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Evaluation of Fuel Economy Differences on a 1978 Volvo for Two Different Motor Oils

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by

Thomas J. Penninga
and
Dave Lawrence

Test and Evaluation Branch
Emission Control Technology Division
Office of Mobile Source Air Pollution Control
U.S. Environmental Protection Agency

Abstract

This report presents the results which were gathered to determine the fuel economy difference between a low viscosity multigrade, synthetic motor oil and a straight 30 weight motor oil. The test vehicle was a 1978 Volvo which has been modified to give consistent vehicle emissions and fuel economy. The car was tested with each oil at ambient temperatures of 40° F, 75°F and 90°F.

The low viscosity synthetic showed no improvement on the Federal Test Procedure (FTP) at 40°F and 90°F and a .74% increase in fuel economy for the 75°F Tests. The Highway Fuel Economy Tests (HFET) showed a 2.13% increase at 40°F, 2.48% increase at 75°F, and 2.71% at 90°F for the low viscosity synthetic multigrade oil.

Background

In the past few years several oil manufacturers have advertised that the use of certain oils will result in a noticeable fuel economy benefit. This benefit is usually claimed to be a result of the special viscosities, additives, friction modifiers or special base stocks. Both industry and government are interested in determining an accurate method for determining the validity of these advertising claims. The EPA and ASTM are developing procedures to properly label fuel efficient (FE) motor oils. Until such procedures are finalized the claims made for "Fuel Efficient" motor oils cannot accurately be verified. Much of the problem lies in what "baseline oil" is used in comparison testings. Depending on the reference oil, an oil which claims 2 to 3 percent improvement in fuel economy may not show improvement over another "non-fuel efficient "(NFE) oil.

The EPA was recently questioned concerning the fuel economy benefits of low viscosity, multigrade, oils over a straight 30 weight oil. This test project was designed to quickly determine for one car if a noticeable fuel economy difference was discernable. A description of the test project is given below

Testing Procedure

The test vehicle was a correlation check vehicle designed to produce repeatable vehicle emissions and fuel economy. A complete vehicle description is given in Attachment A. The testing was performed in an environmental chamber where ambient temperatures and humidity were controlled. The test fuel was supplied from an auxilliary tank which was stabilized in the test cell for at least 12 hours prior to the test. Thus, both the vehicle and the test fuel were at the set point temperatures prior to test. To verify this, the engine oil and water temperatures were required to be within 2.5°F of the temperatures noted for the first test at that temperature. A battery charger was connected to the vehicle battery each night to insure consistent battery charge and alternator loading. The fuel economy was calculated using the Carbon Balance method. This procedure varied slightly from the Federal Register Procedure. The actual fuel density and hydrogen-to-carbon ratio were

entered rather than assumed for each test. Therefore the accuracy of the Carbon Balance procedure was slightly improved.

The test dynamometer was a Labeco single roll electric dynamometer. The vehicle cooling fan was run at a constant 15,800 CFM because the proportional control for the fan was not operating properly. The actual mileages based on dynamometer roll revolutions were used in the calculations. Other test particulars are listed below:

1) The dynamometer was warmed for 20 minutes at 50 miles per hour prior to each test.

2) The vehicle tire pressure was set at 32 psig.

3) The hood was left open for all of the test sequence.

4) An air deflector was placed in front of the cars prior to the FTP and between the FTP and HFET.

5) Vehicle Inertia Weight setting was 2250 lbs.

6) Vehicle Actual Dyno Horsepower setting was 8.8 horsepower at 50 miles per hour.

The vehicle was filled with the low viscosity, multigrade synthetic oil (test oil #1), run for 10 minutes, drained, refilled with test oil #1, run for 10 minutes, drained, and refilled with test oil #1. The car was then tested 5 times at 40°F. Each test consisted of a 1978 CVS FTP and HFET sequences. Three of these tests were voided due to equipment and driver problems. The car was then tested three times at 75° F and three times at 90°F. The oil was then changed using the same "flushing procedure" but with a straight 30 weight oil (test oil #2). The test vehicle was then tested twice at 40°F, 75°F and 90°F.

Test Results

The test results can be analyzed several ways. The first method is based on the ASTM and EPA procedure which selects the closest two tests, if more than two were taken and then averages the two. A comparison is then made between these averages. The results of this analysis are as follows:

Temp.	OIL	FTP	HFET	Combined
40°F	Test Oil #1	18.7061	26.7126	21.6225
40°F	Test Oil #1	19.0595	26.5687	21.8368
	Average	18.8828	26.6407	21.7197
40°F	Test Oil #2	18.67774	26.0742	21.4107
40°F	Test Oil #2	19.2566	26.3281	21.9751
	Average	19.0172	26.2012	21.6929
% Difference		(-) .71%	(+) 1.65%	(+) .17%
75°F	Test Oil #1	20.4607	27.3697	23.0828
75°F	Test Oil #1	20.1785	27.6353	22.9672
	Average	20.3196	27.5025	23.0250
75°F	Test Oil #2	20.2810	26.8088	22.7767
75°F	Test Oil #2	20.3208	27.0810	22.8924
	Average	20.3009	26.9449	22.8346
% Difference		(+) 0.09%	(+) 2.03%	(+) .50%
90°F	Test Oil #1	20.9935	27.5516	23.5119
90°F	Test Oil #1	20.9364	27.8203	23.5598
	Average	20.9650	27.6860	23.5359
90°F	Test Oil #2	20.8288	26.6018	23.0830
90°F	Test Oil #2	21.0471	27.5078	23.5345
	Average	20.9380	27.0548	23.3088
% Difference		(+)0.13%	(+)2.28%	(+)0.96%

A second method of analysis is to look at the averages of all valid tests at each test point. This method also allows standard deviation and coefficient of variation comparisons. The results of this analysis are given below:

Temp.	OIL	Number of Tests	Statistics	FTP	HFET	Combined
40°F	Test Oil #1	3	Mean	19.0093	26.7705	21.8608
			Std.Dev.	.2815	.2360	.2512
			CV.*	1.48%	.88%	1.15%
40°F	Test Oil #2	2	Mean	19.0172	26.2012	21.6929
			Std. Dev.	.4813	.1795	.3991
			CV.*	2.53%	0.69%	1.84%
% Difference (Test Oil #1 Base)				(-).04%	2.13%	0.77%
75°F	Test Oil #1	3	Mean	20.4530	27.6303	23.1597
		Std. Dev.		.2702	.2581	2404
			CV.*	1.32%	0.93%	1.04%
75°F	Test Oil #2	2	Mean	20.3009	26.9449	22.8346
			Std. Dev.	.0282	.1925	.0818
			CV.*	.14%	.71%	.036%
% Difference (Test Oil #1 Base)				(+)0.74%	(+)2.48%	(+)1.40%
90° F	Test Oil #1	3	Mean	20.9535	27.8075	23.5671
			Std. Dev.	.0348	.2498	.0592
			CV.*	.17%	.90%	.25%
90° F	Test Oil #2	2	Mean	20.9380	27.0548	23.3087
			Std. Dev.	.1543	.6407	.3192
			CV.*	.74%	2.37%	1.37%
% Difference (Test Oil #1 Base)				(+)0.07%	(+)2.71%	(+)1.10%

* Coefficient of variation = (std. dev)/mean.

