SEWAGE MANAGEM)M 2013 TO 2020

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ABSTRACT

Sewage is generated by human activities continuously. As the population increases in the country, the quantities of sewage also increases every year. Many sewage systems were introduced in the country to protect the health of human and environment. From the year 1993, the sewage system in Malaysia has been given to the private management. Now, it is Indah Water Konsortium Sdn. Bhd.'s (IWK) responsibility to manage the sewage systems in the country. This study was conducted to study the sewage management needs in Kuantan from the year 2013 to year 2020. The objectives of this study are to study the sewage management system used in Kuantan through community perception, to identify the problems faced by IWK Kuantan in sewage management and to recommend improvements to the existing sewage management system. The information collected for this study was obtained from IWK and several housing areas in Kuantan. The information included in this study were new and old sewage systems used in Kuantan and how IWK manage the problems in sewage management. As a conclusion, IWK in Kuantan is responsible for improvements to the sewage management in Kuantan. Therefore, IWK should provide personnel on standby during weekends and public holidays to handle any problems that may crop up. Thus, it can provide good quality sewerage and protect the health of both humans and the environment.

ABSTRAK

Kumbahan adalah yang dijana oleh aktiviti manusia secara berterusan. Pertambahan penduduk di negara ni menyebabkan kuantiti kumbahan juga semakin meningkat setiap tahun. Banyak sistem kumbahan telah diperkenalkan di negara ini untuk melindungi kesihatan manusia dan alam sekitar. Dari tahun 1993, sistem kumbahan di Malaysia adalah pengurusan penswastaan. Kini, Indah Water Konsortium Sdn Bhd (IWK) bertanggungjawab dalam menguruskan sistem kumbahan di negara Malaysia. Kajian ini telah dijalankan to mengetahui pengurusan kumbahan di Kuantan pada tahun 2013 sehingga 2020. Objektif kajian ini adalah untuk mengkaji sistem ppengurusan kumbahan yang digunakan di Kuantan melalui persepsi masyarakat, untuk mengenal pasti masalah yang dihadapi oleh Indah Water Konsortium Sdn Bhd (IWK) dalam mengurus kumbahan dan mencadangkan sistem pengurus kumbahan yang baru. Maklumat yang dikumpul untuk kajian ini diperolehi daripada pihak Indah Water Konsortium Sdn Bhd Kuantan (IWK) dan kawasan perumahan di sekitar Kuantan. Maklumat penting untuk kajian ini adalah sistem kumbahan baru dan lama yang digunakan di Kuantan dan bagaimana pihak IWK menyelesaikan masalah yang dihadapi dalam pengurusan kumbahan. Kesimpulannya, Indah Water Konsortium Sdn Bhd (IWK) di Kuantan bertanggungjawab untuk meningkatkan pengurusan kumbahan. Oleh itu, ia dapat menyediakan kualiti kumbahan yang baik dan melindungi kesihatan penduduk dan alam sekitar.

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

Sewage is defined as the mixture of water and waste that carried out through the drainage and sewerage systems. The wastes include both organic and inorganic materials. That is also including the human wastes, minerals salts and garbages. The organic substances in sewage decompose rapidly to give off from the hazardous gases foul-smelling. The sewage at large city also contains liquid wastes from various industrial processes. The disposal security is most important to the health of the community. Generally, the wastewater removed from domestic sources is called sewage or community wastewater that consists of 99.9% water and 0.1% solids (Niraj et al, 2011). Sewage from domestic and commercial, industrial and institutional premises should be treated in order to ensure the water can be safely returned to the environment. As a result the provision of sufficient sewerage infrastructure is therefore essential to ensure the health and quality of life of the community (Indah Water Konsortium, 2007).

The collection and treatment of sewage is a most importance service in sewage management. At the treatment plant, sewage is treated to destroy pathogenic organisms and to remove the materials that can have harmful or other undesirable effects in the water. The treated sewage will be discharged into the nearby river or coastal waters. In rural areas, the treated sewage is usually disposed in the soil. Malaysia has been through various experiences and challenges in managing the sewage management system. Indah Water Konsortium Sdn Bhd (IWK) is currently managing the service of sewerage since 1996, whereby sewerage was previously managed at the Local Authority (LA) level (Saiyidah Nafisah, 2011).

