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All That Glitters...

Making Theatrical Lighting And Video Work Together

The explosion in lighting technology — especially automated moving light technology — has been one of the most interesting developments in staging in recent years. It has also been one of the most challenging developments. While the option of adding creative lighting elements to a production has opened up dramatic new staging possibilities, too many events are marred by a lack of coordination between lighting design and video production.

There are physics to be considered when integrating theatrical lighting into a production — inverse square laws, foot candles, digital control protocols, rigging mechanics, and color temperatures. All of these must be considered as you design lighting, as they can affect the other elements of your event in unexpected ways. Let's take one simple aspect of lighting — color temperature — and look at its effect on video. If not spec'd correctly, the wrong lighting fixtures can ruin your broadcast, video taping, or live image magnification. In many situations, the live stage look is important, but good video footage is the ultimate goal. Neither aspect should be sacrificed, and, with the proper design and planning, both can look great.

For those unfamiliar with the physics of lighting, a simple way to understand color temperature is to find an ordinary lamp with an incandescent light bulb and attach it to a dimmer. (An incandescent lamp, of which the common household light bulb is one type, uses a heated metal filament to produce light.) When it is on full, the light emitted is white. Now slowly dim the bulb. You will notice that not only does the light output decrease, but also the light picks up an orange or warmer color. If it were possible to raise the electrical output to the lamp, it would pick up a bluer or cooler color.

IF VIDEO WERE NOT A PART OF THE TECHNICAL REQUIREMENTS, COLOR TEMPERATURE DIFFERENCES BETWEEN LIGHTING INSTRUMENTS WOULD NOT BE CRITICAL. HOWEVER, FEW GENERAL SESSIONS TODAY DO NOT INCLUDE VIDEO

Lighting designers refer to the color of light by its respective temperature. The Kelvin scale, which is based on the Celsius temperature scale, is used in the lighting world. At 0 degrees Kelvin, or Absolute Zero, all energy ceases to exist. At 273 degrees Kelvin, water freezes. At 283 degrees Kelvin, water boils. Much higher, at 3600 degrees Kelvin, a tungsten filament will glow and emit white light. As the filament cools to lower temperatures such as 2600 degrees Kelvin, it gives off orange color, and as it heats to higher temperatures such as 4600 degrees Kelvin, it emits bluer colors. Tungsten will melt slightly above 4600 K, but physicists have extended the scale to relate to color temperatures that are much higher. Some common industry incandescent instruments are the Source Four series by ETC and the Shakespeare ERS by Altman.

Arc lamps are also common in the industry. (Arc lights use high voltage jumping between two electrodes in a tube, with pressurized gas to produce light in the same way that lightning or a spark does.) Arc lights are brighter per energy amount used than incandescent, and therefore are common where much higher light output is needed. They also produce much higher color temperatures. Typical arc source instruments are moving lights such as the Cyberlight and Studio Color from High End Systems, and the MAC series from Martin. Fixed instruments such as the Digimole from Mole Richardson and HMI Fresnels from Arri are also arc-based.

Why is this so important? Different lighting fixtures emit different color temperatures. Most filament-based lamps burn about 3200 K, while most arc lights burn at about 5600 K. Daylight also has a color temperature, about 5000 K, bouncing off that bright blue sky. The brain helps humans not to notice this slight difference in lighting. Unfortunately, cameras, which lack a subconscious intelligence, see a big difference. If a camera is set for 3200 K and you use 5600 K lighting, your video subject will appear blue. Unless your subjects are Smurfs, this will not go over well in the edit suite. If the opposite occurs, the video subject will appear orange.

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Typically, different lighting instruments are used for different applications. Outdoors, where sunlight has laid claim to high CT (color temperature) and high brightness is needed, arc lights are most common. Indoors, where the flexibility and cheaper price of dimmable fixtures are desired, lower CT tungsten lights are most common. However, in today's stage productions, all kinds of fixtures are used together for numerous reasons — reasons that I will discuss in a later column.

There are many ways to adjust color temperature using color correction filters. These are often referred to as CTB (correct to blue) to raise the CT of light or CTO (correct to orange) to lower the CT. These filters are sold commonly by lighting companies and theatrical supply companies. Manufacturers include Rosco, Lee, and Great American Market (GAM). The goal of the use of color correction filters is that all lighting instruments output similar color temperature. If this is achieved, the video engineer can white balance the cameras and reproduce true-to-life color on your video.

If video were not a part of the technical requirements, color temperature differences between lighting instruments would not be as critical. However, few general sessions today don't have video, so it is crucial to make sure that your lighting designer knows what is needed.

Neither lighting nor video production has to suffer if the right planning is done. As the design phase of your event comes together, it is critical that there is strong communication between your team leaders. They are the experts in their respective technical fields — working together, they can help assure a successful event.