IMPROVING THE FILTER SYSTEM FOR THE EXISTING DOMESTIC WASTE PRETREATMENT SYSTEM IN KUKTEM

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ABSTRACT

Water is the one of the resource that very important in our daily lives. However, if our water resources uses every day are polluted by contaminants, it can impacts for ecologies system life cycle and human life. The major pollutants are identified at Sungai Klang which the river are polluted by domestic activities around that area. However, local government was able expense a million Ringgit Malaysia (RM) to built water treatment system but it must be treated at the beginning point to make sure the water will exceed the water quality index specification. Therefore, early treatment or first stage of filter is very important before the domestic waste enter to the rivers. The main purpose of this study is to identified oil and grease on treated water after filtration process and propose of reuse water. Scope of this study was started at cafeteria student which oil interceptor was built. This study also improving the filter system for existing domestic waste pretreatment system(oil interceptor) that have be adaptation from mineral water port system that have being change their system. In design of filter, the material use on this design is defined in various size of aggregate and sand, which is tested to defined their infiltration rate (in/hr). Hopefully with this study, all parties will take part and involved in control pollution on our rivers

ABSTRAK

Air adalah sumber yang paling penting dalam kehidupan seharian. Namun demikian, jika sumber air yang digunakan seharian telah tercemar oleh bahan-bahan yang boleh memberi kemudaratan kepada satu sistem kitaran ekologi dan juga memberikan kesan keatas kesihatan manusia. Kawasan yang paling teruk melanda masalah ini adalah di Sungai klang yang telah dicemari oleh sisa-sisa domestik yang dibuang dari aktiviti-aktiviti yang dijalankan di kawasan perumahan berdekatan. Lantaran itu, dalam kajian ini rawatan awal ataupun peringkat penapisan yang pertama perlu dibuat sebelum dilepaskan ke sungai-sungai. Skop kajian ini dijalankan di kafeteria pelajar dimana terletaknya sebuah perangkap minyak (penapis air). Dalam kajian ini juga ada menampilkan rekabentuk perangkap minyak yang diadaptasikan daripada konsep bekas penapis air dirumah (mineral waterpot system) yang telah diubah penggunaannya bagi mempertingkatkan sistem penapis yang sedia ada. Bahan-bahan yang digunakan adalah terdiri daripada pelbagai jenis saiz batu baur dan pasir yang digunakan untuk penapis, dimana ia akan diuji bagi mendapatkan kadar penyusupan (in/hr). Di akhir kajian ini diharapkan semua pihak-pihak yang terlibat dapat mengambil initiatif ini sebagai salah satu peringkat permulaan dalam mengawal pencemaran dan seterusnya menjaga sungai kita kerana air adalah sumber kehidupan kita.

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LIST OF ABBREVIATIONS

USM	-	University Sains Malaysia
REDAC	-	River Engineering and Urban Drainage Research Center.
KUKTEM	-	Kolej Universiti Kejuruteraan & Teknologi Malaysia
WQI	-	Water Quality Index
DOE	-	Department of Environmental
DO	-	Dissolved Oxygen
BOD	-	Biological Oxygen Demand
COD	-	Chemical Oxygen Demand
AN	-	Ammoniacal Nitrogen
SS	-	Suspended Solid
pH	-	Acidity/ alkalinity
IMD	-	Initial Moisture Deficit
RO	-	Reverse Osmosis
NF	-	NanoFiltration
MEC	-	Malaysia Electric Corporation
JBA	-	Jabatan Bekalan Air Pahang
TAWC	-	Total Available Water-Holding Capacity
RAWC	-	Readily Available Water-Holding Capacity

LIST OF SYMBOLS

f_p	-	The infiltration capacity (depth/time)
f_c	-	A final or Equilibrium capacity.
f_0	-	The initial infiltration capacity
k	-	A constant representing the rate of decrease in f capacity.
K_s	-	Hydraulic Conductivity (cm/hr)
η	-	Porosity
ψ	-	Wetting Front Suction Head (-cm)
θ	-	Moisture Content

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CHAPTER 1

INTRODUCTION

Water is one of the basic needs for all living things. It is also one of the most essential elements in the assurance of the success of the human race. An adequate supply of good quality water is fundamental to the economic and social development of any society.

