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Aug. 30, 2011

LIGHTING TECHNOLOGY – ACCENDO
Research Report

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Summary

Accendo is a Canadian company that has recently rolled out a technology for controlling high-intensity discharge (HID) lighting, such as that commonly found in high-bay manufacturing or athletic facilities.

Accendo required a validated trial of their technology versus lighting using conventional magnetic core and coil ballasts. The project was financed by Ontario Centre of Excellence. Project costs have been tracked by Herbert Sinnock, research manager.

A research team of Sheridan Institute of Technology has carried out experimental trials of both technologies using the following equipment:

1. Accendo equipment: One electronic ballast B 200W/250W, 120-240V MH/HPS and one Metal Halide Lamp Sylvania, 250W.
2. One magnetic ballast ISB Sola-Basic 250W M58 Cat # E-871-FTJ-251 125V - 2.5A and a similar lamp as described above.
3. Two Keene Hibay (KPP) new reflectors with 18” aperture, for each lamp
4. A control panel including switches and a wattmeter
5. HOBOware software and Data Loger HOBO U12 Temp/RH/LightExt.
6. Projenics’ proprietary software for data analysis (www.projenics.net).

The warming-up time for the lamp with magnetic ballast is more than double then the warming-up time for the lamp with electronic ballast (Figures 6 vs. 5 respectively).
After warming-up, the required power of the electronic ballast was 0.215 kW while for the magnetic one it was 0.268 kW, i. e. 24.36% higher. As shown bellow, in corresponding measurement locations, the lamps have similar illuminance no matter the ballast type.

In other words, using electronic ballast versus a magnetic one will result in energy cost savings mainly due to the power loss of magnetic ballast that is greater than the loss of the electronic one.

Another cost savings results from the difference between these ballasts in terms of power factor, which is greater for the electronic ballasts.

New lighting fixtures using electronic ballasts shall be distributed so that the illuminance distribution will remain at least the same as illuminance obtained with the magnetic ballasts and NEW lamps.

Introduction

Accendo is a Canadian company that has recently rolled out a technology for controlling high-intensity discharge (HID) lighting, such as that commonly found in high-bay manufacturing or athletic facilities. This digital ballast technology, the “GloGreen” 250W features microprocessor control that appears
The company requires a validated trial of their technology versus lighting using conventional magnetic core and coil ballasts.

When considering the replacement of lamps, one must ensure that the new lighting systems will provide satisfaction to the users through energy and component cost savings while photometric distribution and light intensity remain at least to the same level.

Therefore, the objective of this research was to analyze the following parameters: the warm-up time, required electrical power and the photometric distribution of the lamps controlled by two different ballasts.
In the first part, the equipment and measurement method are presented. The second part presents the result of the measurements, data analysis and conclusions.

Equipment

During this study, lamps controlled by 2 ballasts (an Accendo electronic ballast versus a magnetic ballast) were analyzed.
Table 1 presents the equipment tested.

Table 1. Description of testing equipment

Acronym	Description	Type	Specifications
Acc	Electronic ballast	Accendo	250W, 120-240V, MH/HPS
ISB	Magnetic ballast	ISB Sola-Basic	250W, M58 Cat # E-871-FTJ-251, 125V
MH	Metal halide lamp	Sylvania	250W
KPP	Keen Hibay	Reflector	18” aperture
HOBOware	Data acquisition software	HOBO	
U12	Data logger	Hobo U12	Temperature / Humidity / Illuminance

Since a black room was not available, measurements were carried out on a test bench installed in a hallway of the college C-wing. The bench consists of the lamp fixtures mounted on the wall at 3.75m height from the floor.

The illuminance meter consists of a HOBO U12 sensor/data logger that can measure simultaneously the illuminance (lux), temperature and humidity. The sensor was mounted on a linear slide that can be positioned at any angle (Figures 1 to 3).

