

# Thinking about plastics: For sustainable development or Hazardous

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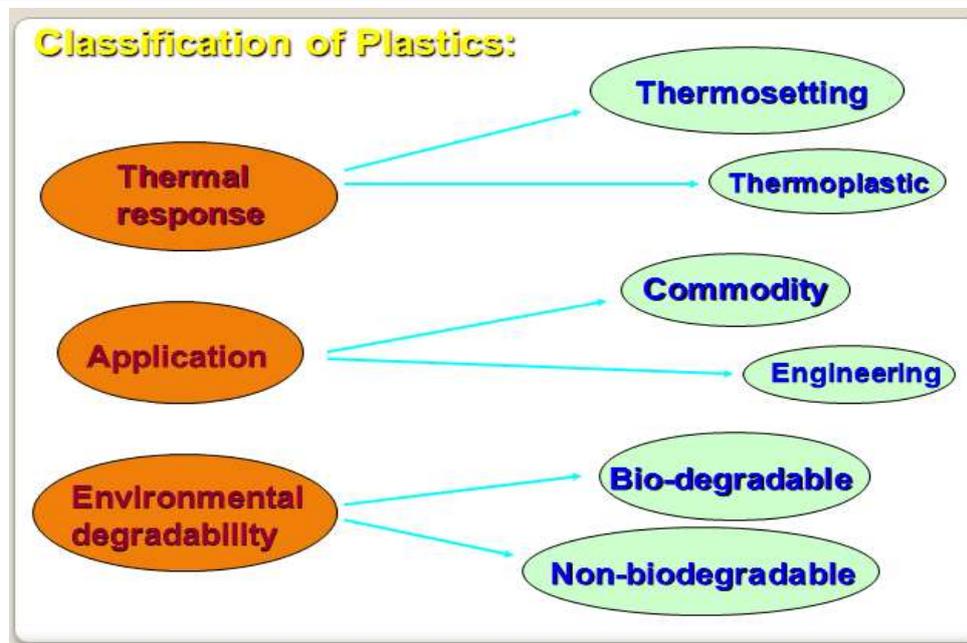
## **Introduction:**

Plastics belong to a group of high polymers which undergoes deformation by heat and pressure at some stage of its manufacture but becomes rigid in its final form. Depending on the environmental degradability, the plastics may be divided as bio-degradable and non-biodegradable. Plastics may hazard or may play a vital role in sustainable development depending on the proper uses and proper planning to manage the plastics waste. A degradable plastic in which the degradation results from the action of naturally occurring microorganisms such as bacteria, fungi etc. and to yield carbon dioxide, water, inorganic compounds and biomass at a rate consistent with other known compostable materials and leave no visible, distinguishable or toxic residue i.e. there is the environmental sustainability. So, sustainability requires that a degradable material should break down completely by natural processes so that the basic building blocks can be used again by nature to make a new life form. But non-biodegradable plastics do not decompose easily by nature or by microorganisms. Plastics made from petrochemicals are not a product of nature and cannot be broken down by natural processes.

In General all man-made products, during manufacture, processing and disposal, have an impact on the environment. The issue therefore is, which of these products under consideration, will impose the least burden on the environment, and contribute to what is termed as 'sustainable development'

## **The Specific reasons for depending on plastics are:**

- **Extreme versatility and ability to be tailored to meet very specific needs.**
- **Lighter weight than competing materials, reduced fuel consumption during transportation.**
- **Extreme durability.**
- **Resistance to chemicals, water and impact.**
- **Good safety and hygiene properties for food packaging.**
- **Excellent thermal and electrical insulation.**
- **Good electrical and thermal conductivity- conductive plastics.**
- **Relatively inexpensive to produce**



For Sustainable development and eco-friendly to environment the bio-degradable plastics is our best choice. But the concept of biodegradable plastics is new in India, which is primarily due to the following reasons:

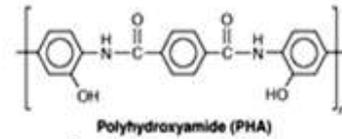
- A. **Cost:** The cost of biodegradable plastics is **2- 10 times** more than conventional plastics. As per the available data, the current price trend of Oxo/Photo-degradable plastics (**Based on Polyethylene material**) and biodegradable plastics for film applications (**copolyester based**) are given below:-
- I. **Oxo/Photo Degradable plastics film / bags** – Rs.90 – 120 per kg (depending upon prices of polyethylene & additive, which are variable and as per the global trend of polymer pricing.)
  - II. **Biodegradable plastics film / bags** - Rs.400 – 500 per kg.
- B. **Lack of initiatives:** There is no legal framework to enforce legislature to acknowledge the disposal problem of conventional plastics, particularly for short lived flexible packaging products. Agro-biotech may be the new buzz word for India's science and technology sector, but alternative biodegradable plastics have still not been identified as a major area for research. During the field survey, it was brought to the notice that for export of products to few countries, the mandatory condition of use of Biodegradable Plastics for packaging is enforced.
- C. **Precaution on use of biodegradable plastics bags:**
- Promoting biodegradable plastics will overall increase India's plastic consumption and it is opined that the major cause of concern would be to segregate between non-biodegradable and biodegradable plastics in the waste stream of Municipal Solid Waste (MSW). Hence, introduction of biodegradable plastics would be helpful only if proper "Eco-labeling" system and "Plastics Coding System" as given in Recycled Plastics Manufacture and Usage Rules, 1999, as amended in 2003.

#### **Bio-plastics: Few examples**

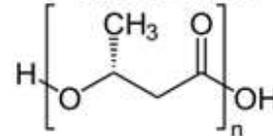
Polyhydroxyamide (PHA), Polyhydroxybutyrate (PHB), Poly (hydroxybutyratehydroxyvalerate) (PHVB), Polyhydroxyvalerate (PHV), Poly(lactic acid)(PLA), etc

## Molecular structures of Bio-plastics

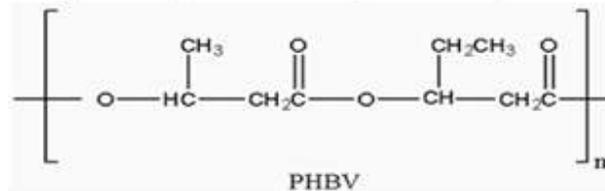
Polyhydroxyamide (PHA),



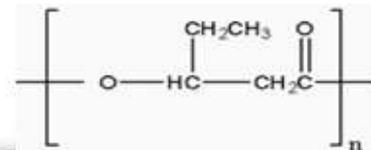
Polyhydroxybutyrate (PHB),



Poly(hydroxybutyrate-hydroxyvalerate) (PHBV),



Polyhydroxyvalerate (PHV)



Other natural plastics are:

➤ **Compostable Plastic:**

A plastic that undergoes degradation by biological processes during composting to yield CO<sub>2</sub>, water, inorganic compounds and biomass at a rate consistent with other known compostable materials and leave no visible, distinguishable or toxic residue.

