Automatic Load Sharing of Transformer by using Microcontroller

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Abstart- **The aim of this project is to protect the transformer under overload condition by load sharing and to provide uninterrupted power supply to the consumers. The sharing of load will be done by connecting another slave transformer to the main transformer through microcontroller. The microcontroller compares the load on main transformer with some refference value. And when the load exceeds the refference value, the slave transformer will share the extra load. Now, in this project three modules are used to control load currents. The first module is a sensing unit which is used to sense the current of load and the second module is a control unit. The last module is microcontroller unit which will read the analog signal. It performs some calculations and finally gives control signal to the relay. A GSM model is also used to inform the control station about switching. The advantages of this project are transformer protection, uninterrupted power supply and short circuit protection.**

I. INTRODUCTION

THE transformer is a static device, which converts power from one load to another. The transformer is very costly and bulky equipment of power system. It operates for 24 hours of a day and feeds the load. Sometimes the situation may occur when the load on the transformer is suddenly increased above its rated capacity. Due to this, the transformer will be overloaded and overheated. Due to overload transformer, the efficiency drops and windings get overheated and may get burnt. Thus by sharing load on a transformer, the transformer is protected.

Electricity has become measure aspect in our day to day life without this many of our needs cannot be fulfilled. We are facing many issues while receiving electricity like voltage fluctuations, power termination at overload condition etc. This project deals with automation of transformer monitoring and controlling .as transformer is the static device which transfers energy from one voltage level to another voltage level. Transformer is electrically isolated inductively coupled device which changes voltage level without changing frequency. Transformer transfers AC voltage from one electrical circuit to another by mutual induction. Distribution transformer is one of the most important equipments in a power system and is called as heart of a power system. Therefore monitoring and controlling of key parameters like voltage and current are necessary for evaluating the performance of the distribution transformer.

In this work, thus slave transformer shares the load of master transformer in case of overload and over temperature condition. A sensor circuit containing microcontroller, current transformer etc is designed to log the data from master transformer and if it is found to be in overload condition, immediately the slave transformer will be connected in the parallel to the main transformer and the load is shared. In this project, three modules are used to control the load current. The first module is a sensing unit, which is used to sense the current of load. The second module is control unit in which relay plays an important role, and its function to change the position with respect to control signal and the last module is a microcontroller. It will read digital signals and performs some calculations and finally gives control signal to the relay.

The controller monitors the amount of current of different loads, the number of units is given to microcontroller through ADC to calculate whether there are limited number of load bearable by a single transformer if not the controller makes the relay to switch on the second transformer to tolerate, ie, to give the sufficient amount of current for driving the load. AT89S52 is the heart of the project, here we are using the LCD to display the status of the transformer and GSM model is also used to inform the control station about switching.

II. LITRATURE SURVEY

1. Akhil Krishnan V, Arun P S, D Yagisthan, Jomice Thomas, D K Narayanan, "Automatic Load Sharing of Transformer using Microcontroller":

The aim of the project is to protect the transformer under overload condition by load sharing and the circuitry contains atmega328 microcontroller as a main component of whole project also they used the GSM technology.

2. Ashish R. Ambalkar, Nitesh M.Bhoyar, Vivek V.Badarkhe, Vivek B.Bathe, "Automatic Load Sharing of Transformer"

The concept of load sharing of transformer or overload protection of transformer is done by using relays and comparator IC's for automatic load sharing between three transformers. The number of transformers to be operated in parallel can also be increased according to demand of a particular area. While operating the number of transformers in parallel they follow some conditions like same voltage ratio, same X/R ratio, same KVA ratings, same polarity etc.

3. Abhishek Gupta, Mohit Kothari, Prabharkar kalani, Prakhar Goyal, Prateek Kambar, Shurveer Singh "Automatic Transformer Distribution and Load Sharing Using Microcontroller"

When the main transformer of the system is overloaded and overheated resulting in interruption of the power supply. The best solution to avoid the overloading is to operate the number of transformer in parallel. Therefore the slave transformer is connected to main transformer to share the load by using the AT89c51 microcontroller as the main component of the system also GSM technology is used to inform the control station.

