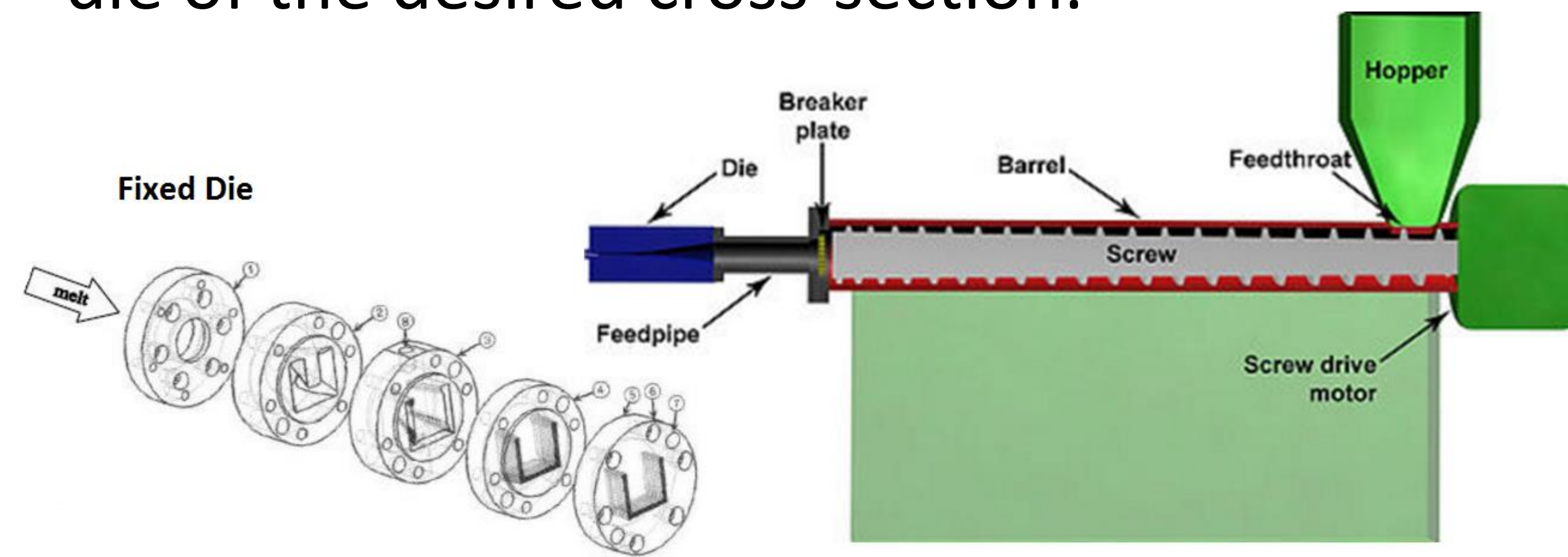


Polymer Extrusion

Polymer Extrusion is a manufacturing process to create parts by melting down plastic beads and then passing the melted plastic through a die of the desired cross-section.

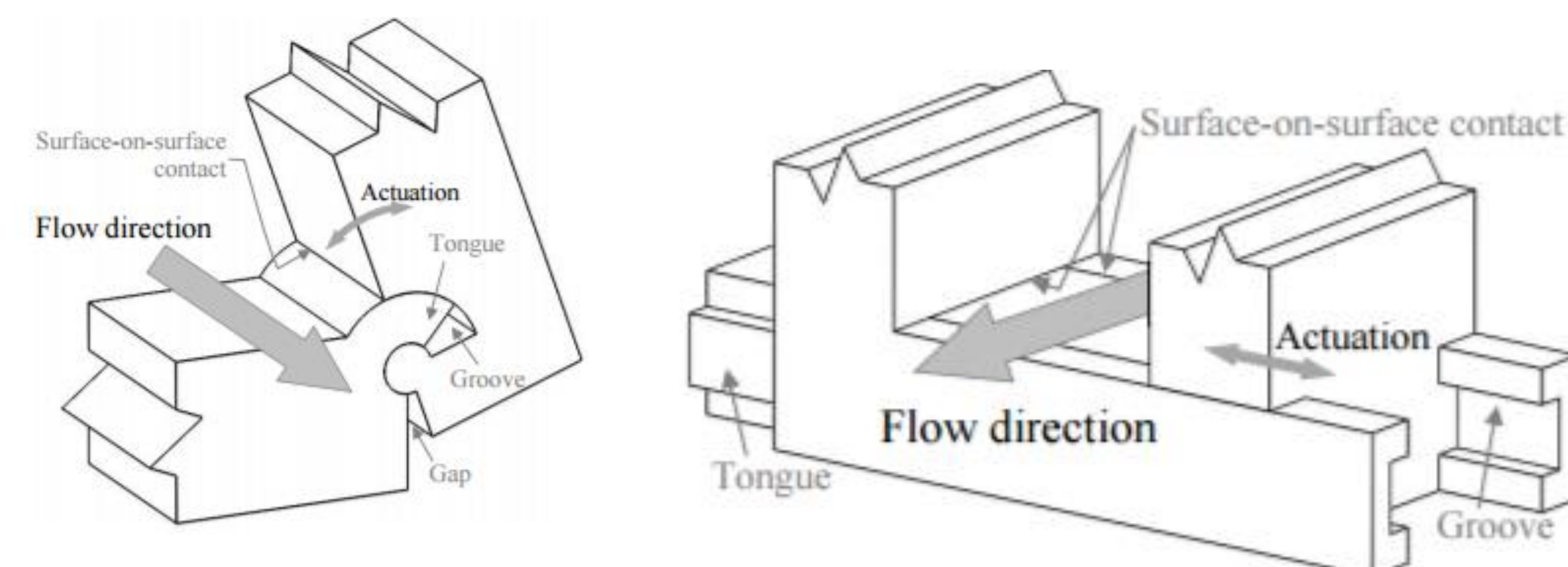


Dies have a fixed cross-sectional area to create a single part size. This research aims to produce dies that change cross-sectional area to allow more complicated parts to be made from a single die.



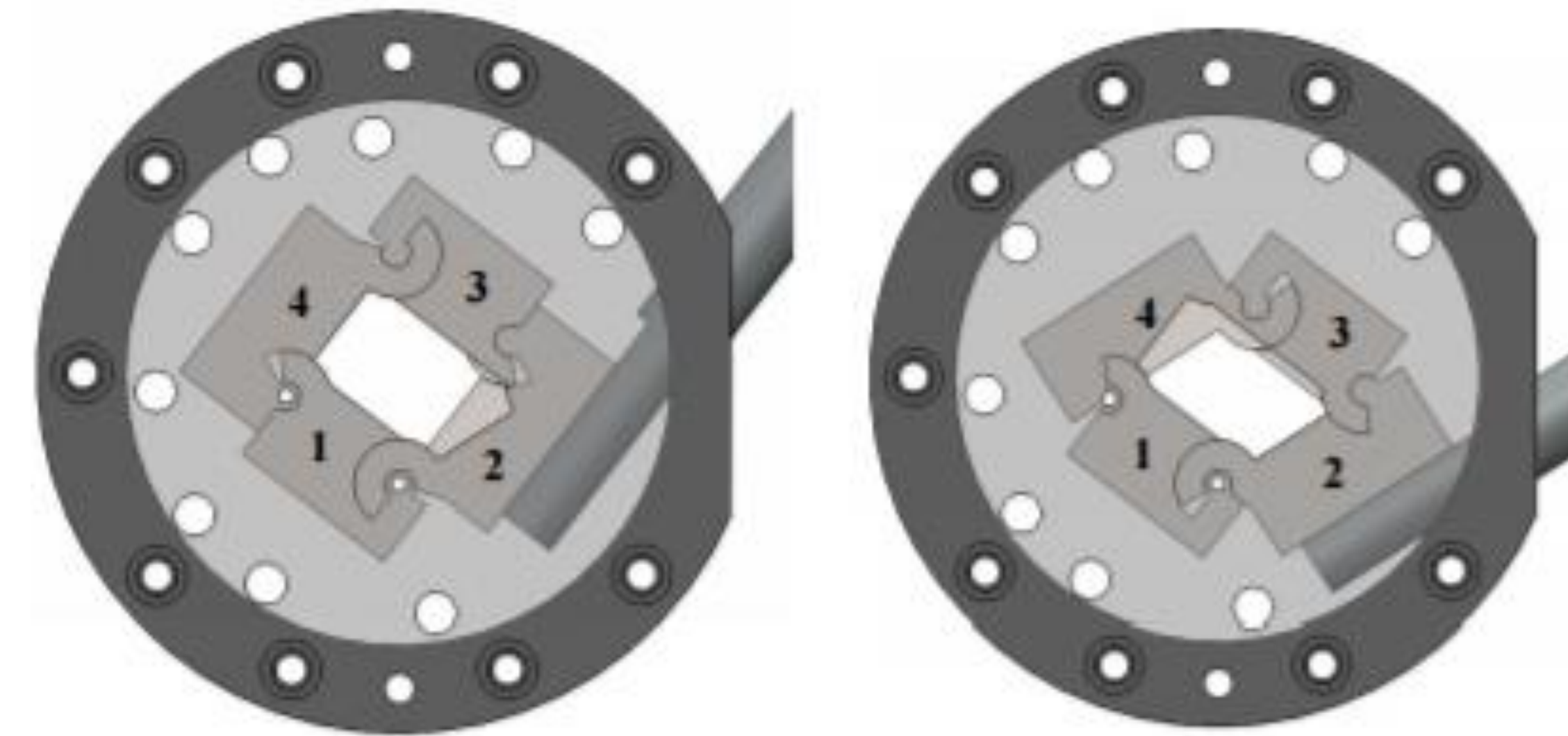
Factors when Designing A Variable Die

- Changing cross sectional area of the die
- Material leaking and seeping into die joints during actuation
- Movement of joints in unison



