

By Jim McFarland

Dealing With Fuel-Economy Opportunities

Elements That Play Into the Goal of Successfully Addressing the Mileage-Improvement Market

Taken in its entirety, this is not a simple subject. However, as SEMA members contemplate the opportunities residing in products legitimately benefiting vehicle fuel efficiency, it may be helpful to consider factors that affect how to proceed. Examined individually, topics discussed in the following paragraphs can be combined for a clearer overall perspective of this somewhat complex market segment.



Note: This story is compiled as an informational guide for exploring opportunities in the fuel-economy market segment. It deals with issues that range from identifying parts to methods of measurement, compliance requirements and rules for advertising mileage gains. Keep in mind that not all potential questions are asked or answered. Rather, use this material in the formulation of how you can and should address fuel-economy product-development benefits and marketing if your parts have that potential.

The Specialty-Equipment Market's Fuel-Economy Landscape

During the time that we have seen OEMs confronted with problems in meeting federally mandated Corporate Average Fuel Economy (CAFE) standards, fuel prices at the pump have risen to historically high levels. In the shadow of these events, emphasis has grown within the existing on-road vehicle owner population to seek increased mileage through driving habits, vehicle maintenance and specialty-equipment market products. Emphasizing this last category, there is a perception both inside and outside the specialty parts industry that the creativity and entrepreneurship of this community could enhance existing or develop new mileage-improving products.

Within this perception, however, there are certain criteria and objectives that require examination—particularly in view of the technological and regulatory complexities associated with contemporary vehicles, coupled with OEM efforts at meeting CAFE requirements, achieving marketable and verifiable fuel economy gains can be a challenge. In order to identify and clarify some of the hurdles to be cleared, we've assembled a range of topics that are among the more important issues you should consider.

Identifying the Obstacles

Which parts may affect mileage performance? Parts that may affect overall mileage performance can be grouped into two basic categories: powertrain and non-powertrain products or systems. Virtually any component associated with vehicle propulsion is in the powertrain category, including tires, wheels and gearing. Engines, transmissions and electronic control systems are obviously in this category. Non-powertrain components are generally associated with vehicle weight, aerodynamics, rolling resistance and other items that absorb energy during on-road vehicle movement.

While the extent to which each of these components affects net fuel econ-

omy varies, specialty parts manufacturers must first determine if their parts are mileage-related and then focus on the degree of influence. In either instance, a time will come when specific tests are required to verify the fuel-economy potential of parts or systems. It is at this point that some decisions are required, but understanding the landscape can be difficult.

Potential Problems Associated With Fuel-Economy Testing

Proper test selection is critical. But first, you need to know what options are available and which one suits your needs best. In that regard, it's important very early that you decide what you'll be doing with test results. Otherwise, you may not spend test money cost-effectively.

If you're going to be testing products only during their development stage, it's arguably wise to minimize costs by using methods that can be implemented in-house. These include on-road tests conducted over specific road courses with mileage computations based on distance traveled and fuel consumed. This can be problematic with late-model vehicle fuel systems, but is nonetheless doable.

If you're planning to advertise mileage benefits for a given product or system, the Federal Trade Commission (FTC) has published guidelines on the U.S. Environmental Protection Agency (EPA) website that describe acceptable steps to marketing fuel-economy benefits (www.epa.gov/otaq/consumer/reports.htm). This topic was covered extensively in a June 2008 *SEMA News* article titled, "Fuel Economy Claims on Retrofit Devices." Plus, the EPA also offers a service whereby it will test a product to determine fuel-economy benefits. And you may, of course, use EPA test data in any marketing materials or efforts, so long as there is no statement that implies EPA endorsement of the product. However, be aware that EPA literature indicates such testing is estimated to cost \$27,000 per product, accompanied by testing in the agency's facilities in Ann Arbor, Michigan. Plus, it will publish all test results, regardless of how the product fares.



