

Importance of Recycling

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Abstract: Recycling is a process change waste materials into new products to prevent waste of potentially useful materials, reduce the consumption of fresh raw materials, reduce energy usage, reduce air pollution (from incineration) and water pollution by reducing the need for “conventional” waste disposal, and lower greenhouse gas emissions as compared to plastic production. Recycling is a key component of modern waste reduction and is the third component of the “Reduce, Reuse and Recycle” waste hierarchy.

Keywords : Recycle, Reuse, Recyclate, Recovery, Drop-off centres, Buy-back centres, Curbside Collection.

I. INTRODUCTION

Recycling has been a common practice for most of human history, with recorded advocates as far back as Plato in 400 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. A considerable investment in recycling occurred in the 1970s, due to rising energy costs. Recycling aluminium uses only 5% of the energy required by virgin production; glass, paper and metals have less dramatic but very significant energy savings when recycled feedstock is used. Countries have to reach recycling rates of at least 50%.

There is some debate over whether recycling is economically efficient. It is said that dumping 10000 tons of waste in a landfill creates six jobs, while recycling 10000 tons of waste can create over 36 jobs.

Critics dispute the net economic and environmental benefits of recycling over its costs, and suggest that proponents of recycling often make matters worse and suffer from confirmation bias. Specifically, critics argue that the costs and energy used in collection and transformation detract from the costs and energy saved in the production process; also that the jobs produced by the recycling industry can be a poor trade for the jobs lost in logging, mining and other industries associated with production.

There are some ISO standards related to recycling such as ISO 15270:2008 for plastics waste and ISO 14001:2004 for environmental management control of recycling practice.

Despite good results, the shift in collection costs from local government to industry and consumers has created strong opposition to the creation of such programs in some areas.

Legislation has also been used to increase and maintain a demand for recycled materials. Four methods of such legislation exist: minimum recycled content mandates, utilization rates, procurement policies, recycled product labelling. Both minimum recycled content mandates and

utilization rates increase demand directly by forcing manufacturers to include recycling in their operations.

II. METHODOLOGY

- For a recycling program to work, having a large, stable supply of recyclable material is crucial.
- Three legislative options have been used to create such a supply: mandatory recycling collection, container deposit legislation, and refuse bans.
- Mandatory collection laws set recycling targets for cities to aim for, usually in the form that a certain percentage of a material must be diverted from the city’s waste stream by a target date. The city is then responsible for working to meet this target.

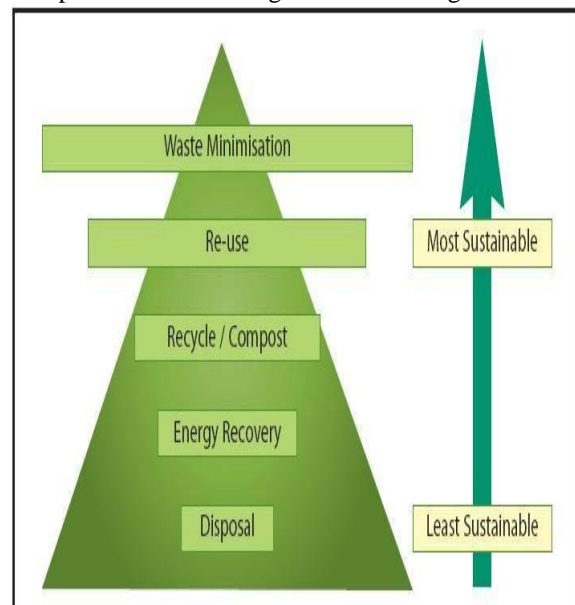


Fig. 1: Relationship between disposal and waste management

- Container deposit legislation involves offering a refund for the return of certain containers, typically glass, plastic, and metal. When a product in such a container is purchased, a small surcharge is added to the price. This surcharge can be reclaimed by the consumer if the container is returned to a collection point. These programs have been very successful, often resulting in an 80 percent recycling rate.



