PWM PIC16F877A DIMMING ELECTRONIC BALLAST FOR HPS LAMP

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Dedicated to my beloved father & mother

Ismail Bin Abdullah & Hamidah Binti Samat

Siblings:
Nazera
Nadia
Nabila
Nazree
Abdul Samat
Nekmaa

And

My Entire friend in MEP programme
For their encouragement
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ABSTRACT

Universiti Teknologi Malaysia (UTM) is a second highest on energy consumption in Johor Baharu. One of the factors influenced the consumption of energy in UTM is street lighting energy usage which consumes about 1,238.24 MWh per year of the total energy consumption in UTM. This is approximately 2.08% of the total of energy consumption in UTM. Currently, the conventional street lighting installed in the UTM consists of 956 units of 150W and 277 units of 250W High Pressure Sodium (HPS) lamp. This type of street lighting usually integrated with magnetic ballast where it is cheap and robust. However, the operation hours cannot be controlled by using this ballast, meaning the operating hours for the street lighting are 12 hours per day, hence consuming more energy. Thus, to overcome the problem on high energy consumption and operating cost, this thesis proposes to use a Pulse Width Modulation (PWM) PIC16F877A dimming electronic ballast to replace the existing system. The aim is to develop the PWM dimming electronic ballast for the street lighting system with more energy saving and environmental friendly. An experiment on the developed electronic ballast controller was performed on one unit of a 150W HPS lamp and the result was projected for 956 units for 150W HPS lamp in UTM. Results show that this new ballast system able to save energy up to 31.79% with a payback period of 1 year and 7 months. Analysis also indicates the reduction of Carbon Dioxide (CO₂) emission of 173397.79 kg per year.
ABSTRAK

Universiti Teknologi Malaysia (UTM) merupakan pengguna kedua tertinggi dalam penggunaan tenaga di Johor Baharu. Faktor yang mempengaruhi penggunaan tenaga di UTM ialah lampu jalan dimana jumlah penggunaan tenaga adalah 1,238.24 MWh bagi setiap tahun. Ia merupakan 2.08% daripada jumlah keseluruhan penggunaan tenaga di UTM. Sebanyak, 956 unit untuk 150W dan 277 unit untuk lampu 250W bagi lampu HPS. Balast magnetik yang digunakan untuk lampu jalan konvensional kerana ianya boleh diperolehi dengan harga yang murah. Bagaimanapun, waktu operasi tidak dapat dikawal menggunakan balast tersebut, bermaksud ia akan beroperasi selama 12 jam setiap hari dan akan menggunakan lebih banyak tenaga. Maka, untuk mengatasi masalah yang berkait dengan penggunaan tenaga yang tinggi dan kos operasi, tesis ini akan mencadangkan untuk menggunakan pemodulatan lebar denyut (PWM) PIC16F877a balast elektronik menggantikan sistem lampu jalan yang sedia ada. Tujuannya adalah membangunkan PWM pemalapan balast elektronik untuk sistem lampu jalan yang dapat menghasilkan penjimatan tenaga dan mesra alam. Ujian dilakukan ke atas satu unit lampu 150W HPS dan keputusan telah diunjuk untuk 956 unit lampu HPS. Keputusan menunjukkan bahawa sistem balast elektronik ini mampu memberi penjimatan tenaga sebanyak 31.79% dengan tempoh bayar selama 1 tahun 7 bulan. Analisis juga dmenunjukkan pengurangan pelepasan karbon dioksida (CO2) kepada 173397.79 kg setiap tahun.