Previous Variable Dies

A previous die that has been completed and tested is the Crescent Die



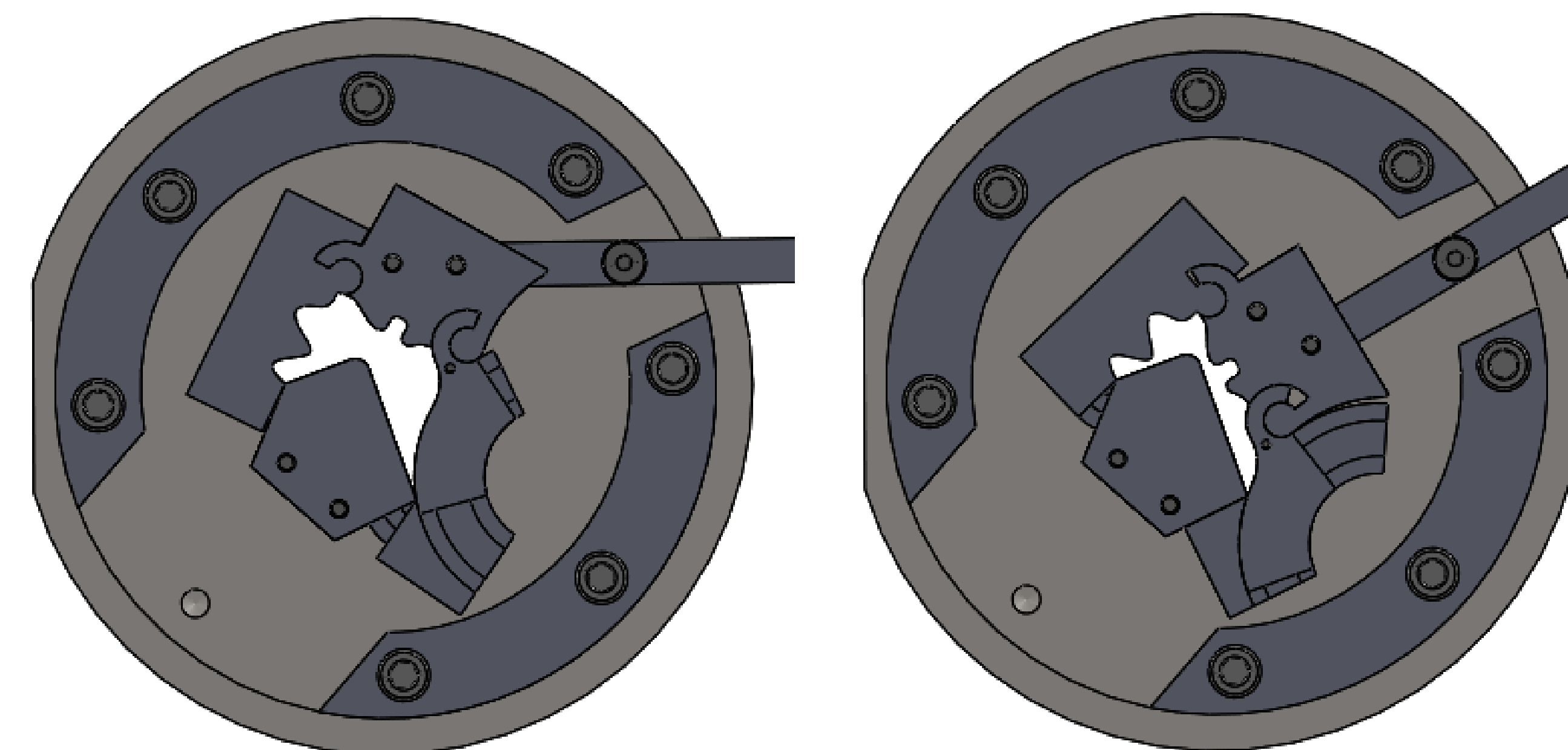
Results fall into a 95% Confidence Interval for repeatability which is the range for fixed dies

New Variable Die

Goal is to create extreme shape change.

Challenges of the new die consist of:

- Change of cross-sectional area
- Complex, puzzle like design
- Tolerances and gaps for leakage between parts



- The sharp corner was not consistently extruded
- Pin exposure to molten extrude led to the pin being pushed out of die

Second Experiment of New Die

Multiple puller speeds were used and all tests were able to be completed without failure of the die

Three discoveries during the experiment were:

- The extrude broke when the puller speed was too high
- The corner was still not consistently produced
- The die was filled with extrude



Comparing Different Extrusion Profiles

Profiles from multiple sections of the extrusion are compared to test repeatability. The profiles are laser scanned and Matlab is used to compare data. Lastly, the standard deviation in variance is taken to determine repeatability.

