Case Study 2 Sharc System – Student Accommodation Block

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Building Type	Student Accommodation Block comprising 150 en-suite rooms
Gas Consumption	1,172,000kWh/year
Heat Demand	1,055,000kWh
Location	East Midlands, City Centre

Thermal Analysis: Monthly gas bills are used to derive a thermal profile for the year. Hourly profile is built from bills and pre-defined building profiles. Peak load is shown to be 583kW.

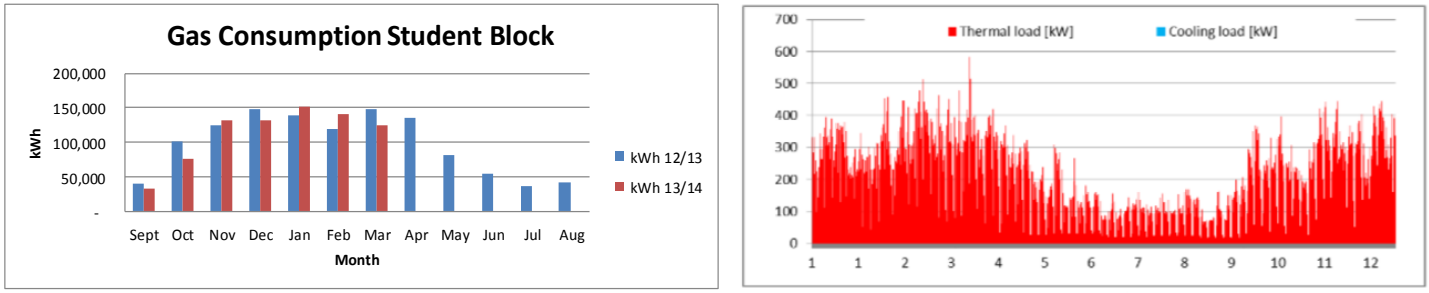

Figure 1 Monthly (kWh) and Hourly (kW) Thermal Profiles for a Typical Student Accommodation Block

Water Analysis: Monthly or half hourly (HH) data is required to ascertain the amount of wastewater available to the Sharc unit for heat recovery. The flow rate of the sewer determines the size of Sharc unit that can be deployed.

The student accommodation block in this case study generated 16,638m^3 of waste water/year. The flow rate varies between 42 and 97l/min depending on time of year. The pass through rate of the SHARC system provides a resultant flow rate for the system of between **126** and **291l/min**.

The various Sharc sizes and their outputs and required max/min flow rates are shown in Table 1 below. Obtaining the flow rates for the accommodation block enables the correct size of Sharc to be selected.

If water flow rate data is not available, the local water utility company will be contacted by Sharc for details of the flow rate in the nearest main sewer.

	Energy Capacity, kW	Min Flow (l/min)	Max Flow (l/min)
Sharc 440	462	379	1514
Sharc 660	703	1136	2082
Sharc 880	937	1514	3407
Sharc 1010	1172	3028	4542

Table 1 Sharc Sizes, Outputs and Flow Rate Requirements

It can be seen that the flow rate at the accommodation block is less than the minimum flow rate for the smallest Sharc unit. For this reason, the nearest main sewer will be used to provide flow to the Sharc unit. In this instance, data was collated for the nearest public sewer, which was ø225mm, which has sufficient flow rate to power the smaller Sharc units.

Site Survey: The survey is conducted on site and takes around 1-2 hours. The survey reveals the current heat generators (boilers, water heaters, calorifiers, etc) as well as identifying pump duties, pipe sizes and routes, valve positions and the various heating circuits. A high level P&ID will be created if none exists for the site.

Potential locations for the Sharc unit and heat pumps will be identified including maintenance access and connections to the existing heating circuits.

Solution: The smallest Sharc unit, the 440, will supply 99.5% of the thermal load required at the student accommodation block. Its peak output is 462kW. Figure 1 demonstrates that the peak demand of 583kW occurs very infrequently, which is why a 462kW unit will supply the vast majority of the demand.

The Sharc unit, heat pumps and pipework will be delivered to site on pre-assembled skid mounts. A typical footprint for the 462kW Sharc unit including heat pumps is approximately 5m x 4m x 2m (L x W x H). The equipment is modular so can be arranged according to space availability, e.g., long and thin or more rectangular. It is also possible to split the various skids up and position them around the plant room if necessary.

Carbon: By changing from gas boilers to electric heat pumps, the following carbon savings can be made:

Baseline		
Gas Consumed, kWh	1,172,000	
Carbon Emission rate, gCO2/kWh	184.04	Source: Defra/DECC's GHG conversion factors for company reporting, June 2013. Gross calorific value.
Carbon Emitted, tonnes	216	
Sharc System		
Building Demand @ 80% Gas Boiler Efficiency, kWh	1,055,000	1,172,000 * 90% = 1,112,000
Heat Pump Generation	1,055,000	
Heat Pump COP	4.2	
Electric Consumed, kWh	251,143	
Carbon Emission rate, gCO2/kWh	445.48	Source: Defra/DECC's GHG conversion factors for company reporting, June 2013. Gross calorific value.
Carbon Emitted, tonnes	112	
Carbon Saved, tonnes	**104**	**Per year**

Table 2 Carbon Savings against Original System

Economic Business case year 1

Utilising SHARC Energy Finance the installation will be installed on a risk free heat purchase agreement, offering the client a 20 year fixed discount to current gas prices generating a £340,000.00 cash saving over the life of the system.

Table 3 Heat purchase including Capital and Operational Costs of the SHARC System