2015

Smog Check Performance Report

DEPARTMENT OF CONSUMER AFFAIRS

BAR

Bureau of Automotive Repair

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Assembly Bill (AB) 2289 (Eng, Chapter 258, Statutes of 2010) marked the first major update to the Smog Check Program since the mid-1990s. The law is a comprehensive effort to modernize California's vehicle emissions inspection and maintenance program (Smog Check). The legislation required the Bureau of Automotive Repair (BAR) to implement both inspection-based performance standards[1] for stations inspecting directed vehicles[2] and improved On-Board Diagnostics (OBD II) inspections for newer vehicles.[3] The law also requires BAR, in cooperation with the Air Resources Board (ARB), to perform annual evaluations of the Smog Check Program. This report satisfies this requirement for 2015.

Background

In March 2009, Sierra Research[4] released a report entitled, "Evaluation of the California Smog Check Program Using Random Roadside Data" that analyzed the effectiveness of the California Smog Check Program. Sierra's primary finding was that many vehicles "either were not actually repaired or were repaired only temporarily."[5] In order to determine this finding, Sierra studied the rate at which vehicles previously certified by a Smog Check station failed a subsequent roadside inspection. BAR's Roadside Inspection Program randomly pulls over vehicles and performs an Acceleration Simulation Mode (ASM) inspection of tailpipe emissions. The vehicle is put on a dynamometer and tested using a BAR-97 Emissions Inspection System, the same test performed by Smog Check stations on enhanced area[6] vehicles.

Sierra found that for 1976-1995 model-year vehicles, that initially failed the ASM portion of the Smog Check, then subsequently passed a retest and were issued a certificate of compliance by a Smog Check station, 49% failed an ASM roadside inspection within one year of certification (i.e., Fail-Pass-Roadside Fail vehicles). The roadside inspection occurred, on average, about six months after the vehicle had been certified. For 1976-1995 model-year vehicles that passed their initial ASM inspection and were issued a certificate by a Smog Check station, 19% failed an ASM roadside test within one year of certification (i.e., Pass-Roadside Fail vehicles).

[1] BAR implemented the STAR Program in January 2013.
[2] A directed vehicle must have its Smog Check performed at a STAR station. These vehicles are 1999 model-year and older vehicles and newer vehicles with the greatest likelihood of failing their next inspection.
[3] BAR implemented statewide OBD II testing on March 9, 2015 for 2000 and newer gasoline-powered vehicles and 1998 and newer diesel-powered vehicles. These tests do not require a tailpipe emissions inspection.
[4] The Air Resources Board (ARB), in cooperation with BAR, hired Sierra Research, Inc. to conduct an independent research and analysis of the Smog Check Program using data collected from roadside inspections conducted in 2003-2006.
[5] "Evaluation of the California Smog Check Program Using Random Roadside Data," page 1-1.
[6] Enhanced Areas are California Smog Check Program areas within any part of an urbanized area of the state which is classified by the U.S. Environmental Protection Agency as not meeting air quality standards. Older model-year registered in enhanced areas require an ASM inspection.

Post-AB 2289 BAR Findings

This 2015 BAR study is based on 2013-2014 Roadside data and illustrates a significant improvement in the Smog Check Program since the implementation of AB 2289. Table 1 compares the Roadside failure rates between the Sierra and BAR studies. Details from the 2015 BAR study are further broken down between STAR and non-STAR stations. As of July 1st there were 5,770 Smog Check Stations with 4,137 STAR certified. As these outcomes indicate, STAR stations outperformed non-STAR stations across the board. The 49% Fail-Pass-Roadside Fail rate for vehicles from the 2009 Sierra study dropped to 36%. This improvement can be tied, in part, to BAR's implementation of the STAR Program. In particular, the study shows that the Fail-Pass-Roadside Fail failure rate was 32% for vehicles that had been inspected at STAR stations compared to 51% for non-STAR stations. In addition, the overall Roadside failure rate for 1976-1995 vehicles within one year of certification was 21% for STAR stations, as compared to 31% for non-STAR stations.