As populations increases by leaps and bounds, it will put more pressure on the environment and threatening sources of water supply. These also show that the problems of human waste need a good service management. In Malaysia there are three main sewage management practices being employed. These are divided into public sewage treatment plant, private sewage treatment plant and individual septic tank. The individual septic tank is particularly known as an on-site treatment system. The individual septic tank is suitable for a single dwelling or individual buildings with a population equivalent (PE) up to 150 and these systems partially treat the sewage. (Noor Wahyu, 2010). The effect of overloading in septic tanks will create unsafe environments and odor problems in the community

Early in 1990s, there was an evolution to a modern sewage treatment plant producing high quality effluent, which can be safely discharged to the environment (Indah Water Konsortium, 2007). IWK has been managing the various methods of sewage treatment systems to protect the public health of the community and the environment. More build developments in sewage treatment have been accepted to improve the reliability and to reduce the area used by the treatment works. These treatments work also accelerate natural treatment rate in controlled conditions. The management of sewage is therefore essential that to be taken seriously to avoid the occurrence of infection. Besides, not having a proper facility of waste treatment could result in discomfort of life. As a result, the best facility can assure the health and quality of life for the community.

In Malaysia, the sewage from commercial and industrial sectors is treated separately by different sewage treatment plant. In urban areas, as the human population grows denser and the environment is not able to cope with the increasing wastes, sophisticated treatment system has to be developed that can produce high quality effluent.

1.2 PROBLEM STATEMENT

Sewage needs treatment to ensure the water is safe to be returned to the environment. These sewage from domestic and commercial sources after treatment can

be released into the river or sea. The provision of sufficient sewerage infrastructure is therefore essential to ensure the health and quality of life of the community (Indah Water Konsortium, 2007). The development of sewage systems in Malaysia has two types. These types are on site sewage system and off site sewage system. Now, IWK is handling more than five thousand numbers of sewage management centres the nationwide.

Sewage is a problem that must be taken seriously by a good management. The quantity of sewage increases every year because the population in Kuantan is always increasing every year. In sewage management, there are a lot of problems. Poor management of sewage will have side effects such as treatment plant breakdown and environmental pollution affecting the health of society in general, especially if it is not handled properly and regularly. Therefore, sewage management has to be effective.

1.3 OBJECTIVES

The objectives for this project are:

1. to study the sewage management system used in Kuantan through community perceptions.
2. to identify sewage management challenges to the sewage service provider.
3. to recommend improvement to the current sewage management system in Kuantan.

1.4 SCOPE OF RESEARCH

The scope of this project was carried out to study the sewage management in Kuantan from 2013 to 2020. The sewage management system in Kuantan the responsibility of IWK. IWK is the national sewerage company and is wholly-owned by Minister of Finance Incorporated, which has been responsible for developing and maintaining a modern and efficient sewerage system in Malaysia. The scope of research is focused on housing areas in Kuantan. Based on the study, we can identify the challenges faced by sewage service provider in sewage management. There are a lot of

challenges for the management to carry out such as the system of sewage, capacity of community in Kuantan, capacity of development in Kuantan and duration work of sewage. Besides, this study also explores the issues of community perceptions towards sewage management in Kuantan. This may be proven from the customer service provided by IWK.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

Water is the natural resources that almost cover 70% off the earth's. Water is the most important role in the development community because without water, life maybe not exist in the universe. Once the water is used, wastewater is produced. Wastewater is called as a sewage. Sewage is defined as the effluent from the residential, commercial, institutional and industry (Nik Fuad, 1990). Sewage also has the potential to cause the disease and pollution of the environment.

Many sewage systems are introduced in the country to protect the health of human and environment. From the year 1993, the sewage system in Malaysia has been put into the privatization management. Now, IWK is responsible to manage the sewage systems in the country. These parts are the study about the types of sewage, types of sewage management systems, factors affecting management of sewage treatment systems used in Kuantan, public perception of the current sewage management and previous study of sewage management in Malaysia.

