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On-Line Monitoring and Protection of Alternator in ETPS

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Abstract: For winding protection of alternator, the on-line monitoring system of winding protection of alternator is designed based on transducer and interfacing card to PC in this project . The system describes the specific hardware and c software program in detail and simultaneously describes the specific application in data collection system of the alternator. The data transfer technique called interfacing card is used for transfer of data's from one end to remote end. The system with good real-time, high reliability, high-speed and good flexibility will have a good prospect. In our project we are mainly focusing on protective scheme especially sensing element called relays. The only way to reduce hardware and cost is to convert hardware based relays into software based relays. For this, we are first converting all individual relay characteristics into software using 'C' language. In next step, we are visually/graphically-representing variation of all alternator parameter in pc using Turbo C + Graphics and we are dynamically monitoring all signal status. For sensing all parameter such as stator current etc., we specially designed PCB for all parameter. All sensed parameter is sending to pc through ADC 0809 and each parameter has unique address location. In our project, communication between our project model and pc is made through specially designed interface card. If any fault occurs in the alternator, the computer gives the signal to trip the faulty portion from the normal portion of the circuit.

Keywords: Online monitoring, ETPS

1. INTRODUCTION

In the protection schemes, mostly hardware-based relays such as electromagnetic, static, microprocessor based relays are used. All these relays mentioned above have their own limitation such as difficult to trace the type of fault, providing individual relays for different relay characteristics and functions makes the entire protective schemes costlier. In power plants various interlocks and protections are used for safeguarding Alternator. Hard-wired logic gates are used in most of the existing power plants. The aim of our project is to convert the existing hardware based relay circuits and protection into a PC based one, by means of which delay in tripping due to logic gate component failure and other reasons can be avoided. The circuit components involve alternator, transducer, potential transformer, current transformer, ADC, interfacing card, drive circuit, buzzer, siren and PC. The aim of this project is focused at building a compact scheme for monitoring the parameters and to protect the Alternator by replacing the Relays into various transducers and are interfaced with the PC and the Alternator Protection is implemented by means of a single computer using the time-sharing scheme. The output voltage of the Alternator is reduced from KV to Volts with the help of potential transformer. The reduced voltage is fed to the voltage transducer which converts the ac voltage into desired low dc voltage of the range 0 to 5 Volts dc. This output dc voltage of the transducer is fed to analog to digital converter which gives digital output, the digital signals are given to the PC through an Interfacing hardware circuit which is also to be included in the project. The transducers always interact with the PC's so that all the parameters of the Alternator especially the voltage is monitored and necessary action is taken by the computer with the help of software programs. The computer Alternators an audible alarm when the voltage exceeds the normal operating levels and it trips the Alternator when the voltage is abnormal and finally the Alternator is safeguarded. Specially designed drive circuits are to be used in the project kit to actuate the alarm buzzer circuits and also to open the Alternator circuit breakers. Buzzer driving circuit to give annunciation, if the system is in alert state and the circuit breaker is operated under the emergency state and the undesired Alternator voltage levels.

1.1 Working

Drive circuit generates trip signal, which is given to circuit breaker to remove the faulty part from the circuit as soon as fault is sensed by computer.

1.2 Circuit Design

1.2.1 Components

- Transistor SL100
- Resistors (2.2 KΩ, 330 Ω)
- Miniature Relay
- Lamp, LED
- Diode, Capacitor (10 µf)

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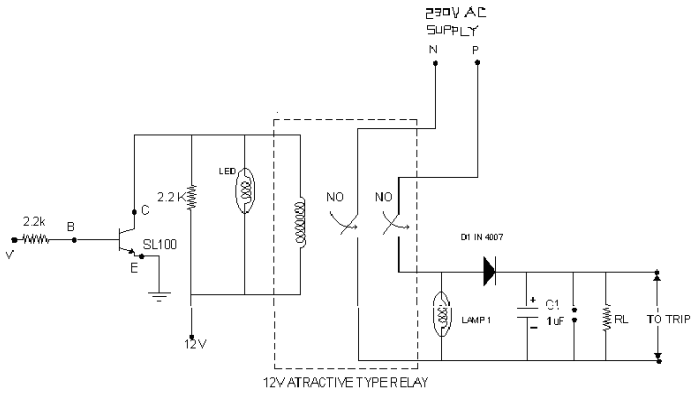

Fig 1: Drive Circuit

The signal from the computer is given to input of the drive circuit as binary signals (1's and 0's). Under normal condition the relay remains at normally open position and if the input signal is 1 then the circuit acts to generate trip signal. If the base of the transistor is provided with input signal (binary signal 1) equivalent to 5V DC, emitter is grounded and collector gains negative potential. If the computer senses the fault condition then the drive circuit forward biases the transistor and hence forming the closed path across relay supply thereby relay is activated to generate trip signal. 230V AC available at the input of the relay is available at the output and it is rectified to DC voltage using diode, capacitor acts a filter and trip signal is given to circuit breaker.

