THE BRITISH BROADCASTING CORPORATION ENGINEERING TRAINING DEPARTMENT

INFORMATION SHEET

COLOUR TEMPERATURE AND MIRED VALUE

The quality, i.e. colour, of a light source is determined by the distribution of radiant flux within the visible spectrum.

This can be defined either by a spectral distribution curve (graph of relative energy v. wavelength) or by comparing the colour of the source to the colour of an ideal incandescent body (black body). The temperature of the ideal incandescent body that gives a matching colour to that of the source is called the colour temperature of the source. If the source is incandescent, e.g. a tungsten lamp, then the colour temperature will also give a fairly accurate indication of the spectral distribution curve for the source. With other types of light source, e.g. fluorescent lamp, the colour temperature is an indication of appearance only and gives no information about the spectral distribution curve of the source.

Fig. 1 shows spectral distribution curves for some typical light sources and Fig. 2 spectral distribution curves of incandescent sources for a range of colour temperatures. Colour temperature is measured in degrees Kelvin ($C^{\circ} + 273$) and some typical values are:-

Tungsten lamps	- 2500 to 3000°K		
Photographic flash bulb	- 3800°K	Blue Sky	- 15000°K
Average daylight	- 6500°K	Carbon Arc Lamp	- 4000°K.

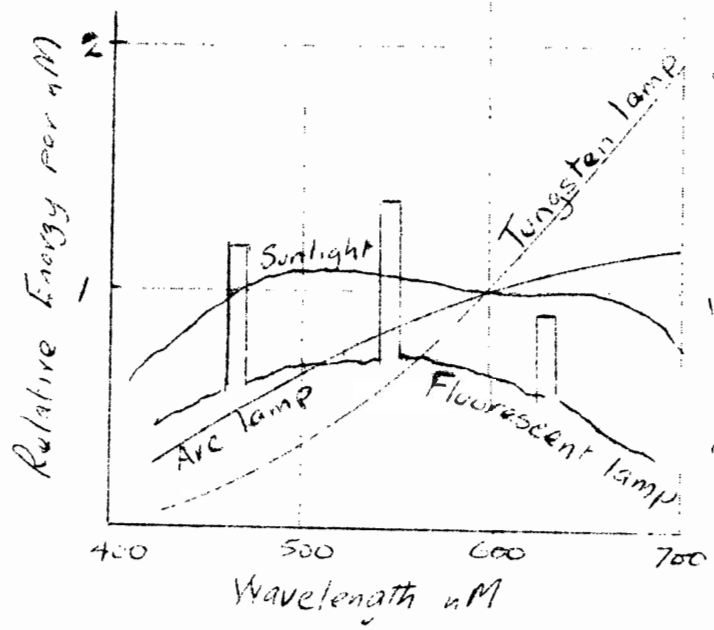

Fig. 1 Energy distribution of typical light sources.

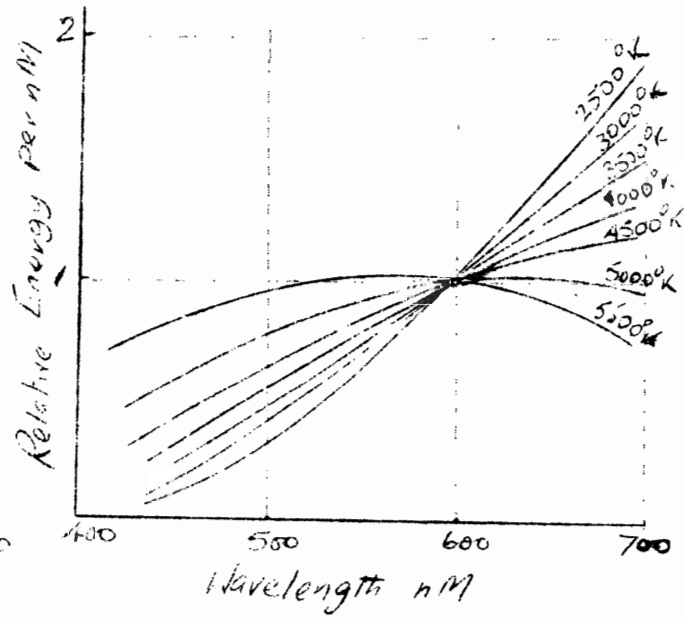

Fig. 2 Relative energy distribution of "black body".

42K

Mired Values

Another way of expressing the quality of an incandescent lamp is to use the reciprocal of colour temp. or rather since this is a very small number, 10^6 x (the reciprocal of colour temperature). The new figure is called the MIRED value of the source, being an abbreviation of micro-reciprocal-degrees. Thus a source of colour temperature 2500°K has mired value

$$\frac{10^6}{2500} = 400 \text{ mireds.}$$

The advantage of this term lies in the use of colour temperature correcting filters.

It can be seen from Fig. 2 that if a filter that attenuates red light more than blue light is placed over a light source it will be possible to obtain a resultant energy distribution that is comparable to a lamp of higher colour temperature and the filter can be said to produce a colour temperature shift. The amount of colour temp. shift however depends on the original colour temperature of the source, so no single figure can be ascribed to the filter. If however mired values are used then it so happens that the filter produces the same mired shift no matter what the original mired value of the source.

Colour Temperature Meters

In the laboratory colour temperature can be measured by comparing the unknown source with a calibrated incandescent source in a visual photometer and adjusting the calibrated source until a colour match is obtained; in the field however a simpler, if less precise, method is required.

The technique normally used is to measure the energy content of the source over narrow bands at the red and blue ends of the spectrum. The ratio of these two measurements gives an approximate measure of colour temperature provided the source is incandescent or has energy distribution similar to an incandescent body. In the case of discontinuous spectra sources, e.g. vapour or fluorescent lamps, this technique is unreliable.

Most instruments incorporate some means of reading directly the ratio of the two measurements. For instance, one type of meter uses a single cell with a lever to place either a red or a blue filter over the cell. The measurement is made by first setting the sensitivity to a standard mark using the red filter and an adjustable mask to cover part of the cell and at the same sensitivity setting switching over to the blue filter. The meter deflection thus obtained can be calibrated directly in colour temperature or mired value.

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4th April 1967