



Optimal Power Factor Correction Effects Based On Energy Conservation System

by

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A thesis submitted in fulfillment of the requirement for the award of degree of
Doctor of Philosophy

**School of Electrical System Engineering
UNIVERSITI MALAYSIA PERLIS**

2015

ACKNOWLEDGEMENT

Alhamdulillah, for without His will, I would certainly cannot pursue this project successfully. I would like to express my greatest gratitude to my last supervisor Professor Dr. Ismail bin Daut for his support, patience and guidance throughout the entire project. Thank you also to Dean, School of Electrical System Engineering and my current supervisor Associate Professor Dr Mohd Fareq bin Abd Malek for his full support, patience and guidance throughout the Thesis correction and comments. His determination has certainly pushed me adhere to the schedule. Thank you to my parents for their eternal support and love. Endless gratitude to the project paper committees and the lecturers especially Dr. Mohd Irwanto Misrun, Dr. Mohd Irwan Yusoff, Dr Gomesh Nair and all lecturer in UniMAP that had sincerely helped and contributed their efforts during 'painful' periods of making this project works. Also to Deputy Director General, Department of Environment Malaysia, Dato' Dr. Ahmad KamarulNajuib bin Che Ibrahim, Director DOE Johor, Encik Mokhtar bin Abdul Majid and DOE Staff for their friendship and companion and last but not least thanks to those who are involved in this project directly or indirectly, may Allah S.W.T. bless of you.

THANK YOU

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TABLE OF CONTENTS

	PAGE
THESIS DECLARATION	i
ACKNOWLEDGEMENT	ii
TABLE OF CONTENTS	iii
LIST OF TABLES	ix
LIST OF FIGURES	xiii
LIST OF ABBREVIATIONS	xx
LIST OF SYMBOL	xxi
ABSTRAK	xxii
ABSTRACT	xxiii
CHAPTER 1 - INTRODUCTION	
1.1 Introduction	1
1.2 Significant of the study	4
1.3 Problem Statement	7
1.4 Objective of the study	8
CHAPTER 2 – LITERATURE REVIEW	
2.1 Introduction	9
2.2 AC Supply	10
2.3 Cause of Low Power Factor	13
2.4 Lower utility fees when improving power factor	14
2.4.1 Reducing peak W billing demand	14

2.4.2	Eliminating the Power Factor penalty	14
2.5	Benefits of Improving Power Factor	15
2.6	Method of Power Factor Correction	15
2.6.1	Fluoresave	15
2.6.2	Capacitor Installation	16
2.7	Description about Power Factor Correction control IC FA 5501	16
2.7.1	Features	16
2.7.2	Block Diagram	17
2.7.3	Pin-Assignment	18
2.8	Description of Hybrid Filtering System	20
2.8.1	Changing Operation	21
2.8.2	Power Factor Correction Operation	23
2.9	History of Harmonics	23
2.10	Harmonic Filtering	27
2.10.1	Passive Filter	28
2.10.2	Active Filter	28
2.11	Power Quality	31
2.11.1	Why Power Quality is Important	35
2.11.2	Definition of Power Quality Terms	36
2.12	Inverters	40
2.13	Rectifier	41
2.14	Induction Motor	41
2.15	Induction Generator	42

2.16	Noise	43
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CHAPTER 3 – RESEARCH METHODOLOGY

3.1	System Design Overview	44
3.1.1	Battery Storage Bank	45
3.2	Energy Conservation System Transmission Method	47
3.3	Inverters Design and Topologies	48
3.3.1	Design Modification	49
3.4	Inverter Circuit Stage	50
3.4.1	Control Circuit	50
3.4.2	Power Circuit	51
3.4.3	Transformer	52
3.5	Electronic Components	53
3.5.1	Power Device	53
3.5.2	Control Device	54
3.6	Simulation Procedure	54
3.6.1	Multisim software	55
3.7	Hardware Prototype	57
3.8	Simulation result of Push-Pull Inverter	60
3.9	Simulation from Power Inverter Circuit	61
3.9.1	No-Load Test Output Waveform	62
3.10	Full Bridge Inverter	66
3.10.1	IGBT	68
3.10.2	Snubber Circuit	69

