DDC NEWSLETTER

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This newsletter will start a new subject on arc lamps “The Projection Lamp”

The information presented in this newsletter is in part from an article on Projection lamps (article by Bob Donofrio and Bob Eckel

We will start this newsletter with a review of the history of lamps used for Projection Displays such as Carbon arc, Xenon arc, Metal Arc and Mercury lamps. It will discuss some of the materials used to fabricate arc lamps. Some theatre projection lamps will be mentioned. A comparison of the projection lamps and projection methods, along with recent improvements in arc lamp design and performance will be discussed. We will also discuss some of the projection systems with emphasis on the newer digital Micro-Displays, which are used as engines for the projection systems now entering the market

Historical

Carbon Arc lamps (ref 1) are associated with the great names such as Sir Humphry Davy with the first carbon arc (1802), William Staite (1849 arc clock work), Col. Rookes Crompton (1878 first arc lamp illuminated football match), in the 1880's Jolin-Partsons, Lever and Pilsen and Paul Jablochkoff (1876). The Russian Jablochkoff Candle arc lamp was the first arc lamp used in large numbers. The carbon arc lamp was used with lantern slides or film for large area projection in such uses as search lights. Almost two hundred years after their invention, carbon arc lamps are still being used in the theatre industry for stage illumination. The National Specialty Products Company of Fostoria, Ohio is one of the companies that still makes the carbons for carbon arc lamps. Carbon arc stage lighting was used to make "Gone with the Wind", "The King and I" and "The Ten Commandments".

Some carbon arc lamps are manufactured by the Atlas Company in Chicago, IL USA. It is well known that metals and salts are added to the carbon arcs via a core fill to change the color temperature of the arc (Table 1).

LAMP TYPE	COLOR TEMP K
Cored Projection Carbon	5,500
NaCl cored Carbon	4,740
Al cored Carbon	6,160
Mercury arc HP	8,500
Xenon arc HP	4,000-6,000
Metal Halide arc HP	3,200 - 8,500

Table 1. Correlated color temperature of various arc sources

There are a number of discharge lamps such as the Crookes tube, the fluorescent lamp and the short arc lamp but in our discussion we are concerned with the short arc lamp. Mercury arc lamp pressures can go from a low of 20 atm to high pressure lamps with internal operating pressures of 200 atm. The low pressure Hg lamps are rich in UV radiation and used for water purification and ozone generation. The medium pressure lamps also have long arc lengths and are used in UV curing. However, the high pressure Hg arc lamps have short arcs. High power Xenon lamps and metal halide lamps have been used for theatre film projectors and search lights. The metal halide high pressure arc lamp contains mercury with a metal Iodide fill gas. Presently, for display projection systems the lamps used are also the Xenon arc lamp, the Metal Halide and Mercury arc lamps. If we look at the color comparison (shown in table 1) of carbon arc lamps and the Xenon and Metal halide lamps we find the interesting result that they are about 5,000K and in the color temperature range used in photographic arts.