

Valley Clean Air Now (Valley CAN) Tune In & Tune Up Program

Parlier, California

March 29, 2008

FINAL REPORT

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With Assistance from

**The Advanced Transportation Technology and Energy Initiative
The Kenneth L. Maddy Institute at California State University, Fresno**

The California Department of Consumer Affairs

Reedley College

Parlier High School

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INTRODUCTION

This is the six in a series of reports describing the Valley Clean Air Now (Valley CAN) Tune In & Tune Up (TI&TU) Program, which is designed to quickly screen and identify high-emitting vehicles in need of emissions-reducing repairs. Relationships established between Valley CAN, the Advanced Transportation Technology and Energy Initiative (ATTEi), and the California Department of Consumer Affairs (DCA) contributed to the program's success.

This report describes the TI&TU event on March 29, 2008 in Parlier and summarizes the data collected during that event. With the assistance of media buys on English and Spanish radio stations and a comprehensive grassroots outreach campaign, a total of 342 vehicle owners volunteered to have their vehicles tested during the Parlier event.

During the Parlier event, vehicles were given a tailpipe emissions test using a hand-held portable emission testing device, performed by staff from DCA. Participating vehicles were tested for exhaust hydrocarbons (HC) and carbon monoxide (CO) during the two-speed idle test using the AutoLogic Model 310-0121 gas analyzer. Because the vehicles were tested under idle conditions, no measurements of nitrogen oxides (NO_x) were made during the TI&TU event. If the vehicle failed any of the two-speed idle cutpoints for HC or CO exhaust emissions or a quick visual inspection for tampering or illumination of the check engine light by DCA staff, the vehicle was judged to be eligible to enter the Valley CAN vehicle repair program.

TI&TU program staff provided repair vouchers worth up to \$500 in emission-related repair costs to the participants that failed the tailpipe emissions test. Data from the TI&TU event are shown in Table 1. Of the 342 vehicles tested, 270 qualified for the repair portion of the program. Vehicle repairs were performed at Reedley Automotive, a Gold Shield certified smog shop in nearby Reedley.

If an inspected vehicle failed either the tailpipe emissions test or visual inspection, the vehicle's owner was directed to an on-site diagnostic testing station at the event where automotive students, supervised by their instructors from the community college, performed a basic under-hood visual inspection and provided written information regarding possible causes of their vehicle's emission problems. This event provided a career technical education opportunity as each student had the opportunity to assess dozens of cars with a wide variety of potential problems.

To summarize, the vehicles went through the following process:

- Arrive at the event and queue up to await testing
- Proceed to the emissions testing station, where DCA staff perform a two-speed idle emissions test with a portable gas analyzer.
- Continue to the under-hood diagnostics station, where automotive students perform a basic visual inspection.
- If the vehicle fails the on-site inspection or emissions test, the owner schedules an appointment with the Reedley Automotive test-and-repair shop before leaving the event.

Emissions benefits generated by the private Tune In & Tune Up program are not included in the Smog Check baseline credits for emissions or in state implementation plan (SIP) calculations.

This report describes only the tailpipe emissions reductions measured from this set of vehicles, and may not be a sample representative of the on-road fleet. Results might vary due to different methods of emission reduction calculations.

Table 1. Tune In & Tune Up Event Data

Location/Date	Vehicles Tested	Coupons Distributed/ Redeemed	Percent Redeemed	Valley CAN Inspection/Repair Costs	Customer-Paid Costs	Total Repair Costs
Parlier, March 29, 2008	342	270/108	40%	\$41,518	\$8,820	\$50,338

The following sections describe data collected and emission reductions obtained in the 2008 Parlier Tune In & Tune Up event.

VEHICLE AND REPAIR DATA

One hundred sixty-seven vehicles began the repair program, where vehicles were first given an initial, confirmatory California Smog Check test and inspection at Reedley Automotive. There were several outcomes from all the vehicles that participated, as shown in Figure 1.