Considering the limited number of tests, the second method of data analysis is considered to be more accurate.

Analysis of Results

Both methods of data analysis indicate no significant difference in Fuel Economy between the two motor oils during the urban FTP cycle. Considering the testing variability, no improvement is indicated. The low viscosity, multigrade oil did show a consistent improvement during the highway testing (HFET). Depending on the temperature and method of analysis between a 1.65% to 2.71% improvement in fuel economy was noted. The combined fuel economy numbers which are a weighted (55/45) average of the FTP and HFET tests showed lower improvements.

The improvements noted in fuel economy on the HFET cycle must be taken in the proper perspective. This testing program is not comprehensive enough to extrapolate the data to other temperatures, oils, or motor vehicles. Some of the unanswered questions surrounding the data are:

1. Does Test Oil #1 have effects on engine components which are not removed by "double flushing" with the next test oil? If Test Oil #1 does have carryover characteristics, the Test Oil #2 oil tests would be artificially high.

2. How many miles are required before the full benefit of Test Oil #1 is realized? It is possible that additional improvements in fuel economy would have been noticed with increased mileage accumulation. The same question exists for the Test Oil #2.

3. How representative of other vehicles was the test vehicle? The impact of viscosity changes on different vehicles depends on part surfaces, bearing tolerances, oil pressure, sliding clearances, oil temperatures, and other design criteria. The data generated in one car cannot correctly be extrapolated to other vehicles.

The HFET data shows increased improvement with higher ambient temperature. This indicates that the multigrade 5W-20 rating versus the straight 30 Weight has a noticeable fuel ecomony effect. The cold start viscosity of the multigrade oil of 5W seems to have little effect in fuel economy. This leads to the conclusion that the Volvo fuel economy during the cold start is not affected by the viscosity of the oil. When the engine is warmed and running at a relatively constant RPM the viscosity of the oil appears to affect fuel economy (ie. the HFET data.)

Conclusions:

The low viscosity multigrade oil showed no significant improvement in fuel economy for the urban cycle at 40°F, 75°F, or 90°F, over the straight 30 weight oil. The low viscosity multigrade oil showed a 2.13% improvement at 40°F, 2.48% improvement at 75°F, and 2.71% improvement at 90°F. over the straight 30 weight oil on the highway cycle. The data is

not comprehensive enough to extrapolate to other vehicles, oils, or temperature.

List of Attachments

Attachment A	Vehicle Description
Attachment B	Test Data

TEST VEHICLE DESCRIPTION

Chassis model year/make - 1978

Engine

type	Volvo B21F in-line 4 cy.
bore x stroke	3.62" x 3.15"
displacement	2.31 liters
compression ratio	8.5:1
maximum power @ rpm	99 HP @ 5200 RPM
fuel metering	Fuel injection
fuel requirement	Unleaded, 91 octane

Drive Train

transmission type	Automatic 3-speed
final drive ratio	3.91:1

Chassis

type	Rear wheel drive, steering left
tire size	175 SR 14
curb weight	3000 lbs.
inertia weight	2250 (as tested)*
passenger capacity	5 passenger

Emission Control System

basic type	Lambda Sond 3-way catalyst (Removed)

*Due to the special use of this vehicle as a laboratory correlation check car, the catalytic converter was removed to obtain more stable emissions. This caused excessively high engine-out emissions and the test inertia weight was lowered to reduce these.

ENVIRONMENTAL PROTECTION AGENCY
MOTOR VEHICLE EMISSIONS LABORATORY
ANN ARBOR, MICHIGAN

CONTROLLED ENVIRONMENTAL TEST CELL

FUEL EFFICIENT OILS PROJECT

PROCESSED: JUN 5, 1980

TEST TYPE: FTP

AVERAGE TEST RESULTS

VEHICLE: VOLVO 242 DL242 VIN: YV24245L1141809 INERTIA WT: 2250 ACTUAL HP: 8.2

OIL TYPE	TEST TEMPERATURE	N	STATISTICS	HC	CO	NOX	CO2	FE (MPG)	BAROMETER (IN-HG)	HUMIDITY (GRAINS/LB)	NOX FAC
				<-----(GRAMS/MILE)----->							
	40.0	3	MEAN	1.458	20.582	3.435	426.776	19.033	29.073	16.789	*NONE*
MOBIL 1 (SYNTHETIC)			STD. DEVIATION	0.042	0.902	0.142	5.759	0.305	0.216	4.021	0.002
			95% MAX ERROR	0.078	1.657	0.261	10.580	0.560	0.397	7.387	0.004
	40.0	3	MEAN	1.475	19.729	3.711	429.463	18.999	28.916	24.269	*NONE*
QUAKER STATE30W			STD. DEVIATION	0.034	0.696	0.086	8.103	0.360	0.320	2.757	0.002
			95% MAX ERROR	0.062	1.279	0.158	14.887	0.661	0.589	5.065	0.004
	40.0 DEGREE PERCENT CHANGE			1.136	-4.146	8.023	0.629	-0.175			
	75.0	3	MEAN	1.533	17.424	2.581	397.846	20.466	28.789	58.807	0.930
MOBIL 1 (SYNTHETIC)			STD. DEVIATION	0.064	0.054	0.249	5.700	0.251	0.218	14.259	0.058
			95% MAX ERROR	0.118	0.100	0.758	10.473	0.461	0.400	26.196	0.107
	75.0	2	MEAN	1.417	16.433	2.735	404.854	20.299	29.089	68.913	0.974
QUAKER STATE30W			STD. DEVIATION	0.004	0.781	0.370	1.610	-0.000	0.068	19.682	0.086
			95% MAX ERROR	0.014	2.377	1.127	4.900	-0.000	0.209	59.886	0.264
	75.0 DEGREE PERCENT CHANGE			-7.516	-5.690	5.970	1.762	-0.814			
	90.0	3	MEAN	1.367	15.634	2.774	391.129	20.933	29.096	79.729	1.021
MOBIL 1 (SYNTHETIC)			STD. DEVIATION	0.026	0.290	0.071	0.707	0.056	0.239	0.666	0.002
			95% MAX ERROR	0.049	0.533	0.218	1.299	0.103	0.439	1.224	0.004
	90.0	2	MEAN	1.178	14.596	2.854	395.224	20.899	29.584	81.298	1.028
QUAKER STATE30W			STD. DEVIATION	0.148	0.011	0.023	2.549	0.140	0.572	2.550	0.012
			95% MAX ERROR	0.452	0.033	0.071	7.757	0.427	1.742	7.759	0.036
	90.0 DEGREE PERCENT CHANGE			-13.786	-6.642	2.892	1.047	-0.159			

