SAE Baja Competition

Problem Formulation and Project Plan Team Drivetrain

Andrew Perryman, Abdulrahman Almuflih, Caizhi Ming, Ruoheng Pan, Zan Zhu

Oct 7, 2013

Overview

- 1. Introduction
- 2. Goal Statement
- 3. Objectives
- 4. Needs Identification
 - a. Customer Needs
 - b. Engineering requirements
 - c. QFD

5. Product Specification

- a. Introduction
- b. Requirements
- c. Constrains
- 6. Project Plan and gantt chart
- 7. Conclusion
- 8. References

1. Introduction

- Sponsored by SAE
- Project description
- Participants
- The engine is provided
- The Baja competition project in NAU:
 - 1. Frame design
 - 2. Suspension design
 - 3. Drive-train design

2. Goal Statement

• To build a rigid and durable Baja vehicle that can successfully complete all of the SAE competition events.

3. Objectives

- Satisfy the client and stakeholder needs and requirements
- Build a drive-train for the Baja vehicle so that it can complete the following tests successfully:
 - 1. Acceleration
 - 2. Traction
 - 3. Maneuverability
 - 4. Specialty
 - 5. Endurance

4. Needs Identification

- Customer Needs
- Engineering requirements
- Quality Function Deployment (QFD)

Customer Needs

- Six most important customer needs
 - Ability to climb the hill
 - Ability to pull an excess load
 - Able to reverse
 - Large max Velocity
 - Durability
 - Inexpensive
- Customer Needs described by Engineering Requirements

Engineering requirements

- Material strength(Kpa)
- Torque(N.m)
- Power efficiency(%)
- Velocity(m/s)
- Cost(\$)

Quality Function Deployment (QFD)

	Engineering Requirements for Drive-train								
Customer Needs	Customer Weights	Cost	Size	Torque	Weight	V elocity	Material strength	Power efficciency	
Safety	7	3			3	1	9		
Accelarate fast	8	1	3	9	3	3		9	
Able to climb the hill	10	1		9	3	3		3	
Able to pull an excess load	10	1		9	3	1		3	
Durability	9	3					9		
Long maintenance period	5	3	3				9		
Drive fast	10	1		3	3	9		3	
Able to reverse	8			9					
Inexpensive	7	9	1		1		3		
	Raw score	164	46	354	142	161	210	162	
	Relative Weight	13%	4%	29%	11%	13%	17%	13%	
	Unit of Measure	Dollors	m^3	N.m	kg	m/s	Kpa	ul	
	*ul> Unitless by r	nethod							

5. Project Specification

- Introduction
- Requirements
- Constrains

Introduction

- 2014 Collegiate Design Series Baja SAE rules govern the requirements and constraint of our design.
- This was provided to us through SAE and explicitly states what is legal and illegal.

Requirements

- All requirements were implied not stated
- Select and Design a transmission given a specific motor that will allow you to complete multiple strenuous tasks.
- This transmission should be able to withstand repeated performances of each task.

Constraints

- Because we are required to design for this part there were not too many constraints specifically for the drivetrain
- The Briggs & Stratton motors are governed at 3800 RPMs

6. Project Plan

- Meet with the client 9/16/13
- Project research 9/17/13---10/7/13
- Calculations 10/7/13---10/18/13
- Final analysis 10/17/13---10/21/13

6. Project Plan

- Parts choosing and ordering 10/21/13---11/7/13
- 3D models 11/4/13---11/15/13
- Build 11/15/13---3/5/14

Gantt Chart

			2013				2014	2014				
_	project Name	Begin date	End date	September	 October	 November	l December	January	 February	l March	 April	l May
0	Contact Client	9/16/13	9/16/13									
9 0	Search for project	9/17/13	10/7/13	-	-							
	search for the CVT	9/17/13	9/30/13									
	Search for the Seconda	9/30/13	10/7/13									
0	report and presentation	10/7/13	10/7/13									
9 0		10/7/13	10/18/13									
-	Safety factor and shear	10/7/13	10/18/13									
	Torque calculation	10/7/13	10/18/13									
	Velocity calculation	10/7/13	10/18/13									
	Gear Ratio calculation	10/7/13	10/18/13									
0	Parts choosing	10/17/13	10/28/13									
	Report and Presentation	10/28/13	10/28/13			1						
	Parts ordering	10/28/13	11/14/13									
	Report and Presentation	11/18/13	11/18/13									
	3D models for parts	11/18/13	12/2/13									
	Report and Presentation	12/2/13	12/2/13				I					
	Assemibe 3D model	1/17/14	2/17/14									
0	Assemble parts	2/17/14	3/17/14									
	Road Test	3/17/14	5/13/14									

Gantt Chart

(Ç	ANTT project		2013			
		Name	Begin date End date			September ÖC	tober
	0	Contact Client	9/16/13	9/16/13		0	
Ŷ	0	Search for project	9/17/13	10/7/13	1000		
		search for the CVT	9/17/13	9/30/13			
		Search for the Secondary Reduction	9/30/13	10/7/13	1000		
	0	report and presentation	10/7/13	10/7/13			
Ŷ	0	calculation	10/7/13	10/18/13	1000		
		Safety factor and shear stress calculation	10/7/13	10/18/13			
		 Torque calculation 	10/7/13	10/18/13	1000		
		 Velocity calculation 	10/7/13	10/18/13			
		 Gear Ratio calculation 	10/7/13	10/18/13	1000		
	0	Parts choosing	10/17/13	10/28/13			
	0	Report and Presentation	10/28/13	10/28/13	and the second		

7. Conclusion

- Needs identification: customer needs, engineering requirements, and QFD
- Project specification: requirements and constrains
- Project plan: Gantt chart

7. References

1. 2014 Collegiate Design Series: Baja SAE®Rules <u>http://www.sae.org/students/2014_baja_rules_8-</u> 2103.pdf

QUESTIONS?