

# CASE STUDY – SUSTAINABILITY IN THE NHS

*"We have an excellent ongoing partnership with Thermal Energy and they regularly pop in to check how the systems are performing. As with all projects, we have had some minor issues and Thermal Energy have worked to get them sorted quickly and with no disruption to patient services"*

**Sam Willitts, Energy & Sustainability Manager**

- ▶ Annual gas savings of £300,000
- ▶ Saved 3,000+ tonnes CO<sub>2</sub> so far, Reduction of 10-20%
- ▶ Instant payback through shared savings



FLU-ACE™

**The NHS is having every last penny squeezed from its budget and the focus of any investment needs to be maintaining or improving patient care. At the same time, the Government is setting energy reduction targets for 2015, 2020 and beyond. In line with these targets, University Hospital Bristol NHS Foundation Trust (UH Bristol) has set a corporate objective to reduce carbon emissions by 5% per annum in line with the national carbon reduction target of 80% by 2050.**

Samuel Willitts, Energy & Sustainability Manager for the UH Bristol has the responsibility to hit these targets. Being one of Bristol's largest employers, the UH Bristol has added pressure from the council to become more sustainable and reduce the city's carbon footprint. In order to meet this target, Sam has implemented many projects including solar panel installation, new energy efficient buildings & recycling.

Faced with the challenge of finding new energy saving projects and the ever rising gas price, Sam decided to look at UH Bristol's extensive steam system to find somewhere he could save money. He was approached by Thermal Energy International (TEI), with an overall solution to regain 80% of the boiler plants' wasted energy.

stack. For a natural gas boiler, this latent energy will be around 18% of energy in the fuel. By the time boiler and distribution losses have been accounted for, TEI can typically save 20% of the fuel bill, as long there is a use for the energy.

The heat recovery unit makes use of the waste heat from UH Bristol's three 6.4 MW boilers and the exhaust gasses from the 8 MW CHP plant downstream of waste heat steam generator. The recovered energy is used to pre-heat the boilerhouse, make up water and displace steam from the Domestic Hot Water (DHW) and heating systems in the Maternity ward 600m away. For the right heat sink, TEI have installed piping loops of up to 1,000m from the source of recovered heat. The Trust is saving 1 million kWh of gas and 2,070 tonnes of CO<sub>2</sub> per annum by putting this waste energy to use.

The FLU-ACE™ control panel continually records the heat being recovered by the hospital and provides fault warnings if there are any issues. With the 7 year maintenance contract provided by TEI, heat recovery availability is maximised to ensure savings are delivered. TEI can also make minor adjustments to optimise heat recovery remotely and will be on site within 3 working days for any major problems.

***"As one of the biggest employers in Bristol, we have a significant environmental impact on our city and so we have a duty to show leadership,"***

Working with TEI, an operating lease agreement was built so that the Trust could benefit from the carbon savings and increased efficiency, whilst using some of the financial savings to pay for it. This allowed the projects to provide the benefits, without the drawbacks of owning capital equipment and compromising budgets reserved for patient care.

The first phase with TEI was to install the company's proprietary FLU-ACE™ technology. The FLU-ACE™ is a direct contact condensing economiser, which reduces the boiler exhaust gas temperature below the exhaust dew point to about 25°C. Cooling beyond the dew point releases all the latent energy in the exhaust by condensing all the moisture inside a separate

The installation of the unit was achieved without shutting down the boiler house and only required 3-4 hours downtime for each individual boiler, maintaining sufficient steam generation capacity to provide services for patients and wards throughout the install.

The second phase of the projects involved converting all 337 mechanical steam traps to TEI's GEM Steam Trap. To keep the steam dry and free of water, a steam trap is required to remove the water formed as the steam condenses at each point of use (heat exchanger), as well as every 30 – 40m along the steam pipework. The UH Bristol has over 300 steam traps installed across site for this purpose.



The US DoE estimates that “approximately 20% of the steam leaving a central boiler plant is lost via leaking traps in typical space heating systems without proactive assessment programs.” These losses occur because conventional mechanical steam traps are designed with a large orifice, requiring an opening and closing mechanism to regulate the flow of condensate through the trap. It is these moving parts that frequently fail in the hot, dirty, pressurised environment of a steam system; either in an open position wasting large amounts of energy or closed preventing heat transfer and causing potentially

Conventional mechanical steam traps fail at an industry accepted rate of 10% per year. Keeping on top of steam trap maintenance was a time consuming activity for the Estates department - a simple audit used to take at least a man-week.

