

**Benjamin Dudek, Tucker Fredrickson, Marco Baca, Juan Rodriguez**  
 Sponsor: Alan Mosley, MiniGrip Process Engineer

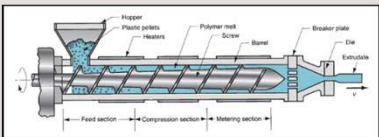
**Problem**

**MiniGrip Problems**

- MiniGrip corporation needs a system that is capable of recycling low-density polyethylene powder with minimal labor and cost.
- Powder accumulated from raw material shipments is being sent to landfills
- Unable to recycle in current form due to low bulk density
- Seeking a more environmentally sustainable solution

**Initial Plans**

- Use as much of the available MiniGrip equipment to cut costs
- Use single screw extrusion as processing method for autonomy
- Need to design an ideal hopper system for gravimetric powder flow to feed plastic into the barrel



**Current Samples**



**Design**

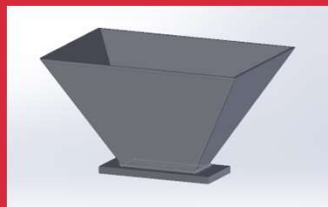
**Hopper System**

**MiniGrip's Hopper**



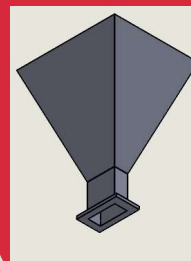
- Powder will not flow
- Pitch angle is too wide
- Shaft hole is too small

**1<sup>st</sup> prototype at 30° pitch:**



- Increased shaft hole size
- Widened pitch angle

**2<sup>nd</sup> prototype at 20° pitch:**

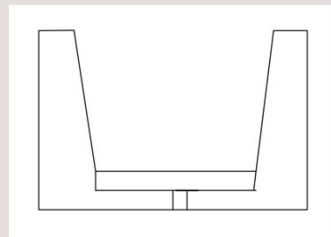


- Increased shaft hole size
- Narrowed pitch angle

**Options for Additional Aid**

- Vibrator attached to hopper
- Auger built into hopper
- Venturi vacuum system feeding into hopper

**Mold**



- Need to design a mold to form the plastic into a shape that is easy to ship to recyclers
- "Cow-patty" form is not acceptable

**Process**

**Conceptualization**

Requirements:

- Be nearly autonomous (minimal labor)
- Done in one working day
- Plastic blocks, not patties

**Assembly**

Initial Design:

- MiniGrip has multiple single screw plastic extruders
- Use MiniGrip hoppers attached with vibrators to get powder to flow into extruders
- Extruder holds enough powder for extruder to run for at least an hour

Testing Concerns:

- Powder doesn't flow down the provided hoppers
- Shaft hole is too small causing powder to clump up in the hopper
- Vibrating hopper doesn't help with the facility hoppers
- Need to combine pellets and powder into a specific ratio

**Final Design**

- Made inlet hole as large as possible
- Changed hopper dimensions
- Use combo of powder and pellets