PURDUE UNIVERSITY

CAPSTONE/DESIGN EXPERIENCE 2016

NFPA 2015/2016 Chainless Challenge

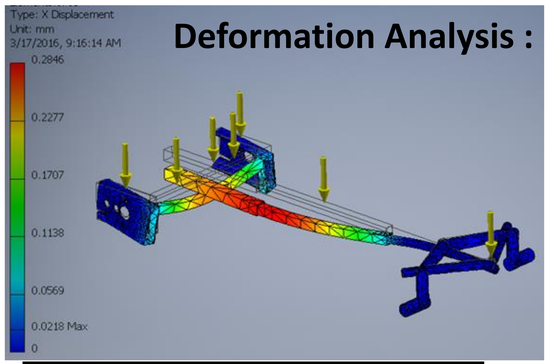
Agricultural & Biological ENGINEERING

Trevor Overstreet (Agricultural System Management)

Overall Objectives:

The team's prototype vehicle was designed to meet two objectives: to excel within the Chainless Drive Competition and to be a competitive addition to the marketplace. These objectives could be broken down into two sets of criteria. For the competition, a bike that is capable of high speeds, allows variable power input, has high energy output per energy input, was designed of energy regeneration, and will continue to function properly after much use. For the marketplace, design an easy to use and maintain, comfortable, technically proficient vehicle than can be manufactured at a low cost was needed. These criteria were combined with safety in bikes final design.

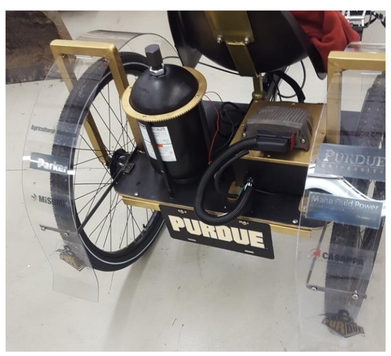
Deformation Analysis :

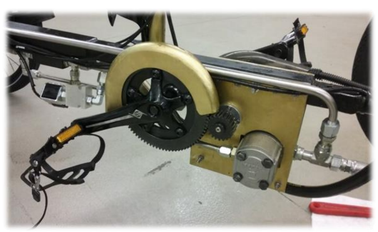


The maximum stress and deformation calculated was 74.4×10^6 N/m^2 and 0.284 mm, respectively. These values are small enough in comparison with the characteristics.

Safety and new ideas:

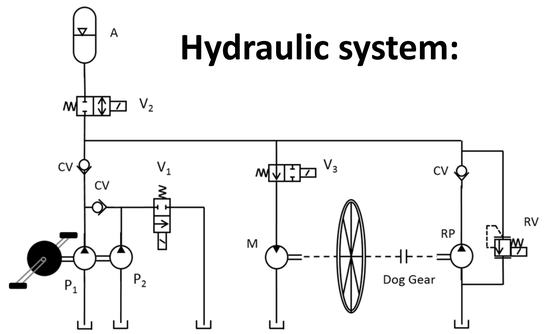
Modifications were made to the HydroKart to ensure that it could be safely operated, stored, and maintained. Below is the 2014,2016 and 2015 (left to right)





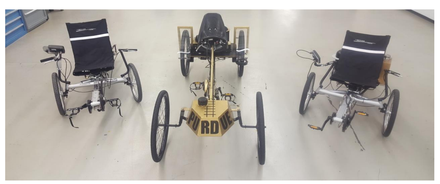
Final Design:

Hydraulic system:



P1 + P2: Dual Gear Pump
M: Gear Motor
RP: Regeneration Gear Pump
RV: Proportional Relief Valve
CV: Check Valves
V1: Two way On-Off Valve normally-closed
V2: Two way On-Off Valve normally-closed
V3: Two way On-Off Valve normally-open
A: Accumulator

Alterative Designs:



Potential Production Cost and Price:

Basic

Feature	Cost
Shimano Nexus 8 Speed	$350

Basic Version Total Cost: $2873.4

Premium

Feature	Cost
Shimano Alfine 8 Speed	$500
Heart Rate Monitor	$170

Premium Version Total Cost: $3193.4

Luxury

Feature	Cost
Shimano Alfine 8 Speed	$500
Heart Rate Monitor	$170
Regeneration Brake	$530

Luxury Version Total Cost: $3723.4

Summary:

We began with a $99 frame from tractor supply for a peddle go cart, used many recycled parts off of Purdue salvage bikes and machined everything at Maha Fluid power. Purdue was the first ever 4 wheeled bike to finish the Chainless Challenge in its 15 year history.

Impact & Sustainability

National Competition Ranking

1st Manufacturability/Workmanship
1st Best Design Chosen by Teams
1st Best Paper, Midway, Presentation
2nd ASME Best Overall
2nd Innovation – Uniqueness of Design/Originality
2nd Reliability & Safety
4th Cost Analysis
4th Best sprint
4th Efficiency Challenge
7th time trail

Computerized heath monitoring system will aid in a more effective work out and raise overall fitness.

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Parker

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Dr. Bernie Engel

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PURDUE ENGINEERING Think impact.