

**THE EFFECTIVENESS OF USING EFFECTIVE MICROORGANISMS (EM) IN
FISH MARKET WASTEWATER**

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ABSTRACT

The increasing pollution of water systems in recent years has been noted that the amount of pollution produced by humans is far exceeds the cleaning capacity of nature. The objectives of the study are to determine the effectiveness of using Effective Microorganisms (EM) in improving the wastewater at the fish market area and to determine the wastewater quality at the fish market area by using EM according to standard from DOE-WQI. The study was conducted at the fish market area which is to determine the wastewater quality before and after adding the Effective Microorganisms (EM). The wastewater quality is determined by done the test according to the parameter of pH, temperature, Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Total Suspended Solid (TSS), Ammonia Nitrogen (AN), and Dissolved Oxygen (DO). The parameters are based on the Water Quality Index (WQI) from the Department of Environment (DOE) and will be referred to Standard Examination of Water and Wastewater by American Public Health Association (APHA,2002). Analysis of data was performed by using 2-way analysis of variance (2-way ANOVA). The significant ANOVA ($P < 0.05$), studies shown the different in values of the monitored the parameters which indicates the data obtained is accurate. The results of WQI is analyze according to the DOE-WQI standard, by using the J-M21 there have an improvement to the wastewater and the status of WQI is change from slightly clean to clean status, 75.74 mg/L to 82.94 mg/L. By using the Activa Orange there have an improvement to the wastewater and the status of WQI is change from slightly clean to clean status, 75.74 mg/L to 83.15 mg/L. Knowing the differences of quality of wastewater at fish market area, before and after using the Effective Microorganism (EM), the Effective Microorganism (EM) can be use as a one of the solution to improve the condition and environment of wastewater quality at fish market area by reducing the pollution.

ABSTRAK

Peningkatan pencemaran sistem air dalam beberapa tahun terakhir telah direkodkan bahawa jumlah pencemaran yang dihasilkan oleh manusia jauh melebihi kapasiti pembersihan alam. Tujuan kajian ini adalah untuk menentukan keberkesanan penggunaan Mikroorganisme Efektif (EM) dalam meningkatkan kualiti air sisa di kawasan pasar ikan dan untuk menentukan kualiti air sisa di kawasan pasar ikan dengan menggunakan EM merujuk piawaian dari DOE-WQI. Penelitian ini dilakukan di kawasan pasar ikan adalah untuk menentukan kualiti air sisa sebelum dan selepas menambah Mikroorganisme Efektif (EM). Kualiti air sisa ditentukan dan diuji sesuai dengan parameter pH, suhu, keperluan oksigen biologi (BOD), keperluan oksigen kimia (COD), jumlah pepejal terampai (TSS), Ammonia Nitrogen (AN), dan oksigen larut (DO). Parameter ini didasarkan pada Indeks Kualiti Air (WQI) daripada Jabatan Alam Sekitar (DOE) dan akan dirujuk Standard Pemeriksaan Air dan Air Limbah oleh American Public Health Association (APHA, 2002). Analisis data dilakukan dengan menggunakan 2-arah analisis varians (2-way ANOVA). The ANOVA signifikan ($P < 0.05$), kajian menunjukkan berbeza dalam nilai-nilai parameter yang dipantau menunjukkan data yang diperolehi adalah tepat.. Keputusan WQI dengan menganalisis bersesuaian dengan standard DOE-WQI, dengan menggunakan J-M21 ada perbaikan terhadap air sisa dan status WQI adalah perubahan dari sedikit bersih ke status bersih, 75.74 mg/L ke 82.94 mg/L. Dengan menggunakan Activa Orange ada perbaikan pada air sisa dan status WQI adalah perubahan dari sedikit bersih ke status bersih, 75.74 mg/L ke 83.15 mg/L. Dengan mengetahui perbezaan kualiti air sisa di kawasan pasar ikan, sebelum dan sesudah menggunakan Mikroorganisme Efektif (EM), yang Efektif Microorganism (EM) boleh digunakan sebagai salah satu penyelesaian untuk meningkatkan keadaan dan persekitaran kualiti air kumbahan di kawasan pasar ikan dengan mengurangkan pencemaran.

