Team H Wrapped

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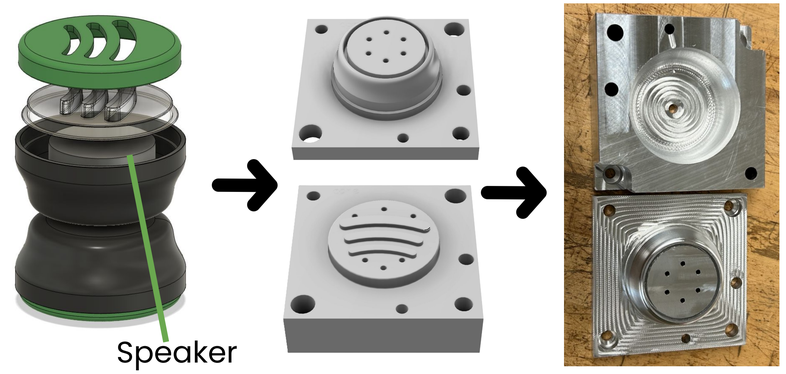
2.008 Design and Manufacturing II, Fall 2024

Journey

- Our Idea: Spotify yo-yo that plays music when pressed



Most Difficult Aspect: Speaker

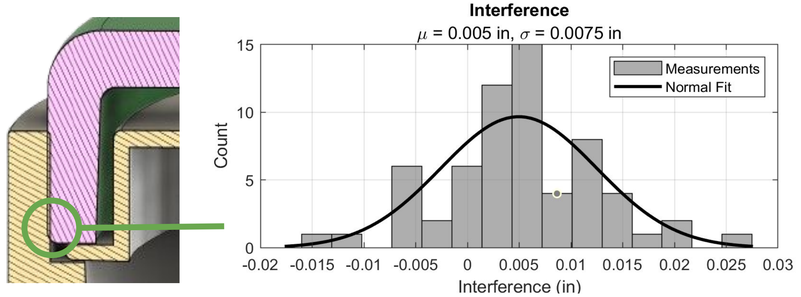
- Goal: speaker press fit inside the body.
- Anticipated to be most difficult
- Large speaker required maximum body size possible with the provided mold blanks, needed to adjust the parting line to accommodate size
  - Interfered with pin on CNC HAAS jig

- Extremely thin press fit ring, required precise feeds and speeds on CNC
  - Broken tools

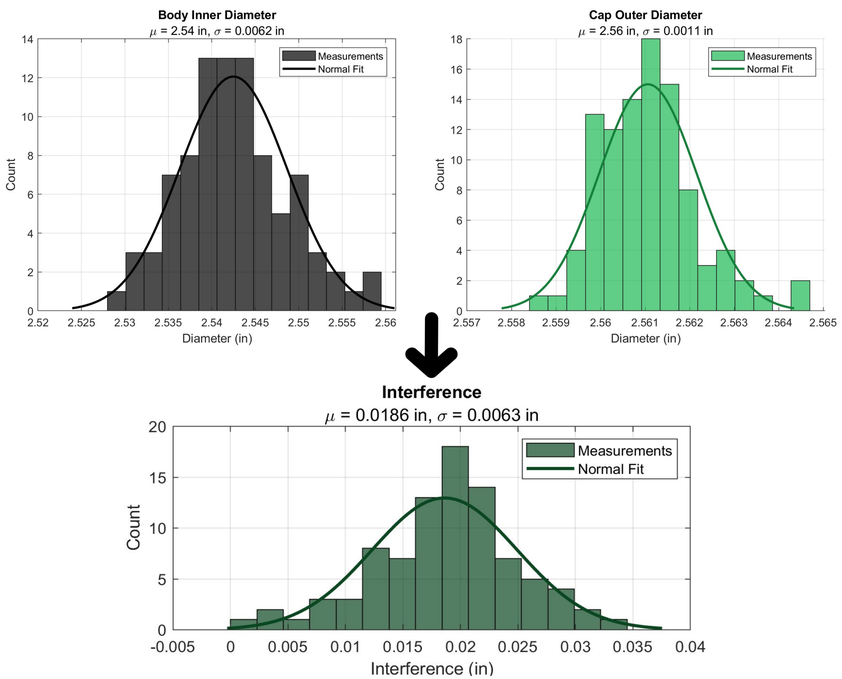
Interference Analysis

$$p = \frac{E\delta}{2R^3}\left[\frac{(r_o^2 - R^2)(R^2 - r_i^2)}{r_o^2 - r_i^2}\right]$$

- Used press fit equation for initial estimate of 0.015” interference
- Due to shrinkage and initial underestimation, the press fit was around 0.005” interference:

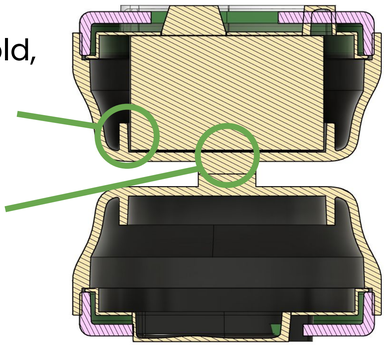


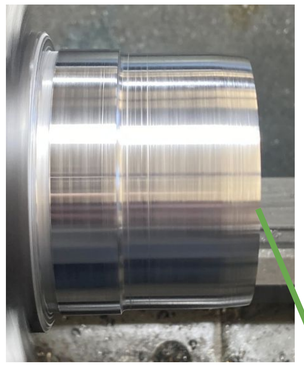
- Remachined the cap mold to allow for shrinkage and a larger interference
- New press fit was more successful with drop test and averaged 0.0186” interference.



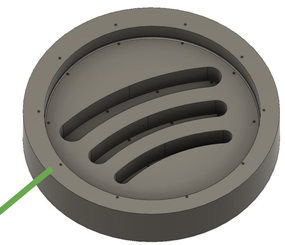
DFM Challenges

- Press fit ring for speaker was getting stuck on mold, so 2° draft angle added
  - Mold release needed every 3 cycles
- Due to size of yo-yo, the shoulder bolt had to be 0.55” long, making it difficult to fabricate





- Fabricated custom die to efficiently punch out the correct size of for the thermoformed piece



2.5” diameter

Lessons Learned

- Importance and application of:
  - Process parameter tracking
  - Statistical process control
- Press fit analysis and iteration
  - Draft angle for speaker
  - Shrinkage effect on press-fit
- Problem-solving post assembly: stress and failure modes
  - Large yo-yo size, speaker adds weight
  - 3D printed parts to better distribute load and prevent fracture

Thank you to 2.008 teaching team!

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