

## Good Practice Case Study

### Replacement of Mechanical Steam Traps with Gem Traps at Antrim Area Hospital



Energy savings of up to 4.6% could be possible by replacing the mechanical steam traps on an existing steam system. At Antrim Area Hospital, the benefits resulting from the steam trap upgrade include:

- **Annual Cost Savings of £3,800 or 4.6%**
- **Carbon dioxide savings of over 219 tonnes/annum**
- **Payback period of about 1.6 years**

### Antrim Area Hospital

Antrim Area Hospital is a 450-bed acute hospital, which opened in 1993. The site currently utilizes coal fuelled centralized steam boilers for space heating, domestic hot water and process steam requirements. Steam is supplied from the Energy Centre to a number of locations including the main plant rooms in the hospital, the laboratory plant room, the catering department and the Hospital Sterilization and Disinfection Unit (HSDU) for process requirements. Steam is used in each of the plant rooms to heat water for space heating and domestic hot water (DHW) using calorifiers and plate heat exchangers.



### The Project

This project involved the replacement of mechanical steam traps with GEM fixed orifice traps at Antrim Area Hospital.

This project received 100% funding from the Northern Ireland public sector Central Energy Efficiency Fund for the steam system upgrade in April 2001 and was installed and commissioned in March 2002.

### Steam Traps

Steam traps are an essential part of any steam system ensuring efficient steam utilisation and good condensate management. If condensate is not purged from the system it can lead to poor heat transfer and possibly water hammer problems. If the non-condensable gases are not purged from the system it can also lead to poor heat transfer and corrosion problems. Steam traps retain steam for maximum utilisation of heat, while releasing condensate and incondensable gases when necessary. A steam trap needs to be able to cope with various flow rates, temperatures and pressures, depending whether the equipment is starting up, under normal operating conditions or going through a cycle of operations.

Experience shows that steam traps work most efficiently when their characteristics are matched to that of the application. The selection of correct steam trap type, correct sizing and installation are very important. The different types of traps include bimetallic, ball float, inverted bucket, thermodynamic and fixed orifice traps, each having their own advantages and disadvantages.

Like all orifice traps, GEM Steam Traps work by using the difference in density between steam and condensate. Steam is 1000 times less dense than condensate so, at the entrance to the trap's orifice, the low density steam is separated from the condensate. The high density, slow moving condensate is then preferentially discharged through the orifice, trapping the low density steam behind it. The GEM Trap 'Venturi' orifice configuration works well over varying loads by using the 'flash' steam, that comes out of condensate as it passes from high to low pressure, to give a self-regulating varying capacity.

All steam trap installations should include strainers to prevent blockages and isolating valves to allow proper routine maintenance

### Energy and Cost Savings

Before the steam trap replacement coal consumption for steam at Antrim Area Hospital was estimated at 13,379MWh, with a total annual cost of £82,600. Table 1 summarises the project benefits.

**Table 1 - Project Benefits**

	Predicted	Post Project Evaluation
Energy Savings	668 MWh	615 MWh
CO <sub>2</sub> Savings	255 tonnes/yr	219 tonnes/yr
Capital Cost	£6,000	£6,000
Savings	£4,300	£3,800
Payback Period	1.4 yrs	1.6 yrs

### Considerations for Other Sites

- It is important to choose the most appropriate type and size of steam trap for each application as this could have an impact on the energy savings possible. A specialist should be consulted before any steam system upgrade is undertaken.
- Problems with blockages to steam trap orifices could be avoided by installing in-line strainers.
- Steam traps should be checked for blockages on a regular basis and cleaned out if necessary.

### Project Conclusions

Overall, the Gem traps have performed very well, although they are expensive to purchase and they do require occasional cleaning.

There is substantially less maintenance required than that of mechanical steam traps and they take up considerably less space. On rare occasions the fixed orifice or trap strainer may require cleaning, but to date none have needed to be replaced.



### 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 442 - Energy and Cost Savings from Steam Trap Replacement

FEB 002 - Steam

ECG 066 - Steam Generation Costs

ECG092 - Steam Distribution Costs

For details of the Carbon Trust's services and free publications, call the helpline on 0800 85 20 05 or visit the website [www.thecarbontrust.co.uk](http://www.thecarbontrust.co.uk)

### Other Publications

Energy Efficiency Office GPG 312 - Invest to Save

### Further Project Information

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