Heavy-Duty Diesel Engine Friction Reduction Testing and Analysis

Overview
Volvo Group Powertrain Engineering is interested in increasing fuel efficiency through the reduction of parasitic friction and pumping losses. A test cell will need to be constructed that can motor the engine and measure power losses using a torque sensor built by the Fall 2011 capstone team. Since the engine will not fire, a heating system will need to be designed and constructed to heat the oil and coolant up to operating temperatures. A test procedure will then need to be laid out and implemented to determine power losses in individual components.

Objectives
The objective of the team is to complete the design and construction of the test cell and implement the test procedure to determine frictional and pumping losses in individual engine components.

Approach
- Customer needs were acquired through weekly teleconferences and an initial site visit.
- The test cell concept was a continuation of the Fall 2011 Capstone Team’s work.
- Additional external research and patentent searches were performed to educate the team on engine friction testing.
- A 3D CAD model was initially produced to design the driveline system and so that it could be manufactured to such small tolerances.
- Parts for the driveline were produced or modified in The Learning Factory machine shop.
- The heating system concept was changed multiple times from its original design. The final design was chosen based off of simplicity and parts that were available for use.
- An initial test run was completed to verify that the test cell works in its intended manner. No data was collected.

Outcomes
- A working test cell was constructed by the team.
- The test cell can be used by future groups to perform the analysis.
- The results of the testing can be used to improve power losses and thus improve fuel efficiency.