Recycling research paper

Business, Industries

Introduction

There has been a rise in the concern relating to how human activities are affecting the environment. Over the last number of years, issues relating to environmental destruction and pollution are a concern of almost every nation in the world. The increasing use and exploitation of natural resources are resulting in the development of unwanted consequences such as increasing waste, which is affecting the lives of many individuals. As such recycling is aimed at reducing the amount of waste products that is discharged into the environment. According to Hill (2003), recycling is the process of changing waste products into usable products.

Recycling can be categorized into three categories. These include reduce, reuse and recycle. Reduce category involves the utilization of products that will save energy and decrease the amount of waste produced. This may involve the use of energy saving bulbs and buying products packaged in recyclable materials. Reusing may involve the searching for an alternative use of a product when it stops performing its initial intended purpose instead of purchasing new products. For instance, most of the plastic shopping bags can be reused more than once for diverse purposes. The third category, recycling entails the collection and sorting out of waste products, for purposes of using them as raw materials to make products that can be sold to consumers.

Benefits of Recycling to the Environment

One of the key benefits of recycling is reducing air and water pollution (Miller, 2007). The use of energy saving products reduces the amount of

energy produced in the environment. Furthermore, reducing the amount of energy produced in industries through utilizing more energy efficient saving raw materials helps to reduce the emission of greenhouse gasses to the atmosphere. Secondly, recycling helps to save and preserve natural resources. Utilization of used products to make new products reduces the need to utilize natural resources in the making of the new products. According to Saddleback Educational Publishing (2008), the process of recycling over one million tons of steel can save up to 1. 3 million tons of iron ore, 718000 tons of coal and 62000 tons of limestone. Additionally, recycling paper can reduce the rate of deforestation of trees. It is estimated that the recycling of one tonne of paper can save 17 trees, 390 gallons of oil and 7000 gallons of water (Saddleback Educational Publishing, 2008). Thirdly, recycling helps reduce solid waste disposal. Increase in solid waste increases the need to have more land for development of landfills. Furthermore, most of the hazardous waste products disposed of in the landfills can easily leak the toxic chemicals in the environment. As such, reduction in solid waste through recycling can reduce the waste products and thus reduce increase the efficiency of the existing landfills.

Wastewater recycling and reuse

There has been an increasing need to reclaim, recycle and reuse wastewater. A major factor that has necessitated such a need has been an increase in scarcity of water resources. According to Tchobanoglous, Burton and Stensel (2003), water recycling is extremely important in urban, industrial and agricultural areas. Reclaimed and recycled water can be utilized for purposes such as irrigation, industrial use, groundwater recharge,

and surface water replenishment. Agricultural irrigation forms the largest use of recycled water. Most of the irrigation approaches require large amounts of water. Consequently, large amounts of water are normally abstracted from the water sources, and this may limit water for other uses. As such, reclaimed water can be very significant in reducing the burden of water abstracted from rivers. Recycled wastewater can also be used for landscape irrigation. Landscape irrigation may constitute irrigation of parks, golf courses, playgrounds and landscape areas around commercial and industrial development. Additionally, recycled water can be used for industrial activities especially cooling and processing needs in industries. Most of the demand for use of water in industries primarily is for cooling. The use of reclaimed water reduces the cost of paying for fresh water supplied municipally. Consequently, this helps reduce industrial overhead costs. Recycled water can also be applied in groundwater recharging. Recharging can be done through direct injection of recycled water into the groundwater aquifers or in spreading basins. Groundwater recharging is important to ensure that hydraulic barriers develop to prevent saltwater intrusion in coastal areas. The recycled water can also be utilized for development of recreational lakes and stream flow augmentation. In urban scale developments, man-made lakes and storage ponds in golf courses can be supplied with reclaimed water. In wetlands, the reclaimed water is significant for the restoration and enhancement of habitats.

Solid waste recycling

Paper recycling

According to Ramachandra (2006), paper contributes a high percentage to

the total amount of domestic waste. Paper recycling has significant benefits to the environment in terms of reducing deforestation. Paper recycling reduces the demand for wood and energy and the process assists in addressing the dumping problems in the city. Consequently, recycling of paper has become a profitable business.

Ramachandra (2006) provides a typical technology for recycling paper and cardboards. In cardboard processing, a semi-mechanical plant is used. Paper scrap is pulped in a beater machine, in the semi-mechanical plant. The paper pulp is spread on a rotating sieve and is pressed mechanically. Cutting is done manually, which is then followed by sun drying. The cardboard is then sheared into sheets from which products such as boxes for shoes are made.

Recycling of plastics

There has been an increase in the use of plastics to an extent it has become an integral in the lives of humans (Siddique, 2007). Usages of plastics vary and may include industrial applications, packaging, medical delivery systems, automotive industry, communication, security systems, housing and distribution of food among many other purposes. Properties such as low density, long life, strength, fabrication capabilities and lightweight and low cost have contributed to the increased use and production of plastics (Siddique, 2007). Consequently, the large number of applications of plastics translates to an ever-increasing volume of plastic wastes that are produced every year from different business. To reduce the waste problem contributed by plastics, recycling efforts have been introduced to handle the situation. Some of the plastics such as those used for packaging foods become waste quickly especially after purchase compared to others. Other plastics can be

reused as many times as possible. Reusing plastics is recommended over recycling as it does not utilize a lot of energy and resources. Recycling plastics reduces the amount of municipal solid waste being landfilled. Additionally, it reduces the levels of contaminations is water bodies.

