

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



**Presented by:
Chris Strzelecki
Advanced Extrusion Solutions
678-428-9262**

Fiber/Carpet Scrap Forms



Fiber Bales



Carpet Rolls



Carpet Squares

Grey Smoke

Ocean Blue

**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.

This Presentation Covers
Carpet Recycling Techniques and
Equipment, Focusing on...
Size Reduction Equipment
Separation Technology
Repelletizing Options

Size Reduction Equipment: Shredders and Grinders

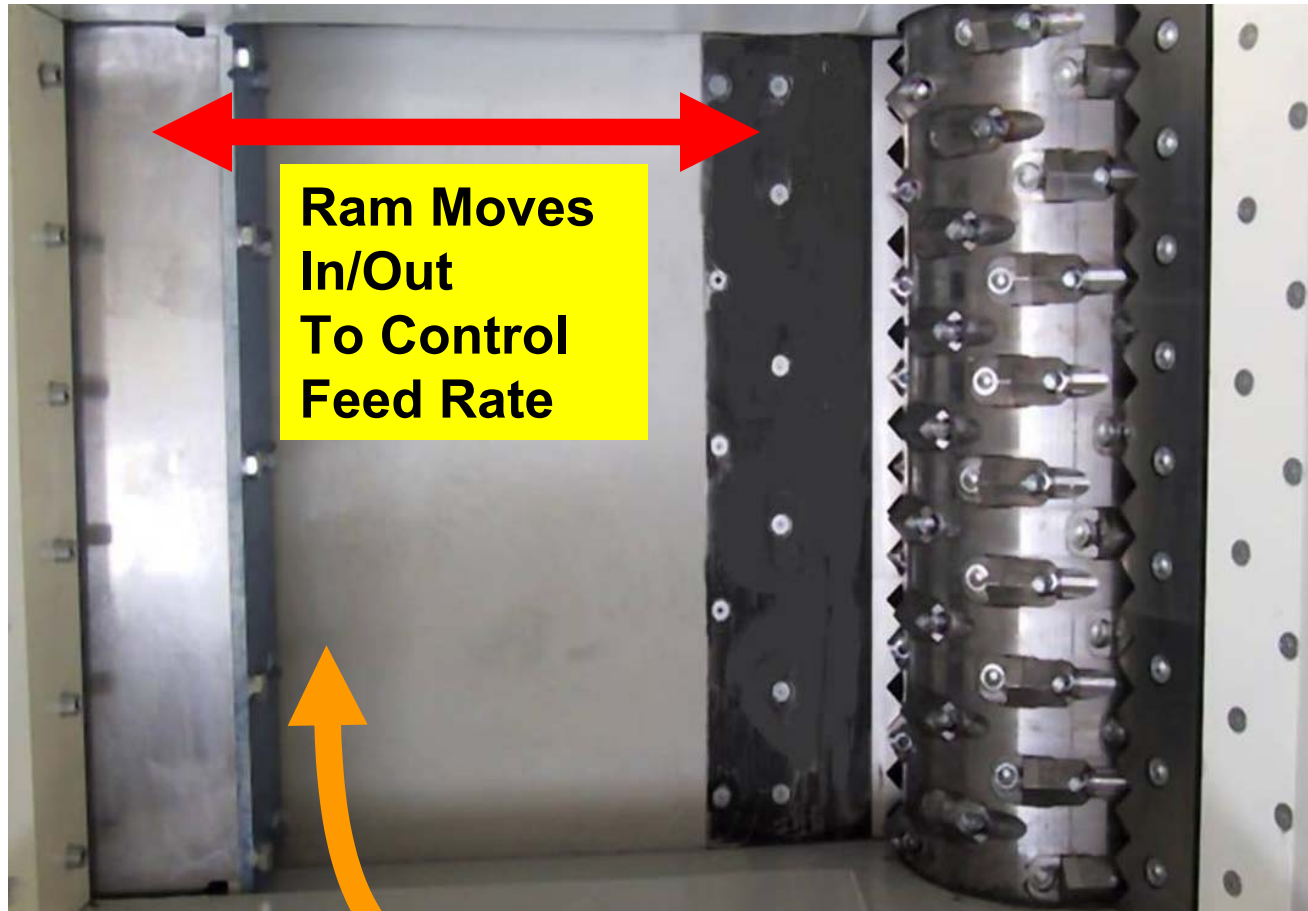


Single-shaft Shredders are good for breaking up carpet into 1-3” sized pieces .

Grinders are used to further reduce the particle size for finer separation if needed.

Designed for Operator to “Dump & Run”

