Automatic Load Sharing of Transformer With Cut Off System

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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 condition by load sharing. Due to overload on transformer, the efficiency drops and windings get overheated and may get burnt. Thus by sharing load on transformer, the transformer is protected. This will be done by connecting another transformer in parallel through a micro-controller. 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 transformer work efficiently and damage is prevented. In this project three modules are used to control the load currents.*

The first module is a sensing unit, which is used to sense the current of the load and the second module is a control unit. The last module is micro-controller unit and it will read the analogue signal and perform some calculation and finally gives control signal to a relay. A GSM modem is also used to inform the control station about switching. The advantages of the project are transformer protection, uninterrupted power supply, and short circuit protection. When designing low-voltage power system to the supply large load currents, paralleled lower-current modules are often preferred over a single, large power converter for several reasons. These include the efficiency of designing and manufacturing standard modular converters which can be combined in any number necessary to meet a given load requirement and the enhanced reliability gained through redundancy.

Keywords- Transformer, Arduino Uno, Current Sensor, Relay.

I. INTRODUCTION

Transformer is the backbone of the electric power transmission and distribution system. The problem of overburden of load, varying voltage and overheating effects is normal problem. It takes a plenty of time to repair it and it is also very costly. Our aim is to save the transformer in overload/peak hours. Due to overload, efficiency gets reduced and secondary winding often gets burnt due to overheating of coils. So, by sharing the load, and reducing the extra burden from main transformer, it is protected. This is hereby done by doing parallel operation of transformers. The aim of this project is to develop an automatic transformer distribution and load sharing system. It will also have sensor to sense the temperature of transformer and share the load. Parallel operation is used to reduce the extra load; the transformer is protected.

II. PROPOSED SYSTEM

Our project, "Automatic load sharing of transformer" is divided in three parts i.e., Monitoring, Controlling and Displaying.

2.1 Monitoring

For monitoring system, we have used Arduino and current sensor through which monitoring of the load that the transformer is handling is done. The Arduino will calculate the load using current calculated by current sensor and display it on LCD display.

2.2 Controlling

In controlling system Arduino control the status (i.e., ON/OFF) of the transformer by relays. If load on the main transformer increases by its rated capacity, then Arduino senses it by current sensor and connects the second transformer to it in parallel. Further if the load increases by the rated capacity of both the transformer the Arduino sends the signal to the relays and switch OFF's both the transformer till the load is not balanced.

2.3 Displaying

This system is also capable of showing the status of the transformers and the load which is present on them. The LCD display shows the status of the transformer i.e., ON/OFF and also shows the load on them which is calculated by using Arduino and current sensor.

III. BLOCK DIAGRAM

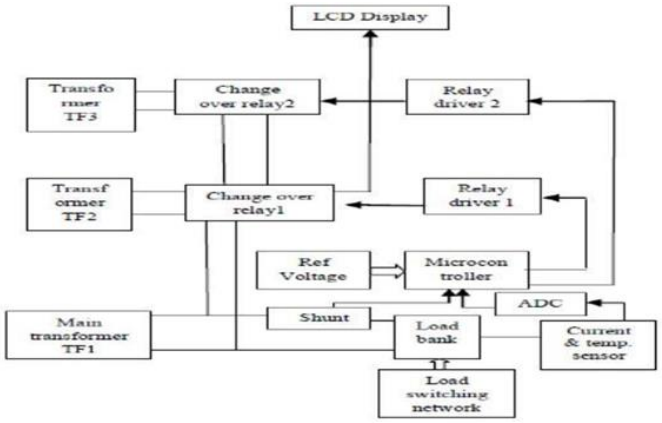


Figure 1.0

1. In circuit only one transformer is operating to feed the loads. A circuit breaker and a relay link a standby transformer in parallel. The load current is continuously measured by the current sensor and fed to the Arduino.
2. The user enters the reference value or maximum load limit, and the priority level of the load is also determined by the user or responsible authority. A single transformer would not be able to feed all of the load during peak hours when demand increases.
3. An Arduino provides a control signal to the relay coil, causing it to be energised, when the load demand exceeds the reference value. As a result, the backup transformer will be linked in series.

IV. PROJECT IMPLEMENTATION

4.1 Hardware Implementation

Arduino Uno is an 8-bit ATmega328P microcontroller-based microcontroller board. It includes extra components to assist the ATmega328P microcontroller, such as a crystal oscillator, serial communication, voltage regulator, and so on. There are 14 digital input/output pins, 6 analogue input pins, a USB connection and Power barrel connector, an ICSP header, and a reset button on the Arduino Uno. Arduino is capable of communicating with a computer, another Arduino board, or other microcontrollers. The ATmega328P microcontroller supports UART TTL (5V) serial communication, which is accessed by digital pins 0 (Rx) and 1 (Tx) (Tx). An ATmega16U2 on the board transmits serial data over USB, appearing to apps on the computer as a virtual com port. The ATmega16U2 firmware uses normal USB COM drivers and does not require an extra driver. A.inf file is necessary on Windows, however. You may transmit and receive simple textual data to and from the Arduino device using the serial monitor included in the Arduino software. When data is transferred through USB to seria chip and USB connection to the PC, two RX and TX LED on the Arduino board will flash (not for serial communication on pins 0 and 1). To communicate serially on any of the Uno digital pins, you'll need a Software Serial library. I2C (TWI) and SPI communication are also available on the ATmega328p. The Arduino software comes with a Wire library that makes using the I2C bus a breeze.

