

# THE STUDY OF INDOOR AIR QUALITY AT LECTURE CLASSROOMS, UNIVERSITI MALAYSIA PAHANG

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Thesis submitted in fulfillment of the requirements for the award of degree of Bachelor of Civil Engineering

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### **TABLE OF CONTENT**

### CHAPTER 1 INTRODUCTION

1.1	Introduction	1
1.2	Problem Statement	2
1.3	Objective of Study	2
1.4	Scope of Study	3

### CHAPTER 2 LITERATURE REVIEW

2.1	Introduc	otion	4
2.2	Air Poll	ution	4
2.3	Air Poll	Air Pollution In The Classroom	
2.4	Air Poll	Air Pollutants	
	2.4.1	Carbon Monoxide	7
	2.4.2	Nitrogen Dioxide	9
	2.4.3	Sulfur Dioxide	11
	2.4.4	Particulate Matter	12

2.5	Factor Affecting Indoor Air Pollution		
	2.5.1	Types of Pollutants	13
	2.5.2	Pollutant Sources	14
	2.5.3	Occupants	15
2.6	Effects of	f Air Pollution	16
	2.6.1	Carbon Monoxide	16
	2.6.2	Nitrogen Dioxide	18
	2.6.3	Sulfur Dioxide	18
	2.6.4	Particulate Mater	19
2.7	Recomme	ended Malaysian Air Quality Guideline	20
CHAPTER	.3	METHODOLOGY	
3.1	Introduct	ion	22
3.2	Study De	sign and Procedure	22
3.3	Material a	and Equipment	24
	3.2.1	Gray Wolf Direct Sense TOX PPC Kit	24
	3.2.2	Dust Detective	25
3.4	Experime	ental Procedures	26
	3.4.1	Sampling Procedure for Measurement of Air	26
		Pollutant	
	3.4.2	Data Analysis	26
3.4	Study Are	ea	27
CHAPTER	4	RESULT AND DISSCUSION	
41	Introduct	ion	28
4.2	Concentra	ation of Pollutants Inside Lecture Classroom	29
	4.2.1	UMP Gambang	29
	4.2.2	UMP Pekan	32
4.3	Concentra	ation of Pollutants Outside Lecture Classroom	35
-	4.3.1	UMP Gambang	35
	4.3.2	UMP Pekan	38
4.4	Comparis	son of Concentration of Pollutant Inside Lecture	41
	T		

Classroom and Outside Lecture Classroom with RMG

	4.4.1	UMP Gambang	41	
	4.4.2	UMP Pekan	44	
4.5	Compar	ison of Concentration of Pollutants at UMP	47	
	Gamban	Gambang and UMP Pekan		
	4.5.1	Inside Lecture Classroom	47	
	4.5.2	Outside Lecture Classroom	50	

### CHATER 5 CONCLUSION AND RECOMMENDATION

5.1	Introduction	54
5.2	Conclusion	54
5.3	Recommendation	56
APPENDIX A		57
APPENDIX B		64
APPEND	X C	66

REFERENCES	69
<b>NEFERENCES</b>	09

### LIST OF TABLES

Table No.	Title	Page
2.1	Component of normal dry air	5
2.2	Type of pollutants and the contaminant sources	6
2.3	Type of air pollutants and their sources	14
2.4	COHb effects to human health	16
2.5	The acute effects and symptoms produced by carbon	17
	monoxide	
2.6	Health effect of different Air Quality Index levels	19
	caused by sulfur dioxide	
2.7	The effects of particulate matter on human health	20
2.8	Recommended Malaysian Air Quality Guideline	21
3.1	Type of pollutants that measured by devices	24
3.2	Time needed for data collection of pollutant	26

### **LIST OF FIGURES**

Figure No.	Title	Page
2.1	Molecular bond of carbon monoxide	7
2.2	Molecular structure of carbon monoxide	8
2.3	Molecular bond of carboxyhemoglobin	9
2.4	Molecular bond of nitrogen dioxide	10
2.5	Molecular structure of nitrogen dioxide	10
2.6	Molecular bond of sulfur dioxide	11
2.7	Molecular structure of sulfur dioxide	11
3.1	Research framework of study	23
3.2	Gray Wolf Direct Sense Tox PPC Kit	24
3.3	Dust Detective	25
4.1	Concentration of $SO_2$ for 3 days of observation inside	29
	lecture classroom at UMP Gambang	
4.2	Concentration of $NO_2$ for 3 days of observation inside	30
	lecture classroom at UMP Gambang	
4.3	Concentration of $PM_{10}$ for 3 days of observation inside	31
	lecture classroom at UMP Gambang	
4.4	Concentration of $SO_2$ for 3 days of observation inside	32
	lecture classroom at UMP Pekan	
4.5	Concentration of $NO_2$ for 3 days of observation inside	33
	lecture classroom at UMP Pekan	
4.6	Concentration of $PM_{10}$ for 3 days of observation inside	34
	lecture classroom at UMP Pekan	
4.7	Concentration of $SO_2$ for 3 days of observation outside	35
	lecture classroom at UMP Gambang	
4.8	Concentration of $NO_2$ for 3 days of observation outside	36
	lecture classroom at UMP Gambang	
4.9	Concentration of $PM_{10}$ for 3 days of observation outside	37
	lecture classroom at UMP Gambang	