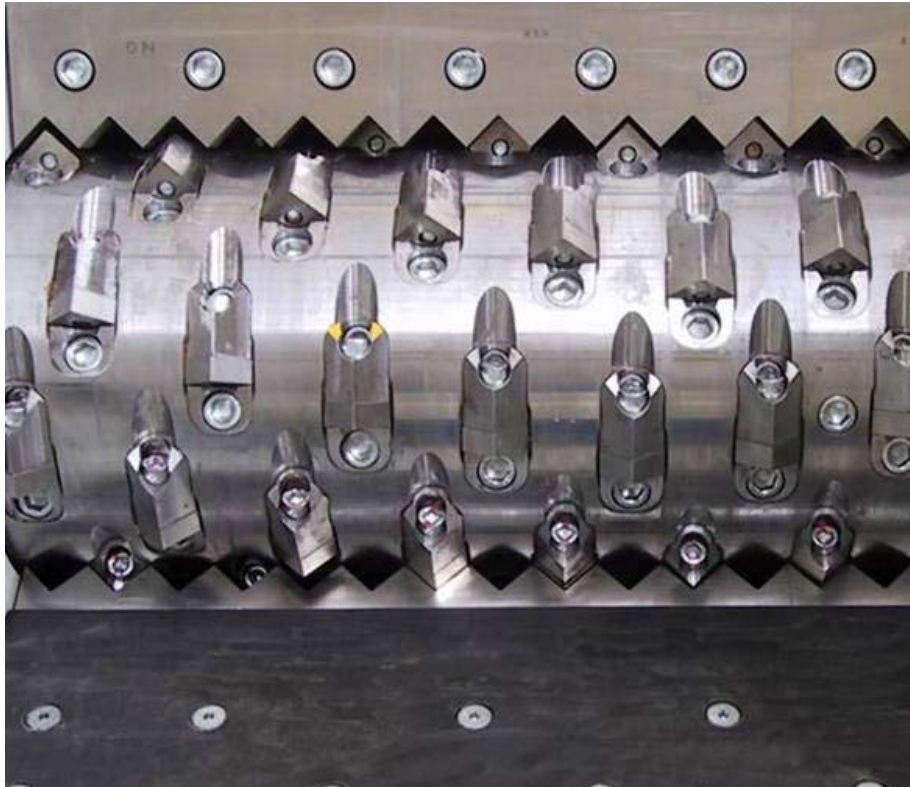
Hydraulically powered ram feeder is controlled by shredder amp feedback to feed consistently without constant operator attention.



**Shredder
Amp feedback**

Single-Shaft Shredders: Rotor Designs

Standard Rotor Design



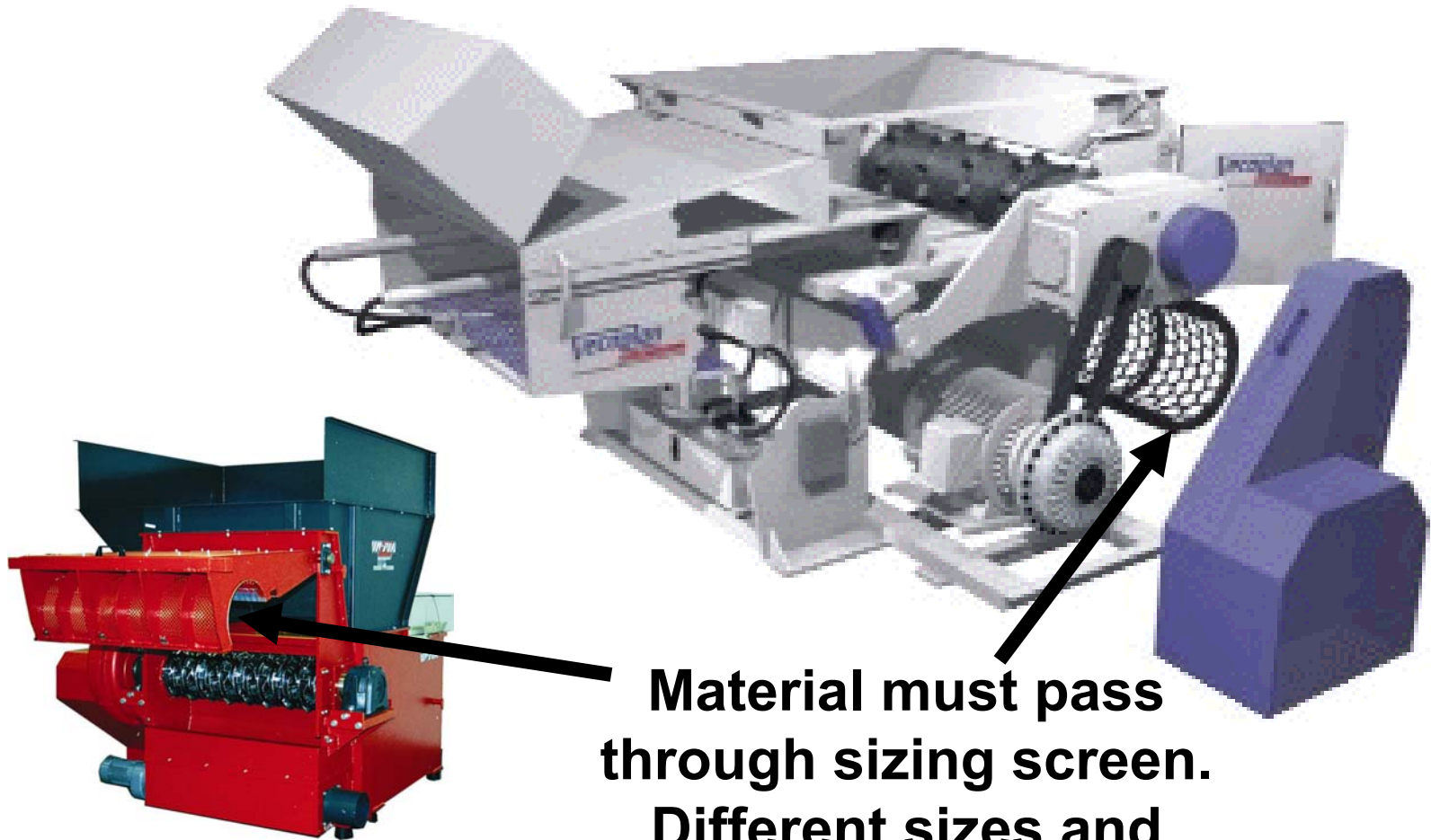
Works great for materials like hard scrap and purgings.