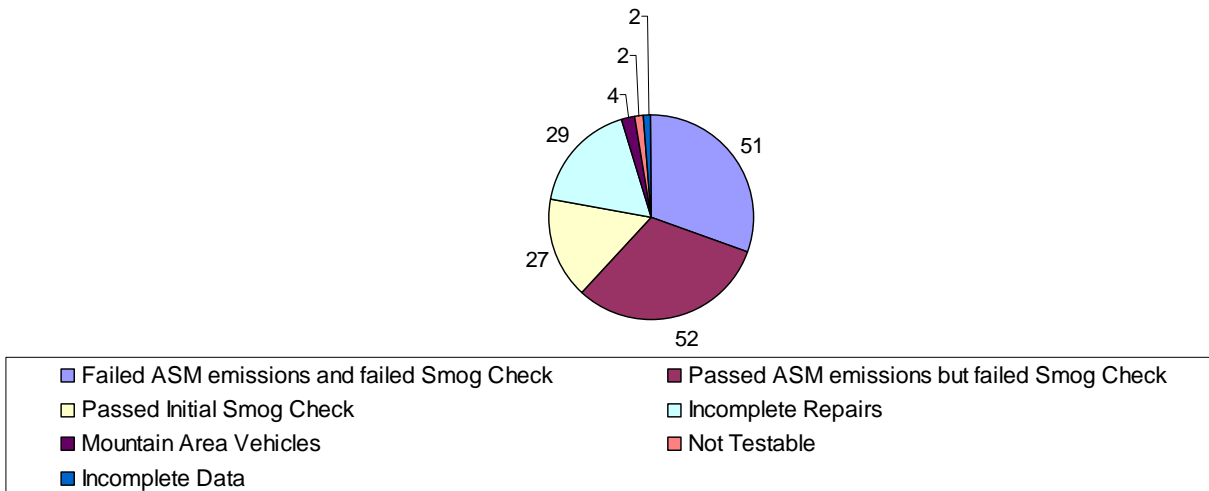


Figure 1. Number of vehicles categorized by emissions testing outcomes.

A total of 103 vehicles were successfully repaired per industry standard practice to Smog Check inspection standards and emissions cutpoints. Of that number, 50% or 52 vehicles, passed the ASM emissions portion of the Smog Check at the repair station but failed the Smog Check inspection because of other reasons. Eighty-four percent of the vehicles that failed the initial screening test at the TI&TU event also failed the ASM inspection at the repair shops. This variance is due to the at-event screening and Smog Check testing being done with different types of equipment as well as the variability of emissions levels from malfunctioning vehicles. Twenty-one percent of the vehicles that entered the repair program (a total of 29) left the TI&TU Program before complete repairs were made, with the majority of those owners not wanting to spend their own money on repairs costing more than the \$500 repair voucher provided by the Valley CAN

Program. Two percent of the vehicles were registered outside the program areas, and did not require NOx-related emission repairs. Two of the vehicles were in such poor condition that the repair shops did not feel that they were repairable, and there were incomplete repair/emissions data for another two vehicles.

The model year distribution of all vehicles participating in the program is shown in Figure 2. Vehicles were given both emissions tests used in the enhanced Smog Check program, the ASM5015 and the ASM2525, which are steady-state loaded mode tests conducted on a dynamometer. All vehicles in the “Passed ASM Emissions” and “Failed ASM Emissions” categories were successfully repaired according to Smog Check program criteria. The average and median model year participating in the program were 1992. The newest model year vehicles in the program that failed the initial Smog Check inspection tended to fail more for other reasons than the ASM emission cutpoints, as shown in Figure 2. Table 2 provides the status of the vehicles that entered the repair program and their average repair costs in the Parlier event.

