==========
Engineering & Technology in India www.engineeringandtechnologyinindia.com
Vol. 1:5 December 2016
==========

An Organisational Study about Advance Waste Management

M. Arun Sankar, PG Scholar

==========

Abstract

More production equals more waste, more waste creates environmental concerns of toxic threat. An economical viable solution to this problem should include utilization of waste materials for new products which in turn minimize the heavy burden on the nation's landfills. Recycling of waste construction materials saves natural resources, saves energy, reduces solid waste, reduces air and water pollutants and reduces greenhouse gases. The construction industry can start being aware of and take advantage of the benefits of using waste and recycled materials. Studies have investigated the use of acceptable waste, recycled and reusable materials and methods. The use of swine manure, animal fat, silica fume, roofing shingles, empty palm fruit bunch, citrus peels, cement kiln dust, fly ash, foundry sand, slag, glass, plastic, carpet, tire scraps, asphalt pavement and concrete aggregate in construction is becoming increasingly popular due to the shortage and increasing cost of raw materials. In this study a questionnaire survey targeting experts from construction industry was conducted in order to investigate the current practices of the uses of waste and recycled materials in the construction industry. This study presents an initial understanding of the current strengths and weaknesses of the practice intended to support construction industry in developing effective policies regarding uses of waste and recycled materials as construction materials.

Key Words: Waste management, constructions, materials. Environmental, Recycling.

Introduction

Infrastructure work for the housing development at Telegraph Bay will generate variable quantities and types of waste materials. This section of the EIA report involves an assessment of

the potential environmental impacts from the waste generated for the proposed development. Reclamation work at Telegraph Bay was completed in 1989. The prime consideration relates to the excavation and removal of 330,000m3 of imported surcharge material and 156,400m3 of other excavated soils from the advance works and construction phase of the development. Post development considerations (following site occupation) have also been incorporated within this assessment. The principal considerations include:

(i) Evaluation on the type and nature of wastes;

(ii) Estimation of total volumes; and

(iii) Assessment of handling, storage, transportation and disposal methods to be adopted and the potential environmental impacts.

Objectives

The overall objectives of the waste management assessment are summarised below:

- To assess the activities involved for the proposed and determine the type, nature and estimated volumes of waste to be generated;
- To identify any potential environmental impacts from the generation of waste at the site
- To recommend appropriate waste handling and disposal measures / routings in accordance with the current legislative and administrative requirements;
- To categorise waste material where practicable (inert material / waste fractions) for disposal considerations i.e. public filling areas / landfill.

Materials and Methods

Tire Rubber

An estimated number of one billion scrap tires have been disposed of in huge piles across the United States. An additional 250 million tires unaccounted for are discarded yearly (RMA, 2011). Whole tires have been used in artificial reefs, break waters, dock bumpers, soil erosion control mats and play ground equipment. Several studies have shown that tire waste can be

successfully used in concrete, grass turf, asphalt mix, embankments, stone cladding, flowable fill and clay composite.

Reclaimed Asphalt Pavement

The transportation sector has used Reclaimed Asphalt Pavement (RAP) for many years. In 2009, the amount of RAP used in asphalt pavements was 56.0 million tons and in 2010, 62.1 million tons. RAP is America's most recycled and reused material; currently, RAP is being recycled and reused at a rate over 99%. RAP is used to backfill pavement edges, rework base and base course. According to the World Business Council for Sustainable Development, manufactures around the world produce more than 25 billion tons of concrete yearly.

Recycled Concrete Aggregate

The Federal Highway Administration (FHWA) projected an increase in aggregates to over 2.5 billion tons per year. Crushed aggregate has been used as base course or granular base in highway construction. Its primary function is to increase the load capacity of the pavement and to distribute the applied load to avoid damage to the sub grade.

Roofing Shingles

Each year, the U.S. generates approximately 11 million tons of asphalt roofing shingle scrap (CalRecycle, 2006). Use of recycled asphalt shingles (both manufacturer's waste and tear-offs) increased from 702,000 tons to 1.10 million tons from 2009 to 2010, which represents a 57% increase. Assuming conservative asphalt content of 20% for shingles, this represents 234,000 tons (1.5 million barrels) of asphalt binder conserved. Roofing shingles are made from a fiberglass or organic backing, asphalt cement, sand-like aggregate and mineral fillers such as limestone dolomite and silica. Beneficial applications include, but not limited, to Hot Mix Asphalt (HMA), cold patch mix asphalt, aggregate substitute, base course, mineral filler and granular base stabilizer. Benefits of using roofing shingles include Lower disposal costs for shingle scrap manufactures, reduced cost in the production of HMA, improved the rutting

resistance of the mixtures considerably, due to a combination of the fibers and harder asphalt and improved resistance to pavement cracking.

