ELECTRONOTES

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STILL PROBLEMS WITH CFL's

Back in July, I wrote a Webnote about Compact Fluorescent Lamps (CFLs) failing. At that time I was saying that after about two years, I had seven bad bulbs. Further I didn't like their sometimes acoustically alarming mode of failure, nor potential Hg contamination if I ever broke one, and I thought they were killing switches.

Here is the update: I now have 13 bad bulbs, and one more bad switch. Actually, I have had three more failures, one "100 watt" equivalent in an open base-up socket, one "100 watt" in a table lamp that gets a lot of use, and the third one in a "60 watt" equivalent in a base-up socket. Two flashes. One just found dead. No pop or bang this time.

So how did three more failures become six? Well, when the 60 watt job blew, I went for a replacement 60. What I found was a paper bag of four of them marked "originally from bathroom". Now I remember – I had had four 60 watt types on the over-the-sink bathroom fixture – one of those frosted glass U-tube fixtures. I remember taking them all out and replacing them with 60 watt incandescents. Didn't remember why exactly. None the less, I took one out of the bag and put it in the fixture. Nothing. Got the whole bag and there was one good one of the four. So I had changed them because they were failing. Yes – I remember now that two were bad, so I guess when a third one went, I made the switch to all incandescent. Why didn't I throw the three bad ones out? Well, remember, it's hard to throw them out. So that's three more bad ones I had forgotten to tally.

I did have the one "good" CFL in the bag, and it was not impressing me. It did come slowly on, you could tell that at least, but it was not doing much else. So I thought about a "brand new out of the box"- a 60 CFL or even a 100 CFL? No, naughty me, I thought of a 60 watt incandescent. I have reserves of these. I went for one, but when I came back, it was a 100 watt incandescent I had brought. What a marvel. Edison was on to something. I screwed it in, and it was this instant, bright, warm cheerful light. Yes, it will cost me a few pennies more to run, but how much would I have to save to justify putting up with that dungeonesque CFL?

That's not quite the end of this report. There is the matter of the bad switch. This was the bathroom switch, which was NOW controlling four 60 watt incandescents which was formerly four 60 watt equivalent CFLs. The switch would click on, but then sputter off after a minute or so – not the best situation for a windowless bathroom in the middle of the night. Well, it did actually "fail" while controlling incandescents. But I can't help think it was the CFLs that weakened it during the year they were in there. I could be wrong.

I tried online without success to find more evidence of failing switches. When you search for "CFLs" and "Switch" you get lots of stuff about switching to CFLs! One posting mentioned an industrial light controller EM relays that fused soon after CFLs were installed. They had to redesign the controller so that the relays closed near the zero-crossing of the AC cycle. I guess that's the same thing. Tricky.

Thinking back to my freshman engineering year, my roommate had a big old metal cased unpolarized capacitor with an ac cord attached. He proposed to charge the capacitor by plugging into the AC line. I told him it wouldn't work. Of course, he just did it and discharged it with a nasty sparking. Well, you don't always get a high voltage – depends on where the cycle is when you pull the plug. That much is luck. I learned two things: 60 Hz is very slow, and the experiment always tells the truth.

Okay – so we are talking about experiments. I wanted to check the current these bulbs draw as a function of time. So I set up a bulb socket and put a 1 ohm resistor is series with the line, and measured the voltage across the 1 ohm. Actually this was 10, 10 ohm resistors in parallel, 0.25 watts each for a total of 2.5 watts possible dissipation. I did this because I didn't have any 1 ohm resistors handy, and because I calculated that with a 100 watt incandescent (about 1 amp) I would have 1 watt across 1 ohm. In my experiments, the resistors never even got warm.

