HEAT RECOVERY SAVINGS FROM OFFICES

The ability of the fluorescent lamp to convert electrical energy into visible radiation (visible light) is, in many respects, very poor. For every 100W consumed, 78W is lost as heat into the surrounding area. The majority of this heat ends up within the occupied space. Combine this with the heat generated by other equipment within the modern ‘electronic’ office and one can see the need for a large and expensive cooling plant.

However, if luminaires are used as a route for air return about 60% of the 78W heat generated is drawn into the plenum, leaving 40% of the 78W heat still entering the occupied space. This difference is quite significant and can result in a reduction in the size of the cooling plant and thereby making cost savings.

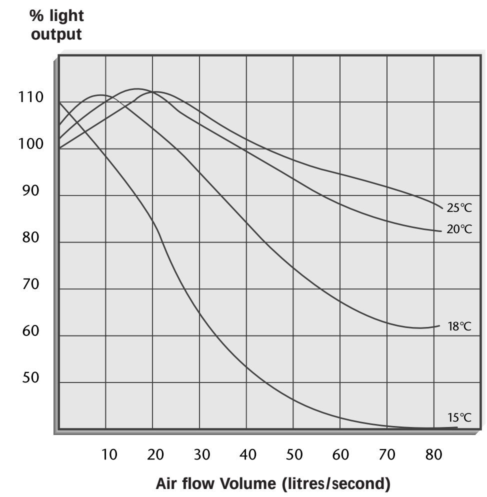
To make use of such potential savings the mechanical engineer will require precise information as to exactly how much heat is entering what space and at what rate. The Whitecroft Lighting air calorimetry chamber is available to provide the data to enable an engineer to make an accurate assessment of the requirements of an office.

INSTALLATION SIMULATION

The air calorimetry chamber enables Whitecroft Lighting to avoid problem situations in a distinct way. The chamber can be used to simulate the exact conditions which will exist within the completed installation. The required ambient air temperature can be achieved to within ±0.5°C accuracy, and then the air drawn through the specific luminaire at flow rates as specified by the client.

The resulting performance data enables the lighting designer to design the scheme taking environmental conditions into full account.

The calorimeter allows luminaire designs to be tuned. As can be seen from the graph below, the output of a luminaire will be increased at certain air flow rates. Given a required air flow rate and predicted ambient temperature, the air return slots, reflectors and baffles can be positioned so that an optimum lamp temperature is achieved and sustained. This results in an energy efficient installation and, possibly, a reduction in the total number of luminaires required to achieve a specified illumination level.



The performance of a typical luminaire with a 36W bi-axial lamp showing the effect of room temperature and extract airflow on light output

AIR RESISTANCE AND PRESSURE DROP

The purpose of air handling luminaires is to allow air from the occupied space to pass through the luminaire into the ceiling void.

This is achieved by maintaining reduced pressure within the void, relative to the space below. Air will only flow into the ’negative plenum‘ so long as the pressure differential is maintained. In order to achieve this the luminaires must offer some resistance to the air flow. As the resistance to air flow increases so does the pressure drop across the luminaire and this in turn results in increased air velocity through the return air holes.

Excessive air velocities can result in ’rush‘ noise from the luminaire.

In short, the design engineer must aim to achieve an acceptable balance between all of these. In the the air calorimetry chamber differential pressure sensors continually monitor both the negative plenum and the main space.

Air flow rate is a known value provided by the method of mechanical air extraction, so the air velocity can be easily calculated. The design engineer can be provided with accurate details of the luminaires air handling characteristics as well as its lighting performance.