



**UNIVERSITI PUTRA MALAYSIA**

***NEW METHOD FOR REDUCTION OF HARMONIC OF THREE  
PHASE RECTIFIER USING HARMONIC INJECTION METHOD***

**ALI SAADON MTAIR**

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RECTIFIER USING HARMONIC INJECTION METHOD**

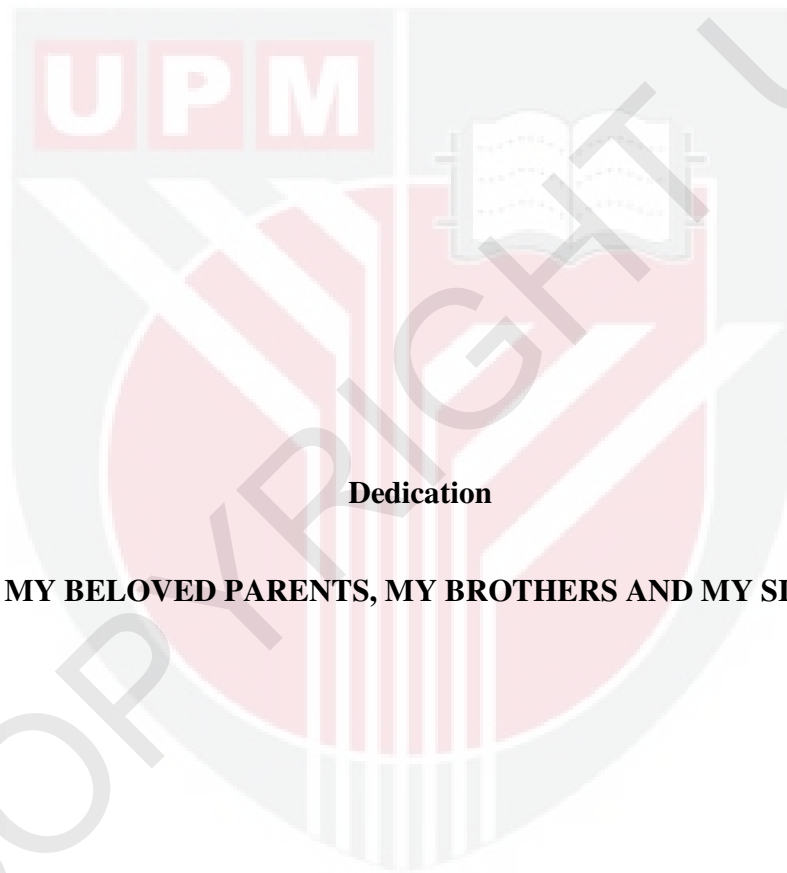


**By**

**ALI SAADON MTAIR**

**Thesis submitted to the School of Graduate Studies, Universiti Putra Malaysia in  
Fulfillment of the Requirements for the Degree of Master of Science**

**October 2011**



**Dedication**

**TO MY BELOVED PARENTS, MY BROTHERS AND MY SISTERS**

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfillment of the requirements for the degree of Master of Science

**NEW METHOD FOR REDUCTION OF HARMONIC OF THREE PHASE RECTIFIER USING HARMONIC INJECTION METHOD**

By

**ALI SAADON MTAIR**

**October 2011**

**Chairman: Professor Madya Norhisam b. Misron**

**Faculty: Engineering**

The three-phase rectifier is becoming more common in power systems. This rectifier produces a non-linear waveform of the input current into a power system. This causes a number of problems for the power system control and for other electrical systems which require such rectifiers. In fact, the harmonic components generated by such power electronic devices have severe effects on several aspects of power networks especially

on distribution. In addition, the high value of Total Harmonic Distortion (THD) causes undesirable distortion on the sinusoidal shape of the wave for the input current.

This thesis proposes a new circuit for three-phase rectifier using harmonic current injection method. The proposed circuit was simulated using MATLAB software. A prototype of the proposed circuit has been developed. The proposed circuit uses active harmonic current injection method with a capacitor bank, which is simple compared to conventional circuits using harmonic current injection method with star-delta transformer as the current injection device.

The prototype has been examined with feedback injection harmonic current to show the validity of the system. The comparison between simulation results and experimental results from the prototype shows minor difference. It has been observed that conventional three-phase rectifiers produce high THD for input currents, i.e., around 7.5%, while the proposed circuit has reduced the THD drawn from the input current supply down to 5.5%. This makes the waveform of the input current close to sinusoidal wave.