4.2 Software Requirement

It underpins both C and C++ programming dialects. Arduino supplies the product library, which gives some normal information and yield system. This is an open-source board which permits simple coding and transfer. Software Implementation Coding or Programming, Program utilized in the project, developed in C language with the Arduino linguistic structure in the Arduino IDE. The programming is likewise utilized for stacking the program code in to Arduino board. In this task, the Arduino IDE was utilized to program, create, debug, and transfer the coding into the microcontroller.

V. FLOW CHART

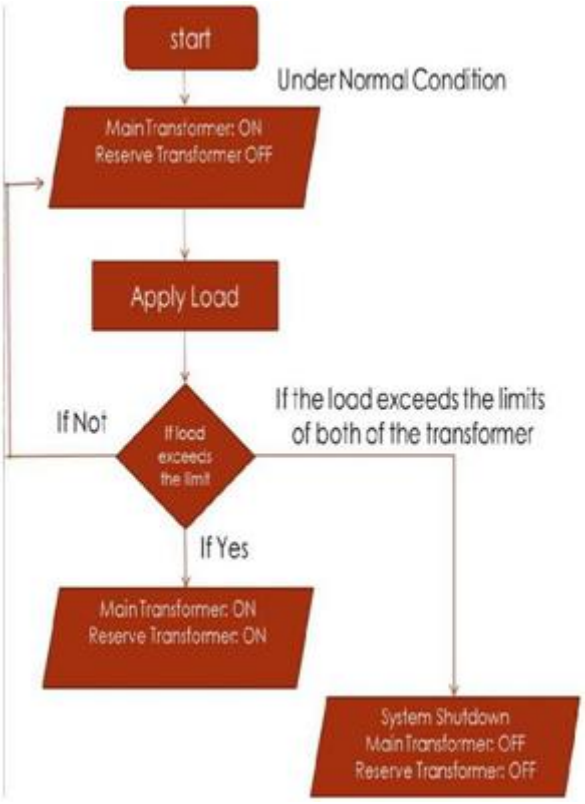


Figure 2.0

1. Transformer load sharing is automated using Arduino. The use of two identical transformers connected in parallel using a changeover relay.

2. Transformer 1 is the primary transformer, also known as the master transformer, while Transformer 2 is the auxiliary transformer, also known as the slave transformer.
3. A circuit breaker and a relay are connected in parallel by a standby transformer. The load current is continually measured by the current sensor and fed to the comparator. The primary transformer is switched on and the reserve transformer is switched off in normal operation.
4. There are different conditions would apply while connecting the load which are discussed below.Under Normal

Condition

In the proposed system only one transformer is operating to feed the loads. A standby transformer is connected in parallel a circuit breaker and relay. The current sensor continuously measures the load current and feeds it to the comparator. Under normal condition the main transformer is in ON condition and the reserve transformer is in OFF condition. The user enters the reference value or maximum load limit, and the priority level of the load is also determined by the user or the responsible authority. During the normal the single transformer can able to feed the entire load.

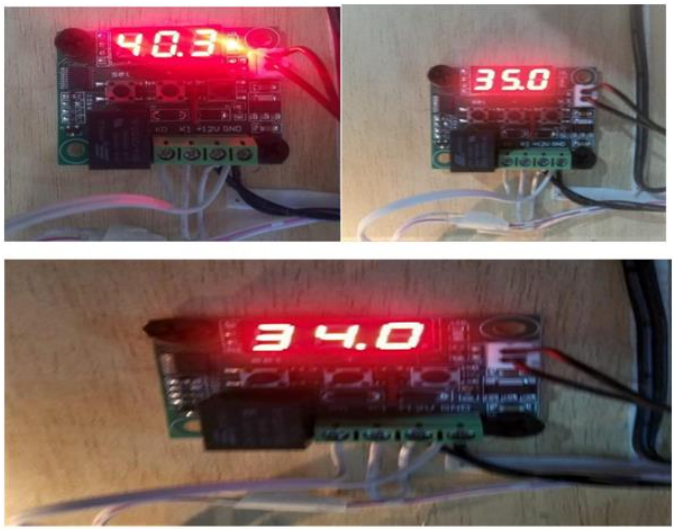
5.1 Under Abnormal Condition

As the load requirement increases, during peak, a single transformer will not be able to feed the entire load. When the load demand exceeds the reference value, the Arduino will send a control signal to the relay coil to energise it. Because the transformers have the same ratings, the standby transformer will be connected in parallel and will share the load equally. Thus, all the loads are feed efficiently providing uninterrupted power supply. If load limits exceed the main transformer is in ON condition and the reserve transformer is in ON condition.

5.2 Shutdown Condition

When the load increases further to a value which is greater that the capacity of the two transforms, priority-based load shading will be implemented. The loads which have the lowest priority will be shut down by opening the respective circuit breakers. If the load limit exceeds the both the transformer. The main transformer and the reserve transformer will be in OFF condition.

VI. RESULTS



VII. FUTURE SCOPE

1. The future scope of our project is mainly in substation.
2. There is a need for the operation of an extra transformer at substations, particularly during peak hours, to meet the additional load requirement.
3. Under severe loads, our project automatically connects the transformer. As a result, there is no need to run both transformers at full power, especially during off-peak hours. As a result, electricity is intelligently shared with the transformer in parallel.

VIII. CONCLUSION

In this paper we discussed our project on. We all know that transformer is the main equipment in power system. As a result, transformer safety is critical. The necessity of transformer load sharing is discussed in this work. The numerous strategies for load sharing with safety are discussed. There is also a criterion for load sharing that must be met. so that the electricity that can be delivered to the customer does not stop. Power system operation will be reliable.

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