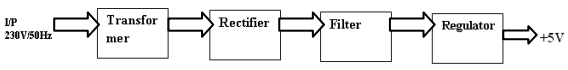
III. METHODOLOGY

In this project, the high load on the master transformer will shared by the slave transformer through various sections.

1) Power supply
2) Microcontroller
3) ADC
4) Relay
5) GSM modem
6) LCD Display

A. Power supply

As our project consist of microcontroller and it work on DC supply so for that we have to design the power supply circuit. Here we use 7805 regulated power supply. The block diagram of regulated power supply is given below and it consist of following



B. Microcontroller

The microcontroller incorporates all the features that are found in microprocessor. The microcontroller has fabricated in ROM, RAM, Input Output ports, Serial port, timers, interrupts and clock circuit.

8052 is an 8-bit processor, meaning that the CPU can work on only 8 bits of data at a time. Data larger than 8 bits has to be broken into 8-bit pieces to be processed by the CPU. The present project is implemented on Keil uVision. In order to program the device, proload tool has been used to burn the program onto the microcontroller.

FEATURES

• Compatible with MCS-51® Products

• 8K Bytes of In-System Programmable (ISP) Flash Memory

– Endurance: 1000 Write/Erase Cycles

• 4.0V to 5.5V Operating Range

• Fully Static Operation: 0 Hz to 33 MHz

• 256 x 8-bit Internal RAM

• 32 Programmable I/O Lines

• Three 16-bit Timer/Counters

• Eight Interrupt Sources

C. ADC

Analog-to-digital converters are among the most widely used devices for data acquisition. Digital systems use binary values, but in the physical world everything is continuous i.e., analog values. Temperature, pressure (wind or liquid), humidity and velocity are the physical analog quantities.

These physical quantities are to be converted into digital values for further processing. One such device to convert these physical quantities into electrical signals is sensor. Sensors for temperature, pressure, humidity, light and many other natural quantities produce an output that is voltage or current.

Thus, an analog-to-digital converter is needed to convert these electrical signals into digital values so that the microcontroller can read and process them.

D. Relay

Relays are the components which allow a low power circuit to switch a relatively high current on and off. The current become zero it does capacity shedding of that particular zone.

To make a relay operate, you have to pass the suitable pull-in and holding current through itys energizing loop. In each case the coil has a resistence which will draw the pull-in and holding currents when it is allied to that supply voltage. So basic idea is to choose a relay with a coil designed to operate from the supply voltage you are using for your control circuit capable of switching and then provide a relevant relay driver circuit so that low power circuitry can control thr current through the relays coil.

E. GSM Modem

Global System for Mobile (GSM) is a second generation cellular standard developed to cater voice services and data delivery using digital modulation.

A GSM modem is a specialized type of modem which accepts a sim card and operates over a subscription to a mobile operator, just like a mobile phone. Here the purpose of GSM modem is to send the monitoring parameters values and faults of transformer to authorized person's number in control room.

It is a class of wireless modem devices that is designed for communication of the computer with GSM and GPRS network. It requires a sim card to send the message.

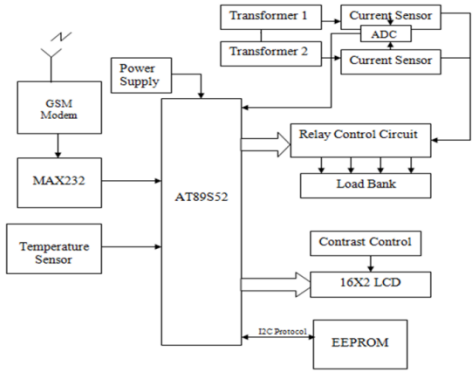
F. LCD

When microcontroller check instructions and forward to GSM modem and the GSM modem immediately send SMS to the mobiles and this will be displayed as load status on the LCD display.