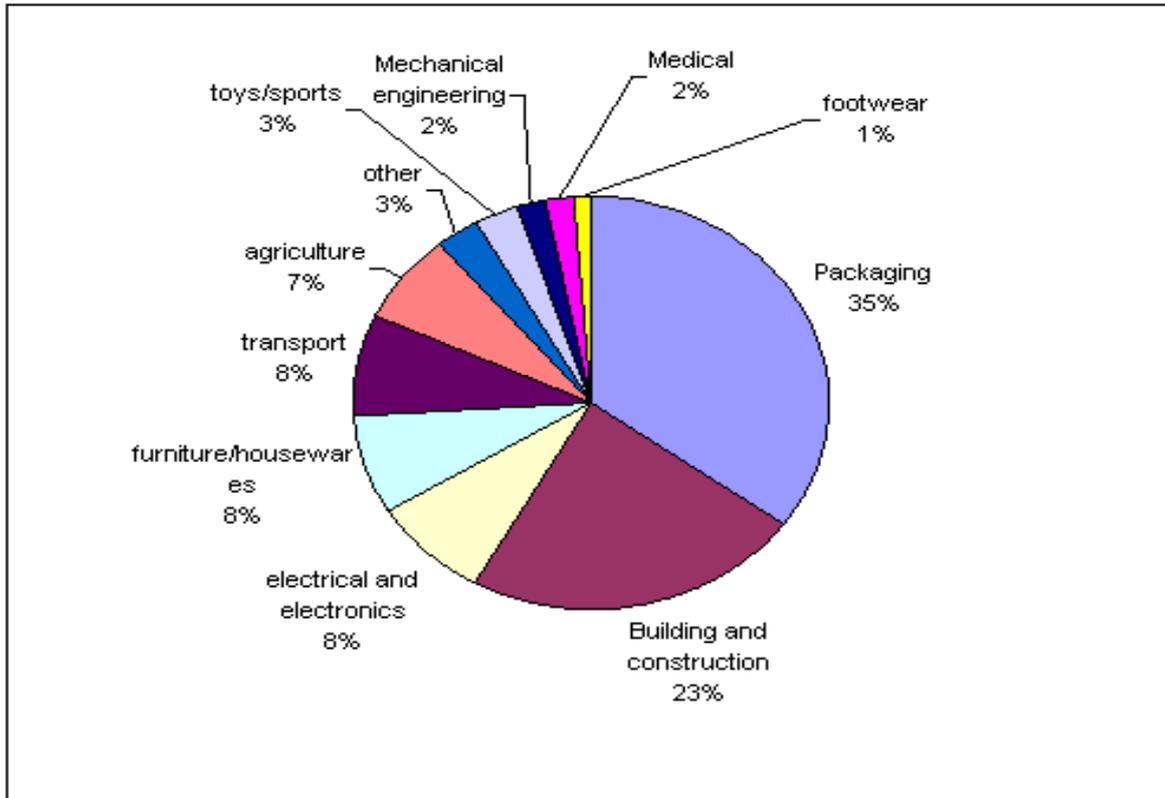
➤ **Photodegradable/ Oxodegradable Plastics:**

Photodegradable/Oxodegradable plastics disintegrate into small pieces when exposed to sunlight (manufacturers add a sun-sensitive component to the plastic to trigger degradation). But sustainability requires that a degradable material should break down completely by natural processes so that the basic building blocks can be used again by nature to make a new life form. Plastics made from petrochemicals are not a product of nature and cannot be broken down by natural processes. Therefore, despite how small the pieces of plastic may become, they are not and cannot be biodegradable

### Uses of Plastics in different fields:

- ❖ Packaging (food containers, wraps, nets, foams)
- ❖ Plastic bags for collection and composting of food waste and as super market carrier bags.
- ❖ Catering products (cutlery, plates, cups straws etc).
- ❖ Agriculture (mulch films, plant pots, nursery films etc)

- ❖ Hygiene products and
- ❖ Medical & Dental Implants (sutures etc)



### Building and construction:

Pipe, Conduit and fittings, Insulation, Flooring etc. PVC: 42.9%, Phenolic resin: 18.8%, Urea/Melamine: 9.8%, Other thermoplastics: 8.8%, HDPE: 5.3%, Unsaturated polyester: 4.7%, PS: 4.3% and other Thermosets: 1.2%

### Consumer and Institutional Products:

Disposable food service ware, Health care and

Medical products, Toys and Sporting goods

- PS: 29.3%, PP: 16.7%, HDPE: 13.6%, LDPE: 12.7%. PET: 7.1%, PVC: 7%, All Thermosets: 6.9% and all Thermoplastics: 6.7%

