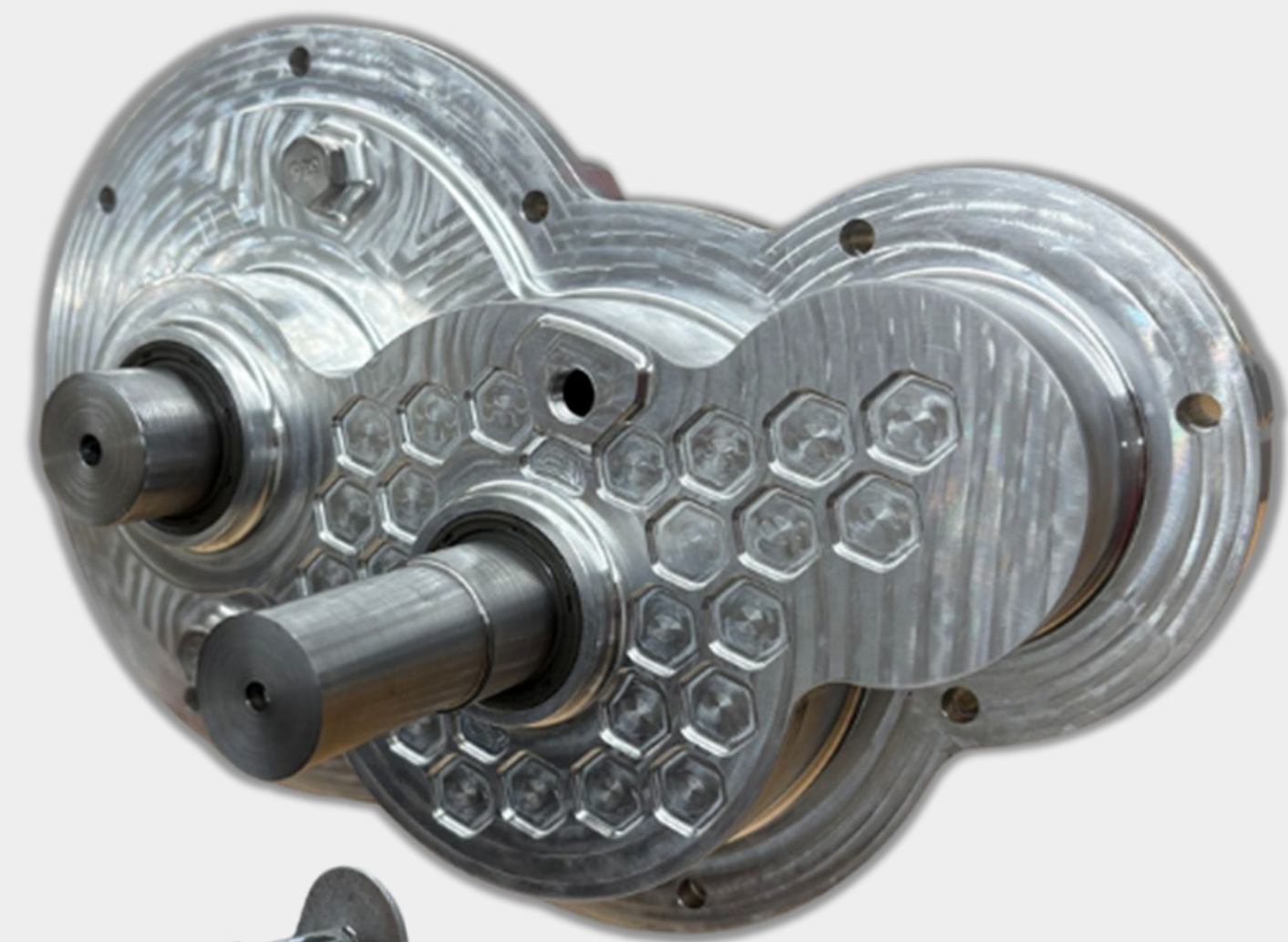


Requirements:

1. Redesign a powertrain system that complies with 2025 Baja SAE Rules.
2. Minimum 10% increase in theoretical top speed.
3. Consistent power delivery for a minimum of 6 hours without failure or servicing.