Table 1: Roadside ASM Failure Rates for 1976 – 1995 Model-Year Vehicles Tested at the Roadside within One Year after Passing a Smog Check

Initial Smog Check Result	2009 Sierra Study (2003-2006 Roadside)	2015 BAR Study (2013-2014 Roadside)		
		All Station Types	Non-STAR	STAR Only
Fail	49%	36%	51%	32%
Pass	19%	19%	25%	17%
Combined Fail Rate	24%	23%	31%	21%

The reduction in the failure rate for Fail-Pass-Roadside Fail vehicles, especially among STAR stations, is substantial. It appears to demonstrate that the quality of the Smog Check Program has improved dramatically since the 2009 Sierra study. This is especially true when considering a few important factors in the 2015 BAR study.

First, the fleet studied is approximately ten years older than it was during the original 2009 Sierra study. As such, these vehicles are more prone to fail a Smog Check inspection[7] than they were in the last study.

Second, while the 2015 BAR study was based on data collected during Roadside inspections from 2013-2014, 44% of the vehicles included in the 2015 BAR study were actually certified at a

[7] The failure rate for 1976-1995 model year vehicles was 19.3% in 2005, versus 29.1% in 2014.

Smog Check station prior to implementation of the STAR Program in January 2013. As stated in the 2014 BAR Smog Check Performance Report[8], the STAR Program benefits appear to have begun before STAR implementation. Stations may have been working to improve their performance in anticipation of the program changes, as a result of BAR's outreach to the industry. The results from STAR and non-STAR stations, detailed in Table 1, were calculated exclusively from vehicles certified after implementation of the STAR Program.

Third, vehicles requiring a Smog Check undergoing change of ownership or initial registration in California can be inspected at any station. These vehicles currently are not required to have the inspection performed at a STAR station. Change-of-ownership and initial registration inspections represent approximately 40% of all Smog Check inspections performed on 1976-1995 model-year vehicles. Non-STAR stations certify approximately 20% of these vehicles. It is assumed that the impact of non-STAR stations certifying vehicles due to a change of ownership or initial registration in California is impacting the program, leading to the 36% figure for all station types shown in Table 1.

Finally, of the Roadside data used to create the STAR vs. non-STAR station comparison in Table 1, approximately 25% of the vehicles were certified prior to implementation of the STAR Program. Therefore, it is reasonable to expect that an analysis of data from vehicles exclusively certified after implementation of the STAR Program would show an even greater improvement. However, such an analysis cannot be completed at this time as the sample size is too small. The 2016 study will perform that analysis.

To better understand the performance of the Smog Check Program, Sierra grouped Roadside results using BAR's Station Performance Algorithm. BAR further enhanced this algorithm to evaluate station performance. The new algorithm, called the Follow-up Pass Rate (FPR), is one of the performance measures of the STAR Program. The FPR evaluates Smog Check stations and technicians based upon the rate at which the vehicles they certified in the previous inspection cycle are passing their Smog Check in the current cycle, regardless of where that inspection occurs, and as compared to similar vehicles. Under the FPR, scores range from a low of zero (0) to a high of one (1).

The 2009 Sierra study grouped stations by high-performing, average, and low-performing. The study further analyzed the performance of these station groups using two scenario criteria. In Scenario 1, high-performing stations had a 0.90 or greater FPR; low performing stations had a 0.10 or lower FPR. In Scenario 2, which was more stringent, the thresholds were a 0.975 FPR for high-performing stations and a 0.025 FPR for low-performing stations.

[8] The 2014 BAR Smog Check Performance Report is available on BAR's Web site at http://www.smogcheck.ca.gov/FormsPubs/index.html.

Figure 1 below compares the Roadside failure rates from the 2015 BAR study to those from the 2009 Sierra study. The Roadside failure rates are lower across the board for all station performance groups using the Scenario 1 criteria, with the percentage of improvement greatest among high-performing stations. Not coincidentally, these stations are most likely to participate in the STAR Program.

Figure 1: Scenario 1 Criteria
Roadside ASM Tailpipe Failure Rates for Vehicles
Within One Year of Failing Initial Smog Inspection Prior to Certification
(1976-1995 Model-Year Vehicles)