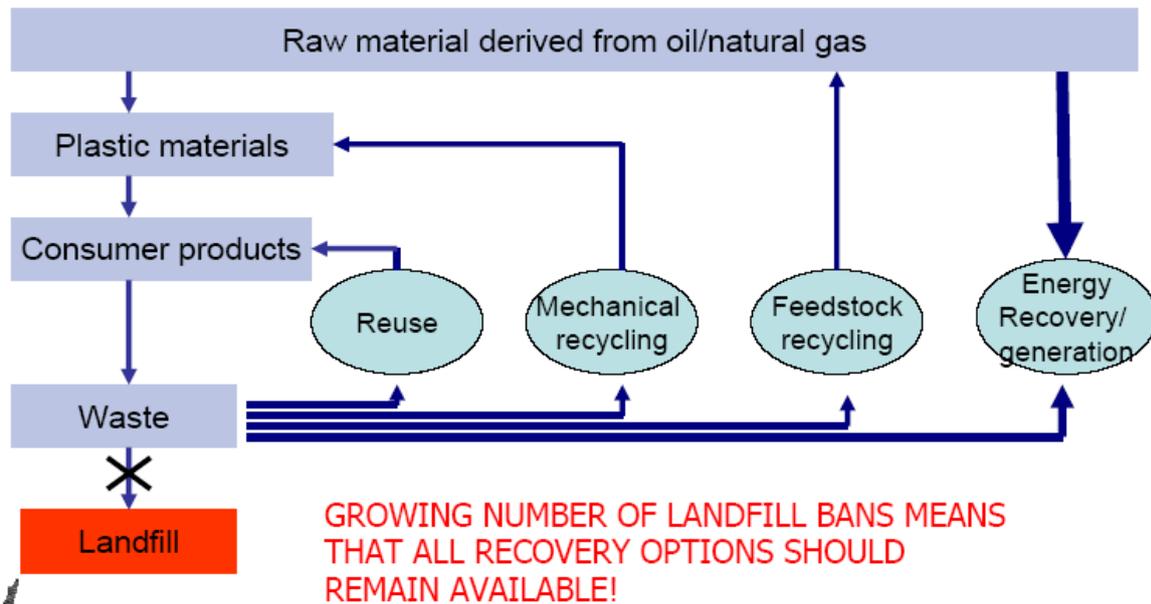
### ALLEGATIONS BROUGHT AGAINST PLASTIC\:

Major allegations brought against the non-biodegradable plastics are: the burning of unwanted plastics produce highly toxic fumes (Hcl gas, dioxin etc.), endless garbage, sewerage problem, problem in agriculture such as choke the earth, making the soil infertile etc. causes environmental hazards.

**Recycling of non-biodegradable plastics is one of the best method to reduce the environment pollution. Through recycling we have**

- Incineration to recover energy (hydrocarbon fuel) ;Chemical recycling to produce monomers, formation of new products etc.

## Simple diagram of Plastic recycling:



Plastics products should be handled with eco-friendly, otherwise, it may hazardous .

In General all man-made products, during manufacture, processing and disposal, have an impact on the environment. The issue therefore is, which of these products under consideration, will impose the least burden on the environment, and contribute to what is termed as ‘sustainable development’.

Plastic waste does not generate toxic leachates which contaminate the soil or ground water resources. On the contrary, those products which do biodegrade with by-products may result in contaminating ground water resources.

Plastics are 100% recyclable via various routes.

Plastic bags are made from Polyethylene and no plasticizers are used for any polyethylene application including poly bags.

- PE is made of only C and H.
- Emission of HCl gas during PVC incineration has a significant advantage in retarding propagation of a flame.
- Since most types of combustion produce dioxin, it is inaccurate to blame any specific material for dioxin production. After a fire in a PVC recycling warehouse in Germany, dioxin levels in fire gases were 1.5 ng TEQ/m<sup>3</sup>. This is comparable to the amount of dioxin found in unrestricted agriculture soil.
- All dioxin created in the process is destroyed before the process is finished, and not emitted to the environment

### We should not change over plastics to paper bags because:

- ❖ Plastic grocery bags consume 40% less energy than paper. (1.34 million MJ vs. 0.58 million MJ for 1 million bags).
- ❖ Plastics generate 80% less solid wastes, produce 70% fewer atmospheric emissions, release up to 94% fewer waterborne wastes.

- ❖ Paper cannot be recycled indefinitely. It can be recycled to a maximum of 4 times.
- ❖ Paper is the third largest industrial polluter to air, water, and land in both Canada and the United States
- ❖ "German Society for Research in the Packaging Market" weight: volume of disposables would increase by a factor of 4:2.5 --along with twice the level of energy consumption and double the cost of packaging.
- ❖ 500 gms coffee 500 gms glass jar or tin plate container 130 gms or, plastic laminated pouch only 12 gms. One kg of salt a pouch of 5gms where, **product weight to package weight is 200:1.**

**So, these are examples of getting“more from less” through plastic packaging and economically plastics give us better support than paper.**

#### **Conclusion:**

The energy from plastic recycling may be used in domestic and Industrial purposes and find out a new route for Sustainable development. So everyone must understand that the environmental legacy we leave behind for future generations will depend on our resolve to: REDUCE-REUSE-RECYCLE

And finally let us agree that:

PLASTICS DO NOT LITTER, PEOPLE DO.

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