Joint Industrial Byproducts Reutilization Initiative

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INTRODUCTION

The main objective of the initiative is to develop a synergistic collaboration among the local institutions for beneficial reuse and utilization of industrial byproducts in the areas of civil, environmental, and agricultural engineering. At present, the Civil Engineering and Surveying Department of the University of Puerto Rico at Mayagüez, the Puerto Rico Conglomerate of Construction, and AES Puerto Rico have joined the partnership. Other potential partners have been identified, including the Bacardi Corporation, India Corporation, and other private manufacturing and construction companies, PR Industrial Development Companies, PR Environmental Protection Agency, PR Aqueduct & Sewer Authority, US Army Engineer Research and Development Center, and PR Solid Waste Management Authority, PR Highway and Transportation Authority. The partnership has been proposed for a period of five years, and will be renewed by the partners based on the results obtained during the initial period.

GOALS AND OBJECTIVES

The goals of the initiative are to (1) encourage collaboration and investment among academia, organizations, business and nonprofit institutes which all will be benefited with outputs and outcomes, (2) explore potential utilization methods of importance, and (3) advance the engineering and scientific research infrastructure which will promote local economy growth.

PROPOSED ACTIVITIES

The partnership will (a) support research to identify industrial by-products and their potential reuse; (b) develop and adapt technologies for reutilization of byproducts; (c) organize workshops and conferences to bring the best engineers, scientists and practitioners to Puerto Rico; and (d) disseminate results to the local industry and the scientific sector.

PREVIOUS EFFORTS AND RESULTS

A literature review was commissioned during 2005 by AES Puerto Rico, LP (AES) to UPRM to gather information regarding potential uses and applications for different types of CCPs.[1] The project was carried out by two researchers from the Civil Infrastructure Research Center (CIRC), from the Civil Engineering Department of UPRM. The CCPs included were fly ash (FA), bottom ash (BA), and manufactured aggregate (MA). The main applications recommended based on the composition and characteristics of CCPs and on volume of recycling, economic impact, and others, are as follows:

- Ground improvement
- Road construction
- Structural fill
- Agricultural soil amendment
- Sewage remediation
- Landfill liners and covers
- Artificial coral reef and explosives remediation
- Alkaline treatment of high explosives such as TNT, RDX, and HMX

US EPA recognized significance of the initial study aforementioned and awarded the 2006 US EPA Coal Combustion Products Partnership (C^2P^2) Award to PR Construction Cluster and UPRM. Also, the results and efforts have been publicized through a media conference and local new papers.

FOLLOW-UP PROJECTS

Further studies have been conducted in accordance to the recommended areas of byproducts reutilization aforementioned. Example projects are:

- Application of manufactured aggregate as in situ capping amendment
- Development of landfill cover with manufactured aggregate
- Treatment of water and wastewater containing explosives-related compounds
- Application of fly ash for soft clay ground improvement

OTHER INDUSTRIAL BYPRODUCTS OF INTEREST

The accumulation of discarded tires has become one of the most important environmental problems in the last years. In Puerto Rico this problem must be attended with promptness since it has increased to a rate of one tire per inhabitant per year (1 tire/inha/yr), very similar to the rate of the USA.

UPRM received a grant from the Puerto Rico Legislature to carryout a review of the state of the art in tires recycling. The main objective of this study was to identify the different uses of discarded tires taking into account the Puerto Rico context. The approach was mainly oriented to tire chips or crumbs which have become commodity for different uses. Themes like asphalt rubber or rubber crumb/chips as contaminant absorption were studied. The use of tire chips as a concrete component, also as sand, gravel or other aggregate substitutes and its usage as compilation of leachate have also

been surveyed. The current situation of pneumatic recycling in Puerto Rico was also analyzed. A summary of this study can be found in Botero et al.[2]

Construction and demolition debris was found to be 17% of the total solid waste production.[3] There are paramount potential of reutilization of C&D debris in Puerto Rico. Included examples are, but are not limited to:

- Construction material, road subbase, rip rap with crushed concrete
- Roofing material, pothole repair with crushed asphalt
- Landscaping, fill material, and landfill cover with screened soil

POTENTIAL OUTCOMES AND OUTPUTS

The outcome measures expected to be achieved under the proposed initiative include, but are not limited to:

- Amount of industrial byproducts reduced,
- Volumes of landfill saved, and
- Dollars gained through local economy development.

The output measures expected to be achieved under the proposed initiative include, but are not limited to:

- Number of industrial groups and governmental supports involved,
- Number of workshops, trainings and courses conducted, and
- Number of publications distributed.

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