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Recycling concrete debris, economic and environmental effects

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ABSTRACT

In this paper, to identify concrete methods of construction and demolition waste management and recycling waste concrete benefits were examined. Costs were calculated in different modes. By comparing them it was found that concrete debris can lead to effective recycling program. Concrete waste recycling programs can result in large economic savings and .this debris can be an affordable way to provide concrete preparation centers, as well as to increase recycling of such waste can be reduced use of natural resources and help protect the environment.

Keywords: *Concrete debris, environmental, economic evaluation, destruction*

Introduction

Now, now here in the world of natural raw materials for construction is not used, while in our country as well as sand, clay and limestone are the most important materials in the production of materials such as bricks, cement blocks used. . Convert sand, gravel and clay building materials in addition to the destruction and erosion of the river bed, causing the destruction of the environment, either before or after conversion of natural materials in the building. Now the environmental standpoint construction debris has been much attention in the world, Construction debris can recover energy and natural resources as well as the need to mine for resources and reduce the need for land for waste disposal. Extensive renovations and construction of devices and different countries have exacerbated the problems of building rubble so In order to optimize the use of natural resources requires long-term strategies in the use of materials and coordination between the different categories in the field of construction and recycling companies and Environmental issues must be taken seriously. Among the different types of construction waste, concrete waste is about 81 percent of the Volume of construction waste. In order to minimize waste recycling concrete is one of the best ways to improve the environmental situation (Vivian WYT, 2009: 688-702). Since most of the concrete volume is stone and aggregate and these materials are usually from natural sources or from rivers and mines directly handled and used therefore, they are economic recovery and conservation will be effective but before addressing the issue of recycling should be assessed demolition of concrete structures. And according to the situation of each structure suitable destruction method is chosen. Then, according to the existing processes for recycling concrete debris recycling environmental impacts will be identified.

Economic and reuse of building materials considered .Finally, we will have an economic analysis comparing the cost of the recycling process of waste and normally. And we will find that there is a positive economic and environmental effects of recycling concrete debris

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Material and Methods

Methods for structural damage with debris recovery approach

Concrete structures can be divided into four groups: large concrete structures .Underground constructions Reinforced and pre stressed concrete and post-tensioned structures.

Massive concrete structures, including hydraulic structures, dams, foundations with big band, the foundations of bridges, thick walls and foundations are reactors.

Conventional methods used to transport concrete are including explosives, cutting with diamond wire, before splitting using non-explosive demolition agents and mechanical splitter, installed by hammering impact, rotating cutting head, cutting sutures and drilling that the methods are underused. However, available methods are include cutting machine needle distance, abrasive water jet blasting, thermal heat metal fittings, heating with short wave concrete cover (Samani. R,1391:62).

Underground structures: the movement of underground structures is more difficult. Ground

structures may be fragile with Hydro, a large hammer, blasting, drilling and diamond wire saws and splitter are chemical degradation.

Reinforced concrete structures: Most of the destruction of concrete structures on the type, size, and degree of displacement depends on the application.

After construction / pre-stretched: concrete elements pre / post-tensioned possible using thermal shock, fragile hydro, gas and Jack Hammer throw pasted. Simple slabs with distances up to approximately 23 feet before (7 km) requirements. In a similar way with concrete are demolished. Beams and slabs may arise after the removal of any concrete mix for the complete unit, from where removed and placed on the ground.

If the units are larger than they could have taken place as a piece must design by a professional engineer who has experience in handling concrete for cutting (Samani R,1391:65).

With the availability of multiple destructive methods such as crushing, hitting, splitting, blasting, cutting, piercing, laser, electric heating, small magnetic wave selection of an appropriate destruction is necessary. Of course, many factors must be considered in selection of demolition in this project to study the economic impact and the effect of environmental factors is sufficient.

Demolition tools: a large number of devices are suitable for the removal of concrete in small quantities. Handle bars, drills and cutters are few examples of these different tools (ACI, 2001: 555). Power hand tools (Kurdo, et al.2003): hand tools that work with compressed air(pneumatic) Pneumatic hand tools in a wide range of different sizes available (squamous fragile and pneumatic hammer) is the most common tools used for 100 years and are Regarding to the rigid structures. Compressed air is available in most areas of the building. Scrub hammer (iron) are also available lighter. Providing a source for adequate pressure and volume of air as well as the equipment necessary to collect moisture and lubrication is necessary. Hydraulic hand tools: a range of tools for concrete are available, including a small impact hammers, drills, saws and grinders electric hand smallest type of power hand tools are available And generally use less energy output than it is confined to limited areas. Gasoline-fueled tools for drilling and fracturing work on small areas that are difficult to access with two models: a model for drilling and tapping, and one only to hit.

