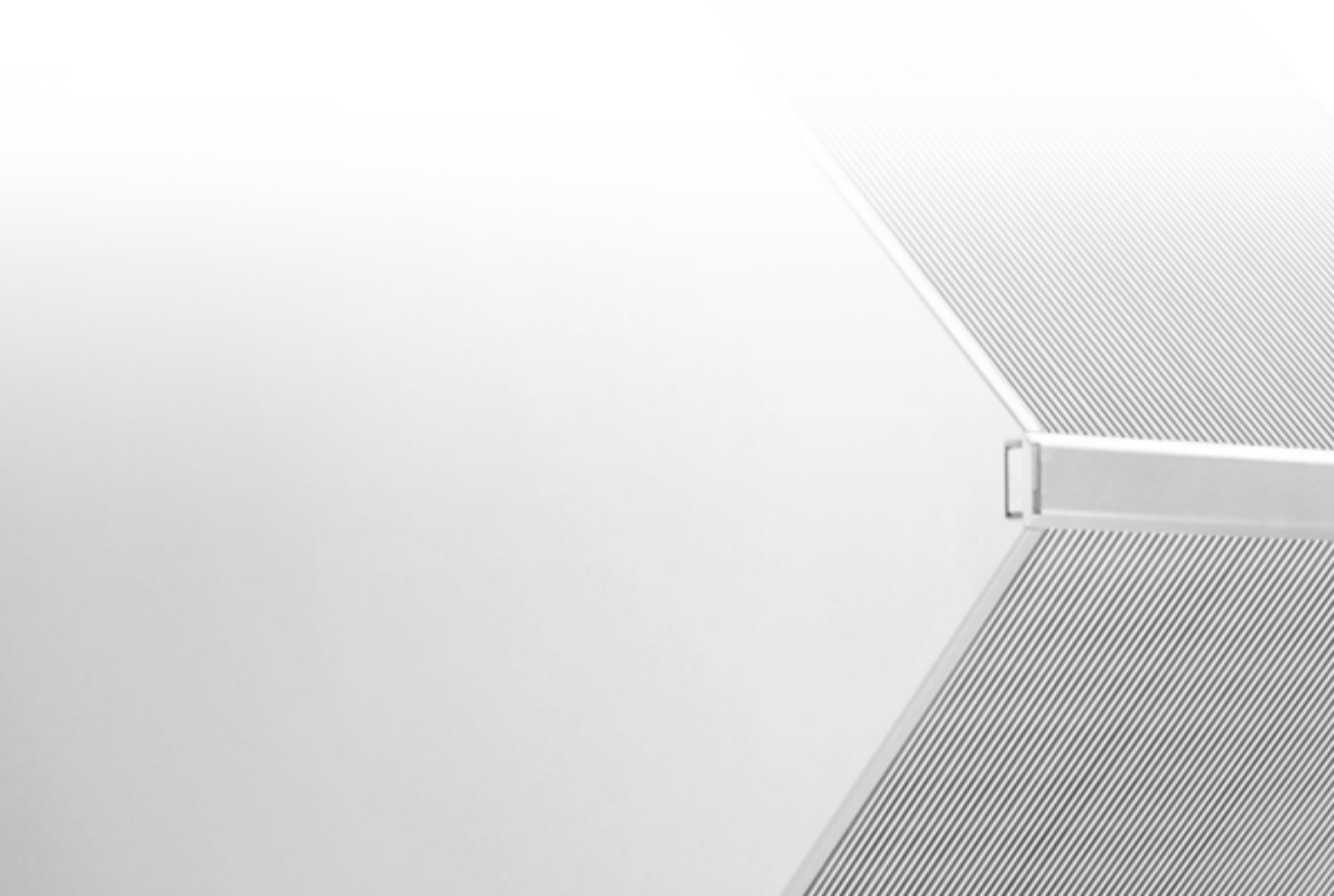
Air-to-air energy recovery

A guide to equipment eligible for
Enhanced Capital Allowances



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Front cover image courtesy of Reznor UK Ltd.

Introduction

Enhanced Capital Allowances (ECAs) are a straightforward way for a business to improve its cash flow through accelerated tax relief. The scheme encourages businesses to invest in energy saving plant or machinery specified in the Energy Technology List (ETL) to help reduce carbon emissions, which contribute to climate change.

The ETL is a register of products that may be eligible for 100% tax relief under the ECA scheme for energy saving technologies[1]. The Carbon Trust manages the list and promotes the ECA scheme on behalf of government.

This leaflet gives an overview of air-to-air energy recovery equipment specified on the ETL and illustrates the reductions in energy bills that can be realised by investing in qualifying ETL energy saving equipment over non-qualifying equipment.

