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Automatic Load Sharing of Transformer

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Abstract - *Power transformers are used in high voltage transmission network to step-up and step-down the voltage. These transformers are generally used for the purpose of transmission of heavy load. So we require transformer voltage at various point in power system. A transformer is a machine used for transforming power without changing the frequency from one circuit to another circuit of the transformer. Transformer is the heart of the power system, it convert the voltage levels. This Paper presents the innovative solution of the load management at distribution side or consumer side. An automated load sharing technique is proposed to share the load of one consumer side transformer to another slave transformer at the time of peak load or at the time of faulty condition. The proposed system work on microcontroller to share load.*

Key Words: LCD Display, Load, Microcontroller, Slave, Transformer.

1. INTRODUCTION

The electricity demand of residential area in China has been increasing rapidly for last twenty years because of some reasons and will resume in the upcoming time and traditional methods in order to cope with capacity availability during peak time can lead to more investment on the power system. Furthermore, the rise in electricity usage by the end users reduces the accuracy, stability and protection of the electricity distribution. Cutting down the peak demand can step down the danger of transmission and distribution network failures. "Changes in electric usage by end-use customers from their normal consumption patterns in response to changes in the price of electricity over time, or to incentive payments designed to induce lower electricity use at times of high wholesale market prices or when system reliability is jeopardized". Load management, which is also termed as demand side management (DSM) is the methodology in which supply of electricity is balanced with electric load by the use of control on the load rather than the output of the power station. To achieve the load management adopt any one of the procedures. Using tariffs other than the normal tariffs to dishearten the excessive usage of electric power load management is beneficial for electric suppliers in sense that it allows them to reduce demand of peak load by virtue of which demand of peaking demand power plants is reduced that causes the overall cost to reduce. Power plants used to generate power at peak hours may take hours to become on line with load. With the help of load management, we can reduce harmful materials to exit into the open atmosphere. This is because of power plants used for peak load demand are usually older by virtue of which their efficiency decreases, and they become dirtier too. So, load management provides a safer and cleaner environment. Technical advancements are constantly arising from both the private industries and the public entities. To design a load management system the main problem, occur is how we make a system so intelligent that it will divide the load to the other system, to decrease the power loss as well as increase the efficiency of the system and decrease the burden on the customers.

2. RELATED WORK

There are different terms used in power system like load shedding, load sharing etc... So first we have to differentiate between load shedding and load sharing.(I) Load shedding – It is process of cut-off the loads on the approximated area according to the load priority to reduce the increase demand greater than the supply.(II) Load sharing - Load sharing means generally equally share the load in power system. In power system load sharing of transformer is achieved with different techniques. It means in distributed power system if two transformer is connected. One transformer share the load in normal condition. If load demand is increasing and one transformer is connected not able to fulfill demand than another transformer is directly connected with main transformer in parallel and share the load. In power system it is called load sharing of transformer. Main transformer is called power transformer and another transformer that are connected with the main transformer are called slave transformer in power system. For supplying a load in more than the rating of an existing transformer, two or more transformers may be connected in parallel with the existing (main) transformer. The transformers are connected in parallel when load on one of the transformers is more than its capacity. Due to the parallel operation of transformer reliability of power system is increase and damage to the various equipment in substation like transformers are reduces. To archive parallel operation of transformers some conditions are to be satisfied compulsory. The two transformers are connected parallel. There are total two buses in the system one is supply bus and another one is load bus. At the load bus, load is connected. E1 is primary side voltage and E2 is secondary side voltage. If a condition occurs and load is suddenly increased, then second transformer is in parallel with the main transformer to supply the load demand.