Hammers / blades fall: for the destruction of paved highways, stops and other plates are used. Weight and height of fall based on the thickness and strength of concrete and the failure rate level is required. Complete collapse concrete fragile and small hammers with hydraulic power, and has three wheels and low soil by an operator to produce and to remove pages concrete. Hammers / Impact fragile hydraulic / pneumatic: that is replaced destroyed equipment and has 27,000 joules of impact energy. Spring hammers: hammers mechanical tools or mechanical arm mounted on concrete pavement and breaking platforms and applications are thin walls and other components. The wrecking ball and lift: the wrecking ball attached to the lift and fall onto concrete or oscillates (Kurdo et al.2003). Drills and saws: Diamond tools winner fuel they use. Holes or smooth surfaces provide and shake a little and when cooled by water to reduce dust. The most common type of diamond saw blades for concrete cutting blade. Kind wins wet and dry diamond grinding blades are also available. Hand saws for cutting signifiers and paving the way to winning and getting there. Saw blades that are mounted on track to make the cut in the wall and the underside of the signifiers are available (Kurdo et al.2003).

Equipment mounted on the machine: the equipment on crooked shovels, loaders sliding and equipment that carriers need to carry the weight of more than 90,000 mounted. Crushed a ball to the moving arm lift requires related equipment damage, need to prepare a carrier such as hoe or excavator hydraulic capacity sufficient for performance also accuse must be animated and related equipment.

Winner of the swivel: wins by rotating rollers with hydraulic lifters and loaders with sliding sizes that fit to provide continuous cutting. Slot machine pick (Reaper): a large blade attached to a hoe to break slabs in large areas and concrete cobblestones and separation of steel-reinforced concrete is used. Fragile resonant frequency: For the energy of a blow to fragile and high-frequency resonance to use the concrete pavement. Concrete pavement used for highways. Drilling for suture: In places where the depth of cut required more than the depth of cut caused by diamond saw this technique used (Samani.R,1391: 67). Destruction of concrete (CPM 7): a material degradation is very quiet and safe, unlike explosive materials in the production of any sound degradation, explosion,

earthquake, smoke and dust does not.(htt:// Construction chemistry and industrial adhesives and materials). Explosives to successfully place for the removal of large volumes of concrete tensions and destruction on multiple locks and seals were used. The explosion completely destroyed and damage to underground use fiber cloth used as mattresses for reducing dust and noise levels when used small explosion (Samani.R,1391:67).

Non-explosive demolition (demolition of concrete structures with heat) with jet flame cutting method: This method has also been used underwater cutting unit to produce a strong flame control rate of oxygen, kerosene and water cooling cutouts Beck's control unit

Thermal Lance: Lance Thermal years were used in typical sections Lance has a tube filled with metal wire through which oxygen passes .When ignited pipes, wires and oxygen consumption and high temperatures generated .Due to safety considerations only in heavy industrial installations and nuclear installations applicable (ACI, 2003 :556).

Methods for recycling waste

Recovery (recycling) process again on renewed materials into new materials can be used.

Recycling lightning: concrete production plants 8 to15 percent increase in carbon dioxide in the world are involved. The processing method used today, a lot of dust is generated and only substances that are used to a lot of fine Concrete Technology Group in Germany were able to find a solution that can recycle concrete with high efficiency. Using lightning in the laboratory can produce a ton of concrete per hour to recycle. The maximum efficiency of the system for recycling 20 tons of concrete per hour and concrete recycling center that can probably be utilized within two years (http://Application lightning recycling concrete debris Translation: wise its excellent race, 187451).

Currently, "there are two ways to recover materials for recycling and re-use are: Recycling transport building materials recycled from demolition perspective identified before recycling, reuse of materials and fewer resources consumed. In the recovery operation, the amount of resources and capital equipment can comply with the following hierarchy: • The recovery in construction site (to reduce transport) • with separate and prepare recyclable at recycling at a central station • Recovery of a remote unit (over 200 miles)(http://construction-debris-recycling-business-plan,569).

In general, the process of recycled concrete building is: crushing and separation becomes material or mass structures and stored in the same place to stage their reuse.

After setting up a recycling plant and determine the standard quality, an information network occur promote recycling of concrete experience and learn from each other and a standard system of classification should be in the destruction or Depot separation recycled aggregate is at different stages and in different conditions.

