Overview

The expected operating time for any projector lamp is usually referred to as ‘lamp life’. The length of time that a lamp will operate depends on the type of lamp (Figure 1) and the power level (e.g. 200W, 350W, etc.). Generally, lower power lamps tend to outlast higher power lamps.

There are two elements that need to be considered when discussing lamp life. The first is the expected length of time that the lamp will operate. The second, less obvious, is known as the brightness decay curve. This is the lamp’s brightness decline over the operating period.

Christie categorizes a lamp as having reached the end of its life if the lamp:

- Begins to flicker
- Fails to strike reliably
- Fails to remain lit
- Physically breaks

A common lamp failure rate curve (Figure 2), shows the expected rate at which lamps will reach end-of-life as the lamp ages.

For the example lamp in Figure 2, 2000 hours would be the point at which half of the lamps produced from a large production sample will have reached the point of failure. Therefore, the typical lamp life for this lamp is 2000 hours.

Furthermore, using the lamp failure curve, one would see that a small percentage of lamps (approximately 5% of total lamps produced) will not reach 200 hours. Many manufacturers, including Christie, offer a pro-rated lamp warranty to compensate customers for these rare instances of early failure. Seventy percent of lamps will achieve between 2200 and 2700 hours and the remaining 30% will operate between 2200 and 2900 hours.

Lamp operating life

Factors such as statistical variances in manufacturing batches and material impurities can affect the life of each individual lamp. When a company states the ‘typical’ lamp life in their documentation, it does not mean that every lamp will last that stated number of hours.

In the projection industry, “typical lamp life” is defined as the time at which 50% of the total number of lamps produced, reach the end-of-life.

By and large, the shape of the curves in Figure 2 reflects the majority of the lamps currently in production. If a lamp is specified at 1000 hours or conversely 3000 hours, the curves still hold true and can be used to determine the failure rate.
Projector Lamp Life Explained

Technology brief

Lamp brightness decay

All projector lamps have a characteristic brightness decay curve (Figure 3) that describes the expected output in brightness over the lamp’s operating life. Different types of lamps have different curves. To estimate the expected brightness of a projection system at any point in the lamp’s operating life, the brightness decay curve for that system’s lamp should be used. Figure 3 represents a brightness decay curve for a typical projector lamp.

![Figure 2. Typical lamp brightness decay curve](image)

In this example, you can see that after 500 hours of lamp usage, the system will have approximately 65% of its initial light output if the system was operated using its maximum power mode and about 75% if operated in a lower power eco mode.

Extending lamp life

Properly maintaining your projector will help maximize brightness and lamp life. Three things that you can do to extend lamp life are:

1) Use the ‘eco mode’
2) Power off the projector when not in use
3) Regularly clean or replace the filters

Eco mode

Today, many projectors are designed to operate the lamps in either full-power or a reduced-power mode (usually referred to as ‘eco mode’). Depending on the model, lamp power, and lamp type, a reduction in 20% of the lamp’s light output and power draw may yield longer lamp life. Consult the projector’s technical specifications for more information about the eco mode rating for your model.

Power off

Lamps typically don’t last as long in 24/7 applications as they do in applications when they can be occasionally turned off; much like the lights in a home or office. To conserve power and extend lamp life, users should power off a projector that is not in use. This should be done manually or automatically depending on the projector and its application.

Filters

Dirty filters in a projector can reduce lamp life as well as negatively affect the performance of other optical/electrical components inside the projector. To ensure the maximum performance of the projector, filters must be clean and therefore should be replaced each time a new lamp is installed.

Conclusion

When considering a projector’s lamp life, it is important to understand that this value is an estimate of the time it will take for the average lamp to reach its end of life. While there are measures that can be taken to maximize this time, there is no guarantee of expected time of use or of expected brightness performance over that time.

It is important to clearly understand the difference between the lamp brightness decay and lamp failure rate curves. These two factors will help installers and end users gauge the expected replacement cycles for lamps, as well as specify a projector’s brightness based on the lifetime brightness decay curves. These are key considerations when selecting a projector rather than relying on lumen values alone.