OAR Box 1260

Prepped by Ollie Stewart

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NOTE

5/1/92

From: Gene Tierney

To: Rich Theroux

RE: I/M Scenarios you Requested

RECEIVED
JUL 10 1992
EPA AIR DOCKET

Attached are the emission reduction estimates and cost effectiveness calculations that you requested. Attachments One and Two show the benefits and cost effectiveness with two different assumptions about repair effectiveness. Attachment Three shows why: Of the 23 vehicles that passed the two-speed test after commercial repairs in our Indiana test program, only 12 passed the IM240. We are continuing to accumulate data on this and will be adjusting the repair effectiveness estimates in MOBILE5 accordingly. California has made similar (preliminary) findings in a large study they are conducting of the BAR90 program. So, Attachment One shows repair effectiveness levels based on this most recent data about repairs in Indiana. Attachment Two shows the MOBILE4.1 repair effectiveness levels.

In general, the cost-effectiveness estimates show the same basic outcome as we found earlier. In other words, the effect of the double amortization you requested only slightly increased the cost-effectiveness estimates. For example, our recommended enhanced program (biennial run #10) comes out at $527 per ton without convenience costs added. With convenience costs added, the estimate is $1636 per ton. The incremental cost-effectiveness of switching to our recommended program is negative (i.e., it saves money). In other words, for each million vehicles in an I/M area, our proposal will reduce actual I/M costs by about $18 million and increase the VOC reductions by about 5,500 tons per year. Including convenience costs, the savings *grows* to about $25 million per year. That is an additional savings of $7 million per year per million vehicles in reduced convenience costs. Even under the most favorable assumptions for test&repair convenience, I think you can see that overcoming this margin of benefit will be difficult. For all enhanced I/M areas combined, the savings amounts to $1.4 billion. That does not include the stationary source control savings.

Attachments One and Two show biennial and annual runs for test-only programs and for test&repair programs. In the test-only case, we added a run that you didn't request but that we felt was important for you to see. Run #10 portrays the maximum benefit we estimate is achievable from I/M, to provide you a reference point for our proposed minimum. We could easily justify an even tougher performance standard.

Per your request, I amortized the costs twice. First, I amortized the capital costs over a 6 year period. Then I estimated test costs for each of the scenarios. The scenarios were then run and the cost outputs were annualized and amortized over a four year period. In the first year, 100% of the benefits were enjoyed, second year 50%, third year 25%, and fourth year 12%. No benefits are left after that year. Attachments Four and Five show the calculations to derive the cost inputs for each scenario. Attachment Six includes further details on the derivation of the test costs in Attachments Four and Five.

The following provides our response to the list of questions you posed:

1) For the test&repair IM240 runs we assumed a station would perform about 29,250 tests in five years, or about 2 vehicles per hour, 9 hours per day. 29,250 tests spread over one test lane would be maximizing the use of that lane and labor to run tests. In order to achieve higher through put in a test&repair lane, we would have to assume higher capital investment to automate and systematize the lane configuration. We assume only $115,000 for the lane in the test&repair scenarios vs. 245,000 for test only lanes. In any case, the IM240 test&repair scenario essentially assumes no down-time on the lane.

2) All of the centralized programs listed on page 46 are competitively bid, contracted systems and are open to all comers. Once bids are received, the state in each of these cases awards the obligation/right to provide testing services at a fixed price for a fixed contractual period to a single contractor (except in Florida, which chose to award contracts to three different contractors in different urban areas or portions thereof). Of the decentralized programs listed, only California and New Mexico have a free market pricing system. Alaska, like all the other states, caps the test fee but in this case the cap is quite high - over $30. It may be that most tests done in Alaska actually cover costs.

3) This cost has been addressed; see Attachment 6.

4) As discussed, the labor overhead was included in the "general overhead" category of the cost assumptions in the Technical Support Document. We used wage rate since most people relate to hourly rate more easily than total labor cost. For the purposes of the cost analysis done here, we removed labor overhead from the general overhead category and recalculated labor costs accordingly.

5) Instead of discounting emission reductions, I annualized and amortized costs for this analysis; see Attachment 6 for details.

6) See question 1 above and Attachment 6 for the discussion of test cost modeling.

7) As we've discussed, I do not think there is a convenience cost advantage to a decentralized network. I agree that there are differences between the two systems but the net effect is close enough to a wash to make not worth struggling over. The real convenience issue is test frequency and we want to cut that in half - dramatically lowering the convenience related costs of I/M over the current situation.

8) One source of data on the actual costs and types of repairs performed in I/M programs is the repairs contractor mechanics do in our test programs and another is data from states that collected good repair information. See Appendix I of I/M Costs, Benefits and Impacts for details on the types of repairs and the associated costs of evaporative system problems. Attachment 7 includes some data on typical repairs and repair costs related to emission test failures. The MOBILE model assumes that an I/M failure leads to an emission reduction that mainly depends on how dirty the vehicle is (super emitter, very high, etc. although not all vehicles return to the normal emitter level) and the technology of the vehicle. It does not assume a particular distribution of specific repairs. MOBILE4.1 does not differentiate repair effects on the basis of the test used and, in fact, assumes the repair effectiveness estimates for the IM240 are identical to the two-speed test. As discussed above, we are finding that this is not correct and we have provided you with updated assumptions about repair effectiveness for the steady-state tests. Deterioration (or decay) rates are not a function of test type but vehicle technology and age.

9) There are two components to the market failure. First, the average fuel economy benefit from the IM240 repair is under 13%. This is low enough to be missed by most motorists. Gasoline is so cheap that motorists don't bother monitoring fuel economy closely, if at all. The other component is a failure in the repair industry: mechanics don't know how to fix cars properly. When repairs are made, optimization for fuel economy (like emissions) is not the prime criterion - driveability is what most motorists are after and that may be in conflict with fuel economy. Finally, given the inability of mechanics to deal with engine problems, motorists that are aware of a fuel economy problem often are frustrated in their attempts to get the needed repair. The radio show "The Car Guys" and similar outlets for motorist frustration are indicative of the degree to which this is a problem. Improved testing, diagnostics, mechanic training, and mechanic certification resulting from our proposed I/M program will dramatically improve this situation.

I hope this helps you come to a rapid conclusion of your review. I am sure you will have questions - I will be available. We are hoping that we can announce on May 11 at the North American Motor Vehicle Emission Control Conference, which is hosted by State and local air pollution officials, that the rule has been released by OMB. They are very anxious to see a proposal.

