

Automatic Load Sharing & Distribution of Transformer based on Micro Controller

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Abstract— The transformer is a static device, which converts power from one level to another level. The aim of the project is to protect the transformer under overload conditions by load sharing. Due to overload on the transformer, the efficiency drops. The micro controller compares the load on the first transformer with a reference value. When the load exceeds the reference value, the second transformer will share the extra load. Therefore, the two transformers work efficiently and the damage is prevented.

Keywords: Transformer Overload, Microcontroller, Sensing Unit, WIFI Module

I. INTRODUCTION

In the normal working of a transformer, the efficiency depends on the loading condition of the transformer. Thus, when it operates at the full load it provides higher efficiency and at above the full load, the overall life of the transformer tends to decrease. Also, rather than using a single large transformer it is better to use 2 transformers in parallel such that higher efficiency could be achieved. So, we introduced our model to provide better sharing of load via using a micro controller. In this project when the load current exceeds and 2nd transformer comes in action and shares the load thus for initial low load condition only 1 transformer will be in action and on the 2nd case for higher load both transformers will work in parallel and feed the load. Thus, overall system efficiency will increase.

Here there is also a plus point that when we are using micro controller some additional features can be achieved with the help of IOT that is monitoring and protection. We can monitor the real-time condition like the temperature of the tank\oil.

II. LITERATURE REVIEW

This project describes about how the transformers will be connected in parallel when load exceeds on one transformer another will be get connected with the help of microcontroller and relays. Also our project would sense the parameters like current, voltage, and temperature.

Here we are using six single pole single through relays for the transformer 1 switching and protection. In normal cases when the load exceeds on one transformer it results in overloading which causes heating results in relay to trip and thus interruption of power supply as well as damages the transformer windings which are costly to repair.

On monitoring the current and voltage the current loading condition and voltage is checked thus protection for over or under voltage and current can be protected.

In our project we are also using WIFI module to keep a check on transformer by the user who is at far end

and could thus monitor the system. For sensing the current, voltage and temperature sensors are present.

III. CONDITIONS FOR PARALLEL OPERATION OF

For the parallel operation of the transformer, primary winding of the transformers are connected to source bus-bars and secondary winding are connected to the load bus-bars. Various conditions that must be fulfilled for the successful parallel operation of transformers are

- Same voltage ratio and turns ratio (both primary and secondary voltage rating is the same)
- Same percentage impedance and X/R ratio.
- Identical position of the tap changer
- Same KVA ratings
- Same phase angle shift (vector group are the same)
- Same frequency rating
- Same polarity
- Same phase sequence.

The convenient conditions of the above points are the same voltage ratio and turn ratio, same percentage impedance, same KVA rating, and the same position of tap changer. Also, the mandatory conditions are the same phase angle shift, same polarity, same phase sequence, and the same frequency. If the convenient conditions are not satisfied, then the paralleled operation is possible but not optimal parallel operation is possible but not optimal.

IV. METHODOLOGY

In current scenario the extra load is fed through a large transformer or is fed by small transformer at overload but in that case the overall system efficiency is low for the lesser load so the energy is wasted and the overall energy cost rise, to overcome this situation we introduce load sharing using 2 transformers. When there is low load only 1 transformer will be in action as the current will be sensed by current transformer and through op amp and fed to microcontroller. And when the load current exceeds the predetermined value, controller will give signal to relay through the driver circuit to bring the 2nd transformer in parallel. Thus in this we improvised this using a micro controller. A trim pot is also provided along with CT's to alter the input to op-amp.

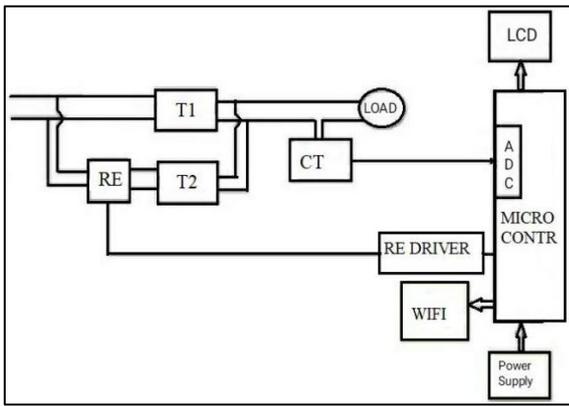


Fig. 1: Block Diagram

As there is a use of micro controller we can monitor some or all of the parameters for the protection of transformers like temperature, voltage, current, etc. These observed parameters along with the real time load sharing situation is then uploaded by using WIFI module and can be monitored from far distances. The current transformer will read out the current flowing through the main system and will provide the values to the controller, this controller when the current values exceed the present values for max load on 1 transformer will give signal using transistor to the operating relays, these relays will bring the 2nd transformer in parallel so the load will be shared.

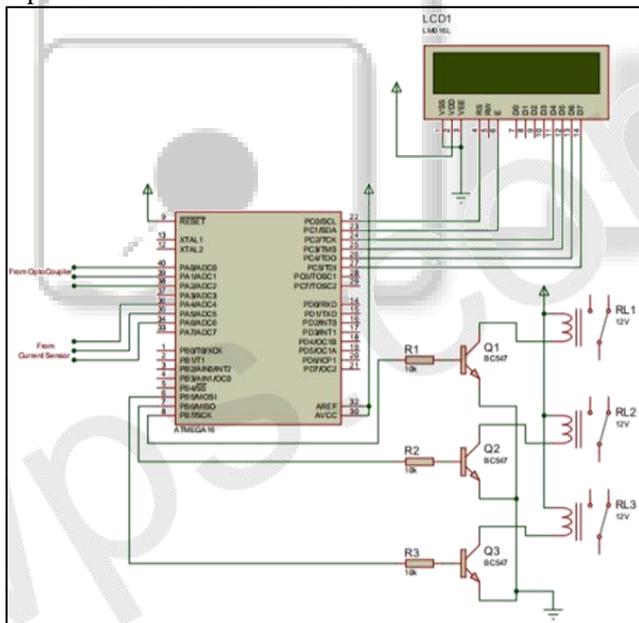


Fig. 2: Basic Connection

V. CONCLUSION

Transformer is the most expensive part in the power system. The continuous overloaded operation decrease efficiency as well as life expectancy of transformer. Also, provide the reliable power to the consumer by using the load sharing of the transformer with another transformer, it increases the efficiency of the system. This system is operate automatically which reduce the manual work for sharing the load.

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