

At a time when some cinema companies are trying to reduce costs by using less expensive conventional film projector xenon lamps as replacements in digital cinema projectors, Matt Jahans of Technical Lamp Supplies UK provides some interesting food for thought about one of the most important components of any digital projection system. He explains why lamps for digital projectors must differ from their 35mm counterparts if optimum projection performance is to be achieved, but that it is still possible to save money on the projector manufacturer's prices. Yes, the article contains something of a 'sales pitch', but Matt, who has lectured on many BKSTS projection courses, also presents real technical arguments for the views he puts forward.



# Lamps for digital cinema

## Digital cinema is happening in the UK and it's certainly happening much quicker than I first anticipated!

A few years ago I was still having conversations with industry colleagues such as "will digital ever take off in the UK?" and "will cinemas be willing to switch from 35mm to digital?" Well we can all see what is happening. Of course in many quarters 35mm film still has a long life, but we also have to accept that in other areas digital cinema will be the way forward.

Digital cinema obviously impacts on cinema exhibitors, which affects cinema suppliers, so we also have to do things differently. Technical Lamp Supplies UK Ltd. has been supplying Xenon lamps to the cinema industry for nearly 25 years. TLS UK Ltd. supply the Xenon lamps to over 70% of the UK's cinema screens including customers such as Odeon, Vue, Cineworld, Empire, Picturehouse and many independent cinemas.

The challenge for TLS UK Ltd. is to continue to supply quality Xenon lamps to our customers for existing equipment and for the new digital projectors. Being OSRAM's premier UK distributor allows us to do this and one of its unique advantages is a very close relationship with the factory in Germany. This gives TLS UK Ltd. direct contact with the R&D department, the opportunity to trial and advise on new lamp types, and a very streamlined process for dealing with stock.

OSRAM is at the cutting edge of 35mm and digital Xenon lamp technology, proudly running the

worlds only fully automated and newly built Xenon lamp manufacturing plant. All OSRAM XBO lamps, not just the digital range, are now built by state of the art automated machines, eliminating the risk of human error and allowing for 24 hour production and an extremely high build quality which is essential for digital Xenon lamps. The new Xtreme Life (XL) lamp range is also born of this technology.

## So What Are The Differences Between The 35mm Film And Digital With Regards To Xenon Lamps?

The optical target between 35mm film and digital is not the same. A Xenon lamp operating in a conventional lamp house has to illuminate an aperture of approxi-

mately 28mm diagonal. In order to achieve an even light distribution the lamp is not truly focused, the light must spill over the edges of the aperture.

However in a digital projector everything works in a different way altogether, as shown in the diagram. The light is typically focused into an integrating rod of approximately 15 to 20mm diagonal. Once inside the integrator the light is mixed, resulting in even light at the exit side.

The much smaller target area and the focused light require a lamp design which provides maximum brilliance from a small area. This is where the OSRAM XBO series for digital cinema comes in to play.

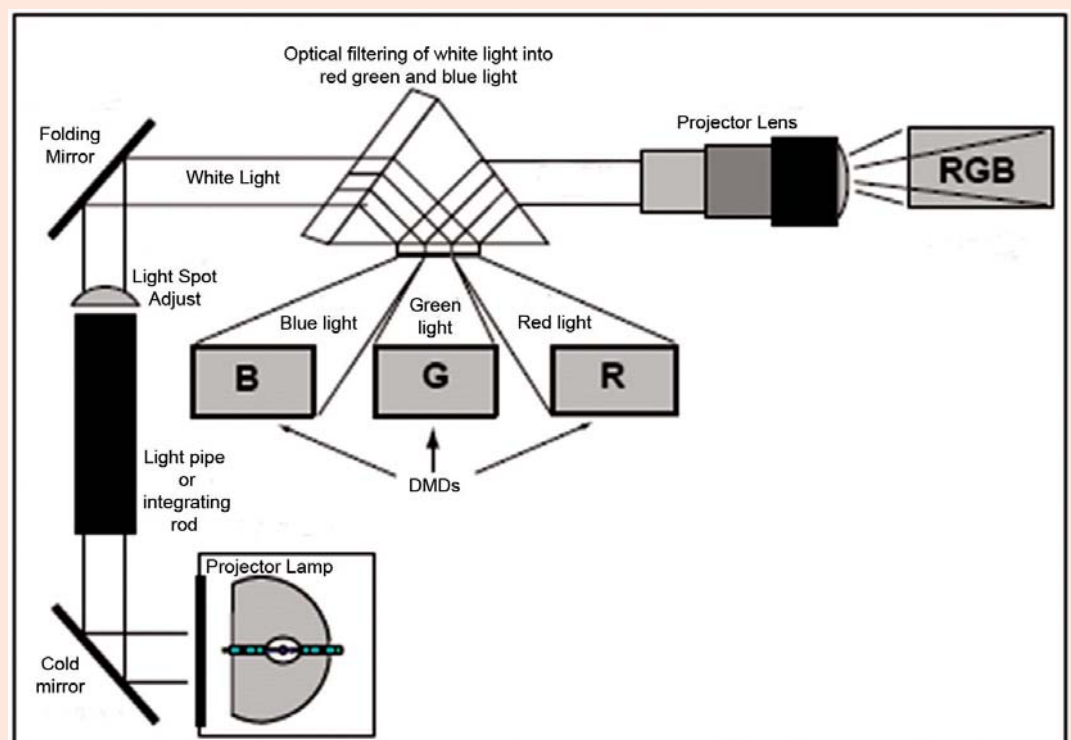
## How Does A Digital Xenon Lamp Achieve Its Maximum Brilliance And System Efficiency?