LCD stands for Liquid Crystal Display. LCD is finding wide spread use replacing LEDs (seven segment LEDs or other multi segment LEDs) because of the following reasons:

1. The declining prices of LCDs.
2. The ability to display numbers, characters and graphics. This is in contrast to LEDs, which are limited to numbers and a few characters.
3. Incorporation of a refreshing controller into the LCD, thereby relieving the CPU of the task of refreshing the LCD. In contrast, the LED must be refreshed by the CPU to keep displaying the data.
4. Ease of programming for characters and graphics.

BLOCK DIAGRAM:



IV. WORKING DESCRIPTION

The project works on the principle of Parallel operation of transformer and has an arrangement of relays, loads, transformers, GSM modem, Microcontroller. In normal operation the master transformer share the load but as the load is beyond the rated capacity of main transformer, the slave transformer connected in parallel automatically and shares the load

In this project "AUTOMATIC LOAD SHARING OF TRANSFORMERS" we are using two transformers, one is the master transformer (TF1) and the next is slave transformer (TF2). Here the load is directly connected to the secondary of main transformer as well as slave transformer; here two transformers are connected through the relay. The transfers switch senses when utility power is interrupted, and starts up the transformer (TF2) which acts as a slave transformer. If the utility power remains absent, the transfer switch disconnected the load from utility and connects to the transformer (TF2), restoring electricity to the load. The transfer switch continues to monitor utility power, and when electricity is restored, switches the load from the transformer (TF2) back to the master transformer (TF1). Once the (TF2) is disconnected, it goes through a cool down routing and it is automatically shut down.

V. CIRCUIT DIAGRAM

VI. ADVANTAGES

1. The load is shared by the transformers is automatically.
2. This project can be operated anywhere in the world and also small as well as large applications.
3. It prevents the main transformer from damage due to problem like overload and overheats.
4. Power consumptions is low and real time monitoring also efficiently works.
5. Un-interrupted power supply to rhe consumers is supplied.
6. Mobile number can be changed at any time.

VII.APPLICATIONS

1. Industrial areas
2. Used in substations
3. Shopping malls
4. This system can be implemented in industries.
5. Power grids

VIII. CONCLUSION

Transformer are one among the most generic and expensive piece of equipment of the transmission and distribution system. It is known as the heart of the power system. Due to its high cost, the protection and maintenance of the transformer is crucial. With increase in load demand day by day and with existing transformers the load demand is to be satisfied and it may lead to increase in load of each transformer. One of the best solutions of overcoming this is by connecting transformer in parallel. In this project of Automatic Load Sharing of Transformers by using Microcontroller, a technology is implemented to share the load on the transformers. This provides un-interrupted power supply and avoids blackouts in the particular areas where there is a varying loads. With the advancement of communication technology, now it is available to receive overload condition of transformer through GSM to the control room. During overload condition exceeding specified limits information is immediately communicated through GSM technology to the concerned authority for possible remedial actions. Hence the transformer is protected from the overload condition and uninterrupted power supply is available to the consumers.

IX. FUTURE SCOPE

Project is mainly used to operate the devices like fans, lights, motors,etc. a GSM based mobile phone. The system has a microcontroller, LCD display, GSM modem, temperature, voltage sensors and the devices to be operated through the relay which are connected to the microcontroller and trip the circuit. The microcontroller is programmed in such a way that if particular fixed format of SMS is sent to GSM modem from mobile phone, which is fed as input to the microcontroller which operates the particular devices. A retuen feedback message will be sent to the mobile phone from the GSM modem. The temperature at the place where devices are being operated can be known. In future this project use in several applications by adding additional components to this project like in solar system, wind system etc. this project can be extended by using GPRS technology, which helps in sending the monitored and controlled data to any place in the world. The temperature controlling systems loke coolant can also use in places where temperature level should be maintained. By connecting wireless camera in industries, etc. it can be see the entire equipment from personal computer only by using GPRS and GPS technology.

X. REFERENCES

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