To ensure there is no wastage of live steam, TEI's team of engineers design each GEM Trap for its specific application and subsequently commission it following installation. This project has eliminated the steam loss from the typical 10% failure rate that conventional mechanical steam traps suffer every

***“We were very impressed with how the installation went. Working with our project managers and estates team, Thermal Energy ensured that we had minimal downtime on our systems whilst connections were made, as well as incorporating our views into pipe runs and critical areas.”***

**says Sam Willitts, Energy and Sustainability Manager.**

dangerous water hammer. The advantage of this design is that specification is simple, typically requiring only the pipework diameter, but with rising energy costs a more efficient and reliable alternative is required.

These problems can be eliminated using the GEM Steam Trap, a permanent steam trap solution with a unique design that eliminates moving parts. With an orifice sized for the maximum condensate flow, it cannot fail open and leak live steam. The only maintenance required is occasional filter and orifice cleaning. This can be completed inline in less than 5 minutes with TEI's GEM servicing tool. Each GEM Trap is performance guaranteed for 10 years, with customers experiencing up to 20 years continuous service with no deterioration in performance.

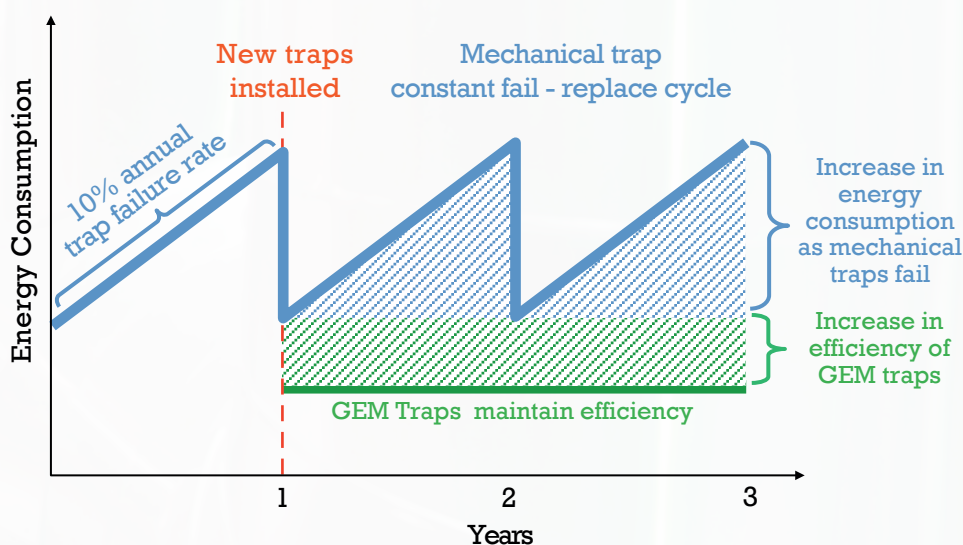
The UH Bristol steam distribution system is more than 5km in length, with steam from the central boiler and CHP plant delivering energy for hot water, space heating and sterile services across the entire estate. Steam is commonly used for heat distribution as a single kilogram of steam contains 15-20 times more energy than the same quantity of hot water. This energy density significantly reduces piping infrastructure and heater exchanger size. Unlike hot water heating systems, steam carries its energy in the form of latent heat, which is released at constant temperature as it condenses to water.

year. Additionally during onsite testing, the GEM Trap was demonstrated to be more efficient than fully operational mechanical steam traps. GEM Traps were supplied for all applications across site, including steam distribution line drainage, variable load domestic and hot water heat exchangers and performance critical sterile services.

Across these two projects, the trust has made reductions in gas usage by more than £300,000 a year. UH Bristol has also saved significant time and money in maintenance, as servicing and replacement of failing traps is no longer required.

Additionally, these projects have saved over 3,000 tonnes of CO<sub>2</sub>, which has helped the trust overachieve the 5% target of emission reduction it had been set.

**Trap performance over time - GEM vs Conventional Mechanical Traps**



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