ENVIRONMENTAL EFFECTS ON AUTOMOTIVE MATERIALS

LINDY ENGGONG

(2000215855)

A thesis submitted in partial fulfillment of the requirements for the award of Bachelor Engineering (Hons) (Mechanical)

Faculty of Mechanical Engineering

University of Technology MARA (UiTM)

SEPTEMBER 2002

ACKNOWLEDGEMENT

It is inevitable that when compiling a paperwork of this type which involves many contributors, that the editor of such a work in indebted to a wide variety of people and organizations.

First, I must thank University of Technology Mara, Shah Alam and especially my project advisor, Associate Professor Ir. Dr. Mohamed Nor Berhan without whom this task would have been most onerous. Secondly, I must thank all the contributors and their respective organizations without whom this task would have been impossible. I would also like to make particular mention of my colleague Azizah bt. Ali who has always been very helpful and encouraging.

However, many of the contributors are also indebted to organizations for their generous supply of support information and figures. Especial mention should be made of the following organizations:

Proton
Toyota
Volvo
Jabatan Kajicuaca
Department of Environment

My sincere thanks
Lindy Enggong

ABSTRACT

This text represents the contents of atmosphere and its effects to automotive materials. Atmospheric corrosion is one of the principal causes of economic losses in the automotive. The text is intended to provide the reader with an introduction to most of the topics that are of concern when a motorcar is being exposed to atmosphere and how vulnerable it is.

It is hoped that this text will help to make us at least aware or possess knowledge of what are the general/common causes of automotive materials' failures together with its preventions as I believe that mostly the public society are dealing with cars in their daily routines. In other words, cars have become basic needs in this modern era for our mobility and strata.

Readers' comments on the contents of this text will be welcomed so that their observations will be of great assistance for the further studies of effects of environment on automotive materials in the near future.

Lindy Enggong

TABLE OF CONTENTS

	CONTENTS		PAGE
	PAGE TITLE		i
	ACKNOWLEDGMENT		ii
	ABSTRACT		iii
	TABLE OF CONTENTS		iv
	LIST OF TABLES		vii
	LIST OF FIGURES		viii
CHAPTER 1	UNDERSTANDING THE EFFECTS OF ENVIRONMENT ON AUTOMOTIVE MATERIALS		1
	1.1	Solar radiation and wind	2
	1.2	Temperature	3
	1.3	Moisture	4
	1.4	Relative Humidity	4
	1.5	Air Pollution	4
	1.6	Acid Rain	4
CHAPTER 2	IDENTIFY THE AUTOMOTIVE MATERIALS		6
	2.1	Metals and Alloys	6

CONTENTS **PAGE**

	2.1.1	Specifications of steels used in the automobile industry	6
	2.1.2	Carbon Steel	8
	2.1.3	Alloy steels	10
	2.1.4	Stainless steel	11
	2.1.5	Aluminium	14
	2.1.6	Aluminium alloys	
2.2	Plastics and Polymers		15
	2.2.1	Polymerization	16
	2.2.2	Amorphous and crystalline plastics	17
	2.2.3	Plastics applications	18
	2.2.4	Future of plastics in the automotive industry	20
2.3	Rubber		21
2.4	Glass and Ceramics		22
2.5	Composites		24
	2.5.1	Background Information	24
	2.5.2	Development of reinforced composite materials	25
2.6	Properties		28
2.7	The range of materials		31
2.8	Characteristics of materials to environment		37

CHAPTER 3 **IDENTIFY SPECIFIC MATERIALS PROBLEM DUE TO ENVIRONMENT** **40**

3.1	Steel	40
3.2	Polymer	40
3.3	Ceramics	41
3.4	Name of components	41
3.5	Typical failure	41
3.6	The causes of failure	42