

Lancashire Constabulary Cuts Energy Costs & Reduces Carbon Footprint

“It was only when we analysed the energy consumption at the end of the first year, that we realised just how much money the packaged plant rooms had saved the taxpayer. The equipment has paid for itself in just a year, and will continue to deliver cost savings throughout its life.”

“If a new system isn’t commissioned properly, all of the inherent energy efficiency of the system can be lost. But I was really impressed with the Armstrong engineers’ ability to get the equipment working at its full potential – right from the beginning”

—Ed Palmer

Summary:

The replacement, by Lancashire Constabulary, of an old oil-fired boiler house, with four new offsite manufactured packaged plant rooms from Armstrong has reduced the energy bills for the Hutton Hall site by £245,633 per annum, saving 744 tonnes of CO₂ emissions a year. Offsite manufacture enabled the new system to be installed within an extremely tight timescale (which would have otherwise meant site occupants being without heating and hot water in the winter months).

Site Owner:

Lancashire Constabulary has responsibility for 220 buildings in the county, including police stations and operational centres with an annual energy bill approaching £500,000 per year. Most of the buildings are of post-war construction with some older stations dating from the Victorian era.

Project:

The system for supply of heating and hot water at the Hutton Hall Police Training Centre, in Preston, Lancashire, needed replacement. The centralised oil-fired boiler, with two calorifiers for hot water supply, had ceased to manage the site’s demand effectively some years previously, necessitating the installation of new heating systems for the accommodation blocks. In 2006, it became necessary to install replacement systems for the remaining buildings at the site, including a sports hall, administrative centre, firing range, dining room and teaching block. The existing system was inefficient, with extensive distribution losses, and engineers advised the Constabulary that the boiler could not meet the needs of the site over the coming winter.

Requirements:

Lancashire Constabulary had a number of priorities. As the site is financed from public funds it was important to reduce the energy costs as much as possible. The energy manager, Ed Palmer, who has developed the Constabulary’s sustainability policy, also wanted to capitalise on the opportunity to improve the energy efficiency and carbon footprint for the estate, and to position the site to meet increasingly stringent environmental legislation. A key part of this strategy involved a move away from oil towards a gas-fired system with reduced carbon impact.

The nature of the operations at Hutton Hall also had an impact on the choice of equipment. The site houses several buildings with 24/7 demand, such as call centres on 24-hour duty, and the National Police Computer Database HQ.

The timescale of the project was such that, once the capital investment was approved, there was insufficient time to carry out the installation (using traditional onsite methods) before the onset of the colder weather. Several weeks were required for groundworks to install gas pipes, meaning that traditional onsite installation of the boiler house could not begin until October. An alternative solution was sought that would ensure continuity of supply of hot water and heating for the site’s occupants.

ENERGY SAVINGS

Energy consumption before:	4,503,600 kWh per annum
Energy consumption after:	2,550,730 kWh per annum
Energy savings:	1,952,870 kWh per annum

COST SAVINGS

As a result of installation of new system:	£126,936.55
As a result of change of fuel:	£118,696.45
Total cost savings:	£245,833.00

CARBON REDUCTION

As a result of installation of new system:	525.27 tonnes of CO ₂ per annum
As a result of change of fuel:	217 tonnes of CO ₂ per annum
Total reduction in carbon emissions:	744 tonnes of CO ₂ per annum

EQUIPMENT INSTALLED

Plant Room 1: Firing Range & Sports Hall

Enclosure size: 3000 x 2500 x 3000
Total output: 160 kW LTHW and 49kW 368 litre storage hot water
System components:

- MBS integrated heating solution incorporating two Armstrong 80kW fully modulated gas-fired condensing boilers and 1 Boss BUF 100 – 199 Condensing gas-fired gas water heater
- Armstrong 4392 Startwin 50 – 200 0.55 kW pumps
- Armstrong Autofill pressurisation unit

Plant Room 2: Lancastrian Building

Enclosure size: 4000 x 3000 x 3000
Total output: 320 kW LTHW and 49kW 368 litre storage hot water
System components:

- MBS integrated heating solution incorporating four Armstrong 80kW fully modulated gas-fired condensing boilers and one Boss BUF 100 – 199 Condensing gas-fired gas water heater
- Armstrong 4392 Startwin 80 – 200 1.5 kW pumps
- Armstrong Autofill pressurisation unit

Plant Room 3: Ellis Building

Enclosure size: 4000 x 2300 x 3000
Total output: 320 kW
System components:

- MBS integrated heating solution incorporating four Armstrong 80kW fully modulated gas-fired condensing boilers
- Armstrong 4392 Startwin 80 – 200 1.5 kW pumps for LTHW
- Armstrong Autofill pressurisation unit

Plant Room 4: Langdale Building

Enclosure size: 3000 x 2500 x 3000
Total output: 240 kW
System components:

- MBS integrated heating solution incorporating three Armstrong 80kW fully modulated gas-fired condensing boilers
- Armstrong 4392 Startwin 80 – 160 1.1 kW pumps for LTHW
- Armstrong Autofill pressurisation unit



Ed Palmer was named
ESTA Energy Manager
of the Year in 2008 for
this project.

Solution:

Ed Palmer carried out a feasibility study comparing three alternative approaches. The solution which proved to be the most effective was the installation of four offsite constructed packaged plant rooms, incorporating highly-efficient variable speed systems based around the Armstrong MBS integrated heating solution, controlling Armstrong IVS pumps and pressurisation equipment.

The MBS incorporates fully modulating boilers, variable primary pumps, automatic fill/pressurisation unit and integrated controls, all pre-specified for optimum efficiency, and pre-assembled for rapid installation on site. It enables excellent boiler efficiencies to be achieved without time-consuming mixing and matching of system components.

Instead of treating the condensing boiler in isolation, the MBS matches pumps, controls and hydraulic system design. This ensures compatibility of components and enables specifiers to meet and exceed the boiler efficiency levels required under the new Part L of the Building Regulations with energy-efficient, low carbon performance designed into the system as standard.

Part L2 calls for minimum overall boiler efficiencies of 84% in new build and 80% in existing buildings. The MBS can achieve overall seasonal efficiencies of 94%, providing significant energy savings and carbon reductions throughout the lifetime of the plant. As the system is fully integrated and pre-assembled, additional system design input is not necessary, and installation and commissioning can be achieved much more easily and quickly..

Benefits – Energy Consumption & Cost:

Energy consumption: The energy requirement of the site was reduced from the equivalent of 4,503,600 kWh per year to 2,550,730 kWh per year (a saving of 1,952,870kWh).

Energy saving (based on kWh reduction): The reduction of 1,952,870 kWh in energy consumption, calculated at a cost of 6.5p per kWh (oil) equates to an annual saving of £126,936.55.

Energy saving (from change of fuel from oil to natural gas):

As the site has moved away from an oil-fired boiler in favour of highly-efficient condensing boilers there are further reductions in energy costs arising from the prices differences between natural gas and oil. Calculated based on a natural gas price of 1.8p per kWh and an oil price of 6.5p per kWh, the cost saving as a result of change of fuel is £118,696.45.

Total energy saving: The two cost-savings, when added together provide an overall cost saving for energy per annum of £245,633.

Pay-back (four packaged plant rooms): Estimated at one year.

Benefits – Environmental:

Carbon emissions (based on kWh reduction): Calculated at a rate of 0.27 kg of CO₂ per kW, the move to the new system (which resulted in a reduction in consumption of 1,952,870kWh) equates to a reduction in carbon emissions of 525.27 tonnes per year.

Carbon emissions (based on change of fuel from oil to gas): As gas is calculated as having approximately one third less carbon emissions per kWh compared to oil, there is a further reduction in carbon emissions resulting from the change of fuel of 217 tonnes of CO₂ per year.

Total carbon emissions: The two carbon reductions added together amount to an overall reduction in CO₂ emissions of 744 tonnes per year.

Benefits – Project:

Timescale: Offsite construction meant that the packaged plant rooms could be assembled concurrently with the excavations for the gas pipes rather than commencing once this work was completed. This significantly shortened the timescales for the project making it possible to complete it by the target date of the start of October.

Reduced installation time: Offsite construction reduced the installation time from several weeks to just a few days. The plant rooms were delivered to site, fully assembled, requiring only final connections.

Lack of disruption: By completing the project by the target date, it was possible to guarantee continuity of supply of hot water and heating for site occupants. Traditional onsite methods of plant room construction could not have met the target date and would have continued into the winter months.

Health and safety: Manufacturing the plant rooms in a purpose-designed factory instead of at the Hutton Hall site reduced the health and safety risks associated with the project.

Reduced contractor access and traffic: Offsite manufacture reduced contractor presence and traffic at the Hutton Hall site, which was occupied throughout the project.

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