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Investigation of Turbo-Dyne Energy Chamber (G:R:Valve Trademark) An Air Bleed Device

(U.S.) Environmental Protection Agency, Ann Arbor, Mich

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78-2 FPH

Investigation of Turbo-Dyne Energy Chamber (G:R:Valve™) - An Air Bleed Device

Technology Assessment and Evaluation Branch
Emission Control Technology Division
Office of Mobile Source Air Pollution Control
Environmental Protection Agency

April, 1978

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(Please read Instructions on the reverse before completing)

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16. ABSTRACT

This investigation involved the testing of an air bleed device, known as G:R:Valves tm, marketed by N.C. Industries. This test was done at the request of the Federal Trade Commission. Advertisements for this device claimed that it would "lower exhaust contanimants," improve fuel economy, etc. The test was done to evaluate actual results with advertisement claims. The test results are presented in tabular form.

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Background

The Environmental Protection Agency (EPA) has tested numerous air bleed devices in the past. This EPA test of the Turbo-Dyne Energy Chamber, (an air bleed device marketed by American Consumer, Inc., and Dan-Mar Products, Inc.) was at the request of the Federal Trade Commission. The installation instructions included with the devices provided to the EPA referred to them as G:R: Valves™ marketed by N. C. Industries. This program does not constitute a full test series under Section 511 of the Energy Policy and Conservation Act.

Advertisements for the device include the following statements: "Get up to 7 more miles per gallon" and "Save up to 2 full gallons every 60 minutes you drive." The instruction sheet indicated that with proper installation "...your automobile will emit lower exhaust contaminants, which will result in instant improvement in fuel economy" (Figure 1). This test program evaluated the performance of the subject devices on two production vehicles to compare actual results with the advertisement claims.

The conclusions from the EPA evaluation test can be considered to be quantitatively valid only for the specific test vehicles used. However, it is reasonable to extrapolate the results from the EPA test to other types of vehicles in a directional manner, i.e., to suggest that similar results are likely to be achieved on other types of vehicles.

Device Description

The G:R: Valve™ is an air bleed device. It is intended to cause enleanment of the intake fuel-air charge when the valve is open. The device is installed in the PCV line between the PCV valve and the carburetor (Figure 1). Installation instructions specify replacing the PCV valve with a new one. For vehicles not equipped with PCV valves installation requires the use of a threaded connection in a hole tapped into the intake manifold. The test installation is illustrated in Figures 2 and 3.

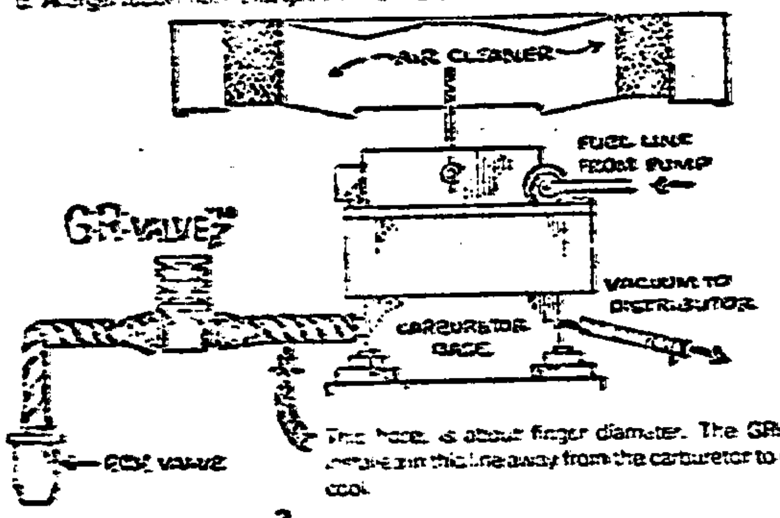
Test Vehicles

The test vehicles were: 1) a production 1970 Chevrolet equipped with a 350 cubic inch engine, three-speed automatic transmission, and H78x15 tires, and 2) a production 1976 Chevrolet equipped with a 350 cubic inch engine, three-speed automatic transmission, and HR78x15 tires. These vehicles were chosen because they represent both the non-catalyst and catalyst equipped vehicles as well as older and newer technologies. Detailed descriptions of the two test vehicles are provided in Appendix A.

Figure I

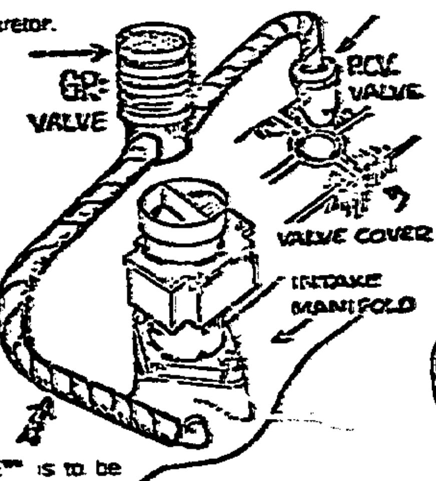
FOR MOST CARS (Exceptions on reverse side)

1. Remove your air cleaner [illegible]
2. Identify the three [illegible] attached to the carburetor
   a. A fuel line, usually metal, to the top section
   b. A small rubber vacuum line to the distributor from bottom section
   c. A larger rubber hose that goes to the P.C.V. valve from the bottom section of the carburetor.



This hose is about finger diameter. The GR VALVE™ is to be inserted in this line away from the carburetor to enable it to breathe cool.

2



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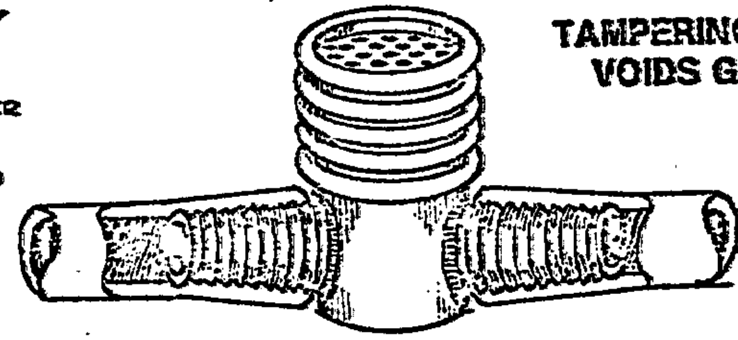
3. Make sure the GR VALVE™ will not interfere with anything, and that the filter section points up. Cut the hose and push the ends of the hose over the nipples of the GR VALVE™. If the hose does not fit snuggly use clamps to insure a tight seal.
4. Replace the air cleaner, and you're finished.



