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Over Power Monitoring System for Industrial Machine

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Abstract - The aim of this project is to activate the relay according to the different electrical power protection features of home and industrial equipment in the event of power outages and low voltage power outages. Electronic devices are more sensitive to electrical changes, as the power difference comes with the provision of easily damaged electrical equipment. In that case it requires additional means of protection to protect the equipment as a load. According to the combined circuits of the voltage comparator the decision to trip relay mechanism, as the voltage varies above or below the set value. The main advantage of these devices is that they also protect the three-phase electrical components from single phase separation and voltage fluctuations in ac voltage waveform.

Keywords: Waveform, comparator

1.INTRODUCTION

Fault protection from electrical systems is very important and essential for reliable operation. The power system is said to be faulty in the event of an unfavorable situation in that power system. Unpleasant situation may result in short circuits, over current power, low power supply, overvoltage etc. Induction motor is one of the most widely used electromechanical devices, so it needs protection against power outages. The stability of a power system is the ability of an electrical system, in a certain initial operating condition, to restore the balance of function after physical disruption, many systemic variables are bound so that almost the entire system remains the same. Voltage stability refers to the system's ability to maintain a stable voltage across all electric buses in a system after a breakdown. In contrast, power outages are mainly caused when the power system is unable to meet its operating power requirement. The risks of power failure are seen as very serious not only for the power grid but also for general users of electrical appliances. Overvoltage and low voltage condition are a form of potential power outage also in the home electrical system. In many cases the aforementioned condition is harmful to the health of the electrical equipment it touches. The overvoltage condition on an induction motor occurs when the voltage in the motor rises above its maximum design limit. Such occurrences in the system damage electrical and critical electrical components designed to operate within pre-designed rated voltages. As a result, during the under-voltage motor, the induction motor is also heated faster because the torque and speed of the induction motor are similarly reduced, resulting in an increase in the power of the induction motor. It is therefore advisable to protect the electrical outlets in power lines and / or under voltage in order to reduce the risk of damage to the power supply network connected to the power supply. The proposed solution is therefore preferred to develop an induction motor-based microcontroller over power supply and under power protection because transmission based on microprocessors offers greater flexibility, more adjustable features, greater set width, higher accuracy, reduced size, and lower costs, and more. much. related functions, such as comprehension control, event recording, error location data, remote configuration, monitoring and evaluation, etc.

Objective

The main purpose of this project is to design and replicate under the power protection system and above the input engine. Induction motor is one of the most important electromechanical machines, so it needs protection from electrical instability. The stability of a power system is the ability of an electrical system, in a certain initial operating condition, to restore the balance of function after physical disruption, many systemic variables are bound so that almost the entire system remains the same. Voltage stability refers to the ability of the power system to maintain a stable power supply on all electrical buses in the system after interruption.

The specific objective of the project is to design the voltage above and below the electrical protection system & design transformer, rectifier, power sensor, power control, transistor, relay. Also, mimic the voltage above and below the voltage protection system in accordance with the design parameters

2. LITERATURE

Idea of over voltage and under voltage control system

Load controllers have been around for 158 years for the simple purpose of reducing or increasing energy. Energy regulators are used to reduce electricity costs and CO2 emissions. This use of energy regulators is often referred to as energy efficiency, or energy efficiency. Voltage adjustment is more needed today than ever before. This is because the demand for electricity is constantly growing and is now beyond the power supply. This produces the effect of a breakdown in the quality of extraordinary electrical energy that is usually very high and sometimes very low. This continuous shift in power consumption damages consumers' electrical appliances and causes them to pay more for their electricity. Consumers want to protect their sites from damage caused by electrical appliances caused by low energy levels and ever-increasing electricity costs. Energy efficiency has become a proven option in areas that supply high voltage to save energy and energy costs, increase the life cycle of electrical equipment, and reduce energy storage and repair costs.

Effect of Voltage Unbalance Monitoring Technique

Annette von Jouanne and Basudeb Banerjee (2001) propose the causes and effect of energy imbalances and discuss related levels, definitions and mitigation strategies. A few of the causes of power imbalances in the energy system and the industries that are produced and the negative effects that result on the system and resources such as imported motors and power converters and drivers. Standards to address energy inequalities are discussed and clarified, and a number of mitigation measures are proposed to address energy inequality issues. This study highlights the importance of identifying potential problems of inequality for the benefit of the client and the client (Annette von Jouanne and Basudeb Banerjee, 2001).

