CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

Nowadays solid waste has causing a great issue to global especially plastic waste which has slow degradation material rate. Plastic waste raises the landfill capacity and causes water pollution. According to Jabatan Pengurusan Sisa Pepejal Negara (JPSPN), there are 17,000 tonnes of municipal waste produced daily in Malaysia and 24% of the total waste is plastic waste. In statistic of JPSPN, Malaysia has 112 landfill facilities however just 6% of them are under environment control. In year 2001 until 2014, the number of landfill increases into 296. Thus JPSPN encourages the implementation of 3R concept which are reduce, reuse and recycle.

Polyethylene terephthalate (PET) is one type of plastic which is made by virgin plastic usually used to packaging of drink. In year 2012, 19 million metric tons of PET have been produced and just one of six of the total number of PET have been recycled or reused in global (The HINDU, 2014). Five of six of PET have been sent to landfill in global (The HINDU, 2014). According to Lesley McFadzean the decompose rate of a plastic bottle is 450 years. PET occupies the landfill capacity for 450 years. Thus reuse PET will reduce the capacity of landfill.

In recent years, most of the countries have taken measurement to recycle PET. In United State and Canada, National Association for PET Container Resources (NAPCOR) has been established to resolve the PET recycle problem. In 2013, NAPCOR has recycled
31.2% of PET. (Waste Management World, 2014) has stated that the demand of PET increases years by years but the recycled PET supply is still limited. PET has been reused to produce varies product such as fibre, fibrefill, carpet, strapping, food and non-food bottles, and thermoformed packaging such as cups and take-out containers. In Beijing, they have bottle-recycling vending machines to collect PET (CCTV News 2014). There is 15000 million ton of PET per years that recycled in Beijing. In Malaysia there is still lack of specific plan to treat PET. Thus this study is an alternative way to reuse PET.

In this study PET are used as an additive fibre into concrete. The flexural behaviour of addition PET into concrete has been concerned. Polymer concrete is a concrete that used polymeric material as a composite material. The flexural behaviour of polymer concrete is 3 times greater than Ordinary Portland cement (OPC) Abdel-Fattah & El-Hawary. (1999). A studied of Effect of recycled PET in the fracture mechanics of polymer mortar has shown that the flexural strength of concrete has increased as the shredded PET increase (Reis et al., 2011).

In the environment aspect, the addition of PET in concrete will reduce landfill and pollution. In economy aspect, the reuse of solid waste as material will save more money and energy. In the aspect of material structure, the strength and melting point of PET could be used to improve the strength of concrete.

Figure 1.1: PET bottle used
1.2 PROBLEM STATEMENT

Nowadays municipal waste management has been concerned about the development of country. Different measurements have been taken to save landfill capacity and environment pollution. This is especially towards plastic waste which has slow degradation rate. PET is a type of plastic that has been recycled worldwide.

In Malaysia, the municipal waste management is still poor due to the lack of technology regarding the waste’s treatment and waste recycling. According to JPSPN, the waste which cannot be recycled will transfer to landfill. Landfill will affect the economy, environment and safety structure of Malaysia. JPSPN has stated that most of the landfill in Malaysia is lack of environment control. According to the JPSPN’s landfill design, most of the landfill bodies will be used to build airport or road. The soil of the landfill bodies is not stable and the settlement will affect the secure of the structure of building. Landfills affect the ground water and surrounding water surface of landfill (Salem et al., 2008). Thus, reuse PET in construction will help to reduce the capacity of landfill since Malaysia is still a developing country. Figure 1.3 shows that the failure of building by using landfill bodies.

Water pollution still exists as a serious problem in Malaysia. For instance, Sungai Juru is one of the rivers which are greatly polluted by waste (Utusan, 2012). The chemical exude into the river will cause harm to the environment and health of the resident in the surrounding. The chemical included ammonia (NH₃), xenobiotic organic compounds (XOCs), dissolved organic carbon (DOC), nutrients and heavy metals (Melnyk et al., 2014). All of the chemical substances cause harm to the ecosystem surrounding, environment and health of the resident. As from the aspect of economy, recycle PET will consume more energy and money compared to reuse PET in construction. Thus, reuse PET in construction would be an alternative ways to prevent littering of PET and also save the budget of recycle PET in industrial. The Figure 1.2 shows that the water pollution of Sungai Juru.