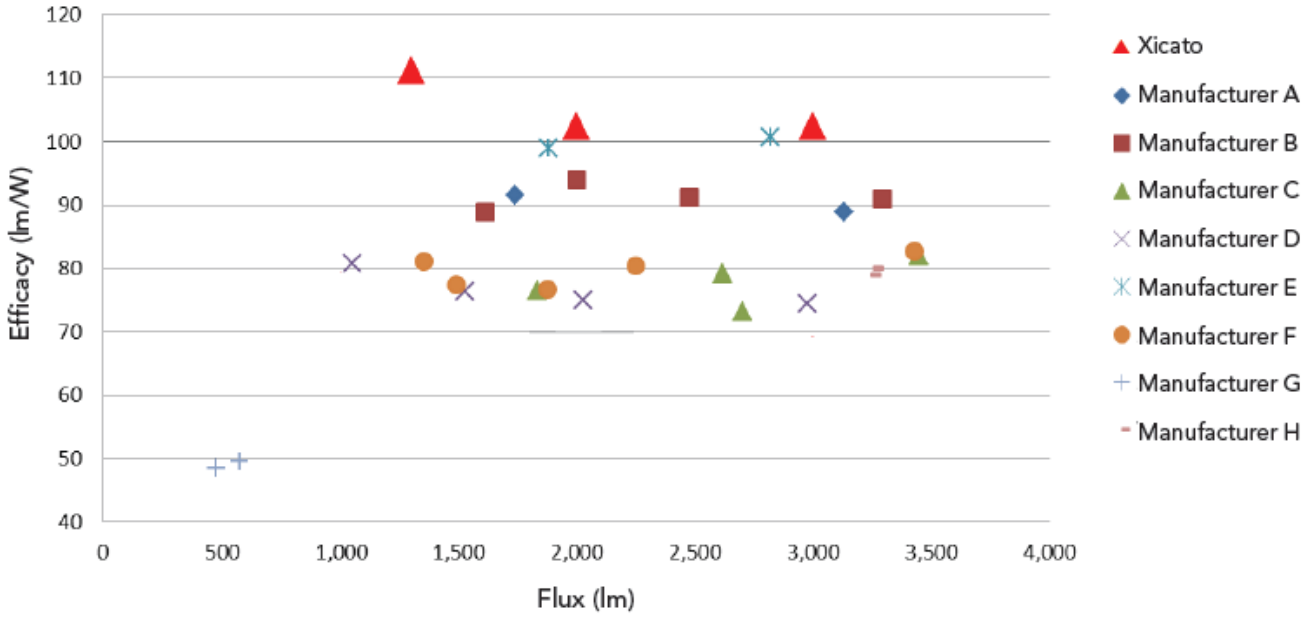
XICATO

XICATO'S INDUSTRY LEADING EFFICACY

All light sources: 3000k, 80 CRI, ~70C Tc, LES 8.9-23mm, ~1000-3000lm
Drive Parameters: Full Load



All data represented here was collected April 2014 from public data sheets of top LED manufacturers in the industry.

Comparing LED Source Efficacies: Apples to Apples Guidance

Luminous efficacy is a measure of how well a light source produces visible light. It is the ratio of luminous flux to power expressed in lumens/watt. While everyone has seen headlines touting 'breakthrough' LED efficacies, little information has been made available describing just how to compare and evaluate one LED source to another. To properly compare LED sources the following questions should be asked and answered.

1. Are the Correlated Color Temperatures (CCT) the same?

   Make sure the CCTs of the sources being compared are the same. Higher CCT sources often have higher efficacy. For example, a 4000K source may have a high efficacy, but the color may be too cool for the application, and this should not be compared to a lower CCT module.

2. Do the light sources have the same Color Rendering Index (Ra and R1-15)?

   CRI is a metric for a source's ability to render colors. Similar to CCT, CRI can greatly affect a source's efficacy. 80 CRI will have a relatively high efficacy compared to a 95+ CRI. However, 80 CRI may not be appropriate for the application.

3. What is the source's "Light Emitting Surface" (LES) dimension?

LED sources are offered in various LES sizes. A source with a larger LES can use more LEDs at lower current densities resulting in a lower power needed to achieve the same light output as another source. In turn, the larger LES source will have higher efficacy. However, a smaller LES will enable relatively tighter beam angles and higher center-beam candlepower, which may be what the application requires.

4. What is the flux?

A basic requirement in comparing two sources is the flux, measured in lumens. Keeping all other variables the same, the higher the flux, the lower the efficacy.

5. Is the source being under-driven at the rated flux?

LED sources can be driven at various current levels to produce different flux levels. Often a light source's data sheet will indicate "maximum current"; however, efficacy calculations may be presented separately and be at a lower current level (e.g. "50% loading"). When a source is under-driven, it will have a higher efficacy. Thus, it is important to ensure that efficacy comparisons are based on consistent loading conditions.

6. Are the module case temperatures the same (T_C°)?

LED performance can greatly depend on the source's case temperature. Typically, the cooler the source (measured at its case temperature measurement point), the higher the flux, and therefore the higher the efficacy. Some data sheets will present efficacy at 25°C; however, the normal operating temperature may be 70°C or higher. Flux comparisons should always be made with the case temperature at the expected operating condition. Data sheets typically provide the information needed to be able to make this assessment.