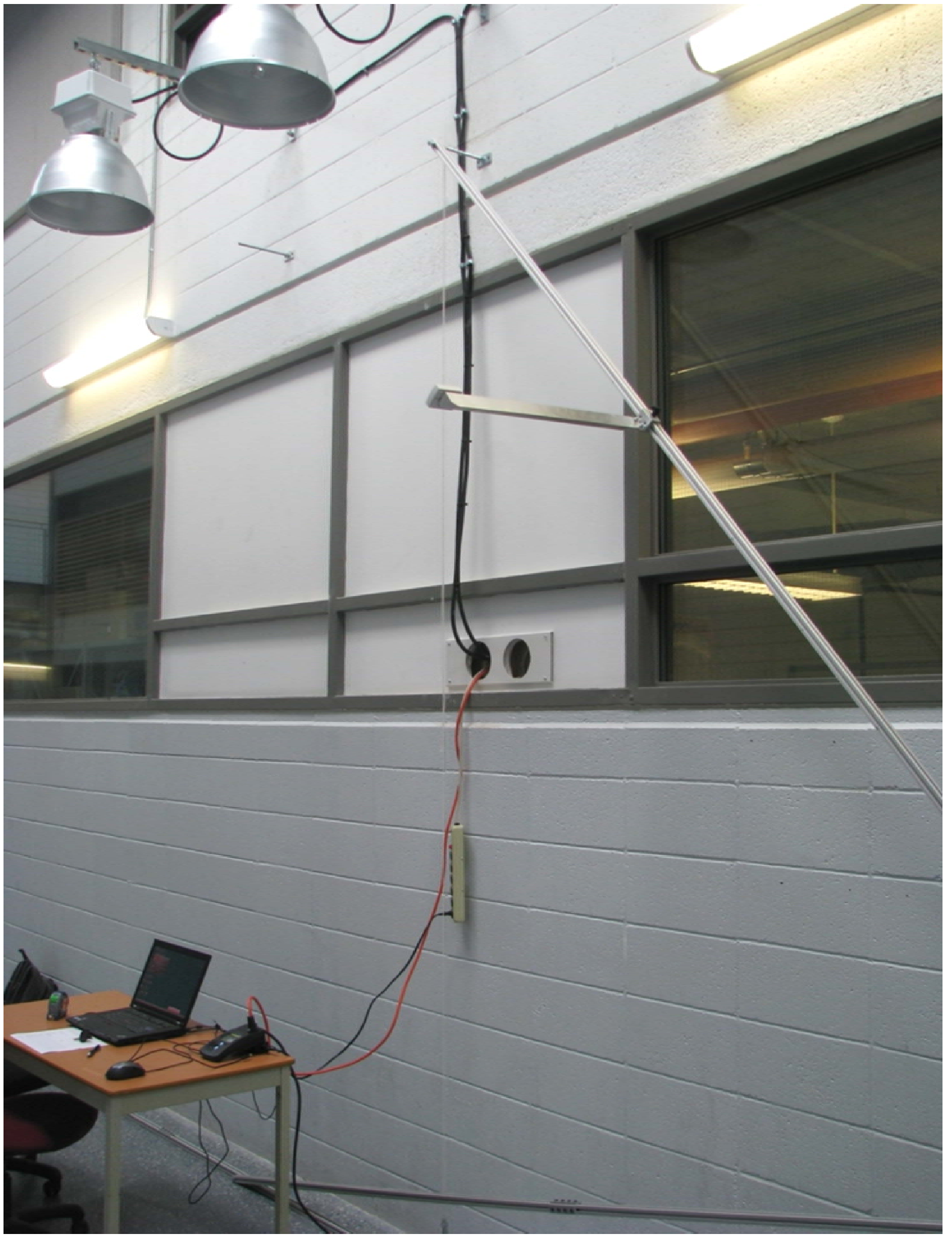

Figure 1. General picture of the testing equipment

The sensor specifications are indexed at this report. The maximum illuminance that it can record is 32,280 lux.