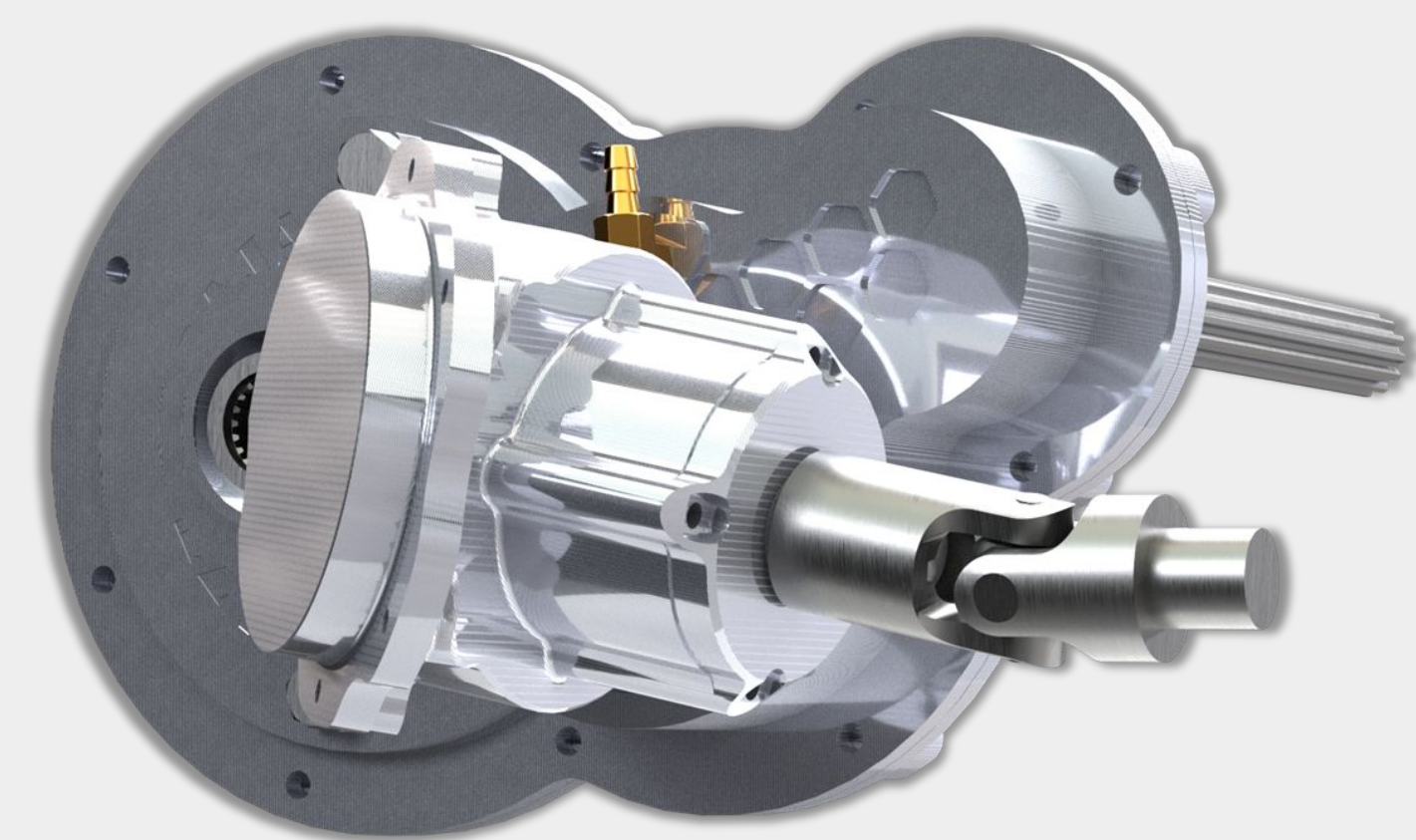
3 Shaft Transaxle

- 2-Stage fixed gear reduction
- Used asymmetric gears, to reduce size and weight while maintaining strength.
- Rear Wheels: 5.086:1 Ratio



Arctic Cat Front Differential

- Shifted part of the gear reduction to the front of the powertrain for better weight distribution.
- Allowed driveshaft to be lighter
- Front Wheels Final Ratio: 5.86:1



