Load Sharing of Transformers Automatically by using Arduino with GSM

Krushna K. Tormad
Student of Electrical Engineering
Guru Gobind Singh Polytechnic
Nashik, Maharashtra, India

Dhiraj A. Nikalje
Student of Electrical Engineering
Guru Gobind Singh Polytechnic
Nashik, Maharashtra, India

Ishwar H. Patil
Student of Electrical Engineering
Guru Gobind Singh Polytechnic
Nashik, Maharashtra, India

Dhanashree A. Gayakhe
Dept. of Electrical Engineering
Guru Gobind Singh Polytechnic
Nashik, Maharashtra, India

Abstract— **Transformer is a primarily stable device which transmits the electric power from one circuit to different circuit with the change in voltage as well as current at stable frequency. It is single device which is work at highest efficiency at full load condition. However, when exceptional condition happen like overloading condition which can result in serious problem in the future. To get away from this condition we are make use of another standby transformer. This supplies the load when overloading is happen on main transformers, which switch on automatically by use of Arduino. This will result in better efficient loading of both transformers. As well as when load is in normal state both transformers can be switched on to supply the load alternately or one by one. This will keep away from thermal overloading of transformer. As well as this system will provide a proper maintenance facility for both transformers. Whenever the sharing of load on transformer happen, then the operator gets a message through the use of GSM. All of these advantages will make this system very efficient and more reliable. In this way transformer will work efficiently and distribute an uninterrupted power supply.**

Keywords— *Arduino, GSM, Transformer, Sensor, Relay*

I. INTRODUCTION

Transformer plays very important role in electrical power system it transmits voltage and current at constant frequency. Transformer is a single device which is work at highest efficiency at full load condition. In parallel operation of transformers, a standby transformer is connected in parallel to the supply the load in excess of the rating of a main transformer. However, when exceptional conditions happen like overloading condition transformer efficiency get reduced. Transformer is a very important component in the electrical power system. When load is increases beyond the capacity of the transformer and thus the overloading occurs and it cause damage to the insulation of transformer windings. To avoid this condition, we use standby transformer which supplies the load when overloading is happen on main transformer which switch on automatically by Arduino. Sometimes the transformer is loaded beyond its nameplate rating when the faults occur in power system this type of overloading cause damage to the transformer. Whenever the sharing of load on transformer happen, then the operator gets a message through the use of GSM. Due to this transformer efficiency and reliability is increased and provide uninterrupted power supply. Likewise, the problem of supply interruption and overloading and overheating can be avoided by this load sharing method. Load sharing It means main

transformer share the load in normal condition and if load demand is increasing and if main transformer is not able to fulfill the demand, then another standby transformer is connected parallel with the main transformer to share the load and provide uninterrupted power supply.

Sometimes in industrial or commercial place also transformer are paralleled to:

- To improve reliability of power system.
- Supply better power quality.
- To meet additional load requirement.
- Prevent voltage sag.
- To improve efficiency of power system.

Due load sharing transformer is protected from overloading and overheating it is also protect the transformer winding and it provide power supply without any interruption.