2.2 TYPES OF SEWAGE

Sewage is also knows as wastewater. The liquid waste obtained from a community. Sewage has more than 99% water and features by volume or flow rate, physical condition, chemicals and bacteriological organisms. There are three types of sewage systems. These systems include sanitary sewage, industrial sewage and combined sewage. Each of the sewages has different benefits and functions.

2.2.1 Sanitary Sewage

Sanitary sewage is also called as domestic sewage. That is the foul discharges from residential and commercial area. Generally, it including discharges from latrines, urinals and laundry. If the characteristics wastewater from stores and service establishments serving the community are similar with household flows, then the commercial wastes are included in the sanitary or domestic sewage. Example of sanitary sewage are shown in Figure 2.1.

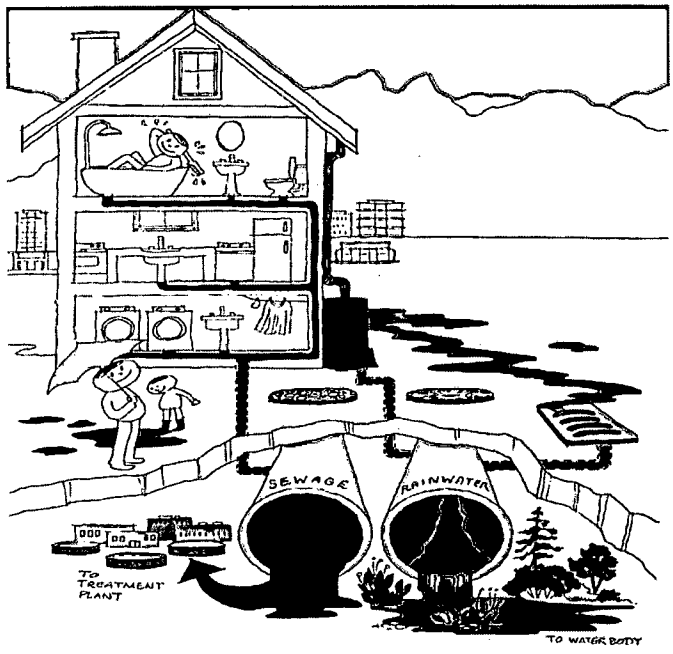

Figure 2.1: Sanitary Sewage

2.2.2 Industrial Sewage

Industrial sewage is the foul discharge from industries. Industrial sewage also uses water from manufacturing or chemical processes. It includes discharges produced during the manufacturing of goods. Many industries depend on the processes that produce wastewaters. Example of industrial sewage are shown in Figure 2.2.

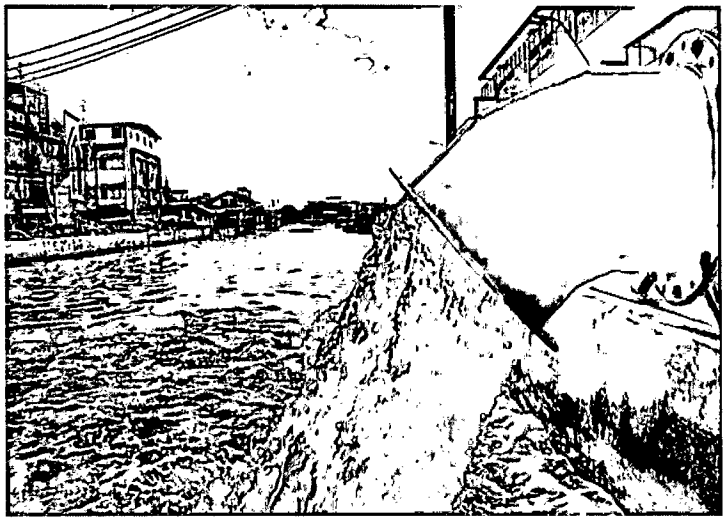

Figure 2.2: Industrial Sewage

2.2.3 Combined Sewage

Combines sewage is the combination of sanitary sewage and storm water. The storm water is rain and snow melt that runs off surfaces such as rooftops, paved streets, highways and parking. The treatment plant able to support the higher capacity because combine sewage leads a large water quality. Example of combined sewage are shown in Figure 2.3.

