

# SonicAire Autosweep

SonicAire



## PROBLEM STATEMENT

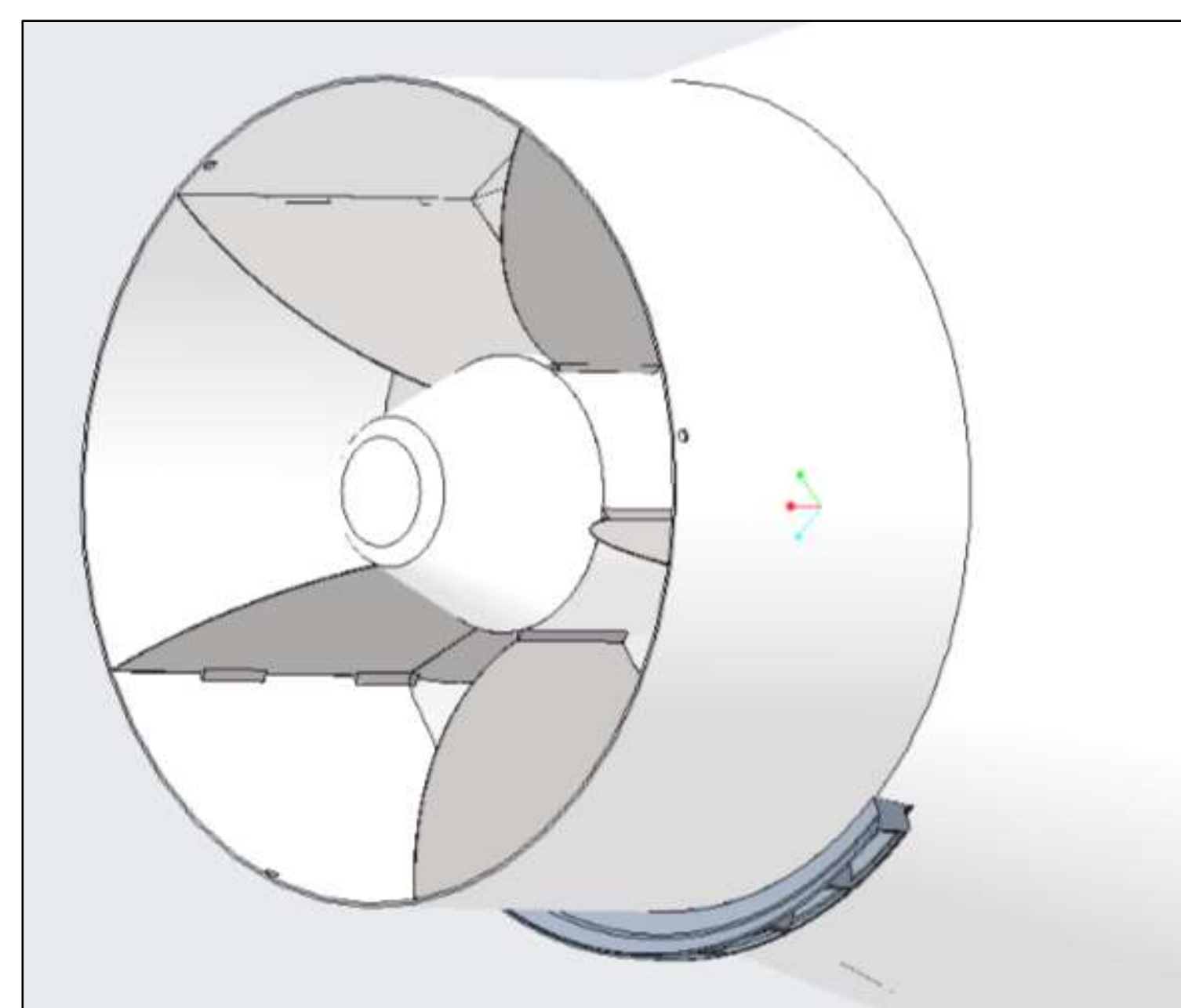
- SonicAire's current floor-mounted fan design has limited range and motion creating a prominent "dead zone" directly in front and under the fan. The goal of this project was to redesign the fan system to eliminate the dust dead zone, improve range and effectiveness, and maintain or reduce the overall height of the unit to better fit in constrained industrial spaces.

