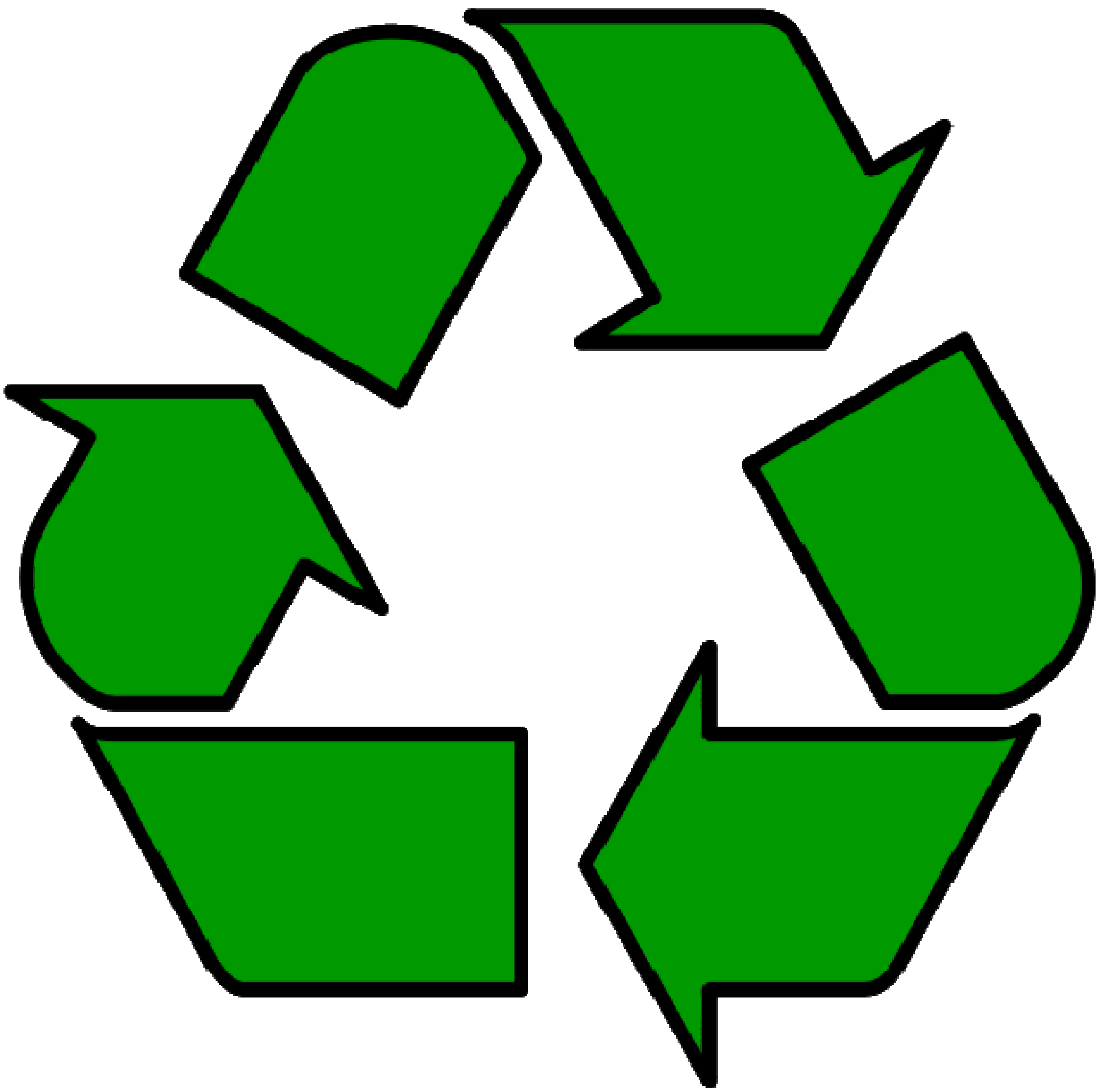
RECYCLING



Prepared by:- Farhad Fattah Ahmed

Card no.: 2114

Introduction

When I thought of raising my level as an engineer, an idea of a research that would do a great benefit to both my city and my country came up to my mind .So I decided to research reusing all the materials that we use daily, which is known as recycling, because nowadays most of those materials are imported into our country from other countries.