4.10	Concentration of SO <sub>2</sub> for 3 days of observation outside	38
	lecture classroom at UMP Pekan	
4.11	Concentration of NO <sub>2</sub> for 3 days of observation outside	39
	lecture classroom at UMP Pekan	
4.12	Concentration of $PM_{10}$ for 3 days of observation outside	40
	lecture classroom at UMP Pekan	
4.13	Comparison of concentration SO <sub>2</sub> inside lecture	41
	classroom and outside lecture classroom with RMG at	
	UMP Gambang	
4.14	Comparison of concentration NO <sub>2</sub> inside lecture	42
	classroom and outside lecture classroom with RMG at	
	UMP Gambang	
4.15	Comparison of concentration PM <sub>10</sub> inside lecture	43
	classroom and outside lecture classroom with RMG at	
	UMP Gambang	
4.16	Comparison of concentration SO <sub>2</sub> inside lecture	44
	classroom and outside lecture classroom with RMG at	
	UMP Pekan	
4.17	Comparison of concentration NO <sub>2</sub> inside lecture	45
	classroom and outside lecture classroom with RMG at	
	UMP Pekan	
4.18	Comparison of concentration PM <sub>10</sub> inside lecture	46
	classroom and outside lecture classroom with RMG at	
	UMP Pekan	
4.19	Comparison concentration of SO <sub>2</sub> inside lecture	47
	classroom at UMP Gambang and UMP Pekan	
4.20	Comparison concentration of NO <sub>2</sub> inside lecture	48
	classroom at UMP Gambang and UMP Pekan	
4/21	Comparison concentration of PM <sub>10</sub> inside lecture	49
	classroom at UMP Gambang and UMP Pekan	
4.22	Comparison concentration of SO <sub>2</sub> outside lecture	50
	classroom at UMP Gambang and UMP Pekan	

4.23	Comparison concentration of NO2 outside lecture	
	classroom at UMP Gambang and UMP Pekan	
4.24	Comparison concentration of PM <sub>10</sub> outside lecture	52
	classroom at UMP Gambang and UMP Pekan	

### LIST OF ABBREVIATION

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API	-	Air Pollution Index
CO	-	Carbon dioxide
CO <sub>2</sub>	-	Carbon monoxide
COHb	-	Carboxyhemoglobin
DOE	-	Department of Environment
MMMF	-	Man-Made Minerals Fibers
NHMRC	-	National Health and Medical Research Council
NO	-	Nitrogen Monoxide
NO <sub>2</sub>	-	Nitrogen Dioxide
O <sub>2</sub>	-	Oxygen
PM <sub>10</sub>	-	Particulate Matter
PPC	-	Pocket PC
PVC	-	Poly Vinly Chloride
RMG	-	Recommended Malaysia Air Quality Guideline
SBS	-	Sick Building Syndrome
SO <sub>2</sub>	-	Sulfur Dioxide
UMP	-	Universiti Malaysia Pahang
VOC	-	Volatile Organic Compound
WHO	-	World Health Organization

### LIST OF APPENDIX

Appendix	Title	Page
A	Result of observation for every station	57
В	Recommended Malaysian Air Quality Guideline	64
С	The study area	66



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### ABSTRACT

The study had been done on the air quality measurement at Universiti Malaysia Pahang. The study was conducted at different place which is inside the lecture classrooms and outside the lecture classrooms. This study was conducted for 12 hours per day starting from 8.00 am until 8.00 pm. The measurement of air quality was taken 3 times for each study areas. In this study, the level of concentration of sulfur dioxide (SO<sub>2</sub>), nitrogen dioxide (NO<sub>2</sub>) and particulate matter  $(PM_{10})$  was measured. The average SO<sub>2</sub> reading inside lecture classroom at UMP Gambang and UMP Pekan is 0.00 ppm. For the reading of SO<sub>2</sub> outside lecture classroom, the average concentration reading recorded for UMP Gambang is 0.074 ppm and for UMP Pekan is 0.053 ppm. The average concentration of NO<sub>2</sub> reading inside lecture classroom at UMP Gambang is 0.015 ppm and for UMP Pekan the average reading is 0.010 ppm. For the reading of NO<sub>2</sub> outside lecture classroom, the value recorded is 0.00 ppm. For the PM<sub>10</sub> reading, the average reading inside lecture classroom is 20 µg/m<sup>3</sup> for UMP Gambang, follow by UMP Pekan which the reading is 18  $\mu$ g/m<sup>3</sup>. For outside lecture classroom, the average reading for PM<sub>10</sub> is 68  $\mu$ g/m<sup>3</sup> which is at UMP Gambang follow by UMP Pekan which the reading is  $20 \,\mu g/m^3$ .

