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Transmission Friction Loss Identification with Modeling Correlation for Coast Down and Cold Start Optimization

Description of Project

Vehicle transmission energy losses in a neutral drive state (unloaded conditions), called "coast down" conditions are critical to understand for fuel economy testing requirements and modeling analysis. This understanding is critical to meet the United States Federal Requirements for General Motors corporate fuel economy. Additionally transmission friction losses during cold engine starting (temperatures to -40C) is critical to improving the design modeling process for the overall powertrain efficiency and the cost effectiveness for engine starting devices. To further reduce these friction losses will allow further weight reduction for the overall powertrain, while still meeting our customer requirements.

The student team will determine the transmission modeling analysis techniques for a high volume GM global program, front wheel drive 6 speed and/or 9 speed transmission program. They will define current data deficiencies, and develop a plan to collect required data to model a specific transmission program for neutral coast down losses and cold start frictional losses. This will include overlap with our internal Pontiac Michigan engine team to help support sizing of engine starting devices for cold start optimization. The team will become familiar with the GM global analysis steps and improve our modeling methods with data correlation for optimizing a powertrain integration with our vehicle engineering center, located in Warren Michigan.

Deliverables

Include a Deliverable (Phase I) and Details Here: BASELINE GOAL

Literature benchmarking from SAE and other sources to determine past and present analysis and testing methods used in the automotive industry for measurements of neutral frictional losses and

cold start sequencing and loading from other automotive OEM's and Tier 1 suppliers. Applying these learnings to a development plan with current modeling tools at General Motors, and testing methods for transmission and full powertrain testing at Pontiac Michigan. The students will gain testing, data collection, data post processing, and modeling skills.

Collect and document experimental measurements of transmission loaded losses (include component level losses including Spin loss, neutral coast down, and cold start frictional losses). Deliver the first analytical model based on GM historical data and collected data. Evaluate the accuracy of the model and its suitability for use for "paper analysis". Provide recommendation on cost/benefit of various options for improving the model.

Phase II: Intermediate Goals

Deliver an improved analytical model including validation of accuracy.

Include a Deliverable Phase III Here: Stretch Goal HUGE SUCCESS

Evaluate the current process of paper analysis vs. experimental testing within GM Transmission development and identify the feasible points where experimental testing could be replaced (completely or partially) with paper analysis.

Location

Most design work will take place on north campus. There will be periodic visits to GM locations. Testing will take place at GM locations in Pontiac and Warren. (MDP will provide transportation)

Project Sponsor Mentor



Wyciechowski, Heather – Lead Project Mentor – Test Technical Specialist – General Motors



Hysko, Alfonso – Senior Project Mentor – Test Technical Specialist – General Motors



Harding, Thomas – Management Project Mentor – Engineering Group Manager for Test Technical Specialist and Transmission Validation Department– General Motors

Project Faculty Mentor



Jason Martz, Assistant Research Scientist, Mechanical Engineering

Key Skills & Project Roles

MDP Sponsored Projects are both a professional and academic learning experience for students. By participating in this program, students are actively preparing for graduate school and a professional career. As part of the experience, MDP expects professional behavior. To best prepare you for future professional opportunities, your experiences on this MDP team will be very broad. In addition to key technical skills that you will bring to the team, you will engage deeply in the self-directed learning of new and important concepts, demonstrate flexibility, collaboration, and cooperation, and develop strong professional communication skills. This also means that you will need to be able to work outside of your traditional area of study in the true multidisciplinary nature of our projects. You won't always be able to anticipate how your skills and expertise will be used, so the MDP Sponsored Project will challenge you to grow and

develop as a professional.

Project Roles	Key Skills and/or Knowledge	Likely Majors
Mechanical Modeling, Simulation and Testing	Combustion Engine knowledge, advanced simulation skills	Mechanical Engineering, MICDE, ISD-AUTO, ISD-GAME, ISD-MFG
Data Analysis and Predictive Analytics	Data analysis technics, experience modeling experimental data,	Data Science, MIDAS, Statistics
Heat Transfer Simulation, Modeling and Optimization	Heat Transfer modeling, simulation techniques, experience with heat transfer modeling tools	Mechanical Engineering, Chemical Engineering, Physics,

Desired Additional Knowledge, Skills and Experience:

MATLAB experience, AMESIM experience, and expert MS Excel skills, modeling exposure

Company Overview

At General Motors, we are passionate about earning customers for life. This vision unites us as a team each and every day and is the hallmark of our customer-driven culture.

In fact, there are a lot of exciting things to share about our company. Our story starts on November 18, 2010, when we completed the world's largest initial public offering, emerging with a solid financial foundation that enables us to produce great vehicles for our customers and build a bright future for employees, partners and shareholders.

Leading the way is our seasoned leadership team who set high standards for our company so that we can give you the best cars and trucks. This means that we are committed to delivering vehicles with compelling designs, flawless quality and reliability, and leading safety, fuel economy and infotainment features. All are intended to create that special bond that can only happen between a driver and their vehicle.

Making the world's best vehicles can only happen with the world's greatest employees. We take great pride in our work, and take great care to deliver exceptional cars and a positive ownership experience to our customers around the world.

Legal Requirements

Citizenship and Right to Work Options (please select)

This project is open to all students regardless of citizenship.

Intellectual Property Agreements / Non-Disclosure Agreements

Students will sign a GM Non-Disclosure and IP Agreement

Internship Information

We have 2 internships available for this team. Once selected to join this team, students with U.S. Citizenship or the right to work permanently in the U.S. will be interviewed.

During the summer internship, students will have the opportunity to test real transmissions using the dynamometer at the Pontiac, MI Powertrain plant. They will work with vehicle integration engineers at Warren Michigan, and support engine optimization work at Pontiac Michigan. They will become familiar with data collection software which is common to the automotive industry.