MOST OF THE TIME. THE ESTIMATED MEAN WILL NOT BE EXACTLY EQUAL TO THE TRUE MEAN DUE TO THE SMALL SAMPLE AND VARIATION BETWEEN TESTS. BASED ON THE "T STATISTIC", THE ERROR IN THE ESTIMATE OF THE TRUE MEAN IS LESS THAN THE MAX. 95% ERROR.
ERROR = STD. DEV. * "T"/SQRT(SAMPLE SIZE).
EXAMPLE: LET MAX. 95% ERROR = X. THE 95% CONFIDENCE INTERVAL ABOUT THE TRUE MEAN "MU" = (MEAN - X < MU < MEAN + X).
NOTE: COMMENTS PERTAINING TO THE TESTS APPEAR IN THE LAST TABLE OF THIS APPENDIX.

ENVIRONMENTAL PROTECTION AGENCY
MOTOR VEHICLE EMISSIONS LABORATORY
ANN ARBOR, MICHIGAN

CONTROLLED ENVIRONMENTAL TEST CELL

FUEL EFFICIENT OILS PROJECT

PROCESSED: JUN 5, 1980

TEST TYPE: HFET

AVERAGE TEST RESULTS

VEHICLE: VOLVO 242 DL242 VIN: VC24245L1141809 INERTIA WT: 2250 ACTUAL HP: 8.8

OIL TYPE	TEST TEMPERATURE	N	STATISTICS	HC	CO	NOX	CO2	FE	BAROMETER	HUMIDITY	NOX FAC
				<----------(GRAMS/MILE)---------->				(MPG)	(IN-HG)	(GRAINS/LB)	
	40.0	3	MEAN	0.917	10.049	3.978	309.233	26.766	29.059	14.535	*NONE*
MOBIL 1 (SYNTHETIC)			STD. DEVIATION	0.029	0.195	0.117	2.791	0.207	0.210	0.972	0.002
			95% MAX ERROR	0.054	0.359	0.215	5.128	0.380	0.386	1.785	0.004
	40.0	2	MEAN	0.934	10.059	4.501	316.054	26.399	28.979	23.143	*NONE*
QUAKER STATE30W			STD. DEVIATION	0.044	0.022	0.010	5.388	0.424	0.438	2.851	0.003
			95% MAX ERROR	0.134	0.067	0.031	16.394	1.290	1.333	8.674	0.009
	40.0 DEGREE		PERCENT CHANGE	1.829	0.095	13.135	2.206	-1.370			
	75.0	3	MEAN	0.914	9.830	3.519	300.519	27.633	28.819	71.716	0.993
MOBIL 1 (SYNTHETIC)			STD. DEVIATION	0.009	0.098	0.157	3.363	0.251	0.226	27.307	0.122
			95% MAX ERROR	0.017	0.180	0.480	6.179	0.461	0.416	50.166	0.224
	75.0	2	MEAN	0.924	9.767	3.574	309.645	26.949	29.074	65.724	0.958
QUAKER STATE30W			STD. DEVIATION	0.006	0.109	0.337	1.984	0.211	0.078	12.161	0.052
			95% MAX ERROR	0.021	0.332	1.028	6.037	0.643	0.237	37.004	0.158
	75.0 DEGREE		PERCENT CHANGE	1.006	-0.637	1.566	3.036	-2.473			
	90.0	3	MEAN	0.878	9.491	3.589	298.403	27.833	29.079	78.828	1.016
MOBIL 1 (SYNTHETIC)			STD. DEVIATION	0.014	0.284	0.265	1.203	0.251	0.228	1.872	0.008
			95% MAX ERROR	0.026	0.522	0.806	2.210	0.461	0.419	3.440	0.015
	90.0	2	MEAN	0.898	9.319	3.417	308.945	27.049	29.559	66.176	0.961
QUAKER STATE30W			STD. DEVIATION	0.014	0.079	0.410	7.895	0.636	0.551	15.891	0.068
			95% MAX ERROR	0.043	0.242	1.250	24.024	1.936	1.677	48.354	0.208
	90.0 DEGREE		PERCENT CHANGE	2.233	-1.814	-4.795	3.533	-2.814			

MOST OF THE TIME, THE ESTIMATED MEAN WILL NOT BE EXACTLY EQUAL TO THE TRUE MEAN DUE TO THE SMALL SAMPLE AND VARIATION BETWEEN TESTS. BASED ON THE "T STATISTIC", THE ERROR IN THE ESTIMATE OF THE TRUE MEAN IS LESS THAN THE MAX. 95% ERROR.
ERROR = STD. DEV. * "T"/SQRT(SAMPLE SIZE).
EXAMPLE: LET MAX. 95% ERROR = X. THE 95% CONFIDENCE INTERVAL ABOUT THE TRUE MEAN "MU" = (MEAN - X < MU < MEAN + X).
NOTE: COMMENTS PERTAINING TO THE TESTS APPEAR IN THE LAST TABLE OF THIS APPENDIX.

ENVIRONMENTAL TEST CELL DATA PROCESSED: JUN 5, 1980

BASELINE: MOBIL 1 (SYNTHETIC) TYPE: FTP

[illegible] [illegible].0 VEHICLE: [illegible] INERTIA WT: 2250 ACTUAL HP: 8.8 SITE: 0220

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	FE	DYNO	ODOMETER	IHP	BARO	TEMP	HUM	NOX FAC	DRIVER
3/12/80	801933	[illegible]	[illegible]	[illegible]	[illegible]	18.7	0220	7370.0	8.8	29.25	40.0	15.72	*NONE*	34786
3/13/80	801974	[illegible]	21.272	3.455	421.22[illegible]	19.3	0220	7410.0	8.8	28.83	40.0	13.41	*NONE*	34786
3/25/80	801945	1.412	19.551	3.281	425.39[illegible]	19.1	0220	7875.0	8.8	29.14	40.0	21.24	*NONE*	34786
MEAN		1.454	20.552	3.435	425.775	19.03				29.07		16.79	1.000	
STD. DEVIATION		0.042	0.902	0.142	5.759	0.30				0.22		4.02	0.002	
MAX. [illegible] ERROR		0.078	1.657	0.261	10.580	0.56				0.40		7.39	0.004	
		|<---------(GRAMS/MILE)			---------->|	(MPG)				(IN-HG)		(GR/LB)		

