

Three Phase Fault Analysis on Transformer

Mr. CH. Sanjeev Kumar ^{1*}
Assistant Professor, Dept. of EEE
St. Peter's Engineering College,
Hyderabad, India
sanjeev.chintala@gmail.com

Kolipaka Sruthi²
UG Scholar, Dept. of EEE
St. Peter's Engineering College,
Hyderabad, India
sruthikolipaka11@gmail.com

Nayan Tiwari³
UG Scholar, Dept. of EEE
St. Peter's Engineering College,
Hyderabad, India
nayantiwari76@gmail.com

Pathakunta Sai Prasad⁴
UG Scholar, Dept. of EEE
St. Peter's Engineering College,
Hyderabad, India
saiprasadpathakunta@gmail.com

ABSTRACT- This paper's goal is to develop a routine tripping mechanism. When a three-phase system has a momentary failure, our project's output resets the system; however, when a permanent fault occurs, it trips the system. Our device recognises these flaws and automatically separates the stock to prevent explosion or fire damage that might affect the control equipment in the sub-stations. The stumbling structure is created by combining three 1-stage transformers with information and output in star associations and three transformers with contribution of 220 volts and output of 12 volts in delta associations. Low voltage testing is demonstrated here. ARDUINO clocks are used for both temporary and long-span faults. Switches are utilised to initiate the tripping mechanism, resulting in the three different sorts of faults on the low voltage side. A transitory trip caused by a transient or short-duration fault recovers quickly, whereas a permanent trip is caused by a longer-duration defect. As a result, in the event of a transient defect, the project's output resets, and in the event of a persistent malfunction, it obtains a permanent trip state. This three-phase fault analysis system automatically distinguishes between a transient disturbance and a permanent fault and suitably interrupts the supply for either a little period of time or a lengthy period of time. **Keywords:** Voltage regulator (LM7805), Relays, 555 timer, Transformer (230 V± 12V AC)

I. INTRODUCTION

Any anomaly in the flow of electric current in a power system is referred to as a fault. An open circuit defect would result, for instance, if the circuit's failure caused the current to be interrupted. A short circuit defect occurs when the circuit's current bypasses the typical load. In a three phase system, the fault may exist just between the phases of the system, or it may exist between one or more phases and the earth. Some phases of three-phase or polyphase systems may be affected by a defect (causing asymmetrical faults). Asymmetrical fault occurs when all phases are equally impacted. Analysis of symmetrical faults is simpler than asymmetrical faults.

II. LITERATURE SURVEY

Vinesh Gamit, Vivek Karode, Karan Mistry, proposed [1] "Fault Analysis on Three Phase System by Auto Reclosing Mechanism", IJERA, eISSN: 2319-1163, Volume:04 Issue:05, May-2015, pp: 292-298 Different failures have been simulated in order to develop an automatic tripping mechanism for the three phase supply system while transient fault and permanent faults occur. In this case, relay and timer 555 have been used to analyse faults. A short-duration defect that quickly restores the supply to the load is regarded as a transitory trip, but a long-duration fault must result in a permanent trip.

Ayesha Khanum G.K, Rukhaya Banu, Nagaraja bodravar, Nandish B M proposed [2] "Three Phase Fault Analysis with Auto Reset for Temporary Fault and Trip for Permanent Fault". It functions as the three phase supply system's automatic trip mechanism. In the event of a transitory problem, the project output immediately resets after a brief interruption, however in the event of a permanent failure, it remains in

tripped condition. To prevent large-scale damage to the control gears in the grid sub-stations, a system that can detect these faults and automatically disconnect the power is designed. Three single phase transformers with star input and output wiring as well as three transformers connected in delta connections with input voltage of 220 volts and output voltage of 12 volts are used in the construction of this system. For handling both short- and long-duration fault circumstances, 555 timers are employed. To trigger the tripping mechanism, a set of switches is employed to cause the LL, LG, and 3L faults on the low voltage side. Short-duration faults, also known as transitory trips, instantly restore power to the load, whereas long-duration faults must result in permanent trips.

