



## AUTOMOTIVE ENGINEERING

# FACT SHEET



## FUEL QUALITY

### BACKGROUND

Beginning in the 1980s, it became apparent that new fuel system designs were highly susceptible to engine deposits caused by gasoline contamination. This resulted in increased emissions and significant vehicle performance issues.

In response to these increasing engine deposits, the Environmental Protection Agency mandated a minimum level of detergent for all gasoline sold in the United States starting in 1996. However, some automakers believe the minimum standards do not go far enough to ensure optimal vehicle performance and their ability to meet increasingly-stringent fuel economy and emissions requirements. The TOP TIER™ program and performance standard were developed to guarantee that program participants' gasoline meets strict targets for engine cleanliness.

AAA conducted primary and secondary research to better understand the benefits of TOP TIER gasoline for consumers.

### KEY FINDINGS

- After 4,000 miles of simulated driving, **the test engine operated on TOP TIER gasolines averaged 19 times fewer intake valve deposits** than when operated on non-TOP TIER gasolines.
- **Long-term use of a gasoline without an enhanced additive package can lead to reductions in fuel economy of 2-4%, drivability issues, and increased emissions.**
- **In most cases, carbon deposits can be reduced or removed from critical engine components by switching gasoline brands to one that meets TOP TIER standards.**
- **Approximately six in ten drivers (63%) believe there is a difference in the quality of gasoline sold by retailers, yet only (12%) of drivers purchase gasoline based upon the detergent additive package.** Additional survey findings, *page 2*.
- **Most TOP TIER gasolines do not cost significantly more than non-TOP TIER gasoline.** The average price difference between the TOP TIER and non-TOP TIER brands surveyed was three cents per gallon over a 12-month period.

To understand if TOP TIER gasoline is a benefit to consumers, AAA pursued five lines of inquiry:

1. Are there differences in the quantity of intake valve and combustion-chamber deposits between engines operated on TOP TIER and non-TOP TIER gasoline?
2. What issues might be experienced by motorists who operate their vehicles' engines on non-TOP TIER gasoline?
3. Can existing engine carbon deposits be reduced or removed by switching to a gasoline that meets TOP TIER standards?
4. What are the current consumer trends in purchasing gasoline?
5. Is there a retail price difference between TOP TIER and non-TOP TIER gasoline?

## CONSUMER GAS PREFERENCES

AAA surveyed U.S. drivers to understand consumer knowledge of variances in fuel quality, usage rate of gasoline that contains an enhanced detergent additive and factors that influence the selection of a gas station.

**Nearly all (96%) U.S. drivers typically drive a vehicle that uses gasoline.**

- 3 percent drive a vehicle that uses diesel fuel.
- 1 percent drive a vehicle powered by an alternative fuel (electric, etc.).

**Nearly two-thirds (63%) of U.S. drivers believe there is a difference in the quality of gasoline sold by different gas stations.**

- One-third (34%) do not believe there is a difference.
- Three percent don't know.

**Only one-third (34%) of U.S. drivers usually buy gasoline that contains an enhanced detergent additive.**

- Nearly half (47 percent) do not buy gasoline with an enhanced detergent additive.
- 18 percent don't know if the gasoline they usually buy contains an enhanced detergent additive.

**Baby boomers (41%) are more likely to buy a gasoline that contains an enhanced detergent additive than millennials (32%).**

**Men (44%) are more likely to buy a gasoline that contains an enhanced detergent additive than women (26%).**

**The primary reasons that U.S. drivers choose a gas station are:**

1. **Location (75%)**
2. **Price (73%)**
3. **Rewards program (29%)**
4. **Gas that contains a detergent (12%)**



## AAA RECOMMENDATIONS

- **For optimal vehicle performance and fuel economy, drivers should use a gasoline that meets TOP TIER standards whenever possible.**
- **Follow your vehicle owner's manual and use the correct fuel for your vehicle.** Many consumers associate fuel quality with the octane of the fuel (regular vs. premium), which is incorrect. TOP TIER retailers adhere to standards in all grades of fuel.
- **If you experience a rough idle, especially when the engine is cold, or hesitation during acceleration, it might be caused by the quality of fuel.** Try changing to a TOP TIER gasoline for several fill-ups.
- **Shop around. It is possible to purchase a TOP TIER fuel for only pennies more per gallon.** While it may be less convenient in some situations, long-term it will save money through better fuel economy and reduced need for repairs.

## METHODOLOGY

- To measure intake valve and combustion chamber deposits, AAA engaged the services of an independent International Standards Organization 17025 certified engine testing lab to perform an ASTM standard test on a variety of fuels.
- To verify secondary research findings related to whether engine carbon deposits can be reversed by switching to a higher-quality fuel, AAA used a borescope to visually inspect a common, high-mileage V-8 engine that was operated on gasoline with a non-enhanced additive package for the majority of its service life. The engine was then run on gasoline containing an enhanced additive package for approximately 1,000 miles, and re-inspected to assess the nature and extent of any changes in the carbon deposits.
- To evaluate consumer gasoline preferences, AAA contracted with a national research company to perform a telephone survey of 1,002 adults (18 years of age and older) living in the continental United States. Survey results are an accurate representation of the total continental U.S. population, 18 years of age and older, with a margin of error of +/- 3.1 percent at a 95 percent confidence level.