

Control of Earth Leakage Current by Smart Earthing System

**Ms. Manisha S. Shingote¹, Mr. Avhad Atul Shivram², Mr. Dalvi Atish Tukaram³, Mr. Kadam Akshay Navnath⁴,
Mr. Kokane Suraj Sanjay⁵**

Assistant Professor in Electrical Engineering, Sir Visvesvaraya Institute of Technology, Nashik, Maharashtra, India¹

BE. Electrical Engineering Students, Sir Visvesvaraya Institute of Technology, Nashik, Maharashtra, India²⁻⁵

Abstract: This system used to maintain and controlling earth resistance. The earth resistance is maintained by controlling moisture of earth using moisture sensor. Soil moisture sensor senses the moisture of the soil and gives data to the micro-controller. If moisture decreases microcontroller operates motor through relay and water supplied to soil. Also we can see the status of moisture content of soil whether the moisture is present or not on (LCD). Also when any fault occurs the fault current flows through earthing and gets grounded, so in the proposed system instead of grounding the fault current we are storing that fault current in a battery through rectifier. And when battery gets fully charged then the battery gets disconnected by relay and fault current continues to flow from earthing to ground. The fully charged status of battery will sense by (vdc) and then it will give command to relay to disconnect the battery.

Keywords: VDC - Voltage Divider Circuit, LCD - liquid Crystal Display

I. INTRODUCTION

Nowadays there is increase in problem due leakage current and widely variations in earth resistance caused breakdown of earthing system. So to eliminate these problems many systems and methods for earthing system are developed. Our project is of earthing system as earthing system is use for protection purpose. And protection/safety of men and machine is the first priority of any industry. But if consider our ordinary earthing system there will be chances Not getting proper earthing. Because for proper earthing the soil should be completely wet if soil remains dry and it is not observed by anyone it may become serious issue if fault persist earthing path will not establish and equipments will get severely damaged. Considering this threat we come up with the idea of automatically maintaining the soil moisture through soil moisture sensor and microcontroller. Our approach is that maintaining soil moisturized all the time so that whenever fault occurs the fault current will grounded easily. Also our approach is that to save earth from rising earths potential if large amount of current is grounded it will damage the soil. So in (smart earthing system) we have added intellectual earthing kit it will lower the current value and then lower value of current will store in battery.

II. OBJECTIVE

1. Provide a system for maintaining and controlling earth resistance.
2. Provide a system to protect the earthing from excessive leakage current.
3. Provide a system to measure and control the moisture content.
4. Provide a system that can store the leakage current

III. BLOCK DIAGRAM

Block Diagram description :-

This project relates to system for maintaining and controlling earth resistance. The earth resistance is maintained by controlling moisture of earth using moisture sensor . And aslo we can store the leakage/fault current in battery through rectifier. Fig 1.shows the arrangement to create the fault , neutral can be disconnected with help of switch and then current continues to flow from phase and earthing. As the earthing current is Ac it cannot be stored, so with the help of bridge rectifier the AC current gets rectify to dc. And we can easily store the dc current in a battery. Initially when fault takes place the battery will charge fully , after battery gets fully charged the voltage divider circuit will disconnect the battery from leakage current through relay (1). And then leakage current will be go directly to ground through earth wire. As shown in figure 1, the number of equipment shown is connected to common earthing point. Soil moisture sensor senses the moisture of the soil and gives feedback to the micro-controller. If moisture decreases microcontroller operates

motor through relay(2) and water supplied to soil. In this project by using soil moisture sensor the moisture content of the soil is measured and by using electronic circuit it maintains moisture level.