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LIST OF ABBREVIATIONS

COD	-	Chemical Oxygen Demand
BOD ₅	-	Biological Oxygen Demand at 5 days
TSS	-	Total Suspended Solid
AN	-	Ammonia Nitrogen
DO	-	Dissolved Oxygen
TDS	-	Total Dissolved Solid
EM	-	Effective Microorganisms
MEQR	-	Malaysia Environmental Quality Report
DOE	-	Department of Environment
LKIM	-	Lembaga Kemajuan Ikan Malaysia
WQI	-	Water Quality Index
APHA	-	American Public Health Association
ANOVA	-	Analysis of Variance

LIST OF SYMBOLS

°C	-	Degrees celsius
Mg/L	-	Milligram per liter
mL	-	Mililiter
NaOH	-	Sodium hydroxide
H ₂ SO ₄	-	Sulfuric acid
NH ₃ -N	-	Ammonia Nitrogen

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CHAPTER I

INTRODUCTION

1.1 Introduction

Rapid economic growth in Malaysia has improved the development process of the country. Many changes have taken place due to urbanization and industrialization. Rapid development, an increase in population, rural-urban migration, and the rate of spending has brought about an increase in waste generation and pollution which has badly affected man and environment.

With the increasing pollution of water systems in recent years, it has been noted that the amount of pollution produced by humans far exceeds the cleaning capacity of nature. The spread of the use of chlorine destroys the critical microorganisms that have self-cleaning functions, a contradiction that intensifies the deterioration of the environment (Teruo Higa, 2008).

Microorganisms cleaned the earth in its early stages when it was polluted, helped create the oceans, rivers, and soil, and helped maintain an environment in which living things could thrive. But nowadays, humans, who cannot live without microorganisms, are insisting on a fanatical cleanliness that has led to the production of antibacterial products whose aim is to eliminate microorganisms. It's easy to imagine what the results will be. Eliminating microorganisms means that microorganisms will find it hard to live in the present environment, the number and

types of microorganisms will drop sharply, and the density of microorganisms living in the soil, rivers, and oceans will also drop (EM America, 2003).

However in polluted water systems, where pollution has built up and foul odors are produced, the amount of beneficial microorganisms will be reduced and putrefactive microorganisms will become dominant. Because of this, the purifying ability of the ecology will decrease, and a vicious circle will occur in which, as the nutrition and oxygen needed to sustain the ecology decrease, the ecology will be damaged even further. Through applying Effective Microorganisms (EM), a compound solution that has the ability to clean the environment, to this type of environment in which putrefactive microorganisms dominate beneficial microorganisms will then dominate (Teruo Higa, 2008).

1.2 Problem Statement

In 2008, the Malaysia Environmental Quality Report (MEQR) has reported that the number of river basins monitored remained at 143 and the number of monitoring stations was 1063. Out of these, 1063 monitoring stations, 612 (58%) were found to be clean, 412 (38%) slightly polluted and 39 (4%) polluted (Figure 1.0).

There was a significantly reduction in the number of clean river basins in 2008 compared with 2007. There were 76 clean river basins in 2008 as compared with 91 in 2007 (Figure 1.2). The decreases in the number of clean river basins were attributed to two factors. Firstly, an increase in the number of polluting sources such as sewage treatment plants, agro-based factories and pig farms which contributed to an increase in the pollution load. Secondly, a decrease in the amount of rainfall in the states of Pahang and Sarawak resulted in 5 and 11 rivers, deteriorated from clean to slightly polluted respectively. Also a small change of water quality index will cause a major shift in the category of rivers. (MEQR, 2008)

Washings, cleanings and sales of goods activities at the fish market area contribute to the generation of wastewater in large quantities every day. If it is not handled properly, it can contribute to pollutions, odor and aesthetic problems to the environment and society. The societies always ignore this issue as the waste from market, either solid wastes or liquids, doesn't contribute much impact to the river pollution. The pollution of the river is seemingly obvious because it could be easily judged by the look, color and smell of the river. Therefore, it is important to study the quality of wastewater currently and determine the recommend suitable solutions to the problem.