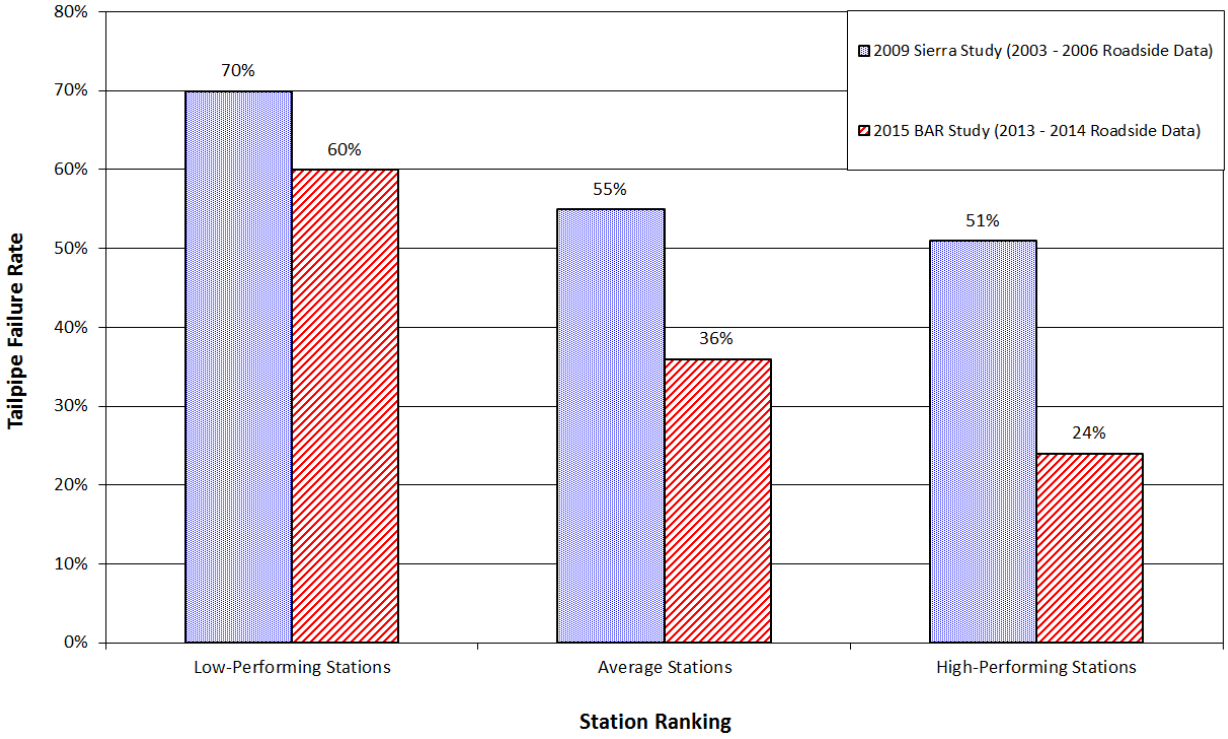
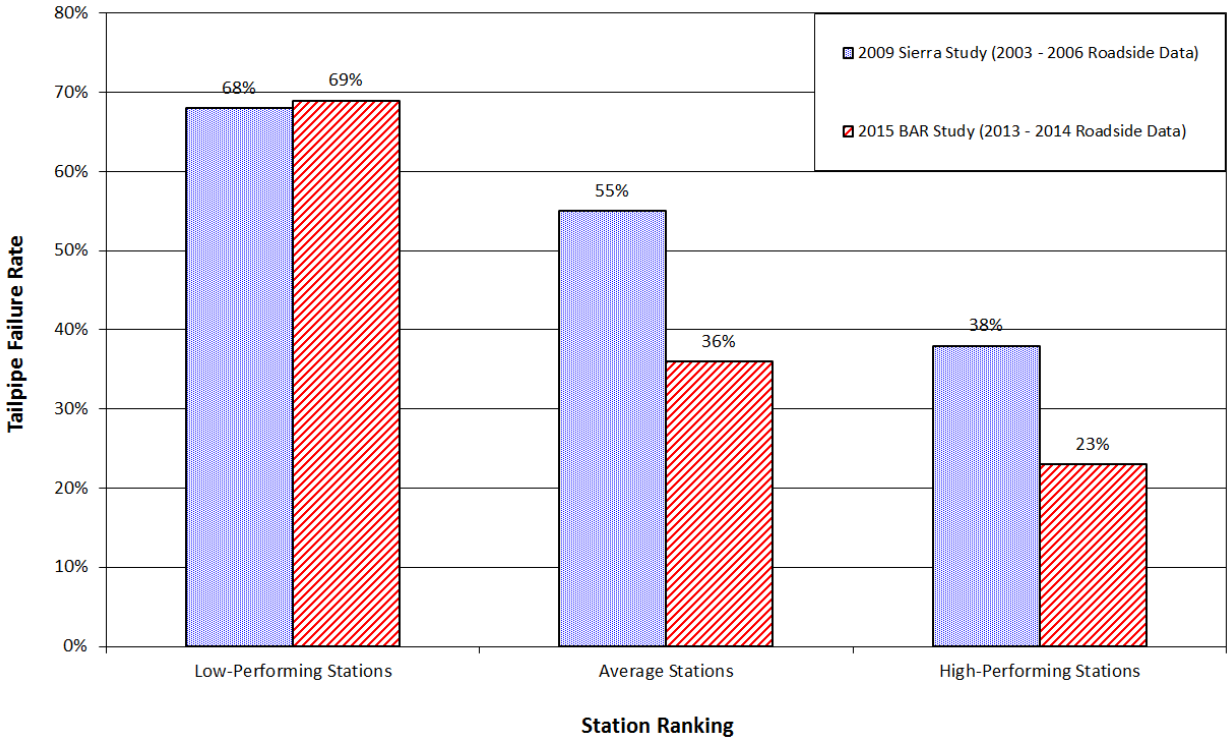


