



THE COLOUR OF LIGHT EXPLAINED WHY LED ARE BETTER

One of the most important attributes of Led lamps is their ability to provide crisp white light in a variety of different colour temperatures to accommodate users' needs.

To fully explain this one needs to go back to the old fluorescent and incandescent technology.

As everything that could be done then can be done with led and more but to understand one needs this following knowledge. But at the same time led does not have the limitations the old technology had.

High pressure sodium and mercury lamps are very limited in the colour and quality of light they produce.

This is a rough explanation of how the CCT of high intensity discharge and fluorescent light sources are measured by the actual visible colour they produce.

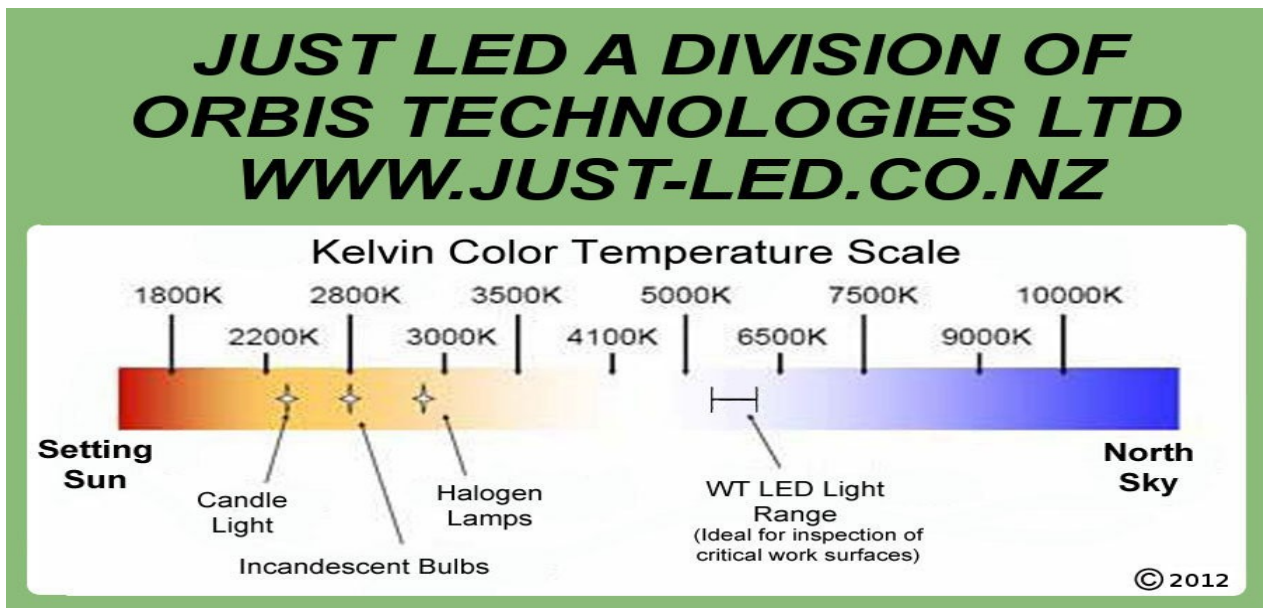
CCT is defined as the absolute temperature (expressed in degrees Kelvin) of a theoretical black body whose chromaticism most nearly resembles that of its light source.

From this standpoint, the CCT rating is an indication of how "warm" or "cool" the light source is. The higher the number, the cooler the lamp. The lower the number, the warmer the lamp.

All of the above readings CCT and Kelvin mean exactly the same thing

This also has a direct bearing on light produced, the lower the Kelvin the more orange yellow the

light the higher the kelvin the more blue end of the spectrum of light.



It is a range of electromagnetic wave forms that can be seen with the naked eye.

So the question of what colour is that light becomes, more or less a personal preference to what one actually needs to adequately provide light for the task they are wanting to perform.

As an example I personally consider light of 6000 kelvin a very good working light whereas my partner considers lights in the 4000 kelvin range. (personal preference) we do though have a selection of different coloured lights for different rooms ranging from 2700 kelvin right through to 6500 kelvin

We both are right in our choices plus the choices we have used sets the tone and the feeling of the room we are in.