The purpose of defending a power system is to detect errors or abnormal operating conditions and to initiate corrective action. The Relay must be able to test various parameters to determine if corrective action is required. Obviously, the relay cannot prevent error. Its main purpose is to detect the error and take the necessary action to minimize damage to the machine or system. The protective relay requires reasonably accurate reproduction of abnormal and normal conditions in the energy system for proper sensitivity and function (Grigsby, 2007).

Analysis of Sensitive Frequency and Voltage Stability in Islanded Microgrid

Hannu Laaksonen, Kimmo Kauhaniemi (2007) describes their research on energy intensity and the frequency of the small island grid and the sensitivity of these values to specific changes in system configuration. In conventional power systems the frequency of a system corresponding to the rotation speed of a straight grid connected to large corresponding generators and power imbalances can be seen as a change in the system density. But on a small island grid it is possible that all generational units are connected to the grid with transformers and there is no inertia of the rotating frequency affect the frequency. In that case the frequency must be created by a powerful electronic device and the frequency is greatly reduced and the unequal power cannot be obtained in the traditional way. The small grid based urban urban voltage (LV) network consists of three converters and synchronous units based on distributed generation (DG). The lessons are conducted with the simulation software of PSCAD.

Power stability in distribution grids with power flow reversal.

Hung D. Nguyen, Konstantin Turitsyn (2014), explains in their study that high levels of diffused generation penetration and compensation for active energy by modern energy electronics may result in the transformation of active and active energy into future distribution grids. The voltage stability of these operating conditions may be very different from the normal power consumption system. The stability characteristics of distributed distribution networks with reverse power are also studied. After introducing a universal algebraic approach to showcasing all energy flow mathematical solutions, we show that new solutions come from a streamlined power system even from three simple bus systems. Some of these solutions are shown to be stable and the system may show an event of greater stability, where more stable balance is present together in a given set of parameters, and the system may turn into an unwanted balance after a disruption. These predictions are confirmed by dynamic simulations of two different systems. Under certain circumstances new circuits are active and may be visible at relatively high volumes. Possible ways to control the energy / energy efficiency and distributed production capacity allowed in future energy systems are proposed and discussed at the end of the paper.

Outcomes and Significance Expected from Project

The expected outcome of this project is to protect the engine from power outages by tripping the “200-240volt” power generator.

Project Signification

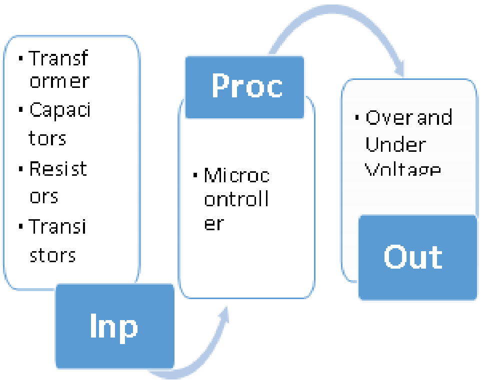
The importance of the project is seen as satisfying the needs of the home consumer to use energy efficiently, securely from harmful power fluctuations while providing long service life and quality services to household appliances. The design of the safety circuit is also seen as a model of vehicle import and safety. In addition, the project aims to provide valuable learning knowledge to students of Electrical and Computer Engineering and other relevant courses at Bahir Dar University, Ethiopia, Africa.

Systems Feasibility

This project reduces the effect of power outages on a secure, cheap import and provides faster response compared to other power generators. This project is therefore widely accepted in the community as energy instability occurs in any industry, home or any energy utility.

Framework

The project framework includes the integration of the following electronic components that include upper and lower electrical protection. This project uses the input, process, and output (IPO) paradigm as shown in Figure1 which includes the configuration of the converter, bridge fixer, power controller, Voltage sensor, Microcontroller, resistance, diode, potentiometer, transistor, power supply, transmission, and the burden. The IPO Paradigm is modeled by simulation using the accepted software that is the best Proteus software.



