Dispelling the “Inefficient Neon” Myth

解惑“霓虹灯效能不足”

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When considering illuminated signage, probably the most important factor to be taken into account is sign brightness. From the point of view of attracting attention to your business or promoting your corporate identity, generally speaking, brighter is better. For many years neon in its multitude of colors has been the medium of choice for performing this task - either in the exposed form or as a means of illuminating channel letters. This type of gas discharge lighting has always been considered very energy efficient, but this attribute has recently come into question, due mainly to the introduction of LED based products. Schemes such as the LEED system (Leadership in Energy and Environmental Design) and legislation (such as California's Title 24) have also focused attention on the efficiency of light sources. So, just how efficient is neon and how does it compare to other sources? As we shall see, in most instances, neon based illumination systems still provide superior performance in terms of "light out for dollar in" - particularly when we take into account relatively recent advances in the areas of phosphor and transformer technologies.

人们在考虑发光标牌的时候，或许最重要的考虑因素就是其亮度。从为生意增加吸引力或为企业推广形象的角度来看，一般来说，越亮越好。多年以来，不论是外露显示或以槽型字方式显示，霓虹灯以其丰富多彩的色泽成为履行此任务的一个非常适中的选择。 这种一直被认为是具有非常好能效的气体放电灯，最近却主要因为LED类产品的引入而受到一些争议。 **LEED system**（能源及环境领导协会）和立法会（如加州的第24标题）均很关注光源能效，因而在霓虹灯的能效及其与其他光源的能效作过比较，得出的结果显示，在绝大多数情况下，霓虹类照明系统在“光输出与金钱投入”的比率方面正如以往一样表现了相当的优越性，尤其在使用新一代荧光粉所制作的灯管以及配合先进变压器技术时，效果更显著。

Light Source Efficiency 光源能效

Lumens/watt (lm/W) is often used as a measure of the efficiency (or to be technically correct, efficacy) of a source in converting electrical energy to light. The lumen output of a source is a measure of the total amount of light emitted. It is sometimes provided by a light source manufacturer but is very difficult to confirm without employing the services of a testing laboratory. Watts are a measure of power consumed, and there are two types of power - real power, which is measured with a wattmeter, and apparent power, which is obtained by multiplying input voltage by input current (also called VA). Real power is what you pay the electricity company for, and it's important to verify that real power is being referred to when discussing lm/W figures. Lumens per watt is a fairly good comparative unit, as long as light sources of similar color are being compared. To put things in perspective, for white light sources, an incandescent bulb has an efficacy of 17-20 lm/W, while at 100 lm/W, a modern T5 fluorescent lamp is one of the most efficient common sources. The best white LEDs used for signage have efficacies of 10-20 lm/W. How do neon sources compare?

流明/瓦(lm/W) 常常被当作一种测量通过电能转变为光源的效能的技术指标，光发出的总量就等于流明的输出。但很多厂商的灯光产品在没有雇用专业测试实验室的服务所宣称的亮度是难以确定的。瓦特是一种光量消耗的测量指标，并有两种关于光量的说法： （一）真正的光量：是以瓦特表测试出来的 （二）外观的光量： 是将输入电压乘输入电流，即所谓（VA） 。真正的光量就是你付给电力公司的金额。与涉及流明数据（lm/W）的确实证明，只要将相近颜色的光源作比较， lm/W 是一个非常好的相对性单位。观点上，白光源如白炽灯泡的效力是17-20 lm/W， 然而新款的T5荧光灯便产生100 lm/W的效力，可谓是最高能效的普遍光源，而给标牌使用的最好的白LED的效力是10-20 lm/W， 那么霓虹灯又怎样比较出来？

High efficiency phosphors and transformers 高效能荧光粉与变压器

There is an enormous range of colors available to the neon sign manufacturer today, made possible by the blending of different luminescent phosphor types, but this was not always the case. Up until the late 1940's very few, relatively inefficient, phosphors were available. The subsequent introduction of the calcium halophosphate family of phosphors together with improvements in the standard blue and green emitters enabled the neon sign industry to offer a full spectrum of color together with a large range of whites of different color temperature. These phosphors and their blends are still in use today - albeit with some subsequent improvement in efficiency. A typical halophosphate white, for example 6500K Snow White, running on a correctly loaded standard ferromagnetic 30mA transformer has an output of 150 lumens per foot of tube for 15mm diameter glass resulting in an efficacy of 35-45 lm/W.

如今，将不同的发光粉混合可制作出很广阔的颜色幅度以供霓虹灯制做商所用，但并不是一开始便如此，直到1940年代末只有极少数，相对而言能效低的荧光粉可以使用，而其后又引入了卤磷酸钙荧光粉和改进过的标准绿、蓝的发射体，使得霓虹工业能够提供具有不同色温白光的完整的颜色光谱，并一直沿用至今，比如经典6500K雪白，直径15mm的灯管，在正确负载连接30MA磁芯变压器下，每尺可得出150流明，相当于35-45 lm/W的效力。

光源	效能 (lm/W)
6500K 标准白色霓虹 /磁芯变压器	**43**
6500K 三基色白色霓虹 /磁芯变压器	**60**
6500K三基色白色霓虹 / 电子变压器	**78**
白色 LED	**10-25**
标准绿色霓虹 /磁芯变压器	**48**
稀土绿色霓虹 /磁芯变压器	**69**
稀土绿色霓虹 /电子变压器	**90**
标准绿色LED (槽型字模块)	**12**
高功率绿色LED	**25**
标准蓝色霓虹 /磁芯变压器	**25**
稀土蓝色霓虹 /磁芯变压器	**23**
稀土蓝色霓虹 /电子变压器	**30**
标准蓝色LED (槽型字模块)	**2**
高功率蓝色LED	**15**
透丹红色霓虹 /磁芯变压器	**8**
透丹红色霓虹 /电子变压器	**10**
标准红色LED (槽型字模块)	**11**