

*Membran Bioreactor : Alternatif Technology for the Treatment of Urban Waste Leachate*

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*Abstract*

*The general approach of urban waste management concerns the stockage of this waste under surface in a favourable soil formation at an urban waste-stocking centre (landfill). The state of the art of this approach is suggesting the integration of engineering barriers as a second barrier to protect the soil contamination from the stocked waste. Before the center is closed for the reason of stock capacity, the center will remain open and receive urban waste for years. Some problems then may arise, as the rainwater will mix with the waste, get concentrated in pollutant, traverse the barriers and finally pollute the soils and ground water. Consequently, the environmental-sound integrated urban waste treatment should consider this problem.*

*A preliminary case study has been conducted to address the above problem. Originally, this study was aimed at exploring the technology of membrane bioreactor for different applications. The origin of the technology, European and French environmental laws, different constructors in the market along with their proposed concept and some applications in different fields have been investigated along with a generic comparison with different actual technologies from the environmental point of view. The study benefited from a literature, interview with the constructors, researchers and engineers from industrial sites using the technology, scientific conference and questionnaires sent to industrial sites all over the France. The study concluded that membrane bioreactor is very suitable for leachate urban waste treatment especially when water recycling and discharge into natural environment is imposed.*

## **I. Introduction**

### **I.1. Problem Description**

The cycle of urban waste can be classified into opened cycle and closed cycle. The closed cycle is characterized by the recycling of waste stream into some reusable materials. Meanwhile, the opened cycle is characterized by inactivation of the urban waste by means of waste collection in hole of a certain dimension at a waste-stocking centre and then cover the waste permanently as the hole is saturated of waste. The closed cycle, even if it generates secondary waste in a relatively very low quantity or a negligible quantity, requires the tri of different urban waste components before the recycling. Consequently, waste recycling technology varies with these waste components.

The simplicity of the opened cycle, no requirement of the facility of industrial process technology is unsurprisingly one of the reason why this cycle is more preferable than the closed one in some countries. Urban waste stocking centre (landfill)<sup>1</sup> can be described simply as a huge open hole or pit drilled on the surface of soil. The pit then is designed to receive urban waste for years until it is fully loaded by the waste. Once the pit is full, it will be covered permanently by semi impermeable layers. The rehabilitation of surface soil at the top of the facility will bring back the facility to the initial natural condition where there was not any waste emplaced.

As soon as the pit is constructed and receives waste, some problems will arise, e.g. odor and hygienic problems. Furthermore, as the pit is remain open during the operation time for practical reason, rainwater will pour into the waste facility and get into contact with the waste. The urban waste-known in

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<sup>1</sup> Di beberapa negara Eropa, fasilitas penimbunan limbah dipisahkan untuk limbah industrial dan limbah perkotaan. Di Perancis fasilitas yang pertama disebut CET kelas 1 dan yang kedua disebut CET kelas 2.