



## AUTOMOTIVE ENGINEERING

# FACT SHEET



## PREMIUM FUEL RESEARCH—PHASE II

### BACKGROUND

In the United States, gasoline is typically available in three grades: 87 octane (regular), 89 octane (mid-grade) and 91/93 octane (premium). Higher octane fuels are formulated to be compatible with specific engine designs that are typically found in high-performance or luxury vehicles.

However, premium-grade gasoline comes at a premium price. Since 2009, the price difference between regular-grade and premium-grade gasoline has increased from a historically steady 10 percent to more than 25 percent.

In addition to an increasing number of vehicles that *require* premium-grade gasoline, many vehicle manufacturers *recommend* the higher octane gasoline for select makes and models. AAA conducted primary research to understand what, if any, benefit is derived from using premium-grade gasoline in these vehicles.

### KEY FINDINGS

Although drivers of vehicles that recommend, but do not require, premium gasoline are unlikely to see any benefit from using premium gasoline during typical city or highway driving, a combination of laboratory and on-road tests were performed to simulate extreme driving scenarios such as towing, hauling cargo and aggressive acceleration. When using premium fuel in these vehicles under these conditions, AAA tests found that:

- Most vehicles tested showed a modest improvement in fuel economy.
  - Test vehicles averaged a 2.7 percent improvement in fuel economy across AAA's tests. Individual vehicle test result averages ranged from a decrease of 1 percent (2016 Audi A3) to an improvement of 7.1 percent (2016 Cadillac Escalade).
- Most vehicles tested showed a modest improvement in performance.
  - Test vehicles averaged an increase in horsepower of 1.4 percent across AAA's tests. Individual vehicle test result averages ranged from a decrease of 0.3 percent (2016 Jeep Renegade) to an improvement of 3.2 percent (2017 Ford Mustang).
- According to national averages, the price difference between regular and premium-grade gasoline is approximately 20 to 25 percent, or 50 cents per gallon.
  - The modest fuel economy improvements recorded during AAA testing do not offset the higher cost of premium-grade gasoline.

To understand the benefit of using premium gasoline in a vehicle that *recommends* but does not *require* its use, AAA pursued three lines of inquiry:

1. If a vehicle is labeled premium recommended, does using premium gasoline result in improved fuel economy?
2. If a vehicle is labeled premium recommended, does using premium gasoline result in increased performance (horsepower)?
3. What is the difference in retail cost between premium and regular gasoline?

## AAA RECOMMENDATIONS



- Always follow the vehicle owner’s manual to determine which type of gasoline is recommended and/or required for your vehicle. Vehicles that **require** premium-grade gasoline should **always** be fueled with the higher octane gasoline.
- Drivers of vehicles that recommend, but do not require, premium-grade gasoline should consider their driving habits, the potential benefits and the costs associated with using higher octane fuel.
- If your engine makes a “pinging” or “knocking” sound when using regular fuel, especially in a vehicle that recommends premium fuel, a higher octane gasoline may resolve the issue, but it’s a good idea to have the vehicle checked by a reputable repair shop.
- Drivers who choose to use premium fuel should shop around for the best price, as it varies significantly between gas stations in any given city. The AAA Mobile app can help drivers identify the least expensive premium-grade gasoline in their area.
- Drivers looking for a higher quality fuel should select a TOP TIER™ gasoline. Previous AAA research found that gasoline meeting TOP TIER™ standards resulted in 19 times fewer engine deposits than non-TOP TIER™ fuel.



## METHODOLOGY

To assess the effects of using premium fuel in vehicles that recommend but do not require premium-grade gasoline, AAA conducted a comprehensive evaluation at the Automotive Club of Southern California’s Automotive Research Center in Los Angeles, California, using an industry-standard chassis dynamometer and emissions test equipment.

For testing, AAA used 87-octane (regular) and 93-octane (premium) gasoline in six vehicle models varying in body style, size, type of fuel delivery system and air induction system. Each vehicle was identified as a model that the manufacturer recommends the use of premium gasoline. All gasoline used for testing was EPA Tier III certification fuel with 10 percent ethanol content in both regular and premium octanes. Certified test fuel was used to remove variability in fuel quality and additives. Each vehicle was tested on a dynamometer, which measures horsepower, and emissions testing equipment to determine fuel economy and tailpipe emissions when using both fuel types in a variety of driving conditions.