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SOLIDIFICATION OF SHIPYARD SOLID WASTE USING DOLOMITE AND RICE HUSK ASH AS ADDITIVES

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ABSTRACT

Industrial solid waste may pollute soil, air, surface water or underground water if it contains toxic substances. This pollution if do not properly managed can cause serious health risks and problem to the surrounding environment. In this study, solidification was used to treat industrial solid waste from Malaysian Shipyard Company. The physical and chemical stability of the waste was improved using cement-based solidification. Similar to conventional concrete production, industrial waste was used to replace sand with the proportions of 0% waste - 100% sand, 50% waste - 50% sand, 70% waste - 30% sand, and 100% waste - 0% sand proportions. 5, 10, 15, and 20% rice husk ash (RHA) and dolomite were added as additives and the effect of these materials on the strength and leaching of the concrete containing waste were investigated. Solidification was evaluated by carrying out compressive strength and leaching test. KH Method was also used in evaluating the effectiveness of the encapsulation technology, which determines the strength and leaching simultaneously. For compressive strength test, sample of 70% waste - 30% sand proportion was found to be the optimum ratio that gives the highest strength for both samples with and without additives. 100% waste - 0% sand also gives higher strength compared to control (0% waste - 100% sand). The results show, presence of dolomite, increased the concrete strength, with the optimum of 10% dolomite addition. However, addition of 20% dolomite gives weaker concrete. Same results of strength were obtained with the addition of RHA. Strength that gained with presence of dolomite gives higher strength when compared to RHA. For leaching test, after encapsulation, the leachability of contaminant were reduced for all samples of waste-sand proportions with and without additives. For oil and grease, sample of 50% waste - 50% sand with 15% dolomite showed better result, which reduced at 83%. KH Method shows that the results are compatible to the standard method for testing strength and leaching. Through solidification, hazardous waste can be safely disposed into landfill or used as by-product.

CHAPTER 1

INTRODUCTION

1.1 Background of the study

Solid waste is defined as waste resulting from human and animal activities that is normally solid or semisolid, or hazardous, useless and unwanted [1]. Waste classified into solid waste is waste material that contains less than 70% water. Solid waste can be categorized as Municipal Solid Waste (MSW), agricultural waste, industrial waste and hazardous waste. In this study, the waste concerned is the waste from industrial; that is shipyard company. Industrial waste comprises waste from industrial processes and manufacturing. This waste is considered hazardous as they may contain toxic substances. Hazardous waste is also referred to as scheduled waste, special waste, toxic waste or sometimes more specifically, as chemical waste that is potentially dangerous to human health and cause physical hazards [1].

In this research, the industrial solid waste was kindly supplied by the Malaysia Shipyard and Engineering, Sdn. Bhd., Pasir Gudang, Johor. This company is an internationally recognized shipyard involved in shiprepair, heavy engineering shipbuilding, and manufacturing activities. Solid waste is recovered from the cleaning of the large oil storage tanks on the board's tankers. This cleaning process is done before carrying out steels repairs jobs and tank coating jobs. The quantity of solid waste is approximately 32,000 tonnes per year. According to the company's Environmental Impact Assessment report, the solid waste contains the following constituents: oil content; 20-60%, water content; 15-40%, solid content; 15-60%. [2]. Based on Department of Environment's (DOE) classification criteria, the solid waste from this company is a scheduled waste as defined in the Environmental Quality (Scheduled Wastes) Regulations 1989. According to the Environmental Quality (Scheduled Wastes) Regulations 1989 [3], the scheduled waste should be