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

Standard AC Motor- motor/gearbox combination drives Rotor at fixed speed. Industry standard, excellent price/performance ratio for most applications.

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

Grinder



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

Elutriator...

Fiber

Backing

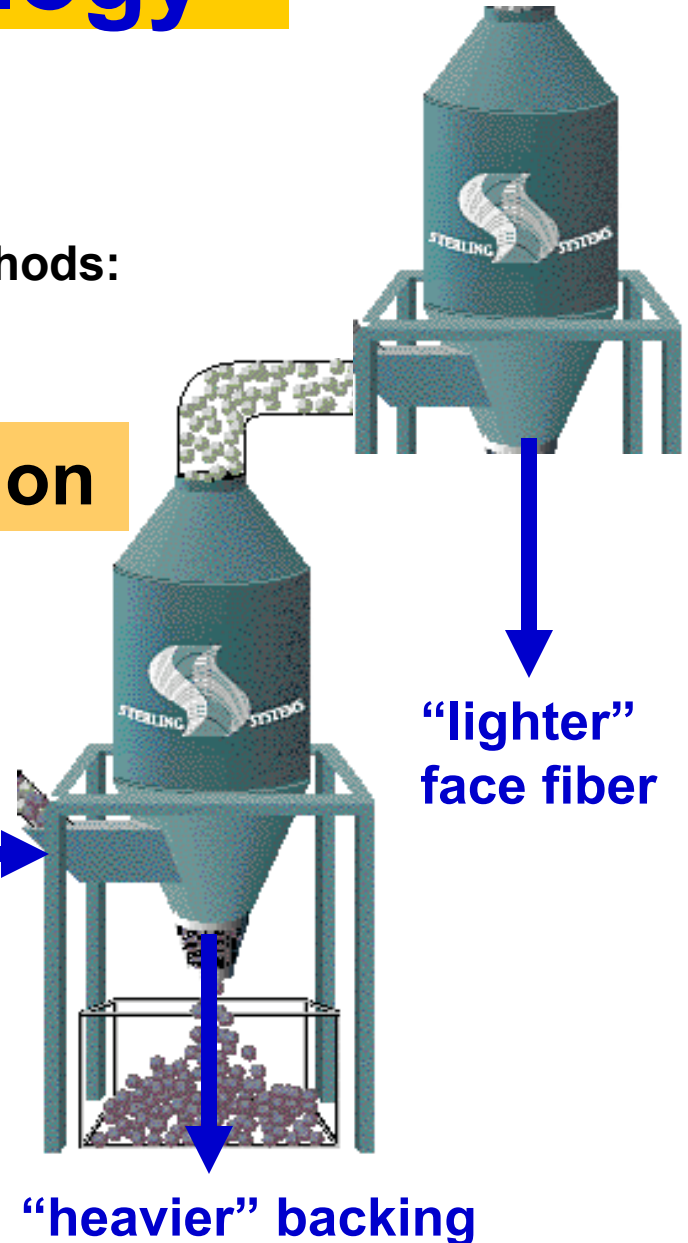
Separation Technology

Step 2. Elutriators

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

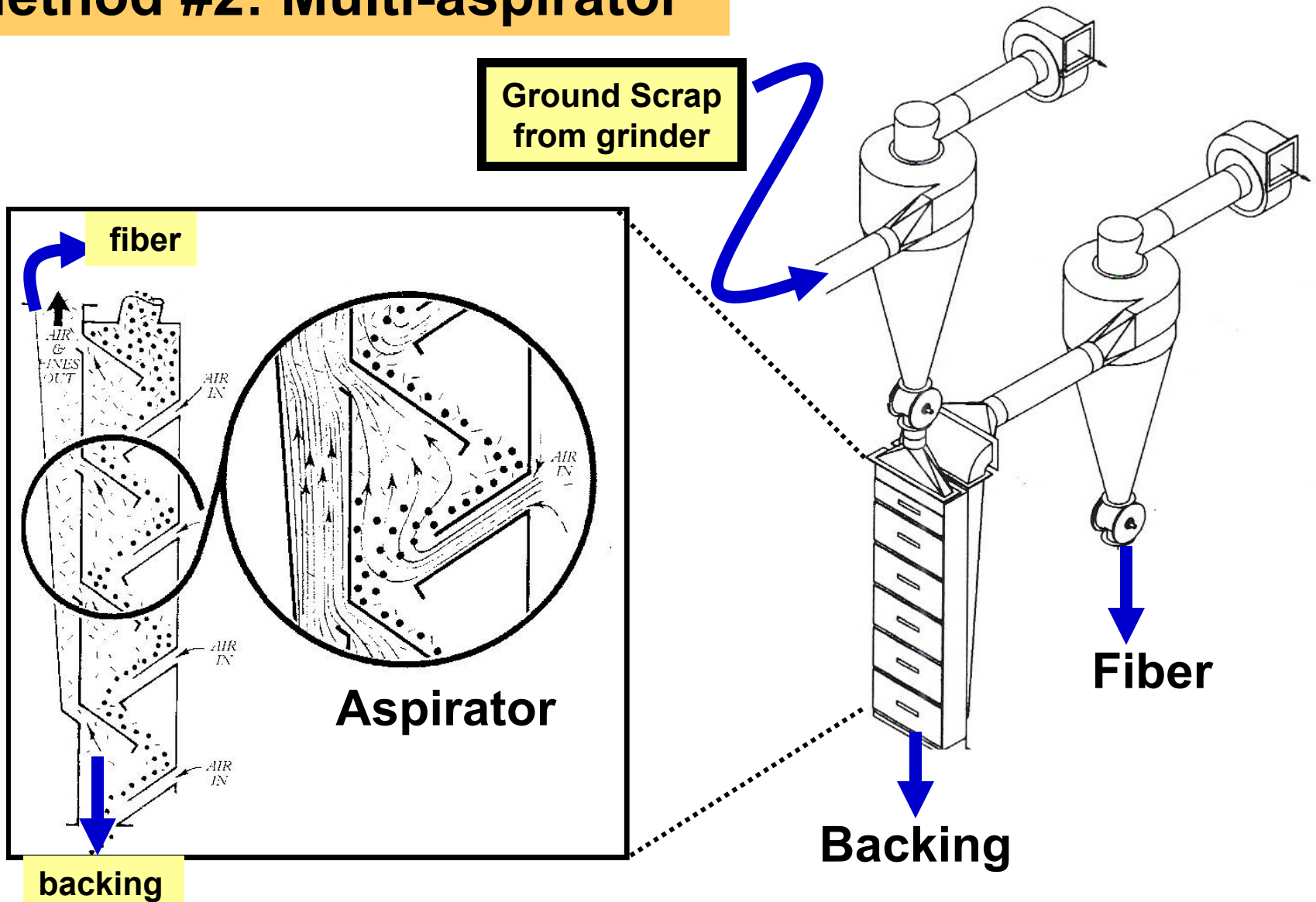
Method #1: Cyclonic Separation

Ground Scrap
from grinder



Separation Technology

Method #2: Multi-aspirator



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:

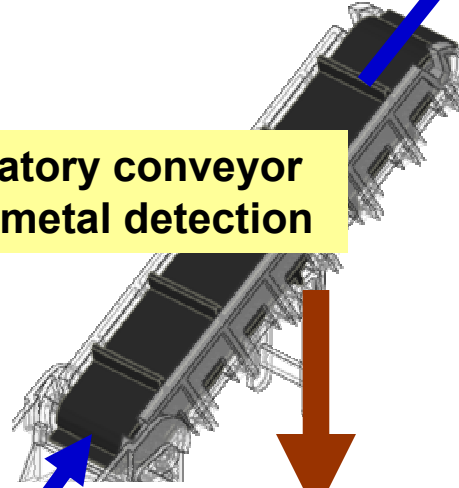
Scrap carpet



Shredder

reduces to 1 to 3 inch pieces

Vibratory conveyor with metal detection



Removes Dirt, CaCO₃, ...

