



South Dock, Charlotte Quay, Dublin 4. by Monrick

The Charlotte Quay Apartments are a new development consisting of 78 apartments in the heart of Dublin as part of the docklands development. The apartments are supplied with heating and hot water from a centralised boiler through a district heating system, rather than each apartment being fitted with a single boiler.

James Elliott Construction Limited constructed Charlotte Quay Apartments, at Ringsend Road in Dublin. The development comprises of 71 apartments, 7 luxury, state of the art penthouse apartments, a 40,000 square foot office block and a 6,000 square foot retail complex. This case study focuses on the district heating system within the apartments only.

All the apartments are designed with energy efficiency and environmental concerns in mind. Each apartment is fitted with a highly insulated glazing system and is mechanically ventilated via heat exchangers to minimise heat loss. The fabric of construction quality allows for less than one air change per hour infiltration, which represents excellent air tightness. The building also uses a combined boiler and micro-CHP system generating electricity on site.

Design Team:

Energy Consultants
Envirobuild & Associates Ltd.

Mechanical Services
Ashcoin Ltd

Developer
James Elliott Construction



Central Plant Utilising Combined Heat & Power Units and Boilers

CHP (Combined Heat and Power) is the simultaneous generation of heat and electricity from the same piece of equipment through the combustion of natural gas. Heat that is usually lost in the power generation process is captured and utilised in heating applications resulting in energy savings and greater running efficiencies.

While CHP has traditionally been the preserve of large commercial or industrial energy consumers, “micro” CHP brings the benefits of “cogeneration” (production of both heat and electricity) to the smaller consumers like nursing homes, leisure centres, public houses /restaurants, small hotels, even large private residences.

It was decided at design stage to incorporate micro CHP into the heating system. By utilising micro CHP, the facility owner could target his own electrical “landlord loads” e.g. pump loads, car park lighting, boiler room loads etc, while at the same time introduce the heat from the CHP into the district heating system, displacing heat generation from the boilers.

An analysis of the landlord loads was performed and it was determined that the base electrical load amounted to a constant 11KWe. On that basis, two Dachs micro CHP units were installed.

In order to ensure that the maximum running hours were achieved from the CHP units, a 7,500 litre buffer tank was also installed. The buffer tank will permit the CHP units to continue running by storing the thermal energy from the units during times of low hot water demand, while continuing to displace electrical imports from the grid.

The Condenser

The CHP units are fitted with internal heat exchangers that extract heat from the generator, engine, oil and flue gases. However, additional external heat exchangers, or “condensers”, were supplied to extract even further heat from the engine exhausts, thereby ensuring the maximum efficiency possible is always achieved from the units.

The additional heat gained in this way is up to 2.3KW, boosting the system efficiency from a minimum of 88% to a maximum achievable efficiency of 99%.

