# Recycled composite material made from non-recyclable waste
## (multi-layer thin film plastic package)

## INTRODUCTION

Today all the Non Recyclable Wastes end up at the dumping ground to be buried. I have created a novel process to transform non-recyclable Multi-layered Plastic Packaging waste to useful Composite Material.

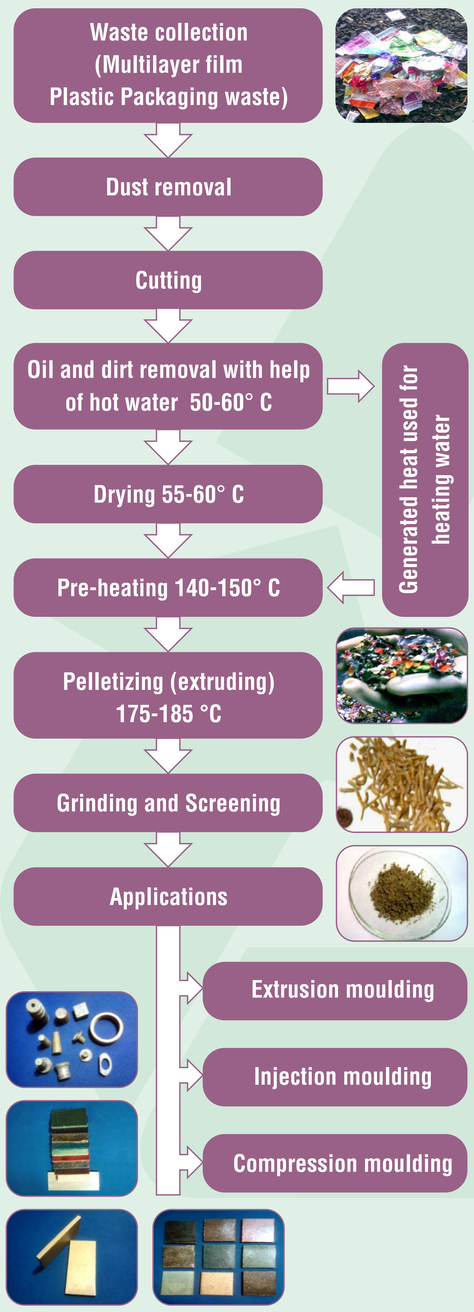
## HYPOTHESIS

By appropriate heat treatment of non-recyclable multilayer film plastic packaging waste, it can be made into a form which is suitable for use as a composite plastic material.

By using this plastic composite material, different articles and sheets can be made useful for different applications.

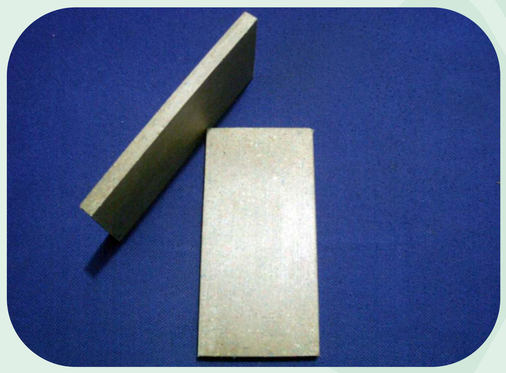
## PROCESS

Recycled composite material made from non-recyclable multi-layer film plastic packaging waste




From **A**

To **B**

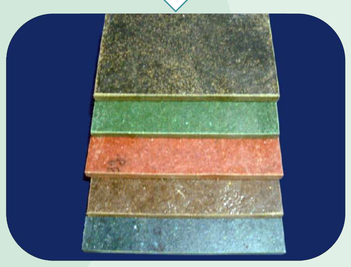


and more

**C**

**D**

**E**



## ADVANTAGES

1. No binders or glues were used throughout the process of making this Composite Material.
2. Multilayers of this plastic packaging waste does not need any separation process or sorting techniques, in comparison with other recycling processes of multilayer plastic packaging waste.
3. Reduction in land pollution by way of dumping waste in ground
4. If used in furniture application, than it can substitute wood, plywood, Medium Density Fibre board (MDF) and thus we can decrease de-forestation.
5. The manufacturing process of this Composite Material is economical.