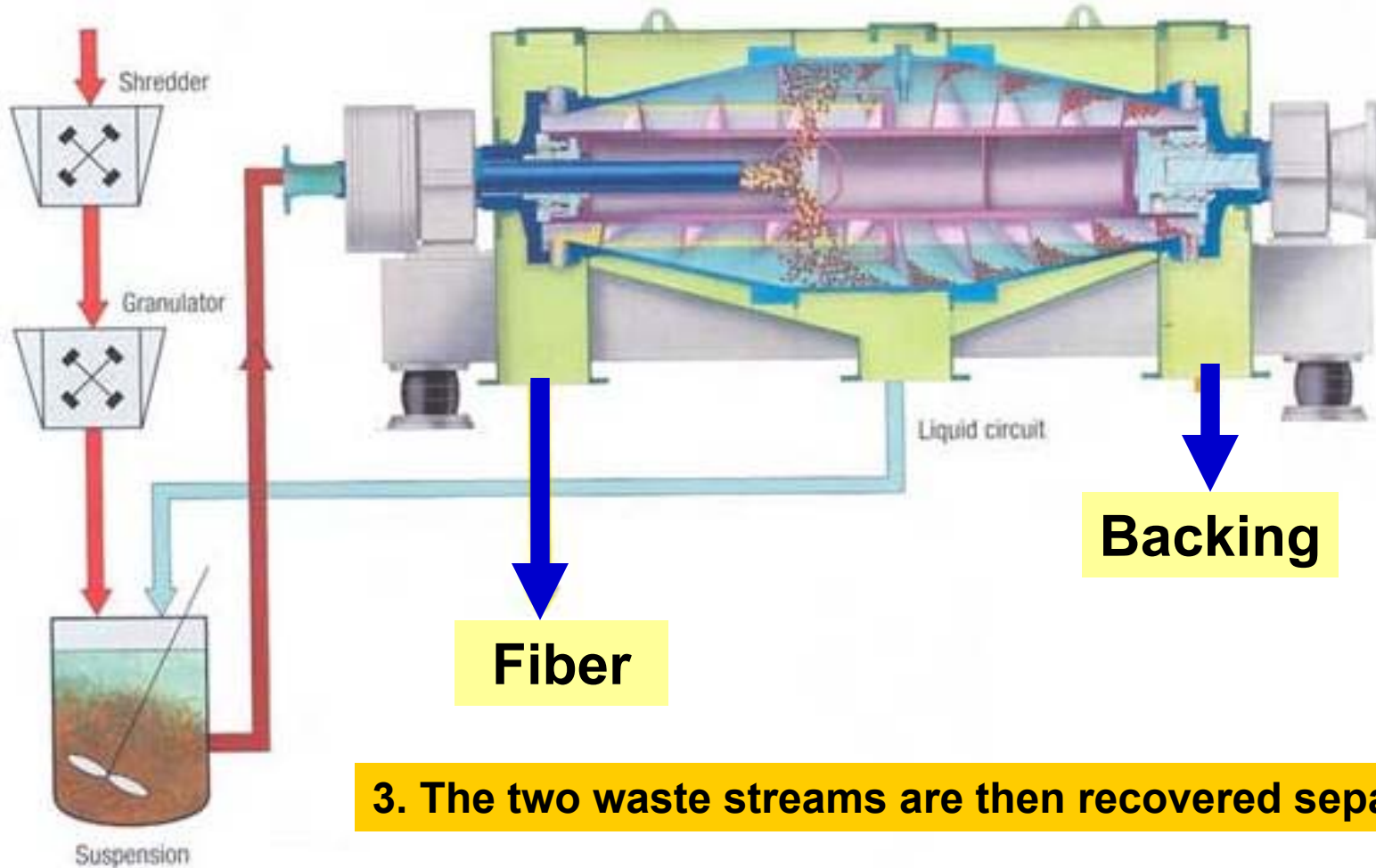


Grinder

Final particle size
3/16 to 1/4 inch ready
for separation

Separation Technology

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

