FUTEK EGYPTIAN MICRO ELECTRONICS

General Electronic Ballast Specification Guidelines

Each country may have a unique set of operating characteristics to deal with factors that are important to its specific condition that may be relatively unimportant to another country

Example starting at -15 or -30 degree is not required in Egypt, while working at room temperature of more than 35C is maybe more important)..

Because there is a wide range of performance criteria for electronic ballasts, and because the impact of the general lighting system on any facility's productivity levels is so critical, ballast manufacturers differ in their approach to dealing with specific operating criteria.

Some choose to focus on a couple of operating specs that they deem more important than others and this, in turn, defines their marketing efforts. It seems to be typical of electronic ballasts, however, that exceptionally good ratings in one category are often achieved at the expense of some other category.

Thus, for example, you may have the phenomena of a ballast which exhibits ultra-low harmonic distortion (good) but generates unusually high levels of EMI or RFI (which can be bad depending on the dynamics of the particular workplace), or a ballast which has a very good soft-starting mechanism (for longer lamp life) but displays a disturbing inability to deal with transient voltage variations.

Alternately, many ballast manufacturers have chosen to aim for "reasonably acceptable" levels of performance in the majority of categories. While these ballasts are rarely rated the "best" in specific categories, they also avoid "poor" ratings.

The obvious quandary in lighting management is that everyone wants to save substantial operating expenses by utilizing more efficient technologies yet no one wants to create a new set of problems that did not exist before - regardless of the volume of savings.

Even though no one has made the perfect ballast yet, it is possible to write a single list of optimal specifications which would fit every single application. The problem is, of course, no one can supply (off the shelf) a ballast which will meet all these specifications!

Operating characteristics which one may consider when making an electronic ballast purchase decision It still remains up to each individual facility operator (or his consultant) to determine which factors are of paramount concern (and need to be positively optimized) and which ones would be deemed acceptable in "reasonable" value ranges.

1. Comparison of ballast efficacies (i.e., the relationship between ballast factor and input wattages)

Typically, one is focused on what is going to happen to light output and current draw when converting to T-8 lamps in conjunction with electronic ballast. Input wattages of 58 ~-64 are pretty standard for electronic ballast driving two 36 watt T-8 lamps. Typical decent ballast factors (the percentage of a lamps rated lumens which will be driven out by the ballast) range from 90~-96.

If 3 and 4 lamp ballasts are considered, input wattages per lamp will be lowered...but so will the ballast factor! Our experience with 3 and particularly 4-lamp ballasts (regard-less of manufacturer) has been that they are statistically less reliable than 2-

lamp ballasts. Increased efficiency often comes at a cost of lower light levels and higher replacement costs.

2. Rapid-start mechanisms vs. instant-start

It is a well-known fact that by utilizing a softer-starting mechanism, the expected life of fluorescent lamps is significantly extended. Rapid-start mechanisms preheat the lamps electrodes before the required voltage for striking the arc is applied. Instant-starting a lamp, on the other hand, applies the jolt of required voltage without a warm-up period. As one would expect, instant-starting is much harder on the electrode, erodes it prematurely and results in predictably fewer lamp starts before failure. Although lamp replacement cost is
not a particularly large percentage of the overall cost of lighting a facility (the dominant portion of cost, by far, is found in the light bill), it is the cost of most concern to a maintenance department since they dont pay the utility bills.

Patterns of usage determine whether or not a facility needs to be concerned with ballast’s starting mechanism. If a facility has long, uninterrupted burn times, then instant starts will have only a minimum effect on lamp life, and one can predict "reasonable" replacement cost values. Many facilities, however, have adopted the policy of turning out lights in unoccupied spaces, even if they are to be unoccupied for short periods. Management edicts and occupancy sensors ensure that this energy savings occurs. This policy results in lots
of starts for the lamps. Because a typical instant-start ballast may give only 10,000 starts before the lamp fails vs. say, 50,000 starts for a soft-start ballast, the trade-off is clearly defined.

"Crest Factor"-- Lamp current Crest Factor directly impacts lamp life. It is defined as peak current divided by average current as delivered by the ballast to the lamp(s). Most lamp manufacturers recommend or require a crest factor of < 1.7 and note that 1.414 is a perfect current sine wave...simply as good as it gets for maximal lamp life. So, while "crest factor" deals with the impact of current or amperage on projected lamp life, the impact of voltage is primarily addressed through the starting mechanism.

3. Parallel vs. Series-Wired Circuits

historically, series-wired circuits have been rapid-started and parallel circuits have been instant-started.
The advantage of parallel-wired lamps is that, should one burn out, the other lamps in the fixture continue to function at full strength and the fixture still has sufficient light coming
out of it to illuminate the workspace. If the lamps are on a series- circuit, however, and one lamp fails, they both shut down and the fixture ceases its function.

Many of today office spaces draw their primary light from a single overhead fixture. If this fixture is a series-wired 2- lamp, the implications are obvious. On the other hand, when
the "goodness" of parallel circuitry is coupled with instant-starting (as it usually is), the facility operator should be aware of the trade-off...i.e., assurances of continuous light and uninterrupted productivity may be at the expense of lamp replacement costs.

The facility operator who is concerned with both reason-able lamp life and uninterrupted lighting will be looking for electronic ballast that is both soft-starting and parallel wired.

