

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

**Chris Strzelecki, Advanced Extrusion Solutions,
Alpharetta, GA**

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

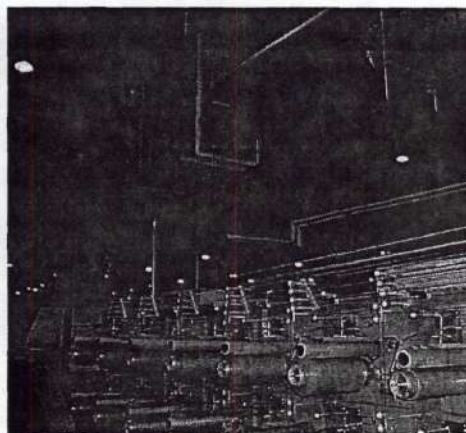
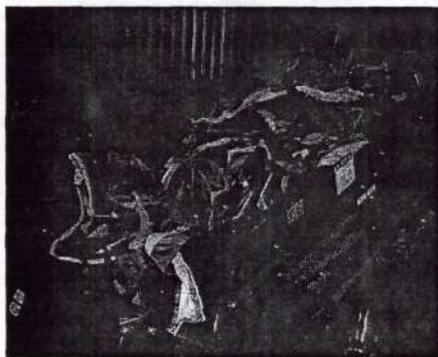
Latest machinery breakthroughs in repelletizing synthetic fiber, nonwovens and carpet waste will be discussed. Different materials (PET, Nylon, PP) and economic factors (energy usage, labor, capital equipment cost, floor space) will also be discussed.

May 13-14, 2002

North West Georgia Trade & Convention Center, Dalton, Georgia

http://www.tfe.gatech.edu/recycle_conf

New Developments In Recycling Of Fiber & Carpet Scrap



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

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



Bales



Bobbins



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

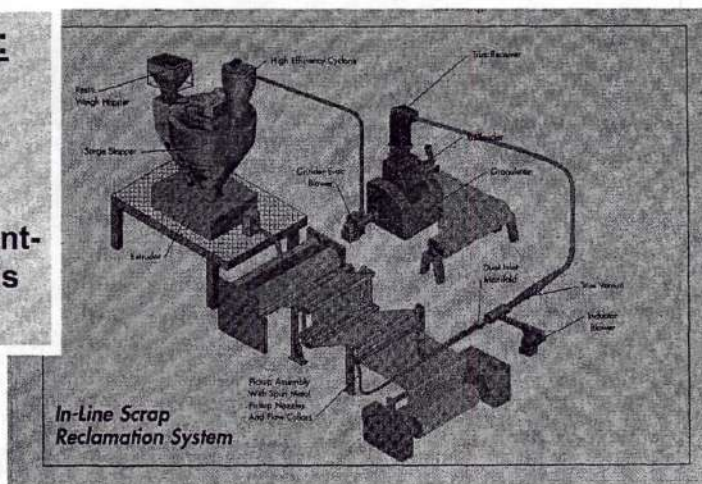
- PP
- Nylon 6
- Nylon 6/6
- PET
- LDPE/LLDPE
- PPS
- Other polymers

In-Line Process Scrap Recovery

Examples:

Slit Tape-
Edge trims

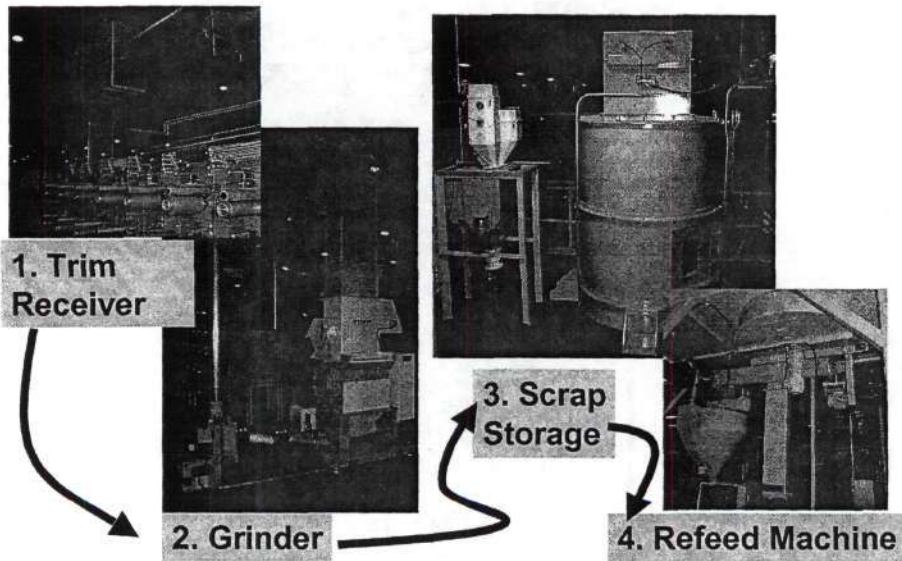
Monofilament-
Broken Ends



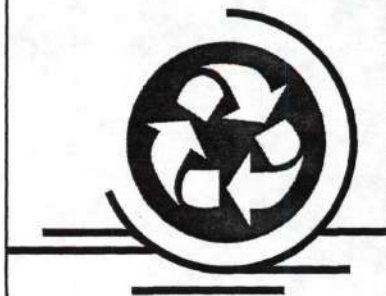
Can typically achieve 5-8% recycling.

In-Line Scrap Recovery + Startup Scrap

Slit Tape & Monofilament - Can achieve 5-20% recycling



Total Scrap Recovery



Ultimate Goal –

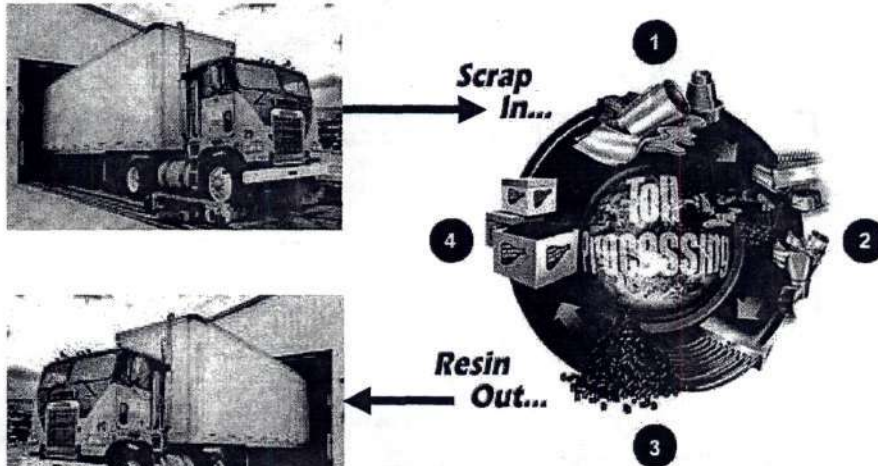
Recovery of All Plant Scrap:

- Off-Spec Material
- Converting Scrap
- In-Line Process Scrap
- Startup Scrap

Improved Profitability

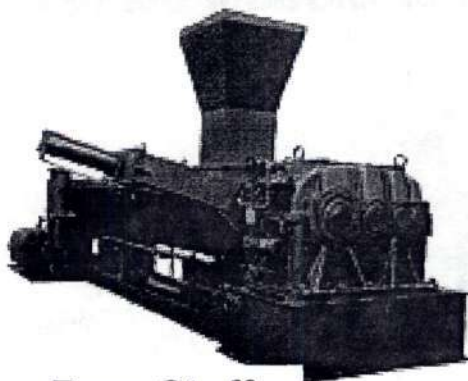
That's what we'll discuss for the rest of the talk...

Toll Repelletizing

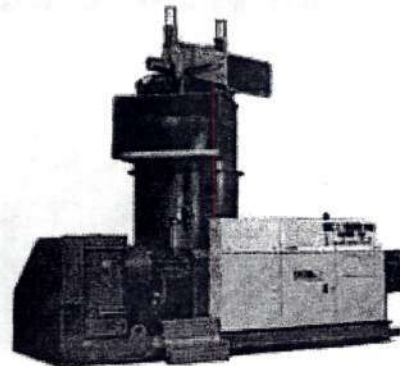


Usually priced per pound.