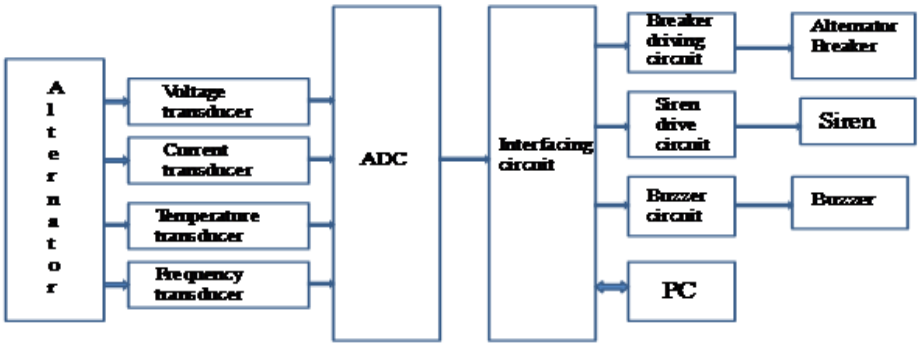

Fig 2 : Block Diagram

2. HARDWARE IMPLEMENTATION

Current transformers of higher ratings are in build in the power measuring or protection circuit of transformer on high voltage applications, However current transformers are rated secondary values from 1 Amps to 5 Amps of maximum and its primary rated for higher amps. In current transducer there is a current transformer, which is of rating 10:1, which reduces the current further to mAmps to in order to make it suitable for small electrical components. The secondary of the current transformer is connected to a 4.7KΩ resistor and a capacitor acts as a filter. The output of the preset, which is in the range of (0 – 5V) is given to ADC. In ADC the analog voltage signal is converted to 8 bit digital signal.The 8 bit digital signal is given to computer through interfacing card. In computer the 8 bit signal is compared with predefined values specified in the program. If the signal (VA) exceeds the predetermined value, computer gives a signal to drive circuits to go for sharing mode.

3. PERFORMANCE ANALYSIS AND RESULTS POWER UNIT IMPLEMENTATION

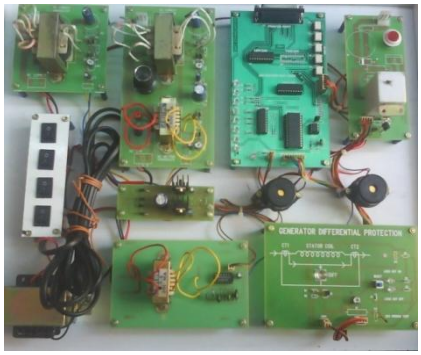

Fig 3 : Hardware Implementation

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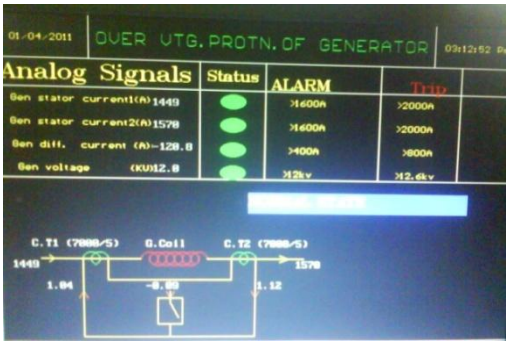

Fig 4 : Monitor system implementation when normal condition\

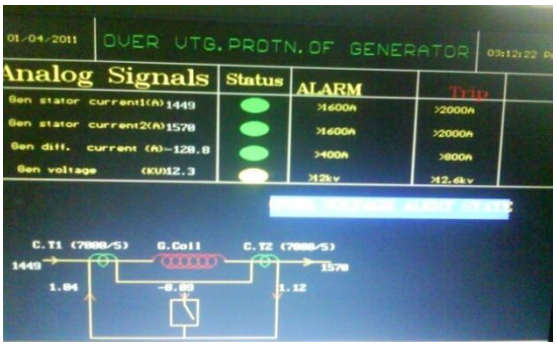

Fig 5 : Monitor system implementation when alert condition

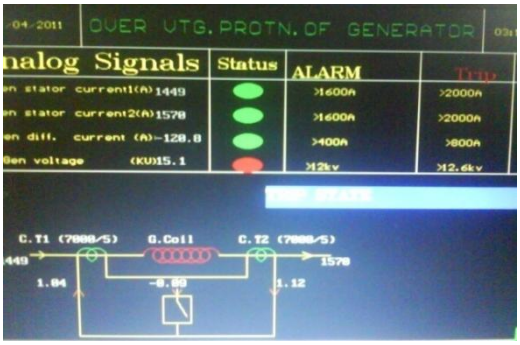

Fig 6 : Monitor system implementation when trip condition

4. CONCLUSION

Thus a compact scheme is designed for monitoring the parameters and to protect the alternator by replacing the Relays into various transducers and are interfaced with the PC and the alternator Protection is implemented by means of a single computer using the time-sharing scheme. Implementing the PC in the field of Alternator Protection improves the reliability and sensitivity effectively.

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