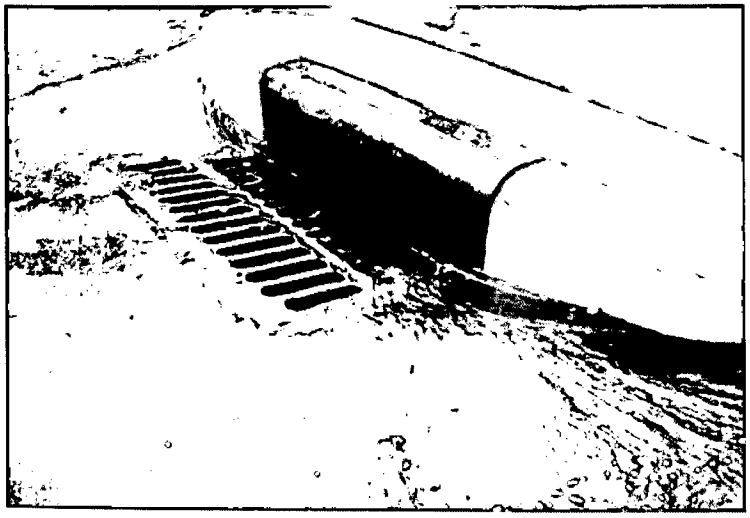

Figure 2.3: Combined Sewage

2.3 TYPES OF SEWAGE MANAGEMENT SYSTEMS

The current management of sewage systems in Malaysia consists of a combination of on-site and off-site system. The type of sewage management systems are described in sections 2.3.1 and 2.3.2.

2.3.1 On Site Sewage System

On site sewage management system is a planning system design of wastewater treatment. This system uses the soil to treat the wastewater produced from homes, businesses or other buildings for human occupancy. On site sewage management system are used in areas where sewage treatment plant at the central public is not being found. Generally, this type of system is a septic tank system. As a result, if the on site sewage management system is not sited, designed, installed, operated and maintained correctly that it can be filled (Noor Wahyu, 2010). On site sewage system should have a proper and efficient method in term of system operation and maintenance to ensure the level of design performance can provide a good quality.

If on site sewage systems not well planned, constructed or maintained, it can give threats to water quality. This system can be a failure and untreated wastewater can be brought to nearby water bodies threatening human health. Besides, these problems also can cause excessive algal growth and harm a aquatic life. If on site sewage system is not correctly located or does not have an appropriate depth of suitable soil, that system can assumed as not fully treat the wastewater. The solids and scums may flow into the drain field and plug it up if the septic tank does not have an adequate treatment. As a result, that also can be a threaten to human health and create odors. Example of on site sewage system are shown in Figure 2.4.

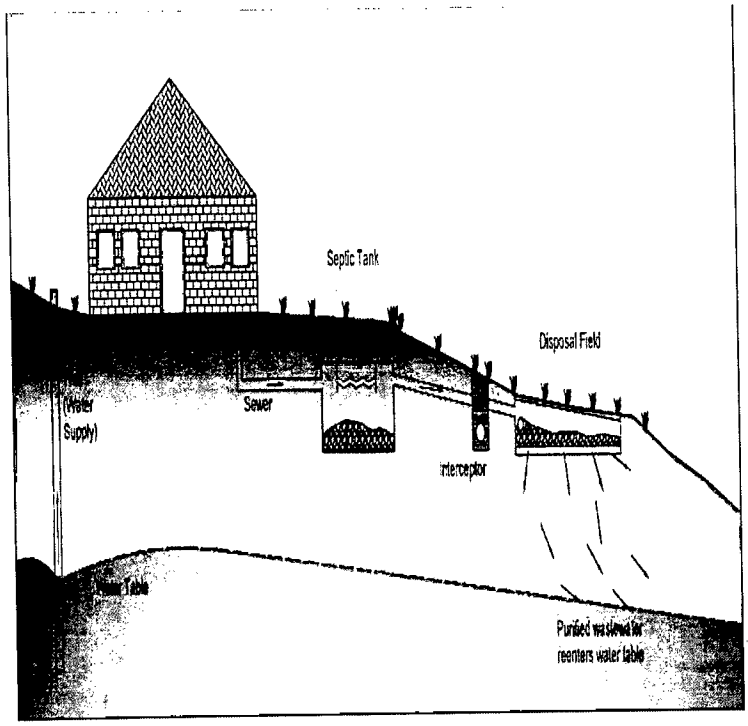

Figure 2.4: On Site Sewage System

2.3.2 Off Site Sewage System

Off site sewage management system is a treatment that have been carried out using a sewerage system. The treatment system is a simple design to reduce biochemical oxygen demand (BOD) and suspended solids (SS) to a reasonable level. This system is achieved by removing solids and aerating wastewater to fulfill the oxygen demand of the wastewater. The different treatment systems remove solids and to provide oxygen in different ways. Besides, the system should achieve all the required standard treatment in the sewage management system.