## REQUIREMENTS

#	Description
1	Maintain a noise level under 80 dB
2	Electrical equipment must be powered by 3-phase + 1 ground, 60 Hz and either be 230, 460, or 575 V
3	Maintain a UL Listed Type 12 dust tight rating
4	Electrical components must fit inside existing enclosure of certain dimensions
5	Maintain Fan Guards
6	Total height needs to be under 38 inches

## CONCEPTS

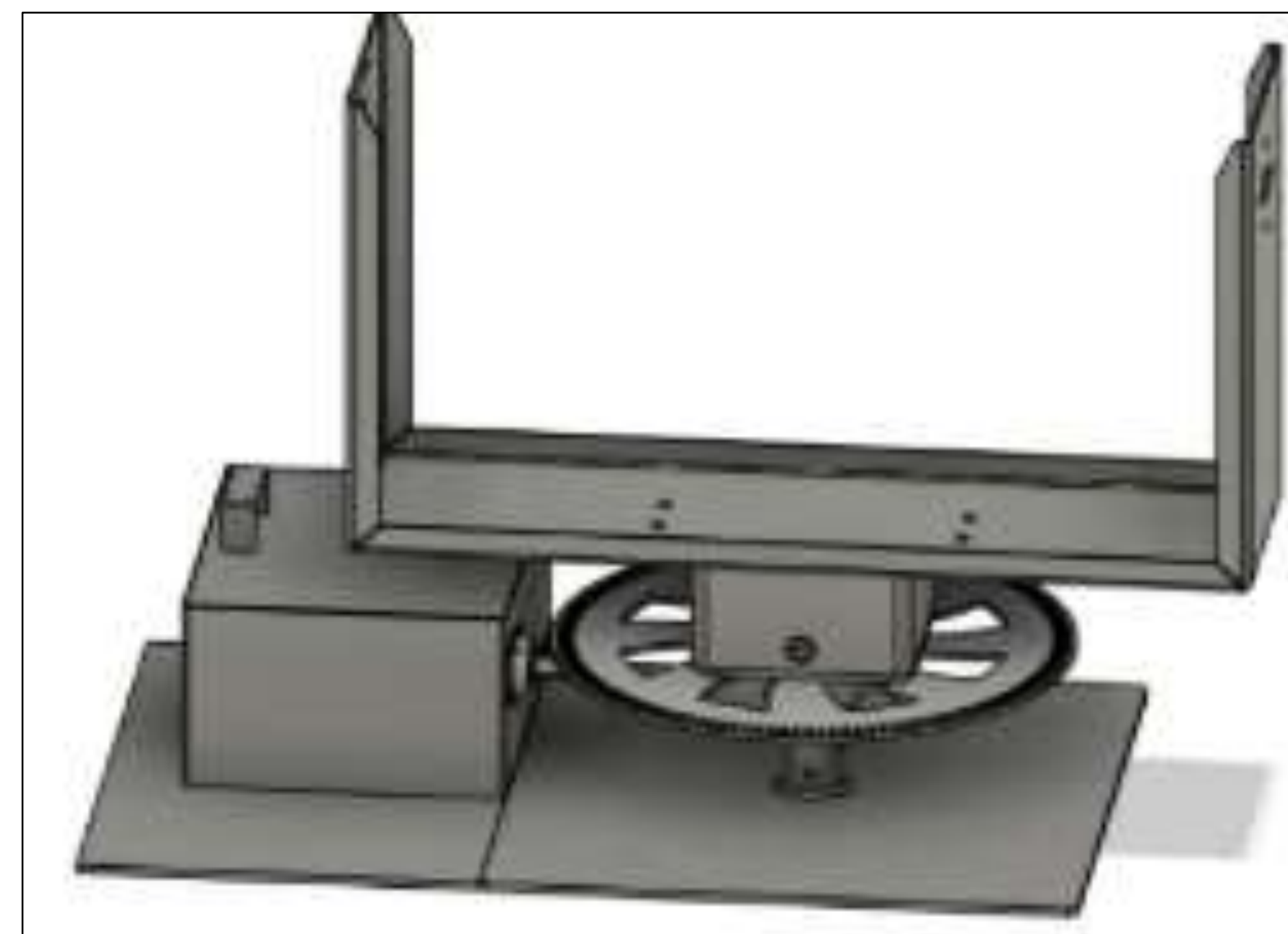
- The first design concept was to fix the problem of having dead space underneath the shroud by making a vent port in the bottom of the shroud.
- The second design concept was to make the fan be able to spin 360 degrees so that the fans will not have to be placed on a grid system, since they will be able to clean all the way around themselves.