Glass

Americans generated 11.5 million tons of glass in the Municipal Solid Waste (MSW) stream in 2010. Glass is composed of silica or sand and contains some amounts of limestone and soda ash used to produce uniform quality and color. According to the Association of Cities and Regions for Recycling (ACRR), people around the world send 1.5 million tons of glass to landfills each year. Glass that ends up in the landfill won't break down for over a million years. Glass cullet creates workability problems in concrete mix and the likely hood of alkali-silica reaction. Beneficial uses are in the secondary applications, such as in the manufacture of fiberglass insulation, roadbed aggregate, driving safety reflective beads and decorative tile.

Plastic

In 2010, plastic waste generated approximately 31 million tons, representing 12.4% of total Municipal Solid Waste. Uses of recycled plastic in the construction industry include plastic strips to add to soil embankments, which has positive results of increasing the measured strength in reinforcement of soils. HMA mixture has a higher stability, reduced pavement deformation; increase fatigue resistance and provide better adhesion between the asphalt and the aggregate (Awwad and Shbeeb, 2007). Grinded polyethylene to provide better coating or attached easily to the aggregate as the surface area of the polymer increases.

Carpet

According to Carpet America Recovery Efforts (CARE) in 2010, carpet waste diverted from landfills was 338 million pounds, 271 million pounds were recycled, 3 million pounds used for alternative fuel and 23 million pounds for cement kilns. Old carpet is being recycled and used in composite lumber (both decking and sheets), tile backer board, roofing shingles, rail road ties, automotive parts, carpet cushion and stepping stones. A study by Wang et al. (2000) proved that by adding fibers to concrete, both toughness and tensile properties increased. Other benefits in

adding carpet fiber to concrete include reduction of shrinkage, improved fatigue strength, wear resistance and durability.

Innovation

Industrial Ecology

Industrial ecology, also referred to as industrial symbiosis, is emerging as a powerful source of innovation in Australia. Industrial ecology promotes enhanced sustainability and resource efficiency by stimulating innovations in the re-use of waste materials. The wastes or by-products of one industry are used as inputs in another industry, thereby closing the material loop of industrial systems and minimising waste.

The Waste Management Association of Australia (WMAA), supported by funding from the New South Wales Office of Environment and Heritage, set up an organisation in 2009 called the Australasian Industrial Ecology Network. This group has been working to promote awareness of industrial ecology, and the opportunities that it creates, through industry events and, more recently, industry workshops where manufacturers can exchange by-products with each other, saving landfill costs and offsetting raw material costs.

These workshops have been held in New South Wales and Melbourne and are sponsored by state and local governments to catalyse innovation and resource efficiency outcomes in their areas. These workshops have been referred to as ‘speed-dating workshops’ as the focus is on finding an industry match. Often there is a need to change manufacturing processes. Support for this is available through the Australasian Industrial Ecology Network.

Advantage

Advanced Disposal brings fresh ideas and solutions to the business of a clean environment. As the fourth largest solid waste company in the U.S., we provide integrated, non-hazardous solid waste collection, recycling and disposal services to residential, commercial,

industrial and construction customers across globally. This technique gives sustainable solutions to preserve the environment for future generations.

Conclusion

Review of several studies suggested that the use of recycled materials has positive impact through different aspects. This include the benefits in enhancing sustainability of the construction industry while reducing cost, providing solutions to environmental pollution and reducing the need for natural resources. In this study, a questionnaire survey was conducted to find out the current practices in using waste and recycled materials in the construction industry. Results indicated that some companies were not aware of the availability, quality of the materials' performance, cost savings, or any other benefits including environmental benefits. It is, thus recommended to create better documentation for green infrastructure, connecting researches and industry with an overview of what recycled materials are available for different construction applications. Companies need to be innovative in their use of recycled materials and reduce their dependency on raw materials. Also, more data and better documentations are needed to encourage the use of waste and recycled materials in the construction industry.

==========

References

- Abu-Lebdeh, T., S. Hamoush, W. Heard and B. Zornig, 2010a. Effect of matrix strength on pullout behavior of steel fiber reinforced very-high strength concrete composites. Constr. Build. Mater. J., 25: 39-46. DOI: 10.1016/j.conbuildmat.2010.06.059\
- Abu-Lebdeh, T., S. Hamoush and B. Zornig, 2010b. Rate Effect on pullout behavior of steel fibers embedded in very-high strength concrete. Am. J. Eng. Applied Sci., 3: 454-463. DOI: 10.3844/ajeassp.2010.454.463
- Awwad, M.T. and L. Shbeeb, 2007. The use of polyethylene in hot asphalt mixtures. Am. J. Eng. Applied Sci., 4: 390-396. DOI: 10.3844/ajassp.2007.390.396
- Begum, R.A., S.K. Satari and J.J. Pereira, 2010. Waste generation and recycling: Comparison of conventional and industrialized building systems. Am. J. Environ. Sci., 6: 383-388. DOI: 10.3844/ajessp.2010.383.388

==========

M. Arun Sankar, PG Scholar
Postgraduate Scholar
Department of Management Studies
Anna University Regional Campus
Madurai 625 019
Tamilnadu
India
Arunsankar33@gmail.com