FINAL YEAR PROJECT REPORT

"Design of an Online Real time Monitoring and Data Logging scheme for Synchronous Generators"

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"Design of an Online Real time Monitoring and Data Logging scheme for Synchronous Generators"

Project Report submitted to the
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in
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Acknowledge

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Regards:

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Abstract

The control of synchronous machines is now moving almost completely from analogue electronic to digital. Therefore the very first reason which motivated us toward this project is that we wanted some digital control (Microcontroller Based) for monitoring different parameters of Synchronous Generator. Thus it is necessary to develop a digital circuit for the monitoring of a power system. In this project Generator parameters like Generator Voltage, Generator load Current, Temperature of windings of generator and Frequency of system are sensed by Potential Transformer, Current tansformer, Temperature sensor (LM35) and internal interrupt of micro controller respectively . Then these parameters are monitored by applying limitations and using LED's to show system status and LCD is used for the Digital Display. After this the parameters are sent to computer for serial port interfacing. At the end the data is uploaded on webpage through data base.

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1. Introduction

2. Monitoring and It's Importance

3. Monitoring Circuits Implementation

4.Data Logging

Chapter 01
Introduction

1.1-History of Power system

In the year 1878, Thomas A. Edison began his incredible work on the research of electric light and formulated the concept of the lighting in the surrounding area, which was driven by a centrally located power station. Realization of the research came in the year of 1879 and by 1882, September 4, he set up a historic Pearl Street Station in New York City, making him the pioneer batch of scientist in the World of Electric Utility Industry

In the beginning, the generator that supplied the electricity to the surrounding could only support the initial load of 30kW for a 110V incandescent lighting. Due to the introduction of the DC motor by Frank J. Sprague in 1884 and the development of the three wire 220V DC system, this allowed the loads to increase. As the demand of electricity and transmission distances started to increase, voltage problems were experienced. By the year of 1885, William Stanley solved the problems with the development and design of the transformer, which has the ability of transmit power at a high AC voltage and low current, minimizing the voltage drops on the transmission lines; making AC source more attractive than DC source. Growth of the AC systems started in the year of 1888, when Nikola Tesla discovered two-phase induction and synchronous motors. This discovery added to the advantages of the poly phase versus the single – phase systems, leading to an expansion in the usage of three-phase line in Germany and United States of America. Making the three-phase synchronous generator the workhorse of the industry

1.2-Synchronous Machines

A synchronous machine is an ac rotating machine whose speed under steady state condition is proportional to the frequency of the current in its armature. The magnetic field created by the armature currents rotates at the same speed as that created by the field current on the rotor, which is rotating at the synchronous speed, and a steady torque results. Synchronous machines are commonly used as generators especially for large power systems, such as turbine generators and hydroelectric generators in the grid power supply. Because the rotor speed is proportional to the frequency of excitation, synchronous motors can be used in situations where constant speed drive is required. Since the reactive power generated by a synchronous machine can be adjusted by controlling the magnitude of the rotor field current, unloaded synchronous machines are also often installed in power systems solely for power factor correction or for control of reactive kVA flow.

1.3-Analog to Digital Control

In a world of change, new technologies replace old ones ever more quickly. In the early years, change was slow with the transition process from the electro-mechanical voltage controller with motor-driven rheostats to high gain rotating exciters.

In recent years, another major technology change has taken place with a move away from the analog control to digital control. This has been made possible due to the rapid developments of electronic devices and technologies such as high performance micro-processors and high intensity integrated circuits. The controller is now reduced to integrated assembly. This had greatly increased it reliability as multiple components are implemented with just Microcontroller. The digital controllers are not simply a digital version of the analog version, but can realize sophisticated control functions that will difficult with the analog circuit thus making it possible to enhance the stability of the power system .

1.3.1-Features

The digital Monitoring for synchronous generator has following features:

- Sensing the system parameters:
- Generator Voltage
- Generator load Current
- Temperature of windings of generator
- Frequency of system
- Monitoring the parameters by applying limitations and using LED's to monitor system operation
- Digital display using LCD
- Sending parameters reading to computer after specific interval of time Serial port interfacing
- Data logging
- Uploading data on web page.

1.4-Basic Requirements

Monitoring of a Power Generator is hardware as well as a software project. As this project is based on microcontrollers, it is important to check whether codes work well as required. So, for development of this project, it can be said that this project is both software and hardware based. Hence the requirements of the project are of two types.

Software Requirements

Hardware Requirements

1.5-Software Requirements

Following software's are used in our project:

- Proton IDE
- Proteus ISIS
- OrCAD
- PIC Flash
- Hyper Terminal
- MATLAB
- Dreamweaver
- WampServer

1.6-Proton IDE

Proton IDE is a professional and powerful visual Integrated Development Environment (IDE) which has been designed specifically for the Proton Plus compiler. A very advanced code explorer for PIC based development on the market.

The code used in the PIC 16f877A has been developed using this amazing software. The serial communication and analog to digital converter commands are studied using its help feature. The PIC code is used to operate the transmitters in different logic combinations from 0-15 and total combination are 16. The combinations can be implementing by pressing respective key. And the sensor data is taken and sent by the PIC is continuous process as in the code.

1.7-Proteus ISIS

This is very important software in the field of electrical engineering to implement the circuit before developing its hardware design. It supports many electronics components like resistors, regulators, capacitors, etc. Many different ICs and Motors are also available as one of its amazing feature of its built-in library. This software is used for hardware circuit implementation not for programming.

1.7.1-Features

Some key features of ISIS are highlighted below.

Supports large number of Microcontroller Units including PIC16F877A.

It generates the proper DC, AC signals for experiments.

Huge gallery of circuit components.

Electromechanical components like Servo and DC motors can be simulated.

Circuit can be transformed to design a Layout in Proteus ARES software

Hex file can be loaded directly to the MCU and observe the result.

Circuit can be simulating for serial communication also.

1.8-OrCAD

OrCAD is a proprietary software tool suite used primarily for electronic design automation. The software is used mainly by electronic design engineers and electronic technicians to create electronic schematics and electronic prints for manufacturing printed circuit boards.

1.9-PicFlash

The PIC FLASH Programmer is are liable and fast production grade programmer for PIC 12, 16 & 18 series Flash. The PIC FLASH programmer communicates to the microchip throughputs cable which is also used for powering the programmer. It's a very easy and simple to understand. The project code is burned to the microcontroller using Easy PIC trainer module and PIC Flash software.

1.10-Hyper Terminal

HyperTerminal is a built-in windows program that can be used to connect to other computers, online services, and host computers and other devices using either modem or a serial DB-9 cable.

1.11-Hardware Requirements

- Circuit Designing for Excitation circuit and monitoring module.
- Programming of PIC microcontroller.
- Making circuit hardware of modules.
- Assembly of all parts on a single board.
- Finalize checking of the working of all circuit modules.
- Data logging
- Uploading data on web page

Following are the hardware requirements for project:

- PIC Microcontroller
- Temperature sensor LM 35
- LCD (16*4 character)

- Step-down AC transformer (220V-15V)
- LED’s
- Diode 1N4007
- Zener Diode (6V8)
- Switches
- MAX 232
- Positive Voltage Regulator LM7805, LM7812
- Negative Voltage Regulator LM7905, LM7912
- Heat Sinks
- Opto couplers
- Operational Amplifiers (LM741)
- DB-9 connectors
- Serial Port Extension cable
- Breadboards
- Vero Boards
- Crystal Oscillators (20MHz)
- Resistors
- Capacitors