3. METHODOLOGY

In the block diagram shown below, the converter, bridge fixer, sub-controller, power controller, power sensor, transistor, power supply, switch, and induction motor are connected to protect the circuit from over voltage and under voltage. The main winding of the 220v AC transformer is connected to the input voltage of the flexible AC and the output is connected to the induction motor. On the first side of the transformer there is a transformer with down steps and descending from 220v to 12v AC. With the help of a bridge fixer, it is converted into 12v DC pure on the second side of the transformer. While monitoring the parameters of the import car, whenever the voltage of the induction motor exceeds the maximum voltage; the microcontroller detects the excess voltage and sends a signal.

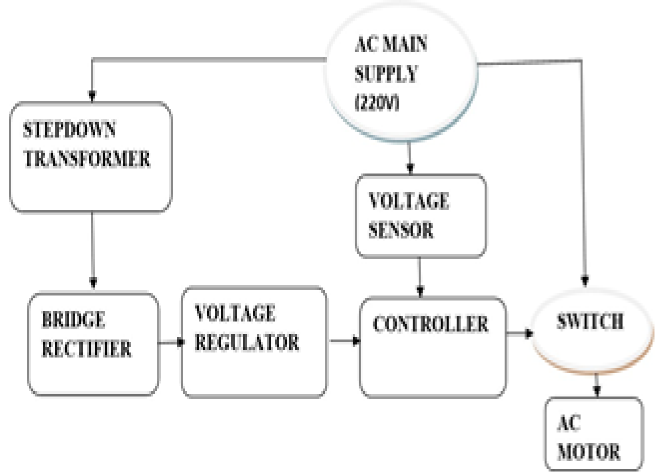


Fig -1: Block diagram of the system

Protection from Overvoltage

In the overvoltage protection system for a single-phase induction motor, it protects the motor from overheating, voltage higher than the average voltage. In the circuit diagram for overvoltage protection consists of a component comparing two voltages one is the supplier and the other is a descent across the flexible resistance. When the voltage drop between the variable resistance is higher than the value stated the comparator produces signals. This signal is supplied by a microcontroller and the microcontroller takes appropriate action.

Protection from low voltage

Under electric power protection a single-phase induction motor provides protection from low voltage. When the supply system has low voltage levels below the induction motor level then under the power supply phase the protection supply is provided to the engine. One category applies. It has the same concept of overvoltage and has a comparator that compares the two voltages in the supply of one form and the other from a decrease in voltage across all resilience. If the voltage drop across all the resistance is lower than the specified value, this signal sends to the microcontroller and the microcontroller stops the motor function in working condition and fails to work when it starts. Pre-set is used to set the specified value as shown in Figure 2

The design of the high voltage and the low voltage control system or part of the flow path describes the process of constructing an active circuit design based on the specified

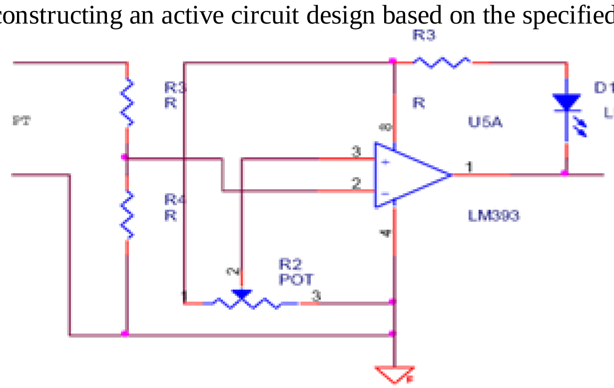


Fig -2: Circuit diagram of overvoltage protection

block diagram. However, the use of this protection circuit will only be mimicked using the approved electronic circuit Proteus software. The purpose of the simulation method is to conserve financial resources during the development process. Circular assembly of parts according to their special function will be done by imitation. The overall design of the over voltage and the underlying voltage control system looks like a circuit in Figure 3

