MATC
OPERATIONS

Lighting

Milwaukee Area Technical College is in the process of updating its lighting.

MATC is switching from T-12 to T-8 lighting in some cases. The Downtown Gym is being converted to T-8.

Overview

Lighting systems are responsible for about 35 percent of the electricity costs in a typical commercial building and 10 percent in industrial settings.

In an effort to reduce lighting energy costs, T8 fluorescent lamps with electronic ballast have quickly become the standard for new fixtures and retrofits in commercial office buildings, schools, and a substantial portion of industrial lighting.

Inside the lamp are electrodes and a gas containing argon and mercury vapor. A stream of electrons flows through the ionized gas from one electrode to the other.

These electrons collide with the mercury atoms and excite them. As the mercury atoms move from the excited state back to the unexcited state, they give off ultraviolet photons. The photons hit the phosphor coating on the inside of the fluorescent tube, and this phosphor creates visible light photons.

A typical conversion of T12 fixtures with magnetic ballast to T8 fixtures with electronic ballast costs about $20 per lamp including parts and labor. **Energy savings from the conversion can pay back the initial investment in two to three years in an industrial application, and five to seven years in a commercial application.**

The table below shows nominal input wattages and efficacy (lighting efficiency in lumens/watt) for T12 and T8 fixtures with comparable light output:

T12 and T8 Comparison (4 ft. lamps)				
	T12s with magnetic ballast		**T8s with electronic ballast**	
Number of lamps	Input watts	Efficacy (lumens/watt)	Input watts	Efficacy (lumens/watt)
2	72	73	58	94
4	144	73	112	97

Notes: Input watts are open fixture ANSI watts.

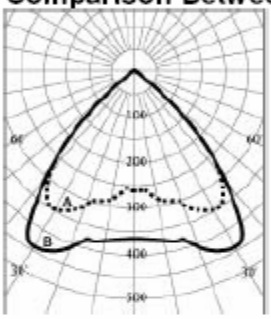
Efficacy is average over life of lamps.

MATC is implementing T-5 in areas of the Downtown Health Building.

T5 Lamps Boost Fluorescent Lighting Efficiency

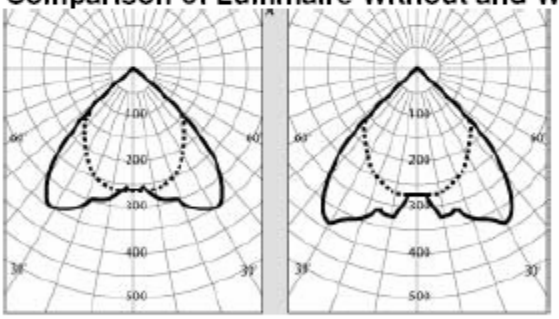
New T5 fluorescent lamps in combination with super-reflective aluminum could increase the efficacy of luminaires for fluorescent lamps by more than 30%. But there are many pitfalls to watch out for.

Comparison Between T8 and T5 Lamps (T5 with Miro)



A =1 x 36W T8 HF, **B** =1 x 28W T5 HF Miro
Light distribution cd/1000 lm (Cross section)
Source: Tommy Govén, AB Fagerhult

Comparison of Luminaire Without and With Miro Aluminium



Combulime Gamma 1x36W T8 HF **A:** Conventional aluminium **B: Miro aluminium**
Light distribution cd/1000 lm **-** Across **...**Along the luminaire)
Source: Tommy Govén, AB Fagerhult

At the Hannover Fair in April 1995, the T5 lamp was introduced with great fanfare. Until then, announcements concerning new products in the fluorescent lighting market had been released at a fairly

Finally MATC is implementing LED lighting in the 8th Street Parking

Efficiency and operational parameters

Typical indicator LEDs are designed to operate with no more than 30–60 milliwatts (mW) of electrical power. Around 1999, Philips Lumileds introduced power LEDs capable of continuous use at one watt (W). These LEDs used much larger semiconductor die sizes to handle the large power inputs. Also, the semiconductor dies were mounted onto metal slugs to allow for heat removal from the LED die.

One of the key advantages of LED-based lighting is its high efficiency, as measured by its light output per unit power input. White LEDs quickly matched and overtook the efficiency of standard incandescent lighting systems. In 2002, Lumileds made five-watt LEDs available with a luminous efficiency of 18–22 lumens per watt (lm/W). For comparison, a conventional 60–100 W incandescent lightbulb produces around 15 lm/W, and standard fluorescent lights produce up to 100 lm/W. (The luminous efficiency article discusses these comparisons in more detail.)

In September 2003, a new type of blue LED was demonstrated by the company Cree, Inc. to provide 24 mW at 20 milliamperes (mA). This produced a commercially packaged white light giving 65 lm/W at 20 mA, becoming the brightest white LED commercially available at the time, and more than four times as efficient as standard incandescents. In 2006 they demonstrated a prototype with a record white LED luminous efficiency of 131 lm/W at 20 mA. Also, Seoul Semiconductor has plans for 135 lm/W by 2007 and 145 lm/W by 2008, which would be approaching an order of magnitude improvement over standard incandescents and better even than standard fluorescents.[25] Nichia Corporation has developed a white light LED with luminous efficiency of 150 lm/W at a forward current of 20 mA.[26]

It should be noted that high-power (≥ 1 W) LEDs are necessary for practical general lighting applications. Typical operating currents for these devices begin at 350 mA. The highest efficiency high-power white LED is claimed[27] by Philips Lumileds Lighting Co. with a luminous efficiency of 115 lm/W (350 mA).