Attachment One

I/M BENEFITS

(Adjusted Repair Effectiveness on Steady State Tests)

		Emission Benefits Percent Reduction			Cost Effectiveness Dollars per Ton	
	BIENNIAL TEST ONLY	**VOC**	**CO**	**NOx**	**No Convenience Costs**	**With Convenience Costs**
1	Idle	4.7%	11.8%	↑*	$5,387	$12,054
2	Idle/Pressure	13.6%	11.8%	↑	$2,238	$4,532
3	Two Speed	5.0%	13.0%	↑	$5,530	$11,841
4	Two Speed/Pressure	13.9%	13.0%	↑	$2,404	$4,654
5	Loaded	5.0%	13.1%	↑	$5,582	$11,830
6	Loaded/Pressure	13.9%	13.1%	↑	$2,380	$4,623
7	IM240	15.5%	31.6%	7.5%	$521	$2,542
8	IM240/Pressure	21.9%	31.6%	7.5%	$673	$2,100
9	IM240/Pressure/Purge	28.2%	31.6%	7.5%	$527	$1,636
10	Maximum	32.7%	39.5%	7.5%	$488	$1,482
	ANNUAL TEST ONLY					
1	Idle	5.4%	13.3%	↑	$7,992	$19,586
2	Idle/Pressure	15.0%	13.3%	↑	$3,498	$7,686
3	Two Speed	5.7%	14.5%	↑	$8,394	$19,397
4	Two Speed/Pressure	15.3%	14.5%	↑	$3,834	$7,942
5	Loaded	5.7%	14.6%	↑	$7,887	$18,784
6	Loaded/Pressure	15.3%	14.6%	↑	$3,562	$7,655
7	IM240	17.5%	35.3%	8.5%	$1,673	$5,245
8	IM240/Pressure	24.3%	35.3%	8.5%	$1,675	$4,256
9	IM240/Pressure/Purge	31.0%	35.3%	8.5%	$1,304	$3,326
10	Maximum	36.1%	44.3%	8.5%	$1,161	$2,965
	BIENNIAL TEST & REPAIR					
1	Idle	3.1%	7.1%	↑	$23,831	$33,985
2	Idle/Pressure	7.6%	7.1%	↑	$10,991	$15,130
3	Two Speed	3.2%	7.7%	↑	$23,425	$33,155
4	Two Speed/Pressure	7.7%	7.7%	↑	$11,050	$15,118
5	Loaded	3.2%	7.8%	↑	$24,723	$34,375
6	Loaded/Pressure	7.7%	7.8%	↑	$11,588	$15,642
7	IM240	9.7%	14.2%	3.8%	$5,724	$9,109
8	IM240/Pressure	12.7%	18.8%	3.8%	$5,145	$7,604
9	IM240/Purge/Pressure	15.9%	18.8%	3.8%	$4,519	$6,492
	ANNUAL TEST & REPAIR					
1	Idle	3.4%	7.9%	↑	$40,165	$58,362
2	Idle/Pressure	8.2%	7.9%	↑	$18,547	$26,161
3	Two Speed	3.6%	8.5%	↑	$39,631	$57,085
4	Two Speed/Pressure	8.4%	8.5%	↑	$18,699	$26,180
5	Loaded	3.6%	8.5%	↑	$41,025	$58,352
6	Loaded/Pressure	8.4%	8.5%	↑	$19,275	$26,733
7	IM240	10.7%	20.8%	4.3%	$11,134	$16,964
8	IM240/Pressure	13.9%	20.8%	4.3%	$9,597	$14,090
9	IM240/Purge/Pressure	17.3%	20.8%	4.3%	$8,210	$11,834

* Steady-state tests result in NOx increases

Attachment Two

I/M BENEFITS

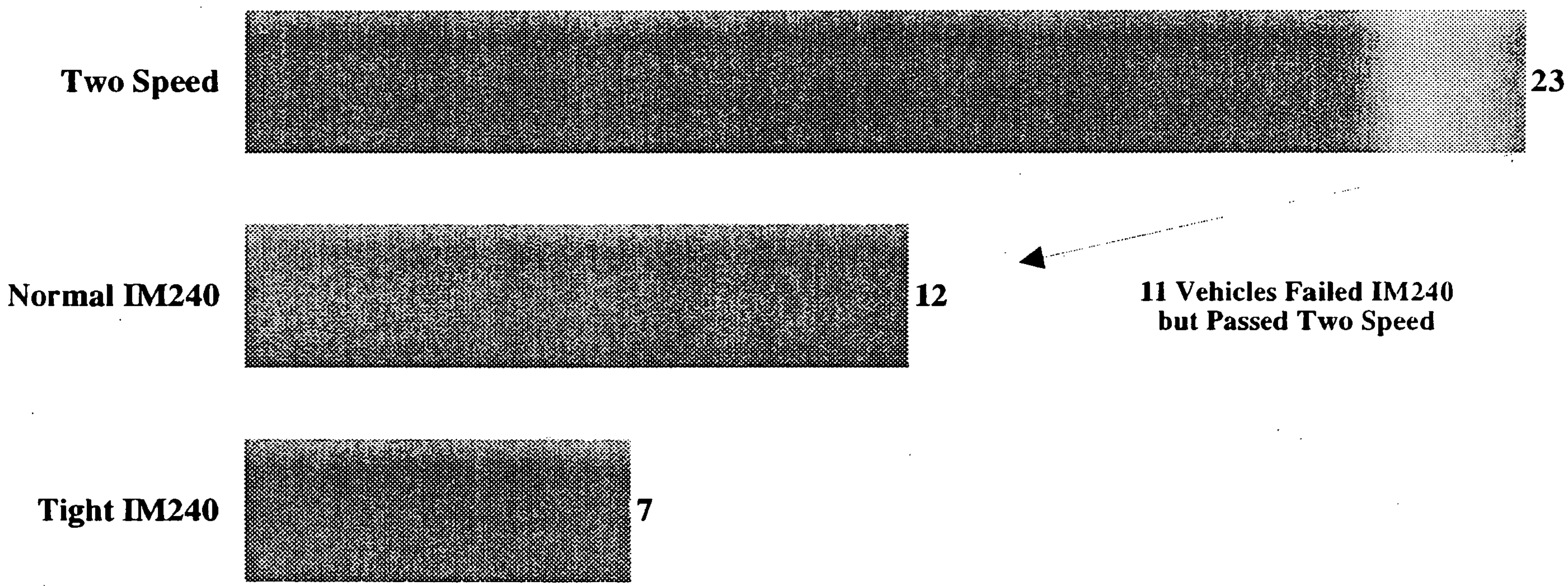
(MOBILE4.1 Equal Repair Effectiveness)

