

EXTENDING THE LIFE OF LUMINAIRES

Lighting essentials

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'...better to illuminate than to merely shine...'

- Thomas Aquinas

Light-emitting diodes (LEDs) have changed the way lighting products and systems are designed and manufactured; due to significant improvements in energy consumption and longevity compared to previous technologies. Products and components are built to last; however, various environmental conditions can cause LED depreciation over time.

This reduction of light output becomes problematic, as it is expected that lighting systems will operate without any issues or failures. Imagine a lighting system failure in an office or hospital; crucial areas where light is needed to perform tasks effectively. There is a calculation method where lights are configured to compensate for light loss over the life of the lighting installation.

The life of a luminaire is most commonly identified from the LED source and is defined by the lumen maintenance value. This value, shown in figure 1, indicates how many operating hours the LED's will run before a predicted percentage of these LED's will depreciate. The light depreciation needs to be assessed by relevant contractors before installation so that ongoing maintenance can be documented. Based on environmental and application factors, the values are selected and applied to the lighting system, refer to Table 1.

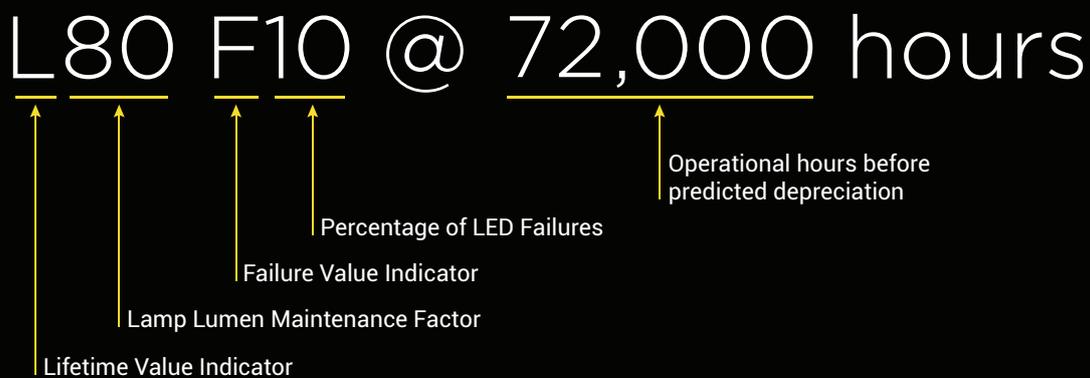


Figure 1: Lumen Maintenance Value Description

As a standard process, these operating values can be up to 30% more than what is needed to achieve the desired light output. This process means the LEDs are running harder, producing more heat, and delivering more light than necessary.

Lighting Application	Estimated Annual Operational Hours	Replacement after 10,000 hours (in years)	Replacement after 72,000 hours (in years) *mLight Standard Offering
Standard Office Environment = 8 hours ¹	2,080	4.8 years	34.5 years
Flexible Office / Education Environment = 12 hours ²	3,120	3.2 years	23.0 years
Shopping Centre / Retail Environment = 16 hours ³	5,820	1.7 years	12.2 years
Hospital Environment = 24 hours	8,730	1.1 years	7.9 years

1 : Based on a 9 am - 5 pm, 5-day working cycle for a general office configuration
2 : Based on an 8-hour 5-day working cycle with staff allowance for flexible working arrangements or school with stanadr operating times and before / after school care
3 : Based on a shooping centre with cleaning times before and after normal operating hours, 7 days a week.

Table 1: Application Operation Hours

There are two official standards used when suppliers calculate these values for LED components. Both of these standards were created by the Illumination Engineering Society (IES).

LM80, created in 2008, identifies the method for "measuring lumen maintenance of LED light sources." The testing on LEDs is conducted over a 6,000 to 10,000-hour period, with measurements taken at intervals of 1,000 hours. TM21, created in 2011, outlines the "lumen degradation estimation method(s) for LED light sources." A line of best fit is extrapolated, from the interval measurements found in LM80, to provide data on the expected lifetime of the LEDs, refer to Figure 2.