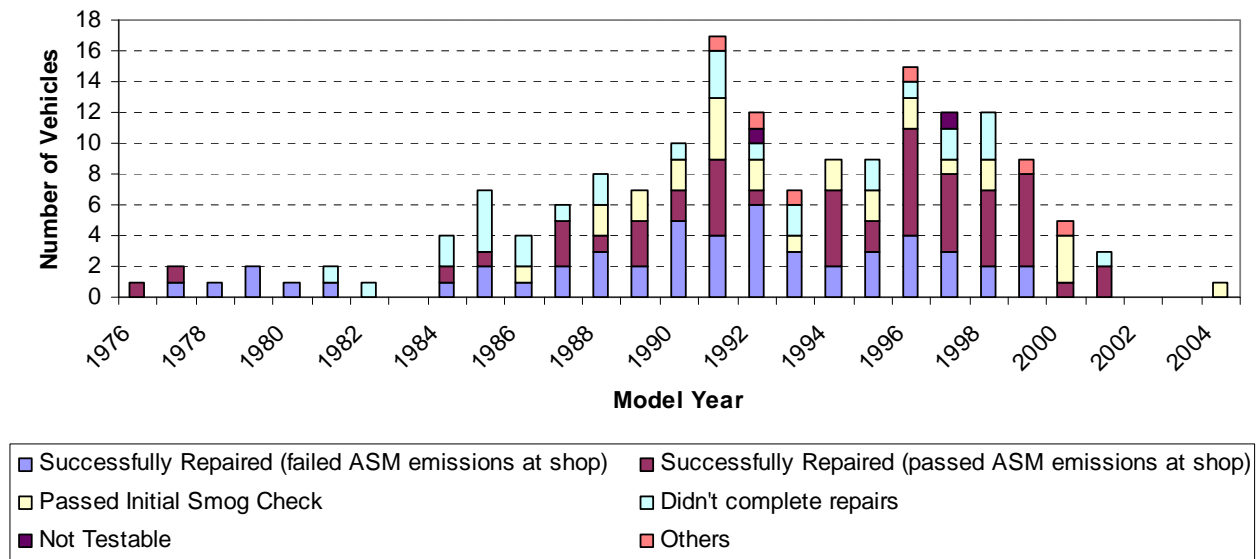


Figure 2. Model year distribution of the vehicles participating in the 2008 Parlier TI&TU Event.

Table 2. Status of vehicles that entered the 2008 Parlier TI&TU Repair Program Event.

Vehicle Category	Average Repair/Diagnosis Cost/Vehicle
Successfully repaired, n = 103	\$583
Failed ASM Emissions and Repaired, n = 51	\$640
Passed ASM Emissions and Repaired, n = 52	\$527
Incomplete Repairs, n = 29	\$275
No NOx requirements, n = 4	\$529
Not testable, n = 2	- - -
Incomplete Data, n = 2	\$633
Vehicle passed Smog Check = 27	\$482

There were 103 vehicles failing the initial screening test that were successfully repaired according to Smog Check criteria. However, only 51, or 50% of those vehicles that failed the initial

inspection failed the test due to emissions failures during the ASM tests. The remaining 52 vehicles that failed the initial Smog Check inspection failed for reasons other than tailpipe emissions failures during ASM testing, which were categorized as visual or functional failures, such as illumination of the malfunction indicator light (MIL). The average repair cost for all the successfully-repaired vehicles was \$583; the minimum cost was \$84, and the maximum repair cost was \$1906. Repair expenses exceeded the \$500 voucher amount for 60 vehicles. An additional 29 vehicles were partially repaired, but for a number of reasons, their repairs were not completed according to Smog Check criteria. The average cost of partial repairs for this group was \$275. Four additional vehicles were repaired according to Smog Check criteria, but because they were registered outside the four cities, there were no Smog Check emission standards for nitrogen oxides (NOx); the data for this group of vehicles are incomplete and/or questionable in some cases. Two vehicles were in such bad state of maintenance that they were judged by the repairs shops as not testable. Twenty-seven, or 16% of the vehicles that failed the Smog Check emissions test during the Parlier TI&TU event passed the initial Smog Check at the repair shop.

SMOG CHECK EMISSION REDUCTIONS

Table 3 summarizes the pre- and post-ASM emissions data for the 103 vehicles that were successfully repaired according to Smog Check criteria for those individual vehicles. The values shown in the table are the average of the ASM5015 and ASM2525 emission tests. Based on the results of this 103 vehicle sample, emission reductions of 82%, 86%, and 69% were achieved for CO, HC, and NOx, respectively, for the successfully-repaired group of vehicles. Again, these results are specific to this vehicle sample (many of which are unregistered) and should not be extrapolated statewide without further analysis.

Table 3. Pre- and post-repair emissions data for the 2008 Parlier TI&TU vehicles.

Vehicle Class	Ave. Before-Repair ASM Emissions			Ave. After-Repair ASM Emissions		
	CO, %	HC, ppm	NOx, ppm	CO, %	HC, ppm	NOx, ppm
Successfully repaired, n = 103	0.71	283	640	0.13	40	197
Failed ASM Emissions and Repaired, n = 51	1.24	518	984	0.12	48	225
Passed ASM Emissions and Repaired, n = 52	0.20	52	302	0.13	32	168
Partial repairs/Left program, n = 29	2.19	436	992	--	--	--
No NOx requirements, n = 4*	0.15	161	--	--	--	--
Not testable, n = 2	--	--	--	--	--	--

*Data incomplete and/or questionable for these vehicles.

