Malaysia’s sewerage industry has evolved over the last half a century. Prior to the country’s independence in 1957, there were no proper sewerage systems and no need for a proper sewage treatment one due to the low population densities and very limited urbanised developments.

Sewage treatment was mainly by way of primitive methods such as pit and bucket latrines, over-hanging latrines and direct discharge to rivers and seas. The need for proper sanitation arose when the country developed and moved from agriculture to an industry-based economy.

In the 1960s, sewage treatment systems in the form of individual septic tanks (ISTs) and pour flush systems were introduced. Small communal systems engaging mainly primary treatment such as the communal septic tanks (CSTs) and Imhoff tanks (ITs) started developing.

In the 1970s, the technology engaged expanded to biological treatment processes in the form of oxidation pond systems using natural means of treatment. In the 1980s, mechanised systems were introduced in Malaysia and oxidation ponds were converted to aerated lagoon systems.

The late 1980s and the 1990s saw the accelerated development of fully mechanised systems in the form of biological filters and activated sludge systems. The later part of the 1990s saw efforts concentrated on the control of mechanised systems which allowed for process optimisation of new systems.

This evolution of treatment processes from primitive to primary and then to secondary systems was mainly due to technology development in the sewerage industry.

The evolution also saw the move from non-mechanical systems to a more mechanical and automated system. New and improved equipment were also continuously introduced due to technological advancements. With time this increased the expectation on environmental standards and the skill level in the design, construction and operations of new sewerage works.

**The Evolution of Sewage Treatment Technology**

In early days of human civilisation, life was too harsh to worry about sewerage systems. As the population was very small, nature took care of the sanitation problems but as civilisation progressed and the population increased, the need for proper sanitation arose.

In Europe, the development of sewerage systems followed the needs that arose as townships grew and population rose. Its evolution started with direct discharge to the streets during the Middle Ages where the streets were the sewage disposal area. Outbreaks of bubonic plague raised the concern for improved sanitation.

In the 19th century, development in sewerage systems included the use of pour flush and sewers discharging to the river. When the pollution level in the rivers worsen, sewage farms were introduced to treat sewage and later developed into proper sewage treatment plants.

During Malaysia’s pre-independence period, the development of sanitation facilities was very limited as the need for sanitation was not critical. *Figure 2.1* showed the sanitation practices in the rural areas while *Figure 2.2* looked at the sanitation practices in the towns. See the early technologies used in *Figures 2.3*. 

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**Figure 2.1: Rural Sanitation Direct Discharges**

**Figure 2.2: Urban Sanitation Discharges**

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**Figure 2.3: Early Technologies Used**
In the 1950s, towns started to develop and population densities began to grow. There was increased need for improvement in the sanitation sector. Technological advancement at that time saw the primary systems using the sedimentation processes. ISTs used this treatment concept. See Figures 2.4 and 2.5.
This primary system could only provide basic primary treatment via sedimentation and digestion. The expected performance of such systems is shown in Figure 2.6.

In the towns, ISTs started to replace the primitive systems, thus reducing the direct pollution levels to the environment. For example, BOD was reduced from 200-400 mg/l to 150-200 mg/l as shown in Figure 2.6.

After Malaysia’s independence in 1957, the need for improved sanitation expanded to community based sanitation as more towns were established. CSTs were introduced to improve the community sewerage systems. See Figure 2.7. In terms of performance, they were similar to ISTs but the CSTs served a bigger population via a series of pipes connecting a row of tanks.

In the 1970s as Malaysia continued to develop and as its towns grew to become cities, the need to improve environmental conditions arose and led to the enactment of the Environmental Quality Act in 1974. Partial secondary treatment systems such as oxidation ponds were introduced. See Figure 2.10.
In the 1990s, improvement in pumps technology allowed for more efficient pumps being introduced into the sewerage industry. Improvements were made in the impeller design, the materials used and the compactness of the whole pump. Various types of aerators such as aspirators, submersible aerators and various improvements in their design were also introduced over the years to allow for more efficient oxygen transfers.

The technological development also included improvement of existing systems such as the use of PLC and SCADA in 1990s. Technological advancement in computer technology and microelectronics allowed for enhancement and optimisation of sewage treatment systems. For example, the use of PLC allowed for better control of the sequencing batch reactors processes or intermittent decanted extended aeration (IDEA) systems.

Progress in Sludge Management

All existing treatment methods mentioned earlier were capable of producing massive quantities of sludge. Prior to the privatisation of sewage services, there were no proper programmes to handle, treat and dispose sludge safely back to the environment. Sludge management was neglected in Malaysia. It was assumed that sludge management would be provided by others but it never materialised. See Figure 2.17.
Figure 2.17 illustrates this assumption that sludge management would be provided by others.
Figure 2.18: Typical Sewage Treatment Systems with Sludge Neglected

Figure 2.19: Progress Improvements of Sludge Management
Currently, there are about 7,500 public sewage treatment plants which generate sludge as by-products of the sewage treatment. There are over one million ISTs which also generate sludge. The national sewerage concessionaire is responsible to provide desludging services at a frequency of once every two years. Figure 2.18 demonstrated the extent of the existing sludge treatment, collection and disposal needs for Malaysia.

Figure 2.19 showed the technological evolution in terms of sludge treatment in Malaysia. The progress included trenching systems, sludge lagoons and sludge drying beds. This was followed by changes to the mechanised dewatering such as filter presses, centrifuges and belt presses to complete centralised sludge treatment facilities which consist of mechanised thickening followed by stabilisation by anaerobic digestions to mechanised dewatering, thermal drying and incinerations.

**An Overview**

In Malaysia, the sewerage technology has evolved from pre-independence era of no treatment to the primary treatment by individual septic tanks in the 1950s. This improved the level of sanitation by providing partial treatment of sewage. In the 1960s, the introduction of CSTs and ITs further improved the effluent quality while the 1970s saw the introduction of partial secondary systems such as oxidation ponds which can produce better effluent quality.

Fully mechanised systems were introduced in the 1980s which provided full secondary treatment that can meet the Department of Environment’s effluent standards consistently.

The above figure demonstrates the technology developments of sewage treatment over the years. An interesting fact is that with advancement in treatment technology, the user of mechanical and electrical equipment shows a steep increasing trend.