



INTERNATIONAL JOURNAL OF ADVANCE RESEARCH, IDEAS AND INNOVATIONS IN TECHNOLOGY

ISSN: 2454-132X

Impact factor: 4.295

(Volume 4, Issue 2)

Available online at: www.ijariit.com

Automatic Sag and Swell Detection and Changeover for Clean Power

Indrajeet Jadhav

indrajeetjadhav000@gmail.com

Jaywant College of Engineering and Management,
Sangali, Maharashtra

Amol Thorat

yogeshdharme45@gmail.com

Jaywant College of Engineering and Management,
Sangali, Maharashtra

Kamble A. A

prawinskamble@gmail.com

Jaywant College of Engineering and Management,
Sangali, Maharashtra

Agane A. A

arvindagane123@gmail.com

Jaywant College of Engineering and Management,
Sangali, Maharashtra

ABSTRACT

The phenomenon of voltage sag and swell happen directly from utility side or at customer side because of operation of certain types of equipment. Mitigation of such phenomenon is important as many of the equipment are sensitive to such conditions and may undergo irreversible damage. In recent years many novel systems for voltage sag and swell detection have been proposed albeit most of them targeted towards utility side voltage sag and swell detection and mitigation. Our present project is an attempt to develop customer side voltage sag and swell detection system based on the embedded system. Again facility for automatic changeover of the power source is considered to facilitate the supply of clean power as long as the phenomenon exists. Hereby we present the concept, design and field results of our attempt.

Keywords: Sag, Swell, Interruption.

1. INTRODUCTION

Voltage sag and swell are a common phenomenon and result directly from utility side or at customer side because of operation of certain types of equipment. Knowledge about the occurrence of such event is important since many of the equipment is sensitive to voltage fluctuations. Such equipment can undergo irreversible damage when subject to voltage fluctuations and hence must be protected from the same. Typical examples of devices that get affected by voltage sag are those based on motors like air conditioners, washing machines etc. These devices if operated forcefully on sag condition tend to produce noise and significant self-heat. This reduces the life of the device. Whereas, voltage swell condition can directly affect the sensitive electronics in the system like converter and control stages.

In recent years many novel systems for voltage sag and swell detection have been proposed albeit most of them targeted towards utility side voltage sag and swell detection and mitigation. In present project, we are trying to develop customer side voltage sag and swell detection system based on the embedded system. Also, a facility for automatic changeover of the power source is considered to facilitate the supply of clean power as long as the phenomenon exists. Here, all phenomenon like voltage sag, swell and interruption are inclusive. The system design is cost effective and fast acting by using 8-bit processor and associated hardware circuit. It is based on open source Arduino platform. For detecting the health of utility power lines simple potential transformer is used as a voltage sensor.

2. Block Diagram

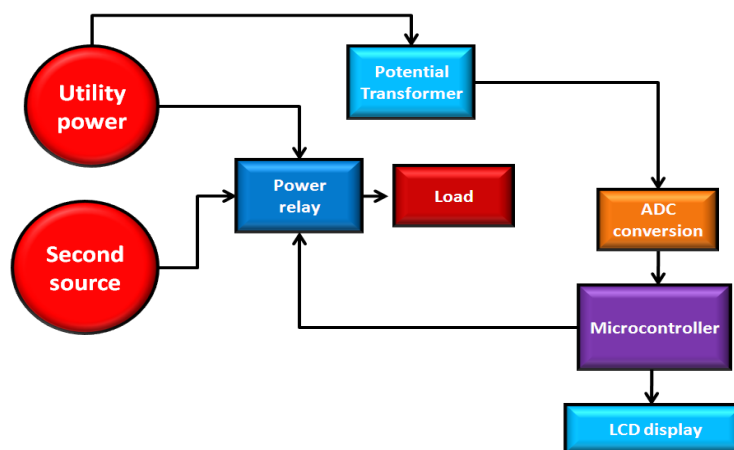


Fig.: Block Dia. Automatic sag and swell detection and Changeover for clean power

a. Sag:

- Reduction voltage magnitude for short duration Specifics:
- Reduction in magnitude is between 10% to 90% of normal value.
- The duration may be short (8msec to 3sec), temporary (3sec to 1min) or long (>1min).
- Caused by starting of heavy loads like induction motor startup, arc furnace, Welding machines etc.
- Power line short by falling of trees and power line to a ground fault because of accident can cause permanent damage to sensitive electrical equipment.

b. Swell

- Increase in voltage magnitude for short duration Specifics:
- Increase in magnitude above 110% of normal value.
- Duration is usually short (8msec to 3sec).
- Caused by sudden switch-off of heavy loads like an induction motor, arc furnace, welding machines etc.
- Can cause permanent damage to sensitive electrical equipment

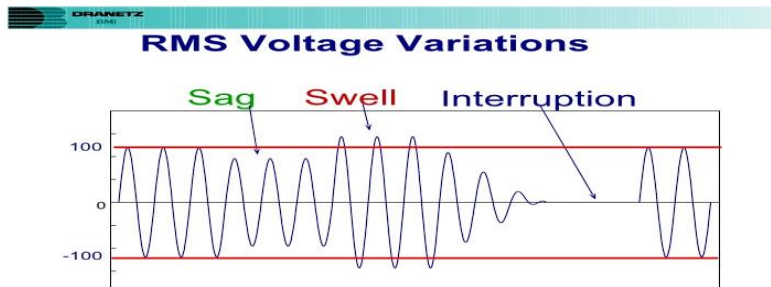


Fig. Sag Swell Formation

3. Hardware Components

- 1) Arduino
- 2) 16x2 LCD
- 3) Relay driver
- 4) Battery(6v)
- 5) Precision rectifier ckt
- 6) Transformer (0-6v)

4. RESULT

Sr.No	Voltage Range(volt)	Condition	Result
1	180	Sag	Reduction of sag changeover to clean power
2	230	Normal	Normal condition, no change over
3	260	Swell	Reduction of the swell changeover to clean power

5. CONCLUSION

Results of system test clearly indicate proper working of the system. We consider that the system will be quite suitable for commercial trial with proper miniaturization and furnishing. However, although the use of Arduino as the main processor has reduced development time, it is observed that the overall code size of Arduino is large. Hence we wish to go for pure embedded C in case of final product development. This would require programming the Atmega328p chip directly using embedded C programming tool chain. This way the size of code and hence efficiency and speed of the system is guaranteed to improve. Also, we would like to go for as much noise free circuit design as possible. This will improve detection system and make system flawless. Also, use of SMT components where ever possible would reduce the form factor of detection and control system. Relay contact pitting is an issue and we consider working over it in a future product. All in all the system works fine and perfectly as per our initial design plans.

6. REFERENCES

- [1] "Voltage sag and swell and what to do about them", www.controleng.com
- [2] "Voltage sag", www.wikipedia.org
- [3] "Application of Wavelet Transform to measure the voltage sag in Power line", Azaz Beg et Journal of Scientific & Engineering Research, Volume-4, Issue-5, pages-1033 to 1038, May-2013
- [4] "Arduino" on www.arduino.cc