		Emission Benefits Percent Reduction			Cost Effectiveness Dollars per Ton	
	BIENNIAL TEST ONLY	VOC	CO	NOx	No Convenience Costs	With Convenience Costs
1	Idle	7.9%	21.3%	↑*	$2,789	$6,726
2	Idle/Pressure	16.9%	21.3%	↑	$1,622	$3,474
3	Two Speed	8.5%	23.6%	↑	$2,822	$6,514
4	Two Speed/Pressure	17.4%	23.6%	↑	$1,717	$3,514
5	Loaded	8.6%	23.8%	↑	$2,848	$6,497
6	Loaded/Pressure	17.5%	23.8%	↑	$1,694	$3,480
7	IM240	15.5%	31.6%	7.5%	$521	$2,542
8	IM240/Pressure	21.9%	31.6%	7.5%	$673	$2,100
9	IM240/Pressure/Purge	28.2%	31.6%	7.5%	$527	$1,636
10	Maximum	32.7%	39.5%	7.5%	$488	$1,482
	ANNUAL TEST ONLY					
1	Idle	9.4%	24.2%	↑	$4,226	$10,915
2	Idle/Pressure	18.9%	24.2%	↑	$2,575	$5,886
3	Two Speed	9.9%	26.6%	↑	$4,402	$10,701
4	Two Speed/Pressure	19.5%	26.6%	↑	$2,793	$6,005
5	Loaded	10.1%	26.9%	↑	$4,107	$10,336
6	Loaded/Pressure	19.6%	26.9%	↑	$2,574	$5,768
7	IM240	17.5%	35.3%	8.5%	$1,673	$5,245
8	IM240/Pressure	24.3%	35.3%	8.5%	$1,675	$4,256
9	IM240/Pressure/Purge	31.0%	35.3%	8.5%	$1,304	$3,326
10	Maximum	36.1%	44.3%	8.5%	$1,161	$2,965
	BIENNIAL TEST & REPAIR					
1	Idle	4.7%	11.9%	↑	$15,210	$21,833
2	Idle/Pressure	9.2%	11.9%	↑	$8,858	$12,258
3	Two Speed	5.0%	13.1%	↑	$14,733	$21,000
4	Two Speed/Pressure	9.5%	13.1%	↑	$8,789	$12,094
5	Loaded	5.0%	13.2%	↑	$15,535	$62,500
6	Loaded/Pressure	9.5%	13.2%	↑	$9,207	$12,493
7	IM240	9.7%	14.2%	3.8%	$5,724	$9,109
8	IM240/Pressure	12.7%	18.8%	3.8%	$5,145	$7,604
9	IM240/Purge/Pressure	15.9%	18.8%	3.8%	$4,519	$6,492
	ANNUAL TEST & REPAIR					
1	Idle	5.4%	13.4%	↑	$25,067	$36,576
2	Idle/Pressure	10.2%	13.4%	↑	$14,741	$20,866
3	Two Speed	5.7%	14.6%	↑	$24,443	$35,363
4	Two Speed/Pressure	10.5%	14.6%	↑	$14,690	$20,644
5	Loaded	5.8%	14.7%	↑	$25,260	$36,078
6	Loaded/Pressure	10.6%	14.7%	↑	$15,117	$21,041
7	IM240	10.7%	20.8%	4.3%	$11,134	$16,964
8	IM240/Pressure	13.9%	20.8%	4.3%	$9,597	$14,090
9	IM240/Purge/Pressure	17.3%	20.8%	4.3%	$8,210	$11,834

* Steady-state tests result in NOx increases

Attachment 3

NUMBER OF VEHICLES PASSING AFTER REPAIR



Attachment 4

TEST-ONLY NETWORK COSTS

	Current Steady State	IM240 Pressure Purge	IM240 Pressure	IM240 Only	Loaded Pressure	Loaded	Two Speed Pressure	Two Speed	Idle Pressure	Idle Only
Lanes per Station	4	4	4	4	4	4	4	4	4	4
Vehicles per Lane (5 Years)	195,000	117,000	117,000	117,000	156,000	156,000	117,000	117,000	156,000	156,000
Total Hours (5 Years)	15,600	15,600	15,600	15,600	15,600	15,600	15,600	15,600	15,600	15,600
<u>Labor Costs</u>										
Staff per Lane	2	3	3	2	3	2	3	2	3	2
Labor Cost	$8.22	$8.22	$8.22	$8.22	$8.22	$8.22	$8.22	$8.22	$8.22	$8.22
Per Test	$1.32	$3.29	$3.29	$2.19	$2.47	$1.64	$3.29	$2.19	$2.47	$1.64
<u>Capital and Equipment Costs</u>										
Test Equipment	$40,000	$120,000	$119,500	$118,900	$40,600	$40,000	$15,600	$15,000	$15,600	$15,000
Other Capital Costs	$215,000	$245,000	$245,000	$215,000	$245,000	$215,000	$245,000	$215,000	$245,000	$215,000
Subtotal	$255,000	$365,000	$364,500	$333,900	$285,600	$255,000	$260,600	$230,000	$260,600	$230,000
Amortized at 10% for 6 years	$340,134	$486,859	$486,192	$445,376	$380,951	$340,134	$347,604	$306,788	$347,604	$306,788
Per Vehicle	$1.74	$4.16	$4.16	$3.81	$2.44	$2.18	$2.97	$2.62	$2.23	$1.97
<u>Summary Test Cost</u>										
Inspection Staff	$1.32	$3.29	$3.29	$2.19	$2.47	$1.64	$3.29	$2.19	$2.47	$1.64
State Oversight	$1.25	$1.75	$1.75	$1.75	$1.75	$1.75	$1.75	$1.75	$1.75	$1.75
Capital Costs	$1.74	$4.16	$4.16	$3.81	$2.44	$2.18	$2.97	$2.62	$2.23	$1.97
Other Costs	$4.19	$6.98	$6.91	$6.91	$5.24	$4.19	$5.24	$4.19	$5.24	$4.19
Total Cost per Test	**$8.50**	**$16.18**	**$16.11**	**$14.66**	**$11.90**	**$9.76**	**$13.25**	**$10.75**	**$11.68**	**$9.55**

