New Developments in Shredding & Recycling of Post-Industrial and Post-Consumer Carpet

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Fiber/Carpet Scrap Forms

Fiber Bales

Carpet Rolls

Carpet Squares
Why Is Carpet So Difficult To Recycle?
Answer:
Carpet is a complex combination of different polymers and additives with different properties and methods of recovery. Value of the recovered material is highest when they are separated.
Size Reduction Equipment:
Shredders and Grinders

Single-shaft Shredders are good for breaking up carpet into 1-3” sized pieces.

Grinders are used to further reduce the particle size for finer separation if needed.
Designed for Operator to “Dump & Run”

Hydraulically powered ram feeder is controlled by shredder amp feedback to feed consistently without constant operator attention.
Single-Shaft Shredders: Rotor Designs

- **Standard Rotor Design**
  Works great for materials like hard scrap and purgings.

- **Film and Fiber Rotor Design**
  Fiber and carpet are difficult to handle—special design prevents wrapping and increases throughput.
The screen determines final material size

Material must pass through sizing screen. Different sizes and designs available.
Shredder Drive Technology


**Hydraulic Motor** - variable-speed, capable of delivering high torque. Expensive and hydraulic system Maintenance is required.

**Hi-Torc Induction Motor** - Delivers maximum torque and power under all conditions and gives full speed control over a wide speed range.
HiTorc Shredder Drive requires no gearbox or fluid coupling and delivers higher throughput for a given HP.
Carpet Square Recovery

Carpet squares are made up of the face fiber and the backing. In order to recover the highest value, it is necessary to separate the face fiber from the backing before recycling.
Carpet Square Recovery

Step 1. Size Reduction

Carpet squares and trims are chopped into small pieces using a single shaft shredder, followed by a grinder:

- **Scrap material**
- **Shredder** reduces to 1 to 3 inch pieces
- **Elutriator...**
- **Grinder**

Final particle size 1/4 to 3/8 inch for separation

- **Fiber**
- **Backing**
Separation Technology

Step 2. Elutriators

Use air to separate the ground up materials by density. There are two common methods:

Method #1: Cyclonic Separation

Ground Scrap from grinder

“heavier” backing

“lighter” face fiber
Method #2: Multi-aspirator

Separation Technology

Ground Scrap from grinder

Aspirator

Fiber

Backings

fiber

AIR IN

AIR OUT
Broadloom Carpet Recovery
Broadloom Carpet Recovery

Step 1. Size Reduction

Carpet is chopped into small pieces using a single shaft shredder, followed by a grinder:

Scrap carpet
→ Vibratory conveyor with metal detection
→ Shredder reduces to 1 to 3 inch pieces
→ Grinder

Removes Dirt, CaCO3, ...

Final particle size 3/16 to 1/4 inch ready for separation
2. Centrifugal Separation system The small pieces are separated by density using liquid.

3. The two waste streams are then recovered separately...
We’ve Covered
Size Reduction Equipment & Separation Technology

Now, We’ll Discuss
Repelletizing Technology
Traditional Repelletizing Systems

Ram-Stuffer

Densifier Drum

Traditional designs require pre-cutting.
Fiber is chopped to 6-8mm using grinder... and fed to twin screw extruder with crammer-densifier.
New Technology For Repelletizing—Integrated Shredder-Extruder Combo

ONE-STEP Operation:
Requires No Prior Size-Reduction For Most Materials Including Fiber, Carpet, Nonwovens...
Feed Loose Scrap via Conveyor

LOOSE SCRAP bales, loose fiber, bobbins, burn-offs, cut pieces…

Conveyor is controlled by Hopper level sensor.

Machine does not require continuous, labor-intensive feeding.
Material Transport Into Extruder

Shred…
Compact…
“Warm-Feed” the Extruder
IN ONE-STEP

For a Copy of the Video clips shown at this Conference, Call 770-242-1386.
Dual Venting Removes Gases From Melt

Removes:
- Spinning oils
- Excess Water
- Process Lubricants
- Other Volatiles

From the End Pellets, Improving Quality.

closed under vacuum

open for cleaning
Three Methods of Pelletizing

Method Used Depends on:

- Polymer Type
- Melt Temperature
- Melt Flow Index
- Degree of Automation
- Level of Operators
- Pellet Quality Required
Water Ring Pelletizer

- LDPE
- LLDPE
- PP (up to 60 MFI)
- HDPE
Strand Pelletizer

• PP (> 60 MFI)
• Nylon 6/6
• Nylon 6
• PET
• PPS
• Others
Underwater Pelletizer

- Same materials as Strand
- Better Pellet Uniformity
- Higher Level of Automation
The Extrusion & Recycling Specialists

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