The Seventh Annual Conference on Recycling of Fibrous Textile and Carpet Waste

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Latest Recycling Machinery Developments for Extrusion of Synthetic Fiber & Carpet Waste

Latest machinery breakthroughs in repelletizing synthetic fiber, nonwovens and carpet waste will be discussed. Different materials (PET, Nylon, PP) and economic factors (energy usage, labor, capital equipment cost, floor space) will also be discussed.

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http://www.tfe.gatech.edu/recycle_conf
New Developments In Recycling Of Fiber & Carpet Scrap

Presented by:
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Post-Consumer Scrap

Requires Sorting...
Washing...
Drying...
Prior To Repelletizing.

We Will Not Talk About PCR Today.

We Are Discussing Post-Industrial.
Post-Industrial
Forms of Fiber/Carpet Scrap

Bobbins
Bales
Nonwovens

Recycling Options For
“Difficult” Materials

- Fibers- staple & continuous
- Monofilaments
- Nonwovens- spunbond, meltblown, needle-punch
- Slit Tape
- Automotive Carpet

What Makes Them “Difficult”...

Mainly Pre-Cutting
Typical Materials for Recycling

- PP
- Nylon 6
- Nylon 6/6
- PET
- LDPE/LLDPE
- PPS
- Other polymers

In-Line Process Scrap Recovery

Examples:
- Slit Tape
- Edge trims
- Monofilament
- Broken Ends

Can typically achieve 5-8% recycling.
In-Line Scrap Recovery + Startup Scrap
Slit Tape & Monofilament - Can achieve 5-20% recycling

1. Trim Receiver
2. Grinder
3. Scrap Storage
4. Refeed Machine

Total Scrap Recovery
Ultimate Goal – Recovery of All Plant Scrap:
- Off-Spec Material
- Converting Scrap
- In-Line Process Scrap
- Startup Scrap

Improved Profitability

That's what we'll discuss for the rest of the talk...
Toll Repelletizing

Usually priced per pound.

Traditional Repelletizing Systems

Ram-Stuffer  Densifier Drum

These Designs usually require Pre-Cutting
Size Reduction Issues For Fiber/Carpet

- Wrapping
- Special Knife Designs
- Maintenance
- Housekeeping
- Feed Issues

FULLY AUTOMATIC CUTTING LINE
1. Loading platform
2. Oscillating blade
3. Motor for adjustment of extraction thickness
4. Metal detector
5. Drive roller gear
6. Moving blade
7. Conveyor (height from 1.50 m to 5 m.)
8. Extraction box
9. Extraction speed regulator
10. "Robot" hydraulic unit
11. Cutting length adjustment
12. C160-20 hydraulic unit
13. Fixed blade

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.

Feed Trim Scrap via Trim Receiver

Trim Receiver/Air Eliminator

Continuous Process Trims

If scrap material isn't present, machine can auto-shut down.
Feed Scrap Rolls via Roll Feeder

Roll Feeder is controlled by Hopper level sensor.

Automatic "Intelligent" Feed System

Hydraulically powered ram feeder is controlled by shredder load to maintain consistent internal feed to extruder section.
Special Shredder Designs For "Difficult" Materials—Fiber & Carpet

Staggered "S-Wave" rotor knives— for peak cutting performance

tight gap / 10-20 mil

Dual Bed Knives Reduce "Wrapping"

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

Continuous Melt Filtration: Dual-Bolt Screen Changers

Extra-thick breaker plates allow large Open Area.

Screen mesh can be adjusted to suit the application.

Screen Changes are made "ON-THE-FLY"

With Backflushing Option, up to 100 changes in-a-row can be automated.
Main Advantages of Integrated Shredder-Extruder

- No Pre-Cutting - "ONE-STEP"
- Maintains Properties- MFI, IV, color
- Cheaper to Run- Energy, Labor & Maint
- Less Floor Space required-- Compact
- Cleaner to Run- Less Housekeeping
- Lower Capital Expense

Single-Drive Shredder/Extruder Combinations

Drawbacks of Single-Drive:
Lower Outputs
Less Flexible Output Range
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
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"The Extrusion & Recycling Specialists"