Available at www.ijsred.com

RESEARCH ARTICLE OPEN ACCESS

AUTOMATIC LOAD SHARING OF TRANSFORMER USING ARDUINO

C .Baby salome chandra * , M.E ,Sanjeev S. **, Manisha G ***, Ajay R****, SanjayR*****, Prem Kumar M ******, Yuvaraj D.*******

(Department of Electrical & Electronics Engineering Email: babysalomechandra@gmail.com)
**(Department of Electrical & Electronics Engineering Email: sanjeevb1mpc@gamil.com)
***(Department of Electrical & Electronics Engineering Email: manishab1mpc@gmail.com)
****(Department of Electrical & Electronics Engineering Email: ajayb1mpc@gmail.com)
*****(Department of Electrical & Electronics Engineering Email: sanjayravi2006@gmail.com)
******(Department of Electrical & Electronics Engineering Email: kumarprem53067@gamil.com)
*******(Department of Electrical & Electronics Engineering Email: yuvab1m

----------**********----------

Abstract:

The aim of the project is automatic load sharing of transformer under overload condition and protect the transformer from damage and to provide uninterrupted power supply. Due to overloading the current flow exceeds and windings get overheated and may get burnt hence the efficiency drops. Thus to protect the transformer by sharing loads by connecting another same rating transformer in parallel through Arduino UNO. The Arduino UNO compares the load on the first transformer with a reference value. When the load is exceeding than the reference value the second transformer will share the extra load. Therefore, the two transformer work efficiently and prevented from damage. 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 the control unit. The last module is Arduino UNO unit and it will read the analog signal from the sensor module and perform some calculation and finally gives control signal to a relay. The advantages of the project is protection of transformer, uninterrupted power supply,

Keywords — **Transformer, overloading, Arduino UNO**

----------**********----------

I. INTRODUCTION

The increasing demand for electricity has led to a significant strain on power

distribution systems. Transformers, as a critical component of these systems, are often subjected to overloading, which reduces their lifespan and efficiency. An Automatic Load Sharing System provides a solution by dynamically distributing the load between transformers or circuits, ensuring optimal performance and avoiding overloading condition. This project focuses on designing and implementing an Automatic Load Sharing System using Arduino UNO, two current sensors, two relays, a step-down transformer, an I2C LCD, and 230V AC bulbs. The system aims to monitor the load current and switch between relays to balance the load effectively. This document elaborates on the components used, their functionality, circuit connections, and the working of the system. The Automatic Load Sharing System utilizes an Arduino UNO microcontroller as the central control unit, equipped with ZMCT103C current sensors to measure the load on each circuit. Relays are used to switch between circuits and balance the load, while a 16x2 I2C LCD display provides real-time monitoring of the current and system status. Additionally, the system incorporates a step-down transformer to ensure a safe operating voltage for the microcontroller and other components, while

bulbs simulate the electrical load for testing and demonstration purposes. Load sharing involves distributing the electrical load across multiple circuits or transformers to ensure optimal performance. Overloading can lead to overheating, reduced efficiency, and damage to electrical components. This project addresses these issues by monitoring the current and automatically switching relays to share the load between circuits. Load sharing involves distributing the electrical load across multiple circuits or transformers to ensure optimal performance. Overloading can lead to overheating, reduced efficiency, and damage to electrical components. This project addresses these issues by monitoring the current and automatically switching relays to share the load between circuits.

II. DESIGN AND CONSTRUCTION

Each current sensor is wired to measure the current flowing through the two transformers. The sensor's VCC and GND are connected to the Arduino's 5V and GND pins, respectively. The analog output (OUT) pin of each sensor is connected to the Arduino's analog input pins (A0 and A1). These sensors output an analog voltage that is proportional to the current flowing through the circuit, which the Arduino reads and converts to actual current values. The relays are connected to two of the digital output pins of the Arduino (typically Pin 2 and Pin 3). The relay's VCC and GND pins are connected to the Arduino's 5V and GND, respectively. The IN (control) pin of each relay is connected to the designated Arduino pins, allowing the Arduino to control the switching action. The NO (Normally Open) terminal of each relay is connected to the respective transformer, and the COM (Common) terminal is connected to the load. The next step in the implementation is writing the software that runs on the Arduino. The

software serves several key functions, including reading sensor values, comparing them against threshold limits, controlling the relays, and displaying information on the LCD.

III. WORKING PRINCIPLE

This returns a load sharing algorithm that determines when to switch between transformers to distribute the load evenly. The algorithm compares the load on each transformer to defined thresholds and switches the relays accordingly.