TAMPERING WITH UNIT VOIDS GUARANTEE

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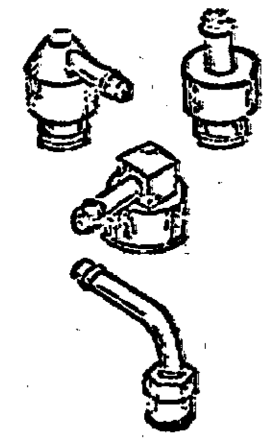

NOTE: Your P.C.V. valves vary and the four above are just a few types. Your GR VALVE™ is designed to work with all types.

Proper installation of GR VALVE™ requires replacement of P.C.V. valve.

5

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1. For some pre 1965 cars and Datsuns and Toyotas and some other foreign cars that do not have P.C.V. valves, simply find a plug in the intake manifold, close to the carburetor.

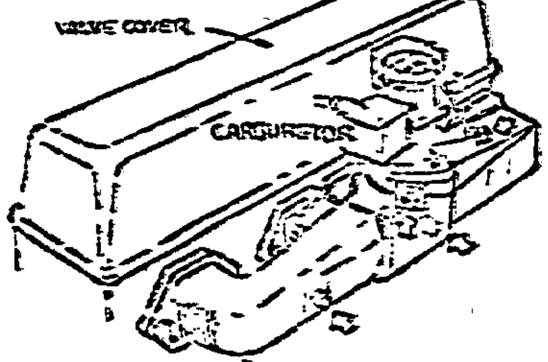
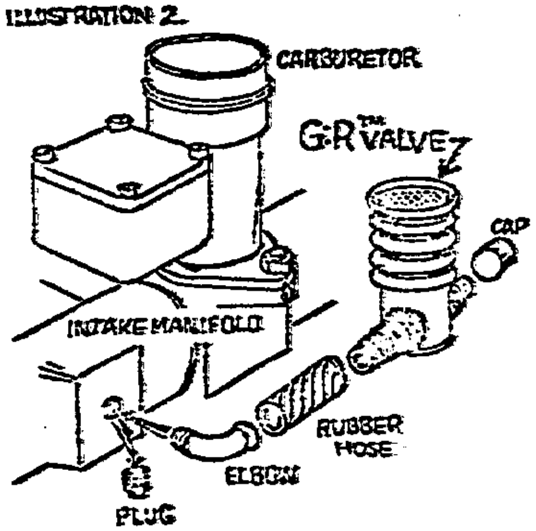


ILLUSTRATION 1

Remove plug and install as shown.
[illegible]

6

ILLUSTRATION 2.



Cap, rubber hose, and elbow can all be purchased inexpensively at any auto accessory parts store.

Some Ford Motor Company products require cutting of approximately two inches out of metal tubing connecting P.C.V. valve and carburetor.

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2. If car does not have plug in intake manifold, just drill and tap hole as shown below.

ILLUSTRATION 3.

Put the hole as close to the center of the manifold as you can, and as close to the carburetor as metal will allow. Drill hole with 11/32" wire drill. Tap hole with 1/3" metric thread. Then proceed with elbow, rubber hose, GR VALVE™ and cap as in illustration #2

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100% UNCONDITIONAL MONEY-BACK GUARANTEE

NCI guarantees that with proper installation of the GR VALVE™, your automobile will emit lower exhaust contaminants, which will result in instant improvement of engine performance and significant improvement in fuel economy. If, for any reason, you are not fully satisfied with the performance of the device after installation, return the GR VALVE™ to the dealer from whom it was purchased within 30 days and the full price will be cheerfully refunded.

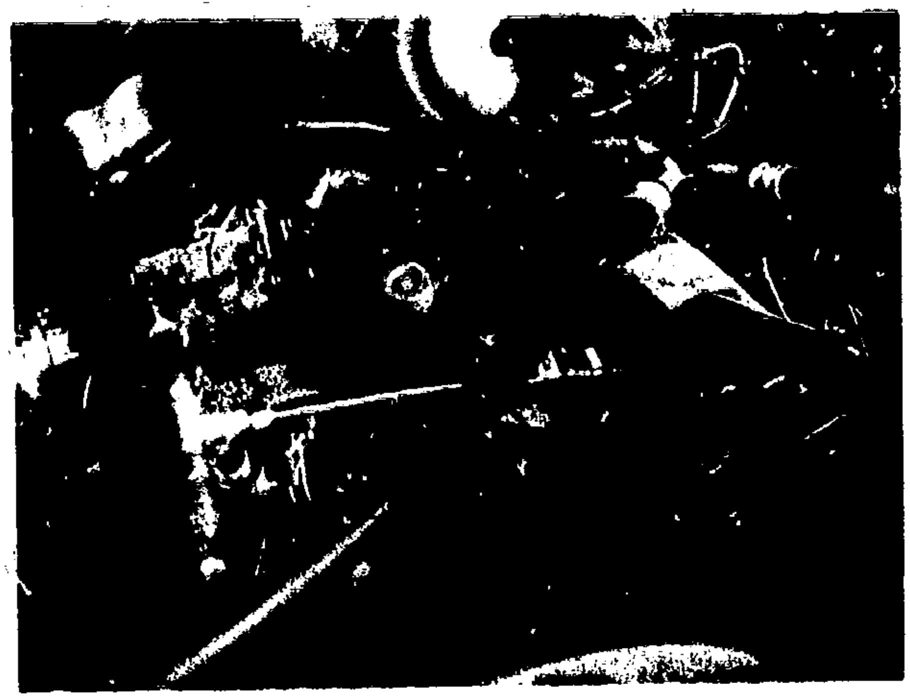
N C Industries

President

PURSUANT TO EXECUTIVE ORDER D-31, THE GR VALVE™ MAY BE LEGALLY INSTALLED ON 1974 AND OLDER VEHICLES IN CALIFORNIA IN ACCORDANCE WITH THE PROVISIONS OF VEHICLE CODE 27156, WITH THE EXCEPTION OF V.W. DIESEL, FUEL INJECTION OR SUPERCHARGED ENGINE VEHICLE.

1

Figure 2



Device as installed in 1976 Chevrolet.

Figure 3

New PCV valve, device, and
PCV hose unit used to replace
the original PCV valve and hose.

Test Program

Exhaust emission and fuel economy tests were conducted in accordance with the 1977 Federal Test Procedure, the EPA Highway Fuel Economy Test, and idle testing. Evaporative emissions were not measured. Each vehicle was tested twice by each test procedure in each of the following configurations:

- -Original PCV valve/no device (Baseline)
- -New PCV valve/device
- -Original PCV valve/device

A total of eighteen tests were run on each vehicle. The test sequence of the various configurations was chosen to account for changes in the vehicles with time. The test sequence for the 1970 Chevrolet was as follows:

Configuration	FTP	HFET	Idle
baseline	x [1/]	x	x
device/new PCV	x	x	x
device/new PCV	x	x	x
device old PCV		x	x
baseline	x	x	x
device/old PCV	x	x	x
device/old PCV	x		

The test sequence for the 1976 Chevrolet was as follows:

baseline	x	x	x
device/new PCV	x	x	x
device/new PCV	x	x	x
device/old PCV	x	x	x
baseline	x	x	x
device/old PCV	x	x	x
baseline	x	x	x

1/ "x" indicates test was performed.