### ABSTRAK

Kajian telah dilakukan pada penilaian kualiti udara di Universiti Malaysia Pahang. Kajian ini dilakukan di tempat berbeza iaitu di dalam kelas dan di luar kelas. Kajian ini dijalankan selama 12 jam sehari bermula pada pukul 8.00 pagi sehingga 8.00 malam. Kualiti udara diambil 3 kali untuk setiap kawasan. Kadar kepekatan karbon monoksida, sulphur dioksida, nitrogen dioksida dan zarah terampai telah diukur dalam kajian ini. Bacaan tertinggi bagi purata sulfur dioksida di dalam kelas di UMP Gambang dan UMP Pekan ialah 0.00 ppm. Untuk bacaan purata sulfur dioksida di luar kelas, bagi UMP Gambang bacaan purata ialah 0.074 ppm dan bagi UMP Pekan bacaan purata ialah 0.053 ppm. Bagi purata bacaan nitrogen dioksida didalam kelas di UMP Gambang ialah 0.015 ppm dan di UMP Pekan ialah 0.010 ppm. Untuk purata bacaan di luar kelas bagi nitrogen dioksida di UMP Gambang dan UMP Pekan menunjukkan nilai 0.00 ppm. Bagi bacaan zarah terampai, bacaan purata di dalam kelas di UMP Gambang ialah 20 µg/m<sup>3</sup>, diikuti UMP Pekan iaitu 18 µg/m<sup>3</sup>. Untuk purata bacaan zarah terampai di luar kelas, bacaan tertinggi dicatatkan oleh UMP Gambang iaitu 68 µg/m<sup>3</sup> dan diikuti UMP Pekan iaitu 20 µg/m<sup>3</sup>.

### **CHAPTER 1**

### **INTRODUCTION**

### **1.1 INTRODUCTION**

During the last three decades, many efforts have been made to protect the population from the harmful exposures to outdoor pollutants. Networks of air monitoring stations have been located strategic places and these provide information on the outdoor pollutant concentrations to which populations are exposed. However, people spend almost average 90% of their time in various indoor likes at home, office, classroom, hospital and restaurant. It is a common belief that while indoors, one is safe from harmful pollutants but the scientific evidences has shown that the indoor air at homes can be more seriously polluted than outdoor. (Zhang and Smith, 2003)

Air pollution is an immense issue that needs more attention and action. Air pollution is the presentation from mining activities, high usage of motor vehicles, deforestation, industrial facilities and open burning into earth's atmosphere. The major pollutant that was emitted to the atmosphere includes particulate matter, carbon dioxide, nitrogen dioxide, and sulfur dioxide. The influence of the releases of this pollutant can cause haze, ozone depletion, greenhouse effect and other. Air pollution is a main factor for a number of health diseases such as respiratory problem, lung cancer and others diseases. Individual reactions to air pollutants depend on the type of pollutant a person is exposed to, the degree of exposure, and the individual's health status and genetics (Bernstein et al., 2004).

### **1.2 PROBLEM STATEMENT**

There is increasing evidence that exposure to physical, chemical and biological indoor pollutants may cause various health problems among students. Students spend most of their daytime in classroom and inadequate ventilation is often suspected to be an important condition leading to health symptoms. (Wargocki et al., 2004)

Since most students spend their long periods of time indoor, indoor air quality has caught attention to research and public institutions. This was because indoor air quality was a huge attention risk factor of human relevance to human exposure to environmental pollutants. Therefore, the purpose of this study was to identify the level of concentration of air pollution at indoor classroom and outdoor classroom.

### **1.3 OBJECTIVE OF THE STUDY**

The objectives of this study are to:

- i. To investigate the concentration of air pollutant outside lecture classroom and inside lecture classroom.
- ii. To compare the data result with Recommended Malaysia Air Quality Guideline (RMG)

### **1.4 SCOPE OF THE STUDY**

This study focused on the indoor air quality measurement in university. This study also observed the comparison between quality of air outside lecture classroom and inside lecture classroom. The measurement involved in this study were the concentration readings of carbon monoxide ( $CO_2$ ), sulfur dioxide ( $SO_2$ ), nitrogen dioxide ( $NO_2$ ) and particulate matter ( $PM_{10}$ ).

These measurements were measured using apparatus of Dust Detective and Gray Wolf Direct TOX PPC Kit. The data collected 3 times for each location. For each observation, 12 hours of observation required to collect data. The research conducted at Blok W, Universiti Malaysia Pahang, Gambang and Faculty of Manufacturing, Universiti Malaysia Pahang, Pekan. This location has been chosen because both locations are used by student for their lecture.

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