WET MARKET WASTEWATER REGULATORY FRAMEWORK IN MALAYSIA

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DEDICATION

Dedicated to my beloved family members especially to my mother, sister and husband, *Puan Naini Binti Abu Yamin, Siti Noraida Binti Abdullah* and *capten Mohd Syahrum Bin Mohd Sabri*

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ABSTRACT

Wet markets are built by local government for residents to purchase their daily necessities and raw food. Many activities at the market produce large quantity of wastewater daily which adversely impacts the environment, particularly in the forms of odor pollution and water pollution as well as waterborne diseases. These problems are aggravated when there are no specific regulations to control the discharge. This study was conducted to assess the level of wastewater contamination in wet markets, propose the most effective treatment system and develop a wet market wastewater regulatory framework. In this study, wastewater from seven wet markets in Kuala Lumpur, Selangor and Melaka were analyzed to examine the discharge loading from the wet markets. The results from these samples were analyzed using Malaysian Sewerage Industry Guidelines (MSIG), to determine the best option of a wastewater treatment system. Interview and surveys were carried out to identify the best option for wastewater treatment. Results showed that the evaluated wastewater has exceeded the minimum requirements for Sewage Regulations 2009. Based on the MSIG approach, interview and survey, the best option for a wet market wastewater treatment system is the system with nine criteria comprising primary screen, sewage pump station, secondary screen, balancing tank, primary clarifier, biological system, final clarifier and finally disinfection stages. Results from the initial research were then used to develop the Wet Market Wastewater Regulatory Framework. In addition, questionnaire and interview were conducted with 30 selected respondents from government enforcement agencies, as well as interviews with officers from the Ministry For The Environment, New Zealand. The findings showed that the wet market Wastewater Regulatory Framework should includes six phases comprising quality inspection of effluent, check against regulatory standard, installation and maintenance of treatment system, processing, enforcement and regulations. In conclusion, it is recommended that wet markets in Malaysia adopt the framework for wastewater management to sustain the environment.

ABSTRAK

Pasar basah dibina oleh kerajaan tempatan untuk rakyat membeli keperluan harian dan makanan mentah. Pelbagai aktiviti di pasar menghasilkan kuantiti air sisa yang banyak setiap hari dan memberi kesan buruk ke atas alam sekitar, terutamanya dalam bentuk pencemaran bau dan pencemaran air serta penyakit bawaan air. Masalah ini menjadi lebih buruk lagi apabila tiada peraturan tertentu untuk mengawal pelepasan sisa tersebut. Kajian ini dijalankan untuk menilai tahap pencemaran air sisa di pasar basah, mencadangkan sistem rawatan yang paling berkesan dan membangunkan rangka kerja untuk mengawal selia air sisa pasar basah. Dalam kajian ini, air sisa dari tujuh buah pasar di Kuala Lumpur, Selangor dan Melaka telah dianalisis bagi mendapatkan tahap parameter air sisa. Keputusan daripada sampel ini dianalisis dengan menggunakan Garis Panduan Industri Pembetungan Malaysia (MSIG), untuk menentukan pilihan yang terbaik dalam sistem air sisa. Temu bual dan kaji selidik telah dijalankan untuk mengenal pasti pilihan terbaik untuk rawatan air sisa kumbahan ini. Dapatan kajian menunjukkan bahawa air sisa yang dinilai telah melebihi keperluan minimum bagi Peraturan-peraturan Kualiti Alam Sekeliling (Kumbahan) 2009. Berdasarkan pendekatan MSIG, temu bual dan kaji selidik, pilihan yang terbaik untuk sistem rawatan air sisa di pasar basah adalah ia harus mempunyai sembilan kriteria yang terdiri daripada penapisan awal, stesen pam kumbahan, penapis sekunder, tangki pengimbang, sistem penjernihan awal, sistem biologi, sistem penjernihan akhir dan pembasmian kuman berperingkat. Hasil daripada penyelidikan awal kemudiannya digunakan untuk membangunkan Rangka Kerja Kawal Selia Air Sisa Kumbahan Pasar Basah. Di samping itu, soal selidik dan temu bual telah dijalankan dengan 30 responden yang terdiri daripada agensi penguatkuasaan kerajaan, serta temu bual dengan pegawai daripada Kementerian Persekitaran, New Zealand. Dapatan kajian menunjukkan bahawa kerangka kerja pengawalseliaan air sisa kumbahan di pasar basah perlu merangkumi enam fasa yang terdiri daripada pemeriksaan kualiti efluen, pemeriksaan terhadap peraturan berkaitan, pemasangan dan penyelenggaraan ke atas sistem rawatan, pemprosesan, penguatkuasaan dan peraturan. Kesimpulannya, adalah disyorkan bahawa pasar basah di Malaysia mengguna pakai rangka kerja bagi pengurusan air sisa kumbahan untuk mengekalkan alam sekitar..

