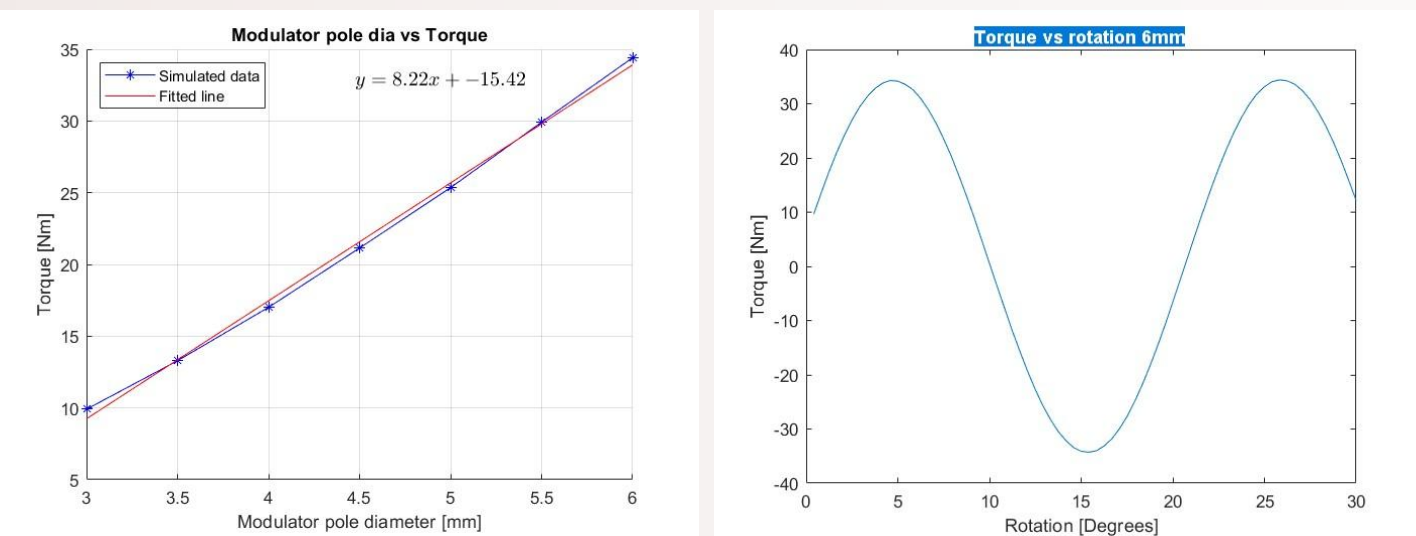


Research & Design

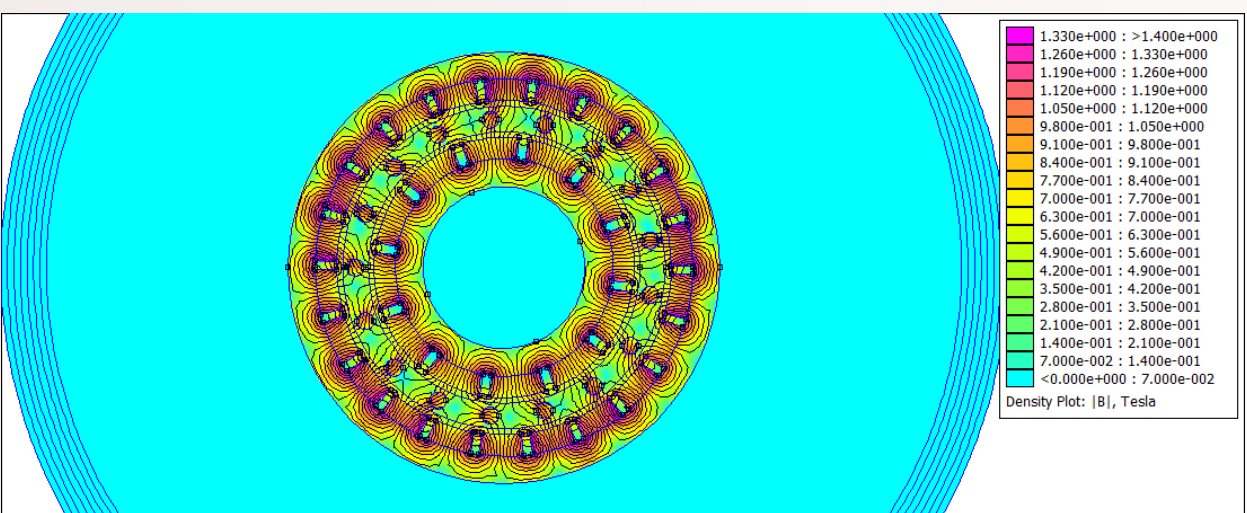
- High-Torque magnetic gear to prevent pump cavitation
- Non-contact – reduces vibration, wear, & maintenance
- Small form factor & concentric design

