WEB DESIGN FOR ENERGY AUDITING PRACTICE

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Bachelor of Electrical Engineering (Industrial Power)

2009

" I hereby declare that I have read through this report entitle "*Web Design for Energy Auditing Practice* " and found that it has comply the partial fulfillment for awarding the degree of Bachelor of Electrical Engineering (Industrial Power)"

Signature : 

Name of supervisor : Puan Wahidah Binti Abdul Halim

Date : 12th MAY 2009

WEB DESIGN FOR ENERGY AUDITING PRACTICE

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A report submitted in partial fulfillment of the requirements for the degree of Bachelor in Electrical Engineering (Industry Power)

Faculty of Electrical Engineering
UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2009

I declare that this report entitle "*Web Design for Energy Auditing Practice*" is the result of my own research except as cited in the references. The report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature : .....

Name : AHMAD KASYAFHAMDI BIN AHMAD AFANDI

Date : 12th MAY 2009

To

Beloved parents

Your prayers make me stronger and keep me moving forward

Lecturers

Fill my heart with the truth and knowledge

Beloved friends

Make my world fill with happiness

All Muslims

May Allah bless you

ACKNOWLEDGEMENT

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ABSTRACT

The purpose of this project is to develop a energy auditing software using LabVIEW 8.5 which can acquire data from the hardware Microcontroller XC866 and then through the web. The main element of this is software is to develop using LabVIEW 8.5. The main purpose of this project is to help users to calculate the cost of electrical energy based on the load and the duration of time needed according to the Domestic Tariff. Software will calculate the cost of electrical by each part in tariff and then plot it into graph. This software helps consumers to calculate the cost of electrical energy in any load that they want to calculate with the duration of time. The result will be shows the total energy cost in Ringgit Malaysia (RM) per day and total energy cost per month.

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MC	Microcontroller
TNB	Tenaga Nasional Berhad
IAP	In Application Programing
ISP	In System Programming
BSL	Boot Strap Loader
CCU6	Capture/Compare Unit 6
ADC	Analog-to-Digital Converter
LIN	Local Interconnect Network
CPU	Central Processor Unit
PWM	Pulse Width Modulation
LED	Light Emitting Diode

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CHAPTER I

INTRODUCTION

1.1 Energy Audit Practice

Energy audit is a systematic study or survey to identify how energy is being used in a building or plant, and identifies energy savings opportunities. Using proper audit methods and equipment, an energy audit provides the energy manager with essential information on how much, where and how energy is used within an organization (factory or building). This will indicate the performance at the overall plant or process level. The energy manager can compare these performances against past and future levels for a proper energy management. The main part of the energy audit report is energy savings proposals comprising of technical and economic analysis of projects. Looking at the final output, an energy audit can also be defined as a systematic search for energy conservation opportunities. [1]

In other words, an energy audit is an inspection, survey and analysis of energy flows in a building, process or system with the objective of understanding the energy dynamics of the system under study. Typically an energy audit is conducted to seek opportunities to reduce the amount of energy input into the system without negatively affecting the outputs. When the object of study is an occupied building then reducing energy consumption while maintaining or improving human comfort, health and safety are of primary concern. Beyond simply identifying the sources of energy use, an energy

audit seeks to prioritize the energy uses according to the greatest to least cost effective opportunities for energy savings. [2]

Because of there are so many definition and the scope of energy audit is too wide, this project only focusing about the energy monitoring system. The main objective of this project is to design a web which can control or monitor the energy system from the software built. There are two (2) software which is involves in this project. First, this project is using LabVIEW 8.5 software as a main element. Second, this project is using Keil Software. Both of this software will be combining together and then will upload to the website and will call as a 'Web Design for Energy Auditing Practice'.

What is the specialized for this project is user can control the energy system from internet. User also can get a report about energy usage for the duration of time for the energy system in terms of graphs and calculation about cost.

1.2 Project Objective

There are 3 objectives for this project:

i. Build software to distribute in graph about energy auditing
   a. Kilowatt hour versus time (month).
   b. Cost versus time (month).

ii. Design a web to demonstrate the application of energy audit and monitoring software.