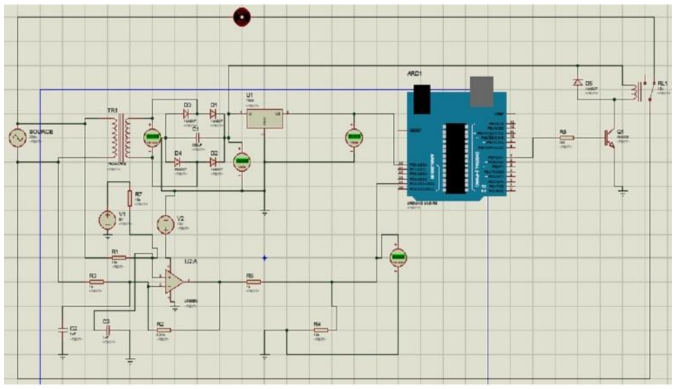
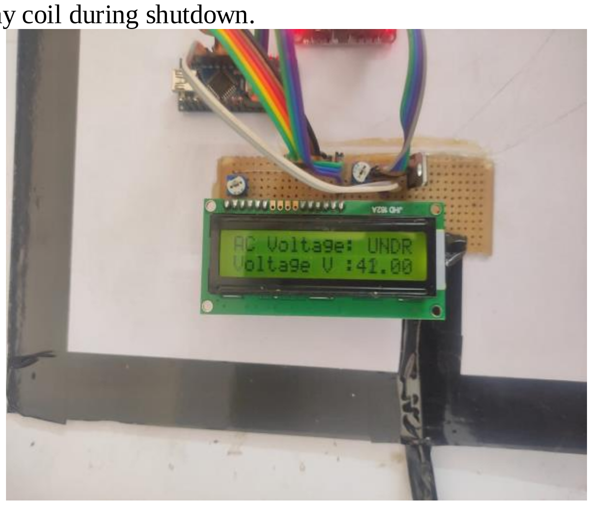


Fig -3: Design of under voltage and over voltage control system using Proteus software

The installation of a microcontroller enables most circuit functions to be precise and mounted at any level as required input supply. In a given high AC circuit, low voltage protection, we can see a voltage sensor used to detect the required voltage that can be detected by a microcontroller. The power controller provides dc 5v fixed to the small controller to power it. The bridge adjuster converts the supply of 12v ac to 15.5v dc and the capacitor is used to smooth the output voltage from the converter. The microcontroller detects the voltage level from pin A4 and sends a signal to the transistor and the transistor is used as a relay drive circuit.

The base of the Transistor (Q1) is connected to the upper diode coil, and as long as the output of the microcontroller remains low, the transistor (Q1) is allowed to operate by obtaining a neutral voltage of R5. However, at present the output of the microcontroller goes up or down during normal electrical conditions, limiting the transistor (Q1) in operation. Resistance Relay R1 automatically shuts off immediately with the connected engine. A protective diode (D5) circuit is used to protect the transistor from the reverse current generated by the relay coil during shutdown.



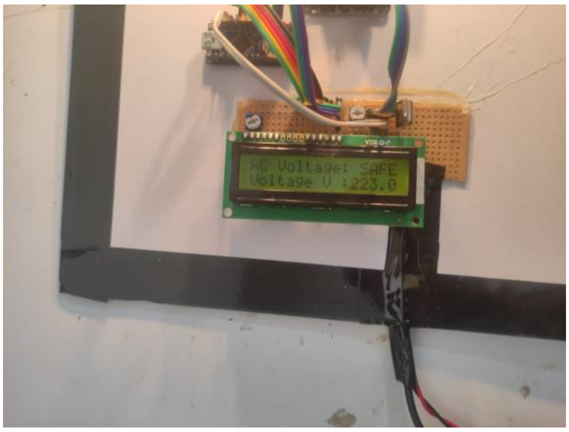


Fig -4: Design of under voltage and over voltage control system showing voltage

4. RESULT AND DISCUSSION

220v AC: 12v AC step down transformer is used to provide a reduced voltage induction motor over voltage and under voltage control system. The voltage transformer will pass through the repair system before it is fitted to 12v DC. Assume that the transformer has 120 coils of basic coil, so the second turn is calculated as:

$$\frac{N1}{N2} = \frac{V1}{V2}$$

120 / N2 = 220 / 12
N2 = 1440 /220 = 7 Turns

From internal circuit of voltage sensor the value of resistors calculated as:
Since the input DC voltage for Arduino Uno is in the range between 4.5 and 5.5v. But the minimum and maximum input AC voltages are 200 and 240v respectively.

