Electronic v Magnetic Ballasts

Many comparisons unfairly hobble magnetic ballast fluorescent lighting by comparing old inefficient class C and D ballasts (removed from sale in Australia in March 2003 by MEPS[1]). Added to that comparisons also often use 'glow-starters' rather than the modern electronic starter which gets rid of flicker on startup and improves lamp life. Many will compare old tubes or cheap tubes that have a shorter life and more mercury than regular lamps.

Electronic Ballasts have their advantages. First they are half the price of magnetic ballasts. Second intelligent electronic ballasts can dim lamps to fraction of their full light output which can be very handy but is not needed in most applications.

EcoSpecifier' independent Conclusion

"There is a seemingly strong case to review the single emphasis on the use of electronic ballasts only, to achieve optimum energy efficiency and environmental outcomes. This review should include the assessment of HP magnetic ballasts, used in conjunction with voltage reduction power saving units, electronic starters, and innovative new technologies in project analyses and Green Star™ credits, to take energy efficiency in lighting to yet a new level of saving."[2]

Energy Efficiency and voltage reduction

At normal voltage a good magnetic ballast consumes only 3 watts more than an electronic ballast.[1] The lower the voltage the more efficient a magnetic ballast becomes, especially the modern ones. Comparing the worst-case old style magnetic ballast and a new high-efficiency electronic ballast (Class A3) the magnetic ballast will actually consume less power if driven at 190 volts and produce only 4.7% less light per watt. More efficient class B1 or B2 magnetic ballast will consume less power than the electronic ballast when driven at 210 volts (Power Saver drives lamps at 206 volts) than the same electronic ballast and produce only 2.7% less light per watt. The magnetic ballast would then consume less power for a tiny loss in light.

Light Power Density or Lumens per Watt and voltage reduction

A low-loss magnetic ballast (Class B1) with voltage reduction can achieve similar or greater lumens per watt than an electronic ballast. Even the old inefficient class C and D magnetic ballasts produce only 2% and 5% less lumens/watt than an electronic ballast when driven at low voltages while consuming 10 % less power.

Reliability

One maker speaks of a failure rate below 2% per 1000 hours operation with their electronic ballast. That sounds quite nice, but for an average supermarket with 3000 hours p.a. of operation this amounts to 6% dropouts per year. Under constant duty, such as in a car park, it means replacing more than 1 of every 6 ballasts annually.

"***Magnetic ballasts are very bullet proof***."
Michael Lane, Lighting Design Lab .[3]

Disposal

The iron and copper in a magnetic ballast is readily and easily recyclable (having different melting temperatures). Theoretically there is no limit to the number of times a magnetic ballast can be recycled. Electronic ballasts are a different matter. In Australia most go to landfill while some are burnt in high temperature incinerators and the pollutants released into the atmosphere (our food chain). Source: CMA Eco Cycle, a division of CMA Recycling.

Ballast upgrade cost savings

Payback Periods for replacing magnetic ballasts with electronic ballasts	
Intensity of use	3000h/a
Electricity price	0.08€/kWh
Replacing a conventional class C magnetic ballast with a class B1 low-loss magnetic ballast	3.5 years
Replacing a conventional class C magnetic ballast with a class A2 electronic ballast	13.1 years
Replacing a class B1 low-loss magnetic ballast with a class A2 electronic ballast	19.4 years

Electronic ballast case studies:
University, Hospital, Institute of Technology, Airport and Manufacturer.

Victoria University, Flinders, Street Melbourne Installed ceiling fittings with two fluorescent lamps and electronic ballasts. Two years on they were all removed and refurbished due to the high failure rate of the electronic ballasts.

Image: Changeover fittings at Victoria University.

Kaufbeuren hospital in Germany[4] installed about 480 luminaires into the ceiling, each fitted with 2 fluorescent lamps, rated 2*13 W, with 1 common electronic ballast. By end of 2004, some 800 lamps had to be replaced.

Upon examination it appeared the ballast misinterpreted a voltage dip as an instance of switch-off and switch-on again and started to heat the filaments, waiting for the lamp current to rise as a signal of successful start, to shut off the heating current. But the lamp current did not rise because the lamp was already in operation, so the pre-heat current remained on and overloaded the filaments.

Swiss Federal Institute of Technology Zurich found a very high failure rate with new ballasts. Following customer complaints the contractor contacted the manufacturer to be told that an initial failure rate of 17% was absolutely normal for electronic ballasts.

Paderborn-Lippstadt airport, Germany, found that out of about 80 electronic ballasts no less than 30 had failed within 4 months in one part of the installation.

Investigation of the cause suggested that the ballasts kill each other, unless other loads absorb their electronic litter. About half a year later the same problem occurred in another location of the same airport, but with different ballasts from a different producer.

Image: Electronic ballast failures at Swiss Federal Institute of Technology, Zurich within one year.

A Lamp Manufacturer that didn't want to be named needed a reliable way of testing T5 80 watt lamps and found that failures of electronic ballasts caused frequent and expensive production stoppages. Magnetic ballasts were substituted (using 400 volts instead of 320) and have ensured smooth production testing of the lamps.

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[1] MEPS http://www.energyrating.gov.au/ballasts2.html
[2] Ecospecifier http://www.ecospecifier.org/knowledge_base/technical_guides/high_performance_fluorescent_lighting
[3] http://www.lightingdesignlab.com/articles/delamping/delamping.htm
[4] http://www.baubiologie.net/docs/elektrosmog-Ballasts-for-fluorescent-lamps.pdf (P 27-29, 42)