
Capital Cost	£192,000	£208,000
Savings	£45,700	£40,570*
Payback Period	4.2 yrs	5.1 yrs

\*This includes an unforeseen maintenance saving of £5,750 per annum.

## Considerations for Other Sites

- The variable dampers added a cost of £33,140 to the project. Without these the project could have been completed for £176,700 reducing the pay back period to under 5 years. The contribution that the variable dampers made to energy savings is negligible and the Centre's management have indicated that they would not install these dampers again, but spend the money on a large heat recovery battery. This strategy has been since employed at the neighbouring Waves Leisure Centre in Lurgan. This simplifies the control system and maintenance regimes.
- Energy savings were reduced because the heat recovery dampers were accidentally switched off for three months. An alarm should be installed on the Building Management System to indicate this condition.
- Adequate system control and monitoring is instrumental in ensuring energy reduction and control strategies are revisited and upgraded, if necessary, in conjunction with the installation of any heat recovery system.



## Project Conclusions

Immediately after installation, problems were encountered in the pool hall with excess humidity. This was caused by low air temperature setpoints (below the water temperature) causing condensation. Fine tuning of the control strategy alleviated the problem but meant the variable diffusers remained fully open for 90% of the time. The active diffusers seemed to work in the changing areas where the ceiling heights were approx 2.5m. In the pool hall the excess height of the ceiling meant there was little benefit from them. Provided proper maintenance is adhered to and the control strategy monitored, the system does work very well but needs daily checks.

## Supporting Information

For Further information on the Central Energy Efficiency Fund see website: [www.psecni.gov.uk](http://www.psecni.gov.uk)

## Publications from the Carbon Trust

GPCS 76: Energy Efficiency in sport and recreation buildings

GPG 55: Good housekeeping in school swimming pools

GPG 56: Saving energy in school swimming pools

GPG 211: Drawing a winner - Energy Efficient Design of Sport's Centres

GPG228: Water related energy savings

GPG390: Saving Energy at Leisure

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## Other Publications

Energy Efficiency Office GPG 312 - Invest to Save

## Further Project Information

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