

HOME ELECTRICAL ENERGY MONITORING SYSTEM

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BORANG PENGESAHAN STATUS LAPORAN
PROJEK SARJANA MUDA II

Tajuk Projek : Home Electrical Energy Monitoring System

Sesi Pengajian :

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Abstract

This project is about home electrical energy monitoring system was developing to monitor household electricity. Home power consumption tends to grow in proportion to the increasing number of large electrical household appliances. It is providing users with a better understanding of the electrical system's operational parameters. A wired clamp current sensor will be used to measure the current flow through a home electrical system. Graphical User Interface (GUI) based on Visual Basic software will be developed to display the energy information to the user. This system plays an important role in providing a clear picture of electricity consumption in home by measures electricity that being used and shows the usage of energy power. Besides that, it help user to concern about electricity usage in home which increasing each year and taking an appropriate method to reduce electricity usage. The motivation behind this approach is to give user an effective advice on their energy consumption levels and to take appropriate action against the inefficient use of energy

Abstrak

Sistem ini adalah berkenaan tentang sistem pemantauan tenaga elektrik yang akan dibangunkan untuk memantau penggunaan elektrik dalam isi rumah. Penggunaan tenaga elektrik di rumah semakin bertambah disebabkan pertambahan peralatan elektrik di rumah. Ia dapat memberi pengguna pemahaman yang lebih baik tentang parameter operasi kuasa elektrik. Sensor arus elektrik akan digunakan untuk mengukur aliran arus semasa melalui sistem elektrik rumah. Antara muka pengguna grafik (GUI) berdasarkan perisian Visual Basic akan dibangunkan untuk memaparkan maklumat kepada pengguna. Sistem ini memainkan peranan yang penting dalam menyediakan gambaran yang jelas tentang penggunaan elektrik di rumah dengan memaparkan tenaga elektrik yang sedang digunakan. Di samping itu, ia membantu pengguna untuk meningkatkan keprihatinan mengenai penggunaan elektrik di rumah yang semakin meningkat setiap tahun dan mengambil langkah yang bersesuaian untuk mengurangkan tahap penggunaan elektrik. Motivasi di sebalik pendekatan ini adalah untuk memberi nasihat berkesan kepada pengguna pada tahap penggunaan tenaga mereka dan mengambil tindakan sewajarnya terhadap penggunaan tenaga yang cekap.

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LIST OF ABBREVIATIONS

AC	–	Alternative Current
DC	–	Direct Current
GUI	–	Graphical User Interface
kWh	–	Kilo-watt-hour
IDE	–	Integrated Development Environment
USB	–	Universal Serial Bus
ADC	–	Analogue to Digital Conversion
RMS	–	Root Mean Square
PC	–	Personal Computer
CT	–	Current Transformer

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CHAPTER I

INTRODUCTION

1.1 Introduction of Project

Malaysia is growing towards to high technology country in achieving to be developed country in 2020. Due to this, the demand for utility usage is increasing day by day cause user still do not know how to reduce the utility usage. Hence, this will cause the user need to pay more in order to fulfil their essential daily lifestyle with technology. Even though there is technology integrated into electrical or electronic equipment such as inverter into the refrigerator system and energy saving for lighting system which can help to reduce the usage of electricity but still many consumers questioned why their utility bills still increasing for each month. This reason has opened many opportunities for many individuals to develop a number of products that can monitor electricity consumption.

1.2 Objective

There are several objectives that need be focused in order to achieve this project.

- a) To provide effective monitoring system of electricity energy consumption in households with their energy consumption level will be appears to display.
 - The idea is to create an effective way for user to know their level of electricity which can be monitor at home.

- b) It provides real-time, prompt and convenient display on electrical energy consumption.
 - The design will allow user to know their electricity consumption in real time which user able to know at present time.

- c) Able give warning signal if the electricity exceed the limit
 - The system able to give warning to user if they reach limit of electricity which can be compare with last usage of electricity.

1.3 Problem statement

Nowadays, the level of electricity consumption is increasing each year because there are no actions are being taken to reduce the usage of electricity. For example, when watching television, sometimes the user forget to switch off the television and leave it open whole day long even though still do not watch it anymore. This will be contributing to the increasing level of electricity waste. By using this system, it will help user to be more sensitive on their level of electricity consumption by displaying the level of electricity usage in the home.

