

Evaluation of Two Consumers Power Company
Vehicles Converted to Use CNG Fuel

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Background

Over the past several years the Mobile Source Pollution Control Program has had the opportunity to evaluate in the laboratory a small fleet of vehicles converted to operate on liquid petroleum gas. Very few vehicles with compressed natural gas have been available in the Michigan area. Thus, when Consumers Power Company offered two CNG-equipped vehicles for testing, the Test & Evaluation Branch accepted this opportunity to broaden EPA's exposure to the use of an alternate fuel. This evaluation also would allow simulation of intermediate duty vehicle operation on compressed natural gas and would thus represent an input to the intermediate duty vehicle technology assessment.

Systems Evaluated

Consumers Power Company supplied two vehicles for EPA test. The first was a 1972 Chevrolet Nova equipped with an automatic transmission and a 250 cubic inch displacement engine. This vehicle had been converted to dual-fuel operation and was thus capable of running on either CNG or gasoline. The second vehicle supplied was a 1972 Chevrolet van equipped, also, with an automatic transmission and a 250 CID engine. The conversion of this vehicle allowed operation on CNG only. The conversion systems used were not commercially available kits, but were systems assembled by the Consumers Power Company.

Test Procedure

Emission testing of both vehicles was performed according to the 1975 Federal emission test procedure as specified in the July 2, 1971, Federal Register, Volume 36, Number 128, Part II. The Nova was tested while operating on CNG and on gasoline for comparative purposes. The van was tested according to light duty vehicle procedures at basic ignition timing of 14° BTDC, and at 8° BTDC to quantify the effect of small timing changes. In addition, the van was tested under simulated intermediate duty vehicle conditions (6000 pound inertia and 31.5 road load horsepower at 50 mph).

To evaluate the effect on maximum power of using CNG, the Nova was tested on an electric chassis dynamometer. Maximum power was measured both with CNG and with gasoline.

Test Results

Table I indicates the results of EPA's testing of the two vehicles. Note that fuel consumption has been calculated based on a carbon balance. Table II indicates the percent reduction in maximum power associated with use of CNG compared to gasoline. Data is reported for 4 different engine speed conditions.

Conclusions

1. The use of CNG results in significant reductions in all three regulated emissions.
2. A major reduction in power capabilities was associated with the use of CNG on the dual-fuel Nova.

TABLE 1

1972 Chevrolet Van
1975 Federal Test Procedure
(all results in grams per mile)

<u>Configuration</u>	<u>Date</u>	<u>HC</u>	<u>CO</u>	<u>CO₂</u>	<u>NOx</u>	<u>Fuel Cons.</u>
14° BTDC	10/11	1.75	5.39	624.9	2.24	1.95 mi/lb
5000# inertia	10/12	1.51	4.20	586.2	2.09	2.07 " "
8° BTDC	10/13	1.06	5.29	658.9	2.20	1.86 " "
5000# inertia	10/16	1.84	7.70	704.1	3.51	1.62 " "
14° BTDC	10/17	1.48	4.70	652.4	6.84	1.87 " "
6000# inertia	10/18	1.73	4.65	648.5	5.87	1.86 " "

1972 Chevrolet Nova

<u>Configuration</u>	<u>Date</u>	<u>HC</u>	<u>CO</u>	<u>CO₂</u>	<u>NOx</u>	<u>Fuel Cons.</u>
CNG	8/16	.94	1.56	582.7	1.90	2.13 mi/lb
	8/17	.84	1.58	626.9	1.94	1.98 " "
Gasoline	8/21	1.55	6.55	709.2	3.95	12.1 mi/gal
	8/24	1.27	5.99	713.2	3.45	12.1 " "

TABLE 2

1972 Chevrolet Nova
Consumers Power VehiclePercent Reduction in Maximum Power
Associated with the Use of CNG

<u>RPM</u>	<u>% Reduction</u>
2500	38%
3500	32%
4000	32%
4400	44%