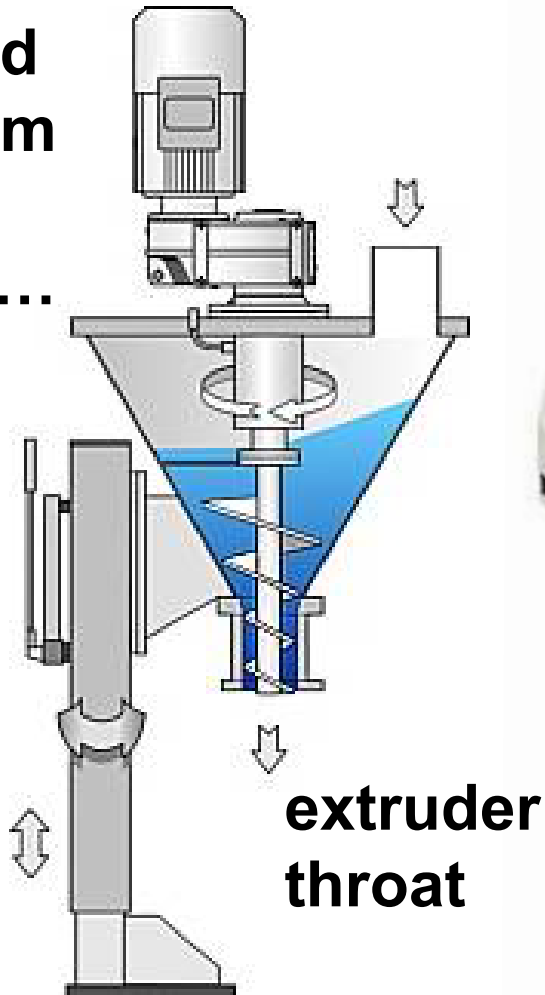


Densifier Drum

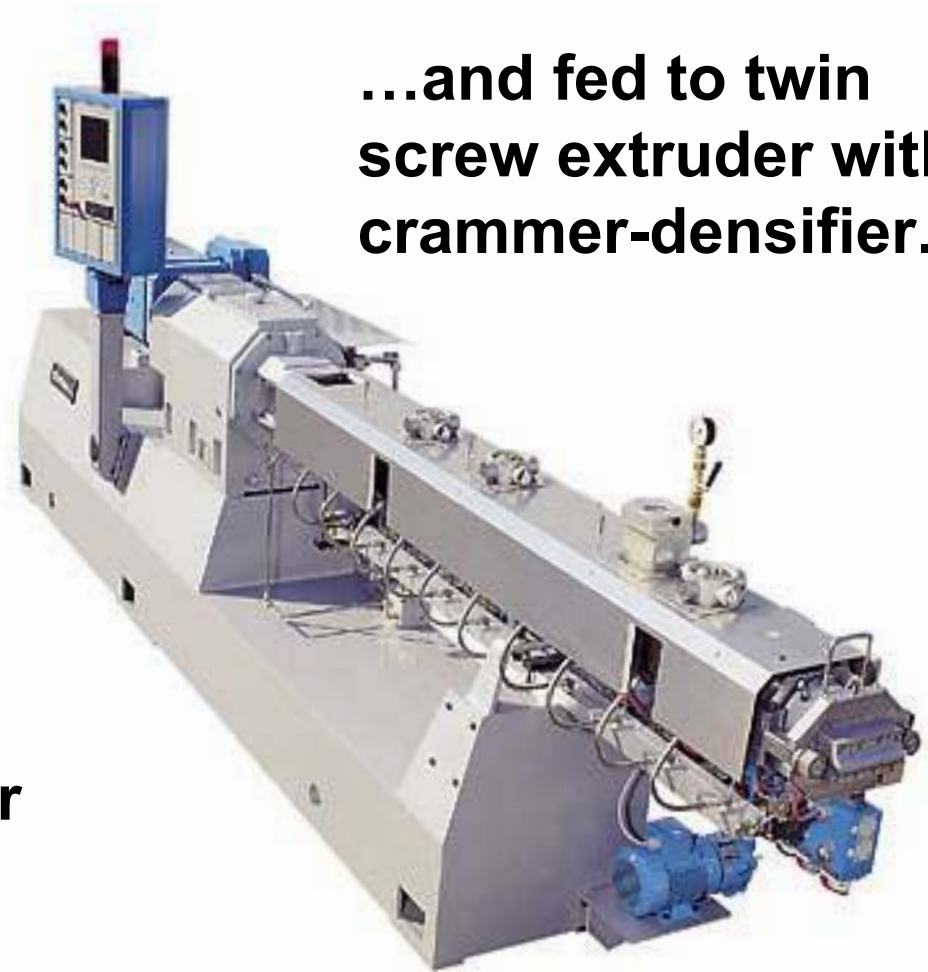
Traditional designs require pre-cutting.