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CHAPTER 1

INTRODUCTION

1.1 Background of the Study

Traditionally, industrial activities consume large quantity of resources and energy such as water and raw materials and produce correspondingly large amount of wastes released into the environment. These industrial wastes cause pollution at local and global scales. Thus, it is important that its release is kept minimal and treated as our first priority towards a sustainable human civilization. The reduction of wastewater release has to be approached systematically to achieve the objectives, which may include reducing water resource utilization, minimizing wastewater release through reducing flow rate and also cutting down wastewater management costs (Ujang, 2000).

For a rapidly developing country like Malaysia, industrial development plays a pivotal role in the national economy. This has driven many governments to set policies that attract multinational companies to invest and set up processing plants in the home country (Ujang, 2006). Rapid increase in industrial activities also drives population growth, particularly in urban cities, and at the same time stimulates the development of residential and industrial areas. These newly developed areas should be equipped with the basic amenities, which include but are not limited to business district, schools, and also wet market.

A wet market or public market, in particular, is an important location for nearby residents to purchase daily necessities like raw cooking materials (Adnan, 2006). In fact, wet market and farmers' market is one of the most popular retail

businesses in most countries. It provides opportunities for self-employment, particularly during economic crisis and also to increase one's income sources. At the end of year 2000, there was a reported 131 farmers' markets with 5,467 registered stores and 412 wet markets with 21,360 outlets in Peninsular Malaysia, as stated in the 8th Malaysia Plan report (RMK-8)

However, the farmers' markets and wet markets have created negative environmental impacts through the production of wastewater and solid waste. Even the stench and flies have often become the cause of illnesses. Whenever there is food handling involved, regardless of in what form such as processing, packaging, storing, and etc., it is natural that wastewater will be generated. The quantity and general quality of the wastewater depends on the strength of the pollutants. Nevertheless, both parameters affect the economy and environment at a different scale, but particularly in terms of its treatment and management (Jorgensen, 1979).

Wastewater generated from wet market activities such as fish preservation, coconut milk remnants, and also raw food handling may be viewed as menial and with little impact to our river water quality. However, it creates a strong stench and an utterly unpleasant sight when cumulated at sump traps and drains within vicinity. This can be extremely uncomfortable for residents and premises nearby. Not only that, it also aggravates air pollution because of the stench created when exposed to sunlight, channeled into rivers, or released as surface runoff (Adnan, 2006).

Traditional wet markets or public markets are mostly built near rivers and estuaries to ease the processes of garbage, food, and wastewater disposal; this remains the main disposal channel for most traditional markets even into this modern age. This indicates that there is no renewal of wastewater and solid waste management system. In addition, most public markets are regarded as commercial trade and thus, there is no requirement on special management system by the authorities and government (Akub, 2007).

In modern societies, a suitable wastewater management is a necessity, not a choice. The system should be designed to collect, treat, and decompose wastes from

human and in wastewater (Peavy et. al., 1985). In Malaysia, wastewater generated from industries and businesses cannot be channeled into residential wastewater treatment plants due to legislation restriction. Most of the wastewater, including that from wet markets, is redirected to the surface runoff system nearby. This is still happening in most wet markets in the country. This also indicates a lack of new approach in the solid waste and wastewater management structure which is well-managed and systematic. Public markets are categorized under commercial business, but the government has yet to specify a well-managed wastewater management system to date (Adnan, 2006).

In Malaysia, there are several environmentally-related legislation both at the federal and state levels for the control of environmental pollution or management of the environment (Jeyabalan and Moorthy, 2012). Furthermore, as quoted by Ishak (2007), to control river water pollution, there are several agencies involved on water management. Laws are used as a form of management response to environmental problems in Malaysia (Daud, 2008). However, the apparent gap in the wastewater and solid waste management system for wet markets calls for a comprehensive study conducted to assess the "Wet Market Wastewater Regulatory Framework for Best Management Practices" which taps into wet market database inventory to formulate suitable wastewater treatment with promising system efficiency.

1.2 **Problem Statement**

The main legal instrument to control water pollution in Malaysia is the Environmental Quality Act 1974 (EQA) and its subsidiary legislation. However, the issue of wet market wastewater is not listed under EQA, and thus is often overlooked (Daud, 2008).

