Heavy-Duty Diesel Engine Friction Reduction Testing and Analysis

Overview
Volvo 1-A designed a test cell to quantify parasitic and pumping frictional losses on Volvo-Mack’s 11 liter Diesel Engine. Thermocouples and pressure transducers were used to quantify pumping frictional losses. A torque sensor, placed between the driveshaft and flywheel was used to quantify parasitic losses.

Objectives
The objective for the senior design is to quantify friction losses on Volvo’s current 11-liter engine model. Team members will remove hardware and specific components to measure energy losses due to friction. The two areas of concern are the engines parasitic losses and pumping losses.

Approach
- Customer Needs Assessment
- Literature Review/Patent Search
- Engineering Specifications
- Concept Generation of Test Cell
- Test Cell Design
- Cad Drawings
- Labview Program Design
- Engine Temp/Pressure Instrumentation
- Sensor Components
- Dynamometer Control
- Torque Sensor Calibration
- Thermocouple/Transducer Calibration

Outcomes
Team Volvo 1-a built a working test cell run by a dynamometer with complete integrated real time censoring, fluid circulation, and Labview data acquisition.
- Future groups will be able to use this test rig to run a multitude of engine tests
- Volvo will be able use this rig in the future to quantify frictional losses and improve on the efficiency of their diesel engines
- Professor Boehman has the addition of a fully functional rig in his engine lab that can be used to run experiments for years
- Volvo and Penn State can continue their partnership and research with the Diesel Engine Emissions Lab with success