

Semester Thesis:

Hybrid Three-Phase Rectifier for Wind Energy Harvester

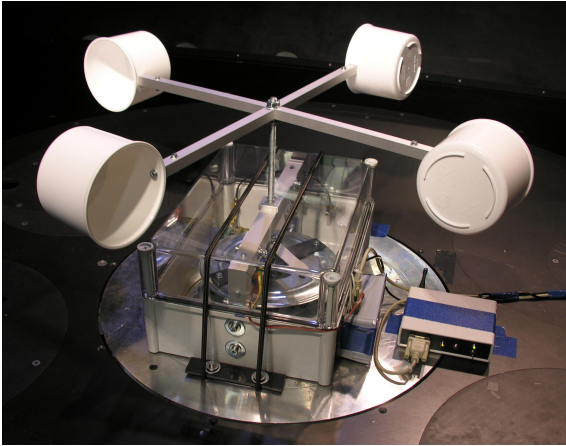


Figure 1: Wind energy harvesting prototype

Motivation and Informal Description: We have built a prototype wind energy harvester (see Fig. 1) which converts wind energy into a electrical energy using a three-phase alternator [1].

Since the output of the power subsystem is an AC signal, it must first be rectified into a DC voltage suitable for use by the attached electronics (e.g., a wireless sensor node).

Passive rectifiers built from silicon diodes are simple and cost effective but exhibit limited conversion efficiency. Active rectifiers, on the other hand, feature improved rectification efficiency at the cost of additional switching circuitry which is restrictive in low-power applications. An alternative design is a hybrid rectifier (see Fig 2), where passive and active rectifier stages are connected in parallel.

Your project: For this semester thesis, you will first design and simulate a hybrid three-phase rectifier circuit as part of the existing wind energy harvesting prototype. Then you will select suitable electronic components and construct a prototype. Finally, you will evaluate the performance of your implementation.

Requirements:

- Experience with a circuit analysis tool (e.g., PSpice)
- Construction of electronic circuits
- Interest in working in the lab with instruments

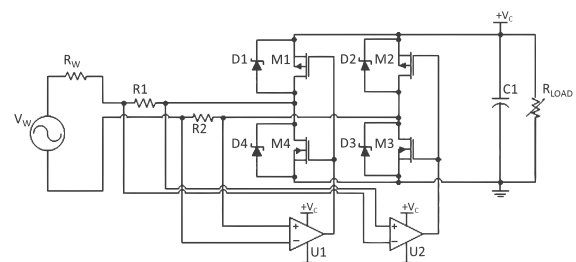


Figure 2: A two-phase hybrid rectifier [2].

Interested? Please have a look at <http://www.tec.ethz.ch/research.html> and contact us for more details!

Contacts

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References

- [1] F. Sutton, Energy Harvesting Wireless Anemometer; Semester Thesis, Distributed Computing Group, ETH Zurich, July 2011.
- [2] D. Porcarelli et. al., Improving the efficiency of air-flow energy harvesters combining active and passive rectifiers; 1st International Workshop on Energy Neutral Sensing Systems, Rome, 2013.