

Comprehensive Energy Survey of Large Office Building

Summary

PowerTherm was contracted to undertake a Comprehensive Energy Survey of a large office building in Dublin. The objectives of the survey were to establish a baseline of energy consumption based on historical information and compare this with industry benchmarks; to analyse how energy was being consumed at the site and identify the energy cost drivers; to identify cost-effective energy saving measures; and to provide monthly energy performance targets to assist in realising the savings. The survey concluded that electricity and gas consumption was above typical performance of a similar building type; provided a series of pie charts illustrating how energy was consumed; and identified cost-effective measures that could reduce total annual energy costs by over 20%.

Site Description

The office building is modern, air-conditioned and 25,000 m² (270,000 ft²) in size.

The building has four main Heating Ventilation and Air Conditioning (HVAC) zones, with six floors in each zone. Each zone is provided with fresh, tempered air by an air handling unit. The fresh air is ducted to each floor and, from there, to a number of Fan Coil Units (FCU) located in the ceiling void. In each FCU the fresh air is mixed with air extracted from the office below and heated or cooled prior to delivery into the office environment. Used air is extracted by exhaust fan. Temperature regulation and scheduling of the HVAC is by a Building Management System (BMS).

The building design allows a considerable amount of daylight to penetrate into the building. However, all floors need supplementary lighting, even on the brightest of days. Areas are lit by high-efficiency T5 fluorescent tubes and Compact Fluorescent Lamps. Lamps are controlled by a Lighting Management System which can dim or switch on/off lamps based on time schedule or the activation of a Presence Detector.

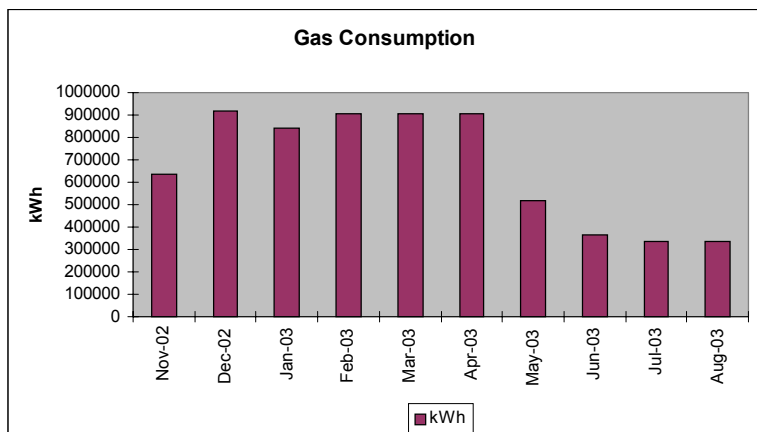
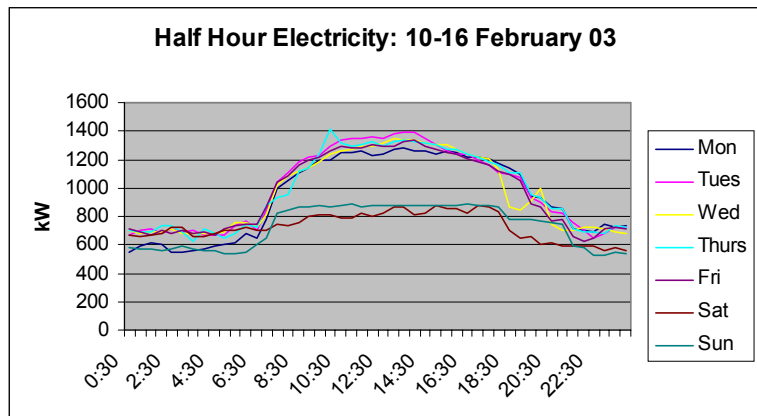
There is no sub-metering of electricity, gas or heat.

Data Collection

Monthly electricity and gas records were available. Half-hourly electrical load data (MV90) was available from the electricity supplier. A 3-phase power meter was used to log the 15-minute electrical load profile of the chillers over a 24-hour period. A clamp-on ammeter, with averaging capabilities, was used to collect current drawn by a number of loads. A lux meter was used to undertake a lighting survey, measuring lux levels at different locations and lamp dimming points.

The building design drawings and installation manuals were reviewed to collect information on the building layout, plant installation and controls.

The facilities manager was consulted regarding occupancy of the various floors and zones. Occupancy was broken into 3 categories of users, each with different needs: office staff, cleaning staff and security staff. Lighting and plant operating hours were collected from the respective computer management systems.



Analysis

The collected data was incorporated into a detailed spreadsheet model to gain an understanding of electrical and gas loads attributable to lighting, heating, cooling, ventilation, pumps, office equipment, etc.

Using the model, the analysis first compared the office building's performance with UK benchmarks for similar buildings. This helped in assessing the extent to which energy savings could be realised from the building.

Further analysis of individual electrical loads allowed a pie chart of electricity use to be prepared.

Recommendations

The survey concluded with 13 categories of recommendations, each with a number of elements. Some were remarkable in their simplicity, merely reflecting the savings to be achieved by matching plant schedules with occupancy requirements. Others were more complex, including a new Air Handling Unit temperature compensation strategy that would maximise the use of free cooling.

The value of energy savings of specific measures was calculated and, where appropriate, the cost of implementing a measure was estimated.

If these measures were implemented, it is expected that the client would save in excess of 20% of its annual energy costs. The majority of measures involved optimising the existing operation or controls, and had little or no cost associated with them.

Energy cost drivers were identified and monthly energy targets developed to assist the client in monitoring progress.

