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AC Generator Paralleling Method

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Abstract

The group designed an AC Generator Paralleling System where a three-phase generator would be connected to the grid and allow to control its supply of real and reactive power to the grid. A synchroscope is used for the determination of any differences in the phase angle between two machines at the time of the synchronization. Materials such as watt meters, resistors, potentiometer, and others were used to design and meet the specifications and standards of the AC Generator Paralleling Method. The group also included a light bulb method in order to check the phase sequence of the two systems.

Background

The goal of making this system was to be able to parallel a generator system in which the generator would be connected to the grid and control its supply of real and reactive power. In order to make the system work and to make sure that the schematic diagram was drawn correctly the group did a testing of the system which would be included in the experiment and testing section of this report. The main purpose of the testing was to make sure that some of the factors met before the synchronization of two electrical inputs. The following aspects should be done before the synchronization: check the complete system for the same voltage of two systems, match the phase rotation and phase angle, and frequency. Once all these parameters are met the synchronization can occur. Synchronization analysis would be included in the section of the experiment and testing of this report.

Objective

The goal of making this system was to be able to parallel a generator system in which the generator would be connected to the grid and control its supply of real and reactive power. The team built multiple prototypes and used a variety of components that did not work properly. Specifically, it was the watt meters that would not measure negative power and the group could not get it to work and in the end, a switch system was used to be able to measure the negative while showing positive numbers.

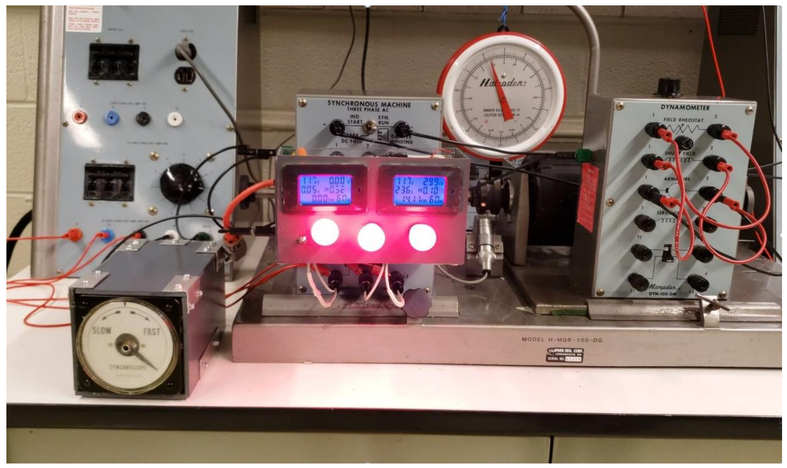

Fig 1. Final equpment set up

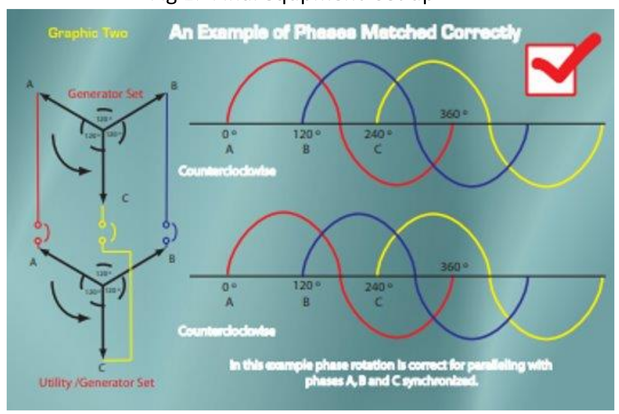

Fig 2. Matched Phase

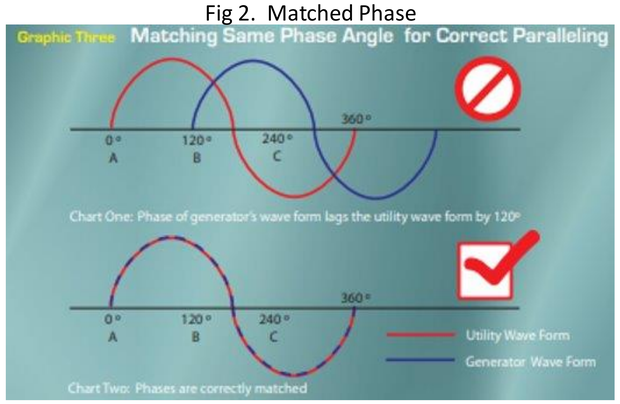

Fig 3: Matched Angle

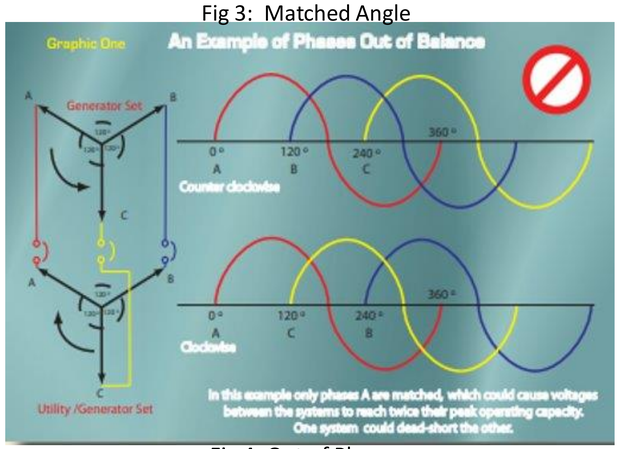

Fig 4: Out of Phase

Methods

- In phase rotation with bulbs connected (The synchroscope rotation would slow down due to high resistance when the bulbs were turned on).
- In phase rotation without the bulbs showed that the synchroscope rotation was smooth.
- Out of phase rotation with bulbs had the bulbs blinking in a sinusoidal wave.
- Torque manipulation was performed after synchronization was achieved

Results

The results of the project were the successful creation of a generator paralleling system. This consisted of achieving full synchronization of the two systems and being able to monitor the synchroscope in real-time as well as control the speed and torque of the system. The bulb method was also a success as it showed how the phases were acting and could also be used in demonstration purposes to show in-phase and out of phase combination. The wattmeters also showed the power flow on both sides of the system.

Conclusion

Overall the project was a success. It was not without its problems like parts breaking and not being able to obtain certain parts as they were not allowed to ship to US. Yet even with all that the group was succefull in complenting the project. The project found similar findings as written material. It was overall a sucefull project with good results.

Acknowledgments

We want to thank Professor Luck for his help in the project especially all the guidance that he gave us throughout the project. We also want to thank TRC companies for their help with theoretical diagrams and conceptual ideas.