

Toyota Maintains Industry-Leading Fuel Economy by Putting Cars on a Diet and 2013 Avalon Will Be Lightest in Segment

September 05, 2012

TORRANCE, Calif. (Sept. 5, 2012) – While powertrain developments such Toyota Hybrid Synergy Drive have helped enhance fuel economy, many of the vehicles across the Toyota product line have improved their efficiency because of a focused effort on weight reduction, and the 2013 Avalon is a prime example.

Avalon Chief Engineer Randy Stephens and his development team at Toyota Technical Center (TTC) in Ann Arbor, Mich., worked toward a goal of making Avalon lighter, yet more rigid, to help improve overall driving performance. As a result, the new 2013 Avalon is 110 lbs. lighter than the 2012 model, tipping the scales at 3,461 lbs. compared to 3,571 for the 2012 model. When it arrives at dealerships later this year, the 2013 Avalon and will be the lightest-weight vehicle in the premium mid-size segment.

“Our target was to dramatically improve all aspects of dynamic performance,” Stephens explained, “Especially in the areas of fuel efficiency, handling and performance.”

Engineering for weight reduction requires examination of all elements of vehicle design and componentry to achieve weight targets and requires collaboration from vehicle design teams to isolate and address a variety of potential weight-loss areas during development. Following this process, the team was able to achieve significant mass reduction in several key areas like body structure, seat structure and wheel design.

It proved to be a challenge, however, due to the weight penalty imposed by equipment necessitated by increased regulations, improved performance targets and added customer features. With each design engineering group’s agreement, mass targets were set and carefully managed to control the overall vehicle target.

Dave Katarzynski, Program Manager of Avalon Vehicle Development offered this insight, “We established two main mass targets early in development: lowest mass among competitors (mass vs. vehicle size) and reduction of one inertia weight class rank. As part of each design engineering group's agreement, mass targets were set for each group. The groups then managed their part by part mass to keep their target and help control the overall goal. Hundreds of mass reduction ideas were tracked throughout development and periodic reviews checked status.”

The importance of mass reduction as a means of improving fuel economy, vehicle dynamics and enhancing the driving experience of the new Avalon was a major consideration, and that is where Stephen Provost, Manager, Ride and Handling, came in.

“Less mass makes Avalon more responsive and engaging near handling limits,” he explained. “Also, with less mass, less tire width is needed to reach competitive grip levels. The smaller width helps minimize drag losses to help enhance fuel economy, too.”

With the Toyota’s engineering mantra of weight reduction in place, lower vehicle weights are achieved utilizing revised lighter weight materials for vehicle construction.

Rob McConnell, Principal Engineer, Body Shell and Exterior Plastics, said, “Through the installation of a higher class of high performance polypropylene resin (more fluid), we were able to decrease the general thickness of the front and rear bumpers, resulting in a decrease in mass, aiding in achieving improved fuel economy. Also, by adopting a higher content of high-strength steel in the pillars and rocker panels, we were able to conserve mass while maintaining crash performance targets.”

Generous weight reduction of 263 lbs. is also evident in the midsize Camry Hybrid from previous generation to current model (3,680 lbs. for 2011 Camry Hybrid vs. 3,417 lbs. for 2012 model), and despite increased length and width, the new 2013 Avalon Hybrid still enjoys a weight advantage over the smaller, previous generation 2011 Camry Hybrid. Though the 2011 Camry Hybrid and the 2013 Avalon Hybrid both include the Hybrid Synergy Drive hardware (electric motors, battery, power control unit, etc.), the new 2013 Avalon model still weighs 87 lbs. less than the smaller 2011 Camry Hybrid (3,593 lbs. for 2013 Avalon compared to 3,680 lbs. for 2011 Camry). The 2013 Avalon offers a combined 40 mpg EPA-rating while the 2011 Camry Hybrid was EPA-rated at 33 mpg combined. This is as much a testament to engineering weight reduction into the vehicle structure as it is to powertrain developments that reduce component mass and overall friction in the name of efficiency.

Tin Bui, a Toyota engineer in charge of Avalon fuel economy and road load development said, “To improve the vehicle's fuel economy we focused on reducing the vehicle's resistance which lowers the engine's effort and fuel consumption. One resistance area we worked on is reducing the vehicle's weight. With reduced vehicle weight, there is less resistance to accelerate the vehicle. Lower vehicle weight also reduces the vehicle's tire rolling resistance allowing it to roll more freely.”

One reason Toyota enjoys success with consumers is because of the brand's focus on producing highly fuel efficient vehicles. In fact, in the U.S. market, Toyota is the most fuel efficient full-line manufacturer offering a vehicle lineup that includes the Prius family (Prius, Prius Plug-in, Prius v, and Prius c) boasting an average combined fuel economy rating of 48 mpg. In addition, the popular Camry sedan offers a 33 mpg average combined fuel economy rating across its models. By the end of 2012, the premium mid-size Avalon Hybrid sedan, that employs many weight-savings engineering tactics, will arrive to market with a combined 40 mpg rating, and offer consumers another highly efficient option.