CAPSTONE EXPERIENCE 2014
Purdue Quarter Scale Chassis Dynamometer

PURDUE UNIVERSITY

Agricultural & Biological ENGINEERING

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Problem Statement

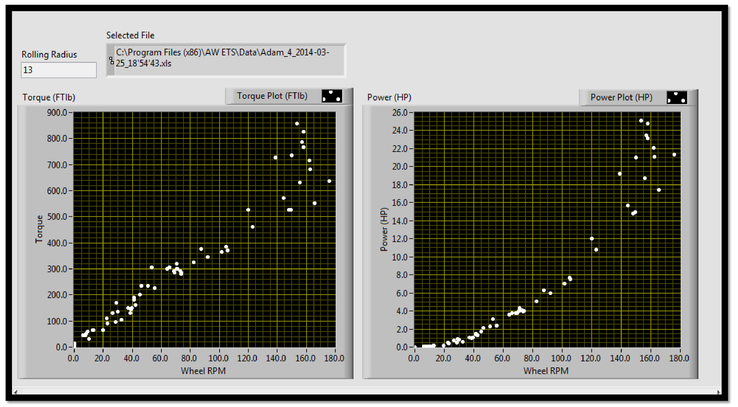
The goal of the project is to design, fabricate, and test a small vehicle chassis dynamometer for the Purdue Quarter Scale Pulling Team that will allow the testing and development of the quarter scale tractors.

Design Criteria

- Ease of operation for students
- Low build cost
- Reliable chassis roller connection to loading device
- Computerized data acquisition capabilities
- Accurate Testing Procedure

Data Acquisition

- Developed using AW ETS software and LabVIEW
- Retrieves data collected by ETS and corrects for tire size and the power transfer through the chassis rollers
- Allows the user to easily view and interpret the data without extensive data modification



Data Acquisition LabVIEW Application

PTO Guard, Belt Guard, and Hitch

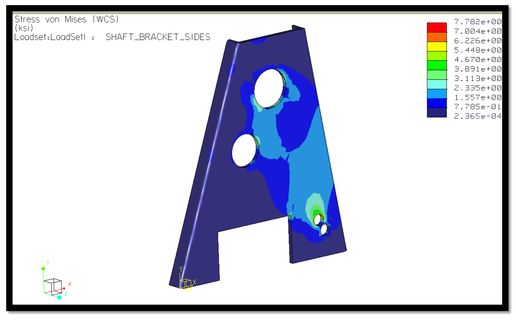
Alternative Solutions

- Four alternative designs considered
- Utilized combinations of hydraulic pumps and gear boxes
- Water brake dynamometer also considered
- All designs considered are vastly more expensive

Chassis Dynamometer Front View

Testing Procedure

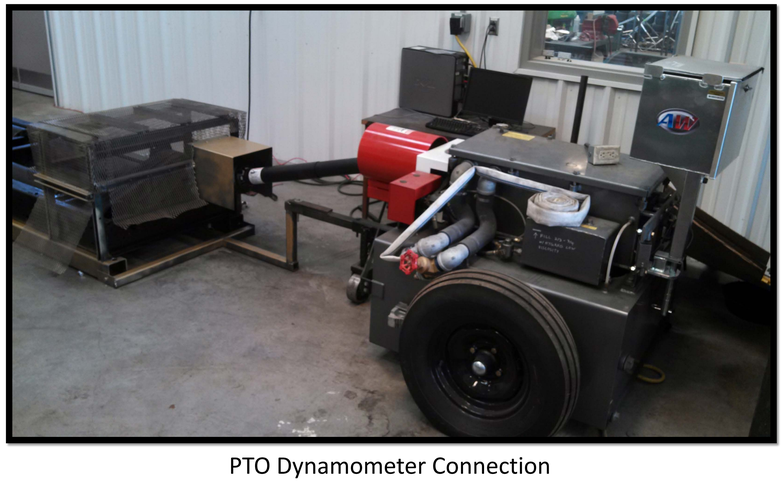
- Developed to allow any user to safely obtain all of the benefits of the chassis dynamometer
- Outlines safety procedures, maximum loading conditions, and maximum speed conditions
- Describes in detail the operation of the data acquisition system and its uses
- Ensures accurate testing procedures that will offer the user meaningful data for their application
- Specifically outlines the testing procedure for Purdue Quarter Scale Tractors to allow for future development of powerful, winning tractors



Swinging Frame FEA

PTO Connection, and Hitch

- Manual belt tensioning system developed
- PTO adapter and upper shaft modification to allow PTO dynamometer connection
- FEA performed on new loading conditions for the hinged upper shaft frame
- Hitch added for safe connection to PTO dynamometer
- PTO guard added and mesh guard modified to safely work with new testing requirements



PTO Dynamometer Connection

Design Area	Item/ Category	Cost	Notes
Chassis Dynamometer	PTO Dynamometer	$30,000.00	Already obtained by department
	Chassis Rollers	$5,000.00	Already donated
	PTO Adapter	$50.00	
	Ramps	$100.00	
	Various components	$600.00	Nuts, bolts, etc
	Data Acquisition	$1,000.00	Computer, cables, ETS software
	Total	$36,750.00	
	Total New Purchases	$1,750.00	

Cost Summary

Sponsor: Dr. John Lumkes
Graduate Advisor: Daniel Skelton
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Scott Brand, Garry Williams, John Andruch
Course Instructors: Dr. Bob Stwalley, Dr. Bernie Engel