BAG DATA

DATE	TEST NUMBER	TYPE	HC 1	HC 2	HC 3	CO 1	CO 2	CO 3	NOX 1	NOX 2	NOX 3	CO2 1	CO2 2	CO2 3	FEC 1	FEC 2	FEC 3
3/12/80	801933	FTP	2.05	1.39	1.28	32.56	19.15	15.47	5.16	2.43	4.49	462.6	438.8	398.6	16.9	18.6	20.6
3/13/80	801974	FTP	2.19	1.28	1.28	33.82	19.37	15.42	5.00	2.39	4.36	456.2	424.4	388.9	17.1	19.3	21.2
3/25/80	801945	FTP	2.23	1.15	1.29	31.63	17.23	14.68	4.75	2.12	4.36	451.1	435.7	390.2	17.3	18.9	21.1
			|<---------------				(GRAMS/MILE)							--------------->|	(MILES/GALLON)		

ENVIRONMENTAL TEST CELL DATA PROCESSED: JUN 5, 1980

CONTRAST: QUAKER STATE30W TYPE: FTP

TEMPERATURE GROUP: 40.0 VEHICLE: VC24245L1141809 INERTIA WT: 2250 ACTUAL HP: 8.8 SITE: D220

DATE	TEST NUMBER	HC	CO	NOX	CO2	FE	DYNO	ODOMETER	IHP	BARO	TEMP	HUM	NOX FAC	DRIVER
3/26/80	801946	1.443	19.656	3.661	437.480	18.7	D220	7923.0	8.8	29.28	40.0	21.13	*NONE*	34786
4/ 9/80	802468	1.511	20.459	3.811	429.640	18.9	D220	8264.0	8.8	28.67	40.0	26.32	*NONE*	35614
4/10/80	801953	1.470	19.072	3.661	421.270	19.4	D220	8290.0	8.8	28.80	40.0	25.36	*NONE*	35614
MEAN		1.475	19.729	3.711	429.463	19.00				28.92		24.27	1.000	
STD. DEVIATION		0.034	0.696	0.086	8.103	0.36				0.32		2.76	0.002	
MAX. 95% ERROR		0.062	1.279	0.158	14.887	0.66				0.59		5.07	0.004	
		<--------(GRAMS/MILE)--------->				(MPG)				(IN-HG)		(GR/LB)		

BAG DATA

DATE	TEST NUMBER	TYPE	HC			CO			NOX			CO2			FEC		
			1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
3/26/80	801946	FTP	2.31	1.18	1.29	29.76	18.20	14.80	5.63	2.35	4.67	479.9	438.9	402.9	16.5	18.7	20.5
4/ 9/80	802468	FTP	2.25	1.31	1.33	30.89	18.70	15.92	5.63	2.64	4.66	468.9	435.7	388.5	16.8	18.8	21.2
4/10/80	801953	FTP	2.35	1.20	1.33	29.19	16.97	15.46	5.63	2.36	4.66	458.2	424.8	386.7	17.3	19.4	21.3
			<----------(GRAMS/MILE)---------->												(MILES/GALLON)		

ENVIRONMENTAL TEST CELL DATA PROCESSED: JUN 5, 1980

BASELINE: MOBIL 1 (SYNTHETIC) TYPE: FTP

TEMPERATURE GROUP: 75.0 VEHICLE: VC2424ZL1141809 INERTIA WT: 2250 ACTUAL HP: 8.8 SITE: D220

DATE	TEST NUMBER	HC	CO	NOX	CO2	FE	DYNO	ODOMETER	IHP	BARO	TEMP	HUM	NOX FAC	DRIVER
3/14/80	801939	1.487	17.404	2.758	397.860	20.5	D220	7480.0	8.8	29.04	76.0	74.27	1.00	34786
3/17/80	801940	1.607	17.383	2.405	392.140	20.7	D220	7546.0	8.8	28.64	75.0	55.97	0.92	34786
3/21/80	801944	1.505	17.488	0.0	403.540	20.2	D220	7798.0	8.8	28.69	75.0	46.18	0.88	34786
MEAN		1.533	17.424	2.581	397.846	20.47				28.79		58.81	0.930	
STD. DEVIATION		0.064	0.054	0.249	5.700	0.25				0.22		14.26	0.058	
MAX. 95% ERROR		0.118	0.100	0.758	10.473	0.46				0.40		26.20	0.107	
		<--------(GRAMS/MILE)--------->				(MPG)				(IN-HG)		(GR/LB)		

BAG DATA

DATE	TEST NUMBER	TYPE	HC			CO			NOX			CO2			FEC		
			1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
3/14/80	801939	FTP	1.90	1.38	1.37	24.22	16.34	14.29	3.84	1.88	3.62	406.5	407.9	372.2	19.6	20.1	22.0
3/17/80	801940	FTP	2.07	1.52	1.41	25.16	15.94	14.26	3.26	1.63	3.23	407.9	397.7	369.6	19.4	20.6	22.2
3/21/80	801944	FTP	1.93	1.41	1.37	24.37	16.63	13.95	0.0	0.0	0.0	407.3	419.6	370.0	19.5	19.5	22.2
			<----------(GRAMS/MILE)---------->												(MILES/GALLON)		

ENVIRONMENTAL TEST CELL DATA PROCESSED: JUN 5, 1980

CONTRAST: QUAKER STATE30W TYPE: FTP

TEMPERATURE GROUP: 75.0 VEHICLE: VC2424SL1141809 INERTIA WT: 2250 ACTUAL HP: 8.8 SITE: D220

DATE	TEST NUMBER	HC	CO	NOX	CO2	FE	DYNO	ODOMETER	IHP	BARO	TEMP	HUM	NOX FAC	DRIVER
3/29/80	801949	1.413	16.986	2.948	403.710	20.3	D220	804.6	8.8	29.04	76.0	82.83	1.04	34789
3/28/80	801948	1.422	15.881	2.474	406.000	20.3	D220	8011.0	8.8	29.14	75.0	55.00	0.91	29420
MEAN		1.417	16.433	2.735	404.854	20.30				29.09		68.91	0.974	
STD. DEVIATION		0.004	0.781	0.370	1.610	-.00				0.07		19.68	0.086	
MAX. 95% ERROR		0.014	2.377	1.127	4.900	-.00				0.21		59.89	0.264	
		(GRAMS/MILE)				(MPG)				(IN-HG)		(GR/LB)		