1.3 Project Scope

The scope of the project is focused about on energy monitoring system only. This software is build using LabVIEW 8.5 as a main element. LabVIEW 8.5 is used to make a calculation about the formula needs in energy auditing including cost. Graphs as shown in the project objective part are the output of this software. Other than that, this software will show the report of this project including the graphs and cost. Cost calculation is made according to the estimated time and tariff which have been decided from energy supplier.

To control or monitor the energy system, *Microcontroller (MC) X Board XC866* circuit is the hardware used to achieve the second objective of this project. This board is programmed by the Keil Micro Vision Software. Keil Micro Vision software is used to transmit a data like the voltage and current to be set in MC X Board XC866 as an input for the LabVIEW 8.5 software. It means that the input of this software build is permanent. Other than that, Keil Micro Vision software also programmed to control ON and OFF of the system build.

1.4 Problem Statement

From the previous research, it has found that the wasting of energy in the house, building or somewhere is a big problem nowadays. So, this software is build to overcome this problem. Before this, if we forgot to switch OFF the fans of lights in our house, we only can turn it OFF if we come back to the house. If our house is build included with this software, we can only turn if OFF only by the internet.

Other problem is consumers only can get their electrical bill once a month. They do not know how much was the electrical energy used for a certain period. With this software, consumers can check their electrical usage for duration of time needed. It means that they can check the cost of electrical usage for a certain period. The result is

consumers will know about the energy usage for everyday and they can calculate their cost of electricity early and no need to wait for the TNB workers to send their electrical bills.

CHAPTER II

LITERATURE REVIEW

2.1 LabVIEW 8.5 Program

LabVIEW is the main element to develop this project. There are many type of versions for this program and LabVIEW version 8.5 (LabVIEW 8.5) is chosen to develop this project. LabVIEW programs are called virtual instruments (VIs). It stress that controls equal inputs and indicators equal outputs. Each VI contains three main parts:

i. Front Panel - How the user interacts with the VI.
ii. Block Diagram - The code that controls the program.

The Front Panel is used to interact with the user when the program is running. Users can control the program, change inputs, and see data updated in real time. Stress that controls are used for inputs- adjusting a slide control to set an alarm value, turning a switch on or off, or stopping a program. Indicators are used as outputs. Thermometers, lights, and other indicators indicate values from the program. These may include data, program states, and other information.

Every front panel control or indicator has a corresponding terminal on the block diagram. When a VI is run, values from controls flow through the block diagram, where they are used in the functions on the diagram, and the results are passed into other functions or indicators.