Background

The ETL comprises two lists: the Energy Technology Criteria List (ETCL) and the Energy Technology Product List (ETPL). The ETCL defines the performance criteria that equipment must meet to qualify for ECA scheme support; the ETPL is the list of products that have been assessed as being compliant with ETCL criteria. To qualify for an ECA one must choose a product on the ETPL.

Setting the scene

On average, 30% of the energy delivered to buildings is lost through departing ventilation air streams. In more modern buildings, the proportion of airborne energy loss can be even greater due to the higher standards of thermal insulation[2]. Mechanical extract ventilation systems can account for a significant proportion of overall building heat loss, or gain.

Air-to-air energy recovery devices recover energy from warm exhaust air and transfer it to the incoming fresh air supply or pre-cool air when the conditioned space is at a lower temperature than the external environment. Installing ECA qualifying air-to-air energy recovery devices in the air-handling units of building ventilation systems could help reduce your business' energy costs.
This could lead to significant reductions in the energy usage that would normally be needed to heat or cool air to the temperature required to achieve thermal comfort for the building occupants, or to meet precise conditions for processes.

Benefits of purchasing ETL listed products

Air-to-air energy recovery products listed in the ETL are highly energy efficient, particularly when compared to older versions of the same technology. An average site can potentially achieve energy savings of 10%-20% by purchasing an ETL listed product.

When replacing equipment, businesses are often tempted to opt for that with the lowest capital cost; however, such immediate cost savings can prove to be a false economy. Considering the life cycle cost before investing in equipment can help reduce costs and improve cash flow in the longer term.

The ECA scheme provides businesses with 100% first year tax relief on their qualifying capital expenditure. This means that businesses can write off the whole cost of the equipment against taxable profits in the year of purchase. This can provide a cash flow boost and an incentive to invest in energy saving equipment which normally carries a price premium when compared to less efficient alternatives.

This leaflet illustrates the reductions in energy consumption, carbon emissions and energy bills that can be realised by investing in qualifying ETL energy saving equipment over non-qualifying equipment.

Important

Businesses purchasing equipment must check the ETPL at the time of purchase in order to verify that the named product they intend to purchase is designated as energy saving equipment. Air-to-air energy recovery equipment that meets the ETL eligibility criteria but is not listed on the Energy Technology Product List (ETPL) at the time of purchase is not eligible for an ECA.

[1] Eligibility for ECAs is based on a number of factors. Visit http://etl.decc.gov.uk/etl to find out more.
[2] The energy impact of ventilation, Malcolm Orme, Air Infiltration and Ventilation Centre (AIVC) Technical note 49, 1998, Code TN 49.

Air-to-air energy recovery equipment eligible under the ECA scheme[3]

There are three types of air-to-air energy recovery equipment specified as energy saving under the ECA scheme:

- Plate heat exchangers (or recuperators).
- Rotating heat exchangers (including thermal and desiccant heat wheels).
- Run-around coils.

Using the baseline scenario below, the potential financial (£), energy (kWh) and carbon savings (tonnes CO_2) have been calculated based on the comparison of two air handling units (AHUs), one fitted with an ECA-compliant product and one fitted with a non-ECA-compliant product. Costs shown are based upon the Chartered Institute of Building Services Engineers (CIBSE) TM30 (Improved life cycle performance of mechanical ventilation systems) calculation spreadsheet.

Baseline scenario:

- A 20% difference in efficiency and a 10% difference in capital cost.
- An AHU costs £3,500.
- Unit fuel prices of 3p/kWh and 9p/kWh for gas and electricity respectively.
- ECA claim values are based on an air flow rate 1m³/second for the heat exchanger.

Information for purchasers

For further information about the ECA scheme, the Energy Technology List (ETL) and other Technology Information Leaflets in the series please visit https://etl/decc.gov.uk or contact the Carbon Trust on +44 (0)300 330 0657 or email ECAQuestions@carbontrust.co.uk.

Plate heat exchangers (recuperators)

Plate heat exchangers are the most common type of heat exchanger found within residential ventilation heat recovery equipment. The units are relatively compact and can be easily incorporated into air handling ductwork.

Figure 1 *Typical 'cross-flow' plate heat exchanger*

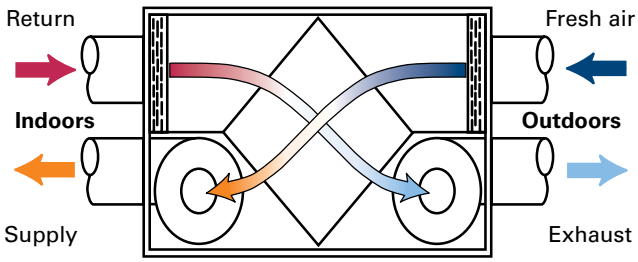


Plate heat exchanger units operate by transferring thermal energy from outgoing to incoming air streams via plate heat exchange surfaces.