Reusing those materials again would first of all be the cause of decreasing the import of those materials from other countries, and second it would decrease the percentage of pollution in our environment .And the most important of all we would save raw materials.

But if we stayed in our current state and position we would lose two important thing which are first money and second which is much more important than money and is absolutely priceless, which is the loss of our environment, so I hope that my research would be the cause of getting the attraction of those who are in charge and are responsible of this country and city to pay a closer attention to this very important subject.

Recycling :- is processing used materials (waste) into new products to prevent waste of potentially useful materials, reduce the consumption of fresh raw materials which is saving them, reduce energy usage, reduce air pollution (from incineration) and water pollution (from landfilling) by reducing the need for "conventional" waste disposal, and lower greenhouse gas emissions as compared to virgin production. Recycling is a key component of modern waste reduction and is the third component of the "Reduce, Reuse, and Recycle" waste hierarchy.

All raw materials and all energy are provided by our environment. Unfortunately, most of the provided raw materials and energy are not useable as they appear in nature (e.g. ores, wind power, etc.) and are spread globally in e.g. deposits. By using energy and resources we have to collect, clean, concentrate, and transform these resources to generate primary raw materials that are useable for people and industry. In physical terms, this means that we have to lower the *entropy* (high entropy = high “disorder” or low “usability” of a material) of the system "environment" by using energy (a system where all substances are distributed evenly is in the state of equilibrium with the highest possible entropy). This is done in industries like power plants, steel and aluminum mills or in the petrochemical industry. With the production, the use and disposal of any good the raw materials the goods are made of or any transformation products (e.g. any emissions) are distributed in our environment (the system) again, which means that the entropy of the system goes up again.

The assignment of any recycling effort is to re-concentrate the raw materials - produce a secondary raw material - and re-decreases the entropy of the system by using energy again. As a matter of fact, the demand on energy and resources is usually lower to produce a good from recycled material as a pure raw material is already available (e.g., metal not ore) and there is no need to start from the very beginning (e.g., dig for ore to refine the metals cars, beverage cans are made from). Recycling assures that a part of the initially used raw materials and energy are utilizable again for our industries to produce new goods for lower costs and with a lower environmental impact. Primary raw materials should only be used to balance the losses during the recycling process, to increase the quality of the secondary raw materials, and to fill up the gap between available secondary raw materials and current demand.

The assignment of any recycling effort is to re-concentrate the raw materials - produce a secondary raw material - and re-decreases the entropy of the system by using energy again. As a matter of fact, the demand on energy and resources is usually lower to produce a good from recycled material as a pure raw material is already available (e.g., metal not ore) and there is no need to start from the very beginning (e.g., dig for ore to refine the metals cars, beverage cans are made from). Recycling assures that a part of the initially used raw materials and energy are utilizable again for our industries to produce new goods for lower costs and with a lower environmental impact. Primary raw materials should only be used to balance the losses during the recycling process, to increase the quality of the secondary raw materials, and to fill up the gap between available secondary raw materials and current demand.

As the substances - from emissions especially - could be distributed in very low local concentrations evenly in the environment the demand on energy and resources to recover the valuable raw materials grows theoretically exponentially. Corollary, recycling and raw material recovery will never be complete.

Recyclable materials include many kinds of glass, paper, metal, plastic, textiles, and electronics. Although similar in effect, the composting or other reuse of biodegradable waste – such as food or garden waste – is not typically considered recycling.[٢] Materials to be recycled are either brought to a collection center or picked up from the curbside, then sorted, cleaned, and reprocessed into new materials bound for manufacturing.