Of course, if a facility has a "rapid-response" to lamp failure, potential problems of either system is neutralized. In the case of series-wired, the light is restored promptly and in the case of parallel-wired, the ballasts operating characteristics are maintained. (When one lamp burns out on a parallel circuit, the ballasts load characteristics change and so do some important criteria...namely Harmonic Distortion ("HD") increases and expected ballast life is reduced...both are good reasons to quickly replace the failed lamp).

4. Harmonic Distortion " HD " THDi

This particular operating characteristic has been brought pretty much under control as far as the ballasts themselves being generators of dangerously high levels of harmonic distortion. The fact is, a well-structured lighting retrofit will drastically lower the volume of current drawn down by the lighting system. Since the percentage of HD generated by today's crop of electronic ballasts is lower than the standard magnetic ballasts they replace, the overall effect is, almost without exception, a lowered volume of HD in the electrical distribution system as a result of the retrofit.

Still, with the proliferation of non-linear loads, harmonic distortion of any magnitude may create an operating problem. Lowered volume of HD is obviously better than higher, particularly if it can be achieved without sacrifice. We are convinced, however, that it is almost always better to completely eliminate HD through filtering so that proper functioning
by all loads requiring a relatively clean sine wave is assured.

5. Transient Protection

Excessive voltage surges, whether externally or internally generated, can "fry" electronic ballast, electronic ballasts manufactured to ANSI and IEEE standards, which require that they be able to withstand 1200 to 1500 transient voltages for an "A" rating. Some ballast manufacturers will "beef up" transient protection to withstand 6000 volts.
The major cause of electronic ballast failure is overheating and voltage surges are the primary cause of overheating. Most ballasts are "thermal-protected" from overheating (Class P is the acceptable rating) which protects the ballast from ambient heat sources but has nothing to do with transient protection.

6. Ground Trickle

most electronic ballasts arrive with the disclaimer "do not use in conjunction with a ground fault interrupting ("GFI") system." This is simply acknowledgement of the fact that

Electronic ballasts, like many diode-rectified loads, dis-charge a tiny amount of current in the ground wire. If there are enough ballast on the system and a GFI is in effect, it will
Sense the current flow and shut down the circuits. GFIs are normally only found on those systems where current carried by the ground conductors poses a safety problem...as around swimming pools, showers, etc. In any case, there is at least one

ballast manufacturer who produces electronic ballast which can peacefully coexist with a GFI.

7. Radio Frequency Interference ("RFI") and Electro- Magnetic Interference ("EMI")
since electronic ballasts are operating at considerably higher frequencies than standard ballasts; they may create interference problems within communications systems. Many electronic ballast manufacturers have issued disclaimers on their product if used in conjunction with power line carriers. The FCC has established an acceptable level for class A applications, but ballasts operating in the high range of this standard can still cause problems in today's workplaces, particularly if the cabling is unshielded...and this is a fairly common situation.

There is some ballast available, however, that operate in the low range of this standard and which will cause no problems, even in sensitive situations.

8. Other Considerations
Sound ratings and Power Factor ratings are usually acceptable for any reputable electronic ballast these days. For the record, though, they should have at least an "A" sound rating and a "High Power Factor" (.92 or above).

So, there are many factors to think about with regard to ballasts...but it all starts with the facility unique needs and then specifying the most reliable ballast which will meet those needs without creating additional problems.
It is hard to believe, but some facilities are still making retrofit decisions based on "up-front" costs. This type of thinking completely disregards the fact that this is an investment decision with an attendant payback involved. The "up-front" cost is really of very little importance since it will be returned in the form of savings anyway.

9. End of life protection
End of lamp life is one of most important factors that never being considered seriously in the past, now day end of life protection circuit have a great importance (any ballast without end of life protection and accidental use protection may cause serious fire problems at end of life)

9. How to specify Electronic ballast
Most important factors to be well pointed when consultancy office specify electronic ballast are:
A) Operating voltage : + or -- 10 % or better to chose AVR system that can give steady light with voltage from 100 V to 270 V (automatic voltage regulated)
B) Number of lamps that ballast will drive: 2 Lamps of 36 W or 32 W or 2 lamps of 18 W etc. Ballast (s) able to activate more than 2 lamps is less reliable.
C) Power factor (PF) : Power factor have to be > 97% for passive types and > 99 % for active types Active Power factor controlled ballasts are more expensive , but more reliable.
D) Crest Factor CF: CF has to be < 1.7 and preferable to be < 1.6 with active power factor controlled Ballast.
E) Harmonic Distortion Total (THDi) : will depend on working place , in all cases THDi have to be < 20 % and < 10 % for places of high importance(hospitals, control rooms)

F) Ground connectivity : Ballast have to be equipped with ground connection
G) Soft Starting : soft starting will be required when light is on and off several times every day (soft start will increase lamp starting to 50000 times vies 10000 rapid start .
H) Parallel connectivity : When ballast is driving 2 lamps , each lamp need to have a separate out put , when removing any of them power will be decreased by 45~50 %
I) End of life protection circuit: Ballast have to be equipped with end of life protection circuit that will be activated at end of lamp life or when the lamp is broken or removed in order to protect the ballast from burn and will function only when condition is normal …

We are glad to inform the energy engineering society of Egypt that FUTEK – JAPAN is producing now in Egypt under special technical joint venture all kind of electronic ballasts and

Compact fluorescent lamps (High Power Factor) that meets all mention criteria and specification with a very competitive cost for both export and local market needs .

This resource has been contributed by Futek Egyptian Micro Electronics (Dr. Mo. Helal). For additional information please contact futek@futekeg.com