Description	Objective	Verification
Gear Reduction	3:1 - 2:1	Analysis
Mechanical Efficiency	95%	Torque & RPM Sensors
Torque Output	6 N*m	Torque Sensors
Max Operating Temperature	205° Celsius	Thermal Sticker and Camera

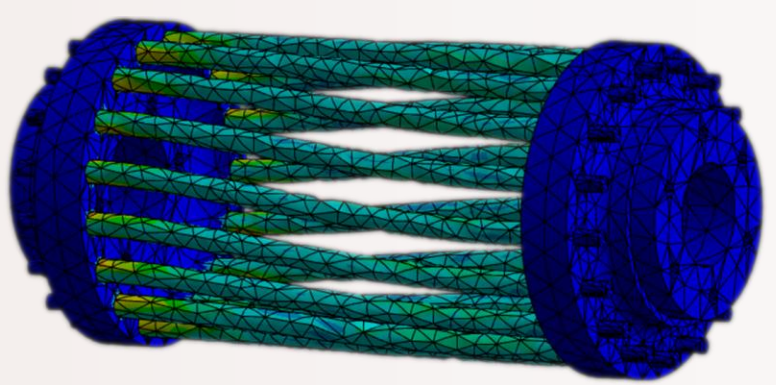
Design Objectives



Slip Torque and Air Gap Sensitivity Simulation



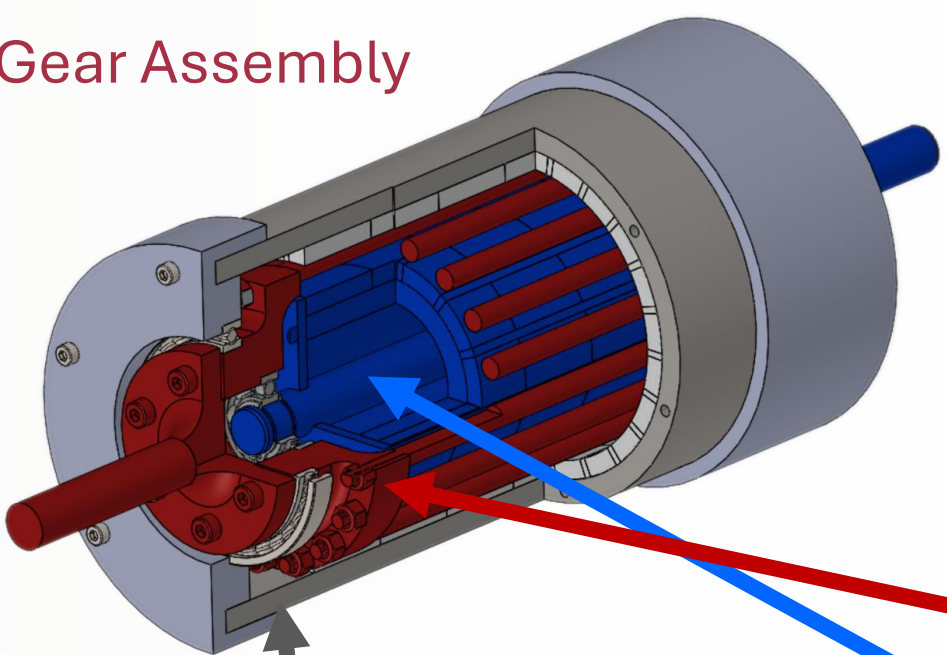
FEMM 2D Flux Distribution Simulation