Also shown above are pre-repair average ASM readings for the vehicles in each subgroup, where emissions data were available. Notable are the higher average pre-repair CO and NOx emissions for the 29 vehicles for which the motorists chose not to participate fully in the TI&TU repair event. Had these vehicles been repaired according to Smog Check criteria, the total emission reductions obtained in the program would have been significantly larger.

Figure 2 illustrates the average pre- and post-repair ASM emissions for the 51 vehicles that failed the pre-repair ASM emissions tests and were later successfully repaired according to Smog Check inspection and emissions standards, resulting in average ASM emission reductions for these events of 90, 91, and 77% for CO, HC, and NOx, respectively.

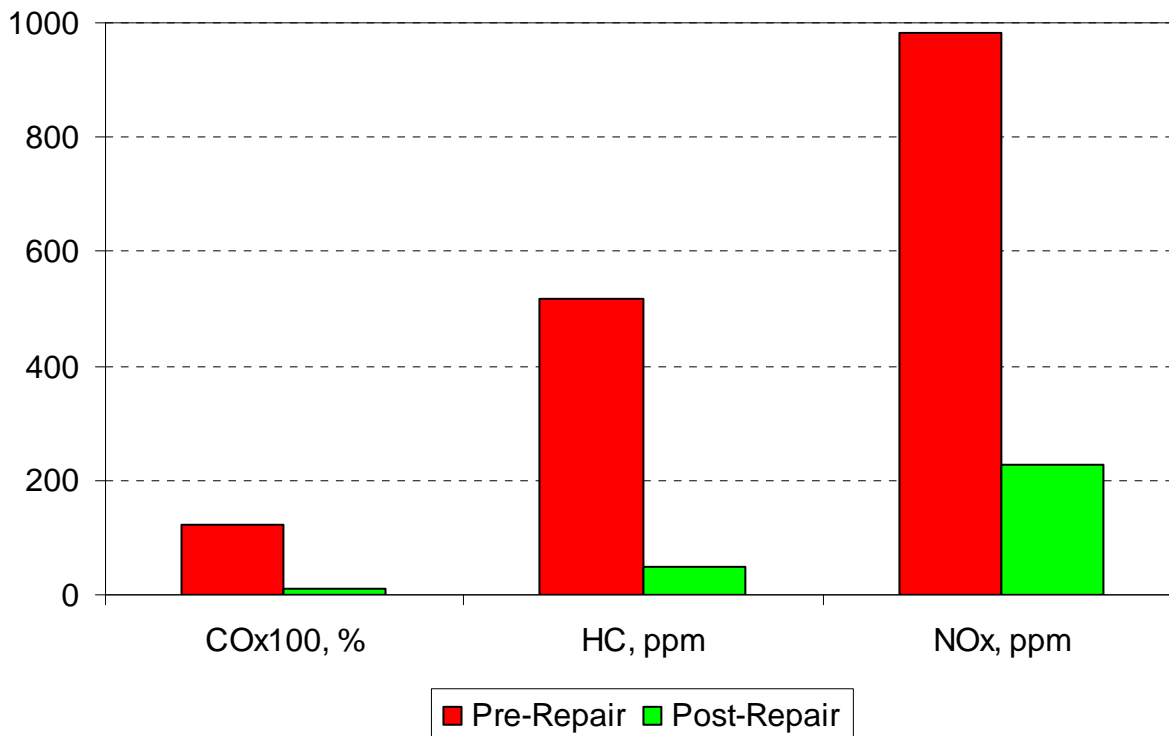


Figure 2. Pre- and post-repair average ASM emissions for the successfully-repaired 51 vehicles that failed the pre-repair ASM emission tests during the four TI&TU events.

Figure 3 displays the average pre- and post-repair ASM emissions for the 52 vehicles that passed the pre-repair ASM emissions tests and were later successfully repaired according to Smog Check criteria, resulting in an average ASM emission reductions of 35, 38, and 44% for CO, HC and NOx, respectively. Note that the vertical emissions scale in Figure 3 is the same as that in Figure 2 for comparison purposes.