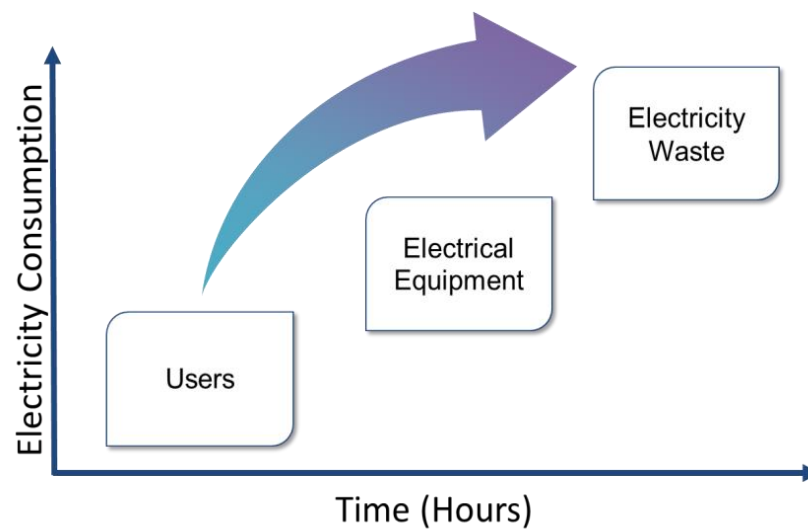


Figure 1.1: Factor contribute to electricity waste

Figure 1.1 show electricity consumption proportional with time. It shows that user play an important roles to control electricity waste by manage electrical or electronic equipment. Electricity bill usually depend on the amount of electricity usage. It happens when users are not aware about their usage of electricity. A system is needed where it can monitor and measure the electricity usage and update users on the increasing electricity utilization.

1.4 Scope of the project

In order to achieve an objective of the project, there are several scope need to be limit. The scope of the project includes:

- a) Create home electrical monitoring system that can be used in the home that is using a single phase electrical connection.
- b) Build graphical user interface (GUI) based on Microsoft Visual Basic using personal computer that could able read, save and display the energy consumption history.

1.5 Importance of Project

- a) Save Electrical Energy.

Electrical energy can be control by user if they know how to manage their electrical or electronic equipment. This can be achieving if user have awareness about electrical consumption of their home.

- b) Minimize Electricity Bills.

By saving electrical energy, it can effect to minimize user electricity utilities. Each month user did not know what make their electricity increase because they did not aware about the usage of electricity.

- c) Save Greenhouse.

Fossil fuel power stations produce gases such as carbon dioxide when producing electricity. This causes an atmospheric imbalance, which in turn has been linked to global warming (global temperature rise).

CHAPTER II

LITERATURE REVIEW

2.1 Overview

This chapter includes the background study regarding electrical usage, electricity power demand, journal and related about electrical consumption. This is important because it the reason why Home Electrical Energy Monitoring System should be developed and how important of the project need to done. It also will discuss about specification for main component of the project such as arduino microcontroller and current sensor.

2.2 Electricity Consumption

Analysis shows that home usually using electricity approximately for 18 hours per day [8]. In 24 hour of electricity consumption, losses are always present in home because user did not aware about their electricity usage. Therefore, there are many solutions to improve the use of electricity in terms of optimization. A research has been done and published on the electrical analysis for various types of industries. Malaysian industries are expected to grow 6.1% of electricity demand from 2005 to 2010 [9]. The study was conducted to analyse the electricity needs for the housing sector. Analysis showed 4.9% increase in electricity demand of the year due to rising

standards of living [9]. The rapid developments of many areas are the cause of the increasing demand in electricity consumption. Therefore, variety devices are developed to monitor the utilization of electricity and installed to provide awareness of the efficiency.

Figure 2.1 shows the demand of electricity consumption proportionally to the years. The electricity consumption for a typical home that taking approximately 18 hours of electricity daily. Starting from 2000, the demands of electricity increasing dramatically approximately almost reach 100 billion kWh per year.

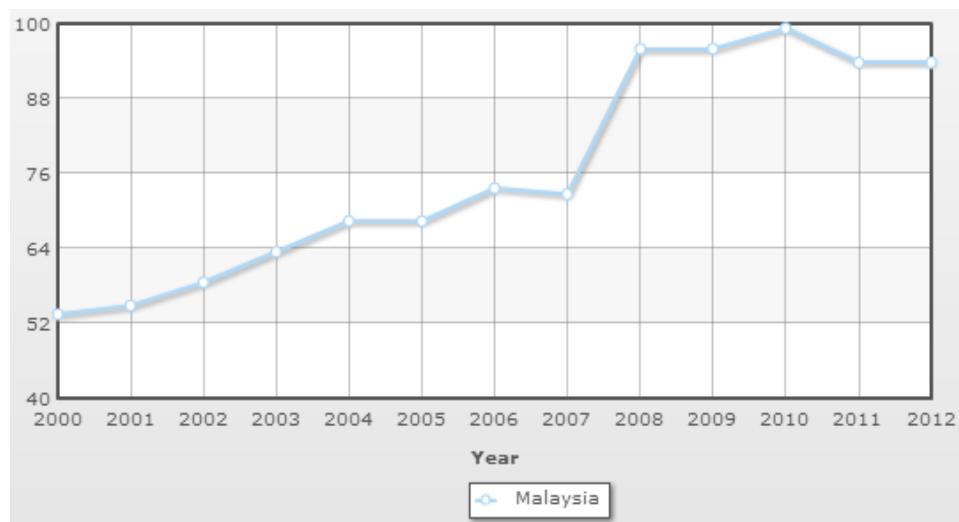


Figure 2.1: Electricity consumption (billion kWh) in Malaysia

2.3 Factor Contribute of Electricity in Home

Figure 2.2 shows graph for electrical energy consumption for a typical home. Based on the graph, most of electricity energy used in your home goes to heating and cooling such as air conditioning, iron, and others because it contribute large power of usage. So making smart decisions about our home's heating, ventilating, and air conditioning system can have a big effect on our utility bills and our comfort.