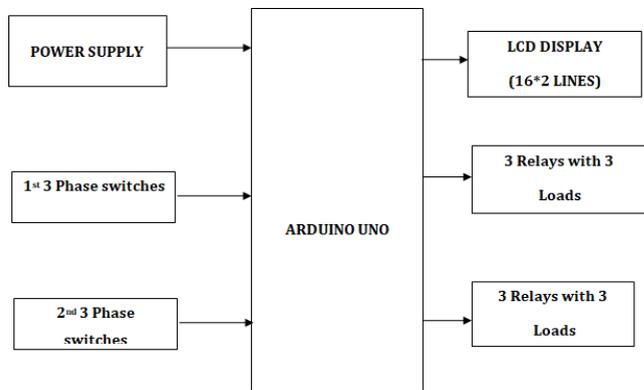
Shubham Ajmera, Surendra Kumar Dholpuria, Akshay Kumar Surender Khatana Published March 2017 proposed [3] "Three Phase Faults Analysis of Power System". Electrical power is increasingly needed by businesses, consumers, and other sectors of the economy. It was created in order to preserve the electrical power needed by these sectors when line to ground (L-G), line to line fault (L-L), or three lines (LLL) varied faults occurred in an electrical system. To prevent significant harm to the control gears, load, or personnel in the grid sub-stations, it is possible to go around the automatic reclosing mechanism of cutting off the supply. In this manner, a tripping mechanism is created to stop both temporary and long-lasting defects.

Sathish Bakanagari¹, A. Mahesh Kumar², M. Cheenya⁴ Three Phase Fault Analysis with Auto Reset for Temporary Fault and Permanent Trip for Permanent Fault: The proposal creates a three-phase transmission system automatic tripping mechanism. The output of the project resets in the event of a temporary fault, whereas it gains a permanent trip condition in the event of a permanent fault. These faults are categorised as LG (Line to Ground), LL (Line to Line), and 3L in a three-phase power system (Three lines). This system can solve the issue by automatically detecting the failure and cutting off the power supply, preventing extensive damage to the system's components.

Ravi Shankar Chauhan¹, Dr. Amrita Sinha² PG Student [Power System], Dept. of EIED, Thapar University, Patiala, Punjab, India¹ Assistant Professor, Dept. of EIED, Thapar University, Patiala, Punjab, India² [5] "Detection and Classification of Internal Faults in Power Transformers using Tree based Classifiers" It suggests a Decision Tree (DT)-based method for identifying and categorising internal power transformer issues. By adjusting the fault resistance, fault inception angle, and percentage of winding under fault in Power System Computer Aided Design (PSCAD)/Electromagnetic Transients including DC (EMTDC), the faults are simulated. The differential currents in phases a, b, and c that pertain to the time and frequency domains are used to extract a number of features. Three characteristics are chosen to separate internal faults from the magnetising inrush, and three more are chosen to categorise faults in the transformer's primary and secondary.

type of pulse has no impact, but applying another pulse to a different set of control terminals or applying a pulse with the opposite polarity resets the switch. When power interruptions shouldn't influence the circuits that the relay is controlling, magnetic latching relays can be advantageous.

The Block Diagram below represents the Arduino and the connections given to the arduino.



A. POWER SUPPLY

All digital circuits require regulated power supply. In this article we are going to learn how to get a regulated positive supply from the mains supply.

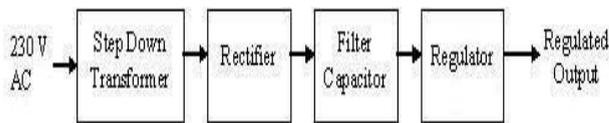


Figure 1: Block diagram of a fixed regulated power supply

B. LCD DISPLAY

A flat, thin electronic visual display called a liquid crystal display makes use of the liquid crystal's ability to modulate light. LCDs are frequently used in displays for computers, televisions, aircraft, instrument panels, signage, etc..



Figure 2: LCD Display

C. RELAY

A switch that is controlled by electricity is a relay. It is made up of a set of working contact terminals and a set of input terminals for one or more control signals. Any number of contacts in various contact forms, such as create contacts, break contacts, or combinations of these, may be present on the switch. Relays are employed when multiple circuits need to be controlled by a single signal or when a circuit has to be controlled by a separate, low-power signal. In order to refresh the signal coming in from one circuit by transmitting it on another circuit, relays were originally utilised in long-distance telegraph circuits. To carry out logical processes, relays were widely utilised in early computers and telephone exchanges. Other operating principles have been developed, such as solid static relays, which use semiconductor features for control without relying on moving elements, in contrast to the typical form of a relay, which uses an electromagnet to close or open the contacts. Electrical circuits are protected from overload or defects by relays with calibrated operating characteristics and occasionally several operating coils; in contemporary electric power systems, digital instruments still carry out similar activities and are referred to as protecting relays. Latching relays only need one control power pulse to permanently operate the switch. Repetition of the same



Figure 3: Relay

D. ARDUINO

A maker of single-board microcontrollers and microcontroller kits for creating digital gadgets and interactive objects that can sense and be controlled both physically and digitally, Arduino is an open-source hardware and software firm, project, and user community. Due to its products' GNU Lesser General Public License (LGPL) or GNU General Public License (GPL) licencing, anyone is allowed to produce Arduino boards and distribute software. Commercially, Arduino boards can be purchased as constructed or as DIY kits. Different types of microprocessors and controllers are used in Arduino board designs. A variety of expansion boards, breadboards (shields), and other circuits can be interfaced with the boards' sets of digital and analogue input/output (I/O) pins. The boards provide serial communications interfaces that can be used to load software from personal computers, including on some models, Universal Serial Bus (USB). Typically, a dialect of elements from the programming languages C and C++ are used to programme microcontrollers. The Arduino project offers an integrated development environment (IDE) based on the Processing language project in addition to using conventional compiler toolchains.

