بسم الله الرحمن الرحيم

قال تعالى :

قُلْ آمَنَّا بِاللَّهِ وَمَا أُنزِلَ عَلَيْنَا وَمَا أُنزِلَ عَلَىٰ إِبْرَاهِيمَ
وَإِسْمَاعِيلَ وَإِسْحَاقَ وَيَعْقُوبَ وَالْأَسْبَاطِ وَمَا أُوتِيَ
مُوسَىٰ وَعِيسَىٰ وَالنَّبِيُّونَ مِن رَّبِّهِمْ لَا نُفَرِّقُ بَيْنَ أَحَدٍ
مِّنْهُمْ وَنَحْنُ لَهُ مُسْلِمُونَ ﴿84﴾

(صدق الله العظيم)

(سورة آل عمران الآية **84**)

Dedication

- To my family.
- To my parents.
- To my university and my teachers in my every step of education.
- To my friends.

Acknowledgement

First of all, i would like to thank my great god for help me to complete this research.

I would like to express my deepest appreciation to my supervisor Dr. Nagm Eldeen Abdo Mustafa Hassanian for all his assistance during this master thesis work, and everybody help me to success of this research.

Abstract:

In this research a high performance battery charger for hybrid electric vehicle is designed to charge the batteries of hybrid electric vehicles, which used fuel-powered and electricity. Three-phase boost rectifier (universal bridge) using diode and isolated gate bipolar transistor is used. It has advantages of Bi-directional power transfer capability and unity power factor operation. To control the DC output voltage the voltage Oriented Control method with pulse width modulation has been used.

Matlab/Simulink software is used to simulate the mathematical model. The DC output voltage with unity power factor (reactive power equal to zero) is obtained.

The charger of hybrid electric vehicle battery must be fully adapted to the battery to preserve the battery from damage and prevent harmonic current in the grid.

المستخلص

في هـذا البحـث تـم تصـميم شـاحن ذو كفـاءة عـاليه يمكـن استخدامه لشحن البطاريات في السيارات الكهربائية الهجين والـتي تعمـل بنظام الوقـود و الكهربـاء.أسـتخدم فـي تحويـل القـدرة مقومـة القنطـرة العامة ثلاثية الأطوار التي تستخدم الثنائي مع الترانستور ثنائي القطبية ذو البوابة المعزولة. وهذه الأليه تمتـاز بأنهـا ثنـائيه الاتجـاه فـي تحويـل التيـار وتحسين لمعامل القدرة. للتحكم في عمليه التقويم وللحصـول علـي جهـد مستمر دون تموجات تم استخدام تقنيـه تعـديل عـرض النبضـة ومخطـط السيطرة علي الجهد الموجه وهي من أفضل الطرق عاليـة الأداء للتحكـم في الجهد الناتج عن عملية التقويم

تـم اسـتخدام برنامـج المحاكـاة (Matlab\Simulink) لتمثيـل النموذج الرياضي الكامل للنظام . وتم الحصول علي جهـد مسـتمر كامـل التقويم مع معامل قدره الوحدة.

شاحن البطارية المستخدم في السيارة الكهربائيـة الهجيـن يجـب أن يكون ملائم للجهد بشكل جيد للحفاظ على البطارية من التلف وكـذلك لمنع حدوث التيارات التوافقية في الشبكة الناتجة من عمليه التقويم.

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List of Abbreviations

Symbols	Descriptions
PWM	Pulse width modulation
IGBT	Isolated gate bipolar transistor
PLL	Phase Look Loop
VOC	Voltage oriented control
DPC	Direct power control
Li-ion	Lithium –ion
HEV	Hybrid electric vehicle
PI	Proportional Integral
PFC	Power Factor Correction
VCO	voltage controlled oscillator