The exhaust sampling attachment on the 1976 Chevrolet was found to be loose in the inspection following the first baseline test. While the test results are comparable to the other baseline tests, they are not included in the analysis of data.

Test Results

The test results are presented in tabular form in Appendix B and in graphic form in Figures 4 through 8. Each group of four histograms represents the test results from the vehicle and test procedure indicated. The first three columns represent the pairs of tests from the baseline, new PCV valve with device, and original PCV valve with device, respectively. The final column represents the mean value of the three test pairs. Also, a statistical analysis of the data is presented in Appendix C.

Fuel Economy

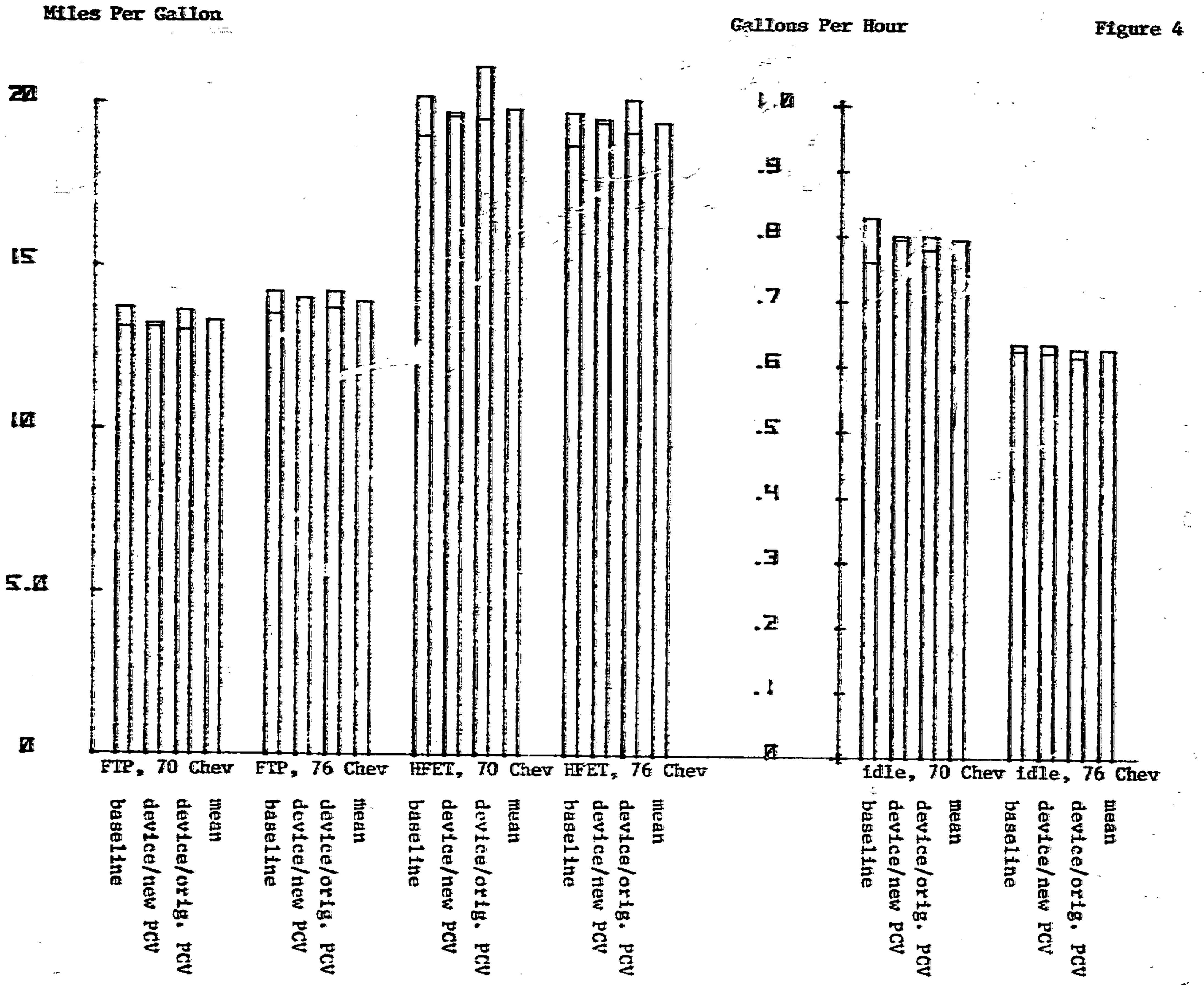
Figure 4 illustrates the fuel economy results. Use of the device does not materially affect fuel economy. There was no significant difference resulting from any configuration at the 90% confidence level (see Appendix C). The only significant difference in fuel economy was between vehicles. No configuration consistently yielded superior fuel economy values, however slight. In many cases the variation between the two tests of a configuration exceeded the variation of the configuration means within a test group. The configuration consisting of the device coupled with a new PCV valve (installation per instructions) yielded less test-to-test variation within that configuration than the other two configurations. The observed reduction in test-to-test variability with the device/new PCV configuration occurred with both test vehicles. The only plausible reason for this observation is, therefore, that the operation of new PCV valves is more stable than older (used) PCV valves. Despite this reduction in test-to-test variation there was no difference in the fuel economy means for each configuration.

Emissions

Figures 5 through 8 illustrate the emission test results for HC, CO, CO_2, and NOx, respectively. Analysis of the FTP and HFET results shows that neither of the two device configurations consistently achieved emissions below the baseline level for any of the regulated pollutants with the possible exception of CO emissions from the 76 Chevrolet with the device/new PCV valve. As was noted above, new PCV valves appear to operate more consistently than used PCV valves and this would account for the observed difference. It is clear that the effect of the configurations varied between the two vehicles.

