

Microcontroller Based On Load Tap Changer for Small Power Transformer

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Abstract: This paper represents a new tap changing method which is designed. Now a days, the power quality issue increases day by day. Then new method is required for improvement of power quality. In this paper, design switching topology of transformer by using relay take place. Because of this topology fast tap changing can be takes place. There are no arc will be produce. In mechanical switching arc is produced and required more time than other technologies due to voltage sag and voltage swell as well as more maintenance required. This problem is removed in this switching technology. It has been tested for reliability and for maintaining the operation voltage of the system. The microcontroller generated signal and pass the signal to relay driver circuit.

Keywords: ON load tap changer, Relay diver circuit, Microcontroller.

1. INTRODUCTION

Power quality issue is increase day by day. Then there is requirement of new technology of tap changing OLTC. This paper is present the relays are used as switching topology. The main factor in power utilisation is the customer demanded an uninterrupted supply is minimum disturbance and also in power utilities it reduces. By considering above, this paper focuses on the tap changing of transformer. In old topologies mechanical switching topologies are used for tap changing of transformer. But drawback of this topology is it produces arc. Because of that the frequent maintenance occurs. It required modern technology. There are number of modern technologies but this paper is present relay topology or tap changing of transformer.

2. LITERATURE SURVEY

Author [1] - N.F.Mailah, Member of IEEE, S.M.Bashi, Member, IEEE and W.H.Meng. In this paper author design a fully electronic on-load tap changer for this Triac used as switching device. Author suggested that use of Triac device which reduces of arcing, contact wear and maintenance that associated with conventional mechanical tap changer.

In this paper semiconductor device and microcontroller as processing element are used which improve the response of tap changer.

Author [2]-Nikunj R. Patel, Makrand M. Lokhande, Jitendra G. Jamnani. In this paper drawback of conventional tap changer like arcing, high maintenance, service costs and slow reaction time are overcome by use of Solid State tap changer. In this semiconductor like thyristor are used for quick operation of OLTC regulator also reduce the problem like flicker and sags.

In this paper any variation at the output voltage of the distribution transformer will be sensed by the microcontroller and compare with the reference value as per the program. This will produce appropriate command to trigger the appropriate pair

of anti parallel thyristors for change in the suitable tapping of transformer. The system stability is improved, because of quick response.

Author [3]- Daniel J. Rogers, Member, IEEE, TimC.Green, Senior Member, IEEE, and Richard W. Silversides, Member, IEEE. In this paper represent a fast mechanical diverter switch design for new arcless hybrid on-load tap changing system. In that for fast response of mechanical tap changer use of compact and air insulated contact that provide arc quenching.

Author [4]- Rolga Roy, Aswani Suseelan, Anugraha P. Author suggested that voltage control is an essential part of the electric energy transmission and distribution system to maintain proper voltage limit at the consumer’s terminal. In that paper author suggested comparison of different methods in that solid state on –load tap changer on microcontroller based which provide flexibility in programming control strategy. Another method is SCADA which collecting information and transferring it back to the central site, analysis it and displaying that information.

3. NECESSITY OF PROJECT

In earlier years we use manually tap changer transformer in electrical system to supply power. This type of tap changer having some disadvantages like as ,slow performance during tap changer, produces arching at each time of tap setting &require regular maintenance also few problem are occurs such as over voltage, under voltage, voltage sag, voltage swell etc. so due to this problem power supplier do not provide uninterrupted power supply to the consumer. To provide the uninterrupted power supply one of the method is by employing microcontroller based on-load tap changer for small power transformer. It has fast response as compare to the manually operated tap changer also problem of arcing during tap changing is not occurs & due to use of relay as switching device problem of harmonics are eliminated. So the aim behind this project is to provide uninterrupted power supply to the consumer.

4. BLOCK DAIGRAM

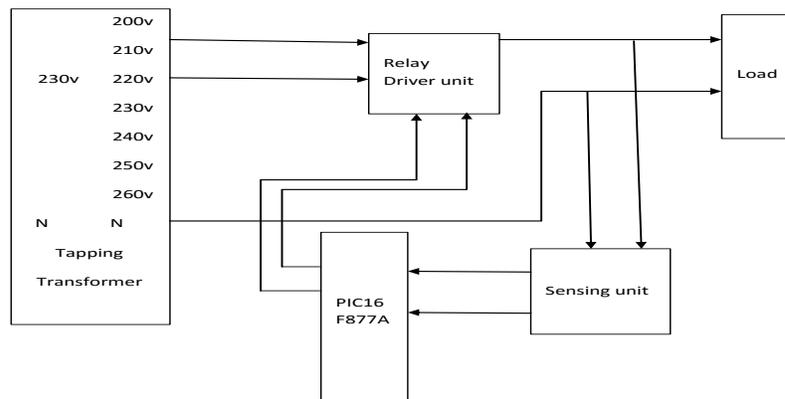


Fig: Block Diagram of tap changer Transformer

4.1. BLOCK DIAGRAM DISCRPTION

The block diagram of microcontroller based tap changing transformer. There are various components in tap changing transformer which are Relay driver circuit, Microcontroller unit, CT sensor, etc. In the block diagram tap changing transformer is connected to relay driver circuit and relay driver circuit is connected to load. The relay driver circuit is control by the microcontroller unit. Microcontroller, is named as PIC16F877A, is used because of fast processing of tap changing transformer. CT sensor is used to sense the voltage and current of load then pass the signal to microcontroller unit. In microcontroller unit program is fed. Then microcontroller generated signal and pass the signal to relay driver circuit. Then relay driver circuit is operated and particular relay of taps of transformer change.