BAG DATA

DATE	TEST NUMBER	TYPE	HC			CO			NOX			CO2			FEC		
			1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
3/29/80	801949	FTP	1.94	1.27	1.28	25.31	15.39	13.73	4.35	1.97	3.92	421.7	410.6	377.1	18.9	20.1	21.9
3/28/80	801948	FTP	1.82	1.30	1.35	22.70	14.54	13.29	3.80	1.54	3.25	427.9	411.0	379.9	18.8	20.2	21.8
			(GRAMS/MILE)												(MILES/GALLON)		

ENVIRONMENTAL TEST CELL DATA PROCESSED: JUN 5, 1980

BASELINE: MOBIL 1 (SYNTHETIC) TYPE: FTP

[illegible] VEHICLE: [illegible] INERTIA WT: 2250 ACTUAL HP: 8.8 SITE: D220

DATE	TEST NUMBER	HC	CO	NOX	CO2	FE	DYNO	ODOMETER	IHP	BARO	TEMP	HUM	NOX FAC	DRIVER
[illegible]	[illegible]	1.337	15.6[illegible]	2.723	[illegible]	21.0	0220	760[illegible].0	8.8	29.29	90.0	79.19	1.02	34786
[illegible]	[illegible]	1.33[illegible]	15.323	2.825	391.[illegible]10	20.9	0220	7670.0	8.8	29.17	90.0	79.52	1.02	34786
[illegible]	[illegible]	1.3[illegible]	15.8[illegible]	0.0	391.140	20.9	0220	7724.0	8.8	28.83	90.0	80.48	1.02	34786
MEAN		1.367	15.634	2.774	391.129	20.93				29.10		79.73	1.021	
STD. DEVIATION		0.025	0.290	0.071	0.707	0.06				0.24		0.67	0.002	
MAX. 95% ERROR		0.049	0.533	0.214	1.299	0.10				0.44		1.22	0.004	
		|<---------(GRAMS/MILE)			--------->|	(MPG)				(IN-HG)		(GR/LB)		

BAG DATA

DATE	TEST NUMBER	TYPE	HC 1	HC 2	HC 3	CO 1	CO 2	CO 3	NOX 1	NOX 2	NOX 3	CO2 1	CO2 2	CO2 3	FEC 1	FEC 2	FEC 3
3/18/80	801941	FTP	1.54	1.28	1.28	20.16	15.34	12.96	4.02	1.72	3.65	394.7	403.2	363.1	20.4	20.4	22.7
3/19/80	801956	FTP	1.60	1.36	1.27	20.52	14.48	13.01	4.10	1.89	3.65	399.6	402.2	366.2	20.1	20.5	22.5
3/20/80	801943	FTP	1.66	1.29	1.32	20.96	15.36	13.10	0.0	0.0	0.0	395.3	403.3	364.8	20.3	20.4	22.6
			|<------------------				(GRAMS/MILE)							------------------>|	(MILES/GALLON)		

ENVIRONMENTAL TEST CELL DATA PROCESSED: JUN 5, 1980

CONTRAST: QUAKER STATE30W TYPE: FTP

TEMPERATURE GROUP: 90.0 VEHICLE: VC24245L1141809 INERTIA WT: 2250 ACTUAL HP: 8.8 SITE: D220

DATE	TEST NUMBER	HC	CO	NOX	CO2	FE	DYNO	ODOMETER	IHP	BARO	TEMP	HUM	NOX FAC	DRIVER
4/ 2/80	801958	1.284	14.613	2.871	397.040	20.8	D220	8117.0	8.8	29.18	90.0	79.49	1.02	35614
4/ 3/80	801952	1.074	14.580	2.837	393.410	21.0	D220	8149.0	8.8	29.99	90.0	83.10	1.04	35614
MEAN		1.178	14.596	2.854	395.224	20.90				29.58		81.30	1.028	
STD. DEVIATION		0.148	0.011	0.023	2.549	0.14				0.57		2.55	0.012	
MAX. 95% ERROR		0.452	0.033	0.071	7.757	0.43				1.74		7.76	0.036	
		(GRAMS/MILE)				(MPG)				(IN-HG)		(GR/LB)		

HAG DATA

DATE	TEST NUMBER	TYPE	HC			CO			NOX			CO2			FEC		
			1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
4/ 2/80	801958	FTP	1.57	1.21	1.21	20.27	13.55	12.35	4.25	1.85	3.76	401.3	410.3	368.8	20.2	20.3	22.5
4/ 3/80	801952	FTP	1.55	1.18	0.51	19.80	13.67	12.34	4.06	1.75	3.97	399.6	405.1	366.7	20.3	20.5	22.8
			(GRAMS/MILE)												(MILES/GALLON)		

ENVIRONMENTAL TEST CELL DATA PROCESSED: JUN 5, 1980

.INE: MOBIL 1 (SYNTHETIC) TYPE: HFET

MPERATURE GROUP: 40.0 VEHICLE: VC2424SL1141909 INERTIA WT: 2250 ACTUAL HP: 8.8 SITE: D220

TE	TEST NUMBER	HC	CO	NOX	CO2	FE	DYNO	ODOMETER	IHP	BARO	TEMP	HUM	NOX FAC	DRIVER
2/80	801932	0.897	10.126	3.933	306.930	26.7	D220	7379.0	8.8	29.21	40.0	15.08	*NONE*	34786
3/80	801973	0.903	10.196	4.112	308.420	27.0	D220	7421.0	8.8	28.82	40.0	13.41	*NONE*	34786
5/80	801954	0.952	9.828	3.891	312.350	26.6	D220	7893.0	8.8	29.15	40.0	15.11	*NONE*	34786
MEAN		0.917	10.049	3.978	309.233	26.77				29.06		14.53	1.000	
STD. DEVIATION		0.029	0.195	0.117	2.791	0.21				0.21		0.97	0.002	
MAX. 95% ERROR		0.054	0.359	0.215	5.128	0.38				0.39		1.79	0.004	
			<--------(GRAMS/MILE)---------->			(MPG)				(IN-HG)		(GR/LB)		

BAG DATA

TE	TEST NUMBER	TYPE	HC			CO			NOX			CO2			FEC		
			1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
2/80	801932	HFET	0.90	0.0	0.0	10.13	0.0	0.0	3.93	0.0	0.0	306.9	0.0	0.0	26.7	0.0	0.0
3/80	801973	HFET	0.90	0.0	0.0	10.20	0.0	0.0	4.11	0.0	0.0	308.4	0.0	0.0	27.0	0.0	0.0
5/80	801954	HFET	0.95	0.0	0.0	9.83	0.0	0.0	3.89	0.0	0.0	312.4	0.0	0.0	26.6	0.0	0.0
			|<----------(GRAMS/MILE)----------|											(MILES/GALLON)		

