POLLUTION INVESTIGATION AND EMISSION INVENTORY FOR RESTAURANT IN MBMB REGION

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SUPERVISOR VERIFICATION

"I hereby declare that I have read this thesis and in my opinion this report is sufficient in terms of scope and quality for the award of the degree of Bachelor of Mechanical Engineering (Plant and Maintenance) with Honours"

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FOR RESTAURANT IN MBMB REGION

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This report is submitted in

fulfillment of requirements for the awards

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DECLARATION

"I hereby declare that the work in this report is my own research except for summaries and quotations which have been duly acknowledged."

Signature : _____

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Date : _____

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DEDICATION

Special for

My Beloved Parents

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I am very grateful to my Final Year Project supervisor, Dr. Tee Boon Tuan, whose input and advice has helped me to solve the problem occurred during conducting this project.

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ABSTRACT

The purpose of this project is to review the level of pollution in terms of area source which focused on a restaurant in the (MBMB) region. This study is also aim to develop emission inventory for pollutants and carbon footprint from gas cooking activities of the restaurant from that area. The study is carried out in Semabok, Alai, Cheng and Malacca City Area by conducting a survey and interview session for the restaurant. Data from the survey is analyzed and the total emission rate that produced in the area is calculated. NO_x gases are higher than other pollutants. The total emission rate for the City Area is the highest compared to other area in MBMB region the six major of emission inventory gases. The total emission rate MBMB region is 44.3878, 823.5617, 136.5617, 2.9993 and 92.5820 ton per year for NO_x, CO, NMVOC, SO_2, and PM_{10}. Then, for the carbon footprint CO_2 gas is 58403.70 ton per year. From the data, it will help the MBMB to make focusing for the critical area that produced high emission rate. Therefore, the strategy that can be reduced the emission inventory by implementing proper usage and awareness.

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ABSTRAK

Tujuan kajian ini adalah untuk mengkaji pencemaran dan inventori pelepasan telah dilakukan untuk mengkaji tahap pencemaran dari aspek punca kawsan (area source) yang tertumpu pada restoran dalam kawasan MBMB. Kajian ini juga akan membangunkan inventori pelepasan bahan pencemar yang berpunca dari aktiviti memasak dan akan membangunkan jejak pancaran dari aktiviti memasak di kawasan restoran tempat kajian. Kajian ini dijalankan di kawasan Semabok, Alai, Cheng dan Bandar Melaka dengan menggunakan kaedah soal selidik dan temubual terhadap sesebuah restoran. Jumlah kadar pelepasan yang terhasil di kawasan kajian dianalisis berdasar data yang diperoleh daripada soal selidik. Gas NOx adalah paling tinggi berbanding gas pencemar yang lain. Kadar pelepasan di kawasan Bandar Melaka adalah paling tinggi berbanding kawasan MBMB yang lain. Jumlah keseluruhan anggaran kadar pelepasan di seluruh kawasan MBMB ialah 44.3878, 823.5617, 136.5617, 2.9993 dan 92.5820 tan/tahun bagi gas NOx, CO, NMVOC, SO_2, dan PM_{10}. Bagi jumlah jejak pancaran CO_2 pula ialah 58403.70 tan/tahun. Melalui data ini, ia dapat membantu MBMB lebih menfokuskan kawasan kritikal yang menghasilkan kadar pelepasan yang tinggi. Oleh itu, strategi yang boleh diambil kira adalah melaksanakan kempen kesedaran dan penggunaan bahan bakar yang bijak.

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LIST OF SYMBOLS AND ABBREVIATIONS

MBMB	=	Malacca Historic City Council
EI	=	Emission Inventory
CO	=	Carbon Monoxide
CO_2	=	Carbon Dioxide
SO_2	=	Sulfur Dioxide
NO_X	=	Mono-Nitrogen Oxides
NO_2	=	Nitrogen Dioxide
PM	=	Particulate Matter
BC	=	Black Carbon
VOC	=	Volatile Organic Compounds
HM	=	Heavy Metals
Pb	=	Lead
O_3	=	Ozone
EEA	=	European Environment Agency
US EPA	=	United States Enviroment Protection Agency

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

Pollution and emission inventory is one of the major problem face by many urban centers across the country and do not miss the Melaka heritage city. Nowadays, many natural disaster and diseases are occurred around the world and also in the country. The disasters and diseases are caused by the human that produce variation of pollution.

