assume that 'on' and 'off' switching will occur at the same illuminance. Where this is not the case, where the luminaires are switched off at an illuminance appreciably greater than that at which they are switched on, the mean of the two illuminances should be taken as the 'trigger' illuminance.

Dimming 'top-up' (Figure 3.14)

Estimation of energy saving from continuous dimming is complicated by the fact that the lamp circuit luminous efficacy generally decreases as a lamp is dimmed. For a well-designed tubular fluorescent dimming circuit, the cathode heaters consume some 12 per cent of the nominal power consumption and the remaining wattage is roughly proportional to the light output. Figure 3.13 has been constructed on this basis. It shows the percentage of a normal working year during which the luminaires would have to be switched off in order to ensure the energy saving obtainable by continuous photo-electric dimming. It applies to dimmer systems that can control down to 10 per cent output or less.

Dimmer systems can also be designed to operate at less than 100 per cent output when the installation is new so that the maintained illuminance is achieved as a constant value (see sections 3.4, Daylight, and 3.8.2, Maintained illuminance) through life. For example, if the maintenance factor (MF) is 0.5, when new the luminaire will operate at 50 per cent output (i.e. bringing the initial illuminance of 1000 lux down to the design maintained illuminance of 500 lux) and then increase power as the light losses increase. This approach will lead to valuable energy savings even before daylight is taken into account. Over lamp life, the percentage energy saving S_m (relative to an undimmed, fully lit installation) is of the order of:

$$S_m = [(1 - \mathrm{MF})/2] \times 100\%$$

The effect of the maintenance factor is to reduce the dimming range. In the example above, the effective dimming range with new lamps would be from 50 per cent down to, say, 10 per cent (e.g. from a maintained illuminance of 500 lux down to 100 lux). At the end of the effective lamp life, i.e. when the circuit is at full

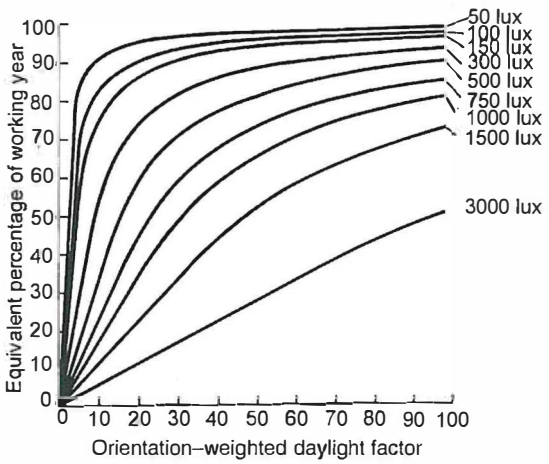

Figure 3.14 Dimming 'top-up' by photo-electric control