ENVIRONMENTAL TEST CELL DATA

PROCESSED: JUN [illegible] 1980

CONTRAST: QUAKER STATE30W TYPE: HFET

TEMPERATURE GROUP: 40.0 VEHICLE: VC24245L1141809 INERTIA WT: 2250 ACTUAL HP: 8.8 SITE: D22[illegible]

DATE	TEST NUMBER	HC	CO	NOX	CO2	FE	DYNO	ODOMETER	IHP	BARO	TEMP	HUM	NOX FAC	DRIVER
3/26/80	801957	0.903	10.042	4.501	319.870	26.1	D220	7945.0	8.8	29.29	40.0	21.13	*NONE*	34786
4/ 9/80	802469	0.965	10.077	4.501	312.240	26.7	D220	8269.0	8.8	28.67	40.0	25.16	*NONE*	35614
MEAN		0.934	10.059	4.501	316.054	26.40				28.98		23.14	1.000	
STD. DEVIATION		0.044	0.022	0.010	5.388	0.42				0.44		2.85	0.003	
MAX. 95% ERROR		0.134	0.067	0.031	16.394	1.29				1.33		8.67	0.009	
		<--------(GRAMS/MILE)--------->				(MPG)				(IN-HG)		(GR/LB)		

BAG DATA

DATE	TEST NUMBER	TYPE	HC			CO			NOX			CO2			FEC		
			1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
3/26/80	801957	HFET	0.90	0.0	0.0	10.04	0.0	0.0	4.50	0.0	0.0	319.9	0.0	0.0	26.1	0.0	0.0
4/ 9/80	802469	HFET	0.97	0.0	0.0	10.08	0.0	0.0	4.50	0.0	0.0	312.2	0.0	0.0	26.7	0.0	0.0
			<----------(GRAMS/MILE)---------->												(MILES/GALLON)		

ENVIRONMENTAL TEST CELL DATA PROCESSED: JUN 5, 1980

BASELINE: MOBIL 1 (SYNTHETIC) TYPE: HFET

TEMPERATURE GROUP: 75.0 VEHICLE: VC24245L1141809 INERTIA WT: 2250 ACTUAL HP: 8.8 SITE: D220

DATE	TEST NUMBER	HC	CO	NOX	CO2	FE	DYNO	ODOMETER	IHP	BARO	TEMP	HUM	NOX FAC	DRIVER
3/14/80	801955	0.922	9.801	3.408	303.910	27.4	D220	7520.0	8.8	29.08	75.5	75.54	1.00	34786
3/17/80	801968	0.919	9.940	3.631	297.170	27.9	D220	7557.0	8.8	28.66	75.0	96.91	1.11	34786
3/21/80	801966	0.904	9.751	0.0	300.480	27.6	D220	7802.0	8.8	28.72	75.0	42.70	0.87	34786
MEAN		0.914	9.830	3.519	300.519	27.63				28.82		71.72	0.993	
STD. DEVIATION		0.009	0.098	0.157	3.363	0.25				0.23		27.31	0.122	
MAX. 95% ERROR		0.017	0.180	0.480	6.179	0.46				0.42		50.17	0.224	
		I<--------(GRAMS/MILE)---------->I				(MPG)				(IN-HG)		(GR/LB)		

BAG DATA

DATE	TEST NUMBER	TYPE	HC			CO			NOX			CO2			FEC		
			1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
3/14/80	801955	HFET	0.92	0.0	0.0	9.80	0.0	0.0	3.41	0.0	0.0	303.9	0.0	0.0	27.4	0.0	0.0
3/17/80	801968	HFET	0.92	0.0	0.0	9.94	0.0	0.0	3.63	0.0	0.0	297.2	0.0	0.0	27.9	0.0	0.0
3/21/80	801966	HFET	0.90	0.0	0.0	9.75	0.0	0.0	0.0	0.0	0.0	300.5	0.0	0.0	27.6	0.0	0.0
			I<----------(GRAMS/MILE)---------->												I (MILES/GALLON)		

ENVIRONMENTAL TEST CELL DATA PROCESSED: JUN 5, 1980

CONTRAST: QUAKER STATE30W TYPE: HFET

TEMPERATURE GROUP: 75.0 VEHICLE: VC2424SL1141809 INERTIA WT: 2250 ACTUAL HP: 8.8 SITE: D220

DATE	TEST NUMBER	HC	CO	NOX	CO2	FE	DYNO	ODOMETER	IHP	BARO	TEMP	HUM	NOX FAC	DRIVER
3/28/80	801960	0.929	9.845	3.336	311.060	26.8	D220	8026.0	8.8	29.13	75.0	57.12	0.92	29420
3/29/80	801962	0.919	9.691	3.814	308.230	27.1	D220	8064.0	8.8	29.02	75.0	74.32	1.00	34786
MEAN		0.924	9.767	3.574	309.645	26.95				29.07		65.72	0.958	
STD. DEVIATION		0.006	0.109	0.337	1.984	0.21				0.08		12.16	0.052	
MAX. 95% ERROR		0.021	0.332	1.028	6.037	0.64				0.24		37.00	0.158	
		(GRAMS/MILE)				(MPG)				(IN-HG)		(GR/LB)		

BAG DATA

DATE	TEST NUMBER	TYPE	HC			CO			NOX			CO2			FEC		
			1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
3/28/80	801960	HFET	0.93	0.0	0.0	9.85	0.0	0.0	3.34	0.0	0.0	311.1	0.0	0.0	26.8	0.0	0.0
3/29/80	801962	HFET	0.92	0.0	0.0	9.69	0.0	0.0	3.81	0.0	0.0	308.2	0.0	0.0	27.1	0.0	0.0
			(GRAMS/MILE)												(MILES/GALLON)		

ENVIRONMENTAL TEST CELL DATA

PROCESSED: JUN [illegible]

SELINE: MOBIL 1 (SYNTHETIC) TYPE: HFET

TEMPERATURE GROUP: 90.0 VEHICLE: VC24245L1141809 INERTIA WT: 2250 ACTUAL HP: 8.8 SITE: [illegible]

DATE	TEST NUMBER	HC	CO	NOX	CO2	FE	DYNO	ODOMETER	IHP	BARO	IEMP	HUM	NOX FAC	DRIVE?
/20/80	801959	0.886	9.668	0.0	299.290	27.8	D220	0.0	8.8	28.83	90.0	80.48	1.02	34786
/18/80	801967	0.889	9.643	3.777	298.900	27.6	D220	7660.0	8.8	29.28	90.0	79.22	1.02	34786
/19/80	801942	0.862	9.164	3.402	297.020	28.1	D220	7696.0	8.8	29.13	90.0	76.79	1.01	34786
MEAN		0.878	9.491	3.589	298.403	27.83				29.08		78.83	1.016	
STD. DEVIATION		0.014	0.284	0.265	1.203	0.25				0.23		1.87	0.008	
MAX. 95% ERROR		0.026	0.522	0.806	2.210	0.46				0.42		3.44	0.015	
		<--------(GRAMS/MILE)--------->				(MPG)				(IN-HG)		(GR/LB)		