3.11	Simulation Circuit of Full Bridge Inverter	71
3.11.1	Sinusoidal Pulse Width Modulation	71
3.11.2	Full Bridge Inverter Simulation Result	75
3.12	Hybrid Filtering System	82
3.12.1	Application Circuit	83
3.12.2	Circuit Function	92
 CHAPTER 4 – INVESTIGATION PROCEDURE AND RESULTS		
4.1	Introduction	96
4.2	Investigation Set-Up	97
4.3	Troubleshooting	101
4.4	Investigation Results	101
4.5	The Investigation Result Source by Inverter in No- Load Test and Variable Load Test	102
4.5.1	The investigation % VTHD results source by Inverter in no-load test	102
4.5.2	The investigation of harmonics effects and power factor source by Inverter with 0.5 HP Induction Motor as a load	103
4.5.3	The investigation of harmonics effects and power factor source by Inverter with 1.0 HP Induction Motor as a load	107
4.5.4	The investigation of harmonics effects and power factor source by Inverter with 1.5 HP Induction Motor as a load	111
4.5.5	The investigation of harmonics effects and power factor source by Inverter with 2.0 HP Induction Motor as a load	115

4.6	THD Percentage Variation with Passive Filter	119
4.7	THD Percentage Variation with Active Filter	123
4.8	The Graph Comparison of different types of Inverter with variable horse power load of Induction Motor	127
4.8.1	Investigation graft with load Induction Motor 0.5 HP	127
4.8.2	Investigation graft with load Induction Motor 1.0 HP	131
4.8.3	Investigation graft with load Induction Motor 1.5 HP	135
4.8.4	Investigation graft with load Induction Motor 2.0 HP	139
4.9	Investigation results on Conventional PFC and Hybrid Filtering System	143
4.9.1	Comparison at 20V	143
4.9.2	Comparison at 40V	145
4.9.3	Comparison at 80V	147
4.9.4	Comparison at 120V	149
4.9.5	Comparison at 160V	151
4.9.6	Comparison at 240V	153
4.10	Simulation results using MotorSolve Software	155
4.10.1	Single Phase Induction Motor (0.5HP)	155
4.11	Comparison of the Speed, Percentage of THDi and Power Factor of Single Phase Induction Motor (0.5HP) (Full Load)	158
4.10.1	Comparison of Speed	158
4.11.2	Comparison of the percentage of THDi	160
4.11.3	Comparison of the Power Factor	161
4.12	Comparison of the Power Factor and Efficiency of Single Phase Induction Motor (0.5HP) (Different Load)	163

4.13	The effect of Power Factor Improvement on Power Loss of Single Phase Induction Motor (0.5HP)(No Load)	165
4.13.1	Relationship among Power Factor, Friction and Windage Losses of Single Phase Induction Motor (0.5HP)	168
4.13.2	Relationship between Power Factor and Rotor Loss of Single Phase Induction Motor (0.5HP)	168
4.13.3	Relationship between Power Factor and Stator Copper Loss of Single Phase Induction Motor (0.5HP)	170
4.13.4	Relationship between Types of Losses with Power Factor and Efficiency of Single Phase Induction Motor (0.5HP)	172
4.14	The Noise Emission Monitoring Investigation	176
CHAPTER 5 – DISCUSSION AND ECONOMICAL ASPECTS		
5.1	Discussion	180
5.2	Summary	190
5.3	Economical Aspects and Its Factor of Assessment	192
CHAPTER 6 – CONCLUSION AND RECOMMENDATION		
6.1	Conclusion	197
6.2	Recommendation	199
REFERENCES		200
APPENDIX A		206
LIST OF PUBLICATION		206
APPENDIX B		209
LIST OF AWARDS		209