Plastics recycling methods

Mechanical Recycling

Mechanical recycling of plastics involves processes such as melting, shredding and granulation of waste plastics. The waste plastics need to be sorted prior to the mechanical recycling process. According to Siddique (2007), this is then followed by melting the plastics and molding them into new shapes. Additionally, after melting the plastics can be granulated. Mechanical recycling is normally preferred as it is more environmentally friendly than incineration of the plastics.

Chemical recycling of plastics

Chemical recycling may involve processes such as thermal processing, chemical modification, and fillers. In chemical modification, processes involved include pyrolysis and hydrolysis. Hydrolysis relates to chemical decomposition while the pyrolysis relates to thermal decomposition. Thermal reprocessing, on the other hand, involves heating of thermoplastics at extremely high temperatures to obtain plastic flow. The plastic flow can then be converted to new products in the processes of cooling. The downside to thermal reprocessing is that if it is repeated excessively, it can adversely affect the plastic properties. Additionally, thermoplastics that undergo thermal processing need to have similar thermal properties. In cases where

it becomes difficult to sort the plastics, special equipment can be used, which takes into account the different thermal properties of the various plastics.

In cases where the chemical composition of the plastics is not significant, the plastics can be used as fillers, for instance, in road construction. Further, the plastic waste can be used as a substitute for inorganic aggregates in concrete applications to reduce the dead weight of structures (Siddique, 2007). Furthermore, recycled rubber can be used in asphaltic mixes to increase skid resistance under icy conditions and increase crack resistance.

Solid waste recycling of metals

Presence of metals is common in municipal solid waste. According to Hosetti (2006), metals such as iron, steel copper, aluminum, zinc, and lead are common in waste streams. The use of recyclable metal can significantly reduce the operating costs incurred in industries. Sources of metals for recycling are usually cheap, and their production consumes less energy than the extraction of metals from natural ores. Metals that are normally dumped in landfill can be a dangerous source for hazardous leaching into the soil, which in most cases is toxic to the organisms and environment.

Scrap types and Types of metal recycling

Graedel et al., (2011) provides different types of recycling based on the scrap available. For instance, home scrap can be recycled using the process that initially generated it. This process is normally economically beneficial and easy to accomplish. New scrap is not normally recycled within the same facility as home scrap, but it is rather transferred to a scrap market. Old

scrap is metal that have reached their end of life. Their recycling process will require more effort especially in cases where the metal is a small part of a complex product (Graedel et al., 2011).

One approach of metal recycling is referred to as functional recycling (Graedel et al., 2011). The functional recycling relates to that portion of the end of life recycling in which the metal in a redundant product is separated and sorted to obtain recyclables, which are then reused as raw materials in the production process, which generates metal. Nonfunctional recycling relates to that portion of the end of life recycling in which the metal is collected as an old metal scrap.

One of the most significant metals recycled is aluminum. Aluminum is normally a sustainable metal that never wears out and can repeatedly be recycled. According to Saddleback Educational Publishing (2008), recycling of aluminum cans results to a reduction of about 95 % in energy usages compared to the production of new cans. Aluminum recycling process involves shredding, cleaning, melting and mixing with a pure aluminum base prior to recasting into new aluminum products (Saddleback Educational Publishing, 2008). The first stage involves the shredding of the aluminum cans. This is then followed by the de-coating lacquer on the cans. Once this is done, the cans are ready for melting, which is then followed by casting into new shapes.

Recycling Glass

Glass is one of the easiest products to recycle with guaranteed maintenance of quality of product. Glass is normally collected from factories and other sources and taken to recycling plants where monitoring is done to evaluate

its purity levels. Once evaluated, the glass is crushed to form cullet. Then the cullet is mixed with other raw materials and melted. According to Morgan (2009), recycling glass has some significant benefits. The cullet used in the recycling process normally melts at a lesser temperature than the raw material used in the glass making process. Consequently, this process saves energy. Additionally, if the energy sources used are fossil fuels, the carbon emission are reduced significantly. The recycled glass can be used in various ways. For instance, recycled glass can be used to make new glass bottles and jars. In the construction industry, recycled glass is used to make glasphalt, which is a road surface type that contains 30 percent recycled glass (Morgan, 2009)

Recycling Challenges

One of the major challenges in recycling is that it can be time consuming especially in cases where sorting is to be done. Normally waste is not arranged in order of the different materials. A person has to be employed and compensated for sorting the different materials. Furthermore, the lack of awareness of recycling makes it difficult to promote the recycling culture. In cases such as bars where there is high use of glass, most of waste glass is normally thrown away instead of being stored and sold to recycling companies. Furthermore, recycling needs to be economically viable. The recycled products need to have a ready market. For large companies to be involved in recycling, there needs to be evidence of economic gains to ensure they break even. Consequently, the recycling processes needs to be low cost to ensure profitability in such an entity. The recycling process leads to a lot of chemical exposure as a variety of waste material are involved. As

such, necessary precautions need to be taken into account to reduce exposure of employees to hazardous substances

Conclusion

Recycling is still not heavily applied and more efforts in the processes of waste recycling need to be done. Challenges continue to be a hindrance to recycling but with proper economic evaluations large, and small companies can be able to make recycling profitable. Furthermore, more effort needs to be done in wastewater recycling. Much of the effort in recycling has be done on solid waste but by applying wastewater recycling pressure on water resources can also be reduced significantly

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