The emission inventory or most commonly known that is air pollutant. The pollution is one of sources of effect to the green house, ozone layer and causes the climate change. For the area in Melaka especially MBMB region, the drastic effect of air pollution and emission inventory are the weather are not in a good or comfortable condition for healthy of all citizen. The weather remains sometimes too hot without the rain and sometimes to cool with non-stop raining. The data and survey from the

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clinic that prove the effect is like flu, cough, fever and skin diseases. Increasing of the restaurant around these areas also causes the addition of air pollutant and emission inventory from the cooking activity. The cooking smoke without controlled becomes the big contribution to the emission inventory.

The main aim of this project is to develop the emission inventory through cooking activities especially in the restaurants. Fundamentally, there are three types of sources in emission inventory that are point sources, area sources and mobile/line sources. Cooking is included in area sources and the focus for this study.

1.2 PROBLEM STATEMENT

The emission inventory is a detailed list of air pollutant emissions associated with the various sources of emissions discharge to the atmosphere. In the restaurant, the emission is mainly from gas cooking. The emission from cooking include carbon monoxide (CO), sulfur dioxide (SO_2), and (NO_X) mono-nitrogen oxides NO and NO_2 (nitric oxide and nitrogen dioxide). The aims of this project are to develop an emission inventory profile for restaurant, investigate the pollution level and emission from gas cooking in restaurant. Besides that, the project plan to develop a carbon footprint from gas cooking activities in restaurants. The targeted area for case study is MBMB region in Melaka. It is hope the project will assist in providing emission data for the area and align with the state aspiration in creating green (Green Technology) and sustainable city.

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1.3 OBJECTIVES

There are several objectives to doing this pollution investigation and emission inventory in MBMB region which are:

1) Develop an emission inventory profile for restaurant in MBMB region area.
2) To investigate the pollution level and emission form gas cooking in restaurant.
3) To develop a carbon footprint from gas cooking activities in restaurant.

1.4 SCOPE OF STUDY

This project is to identify source categories existing in the emission inventory area and develop the emission inventory database. Besides that, investigations are referring to the emission factors as provided in the CORINAIR guidebook and EPA AP-42. Furthermore, define an emission for each area source category relevant in study area. The case study area selected from MBMB region are Semabok, Alai, Cheng and City Area Malacca. The others regions are estimated only base on the selected region. The focus is on the coking activities in the restaurant.

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1.5 EXPECTED OUTCOMES

The expected outcomes from this project are finding the detail of the specific emission inventory and air pollution in the source area of the MBMB region. Based on the result, it will assist in determining the air quality level of the MBMB region. This project will also refer to the similar emission inventory project in Chiang Mai City, Thailand and Nakhon Ratchasima, Thailand. The combine result then will study to how to improve the air quality for the future to make sure the Malacca will be are sustainable city with 'Green Technology'.

1.6 IMPORTANCE OF THE PROJECT

Project are importance to prove that the emission inventory and air pollution one of the reason that will cause the human health problem and environment problem. Furthermore, this project will be are guide line to other city in Malaysia about the importance of air quality for all human being and environment. In addition, result of this project will assist in providing the emission inventory and how necessary measures could be taken to overcome this problem.

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1.7 LIMITATION

In the development of emission inventory, there are several limitations to this pilot research need to be acknowledged. It is reasonable to describe that the accuracy of emissions estimates are not perfect. It means the raw results is right but for the detail are not good enough because of the limitation. In this research, there are a few technical issues that need to be considered.

The emission inventory is for the first time introduced in Malaysia and started in Malacca that is this research. Therefore, the community is not alert and exposed about it. This factor is limitation during the survey and questionnaire. Example the owner of restaurant and the worker do not give the exact answer in the response.

Furthermore, our country Malaysia does not have local emission factors. Most of the emission factors for this inventory were generally derived from EMEP/EEA Air Pollution Emission Inventory Guidebook. So that, obviously differences between the locations, surrounding, and climate in the European and Malaysia.

Moreover, the information by the MBMB also not the latest information like the new restaurant is not including in the list of restaurant. But MBMB also mention that they will update the information once a year at the end of the year. That mean the estimation are suitable for the last year emission inventory that is 2014. Some research on these area sources is needed in the future with latest information and once a year to control the emission inventory value.

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