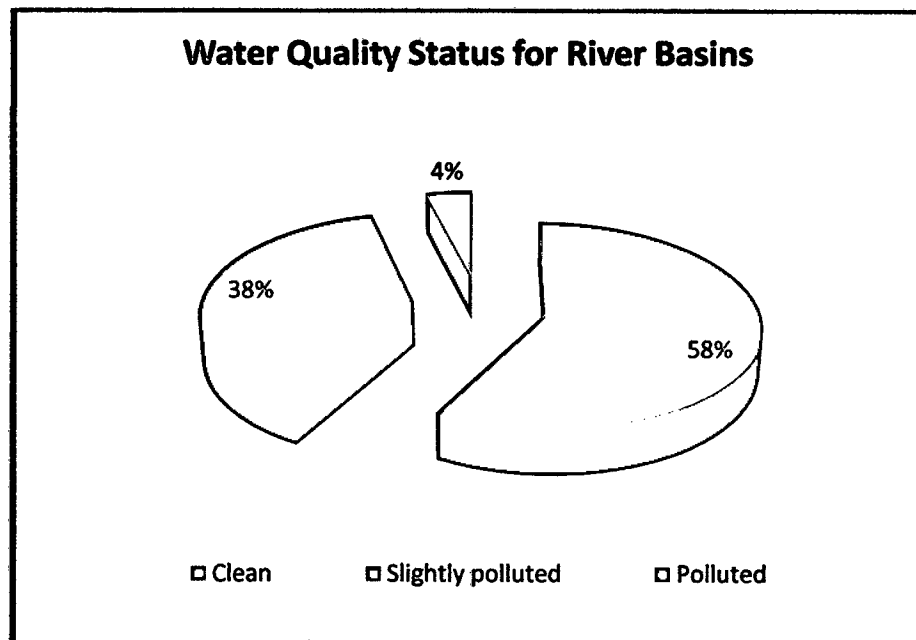


Figure 1.0: Water Quality Status for River Basins in Malaysia (MEQR, 2008)

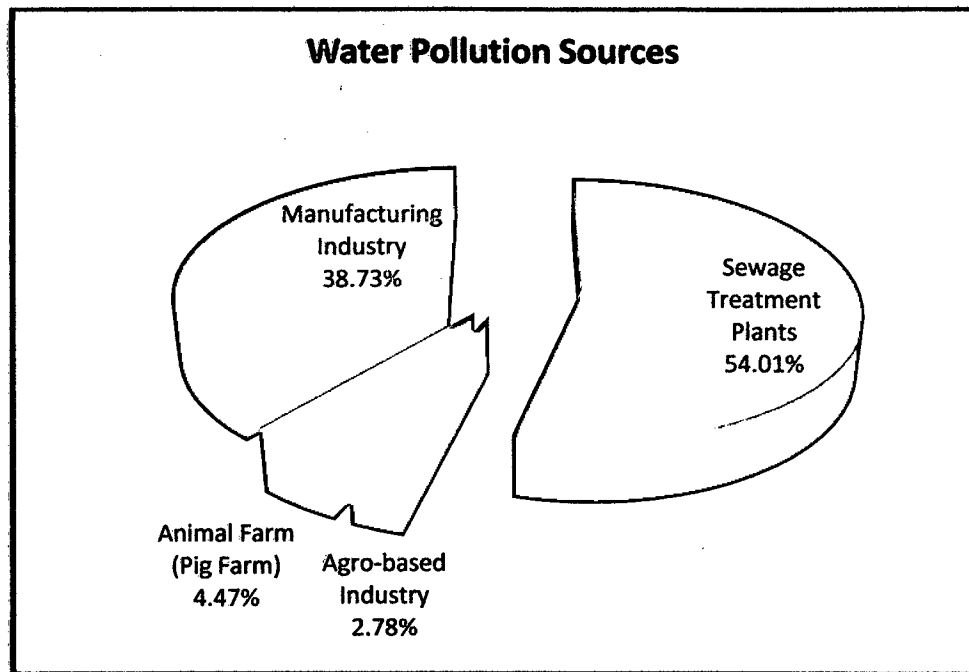


Figure 1.3: Composition of Water Pollution Sources by Sector in Malaysia
(MEQR, 2008)

1.3 Objectives

The objectives of this study are:

- a) To determine the effectiveness of using Effective Microorganisms in improving the wastewater quality at the fish market area
- b) To determine the classification of wastewater quality at the fish market area using Effective Microorganisms

1.4 Scope of Study

The scope of this study is to determine the wastewater quality at the fish market area before and after using the Effective Microorganisms (EM). The wastewater quality is determined by done the test according to the parameter of pH, temperature, Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Total Suspended Solid (TSS), Ammonia Nitrogen (AN), and Dissolved Oxygen (DO). The parameters are based on the Water Quality Index (WQI) from the Department of Environment (DOE).