Attachment 5

TEST AND REPAIR NETWORK COSTS

	Current Cost Limited Steady State	IM240 Pressure Purge	IM240 Pressure	IM240 Only	Loaded Pressure	Loaded Only	Two Speed Pressure	Two Speed	Idle Pressure	Idle Only
Vehicles per Lane (5 Years)	5,125	29,250	29,250	29,250	10,250	10,250	5,125	5,125	5,125	5,125
Total Hours (5 Years)	2,563	16,088	14,625	13,163	5,125	4,613	3,075	2,563	3,075	2,563
Labor Costs										
Labor Cost	$15.00	$15.00	$15.00	$15.00	$15.00	$15.00	$15.00	$15.00	$15.00	$15.00
Per Test	$7.50	$8.25	$7.50	$6.75	$7.50	$6.75	$9.00	$7.50	$9.00	$7.50
Capital and Equipment Costs/Lane										
Test Equipment	$15,000	$120,000	$119,500	$118,900	$30,600	$30,000	$15,600	$15,000	$15,600	$15,000
Other Capital Costs	$20,000	$115,000	$115,000	$115,000	$60,000	$60,000	$30,000	$30,000	$30,000	$30,000
Subtotal	$35,000	$235,000	$234,500	$233,900	$90,600	$90,000	$45,600	$45,000	$45,600	$45,000
Amortized at 10% for 6 years	$35,000	$313,457	$312,790	$311,990	$120,848	$120,047	$60,824	$60,024	$60,824	$60,024
Per Vehicle	$6.83	$10.72	$10.69	$10.67	$11.79	$11.71	$11.87	$11.71	$11.87	$11.71
Summary Test Cost										
Inspection Staff	$7.50	$8.25	$7.50	$6.75	$7.50	$6.75	$9.00	$7.50	$9.00	$7.50
State Oversight	$2.00	$6.00	$6.00	$5.00	$6.00	$5.00	$6.00	$5.00	$6.00	$5.00
Capital Costs	$6.83	$10.72	$10.69	$10.67	$11.79	$11.71	$11.87	$11.71	$11.87	$11.71
Other Costs	$1.37	$11.87	$11.52	$11.18	$10.83	$10.48	$8.38	$7.68	$8.38	$7.68
Total Cost Per Test	**$17.70**	**$36.84**	**$35.72**	**$33.59**	**$36.12**	**$33.94**	**$35.25**	**$31.89**	**$35.25**	**$31.89**

Attachment Six

DERIVATION OF I/M TEST COSTS

TEST ONLY COSTS

- Based on your comments I revised the cost estimate methodology to pull the labor overhead costs out and adjust them separately from the throughput adjustment. I also pulled out all capital expenditure costs and amortized them over 6 years. The net effect of this is to reduce the estimated cost of our proposed program (i.e., the test-only, IM240, pressure, purge scenario). Remember that we were adjusting the labor overhead and other capital expenditure costs by 1.66, which, it turns out, is an overestimate.

- Test volume per lane is a function of the types of tests being performed. We assumed the use of second chance testing and extended preconditioning in the loaded, two speed and idle scenarios.

- Staffing per lane also varies by tests performed. Implementation of a pressure test is assumed to require a third position in the lane, requiring an additional inspector and a longer test lane (the alternative is to increase the test time, which would be less cost efficient and an unlikely choice). Staff costs are assumed to be the same per inspector regardless of the types of tests performed.

- Test equipment costs are pretty straight-forward. Other capital costs (building construction, etc.) are varied only to account for a longer test lane to accommodate three positions. Both of these costs are amortized over 6 years at 10%.

- State oversight costs are assumed to increase by 50¢ per test for all test-only scenarios.

- Other costs are adjusted by the throughput adjustment factor for the scenario.

TEST & REPAIR COSTS

- Vehicles per station for the idle and two-speed test were assumed identical to current decentralized. In the case of the loaded steady-state test scenarios, I assumed higher test volumes. The IM240 scenarios assume even higher test volumes.

- Labor costs are a function of the skill mix required and the number of hours spent doing testing. In a system where you have many stations and lanes, you can hire specialists to do things like calibrate and maintain the equipment. In a low volume system, the inspector would have to take over the routine maintenance items and service contracts would be needed to cover more complex tasks.

- Labor costs per test are a function of the number of hours dedicated to the testing process. In a test&repair system, when the inspector wasn't doing a test, he or she might be doing other tasks, like repairs. In the test&repair IM240 scenarios, however, the test volume is such that a full-time inspector would be needed. In the case of the test-only scenarios, labor is dedicated to testing full time.

- Capital costs were dealt with in the same fashion as for test-only scenarios.

- State oversight costs vary depending on the station volume and the types of tests being performed.

- Other costs are also a function of types of tests and test volume. It is assumed that economies of scale are lost in lower volume systems.

Attachment Seven

REPAIR COSTS AND TYPES OF REPAIRS IN I/M PROGRAMS

The charts in this attachment come from a study EPA did in cooperation with the motor vehicle manufacturers. The charts on the first two pages show the kinds of problems found on vehicles that fail an I/M test and the contribution they make to emission reduction benefits. The tables on the subsequent pages are from the Wisconsin annual I/M report. They show, by model year, the kinds of repairs and the cost of repairs performed in the program on light duty vehicles.

of the repaired vehicles. It was even more effective than the oxygen sensor at reducing HC per vehicle, at 1.11 g/mi, but only about 1/3 as effective at reducing CO.