Twin Screw Repelletizing

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

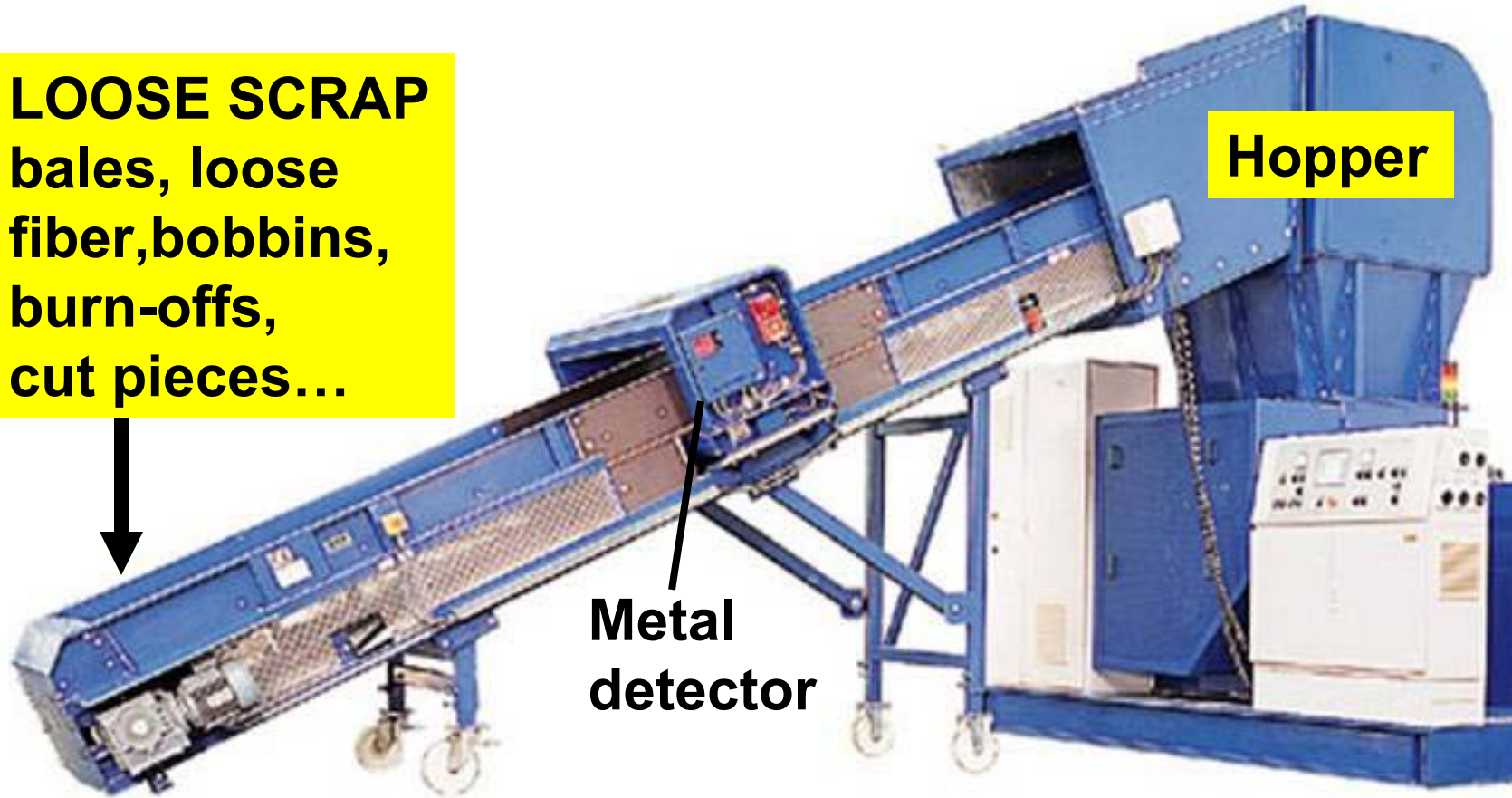


ONE-STEP Operation:

**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...

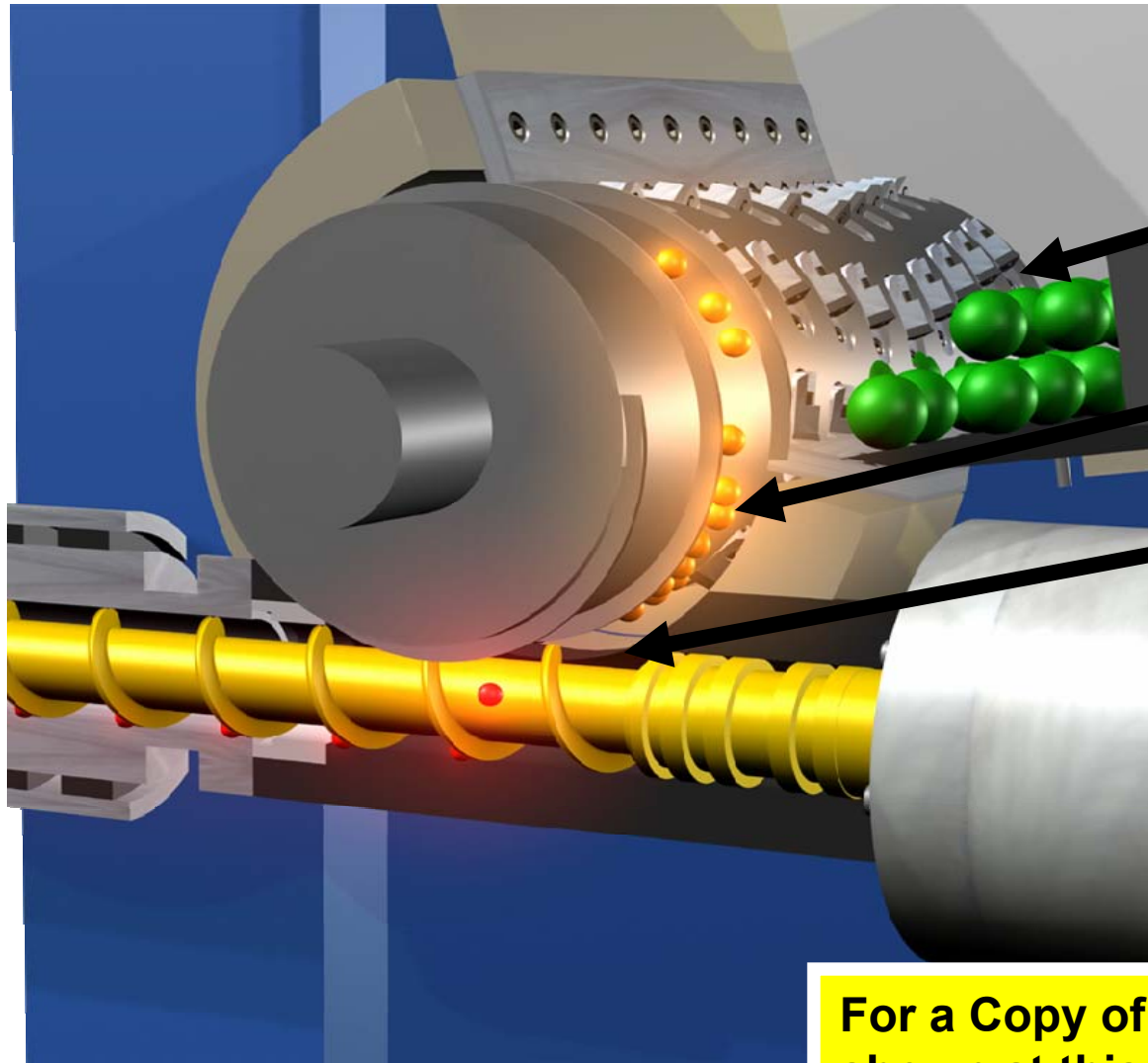


**Metal
detector**

**Conveyor is controlled by
Hopper level sensor.**

**Machine does not require continuous,
labor-intensive feeding.**

Material Transport Into Extruder



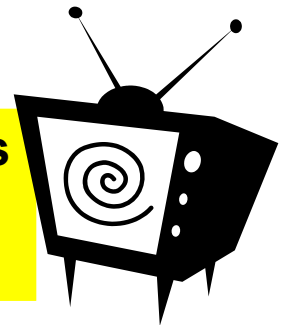
Shred...

Compact...

“Warm-Feed”
the Extruder

IN ONE-STEP

For a Copy of the Video clips
shown at this Conference,
Call 770-242-1386.

