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FUEL CONSUMPTION, EMISSIONS, AND POWER CHARACTERISTICS OF THE 1975 FORD 140-CID AUTOMOTIVE ENGINE-- EXPERIMENTAL DATA

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Bartlesville Energy Research Center
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INTERIM REPORT

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Prepared for

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16. Abstract

Experimental data were obtained in dynamometer tests of the 1975 Ford, 140 cubic-inch displacement, 2-bbl engine to determine steady-state fuel consumption and emissions of hydrocarbon, carbon monoxide, and oxides of nitrogen. These data were obtained in detail adequate to construct performance maps for the entire speed/load operating range of the engine.

The objective of the test work was to obtain data that describe engine performance characteristics in engineering terms; the data are so presented. The comparison or judgment of engine performance was not an objective and such assessments are avoided.

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PREFACE

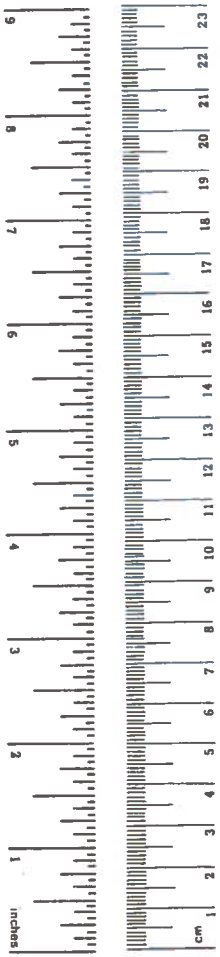
This report, prepared by the U.S. Energy Research and Development Administration, Bartlesville Energy Research Center for the U.S. Department of Transportation, Transportation Systems Center, Power and Propulsion Branch, Cambridge MA, presents results of an automobile engine test. This represents one of a series of 1975 engines tested.

Mr. Ralph G. Colello is the technical monitor of this project.

METRIC CONVERSION FACTORS

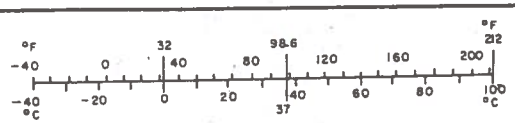
Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
in	inches	2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
		AREA		
in^2	square inches	6.5	square centimeters	cm^2
ft^2	square feet	0.09	square meters	m^2
yd^2	square yards	0.8	square meters	m^2
mi^2	square miles	2.6	square kilometers	km^2
	acres	0.4	hectares	ha
		MASS (weight)		
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
		VOLUME		
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft^3	cubic feet	0.03	cubic meters	m^3
yd^3	cubic yards	0.76	cubic meters	m^3
		TEMPERATURE (exact)		
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C



Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
		AREA		
cm^2	square centimeters	0.16	square inches	in^2
m^2	square meters	1.2	square yards	yd^2
km^2	square kilometers	0.4	square miles	mi^2
ha	hectares (10,000 m^2)	2.5	acres	
		MASS (weight)		
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
		VOLUME		
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m^3	cubic meters	35	cubic feet	ft^3
m^3	cubic meters	1.3	cubic yards	yd^3
		TEMPERATURE (exact)		
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F



1. INTRODUCTION

The data acquired from tests of a 1975 Ford 140-CID engine are presented in this report. This engine is used by Ford in the subcompact vehicles (Pinto and Bobcat). The test results are sufficient to establish steady-state maps for fuel consumption and emissions (carbon monoxide, unburned hydrocarbon, and oxides of nitrogen) over the entire operating range of the engine.

The objective of this program is to obtain engine performance data for estimating emissions and fuel economy in varied service and duty. The intent of this work is to provide basic engine characteristic data required as input for engineering calculations involving ground transportation.

2. ENGINE TEST REPORT

A list of general engine specifications for the Ford 140-CID, 2V engine are given in table 1. The engine tests were run using a single batch of unleaded regular grade gasoline; the fuel analysis is given in table 2.

The engine was mounted on a test stand and coupled to an eddy-current dynamometer. Engine cooling was provided through the use of a cooling tower instead of a radiator and the fan was not included in the test installation. The engine was equipped with an alternator but it was not wired into the engine's electrical system. The emission control systems included exhaust gas recirculation (EGR) and air injection (Thermactor).

The engine was operated at various speeds and loads designed to approximate road-load conditions over a 40-hour period for break-in. Details of the break-in schedule are given in table 3. The engine tests began on February 21, 1976 and ended on April 1, 1976 giving a total engine operating time of about 85 hours. The engine was tested while operating at the following steady-state modes:

Speeds: 1,000; 1,500; 2,000; 2,600, 3,000; 3,500; 4,000; 4,800 rpm

Loads: 0, 10, 25, 40, 60, 75, 90, 100 pct of full load (repeats at 0, 25, 40, 60 pct of full load)

Idle speed loads: 0, 3, 6 bhp (repeats at each condition)

Total number of test modes	71
Repeats	34
Total number of tests	105

The following data were recorded:

Test number
Date
Barometric pressure, mm Hg
Dew point, °F
Inlet air temperature, °F
Speed, rpm
Torque, lb-ft -- BLH strain gage load cell; Daytronics indicator
Fuel rate, lb/hr -- Fluidyne positive displacement fuel flow meter
Ignition timing, °BTC

Manifold vacuum, in. Hg
Throttle angle, degrees
CO, pct -- Beckman NDIR
CO_2, pct -- Beckman NDIR
O_2, pct -- Beckman polarographic detector
HC, ppmC -- Custom-built heated flame ionization detector
NO_x, ppm -- Thermo-Electron chemiluminescent detector
Oil temperature, °F
Oil pressure, psig
Coolant temperature, °F
Exhaust temperature, °F
Exhaust pressure, in. H_2O
Intake manifold temperature, °F

The computed data include absolute humidity (grains/lb dry air), power (bhp), air-fuel ratio (includes air injection), and emission rates of carbon monoxide (CO), unburned hydrocarbons (HC), and oxides of nitrogen (NO_x) in grams/hour. The following equations were applied in the computations:

$$W = \exp\left[12.02\left(\frac{D - 1.4}{D + 212}\right)\right]$$

$$H = \frac{4348\ W}{B - W}$$

$$P = \left(\frac{N \times T}{5252}\right)\left(\frac{736.6}{B - W}\right)\left(\frac{t + 460}{545}\right)^{0.5}$$

$$A/F = 4.895\ \frac{(CO) + 2(CO_2) + 2(O_2) + \left(\frac{NO_x}{10^4}\right) + 3.148\ (CO_2)\left(\frac{CO + CO_2}{CO + 3CO_2}\right)}{(CO) + (CO_2) + \left(\frac{HC}{10^4}\right)\left[1 + .03148(CO_2)\left(\frac{CO + CO_2}{CO + 3CO_2}\right)\right]}$$

The equation for A/F is based on:

1. Fuel = $CH_{2.099}$
2. Water-gas-shift equilibrium constant = $\frac{(CO)\ (H_2O)}{(CO_2)\ (H_2)} = 3$
3. HC was determined on a raw exhaust basis, all other species measured on a dry basis.
4. All NO_x is NO.

$$\text{Mass CO} = (\text{Exhaust flow rate}) \times (\text{CO}) \times \frac{\text{Mol. wt CO}}{\text{Mol. wt exhaust}}$$

$$\times \text{ correction for water removal}$$

$$\text{Mass CO} = 4.383\ (\text{F})\ (\text{A/F} + 1)\ (\text{CO}) \left[\frac{1}{1 + .03148(\text{CO}_2) \left(\frac{\text{CO} + \text{CO}_2}{\text{CO} + 3\text{CO}_2} \right)} \right]$$

$$\text{Mass HC} = 0.0002207\ (\text{F})\ (\text{A/F} + 1)\ (\text{HC})$$

$$\text{Mass NO}_x = 0.0007201\ (\text{F})\ (\text{A/F} + 1)\ (\text{NO}_x) \left[\frac{1}{1 + .03148(\text{CO}_2) \left(\frac{\text{CO} + \text{CO}_2}{\text{CO} + 3\text{CO}_2} \right)} \right] \times K_H$$

$$K_H = \frac{1}{1 - .0047\ (H - 75)}$$

where A/F = air-fuel ratio

B = barometric pressure, mm Hg

CO = carbon monoxide concentration, vol pct

CO_2 = carbon dioxide concentration, vol pct

D = intake air dew point, °F

F = fuel rate, lb/hr

H = humidity, grains H_2O/lb dry air

HC = unburned hydrocarbon concentration, ppmC, vol

K_H = humidity correction factor

N = engine speed, rpm

NO = nitric oxide concentration, ppm, vol

NO_x = nitrogen oxides concentration, ppm, vol

O_2 = oxygen concentration, vol pct

P = corrected power, brake horsepower

t = intake air temperature, °F

T = Torque, ft-lb

W = water vapor pressure, mm Hg

TABLE 1. - Manufacturer's engine specifications

Model No. 2.3 "A" (EGR-AIR)-R2

Displacement	140 cubic inches (2,300 cc)
Maximum horsepower	85.5 at 4,800 rpm
Maximum torque	113 at 2,600 rpm
Bore and stroke	3.78 in. x 3.126 in.
Configuration	In-line 4-cylinder with OHC
Compression ratio	8.4
Firing order	1-3-4-2
Ignition timing at idle speed:	
Manual transmission	6° BTC at 850 rpm
Automatic transmission	6° BTC at 750 rpm (in drive range)
Block material	Cast iron
Head material	Cast iron
Number of crank shaft main bearings	5
Number of compression rings/piston	2
Number of oil rings/piston	1
Cam drive	Notched belt and sprocket
Valve port size:	
Intake	1.736 in.
Exhaust	1.500 in.
Theoretical valve lift at zero lash:	
Intake	0.4000 in.
Exhaust	0.4000 in.
Valve timing:	
Intake, opens	22° BTC
Intake, closes	66° ABC
Exhaust, opens	64° BBC
Exhaust, closes	24° ATC
Spark plug gap	.032-.036 in.
Engine weight	350 lb
Air-injection system:	
Pump type	2-vane positive displacement
Air delivery point	Exhaust manifold
Exhaust-gas-recirculation system:	
Valve type	Internal tapered stem type
Control signal	Manifold vacuum
Point of discharge	Intake manifold
Crankcase emission control:	
Control method	Positive crankcase ventilation
Point of discharge	Intake manifold
Carburetor type	Two Venturi, staged (D52 E-9501-BA)
Distributor specifications: (D52E-12127 EASA2)	
Centrifugal advance, begins	0-2° @ 675 distributor rpm
Centrifugal advance, full	14° @ 2,250 distributor rpm
Vacuum advance, begins	4 in. Hg manifold vacuum
Vacuum advance, maximum	5-1/4° @ 7 in. Hg vacuum

