

# Process for Recycling of Materials

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## Introduction

Recycling is a process to 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 and water pollution by reducing need for conventional waste disposal and lower green house gas emission as compared to plastic production. Recycling is a key component of modern waste reduction and is the third component of the - Reduce Reuse, Recycle waste hierarchy.

The literal meaning of recycling is the procedure of making used or unwanted products into new manufactured products.

Recycling is the process of collecting and processing materials that would otherwise be thrown away as trash and turning into new products. Recyclable materials include some kinds of glass, paper, metal, textiles and electronics.

## Recycling Process

The recycle process involves several steps. The first process includes has three steps that form a circle. The first steps are collecting recyclables, processing the recyclables and making them into new items, and purchasing recycled products. Collection of recyclables include curbside and recycling centers. The second step in the process can vary depending on the recyclable materials being used. The third step in the process is becoming easier as more products are made using recycled materials. Therefore in brief recycle includes the three steps below, which create a continuous loop, represented by the familiar recycling symbol.

Step 1 - Collection and processing

Step 2 - Manufacturing

Step 3 - Purchasing new products made from recycled materials

## Area of Recycling

The four broad areas in which something of value may be obtained from wastes are the following -

1. Direct recycle as raw materials to the generator as with the return to feed stock of raw materials not completely consumed in a synthesis process.
2. Transfer as a raw material to another process, a substance that is a waste product from one process may serve as a raw materials for another, sometimes in an entirely different industry.
3. Utilization for pollution control or waste treatment, such as use of waste alkali to neutralize waste acid.



4. Recovery of energy, for example, from the incineration of combustible hazardous wastes.

### Physical Methods of Waste Treatment

Knowledge of the physical behavior of wastes has been used to develop various unit operation for waste treatment that are based upon physical properties.

These operations include the following -

- |                        |   |                        |
|------------------------|---|------------------------|
| 1. Phase separation    | - | Filtration             |
| 2. Phase transition    | - | Distillation           |
|                        |   | Evaporation            |
|                        |   | Physical Precipitation |
| 3. Phase transfer      | - | Extraction             |
|                        |   | Sorption               |
| 4. Membrane separation | - | Reverse Osmosis        |
|                        | - | Hyper                  |
|                        | - | Ultra Filtration       |

### Chemical Treatment

The applicability of chemical treatment to wastes depends upon the chemical properties of the waste constituents, particularly acid base, oxidation-reduction, precipitation and complexation. Reactivity, combustibility, flammability, corrosivity and compatibility with other wastes. The chemical behavior of wastes translates to various unit operations for waste treatment that are based upon chemical properties and reactions. These include the following -

1. Acid/base neutralization
2. Chemical extraction and leaching
3. Hydrolysis
4. Chemical precipitation
5. Oxidation/reduction
6. Ion exchange

Some of the more sophisticated means available for treatment of wastes have been developed for pesticide disposal.

### Some other recycling process are following -

1. **Photolytic Reaction** : As photolysis proceeds, more H-C bonds are broken, The C-O bonds are broken and the final product is a harmless organic polymer.
2. **Thermal Treatment Methods** : In this method – Many industrial wastes, including hazardous wastes are burned as hazardous waste fuel for energy recovery in industrial furnaces and boilers and in incinerators for nonhazardous wastes.
3. **Biodegradation of Wastes** : Biodegradation of wastes is their conversion by biological process to simple molecules which can be used as an energy sources.
4. **Land Treatment** : Land treatment is most used for petroleum refining wastes and is applicable to the treatment of fuels and wastes.



5. **Composting** : Composting of hazardous wastes is biodegradation of solid or solidified materials which must be supplied other useful materials.
6. **Chemical Fixation** : Chemical fixation is a process that binds a hazardous waste substance in a less mobile, less toxic form.

#### Examples of Recycling

Recycling of scrap industrial impurities and products on a large scale with a number of different materials. Most of these materials are not hazardous but as with most large-scale industrial operations. This recycle may involve the use or production of hazardous substances. Some of the more important examples are the following -

1. **Glass** : Which makes up about 10 percent of municipal refuse.
2. **Paper** : Commonly recycled from municipal refuse.
3. **Ferrous metals** : Composed primarily of iron and used largely feedstock for electric arc furnaces.
4. **Plastic** : Consisting of a variety of moldable polymeric materials and composing a major constituent of municipal wastes.
5. **Catalysts** : From chemical synthesis or petroleum processing.
6. **Organic substances** : Especially solvents and oils, such as hydraulic and lubricating oils.

#### Benefits of Recycling

1. Reduces the amount of waste sent to land-fills and incinerators.
2. Conserves natural resources such as Timber, Water and Minerals.
3. Prevents pollution by reducing the need to collect new raw materials.
4. Saves energy
5. Reduces greenhouse gas emissions that contribute to global climate change.
6. Helps sustain the environment for future generations.
7. Helps create new well paying jobs in the recycling and manufacturing industries.

#### References

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