5. HARDWARE DESIGN

5.1. PIC16F877A MICROCONTROLLER

The PIC microcontroller, PIC16F877A is one of the most popular microcontrollers in the industry. This controller is very convenient to use. The coding or programming of this controller is also easier. One of the main advantages is that it can be write-erase as many as possible because it use FLASH memory technology. It has total number of 40 pins & there 33 pins for input and output. Its SRAM is 368 bytes & EEPROM is 256 bytes.

5.2. TRANSFORMER

Tap transformer is used. There are seven taps in which centre tap having voltage 230vlt, above three taps are having voltage 240 v, 250v, 260v respectively and below taps are having voltage 220v, 210v and 220v respectively.

5.3. RELAY DRIVER CIRCUIT

Relay driver circuitries used for the changing the tap of transformer. Signal is passes from microcontroller to relay and the relay is operated. In relay driver circuit seven relays are used. For one tap one relay is used. Specifications of relays are as follows-

| | |
|---------------------------|------------------|
| Voltage | 250V Ac/ 12V Dc |
| Current capacity | 10 A |
| On/off Switching capacity | 30 operation/min |
| Operation time | 10 m sec |

5.4. POWER SUPPLY

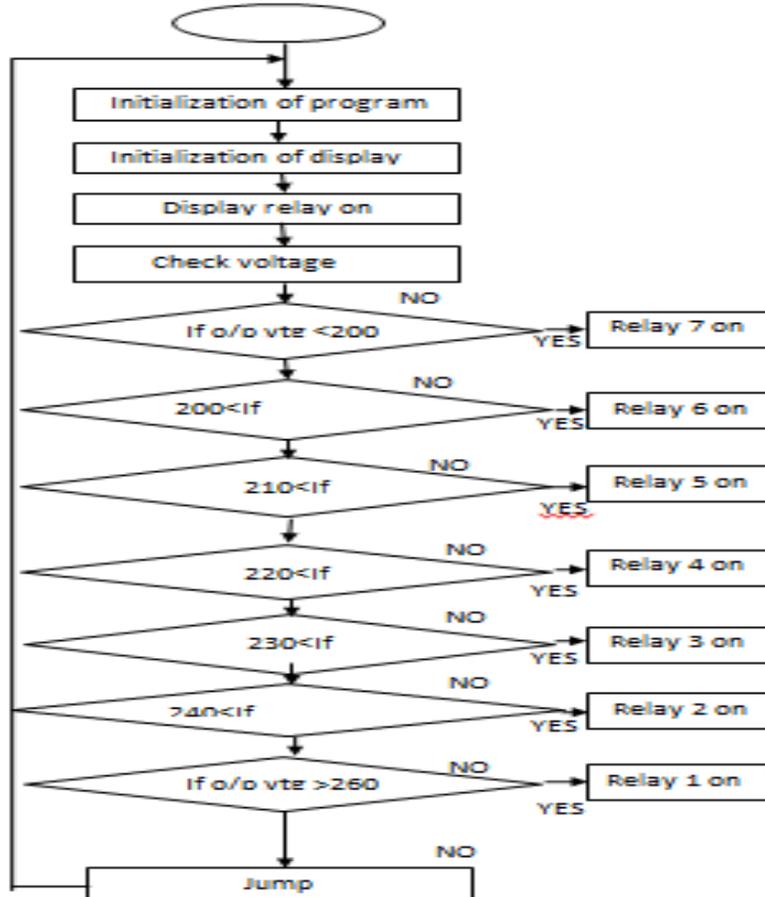
There is requirement of DC supply for microcontroller and display. Both units require 5V DC supply for operation. For this by using step down transformer 230V is converted to 12V AC. Further it is converted to 5V DC by using Bridge rectifier, capacitor and LM7805 voltage regulator.

5.5. LCD

The 16/2 LCD display is used to visualise the output if the application. It issued to check the output of different models interfaced with the output. The output voltage and the operated relay number is displayed on the display.



5.6. FLOCHART



| I/p vtg | o/p vtg | Tap1 200v | Tap2 210v | Tap3 220v | Tap4 230v | Tap5 240v | Tap6 250v | Tap7 260v |
|------------|------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| 237v | 199v | Off | off | off | off | off | off | On |
| 237v | 209v | Off | off | off | off | off | on | Off |
| 237v | 220v | Off | off | off | off | on | off | Off |
| 237v | 228v | Off | off | off | on | off | off | Off |
| 237v | 239v | Off | off | on | off | off | off | Off |
| 237v | 252v | Off | on | off | off | off | off | Off |
| 237v | 259v | On | off | off | off | off | off | Off |

6. RESULTS

When load is increase or decrease than particular RELAY is operated and Tap are changing

7. CONCLUSION

As the variation in output voltage of the transformer, that is increasing or decreasing voltage is detected by the microcontroller which in turns computes & executes necessary command instruction to be passed on the respective relay, according to the command respective relay is on and required tap is get selected so the voltage of the system is maintained at nominal value.

8. ACKNOWLEDEMENT

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9. REFERENCES

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