TABLE 2. - Fuel specifications

Fuel No.	7602
Research octane No.	91.5
Motor octane No.	83.8
Reid vapor pressure, psig	11.9
Distillation, °F:	
10 pct	134
50 pct	214
95 pct	388
100 pct	418
API gravity, degrees	67.0
FIA analysis, pct:	
Aromatics	11
Olefins	16
Paraffins	73
Sulfur, pct	.0240
Lead, g/gallon	Trace
Hydrogen to carbon ratio	2.09

TABLE 3. - Engine break-in schedule

Simulated vehicle speed, mph	Engine speed, rpm	Manifold vacuum, in. Hg	Fraction of time in mode
0	700 (idle)	15.2	1/10
20	1,200	15.1	"
30	1,600	13.8	"
40	2,000	11.3	"
50	2,450	10.4	"
60	2,900	9.8	"
25	1,400	14.5	"
35	1,800	12.1	"
45	2,200	10.9	"
55	2,650	10.1	"

Mileage per cycle = 90 miles.
Total mileage accumulated over the 40-hour break-in period = 1,440 miles.

3. DISCUSSION OF TEST RESULTS

Engine performance data show good repeatability. Brake horsepower, torque, and brake specific fuel consumption (bsfc) at wide open throttle (WOT) for various engine speeds (figure 1) show results typical of gasoline engines and are in fair agreement with the specifications given in table 1. The computation of air-fuel ratio was influenced by the operation of the air-injection system, especially at low power output levels. The air-fuel ratio versus power trend (figure 2) was repeatable for each engine speed throughout the entire operating range of the engine. The air-injection system promotes the oxidation of unburned HC and CO by introducing the air into the exhaust stream at a point where the gas temperatures will support combustion. This system maintains low CO and HC emission rates (figures 3 and 4) except near WOT. The NO_x emissions (figure 5) were well-controlled throughout the tests and showed peak emission rates typically near 75 pct of full power for any given engine speed. This is indicative of an engine with enrichment near WOT conditions. Fuel rates were found to be nearly linear with power up to about 75 pct of maximum power for any engine speed. Minimum values of bsfc can be found near this condition.

4. CONCLUSIONS

The repeatability of emission rates and fuel consumption was satisfactory for the purposes of this test.

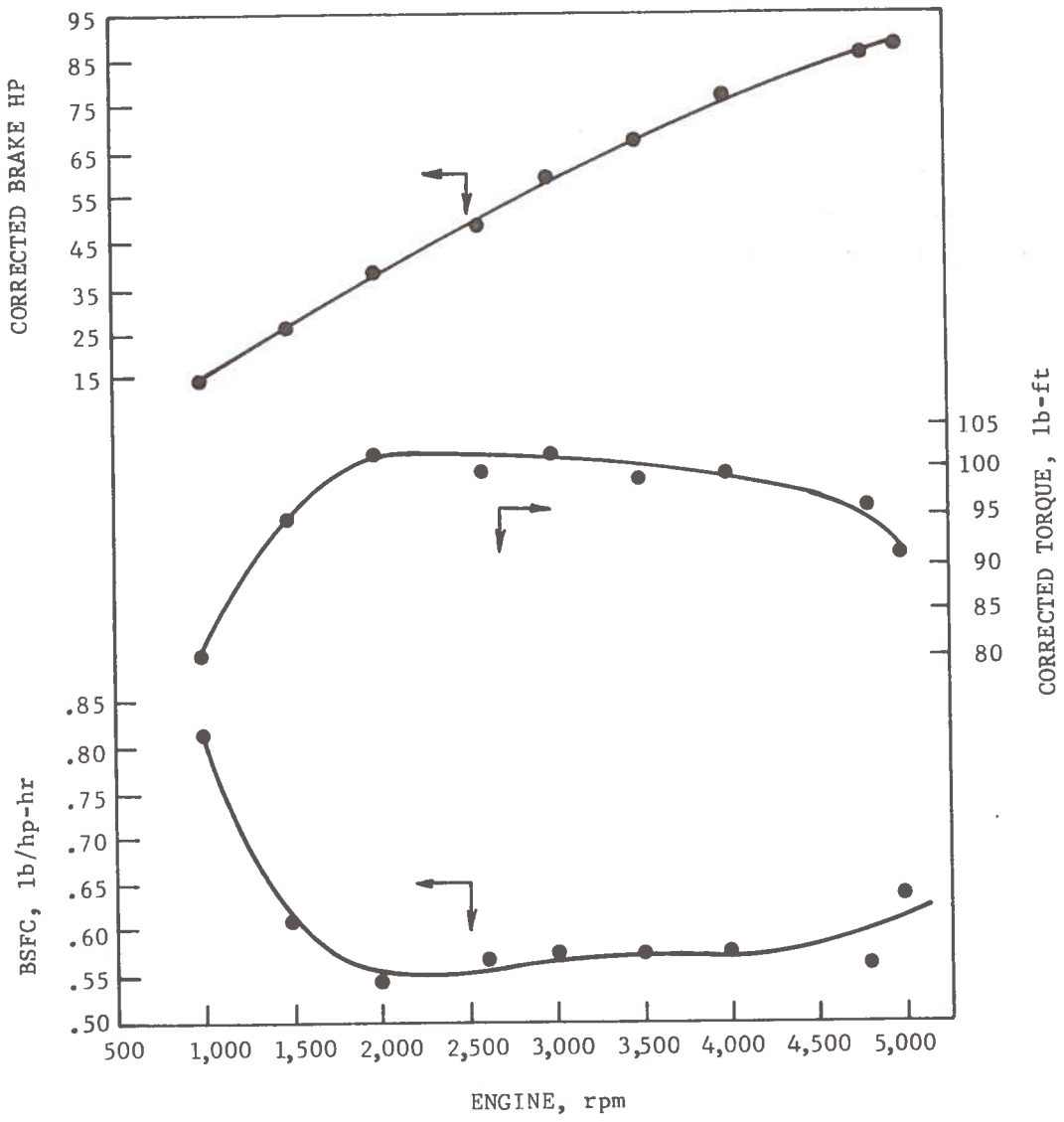


FIGURE 1. - Brake Specific Fuel Consumption, Torque, and Brake Horsepower versus Engine rpm at Wide Open Throttle--Ford 140-CID, 2V Engine.

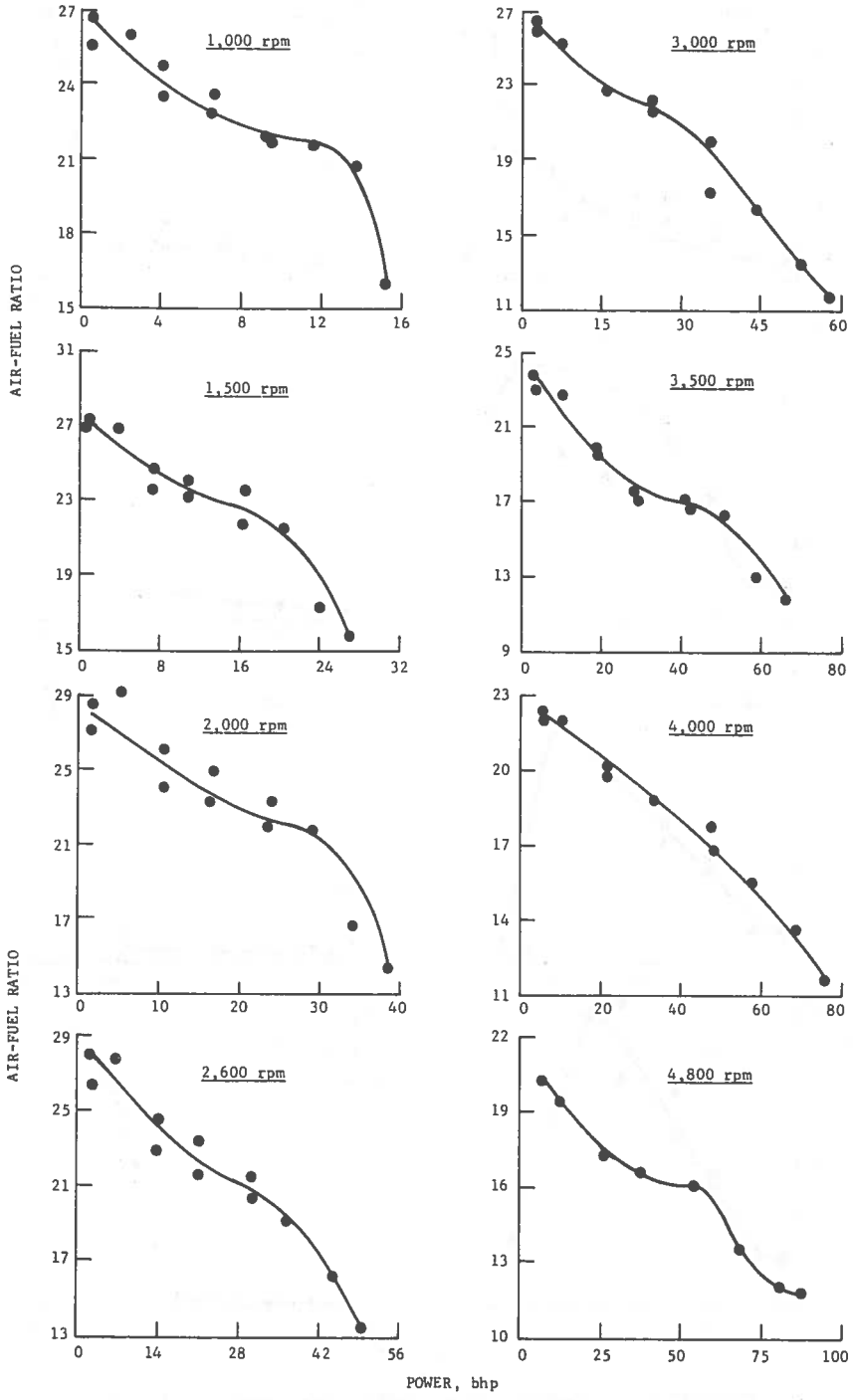


FIGURE 2. - Air-Fuel Ratio versus Power at Various Speed and Load Conditions--Ford 140-CID, 2V Engine.