Off site sewage system is also divided by two types. This type is centralized and multipoint planted. Centralize plant was driven according to the strategic planning of sewerage catchment. Where, the centralize plant being invested on the high cost of the construction with general technology be applied. Generally, the system requires larger land area than multipoint plant. Multipoint plant is developed by the developer based on the specific development to serve small numbers of PE. IWK also is responsible for planning and rationalizing the public sewerage facilities to reduce the total treatment

plants that used the multipoint concept or regionalization (Indah Water Konsortium, 2013). Example of off site sewage system are shown in Figure 2.5.

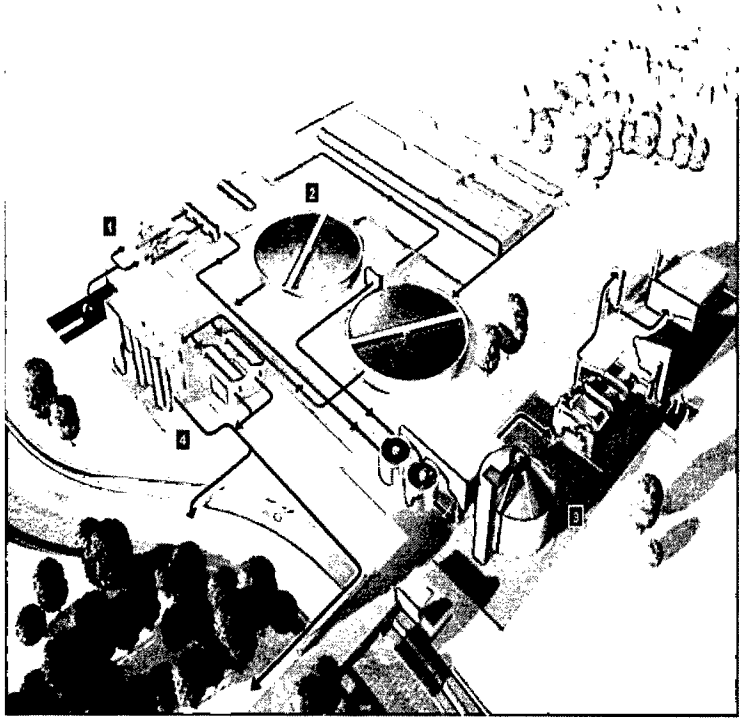

Figure 2.5: Off Site Sewage System

2.4 FACTORS AFFECTING MANAGEMENT OF SEWAGE TREATMENT SYSTEMS USED IN MALAYSIA

The factors affecting management of sewage treatment systems used in Malaysia are described in sections 2.4.1, 2.4.2 and 2.4.3.

2.4.1 Environmental Factor

Environmental system is one of the factors that affects the sewage treatment system. This factor can give impacts to the sewage treatment plant to ensure the protection of environmental quality and public health. As a result, adour can give effects of public health. The public health considerations need to give a look at the requirements that have been stated by the regulatory agencies for effluent discharge standards. Environmental criteria also including natural and man-made resources that

may be examined in an environmental impact assessment. The understanding about an environment is essential to select the system and should be implemented through the control, a comprehensive site evaluation process (Massoud et al, 2009). This evaluation will be determined by the capacity that carried out by the environment. According to Noor Wahyu (2010) decentralized plants can cause a higher whole environmental impact on the site.