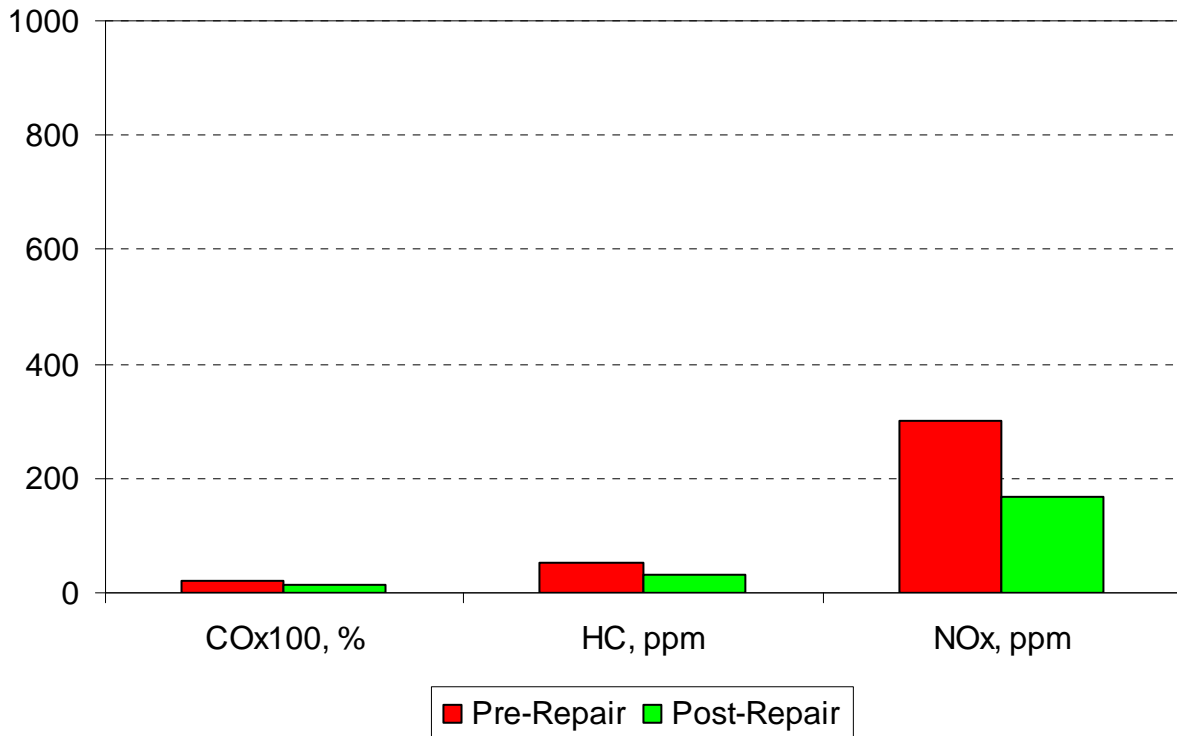


Figure 3. Pre- and post-repair average ASM emissions for the successfully-repaired 52 vehicles that initially passed the pre-repair ASM emission tests during the four TI&TU events.

Table 2 and Figures 2 and 3 show that the vehicles that passed the pre-repair ASM emission tests, although they failed the initial Smog Check inspection, had much lower initial emissions and smaller absolute and percentage emission reductions after successful repairs than the vehicles that initially failed the emissions portion at the Smog Check repair shops.

COMPARISON WITH THE 1995 CALIFORNIA I/M PILOT PROGRAM

In 1995, the California Air Resources Board tested a set of more than 600 vehicles using the Federal Test Procedure (FTP), IM240, ASM 5015, ASM2525, and two-speed idle tests using the BAR90 analyzer. In that unique study, the vehicles that failed the IM240 or the ASM test were repaired according to emissions criteria using the test that they failed. BAR-employed technicians repaired the failing vehicles, and their pre- and post-repair emissions data were collected at State of California-operated facilities. The California I/M Pilot Study provided the maximum possible repair benefit obtainable in an inspection and maintenance (I/M) program, as the mechanics were employed by the State, and their performance was monitored in a centralized I/M program format with no owner intervention. The emissions reductions obtained in the Valley CAN 2008 Parlier TI&TU event are compared with results from the previous TI&TU programs and those obtained during the California Pilot Program in Table 3.

Table 3. Pre- and post-repair emissions data from the 2008 Parlier TI&TU event and previous TI&TU Programs, and the 1995 California I/M Pilot Program.

