

Should I Turn Off Fluorescent Lighting When Leaving A Room?

Short Answer: Turn them off if you will be gone for more than about 15-20 minutes (for details keep reading).

There are a few misconceptions about fluorescent lighting that keep too many people from turning lights off to save energy. The first misconception is that it takes more energy to start a fluorescent light than it takes to run it. The second misconception is that turning a fluorescent light off and on will wear it out right away. Like many of our myths about energy, there is a small amount of truth in the belief. (Special thanks to Steve Selkowitz of Lawrence Berkeley National Labs for doing the research that this article is based on.)



Misconception #1: It takes more energy to start a fluorescent that it does to run it, so leave the lights on all the time to save money on your electric bill.

Reality: When you turn on a fluorescent light bulb (correctly called a "lamp"), there is a very brief jump in current when the ballast charges the cathodes and causes the lamp to start. This inrush of current can be many times greater than the normal operating current of the lamp. However, the spike of current draw normally lasts no longer than 1/10th of a second, and draws the equivalent of about 5 seconds of normal operation. So, if you turn your fluorescent lamp off and on more frequently than every 5 seconds, you will use more power than normal. So, normal switching of fluorescent lamps has very, very, very little effect on a power bill.

Misconception #2: Turning fluorescent lamps off and on wears them out right away.

Reality: Electric lights have a published rating for expected life. This rating is in the hundreds of hours for many incandescent lights, and in the thousands of hours for most fluorescents. Fluorescent lights have a life rating based on how many hours they are left on every time they are turned on. This is usually referred to as "burn time", and for fluorescent lights the burn time is three hours.

Every time a fluorescent light is turned on, a tiny amount of the coating on the electrodes is burned off. Eventually, enough coating is burned off, and the lamp fails to start. Most full-size fluorescent lamps are rated to last 20,000 hours when left on for 3 hours every time they are turned on. This means that the lamp has roughly 6,667 starts available to use up. (20,000/3 = 6,667)

Longer burns extend lamp life. If you "burn" your fluorescent lamps shorter than 3 hours per start, you use up your potential starts faster. If you "burn" them longer than 3 hours per start, you use up your starts more slowly. However, you are paying energy costs for the operating time of the lamps, and the most efficient lamp is the one that is not on when it

is not needed. See Table 2 for the effects of longer burn time on lamp life.

But longer burns use more energy. Operating a light when it is not needed is simply spending money for no purpose. Today's rapidly rising electric rates mandate that every building becomes leaner with energy use to control costs. See Table 3 for a comparison of operating costs for a typical fixture.

Find the trade off point.

There is a point where the amount of money you save from turning off the light exceeds the cost of reducing lamp life by more frequent starts. If you use the formula in Table 1 at \$0.05 KWh, you come up with a time of about 15 to 20 minutes for that point. As energy rates go higher, that time becomes shorter. If you pay less than a nickel per kilowatt hour, your turning-off point would be longer.

The kind of ballast you use may make a difference if you turn your fluorescent lights off frequently. There are three different kinds of electronic ballasts: instant start; rapid start; and programmed start. Which one you use can influence your choice of how frequently to switch off your fluorescent lights. Check with your ballast supplier, or contact a lighting specialist at the Lighting Design Lab for more information on different types of ballasts.

Table 1: The "Official Formula" to calculate how often to switch lamps off and on

In "Economics of Switching Fluorescent Lamps" IEEE Transactions on Industry Applications Vol 24, No 3, May/June 1988, Carriere & Rea provide a function f(u), that describes the lamp life in burning hours relative the rated lamp life under that standard burning cycle of 3 hours lamp operation per start.

$$\text{Actual Lamp Life} = \text{Rated Lamp Life} \times f(u) \text{ where, } f(u) = 1.71 (1 - \exp[-(u/3.89)^{0.505}]) \text{ u} = \text{burning cycle, hours of operation per start}$$

Table 2: Burn hours and Fluorescent Lamp Life for a Typical 4-foot Rapid Start Lamp (32W)

3 hr	6 hr	12 hr	24 hr
20,000	24,000	28,000	34,000

Table 3: Comparative annual operating costs for a 3-lamp T-8 fixture with electronic ballast (94W) (@USD\$0.05/kWh)

Burn Time per day	Annual Hours	Annual Cost (USD\$)
3 hrs	1095	\$5.15
6 hrs	2190	\$10.29
12 hrs	4380	\$20.59
24 hrs	8760	\$41.17