2.4.2 Economical Factor

Site selection and plant layout have significant effects in redundancy requirement of a treatment plant. It also to consider planning and concept development stages to provide adequate infrastructure in the current design. Wastewater need to be divided into the smaller modules to make it easier to manage and to decrease the requirements for expert operations and maintenance (Noor Wahyu, 2010). As such, the operations and maintenance of a facility will not be as complex or difficult. However, it should be in mind that the cost of small treatment plant for building and operating of treatment plant consider more expensive than one large central system. Besides, the facilities of requirement for small treatment plants also will be more.

Treatment plant should have more machineries and equipments. Redundancy requirements of a treatment plant may have signed to make the maintenance processes and to avoid the equipment failure. The small treatment plant technologies can be placed nearer to the human settlement without demanding large area of the land reserved and it also will cause the lower cost in implementation. However, the centralized system also can consider if the location has a high density of the population. Besides, the larger treatment plant also can savings in operational cost, but only if the investment cost is higher. Hence the population density and location and the efficiency of each system as compared to its cost should be considered.

2.4.3 Technical Factor

The technical factor is related to the design, construction and manufacturing issues. The differences areas of occupied by residents can give the great effects in the

design of the system built (Noor Wahyu, 2010). The quality of constructing sewerage is different each other, in term of the design, reliability, performance and workmanship. The good and strong design, operator commitment and responsible administration are essential functions to get a successful wastewater treatment. The weakness of these functions may cause the process failure. Furthermore, the manpower required at the site can reduce due to the Package Plant units. The Package Plant units are manufactured at the factory and delivered to site for installation and operation. As such, it can decrease the daily supervision required to operate the equipment. Otherwise, the allowance for the future development is one of the factors that should not be avoided to ensure the treatment facilities be used is efficiently and effectively.

2.5 PUBLIC PERCEPTION ON CURRENT SEWAGE MANAGEMENT

Year 2008, IWK was appointed by ECO-Asia as a mentor to sewerage Medan City firm during launching a campaign to raise awareness of the importance sewerage services (Azhar Ibrahim, 2013). Two experts who work in IWK give some experiences and teach 30 staff from Medan on the crucial steps in implementing awareness campaign. The development of sewage treatment should be done consistent with the growth of a country. Besides, the community should inculcate of recycling waste in order to preserve the environment.

A public perception study on sewage management implemented in Malaysia shows several interesting and unexpected findings. The general public perception patterns are related to odor, noise and visual impact. The level of public awareness regarding sewage management was surprisingly low, so should to educate the community on health and quality of the environment (Tso et al, 1990). Some understanding of the people's attitude is important for the planning and design of sewage works. By considering the people's attitude and view, the sewage treatment facilities can function effectively. Besides, the authorities may have more information on which to base their decision and information from technical and economical consideration.

The respondents are questioned for various topics which related to the sewage management. The questions are their reasons for staying in the area, and their feelings and complaints about living in the round of sewage management. Furthermore, several housing developers are also interviewed to get a wider purview of the actual situation. Several interesting findings are obtained in these research regarding the perception of the impacts of sewage treatment plants on the environment. The major concern of the respondents was the admittance of odour. Other factors of concern were noise, pests, visual impacts and health hazards. The impact of odour on community being is mainly psychological, but instead of causing actual physical harm. Offensive odour may cause lack of appetite for food, impaired respiration, nausea, vomiting and mental perturbations.

2.6 STATUS OF SEWERAGE SYSTEM IN MALAYSIA

Sewerage system in Malaysia was progressively developed along the year since 1950's. In 1970, the population in the country was presented by the centralized sewerage system. According to Noorwahyu (2010) only 3.4% of the population was presented by the centralized sewerage system and mostly in major towns. During 1970's, majority of population in urban areas mostly used septic tanks and bucket latrines as for wastewater treatment facilities. While, the communities in rural areas were using pit latrines or resort to the natural environment. This was recognized as the most successful model by the World Health Organization, with a minimum of 90% coverage in year 1995. However for the urban areas, the used of conventional sewerage approach has been adoption.

As advanced in technologies, innovation on the treatment systems and involvement from the Government by establishment of Sewerage Service Act 1993 as well, the evolution of sewerage system in Malaysia was gradually increased and developed. The numbers of on site sewage system was escalating in early 1980's whereas the developer needs to provide a treatment plant for construction of more than 30 houses or 150PE. The evolution of sewerage system in Malaysia are shown in Figure 2.6.

