

## Process Capabilities for Industrial Pilot Scale Applications



Ambient and Heated Mixing  
Coating  
Blow Molding  
Calendaring  
Compression Molding  
Cutting / Stamping  
Emulsification  
Extrusion Compounding (single & twin screw)  
Fibers / Filaments (variable diameter) Injection  
Molding  
Lamination  
Puffing/Foaming  
Particle Sizing (screen / mesh)  
Reactive extrusion (chemistry within the melt)  
Ribbons / Sheets (variable width/thickness)  
Roll milling  
Size Reduction  
Spray and Freeze Drying



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## NCAUR Pilot Plant

### Extrusion & Molding

### Polymer Processing & Characterization

A UNIQUE RESOURCE



United States Department of Agriculture  
**Agricultural Research Service**

National Center for Agricultural Utilization Research





## Extrusion

- Werner-Pfleiderer ZSK 30mm twin-screw  
3 dry feeders & 4 liquid pumps  
rod & sheet dies  
foam/puff cutter
- Brabender Intelli-Torque single screw  
rod, ribbon, sheet & blown film dies
- Leistritz Micro18 twin-screw  
2 dry feeders & 2 liquid pump  
slit and filament dies



## History

Past collaborations have led to groundbreaking products and advances. The Utilization Research centers were authorized and built in 1939. NCAUR has been designated an International Historic Chemical Landmark by the American Chemical Society and the Royal Society of Chemistry (UK).



## Injection Molding

- Engel Victory 125 Injection Molder  
ASTM sample & specialty molds

## Compression Molding

- Carver hydraulic presses - water cooled  
Various molds

## Mixing

- Brabender Rheometer
- Heated roll mill

## 3-D printing (resins)

- Flashforge Creator - Dual Nozzle



## Post-processing

- Film, Sheet, & Ribbon Calendaring
- Fiber/Filament Drawing
- Brabender Granu-grinder (1.0 mm)
- Thomas Wiley Mill (1.0-3.0 mm)
- Vibratory Sieves (18-200 Mesh size)
- SPEX Freeze Mill (0.1-100 g)
- ASTM D638 Tensile Bars



## Characterization

- Instron Materials Testing System  
ASTM 638 Tensile Properties  
Peel, Puncture, 3-Point Bend, Impact
- Controlled Environment
- Melt flow properties: rheometry, viscosity
- Thermal analysis: DSC, TGA, DMA
- Spectral analysis: UV-VIS, FT-IR
- Microscopic Analysis: SEM, AFM, Digital
- Elemental analysis: NMR, CHN Analyzer
- HPLC-SEC Molecular weight (20K-10M)
- Film Adhesion and Abrasion
- Thin Film Thicknesses (0-500um, 0-2mm)
- Permeability

## Partnerships

We are eager to explore new partnerships that would make use of the NCAUR Pilot Plant to develop new products from agricultural products, co-products, and waste; new packaging materials to improve food quality and safety; and new energy-efficient methods for processing plastics and bioplastics. Partnerships may take the form of Cooperative Research and Development Agreements (CRADAs) and Material Transfer Research Agreements (MTRAs).

