

**Fuel Economy Comparison**  
**TEST REPORT**

**With**  
**Toyota and Hyundai Automobiles**

**When Tested Over the CARB Approved**  
**AMA Road Test Cycle**

**For:**  
**SaviCorp**  
**2530 South Birch Street**  
**Santa Ana, CA 92707**

**March 5, 2015**

**Conducted by**  
**Olson-Ecologic Engine Testing Laboratories**  
**Fullerton, CA**



## **Introduction**

This report provides fuel economy data from relatively new automobiles when being driven over a California Air Resources Board approved driving route. Initial fuel economy data is measured over the CARB route as baseline data with the vehicle in OEM condition. The same route, vehicle and driver repeats the drive cycle with the SaviCorp dyno valve installed and operating to measure the fuel economy and compare the measured improvement in fuel economy.

The EPA evaluation of fuel economy over a specified road route used to be identified as the “511 Program.” This referred to EPA’s testing program as a consensual test to measure fuel economy of automobiles under section 511 of the Motor Vehicle Information and Cost Savings Act. That authority and test protocol was recodified and testing is now done by road testing as described in this test report, plus the use of indoor laboratory chassis dynamometers.

## **Automobiles Tested**

The two automobiles tested in this project are as follows:

Vehicle Make	Toyota	Hyundai
Vehicle Model	Highlander	Sonata
Model Year	2008	2015
Engine Size	3.5L	2.8L
EPA Fuel Economy MPG		
City	18	25
Highway	24	37
Combined	20	29

## **Driving Protocol**

All driving and precise fuel addition was done by experienced Olson-EcoLogic Engine Testing (OE) technicians. The driving route and average performance conditions, plus the actual road map followed for all testing, is shown in the Appendix.

This driving route is California Air Resources Board approved and accepted by AMA. The test vehicles were first operated over the driving route with a full fuel tank as a baseline measurement with all original automotive equipment operating in a normal



manner. After the cycle was completed the fuel tank was precisely filled and recorded to determine the miles per gallon used for baseline comparison.

The SaviCorp DynoValve system was then energized and the vehicles were driven over the same route by the same drivers and returned to the same gasoline pump to accurately measure the fuel used to calculate the miles per gallon while the DynoValve system was operating. The difference between the baseline operation and identical operation with the DynoValve system was calculated and is shown in the following Figures 1 and 2 for the two vehicles:



## Test Results

**Figure 1. Toyota Automobile**

### DynoValve Fuel Economy Report

Vehicle Make	Toyota
Vehicle Model	Highlander
Model Year	2008
Engine Size	3.5L
Tank Size	19.2

### U.S. Environmental Protection Agency Fuel Economy Averages

City	Hwy.	Combined
18	24	20

### OEM Run Average

<b>Mileage FINISH</b>	103,516 miles
<b>- Mileage START</b>	- 103,464 miles
<b>= Miles Driven</b>	= 52 miles
<b>÷ Fuel Used</b>	÷ 2.497 gal
<b>= Fuel Economy</b>	= 20.94 MPG

### Operating with DynoValve 125-1-1250 5 x 5

<b>Mileage FINISH</b>	103,577 miles
<b>- Mileage START</b>	- 103,525 miles
<b>= Miles Driven</b>	= 52 miles
<b>÷ Fuel Used</b>	÷ 1.891 gal
<b>= Fuel Economy</b>	= 27.50 MPG

<b>Improvement in Fuel Economy</b>	<b>31.3%</b>
------------------------------------	--------------



## Test Results

### Figure 2. Hyundai Automobile

#### DynoValve Fuel Economy Report

Vehicle Make	Hyundai
Vehicle Model	Sonata
Model Year	2015
Engine Size	2.4L
Tank Size	18.5

#### U.S. Environmental Protection Agency Fuel Economy Averages

City	Hwy.	Combined
25	37	29

#### OEM Run Average

<b>Mileage FINISH</b>	5,794 miles
<b>- Mileage START</b>	- 5,742 miles
<b>= Miles Driven</b>	= 52 miles
<b>÷ Fuel Used</b>	÷ 1.929 gal
<b>= Fuel Economy</b>	= 26.96 MPG

#### Operating with DynoValve 125-1-1250 60 x 5

<b>Mileage FINISH</b>	5,853 miles
<b>- Mileage START</b>	- 5,802 miles
<b>= Miles Driven</b>	= 51 miles
<b>÷ Fuel Used</b>	÷ 1.474 gal
<b>= Fuel Economy</b>	= 34.60 MPG

<b>Improvement in Fuel Economy</b>	<b>28.3%</b>
------------------------------------	--------------



## Appendix

ARB Approved Test Drive Route

# ARB Approved Test Drive Route

## Mileage Accumulation Report

Test Procedure-Mileage Accumulation (AMA Route)

1. All mileage was accumulated on the public roads in the Orange County California area. The basic mileage accumulation route shown in Fig.1 attached was used with modifications as necessary to satisfy the test requirements

2. Data for the driving schedule:

Average speed of cycle; 29.2 MPH  
Total mileage of cycle; 53.7 miles

<u>Driving Mode</u>	<u>Approximate events per mile</u>
Stops	.74
Normal acceleration from stop	.71
Normal Acceleration from 20 MPH	1.32
Wide Open throttle acceleration and fast deceleration	.11
Idle Time	15.21

<u>Speed MPH</u>	<u>% of total miles</u>
30 MPH .....	6%
35 MPH .....	9%
40 MPH .....	9%
45 MPH .....	20%
50 MPH .....	3.3%
55-60 MPH .....	35.2%

Variable acceleration & deceleration: 17.5%

Total: 100%

# ARB Approved Test Drive Route

## Mileage Accumulation Report

### 3. Route Description

Start Point: SaviCorp  
2530 South Birch Street  
Santa Ana, CA 92707

1. Exit parking lot on Central, go to stop sign at Main St.
2. Turn right on Main & drive west to MacArthur
3. Turn left on MacArthur and drive east on the ramp on Highway 55 south, meeting stop light
4. Drive south on Highway 55 to the end of Highway 55, where it turns into Newport Blvd. southbound, stop light
5. Proceed southbound on Newport Blvd. to off ramp or Pacific Coast Highway, stop light
6. Turn left onto Pacific Coast Highway and drive south to Camino de Las Ramblas
7. Enter the northbound on ramp for Interstate 5, metering light
8. Proceed north on Interstate 5 to the transition ramp to Interstate 405 north
9. Proceed north on Interstate 405 to the MacArthur Blvd off ramp, stop light
10. Turn right onto MacArthur Blvd. and drive west to Main Street, stop light
11. Turn right on Main Street and drive north to Central Avenue
12. Turn right on Central Street and drive to SaviCorp parking lot end of mileage loop

Finish Point: SaviCorp  
2530 South Birch Street  
Santa Ana, CA 92707

Speed Limits: Freeways - 65 MPH  
City Streets - 25 to 50 MPH

Road Type: Freeway - 25.7  
City Street - 28 miles  
Total: 53.7 miles

Stops: Stop Lights.....76  
Stop Signs.....1  
Railroad crossings.....0  
Possible stops.....79  
Planned stops.....28

4. The method of recording or certifying the mileage accumulation is that each driver writes the odometer reading, fuel used and other applicable data on the accumulation record sheet.

5. Note that since the mileage accumulation was performed on the public streets, the drivers was instructed to follow normal traffic patterns and flow, observing all speed limits and the maximum seed of 55 MPH. Drivers maintained accumulation record sheets and made entries at the beginning, at designated "check points", and the end of the course.