History

Recycling has been a common practice for most of human history, with recorded advocates as far back as Plato in ٤٠٠ BC. During periods when resources were scarce, archaeological studies of ancient waste dumps show less household waste (such as ash, broken tools and pottery)—implying more waste was being recycled in the absence of new material. In pre-industrial times, there is evidence of scrap bronze and other metals being collected in Europe and melted down for perpetual reuse. In Britain dust and ash from wood and coal fires was collected by 'dustmen' and down cycled as a base material used in brick making. The main driver for these types of recycling was the economic advantage of obtaining recycled feedstock instead of acquiring virgin material, as well as a lack of public waste removal in ever more densely populated areas.

In ١٨١٣, Benjamin Law developed the process of turning rags into 'shoddy' and 'mungo' wool in Batley, Yorkshire. This material combined recycled fibres with virgin wool. The West Yorkshire shoddy industry in towns such as Batley and Dewsbury, lasted from the early ١٩th century to at least ١٩١٤.

Industrialization spurred demand for affordable materials; aside from rags, ferrous scrap metals were coveted as they were cheaper to acquire than was virgin ore. Railroads both purchased and sold scrap metal in the ١٩th century, and the growing steel and automobile industries purchased scrap in the early ٢٠th century. Many secondary goods were collected, processed, and sold by peddlers who combed dumps, city streets, and went door to door looking for discarded machinery, pots, pans, and other sources of metal. By World War I, thousands of such peddlers roamed the streets of American cities, taking advantage of market forces to recycle post-consumer materials back into industrial production.

Wartime:

Resource shortages caused by the world wars, and other such world-changing occurrences greatly encouraged recycling. Massive government promotion campaigns were carried out in World War II in every country involved in the war, urging citizens to donate metals and conserve fiber, as a matter of significant patriotic importance. For example in ١٩٣٩, Britain launched the programmer Paper Salvage to encourage the recycling of materials to aid the war effort. Resource conservation programs established during the war were continued in some countries without an abundance of natural resources, such as Japan, after the war ended.

The modern era of recycling

The modern era of recycling began in the meandering wake of the Mobro ٤٠٠٠. The infamous garbage barge spent much of ١٩٨٧ traveling up and down the eastern seaboard looking for a place to dump its ٣٠٠٠-ton load of New York trash. It was refused at every port. By the time the spurned vessel returned to Long Island, still ferrying its fetid cargo, it had become the poster child for what was trumpeted as a national crisis: dwindling landfill space. Faced with the scale of their own refuse, Americans took action. Nascent recycling programs blossomed into major operations. Municipalities invested in trucks for curbside pickups and in facilities to handle mountains of castoff material. Kindergartners were taught the virtues of separating clear glass from green. Almost overnight, it seemed, recycling was embraced by the public as a kind of all-purpose absolution for our environmental sins.

Yet doubts remained. Some critics wondered if, far from being an environmental panacea, recycling is actually a giant placebo that makes us feel virtuous but wastes both money and resources. Take the much-maligned plastic water bottle. It's almost always made from petroleum, a resource that certainly seems worth conserving, and if you chuck it in the trash, the container will live on in a landfill for centuries. But how much diesel fuel does the truck that collects these bottles burn? How much energy does the recycling plant consume; what fumes does it emit into the atmosphere? And what does it all cost, anyway?