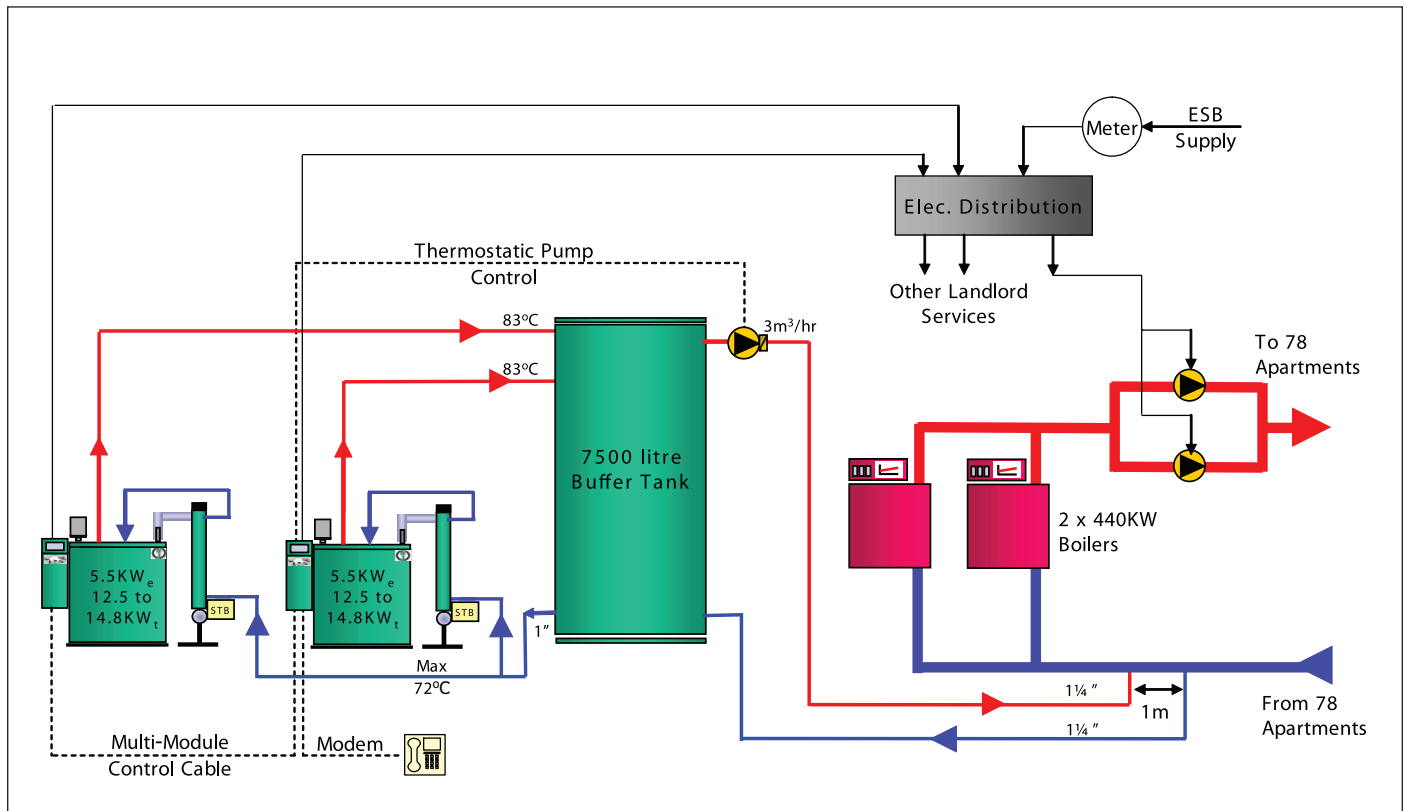
Electrical Integration

Each CHP unit is connected to the apartment complex through the boiler room distribution board via two 3 x 20amp circuit breakers. The complex’s demand for electricity has therefore been reduced by a total of 11kWe, resulting in lower electricity costs, increased efficiencies and reduced carbon footprint.



Dachs micro CHP Technical Data:

- ◆ Engine: 599cc 4 stroke Sachs gas engine
- ◆ Fuel Input: 20.5 kW
- ◆ Electrical Output: 5.5 kW
- ◆ Thermal Output: 12.5 – 14.8 kW
- ◆ Efficiency: 88% - 99%
- ◆ Weight: 530kg
- ◆ Dimensions: 1000mm high x 720mm wide x 1070mm deep



As can be seen from the schematic diagram, two CHP units are utilised in conjunction with two large boilers. The CHP units heat water which is then fed to a 7500 litre buffer tank. The hot water passes from the tank to the boilers via the return line from the apartments (this water would have retained some heat). The boilers add heat when required and the water is fed to all 78 apartments.

All 78 apartments are supplied with a Danfoss Heat Station which acts as the interface between the District Heating network and the apartment. This unit ensures enough instantaneous hot water for showers, baths and taps and removes the inefficiencies associated with traditional storage cylinders. Space heating in the apartment is controlled by a programmable room thermostat which provides optimum comfort and economy by automatically controlling room temperatures. The system incorporates smart energy metering which can be remotely downloaded for invoice generation from any PC with modem connection.