So not to be misleading here, there are some reasonable limits that have been set by governing Bodies, as to what is an acceptable level of light required for public places and they do actually have to be adhered to.

The Home however is not covered by those regulations ONLY RECOMMENDED

The following chart has some of the recommended kelvin temps indicated

27K - 2700 Kelvin	Often used as accent lighting to blend in with fluorescent 2700K applications.
3K - 3200 Kelvin	Used as a primary light source for retail applications.
3700 Kelvin	Coated lamps. Used where a "softer" metal halide light source is desired.
4000 Kelvin:	Used in general lighting; factories: parking lots, warehouses
5K - 5500 Kelvin	Daylight lamps: horticulture, aquariums, high color definition.
Special Colours	Blue, Green, Magenta, Pink, Yellow. Special applications where colour is needed without light loss due to filters.

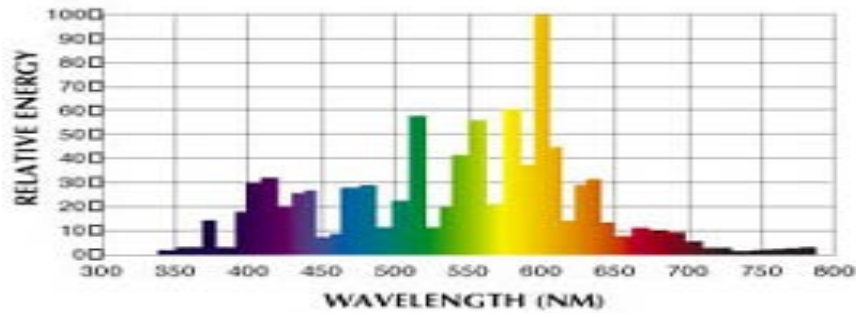
However with the colour of light we have the following to consider also

Spectral Energy Distribution

When we look at a light source, we "perceive" a single colour. In reality, we are seeing literally thousands of colours and hues of colours made up of a combination of different wavelengths of light. These different combinations, and the relative intensity of various wavelengths of light, can be used to determine a light source's CRI.

Take for instance the spectral image of a standard HID light indicated below

**TYPICAL SPECTRAL ENERGY DISTRIBUTION
400W, 4000K METAL HALIDE LAMP**



Colour Rendering Index (CRI)

In general, CRI is an indication of a lamp’s ability to show individual colours relative to a standard. This value is derived from a comparison of the lamp’s spectral distribution compared to a standard (typically a black body) at the same colour temperature.

Incandescent lighting is the only light source that follows a true black body curve. Other sources (i.e. metal halide) are rated with a Correlated Colour Temperature (CCT). The CCT, however, does not provide information on the quality of colour. For this, a Colour Rendering Index (CRI) is also necessary. In general, the higher the CRI rating of a lamp, the better different colours will show. However, this guideline can be misleading with certain lamp types because a high CRI sometimes makes different colours easier to distinguish, but standard colours may appear different than they actually are. The following is an example of how the colour "white" may appear under different light sources.

Standard	"Hylux"	Color Corrected
Metal Halide	Metal Halide	White HPS
4000K	5500K	2300K
CRI - 65	CRI - 90	CRI - 90
White is	White is	White is
White	Bluish-green	Yellow

Colour Shift and Variation

Different colours are achieved in metal halide lamps by using different arc

tube designs and by introducing various chemicals inside of the lamp arc tube. New lamps need to have these chemicals "burn-in" for approximately 100 hours before they reach their optimum colour and light level. This is why new lamps can sometimes be unstable or vary in colour.