Fig. 2: Connection between collection, transportation, recovery, recycling and analysis

- One method of increase supply of recyclates is to ban the disposal of certain materials as waste, often including used oil, old batteries, tires and garden waste. One aim of this method is to create a viable economy for proper disposal of banned products. Care must be taken that enough of these recycling services exist, or such bans simply lead to increased illegal dumping.
- Recyclate is a raw material that is sent to, and processed in a waste recycling plant or materials recovery facility which will be used to form new products. The material is collected in various methods and delivered to a facility where it undergoes re-manufacturing so that it can be used in the production of new materials or products. For example, plastic bottles that are collected can be re-used and made into plastic pellets, a new product.
- The quality of recyclates is recognized as one of the principal challenges that needs to be addressed for the success of a long term vision of a green economy and achieving zero waste. Recyclate quality is generally referring to how much of the raw material is made up of target material compared to the amount of non-target material and other non-recyclate material.
- A number of different systems have been implemented to collect recyclates from the general waste stream. These systems lie along the spectrum of trade off between public convenience and government ease and expense. The three main categories of collection are “drop-off centres”, “buy-back centres”, and “curbside collection”.
- Drop-off centres require the waste producer to carry the recyclates to a central location, either an installed or mobile collection station or the reprocessing plant itself. They are the easiest type of collection to

establish, but suffer from low and unpredictable throughput.

- Buy-back centres differ in that the cleaned recyclates are purchased, thus providing a clear incentive for use and creating a stable supply. The post-processed material can then be sold on, hopefully creating a profit.
- Curbside collection encompasses many subtly different systems, which differ mostly on where in the process the recyclates are sorted and cleaned. The main categories are mixed waste collection, commingled recyclates and source separation. A waste collection vehicle generally picks up the waste.
- Once commingled recyclates are collected and delivered to a central collection facility, the different types of materials must be sorted. This is done in a series of stages, many of which involve automated processes such that a truckload of material can be fully sorted in less than an hour. Some plants can now sort the materials automatically, known as single-stream recycling. In plants a variety of materials are sorted such as paper, different types of plastics, glass, metals, food scraps, and most types of batteries. A 30 percent increase in recycling rates has been seen in the areas where these plants exist.



Fig. 3: Materials of recycling

- Initially, the commingled recyclates are removed from the collection vehicle and placed on a conveyor belt spread out in a single layer. Large pieces of corrugated fiberboard and plastic bags are removed by hand at this stage, as they can cause later machinery to jam.
- Automated machinery such as disk screens and air classifiers separate the recyclates by weight, spilling lighter paper and plastic from heavier glass and metal. Cardboard is removed from the mixed paper and the most common types of plastic. This separation is usually done by hand but has become automated in some sorting centers; a spectroscopic scanner is used to differentiate between different types of paper and plastic based on the absorbed wavelengths, and subsequently divert each material into the proper collection channel.
- Strong magnets are used to separate out ferrous metal, such as iron, steel, and tin-plated steel cans.



Fig. 4: Recycling bin

- Finally, glass is sorted on the basis of its colour: brown, amber, green or clear. It may either be sorted by hand, or via an automated machine that uses coloured filters to detect different colours. Glass fragments smaller than 10 mm across cannot be sorted automatically, and are mixed together as ‘glass fines’.

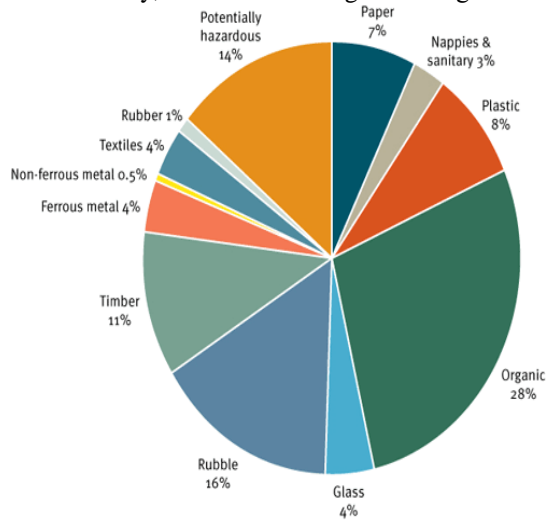


Fig. 5: Percentage of recycling materials

III. RESULT

Environmental effects of recycling:

Material	Energy savings	Air pollution savings
Aluminium	95%	95%
Cardboard	24%	-
Glass	5-30%	20%
Paper	40%	73%
Plastics	70%	-

- Reduces amount of waste sent to landfills.
- Conserves natural resources.
- Saves energy.
- Reduces greenhouse gas emissions.
- Helps to create new jobs.
- Helps to sustain the environment for future generations.

IV. CONCLUSION

Complete recycling is impossible from a practical stand point. In summary, substitution and recycling strategies only delay the depletion of non-renewable stocks and

therefore may buy time in the transition to true or strong sustainability, which ultimately is only guaranteed in an economy based on renewable resources.

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