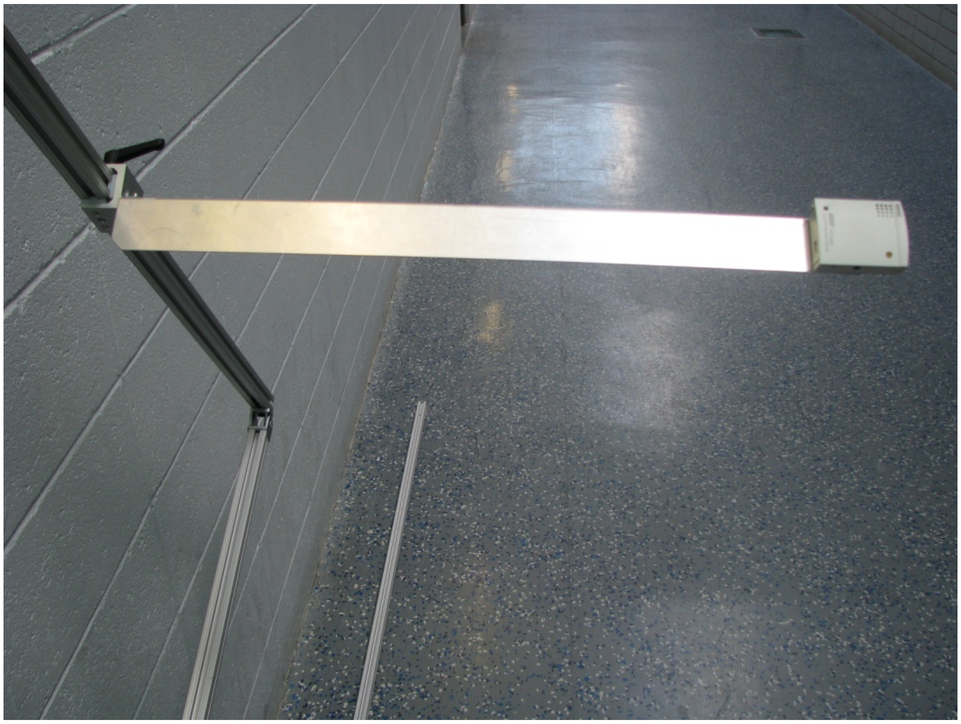

Figure 2. Sliding arm with the sensor

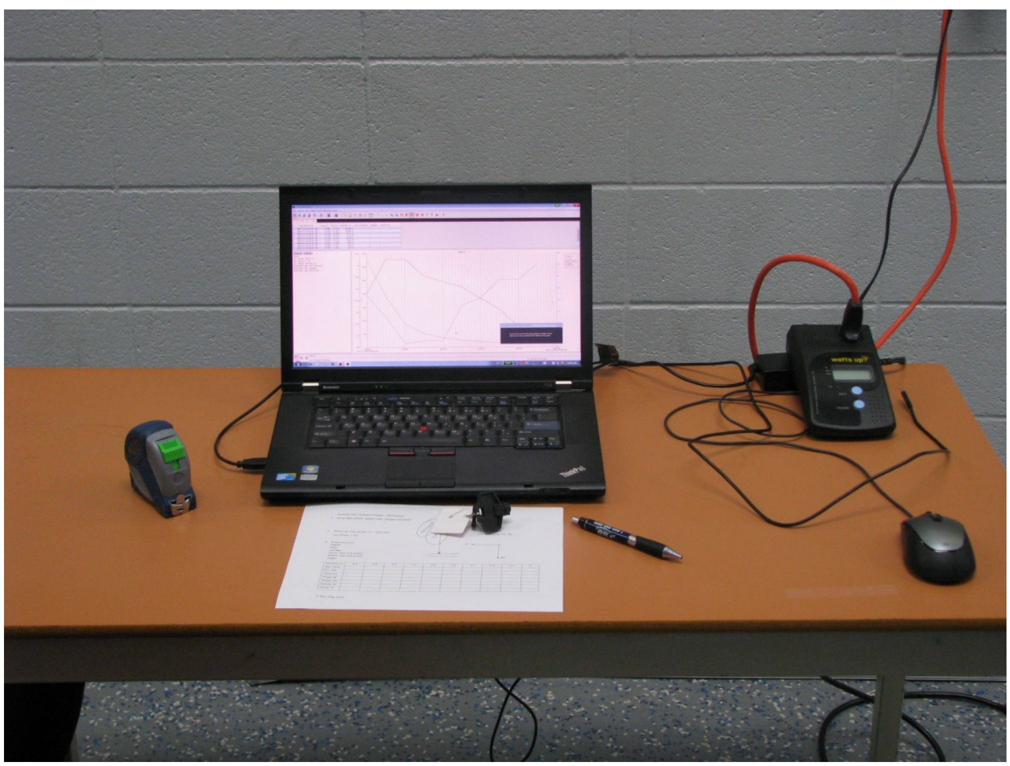

Figure 3. Data acquisition equipment

Methods

Warm-up time measurement

Illuminance measurements at 0.3m distance from the bulb were taken every 10s after switching on the lamp. The measurement stops after the light intensity reached the maximum level of illuminance the sensor can record.

Photometric measurements

The illuminance of each lamp was measured in polar coordinates; the radius was varied by steps of 0.3m (1ft) within the interval 0.3 to 3m. Additional measurements have been taken when azimuth (alpha) was varied in steps of 10^o within the range 30^o to 90^o (Fig. 4).

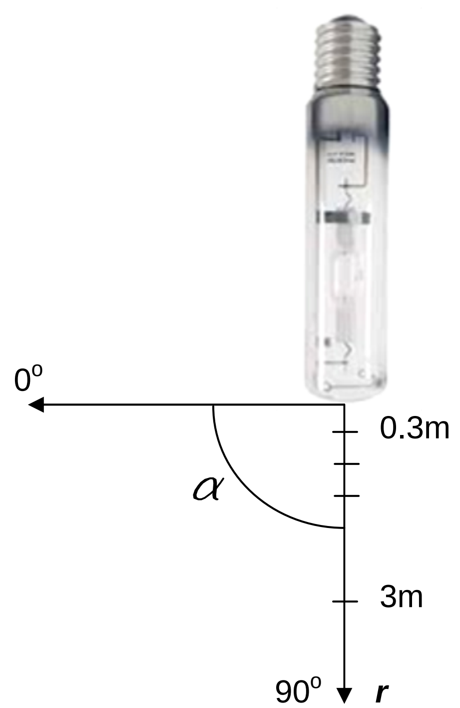

Figure 4. Radius ***r*** and azimuth α for lamp measurement coordinates

Note: Due to existing environment light, the measurements have been taken in two steps:

- One measurement series for environment light only.
- Second measurement series for both lamp and environment light intensity.

When processing the data, we subtracted all the time the values of environment illuminance from corresponding total light.

The electrical power consumption [W] was recorded as the stable value after warming up of the lamp.

Results

Warm-up time and electrical power consumption

The warming-up time for the lamp with magnetic ballast is more than double then the warming-up time for the lamp with electronic ballast (Figures 6 vs. 5 respectively).