Traditional Repelletizing Systems



Ram-Stuffer

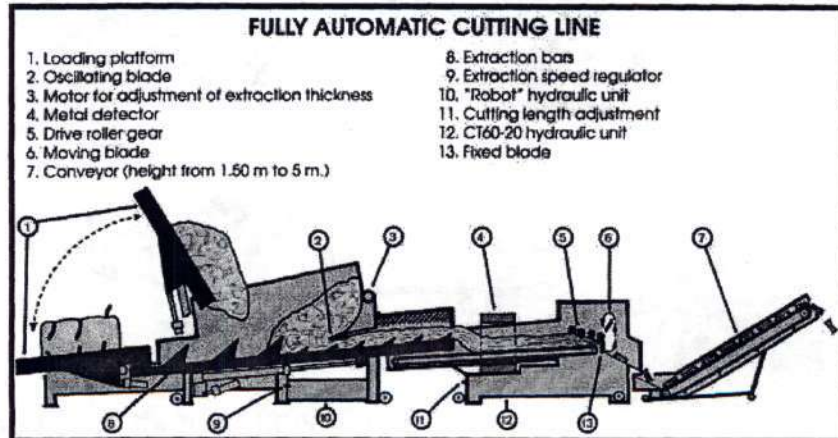


Densifier Drum

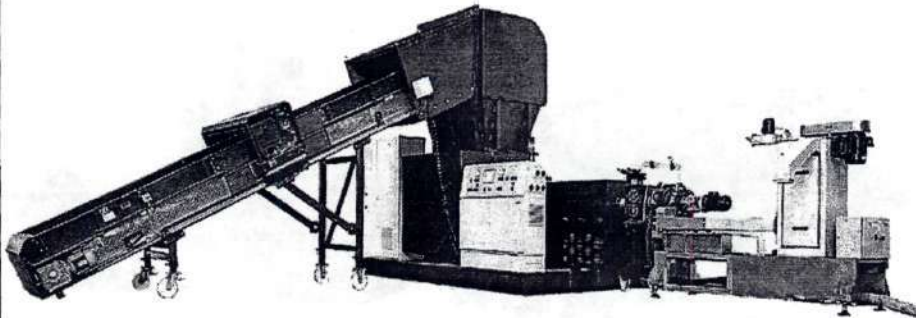
These Designs usually require Pre-Cutting

Size Reduction Issues For Fiber/Carpet

- Wrapping Special Knife Designs
- Maintenance Housekeeping
- Feed Issues



New Technology For Repelletizing— Integrated Shredder-Extruder Combo

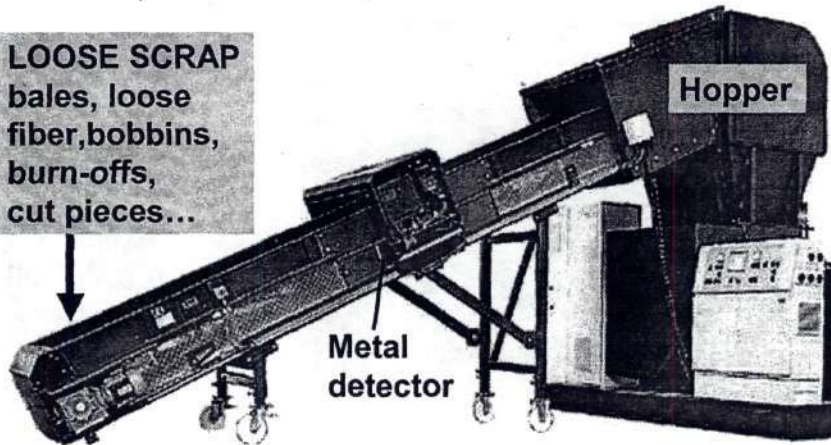


ONE-STEP Operation:

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...

