Universal charging from PV

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INTRODUCTION

This project has been a part of the course 31015 Introductory project. The general purpose has been to charge a lead acid battery (12 V or 24 V) from a photovoltaic panel, by the use of a Maximum Power Point Tracking (MPPT) system and a DC/DC converter. Secondly the aim has been to investigate the need for MPPT in reference to the extra cost versus efficiency. This is done by implementing the system on a solar cell lightning column provided by the company Alfred Preiss. Thirdly the criteria of the design have been to make the system as cheap and universal as possible. Hence this PV charging system could be a **proper alternative for diesel/gas generators in countries without central power supply**. Our aim has been the African countries.

THEORY

We have primarily used skills obtained in the course, Power electronics. The first issue was to find the proper type of DC/DC converter. Our goal from the beginning was to make the converter as universal as possible. With this in mind we chose to go for the **Single-ended primary-inductor converter** (SEPIC). A SEPIC converter has the advantage of being able to boost the input voltage or to buck the input voltage, which is exactly what we had in mind for our device. Then we calculated the ideal sizes and properties of the components (inductors, capacitors, Schottky diodes and transistors) from the equations, derived from the circuit analysis and in reference to the theory of Mohan (2012).

METHODS

The SEPIC converter was built by hand step for step. Since we did not have any proper sized inductors, we made them by ourselves.
The MPPT algorithm was written in the C programming language, and was configured on the microcontroller (type of dsPIC3F) by a PICkit device.

RESULTS

Results obtained from the first test drive on the 20th of April 2012.
The test was performed with a regular power supply instead of the actual PV. For seven different input voltages and currents the **average efficiency of the device was 87 %** (our goal 75 – 85 %).

CONCLUSION

So far the device has been working with a higher efficiency than expected, though these results have been obtained with a “false” PV panel. The final results will be obtained in the three-week period in June. Regarding the final results we will hopefully be able to present these on the 22th of June.

REFERENCES

Mohan, N. (2012). *Power Electronics - A first course*. New Jersey: John Wiley & Sons