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EVALUATION OF THE STP MODULATING AIR BLEED

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Environmental Protection Agency
Emission Control Technology Division
Test and Evaluation Branch

Background

The Test and Evaluation Branch of the Emission Control Technology Division is responsible for the testing of devices designed to reduce emissions from automobile engines. The "modulating air bleed" manufactured by the STP Corporation is one such device. EPA was supplied with three systems for evaluation. The vehicles used in the evaluation included one uncontrolled car, and two cars with a moderate degree of emission control.

Device Description

The device is essentially an air-bleed used in conjunction with a delayed spark advance. The air bleed is a modulating type working off a ported vacuum source. The vacuum delay valve is installed in the vacuum line between the distributor and carburetor.

The system contains an adjustment to regulate the amount of air bleed at idle. Under wide open throttle conditions there is no bleed.

For cars that do not have a ported vacuum source, a valve is installed in the vacuum advance hose and operated through a mechanical linkage connected to the throttle linkage. The air bleed and vacuum delay valve receive their vacuum through this valve.

The device was tested on three vehicles, a 1963 Chevrolet, a 1970 Plymouth Valiant, and a 1971 Ford. The 1963 Chevrolet was equipped with a 283 CID engine and a 3-speed manual gearbox. The 1970 Valiant was equipped with a 225 CID engine and a 3-speed automatic transmission. The 1971 Ford was equipped with a 351 CID engine and a 3-speed automatic transmission.

Test Program

All three cars were adjusted to manufacturer's specifications prior to baseline testing. Two tests were run in the baseline configuration. The devices were then installed on the cars and two tests were run on each vehicle.

All tests were run according to the 1975 Federal Test Procedure (Federal Register, Vol. 37, No. 221, Part II, November 15, 1972).

Results

The 1963 Chevrolet was run in two configurations. One configuration used nominal 20-second vacuum delay valve and the other used a nominal 60-second vacuum delay valve. With the 20-second vacuum delay valve there was a 38% decrease in HC, a 42% decrease in CO, a 120% increase in NOx and a 4% increase in fuel economy over baseline testing. With the 60-second vacuum delay valve, the HC and CO decreases remained about the same while the NOx increased only 20% and fuel economy increased 1% over baseline.

The 1970 Plymouth Valiant showed a 23% decrease in HC, a 66% decrease in CO, a 9% decrease in NOx and a 6% increase in fuel economy over baseline.

The 1971 Ford showed a 10% decrease in HC, a 46% decrease in CO, a 35% decrease in NOx and a 1% decrease in fuel economy.

Conclusions

The effectiveness of the device varies from car to car. Significant reductions in HC and CO concentrations were measured for all three vehicles. Nox concentrations were reduced from two of the vehicles but large increases occurred from the 1963 Chevrolet.

Changes in fuel economy varied from -1% to +6%. The 1970 Valiant showed a 6% increase and in one configuration the 1963 Chevrolet showed a 4% increase. The 1971 Ford was characterized by a 1% penalty in fuel economy.

STP - 1963 Chevrolet

Mass emissions in grams per mile

	HC	CO	NOx	Fuel Economy	
Baseline	11.54	100.61	1.36	14.5	mpg
Device Test (20-sec. VDV)	7.12	58.8	2.99	15.1	mpg
% Change	-38%	-42%	+120%	+4%	
Device Test (60-sec. VDV)	7.30	58.9	1.63	14.7	mpg
% Change	-37%	-41%	+20%	+1%	

STP - 1970 Plymouth Valiant

Mass emissions in
grams per mile

	HC	CO	NOx	Fuel Economy	
Baseline	1.84	30.0	4.83	18.7	mpg
Device Test (avg. of 2)	1.42	10.1	4.41	19.8	mpg
% Change	-23%	-66%	-9%	+6%	

STP - 1971 Ford LTD

Mass emissions in grams per mile

	HC	CO	NOx	Fuel Economy
Baseline	2.68	14.64	4.75	12.7 mpg
Device Test (avg. of 2)	2.40	7.85	3.11	12.6 mpg
% Change	-10%	-46%	-35%	-1%