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# New CALiPER Snapshot on TLEDs

Linear fluorescent lamps — energy efficient, long-lived, and relatively inexpensive — have been a staple of ambient lighting in offices, classrooms, and other commercial spaces, where they're usually housed in troffers. Linear LED lamps, commonly known as TLEDs, typically draw about 60% of the power of linear fluorescents and have become a viable alternative, used mainly in retrofit situations. DOE's CALiPER program has released a new Snapshot report on TLEDs that's based on LED Lighting Facts® data.

Among the key findings:

- TLEDs now comprise more than 50% of all lamps listed with LED Lighting Facts, and more than 10% of all listed products.
- TLEDs offer the highest mean efficacy of any lamp type, and also include the listed product with the highest efficacy (190 lm/W).
- In aggregate, TLED efficacy decreases by 3 lm/W for every 1000K decrease in CCT.
- While the raw efficacy of TLEDs exceeds that of dedicated LED troffers, the reverse is true if TLED efficacy is adjusted to account for luminaire efficiency. In other words, dedicated LED troffers tend to exceed the efficacy of troffers fitted with TLEDs.
- Almost all (98%) of the listed TLEDs have a CRI in the 80s, with most between 80 and 85.
- A vast majority (97%) of TLEDs that are currently listed by LED Lighting Facts (and that report this optional metric) have a power factor of 0.90 or greater.
- Nearly 90% of the currently listed TLEDs (which include 2'- and 4'-long products) emit between 1,000 and 3,000 lumens. This is generally less than the emission of a typical 4' linear fluorescent lamp. Of the more than two-thirds of TLED products that are identified as having a 4' length, the mean output is 2,094 lumens.

As the numbers from LED Lighting Facts attest, TLEDs seem to be everywhere, and their numbers are growing rapidly. But while their rise to prominence is indisputable, they're not necessarily a clear favorite when evaluating performance.

LED Lighting Facts data show that TLEDs consistently draw less power and emit fewer lumens than the linear fluorescent lamps they're intended to replace. On balance, they have somewhat higher efficacies, but the energy savings achieved are in large part due to the lower power draw. Importantly, TLEDs offer more of a directional emission than linear fluorescent lamps, meaning they can make troffers or other luminaires more efficient,

delivering equal illuminance to the work plane, with fewer lamp lumens. However, sometimes the increased luminaire efficiency can't compensate for the reduced lamp lumens. In such cases, energy savings are derived from reducing the light levels, which may or may not be acceptable. The change in distribution, something that's not obvious from the LED Lighting Facts data, presents yet another issue, as it can change both the appearance of the luminaire and the distribution of light within a space.

TLEDs are often compared to other LED options for replacing a fluorescent lighting system — such as using retrofit kits or dedicated LED fixtures. At first glance, TLEDs may appear to be superior, with higher efficacy and likely lower product and installation costs. But accounting for factors such as luminaire efficiency may tip the balance against TLEDs in some scenarios, and their long-term costs may be increased by factoring in the remaining life of existing fluorescent ballasts, if they're to be reused.

Nevertheless, viable TLED options are increasingly available, which was not the case a few years ago. And as they push the efficacy limits for LED products, TLEDs can be compelling replacements for fluorescent tubes, as long as other tradeoffs are appropriately accounted for. But there are thousands of choices when specifying TLEDs. And as the new Snapshot report shows, there's considerable diversity in performance, even when examining only basic attributes. The Snapshot doesn't address the electrical and safety considerations when changing from fluorescent to LED lamps, nor does it examine features such as distribution of light or lifetime. It also doesn't distinguish between the different types of TLEDs (UL Type A, those that can operate directly on a fluorescent ballast; UL Type B, those with an integrated driver; UL Type C, those with an external driver; and hybrids), because they don't differ appreciably in photometric performance. Their distinguishing features, however, are very important considerations during specification and installation.

When evaluating TLEDs, it's critical to examine the expected performance of the complete lamp and luminaire system, understand the complexities of installation, and be cautious in considering long-term performance.

For a closer look at the findings, download the full report. For additional guidance, see the DOE Fact Sheet *Upgrading Troffer Luminaires to LED*.

Best regards,
Jim Brodrick

As always, if you have questions or comments, you can reach us at postings@akoyaonline.com.