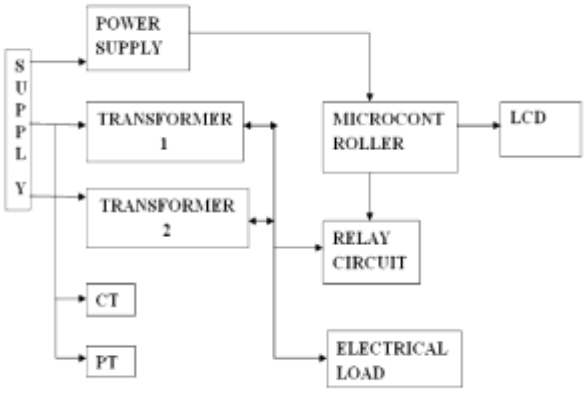

Fig. 1. Block Diagram of the Proposed System

3. METHODOLOGY

3.1 TRANSFORMER

A transformer is an electrical device that transfers electrical energy between two or more circuits through electromagnetic induction. Transformers convert AC voltage from one level to another level with a little loss of power. A transformer operates on the principals of "electromagnetic induction", in the form of mutual induction. The transformer used here is a one to one transformer so that it can be directly fed to the measuring devices by rectification Various conditions that must be fulfilled for the successful parallel operation of transformers:

I) Same voltage Ratio & Turns Ratio (both primary and secondary Voltage Rating is same).

II) Same Percentage Impedance and X/R ratio.

III) Same KVA ratings.

IV) Same Phase angle shift (vector group are same).

V) Same Frequency rating. Same Polarity.

VI) The convenient are: Same voltage Ratio & Turns Ratio, Same Percentage Impedance, Same KVA Rating.

3.2 LCD DISPLAY UNIT

The display used is 16x2 LCD (Liquid Crystal Display); which means 16 characters per line by 2 lines. The standard is referred as HD44780U, which refers to the controller chip which receives data from an external source (Here Atmega16) and communicates directly with the LCD. Here 8-bit mode of LCD is used, i.e., using 8-bit data bus. The three control lines are EN, RS, and RW. The EN line is called "Enable" When the other lines are ready completely, bring EN high (1) and should wait for the minimum time required by the LCD datasheet and end by bringing it low (0) again. The RS line is "Register Select" line. When RS is low (0), the data is treated as a command or special instruction (such as clear screen, position cursor, etc.). When the RS is high (1), the data sent is text data which is displayed on the screen. For example, to display the letter "B" on the screen you would set RS high. The RW line is "Read/Write" control line. When RW is low (0), the information on the data bus is written to the LCD. When RW is high (1), the program is, DB2, DB3, DB4, DB5, DB6, and DB7.19.

3.3 POWER SUPPLY

The power supply is an electrical device that supplies electrical power to an electrical load. The primary function of a supply is to convert electrical current from a source to the correct voltage, current and frequency to the power load. It's converts mains AC to lowvoltage regulated DC power and wireless energy transfer to power their loads with wired connection.

3.4 SMOOTHING CAPACITOR

Smoothing is performed by a large value electrolytic capacitor connected across the DC supply to act as reservoir, supplying current to the output when the varying DC voltage from the rectifier is decreasing .The unsmoothed varying DC and the smoothed DC.

3.5 VOLTAGE REGULATOR

Voltage regulators produce fixed DC output voltage from variable DC (a small amount of AC on it). Fixed output is obtained by connecting the voltage regulator at the output of the filtered DC. It can also be used in circuits to get low DC voltage from high DC voltage (for example we use 7805 to get 5V from 12V). Two types of voltage regulators are:

I. Fixed voltage regulators (78xx, 79xx)

II. Variable voltage regulators (LM317).

3.6 ADVANTAGES

I. The load is shared by transformer is automatically.

II. No manual error are taking place.

III. It privent the main transformer from damage due to the problem like overload and overheas.

IV. Un-interrupted power supply to the consumers is supplied.

V. Better outcome.

VI. Power can transfer to long distance with less cost.

VII. It is increasing the efficiency of the system, makes the system more flexible and reliable. But it increasing the short circuit of the transformer.

3.7 DISADVANTAGES

I. It's not safe if you are not careful with it.

II. Transformer cannot store power.

4. CONCLUSION

In our implemented hardware, we successively protect our power transformer during peak load and share the burden to the other slave transformer and monitoring the conditions and load over transformer in a control room. Overloaded transformer once shifts its load will not be able to take load back if it is unloaded. This is the flaw of the research, but this is open for further research. Through the numerical results, we conclude that the proposed load sharing method could effectively detect anomaly states. Finally, these results reveal the vulnerability of the load sharing systems and emphasize the necessity of load management and monitoring this management via modern communication device. Meanwhile, it is dispensable to study the characteristics of load management and development of modern methods.

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