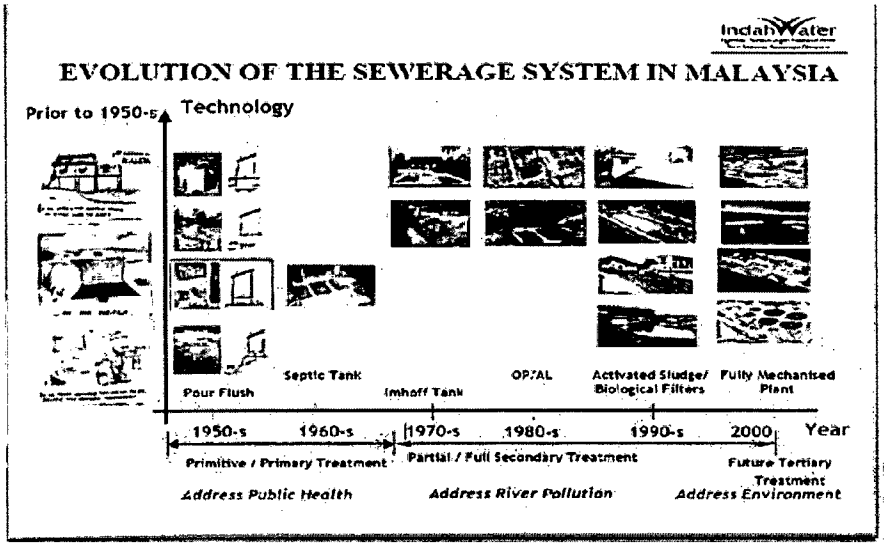

Figure 2.6 The Evolution Sewerage System in Malaysia

The total number of sewage treatment plants (STPs) in Malaysia at present is estimated to be more than twelve thousand plants. Of these, a total about 5,222 STPs are public plants which operated by Indah Water Konsortium Sdn. Bhd serving a total PE of approximately 18million. Moreover, there are around 3,635 CSTs in Malaysia with the PE serving 434,000PE. In addition, there are an estimated 1.1 million ISTs, with a connected PE of almost 5.5 million of which only 35% are receiving regular desludging services. There are also an estimated 4 million PE using pour flush or primitive systems. The distribution of sewerage system in Malaysia is tabulated in Table 2.1.

Table 2.1 Distribution of Sewerage in Malaysia (Noor Wahyu, 2010)

Sewerage System	Nos	Population Equivalent (PE)
Regional STPs (Public STP)	74	5,600,000
Multipoint STPs (Public STP)	5,290	12,300,000
Communal Septic Tanks (CST)	3,634	434,000
Private STPs	3,415	2,000,000
Individual Septic Tank (IST)	1,200,531	5,500,000
Pour Flush (PF)	761,000	3,800,000
Total	1,973,944	29,634,000

2.7 TYPES OF SEWAGE TREATMENT PLANT IN MALAYSIA

Basically, types of sewage treatment plant in Malaysia can be classified into five main group as follows:

i. Group 1 – Communal Septic Tank
ii. Group 2 – Imhoff Tank (IT)
iii. Group 3 – Oxidation Pond (OP)
iv. Group 4 – Mechanical Plant with Media (MPM)
v. Group 5 – Mechanical Plant without Media (MPWM)

2.7.1 Communal Septic Tank (CST)

Communal Septic Tank (CST) is make up 53% from all treatment plants in Malaysia. Usually, these tanks connec of some properties and they are available amidst buildings or adjacent to buildings. It is primary treatment system. This system consists of two chambers. The influent enters into first chamber where solids settle and partially clarified effluent overflows to the second chamber. The sludge collected in the first chamber and required regular desludging. In addtional, settlement occurs in the second chamber before effluent is discharged to the drain. These systems however, are not designed to meet either Standard A or Standard B of the effluent standard. The typical photo of Communal Septic Tank are shown in Figure 2.7.