The boiler plant consists of two Viessman Vitoplex 200 440kW gas fired boilers. From the main header, heat is distributed to each apartment using a duty/standby pump arrangement. Each pump is rated for 7.4kW, but modulates down to a minimum of 30% depending on heat demand.



Mechanical Ventilation

In order to optimise the thermal performance and overall comfort levels of the living spaces, a balanced approach was taken where by appropriate levels of fabric U-values and fabric air tightness were implemented. To further reduce the space heating requirement, The ventilation levels were optimised with the aid of heat recovery ventilation(HRV) technology, thus decreasing further the space heating load. Good fabric air tightness was achieved in the region of 1 ACH (air changes per hour) @ 50pa, thus improving the performance of the HRV system and reducing infiltration losses. A balanced approach delivers good results whereby equal attention is given to Insulation, Ventilation and Innovative heating systems. Integrating the micro CHP into the DH (district heating) design will improve energy performance in the region of 10 kWh/m²/yr.

The Charlotte's Quay project received grant aid from Sustainable Energy Ireland's, House of Tomorrow scheme. As the apartments have utilised energy saving and renewable technology they received a grant based on the design.

The apartments utilised district heating with heat metering, micro CHP, heat recovery ventilation, high levels of insulation and highly insulated glazing. As part of the energy performance specification by Enviroworld, the apartments have a target energy rating of A3, with some internal south facing units performing better.

Advantages of Natural Gas

- ◆ There is no need to set aside areas for storage facilities with Natural Gas. There is a constant supply 24 hours a day, 365 days a year. No necessity to order or arrange delivery of your fuel.
- ◆ Natural Gas appliances are instantly controllable at the flick of a switch, or by simple or elaborate programmers as required. It provides full instant heat when turned on and stops instantly when turned off, no warming up or cooling down.
- ◆ Natural Gas is a clean fuel in its initial raw state; in burning leaves low levels of residue which can help ensure lower maintenance costs on plant and equipment.
- ◆ On-site natural gas monitoring allows industrial and commercial users to monitor and maintain energy saving initiatives. This allows businesses greater control over the management of energy costs and conservation of energy use.
- ◆ Natural Gas Meter dimensions; 835mm wide, 635mm high, 300mm deep.



Natural Gas Meter supplying central plant. Bord Gáis Networks G65 meter supplying up to 1035 kW.

Supported by



"We were delighted to support the Charlotte's Quay development under our House of Tomorrow Programme, in particular this pilot scheme provides proven demonstration of how CHP can be successfully incorporated into the sustainable heating of apartment dwellings. For further information on SEI or other similar case studies visit www.sei.ie or call 1850 376 666." SEI

Disclaimer

This information is only a guideline to the different products available for use with natural gas in new development construction. Users should ensure that products are suitable for the specific circumstances in which they seek to apply them. Contact the supplier or manufacturer directly for specific information on building requirements and materials needed for installation. Professional advice specific to the project should always be sought. The current Irish Gas Standards and Technical Guidance Documents (Building Regulations) override all contents. Users should ensure they always have the most up to date information.

Suppliers:

Combined Heat and Power System:

Kinviro Limited
PO Box 20
Greystones
Co. Wicklow

Tel: (01) 4433825
Fax: (01) 2877535

Boilers:

Precision Heating
Unit 504B
Northwest Business Park – Phase II
Mitchelstown Road, Ballycoolin
Dublin 15

Tel: (01) 8091571
Fax: (01) 8091570

Apartment Heat Meters:

Danfoss Ireland Ltd.
Unit A4
Centre Point Business Park
Dublin 12

Tel: (01) 6268111
Fax: (01) 6269334



February 2008



New CONNECTIONS 1850 427 737
www.bordgais.ie
New development site drawings: plans@bge.ie

New Connections: Dublin: Arena Road, Sandyford Business Park, Dublin 18.
Cork: PO Box 51, Gasworks Road, Cork.