FIGURE 38

Contribution of Subsystems to Total HC Repair Benefit -- by Quota Group

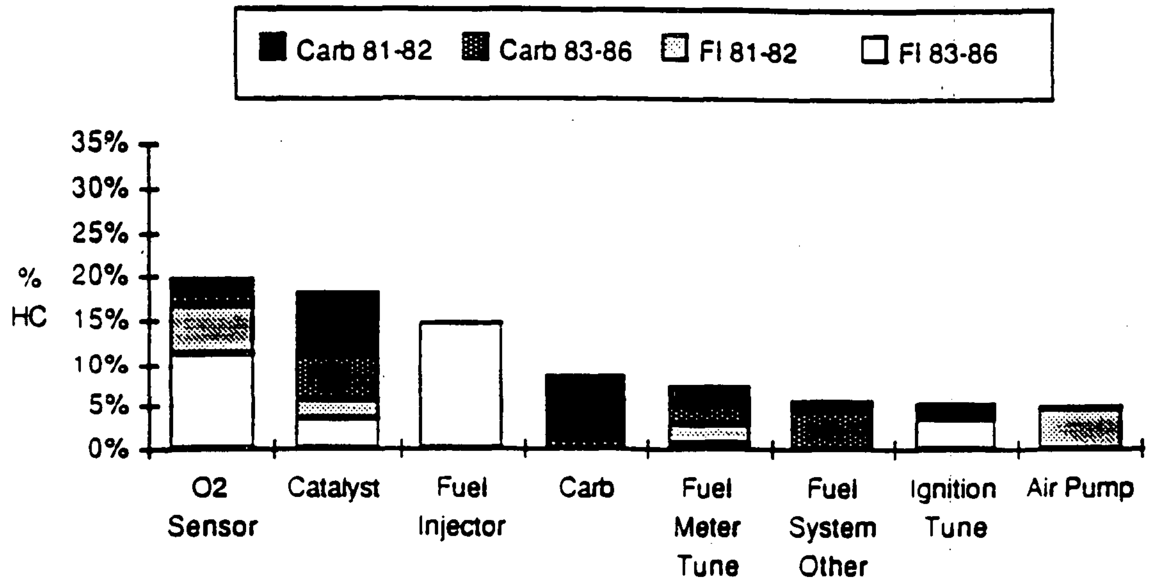
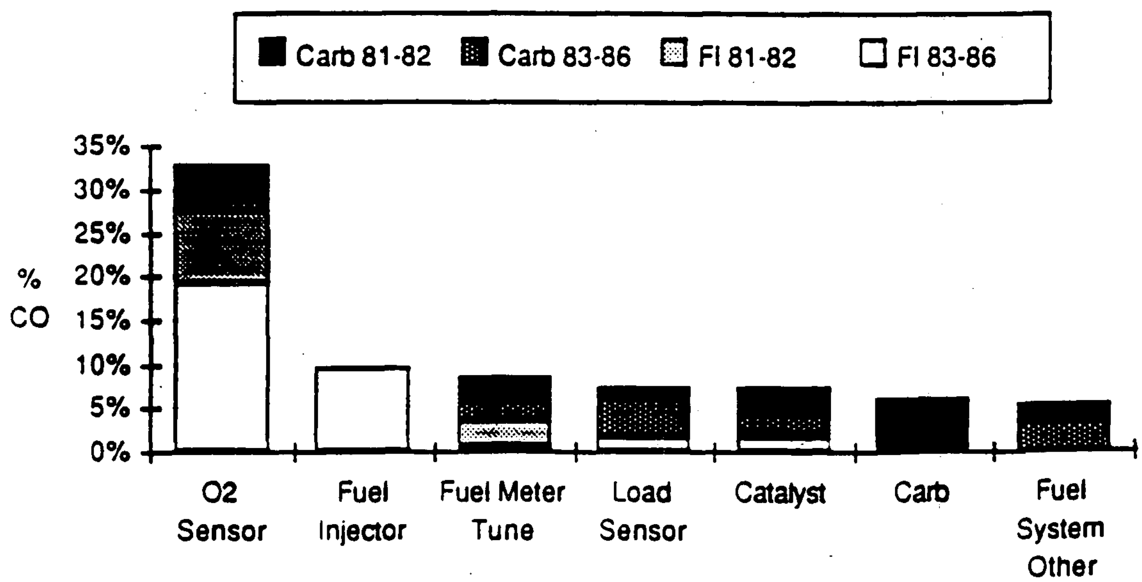


FIGURE 39

Contribution of Subsystems to Total CO Repair Benefit -- by Quota Group



sample size, the multiple regression tracked the averages of isolatable repairs closely.

Figures 34 and 35 chart the average emission reductions from the preceding table. Dark columns indicate those subsystems that have statistically significant reductions for that pollutant. The average reduction for all repairs -- not just the seven major ones -- is also included in the figures. See Appendix H for breakdowns of these figures by quota group.

FIGURE 34

Average HC Reduction per Isolatable Subsystem Repair

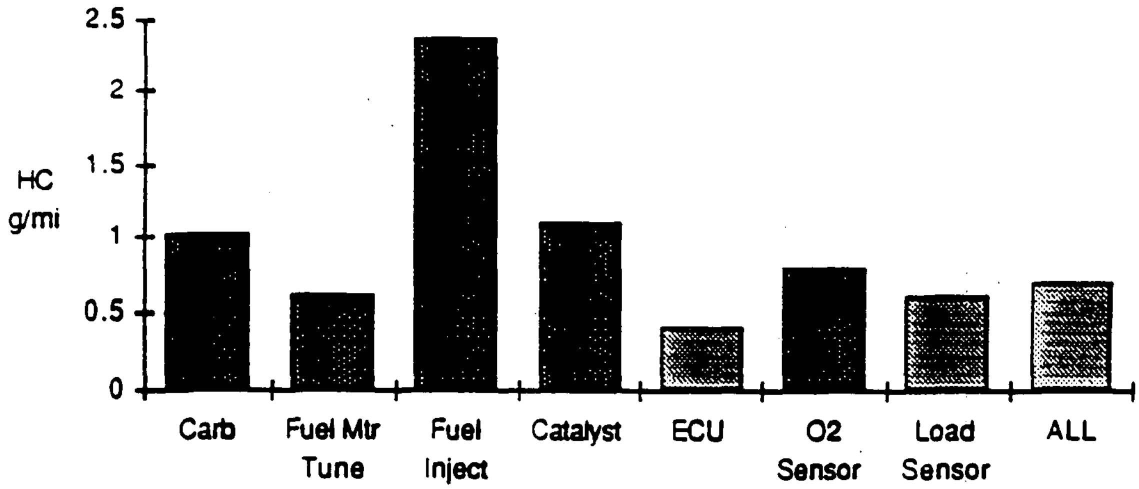
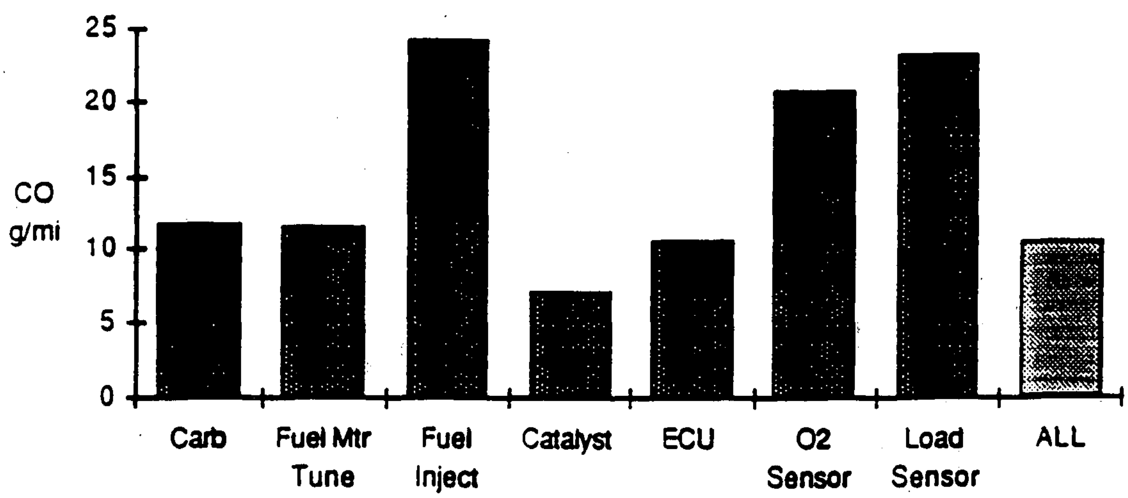


