Active Vehicle Grille

Overview

Active grille shutters are specialized devices that are hidden behind the main grille of certain automobiles in order to regulate airflow to the engine. These shutters open and close based upon a pre-defined signal from the car’s engine management system to optimize and balance aerodynamic drag and engine cooling requirements. This in turn increases the vehicle’s gas mileage. Using a 2010 Camaro as a test bed, our team was tasked by General Motors (GM) to design and build active shutters that are mounted directly to the main grille instead of behind it. Not only would these shutters serve to improve the vehicle’s gas mileage, but would also be seen by the customer, providing a visually appealing selling point for the vehicle.

Objectives

- Design and build functioning active grille shutters that can be seen from outside the vehicle
- Grille shutters should have ability to open from fully open to fully closed in one motion, or in varying increments
- Mount final prototype to 2010 Chevrolet Camaro

Approach

- Gathered customer needs from General Motors engineers and developed five possible concepts
- Reviewed existing patents and current active vehicle grille designs
- Used concept scoring/screening matrices to choose a design that best suited GM’s needs
- Developed drawings and SolidWorks models for various iterations of final concept
- Constructed preliminary prototypes in order to physically simulate motion of grille shutters
- Acquired necessary materials, components, and software in order to construct final prototype
- Developed code in Labview program to operate motor, which in turn rotates grille shutters
- Fabricated active vehicle grille and mounted it onto front end of a 2010 Camaro
- Tested motion of grille shutters using Labview code

Outcomes

- Developed fully mechanical prototype and mounted it onto Camaro
- Grille shutters successfully cycle from fully open to fully closed in one smooth motion and in varying increments
- Shutters can be easily seen from the outside, adding an aesthetically pleasing element to the car
- GM estimates that a finalized production version of the prototype can increase vehicle gas mileage by 5-10%