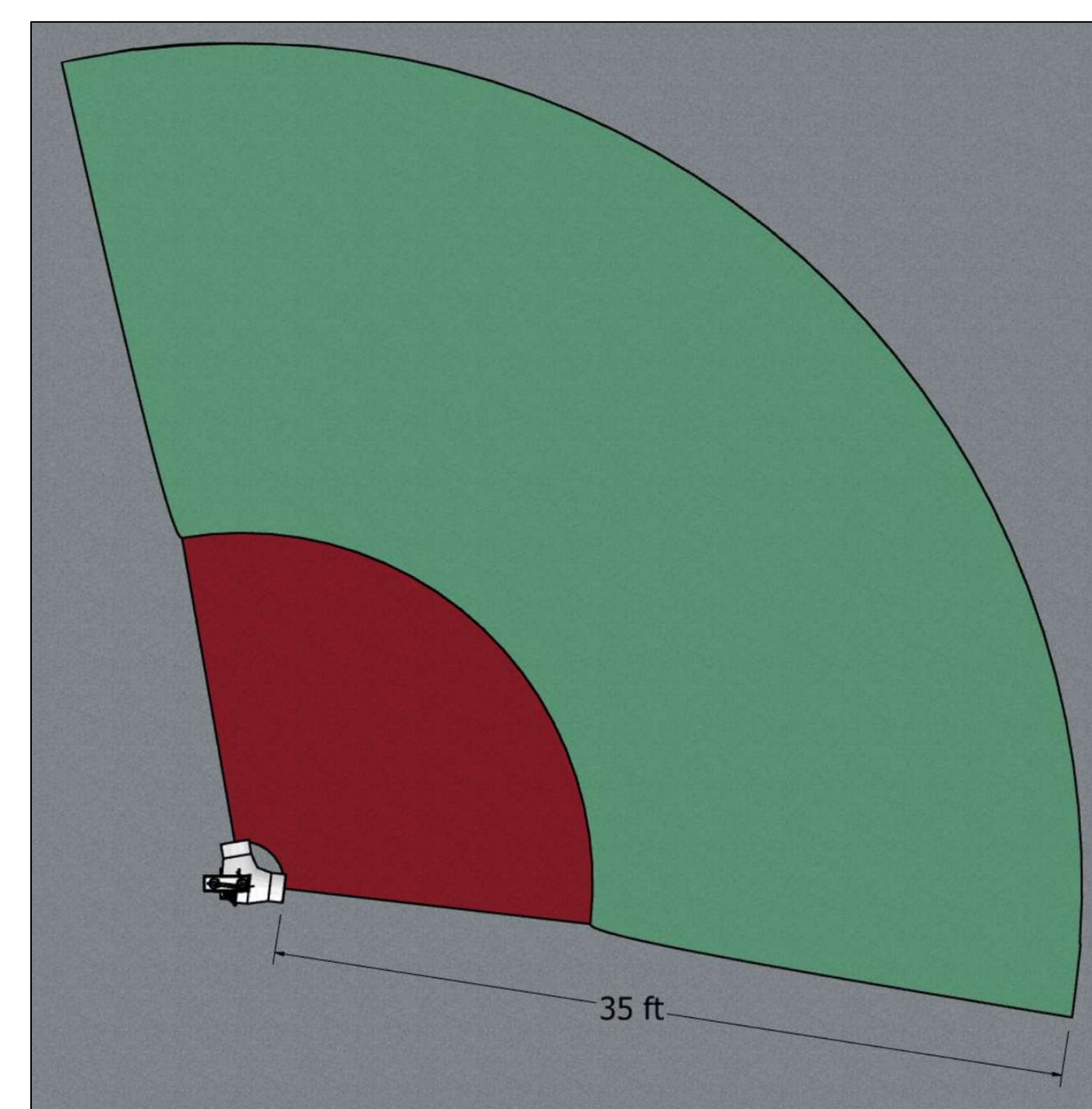
## FINAL DESIGN, APPROACH, PLAN

- The final solution for the SonicAire AutoSweep redesign focuses on enabling smooth, reliable 360-degree continuous rotation while maintaining a compact and serviceable structure. The team prioritized durability, modularity, and electrical safety in the final implementation. The design consolidates rotating components, reduces mechanical complexity, and maintains compatibility with existing SonicAire electrical and mechanical systems. The fan also has some rotation inside of the yoke, giving it even greater coverage.