There are four techniques that can be used to maximise arc brilliance and system efficiency:

1. Increase bulb pressure
2. Increase lamp current
3. Reduce bulb diameter
4. Sharpen the cathode tip

In reality all four measures can individually increase brilliance but there are drawbacks, so the right compromise is required.

A very easy way to achieve maximum light output through a small aperture is with a sharper cathode tip. This concentrates the electrical current into a small area which generates a higher plasma





density in front of the cathode. The drawback is that cathode burn back increases which leads to lamp flicker and other maintenance issues. OSRAM typically use a blunter tip which may have slightly less light output initially, but will be more stable and suffer from less light drop off over life.

This theory is often seen with other lamp manufacturers claiming increased lamp brightness, particularly with 35mm lamps. This of course is only seen at the start of life, with latter results being something very different. Improved lamp brightness should be measured at the end of life and not at the beginning. Osram's high quality becomes most obvious at the end of life, as this is where lamp performance becomes most crucial and demanding.

Reducing the bulb diameter is another way to maximise efficiency, however this must be combined with complementary optics, a purpose built reflector. The theory here is that some of the reflected light rays are reflected very close to the reflector neck but such rays are blocked by the bulb itself. A smaller bulb diameter allows these rays to pass by resulting in an increase in total light.

The drawback with this theory is that the lamp is now more susceptible to divitrification (a breakdown of the quartz structure) due to an increase in bulb wall temperature, caused by the close proximity of the arc to the quartz. The system is also rendered more susceptible to cooling or arc misalignment issues.

The most obvious way to generate more light goes without saying, increase the lamp current. This will give more light in the short term but with increased electrode wear leading to flicker and bulb darkening. TLS UK Ltd. teach projection staff to increase current, when or if required, in gradual increments, paying heed to the lamp's operating current range. Extreme current increases that ignore the current range will only offer very short lived benefits !

The final and best option to increase lamp brilliance and efficiency is to increase the bulb pressure, this is because it has little negative effect on the lamp. However increase in bulb pressure causes the voltage to rise which must be compensated by a reduction in arc gap. This keeps the lamp running at the specified wattage.

It must be remembered that a shorter arc gap alone, without an increase in current or pressure will not provide an increase in overall performance. The wattage of a Xenon lamp is defined primarily by three parameters: arc gap, pressure and current. In operation a smaller arc gap would reduce operating voltage and consequently the total arc

*Mk II Replacemnt Filter for the Christie CP2000 Projector*



power, this must be compensated by increasing current, fill pressure or both.

Increasing the bulb pressure can lead to production issues for some manufacturers, while an automated plant allows OSRAM to achieve this without problem.

**Which Lamp Shall I Use?**

Digital projection requires the optimum components throughout, and this of course includes the Xenon lamp. A premier brand of lamp will give the performance that digital requires but cinemas must factor the cost in as well. Xenon lamps are expensive to buy and digital lamps cost a bit more, but beware of projector equipment manufacturers or installers inflating the price further on their own brand of lamp.

Look not only at the cost of the lamp but also the hidden costs and the warranty. Is the warranty pro-rata or is the lamp covered by 100% warranty ?

An example is with lamps for the Christie CP 2000 projector. A digital projector installer will typically sell the Christie CDXL lamp for up to + 30% more per lamp than TLS UK Ltd. would sell the OSRAM equivalent. There is no reason for such high prices other than that cinemas have no choice if they are unaware of proven equivalents. As I said before, digital lamps are more expensive than 35mm lamps but they shouldn't be 'that' expensive ! Christie only offers a 100% warranty during the first half of the warranty period. The final half of the warranty period is pro-rata, compared to OSRAM who offer

100% warranty throughout the warranty period. Both OSRAM and Christie's warranty covers optical and mechanical projector parts if damaged through the fault of the lamp. It must also be remembered that lamp house filters have to be bought separately for each Christie lamp while TLS UK Ltd. provide its new Mk.2 model mini pleat filter free of charge (pictured below).

As you can see this gives food for thought, check what you are paying, do examine your lamp warranty to see what it really means and look out for hidden costs.

**Conclusion**

The Xenon lamp market is rapidly changing and the demands on manufacturers are increasing immensely with digital. Choose carefully what you buy and ensure what you use is up to the job.

OSRAM have increased their warranty for no extra cost in the form of the new XL range of lamps (mentioned elsewhere in this edition of Cinema Technology) and have switched to 100% (and not pro rata) warranty across the board. These changes are not paperwork only marketing exercises, but because of the quality and consistency improvements that their fully automated manufacturing plant can now provide.

TLS UK Ltd. can supply digital OSRAM XBO lamps for the Barco DP series, Cinemeccanica, Christie CP 2000, NEC digital, Sony SRX series, etc.

Feel free to contact me for any technical advice or lamp requirements, I'm always happy to talk!

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**BE AWARE ...**  
**at The Odeon,**  
**Guildford on**  
**Tuesday**  
**April 22nd**  
**Details page 29**