TECH NEWS

by Rodger J. Ross

MORE LIGHT PER WATT WITH METAL HALIDE LAMPS

The latest development in improving light sources for film and television applications is the metal halide lamp. Two types of these lamps are now available – CSI lamps made by Thorn Lighting Ltd. in the UK, and HMI lamps from Osram GmbH, West Germany. There are considerable differences between these lamps, but both produce daylight quality illumination, and light output is much greater than the familiar tungsten halogen sources.

Metal halide lamps have some disadvantages however – a ballast unit is needed to operate the lamps, and flicker problems have been encountered, due to the cyclical rise and fall in light output at the power line frequency. It is anticipated that further developments will eliminate or at least reduce these drawbacks, and the new lamps will take over as the main source of supplementary lighting for television news filming and other motion picture applications where artificial light is needed to supplement daylight.

Characteristics of Light Sources

For many years high-powered carbon arc lamps were used extensively in 35mm film production for lighting studios and controlling contrast outdoors. Carbons could be produced giving either tungsten or daylight quality illumination. Filming with 16mm cameras called for smaller, lighter, more convenient and less costly fixtures. This could be achieved at first only with incandescent filament lamps, over-run to give light output with a colour temperature of approximately 3200K. The life of these lamps was quite short, and besides, blackening of the bulbs soon altered the colour of the illumination and reduced light output.

In the late 1950 s the tungsten halogen light source was introduced, known in the beginning as the quartz iodide lamp. These lamps had an outstanding advantage over conventional incandescent lamps – light output and colour temperature remained constant over the life of a lamp.

In a conventional incandescent lamp tungsten evaporates from the filament and deposits on the inner surface of the bulb, producing a blackening effect and reducing light output as much as 60 percent. Iodine added to the gas in the bulb combines chemically with the evaporated tungsten and migrates back to the filament to reduce blackening. Lamp envelopes were made of quartz to withstand the very high temperatures needed for the chemical reaction.

The great popularity of tungsten halogen lamps led to the design and development of a wide range of light weight, portable fixtures, especially suited to the needs of 16mm filming. Lighting kits were constructed that could be packed into a small carrying case and set up quickly and easily on location. Lamps are available also in the 30-volt range, operating from batteries, in convenient size and wattage ratings.

Successful use in the field led to the development of tungsten halogen equipment for studio use also. For example, the Maxi-Brute, fitted with six 1000-watt lamps, produces over 5000 foot candles at a distance of 20 feet, with a current rating of 50 amperes.

Tungsten halogen lamps operate in a colour temperature range of 3200 to 3400K, producing light that can be mixed with other incandescent sources. Balancing tungsten halogen lamps with daylight calls for blue filtering, and this cuts down the amount of available light by about a half.

Metal Halide Lamps

At the SMPTE technical conference in Toronto in November 1974, Gideon Fiat of the American Broadcasting Co., New York, co-authored a paper on lighting for television news filming in which the advantages of metal halide lamps were emphasized. A major problem for television news cameramen, he pointed out, is that daylight is often present, indoors entering through windows, as well as outdoors, and daylight-balanced colour film in the camera is the best choice. Daylight quality light sources are needed to supplement the available light, but the blue filtering required with tungsten halogen lamps cuts down the light to such an extent that higher wattage lamps must be used, with the risk of overloading available electrical circuits.

The mercury arc lamp has long been known as a highly efficient light source, but it has the disadvantage – in lighting for film – that the light consists mainly of a few highly concentrated, narrow spectral lines. The addition of rare earth iodides to an argon gas filling created what is now known as the metal halide lamp. These developments have produced a light source in which the spectral lines of the mercury arc are reduced, and the empty spaces filled in, to give a light output close to 5600K. The light from metal halide lamps can be mixed with daylight or carbon arcs for the exposure of colour films.

The HMI lamp, introduced in 1970 by Osram, offers the advantages of higher light output, daylight quality illumination, rugged construction, lower infra-red radiation, and compact size. Available now according to latest reports are 200, 575, 1200, 2500 and 4000 watt lamps. The 575-watt lamp produces 90 lumens per watt at a colour temperature of 5600K. In comparison, a tungsten halogen lamp, after blue filtering to raise the colour temperature to daylight quality, produces only about 14 lumens per watt.

Infra-red radiation is about half that of incandescent filaments. This reduces thermal problems considerably. The size of a 575-watt HMI

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