CLASSIFICATION OF PARTIAL DISCHARGE USING COMBINATION OF ACOUSTIC EMISSION DETECTION AND S-TRANSFORM ANALYSIS

Thesis is presented in partial fulfillment for the award of the

Bachelor of Engineering (Hons) Electrical

UNIVERSITI TEKNOLOGI MARA

MOHD HAKIM BIN SHAHBUDIN

FACULTY OF ELECTRICAL ENGINEERING

UNIVERSITI TEKNOLOGI MARA (UiTM)

SHAH ALAM

JANUARY 2013

ACKNOWLEDGEMENT

In the name of Allah The Most Merciful,

Honestly, Alhamdulillah, thanks to Allah S.W.T for the blessing of the Final Year Project including the report and submit it on time. With full effort without knowing the meaning of tiredness and surrender, finally this project is completed. Thank and really appreciate to our one and only tolerable supervisor, Dr. Ahmad Farid Abidin. Without his high dedication, responsibilities and motivation in guiding, this project will not be completed.

Thanks to parents and families for their full support. In addition thanks to our colleagues who always support and push us to finish this project. I will never forget about that. Last but not least also apologize on weakness and mistakes that have done through the process on completing this project.

ABSTRACT

Partial Discharge (PD) is an electrical phenomenon which causes insulation to deteriorate and frequently is the reason for breakdown of an insulation system resulting in failure of the equipment. This project is conducted in order to identify a detected partial discharged using non-contact type of acoustic measurement. This study will be performed with laboratory experimental work in order to validate the experimental data. With the aid of an ultrasonic probe as detecting device, the ultrasonic signal is recorded and the data will be analysed in personal computer (PC) with the aid of MATLAB software. The recorded time-domain signal is then transformed into frequency-domain by using the S-Transform (ST) analysis. This study is to detect the acoustic PD and classify the pattern of ultrasonic sound emitted.

TABLE OF CONTENTS

DECLARATION		i
ACKNOWLEDGEMENT		ii
ABSTACT		iii
TABLE OF CONTENTS		iv
LIST OF FIGURES		vi
LIST OF TABLES		viii
LIST OF ABREVIATIONS		ix

CHAPTER	**DESCRIPTION**	**PAGE**
1	**INTRODUCTION**	**1**
	1.1 Introduction	1
	1.2 Problem Statement	1
	1.3 Objective	2
	1.4 Scope of Work	2
	1.5 Thesis Organization	2
2	**LITERATURE REVIEW**	**4**
	2.1 Introduction	4
	2.2 Partial Discharge	4
	2.2.1 Internal Discharges	5
	2.2.2 Surface Discharges	5
	2.2.3 Corona Discharges	6
	2.2.4 Treeing Channel	7
	2.3 Necessity of Detection of PD	7
	2.4 The Existing Tecniques of the PD Detection Technique	8
	2.4.1 Acoustic Detection	9
	2.4.2 Visual or Optical Detection	9
	2.4.3 Chemical Detection	10
	2.4.4 Electrical Detection Method	10
	2.5 Summary	11

3	**METHODOLOGY**		**12**
	3.1	Introduction	12
	3.2	Steps of Pd Analysis	12
	3.3	Experimental Setup	14
		3.3.1 The AC Dielectric Test Set	14
		3.3.2 High Voltage Transformer	17
		3.3.3 Ultraprobe Device 10000 Gun Detector	18
		3.3.4 MATLAB Software	19
	3.4	Overview of Methodology	20
		3.4.1 Partial Discharge Types	21
		3.4.2 Preparing the Test Vessel DG100	23
		3.4.3 Using the Vacuum Pump (B078R04)	25
		3.4.4 Discharging using Discharge Rod	27
		3.4.5 S-Transform (ST)	28
		3.4.6 Experimental Work	28
	3.5	Summary	31
4	**RESULT AND DISCUSSION**		**32**
	4.1	Introduction	32
	4.2	Result sing MATLAB Software	32
	4.3	Comparison Maximum Data from Sum Absolute Graph	40
	4.4	Summary	41
5	**CONCLUSION**		**42**
	5.1	Conclusion	42
	5.2	Future Recommendation	43
	REFERENCES		44
	APPENDICES		46