Analysis of the idle emissions results for each vehicle shows that the configurations utilizing the device yielded lower HC, CO and NOx on the 1970 Chevrolet. The configuration consisting of the device and the new

Figure 4



Miles Per Gallon
Gallons Per Hour
20
15
10
5.0
0
1.0
.9
.8
.7
.6
.5
.4
.3
.2
.1
0
FTP, 70 Chev
FTP, 76 Chev
HFET, 70 Chev
HFET, 76 Chev
idle, 70 Chev
idle, 76 Chev
baseline
device/new PCV
device/orig. PCV
mean

Figure 5

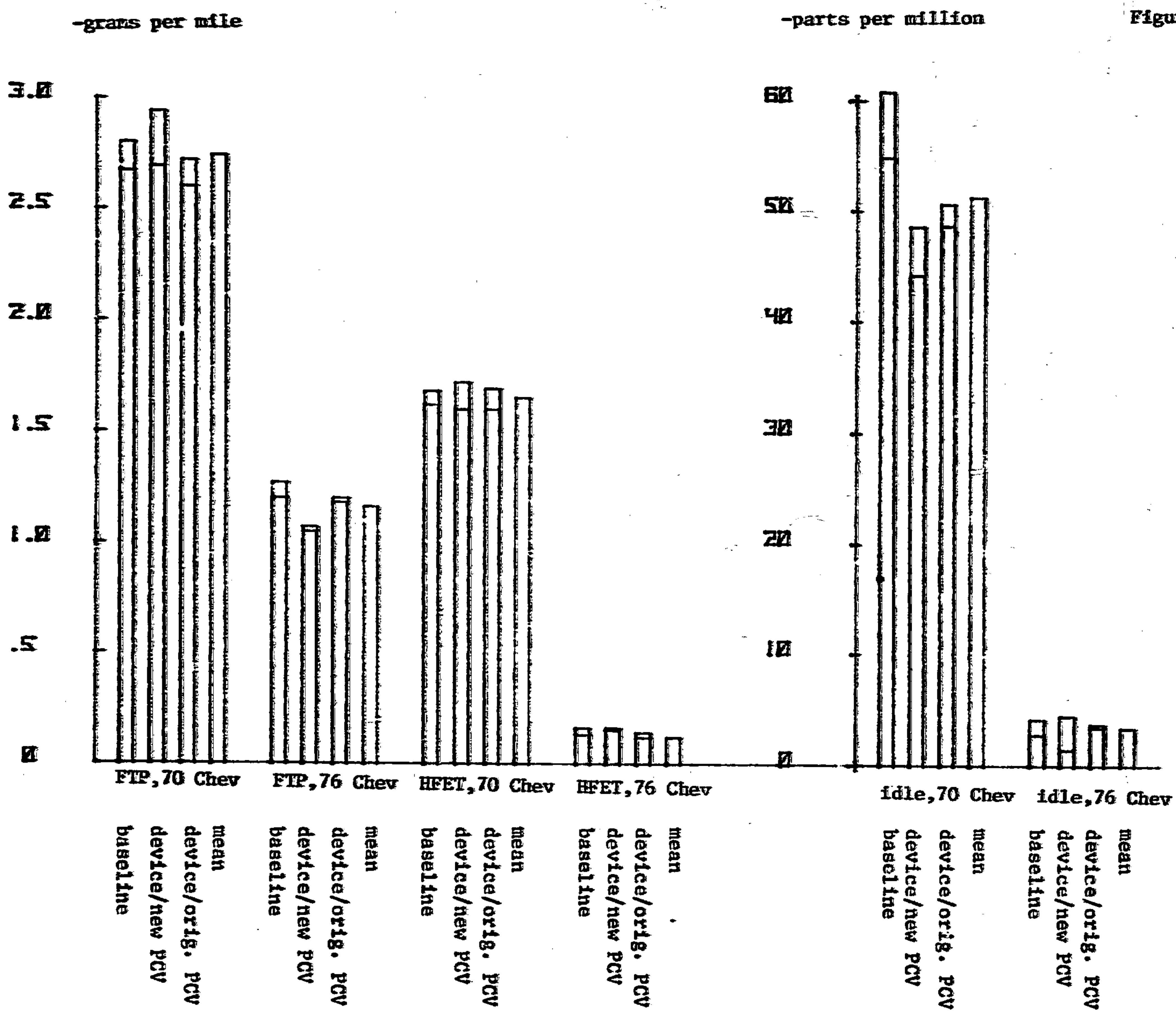

-grams per mile
3.0
2.5
2.0
1.5
1.0
.5
0
FTP,70 Chev
baseline
device/new PCV
device/orig. PCV
mean
FTP,76 Chev
baseline
device/new PCV
device/orig. PCV
mean
HFET,70 Chev
baseline
device/new PCV
device/orig. PCV
mean
HFET,76 Chev
baseline
device/new PCV
device/orig. PCV
mean
-parts per million
60
50
40
30
20
10
0
idle,70 Chev
baseline
device/new PCV
device/orig. PCV
mean
idle,76 Chev
baseline
device/new PCV
device/orig. PCV
mean