Recycling old concrete generally involves a five-step process:

1-picking and crushing old concrete

2-.break concrete in primary and secondary crusher.

3-Removing the steel bars and other components that have been buried in concrete

4-Grading and and Washing

5-depot of the aggregate of coarse and fine grain is obtained

The final product must be cleaned of contaminants such as dirt pieces, wood and other materials .Why is concrete that reduces the material strength properties and durability of concrete is recycled. Recycled concrete recycled aggregates can be used to replace part of a fine-grained or coarse-grained and fine-grained or coarse-grained or both total replacement of concrete recovery is mainly due to "higher water absorption and resistance less than natural aggregates. Because sticking mortar strength, the strength of the mortar in the stone aggregate less recycled aggregates, due to more porous than the aggregate, has more water is absorbed.

Removal of concrete, vibrating action, in order to amass the mass action by the concrete, causing the concrete to be considered in concrete operations and improve working conditions for workers engaged in economic .planning, from the elimination of vibration operations, can be an important factor in the application of self-compacting concrete which can be your pores, even when reinforcement density, full and flat surface, no non-homogeneous state to cover. Therefore, the SCC with concrete debris, both in terms of cost and environmental protection and energy is justified.

Another proposed materials recycling concrete debris is recycled concrete armed because all fittings should be of concrete crushing operations, any fittings that have not been

previously removed, must be processed after the Preliminary comminution concrete recovery to be separated. After crushing, the piece of steel or suspended by magnets magnetic that are at the top of the conveyor belt or manually, by the people, the primary crusher conveyor belts can be removed and sold as scrap, which has good demand and can also be used in the production of reinforcement.

1. Economic evaluation of the effects of the re-use of building materials in terms of environmental parameters in accordance with the regulations of the financial items affecting

One of the main problems is the use of low quality concrete debris and yet documented research, high-quality products from the recycling of these materials to approve the entire industry there. In such circumstances, the government can use these materials are widely used in your project. That will be encourages the industry for this work. The government can with incentive programs, protection the development of recycling technologies to improve them. T he environmental education and raising awareness about the existence of concrete debris in the environment and recycling methods can also be effective to use them in the manufacturing sector. It is also important that standards organizations do this ongoing activities with the aim of developing standard specifications for recycled waste. By the trust of the industry will be focused in the use of waste as raw materials for construction materials.

Observe and using the items in the statutes can be a positive and encouraging role in recycling and waste concrete. The price and quality of recovery is debatable issues. Economic aspects of the construction waste recycling in addition to technical issues, it is important to have the same value. Economic factors recycling concrete debris is: The high costs of raw materials • Transport costs • The cost of burying waste from production to waste disposal sites .Increasing cost of raw materials and irreversible environmental damage long-term, important to recycling of construction waste, especially "the concrete debris". High amounts of demolished concrete products and old buildings that were destroyed created severe indigenous and environmental problems (Vivian .WYT, 2009:688-702). When recycled aggregates for concrete production used than when natural aggregates such as sand and gravel used in construction costs and increased levels of carbon dioxide emissions .As a result, use of recycled materials is limited. Therefore, we must create a balance between quality costs and environmental impact.

Generally environmental recycle trash will include:

Reducing the negative environmental impacts of construction.

Reducing decreased natural resources and mineral aggregates river.

By reducing emissions associated with the production and transport, less pollution is created.

Energy and less water compared to many far future uses of new materials.

Using less energy to produce and transport, reduce greenhouse gas emissions (Construction Waste Management Guide, 2005: 50).

If we want economic analysis on the issue of recycling concrete debris can be stacked in a depot and disposal costs of waste with recycling trash compare the cost situation. In the first situation that concrete debris to land used for waste and waste accumulation as a result of expenses incurred for costs, transportation costs, air pollution, noise pollution and energy consumption.

In this case, there is the issue of discharge and paving materials that for it the blades are necessary. Cost of manpower, fuel and overhead is fixed. The demolition costs, including capital costs and equipment (maintenance, manpower, fuel and fixed costs) should be considered. The storage, manpower is considered. Sorting stage in which equipment such as excavators are used and the cost of capital, equipment, working capital and installation cost is estimated.