FIGURE 35

Average CO Reduction per Isolatable Subsystem Repair



WISCONSIN DEPT. OF TRANSPORTATION
MOTOR VEHICLE INSPECTION PROGRAM
SAS PGM#J1415640 (P7314183)

S U M M A R Y B Y M O D E L Y E A R
WAIVER INSPECTIONS INCLUDING AVERAGE COSTS PER VEHICLE
ANNUAL----- REPORT FOR 04/01/88 THRU 03/31/89

REPORT : P73-141-5615
DATE : 04/25/89
PAGE : 1

	<---------T A M P E R I N G ------>						<---------------------------W A I V E R S --------------------------->											
	<---------REPAIRED--------->						<-------------------- WAIVER CRITERIA SATISFIED-------------------->											
YEAR	TAMP INSP #	THER AIR CLNR	AIR PUMP SYSM	PCV SYSM ----	CAT CONV ----	FUEL FILR RSTR	*REPAIR COSTS >$55* #	AVE	RANGE	**MODEL YEAR >10** COSTS OF LO-M #	AVE	RANGE	*** EST COST >$55*** COSTS OF LO-M #	AVE	RANGE	TECH DIFF #	WAIV GRNT #
1989									-			-			-	6	6
1988	5						2	73	68-77			-			-	54	56
1987	21	1					18	140	56-536			-	1	46	46- 46	56	75
1986	80	2	3	1			77	111	56-830			-	3	117	57- 162	41	121
1985	245	17	7	5			228	101	55-497			-	15	70	20- 340	47	290
1984	501	53	18	6	5	2	464	105	55-999			-	38	58	13- 175	56	558
1983	800	82	28	11	7	1	544	114	55-999			-	47	56	13- 406	29	621
1982	905	182	70	41	12	8	809	103	55-999			-	86	64	8- 350	41	938
1981	1198	236	124	61	30	15	1089	107	55-999			-	91	53	15- 424	79	1359
1980	1073	233	96	54	25	10	923	98	55-999			-	115	55	1- 999	117	1[illegible]57
1979	2760	602	132	233	58	71	2369	99	55-999			-	317	47	5- 450	254	2945
1978	1867	422	56	178	31	45	1472	90	54-999			-	234	45	10- 550	154	1947
1977	1116	247	29	121	20	30	599	91	25-789	296	48	1- 275	81	46	4- 154	199	1[illegible]75
1976	693	158	38	77	17	30	303	84	12-477	227	50	1- 677	49	43	11- 150	153	742
1975	370	89	12	38	9	8	145	88	55-833	129	51	9- 431	21	46	18- 97	100	395
1974	205	61	9	26			89	84	55-245	74	44	6- 210	7	40	15- 76	54	224
1970	55	16	1	9			31	111	55-999	13	52	4- 125			-	18	62
TOTALS	11694	2398	633	881	214	220	9182	99	12-999	739	49	1- 677	1103	50	1- 999	1478	12587

WISCONSIN DEPT. OF TRANSPORTATION
MOTOR VEHICLE INSPECTION PROGRAM
SAS PGM#J1415650 (P7314184)

S U M M A R Y B Y M O D E L M A K E
WAIVER INSPECTIONS INCLUDING AVERAGE COSTS PER VEHICLE
ANNUAL----- REPORT FOR 04/01/88 THRU 03/31/89

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	<---------T A M P E R I N G ------>						<---------------------------W A I V E R S --------------------------->															
	<---------REPAIRED--------->						<-------------------- WAIVER CRITERIA SATISFIED-------------------->															
YEAR	TAMP INSP #	THER AIR CLNR	AIR PUMP SYSM	PCV SYSM ----	CAT CONV ----	FUEL FILR RSTR	*REPAIR COSTS >$55* #	AVE	RANGE		**MODEL YEAR >10** COSTS OF LO-M #	AVE	RANGE		*** EST COST >$55*** COSTS OF LO-M #	AVE	RANGE		TECH DIFF #	WAIV GRNT #
AMC	174	30	14	18	3	3	117	103	55	900	29	43	7	228	13	52	15	240	18	177
AUDI	41	4		1			30	158	57	666					11	57	15	150	3	44
BUICK	1075	177	24	95	18	26	869	93	27	999	69	42	1	138	69	49	5	195	120	1127
CAD	326	44	10	40	4	12	261	104	55	600	25	59	12	173	30	43	16	144	25	341
CHEV	1904	430	75	116	28	53	1529	97	55	999	108	48	4	189	165	51	1	999	330	2132
CHRYS	257	63	22	9	10	3	197	93	25	457	31	40	5	107	32	63	15	450	17	277
DODGE	806	152	55	24	19	8	624	102	55	999	57	59	3	677	94	47	11	190	53	828
FIAT	10	1	3				8	130	57	504	1	90	90	90						9
FORD	2236	652	207	198	40	35	1771	98	12	999	150	50	1	216	203	50	10	550	246	2370
HONDA	118	13	1				88	90	55	337	1	5	5	5	27	47	10	86	4	120
LINCN	103	35	15	7	3	6	78	108	55	999	9	60	26	171	7	62	26	133	12	106
MAZDA	118	10	5	1		1	109	109	55	999	1	32	32	32	8	40	20	53	5	123
MERC	621	169	70	55	7	9	509	105	55	999	18	40	16	150	67	43	10	175	61	655
NISAN	173	8	5		1		145	96	55	875	4	98	52	210	21	49	18	175	7	177
OLDS	1238	158	27	172	23	29	920	99	55	999	138	52	5	259	104	49	4	515	138	1300
OPEL	1										1	38	38	38						1
OTHER	360	67	14	22	14	14	261	109	55	999	24	86	9	700	37	66	23	350	211	533
PLYM	663	124	59	17	20	8	498	96	55	895	52	48	1	465	81	44	10	193	58	589
PONT	985	182	20	86	22	13	760	103	55	999	88	54	7	431	69	53	13	424	140	1057
RENLT	101	12	1		2		92	93	55	497					9	52	27	89	2	103
SUBAR	34	4					27	95	55	222	1	82	82	82	6	102	40	350		34
TOYOT	131	15	5	4			111	93	55	381	6	37	20	52	14	41	15	131	14	145
VOLKS	194	45	1	16			148	91	55	543	9	39	20	54	35	56	10	329	13	203
VOLVO	15	4					12	92	58	186	2	32	25	39	1	75	75	75	1	16
TOTAL	11694	2389	633	881	214	220	9182	99	12	999	824	50	1	700	1103	50	1	999	1478	12567