BAG DATA

DATE	TEST NUMBER	TYPE	HC			CO			NOX			CO2			FEC		
			1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
/20/80	801959	HFET	0.89	0.0	0.0	9.67	0.0	0.0	0.0	0.0	0.0	299.3	0.0	0.0	27.8	0.0	0.0
/18/80	801967	HFET	0.89	0.0	0.0	9.64	0.0	0.0	3.78	0.0	0.0	298.9	0.0	0.0	27.6	0.0	0.0
/19/80	801942	HFET	0.86	0.0	0.0	9.16	0.0	0.0	3.40	0.0	0.0	297.0	0.0	0.0	28.1	0.0	0.0
			<----------(GRAMS/MILE)---------->												(MILES/GALLON)		

ENVIRONMENTAL TEST CELL DATA PROCESSED: JUN 5, 1980

ONTRAST: QUAKER STATE30W TYPE: HFET

TEMPERATURE GROUP: 90.0 VEHICLE: VC24245L1141809 INERTIA WT: 2250 ACTUAL HP: 8.8 SITE: D220

DATE	TEST NUMBER	HC	CO	NOX	CO2	FE	DYNO	ODOMETER	IHP	BARO	TEMP	HUM	NOX FAC	DRIVER
4/ 2/80	801950	0.888	9.377	3.127	314.530	26.6	D220	8138.0	8.8	29.17	90.0	54.94	0.91	35614
4/ 3/80	801964	0.909	9.262	3.708	303.360	27.5	D220	9170.0	8.8	29.95	90.0	77.41	1.01	35614
MEAN		0.898	9.319	3.417	308.945	27.05				29.56		66.18	0.961	
STD. DEVIATION		0.014	0.079	0.410	7.895	0.64				0.55		15.89	0.068	
MAX. 95% ERROR		0.043	0.242	1.250	24.024	1.94				1.68		48.35	0.208	
		<-------(GRAMS/MILE)--------->				(MPG)				(IN-HG)		(GR/LB)		

BAG DATA

DATE	TEST NUMBER	TYPE	HC			CO			NOX			CO2			FEC		
			1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
4/ 2/80	801950	HFET	0.89	0.0	0.0	9.38	0.0	0.0	3.13	0.0	0.0	314.5	0.0	0.0	26.6	0.0	0.0
4/ 3/80	801964	HFET	0.91	0.0	0.0	9.26	0.0	0.0	3.71	0.0	0.0	303.4	0.0	0.0	27.5	0.0	0.0
			<----------(GRAMS/MILE)---------->												(MILES/GALLON)		

ENVIRONMENTAL PROTECTION AGENCY
MOTOR VEHICLE EMISSIONS LABORATORY
ANN ARBOR, MICHIGAN

CONTROLLED ENVIRONMENTAL TEST CELL

PROCESSED: JUN 5, 1980

FUEL EFFICIENT OILS PROJECT

AVERAGE TEST RESULTS

TEST NUMBER	OIL TYPE	TEMPERATURE	COMMENTS	VEHICLE: VOLVO 242 DL242 TYPE: FTP
801933	MOBIL 1 (SYNTHETIC)	40.0	VOLVO TCV COLD RM TEST 40 DEG. F NOX ON BAG 2 DID NOT RETURN TO SPAN POINT SUMMARY CODE 41 - MOBIL OIL 5W 20	
801974	MOBIL 1 (SYNTHETIC)	40.0	VOLVO 40 DEG. F COLD ROOM FUEL EFFICIENT OILS TESTING MOBILE 1 REFERENCE OIL SUMMARY CODE 41 - MOBIL OIL 5W 20	
801945	MOBIL 1 (SYNTHETIC)	40.0	EPA-542 WHT VOLVO T.C.V ROOM @ 40 DEG. F MOBIL #1 NOX INSTRUMENT DOWN FOR REPAIR: VALVES QUESTIONABLE SPAN CHECK BG #2 HC DID NOT RETURN. SUMMARY CODE 41 - MOBIL OIL 5W 20	
801946	QUAKER STATE30W	40.0	VOLVO TCV EPA-542 COLD RM @ 40 DEGREES F STD 30 W QUAKER STATE OIL TEMP @ START FTP/ 43.2 DEGREES F SUMMARY CODE 42 - QUAKER STATE 30W	
802468	QUAKER STATE30W	40.0	VOLVO EPA 542 COLD ROOM @ 40 DEG. F W/QUAKER STATE 30W NOX SPAN CHECK DID NOT RET ON BAG ONE, & BAG TWO	
801953	QUAKER STATE30W	40.0	VOLVO COLD ROOM QUAKER STATE 30W @ 40 DEGREES F FTP	
801939	MOBIL 1 (SYNTHETIC)	76.0	VOLVO 75 DEG. FTP COLD ROOM FUEL ECONOMY OILS TEST REFERENCE OIL MOBILE 1 SUMMARY CODE 41 - MOBIL OIL 5W 20	
801940	MOBIL 1 (SYNTHETIC)	75.0	VOLVO TCU VEH. COLD RM @ 75 DEG. F MOBIL #1 REFERENCE OIL TEST STARTED 5 DEGREES BELOW COLD RM SET POINT (75 DEG. F) SUMMARY CODE 415-1MOBILE OIL 5W 20	
801944	MOBIL 1 (SYNTHETIC)	75.0	VOLVO TCV COLD RM @ 75 DEG. FTP MOBIL 1 NOX INSTRUMENT DOWN FOR REPAIR SUMMARY CODE 41 - MOBIL OIL 5W 20	
801949	QUAKER STATE30W	76.0	VOLVO T.C.U. EPA-542 ROOM @ 75 DEG. F QUAKER STATE 30W SUMMARY CODE 42 - QUAKER STATE 30W	
801948	QUAKER STATE30W	75.0	VOLVO TCV EPA-542: ROOM @ 75 DEG. F W/30W QUAKER STATE OIL NOX OF BAG TWO DID NOT RET. TO SPAN CHECK VALVE SUMMARY CODE 42 - QUAKER STATE 30W	
801941	MOBIL 1 (SYNTHETIC)	90.0	VOLVO FDTP AT 90 DEG. F FUEL ECON. REFERENCE OILS DEFLECTOR WAS IN PLACE ALL THRU BAG 3 BAG 1 NOX DID NOT RETURN TO ORIGINAL SPAN PT. DURING CHECK SUMM. CODE 41 MOBIL	

