Magic of MicroPellets
Setting the Stage
Pellet Size Comparison

MicroPellet = 1 mm or smaller

MiniPellet = 1 mm to 2 mm

Standard pellet = 2 mm or larger
Testing

- **Bulk density test**
  - Powder allowed to flow into cup.
  - Remove excess powder. Weigh.
  - Bulk density = powder weight / volume
  - ASTM D1895

- **Dry flow test**
  - Standard weight of powder placed in funnel. Time taken to flow through standard orifice measured.
  - ISO 6186
  - ASTM D1895

![Bulk density cup](image)

Bulk density cup
Capacity 100 cc

![Dry flow funnel](image)

Dry flow funnel
3.5 mm
Powder/MicroPellet Comparison

Apparent Density and Dry Flow

Density = 34
Flow = 27 seconds

Density = 53
Flow = 11 seconds

Dowlex 2631 UE RX-102
MI 7, Density 0.935
MicroPellet Shape
Related to Molding

- Filling tight cavity molds
  - MicroPellets can be introduced through the vent or insert areas of the mold.
- Flow into difficult areas of the molds
- Higher Bulk density allows more material to fit in the mold
- PSD measures the diameter of a particle
- Powder dust can be harmful
  - Contamination
  - Employee health
  - Explosive/Flammable
- Higher bulk density equates to less voids during lay-down
  - Less bubbles, requires less time to dissolve
- Bridging of material
- Consistency!!!!!!!!
PSD measures the diameter of the particle, not the length.
Powder Tank under natural light

MicroPellet Tank under natural light
Controlling the Process

• **K-Paq** measures the mold temperature and the internal air pressure in real time.

• The data is transmitted out of the oven and cooler bays to a control station where the data is then recorded for in-line analysis.
Thermocouple in Mold
Temperature graphing

- Material starts to melt
- Melting complete
- During the cooking bubbles will be dissolved

Optimum process temperature (PIAT)

Solidification

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Cooking Comparison

Powder in the mold
Cooking Comparison
Laying Down on the Mold

Density = 34

Density = 53
Processing time

- Used the Rotolog to determine the peak internal air temperature.

- Oven shuts down at PIAT of 375°F/191°C
  - Powder tank took 70 minutes to reach PIAT
  - MicroPellet tank reached PIAT in 64.5 minutes.
Bulk Density

• Same time needed for both parts
  – 3800 lbs/1720 kgs shot size for the powder
  – 4000 lbs/ 1814 kgs shot size for the Micros
Try to Watch Both Hands
Cooking Comparison
Temperature graphing

- Material starts to melt
- Melting complete

Dowlex 2631 UE RX-102
MI 7, Density 0.935
Final Act
Benefits of using MicroPellets

- Cleaner – virtually no dust
- Compounding (e.g., Coloring) and MicroPelletizing can be achieved in a single step
- Micropellets have a better packing density than powder.
- Improved flow characteristics: Fills hard to reach areas in complex molds. Enables more uniform inner layers.
- Consistent lay-down and cook times.
Powder

MicroPellets

All Pictures Taken With Flash
Benefits of using MicroPellets

- Enhanced part detail definition (threads, logos, lettering)
- Better impact results are typically reported.
- Segregation of powder in the container
- Possibility of improved process conditions:
  - Lower temperatures
  - Reduced cycle times
  - Slower rotation speeds
  - Faster mold charging
- Uniform wall thickness, giving potential of shot weight reduction.
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