Figure 6

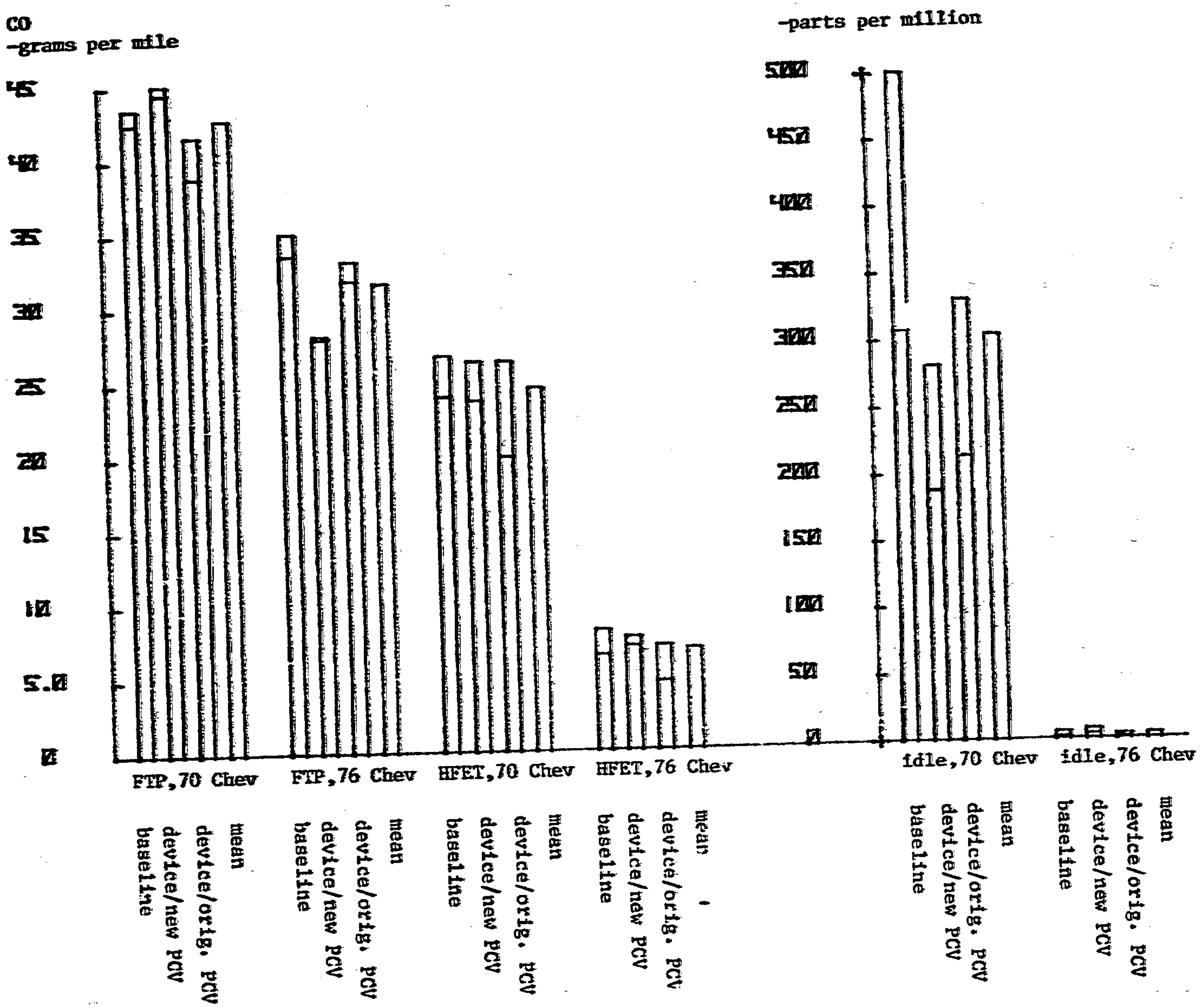
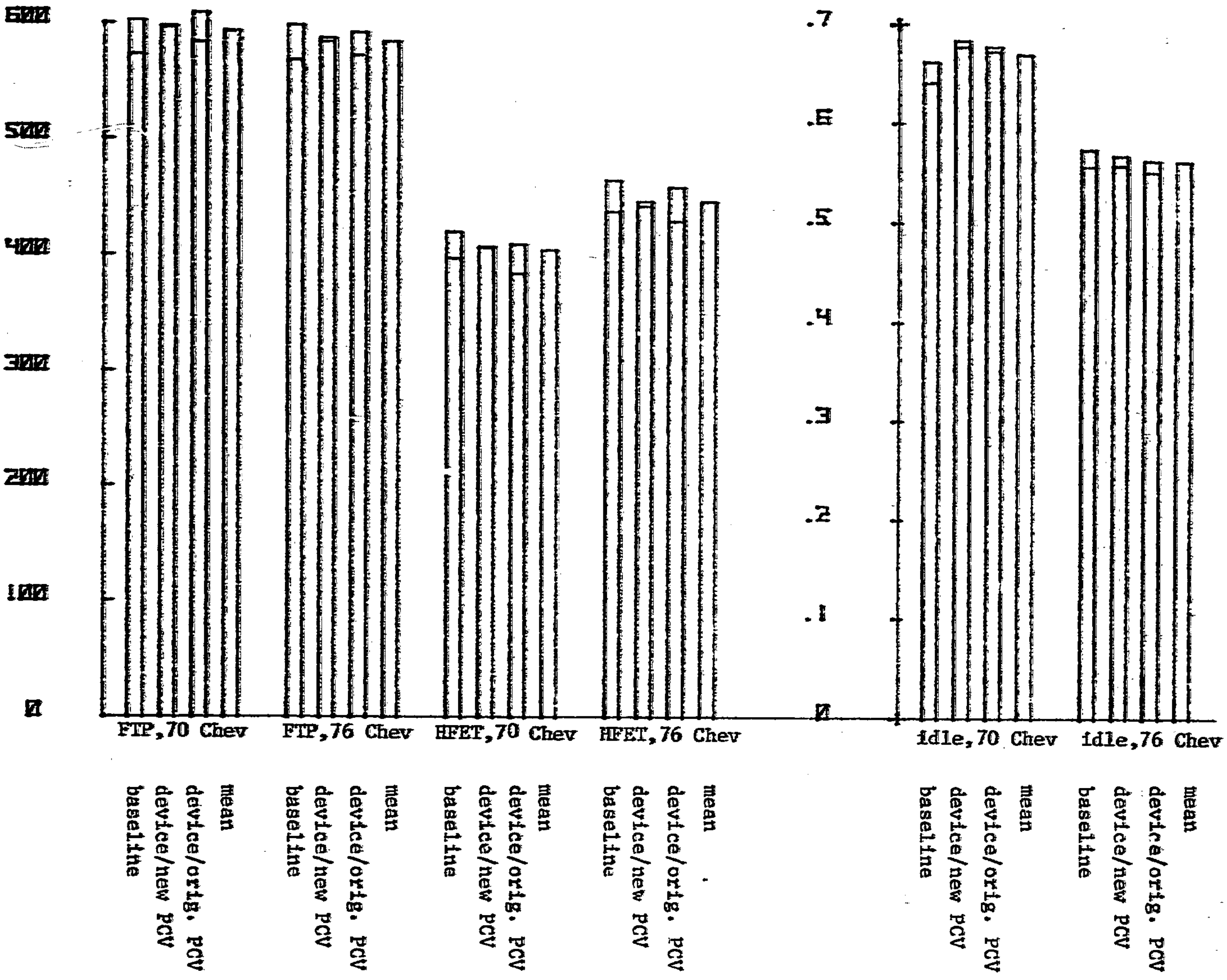

CO
-grams per mile
45
40
35
30
25
20
15
10
5.0
0
FTP, 70 Chev
FTP, 76 Chev
HFET, 70 Chev
HFET, 76 Chev
baseline
device/new PCV
device/orig. PCV
mean
-parts per million
500
450
400
350
300
250
200
150
100
50
0
idle, 70 Chev
idle, 76 Chev

Figure 7



CO_2
-grams per mile
-percent
0
100
200
300
400
500
600
.1
.2
.3
.4
.5
.6
.7
FTP, 70 Chev
FTP, 76 Chev
HFET, 70 Chev
HFET, 76 Chev
idle, 70 Chev
idle, 76 Chev
baseline
device/new PCV
device/orig. PCV
mean