WISCONSIN DEPT. OF TRANSPORTATION
MOTOR VEHICLE INSPECTION PROGRAM
SAS PGM=J1415110 (P7314178)

SUMMARY BY MODEL YEAR
REPAIR DATA: ITEMS REPLACED, OR ADJUSTED AS NECESSARY
ANNUAL----- REPORT FOR 04/01/88 THRU 03/31/89

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REPORT INCLUDES DATA FROM A 10%
SAMPLE OF TESTS WITH FAIL STATUS

WEIGHT CLASS: AUTOS

YR	MAKE	SPARK PLUGS AND/OR PLUG/W (2)	AIR CLEANER FILTER (4)	CHOKE (6)	ENGINE IDLE SPEED (8)	IDLE AIR/FUEL MIXTURE (10)	ENGINE TIMING DWELL ANGLE/PT (12)	PCV VALVE AND SYSTM (14)	VACUUM HOSES (16)	DISTRIB CAP, ROTOR, CONDNSR (18)	OTHER CARB, FUEL INJCT SYS (20)	AIR PUMP OPERATN (22)	OXYGEN SENSOR (24)	CATALYTIC CONVERTR (26)	THERMOS AIR CLEANER (28)	OTHER (30)	TOTALS
90		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
89	%																
88		4	6	0	3	2	2	1	1	0	3	0	1	0	0	8	31
	%	12.9	19.4	0.0	9.7	6.5	6.5	3.2	3.2	0.0	9.7	0.0	3.2	0.0	0.0	25.8	
87		16	19	3	25	26	17	4	5	2	21	2	4	0	1	17	162
	%	9.9	11.7	1.9	15.4	16.0	10.5	2.5	3.1	1.2	13.0	1.2	2.5	0.0	0.6	10.5	
86		28	38	5	21	20	16	13	9	3	16	5	4	0	1	16	195
	%	14.4	19.5	2.6	10.8	10.3	8.2	6.7	4.6	1.5	8.2	2.6	2.1	0.0	0.5	8.2	
85		63	55	24	59	61	40	29	17	12	16	1	8	1	0	18	404
	%	15.6	13.6	5.9	14.6	15.1	9.9	7.2	4.2	3.0	4.0	0.2	2.0	0.2	0.0	4.5	
84		66	57	23	88	77	54	33	29	19	20	4	9	3	3	20	505
	%	13.1	11.3	4.6	17.4	15.2	10.7	6.5	5.7	3.8	4.0	0.8	1.8	0.6	0.6	4.0	
83		78	77	19	106	96	62	47	35	27	20	11	7	1	7	23	616
	%	12.7	12.5	3.1	17.2	15.6	10.1	7.6	5.7	4.4	3.2	1.8	1.1	0.2	1.1	3.7	
82		71	75	29	120	102	64	41	38	21	13	7	8	3	3	27	622
	%	11.4	12.1	4.7	19.3	16.4	10.3	6.6	6.1	3.4	2.1	1.1	1.3	0.5	0.5	4.3	
81		79	86	46	167	166	96	51	44	26	18	14	9	3	4	26	835
	%	9.5	10.3	5.5	20.0	19.9	11.5	6.1	5.3	3.1	2.2	1.7	1.1	0.4	0.5	3.1	
80		118	114	60	231	253	114	70	62	30	28	11	3	2	7	27	1130
	%	10.4	10.1	5.3	20.4	22.4	10.1	6.2	5.5	2.7	2.5	1.0	0.3	0.2	0.6	2.4	
79		222	242	130	548	560	290	166	143	68	43	13	2	3	9	55	2496
	%	8.9	9.7	5.2	22.0	22.4	11.6	6.7	5.7	2.8	1.7	0.5	0.1	0.1	0.4	2.2	
78		166	187	101	412	457	207	103	102	37	37	11	2	2	11	45	1880
	%	8.8	9.9	5.4	21.9	24.3	11.0	5.5	5.4	2.0	2.0	0.6	0.1	0.1	0.6	2.4	
77		136	143	73	267	301	139	86	76	44	27	8	3	2	7	27	1338
	%	10.2	10.7	5.5	19.9	22.5	10.4	6.4	5.7	3.3	2.0	0.6	0.2	0.1	0.5	2.0	
76		81	75	36	155	184	83	41	42	19	11	7	0	0	3	16	753
	%	10.8	10.0	4.8	20.6	24.4	11.0	5.4	5.6	2.5	1.5	0.9	0.0	0.0	0.4	2.1	
75		41	61	24	102	108	46	33	22	13	9	2	0	2	4	10	477
	%	8.6	12.8	5.0	21.4	22.6	9.6	6.9	4.6	2.7	1.9	0.4	0.0	0.4	0.8	2.1	
74		20	17	17	45	47	24	13	16	9	2	1	1	1	1	7	221
	%	9.0	7.7	7.7	20.4	21.3	10.9	5.9	7.2	4.1	0.9	0.5	0.5	0.5	0.5	3.2	
-> OLDER		2	2	2	6	8	3	0	1	2	0	0	0	0	0	1	27
	%	7.4	7.4	7.4	22.2	29.6	11.1	0.0	3.7	7.4	0.0	0.0	0.0	0.0	0.0	3.7	
ALL YEARS		1191	1254	592	2358	2488	1257	731	642	333	284	97	61	23	61	343	11693
	%	10.2	10.7	5.1	20.1	21.1	10.8	6.3	5.5	2.8	2.4	0.8	0.5	0.2	0.5	2.9	

WISCONSIN DEPT. OF TRANSPORTATION
MOTOR VEHICLE INSPECTION PROGRAM
SAS PGM=J1415110 (P7314178)

SUMMARY BY MODEL YEAR
REPAIR DATA: ITEMS REPLACED, OR ADJUSTED AS NECESSARY
ANNUAL----- REPORT FOR 04/01/88 THRU 03/31/89