As metal halide lamps age, chemical changes occur in the lamp causing shifts in the chromatics of the lamps. Different lamp designs shift in different ways, and different lamps from the same group may shift in different amounts. Generally, over economic life lamps will shift 200K to 300K in color temperature. After economic life, a lamp may change as much as 500K to 600K. As a group of lamps ages together in a facility, the lamps will generally shift at the same rate causing very little colour variation from lamp to lamp. However, if new replacement lamps are introduced into the group of lamps, colour differences may be more noticeable, because the new lamps have not aged and shifted with the remainder of lamps. This is just one of the reasons why many users of metal halide lamps prefer to group re-lamp as opposed to spot re-lamping.

So the education of light colour ends here.

Led the future does not have this re-lamping problem it just does not exist with led as the colour of the light that is emitted is very stable The colour shift is negligible if not virtually undetectable to human eye

A standard fluorescent or Hid light has only one tenth the life span of an Led light

And to further influence the colour problem in the existing older technologies an example of colour shift is really noticeable.

When compared for instance with led tubes 1% percent reduction in a thousand hours against a comparison replacement for fluorescent tube which after 1000 thousand hours use has lost almost **18%** to **25%** percent of its luminosity and the colour definition has also reduced considerably by as much as **15%** percent.

These types of lights used more in commercial and retail sectors require lights to be replaced every two years.

A constant cost which actually offsets any real savings.

If Led tubes where used an expected life would be in the region of ten years if the said light was used constantly **10 to 12** hours a seven days a week This is far greater than fluorescent technology currently in use. You would be replacing them within 18 months

So in essence fluorescent tubes then become cost inefficient. Especially if one was utilizing said tubes in a colour specific business such as a clothing, fabric, painting, printing etc

The Different Colours

The disadvantage of the many colours of lamps offered by older generic brands of Lighting is that they required filters to effect the colour that is needed not so with Led

Led and the Colour of light

Led has one very huge advantage it can be manufactured to suit all of the ranges that the older technology could do and quite a bit more.

When lighting components of the past were purchased, the term Kelvin was very rarely used only by the film studios photographers and the like.

It is only since the advent of Led Lighting, plus the fact that led lighting can be manufactured to very specific tolerances.

That Lighting companies have coerced to using the terms of Kelvin, instead yellow light a clear light meaning none frosted light bulb and white light a frosted light bulb how confusing this has become.

We now welcome the Led light with its very precise definitions of light and its colour

WWW.JUST-LED.CO.NZ
LED 1.2MT TUBE LIGHT



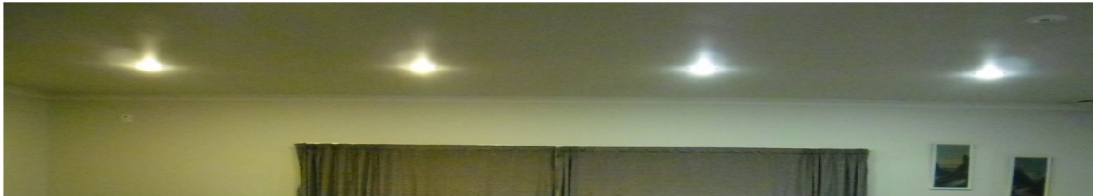
THIS LIGHT REPLACES
1.2 MT FLUORSCENT TUBES

Led is always expressed in Kelvin for lighting there are three main kelvin ranges commonly used

2700 3500

Known as warm white the actual colour is Red to Yellow

below is a picture of a room with both warm lights at 2700 kelvin on the left and 4000 kelvin on the right.



3500 5500 Known as Cool white the actual colour is yellow through to white the lights in this photo are 5000 kelvin on the right and 2700 kelvin on left

5500 6500 Known as Daylight white the actual colour is white through to



Blue white on the far right

There are other ranges of kelvin that led can be manufactured too but these are speciality devices and are generally made to order for specific clients. However when a customer requires a specific colour then led really does shine.

When a particular light colour is required then the light colour is expressed in NM nano meters per second.

Led is and can be precisely controlled so all the visible spectrum of light can actually be produced without utilising a filter. One very big advantage over older types of lighting.

Led colour is determined at manufacture with the addition of certain chemicals and elements in the production of the led chip itself

The chart that follows shows the full kelvin range that led lights can be manufactured to including the full colour range. As the separate nM chart