ENVIRONMENTAL PROTECTION AGENCY
MOTOR VEHICLE EMISSIONS LABORATORY
ANN ARBOR, MICHIGAN

CONTROLLED ENVIRONMENTAL TEST CELL
AND
CERTIFICATION
AVERAGE TEST RESULTS

PROCESSED: JUN 5, 1980

TEST NUMBER	LOCATION	TEMPERATURE	COMMENTS	VEHICLE: VOLVO 242 DL242	TYPE: FTP
801956	MOBIL 1 (SYNTHETIC)	90.0	COLD ROOM FUEL EFFICIENT OILS TEST REFERENCE OIL 90 DEG. F MOBILE 1 FTP NOX INSTRUMENT UNSTABLE SUMMARY CODE 41 - MOBIL OIL 5W 20		
801943	MOBIL 1 (SYNTHETIC)	90.0	FTP VOLVO MOBIL 1 REFERENCE OILS HUMIDITY OUT OF SPEC. - 24 HR SOAK HUMIDITY IS AVE. VALUE NOX INSTRUMENT DOWN FOR MAINT. SUMMARY CODE 41 - MOBIL OIL 5W 20		
801958	QUAKER STATE30W	90.0	VOLVO EPA-542 ROOM @ 90 DEG. F W/QUAKER STATE 30 W VEH WAS IN SECOND GEAR FOR FRIST ACCEL OF BAG #1 SUMMARY CODE 42 - QUAKER STATE 30W		
801952	QUAKER STATE30W	90.0	VOLVO EPA-542 ROOM @ 90DEGREES F FTP-QUAKER STATE 30W OIL 15 SEC. OF BAG ONE VARIAW PAPER-SLIPPING SUMMARY CODE 42-QUAKER STATE 30W		

ENVIRONMENTAL PROTECTION AGENCY
MOTOR VEHICLE EMISSIONS LABORATORY
ANN ARBOR, MICHIGAN

CONTROLLED ENVIRONMENTAL TEST CELL

PROCESSED: JUN 5, 1980

FUEL EFFICIENT OILS PROJECT

AVERAGE TEST RESULTS

TEST NUMBER	OIL TYPE	TEMPERATURE	COMMENTS	VEHICLE: VOLVO 242 DL242	TYPE: HFET
801932	MOBIL 1 (SYNTHETIC)	40.0	VOLVO TCV COLD RM. TEST @ 40 DEG. F MOBIL 1 OIL		
			SUMMARY CODE 41 - MOBIL OIL 5W 20		
801973	MOBIL 1 (SYNTHETIC)	40.0	VOLVO - 2 HFET @ 40 DEG. F W- MOBILE 1 5W-20 OIL		
			SUMMARY CODE 41 - MOBIL OIL 5W 20		
801954	MOBIL 1 (SYNTHETIC)	40.0	VOLVO TCV EPA 542 ROOM. @ 40 DEG. F MOBIL #1 REFERENCE OIL NOX INSTRUMENT DOWN FOR REPAIR---VALVES ARE QUESTIONABLE SUMMARY CODE 41 - MOBIL OIL 5W 20		
801957	QUAKER STATE30W	40.0	VOLVO TCV EPA-542 COLD RM @ 40 DEGREES F RAN W/STD 30 W QUAKER STATE NOX OF BAG #3 DID NOT RET TO SPAN CHECK SUMMARY CODE 42 - QUAKER STATE 30W		
802469	QUAKER STATE30W	40.0	VOLVO EPA 542 ROOM W/QUAKER STATE 30 W @40 DEG. VARIAN NOT OPERATING PROPERLY - SHORT MILEAGE		
801955	MOBIL 1 (SYNTHETIC)	75.5	VOLVO 75 DEG. 2 HFET'S COLD ROOM FUEL ECONOMY OILS TEST REFERENCE OIL MOBIL 1		
			SUMMARY CODE 41 - MOBIL OIL 5W 20		
801968	MOBIL 1 (SYNTHETIC)	75.0	VOLVO TCV VEH. COLD RM @ 75 DEG. F MOBIL 331 REFERENCE OIL NOX ON HFET 1 DID NOT RETURN TO SPAN WITHIN TOLERENCE SUMMARY CODE 41 - MOBIL OIL 5W 20		
801966	MOBIL 1 (SYNTHETIC)	75.0	VOLVO COLD ROOM FE REFERENCE OILS MOBIL @ 75 DEG. NOX INSTRUMENT DOWN FOR REPAIR SUMMARY CODE 41 -MOBILE OIL 5W 20		
801960	QUAKER STATE30W	75.0	VOLVO TCV EPA-542 COLD ROOM @ 75 DEG. QUAKER STATE 30W		
			SUMMARY CODE 42 - QUAKER STATE 30W		
801962	QUAKER STATE30W	75.0	VOLVO T.C.V. EPA-542 ROOM @ 75 DEG. F QUAKER STATE 30W		
			SUMMARY CODE 42 - QUAKER STASTE 30W		
801959	MOBIL 1 (SYNTHETIC)	90.0	NOX INSTRUMENT DOWN. FOR MAINT SOAK TIME 24 HRS HUMIDITY IS AVE. VALUE WHT VOLVO TCV @ 90 DEGREES F COLD RM REF. OILS SUMM. CODE 41 -MOBIL OIL 5W 20		
801967	MOBIL 1 (SYNTHETIC)	90.0	WHT TCU VOLVO RM @ 90 DEG. F HFET MOBILE REFERENCE OIL #1		
			SUMMARY CODE 41 - MOBIL OIL 5W 20		

ENVIRONMENTAL PROTECTION AGENCY
MOTOR VEHICLE EMISSIONS LABORATORY
ANN ARBOR, MICHIGAN

CONTROLLED ENVIRONMENTAL TEST CELL
AND
CERTIFICATION
AVERAGE TEST RESULTS

PROCESSED: JUN 5, 1980

TEST NUMBER	LOCATION	TEMPERATURE	COMMENTS	VEHICLE: VOLVO 242 DL242	TYPE: HFET
801942	MOBIL 1 (SYNTHETIC)	90.0	VOLVO 2-HFET FUEL EFFICIENT OILS 90 DEG. F TEST MOBIL #1 15 SEC BETWEEN HFET #1 & #2 TEST TOTEST NOX INSTRUMENT UNSTABLE SUMMARY CODE 41 - MOBIL OIL 5W 20		
801950	QUAKER STATE30W	90.0	VOLVO EPA 542 ROOM @ 90 DEG. F HFET QUAKER STATE 30W SUMMARY CODE 42 - QUAKER STATE 30W		
801964	QUAKER STATE30W	90.0	VOLVO EPA-542 ROOM @ 90DEGREES F HFET W/QUAKER STATE 30W SUMMARY CODE 42 - QUAKER STATE 30W		