M1.04 Car Braking System Design & Optimization

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Sponsor: Abhimanyu Sharotry – Bobcat Racing

TEXAS STATE UNIVERSITY

The rising STAR of Texas

BOBCAT RACING

BACKGROUND

The Formula SAE competitions challenge teams of university undergraduate and graduate students to conceive, design, fabricate, develop and compete with small, formula style vehicles. The competition is an engineering education competition that requires performance demonstration of vehicles in a series of events, both off track and on track against the clock

GOAL

To optimize the braking assembly of the Bobcat Racing Formula Car. Through Design, Manufacturing, and implementation , we will be able to supply a functioning and optimized brake assembly for Bobcat Racing to use in their formula car.

OBJECTIVES

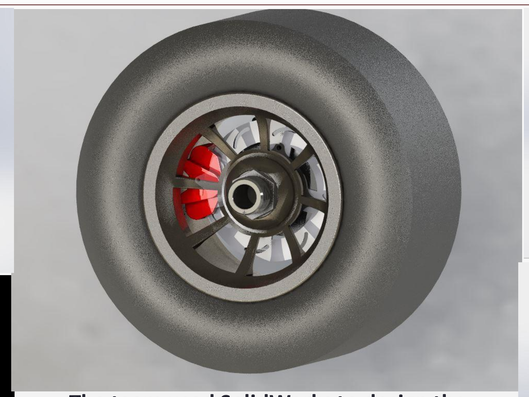
- Functionality between Brake Components
- Optimized Design for reliability and performance
- Reliability that supports the driver and car

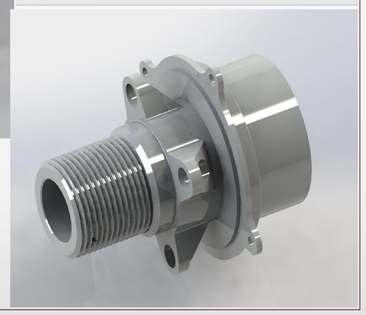
SPECIFICATIONS

- 1045 Carbon Steel Spindles
- Be able to fully stop a 400lb Car with driver
- Dual piston Willwood PS-1 Brakes
- A36 Carbon steel (7 gauge) brake rotors
- 7.25 in brake rotor diameter

PROTOTYPES

DESIGN





The team used SolidWorks to design the components in the assembly. Implementing knowledge from previous courses taken here at Ingram School of Engineering

KEY OPTIMIZATION POINTS

- Material Selection- (1045 Carbon Steel vs Aluminum)

Strength & Durability
Cost
Machineability

- Design Enhancements on Spindle
- Heat dissipation on brake rotors

THERMAL ANALYSIS

PARAMETERS-
CONVECTION- 90 W/M^2
HEAT POWER= 6660W
INITIAL TEMP =72°F

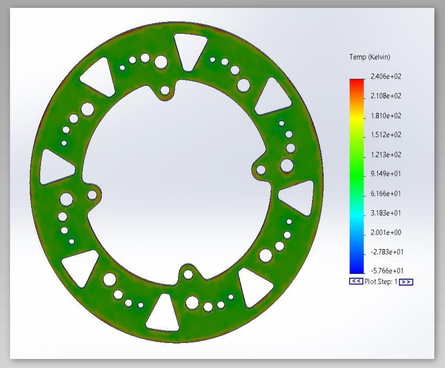
THERMAL ANALYSIS BENEFITS-

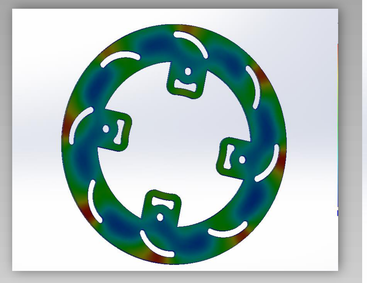
- Test operating temperatures
- Visual representation on heat points
- Data prior to manufacturing parts

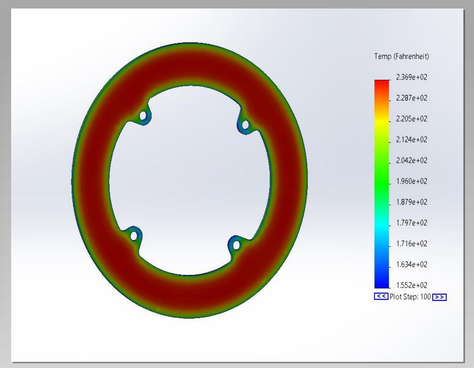
$$KE = \frac{1}{2}mv^2$$

$$HeatPower_{total} = \frac{KE}{\Delta t}$$

$$HeatPower_{onebrake} = \frac{(.6)HeatPower_{total}}{2}$$

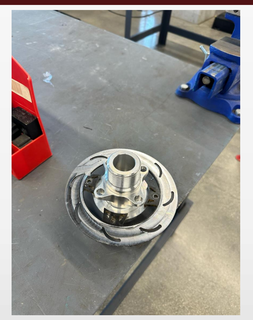






CURRENT STATUS

- Design process is completed
- Assembly for one wheel completed
- Manufacturing process for one wheel completed
- Next steps (combine with brake pedal assembly components)
- Mounted on to a Bobcat Racing (BR) car and tested.



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West Masone – Chassis Lead, Specifications advisor
Harrison Thramann- Makerspace operations
Manufacturing support

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