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REPORT INCLUDES DATA FROM A 10%
SAMPLE OF TESTS WITH FAIL STATUS

WEIGHT CLASS: AUTOS

YR	MAKE	SPARK PLUGS AND/OR PLUG/W (2)	AIR CLEANER FILTER (4)	CHOKE (6)	ENGINE IDLE SPEED (8)	IDLE AIR/FUEL MIXTURE (10)	ENGINE TIMING DWELL ANGLE/PT (12)	PCV VALVE AND SYSTM (14)	VACUUM HOSES (16)	DISTRIB CAP, ROTOR, CONDNSR (18)	OTHER CARB, FUEL INJCT SYS (20)	AIR PUMP OPERATN (22)	OXYGEN SENSOR (24)	CATALYTIC CONVERTR (26)	THERMOS AIR CLEANER (28)	OTHER (30)	TOTALS

WISCONSIN DEPT. OF TRANSPORTATION
MOTOR VEHICLE INSPECTION PROGRAM
SAS PGM#J1415040 (P7314174)

S U M M A R Y B Y M O D E L Y E A R
REPAIR DATA: AVERAGE REPAIR COST
ANNUAL----- REPORT FOR 04/01/88 THRU 03/31/89

REPORT :P73-141-5015
DATE : 04/26/89
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REPORT INCLUDES DATA FROM A 10%
SAMPLE OF TESTS WITH FAIL STATUS

WEIGHT CLASS: AUTOS

REPAIRED BY	REPAIR FACILITY VEH#	PART	LABOR	TOTAL	RANGE	OWNER VEH#	PART	RANGE	TOTAL VEH#	PART	LABOR	TOTAL	RANGE
1988	14	15	0	15	0- 140	4	9	10 - 14	18	14	0	14	0- 140
1987	70	8	0	8	0- 87	10	9	0 - 20	80	8	0	8	0- 87
1986	72	36	0	36	0- 234	22	13	0 - 103	94	31	0	31	3- 234
1985	127	49	0	49	8- 279	24	15	5 - 72	151	44	0	44	5- 279
1984	135	55	0	55	9- 384	38	20	1 - 185	173	47	0	47	1- 384
1983	167	62	0	62	9- 600	48	17	0 - 153	215	52	0	52	3- 600
1982	159	41	0	41	2- 216	46	19	3 - 108	205	36	0	36	2- 216
1981	216	54	0	54	1- 750	47	22	0 - 156	263	48	0	48	1- 750
1980	267	45	0	45	5- 411	80	22	5 - 194	347	40	0	40	5- 411
1979	587	43	0	43	2- 723	187	21	2 - 156	774	37	0	37	2- 723
1978	415	40	0	40	2- 500	170	15	2 - 140	585	33	0	33	2- 500
1977	287	39	0	39	5- 377	107	20	2 - 200	394	34	0	34	2- 377
1976	175	39	0	39	3- 659	76	19	2 - 140	251	32	0	32	2- 659
1975	90	31	0	31	4- 210	52	15	3 - 150	142	25	0	25	3- 210
1974	39	55	0	55	2- 941	26	19	0 - 200	65	41	0	41	2- 941
1900	4	28	0	28	26- 51	5	11	0 - 51	9	19	0	19	0- 51
ALL MODEL YEARS	2824	43	0	43	0- 941	942	19	0 - 200	3766	37	0	37	0- 941

WISCONSIN DEPT. OF TRANSPORTATION
MOTOR VEHICLE INSPECTION PROGRAM
SAS PGM#J1415050 (P7314175)

S U M M A R Y B Y V E H I C L E M A K E
REPAIR DATA: AVERAGE REPAIR COST
ANNUAL----- REPORT FOR 04/01/88 THRU 03/31/89

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REPORT INCLUDES DATA FROM A 10%
SAMPLE OF TESTS WITH FAIL STATUS

WEIGHT CLASS: AUTOS

REPAIRED BY	REPAIR FACILITY VEH#	PART	LABOR	TOTAL	RANGE	OWNER VEH#	PART	RANGE	TOTAL VEH#	PART	LABOR	TOTAL	RANGE
AMC	52	31	0	31	0- 257	27	17	0 - 76	79	26	0	26	0- 257
AUDI	5	21	0	21	0- 45	1	25	25 - 25	6	22	0	22	0- 45
BUICK	309	36	0	36	6- 298	87	16	2 - 150	396	32	0	32	2- 298
CAD	92	53	0	53	8- 500	12	25	0 - 200	104	49	0	49	3- 500
CHEV	402	48	0	48	1- 941	200	22	3 - 200	602	40	0	40	1- 941
CHRYS	83	32	0	32	8- 157	25	18	2 - 72	108	29	0	29	2- 157
DODGE	134	44	0	44	6- 377	40	20	2 - 185	174	39	0	39	2- 377
FIAT	3	53	9	62	21- 137	1	0	0 - 0	4	40	7	47	0- 137
FORD	444	44	0	44	4- 750	141	19	2 - 158	585	38	0	38	2- 750
HONDA	22	38	0	38	14- 113	14	11	0 - 33	36	26	0	26	0- 113
LINCN	36	54	0	54	8- 723	8	19	0 - 71	44	48	0	48	0- 723
MAZDA	32	32	0	32	0- 118	7	28	3 - 85	39	31	0	31	0- 118
MERC	191	43	0	43	2- 350	51	18	0 - 79	242	37	0	37	2- 350
NISAN	43	59	0	59	0- 171	15	14	0 - 49	58	47	0	47	3- 171
OLDS	418	43	0	43	3- 288	135	18	2 - 128	553	37	0	37	2- 288
OPEL	0	0	0	0	0- 0	1	24	24 - 24	1	24	0	24	24- 24
OTHER	41	46	0	46	0- 197	13	10	0 - 33	54	37	0	37	0- 197
PLYM	157	38	0	38	2- 252	42	18	0 - 97	199	32	0	32	2- 252
PONT	258	44	0	44	4- 600	88	17	4 - 194	347	37	0	37	4- 600
RENLT	26	73	0	73	19- 178	9	18	5 - 43	35	59	0	59	5- 178
SUBAR	7	38	0	38	0- 110	3	32	0 - 84	10	35	0	35	0- 110
TOYOT	34	47	0	47	18- 158	13	8	0 - 38	47	36	0	36	[illegible]- 158
VOLKS	28	49	0	49	5- 319	8	3	0 - 12	36	39	0	39	5- 319
VOLVO	6	97	0	97	0- 232	1	7	7 - 7	7	84	0	84	2- 232
ALL 29999	2824	43	0	43	0- 941	942	19	0 - 200	3766	37	0	37	0- 941