Figure 2 below shows the results among the three station groups using the more stringent Scenario 2 criteria. The Roadside failure rates in Figure 2 dropped significantly for high-performing and average stations; however, the failure rate for low-performing stations increased by one percent.

Figure 2: Scenario 2 Criteria
Roadside ASM Tailpipe Failure Rates for Vehicles
Within One Year of Failing Initial Smog Inspection Prior to Certification
(1976-1995 Model-Year Vehicles)



The 2009 Sierra study also included an analysis of emissions reductions lost due to poor Smog Check inspection performance. Using Scenario 2 criteria, the 2009 Sierra study indicated that if all Smog Check stations performed on par with high-performing stations when testing 1976-1995 model-year vehicles, an additional 70 tons per day (tpd) of reactive organic gasses (ROG) and oxides of nitrogen (NOx) would have been eliminated from the air. This was based on ARB's EMFAC 2002 emissions model run for calendar year 2005. A recalculation using ARB's more recent EMFAC 2011 model for calendar year 2005 revised that lost benefit from 70 tpd to 50 tpd.

By comparison, the 2013-2014 Roadside data used in the 2015 BAR study show the lost benefit at only 21 tpd. This is based on ARB's EMFAC 2011 emissions model run for calendar year 2014. This result demonstrates that the Smog Check Program is now capturing more of its projected emissions reductions (21 tpd lost in 2014 vs. 50 tpd lost in 2005). However, not all of this improvement can be attributed to implementation of AB 2289; some of the credit also must be given to a reduction in the size of the 1976-1995 model-year fleet.

Conclusion

The 2015 BAR study shows that the Smog Check Program has significantly improved since implementation of AB 2289. In particular, implementation of the STAR Program has incentivized better inspection performance by Smog Check stations. While Roadside results collected after implementation of the STAR Program are overwhelmingly positive, the true impacts of the program, although unknown at this time, may be even greater. Much of the Roadside data collected for this study were for vehicles certified by Smog Check stations prior to STAR Program implementation. The 2016 study will be able to analyze the Roadside results with all vehicles certified after STAR implementation.

Despite this improved performance, there is still a small group of stations that continue to diminish the overall effectiveness of the Smog Check Program. There are two primary reasons. First, current STAR rules allow some low-performing stations to become STAR stations. This is especially true for newer stations, which can qualify for STAR without an FPR score. Second, is that non-STAR stations still perform a significant number of change-of-ownership and initial registration inspections. Approximately 40% of the inspection market for 1976-1995 model-year vehicles is due to a change-of-ownership or initial registration. Neither of these inspection reasons are required by law to be performed at a STAR station. Only biennial (every other year) registrations are required to have a Smog Check inspection at a STAR station.

BAR is in the process of amending regulations to address the issue of low-performing stations entering the STAR Program. AB 2289 also improved BAR's ability to identify and discipline stations performing improper inspections, such as performing a Smog Check on a surrogate vehicle to get an otherwise failing vehicle to pass the inspection. Most notably, in March 2015, BAR implemented OBD II inspections for newer vehicles using BAR-certified inspection equipment. The new program includes BAR developed Smog Check database software to provide significantly better detection of improper inspections on newer model-year vehicles equipped with OBD II.