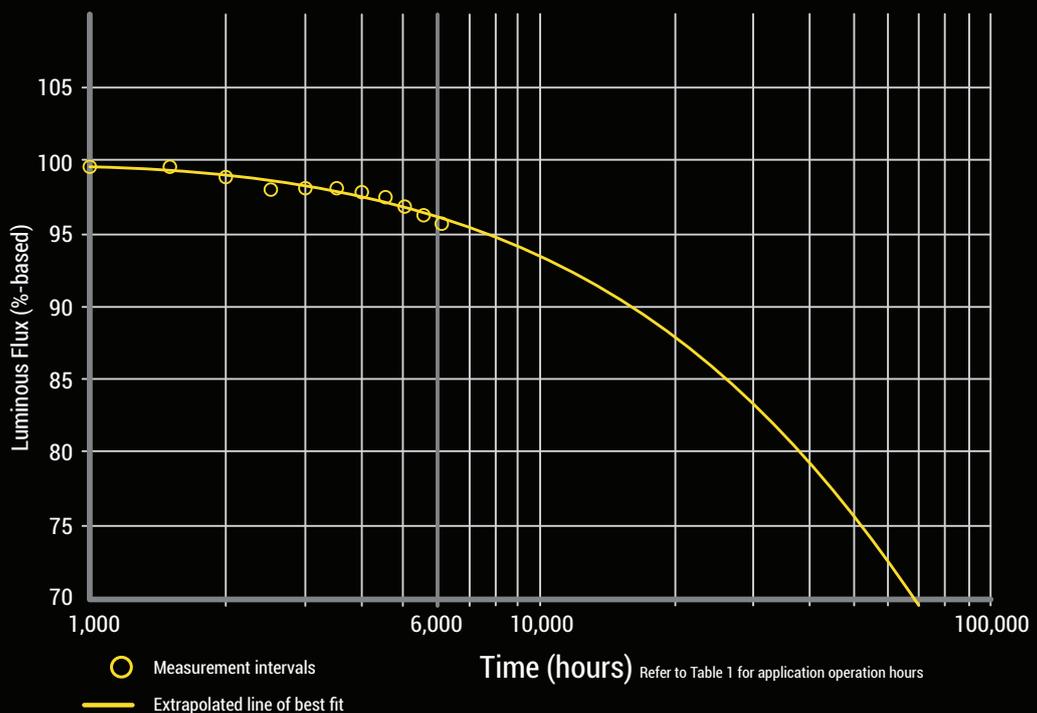


Figure 2: Lumen Depreciation Prediction Graph

These methods are 'projections' and 'estimations' and are not accurate representations of LED performance when environmental conditions are considered.

A method of combatting light depreciation known as Constant Light Output (CLO) has been implemented by some manufacturers, where a scheduled increase of current is applied, refer to Figure 3. This feature is an improvement, but it is still based on calculated values, which does not consider the type of LED used or important external factors beyond the LED component itself.

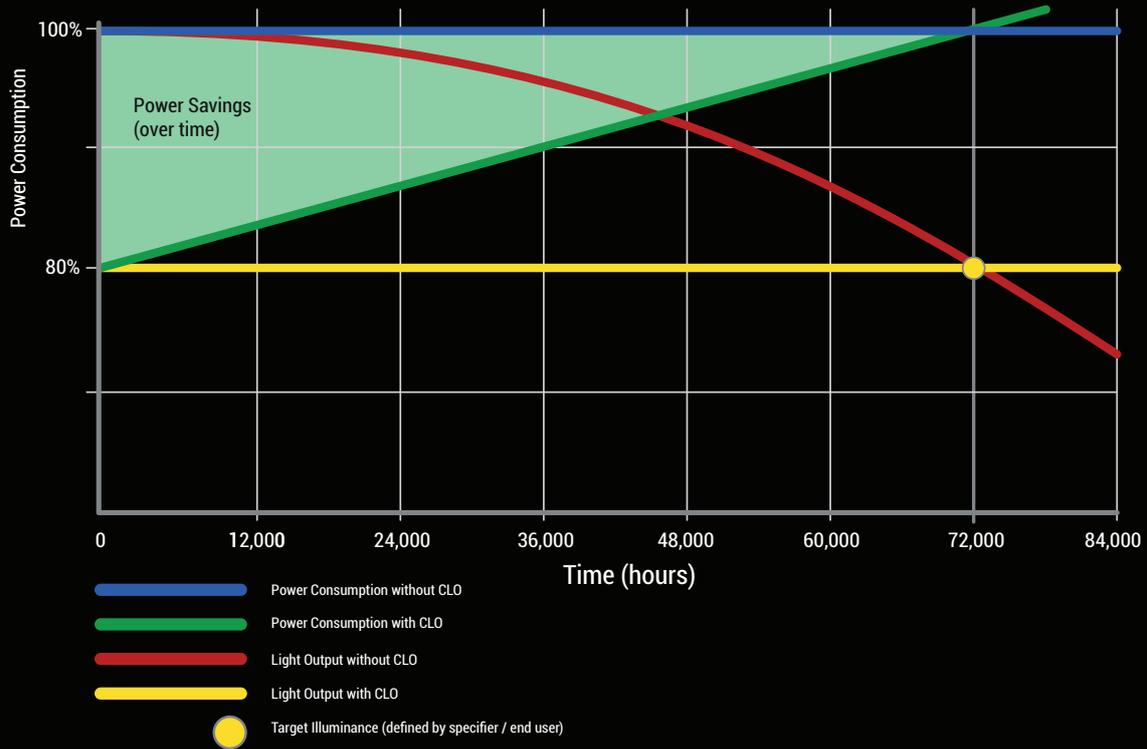


Figure 3: Constant Light Output Method

A system of measuring, and then maintaining, the required light output needs to be established for better lighting solutions that stand the test of time.

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