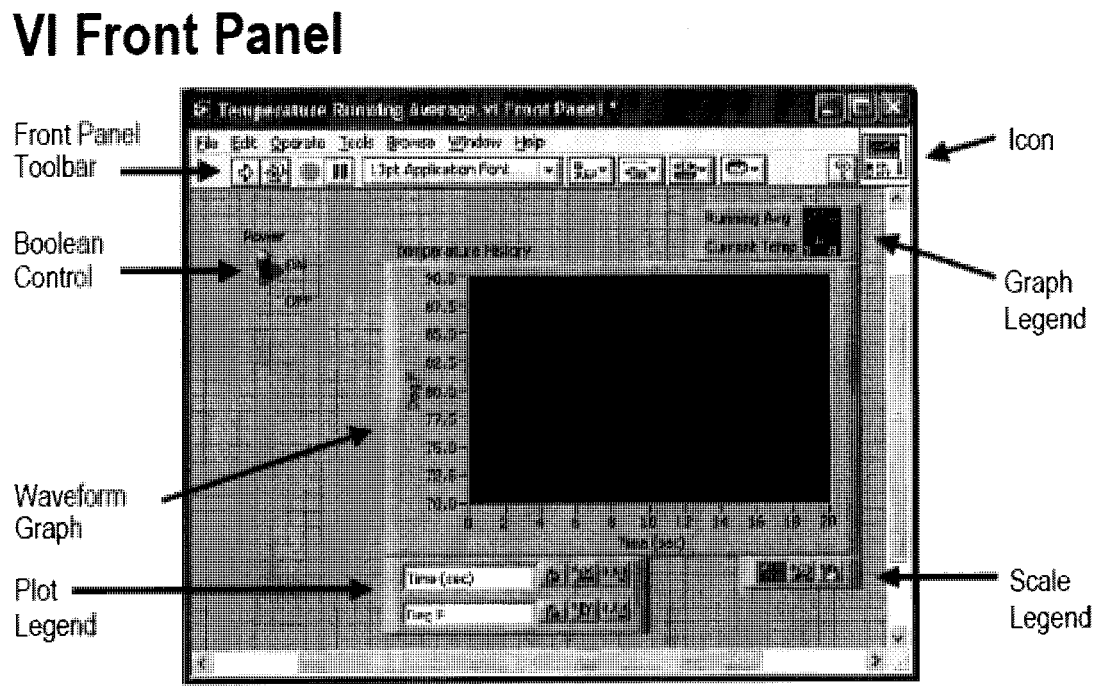

Figure 2.1: VI Front panel example with labels

The front panel is the user interface of the VI. The front panel builds with controls and indicators, which are the interactive input and output terminals of the VI, respectively. Controls are knobs, pushbuttons, dials, and other input devices. Indicators are graphs, LEDs, and other displays. Controls simulate instrument input devices and supply data to the block diagram of the VI. Indicators simulate instrument output devices and display data the block diagram acquires or generates.

VI Block Diagram

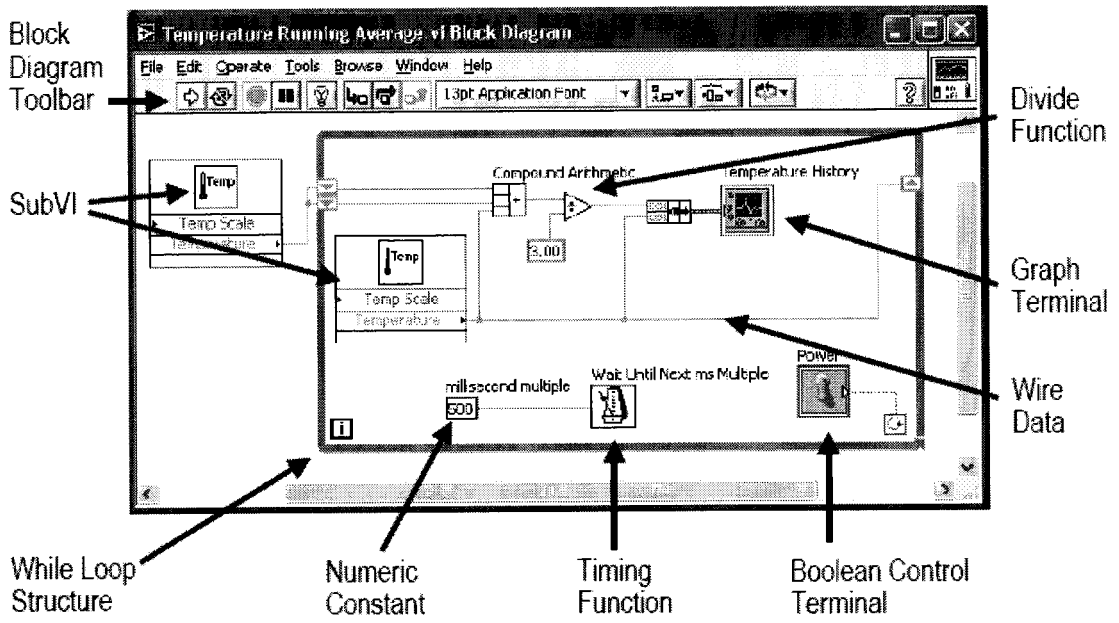

Figure 2.2: VI Block diagram example with labels.