## APPLICATIONS

1. Furniture applications such as benches, tables, cardboards, partitions, doors, windows, cupboards, doors and windows profiling etc.
2. Decorative applications such as show pieces, pots, photo frames, name plates, pen holder, card holder etc.
3. Roofing application.
4. Water proofing applications such as doors and windows, Make-shift cabins.
5. Construction applications like ceiling, flooring, paneling, construction supports, fencing etc.

## COST OF COMPOSITE MATERIAL

| Manufacturing cost of 1 kg Composite Material | Cost in Rupees / USD(Approx) |
|---|---|
| Raw Material (plastic packaging waste) | 6.00 |
| Drying | 1.50 |
| Pre-heating | 1.50 |
| Pelletizing | 4.50 |
| Grinding | 0.75 |
| Labour | 5.00 |
| Total Cost | Rs.19.25 / $ 0.38 |

## TESTING DATA OF COMPOSITE MATERIAL (SHEET FORM):-

Tests 1-4 done by CIPET, Ahmedabad-India.
Tests 5-7 done by myself.
Tests 8-10 done by NSIC, Rajkot-India.
Tests 11-15 done by Envitro Lab, Rajkot-India.

| Sr.No. | Tests | Unit | Results Obtained |
|---|---|---|---|
| 1. | Density | g/cc | 1.08 |
| 2. | Flexural Strength | $kg/cm^2$ | 111.4 |
| 3. | Izod Impact (Noched) | J/m | 39.4 |
| 4. | Rockwell Hardness (R Scale) | - | 46 |
| 5. | Water Absorption (12 Hours) | - | 0 |
| 6. | Water Absorption (24 Hours) | - | 2 g increase in Weight |
| 7. | Water Absorption (15 Days) | - | 2 g increase in Weight |
| 8. | Nail Holding | kg | Nail comes out at 60 kg |
| 9. | Screw Holding | kg | Screw comes out at 190 kg |
| 10. | Tensile Strength | $N/mm^2$ | 4.34 |
| 11. | $NO_2$ Produced On Melting at 200 °C | - | ND |
| 12. | $SO_2$ Produced On Melting at 200 °C | - | ND |
| 13. | Auto Ignition | °C | >378 °C |
| 14. | Shore A Hardness | - | 93 |
| 15. | Fire Preparation | - | Low Flame Spread |

$kg/cm^2$ = kilograms / square centimeters
g/cc = grams /cubic centimeters
J/m = joule / meters
m = meters
$N/mm^2$ = Newton / square millimeters
ND = Not detected

## CONCLUSION

In my process, I am able to recycle the multilayer film plastic packaging waste, into a Composite Material powder, by providing appropriate heat treatment. This Composite Material can further be used for making various articles and sheets with the help of extrusion, injection or compression moulding. Hence, this process is novel, economical and environment friendly.

## REFERENCES


**PATENT REFERENCES:**

- Gibbons, Dolan et al, U.S patent no. US 2003/0157301 A1, **(2003)**
- Lee, young chui et al, European patent no. EP1683829 A1, **(2006)**
- H. Khim Boo, Walter A. et al, US patent no. 5183212, **(1993)**
- Ronald N. Roberto, US patent no. 5335786, **(1994)**

**JOURNAL REFERENCES:**

- L. Castle, Packaging Technol. & Sci., Vol. 7, pgs 291 – 297, **(1994)**
- Susan E. Selke, Packaging Technol. & Sci. Vol. 1, pgs 93 – 98, **(1987)**
- Lars G. Lindfors, J. Chem. Technol. & Biotech., Vol. 30, pgs 180 – 186, **(1979)**

**BOOK REFERENCES:**

- 'All India Plastic Manufacturers Association(AIPMA)', members directory 2004-2005.
- 'CIPET - Plastic materials' (2007), **Publisher:** Central Institute of Plastics Engineering and Technology.
- 'Plastic materials – fifth edition' by J. A. Brydson (1989), **Publisher:** Buttersworth Heinmann