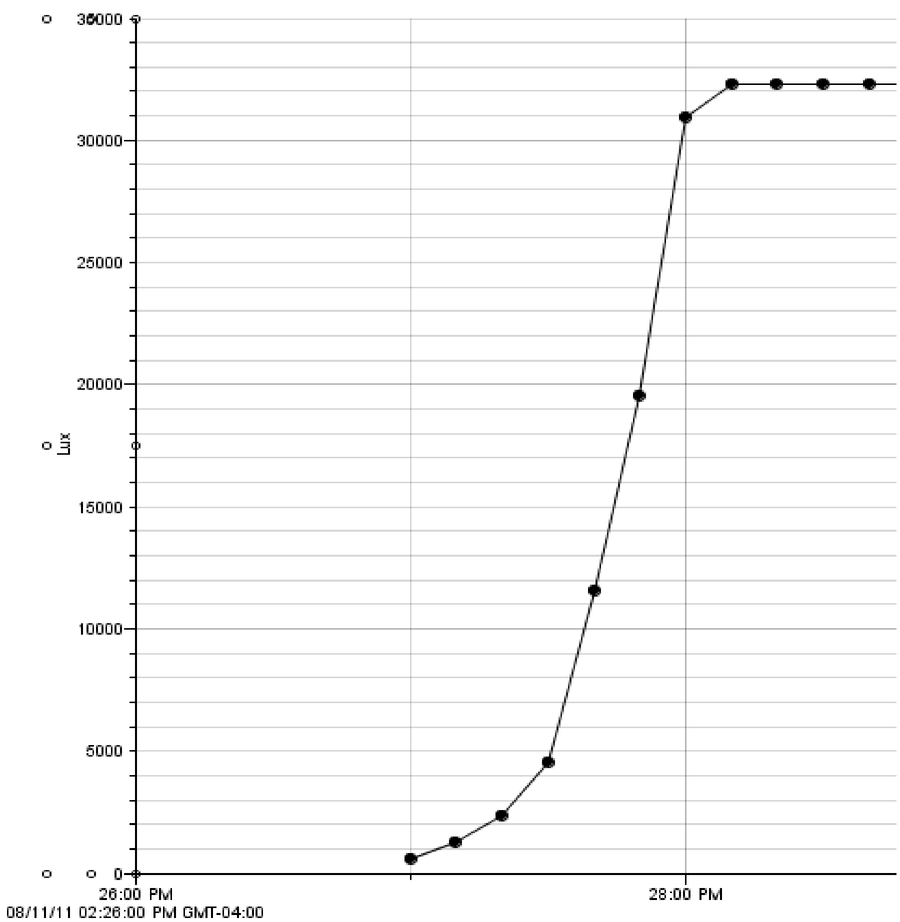

Fig. 5. Electronic ballast – warming-up curve

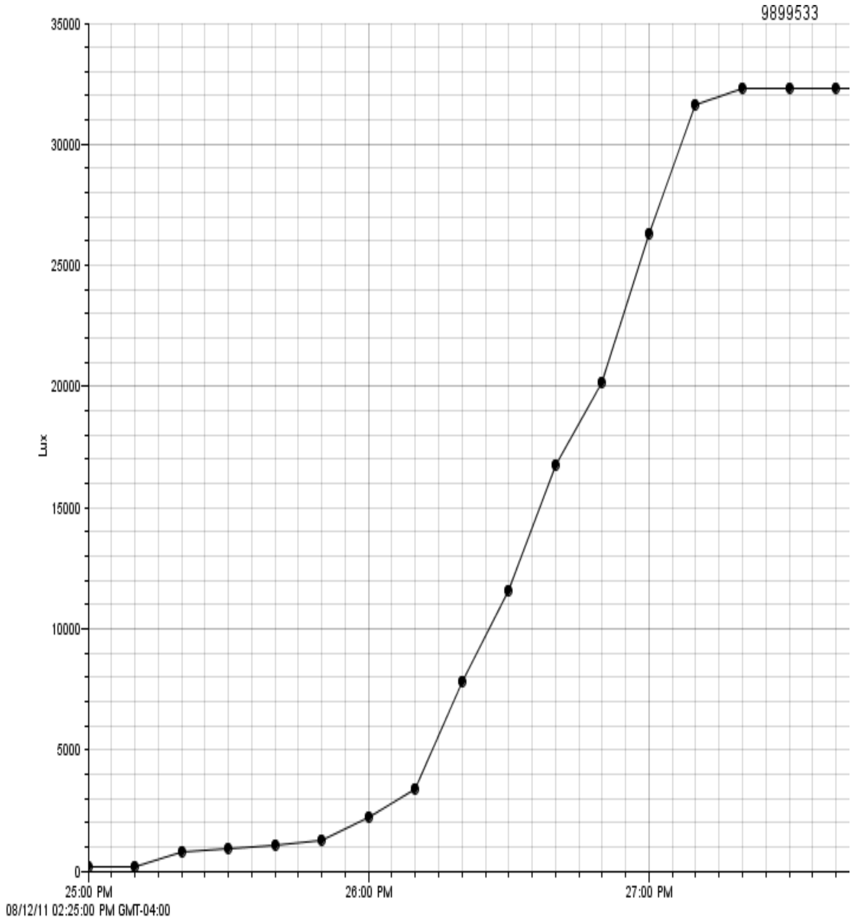

Fig. 7. Magnetic ballast – warming-up curve

After warming-up, the required power of the electronic ballast was 0.215 kW while for the magnetic one it was 0.268 kW, i. e. 24.36% higher. As shown bellow, in corresponding measurement locations, the lamps have similar illuminance no matter the ballast type.