Program	Pre-/Post-Repair Ave. ASM Emissions			Percent Reduction		
	CO, %	HC, ppm	NOx, ppm	CO	HC	NOx
Fresno TI&TU 2005	1.39/0.09	131/46	710/335	94	65	53
Bakersfield TI&TU 2006	1.68/0.27	210/67	923/333	84	69	64
Stockton TI&TU 2006	0.98/0.18	127/51	666/221	82	60	67
Arvin TI&TU 2007	1.53/0.20	140/57	602/249	87	59	59
2006 Visalia and 2007 Merced, Fresno, and Modesto TI&TU Programs						
Failed Pre-Repair ASM Emissions	1.26/0.13	177/45	972/244	90	75	75
Passed Pre-Repair ASM Emissions	0.12/0.14	40/35	244/171	-10	13	30
Parlier TI&TU 2008						
Failed Pre-Repair ASM Emissions	1.24/0.12	518/48	984/225	90	91	77
Passed Pre-Repair ASM Emissions	0.20/0.13	52/32	302/168	36	39	44
CA I/M Pilot Program 1995	1.36/0.22	160/50	884/419	84	69	52

Although there is a 10-13 year difference and vehicle model years/technologies are different between the Valley CAN and California I/M Pilot programs, comparisons between pre- and post-repair emissions levels, along with percent emission reductions, are quite similar. However, the emission reductions from the vehicles that failed the pre-repair ASM emissions tests from the Parlier TI&TU event described in this report are much larger than those obtained in the government-run California I/M Pilot Program.

COSTS OF EMISSION REDUCTIONS

Using statistical relationships derived from the California I/M Pilot Study, where regression relationships were calculated between ASM emission reductions and corresponding FTP data, it is possible to derive rough approximations of tons/year of emission reductions from this Program. Although there is scatter among the different emission test types regarding emission reduction relationships, we used these statistical relationships to estimate total emission reductions for the 51-vehicle fleet that initially failed the emissions portion of the initial Smog Check inspection at the repair shops, assuming that the repairs are effective for 10,000 miles. Estimated reductions would be different if the duration of repairs differs from the 10,000-mile assumption for repair effectiveness. We did not calculate the emission changes and associated costs for the 52 vehicles that passed the ASM emission tests but failed the initial Smog Check inspection, because the pre-repair emissions for this portion of the successfully-repaired vehicles were very low as compared with the emissions-failing vehicles in the Parlier event. These estimates are provided in Table 4. These reductions may be significantly different from those obtained in other programs.

Table 4. Emission reductions from the 51 successfully-repaired vehicles, assuming repair effectiveness for 10,000 miles.

Emission Reductions	CO	HC	NOx
Pounds per vehicle	470	127	30
Pounds from 51 vehicles	23,947	6,475	1,530
Tons from 51 vehicles	12.0	3.24	0.76

The 51 vehicles were repaired according to Smog Check emissions criteria at a total cost of \$32,660, or an average cost of \$640 per vehicle. Because it is not possible to apportion the repair types to specific emission reductions, we can provide two calculations in terms of dollars/ton for the Parlier event TI&TU Program effectiveness. If we sum the pollutants CO + HC + NO_x, the cost-effectiveness of the program is \$2044/ton for exhaust emission reductions. The cost-effectiveness for HC + NO_x emissions combined is \$8,160/ton. These costs also include the cost of the Smog Check inspection. Because Smog Check repairs also include those that reduce evaporative or nontailpipe HC, these costs are upper limit costs for the three pollutants. If evaporative or nontailpipe HC emission reductions had been measured in this program, the true cost-effectiveness values would be less than the ones shown here. Because there was no testing for particulate matter (PM) exhaust emissions, it is not possible to calculate PM emission reductions that were obtained in this program.

The emission reductions obtained from the 52 vehicles that initially passed the ASM emissions testing portion of the Smog Check inspection at the repair shops were very small because the pre-repair emissions were relatively low when compared with the ASM-failing vehicles (Table 3 and Figure 3). Net average CO, HC, and NO_x emissions after repairs decreased by only 0.07%, 20 and 133 ppm, respectively, so the dollar-per-ton emission reductions for this portion of the successfully repaired vehicles are much higher, at \$26,900 per ton of HC and NO_x combined, than the reductions obtained from the 51 vehicles that initially failed the ASM emission tests prior to repairs.

