IDENTIFICATION OF THE MUNICIPAL SOLID WASTE CHARACTERISTICS AND POTENTIAL OF PLASTIC RECOVERY AT BAKRI, LANDFILL, MUAR MALAYSIA

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I. Introduction
Municipal solid waste management (MSWM) is a major responsibility of local governments which typically consuming between 20% and 50% of municipal budgets in developing countries (Peter, 1996). Three primary sources of (MSW) are classified as residential area, institutional and commercial waste, (Tariq, 2007). Generally MSW consist of around twenty different categories: Food waste, paper (mixed), cardboard, plastic (rigid, film and foam), textile, wood waste, metals (ferrous or Non-ferrous), diapers, news print, high grade and fine paper, fruit waste, green waste, batteries, construction waste and glass, these categories can also be grouped into organic and inorganic (Marine, 2007). Approximately in Malaysia, between 70 to 80 percent of municipal solid waste is placed in landfill (Sumiani, 2009).

Bakri landfill with area 800m2 was established in 1998. This landfill located in Bukit Bakri, Muar, Johor Darul Ta’ zim to serve the city of Muar (350 kilometers south of Kuala Lumpur, capital city). Bakri landfill used as dumping site for household waste for around 22 years without any recorded data of the types, quantity and quality of solid waste. The sharp increasing rate of domestic waste generation in Muar area compare to the percentage of recovery and recycling are the reasons that put the MSW department under pressure to make plan for finding the new disposal area or to introduces the new method for handling the waste material.

This study aimed to describe and classify the municipal solid waste collected from Bakri landfill to determine the feasible method to reduce the amount of disposed waste. In order to achieve this, the study focused to evaluate the potential of plastic recovery.

II. Method of Waste Characterization

1. Random sampling
This procedure is applicable for collecting the representative municipal solid waste in waste stream. Base on the American Society for Testing and Materials (ASTM 1282),The first step in random sampling method is a random pick up of the garbage bag from arrival waste loads (trucks) which is usually an amount of 15 or 20 kg per unit (MSW trucks). In this part only MSW trucks were considered to take the samples. Next, the waste was separated according to the selected classification such as wood, paper, class and green waste. Each category was weighted by using a weight balance and the materials were discarded after recorded these data In order to obtain accurately measure of waste characterization the original plan called for sorting 200 kg of MSW which can be considered as a representative of the total MSW composition in study region.
2. Proximate Analysis

Proximate analysis consist of moisture content, ash content, volatile matter and fixed carbon determined by put the selected sample to different range of the temperature, between 100°C until 950°C. The laboratory methods to measuring the proximate analysis of samples in this research were carried out based on ASTM standard (International Directory of Testing Laboratories). This standard determine the condition of lab analysis such moisture and volatile content.

III. Result and discussion

This part presents several graphical summaries of the disposed materials in Bakri waste stream which are divided into three major categories, Figure 1 presents the aggregated composition of main disposed groups of solid waste at Bakri. An average of 330 tones of materials discharged daily at Bakri landfill (except the soil that used for waste covering). Municipal solid waste with almost 280 tons per day is largest fraction. The second largest component is wood which comprised 15 tons per day.

The major bulk density of the disposed waste in Bakri landfill presents in Figure 2. (Disposed materials are the quantity of solid waste that was not recovered or composed). As Figure 2 indicates organic waste such as, food waste, fruit followed by plastic and paper make up the largest fraction of generated wastes in Bakri. Top seven individual materials were most prevalent in the Bakri disposed waste stream included of food waste (39 percent), mixed paper (10.0 percent), plastic film(9.0 percent) fruit waste (9.0 percent), diapers (8.0 percent), news print (6.0 percent), cardboard (5.0 percent), yard waste (3.0 percent). This high percentage of plastic can be explained by increasing the number of packaging factories around Bakri landfill. The waste materials from these manufacturing plants mostly include of high volume of different

![Fig. 1. Quantity of aggregated Disposal Solid Waste (Tones / Day).](image1)

![Fig. 2. Municipal Solid Waste Compositions.](image2)