The construction of the unit ensures that supply and exhaust gas streams are physically separated so that cross-contamination and leakage is minimal (this can be an important consideration in certain applications such as in pharmaceutical clean rooms and hospitals).

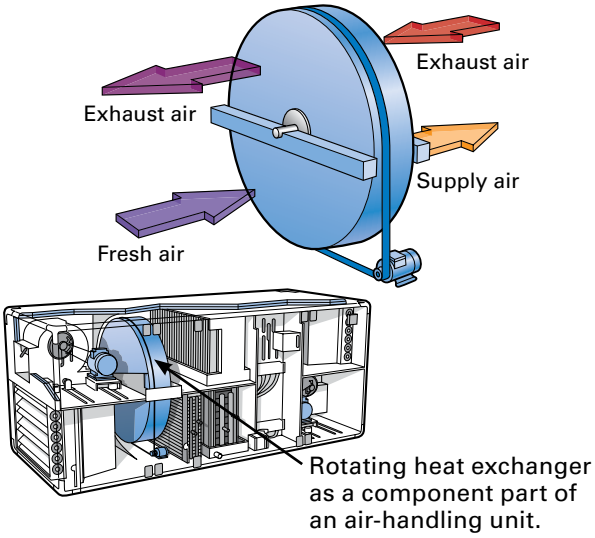
Installing a specified energy saving ETL plate heat exchanger at a cost of £1,800 rather than a non specified product with a cost of £1,620 with respective annual running costs of £637 and £809, the potential annual savings are:

- £206.
- 6,880kWh.
- 1.3 tonnes CO_2.

[3] The descriptions of the air-to-air equipment given in this leaflet are examples only. The formal criteria and details governing the ECA scheme can be found at http://etl.decc.gov.uk/etl

Rotating heat exchangers (thermal wheels and desiccant wheels)

Figure 2 *Typical rotating heat exchanger*[4]



Rotating heat exchangers operate by collecting thermal energy from the outgoing extract air stream and transferring it to the incoming, fresh air stream as the porous wheel slowly rotates into the fresh air path. Thermal wheels recover sensible heat, while desiccant wheels recover both sensible heat and latent heat.

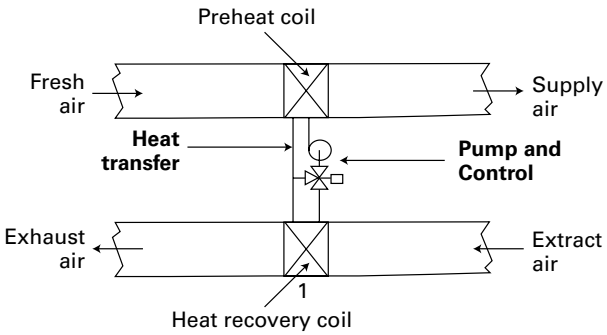
The disadvantage of rotating heat exchangers is the greater cross-contamination between exhaust and fresh supply air. In many applications, such as offices, warehouses, retail premises and factory spaces this is not a problem and recirculation of the air is commonplace. However, cross-contamination means that this technology is unsuitable for situations such as hospital operating theatres and food production environments.

Installing a specified energy saving ETL thermal wheel heat exchanger at a cost of £2,160 rather than a non specified product with a cost of £1,944, with respective annual running costs of £591 and £737 the potential annual savings are:

- £175.
- 5,840kWh.
- 1.1 tonnes CO_2.

Run-around coils

Figure 3 *Typical run-around coil heat recovery system arrangement*



1 Run-around coils use two physically separated heat exchangers (coils) in the air supply and exhaust ducts to recover and transfer heat between them. The heat is transferred from the exhaust to supply air using an intermediate heat transfer fluid, such as water.

2 The main advantage of this system is that the supply and extract ducts can be physically separated, even in different parts of the building. This provides maximum possible flexibility, as well as no possibility of cross contamination between air streams.

3 The main disadvantage of this system is that, because an intermediate fluid is used as a heat transfer medium, the system's efficiency is reduced and electricity is required for pumping fluid. However, pumping liquids remains significantly less energy-intensive than moving air with fans.

Installing a specified energy saving ETL run-around coil at a cost of £1,320 rather than a non specified product with a cost of £1,188, with respective annual running costs of £778 and £954 the potential annual savings are:

- £211.
- 7,040kWh.
- 1.3 tonnes CO_2.

[4] Rotating heat exchange image courtesy of **Fläktwoods**

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↘ SME Network

An online community for SMEs with the aim of increasing the sharing of best practice between SMEs looking to reduce carbon emissions from their estate and operations. **http://smenetwork.carbontrust.com**

* Subject to terms and conditions.

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Published in the UK: February 2014.

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