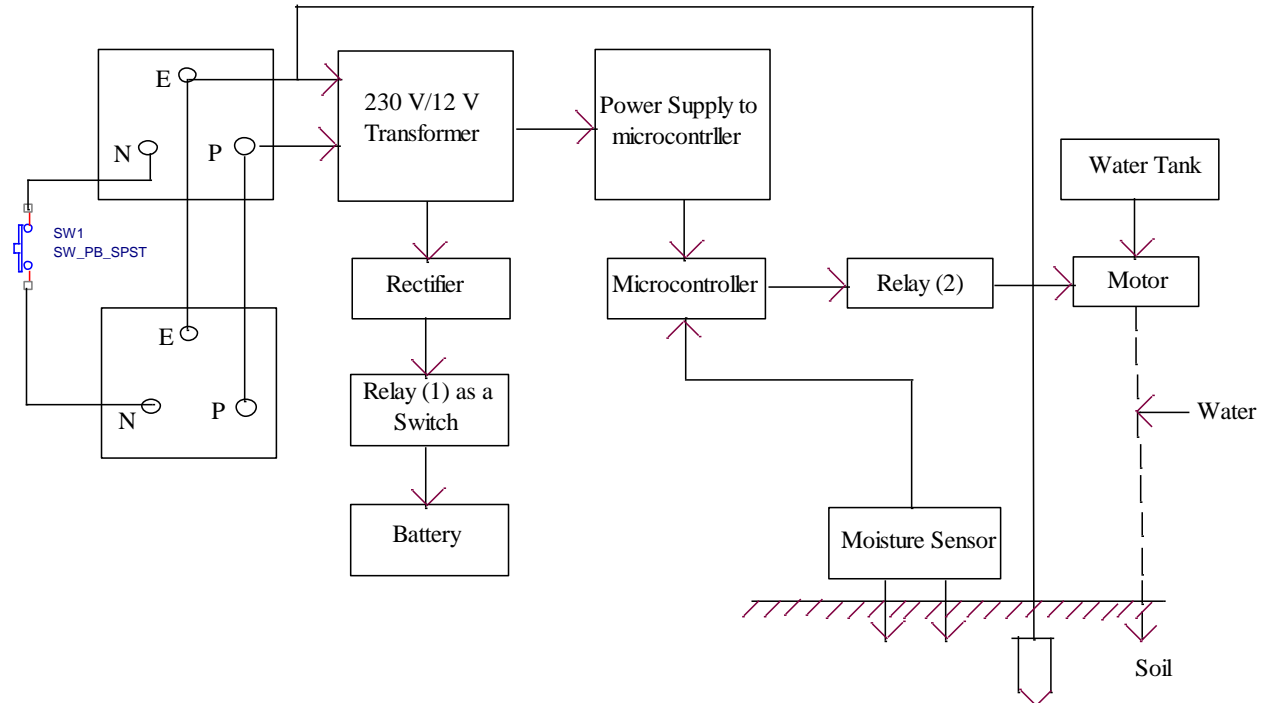


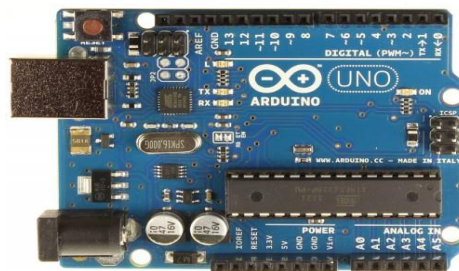
Fig.1 Block Diagram

The micro-controller circuit continuously Monitoring moisture level if moisture level goes down the controller circuit automatically operate relay and water is supplied to earth here moisture level is goes up to required level.

IV. COMPONENTS

4.1 Atmega 328 Microcontroller :-

Fig.2 Microcontroller



Microcontroller is the main component. It will control the on/off operations of motor. According to data given by moisture sensor it will control operation of motor.

It has following specifications :-

1. 14 digital input/output pins (of which 6 can be used as pwm outputs)
2. 6 analog inputs
3. 6 Mhz crystal oscillator
4. USB connection & a power jack
5. An ICSP header and a reset button.

4.2 Relay :-

Relay is a sensing device generally use to sense the fault.

It can be used as a switch to make an break the contacts

In this project relay is used as a switch to on/off the motor as well as to switch on/off the current flow towards the battery

4.3 Rectifier :-

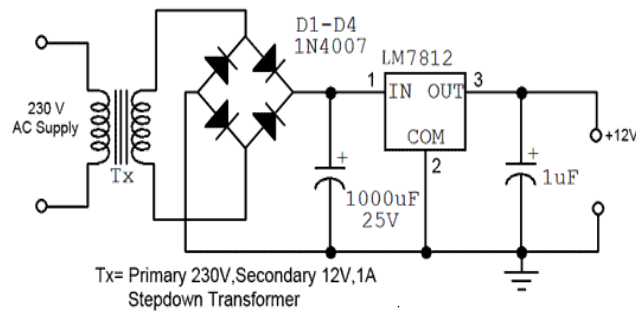


Fig.3 bridge rectifier

In this project rectifier is used to rectify the ac leakage current.

Fig.3 shows the the bridge rectifier along with the capacitors as a filter.

LM7812 is used to produce 12v at the output . and 12v output terminals is connected to battery.

4.4 Moisture Level Sensor :-

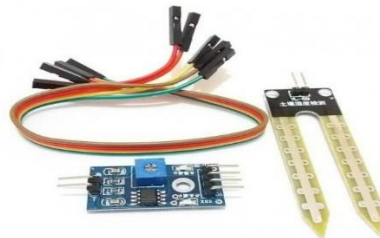


Fig.4 moisture level sensor

Soil moisture sensor senses the water content in soil and gives data to microcontroller.

The soil moisture sensor connected to microcontroller through probes.

It has two leads which is to be properly inserted in a soil, so that it can properly sense the moisture content in the soil.

V. ADVANTAGES

1. Leakage current is used to charge the battery.
2. Fully charged battery can be used for various applications as per requirement.
3. Same system can be used for higher leakage current with high storage capacity batteries.
4. With the help of moisture sensor and water tank we can keep soil always moisturized.
5. As soil remains moisturized all the time we will get proper earthing.
6. Save the Earth From Excessive Leakage Current.

VI. DISADVANTAGE

1. To keep soil moisturized microcontroller should be powered 24x7.
2. Cost is Higher than normal Earthing System
3. Smart earthing system kit requires to protect from harsh environmental conditions.

**VII. APPLICATIONS**

1. In Substations where fault current is very high that can be stored with this Smart earthing system.
2. It can be implement for Domestic Purpose also.

VIII. CONCLUSION

Smart earthing system reduced the damage to the equipment because of earth leakage current. It also helps to maintain and control earth resistance. It is possible to control and store leakage current in battery instead of going grounded.

REFERENCES

- [1]. IEEE Std. 80-2000, —IEEE Guide for Safety in AC Substation Groundingl, IEEE: Institute of Electrical and Electronic Engineers, Inc., New York, 2000, Page(s) 1- 192.
- [2]. F. Gatta, S. Lauria, G. Parise, — Common grounding system in urban areasl (in italian), Conference on —Safety in complex systeml-Bari (Italy) 16-17 October 2003.
- [3]. K. M. Bhatia and B. K. Jain, —Standardization in the Field of Electrical Safetyl.
- [4]. IEEE Std. 142-2007,—IEEE Recommended Practice for Grounding of Industrial and Commercial Power Systeml, IEEE: Institute of Electrical and Electronic Engineers, Inc., New York, 2007. Page(s): 1-215.
- [5]. Brian Allport, —Practical considerations (substation earthing)l, VA TECH Reyrolle Transmission.
- [6]. H.B. Dwight, "Calculations of Resistances to Ground", AIEE Transactions, December 1936, pp.1319-1328