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Sequence VG Information Letter 02-1
Sequence No. 10

January 8, 2002

ASTM consensus has not been obtained on this information letter. An appropriate ASTM ballot will be issued in order to achieve such consensus.

TO: Sequence VG Mailing List

SUBJECT:
1. Deletion of Quality Index for Power
2. Dropping NOx Measurements
3. Ratings Changes Recommended By the Light Duty Rating Task Force
4. Extended Time Period for Blowby Reworks

1. At the November 14, 2001 meeting of the Sequence V Surveillance Panel, the panel agreed to drop the requirement to monitor and calculate the Quality Index value for Power. Tables A2.1, A2.2 and Section A2.3, and Section A2.3.1 contained in Annex A2 of Test Method D6593 have been revised to reflect this change.

2. The panel also agreed to drop the requirement to measure NOx. Sections 9.6.1.1, 12.5.5.1 and Figure A3.19 have been revised and Sections 9.6.1.2, 12.3.3.2, 12.5.5.2 and 14.2 have been deleted to remove this requirement.

3. The panel also agreed to adopt a number of changes suggested by the Light Duty Rating Task Force. Section 13.1.3 has been revised to delete the requirement to use a 15W cool white bulb to facilitate rating of cylinder varnish, since the rating of this parameter was removed by a previous information letter. Section 13.1.5 has been added to require that a rater attend at least one workshop per year. Table 7 has been revised to show Interpolated values and to correct an error for ≥ 0.125 < 0.375 depths. The definitions for *tight* and *free* rings have been removed since only hot and cold stuck rings are evaluated. Sections 3.1.5 and 3.1.14 have been deleted and remaining sections have been renumbered accordingly.

4. Finally, the panel agreed to allow the time period to make adjustments to ring gaps to be increased from during the break-in to within the first 48 hours of the test. Section 12.4.1 has been revised to reflect this change.

The attached changes to Test Method D6593 are effective November 14, 2001.

Peter Misangyi
Product Engineering
Ford Motor Company

John Zalar
Administrator
ASTM Test Monitoring Center

Attachment

c: ftp://www.tmc.astm.cmri.cmu.edu/documents/gas/sequencev/procedures_and_ils/vgil02-1-10.pdf

Distribution: Email

(Revises Test Method D6593-00, as amended by Information Letters 01-1, 01-2 and 01-3)

3. Terminology

3.1. *Definitions:*

3.1.5. Deleted. Existing Sections 3.1.6 through 3.1.13 have been renumbered as 3.1.5 through 3.1.12.

3.1.14. Deleted. Existing sections 3.1.15 through 3.1.17 have been renumbered as 3.1.12 through 3.1.15

9.6.1.1. Instruments for measurement of O_2, CO, and CO_2 are required. Equipment suitable for automobile emission measurements is recommended. Non-dispersive infrared instrumentation for CO and CO_2, and electro-chemical or paramagnetic instrumentation for O_2 are required (see SAE J254).

9.6.1.2. Deleted

Table 2. Sequence VG Operating Specification

Condition	Stage I	Stage II	Stage III
Duration, minutes	120	75	45
Engine Speed, r/min	1200 ± 5	2900 ± 5	700 ± 15
Engine Power, kW	Record	Record	1.10 to 1.50
Manifold Abs Press, kPa (abs)	69 ± 0.2	66 ± 0.2	Record
Engine Oil, In, °C	68 ± 0.5	100 ± 0.5	45 ± 1
Engine Coolant Out,°C	57 ± 0.5	85 ± 0.5	45 ± 1
Engine Coolant Flow, L/min	48 ± 2	Record	Record
Engine Coolant Pressure, kPa (gauge)	70 ± 10	70 ± 10	70 ± 10
RAC Coolant, In, °C	29 ± 0.5	85 ± 0.5	29 ± 1
Rocker Cover Flow, L/min	15 ± 1	15 ± 1	15 ± 1
Intake, Air, °C	30 ± 0.5	30 ± 0.5	30 ± 0.5
Intake Air Press, kPa (gauge)	0.05 ± 0.02	0.05 ± 0.02	0.05 ± 0.02
Exhaust Gas Analysis			
O_2, Vol. %	1.0 Max	1.0 Max	3.0 Max
CO, Vol. %	1.0 max	2.0 max	8.5 ± 1.5
CO_2, Vol. %	13.5 - 15.5	13.5 - 15.5	Record
Blowby Flow Rate, Avg, L/min	----------	60 - 70	---------
Intake Air Humidity, g/kg	11.4 ± 0.8	11.4 ± 0.8	11.4 ± 0.8
Exhaust Back Pressure, kPa abs	104± 2	107 ± 2	Record
Fuel Flow, kg/min	Record	Record	Record

12.3.3.2. Deleted

12.4.1. *Blowby Flow Rate Adjustment*--A blowby adjustment may only be made during the break-in or within the first 48 h of the test. Blowby may drop from the break-in level but the corrected average Stage II blowby for the test during the first 120 h of the test shall fall within the range from 60 to 70 L/min. Adjust the blowby by changing the ring gaps or replacing piston rings as necessary. Ensure that the ring and piston combination in each cylinder meet the criteria in Table 1. Use the ring cutting procedure outlined in 7.8.5.2

12.5.5.1. Use the CO, CO_2, and O_2 levels in the exhaust gas to determine the characteristics of combustion that occur during the test. Use these three parameters in conjunction to determine the normalcy of combustion and any significant changes in combustion that occur throughout a particular test. Levels of these components in all three stages are controlled by the program in the EPROM chip. No adjustments can be made to change the exhaust gas components. If the levels are different than what appears in Table 2, check the EEC system. Correcting a fault in the EEC system is the only way to achieve the correct levels of air/fuel ratio.