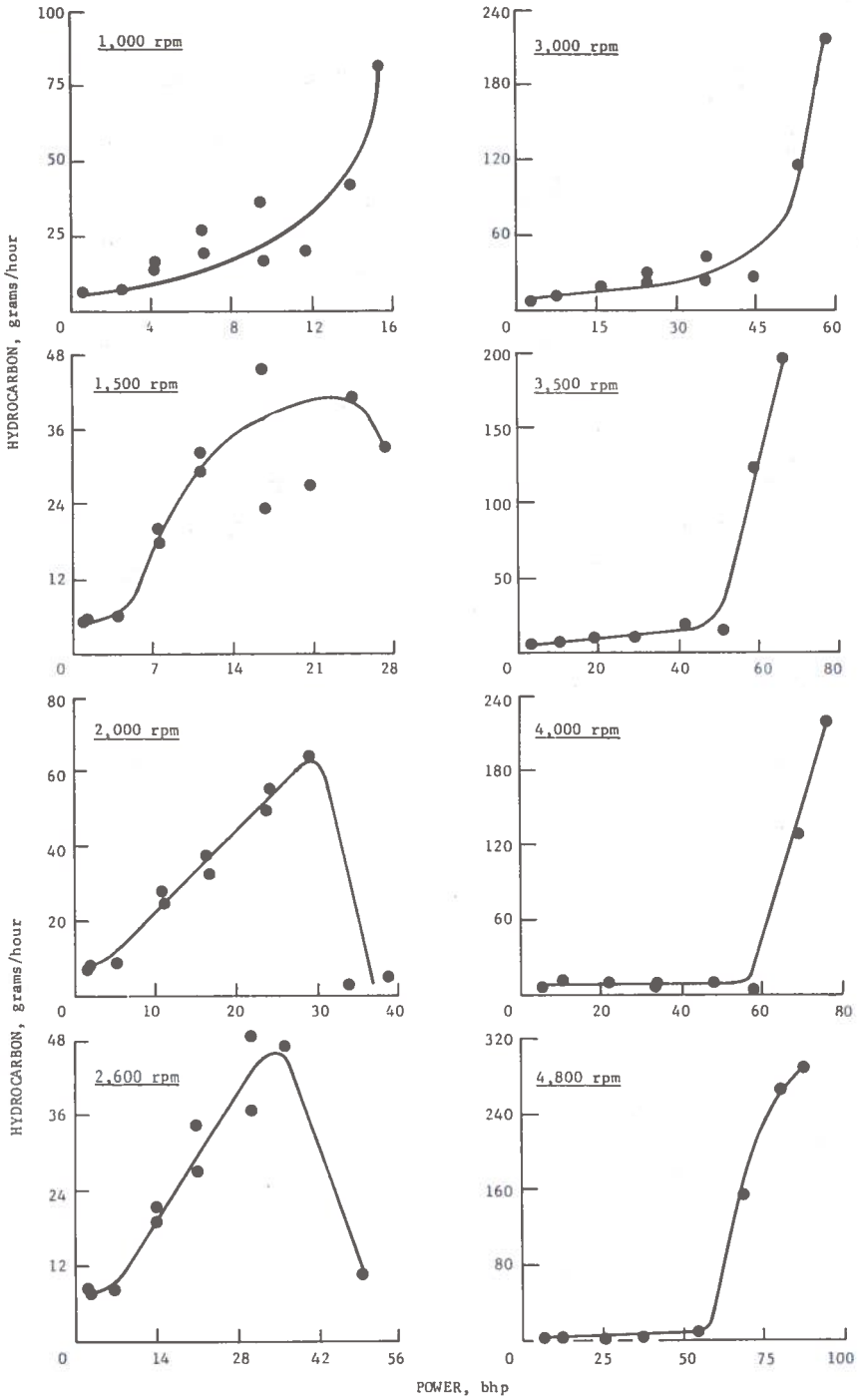


FIGURE 3. - Hydrocarbon Emissions versus Power at Various Speed and Load Conditions-- Ford 140-CID, 2V Engine.

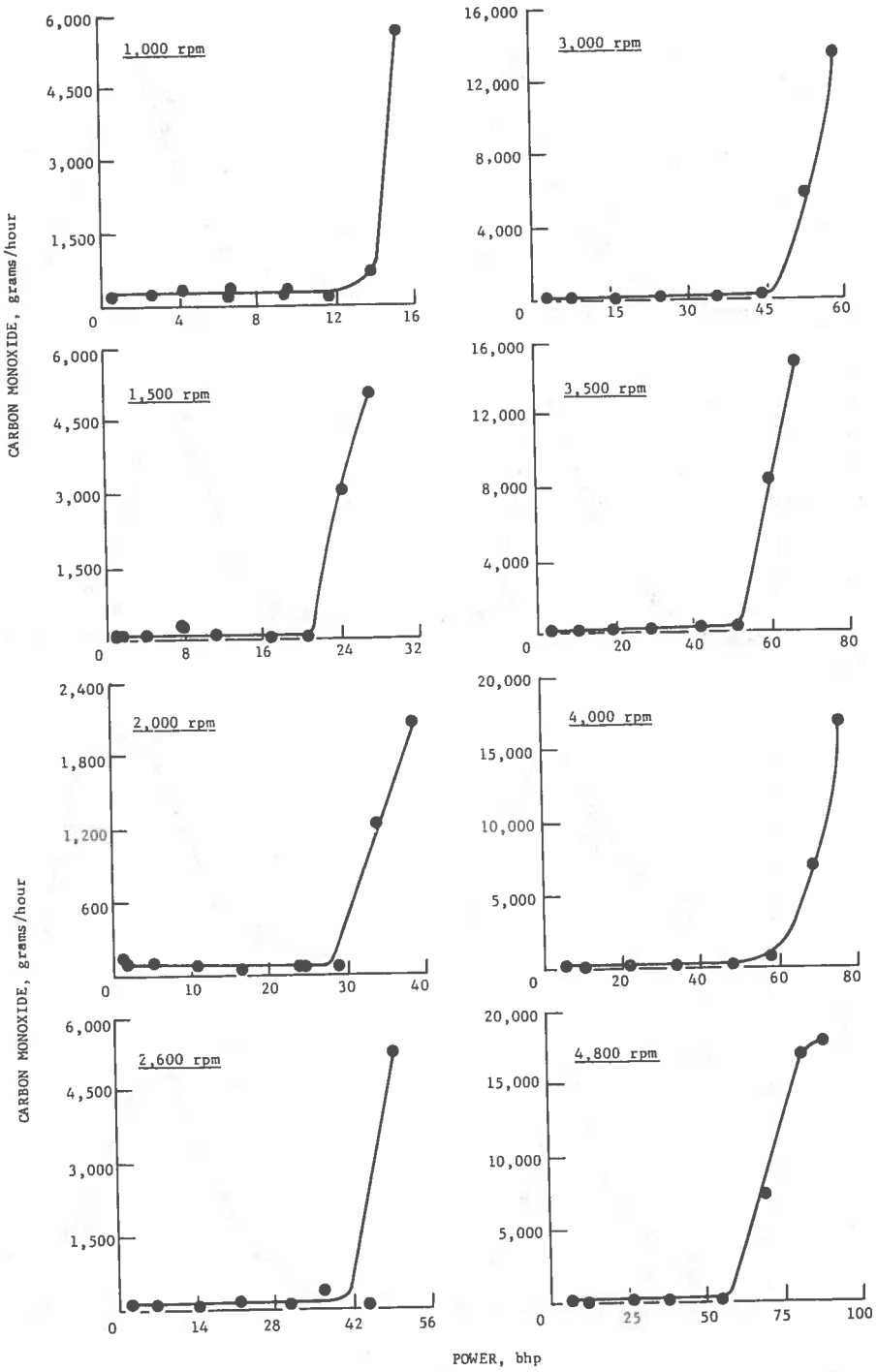


FIGURE 4. - Carbon Monoxide Emissions versus Power at Various Speed and Load Conditions-- Ford 140-CID, 2V Engine.

