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A close look on recycling of plastics & waste management

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Abstract

Plastics have became a symbol of our throw-away society. Majority of plastics are non-biodegradable but are recyclable with the technological advances, plastics recycling is economically feasible.

Now-a-days recycled materials are even competiting with virgin materials with the exception of very few field on the basis of price and performance. Recycling issue should not be assessed purely in terms of environmental considerations because recycling makes good economic sense too.

Key words: PS (Polystyrene); HOPE (High Density Polyethylene); PP (Polypropylene); PVC (Poly Vinyl Chloride); PET (Polyethylene Tetrapthalate); PC (Poly Carbonate); PMMA (Polymethyl Methacrylate); PU (Poly Urathane); MFI(Melt Flow Index).

Introduction

Recycling of plastics waste has became indespensable in order to face the more & more critical problems deriving from the disposal of industrial & muncipal waste.

The recycling of plastics should be considered from the **Basic 3E's** i.e., Economy, Energy & Ecology.

The recycling[1] of plastics serves following purposes:

i. Conversion of waste material into new products.
ii. Economy- Since, raw material sources are decreasing day-by-day hence recycling helps to lesson the consumption of virgin material.
iii. Saving due to cost reduction.
iv. Ecology & Energy:- The energy consumption[2] in recycling plastics is very less as compared to the other recycling ex- paper, glass, etc.
v. Ecology:-To save our precious environment from the possible pollution[3] from the huge deposition of plastics from industrial as well as the muncipal waste & in the way recycling helps to maintain the delicate eco-balance of the nature.

According to data (Jan 2010) we can conclude what is the position of virgin polymer demand & supply Scenario for all polymers. (Table- 1).

Table 1. Polymer demand Vs. Supply scenario (India) (for all Polymer)

Year (s)	Capacity	Production	Import	Export	Demand
2000-01 (F)	4,188	3,903	386	821	3,468
2001-02 (F)	4,242	4,043	535	583	3,994
2002-03 (F)	4,242	4,043	877	236	4,584
2003-04 (F)	4,442	4,233	1,211	193	5,250
2004-05 (F)	4,645	4,323	1,015	220	5,900
2005-06 (F)	4,745	4,432	872	250	6,520
2006-07 (F)	4,840	4,700	872	260	7,400
2007-08 (F)	4,840	4,700	930	240	7,900
2008-09 (F)	4,950	4,740	940	230	8,500
2009-10(F)	4,990	4,770	930	240	9,200

Scope of Recycling:- Recycling of plastics waste deserves to be taken as **"priority project"** to.

i. To suppliment the production of virgin matenial.
ii. To save our valuable foreign exchanges by reducing the imports (since, plastics is a petroleum product which is largely we import),
iii. To protect the environment.

Pattern of plastic waste collection Transfer[5] & Recycling in India.

Method to obtained Recycled Materials:

Step - 1:- Collection of the waste Materials
Step - 2:- Separation of the Materials
Step - 3:- Grinding of the Materials
Step - 4: - Washing of the Materials
Step - 5:- Preparation of the granules
Step - 6:- By Agglomerator
Step - 7:- By extruder

Technology :- In Plastics recycling basically three approaches are adopted:-

1. Mechanical Recycling:- This technology is widely practiced in India. They are generally reprocessed into pellets which can be used in many critical applications.

Mechanical recycling can be used for all thermoplastics. Further more it offers following advantages:-

a. Eco- friendly
b. Generation of employment
c. Results in considerable saving in terms of precious petroleum.

2. Commingled Recycling:- The plastics[1] wastes that can't be separated from individual plastics are recycled together as commingled wastes. Recycling of multilayer film & containers fall under their category. In India it is seldom practiced.

3. Feed stock or chemical Recycling:- It yields monomers from polymers and they are again polymerised to give pure polymer in the macromolecular stucture is broken down to basic monomer and this can reused for manufacture of quality plastics products.

Development countries adopt technologies such as pyrolysis, Hydrogenation and chemolysis to get high purity monomers.

Unlike mechanical reclycling and commingled recycling, this technique doesnot have the problems of contamination and incompatibility amongs various plastics.

Applications of recycled plastics[6]:-

Different recycled plastics are of different uses. Some recycled plastics and their uses are-

1. Applications of recycled **PS :-**
   a. Packaging foam:- It is packaging foam for protection from shock.
   b. PS. Wood substitute:- It is used as replacement materal in house, Building & Furniture production.
   c. Sorbant Polymers:- Recycled PS foam can be used as a sorbant to absorb or sorb ions and molecules of different Substances.
2. Applications of recycled[5] **HDPE:-**
   a. Injection molded articles:- It includes low cost suitcases, molded luggages, bottles etc.
   b. Blow molded bottles/ Containers.
   c. Corregated drainage pipes
   d. Structural applications
   e. Agricultural pipes
3. Applications of recycled **PP :-** Auto parts, bind feeders, furnitures, slip sheets, packing end cap etc.
4. Applications of recycled **PVC:-** Co-extruded PVC pipe, co-extruded cladding, guttering, down pipes, co-extruded window frames, PVC plastics wood etc.
5. Applications of recycled **PET:-** Staple fibres, filaments, Non-owvens, fibre fill, strapping, carpets, sheets, multi layers films, co-extrusion.
6. Applications of recycled **PC blends and alloys:-**
   a. PC- PBT resin:- Jail light housing.
   b. PC- ABS resin:- Instrument panes
   c. PC- PMMA resin:- Automotive screens
7. Applications of recycled ABS:- Outer casing of printers, radiators, radiator grills etc.
8. Applications of **PU** [6]:- Carpets underlay, high load bearing padding etc.

Plastics waste Management:- The suitable way by which plastics wastes are managed to avoid the pollution and to help in the controlling of the supply of the virgin polymer material is called plastics waste management.

Need of Plastics waste Management:- The unawareness and illiteracy amongs the masses in desposing the waste plastics into the proper container and lack of proper training to manage it have pose this manmade material as a material of adverse nature to enviornment due to its graduability of plastics which became a serious issue in not at all required in the application of cables, underground piping, plastics capsules used for preserving the glory, history and culture and plastic curency etc.

How plastics waste Managemnet will possible:- The effects of plastics materials could be reduced to an eco-friendly lable by initiating an enromous programmes amongs the end users and processors about the following factors:-

a) Use of plastics Materials
b) Disposal of plastics materials
c) Segregation of plastics wastes
d) Recycling of plastics materials wastes
e) Hazards from plastics wastes
f) Abuses and misuses
g) Identifications of plastics

The manufacturers of plastics end product from either virgin of recycle plastics shall mark the symbol at the time of processors to identify of basic raw materials. The symbols defined by the society of the plastics industry (SPI), USA.

In addition to symbols indicated, end products made out of recycled/reprocessed plastics whereever possible shall be marked with **"recycled indicating percentage of used of recycled materials" .**

Therefore alternatively, the following codification shall be used:-

RO- No recycled/ reprocessed
Rl- Less than 10%
R2- Between 11-20%
R3- Between 21-30%
R4- Between 31-40%
R5- Between 41-50%
R6- Between 51-60%
R7- Between 61-70%
R8- Between 71-80%
R9- Between 81-90%
RIO- Above 90%

However carry bags/ containers made out of recycled plastics shall be labelled as:- **"Not suitable for baking/ storing / carrying food products".**

Physical properties of recycled plastics:- Physical properties like M.F.I., specific gravity, HDT, tensile strength, impact strength, hardness of recycled plastics material may be comparable with virgin material on addition of $CaCO_3$ or talk to recycled materials.

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