GROSS-POLLUTING VEHICLES

The Bureau of Automotive Repair has adopted criteria for vehicles tested in the Smog Check Program for determining whether tested vehicles can be categorized as gross high polluters. The gross emitter cutpoints for CO, HC, and NO_x differ by vehicle model year groups, with more lenient (higher) emissions cutpoints for older vehicles and tighter (lower) emissions cutpoints for newer model year vehicles. Table 5 summarizes the vehicles identified as gross polluters by testing outcomes from the Parlier TI&TU event.

Table 5. Gross-polluting vehicles by vehicle category from the Parlier TI&TU event.

Vehicle Class	Number	Percent
Failed ASM Emissions and Repaired, n = 51	25	49
Passed ASM Emissions and Repaired, n = 52	0	0
Partial repairs/Left program, n = 29	19	66
Not testable, n = 2	Data not available	- - -
All others, n = 33	>2	>6

Gross polluters were identified in each of the categories except those that initially passed the ASM emissions-testing portion of the Smog Check inspection at the repair facilities. Notable is the much higher fraction of high emitters found in the group of 29 vehicles that were only partially repaired. From Table 2, we also observe that the emissions of this group were generally higher on average than any of the other vehicle categories, so this is a group that merits further attention regarding potential for emission reductions. It is possible that the “not testable” group of vehicles had a significant number of gross polluters, but there are no emissions data available from this

category. Data were incomplete for some of the vehicles in the “all others” category, so the number of gross polluters in this group is a lower-limit value.

PARLIER TUNE IN & TUNE UP PARTICIPANTS

The following demographic data were compiled for those who participated in the Parlier Tune In & Tune Up event. Figure 4 is a map of the Parlier area with three sets of information. The dots show the residence of participants; the color shadings give the average household income by census tract, and the legend provides the participant totals by average income range. Although outreach for the program focused on the Parlier/Reedley area and most participants were from the immediate area, there were some participants from as far as Clovis and Tulare, about 35 miles from Parlier. In addition, all but 4 of the 141 participants for whom data were available live in census tracts that averaged less than \$50,000 annual income in the 2000 census.

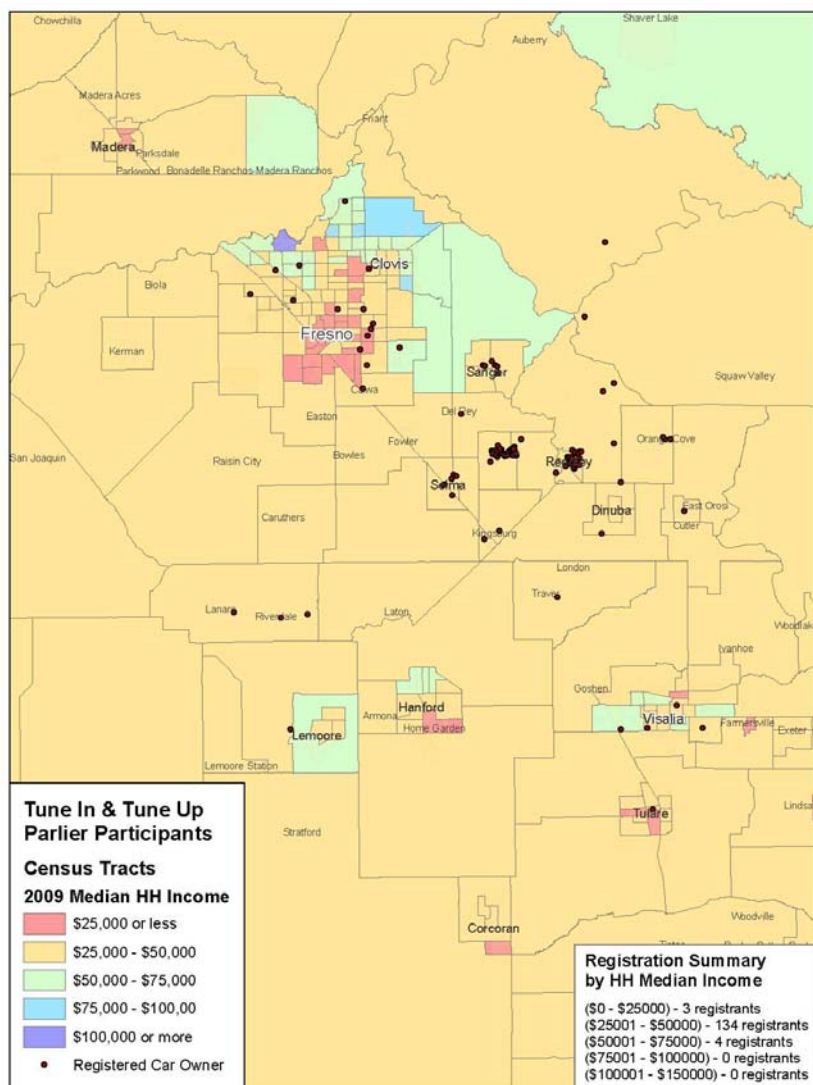


Figure 4. Location, census tract average household incomes, and incomes of participants in the Parlier Tune In & Tune Up Program.

