SAE Mini Baja - Drivetrain

Problem Definition and Project Plan

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Overview

- Introduction
- Needs
- Project Goal
- Objectives
- Operating Environment
- Constraints
- Gathering Information
- Project Planning

Introduction

- SAE Sponsored
- Project Description
- Participants
- NAU Mini-Baja composed of 3 teams:
    1. Frame
    2. Drivetrain
    3. Suspension

Customer Needs

Dr. John Tester

- Lightweight - Dr. Tester wants the vehicle to be, at most, 450 pounds, which is 150 pounds lighter than last year’s Mini Baja design

Problem Definition and Project Goal

- Design and develop a drivetrain that is able to attain the desired torque and speed for the SAE Mini Baja in order to place in the top 10 in the Hill Climb and Acceleration challenges against competing universities.

Objectives

Objectives	Measurement Basis	Units
Size	Volume gearbox occupies	in^3
Weight	Gearbox weight	pounds
Cost	Cost to produce	dollars
Acceleration Test	Timed from 0-100ft	seconds
Hill Climb Test	Distance traveled	feet
Safety	Adequate factor of safety	F.O.S.

Constraints

- Use provided engine - Briggs & Stratton 10 hp OHV Intek
- Design drivetrain within SAE baja rules
- Complete a 100 ft trial in 4 seconds on level dry pavement
- Able to climb an incline of greater than 60 degrees
- Manufacturable