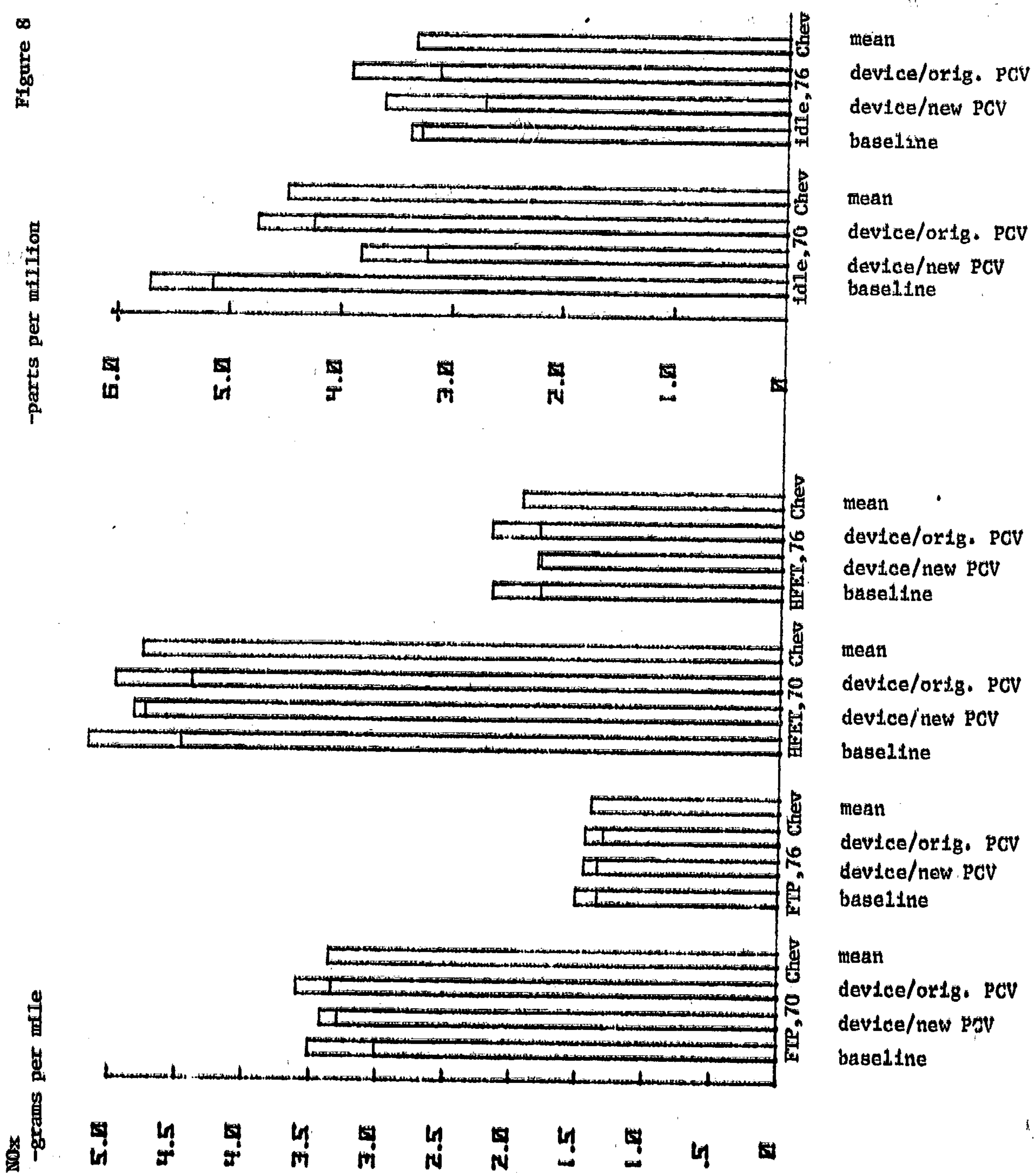


Figure 8
-parts per million
NOx
-grams per mile
idle,76 Chev
idle,70 Chev
HFET,76 Chev
HFET,70 Chev
FTP,76 Chev
FTP,70 Chev
mean
device/orig. PCV
device/new PCV
baseline
6.0
5.0
4.0
3.0
2.0
1.0
0
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
.5
0

PCV valve, as recommended in the instructions, consistently yielded the lowest levels of these pollutants. In contrast, these same configurations did not effect HC or CO emissions and tended to increase NOx emissions on the 1976 Chevrolet. The statistical analysis for HC and NOx indicated that the vehicle/ configuration interactions were significant. This means that the various configurations had different effects on HC and NOx levels at idle but that these effects were not consistent between vehicles.

The CO levels varied significantly among the configurations for the FTP. Also, there was a significant interaction between the vehicles and the various configurations. From figure 6 it is apparent that the device coupled with a new PCV valve yielded CO levels greater than the baseline levels for the 1970 Chevrolet. The same configuration resulted in lower CO emissions than baseline for the 1976 Chevrolet. Again the configurations yielded statistically significantly different results as well as having significantly different effects on the two vehicles.

The CO emissions from the 1976 Chevrolet exceeded the 1976 Federal Emission Standard for the FTP in all three configurations. High levels of CO from the baseline configuration indicate a relatively rich fuel/air ratio. Air bleed devices are intended to enlean the fuel/air ratio. Using an air bleed device on a vehicle with a lean mixture can cause an increase in HC and CO emissions due to lean misfire. However, using an air bleed device on a vehicle with a rich fuel mixture should provide noticeable reductions in CO emissions. This is because an increase in the proportion of air relative to fuel promotes more complete combustion (within limits).

Despite the rich mixture of the 1976 Chevrolet, the CO emissions did not drop in all cases with the installation of the device. CO emissions did fall in the FTP. The CO levels for the HFET test of the device configurations were comparable to the baseline results. This indicates that the air bleed valve may have been closed during much of the highway cycle. The device does not universally decrease the levels of the regulated exhaust emissions.

Conclusions

-The G:R:Valve™/Turbo-Dyne Energy Chamber air bleed device did not have any statistically significant impact on the fuel economy levels of either vehicle.

-The device did not have a consistent effect on emissions. It had a statistically significant effect on some emission levels only when installed in a vehicle with specific characteristics and when the vehicle was driven in a specific manner.

Appendix A

TEST VEHICLE DESCRIPTION

Chassis model year/make - 1970 Chevrolet
VIN - EPA - 160

Engine

type	4 stroke, Otto Cycle, 8 cyl., ohv.
bore x stroke	101.6mm (4.00 in.) x 88.4mm (3.48 in.)
displacement	5.74 litre (350 cu. in.)
compression ratio	9.0:1
maximum power @ rpm	250 bhp @ 4800 rpm
fuel metering	Single, 2 barrel
fuel requirement	regular

Drive Train

transmission type	3 speed automatic
final drive ratio	2.75:1

Chassis

type	front engine, rear wheel drive
tire size	H78x15
curb weight	4100 lb.
inertia weight	4500 lb.
passenger capacity	6

Emission Control System

basic type	EM

Appendix A (cont.)