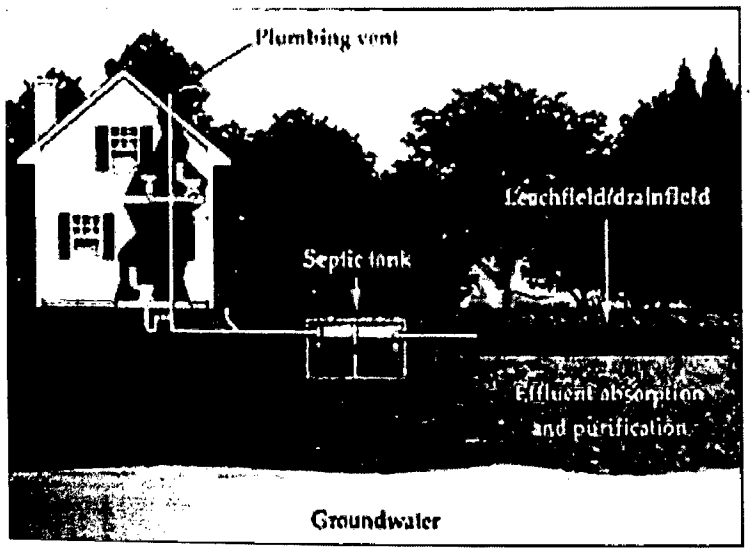

Figure 2.7 Communal Septic Tank (CST)

2.7.2 Imhoff Tank (IT)

Imhoff tank is simple form of sewage treatment plant. IT requiring very little operational skill. IT constitue 245 or 800 numbers of all sewage treatment plants in Malaysia. They provide limited treatment of sewage and are not suitable long term solution. If the tanks are not properly maintained, the effluent can rapidly deteriorate. Generally, IT used to servive small communities up to a PE of 1000. IT are cheap to install, operate and maintain and IT only partially treat sewage. According to Noor Wahyu (2010), the effluent from the IT will not meet the environmentak requirement of the Department of Environment (DOE). Besides, IT as the popular method of servicing small communities. Figure 2.8 is shown the Imhoff Tank (IT).

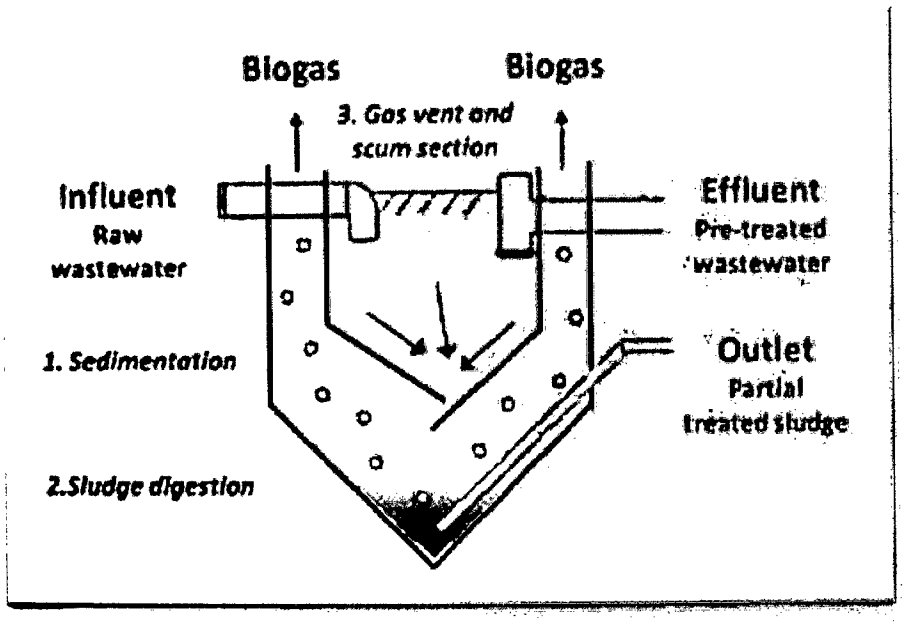

Figure 2.8 Imhoff Tank (IT)

2.7.3 Oxidation Pond (OP)

Oxidation ponds are a popular sewage treatment method for small communities because of their low construction and operating costs. Oxidation pond represents 12% or 500 numbers of sewage treatment plants. New oxidation pond can treat sewage to Standard B effluent level but require maintenance and periodic desludging in order to maintain the standard. Typically at least two ponds constructed and the first reduces the