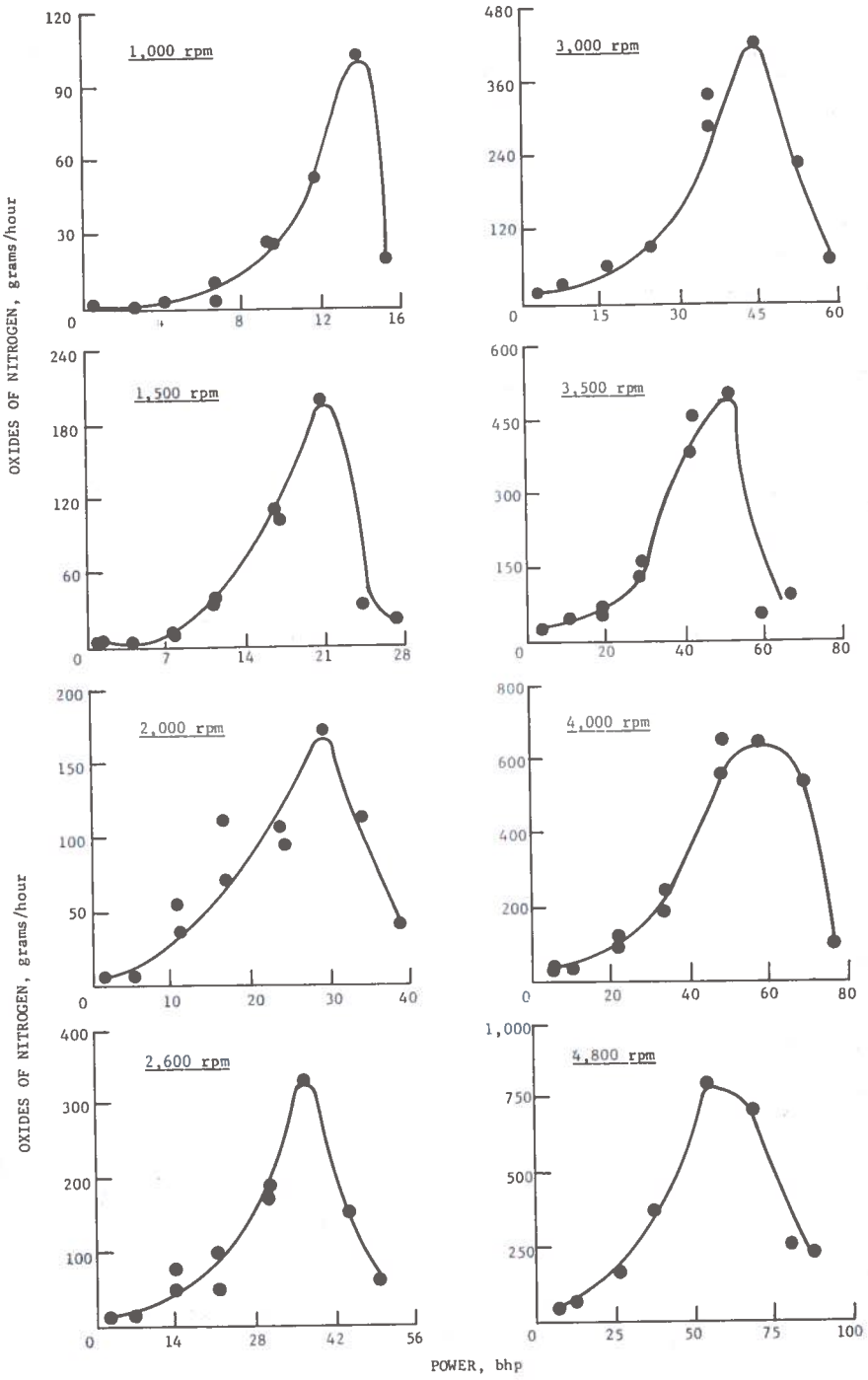


FIGURE 5. - Oxides of Nitrogen Emissions versus Power at Various Speed and Load Conditions--Ford 140-CID, 2V Engine.

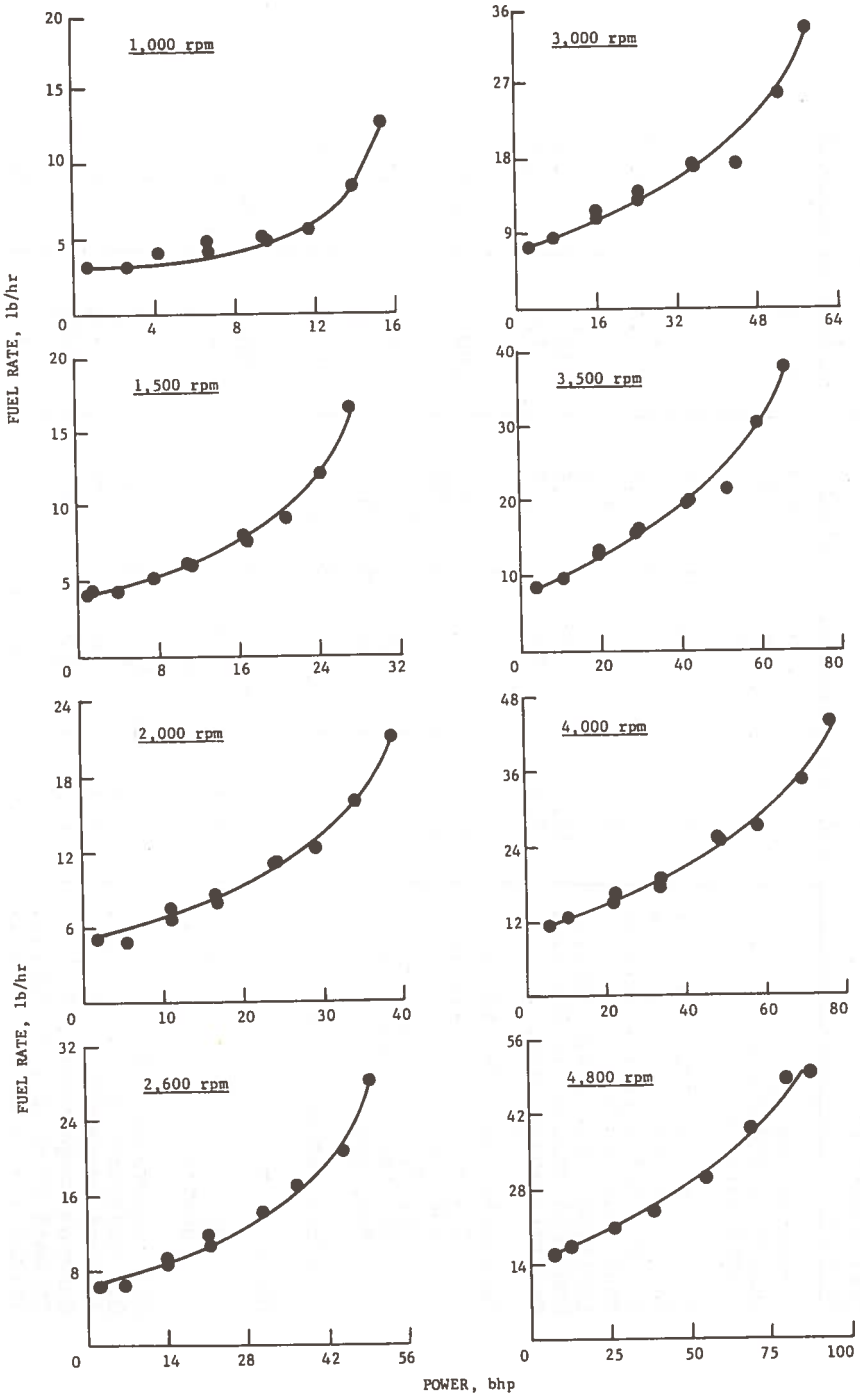


FIGURE 6. - Fuel Rate versus Power at Various Speed and Load Conditions--Ford 140-CID, 2V Engine.

Engine..... Ford 140-CID
Fuel..... 7602

Test Number.....	1	2	3	4	5
Test Date.....	2/21/76	2/21/76	2/21/76	2/21/76	2/21/76
Barometer, mm Hg.....	735.3	735.3	735.3	735.3	735.3
Humidity, grains/lb.....	47	47	47	47	47
Temperature, F.....	100	97	99	96	97
Engine speed, rpm.....	850	850	850	750	750
Torque, lb-ft.....	1.0	19.7	36.5	1.0	19.7
Power, bhp*.....	.2	3.3	6.1	.1	2.9
Fuel rate, lb/hr.....	2.7	3.5	4.0	2.7	3.2
Ignition timing, deg BTC....	7.0	7.5	7.0	7.0	7.5
Manifold vacuum, in Hg.....	16.1	13.5	9.5	16.0	11.9
Throttle angle, deg.....	0.0	1.5	3.0	1.0	1.5
Concentrations, dry basis:					
CO, %.....	.8700	.5200	1.3000	.8080	1.7200
CO2, %.....	7.00	7.50	8.50	7.20	7.00
O2, %.....	10.30	9.30	8.80	10.00	9.50
HC, ppmC.....	550	844	603	540	542
NOx, ppm.....	22	32	118	26	30
Air-fuel ratio.....	26.80	25.57	22.67	26.29	24.08
Emission rates, g/hr:					
CO.....	262.9	193.7	492.7	238.7	552.1
HC.....	8.4	15.8	11.5	8.0	8.8
NOx**.....	1.0	1.7	6.5	1.1	1.4
Oil temperature, F.....	171	176	178	178	174
Oil pressure, psi.....	44	44	44	44	40
Coolant temperature, F.....	177	177	175	174	181
Exhaust temperature, F.....	875	825	875	875	775
Exhaust pressure, in H2O....	3.0	3.0	3.0	2.0	2.0
Intake man. temp., F.....	147	144	137	151	147

* Corrected - SAE J816b
** Corrected for humidity.

