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SUSTAINABILITY OF RECYCLABLE POLYMER BY PRODUCING FIBER REINFORCED POLYMER (FRP) FROM KHULNA CITY, BANGLADESH

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Abstract- *The production of Fiber Reinforced Polymer (FRP) from recyclable polymer can be great contributive in conventional solid waste management. This study deals with the production of FRP from recyclable polymer, use and environmental interpretation in Khulna City. Firstly, the amount of solid waste and the percentage of recyclable polymer of Khulna city were evaluated. Subsequently, the suitability of these polymers for FRP production was assessed. In this context, overall production cost, problem in production and management feasibility were analyzed. This FRP can be used as replacement of other structural material, for architectural view and where low weight, proper stiffness and more durability is needed. The production of FRP from recyclable solid waste indicates a better use of recyclable polymer which can be used for a long time. Polymer is a great threat to the environment especially soil as it is an aseptic material, so production of FRP control the threat.*

Key words: Fiber Reinforced Polymer (FRP), Carbon FRP, Recyclable Polymer, Soil and water Pollution, Tensile Strength.

1. INTRODUCTION

The increasing quantity of solid wastes is growing environmental problem in developing countries. Compared to cities and towns of industrialized countries, those of developing countries generate less solid wastes per capita because, in developing countries generate less perching power and therefore consume less, there is less industrial activity and there is high rate of reuse of solid waste by the poorer sections of the community [1]. FRP and carbon FRP constituents are commonly used in the Khulna city which are generally, rubbish, residential wastes, commercial waste, demolition and construction waste etc. This paper mainly deals with an appropriate solid waste management system and thereby by accumulating the data of the required amount for the industrial production of FRP is therefore compared. The study steps are shown in Figure.1

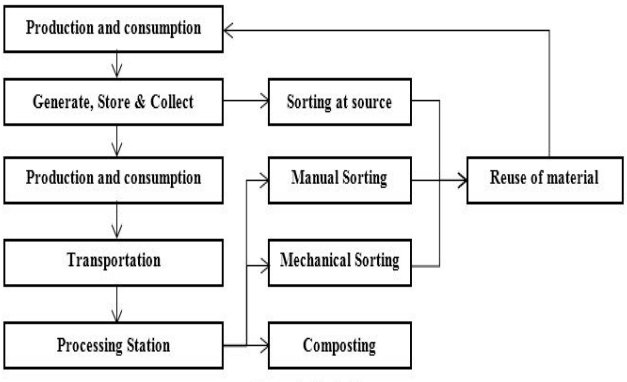

Figure 1: Study Steps

2. STUDY AREA AND DATA

The quantity and general composition of solid waste generated due to different activities is of critical importance in operating and design of solid waste management system. It is however difficult to obtain reliable data from different places. This is primarily because most data are based on measurements of wastes at disposal site. Khulna (22°49′0″N 89°33′0″E) is a divisional district developing city at the southern part of Bangladesh of 23 sq. miles with a population density of 14364/km^2. It remains generally warm throughout the year. The quantity of waste produced per capita is approximately 0.77 kg/capita/day. Estimated waste generation per day is approximately 2780 ton/day. The useable plastic, paper, rags, metals and glass and ceramics waste for FRP production can be estimated approximately of 13%, 6%, 8%, 0.7% and 3% of the total

waste generated per day in Khulna City which is found from correlation and regression techniques [2]. The certain types of wastes that are produced from Khulna city that can be of, jute mill waste, rubbish, residential waste, refuse, garbage, construction wastes, commercial waste, medical waste and sewage.

3. METHODOLOGY

3.1 Handling & Storage

In Khulna City on-site handling and storage system is available for the collection of waste. Generally on site handling is divided in communal storage and household storage. The Khulna city dwellers prefer the household storage system by bucket and thereby taken to garbage storage car which is generally manually driven rickshaw.

3.2 Collection

About 60-80% of the total cost of the solid waste management retain in collection system. There are four different types of collection system: communal, block, curb-side and house to house. In Khulna city curb side and house to house collection system is mostly preferred. Hauled container system is generally used by "Pradipan Corporation" to collect the waste.

3.3 Transportation

"Pradipan Corporation" collects the waste and keeps these in a dustbin of Ward. From dustbin heavy vehicles collect the wastes to the dumping site. The vehicle collects waste by a kart crawler. From the volume of the kart the amount of the waste can be estimated.

3.4 Processing Station

Generally the dumping sites are termed as the processing stations where waste stabilization ponds are present and dumped under soil. The plastics, glass and metals are collected before then to the dumping site. [3]

3.5 Estimation of the Waste

Fiber reinforced plastic needs glass, carbon, paper, wood and aramid. The aramid may be of epoxy, vinylester, polyester thermosetting plastic and phenol formaldehyde resins. Carbon fiber reinforced plastics are composed of the same constituent of FRP with carbon nano-tubules. The amount of such plastic in Khulna city is not rear but not also common in practice. Of the estimated 13% useable plastic in Khulna city we can have hardly 0.03% of the plastic which is useable for the industries to process FRP and CFRP.

4. RESULT AND DISCUSSION

4.1 Handling, Storage & Collection

The reusable plastics and glasses that develop in household activities are generally kept by the housemasters. The collectors during handling and storage separate these useable solid wastes and let them to sell in local markets. These local markets buyer handle the wastes and sell to larger consumers of plastic industries. In this mean time only solid to semi solid wastes are stored at the dumping site. The different wards of Khulna city having the retailer shop which buy the household solid waste in cheap rate. A bar diagram of the estimated total waste percentage by weight per day is shown here in Figure.2

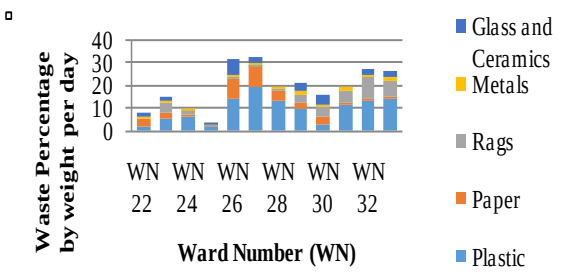

Figure 2. Waste Collection Percentage by weight from different wards

4.2 Economic Production Criteria of FRP and CFRP from Khulna City

The figure 2 states that the use of plastic, glass and rags are not very less for the economic production of FRP and CFRP. Moreover, the use of aramid in this location is close to zero and they are mainly found from the tires or from nylon-6, 6. An industrial production of FRP and CFRP targets of about 3000 ton/day which needs a huge polymer. In this respect Khulna city is not enough to cover such criteria (Ahmed & Rahman, 2010)[3].

5. CONCLUSION

The storage, collection and transportation of the solid waste management of Khulna city is associated with totally by "Pradipan Corporation". The collection of data of the plastics, paper, rags and glass and ceramics in the regions are taken from the retailer store since there is no proper treatment plant and well as dumping site. The bar diagram of Figure 2 shows the percentage by weight per day of the accumulated solid wastes in the different wards of Khulna city. Ward No. 27 shows the maximum accumulation of solid waste this is because it stands in the city heart.

The economic production of FRP and CFRP resembles with the production of solid waste in the Khulna City. From the study, the use of aramid type products is very less and rear as a result, this constituent should be borrowed for the production. Since, there needs to have 3000 ton/day of plastic as such to produce FRP and CFRP industrially it si impossible for selecting Khulna city as source of the constituents for FRP and CFRP.

6. RECOMMENDATION

It is recommended to the data collection to look after on the medical waste and the transportation and vehicular waste which is a great source of aramid.

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