AZO Materials

**Recycling Process**

Recycling of polyamide 6 is very essential especially because its presence in landfills is very dangerous and may result in huge fires containing hazardous gases. The key use of polyamide 6 is in carpets and a recycling process for this was initially devised by DuPont in 1944 although recycling a dirty carpet is still a challenge. Statistics show that every 10 t of carpet waste produces 0.8 t of PA 6 and 1 t of PA 66. The Carpet Reclamation Program by DuPont processes more than 700 t of carpet each month, collecting carpets from more than 80 collection locations in the US. Waste material obtained from processing can be formed into fuel pellets for use in coal-fired power stations and cement kilns.

The different ways of recycling polyamide 6 are:

**De-Polymerization or Chemical Recycling**

This method disintegrates the long polymer chain into monomers that can be polymerized again converting the waste into products with the quality of the virgin polymer. It is possible to depolymerize polyamide 6 into its monomer caprolactam by acidolysis, aminolysis, hydrolysis or catalyzed depolymerization in vacuum. DuPont presently prefers aminolysis and catalyzed depolymerization is also gaining popularity.

Depolymerization is the main method used to recycle carpets and include the following steps:

**Acidolysis** – An acid catalyst is used to depolymerize PA 6 and the cut waste is melted in continuous reactor and subjected to steam treatment. Caprolactam is recovered for further usage.

**Hydrolysis** – Depolymerizing PA6 in a high-pressure steam reactor yields around 70% of caprolactam.

**Aminolysis** – Aminloysis has been accepted by DuPont as the ideal option for recycling carpet. Backing separation, dirt and contaminant removal is initially done after which chipping, shredding, passing through a hammer mill, screening then grounding to particles of 1.5 mm is done.

A slurry is formed by adding water and later separation by density is carried out forming a material having 98.5% purity.

**Extracting Recycling or Recovery of Polymer Components**

This method is used to recover individual components of the polymeric mixture without attaining the monomer level.

**Mechanical Recycling or Re-melting**

This technique is to perform melt-bending of the complete structure.

**Thermal Recycling**

This method involves only energy recovery during incineration of the polymer waste.