The system displays the load sharing information on an LCD display, including the current load on each transformer and the status of the relays. This automated system optimizes transformer usage, reduces the risk of overload and overheating, and minimizes human error. The automatic load.

sharing system using Arduino works by monitoring the load on each transformer and switching between them based on predetermined conditions. The system uses current transformers to measure the current flowing through each transformer and sends the data to the Arduino Uno. The Arduino Uno

IV. COMPONENTS

Here are the components used in automatic load ,sharing of transformers using Arduino,

Main Components

A.Arduino Uno

The Arduino Uno is a microcontroller board used for automating load sharing. It is a popular choice for DIY projects and industrial applications due to its ease of use, flexibility, and affordability. The Arduino Uno has 14 digital input/output pins, 6 analog inputs, a 16 MHz quartz crystal, and a USB connection. It can be powered by a USB cable or an external power supply.

are designed to provide a proportional output current that is a fraction of the primary current.

Current transformers are typically used in power systems to measure current, monitor load, and detect faults. In the automatic load sharing system, current transformers are used to monitor the load on each transformer and send the data to arduino

Fig 1 Ardunio

Fig 2 current transformer

C.Relays

Relays are used to switch between transformers based on load conditions. A relay is an electrically operated switch that can be controlled by a lowvoltage signal. In the automatic load sharing system, relays are used to switch between transformers to distribute the load evenly. The relays are controlled by the Arduino Uno, which sends a signal to the relay coil to switch the contacts.,shown in Fig 2

Fig 3 Relay

D.LCD Display

An LCD display is used to display load sharing information. The LCD display shows the current load on each transformer, the status of the relays, and any error messages. The LCD display is connected to the Arduino Uno and is updated in real-time. The LCD display provides a userfriendly interface for monitoring the load sharing system.

B.Current Transformers

Current transformers are used to measure the current flowing through each transformer. They

II. TITLE MUST BE IN 24 PT REGULAR FONT. AUTHOR NAME MUST BE IN 11 PT REGULAR FONT. AUTHOR AFFILIATION MUST BE IN 10 PT ITALIC. EMAIL ADDRESS MUST BE IN 9 PT COURIER REGULAR FONT.

E.Transformers

Transformers are the main components of the load sharing system. Two or more transformers are connected in parallel to distribute the load. The transformers are designed to operate at the same voltage and frequency. The load sharing system ensures that the load is distributed evenly between the transformers, preventing overload .

Fig 4 Step down transformer

V. DEVELOPMENT

The Automatic Load Sharing System has successfully demonstrated its ability to balance loads between two transformers, preventing overloads and optimizing power distribution. However, there are several areas where the system can be expanded and enhanced to make it more robust, scalable, and adaptable to modern energyy

demand the system could analyze data from sensors and components to predict when maintenance is needed, allowing for predictive maintenance instead of reactive repairs, thus minimizing system downtime.

Smart Grid Integration: By connecting the system to a smart grid, the Automatic Load Sharing System could receive real-time data from grid sensors, allowing for more efficient load distribution based on overall grid demand. This integration would enable dynamic optimization of electricity flow, balancing both local and grid-wide power distribution

Energy Storage Systems:The system could be enhanced with energy storage solutions, such as batteries, to store excess renewable energy when available and release it when demand peaks or renewable energy production is low. The system could analyze data from sensors and components to predict when maintenance is needed, allowing for predictive maintenance instead of reactive repairs, thus minimizing system downtime.

VI.CONCLUSIONS

The Automatic Load Sharing System represents a significant advancement in ensuring efficient and reliable power distribution across transformers. By preventing overloads and optimizing energy usage, the system offers several key advantages, including increased transformer lifespan, energy efficiency, and operational stability. It provides real-time monitoring, dynamic load distribution, and fault protection, making it a reliable solution for industrial, commercial, and residential applications. While the system has proven to be effective in its current form, there is vast potential for future enhancements. Expanding the system to handle multiple transformers, integrating it with smart grids, incorporating renewable energy sources, and enhancing it with advanced algorithms for predictive load sharing are just some of the many opportunities for improvement.

Ultimately, the system's ability to balance load, optimize transformer usage, and provide real-time feedback positions it as a robust solution for the future of power management, contributing to a more efficient and reliable energy infrastructure.

VII.REFERENCES

1. Automatic Substation Load Sharing and Sharing Using Programmable Switching Control, Journal of Selected Areas in Microelectronics, Volume 6, Issue 2, pp. 59-
61, 2014. S.R.Balan, P.Sivanesan, R.Ramprakash,

2. B.Ananthakannan, and K.MithinSubash," GSM Based Automatic Substation load Shedding and Sharing Using Programmable Switching Control,"

