Energy Efficient Buildings –
One company's approach to help reduce carbon emissions

The construction industry is the single largest user of material resources in the economy, generating 100 million tonnes of waste every year*. It is now recognised that the construction sector has an obligation to lead the way in working towards the reduction of CO_2 gasses. *B&E* seeks the views of Client, Architect & Contractor and asks Jackie Blanden, director, Export Sales, WMProtek AB 'How are we doing?'

All types of buildings account for approximately 47% of total UK carbon emissions; and non residential buildings are responsible for approximately half of this amount. The UK has a large stock of older buildings with outdated building envelopes and structures. Service designs are also outdated, and the combination of these two factors leads to poor energy performance and inefficient use of these old buildings which are often situated in prime inner city locations.

Listed building status and conservation orders on many of these older buildings make them difficult for developers to refurbish in a cost effective way to minimise the carbon emissions from the building. Other factors affecting the refurbishment of these buildings include the change in the way buildings are used, with more computers, computer rooms and a range of small electrical devices adding to the environmental balance of the workplace, while at the same time demanding good indoor air quality and attractive, flexible working space.

Jackie Blanden commented, "Developing a methodology to refurbish older buildings is an important step towards reducing carbon emissions by improving the buildings' in-situ fabric, core services and use of equipment, while retaining the architectural integrity of the building. Protek's approach is based on experience in the UK, mainland Europe and Asia, the last where climate and cultural differences have been at the forefront of dealing with these issues.

"Sweden has been at the cutting edge of energy efficient systems for decades. We have understood for some time that the highest carbon emissions are associated with the construction industry because of the high carbon footprint of building materials; therefore energy efficiency is only ***one*** aspect in Protek's approach to cooling, heating and ventilation systems to reduce overall carbon emissions. In creating a modular system, Protek has tried to address not just the energy used to make and deliver parts but also the energy to dismantle and dispose of them afterwards."

While the design approach adopted by Protek is bespoke to meet the needs of individual buildings, the constituent elements include:

- **A raised floor to distribute air conditioned air throughout the building.**
  The system utilises the raised floor as a means of circulating the air conditioning system air supply to where it is needed. By using the raised floor void, metal ducts are not required, leading to a significant reduction in the requirement for galvanised steel and internal insulation materials. In addition these under floor spaces can accommodate electrical power and IT distribution eliminating the need for separate steel ducts. Second hand or recycled floor tiles in a range of materials can also be used to create the floor surface.

- **Outdoor AHUs with rotary energy recovery and CO_2 control.**
  The rotary energy recovery units provide approximately 70% energy recovery of heating or cooling of the outdoor air by the use of thermal wheels in the air handling plant. In addition, CO_2 control ensures only the necessary amount of outdoor air is delivered into the rooms, lowering the average load of outdoor air to around 70% of the designed quantity.

- **Zone Units (Compact Air Handling Units), using energy efficient EC fans for stepless control of the airflow.**
  The Zone Units use high performance centrifugal fans with integrated electronics enabling very efficient air handling (better than 91%). With a well built building with a high thermal efficiency, the required air conditioning can be delivered using 10% of the normally required energy.

- **Protek's PCO, a powerful network based, fully digital controller**
  The PCO enables all operation made by a PC connected to the PCO's TCP/IP Ethernet port. By using a web browser to connect to the PCO, all set points and parameters can be read and adjusted. The PCO stores all the alarms, data and statistics in the WebDataBase and this data is logged and monitored. This allows effective control and maintenance of the buildings' services anywhere in the world by Protek's trained and qualified personnel to:
  - optimise energy efficiency for each individual zone
  - monitor electrical consumption

- **Ice storage chillers**
  This uses off peak electricity to produce ice which is stored in special tanks and melted down during the day when the cooling demand exists in the building. This design reduces the daytime demand on the grid, and consequently spreads the electricity demand over 24 hours rather than during 8 to 10 hours during the day.

- **Free Cooling using OA air and dry coolers**
  The use of cold outdoor air to produce chilled water (9 to 10°C) for the Cooling Systems using the Dry coolers (normally provided for refrigeration cooling) and reducing the demand on the refrigeration compressors.

- **Taking care of the building envelope**
  The use of double glazing, insulated walls and roofs, to minimise heat losses and gains through the façade.

Consequently, Protek has coupled their design for cooling. heating and ventilating buildings with advice to engineers, architects and builders to ensure the overall operating building has the lowest possible carbon emission.

The recommendations include:

- Where feasible buildings must be refurbished rather than demolished and rebuilt, reducing material demands by the re-use of materials such as brick, glass, timber and tiles, consequently reducing energy demands and carbon emissions at the point of material production.

- To have the highest resistance to heat flow, the building should incorporate multiple glazing, efficient sealing of the building, insulated walls and roofs, location of glazing and the use of natural shading to reduce solar gains.

- Heat recovery for cooling and heating by using thermal wheels in air handling plants to recover room heat for heating and use cooling from cold outdoor air. In addition the use of cold outdoor air to produce chilled water (9 to 10°C) for the Cooling Systems using the Dry coolers normally provided for refrigeration cooling and reducing the demand on the refrigeration compressors.

- Protek designs also include the use of off peak electricity for producing ice water stored in special tanks, which is melted down when a cooling demand is required in the building. This reduces the daytime electricity demand at the grid.

- All Zone units, OA AHUs and FTUs should use energy efficient components such as fans, wherever possible.

- Protek monitors buildings that incorporate their system for a minimum of two years to optimise energy savings and review electricity consumption.

Concluding, Jackie told ***B&E*** that Protek has just completed a successful installation in a refurbished building situated at 77-79 Farringdon Road in London's mid town. During the internal fit out she would be pleased to take interested readers on site to demonstrate the compatibility between the building envelope and Protek's approach to a high performance work space and the reduction of carbon emissions. ***Jackie can be contacted on jblanden@wmprotek.com***

Source: *Statistics supplied by the Carbon Emissions Trust