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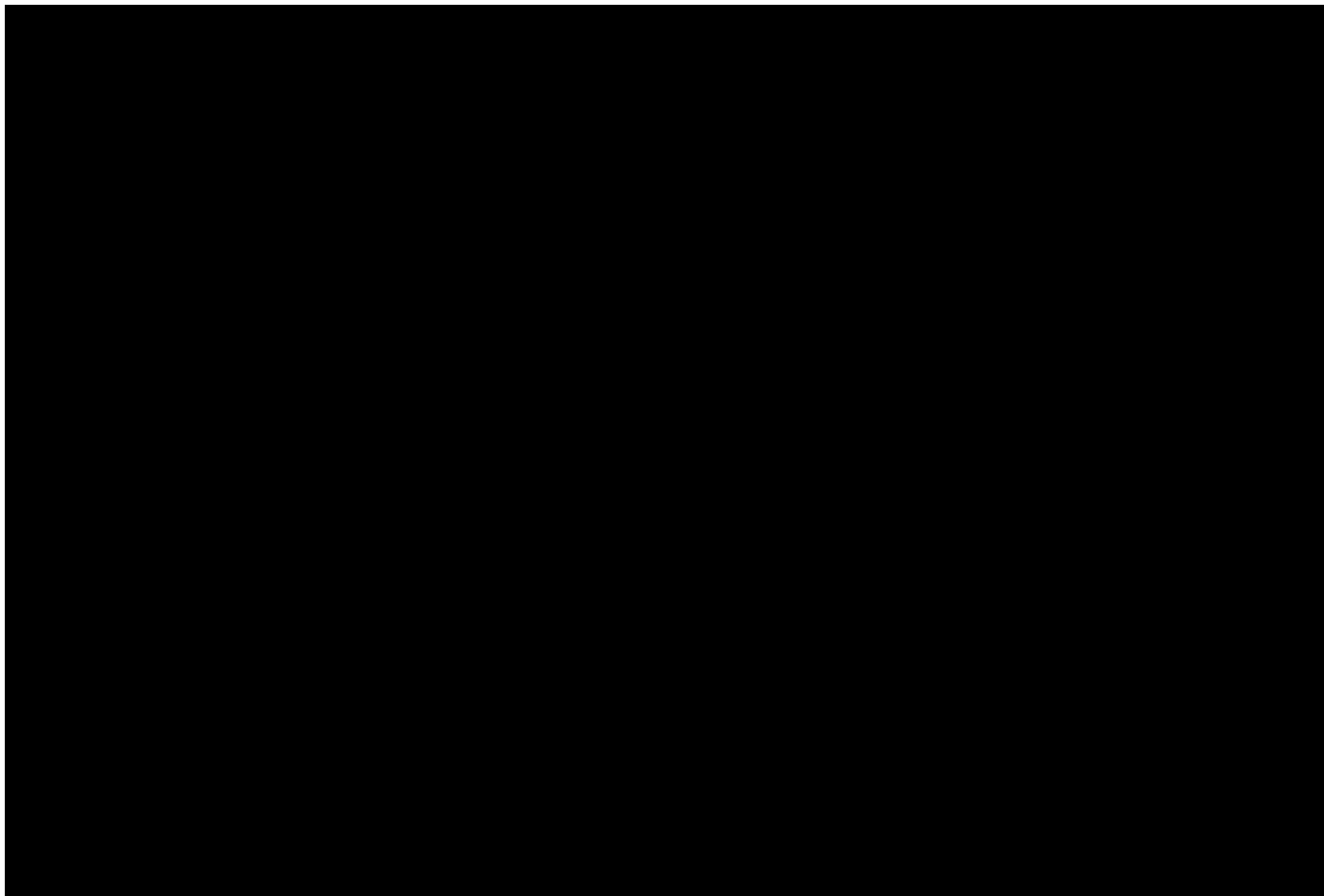
A description of test protocols recognized by the regulatory agencies is discussed later in this story. However, regardless of the method you select, test-to-test repeatability of a method

conducted in a “scientific manner” is necessary if you plan to use results in marketing materials. Even if you decide to configure your own in-house test procedure, modeling it after one of

those discussed elsewhere in this story is a wise decision. At the very least, data from such tests will eventually need to be correlated with results from “recognized” protocols, so why not get onto that page from the beginning?

Various and Acceptable Methods of Measurement

Before you begin choosing a type of fuel-economy test, you need to clearly define your objectives. While various test protocols are prescribed by governmental agencies as meeting their specific requirements, some of these may not be cost-effective for product development. On the other hand, you may want to combine your purposes in a fashion that makes sense to use one of the prescribed methods for both product development and marketing efforts. But, in order to make informed decisions about how you should proceed, it is worthwhile to become familiar with the prescribed methods. We will also provide descriptions of methods that apply to marketing issues.



