Feel the heat

Delivering heating and hot water to multiple dwellings can be a real challenge for housing associations. **Beata Blachut** and **Silas Flytkjaer** explain how small-scale CHP and district heating can be the ideal low carbon solution when it comes to building to the higher levels of the Code.

A major challenge with the provision of heating and domestic hot water (DHW) to multiple dwellings is to combine the required levels of flexibility and responsiveness with an energy efficient system. Combined heat and power (CHP) serving a district heating scheme is an obvious way to address this but there have been problems with control in the past, resulting in disappointing performance. There is also a misconception that CHP is only suitable for very large developments.

In fact, modular CHP provides a scalable solution, much like modular boilers are now the norm rather than one large boiler, making it suitable for social housing accommodation of all sizes. Furthermore, by paying careful attention to the heat interface units that are used in each dwelling, the system can be highly controllable and fully responsive to tenants' heating and DHW requirements.

As CHP generates both heat and electrical power it is important to maximise the time the CHP is running and minimise the purchase of electricity from the grid, as this is the most expensive utility. Traditional CHP designs have a fixed power output so in the past it has been necessary to match them to the base electrical load, which imposes constraints on the energy savings that can be achieved.

However, more modern designs are able to modulate their output and track site demand, so electricity generated never exceeds demand, meaning there is no need to 'dump' heat or sell surplus electricity to the grid at unfavourable rates. In this way the units can be matched approximately to the building load and will then 'self-learn' and adapt to changing conditions.

As noted earlier, factors such as inconsistent performance of the heating, long delays in supply of hot water and variable hot water temperature have given district heating in multiple dwellings a bad name. Yet all of these issues can be addressed by taking a holistic approach to the design of the system.

For example, traditional CHP plant is designed to maintain a constant temperature differential and this results in variation in the temperature of the water being supplied to the heating system. As a result, the performance of the heating system may be inconsistent.

Heat distributors

The solution is to incorporate a 'heat distributor' to ensure that the actual flow temperature consistently corresponds to the design flow temperature. This arrangement ensures the CHP always produces high grade heat, and any surplus heat can be stored to help optimise CHP operating times and reduce the likelihood of back-up boilers being operated.

Within the dwellings the key to control lies in the design of the heat interface units (HIUs) that are installed in each apartment. These provide the interface between the hot water coming from the plant room and the heating and hot water systems in the apartment.

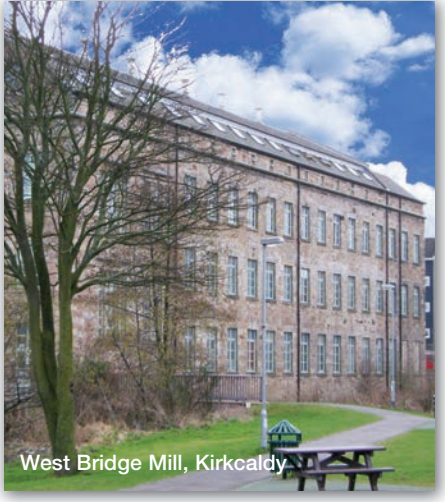
Historically, these have been treated as an accessory rather than an integral part of the system. However, some view the HIUs as the key to not just improving control but also delivering maximum energy efficiency and making use of the right valves – specifically control valves and

differential pressure controllers – within the HIUs is the way to achieve this.

The correct configuration on the valves enables individual temperature control in each room, ensures a safe temperature for DHW and compensates for variable loads, supply temperatures and different pressures. Responsive HIUs are also fitted with an idle temperature controller, keeping water in the supply pipe warm so that hot water is always available, even at warmer times of the year when there is little or no demand for space heating.

This arrangement also maintains low return water temperatures to the CHP plant, which helps to optimise efficiency and is a requirement of Part L of the Building Regulations.

All of these factors played a role in the specification of CHP and district heating at West Bridge Mill in Kirkcaldy, an award-winning social housing facility operated by Link Group Housing Association. The former rope mill has


West Bridge Mill, Kirkcaldy

been converted into 16 separate flats, all of which are served by SAV LoadTracker mini-CHP, reducing energy bills by around 70% compared to using traditional boilers and grid electricity. The system also features integrated energy meters and a datalogger for monitoring of energy consumption by each apartment.

Each of the apartments is fitted with a FlatStation HIU to provide efficient heating as well as instantaneous domestic hot water when it's needed, without the need for hot water storage within the apartment. As hot water is only generated when it's needed, combined with the pre-insulation of the FlatStations, there are no standing heat losses and overall efficiency is greatly improved.

As Colin Reed, energy and sustainability officer at Link Group Housing Association, observed: "For the people living in the flats it's controllable. It's instant heat, it lasts all day and if they're cold they just turn it up a little bit."

So there is great potential for housing associations to make use of CHP and district heating to reduce their costs and carbon footprint, while improving heating and hot water services for tenants. The key is to ensure that the system is capable of delivering the required levels of flexibility and responsiveness.

● Beata Blachut and Silas Flytkjaer are product managers with SAV Systems.

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