ENERGY

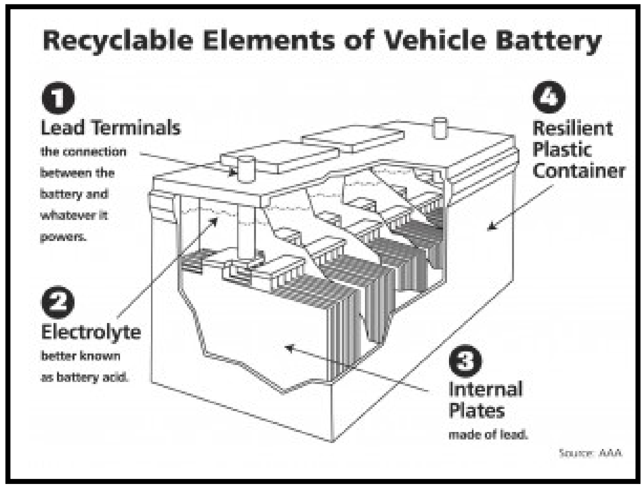
The amount of energy saved through recycling depends upon the material being recycled. Some, such as aluminum, save a great deal, while others may not save any. The Energy Information Administration (EIA) states on its website that "a paper mill uses ٤٠ percent less energy to make paper from Some critics argue that it takes more energy to produce recycled products than it does to dispose of them in traditional landfill methods, since the curbside collection of recyclables often requires a second waste truck. However, recycling proponents point out that a second timber or logging truck is eliminated when paper is collected for recycling, so the net energy consumption is the same.

It is difficult to determine the exact amount of energy consumed or produced in waste disposal processes. How much energy is used in recycling depends largely on the type of material being recycled and the process used to do so. Aluminum is generally agreed to use far less energy when recycled rather than being produced from scratch. The EPA states that "recycling aluminum cans, for example, save ٩٥ percent of the energy required to make the same amount of aluminum from its virgin source, bauxite."

Every year, millions of tons of materials are being exploited from the earth's crust, and processed into consumer and capital goods. After decades to centuries, most of these materials are "lost". With the exception of some pieces of art or religious relics, they are no longer engaged in the consumption process. Where are they? Recycling is only an intermediate solution for such materials, although it does prolong the residence time in the anthroposphere. For thermodynamic reasons, however, recycling cannot prevent the final need for an ultimate sink" (Brunner, ١٩٩٩, p. ١).

Studies have shown that recycling in itself is inefficient to perform the "decoupling" of economic development from the depletion of non-renewable raw materials that is necessary for sustainable development. When global consumption of a natural resource grows by more than ١ percent per annum, its depletion is inevitable, and the best recycling can do is to delay it by a number of years. Nevertheless, if this decoupling can be achieved by other means, so that consumption of the resource is reduced below ١ percent per annum, then recycling becomes indispensable—indeed recycling rates above ٨٠ percent are required for a significant slowdown of the resource depletion.

Recycling Batteries



Some batteries contain toxic heavy metals, making recycling or proper disposal a high priority. These batteries are Dutch; the Netherlands openly encourages battery recycling. The large variation in size and type of batteries makes their recycling extremely difficult: they must first be sorted into similar kinds and each kind requires an individual recycling process. Additionally, older batteries contain mercury and cadmium, harmful materials that must be handled with care. Because of their potential environmental damage, proper disposal of used batteries is required by law in many areas. Unfortunately, this mandate has been difficult to enforce. Lead-acid batteries, like those used in automobiles, are relatively easy to recycle and many regions have legislation requiring vendors to accept used products. In the United States, the recycling rate is ٩٠%, with new batteries containing up to ٨٠% recycled material.

Japan, Kuwait, the USA, Canada, France, the Netherlands, Germany, Austria, Belgium, Sweden, the UK and Ireland all actively encourage battery recycling programs.

In ٢٠٠٦ the EU passed the Battery Directive of which one of the aims is a higher rate of battery recycling. The EU directive said at least ٢٥% of all the EU's used batteries must be collected by ٢٠١٢, and rising to no less than ٤٥% by ٢٠١٦, of which, that at least ٥٠% of them must be recycled.