Engine..... Ford 140-CID
Fuel..... 7602

Test Number.....	6	7	8	9	10
Test Date.....	2/21/76	2/21/76	2/21/76	2/21/76	2/21/76
Barometer, mm Hg.....	735.3	735.3	735.3	735.3	735.3
Humidity, grains/lb.....	47	47	47	47	47
Temperature, F.....	97	96	98	99	99
Engine speed, rpm.....	750	1000	1000	1000	1000
Torque, lb-ft.....	36.5	78.5	71.2	60.0	49.0
Power, bhp*.....	5.3	15.3	13.9	11.7	9.6
Fuel rate, lb/hr.....	3.7	12.5	8.5	5.6	4.8
Ignition timing, deg BTC....	8.0	10.0	17.0	17.0	17.0
Manifold vacuum, in Hg.....	9.5	.5	6.9	7.8	9.1
Throttle angle, deg.....	3.0	67.0	8.0	7.0	6.0
Concentrations, dry basis:					
CO, %.....	1.4200	5.6000	.6800	.3570	.6650
CO2, %.....	7.50	7.40	9.68	9.80	9.30
O2, %.....	9.20	5.75	6.75	7.20	7.50
HC, ppmC.....	761	1607	857	773	771
NOx, ppm.....	57	140	730	740	420
Air-fuel ratio.....	23.73	15.91	20.71	21.49	21.69
Emission rates, g/hr:					
CO.....	522.6	5635.9	661.2	178.9	290.6
HC.....	14.1	81.4	41.9	19.5	17.0
NOx**.....	3.0	20.4	103.0	53.8	26.6
Oil temperature, F.....	181	185	188	188	187
Oil pressure, psi.....	41	45	45	45	45
Coolant temperature, F.....	180	179	177	178	174
Exhaust temperature, F.....	625	850	725	750	695
Exhaust pressure, in H2O....	2.0	10.0	8.0	7.0	4.0
Intake man. temp., F.....	146	127	130	123	136

* Corrected - SAE J816b
** Corrected for humidity.

Engine..... Ford 140-CID
Fuel..... 7602

Test Number.....	11	12	13	14	15
Test Date.....	2/21/76	2/21/76	2/21/76	2/21/76	2/21/76
Barometer, mm Hg.....	735.3	735.3	735.3	735.3	735.3
Humidity, grains/lb.....	47	47	47	47	47
Temperature, F.....	97	97	95	96	93
Engine speed, rpm.....	1000	1000	1000	1000	1500
Torque, lb-ft.....	34.4	21.8	13.4	3.0	93.2
Power, bhp*.....	6.7	4.2	2.6	.6	27.1
Fuel rate, lb/hr.....	4.1	4.0	3.1	3.1	16.5
Ignition timing, deg BTC....	7.0	10.0	8.0	8.0	17.5
Manifold vacuum, in Hg.....	11.3	14.1	16.2	16.8	.5
Throttle angle, deg.....	3.0	2.5	2.5	2.0	67.0
Concentrations, dry basis:					
CO, %.....	.8430	.6950	.6430	.5300	4.7500
CO2, %.....	8.25	8.00	7.60	7.50	9.68
O2, %.....	8.75	9.25	9.80	10.00	4.50
HC, ppmC.....	960	620	406	346	621
NOx, ppm.....	69	51	35	32	140
Air-fuel ratio.....	23.47	24.62	25.91	26.56	15.57
Emission rates, g/hr:					
CO.....	336.6	284.9	219.3	185.5	5037.4
HC.....	19.3	12.8	7.0	6.1	33.1
NOx**.....	4.0	3.0	1.7	1.6	21.5
Oil temperature, F.....	187	186	186	185	191
Oil pressure, psi.....	44	45	45	45	50
Coolant temperature, F.....	178	174	177	176	177
Exhaust temperature, F.....	700	800	875	875	925
Exhaust pressure, in H2O....	4.0	3.0	3.0	3.0	12.0
Intake man. temp., F.....	137	136	142	144	117

* Corrected - SAE J816b
** Corrected for humidity.

Engine..... Ford 140-CID
Fuel..... 7602

Test Number.....	16	17	18	19	20
Test Date.....	2/21/76	2/21/76	2/21/76	2/21/76	2/21/76
Barometer, mm Hg.....	735.3	735.3	735.3	735.3	735.3
Humidity, grains/lb.....	47	47	47	47	47
Temperature, F.....	98	102	95	92	91
Engine speed, rpm.....	1500	1500	1500	1500	1500
Torque, lb-ft.....	82.7	70.1	57.5	38.6	26.0
Power, bhp*.....	24.2	20.6	16.8	11.2	7.6
Fuel rate, lb/hr.....	12.1	9.1	7.7	6.0	5.2
Ignition timing, deg BTC....	15.0	22.5	23.0	22.5	23.0
Manifold vacuum, in Hg.....	2.0	5.5	9.5	13.2	16.0
Throttle angle, deg.....	19.0	14.0	10.0	7.0	5.0
Concentrations, dry basis:					
CO, %.....	3.6000	.0640	.0470	.1500	.4950
CO2, %.....	9.00	10.20	9.05	8.80	8.15
O2, %.....	5.50	6.80	8.00	8.50	9.00
HC, ppmC.....	948	664	613	1071	664
NOx, ppm.....	270	1700	950	450	135
Air-fuel ratio.....	17.06	21.30	23.38	23.84	24.55
Emission rates, g/hr:					
CO.....	3095.0	51.5	35.3	89.9	263.6
HC.....	41.0	26.9	23.1	32.3	17.8
NOx**.....	33.7	198.4	103.4	39.1	10.4
Oil temperature, F.....	196	196	185	188	191
Oil pressure, psi.....	47	48	51	50	50
Coolant temperature, F.....	177	176	176	177	176
Exhaust temperature, F.....	975	950	800	775	800
Exhaust pressure, in H20....	11.0	10.0	8.0	5.0	5.0
Intake man. temp., F.....	111	114	116	120	125

* Corrected - SAE J816b
** Corrected for humidity.

Engine..... Ford 140-CID
Fuel..... 7602

Test Number.....	21	22	23	24	25
Test Date.....	2/21/76	2/21/76	2/21/76	2/21/76	2/25/76
Barometer, mm Hg.....	735.3	735.3	735.3	735.3	740.5
Humidity, grains/lb.....	47	47	47	47	37
Temperature, F.....	92	93	94	76	102
Engine speed, rpm.....	1500	1500	2000	2000	2000
Torque, lb-ft.....	13.4	4.4	99.5	89.0	74.3
Power, bhp*.....	3.9	1.3	38.7	34.0	29.0
Fuel rate, lb/hr.....	4.3	4.3	21.0	15.9	12.2
Ignition timing, deg BTC....	16.0	16.0	23.0	23.0	28.0
Manifold vacuum, in Hg.....	16.8	18.0	.5	2.0	4.2
Throttle angle, deg.....	3.0	3.0	67.0	24.0	23.0
Concentrations, dry basis:					
CO, %.....	.2100	.1880	1.7000	1.1500	.0620
CO2, %.....	7.70	7.60	13.75	12.10	9.45
O2, %.....	9.80	10.00	.15	3.00	6.75
HC, ppmC.....	249	232	75	51	1154
NOx, ppm.....	58	51	240	720	1125
Air-fuel ratio.....	26.79	27.25	14.26	16.56	21.61
Emission rates, g/hr:					
CO.....	101.1	92.8	2068.8	1240.5	68.0
HC.....	6.0	5.8	4.6	2.8	63.7
NOx**.....	4.1	3.7	42.4	112.7	171.7
Oil temperature, F.....	194	192	207	212	211
Oil pressure, psi.....	50	50	53	50	52
Coolant temperature, F.....	176	176	176	177	176
Exhaust temperature, F.....	850	875	1000	1075	1075
Exhaust pressure, in H2O....	4.0	4.0	35.0	23.0	11.1
Intake man. temp., F.....	125	127	112	110	121

* Corrected - SAE J816b
** Corrected for humidity.

Engine..... Ford 140-CID
Fuel..... 7602

Test Number.....	26	27	28	29	30
Test Date.....	2/25/76	2/25/76	2/25/76	2/25/76	2/25/76
Barometer, mm Hg.....	740.5	740.5	740.5	740.5	740.5
Humidity, grains/lb.....	37	37	37	37	37
Temperature, F.....	108	105	106	105	90
Engine speed, rpm.....	2000	2000	2000	2000	2000
Torque, lb-ft.....	61.7	42.8	28.1	13.4	4.4
Power, bhp*.....	24.1	16.6	10.9	5.2	1.7
Fuel rate, lb/hr.....	10.9	7.8	6.5	4.8	4.9
Ignition timing, deg BTC....	29.0	28.0	30.0	28.0	28.0
Manifold vacuum, in Hg.....	5.0	11.8	15.2	18.9	18.9
Throttle angle, deg.....	20.5	12.0	9.0	6.5	6.0
Concentrations, dry basis:					
CO, %.....	.0670	.0690	.1030	.1750	.1620
CO2, %.....	8.80	8.50	8.00	7.00	7.20
O2, %.....	7.75	8.75	9.25	10.50	10.25
HC, ppmC.....	1037	806	705	301	291
NOx, ppm.....	650	650	370	87	75
Air-fuel ratio.....	23.19	24.67	25.81	28.97	28.30
Emission rates, g/hr:					
CO.....	70.5	55.4	72.1	103.7	94.4
HC.....	55.0	32.5	24.8	9.0	8.5
NOx**.....	95.2	72.6	36.0	7.2	6.1
Oil temperature, F.....	192	197	200	200	198
Oil pressure, psi.....	52	50	51	51	51
Coolant temperature, F.....	171	174	174	172	172
Exhaust temperature, F.....	1040	900	875	875	875
Exhaust pressure, in H2O....	8.3	8.0	9.0	8.3	7.0
Intake man. temp., F.....	112	110	112	114	120

* Corrected - SAE J816b
** Corrected for humidity.