The block diagram contains this graphical source code. Front panel objects appear terminals on the block diagram. Additionally, the block diagram contains functions and structures from built-in LabVIEW VI libraries. Wires connect each of the nodes on the block diagram, including control and indicator terminals, functions, and structures.

2.2 Charge of Electrical Energy

Charge of electric energy is according to the tariff which has been decided by electrical energy supplier. Calculation for electric energy is shown below.

$$\text{Cost of electrical energy} = \frac{\text{Watt x Hour x Tariff rate}}{1000} \quad (2.1)$$

2.3 Tariff Rate

Tariff rate which will be use in this project is Tariff A according to the energy supplier of Malaysia, Tenaga Nasional Berhad (TNB). Actually, according to the Tenaga Nasional Berhad (TNB), there are 16 types of tariff. For this project, Tariff A [3] is the only one tariff that will be use in this project. This is because to minimize the scope of this project which is too wide. Table 2.1 below describes the tariff which will be use in this project:

Tariff Category	Unit	Rates
Tariff A		
Domestic Tariff		
For monthly consumption between 0-400 kWh per month:		
For the first 200 kWh (1 - 200 kWh) per month	sen/kWh	21.8
For the next 200 kWh (201 - 400 kWh) per month	sen/kWh	34.5
The minimum monthly charge is RM3.00		
For monthly consumption more than 400 kWh per month:		
For the first 500kWh (1-500 kWh) per month	sen/kWh	30
For the next 100 kWh (501-600 kWh) per month	sen/kWh	39
For the next 100 kWh (601-700 kWh) per month	sen/kWh	40
For the next 100 kWh (701-800 kWh) per month	sen/kWh	41
For the next 100 kWh (801-900 kWh) per month	sen/kWh	43
For the next kWh (901 kWh onwards) per month	sen/kWh	46
The minimum monthly charge is RM3.00		

Table 2.1: Tariff A

2.4 Watt versus Time Graph

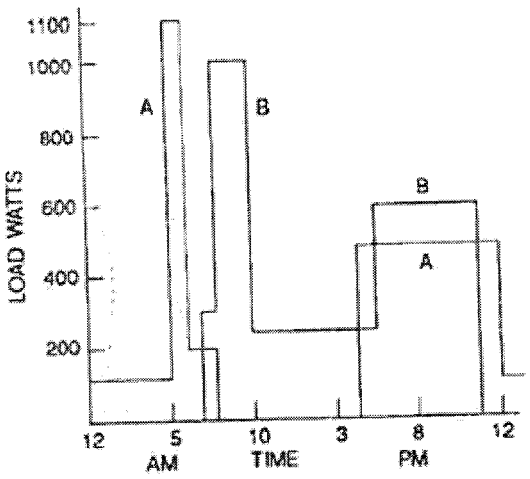

Figure 2.3a

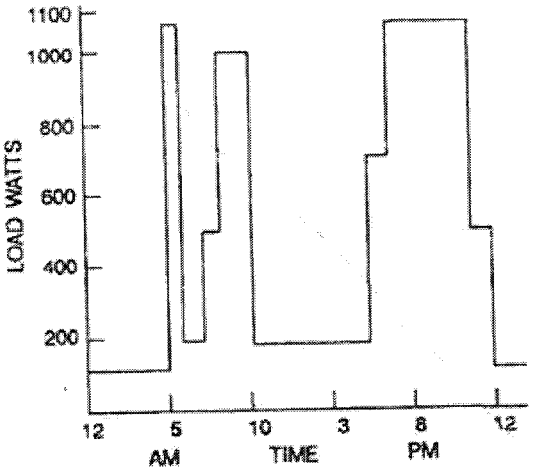

Figure 2.3b

Graph in Figure 2.3a shows that load for two (2) types of building A and B [4]. For graph in Figure 2.3b, it shows the total of loads for the two (2) types of building. What will this software shows is the total of loads which is came out from the hardware (XC866) set by Keil Micro Vision software.

These graphs are the draft or an example of the output of this software. From the graph, we can calculate about the energy consumed for duration of time. Energy consumed can be calculated according to the formula below.

Energy consumed = Watt x Duration of Time (2.2)