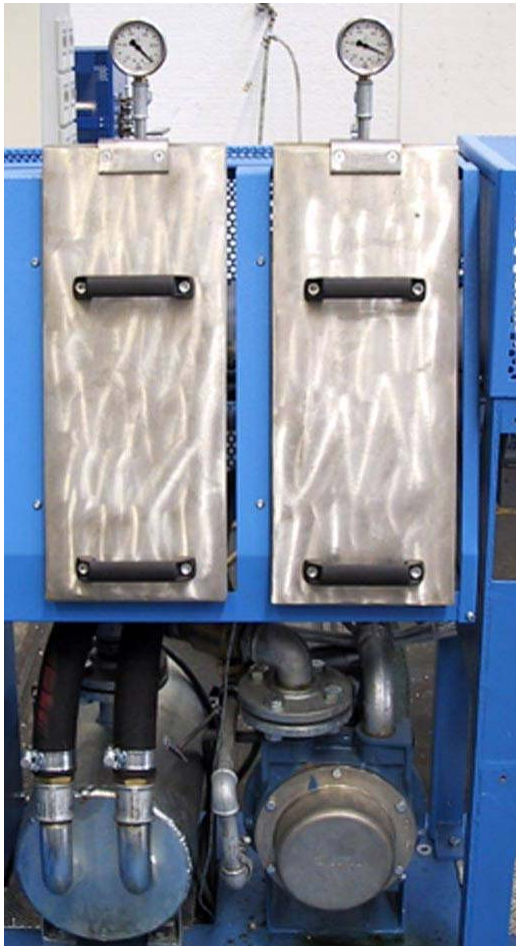


Dual Venting Removes Gases From Melt

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**

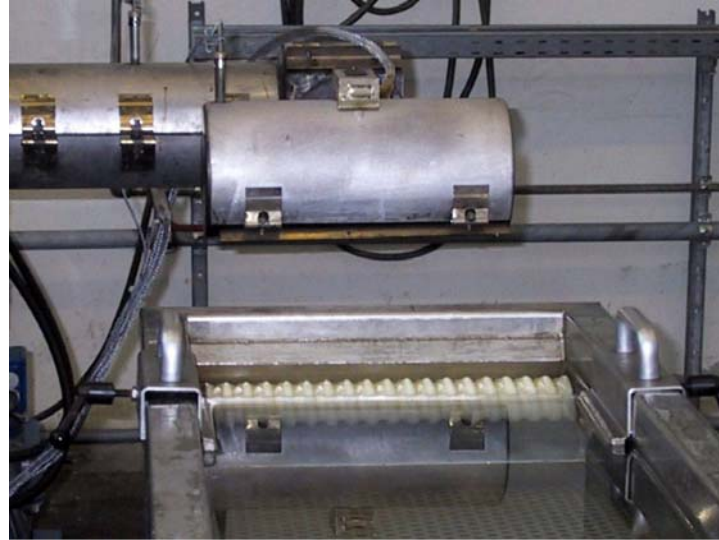
Water Ring Pelletizer

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



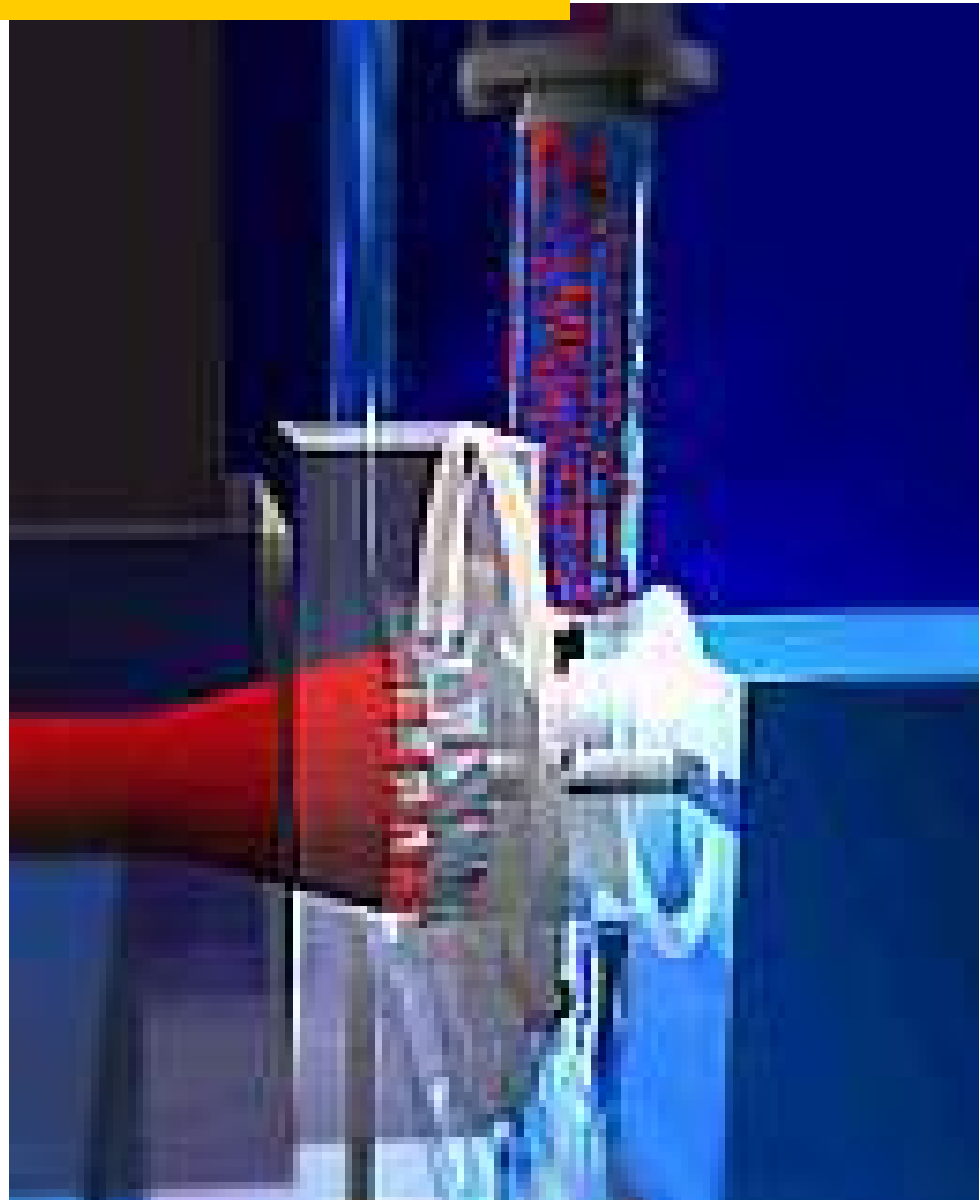
Strand Pelletizer

- PP (> 60 MFI)
- Nylon 6/6
- Nylon 6
- PET
- PPS
- Others



Underwater Pelletizer

- Same materials as Strand
- Better Pellet Uniformity
- Higher Level of Automation



Contact Information

**Chris Strzelecki
Advanced Extrusion Solutions
PO Box 920218
Norcross, Georgia 30010
phone 678-428-9262**

**“The Extrusion &
Recycling Specialists”**