One would think that these reserves of fresh water would be quite sufficient for the world's population, but the great majority of this fresh water is practically useless. Approximately 70% is bound up in glaciers, about 30% is below ground and only 0.006 % is available in the world's river. (K.M.Adullaev)

Heading towards the 21st century, it is estimated that water will be one of the most critical source available. Continued population growth, increase in industrialization, and contamination of both surface and ground waters, uneven distribution of water resources and periodic droughts are some of the major problems we face today concerning water.

According to the 'Secretary-General of United Nations Commission on Sustainable Development (1997)' it is stated that there is a possibility of no clean water would be available in neither developed country nor developing country. This report also stated that the usage of water has increased more than 3 times than the population if the earth and this situation are causing shortage of water, pollution of water, health problems, growth in economy and agricultural limitations which is leading to a negative impact on the ecosystem.

As the diagram (figure 1.1) above shows, assessment of the occurrence of chemicals that can harm water quality, such as nutrients and pesticides in water resources, requires recognition of complicated interconnections among surface water and ground water, atmospheric contributions, natural landscape features, human activities, and aquatic health. The vulnerability of surface water and ground water to degradation depends on a combination of natural landscape features, such as geology, topography, and soils; climate and atmospheric contributions; and human activities related to different land uses and land-management practices.

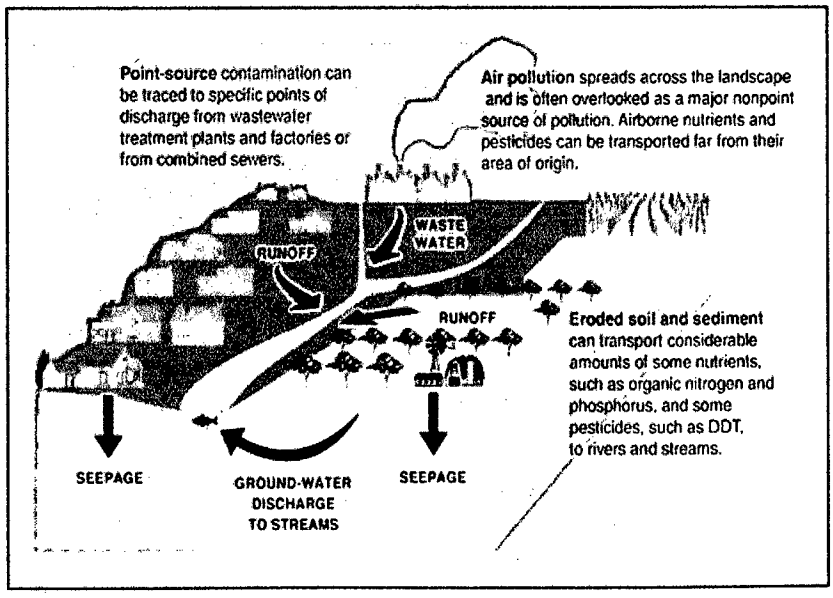

Figure 1.1 Assessment of The Occurrence of Chemicals That Can Harm Water Quality

1.1 General Definitions of Water Quality

Water quality is a term used to describe the chemical, physical, and biological characteristics of water, usually in respect to its suitability for a particular purpose. Although scientific measurements are used to define water's quality, it's not a simple thing to say that "this water is good," or "this water is bad." When the average person asks about water quality, they probably want to know if the water is good enough to use at home, to play in, to serve in a restaurant, or if the quality of our natural waters is suitable for aquatic plants and animals (Howard Perlman, 2005).

The definition pretreatment is a method, technique, or process designed to remove solids and or pollutants from solid waste, waste streams, effluents, and air emissions.

1.2 Objective of Study

Here, briefly are the objectives of this study:

i. Improve the filter system for the existing domestic waste pretreatment system in KUKTEM by making a new design based on existing pretreatment system.

1.3 Scope of Study

i. The scopes of study area focus on KUKTEM Student Cafeteria domestic waste pretreatment system.

ii. Design Model for improve existing filter for domestic waste pretreatment system.

iii. Determine the materials used for filter based on it types and sizes.

1.4 Problem Statement

The domestic waste systems at KUKTEM are not in good condition because domestic waste not well treated before its release to the main drainage. The domestic waste content cooking oil and others contaminant that can be danger to the fish and wildlife if the polluted water released from the drainage to the river.

1.5 Important of Study

The important of this study which is entitled 'Improve the Filter System for the Existing Domestic Waste Pretreatment System' is to find the solution for reducing the oil in domestic waste.

