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Continuously Expanding Mandrel

Cory Bleistein

Virginia Commonwealth University

Dylan Dawson

Virginia Commonwealth University

Anton Rabinky

Virginia Commonwealth University

Marshall Smith

Virginia Commonwealth University

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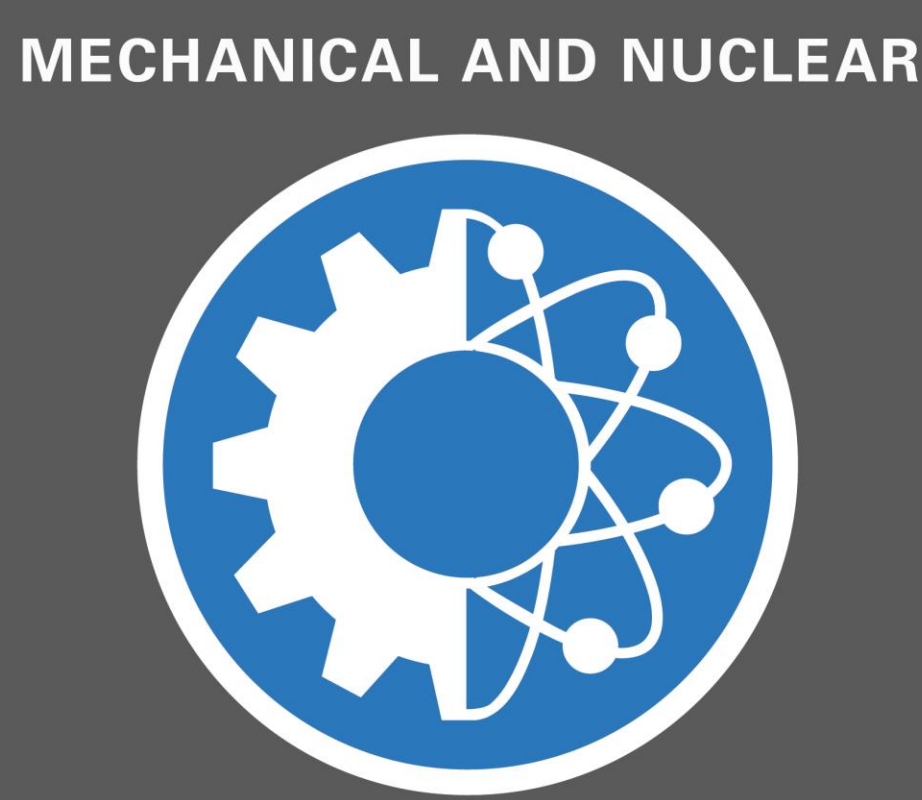
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Team Members: Cory Bleistein, Dylan Dawson, Anton Rabinky, Marshall Smith
Faculty Advisor: Dr. Charles Cartin

Sponsor: Sealeze
Sponsor Advisors: David Chrisman, Milo Hairfield, Doug Laws, Rick Weaver



Continuously Expanding Mandrel



Project Purpose

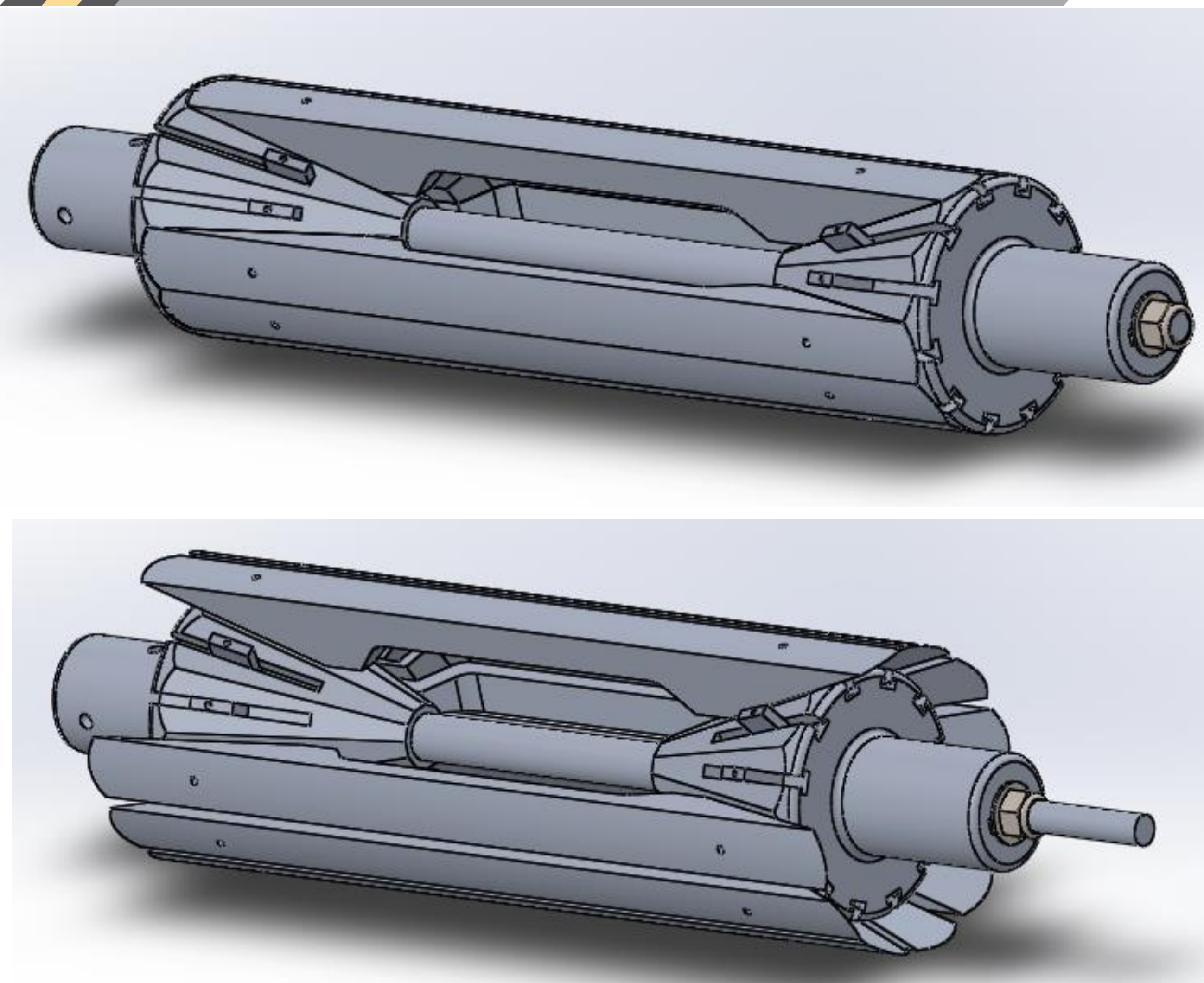
The purpose of this project was to develop a better system to create spiral-wrapped strip brushes in a continuous fashion at a variable diameter with various materials for the core, backing and filament within a narrow margin of tolerances. By creating a single expanding mandrel that is variable in size, we aimed to eliminate the need for excess numbers of project specific milled shafts, primarily increasing efficiency and safety.

Process and Design

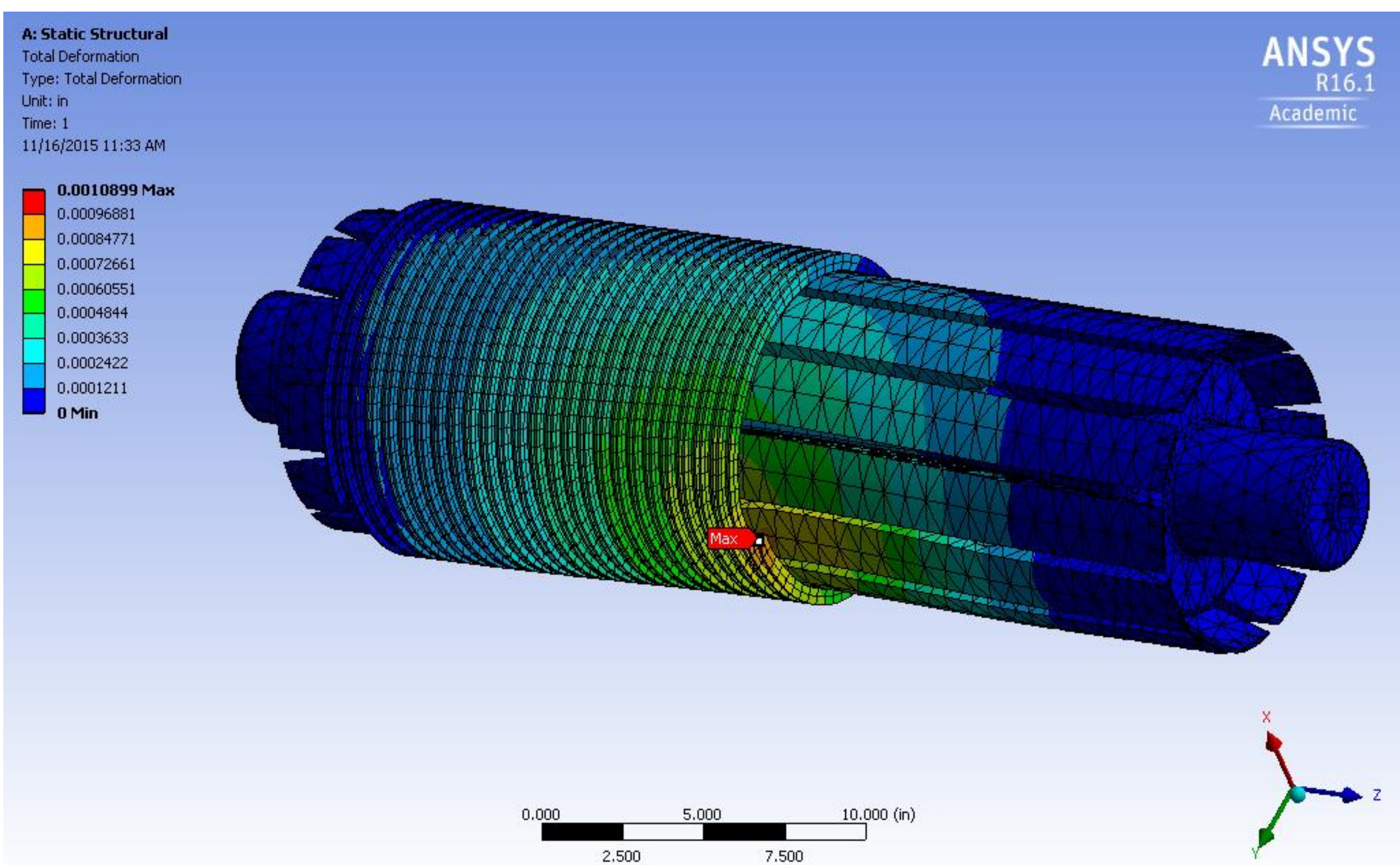
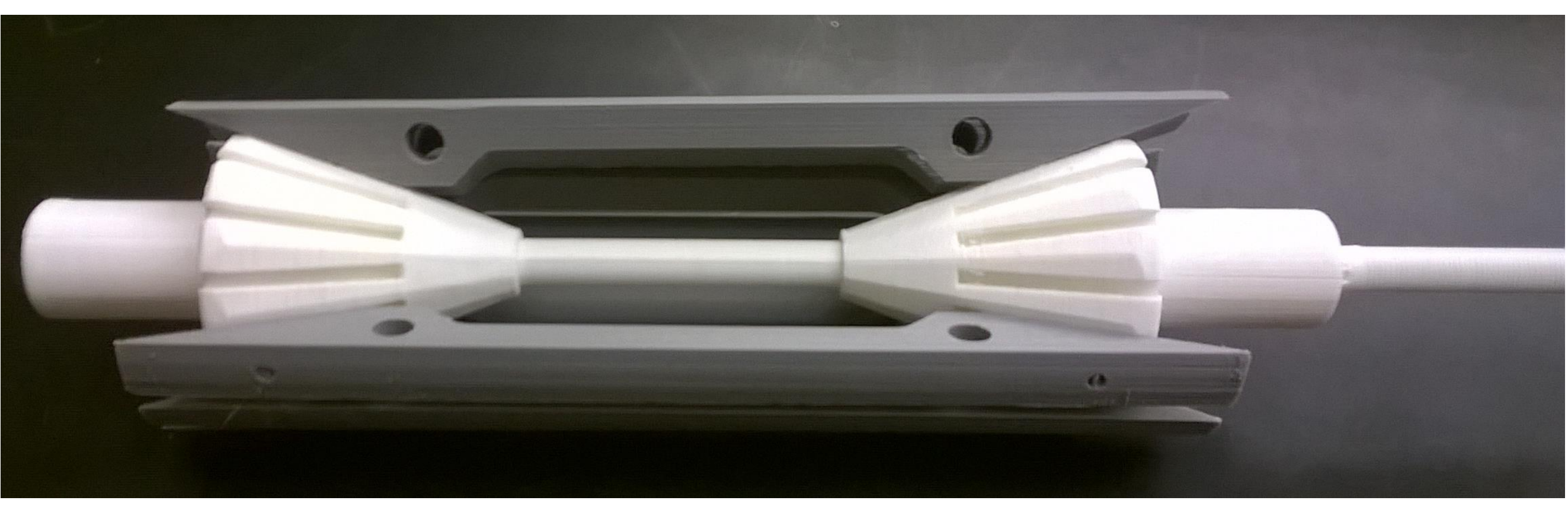
Through a process involving dozens of iterations and constant adjustment of our basic concepts and goals, our final design was finalized and modeled for analysis via 3D printing.

The mandrel works by have two cones mounted upon a long central rod. One is hard mounted via dowels and the second is free-floating, guided by a keyway. A series of wedges are mounted along the many flat faces of the cones, held in place by 'T' shaped keys sliding along keyways machined parallel to each face (right). By tightening or loosening the bolt, the free-floating cone is allowed to move, either forcing the wedge outwards or allowing them to be compressed. This allows for extremely fine adjustment of the wedges and subsequently the outer diameter, resulting in the desired size for the coiled brush when wrapped.

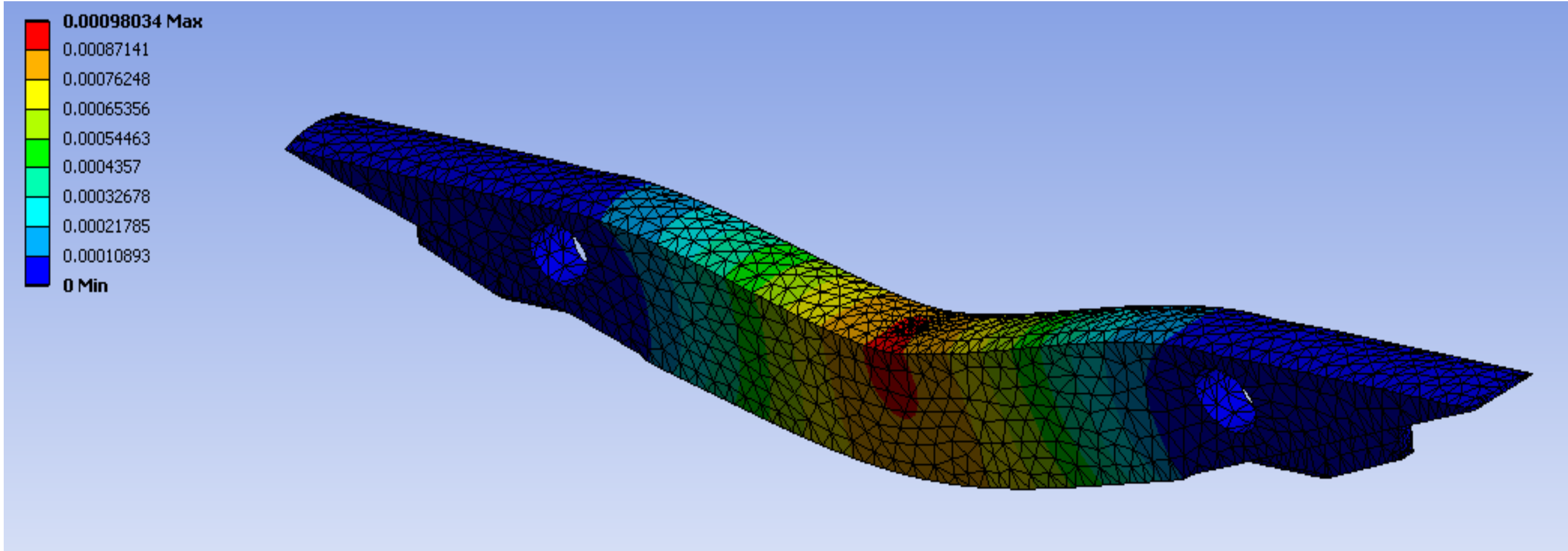
Final Design



The final mandrel can be seen above in the fully closed configuration (top) and fully open configuration (above). Machined from anodized 7075-T6 Aluminum with 4130 Alloy Steel keys, the resultant mandrel has an 8" to 10" range and a weight of approximately 150 lbs.



Total Deformation of a model via ANSYS, showing the strength of the final design with a 750 lbf load.



Wedge deformation amounts to 0.001" at 750 lbf.

The Sponsor



Problem solved.
Sealeze is a company locally based in Chesterfield, specializing in Strip Brushing and Weather Seal products used for shielding, sealing, cleaning, skirting, and other industrial applications.