Engine..... Ford 140-CID
Fuel..... 7602

Test Number.....	31	32	33	34	35
Test Date.....	2/25/76	2/25/76	2/25/76	2/25/76	2/25/76
Barometer, mm Hg.....	740.5	740.5	740.5	740.5	740.5
Humidity, grains/lb.....	37	37	37	37	37
Temperature, F.....	91	98	84	82	97
Engine speed, rpm.....	2600	2600	2600	2600	2600
Torque, lb-ft.....	99.5	89.0	74.3	61.7	42.8
Power, bhp*.....	49.7	44.7	36.8	30.6	21.5
Fuel rate, lb/hr.....	28.1	20.6	17.0	14.2	10.7
Ignition timing, deg BTC....	25.0	26.0	27.0	30.0	33.0
Manifold vacuum, in Hg.....	.5	2.1	4.0	4.5	10.5
Throttle angle, deg.....	70.0	31.0	29.5	26.5	16.0
Concentrations, dry basis:					
CO, %.....	3.4000	.0490	.2850	.0895	.0980
CO2, %.....	12.25	12.85	10.55	9.55	8.70
O2, %.....	.10	1.70	4.90	6.50	7.75
HC, ppmC.....	138	16	695	577	518
NOx, ppm.....	280	800	1750	960	320
Air-fuel ratio.....	13.46	16.20	19.12	21.37	23.34
Emission rates, g/hr:					
CO.....	5265.4	67.2	383.1	113.5	102.7
HC.....	10.7	1.1	47.0	36.8	27.3
NOx**.....	60.3	152.6	327.3	169.4	46.7
Oil temperature, F.....	221	224	224	205	207
Oil pressure, psi.....	50	51	54	53	53
Coolant temperature, F.....	176	177	174	174	174
Exhaust temperature, F.....	1275	1325	1150	1150	1090
Exhaust pressure, in H20....	70.0	60.0	45.0	40.0	23.0
Intake man. temp., F.....	108	110	116	114	121

* Corrected - SAE J816b
** Corrected for humidity.

Engine..... Ford 140-CID
Fuel..... 7602

Test Number.....	36	37	38	39	40
Test Date.....	2/25/76	2/25/76	2/25/76	2/26/76	2/26/76
Barometer, mm Hg.....	740.5	740.5	740.5	748.1	748.1
Humidity, grains/lb.....	37	37	37	38	38
Temperature, F.....	99	92	87	99	108
Engine speed, rpm.....	2600	2600	2600	3000	3000
Torque, lb-ft.....	28.1	13.4	4.5	101.6	91.1
Power, bhp*.....	14.1	6.7	2.2	58.4	52.8
Fuel rate, lb/hr.....	8.8	6.4	6.3	33.5	25.8
Ignition timing, deg BTC....	33.0	32.5	33.0	28.5	29.0
Manifold vacuum, in Hg.....	14.2	18.5	18.5	.5	22.0
Throttle angle, deg.....	12.0	9.0	8.0	70.0	39.5
Concentrations, dry basis:					
CO, %.....	.0970	.1200	.1080	8.1700	4.0000
CO2, %.....	8.40	7.40	7.30	9.30	12.10
O2, %.....	8.50	10.00	10.00	.80	.85
HC, ppmC.....	424	216	226	2623	1611
NOx, ppm.....	390	140	120	320	1125
Air-fuel ratio.....	24.53	27.76	27.96	11.74	13.59
Emission rates, g/hr:					
CO.....	87.3	90.2	80.7	13378.0	5731.7
HC.....	19.2	8.2	8.5	216.2	116.2
NOx**.....	48.8	14.6	12.5	73.2	225.3
Oil temperature, F.....	212	212	211	224	234
Oil pressure, psi.....	53	54	54	56	53
Coolant temperature, F.....	176	178	178	181	185
Exhaust temperature, F.....	990	975	975	1200	1325
Exhaust pressure, in H20....	15.0	10.0	8.0	65.0	60.0
Intake man. temp., F.....	118	124	126	101	96

* Corrected - SAE J816b
** Corrected for humidity.

Engine..... Ford 140-CID
Fuel..... 7602

Test Number.....	41	42	43	44	45
Test Date.....	2/26/76	2/26/76	2/26/76	2/26/76	2/26/76
Barometer, mm Hg.....	748.1	748.1	748.1	748.1	748.1
Humidity, grains/lb.....	38	38	38	38	38
Temperature, F.....	112	106	95	94	92
Engine speed, rpm.....	3000	3000	3000	3000	3000
Torque, lb-ft.....	76.4	61.7	42.8	28.1	13.4
Power, bhp*.....	44.4	35.7	24.5	16.1	7.7
Fuel rate, lb/hr.....	18.1	16.9	13.9	11.6	8.5
Ignition timing, deg BTC....	33.0	35.5	37.0	36.0	35.0
Manifold vacuum, in Hg.....	4.2	5.8	9.2	12.8	17.5
Throttle angle, deg.....	30.0	26.0	19.0	14.0	10.5
Concentrations, dry basis:					
CO, %.....	.2700	.1520	.1090	.1060	.1030
CO2, %.....	13.30	12.70	10.05	9.45	8.40
O2, %.....	2.10	3.15	7.00	7.75	9.00
HC, ppmC.....	433	397	343	363	239
NOx, ppm.....	2500	1700	520	390	260
Air-fuel ratio.....	16.33	17.24	21.54	22.71	25.14
Emission rates, g/hr:					
CO.....	326.1	181.6	135.7	116.0	92.5
HC.....	26.3	23.8	21.5	20.0	10.8
NOx**.....	422.0	283.9	90.5	59.6	32.6
Oil temperature, F.....	231	231	227	226	224
Oil pressure, psi.....	53	53	55	56	56
Coolant temperature, F.....	184	178	181	176	178
Exhaust temperature, F.....	1325	1200	1150	1100	1025
Exhaust pressure, in H2O....	46.0	40.0	34.0	26.0	16.0
Intake man. temp., F.....	106	116	126	119	117

* Corrected - SAE 816b
** Corrected for humidity.

Engine..... Ford 140-CID
Fuel..... 7602

Test Number.....	46	47	48	49	50
Test Date.....	2/26/76	2/26/76	2/26/76	2/26/76	2/26/76
Barometer, mm Hg.....	748.1	748.1	748.1	748.1	748.1
Humidity, grains/lb.....	38	38	38	38	38
Temperature, F.....	92	92	94	100	100
Engine speed, rpm.....	3000	3500	3500	3500	3500
Torque, lb-ft.....	5.0	99.5	89.0	76.4	61.7
Power, bhp*.....	2.9	66.3	59.4	51.3	41.4
Fuel rate, lb/hr.....	7.4	37.9	30.6	21.5	19.7
Ignition timing, deg BTC....	36.0	32.0	32.0	36.0	35.0
Manifold vacuum, in Hg.....	18.5	.5	2.5	4.2	6.0
Throttle angle, deg.....	9.0	69.0	45.0	35.0	29.0
Concentrations, dry basis:					
CO, %.....	.1210	8.0000	5.1000	.2300	.1550
CO2, %.....	7.95	9.20	11.00	12.85	12.40
O2, %.....	9.50	.55	.70	2.00	2.80
HC, ppmC.....	179	2107	1489	216	260
NOx, ppm.....	165	360	240	2500	2000
Air-fuel ratio.....	26.29	11.66	12.98	16.35	17.05
Emission rates, g/hr:					
CO.....	98.7	14743.4	8347.8	331.0	213.1
HC.....	7.3	195.4	122.6	15.6	18.0
NOx**.....	18.8	92.7	54.9	502.9	384.4
Oil temperature, F.....	222	223	242	241	240
Oil pressure, psi.....	56	56	54	55	55
Coolant temperature, F.....	176	180	182	181	181
Exhaust temperature, F.....	1025	1320	1350	1400	1375
Exhaust pressure, in H2O....	14.0	85.0	75.0	60.0	45.0
Intake man. temp., F.....	117	92	94	106	117

* Corrected - SAE J816b
** Corrected for humidity.

Engine..... Ford 140-CID
Fuel..... 7602

Test Number.....	51	52	53	54	55
Test Date.....	2/26/76	2/26/76	2/26/76	2/26/76	2/27/76
Barometer, mm Hg.....	748.1	748.1	748.1	748.1	746.3
Humidity, grains/lb.....	38	38	38	38	36
Temperature, F.....	100	100	100	100	95
Engine speed, rpm.....	3500	3500	3500	3500	4000
Torque, lb-ft.....	42.8	28.1	15.5	5.0	99.5
Power, bhp*.....	28.7	18.9	10.4	3.4	76.1
Fuel rate, lb/hr.....	15.9	13.0	9.8	8.8	43.7
Ignition timing, deg BTC....	38.0	38.0	38.0	39.0	35.0
Manifold vacuum, in Hg.....	9.0	12.2	17.0	18.0	.5
Throttle angle, deg.....	22.0	17.0	12.0	11.0	70.0
Concentrations, dry basis:					
CO, %.....	.1600	.1400	.1030	.1080	7.9200
CO2, %.....	12.10	10.55	9.20	8.80	9.20
O2, %.....	3.40	5.50	7.50	8.00	.40
HC, ppmC.....	192	167	164	142	2049
NOx, ppm.....	840	370	370	220	350
Air-fuel ratio.....	17.54	19.85	22.71	23.60	11.60
Emission rates, g/hr:					
CO.....	182.8	150.1	95.5	94.2	16787.6
HC.....	11.0	9.0	7.7	6.2	218.6
NOx**.....	134.1	55.4	48.0	26.8	103.1
Oil temperature, F.....	237	235	232	230	231
Oil pressure, psi.....	55	56	56	57	59
Coolant temperature, F.....	180	180	180	177	181
Exhaust temperature, F.....	1350	1250	1175	1150	1500
Exhaust pressure, in H2O....	32.0	25.0	18.0	15.0	116.0
Intake man. temp., F.....	131	137	120	118	92

* Corrected - SAE J816b
** Corrected for humidity.