SUMMARY

The Parlier Tune In & Tune Up event was successfully conducted on March 29, 2008. There were 342 motorists who brought their vehicles to the event to participate in the Program. Nearly half 270 of those who came to the events qualified for the repair voucher at Reedley Automotive smog shop for repairs. The total spent on Smog Check inspections and repairs for the Parlier event was \$50,338, with \$8,820 of that amount spent on repairs directly by vehicle owners.

There were 103 vehicles that were successfully repaired according to Smog Check program criteria, at an average cost of \$583 per vehicle. One-half of the vehicles (51) that entered the repair program failed the emissions portion of the Smog Check inspection, while 52 failed for reasons other than the emissions test. Half of the vehicles that failed the emissions portion of the initial Smog Check inspection were classified as gross polluters according to Smog Check emissions criteria. The average repair cost for the vehicles that failed the emissions test was \$640, and those vehicles' CO, HC, and NO_x emissions were reduced by 90, 91, and 77%, respectively. For the remaining 52 vehicles that failed the Smog Check inspection but did not fail for emissions, their average repair cost was \$527. For those 52 vehicles, CO, HC, and NO_x emissions decreased by 35, 38, and 44%, respectively, after repairs. Although those 52 vehicles were successfully repaired according to Smog Check criteria, their emission reductions were small when compared with those that failed the emissions portion of the Smog Check inspection before repairs.

The owners of 29 participating vehicles chose not to have their vehicles completely repaired according to Smog Check inspection criteria for a variety of reasons. The average pre-repair emissions were generally highest for this group of vehicles, so a significant emissions benefit was lost from those vehicles. Sixteen percent of the vehicles that failed the emissions/inspection on the day of the TI&TU event passed the Smog Check inspection at the repair shops.

Large emission reductions were obtained from the effectively-repaired 51 vehicles that failed the emissions portion of the Smog Check inspection; their emission reductions were larger than those obtained from repaired vehicles in the 1995 California I/M Pilot Program. If each of these vehicles was driven 10,000 miles per year and the repairs lasted for 10,000 miles, each vehicle's emissions would be reduced by a total of 470, 127, and 30 pounds per year of CO, HC, and NO_x, respectively. In a one-year period, the 51 successfully-repaired vehicles' emissions would be reduced by 12, 3.2, and 0.76 tons of CO, HC, and NO_x, respectively.

The cost-effectiveness of the 51 successfully-repaired vehicles in the Parlier Tune In & Tune Up Program was \$2,044/ton for the sum of carbon monoxide, exhaust hydrocarbons, and nitrogen oxide emissions. For exhaust hydrocarbons and nitrogen oxides combined, the cost of emission reductions was \$8,160/ton. These are upper-limit values, because reductions of evaporative or nontailpipe hydrocarbons emissions obtained by performing Smog Check repairs were not measured in this program. Additional program benefit would have been obtained if all participating vehicles had been completely repaired.

ACKNOWLEDGMENTS

The Valley CAN Program provided strategic, logistical and financial support of the Parlier Tune In & Tune Up event. We thank the California Department of Consumer Affairs staff who provided on-site support by administering the emissions test used to identify high-emitting vehicles in this study, Roger Teschner from the Advanced Transportation Technology and Energy Initiative (ATTEi) at Fresno City College, the Kenneth L. Maddy Institute at California State University, Fresno for providing additional funding through a grant from the California Partnership for the San Joaquin Valley to outreach to smaller environmental justice communities, Parlier High School, and the automotive students and instructors from Reedley College. We acknowledge Mary Teschner for creating the initial databases for the vehicles that participated in the Parlier TI&TU event and Cynthia Stover who was instrumental in providing key data. The certified Gold Shield repair shop that participated in the Parlier TI&TU event was Reedley Automotive.