This study will consist of in-situ measurement during wastewater sampling as well as laboratory testing after wastewater sampling. A sample of wastewater is taking from a location at the fish market area. To find the differences of wastewater quality and the effectiveness of using Effective Microorganisms (EM), the experimental of the parameter need to be done. While done the sampling the wastewater, the parameter to be tested for in-situ measurement is Dissolved Oxygen (DO), pH and temperature. The other test is done for laboratory measurement which is Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Total Suspended Solid (TSS), and Ammonia Nitrogen (AN). The test of BOD and TSS must be done within 24 hour sample has been taken. For COD and AN, the testing can be made within 48 hour sample has been taken but the sample must be preserve and store at the refrigeration.

There are two phases of process in the laboratory's experimental which is the first, need to determine the quality of the samples without adding the Effective Microorganisms (EM) and the second, is to determine the quality of the samples with adding the Effective Microorganisms (EM). After the experiment done, the data collect is use for classification the standard quality of wastewater from fish market.

1.5 Significant of Study

By knowing the differences of wastewater quality at fish market area, which is before and after using the Effective Microorganism (EM), according to the standard, the effectiveness of using the Effective Microorganism (EM) can be determine. If the result obtained from the study shown the improving of the wastewater quality, the use of effective microorganisms as a one of the solution to improve the condition and environment of wastewater quality at fish market area can be proved.

The used of effective microorganisms instead of using chlorine as the material to reducing the pollution at the market area without effecting the river water quality with the substance that can harmful the aquatic life in the river. Nowadays, implication of using the chlorine as the cleaning method at the fish market will effected to the wastewater produce. These will also affected to the river water quality which is the wastewater from the fish market is discharge through to the river. Free chlorine (chlorine gas dissolved in water) is toxic to fish and aquatic organisms, even in very small amounts. Chlorine affects fish and aquatic organisms. It is important to realize chlorine becomes more toxic as the pH level of the water drops.

Through applying the effective microorganisms in wastewater treatment at the fish market can reduce the cost used to treat the wastewater and to clean the environment of fish market area. The cost of using the effective microorganisms is less than using the chlorine as the material that always used as the cleaning function. Through applying the effective microorganisms, the environment at the fish market area can be cleaned and also the wastewater from the fish market area can be treated.

CHAPTER II

LITERATURE REVIEW

2.1 Introduction

Rivers are a very important natural resource to our country. Not only majority of our water supply comes from rivers, but in fact rivers also provide us with food as well as generate income for the country through its aesthetic values. Therefore each and every one of us needs to play a part in protecting our rivers.

Contaminated water, both of the remaining results from human activities or natural around various issues and bring discomfort to everyday people life. Waste water revenue activities in the public fish market, such as preservation of fish waste water, the remaining raw materials and water washing may be regarded as a small problem, insignificant and not cause any great risk to water quality. If it is not handled properly, it can contribute to pollutions, odor and aesthetic problems to the environment and society.

However in polluted water systems, where pollution has built up and foul odors are produced, the amount of beneficial microorganisms will be reduced and putrefactive microorganisms will become dominant. Because of this, the purifying ability of the ecology will decrease, and a vicious circle will occur in which, as the nutrition and oxygen needed to sustain the ecology decrease, the ecology will be damaged even further. Through applying EM, a compound solution that has the ability to clean the environment, to this type of environment in which putrefactive

microorganisms dominate beneficial microorganisms will then dominate. As the micro-flora becomes more productive this will greatly change the ecological pyramid.

2.2 Causes and Sources of River Pollution

River pollution is any human-caused contamination of water and river that reduces its usefulness to humans and other organisms in nature. When our water supply is contaminated, it is a threat to human, animal, and plant health unless it goes through a costly purification procedure. According to Tchobanoglous and Schroeder (1985), urbanization and uncontrolled development generally contributes significantly to river pollution. There are many specific causes of water pollution, but firstly, it's important to understand two broad categories of water pollution which are point source pollution and non point source pollution.

2.2.1 Point Source Pollution

Point source pollution occurs when harmful substances are emitted directly into a body of water. An example of a point source of water pollution is a pipe from an industrial facility discharging effluent directly into a river. These effluents contain chemical and toxic waste which endangers living things. People throwing rubbish into the river is also considered as point source pollution (Tchobanoglous and Schroeder, 1985).