Abstrak thesis yang dikemukakan Senate Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains

**KAEDAH BARU UNTUK MENGURANGKAN HARMONIK PENERUS TIGA FASA MENGGUNAKAN KAEDAH SUNTIKAN HARMONIK**

Oleh

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**Oktober 2011**

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Penerus tiga fasa menjadi perkara biasa dalam sistem kuasa. Ianya menghasilkan gelombang arus yang tidak terurus ke dalam sistem kuasa. Ini menyebabkan pelbagai masalah pada sistem kuasa dan sistem elektrik yang lain di mana penerus diperlukan. Tambahan pula, komponen harmonik dihasilkan oleh peralatan elektronik kuasa mempunyai kesan buruk terhadap beberapa aspek jaringan kuasa terutamanya dalam pengagihan. Tambahan pula, ketinggian jumlah gangguan harmonik (THD) menyebabkan gangguan yang tidak diingini terhadap bentuk sinusoidal arus gelombang masukan.

Tesis ini mencadangkan litar baru untuk penerus tiga fasa menggunakan cara cucukan arus harmonik. Litar yang dicadangkan telah disimulasi dengan menggunakan MATLAB. Prototaip litar cadangan telah dibangunkan. Litar cadangan menggunakan cucukan arus harmonik yang aktif dengan bank kapasitor di mana ianya lebih ringkas berbanding dengan litar sedia ada menggunakan cara cucukan arus harmonik dengan pengubah segitiga-bintang sebagai peralatan arus cucukan.

Prototaip telah diperiksa dengan maklum balas arus cucukan harmonik menunjukkan pergesahan terhadap sistem. Perbandingan antara keputusan simulasi dan keputusan amali menunjukkan perbezaan minor. Pemerhatian terhadap penerus konvensional penukar arus terus tiga fasa menghasilkan THD yang tinggi untuk arus terus, sebagai contoh 7.5%, sementara litar yang dicadangkan telah menurunkan THD arus masukan bekalan kepada 5.5%. Ini menjadikan bentuk gelombang arus masukan hampir kepada sinusoidal.

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I certify that an Examination Committee met on \_\_ to conduct the final examination of Ali Saadon Mtair AL-Ogaili on his Master of Science thesis entitled” Improvement of Current Harmonic in Three-Phase Bridge Rectifier Using Harmonic Current Injection Method” in accordance with Universiti Putra Malaysia (Higher Degree) Act 1980 and Universiti Pertanian Malaysia (Higher Degree) Regulation 1981. The Committee recommends that the candidate be awarded the relevant degree. Members of the Examination Committee are follows:

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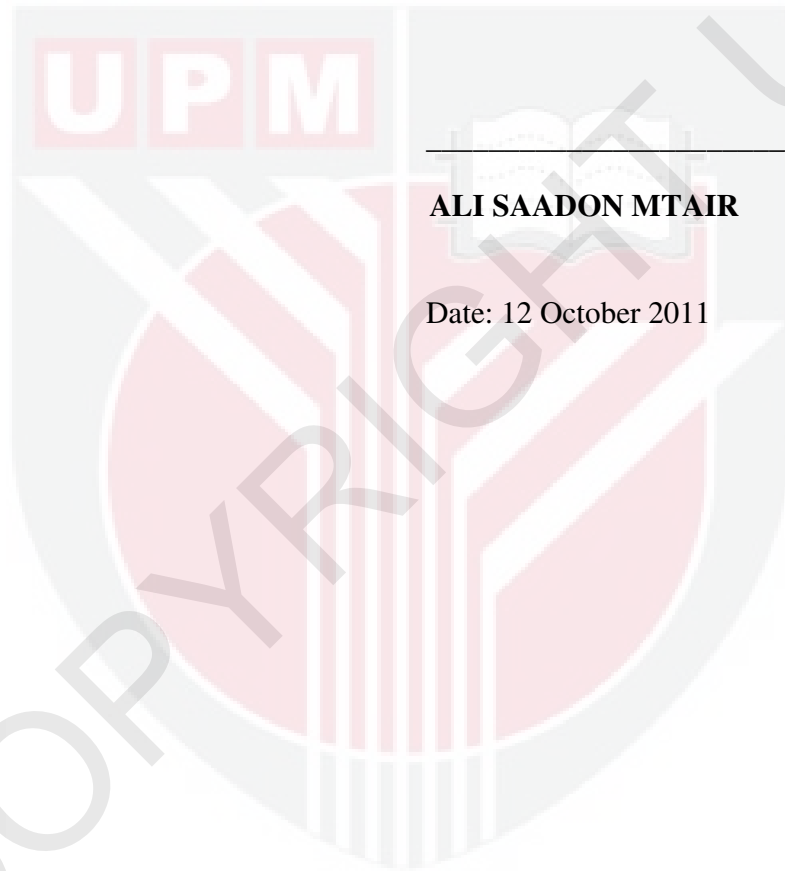
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## DECLARATION

I declare that the thesis is my original work except for quotations and citations, which have been duly acknowledged. I also declare that it has not been previously, and is not concurrently, submitted for any other degree at Universiti Putra Malaysia or at any other institution.



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**ALI SAADON MTAIR**

Date: 12 October 2011

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