

Load Shedding In Single Phase Distribution System

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ABSTRACT

Power reliability is most essential problem for emergency utility. In proposed system automatic phase voltage detection is there which detects the unbalancing of load in 3 phase system. If any problem detected in connected phase the unit shift the load to the phase a vice versa. If all the phases are not available then only a battery storage supply is use to maintain the power supply. In this project implementation of simulation in Mat lab software and hardware will be prepared of a single phase prototype. Results will be compared and testing in different abnormal conditions will take place.

Keywords: Microcontroller-8051, Mat lab, Rectifier, Power Transformer.

I. INTRODUCTION

This is 21st century and the world has gone fully automatic with the help of logics and electricity. All over the world power generation has taken place in abundant due to which sometimes low voltage occurs when voltage on any of the line increases. According to survey in India the generation is 1,010 kWh and the consumption is about 746 kWh among which energy consumption in agriculture is the highest.

II. METHODS AND MATERIAL

1. Block Diagram

In the figure the system block diagram is given by studying the system practically.

- 1) Transformer
- 2) Rectifier
- 3) Microcontroller
- 4) Relay driver

This is for the automatic selection of one phase from three phase system under unbalance condition. Here

we are using three 12V step down transformers. These transformers will step down the 220 V supply to 12 V AC. Further this 12V AC is given to rectifier so as to produce 12V DC.

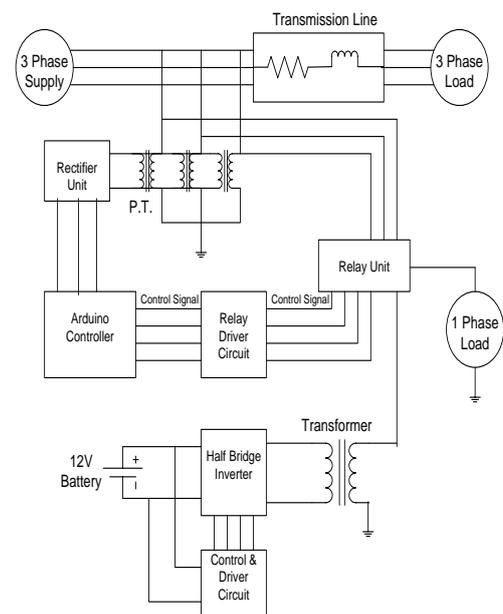


Figure 1. System Block Diagram

Then this 12V supply is given to the comparator circuit. This comparator circuit will produce +12V

between one terminal and ground and -12V between another terminal and ground and 24V will be obtained between two terminals. Comparator circuit is used to compare the voltage level between two phases. Then microcontroller is used to produce the signal and allow to work properly. But output from comparator will be 12V and microcontroller needs only 5V to operate on. So voltage regulator LM7805 is used to produce 5V supply for microcontrollers input. When there will be low voltage in any of the phase from three phase at that time it will be detected and signals will be produced by microcontroller. These signals will be given to the relay driver ULN2003 which will further operate the relays by giving the trip signals. These relays are used for switching purpose only which will automatically switch the available phase. When 6V will be given to the relay it will connect its contacts from NO to NC and path will be provided for 220V and hence that phase will be selected automatically to operate a load.

Usually power theft takes place from the neutral line of distribution system. When the value obtained will be less than the reference value at that time signal will be produced and will be given to the voltage to the current converter and thus this will operate alarm circuit. ACS712 current sensor is used which will sense the difference in current and will give signal to the microcontroller which will alarm the buzzer indicating theft detection.

Using inverter and DC-DC converter, standby supply is provided when all three phase will be out of phase.

2. Material

A) Transformer



Figure 2. 1-phase Transformer

Transformer is a static device which is used to transform electric power from one circuit to another circuit at same frequency.

According to operation two types of transformers are there:

1) Step up Transformer

It is used to step up voltage of the system. It is generally used on the generation side which in turn overcomes the losses.

2) Step down Transformer

It is used to step down voltage of the system. It is generally used on the distribution side as much as voltage suitable to the application of industry and homes.

Hence transmission and distribution is totally dependent on the transformer and so it is known as the heart of power system as this is a device which makes the transmission of power more efficient and with losses.