V0min=4.5v, minimum output voltage V0max=5.5v, maximum output voltage Vin min=200v, minimum input voltage Vin max=240v, maximum input voltage

Let R1=10KΩ , R2 and R3 can be found as Using Kirchhoff's voltage and current laws we can obtain R2 and R3. V0min= Vin min(R2*R3)
(R1R2+R1R3+R2R3)

4.5v=200v (R2R3)/ (10*R2+10*R3+R2R3) from this equation

R3=55*R2/(185R25.5)………..
.........................1
V0max= Vin max (R2*R3)/ (R1R2+R1R3+R2R3) 5.5v=240v (R2R3)/ (10*R2+10*R3+R2R3)

R3=45*R2/(195.5*R2)……..…………………………………
………………..2
Equating equation 1 and 2 gives R2=1KΩ and R3=310Ω

Recommendations
Based on the findings and findings of the study, the recommendations are based on very small research findings. The following recommendations are suggested:
Given the difficulties encountered during the conduct of research related to the use of official simulation software, it was noted that with the use of limited software software not all electronic components are available thus simulation sometimes fails. Thus, the purchase of licensed simulation software in electronics and electrical engineering is highly recommended.
Since mimicking the design of a circuit for power outages has proven to be successful, it is recommended that this circuit design be used literally to test its actual performance on a real-world problem.

Future work
Based on the work done in this project which protecting induction motor using microcontroller some modifications need to be made in the future work, instead of relay it will be changed by cycloconverter. Because the relay needs some amount of time to sense a trip signal to protect the induction motor from damage, but using cycloconverter the induction motor can get rated voltage without interruption.

5. CONCLUSION

In this project, induction motor protection using a microcontroller is proposed. For electrical circuits induction motor is designed and the results are guaranteed by Proteus simulation. By analyzing the induction motor the current power of the input engine can be zero (open circuit) below and above the voltage level but the circuit is close to normal mode as the electrical power varies in the system. Whenever the supply voltage exceeds the average voltage of the induction motor, the voltage sensor receives overvoltage and the microcontroller receives this voltage and sends a travel signal to transmit thus protecting the input engine from overheating. As the supply voltage goes below the minimum induction motor voltage, then the voltage sensor detects the voltage supplied by the microcontroller and sends a signal to the relay to prevent the input engine from overloading. When the supply voltage is in the normal range from 200V to 240V, then the input engine is operating smoothly without damage.

The upper and lower voltage control system is very important, in order to protect the induction motor from uneven voltage and the purpose of the design system is to solve problems that occur due to unequal power. Research findings indicate that induction motor-based microcontroller protection gains many benefits from existing operating systems. Based on simulation results, the system has faster response, better differentiation and accurate detection under unusual conditions and better economic performance. Therefore, the design and imitation of the voltage above and below the voltage protection circuit satisfies the requirements of the technical parameters.

REFERENCES

[1]. Annette von Jouanne and Basu deb Banerjee, "Causes and Effect of Voltage Unbalance Mitigation Techniques", 2001.

[2]. Badri Ram and D N Vishwakarma, "power system protection and switch gear", New Delhi: Tata McGraw hill, 1995.

[3]. Frank D. Petruzella, "Electric motors and control systems", New York: McGraw- Hill, 1st Ed, 2010.

[4]. Hannu Laaksonen, Kimmo Kauhaniemi, "Sensitivity Analysis of Frequency and Voltage Stability", in Islanded Microgrid, 2007, retrieved from http://www.researchgate.net/publication, accessed 6/4/2014.

[5]. Hung D. Nguyen, Konstantin Turitsyn, "Voltage multi-stability in distribution grids With power flow reversal",2014,retrieved from http://www.researchgate.net/publication, accessed 6/10/2014.

[6]. Microcontroller Arduino UNO; www.atmel.com/Images/doc2466.pdf.