

EXHAUST EMISSIONS FROM FOUR
GENERAL MOTORS LOW EMISSION
PROTOTYPE VEHICLES

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Background

The General Motors Corporation supplied four low emission prototype vehicles to the Office of Air Programs for evaluation. The test vehicles were desired to demonstrate possible 1975-76 emission control systems and to compare emissions measured by the 1972 and 1975 Federal Emission Test Procedures. Testing of each vehicle at both the GM and EPA laboratories enabled comparison of low emission test capabilities.

Vehicles Tested

The following is a brief description of each of the vehicles tested:

Vehicle #61420

The test vehicle was an Oldsmobile 88 equipped with a 455 CID engine and automatic transmission. The vehicle was equipped with exhaust gas recirculation, an oxidizing catalytic reactor and air pump. The fuel specified was Indolene Clear (lead free).

Vehicle #61421

An Oldsmobile 88 with a 455 CID engine and automatic transmission was equipped with exhaust gas recirculation, dual bed oxidizing-reducing catalytic reactor and an air pump. Test fuel was Indolene Clear (lead free).

Vehicle #60418

A 455 CID Oldsmobile 88 with an automatic transmission was converted to run on LPG fuel. The vehicle was equipped with exhaust gas recirculation, two oxidizing catalysts and an air valve to add oxidizing air to the catalysts.

Vehicle #62115

A Buick Gran Sport with 455 CID engine and automatic transmission was equipped with a modified intake manifold to facilitate early fuel evaporation. In addition exhaust gas recirculation, oxidizing catalyst and air pump systems were employed. Test fuel was Indolene Clear (lead free).

Test Program

All testing was performed in accordance with the July 2, 1971, Federal Register. This procedure will be used for the certification of 1975 model year light duty vehicles.

Test Results

The full series of tests run by GM and EPA are presented in the Appendix of this report. Vehicle #61421 with the dual bed reactor showed the lowest overall emissions meeting the 1976 emission levels in one test of four.

Vehicle #60418 and #61420 consistently achieved the emission levels required for 1975 both having somewhat too high oxides of nitrogen emissions to meet the 1976 requirements.

Conclusions

While three of the vehicles tested demonstrated emission levels approaching those required for 1975 with one of these achieving 1976 levels in one test, these are experimental vehicles with no definitive measure of the durability capabilities of the system. The emission levels measured at the EPA laboratory are generally in good agreement with those measured by General Motors.

Vehicle #62115 Early Evaporative Manifold
 Oxidizing Catalyst
 EGR
 Buick GS
 A.I.R.

455 CID

	HC		CO				CO ₂		NO _x	
	1972	1975	Normal		Long Path		1972	1975	1972	1975
			1972	1975	1972	1975				
Testing at GM 3/15/72 3/17/72	1.09	0.70	---	---	4.05	2.06	---	---	1.23	1.17
	1.02	0.72	---	---	4.19	2.30	---	---	1.05	1.02
Testing at EPA 3/22/72 3/24/72	.91	0.61	4.71	2.46	4.93	2.74	870.1	331.9	1.12	1.07
	1.29	0.83	4.16	2.20	4.38	2.42	820.2	781.9	1.18	1.12
Testing at GM 3/30/72 4/4/72	1.08	0.73	---	---	4.90	2.90	---	---	1.14	1.12
	1.04	0.69	---	---	4.90	2.52	---	---	0.91	0.86

Vehicle#61421

Dual Bed Catalyst

EGR

455 CID

Oldsmobile 88

Programmed A.I.R.

HC		CO				CO ₂		NOx		
1972	1975	Normal		Long Path		1972	1975	1972	1975	
		1972	1975	1972	1975					
Testing at GM										
2/8/72	0.49	0.31	---	---	3.41	1.68	---	---	0.46	0.38
2/18/72	0.56	0.36	---	---	5.34	2.72	---	---	0.53	0.43
Testing at EPA										
2/23/72	0.66	0.41	6.19	5.29	6.25	5.35	1025.1	979.7	0.66	0.54
2/24/72	0.73	0.43	8.84	5.33	---	---	1023.1	981.7	0.57	0.48
2/26/72	0.66	0.38	6.26	3.08	6.26	3.10	1008.8	972.7	0.56	0.48
2/29/72	0.63	0.37	4.24	2.16	---	---	942.3	899.3	0.48	0.37
Testing at GM										
3/4/72	0.48	0.34	---	---	4.86	3.70	---	---	0.60	0.48
3/6/72	0.59	0.38	---	---	5.44	2.78	---	---	0.57	0.46

Vehicle #61420 Oxidizing Catalyst
 EGR
 Oldsmobile. 88
 A.I.R.

455 CID

	HC		CO				CO ₂		NOx	
	1972	1975	Normal		Long Path		1972	1975	1972	1975
			1972	1975	1972	1975				
Testing at GM										
2/16/72	0.38	0.27	---	---	7.21	3.87	---	---	1.08	1.10
2/18/72	0.43	0.27	---	---	5.72	3.23	---	---	1.05	1.09
Testing at EPA										
2/23/72	0.29	0.20	6.16	3.62	6.20	3.70	952.0	904.3	1.14	1.16
2/24/72	0.26	0.17	5.52	2.83	5.57	3.04	937.0	889.1	1.07	1.09
2/26/72	0.31	0.18	5.32	3.08	5.28	3.12	938.0	892.2	1.11	1.11
2/28/72	0.40	0.26	5.70	4.03	5.80	4.13	918.9	876.3	1.06	1.08
2/29/72	0.27	0.17	8.14	4.54	8.18	4.67	956.0	911.0	1.16	1.18
Testing at GM										
3/6/72	0.36	0.25	---	---	6.17	2.94	---	---	1.00	1.01
3/10/72	0.35	0.26	---	---	4.48	2.17	---	---	1.18	1.18

Vehicle #60418 LPG
 Oxidizing Catalyst 455 CID
 EGR - 2 Stage
 Oldsmobile 88

HC		CO				CO ₂		NOx		
1972	1975	Normal		Long Path		1972	1975	1972	1975	
		1972	1975	1972	1975					
Testing at GM 2/29/72 3/2/72	0.32	0.23	---	---	1.99	1.34	---	---	0.80	0.78
	0.34	0.23	---	---	3.10	2.28	---	---	0.69	0.70
Testing at EPA 3/21/72 3/22/72 3/23/72	0.20	---	2.42	---	2.86	---	902.0	---	0.79	---
	0.27	0.19	0.96	1.01	1.34	1.28	870.9	866.9	0.72	0.75
	0.21	0.15	0.70	0.37	1.20	0.82	889.7	744.4	1.02	0.90
Testing at GM 4/3/72 4/9/72	0.24	0.19	---	---	1.61	0.97	---	---	0.78	0.82
	0.17	0.14	---	---	1.81	1.04	---	---	0.73	0.73