B). Rectifier



Figure 3. Bridge rectifier

The rectification is a process in which single phase A.C. is converted to D.C. and the device that is used for this purpose is known as rectifier. Normally bridge rectifier is used which uses four individual rectifying diodes those are connected in a closed loop known as bridge configuration which produces the desired output. Specialty of bridge circuit is that, that no center tapped transformer and no control signals are required and hence size and cost are reduced. The secondary winding of transformer is connected to one side terminals of the diode bridge and the other side terminals are connected to the load.

C). Microcontroller

Microcontroller and microprocessor are used for controlling device. We are not using microprocessor because in microprocessor RAM, ROM, I/O Port, Timer, Serial COM Port are not inbuilt and we are connect them externally. Microprocessor cost is high and function is very complex. The basic structure of microprocessor is given.

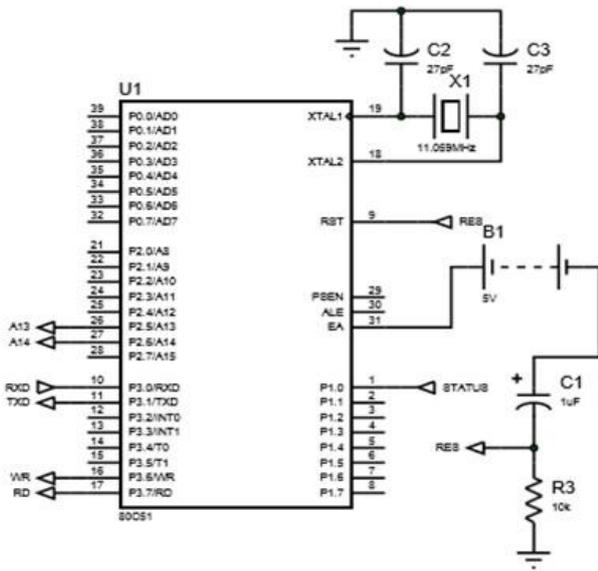


Figure 4. Microcontroller

Microcontroller is a one type of computer which is small in size and get at low cost. It is generally used for controlling purpose by sending signals.

The AT89C51 is a low-power, high-performance CMOS 8-bit microcomputer with 4K bytes of Flash programmable and erasable read only memory (PEROM). The device is manufactured using Atmel's high-density non-volatile memory technology and is compatible with the industry standard.

In microcontroller is a small computer in single instigated circuits in modern terminology its similar to but less sophisticated then a system on chip or SOC, an SOC may include a microcontroller as one of the components.

MCS-51 instruction set and pin out. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional non-volatile memory programmer. By combining a versatile 8-bit CPU with Flash on a monolithic chip, the Atmel AT89C51 is a powerful microcomputer which provides a highly-flexible and cost-effective solution to many embedded control applications.

III. RESULTS

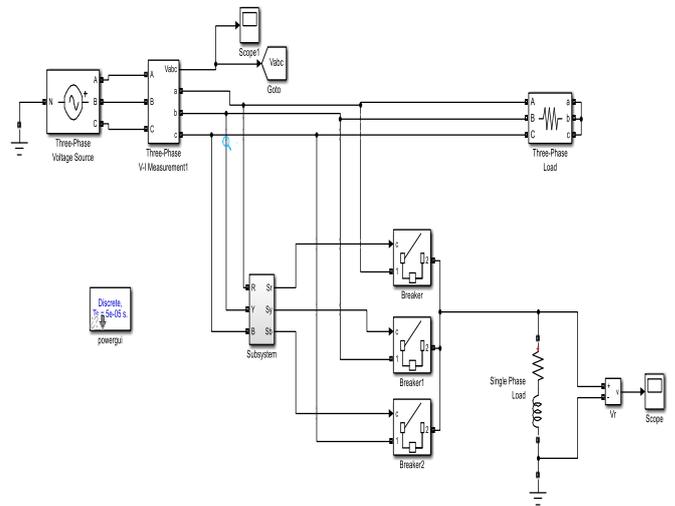


Figure 5. Simulation of Proposed System

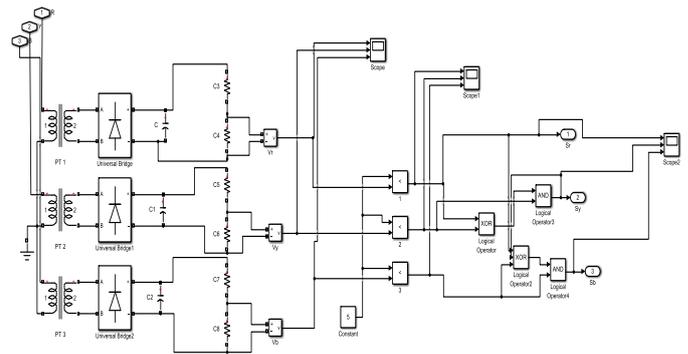


Figure 6. Simulation of Control Circuit

In mat lab simulation ckt are shown in figure and Supply Input and Load Voltage waveforms are got it.

