St Paul's Cathedral, London

Hamworthy provided a flexible and efficient modular boiler and hot water solution to fit the building and the cathedral has reduced its gas consumption by close to 40% compared to using the old boilers before the refurbishment.

Sector: Historic building

Building: Grade 1 listed refurbishment

Products: Wessex ModuMax mk3 boiler, Powerstock glass lined calorifier

Application: Space heating 1,016kW, domestic hot water 1,000L

The prestigious St Paul's Cathedral – over 300 years old – faced failing church boilers. As a Grade 1 listed building, the delicate building structure is subject to strict regulations, prohibiting alterations without special permissions. Hamworthy provided a flexible and efficient modular boiler and hot water solution to fit the building and St Paul's cathedral has reduced its gas consumption by close to 40% compared to using the old boilers before the refurbishment.

The cathedral's existing heating system consisted of three steel shell boilers fitted in the 1960s which received a burner upgrade in the 1980s. Problems on the equipment occurred and were fixed until the boilers finally started leaking and could not be repaired anymore. At this point, Robin Bunton from Bunton M&E Services advised replacement boilers were necessary. Together with Mike Crouch, Hamworthy's agent for the area, and Nick Coates from Blue Print Building Services Design, he worked on the specification for the cathedral's heating and hot water refurbishment project with Clerk of Works Martin Fletcher.

The Solution

> The cathedral was seeking reliable and energy efficient commercial boilers to meet its high heating and hot water demand while keeping the running costs down. To avoid changing the flues, they initially planned to replace the older system with pressure jet steel shell boilers. Robin, however, recommended Hamworthy's Wessex ModuMax mk3 condensing modular boilers as most efficient way to heat the church and to meet the reliability and energy efficiency requirements, as well as compliance with current legislation to eliminate inefficient boilers.

He commented,

> "We have used the Wessex boilers since they were introduced and we know they are a very reliable product. They are space saving, great in refurbishment projects and buildings where you can't change the building fabric, such as St Paul's. Hamworthy also has an excellent after sales and spares service, with their own engineers, which is why I prefer working with them."

Tom Fletcher, Works Manager at St Paul's Cathedral, added,

> "Once we understood we needed to replace the Cathedral's heating and hot water plant, we were set a target of reducing gas usage by 10% once the project was complete in line with the Cathedral's sustainability ambitions. In discussions with our M&E consultant, our engineer and examining the constraints of the building, we elected to use the Hamworthy boilers because they offered efficiency as well as significantly reduced disruption to the building during the project because of their small modular form."

Old pipe system installation preparation

Heating systems for churches such as St Paul's are worn by decades of use, which is why preparation works six months prior to the installation of the boilers were carried out. Two MagnaClean® filters were installed to clear the heating system from sludge and debris, followed by a system flush. To create hydraulically separate systems from the new cathedral boilers to the existing radiator system, a plate heat exchanger has been installed. This not only divides the primary and secondary circuits, but also ensures a highly efficient heat transfer with minimal losses between the two, thanks to the heat exchanger's large surface areas. It also stops any dirt and debris from the secondary circuit entering the cathedral's new modular boilers and pumps.

The complete plant room was fabricated and built off-site at Bunton M&E Services workshop, dismantled and delivered to site reducing the total installation time on-site to just four weeks.

Space-saving, energy efficient and powerful products wanted

For the boiler installation, two Wessex ModuMax mk3 WM254/508V modular condensing boilers were chosen. This combination consists of two stacks with two boiler modules in each, delivering a total output of up to 1,016kW and a turndown ratio of 20:1. The turndown ratio refers to the ratio of maximum capacity to minimum capacity. In St Paul's case, the boilers can deliver any output from 50.8kW up to 1,016kW. This ensures the load is matched to warm the building up, and in periods of low heat demand, the boilers are not constantly cycling and wasting energy. The modules can easily be stacked on top of each other and side by side to offer a variety of installation options.

Backed up by a 10-year warranty on the heat exchanger, the space saving modular boiler, which fits through a standard doorway, provided the installation flexibility needed for St Paul's Cathedral.

Project challenges

As the system was changing from steel shell boilers to condensing boilers, modifications to the flues were required. Robin commented,

> "You have to be very aware of the structure of the building as you cannot change anything without permission. A FuranFlex flue liner was specified by Flues UK and installed down the length of the 100ft rain water chute into the plant room."

The flue liner was installed to meet the needs of modern condensing gas boilers which meant ensuring pressure and water tightness, as well as providing protection from the condensate which can cause corrosion due to its slight acidity of typically 3.5pH.

Meeting hot water requirements

Due to the popularity of St Paul's Cathedral, the summer months are a challenge in terms of hot water demand. Coach parties arrive at the cathedral and use the facilities such as toilets and catering at the same time in a relatively short period, causing an extremely high peak demand. Two Hamworthy Powerstock PS500 glass-lined hot water calorifiers with a capacity of 500 litres each and a recovery time of 18 minutes were chosen to meet the requirements. The heat to the indirect-fired water heaters (you can read more here about Indirect vs Direct Hot Water Systems) is supplied by the Wessex ModuMax mk3 condensing modular boilers.

Robin elaborated,

> "The Powerstock calorifiers have a quick recovery to cope with these peaks in demand. We had to install two 500 litre models, as we couldn't get the larger 1,000 litre model into the plant room."

Noticeable improvement

Heating a church can take a long time due to its large space, but the cathedral has already felt a significant change from the time prior to the installation of the new boilers.

Robin said,

> "The speed of heat up has greatly improved. Previously it would take a week to heat the cathedral up from cold, but now it only takes one day, the heating runs 24/7 on weather compensation."

Weather compensation means a small outdoor sensor is fitted to adjust heating controls according to outside temperature changes to ensure more efficient operation of the heating system.

Tom commented,

> “Since the installation, we have found that we have managed to reduce gas consumption by close to 40%. This means that we have not only reduced our carbon footprint but have also benefited from significant savings on our gas bill, well above our initial project target.”

Ticking the boxes of a successful project

The challenge to provide an energy efficient and compact heating solution to be fitted to an old heating system without changing St Paul’s Cathedral’s building structure was successfully met. Space restrictions were overcome by choosing a modular boiler system to allow installation flexibility and access. Thanks to multiple water heater sizing options and their quick recovery time, the peaks in hot water demand in a short period of time were met whilst taking plant room space into account.

For heating advice on listed or historic buildings why not book one of our experts for a free site survey? Alternatively, contact your local Area Sales Manager.