Photometric distribution

The typical photometric distribution varies exponentially with radial distance as shown below. All graphs are represented for a radial distance between 0.6m to 3m (2ft to 10ft). An exponential mathematical function has been fitted to the experimental points with a coefficient of determination $R^2 > 99.9\%$.The experimental data is represented by markers while the fitted data is represented by lines.

In Fig. 8, the lamps illuminance straight vertical down is shown. It can be noted a certain difference between the work of two ballasts, while at 80^o there is no difference (Fig. 9).

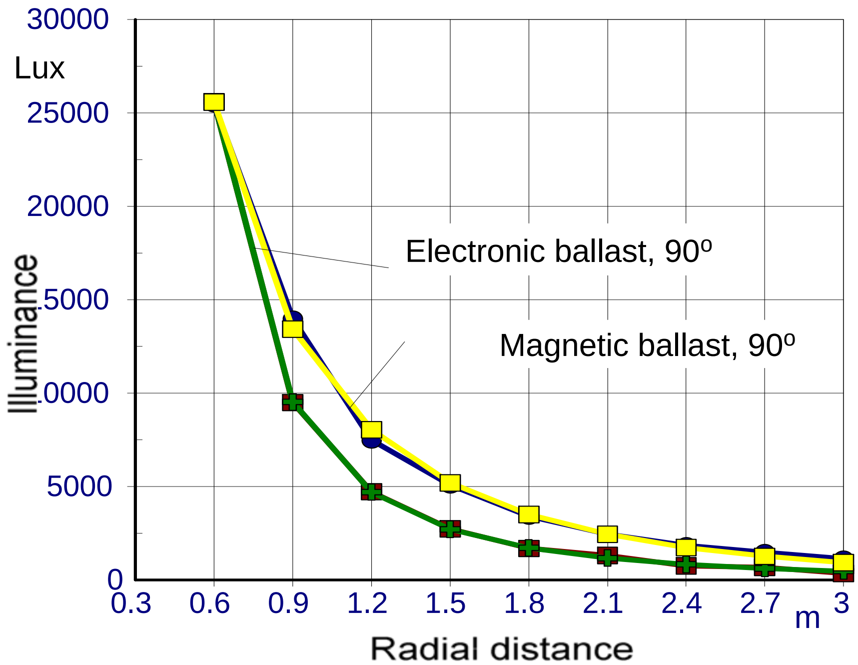

Figure 8. Lamps illuminance (straight vertical down)