CHAPTER 2

LITERATURE REVIEW

2.1 Water Pollution

Water pollution has many sources. The most polluting of them are the city sewage and industrial waste discharged into the rivers. Presently, only about 10% of the waste water generated is treated, the rest is discharged as it is into our water bodies. Due to this, pollutants enter groundwater, rivers, and other water bodies. Such water, which ultimately ends up in our households, is often highly contaminated and carries disease causing microbes. Agricultural run-off, or the water from the fields that drains into rivers, is another major water pollutant as it contains fertilizers and pesticides.

2.1.1 Effects of water pollution

Palm oil processing mills produce high temperature water with a high BOD, which is normally treated in a retention pond before being discharged into rivers. Nevertheless, the impacts on the rivers are obvious especially during low flow periods.

The water pollution indeces for rivers in Sarawak show that even rivers in areas with low population densities the rivers are moderately polluted (WQI 60-70%). Rivers like the Miri river with more human activities are classed as very polluted (WQI <50%). Generally, all the rivers have been deteriorating since 1995. The point source discharges, which affect the water catchment area, are much easier to inspect, monitor and control than the non point source pollution which originates from many different places.

2.2 Wastewater

Every community produces both liquid and solid wastes. The liquid portion wastewater is essentially the water supply of the community after it has been fouled by variety of uses. From the standpoint of sources generation, wastewater maybe defined as a combination of the liquid or water carried wastes removed from residences, institutions and commercial and industrial establishments, together with such groundwater, surface water and storm water as maybe present. (Eddy &Metcalf, 1991)

Wastewater is also known as any water derived from one or more previous uses. It usually had undergone some degradation in quality as a result of use. It may be furnished untreated or collected and treated for some additional water use. Treatment by one or several processes results in for the water to be suitable either for discharge or for reuse.

Untreated wastewater usually contains decomposition of the organic materials, numerous pathogenic or disease causing microorganisms, nutrients which can stimulate the growth of aquatic plants and it may contain toxic compounds. For these reasons, the immediate removal of wastewater from its sources of generation, followed by treatment and reuse or disposal is not only desirable but also necessary in the current industrialized society.

2.3 Wastewater Classifications

Wastewater can be classified into 4 categories which are:

i. Domestic Wastewater

This type of wastewater is discharged from residential area, commercial, institutional and recreational facilities.

Today, many people dump their garbage into streams, lakes, rivers, and seas, thus making water bodies the final resting place of cans, bottles, plastics, and other

household products. The various substances that we use for keeping our houses clean add to water pollution as they contain harmful chemicals. In the past, people mostly used soaps made from animal and vegetable fat for all types of washing. But most of today's cleaning products are synthetic detergents and come from the petrochemical industry. Most detergents and washing powders contain phosphates, which are used to soften the water among other things. These and other chemicals contained in washing powders affect the health of all forms of life in the water.

ii. Agricultural Run Off

The use of land for agriculture and the practices followed in cultivation greatly affect the quality of groundwater. Intensive cultivation of crops causes chemicals from fertilizers (e.g. nitrate) and pesticides to seep into the groundwater, a process commonly known as leaching. Routine applications of fertilizers and pesticides for agriculture and indiscriminate disposal of industrial and domestic wastes are increasingly being recognized as significant sources of water pollution.

The high nitrate content in groundwater is mainly from irrigation run-off from agricultural fields where chemical fertilizers have been used indiscriminately.

iii. Industrial Wastewater

It is basically the spent water from industrial operations such as food processing and many more. This type of wastewater is known to be hazardous towards human's health and the environment because industrial wastes are more likely to contain toxic and nonbiodegradable compounds. Industrial pollution from the petroleum industry is a major threat to coastal ecosystems. Hydrocarbon contamination that enters the food network of the sea via plankton is accumulated in the lipid fractions of the marine

organisms, and may be responsible for the accumulation of carcinogenic compounds within the food web. Also of concern are organochloride compounds from herbicide and pesticide use; unfortunately the concentrations and fates of these pollutants are unknown.

iv. Municipal Wastewater

It is a combination of domestic and industrial wastewater together with the groundwater, runoff water and storm water.

2.4 Water Quality Index (WQI)

The parameters chosen for the WQI based on the DoE's formula are DO, BOD, COD, SS, AN and pH.

The formula used in the calculation of the DoE's WQI is:

$$WQI = 0.22*SIDO + 0.19*SIBOD + 0.16*SICOD + 0.15*SIAN + 0.16*SISS + 0.12*SIpH$$