Evaluating Fuel Economy During Emissions Measurements

For emissions compliance purposes, OEMs and specialty-parts makers must subject their products to the Federal Test Procedure (FTP). Simply stated, this test is performed on a chassis dynamometer using a “drive cycle” intended to replicate normal vehicle operation, during which exhaust emissions are measured. In addition to determining emissions levels, a fuel-economy “estimation” (a mathematical calculation based on emissions output) is computed. The computation is based on a comparison of carbon content in the test fuel to emissions output (thus the so-called “carbon-balance” terminology). Even though there was a recent update of this protocol that was intended to provide a closer correlation to actual on-road mileage, the EPA’s method remains as its basis for comparing fuel economy vehicle-to-vehicle instead of what might be termed “real-world” mileage.

For evaluating fuel economy, the EPA presently recognizes (for mileage product evaluation) only the FTP and the Highway

Fuel Economy Test, the latter comprised of a drive cycle of greater length during simulated on-road vehicle operation. Although these descriptions are simplified, more detailed data is available on the EPA’s website (www.epa.gov). Of possible interest is the fact CO₂ emissions are a major mathematical component in the carbon-balance computation for mileage. Because of this, you can determine if any changes in CO₂ occur (baseline to device test) in addition to fuel-economy shifts while measuring the levels of the other compliance-related emissions (HC, CO and NO_x).

In addition to the FTP, the OEM (and aftermarket) are also required to perform a more aggressive test at higher vehicle speed (on the chassis dyno) intended to expose emissions output outside the traditional FTP. This protocol is designated USO6, is much shorter (and generally slightly less expensive) than a full FTP and is used by some test facilities as a “development” test for clients that want to use a formal procedure. A decision to use this method (or any other of its type) should be discussed with your chosen test facility to make certain that the results are consistent with your objectives and budget.

(Be aware there are two fundamental methods of emissions measurement: Constant Volume Sampling (CVS) and raw sampling. At the risk of oversimplification, CVS testing involves collecting and analyzing all emissions produced during an FTP or USO6 test. This is a mass flow technique with standards based on grams/mile of vehicle travel on the chassis rolls. Raw sampling is associated with placing a probe(s) in a vehicle’s exhaust system and sampling emissions concentrations as they exit the vehicle.)

Other Methods for Fuel-Economy Measurement

As an alternative to the methods just discussed, the Society of Automotive Engineers (SAE) has developed its approach to mileage measurement. Specifics of the two principle ones are described in detail on the SAE’s website (www.sae.org). Look for SAE J12256 and J1082, to aid in your search. These procedures outline gravimetric measurement of fuel consumed during mileage tests and are on-road procedures that can be performed either in-house or by commercial testing facilities.

we need to look more closely at products focused on fuel savings—principally for the five- to 10-year-old vehicle population, not necessarily those current or forthcoming.

Mandated CAFE standards have had, at least to date, little impact on the types of vehicles that have populated the SEMA-member landscape, but that's changing. Add improvements in fuel economy that are directly proportional to CO₂ (greenhouse gas) reductions, and the benefits from mileage gains expand accordingly. Parts that reduce vehicle drag coefficients, rolling friction or any related energy-absorbing function can all increase fuel economy. But outside of that list and the one comprised of proper vehicle maintenance and sensible driving habits, we're led back to the powertrain and what can be done there.

It's been said (and, in some cases, demonstrated) that engines with improved combustion efficiency and increased power can be driven in a way to optimize fuel economy. In fact, these same "performance" engines are also fuel efficient when operated at lower-than-normal rpm (reduced mass air flow). How else, for example, could a late-model Z06 Corvette achieve 25-plus mpg on the highway? Categorically, it is not accurate to say all high-output engines are gas guzzlers.

By large measure, fuel economy is a function of an engine's air capacity and the optimization of combustion pressure. Whether this is achieved by turbocharging a small-displacement, four-cylinder engine, application of controlled auto ignition for gasoline engines, low NO_x diesel combustion, spray-guided direct-fuel injection, homogeneous charge compression ignition or any other emerging combustion technology, an overall reduction in mass air flow and the ability to achieve the highest possible energy content release is the endgame sought.

A time may come when specialty-equipment parts manufacturers will have fewer opportunities to enhance a vehicle's powertrain efficiency. Some would say that such signs are already around us. But if history is worth considering, there's ample evidence that the ingenuity and perseverance that carried this industry to its present stature will aid its continuation. And in this context, the search for improving and personalizing our modes of transportation will survive as well. Improving fuel economy with specialty-equipment market products is but another rung on the ladder. ■