Engine..... Ford 140-CID
Fuel..... 7602

Test Number.....	56	57	58	59	60
Test Date.....	2/27/76	2/27/76	2/27/76	2/27/76	2/27/76
Barometer, mm Hg.....	746.3	746.3	746.3	746.3	746.3
Humidity, grains/lb.....	36	36	36	36	36
Temperature, F.....	110	112	111	111	105
Engine speed, rpm.....	4000	4000	4000	4000	4000
Torque, lb-ft.....	89.0	74.3	61.7	42.8	28.1
Power, bhp*.....	69.0	57.7	47.9	33.2	21.7
Fuel rate, lb/hr.....	34.6	27.1	23.3	17.5	15.8
Ignition timing, deg BTC....	33.0	37.0	41.0	40.0	20.0
Manifold vacuum, in Hg.....	1.2	4.1	5.5	8.5	11.5
Throttle angle, deg.....	50.0	40.0	32.0	25.0	40.0
Concentrations, dry basis:					
CO, %.....	3.6000	.4100	.1370	.1200	.1220
CO2, %.....	12.10	13.60	9.20	11.40	10.55
O2, %.....	.55	1.00	2.65	4.60	5.75
HC, ppmC.....	1321	57	110	101	133
NOx, ppm.....	2000	2700	2300	1000	500
Air-fuel ratio.....	13.61	15.50	17.69	18.77	20.11
Emission rates, g/hr:					
CO.....	6932.7	701.6	238.4	162.2	160.9
HC.....	128.0	4.9	9.6	6.9	8.8
NOx**.....	535.3	642.2	556.3	187.8	91.7
Oil temperature, F.....	247	252	252	248	241
Oil pressure, psi.....	57	55	55	55	56
Coolant temperature, F.....	181	181	182	178	178
Exhaust temperature, F.....	1450	1450	1400	1350	1290
Exhaust pressure, in H2O....	101.0	85.0	67.0	54.0	40.0
Intake man. temp., F.....	94	104	108	127	137

* Corrected - SAE J816b
** Corrected for humidity.

Engine..... Ford 140-CID
Fuel..... 7602

Test Number.....	61	62	63	64	65
Test Date.....	2/27/76	2/27/76	2/28/76	2/28/76	2/28/76
Barometer, mm Hg.....	746.3	746.3	750.7	750.7	750.7
Humidity, grains/lb.....	36	36	100	100	100
Temperature, F.....	103	106	100	100	100
Engine speed, rpm.....	4000	4000	4300	4800	4800
Torque, lb-ft.....	13.4	7.0	94.3	86.9	74.3
Power, bhp*.....	10.3	5.4	87.7	80.8	69.1
Fuel rate, lb/hr.....	12.4	11.0	49.7	48.8	39.4
Ignition timing, deg BTC....	41.0	40.0	34.0	33.0	33.0
Manifold vacuum, in Hg.....	15.3	16.5	.5	1.5	2.8
Throttle angle, deg.....	13.0	12.0	67.5	62.0	51.0
Concentrations, dry basis:					
CO, %.....	.1180	.1050	7.2500	7.0000	3.3500
CO2, %.....	9.55	9.45	10.20	10.70	12.40
O2, %.....	7.00	7.25	.25	.22	.32
HC, ppmC.....	187	137	2351	2187	1409
NOx, ppm.....	210	195	510	580	1750
Air-fuel ratio.....	21.89	22.25	11.88	12.04	13.57
Emission rates, g/hr:					
CO.....	133.3	107.4	17741.4	16937.8	7326.8
HC.....	10.6	7.1	289.5	266.3	155.1
NOx**.....	33.0	27.7	232.3	261.3	712.5
Oil temperature, F.....	240	236	244	257	261
Oil pressure, psi.....	59	60	61	55	53
Coolant temperature, F.....	180	177	181	181	181
Exhaust temperature, F.....	1200	1200	1400	1475	1565
Exhaust pressure, in H2O....	25.0	15.0	160.0	160.0	155.0
Intake man. temp., F.....	136	130	102	110	107

* Corrected - SAE 816b
** Corrected for humidity.

Engine..... Ford 140-CID
Fuel..... 7602

Test Number.....	66	67	68	69	70
Test Date.....	2/28/76	2/28/76	2/28/76	2/28/76	2/28/76
Barometer, mm Hg.....	750.7	750.7	750.7	750.7	750.7
Humidity, grains/lb.....	100	100	100	100	100
Temperature, F.....	100	100	100	100	100
Engine speed, rpm.....	4800	4800	4800	4800	4800
Torque, lb-ft.....	59.0	40.7	28.1	13.4	7.5
Power, bhp*.....	54.9	37.8	26.1	12.5	7.0
Fuel rate, lb/hr.....	30.0	24.0	20.8	17.4	15.7
Ignition timing, deg BTC....	39.0	39.0	38.0	40.0	40.0
Manifold vacuum, in Hg.....	4.5	8.0	10.2	12.8	14.1
Throttle angle, deg.....	43.0	30.0	25.5	21.0	18.0
Concentrations, dry basis:					
CO, %.....	.0520	.0490	.0480	.0600	.0740
CO2, %.....	13.75	13.45	13.00	11.40	10.85
O2, %.....	1.65	2.35	3.20	5.30	6.00
HC, ppmC.....	80	29	22	26	38
NOx, ppm.....	2200	1250	620	290	205
Air-fuel ratio.....	16.12	16.63	17.30	19.41	20.24
Emission rates, g/hr:					
CO.....	102.2	79.7	70.5	83.6	97.2
HC.....	7.9	2.3	1.6	1.8	2.5
NOx**.....	804.6	378.6	169.6	75.2	50.1
Oil temperature, F.....	260	264	261	260	256
Oil pressure, psi.....	53	54	55	56	56
Coolant temperature, F.....	180	181	179	178	178
Exhaust temperature, F.....	1550	1475	1465	1400	1375
Exhaust pressure, in H20....	120.0	80.0	65.0	55.0	50.0
Intake man. temp., F.....	118	141	151	168	171

* Corrected - SAE J816b
** Corrected for humidity.

Engine..... Ford 140-CID
Fuel..... 7602

Test Number.....	71	72	73	74	75
Test Date.....	2/27/76	2/27/76	2/27/76	2/27/76	2/27/76
Barometer, mm Hg.....	744.0	744.0	744.0	744.0	744.0
Humidity, grains/lb.....	36	36	36	36	36
Temperature, F.....	93	96	97	96	91
Engine speed, rpm.....	1000	1000	1000	1000	1500
Torque, lb-ft.....	49.1	34.4	21.8	3.0	57.5
Power, bhp*.....	9.4	6.6	4.2	.6	16.5
Fuel rate, lb/hr.....	5.1	4.8	4.0	3.1	7.9
Ignition timing, deg BTC....	17.5	12.5	8.0	9.0	23.0
Manifold vacuum, in Hg.....	9.5	11.6	13.5	17.1	8.7
Throttle angle, deg.....	6.0	5.0	3.0	2.0	10.0
Concentrations, dry basis:					
CO, %.....	.4900	.4100	.7080	.5800	.0800
CO2, %.....	9.20	9.00	8.24	7.50	9.68
O2, %.....	7.50	8.00	8.50	9.25	7.00
HC, ppmC.....	1539	1151	791	389	1266
NOx, ppm.....	425	180	60	37	1100
Air-fuel ratio.....	21.83	22.68	23.48	25.52	21.65
Emission rates, g/hr:					
CO.....	226.4	187.3	277.7	190.7	57.3
HC.....	35.8	26.5	15.6	6.4	45.6
NOx**.....	27.3	11.4	3.3	1.7	109.5
Oil temperature, F.....	181	182	181	181	190
Oil pressure, psi.....	43	44	44	44	48
Coolant temperature, F.....	175	176	176	174	172
Exhaust temperature, F.....	700	735	750	875	875
Exhaust pressure, in H2O....	4.0	3.0	3.0	2.0	10.0
Intake man. temp., F.....	134	134	136	144	112

* Corrected - SAE J816b
** Corrected for humidity.

Engine..... Ford 140-CID
Fuel..... 7602

Test Number.....	76	77	78	79	80
Test Date.....	2/27/76	2/27/76	2/27/76	2/27/76	2/27/76
Barometer, mm Hg.....	744.0	744.0	744.0	744.0	744.0
Humidity, grains/lb.....	36	36	36	36	36
Temperature, F.....	95	97	98	95	97
Engine speed, rpm.....	1500	1500	1500	2000	2000
Torque, lb-ft.....	38.6	26.0	3.0	61.7	42.8
Power, bhp*.....	11.1	7.5	.9	23.7	16.4
Fuel rate, lb/hr.....	6.2	5.3	4.1	10.9	8.5
Ignition timing, deg BTC....	22.0	24.0	16.0	32.0	30.0
Manifold vacuum, in Hg.....	13.1	16.0	18.0	6.2	12.0
Throttle angle, deg.....	7.0	5.0	4.0	17.0	10.0
Concentrations, dry basis:					
CO, %.....	.2100	.5800	.2300	.0630	.0670
CO2, %.....	9.05	8.40	7.60	9.55	9.20
O2, %.....	8.00	8.50	9.75	7.00	7.75
HC, ppmC.....	986	764	227	990	921
NOx, ppm.....	420	160	60	775	1000
Air-fuel ratio.....	23.00	23.56	26.84	21.81	22.88
Emission rates, g/hr:					
CO.....	124.0	304.1	105.1	62.4	54.0
HC.....	29.3	20.2	5.2	49.3	37.4
NOx**.....	34.5	11.7	3.8	106.7	112.1
Oil temperature, F.....	191	191	188	190	197
Oil pressure, psi.....	48	48	48	50	50
Coolant temperature, F.....	175	174	174	174	174
Exhaust temperature, F.....	800	825	875	1000	875
Exhaust pressure, in H2O....	8.0	5.0	5.0	21.0	15.0
Intake man. temp., F.....	117	121	131	109	111

* Corrected - SAE J816b
** Corrected for humidity.