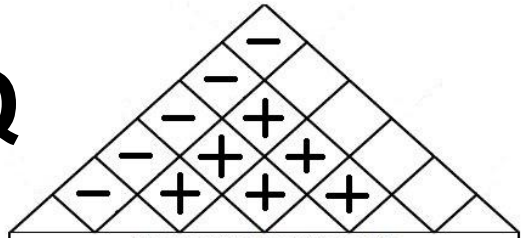
Testing Environment

- Pavement
- Mud
- Gravel
- Rock

Acceleration Challenge

Hill Climb

QFD/HOQ

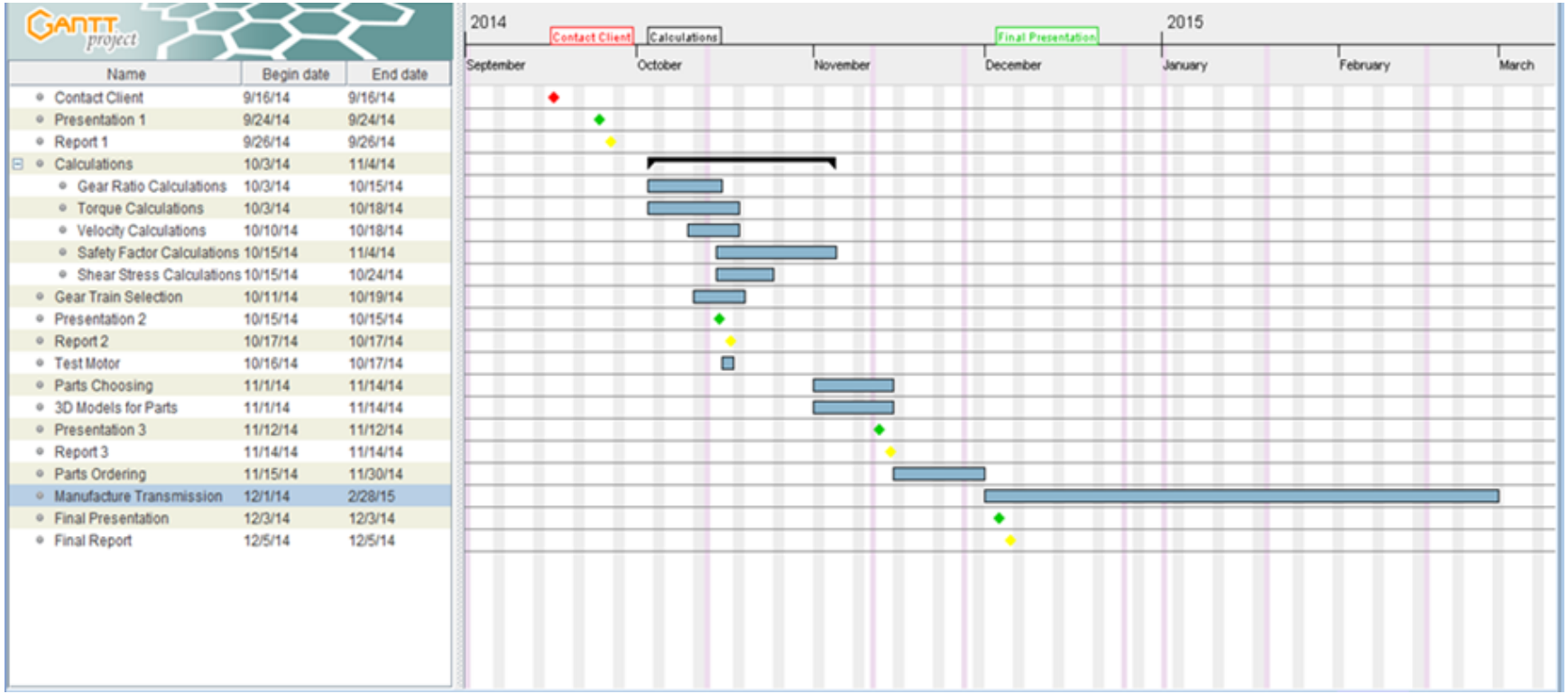


			Engineering Requirements						
	High -9 Medium - 5 Low - 1 None - 0		Cost	Weight	Volume	Acceleration	Hill Climb Angle	Safety	NAU Baja 2013-14
		Weighted %	↓	↓	↓	↑	↑	↑	
Customer Needs	Lightweight	30%	9	9	9	9	9		
	Reverse Gear	20%	5	9	9				X
	Reliable	30%	9	9	1			9	X
	Manufacturing Limitations	10%	9	9	9	9	9		X
	Inexpensive	10%	9	9	5	9	9	9	
		Units	$	lbs	in^3	sec	Degrees	F.O.S.	
		Score	8.2	9	6.2	4.5	4.5	3.6	
		Weighted Percentages	22.78%	25.00%	17.22%	12.50%	12.50%	10.00%	
		Targets	2500	100	1000	4	65	>2	
		NAU Baja 2013-14	3000	160	1809.5	5.879	40	10	

Research

- State of the Art
  - Transmissions Textbook
  - SAE 2015 Rules
  - SAE Mini Baja 2013-2014 NAU Chapter Webpage
  - Previous SAE Mini Baja projects from other universities

Gantt Chart



Name	Begin date	End date
Contact Client	9/16/14	9/16/14
Presentation 1	9/24/14	9/24/14
Report 1	9/26/14	9/26/14
Calculations	10/3/14	11/4/14
Gear Ratio Calculations	10/3/14	10/15/14
Torque Calculations	10/3/14	10/18/14
Velocity Calculations	10/10/14	10/18/14
Safety Factor Calculations	10/15/14	11/4/14
Shear Stress Calculations	10/15/14	10/24/14
Gear Train Selection	10/11/14	10/19/14
Presentation 2	10/15/14	10/15/14
Report 2	10/17/14	10/17/14
Test Motor	10/16/14	10/17/14
Parts Choosing	11/1/14	11/14/14
3D Models for Parts	11/1/14	11/14/14
Presentation 3	11/12/14	11/12/14
Report 3	11/14/14	11/14/14
Parts Ordering	11/15/14	11/30/14
Manufacture Transmission	12/1/14	2/28/15
Final Presentation	12/3/14	12/3/14
Final Report	12/5/14	12/5/14

Worden

Conclusion

- Project Introduction
- Customer Need - Weigh, at most, 450 pounds
- Project Goal - Competitive drivetrain in the top 10
- Objectives - Lightweight and safe transmission
- Constraints - Manufacturable at NAU
- QFD/HOF
- Testing Environment - Off road
- Project Planning/Schedule

References

- 2015 Collegiate Design Series: Baja SAE Rules http://bajasae.net/content/2015%20BAJA%20Rules%20.pdf
- Tester, John T., PhD, Associate Professor Northern Arizona University, personal communication, Sept. 2014.
- SAE Mini Baja 2013-2014 NAU Chapter Webpage: http://www.cefns.nau.edu/capstone/projects/ME/2014/SAE-MiniBaja/
- Transmissions Textbook: Lechner, G., Harald Naunheimer. Automotive Transmissions: Fundamentals, Selection, Design and Application. Berlin: Springer, 1999.
- NAU Student Chapter of SAE “2006 Mini Baja,” www.cens.nau.edu/~jtt3/Minibaja06, April 2006

Questions?