Crushing process includes primary and secondary crushing and magnetic separation. Primary and secondary crushing and milling equipment page are also considered. In each of these cases we are dealing with fixed costs and variable machine. Because the recycling process, depreciation blades is more equipment maintenance costs are also higher. Washing process (air meeting or screening) stage includes fuel and recycled water in order to precipitate out particles and dust will be.in the final production stage the end products produced with aggregate will be sold. In the Processing mode: equipment such as crushers and drilling machines and at the stage of crushing, magnetic separation equipment are also available. Hand-stage separation process and separation is the Stage that separation of

pieces of wood, paper and plastic, which is still with Crushed materials will done. That Staffing needs can be seen at this stage.

Washing, screening and screening process stage include: fuel and recycled water where dust and particles are laid down and the production of end products in which the aggregate production and to natural products in the market with a lower price to sell.

The results of comparing costs in the two cases in Table (1) are presented and compared suggest that the use of recycled aggregates production method in the long term, the use of natural materials, is more economical. Of course one of the factors in the survival of aggregate recycling is the availability of nutrients. If construction waste or other power sources are not available or some seasonal conditions exist for the availability of local power greatly reduced operating profit (Samani.R, 1391:80).

Conclusion

With the dwindling of natural resources probably the demand will Rise for recycled concrete aggregates Concrete recycling to a justifiable economic and environmental choice make than in the case of waste debris. Especially in places where the cost of natural materials is high or where concrete waste disposal problems associated with recycling methods should be examined

Construction debris and construction waste although fewer risks for the environment and human health, but improper management of this debris gradually they multiply the risk. This debris can cause the aggregation to change the texture of the soil. And aesthetic point of view accumulating heterogeneous environment that prevented us from having a beautiful environment and the economic benefits will be followed by a decline. There is also a pile of debris from land use and reduce their prices.

Table1. compares the cost of process waste and recycled waste in concrete

Process	Waste disposal method		Recycling of waste	
	Cost	Revenue	Cost	Revenue
Construction waste		Tipper cost factory found	2914.6	
The cost of waste disposal at the site for	6566.42			6566.42
Space debris disposal	18,777.61			18,777.61
Transportation	576.03			576.03
air pollution	3136.34			3136.34
Emissions	3267.35			3267.35
energy consumption	4316.89			4316.89
noise pollution	3323.70			3323.70
	The absurdity of		Storage of	
Equipment	145			
Manpower	45.8		37.413	
Fuel	17.2			
Fixed overhead	40.6			
	Anfja in			
Capital	137.8			
Working asset	19.4			
Maintenance and repair of equipment	30.1			
Manpower	124.8			
Fuel	15.9			
Fixed overhead	40.6			
save	37.4			
	Classification		Classification of	

Capital			168.4				168.4		
Working asset			19.4				19.4		
Maintenance and repair of equipment	35.2						35.2		
Manpower		45.8					45.8		
Fuel		7.8					7.8		
Fixed overhead		40.6					40.6		
						Debris of			
Capital							156.2		
Working asset							19.4		
Maintenance and repair of equipment							34.9		
Manpower							45.8		
Fuel							7.8		
Fixed overhead							40.6		
	Crushing process								
Primary crusher									
Equipment			165.1				163.2		
Working asset			18.9				20.5		
Equipment maintenance and repair	30.1			10.2			40.2		
Manpower		45.8					45.8		
Fuel		9.8					9.8		
Fixed overhead		40.6					40.6		
					A magnetic Da				
Equipment		168				120.8			
Working asset		19.3				16.6			
Equipment maintenance and repair	32.2			10.1		15.9			
Manpower		45.8				45.9			
Fuel		9.9				8.7			
Fixed overhead		40.6				40.6			
Secondary crusher									
Equipment		90				166.6			
Working asset		17.6				20.8			
Equipment maintenance and repair	22.3					42.3			10:10
Manpower		45.8				45.8			
Fuel		8.9				9.9			
Fixed overhead		40.6				40.6			
Manual clearing remaining contamination									
Manpower						37.4			
Clearing large chunks of wood-paper. Plastic, etc. into the ground for waste						190.027			
The shape of the underlying (page turning)									
Equipment		90							
Working asset		17.6							
Equipment maintenance and repair	22.3								
Manpower		45.8							
Fuel		8.9							
Fixed overhead		40.6							

Washing / screening air		Washing or leakage of air		
Weather	0.6		0.6	
Fuel	7.8		7.8	
End products graded				
Aggregate 20	550		506	45.00
Aggregate 10	1000		800	200.00
Aggregate 7	270		266.4	3.60
Aggregate 75	480		462	33.40
Total	44,321.04	20.3	6738.74	40,256.44
Net profit	-44,300.74		33,517.70	

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