Engine..... Ford 140-CID
Fuel..... 7602

Test Number.....	81	82	83	84	85
Test Date.....	2/28/76	2/28/76	2/28/76	2/28/76	2/28/76
Barometer, mm Hg.....	750.7	750.7	750.7	750.7	750.7
Humidity, grains/lb.....	100	100	100	100	100
Temperature, F.....	80	85	85	87	90
Engine speed, rpm.....	2000	2000	2600	2600	2600
Torque, lb-ft.....	28.1	4.0	61.7	42.8	28.1
Power, bhp*.....	10.7	1.5	30.7	21.3	14.0
Fuel rate, lb/hr.....	7.4	4.9	14.2	11.7	9.3
Ignition timing, deg BTC....	29.0	26.0	33.0	33.0	33.0
Manifold vacuum, in Hg.....	15.0	19.0	6.1	10.0	14.5
Throttle angle, deg.....	9.0	5.0	20.0	15.0	10.0
Concentrations, dry basis:					
CO, %.....	.1220	.2450	.0900	.1000	.1030
CO2, %.....	9.05	7.95	11.00	10.30	9.55
O2, %.....	8.60	10.25	6.50	7.25	8.20
HC, ppmC.....	756	260	803	654	479
NOx, ppm.....	400	59	850	500	460
Air-fuel ratio.....	23.83	26.88	20.48	21.56	23.07
Emission rates, g/hr:					
CO.....	90.1	134.8	108.0	104.3	91.4
HC.....	28.1	7.2	48.5	34.3	21.4
NOx**.....	55.0	6.0	189.9	97.0	76.0
Oil temperature, F.....	197	194	210	211	211
Oil pressure, psi.....	56	54	55	55	55
Coolant temperature, F.....	172	174	176	175	175
Exhaust temperature, F.....	890	950	1100	1075	1000
Exhaust pressure, in H20....	10.0	5.0	35.0	25.0	17.0
Intake man. temp., F.....	114	124	116	120	112

* Corrected - SAE J816b
** Corrected for humidity.

Engine..... Ford 140-CID
Fuel..... 7602

Test Number.....	86	87	88	89	90
Test Date.....	2/28/76	2/28/76	2/28/76	2/28/76	2/28/76
Barometer, mm Hg.....	750.7	750.7	750.7	750.7	750.7
Humidity, grains/lb.....	100	100	100	100	100
Temperature, F.....	88	91	91	92	90
Engine speed, rpm.....	2600	3000	3000	3000	3000
Torque, lb-ft.....	5.0	61.7	42.8	28.1	5.0
Power, bhp*.....	2.5	35.6	24.7	16.2	2.9
Fuel rate, lb/hr.....	6.3	17.4	13.0	10.8	7.4
Ignition timing, deg BTC....	34.0	35.0	35.0	36.0	36.0
Manifold vacuum, in Hg.....	18.9	4.9	9.5	14.0	18.5
Throttle angle, deg.....	7.0	26.0	17.0	12.0	8.0
Concentrations, dry basis:					
CO, %.....	.1750	.1010	.1060	.1115	.1340
CO2, %.....	8.00	11.00	9.55	9.55	8.25
O2, %.....	9.80	6.00	7.20	7.80	9.50
HC, ppmC.....	211	558	484	347	179
NOx, ppm.....	100	1250	400	330	135
Air-fuel ratio.....	26.45	20.10	22.05	22.68	25.86
Emission rates, g/hr:					
CO.....	122.9	145.5	126.7	113.4	107.0
HC.....	7.5	40.4	29.1	17.7	7.2
NOx**.....	13.1	335.2	89.0	62.5	20.1
Oil temperature, F.....	207	214	218	218	215
Oil pressure, psi.....	55	56	55	56	55
Coolant temperature, F.....	174	174	174	174	174
Exhaust temperature, F.....	1000	1200	1150	1075	1025
Exhaust pressure, in H20....	10.0	50.0	32.0	23.0	15.0
Intake man. temp., F.....	119	116	132	125	120

* Corrected - SAE J816b
** Corrected for humidity.

Engine..... Ford 140-CID
Fuel..... 7602

Test Number.....	91	92	93	94	95
Test Date.....	2/28/76	2/28/76	2/28/76	2/28/76	2/28/76
Barometer, mm Hg.....	750.7	750.7	750.7	750.7	750.7
Humidity, grains/lb.....	100	100	100	100	100
Temperature, F.....	106	106	107	105	107
Engine speed, rpm.....	3500	3500	3500	3500	4000
Torque, lb-ft.....	61.7	42.8	28.1	5.5	62.0
Power, bhp*.....	42.1	29.2	19.2	3.7	48.3
Fuel rate, lb/hr.....	20.1	16.4	13.5	8.7	25.0
Ignition timing, deg BTC....	38.0	38.0	38.0	37.0	37.0
Manifold vacuum, in Hg.....	5.9	9.0	12.0	18.0	4.1
Throttle angle, deg.....	28.0	21.0	16.0	10.0	39.0
Concentrations, dry basis:					
CO, %.....	.1440	.1620	.1295	.1030	.1305
CO2, %.....	13.00	13.00	11.40	9.55	13.45
O2, %.....	2.70	3.10	5.50	7.80	2.55
HC, ppmC.....	263	165	179	138	120
NOx, ppm.....	1775	770	350	185	2050
Air-fuel ratio.....	16.85	17.14	19.49	22.75	16.74
Emission rates, g/hr:					
CO.....	198.7	186.2	140.3	84.6	222.4
HC.....	18.6	9.5	9.8	5.7	10.3
NOx**.....	455.9	164.8	70.6	28.3	650.3
Oil temperature, F.....	226	230	231	230	237
Oil pressure, psi.....	57	56	57	57	59
Coolant temperature, F.....	180	180	180	177	182
Exhaust temperature, F.....	1350	1325	1250	1150	1410
Exhaust pressure, in H20....	50.0	35.0	30.0	15.0	70.0
Intake man. temp., F.....	120	131	137	127	111

* Corrected - SAE J816b
** Corrected for humidity.

Engine..... Ford 140-CID
Fuel..... 7602

Test Number.....	96	97	98	99	100
Test Date.....	2/28/76	2/28/76	2/28/76	2/28/76	2/28/76
Barometer, mm Hg.....	750.7	750.7	750.7	750.7	750.7
Humidity, grains/lb.....	100	100	100	100	100
Temperature, F.....	111	108	110	113	95
Engine speed, rpm.....	4000	4000	4000	850	850
Torque, lb-ft.....	42.8	28.0	7.0	1.0	19.0
Power, bhp*.....	33.5	21.9	5.5	.2	3.1
Fuel rate, lb/hr.....	18.8	16.1	11.2	2.5	3.3
Ignition timing, deg BTC....	41.0	41.0	40.0	8.0	8.0
Manifold vacuum, in Hg.....	8.8	11.2	16.2	155.0	12.5
Throttle angle, deg.....	24.0	20.0	12.0	1.0	2.5
Concentrations, dry basis:					
CO, %.....	.1250	.1250	.1010	.5300	.5630
CO2, %.....	11.80	11.25	9.95	7.60	8.15
O2, %.....	4.75	5.60	7.30	9.80	9.00
HC, ppmC.....	140	145	121	460	751
NOx, ppm.....	910	510	205	42	51
Air-fuel ratio.....	18.75	19.65	21.94	26.14	24.39
Emission rates, g/hr:					
CO.....	181.0	163.2	102.9	145.4	191.9
HC.....	10.2	9.5	6.2	6.4	12.9
NOx**.....	245.4	123.9	38.9	2.1	3.2
Oil temperature, F.....	242	242	237	218	174
Oil pressure, psi.....	57	58	58	27	38
Coolant temperature, F.....	178	177	178	178	184
Exhaust temperature, F.....	1325	1275	1200	950	775
Exhaust pressure, in H20....	50.0	40.0	25.0	1.0	1.0
Intake man. temp., F.....	118	134	127	162	151

* Corrected - SAE J816b
** Corrected for humidity.

Engine..... Ford 140-CID
Fuel..... 7602

Test Number.....	101	102	103	104	105
Test Date.....	2/28/76	2/28/76	2/28/76	2/28/76	4/ 1/76
Barometer, mm Hg.....	750.7	750.7	750.7	750.7	746.0
Humidity, grains/lb.....	100	100	100	100	86
Temperature, F.....	91	94	98	96	98
Engine speed, rpm.....	850	750	750	750	5000
Torque, lb-ft.....	37.0	1.0	19.0	37.0	89.0
Power, bhp*.....	6.0	.1	2.8	5.4	86.3
Fuel rate, lb/hr.....	4.3	2.5	3.2	3.6	54.8
Ignition timing, deg BTC....	8.0	8.0	7.5	9.0	28.0
Manifold vacuum, in Hg.....	8.1	15.8	12.9	7.0	.5
Throttle angle, deg.....	5.0	1.0	2.0	4.0	69.0
Concentrations, dry basis:					
CO, %.....	.2450	.8430	1.2500	.0670	7.3000
CO2, %.....	9.30	6.95	7.30	8.50	10.20
O2, %.....	7.80	10.25	9.25	8.50	.23
HC, ppmC.....	989	668	1111	1334	2374
NOx, ppm.....	150	255	345	195	520
Air-fuel ratio.....	22.52	26.85	24.22	24.21	11.60
Emission rates, g/hr:					
CO.....	99.3	237.0	402.8	24.6	19527.2
HC.....	20.2	9.5	18.0	24.7	314.4
NOx**.....	11.3	13.3	20.7	13.3	241.3
Oil temperature, F.....	180	181	181	182	240
Oil pressure, psi.....	40	42	40	39	61
Coolant temperature, F.....	181	182	182	186	183
Exhaust temperature, F.....	775	825	760	700	1430
Exhaust pressure, in H2O....	3.0	1.0	1.0	1.0	170.0
Intake man. temp., F.....	142	151	154	151	100

* Corrected - SAE 816b
** Corrected for humidity.