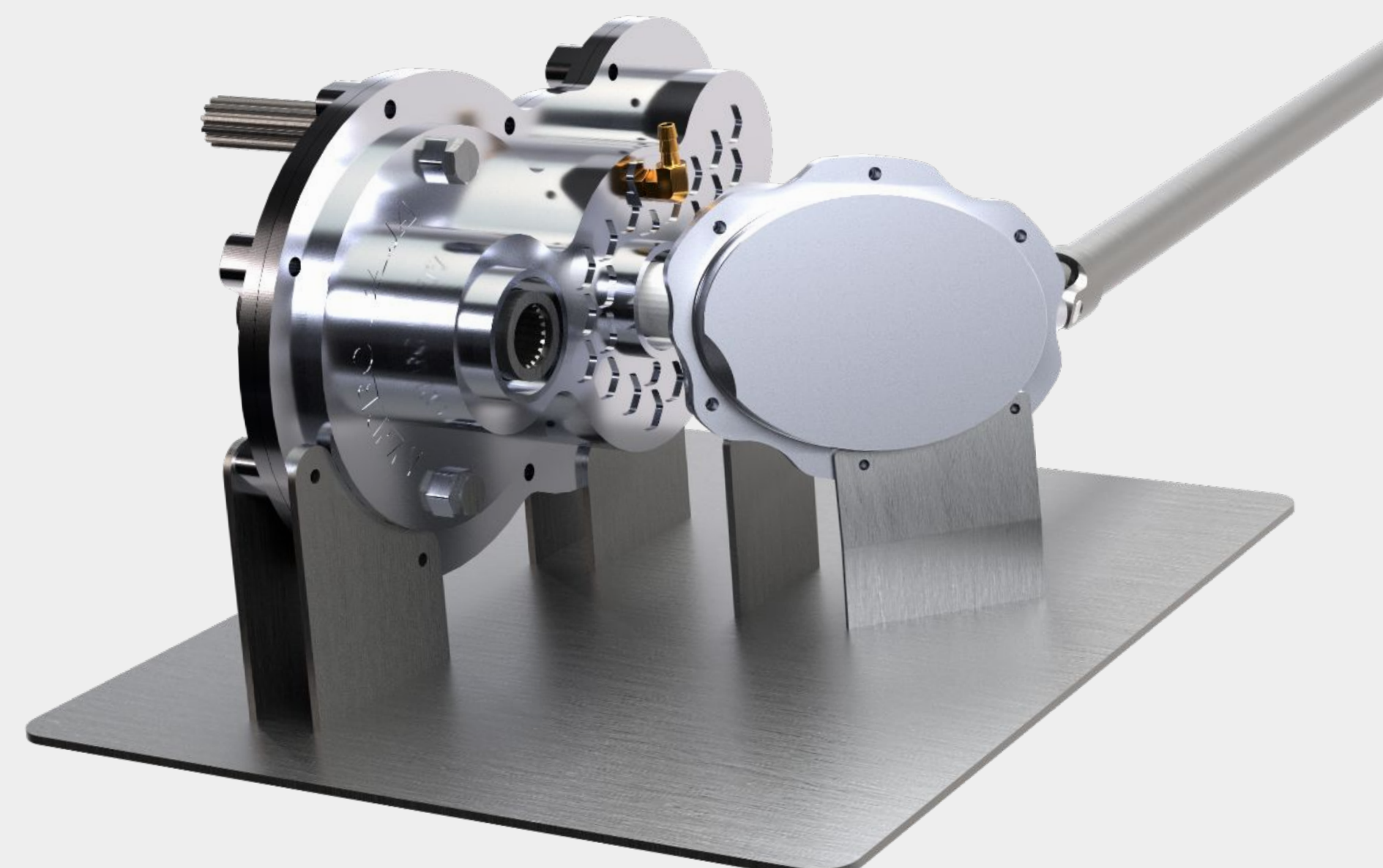
Bevel Gearbox

- Bevel gears transfer the rotational power from the transaxle to the driveshaft.