TEST VEHICLE DESCRIPTION

Chassis model year/make - 1976 Chevrolet Impala
VIN - IL47V61234368

Engine

type	4 stroke, Otto Cycle, 8 cyl., ohv.
bore x stroke	101.6mm (4.00 in.) x 88.4mm (3.48 in.)
displacement	5.74 litre (350 cu. in.)
compression ratio	8.5:1
maximum power @ rpm	145 hp @ 3800 rpm
fuel metering	Single, 2 barrel carburetor
fuel requirement	Unleaded regular

Drive Train

transmission type	3 speed automatic
final drive ratio	2.73:1

Chassis

type	front engine-rear drive
tire size	HR78x15
curb weight	4266 lb.
inertia weight	4500 lb.
passenger capacity	6

Emission Control System

basic type	EM/EGR/CAT

Appendix B

Test Results (Grams Per Mile)

70 Chevrolet FTP	Base	Base	New PCV/ Device	New PCV/ Device	Orig.PCV/ Device	Orig.PCV/ Device	$\bar{x}$	s	$(s/\bar{x})$x 100%
Bag 1–HC	4.329	4.352	3.659	4.618	4.494	3.609	4.177	0.434	10.4%
NOx	3.813	3.964	3.749	3.941	3.687	4.202	3.893	0.186	4.8%
CO_2	573.66	579.83	569.67	569.45	554.93	578.38	570.99	8.97	1.6%
CO	89.689	90.009	79.881	93.516	87.183	81.495	86.962	5.287	6.1%
MPG	12.2	12.1	12.6	12.1	12.6	12.4	12.3	0.23	1.9%
Bag 2–HC	2.402	2.397	2.417	2.538	2.278	2.378	2.402	0.083	3.5%
NOx	2.435	2.644	2.549	2.576	2.648	2.622	2.579	0.081	3.1%
CO_2	641.55	637.90	635.90	637.63	620.79	647.74	636.92	8.96	1.4%
CO	32.674	31.351	34.109	33.130	25.100	31.718	31.347	3.217	10.3%
MPG	12.7	12.8	12.7	12.7	13.3	12.6	12.8	0.2	2.0%
Bag 3–HC	1.913	2.398	2.465	2.426	2.227	2.268	2.283	0.203	8.9%
NOx	3.516	4.831	4.355	4.638	4.385	4.987	4.452	0.520	11.7%
CO_2	440.91	550.78	538.84	539.33	533.51	560.27	527.27	43.40	8.2%
CO	25.502	31.913	37.777	31.513	28.628	30.210	31.091	4.071	13.1%
MPG	18.2	14.6	14.6	14.9	15.2	14.4	15.3	1.44	9.4%
Weighted HC	2.67	2.80	2.69	2.94	2.72	2.60	2.74	0.12	4.4%
NOx	3.01	3.51	3.29	3.42	3.34	3.60	3.36	0.21	6.1%
CO_2	573	602	596	597	583	609	593	13	2.2%
CO	42.5	43.5	44.5	45.1	38.8	41.6	42.7	2.3	5.4%
MPG	13.7	13.1	13.2	13.1	13.6	13.0	13.3	0.3	2.2%

76 Chevrolet FTP

		Base*	Base	Base	New PCV/ Device	New PCV/ Device	Orig.PCV/ Device	Orig.PCV/ Device	$\bar{x}$	s	$(s/\bar{x})$x 100%
Bag 1-HC		2.049	2.181	2.162	1.705	1.995	2.296	2.043	2.064	0.206	10.0%
	NOx	2.305	2.380	2.604	2.332	2.315	2.199	2.468	2.383	0.139	5.8%
	CO_2	600.22	576.83	604.43	600.94	583.84	583.05	602.43	591.92	12.00	2.0%
	CO	51.195	52.501	55.759	38.592	50.053	58.132	51.270	51.051	6.792	13.3%
	MPG	12.9	13.3	12.7	13.3	13.3	13.0	12.9	13.1	0.3	2.0%
Bag 2-HC		0.867	1.014	1.111	0.921	0.876	0.917	1.011	0.975	0.086	8.9%
	NOx	0.737	0.706	0.764	0.724	0.849	0.737	0.719	0.750	0.052	7.0%
	CO_2	619.68	586.87	615.38	607.17	609.07	594.04	607.37	603.32	10.64	1.8%
	CO	26.454	32.704	34.335	29.026	25.403	28.544	32.006	30.336	3.276	10.8%
	MPG	13.4	13.8	13.2	13.5	13.6	13.8	13.4	13.6	0.2	1.7%
Bag 3-HC		0.723	0.816	0.893	0.786	0.743	0.847	0.914	0.833	0.065	7.8%
	NO_x	1.818	1.805	2.115	1.786	1.961	1.745	2.202	1.905	0.148	7.8%
	CO_2	548.88	524.46	558.67	539.19	535.19	522.24	555.83	539.16	15.21	2.8%
	CO	15.309	20.630	20.673	17.623	16.858	18.025	21.512	19.220	1.945	10.1%
	MPG	15.4	15.9	14.9	15.6	15.7	16.0	15.1	15.5	0.4	2.8%
Weighted-HC		1.07	1.20	1.27	1.05	1.07	1.18	1.20	1.16	0.09	7.3%
	NOx	1.35	1.35	1.51	1.35	1.45	1.31	1.44	1.40	0.08	5.5%
	CO_2	596	568	598	587	584	572	592	584	12	2.0%
	CO	28.5	33.5	35.0	27.9	28.1	31.8	33.1	31.6	3.0	9.3%
	MPG	13.8	14.2	13.5	14.0	14.0	14.2	13.7	13.9	0.3	2.0%

* Not included in statistical comparison.

70 Chevrolet HFET

	Base	Base	New PCV/ Device	New PCV/ Device	Orig.PCV/ Device	Orig.PCV/ Device	$\bar{x}$	s	$(s/\bar{x})$x 100%
HC	1.62	1.68	1.60	1.72	1.69	1.60	1.65	0.05	3.1%
NOx	4.48	5.17	4.75	4.83	4.97	4.40	4.77	0.29	6.1%
CO_2	397	420	407	406	409	384	404	12	3.0%
CO	24.0	26.7	23.7	26.3	26.3	19.9	24.5	2.6	10.6%
MPG	20.0	19.0	19.7	19.6	19.5	21.1	19.8	0.7	3.6%

76 Chevrolet HFET

	Base*	Base	Base	New PCV/ Device	New PCV/ Device	Orig.PCV/ Device	Orig.PCV/ Device	$\bar{x}$	s	$(s/\bar{x})$x 100%
HC	0.14	0.16	0.13	0.16	0.15	0.14	0.12	0.12	0.02	12.1%
NOx	1.53	1.80	2.16	1.82	1.80	1.81	2.17	1.94	0.18	9.1%
CO_2	444	437	464	446	442	429	458	446	13	2.9%
CO	8.2	8.1	6.4	7.0	7.6	7.0	4.6	6.8	1.2	18.2%
MPG	19.4	19.7	18.7	19.4	19.5	20.1	19.1	19.4	0.5	2.5%