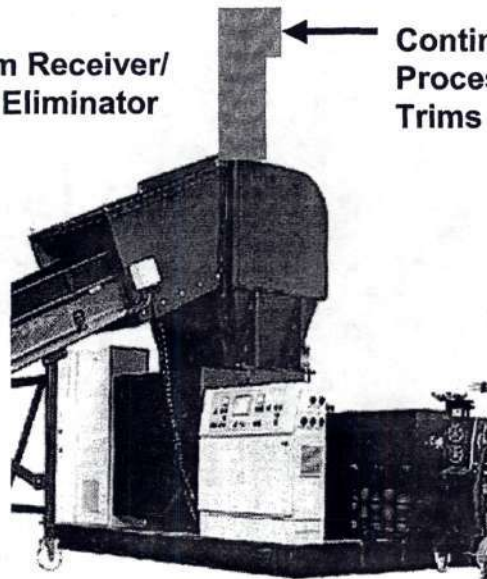


Conveyor is controlled by
Hopper level sensor.



Feed Trim Scrap via Trim Receiver

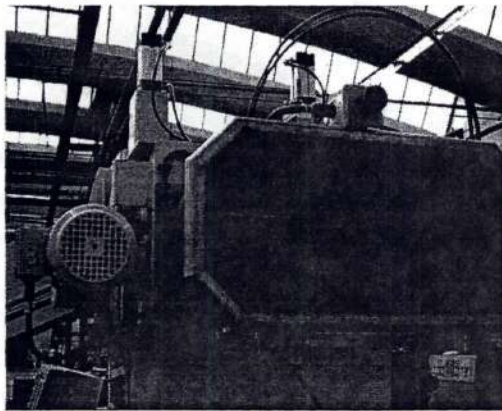
Trim Receiver/
Air Eliminator



Continuous
Process
Trims

If scrap
material
isn't present,
machine can
auto-shut
down.

Feed Scrap Rolls via Roll Feeder

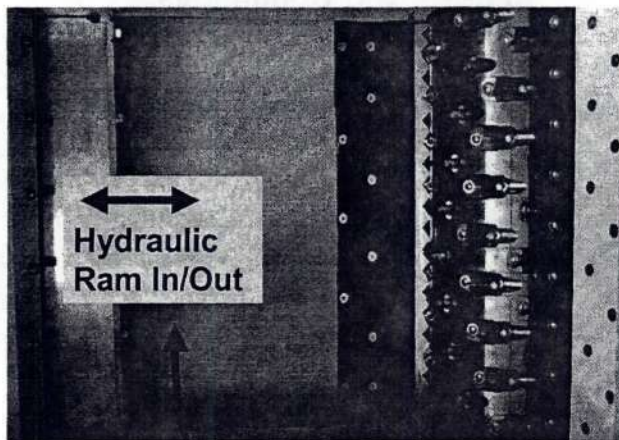


Rolls
From Roll
Stand

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.