Driveshaft

- 1" OD, 0.75" ID Chromoly Steel Drive Shaft
- Custom machined U-joints

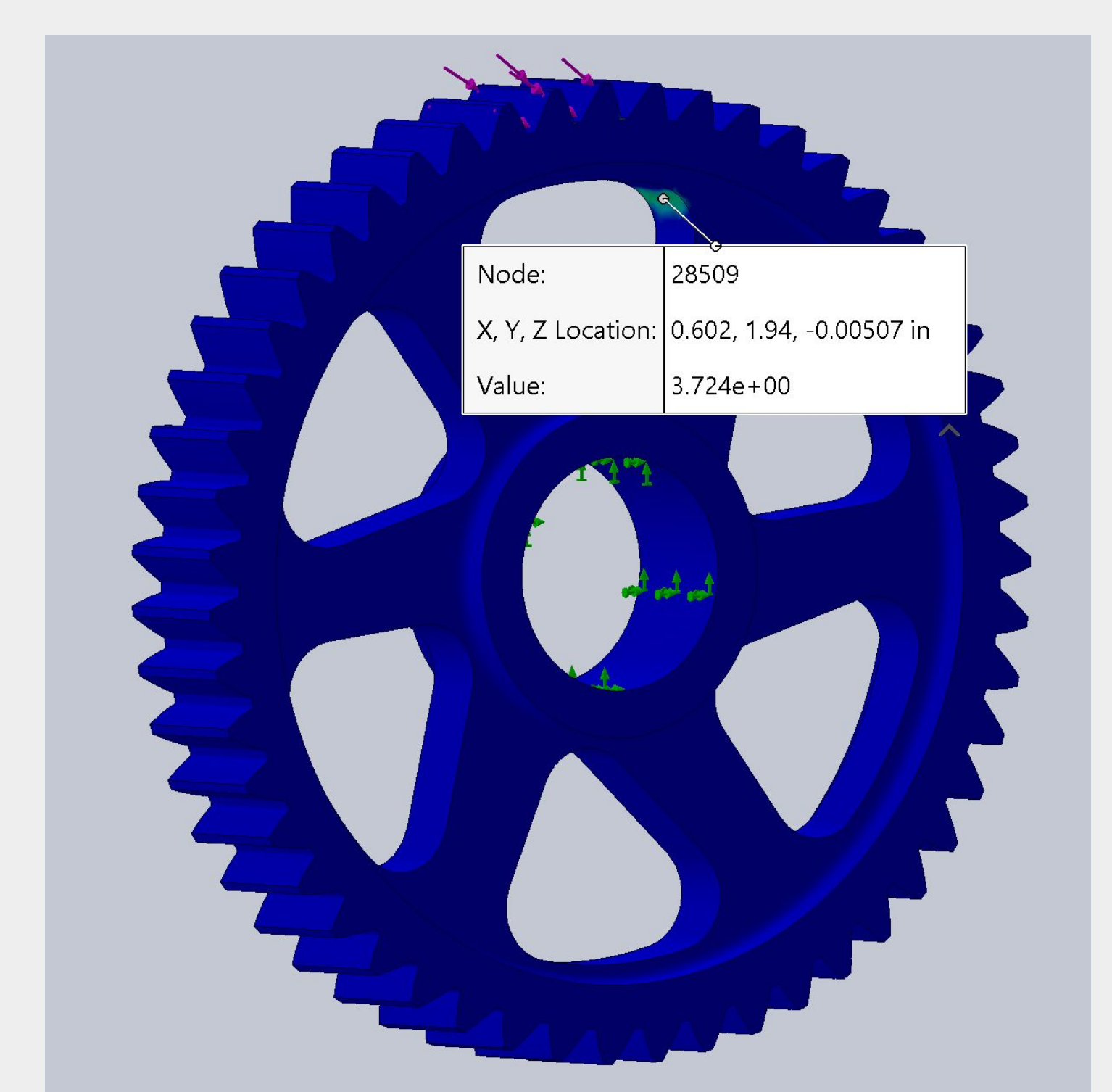


Rear-Biased AWD System:

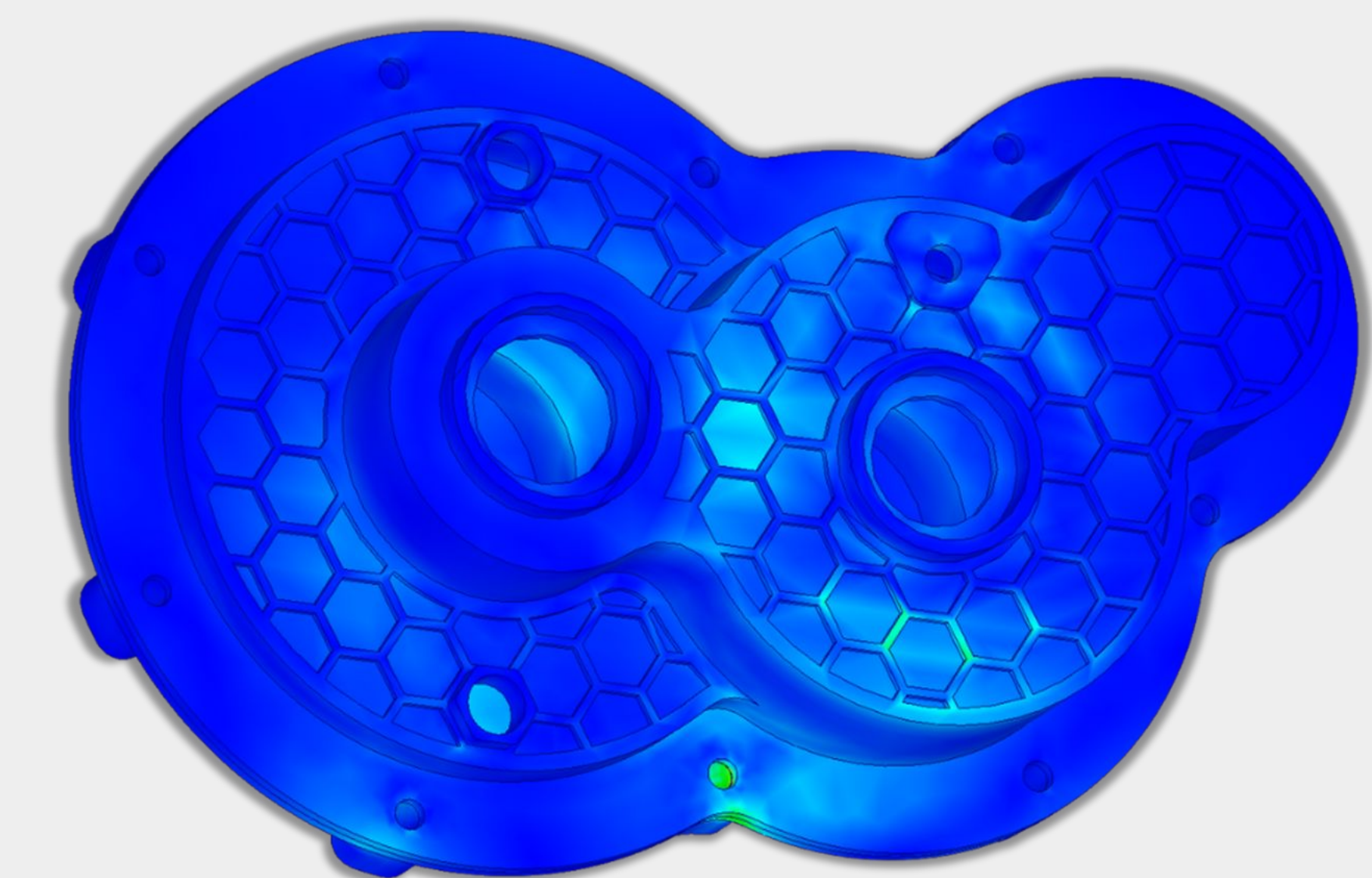
Sprag clutch placed along driveshaft to control power delivery to front wheels based on the difference in front and rear wheel speed.

Design Validation:

- Maintained FOS above 1.3 for the complete design.
- - Theoretical Top Speed = 40.36 MPH at 3000 RPM
 - ◆ - Previous Drivetrain Top Speed: 30.45 MPH at 3000 RPM (24.5% Increase)
- - Theoretical Max Torque = 407.72 ft-lbs at 2400 RPM
 - ◆ - Previous Drivetrain Max Torque: 506.53 ft-lbs at 2400 RPM (19.5% Decrease)
- Total system weight: 30.316 lbs
 - ◆ Previous Drivetrain Weight: 31.906 (5% Decrease)



Gear FEA Analysis:



Casing FEA Analysis:



AZTEC Baja Top Speed

Jacob Cahill, Noah Davis, Joe Wiest, Jacob Baumgardner, Alvin Gopez

Fall 2025