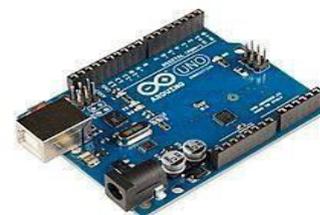


Figure 4: Arduino

E. PUSH BUTTONS

Momentary and non-momentary push button switches make up the majority of the available options. Calculators, push-button phones, kitchen appliances, magnetic locks, and a number of other mechanical and electronic devices used in homes and businesses typically use these switches.



Figure 5: Push Button

A transformer's main function is to step-up or step-down the voltage from the primary to the secondary windings. This is done simply by adjusting the ratio of coils on one side to the other.



Figure 6:Transformer

G.FINAL HARDWARE

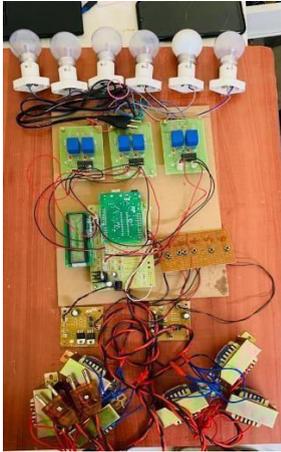


Figure 7: Hardware Kit

To verify the three phase fault analysis, the project uses six step-down transformers to handle the entire circuit at a low voltage of 12 volts. Three transformers' primary are connected in a star configuration to a three-phase supply, and the secondary of each is similarly connected. The second set of three transformers has their secondaries connected in a delta configuration with their primary connected in a star to three phase configuration. Six relay coils receive the rectified and separately filtered outputs from each of the six transformers. Each of the six pushbuttons, which are each connected across the relay coil, is intended to cause a star fault, such as an LL fault or a 3L problem. The NC contacts of all the relays are made parallel while all the common points are grounded

IV. HARDWARE AND RESULTS

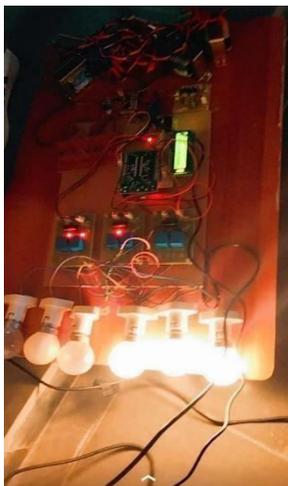


Figure 8: Output

Vol 13 Issue 06, June/2022, ISSN:0377-9254
Hence, during single press on push button the LCD displays temporary fault and during long press on the push button it displays permanent fault. During permanent fault or temporary fault the loads are turned off.

V. CONCLUSION

Six single phase transformers, three of which are wired in star out configuration and the remaining three in delta connections, are used to construct this three phase fault analysis system. The transformers' input is 220 volts, while their output is 12 volts. A set of switches that produce the LL, LG, and 3L faults are used to introduce faults on the low voltage side. A transient trip occurs when the supply reconnects to the load after a short-term malfunction, whereas a permanent trip occurs when the supply and load are disconnected for an extended period of time.

VI. ACKNOWLEDGEMENT

We are very grateful to our experts for their valuable suggestions to improve this paper.

In this project, loads are protected and the faults are easily detected with respect to time. The faults are easily displayed on LCD.

REFERENCES

- 1) Y. Nishida, S. Murakami, H. Toshi, H. Mizoguchi "Minimally privacy-Violative system for Locating Human by ultrasonic Radar Embedded on ceiling", in proceedings of 2004 IEEE International conference on systems, man and cybernetics(SMC '04), PP 1549-1554, October 2004.
- 2) T. Hori, Y. Nishida, S. Murakami, H. Aizawa, H. Mizoguchi "Distributed Sensor Network for a Home for the Aged," in Proceedings of 2004 IEEE International Conference on System, Man Cybernetics (SMC '04), pp.1577-1582, October 2004.
- 3) S. Murakami, Y. Nishida, T. Hori, H. Mizoguchi, Bg Detecting Human Head Location Using a Simply Installed Ultrasonic Radar System, h in proceedings of the 22nd Annual Conference of the Robotics Society of Japan, 1A23(1)-(2), September 2004.