Hydraulic
Ram In/Out

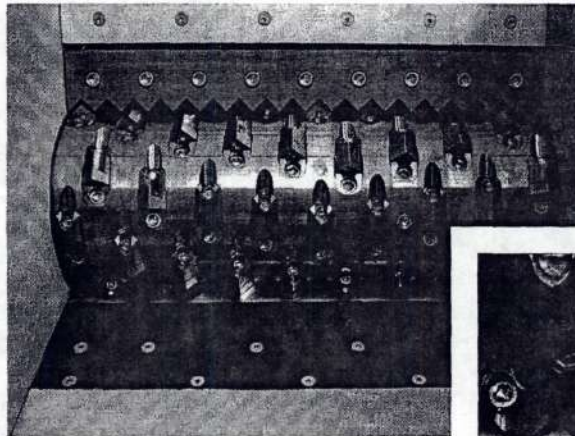
Shredder
Amps

Scrap
Material
Transport
To
Extruder

Video
clip

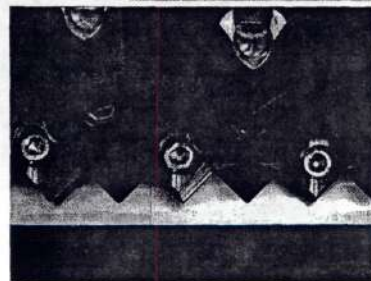


Special Shredder Designs For "Difficult" Materials—Fiber & Carpet



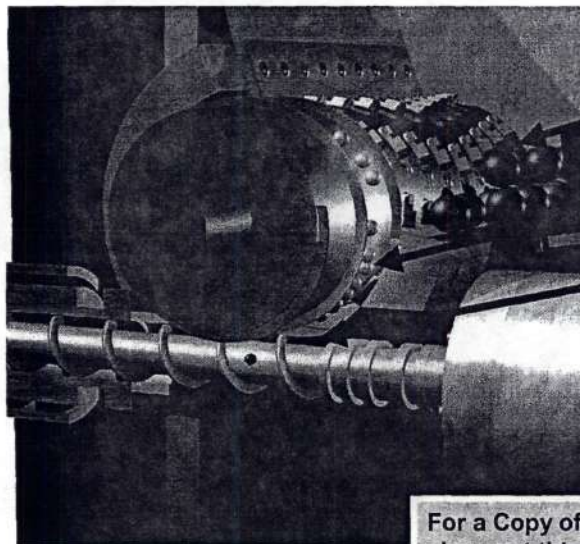
Staggered "S-Wave"
rotor Knives--
for peak cutting
performance

tight gap / 10-20 mil



Dual Bed Knives
Reduce "Wrapping"

Material Transport Into Extruder



Shred...

Compact...

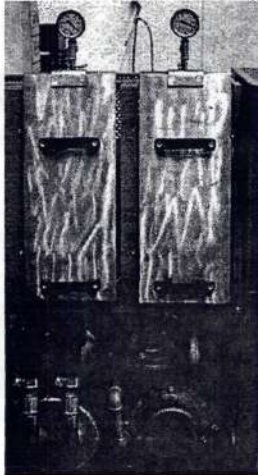
"Warm-Feed"
the Extruder

IN ONE-STEP

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



Dual Venting Removes Gases From Melt



closed under vacuum

Removes:

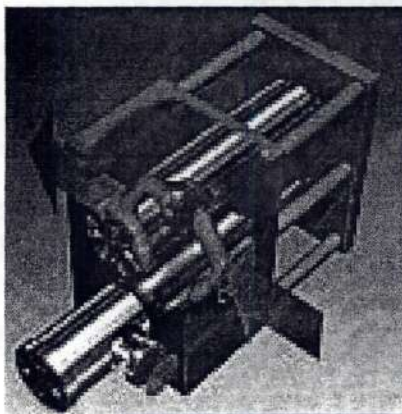
Spinning oils
Excess Water
Process Lubricants
Other Volatiles

From the
End Pellets,
Improving Quality.



open for cleaning

Continuous Melt Filtration: Dual-Bolt Screen Changers



Screen Changes
are made
"ON-THE-FLY"



Extra-thick
breaker plates
allow large
Open Area.



Screen mesh
can be adjusted
to suit the
application.

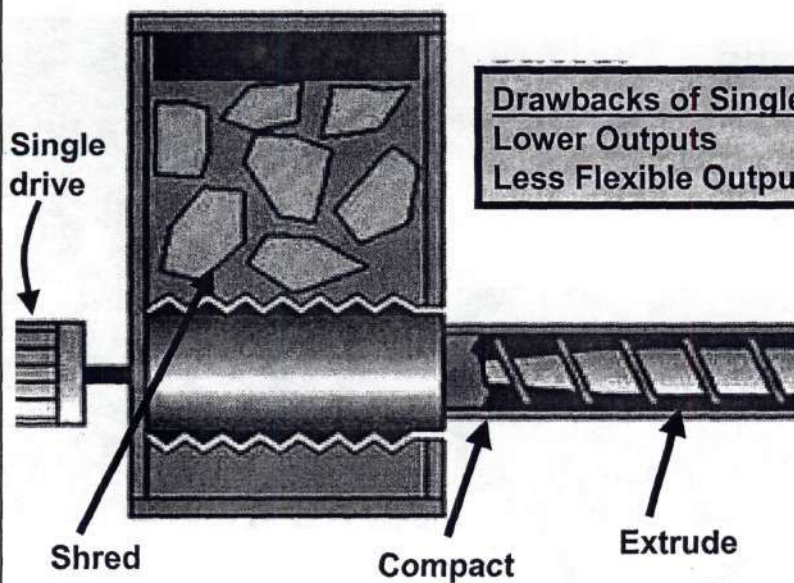
With Backflushing Option,
up to 100 changes
in-a-row can be automated.