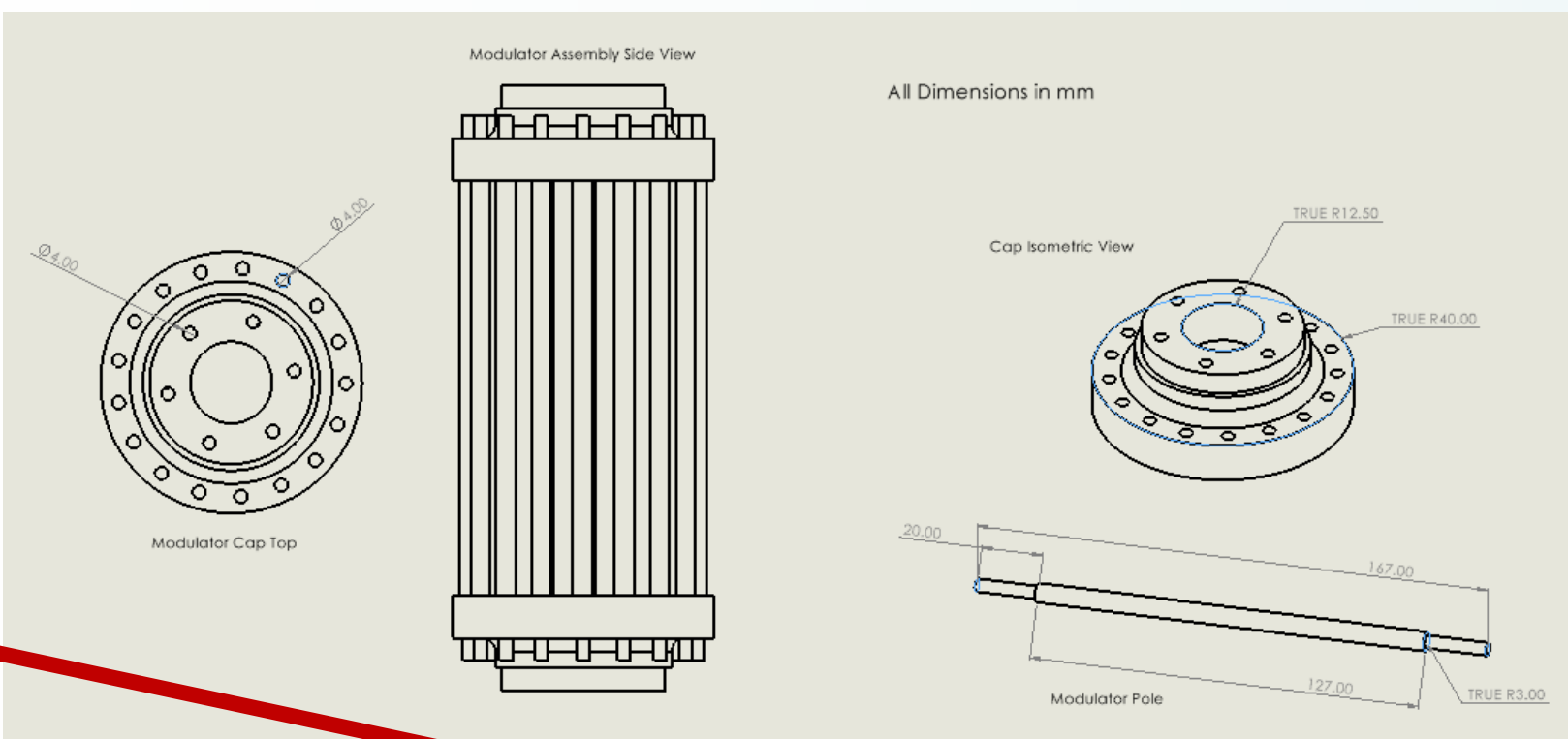
FEA – Deformation and Stress FOS of 4

Design & Final Build Result

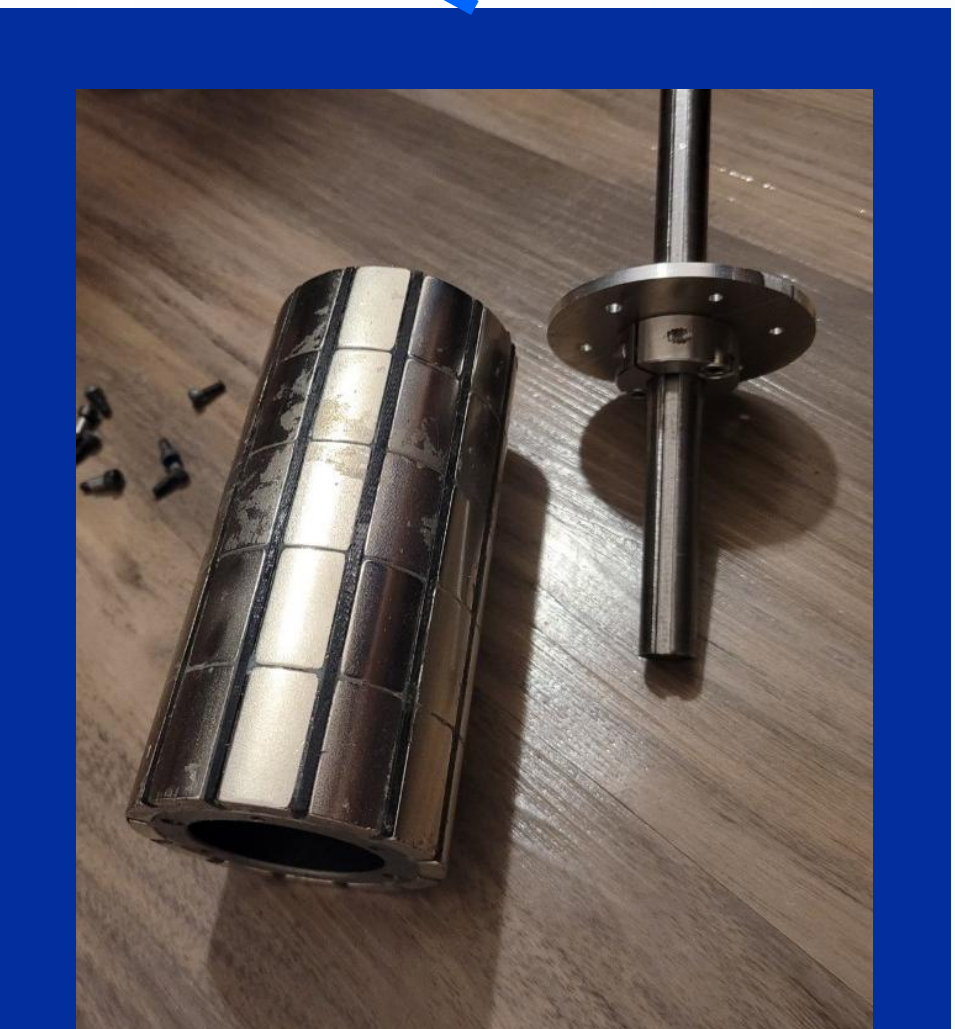
Gear Assembly



Flux Modulator Drawing



Ring Gear Assy.



Sun Gear Assembly



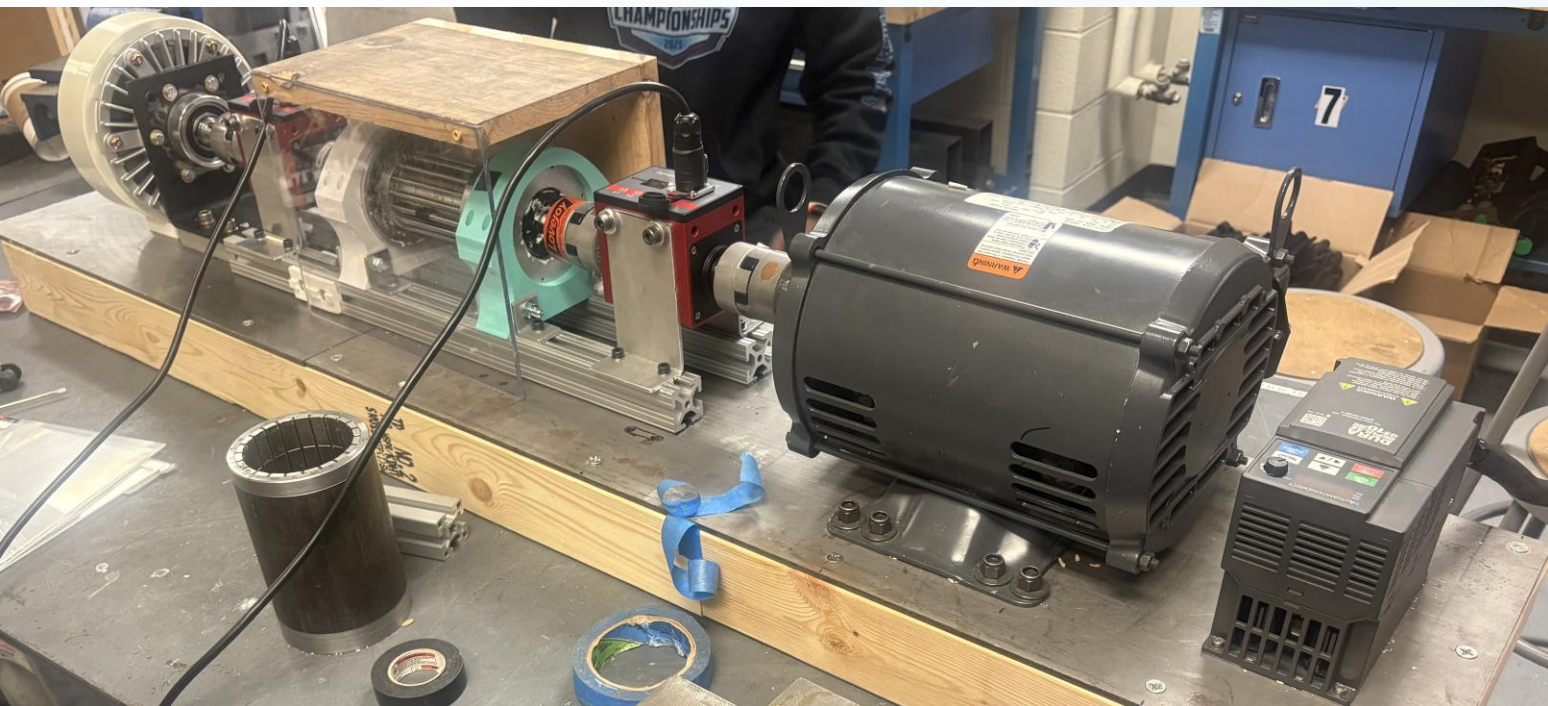
Modulator-Sun Assembly



Ring Magnets



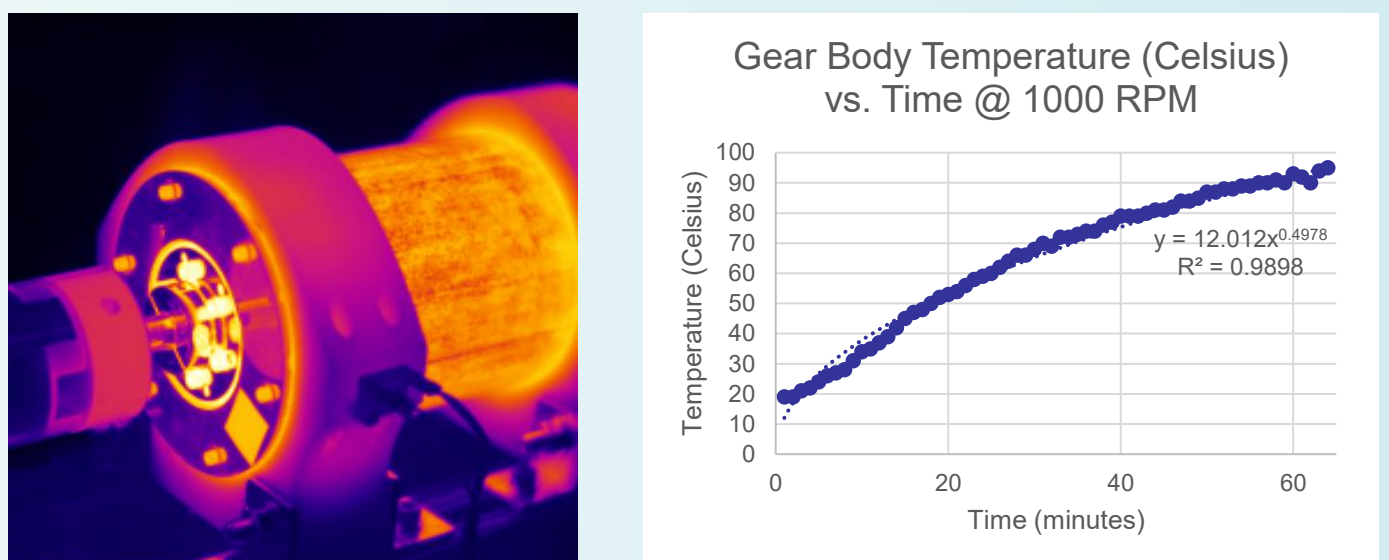
Machined Caps



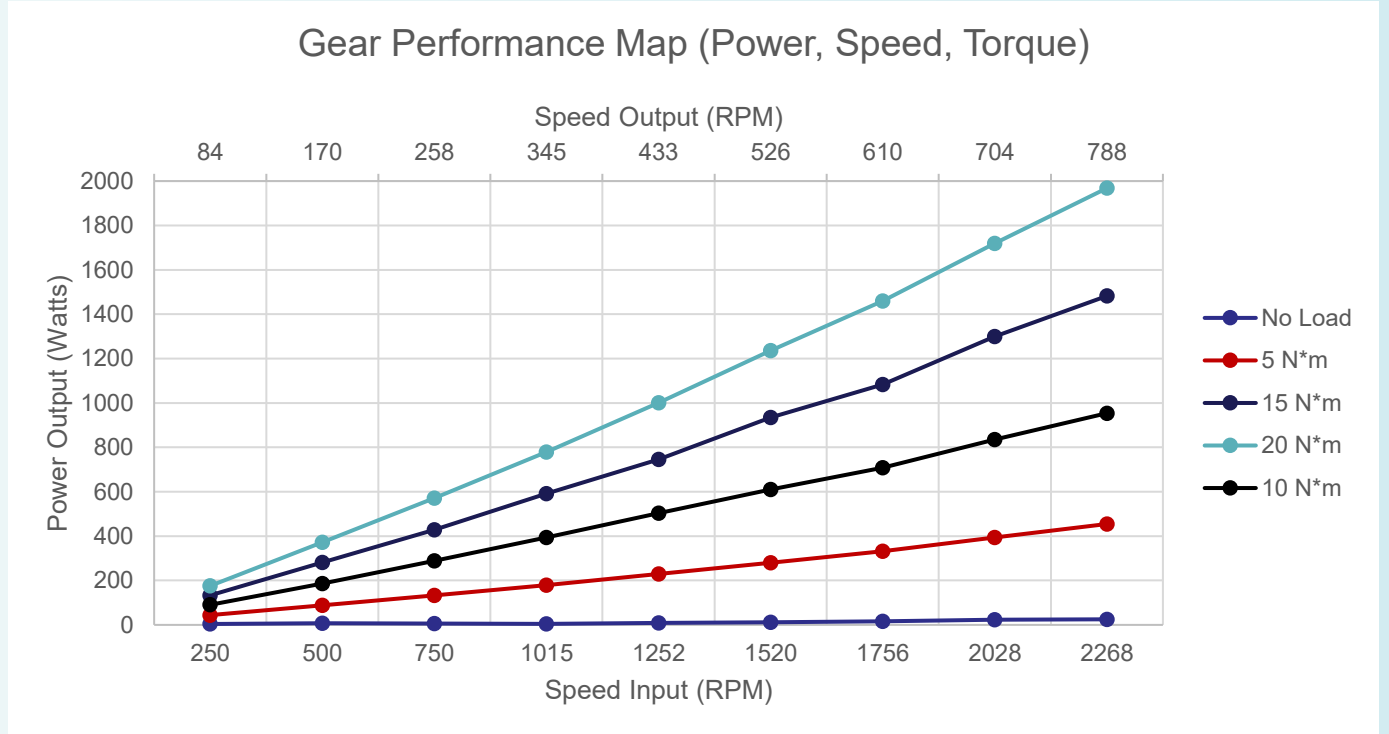
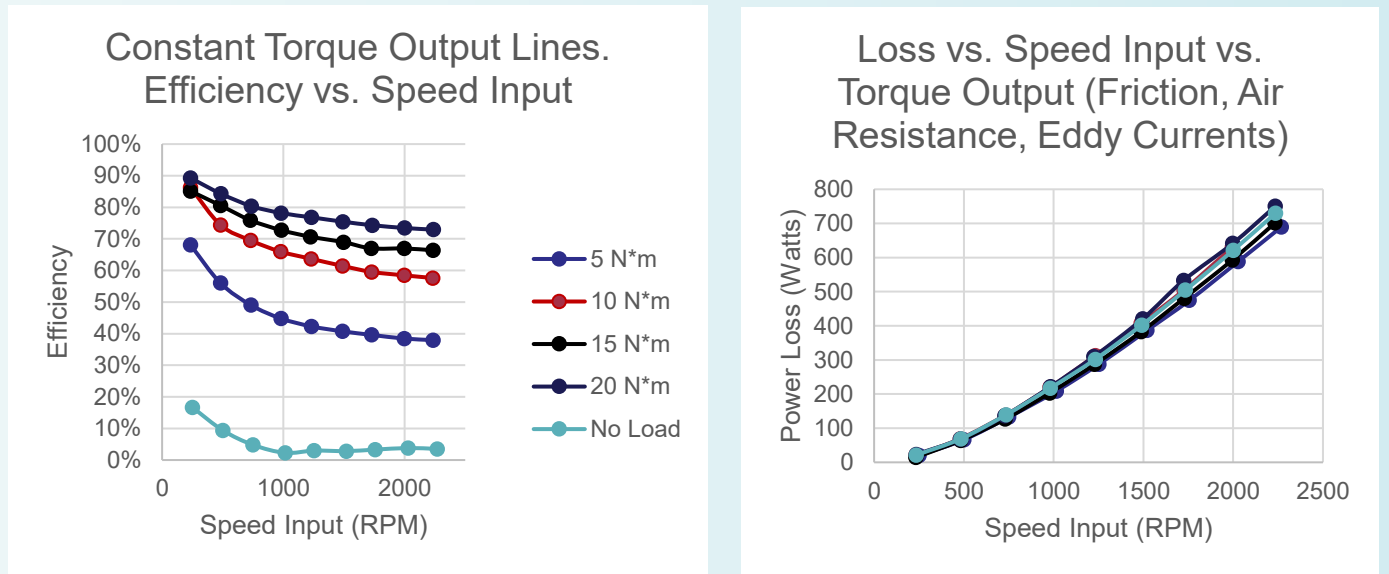
Test Rig Layout & Assembly

Testing & Analysis

Thermal Analysis – Max Temperature 188 °C



Efficiency & Power Analysis Max Torque Out = 55 Nm



Torque Output, Speed Input, and Efficiency									
Torque Output (N*m)	20	15	10	5	0	234	484	736	981
	89%	84%	80%	78%	77%	75%	74%	73%	73%
	85%	81%	76%	73%	71%	69%	67%	67%	66%
	86%	74%	70%	66%	64%	61%	60%	58%	58%
	68%	56%	49%	45%	42%	41%	40%	38%	38%
	17%	9%	5%	2%	3%	3%	3%	4%	4%
	234	484	736	981	1232	1491	1734	2001	2237
	Speed Input (RPM)								

- Project Overview
- Future Design - Insulate Flux Modulator to reduce temperature
 - All Requirements Met