LIST OF TABLES

NO.		PAGE
2.1	Pin Assignment of IC FA5501	19
2.2	The value of components in the Active Filter	31
3.1	The specification of TIP35C Transistor	53
3.2	Simulation results comparison between Single Phase Push-Pull Inverter and Dual-Push Pull Inverter Circuit	63
4.1	The percentage of voltage Total Harmonics Distortion (%VTHD) source by Inverter in No-Load Test	102
4.2	The percentage of voltage Total Harmonics Distortion (%VTHD) source by Inverter with 0.5HP Induction Motor as a load	103
4.3	The percentage of current Total Harmonics Distortion source by Inverter with 0.5HP Induction Motor as a load	104
4.4	The percentage of 3 rd harmonics distortion source by Inverter with 0.5HP Induction Motor as a load	104
4.5	The percentage of 5 th harmonics distortion source by inverter with 0.5HP Induction Motor as a load	105
4.6	The percentage of 7 th harmonics distortion source by inverter with 0.5HP Induction Motor as a load	105
4.7	The Power Factor source by Inverter with 0.5HP Induction Motor as a load	106
4.8	The speed of motor source by Inverter with 0.5HP Induction Motor as a load	106
4.9	The percentage of voltage Total Harmonics Distortion (%VTHD) source by Inverter with 1.0HP Induction Motor as a load	107
4.10	The percentage of current Total Harmonics Distortion source by Inverter with 1.0HP Induction Motor as a load	108

4.11	The percentage of 3 rd harmonics distortion source by Inverter with 1.0HP Induction Motor as a load	108
4.12	The percentage of 5 th harmonics distortion source by inverter with 1.0HP Induction Motor as a load	109
4.13	The percentage of 7 th harmonics distortion source by inverter with 1.0HP Induction Motor as a load	109
4.14	The Power Factor source by Inverter with 1.0HP Induction Motor as a load	110
4.15	The speed of motor source by Inverter with 1.0HP Induction Motor as a load	110
4.16	The percentage of voltage Total Harmonics Distortion (%VTHD) source by Inverter with 1.5HP Induction Motor as a load	111
4.17	The percentage of current Total Harmonics Distortion source by Inverter with 1.5HP Induction Motor as a load	112
4.18	The percentage of 3 rd harmonics distortion source by Inverter with 1.5HP Induction Motor as a load	112
4.19	The percentage of 5 th harmonics distortion source by inverter with 1.5HP Induction Motor as a load	113
4.20	The percentage of 7 th harmonics distortion source by inverter with 1.5HP Induction Motor as a load	113
4.21	The Power Factor source by Inverter with 1.5HP Induction Motor as a load	114
4.22	The speed of motor source by Inverter with 1.5HP Induction Motor as a load	114
4.23	The percentage of voltage Total Harmonics Distortion source by Inverter with 2.0HP Induction Motor as a load	115
4.24	The percentage of current Total Harmonics Distortion source by Inverter with 2.0HP Induction Motor as a load	116
4.25	The percentage of 3 rd harmonics distortion source by Inverter with 2.0HP Induction Motor as a load	116

4.26	The percentage of 5 th harmonics distortion source by inverter with 2.0HP Induction Motor as a load	117
4.27	The percentage of 7 th harmonics distortion source by inverter with 2.0HP Induction Motor as a load	117
4.28	The Power Factor source by Inverter with 2.0HP Induction Motor as a load	118
4.29	The speed of motor source by Inverter with 2.0HP Induction Motor as a load	118
4.30	Input Voltage at 20V with Passive Filter	119
4.31	Input Voltage at 60V with Passive Filter	120
4.32	Input Voltage at 100V with Passive Filter	120
4.33	Input Voltage at 140V with Passive Filter	121
4.34	Input Voltage at 180V with Passive Filter	121
4.35	Input Voltage at 240V with Passive Filter	122
4.36	Input Voltage at 20V with Active Filter	123
4.37	Input Voltage at 60V with Active Filter	124
4.38	Input Voltage at 100V with Active Filter	124
4.39	Input Voltage at 140V with Active Filter	125
4.40	Input Voltage at 180V with Active Filter	125
4.41	Input Voltage at 240V with Active Filter	126
4.42	The percentage of the speed increase with three types of filtering systems compared to without filtering system	159
4.43	The percentage of THD _i decrease with three types of filtering systems compared to without filtering system	161
4.44	The percentage of Power Factor Increase with tree types of filtering systems compared to without filtering system	163
4.45	Block Rotor test data of single phase Induction Motor	169

4.46	Rotor Loss of single phase Induction Motor	170
4.47	DC Resistance test of Single Phase Induction Motor	171
4.48	Stator Copper Loss of Single Phase Induction Motor	172
4.49	Segregation of losses for Single Phase Induction Motor	173
5.1	Bill Consumption for variation filtering system and power factor correction	193

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LIST OF FIGURES

NO.		PAGE
2.1	Sine Wave	12
2.2	Fundamental with two harmonics	12
2.3	Block diagram of IC FA 5501	17
2.4	Pin assignment of IC FA 5501	18
2.5	Outline of Hybrid Filtering System circuit	20
2.6	Timing chart of switching operation	22
2.7	Connection a nonlinear load	26
2.8	Passive filter	28
2.9	Active filter	30
2.10	Graphical representation of Power Quality parameters	32
2.11	Power Quality at a Glance	33
2.12	Classical model of the power system	34
2.13	Modern model of the power system	35
2.14	Oscillatory transients	40
3.1	Design flow overview for Power Factor Correction Converter and Turbine Generator System	44
3.2	12V batteries connection to increase battery bank storage capacity	45
3.3	Energy Conservation System transmission method	47
3.4	Block diagram of the Inverter circuit design using Push-Pull Topology	48
3.5	Push-Pull configuration	49

3.6	Block diagram of Inverter circuit design using two Push-Pull Circuit	50
3.7	Control Circuit diagram	51
3.8	Power Circuit diagram	52
3.9	Center-tapped transformer block diagram	52
3.10	The TIP35C transistor	53
3.11	Pin connection diagram of CD4047	54
3.12	Flow chart of the software procedure	55
3.13	Inverter circuit diagram using Multisim	56
3.14	Test setup to measure the output waveform, voltage and harmonics with no load connected	59
3.15	Test setup to measure the output waveform, voltage and harmonics with no load connected	59
3.16	Simulation result	60
3.17	Simulation result	61
3.18	The simulation result of Inverter output voltage using Single Push-Pull circuit	64
3.19	The simulation result of inverter output voltage waveform using Dual Push-Pull Circuit	65
3.20	Full Bridge Inverter	66
3.21	The current and voltage signal for Inverter circuit	67
3.23	Structure of IGBT	68
3.23	(a) Schematic circuit	70
	(b) IGBT turn-off with/without polarized snubber	70
3.24	Design Schematic to generate SPWM pattern without L-C filter using PSPICE software	71
3.25	The SPWM pattern in PSPICE software	73

3.26	Design Schematic to generate SPWM pattern with L-C filter using PSPICE software	73
3.27	The experimental Full Bridge Inverter	75
3.28	Simulation of Voltage stress and power losses at IGBT	76
3.29	Simulation of Power losses at inverter output	77
3.30	Simulation of Inverter output voltage without using L-C filter	78
3.31	Simulation of Inverter output voltage with using L-C filter	79
3.32	Simulation of Harmonic content at Inverter output without using L-C filter	80
3.33	Simulation of Harmonic content at Inverter output with using L-C filter	81
3.34	Typical application circuit	82
3.35	Application circuit for Hybrid Filtering System	83
3.36	Layout design for Hybrid Filtering System	94
3.37	The actual circuit of Hybrid Filtering System	95
4.1	Investigation set-up for testing the Inverter with no-load and load test without filter	97
4.2	Investigation set-up for testing Inverter with filtering system in Energy Conservation system	99
4.3	Investigation set-up for testing with Hybrid Filtering System	100
4.4	The % VTHD Vs load 0.5HP Induction Motor between different Inverter	127
4.5	The % THDi Vs load 0.5HP Induction Motor between different Inverter	128
4.6	The 3 rd harmonics Vs load 0.5HP Induction Motor between different Inverter	128
4.7	The 5 th harmonics Vs load 0.5HP Induction Motor between different Inverter	129

4.8	The 7 th harmonics Vs load 0.5HP Induction Motor between different Inverter	129
4.9	The Power Factor Vs load 0.5HP Induction Motor between different Inverter	130
4.10	The Speed Vs load 0.5HP Induction Motor between different Inverter	130
4.11	The %VTHD Vs load 1.0HP Induction Motor between different Inverter	131
4.12	The % THDi Vs load 1.0HP Induction Motor between different Inverter	132
4.13	The 3 rd harmonics Vs load 1.0HP Induction Motor between different Inverter	132
4.14	The 5 th harmonics Vs load 1.0HP Induction Motor between different Inverter	133
4.15	The 7 th harmonics Vs load 1.0HP Induction Motor between different Inverter	133
4.16	The Power Factor Vs load 1.0HP Induction Motor between different Inverter	134
4.17	The Speed Vs load 1.0HP Induction Motor between different Inverter	134
4.18	The %VTHD Vs load 1.5HP Induction Motor between different Inverter	135
4.19	The % THDi Vs load 1.5HP Induction Motor between different Inverter	136
4.20	The 3 rd harmonics Vs load 1.5HP Induction Motor between different Inverter	136
4.21	The 5 th harmonics Vs load 1.5HP Induction Motor between different Inverter	137
4.22	The 7 th harmonics Vs load 0.5HP Induction Motor between different Inverter	137
4.23	The Power Factor Vs load 0.5HP Induction Motor between different Inverter	138

4.24	The Speed Vs load 0.5HP Induction Motor between different Inverter	138
4.25	The %VTHD Vs load 2.0HP Induction Motor between different Inverter	139
4.26	The % THDi Vs load 2.0HP Induction Motor between different Inverter	140
4.27	The 3 rd harmonics Vs load 2.0HP Induction Motor between different Inverter	140
4.28	The 5 th harmonics Vs load 2.0HP Induction Motor between different Inverter	141
4.29	The 7 th harmonics Vs load 2.0HP Induction Motor between different Inverter	141
4.30	The Power Factor Vs load 2.0HP Induction Motor between different Inverter	142
4.31	The Speed Vs load 2.0HP Induction Motor between different Inverter	142
4.32	The Harmonics Average Vs Harmonics Number between Conventional PFC and Hybrid Filtering System at 20V	143
4.33	The %THD Vs Harmonics Number between Conventional PFC and Hybrid Filtering System at 20V	144
4.34	The Power Factor Vs Harmonics Number between Conventional PFC and Hybrid Filtering System at 20V	144
4.35	The Harmonics Average Vs Harmonics Number between Conventional PFC and Hybrid Filtering System at 40V	145
4.36	The %THD Vs Harmonics Number between Conventional PFC and Hybrid Filtering System at 40V	145
4.37	The Power Factor Vs Harmonics Number between Conventional PFC and Hybrid Filtering System at 40V	146
4.38	The Harmonics Average Vs Harmonics Number between Conventional PFC and Hybrid Filtering System at 80V	147
4.39	The %THD Vs Harmonics Number between Conventional PFC and Hybrid Filtering System at 80V	147

4.40	The Power Factor Vs Harmonics Number between Conventional PFC and Hybrid Filtering System at 80V	148
4.41	The Harmonics Average Vs Harmonics Number between Conventional PFC and Hybrid Filtering System at 120V	149
4.42	The %THD Vs Harmonics Number between Conventional PFC and Hybrid Filtering System at 120V	149
4.43	The Power Factor Vs Harmonics Number between Conventional PFC and Hybrid Filtering System at 120V	150
4.44	The Harmonics Average Vs Harmonics Number between Conventional PFC and Hybrid Filtering System at 120V	151
4.45	The %THD Vs Harmonics Number between Conventional PFC and Hybrid Filtering System at 120V	151
4.46	The Power Factor Vs Harmonics Number between Conventional PFC and Hybrid Filtering System at 120V	152
4.47	The Harmonics Average Vs Harmonics Number between Conventional PFC and Hybrid Filtering System at 240V	153
4.48	The %THD Vs Harmonics Number between Conventional PFC and Hybrid Filtering System at 240V	153
4.49	The Power Factor Vs Harmonics Number between Conventional PFC and Hybrid Filtering System at 240V	154
4.50	The Nameplate Data of Single Phase Induction Motor	155
4.51	The graph of the Power Factor Vs Rotor Speed of Single Phase Induction Motor	156
4.52	The graph of the Efficiency Vs Rotor Speed of Single Phase Induction Motor	157
4.53	The graph of the Speed Vs Input Voltage of Single Phase Induction Motor (Full Load)	158
4.54	The graph of the percentage of THD _i Vs Input Voltage of Single Phase Induction Motor (Full Load)	160
4.55	The graph of the Power Factor Vs Input Voltage of Single Phase Induction Motor (Full Load)	162

4.56	The graph of the Power Factor Vs Percentage Loads of Single Phase Induction Motor	164
4.57	The graph of the Efficiency Vs Percentage Loads of Single Phase Induction Motor	165
4.58	The graph of the Input Power Vs Input Voltage of Single Phase Induction Motor (No Load)	166
4.59	The graph of the Power Factor Vs Input Voltage of Single Phase Induction Motor (No Load)	167
4.60	The graph of the Separating Friction and Windage Loss Based on No-Load Data of Single Phase Induction Motor	168
4.61	The Power Factor (%) and Efficiency (%) of Single Phase Induction Motor	174
4.62	Power Losses of Single Phase Induction Motor	175
4.63	The Noise Emission Monitoring at Energy Conservation System during Day Time	177
4.64	The Noise Emission Monitoring at Energy Conservation System during Night Time	178

LIST OF ABBREVIATIONS

W	Power
p.f	Power Factor
kVA	Apparent Power
kVAR	Reactive power
f	Frequency
DC	Direct Current
AC	Alternate Current
I	Current
V	Voltage
n	Speed
P.Q	Power Quality
C	Capacitance
L	Inductance
R	Resistance
τ	Torque
η	Efficiency
t	Time
N	Winding

LIST OF SYMBOL

W	Power (Watt)
p.f	Power Factor
kVA	Apparent Power (Kilo Volt-ampere)
kVAR	Reactive Power (Kilo-Vars)
f	Frequency (Hertz)
DC	Direct Current(Volt)
AC	Alternate Current (Volt)
I	Current (Amprere)
V	Voltage (Volt)
n	Speed (rpm)
P.Q	Power Quality
C	Capacitance (Farad)
L	Inductnace (Henry)
R	Resistance (ohm)
τ	Torque (N.m)
η	Efficiency (%)
t	Time (Second)
N	Winding (Turns)

Kesan Pembetulan Faktor Kuasa Optimum Berasaskan Sistem Penjimatan Tenaga

ABSTRAK

Dalam tesis ini, aplikasi inverter dan teknik pembetulan faktor kuasa di dalam sistem penjimatan tenaga dibentangkan secara komprehensif. Beberapa kaedah diperkenalkan untuk menindas harmonik ke peringkat rendah dan kaedah peningkatan pembetulan faktor kuasa pada sistem dengan keputusan yang diperolehi dibincangkan di dalam tesis ini. Secara umumnya, kaedah reka bentuk penyongsang dan penapisan sistem dibincangkan, dan kajian perbandingan dilakukan berdasarkan kepada tenaga bersih, aspek ekonomi dan keberkesanan. Dengan mereka bentuk teknik-teknik yang perlu dan metodologi, faktor keseluruhan kuasa (PF) dan kesan ganjil harmonik sehingga herotan harmonik ke 7 boleh meningkat kepada jangkaan. Kaedah menggunakan dan diuji pembolehkan penyongsang dan penapisan sistem dilaksanakan dalam kajian ini dan ia telah digunakan untuk menjana tenaga bersih dan kitar semula pada sistem penjimatan tenaga. Dalam kajian ini juga menerangkan aplikasi penyongsang, pembetulan faktor kuasa dan peralatan kawalan harmonik untuk beban pada kuasa-kuda yang berbeza (hp) bagi motor induksi. Tesis ini juga menyampaikan teknik yang berkaitan reka bentuk penyongsang jambatan penuh dan pembetulan faktor kuasa litar Sistem Penapisan Hibrid. Pengukuran telah dijalankan untuk mencirikan generasi dan faktor kuasa keperluan harmonik beban. Utiliti elektrik membekalkan kemudahan baru ini memerlukan bahawa motor induksi memenuhi had semasa harmonik dinyatakan oleh standard IEEE 519. Dalam tesis ini, perbandingan antara jenis Inverter, sistem penapisan seperti penapis pasif dan aktif, pembetulan faktor kuasa konvensional (PFC) dan Sistem Penapisan Hibrid telah dibincangkan. Perbandingan yang dilakukan antara inverter itu, sistem penapisan, pembetulan faktor kuasa konvensional (PFC) dan Sistem Penapisan Hibrid untuk membandingkan harmonik purata dari asas bawah sehingga harmonik ke 7, peratusan jumlah harmonik penyelewengan (% THD), kelajuan motor, kerugian dan faktor kuasa. Dari hasil uji kaji yang diperolehi ia telah mendapati bahawa jumlah harmonik penyelewengan akan dikurangkan sehingga 7% dan faktor kuasa akan meningkat kepada 0.97 dengan menggunakan Sistem Penapisan Hibrid.

Optimal Power Factor Correction Effects Based On Energy Conservation System

ABSTRACT

This thesis present an application of inverter and power factor correction technique on energy conservation system were presented comprehensively. Some methods were introduced to suppress low order harmonics and improve the power factor correction on the system and their results obtained were discussed. In general, the method of design inverter and filtering systems were identified, and comparative studies were performed based on their ease of applications, clean energy, economic aspects and effectiveness. By designing the necessary techniques and methodology, the overall power factor (PF) and the odd harmonic effects until 7th harmonic distortion were improved in accordance to the expected result. Method of utilizing and testing the variable for inverter and filtering system were performed in this study and was applied to generate clean and recycling energy on the energy conservation system. This thesis present results of the applications of inverter, power factor correction and harmonic control equipment for loads on a different horsepower (hp) of induction motor. This thesis also presented the related techniques of designed full bridge inverter and Hybrid Filtering System. Computation was conducted to characterize the harmonic generated and power factor requirements of the load. The electric utility supplying the new facility required that the induction motor meet the harmonic current limits specified by the IEEE 519 standard. This thesis present the comparisons between the different types of inverter, filtering system such as passive and active filter, conventional power factor correction (PFC) and Hybrid Filtering System were discussed. the comparison is performed between the inverter, filtering system, conventional power factor correction and Hybrid Filtering System to compare the average harmonic from fundamental until 7th harmonic, percentage of total harmonic distortion (%THD), speed of motor, losses and power factor. From the experimental result obtained it was found that total harmonic distortion will be reduced by 7% and the power factor will be increased to 0.97 by using the Hybrid Filtering System.

CHAPTER 1

INTRODUCTION

1.1 Introduction

Electric power quality study consists of determining momentary variations in voltage, current and frequency relative to their steady state values under consideration. If the sensitive equipment works as planned then there is no need to conduct power quality survey, otherwise it becomes unavoidable. Restrictions on AC supply lines are more severe today as compared to past but the loads are creating more transients and distortions than the older versions of the similar equipment. Alternatively, today's industrial load themselves destroy power quality and require utility to provide fresh clean AC power supply. It has been observed that the loads more sensitive to power quality are often the source of its garbage. Among disturbance voltages sags, caused by usually short circuit faults, are more significant and frequent than impulses, harmonics, outages, surges, spikes and impulses. Voltage sags and surges can garble computer system data even if the transient time is sufficiently expeditious. System hardware is withal affected very lamentably if the utility spinning reserve is low. Momentary interruptions do cause operational quandaries for sensitive industrial equipment. Like voltages sags transient over voltages can additionally disrupt operation of electronic equipment. Short duration transients and momentary harmonic resonance are most arduous power quality quandary to identify and to eliminate (N. Khan, 2003).