II. BLOCK DIAGRAM
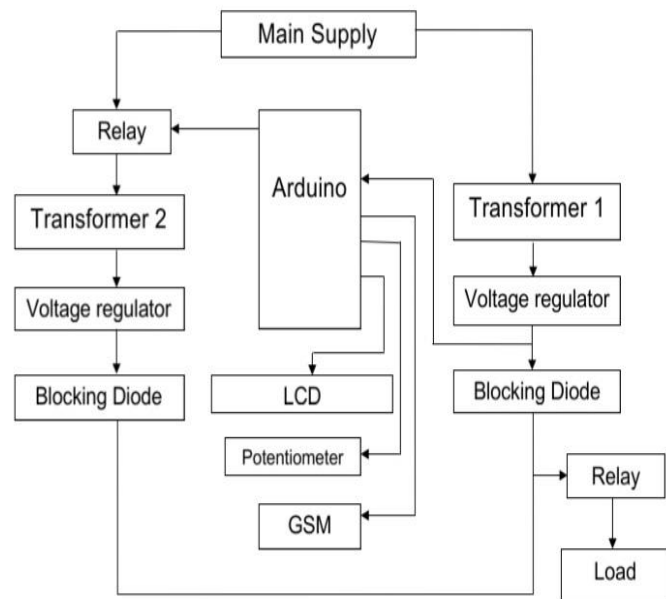
III. METHODOLOGY

Transformer is very important device in electrical power system so it is necessary to protect the transformer from overloading and overheating due the overloading and overheating the transformer efficiency decreases and winding may damage or may burnt or it also reduce the lifespan of transformer winding due to this interruption in power supply occurs. It is very huge problem in power system. So to protect the transformer and avoid this condition we connect transformers in parallel to share the load by using Arduino. Basically Arduino is the open source electronic platform based on easy to use software and hardware. It is able to read inputs. We can tell the Arduino board what to do by sending a set of instructions to the microcontroller on the board. To do so we use the Arduino programming language (based on wiring), and the Arduino software (IDE), based on processing. Arduino is very simple to. In the automatic load sharing system two transformers are uses. Only one transformer is operating to feed the load & another transformer connected parallel is called Auxiliary Transformer. This auxiliary Transformer is connected through Relay and Circuit Breaker. The current Transformer measures the load current continuously and feed it to the Arduino. As the load demand increases (maximum load level is entered by the user) the single transformer would not able to feed the entire load. When the load current increases beyond the reference value the Arduino will give a signal to the relay to energize the relay coil. & Auxiliary Transformer will connect in parallel. Both Transformers share load equally & without Interruption. Whenever the sharing of load on transformer happen, then the operator gets a message through the use of GSM. Basically GSM (Global system for mobile communication) is a type of hardware device. It is design for wireless radiation monitoring through SMS. It is use for send and receives SMS. If the load increases beyond the capacity of two Transformers, then the Both Transformer will be shut down. When the load comes to the normal value, main transformer will be shut down because of main transformer was connected in the system, this avoid thermal loading and power supply is providing by standby transformer to avoid interruption of supply. By providing alternating switching to the Transformer can be cooled by natural method. If the transformers are connected in parallel we can shut down any one of them for maintenance purpose. Due to this efficiency of system will increase and it provide uninterrupted power supply.

Conditions for parallel operation of transformer are:

- Transformer have same voltage ratio and turn ratio
- Same percentage impedance and X/R ratio
- Same polarity
- Same KVA rating
- Same phase sequence
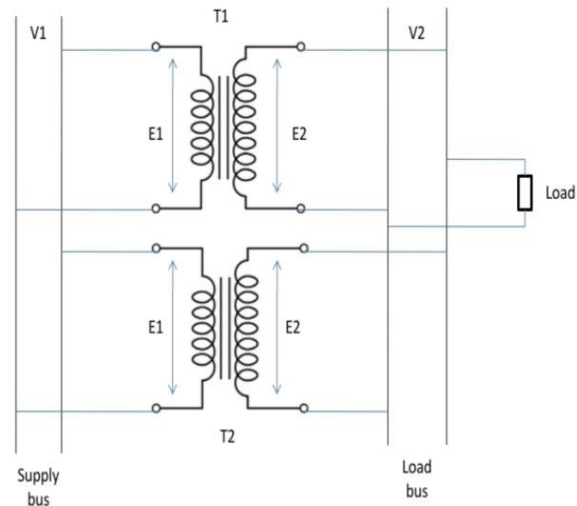
Parallel operation of transformer

- **Same voltage ratio and turn ratio :**
  Transformer have same voltage ratio or turn ratio because if the transformer have different voltage or turn ratio the induced secondary voltage of them will be different so it will cause damage to the winding or power loss in transformer.

- **Same percentage impedance and X/R ratio :**
  Transformers may have same per unit impedance and different X/R ratio. Same percentage impedance implies load sharing in proportion to their KVA rating. If X/R ratios are different total line current will not appear to be the sum of transformer currents which implies reduced combined capacity.

- **Same polarity :**
  Transformers have always same polarity otherwise, enormous flow of current will flow in transformer but no load will be fed from these transformers. The direction of induced emf in the secondary of transformer is indicated by polarity.

- **Same KVA rating :**
  In the parallel operation of transformer the load sharing is depend on KVA rating. If the KVA rating is different the load is share by transformer is unequal. If transformer have same KVA rating then the transformer share the equal load.

- **Same phase sequence :**
  Same phase sequence is required in transformer because if the phase sequence is not same it cause short circuit of each pair of phase in every cycle.

IV. COMPONENT DETAILS

Table 1: Electrical components specification of working

Sr.no	Components	Specification
1.	Transformer	230V-12V
2.	Capacitor	Electrolyte 25vdc
3.	Voltage regulator	7805, 7812
4.	Resistor	1K, 10K
5.	Diode	IN4007
6.	Relay	SPDT 12v dc
7.	LCD	16×2
8.	Arduino	-
9.	GSM	-

V. ADVANTAGES

The advantages of load sharing of transformer using Arduino are mentioned below.

1) Provides power supply to the consumer without any interruption.
2) The load is shared by transformers automatically.
3) It protects the transformer from overloading and overheating.
4) No manual errors are taking place in this system.

VI. CONCLUSION

In this consequently manner we conclude that the automatic load sharing system provides uninterrupted power supply and this system protect the transformer from overloading and overheating and due to this system efficiency and reliability is also increases and also lessen human involvement. This system is also provide alternating switching to the transformer and because of this it can be cooled by natural method. Due to this power supply is provided without any interruption.

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