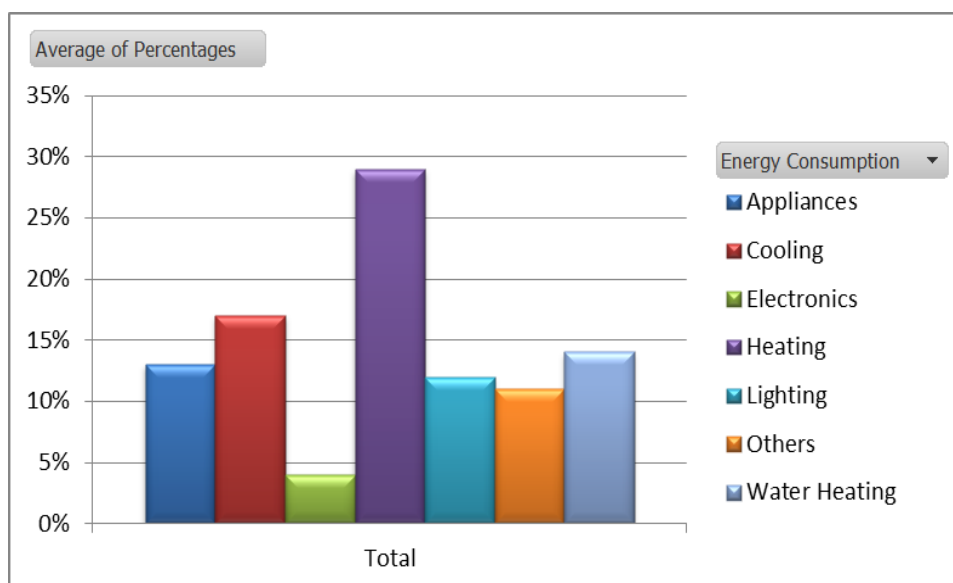


Figure 2.2: Energy Consumption For A Typical Home

All these aspects have been integrated to design a Home Electrical Energy Monitoring Electrical System. This product will be used to measure the electricity consumption and help the user to monitor of usage day-to-day. The purpose of this product is to overcome the wastage of electricity thus making the high level of awareness among consumers. In addition, this product will also monitor and record consumption of electricity daily. This is important because it allow users to estimate on their utilization.

Home electrical energy monitoring system is easy to handle, cheap and user friendly. The system is developed based on electronics, graphical user interface system and programming. The concept is every time users use electricity, GUI will show how many the amount used that they used. All information and notification will be displayed on the GUI. The system will enable users to manage and see the day-to-day usage of electricity. Instead, the users can compare the previous meter reading from suppliers to ensure that their electricity consumption synchronized.

It also will monitor all the information about the flow of power and help to identify the total utilization of electricity per month. Therefore it very important to have an effective monitoring system to ensure the reliability of electricity for both electricity suppliers and customers.

2.4 Microcontroller Arduino

Arduino is an open-source single-board microcontroller. There many design or type of arduino such as UNO, Nano, Due, Fio and others. Each type have their own functionality and specification. It was designed to make the process of using electronics projects more accessible. The hardware consists with an Atmel AVR processor and on-board input/output support. The software that was used for arduino consists of a standard programming language compiler. Arduino hardware is programmed using a Wiring-based language (syntax and libraries) where it similar to C++ programming but it has some modifications on programming.

An Arduino board using of an 8-bit Atmel AVR microcontroller with complementary components that incorporation into other circuits. The Arduino has 14 digital I/O pins labelled 0 to 13 that can be used to turn motors and lights on and off and read the state of switches. Each digital pin can sink or source about 40 mA of current. Most boards include a 5 volt linear regulator and a 16 MHz crystal oscillator (or ceramic resonator in some variants). An Arduino microcontroller is also pre-programmed with a boot loader that simplifies uploading of programs to the on-chip flash memory, compared with other devices that typically need an external programmer.

To interact with the outside world, the program sets digital pins to a high or low value using C code instructions, which corresponds to +5 V or 0 V at the pin. The pin is connected to external interface electronics and then to the device being switched on and off. To determine the state of switches and other sensors, the Arduino is able to read the voltage value applied to its pins as a binary number. The interface circuitry translates the sensor signal into a 0 or +5 V signal applied to the digital I/O pin. If the pin is at 0 V, the program will read it as a 0 or LOW. If it is at +5 V, the program will read it as a 1 or HIGH.

Arduino is different from other platforms on the market because of these features: