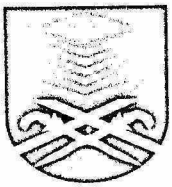
CONDITION MONITORING OF OVERHEAD LINE UTILISING INFRARED THERMOGRAPHY (IRT)

Thesis is presented in partial fulfillment for the awards of Bachelor of Engineering (Honors) in Electrical.
MARA UNIVERSITY OF TECHNOLOGY



MOHD RAZIF BIN HAJI MD SEKAK
FACULTY OF ELECTRICAL ENGINEERING
MARA UNIVERSTY OF TECHNOLOGY
40450 SHAH ALAM, SELANGOR DARUL EHSAN.

ACKNOWLEDGEMENT

All praises be to Allah, Load of the Universe, the Merciful and Beneficent to Nabi Muhammad S.A.W, His Companion and the people who follow His path.

The author wishes to express his sincere gratitude to Ir.Harizan Bin Hj.Che Mat Haris for his professional guidance and support. Recognition is given to staff of Department of Electrical Maintenance, MARA University of Technology. I would like to thank to the staffs of AFCM Sdn.Bhd. especially to En. Mohd.Rofizan B. Zulkifli, En.Ismail B. Ghazali, and the company manager, En. Ahmad Fawzal B. Mohd.Noor for their support in accomplishing this project. Thank also to staff of SASA TIGA Sdn.Bhd. specially to En.Mohd.Farihan.

I also would like to thank to my brother, and his family because of the moral and material support. Gratefully thank to my mother, and my father, and also to all my family, for the support throughout the years and without them, Iwould never have gone this far.

Finally, I would like to extend my sincere thanks to all lecturers and all my friend for the continuous assistance in every aspect either directly or indirectly throughout to complete this project.

Thank you,

Mohd.Razif Bin Hj. Md.Sekak
MARA University of Technology,
Shah Alam, Selangor, Darul Ehsan.

ABSTRACT

In view of increasing demand for reliable and high quality power supply, Electrical Utilities such as Tenaga Nasional Berhad (TNB) are interested in avoiding transmission failures by identifying problems at an early stage. However, degradation because of ageing and operational service conditions is inevitable. The monitoring and location of incipient failures on overhead lines, known as Condition Monitoring (CM) is thus imperative.

The primary objectives are to early detection of defect and addressed it before they read to major breakdown. This paper proved that condition monitoring or predictive maintenance is very beneficial compared to preventive maintenance in terms of increasing equipment availability and reduced maintenance cost (more efficient repair). This paper fully describes the Condition Monitoring technique for overhead lines using Infrared Thermography Camera.

TABLE OF CONTENTS

CHAPTER	DESCRIPTION	PAGE
	Declaration	i
	Acknowledgement	ii
	Abstract	iii
	Table of Contents	iv-vi
	List of Figures	viii-ix
	List of Tables	x
1.	**INTRODUCTION**	
1.1	Introduction	1
1.2	Condition Monitoring can demonstrate rapid payback	2
1.3	Condition Monitoring Response To Machine Failure	3
2.	**INFRARED THERMOGRAPHY TECHNIQUES**	
2.1	Introduction	4-5
2.2	About Infrared Thermography	6
2.2.1	Electromagnetic Spectrum	7
2.2.2	The Term of Blackbody	8
2.2.3	Non-blackbody Emitters	9
2.2.4	Infrared Semi-transparent	11
2.3	Theoretical of Infrared Thermography	13
2.3.1	I^2R Loss	13
2.3.2	Load	13-14
2.3.3	Localized Resistance	14

TABLE OF CONTENTS

CHAPTER	DESCRIPTION	PAGE
	2.3.4 Harmonics	15
	2.3.5 Induced Heating	15
2.4	Source of Thermal Pattern Variances of Electrical System	16
2.5	Electrical Thermography	16-17
	2.5.1 Application of Electrical Thermography	17
	2.5.2 Benefits of Infrared Electrical Inspections	18-19
3.	**OVERHEAD LINES**	
3.1	Introduction	20
3.2	Poles and Towers	20-22
3.3	Components To Be Scanned	23
	3.3.1 Lightning Arrester	23
	3.3.2 Connector (BG Clamp)	23
	3.3.3 Drop Fuses	23
	3.3.4 Switch Link	23
4.	**DESIGN METHODOLOGIES**	
4.1	Site location	24
4.2	Infrared Thermography Camera	24
	4.2.1 Thermogram	24
	4.2.2 Description of Agema 550 Thermovission	25-26
4.3	Thermography Measurement Techniques	26-27
	4.3.1 Emissivity	28
	4.3.2 Ambient temperature	29