Recycling Industrial Waste

Although many government programs are concentrated on recycling at home, a large portion of waste is generated by industry. The focus of many recycling programs done by industry is the cost-effectiveness of recycling. The ubiquitous nature of cardboard packaging makes cardboard a commonly recycled waste product by companies that deal heavily in packaged goods, like retail stores, warehouses, and distributors of goods. Other industries deal in niche or specialized products, depending on the nature of the waste materials that are present. The glass, lumber, wood pulp, and paper manufacturers all deal directly in commonly recycled materials. However, old rubber tires may be collected and recycled by independent tire dealers for a profit. Levels of metals recycling are generally low. In ٢٠١٠, the International Resource Panel, hosted by the United Nations Environment Programmed (UNEP) published reports on metal stocks that exist within society and their recycling rates. The Panel reported that the increase in the use of metals during the ٢٠th and into the ٢١st century has led to a substantial shift in metal stocks from below ground to use in applications within society above ground. For example, the in-use stock of copper in the USA grew from ٧٣ to ٢٣٨kg per capita between ١٩٣٢ and ١٩٩٩.

The report authors observed that, as metals are inherently recyclable, the metals stocks in society can serve as huge mines above ground. However, they found that the recycling rates of many metals are very low. The report warned that the recycling rates of some rare metals used in applications such as mobile phones, battery packs for hybrid cars and fuel cells, are so low that unless future end-of-life recycling rates are dramatically stepped up these critical metals will become unavailable for use in modern technology. The military recycles some metals. The U.S. Navy's Ship Disposal Program uses ship breaking to reclaim the steel of old vessels. Ships may also be sunk to create an artificial reef. Uranium is a very dense metal that has qualities superior to lead and titanium for many military and industrial uses. The uranium left over from processing it into nuclear weapons and fuel for nuclear reactors is called depleted uranium, and it is used by all branches of the U.S. military use for armour-piercing shells and shielding.

The construction industry may recycle concrete and old road surface pavement, selling their waste materials for profit.

Recycling Metal

Iron and steel are the world's most recycled materials, and among the easiest materials to reprocess, as they can be separated magnetically from the waste stream. Recycling is via a steelworks: scrap is either remelted in an electric arc furnace (٩٠-١٠٠% scrap), or used as part of the charge in a Basic Oxygen Furnace (around ٢٥% scrap).[١] Any grade of steel can be recycled to top quality new metal, with no 'downgrading' from prime to lower quality materials as steel is recycled repeatedly. ٤٢% of crude steel produced is recycled material. Aluminum is one of the most efficient and widely recycled materials. Aluminum is shredded and ground into small pieces or crushed into bales. These pieces or bales are melted in an aluminum smelter to produce molten aluminum. By this stage, the recycled aluminum is indistinguishable from virgin aluminum and further processing is identical for both. This process does not produce any change in the metal, so aluminum can be recycled indefinitely.

Recycling aluminum saves ٩٥% of the energy cost of processing new aluminum. This is because the temperature necessary for melting recycled, nearly pure, aluminum is ٦٠٠ °C, while to extract mined aluminum from its ore requires ٩٠٠ °C. To reach this higher temperature, much more energy is needed, leading to the high environmental benefits of aluminum recycling. Americans throw away enough aluminum every year to rebuild their entire commercial air fleet. Also, the energy saved by recycling one aluminum can is enough to run a television for three hours.

Recycling Glass

Glass bottles and jars are gathered by a curbside collection truck and bottle banks, where the glass may be sorted into color categories. The collected glass *cullet* is taken to a glass recycling plant where it is monitored for purity and contaminants are removed. The cullet is crushed and added to a raw material mix in a melting furnace. It is then mechanically blown or molded into new jars or bottles. Glass cullet is also used in the construction industry for aggregate and glass halt. Glass halt is a road-laying material which comprises around ٣٠% recycled glass. Glass can be recycled indefinitely as its structure does not deteriorate when reprocessed.

Plastic

Plastic recycling is the process of recovering scrap or waste plastics and reprocessing the material into useful products. Compared to glass or metallic materials, plastic poses unique challenges. Because of the massive number of types of plastic, they each carry a resin identification code, and must be sorted before they can be recycled. This can be costly; while metals can be sorted using electromagnets, no such 'easy sorting' capability exists for plastics. In addition to this, while labels do not need to be removed from bottles for recycling, lids are often made from a different kind of non-recyclable plastic.

