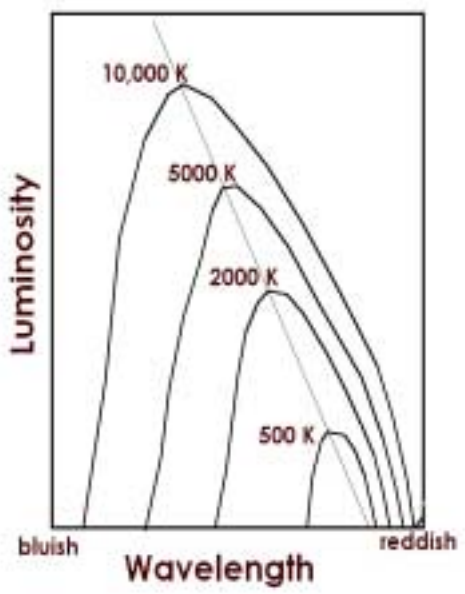
A Light Look at Colour Temperature

by Angus Jack

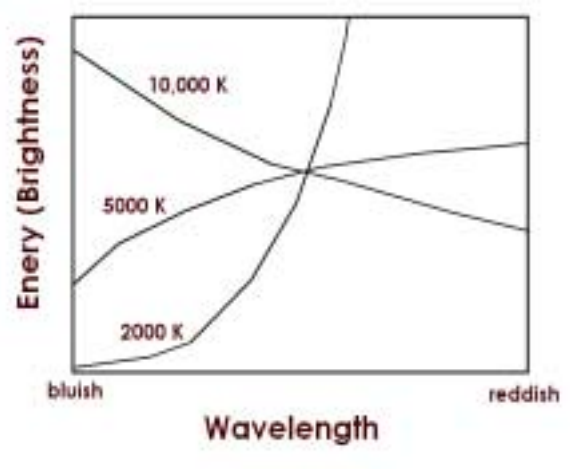
Have you ever come across the term 'colour temperature' when, in those idle moments, you have been trying to fine-tune your monitor? I have often wondered what exactly the term means. Having now delved into the subject I will try and explain it.

The term is used to describe the colour balance of the device i.e. how much red, green and blue are mixed in to make what the device outputs as white. But where did this term actually come from? To answer this we need to delve back into the distant days when we sat (at the back) in the physics class at school.

All objects radiate electromagnetic radiation because of their intrinsic heat (unless of course they are at absolute zero which, of course, is an impossibility). This is often referred to as thermal radiation. At room temperature objects primarily radiate in the infrared (indeed a developer working at his desk probably emits about 80 watts, whereas a bricklayer probably emits about 300 watts). Objects that are heated to a few thousand degrees emit visible light. Figure 1 shows a generalized curve of the emitted radiation of an object heated to various temperatures.



As the temperature increases the total luminosity emitted generally increases for all wavelengths. Lower wavelengths are equivalent to purple/blue colours and higher wavelengths are equivalent to red/orange colours. So, as the temperature increases, the overall luminosity increases (energy radiated) but the curve shifts towards the lower wavelengths. If you imagine heating up an iron bar, first it glows red and then, as the temperature increases, the bar starts to glow white and finally, if you could heat it enough, it would glow blue (assuming of course it had not melted). The general 'brightness' of the glow increases all the time but the colour gets bluer. By performing a scaling exercise (back to the maths lesson this time, I'm afraid) on Figure 1 and zooming in we can plot all the curves so they pass through the same point just to show relative luminosity within the portion of the spectrum visible to humans.



Imagine now that our monitor states that it has a colour temperature of 2000 K. This would mean that the colour it emits as white would consist mostly of higher wavelengths and hence appear reddish pink, this appearance is often termed "warm". Changing the monitor setting to say 5000 K would result in a more balanced shade as the white would contain almost equal amounts of red and blue. A setting of 10,000 K would contain more blue light than red and appear bluish, often termed "cold". A similar effect is observed comparing fluorescent light with an ordinary incandescent light. Fluorescent light often feels harsher or colder than say an equally rated incandescent light bulb. This is because incandescent filaments are at about 3000 K whereas a florescent light has a colour temperature of about 6000 K (they don't feel hot though, as they are supremely efficient in emitting their energy only within the visible spectrum). Well that's enough of that, back to the Delphi, I say!

Pics from BorCon

Dale Fuller and Maureen Catto (centre) with Phil and Joanna