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

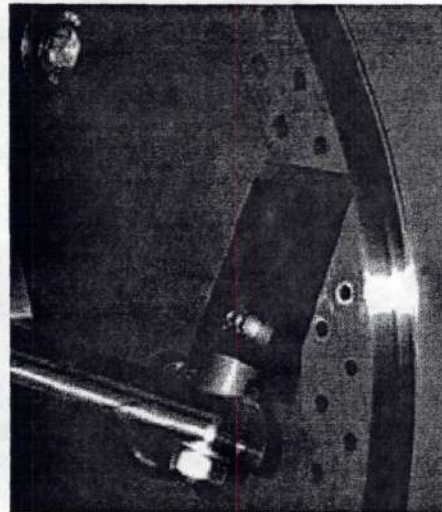
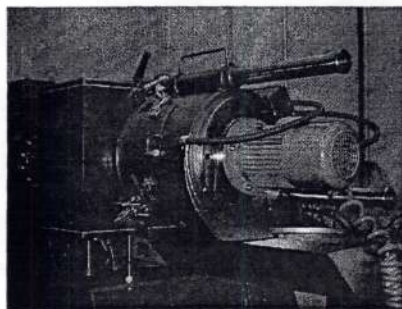
Three Methods of Pelletizing

Method Used Depends on:

- **Polymer Type**
- **Melt Temperature**
- **Melt Flow Index**
- **Degree of Automation**
- **Level of Operators**
- **Pellet Quality Required**

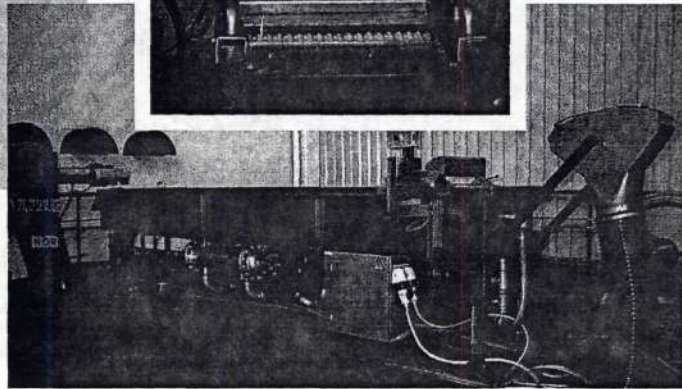
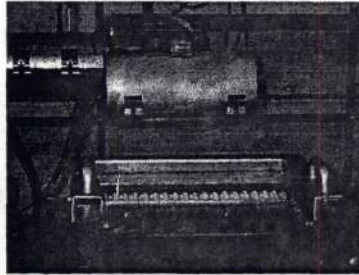
Water Ring Pelletizer

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



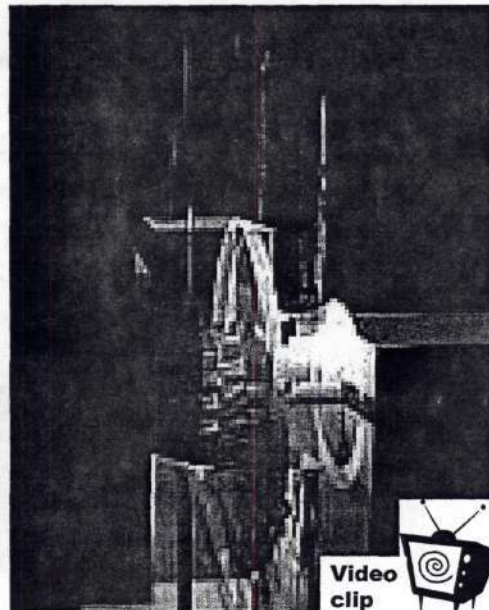
Strand Pelletizer

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



Underwater Pelletizer

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



Contact Information

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

**"The Extrusion &
Recycling Specialists"**