Daily activities from public wet market usually contribute to the generation of wastewater in large quantities. As quoted by Shahari (2011), poultry slaughtering activities is one of the activities that contribute to river pollution. If the wastewater from the wet market is not properly treated, it will contribute to environmental

pollutions. In addition, marine pollution is controlled entirely by the Department of Environment (DOE), but in the case of contamination of rivers, there are several agencies that are responsible for the management of this important water source (Ishak, 2007).The increasing functional of the wet market makes this place one of the significant sources of solid waste and wastewater, but there is no act or regulation provided by the government related to this, except for Environment Quality Act, Sewage Regulations, 2009.

A significant portion of sullage or greywater from domestic and commercial sources ends up into the streams without any sort of treatment (DOE 2003, 2004 and SWMA 2004).To date, there is no gazetted standard for sullage release from either the Local Government Act, 1976 or the Environment Quality Act 1974 for wet markets to curb river water pollution. According to Idris (2004), DOE is doing its best to control pollution from the industrial areas and wastewater treatment plants. However, there is a lack of adequate enforcement in controlling sullage and diffuse pollution from various urban sources. Not only that, in terms of installation of treatment plant or pretreatment facilities, the facility is due to cause problems from construction cost, inspection, and maintenance perspectives if built in crowded residential areas. As such, its solution proves to be a challenge and is not straightforward.

1.3 **Objectives of Study**

The objectives of this study are as below:

i. To examine the discharge loading from existing wet market and propose best option for wet market wastewater treatments including suitable wastewater treatments with recommended efficiency; and
ii. To propose Wet Market Wastewater Regulatory Framework for Best Management Practices.

1.4 Scope of Study

The scope of this study is as follows:

i. Sampling of wet market effluent from selected wet market based on available database. This included Pasar Dato Keramat Kuala Lumpur, Pasar Raja Bot Kuala Lumpur, Pasar Borong Kuala Lumpur, Pasar Selayang Selangor, Pasar Besar Seremban, Pasar Jasin, Melaka and Pasar Borong Batu Berendam, Melaka.
ii. Performing water quality analysis based on several water parameters including pH, BOD, COD, AN, TSS, Oil & Grease, and E-Coli according to the Sewage Regulations 2009 effluent standard. There were 34 samples collected and analysed.
iii. Performing questionnaire survey on selected agencies. This included Majlis Perbandaran Subang Jaya (Planning Department), Department of Environment Putrajaya (Enforcement Division), and Research & Technology, Industrial and Construction Waste Department, SWCorp Headquarters.

Moreover, three expert officers were contacted for the qualitative analysis (interview session). They were from the Bay of Plenty Regional Council, Rotorua, New Zealand; Watercare Services Ltd, New Zealand; Department of Environment Putrajaya (Enforcement Division), Suruhanjaya Perkhidmatan Air Negara (Enforcement Division), and Research & Technology, Industrial and Construction Waste Department, SWCorp Headquarters. This session was conducted to facilitate in the development of the wet market regulatory framework.

1.5 Significant of Study

Analysis on the water quality is necessary to predict the level of pollutant as well as to develop guidelines and new management framework to control river pollution from wet markets. This pioneering study in Malaysia provides insight to the best measure to ensure a sustainable water resources and environment. This important study also provides:

i. More up-to-date study on current wet market pollution load;
ii. More detailed study on wet market wastewater treatment and system efficiency; and
iii. Insight into the formulation of wet market wastewater management and framework on legislation for the related agencies.

1.6 Organisation of the Thesis

This thesis consists of five chapters. Chapter 1 contains an introduction and the research background, as well as research aim, objectives and scope of study. Chapter 2 covers existing literature, including general information on wet markets in Malaysia, classification of water pollution sources in Malaysia, inventory of wet market in Malaysia, approach to curb water pollution in Malaysia and New Zealand, legislation related to wet market, role of agencies and example of existing policy cycle model (Electricity Regulatory Framework by AWER).

Chapter 3 consists of a framework, experimental setup, and also details on the experimental procedures. Chapter 4 presents the results and discussion. Phase 1 entailed retrieval of wet market inventory from available database. In phase 2, wet market wastewater sampling was carried out. In phase 3, wet market discharge loading was determined. Phase 4 focuses on determination of suitable wet market wastewater treatment system and recommended system efficiency. Phase 5 deals the wet market wastewater regulatory framework. The last chapter, Chapter 5, presents the conclusion and recommendations for future studies.

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