A COMPARATIVE STUDY DC-DC POWER CONVERTER BETWEEN BOOST CONVERTER AND SERIES PARALLEL-LOADED RESONANT CONVERTER (S-PRC) FOR MICRO-FUEL CELLS

This project thesis is presented in partial fulfilment for the award of

Bachelor in Electrical Engineering (Hons)

UNIVERSITI TEKNOLOGI MARA (UITM)

MOHD SUHAIZIL BIN YAAKOP

Faculty of Electrical Engineering

UNIVERSITI TEKNOLOGI MARA (UiTM)

40450 Shah Alam, Malaysia

May 2010

ACKNOWLEDGEMENT

In the name of Allah The Most Gracious and Most Merciful.
Within the Salawat and Salam to Prophet Muhammad S.A.W.

I would like to express my thanks to my supervisor, Dr. Mohammad Nawawi Seroji for his invaluable guidance, assistant, support, encouragement and advice. He has been trying his best in accompanying and guiding me to understand this project correctly and who has given me a lots of motivation so that I can complete this thesis successfully.

I am proud with my commitment and dedication during doing this thesis. I also want to express my special thanks to my beloved parents and all my friends who have encourage and support me along the way.

The last but not least, to all people that involved directly or indirectly with full willingness of contributing their effort, time, energy and idea in helping me completing this thesis. There are no exact words that can express my feeling of gratitude toward them except thank you.

ABSTRACT

Micro-Fuel cells (μ-FCs) are an emerging technology that has attracted lots of attention and research efforts. The fuels used are cheap and abundant, and the fast recharging mechanism makes μ-FCs attractive replacements to many of today's energy sources. This project is aimed to compare two power converters namely Boost Converter and Series Parallel-Loaded Resonant Converter (S-PRC) for μ-FCs that would provide a more efficient power source for consumer electronics. The design is challenging given the low input voltage from a single μ-FC and its load dependent voltage characteristics on Cell Phone.

The theoretical design is compared with the detailed simulation of both power converters carried out using PSIM Simulation software. Beside that, the value of the parameters will also influence the maximum performance of the system. MATLAB software is also used to produce the Voltage Conversion Ratio plot for S-PRC design.

The results of both power converter designs are compared to demonstrate the difference based on the control type, component count & size. The analysis of the both power converters operating in the opened loop operation was analyzed under the steady state conditions.

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CHAPTER 1

INTRODUCTION

This chapter presents on the background of DC-DC converter, basic of boost, buck, buck-boost and resonant converter, problem statement, objective and scope of work of this research. The related subject such as differences between hard switching and resonant switching, soft-switching DC-DC converters and introduction of fuel cells are also overviewed.

1.1 BACKGROUND OF DC-DC CONVERTER

There are many different types of DC-DC converter, each of which tends to be more suitable for some types of application than for others. For convenience they can be classified into various groups, however. For example some converters are only suitable for stepping down the voltage, while others are only suitable for stepping it up; a third group can be used for either. These are several converter topologies that accomplish unregulated DC – regulated DC conversion. These include:

1. Buck Converter (Step-down).
2. Boost Converter (Step-up).
3. Buck-Boost Converter (Step-down/step-up).
4. Resonant Converter.