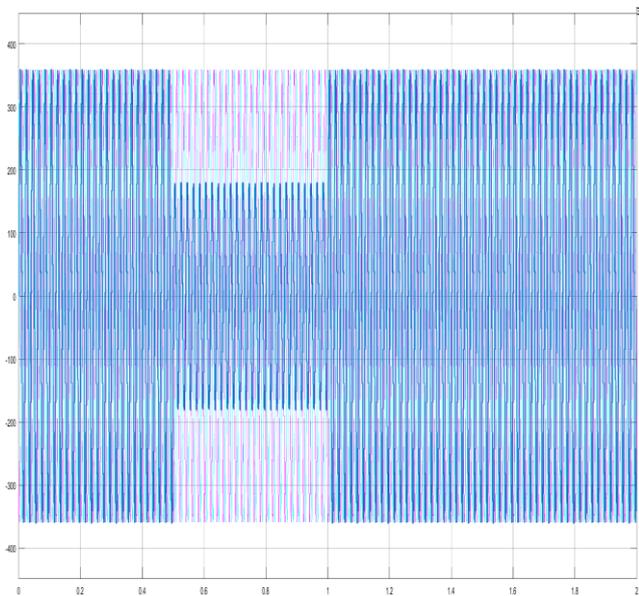


Figure 7. Simulation of supply voltage Wave form

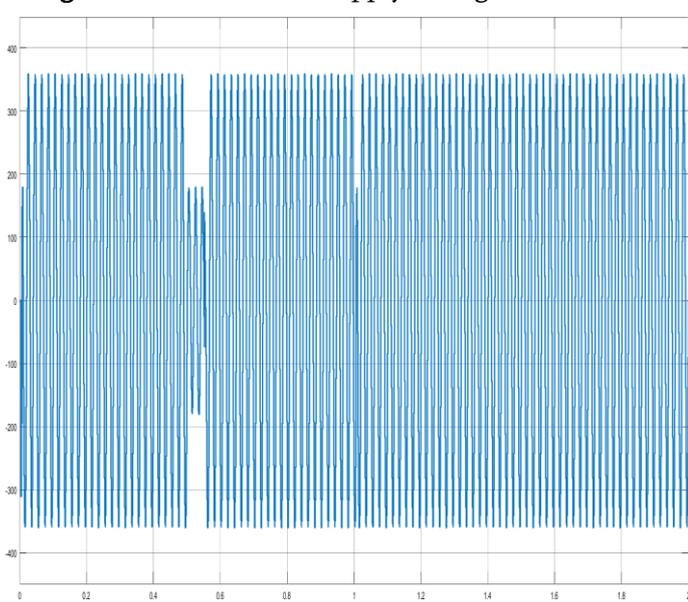


Figure 8. Simulation of load voltage Wave form

Over project results are always continuity power supply provided to the consumer load. If one phase are fail or down voltage than available another phase are used. If all the phases are not available then only a battery storage supply is use to maintain the power supply.

In this project implementation of simulation in Mat lab software and hardware will be prepared of a single phase prototype. Results will be compared and testing in different abnormal conditions will take place.

Implementation area of this system is a distribution network of electrical power supply system.

IV. CONCLUSION

This project presented the load shedding in single phase distribution system in which the power reliability is most essential problem for emergency utility. In this system equipment is developed which is made up of an electronic and electrical circuit which sense this type of problem and act accordingly. electrical power theft detection system is used to detect an unauthorized tapping on distribution lines. Implementation area of this system is a distribution network of electrical power supply system. Our systems are used in medical clinic, Emergency hospital ward.

In this project implementation of simulation in MATLAB software and hardware will be prepared of a single phase prototype. Results will be compared and testing in different abnormal conditions will take place.

V. REFERENCES

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