M2.03 – LDPE Powder Recycling

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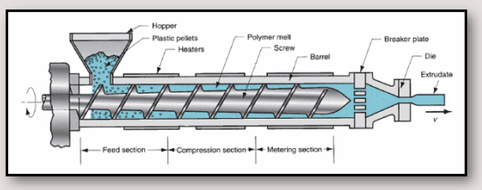
Problem

MiniGrip Problems

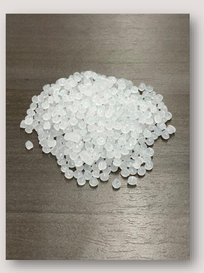
- MiniGrip corporation needs a system that is capable of recycling low-density polyethylene powder with minimal labor and cost
- Powder accumulated from raw material shipments is being sent to landfills
- Unable to recycle in current form due to low bulk density
- Seeking a more environmentally sustainable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

MiniGrip's Hopper

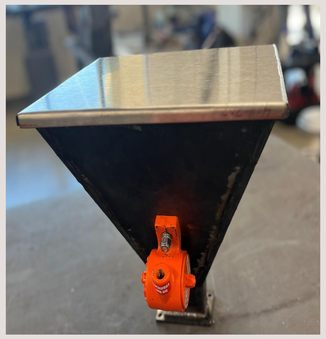
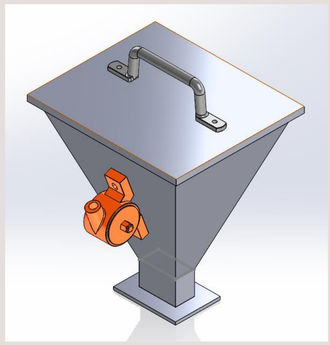
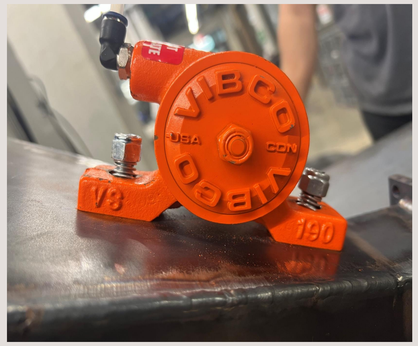

- Powder will not flow
- Pitch angle is too wide
- Port hole is too small



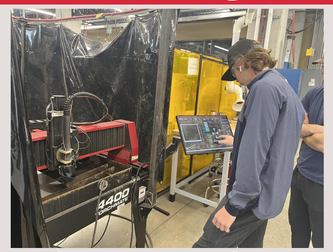
Samples

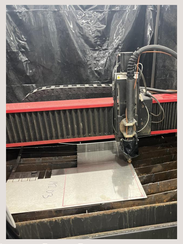
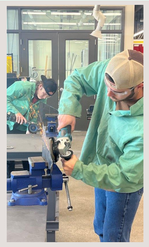



Final Design

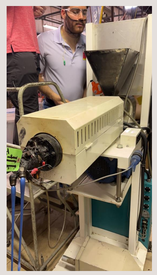
Design Development



Plasma cutting the pieces for the hopper

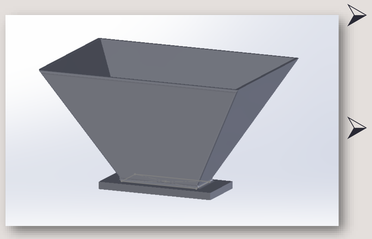

Attaching the Vibrator on to the hopper


On-site testing

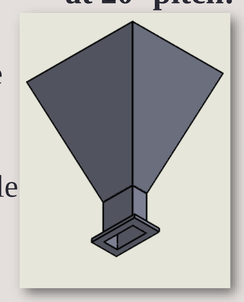
Design Transitions

1st prototype at 30° pitch:



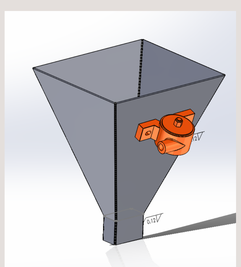
- Increased shaft hole size
- Widened pitch angle

2nd prototype at 20° pitch:



- Increased shaft hole size
- Narrowed pitch angle

3rd prototype With vibrator



Process

Conceptualization

- Powder can flow for an hour without being checked
- Use MiniGrip's single screw extruders
- Use MiniGrip's 90 psi air system

Manufacturing

Production Steps:

- Design and run cuts through Torchmate
- Drill holes onto the plates
- Prep metal to get welded
- Weld parts together
- Bolt vibrator onto hopper

Final Design

- Increased port hole size allowed for wider area for powder to flow
- Vibrator acts as an auger stimulating clumped powder to move
- Springs attached to vibrator allowed for extra vibration

Next steps

- Hopper is ready to process powder on site
- Design indexing table equipped with molds to refine product shape
- Design automated process for filling hopper with powder
- Add solenoid valve to air system to control the flow of air to vibrator