70 Chevrolet Steady State

	Base	Base	New PCV/ Device	New PCV/ Device	Orig.PCV/ Device	Orig.PCV/ Device	$\bar{x}$	s	$(s/\bar{x})$x 100%
HC(ppm)	60.70	54.79	44.12	48.54	48.62	50.55	51.22	5.79	11.3%
NOx(ppm)	5.146	5.709	3.232	3.819	4.746	4.248	4.483	0.903	20.1%
CO_2(%)	0.662	0.642	0.677	0.683	0.672	0.677	0.669	0.015	2.3%
CO(ppm)	500.74	307.19	187.99	281.17	213.52	329.95	303.43	110.95	36.6%
Gal./Hr	0.828	0.760	0.795	0.800	0.779	0.800	0.794	0.023	2.9%

76 Chevrolet Steady State

	Base*	Base	Base	New PCV/ Device	New PCV/ Device	Orig.PCV/ Device	Orig.PCV/ Device	$\bar{x}$	s	$(s/\bar{x})$x 100%
HC(ppm)	15.53	4.15	2.79	1.43	4.48	3.71	3.42	3.33	1.10	33.0%
NOx(ppm)	2.007	3.297	3.389	3.626	2.719	3.134	3.922	3.348	0.413	12.3%
CO_2(%)	0.526	0.573	0.556	0.567	0.557	0.550	0.562	0.561	0.008	1.5%
CO(ppm)	14.03	5.27	1.37	3.33	7.42	0.92	3.19	3.58	2.44	68.1%
Gal./Hr	0.606	0.635	0.625	0.635	0.622	0.615	0.628	0.627	0.008	1.2%

Appendix C

Analysis of Variance Tables

Sources of variation:

- -Vehicles - difference due to different characteristics of each vehicle.
- -Configurations - difference due to the different configurations (baseline, device with new PCV, and device with original PCV).
- -Vehicle/Configuration - the interaction of the two effects which cause a synergistic effect.
- -Residual - differences not due to the above (error).

Analysis of Variance Table

Sources of Variation	Sum of Squares (SS)	Degrees of Freedom (DF)	Mean Square (SS/DF)	Mean Square Ratio (MS/MS residual)	Minimum MSR at which factor is significant at 90% confidence level	Highest level of significance
FTP-HC						
vehicle	7.44	1	7.44	297.60	3.78	99.5%
configuration	0.01	2	0.005	0.20	3.46	-
veh./config.	0.05	2	0.025	1.00	3.46	-
residual	0.05	6	0.025			
total	7.55	11				
FTP-CO						
vehicle	369.63	1	369.63	336.54	3.78	99.5%
config.	13.67	2	6.84	6.23	3.46	95%
veh./config.	49.23	2	24.62	22.42	3.46	99.5%
residual	6.59	6	1.10			
total	439.12	11				
FTP-CO_2						
vehicle	290.09	1	290.09	1.23	3.78	-
config.	68.17	2	34.09	0.14	3.46	-
veh./config.	47.16	2	23.58	0.01	3.46	-
residual	1413.50	6	235.58			
total	1818.9[illegible]	11				

FTP-NOx

vehicle	11.52	1	11.52	115.20	3.78	99.5%
config.	0.01	2	0.005	0.05	3.46	-
veh./config.	0.04	2	0.02	0.02	3.46	-
residual	0.58	6	0.10			
total	12.15	11				

FTP-MPG

vehicle	1.27	1	1.27	10.58	3.78	97.5%
config.	0.01	2	0.005	0.04	3.46	-
veh./config.	0.08	2	0.04	0.33	3.46	-
residual	0.73	6	0.12			
total	2.09	11				

HFET-HC

vehicle	6.82	1	6.82	2046.20	3.78	99.5%
config.	0.00	2	0.000	0.00	3.46	-
veh./config.	0.00	2	0.000	0.00	3.46	-
residual	0.02	6	0.003			
total	6.84	11				

HFET-CO

vehicle	939.87	1	939.87	176.17	3.78	99.5%
config.	8.45	2	4.23	0.79	3.46	-
veh./config.	0.32	2	0.16	0.03	3.46	-
residual	32.01	6	5.34			
total	980.65	11				

HFET-CO_2

vehicle	5334.09	1	5334.09	23.35	3.78	99.5%
config.	181.17	2	90.59	0.40	3.46	-
veh./config.	45.16	2	22.58	0.10	3.46	-
residual	1370.50	6	228.42			
total	6930.92	11				

HFET-NOx

vehicle	24.20	1	24.2	273.96	3.78	99.5%
configuration	0.02	2	0.01	0.11	3.46	-
veh./config.	0.04	2	0.02	0.23	3.46	-
residual	0.53	6	0.09			
total	24.79	11				

HFET-MPG

vehicle	0.57	1	0.57	1.14	3.78	-
configuration	0.65	2	0.33	0.66	3.46	-
veh./config.	0.12	2	0.06	0.12	3.46	-
residual	3.01	6	0.50			
total	4.35	11				

Idle-HC

vehicle	6880.35	1	6880.35	1189.34	3.78	99.5%
config.	74.10	2	37.05	6.40	3.46	95%
veh./config.	64.66	2	32.33	5.59	3.46	95%
residual	34.71	6	5.79			
total	7053.82	11				

Idle-CO

vehicle	269718.07	1	269718.07	54.18	3.78	99.5%
config.	15655.02	2	7827.51	1.57	3.46	-
veh./con.	16060.58	2	8030.29	1.61	3.46	-
residual	29868.57	6	4978.10			
total	331302.24	11				

Idle-CO_2

vehicle	0.0349	1	0.0349	2094.00	3.78	99.5%
config.	0.0004	2	0.0002	12.00	3.46	99%
veh./config.	0.0006	2	0.0003	18.00	3.46	99.5%
residual	0.0001	6	0.00002			
total	0.0360	11				

Idle-NOx

vehicle	3.868	1	3.868	19.499	3.78	99.5%
configuration	2.203	2	1.102	5.599	3.46	95%
veh./config.	1.541	2	0.771	3.917	3.46	90%
residual	1.181	6	0.197			
total	8.793	11				

Idle-Gal/Hr

vehicle	0.084	1	0.084	186.667	3.78	99.5%
config.	0.0002	2	0.0001	0.222	3.46	-
veh./config.	0.0001	2	0.00005	0.111	3.46	-
residual	0.0027	6	0.0005			
total	0.0870	11				