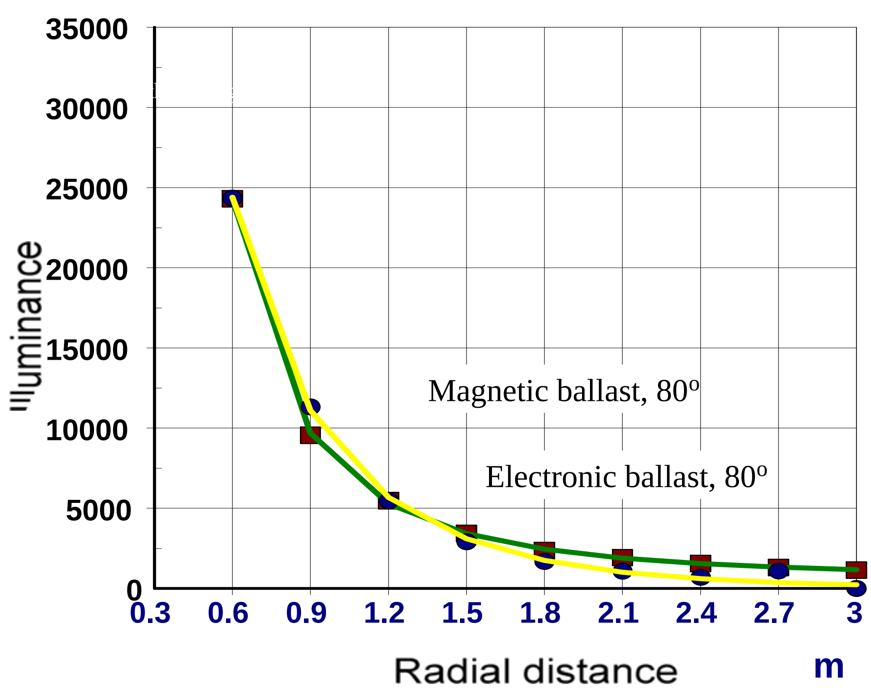

Figure 9. Lamps illuminance at 80°

The graph in Fig. 10 shows the illuminance distribution of the lamp controlled by the electronic ballast. The surface was drawn using a non-linear equation of two independent variables (radius r and azimuth α).

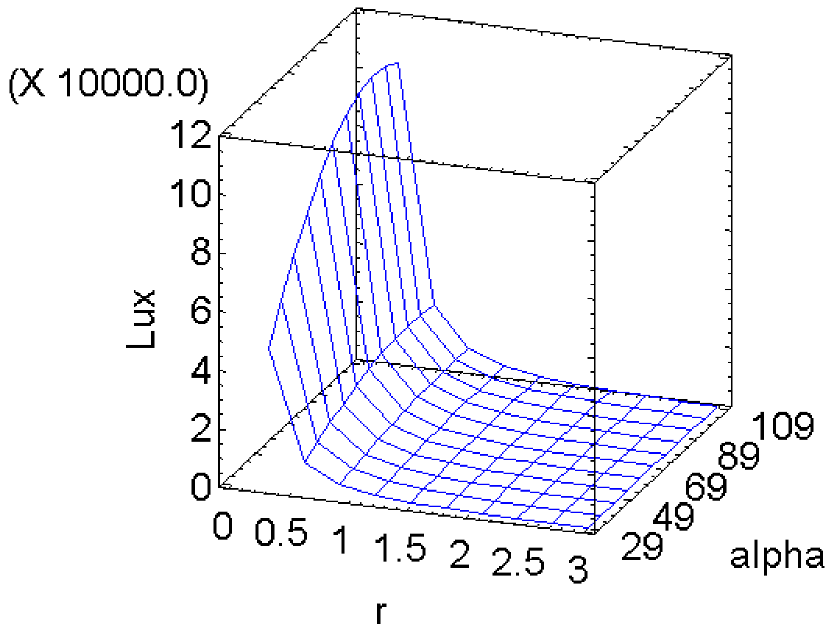

Figure 10. Electronic ballast lamp Illuminance distribution

Conclusions

After warming-up, the required power of the electronic ballast was constantly 0.215 kW while for the magnetic one it was 0.268 kW, i. e. 24.36% higher. As shown above, in corresponding measurement locations, the lamps have similar illuminance no matter the ballast type.

In other words, using electronic ballast versus a magnetic one will result in energy cost savings mainly due to the power loss of magnetic ballast that is greater than the loss of the electronic one.

Another cost savings results from the difference between these ballasts in terms of power factor, which is greater for the electronic ballasts.

Retrofitting the lighting in a high-bay manufacturing or athletic facility shall take into consideration:

- New lighting fixtures using electronic ballasts to be distributed so that the illuminance distribution will remain at least the same as illuminance generated with the magnetic ballasts and NEW lamps.
- Cost savings resulting from electrical power loss difference between the two types of ballasts: (magnetic vs. electronic) vs. cost of new equipment and labor.
- Cost savings from energy loss using magnetic ballasts due to the power factor.
- Acceptable time frame for return of investment

Data from this report may be used by Accendo in presenting their products and preparing quotes for potential customers provided that full credit is given to Sheridan Institute of Technology and Ontario Center for Excellence.

NOTE: The authors reserve the right to draw on to material contained in this report in preparing an article for publication in professional journals or for delivery at professional meetings and symposia.

Acknowledgements

The authors gratefully acknowledge the financing of this research by Ontario Center for Excellence.
The authors express their thanks to Andrew Orton – Lab Technologist for his valuable contribution in procuring materials and assistance in installing of all necessary equipment.