CAD model showing full yoke and motor assembly



Previous fan coverage

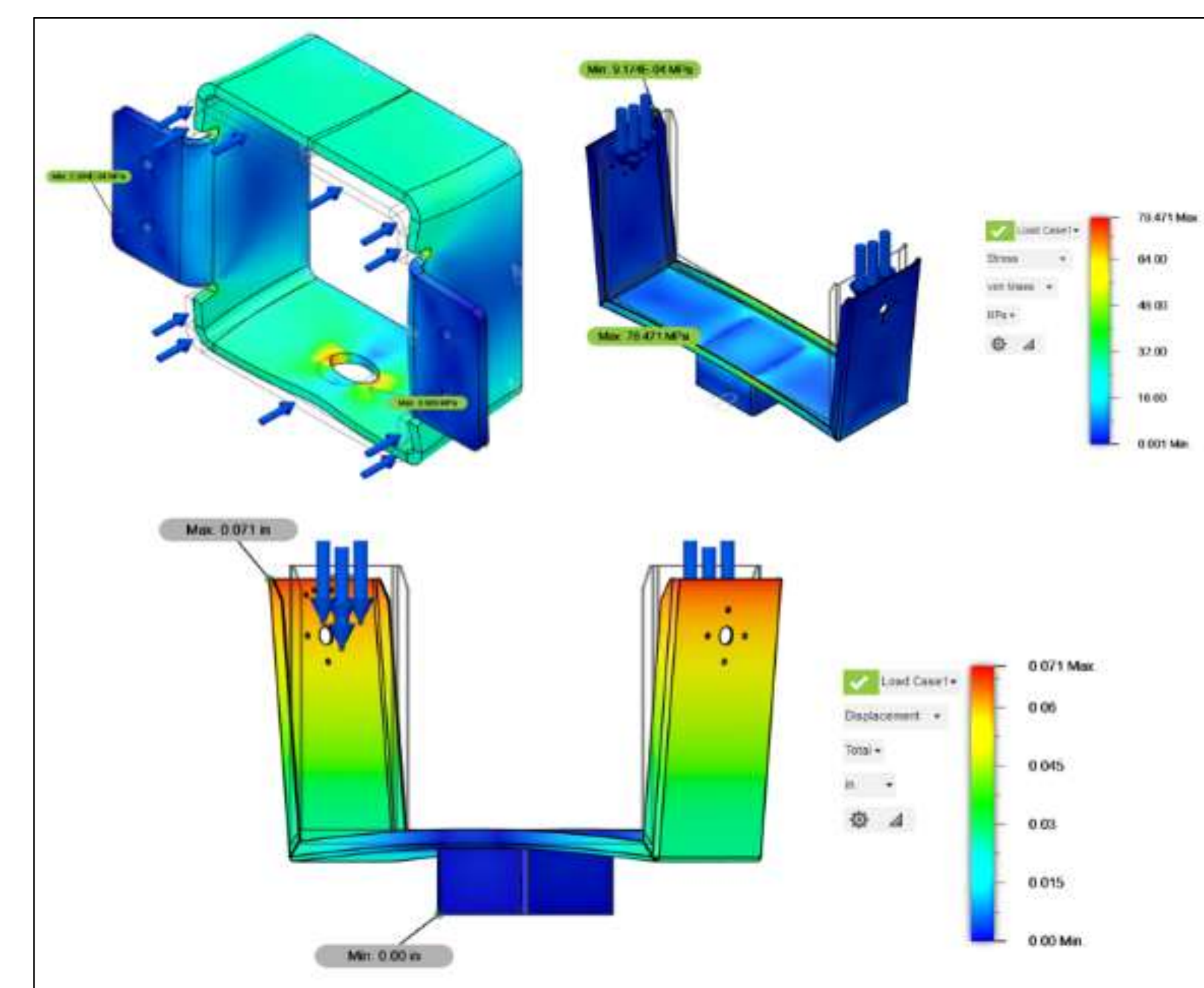


## RESULTS

The following tests were performed to ensure that the final design met all the requirements that were previously established:

Test	Status	Notes
360° Rotation Test	Passed	Smooth motion; slip ring performed without fault
Electrical Load Test	Passed	Stable Power, no circuit interruptions
Noise Compliance Test	Passed	Measured between 68-74 dB at 10-30 ft
Slip Ring Continuity Test	Passed	No signal loss during extended full-speed rotation
Durability Test	Ongoing	Mid-term stress testing showed minor heat buildup after long cycles
Structural Stress Test	Passed	Confirmed robust base; high FOS; allowed for thinner material choice

Stress analysis on yoke and slipping housing



## SUMMARY AND CONCLUSIONS

The final solution was to create a new yoke for the fan that will give it more mobility and allows it to reach the previously unreachable "dead zone".

### Our Focus:

- 360-degree continuous rotation.
- Compact and reliable structure.
- Minimizing height.
- Ensuring durability while simplifying maintenance.

### New bearing-supported rotation:

- Enables smooth and unrestrictive movement.

### Custom Baseplate:

- Securely houses the motor and other electrical components.
- Improves system stability and ease of assembly.

### Sheet metal housing slipping:

- Facilitates reliable electrical connections during rotation.

## FUTURE WORK

- Focus on system integration across multiple fans for networked control
- Evaluate automated cleaning cycle scheduling via PLC control
- Test alternate materials for further weight reduction or cost savings

## TEAM & ACKNOWLEDGEMENTS

- Joseph Hearn: Mechanical Engineering
- David Stamey: Engineering Technology
- Nicolai Geraci: Engineering Technology
- Maggie O'Brien: Engineering Technology
- Sponsor Contacts: Michael McWilliams  
Rob Barlett, Taylor Andrews
- Faculty Mentor: Chaitanya Borra