To help in identifying the materials in various plastic items, resin identification code numbers ١-٦ have been assigned to six common kinds of recyclable plastic resins, with the number ٧ indicating any other kind of plastic, whether recyclable or not. Standardized symbols are available incorporating each of these resin codes.

Rubber Tyres

Tire recycling or rubber recycling is the process of recycling vehicles tyress that are no longer suitable for use on vehicles. These tyres are among the largest and most problematic sources of waste, due to the large volume produced and their durability. Those same characteristics which make waste tyres such a problem also make them one of the most re-used waste materials, as the rubber is very resilient and can be reused in other products. In the United States, approximately one tyre is discarded per person per year. However material recovered from waste tyres, known as "crumb" is generally only a cheap "filler" material and is rarely used in high volumes. Tyre recycling is also fairly common. Used tires can be added to asphalt for producing road surfaces or to make rubber mulch used on playgrounds, basketball courts and new shoe products. They are also often used as the insulation and heat absorbing/releasing material in specially constructed homes known as earth ships. It is arguable that tire crumb in applications such as basketball courts could be better described as "reused" rubber rather than "recycled".

Building and Construction Waste

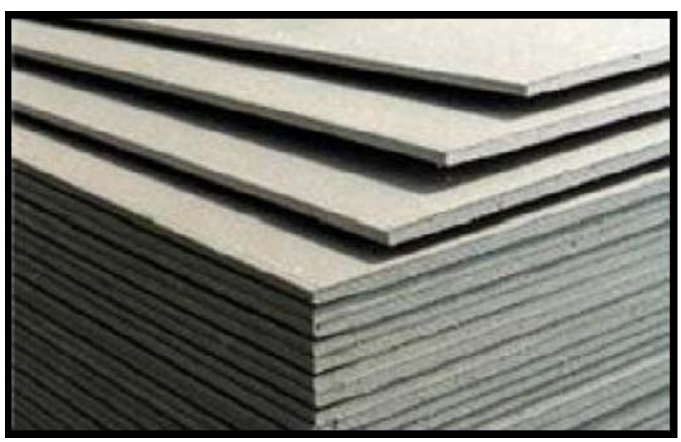
Concrete aggregate collected from demolition sites is put through a crushing machine, often along with asphalt, bricks, dirt, and rocks. Smaller pieces of concrete are used as gravel for new construction projects. Crushed recycled concrete can also be used as the dry aggregate for brand new concrete if it is free of contaminants. Builder's rubble (like broken down bricks) is also used for railway ballast and gravel paths. This reduces the need for other rocks to be dug up, which in turn saves trees and habitats.

١- Asphalt and tarmac:

Asphalt including Asphalt including asphalt shingle can be melted down and in part recycled. Tarmac can also recycle and there is now an active market for recycling tarmac in the developed world. This includes tarmac *scalpings* produced when roads are scarified prior to lying of a new surface.

٢- Gypsum, plaster and plasterboard products:

Because up to ١٧% of gypsum products are wasted during the manufacturing and installation processes. Wallboard (Australia and others), plasterboard, Gyp (New Zealand), drywall (USA) or plasterboard (UK and Ireland) is frequently not re-used and disposal can become a problem. Some landfill sites have banned the dumping of gypsum because of the tendency to produce large volumes of hydrogen sulfide gas. Some manufacturers take back waste wallboards from construction sites and recycle it into new wallboard. Recycled paper is typically used during manufacturing. More recently, recycling at the construction site itself is being investigated. There is potential for using crushed plasterboard to amend certain soils at building sites, such as clay and silt mixtures (bay mud), as well as using it in compost.



At last I say by reusing those daily materials and recycling them, we would have served this country, and then we would be the real patriots of this land.