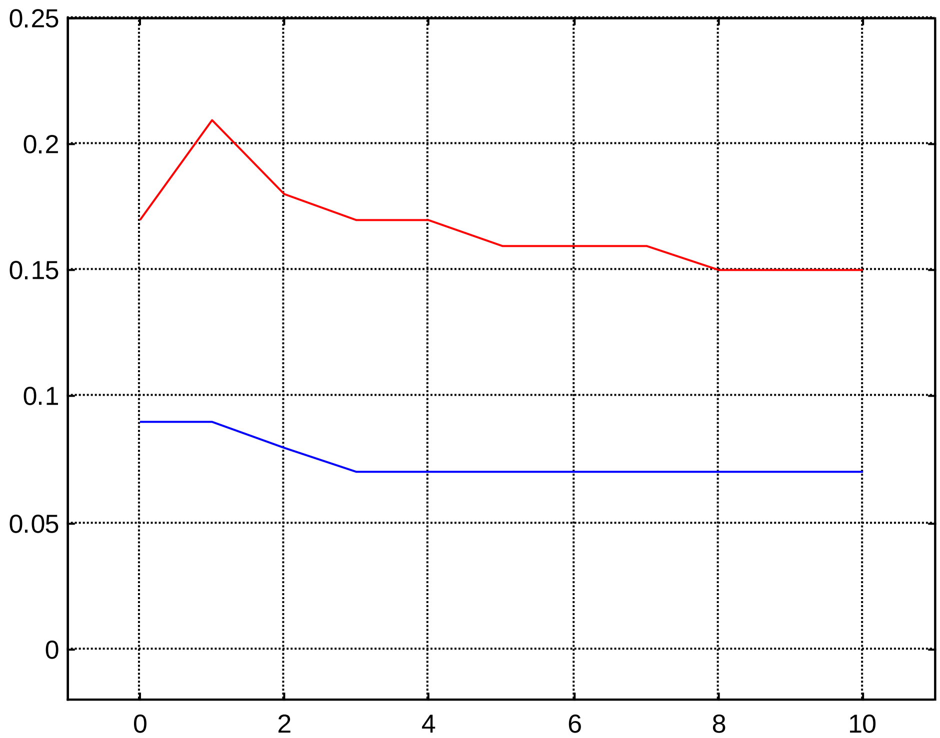
Also, looking at the CFL boxes, it said that the "60 equivalent" drew 13 watts (that's 22%) while the "100 equivalent" drew 26 watts (that 26%). Let's note right here that perceptually, at least for me, with the GE "Energy Smart" bulbs, the CFLs were noticeably somewhat dimmer. So without a light meter of some sort, I'm not sure what the equivalence means. It does not seem possible that the CFL light is much less than 2/3. So you do get more light for the watt.

Measuring the drop across the 1 ohm resistor, for the incandescents (GE Soft White – Long Life) it was 0.81 volts for the 100 watt, and 0.43 volts for the 60 watt. The currents would be the same numbers, and the watts (121 volts, nearly all across the bulb) of 98 watts and 52 watts respectively. Sound pretty nominal.

I was interested in the turn-on characteristics, which is shown in the graph, but after 10 minutes, the 100 equivalent was producing 0.15 volts while the 60 equivalent was producing 0.07 volts. This would correspond to 18 watts for the 100 watt equivalent (26 watts on the box) and 8.5 watts for the 60 watt equivalent (13 watts on the box). Something wrong here. Anyone know? The measurements are low by 0.69 and 0.65. Am I missing an RMS correction in the case of the CFLs. Ballast? Power factor?

No matter at the moment - I wanted to see if they had a larger turn-on current and they do (see Fig). Note that the 100 equivalent actually started high and went up even higher after a minute, then fell from a peak of 140% of its steady state to the steady state after about eight minutes. The beginning jump corresponded to a noticeable brightening of this bulb, and it stayed about the peak brightness thereafter (after 2 minutes)

The 60 equivalent did not have the apparent rising start-up overshoot of the 100 equivalent. Instead, it started about 129% of its steady-state and fell off after about three minutes. It brightened about the same rate as the 100 equivalent.



Another test was to see if we started with the bulb “warmed up” if it went through the start-up overcurrent. So unplugging for one second, it was the case for both bulbs that their currents went through essentially the same start-up, although much faster – about a minute or two, and the brightness was essentially full at plug in.

So, roughly speaking, they do have a start-up which draws 1.3 to 1.4 times the steady state and lasts for perhaps 4 minutes.   That’s roughly 3 minutes at 35% extra or a full minute’s worth of 100% over. So the magic time is a minute. With regard to the issue of conserving power, and that only, don’t turn it off if you are going to turn it on again in less than a minute.