12.5.5.2. Deleted

13.1.3. Rate pistons and RAC's against a white background using white fluorescent bulbs and a 100 % white deflector. Maintain the illumination level between 350 and 600 fc (3800 to 6500 lx), and measure the illumination level 355 mm (14 in.) from the desk top.

13.1.5 A rater shall attend at least one ASTM or CRC Rating Workshop having VG specific or comparable hardware.

Table 7 Interpolated Average Sludge Site Ratings

Total	Site Ratings	Total	Site Ratings
<0.125	Clean	≥3.500<6.000	C
≥0.125 < 0.375	¼ A	≥6.000< 12.00	D
≥0.375 < 0.625	½ A	≥12.00< 24.00	E
≥0.625 < 0.875	¾ A	≥24.00< 48.00	F
≥0.875 < 1.250	A	≥48.00< 96.00	G
≥1.250 < 1.750	AB	≥96.00< 192.0	H
≥1.750 < 2.500	B	≥192.0< 384.0	I
≥2.500 < 3.500	BC	≥384.0	J

14.2. Deleted. Existing sections 14.3 through 14.9 renumbered as 14.2 through 14.8

14.8. *Quality Index* --Requirements for quality index are listed in Annex A2. If the end of test quality index value is below 0.000 for reference oil tests, review the test operations with the TMC. The TMC will issue a letter to the laboratory and the test purchaser on its opinion. The laboratory will document its comments regarding end of test quality index values less than 0.000 for non-reference oil tests. The laboratory or test purchaser may request TMC review of test operations for non-reference oil tests. The TMC will issue a letter to document its opinion.

A2.3.1. This portion of the test will start, at most, 20 min after the beginning of a transition and continue until the beginning of the next stage. By 20 min into a stage all parameters shall be in the steady state condition listed in Table 3. The start of the transition is considered the start of the stage. Calculate the quality index using values reported to the accuracy levels in Table 2.1.

Table A2.1 Accuracy Levels of Data Points to be Used in QI Calculations

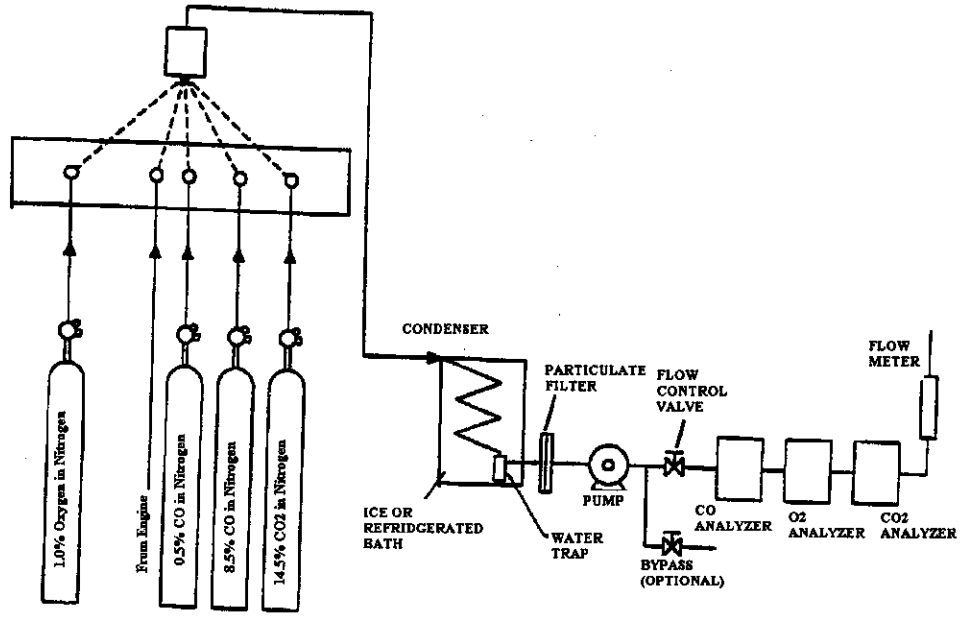
Parameter	Field Length
Speed	5.0
Humidity	5.1
Temperature	5.1
Manifold Absolute Pressure	5.1
Intake Air Pressure	6.3
Exhaust Backpressure	6.1
Coolant Outlet Pressure	6.1
Coolant Flow	6.1

Table A2.2 L & U CONSTANTS and OVER and UNDER RANGE VALUES

Parameter	Stages	L	U	Over Range	Under Range
Coolflow	1	47.47	48.53	87.0	0
Cooloutt	1	56.71	57.29	113.0	0
	2	84.71	85.29	113.0	0
	3	44.71	45.29	113.0	0
Exhbprs	1	103.92	104.08	115.0	0
	2	106.92	107.08	115.0	0
Humidity	1, 2, 3	10.85	11.95	64.0	0
Intairpr	1, 2, 3	0.04	0.06	1.05	0
Intairt	1, 2, 3	29.80	30.20	49.0	0
Oilint	1	67.79	68.21	120.0	0
	2	99.79	100.21	120.0	0
	3	44.79	45.21	120.0	0
Speed	1	1198.1	1201.9	3156.0	0
	2	2898.1	2901.9	3156.0	0
	3	698.1	701.9	3156.0	0
Map	1	68.92	69.08	76.0	0
	2	65.92	66.08	76.0	0
Cooloutp	1, 2, 3	69.35	70.65	159.0	0
Raccint	1, 3	28.63	29.37	120.0	0
	2	84.63	85.37	120.0	0
Raccfl	1, 2, 3	14.85	15.15	29.0	0

A2.3. Maximum allowable system time constants for the controlled parameters

Control Parameter	Time Constant, seconds
Engine Speed, r/min	1.9
Manifold Abs Press, kPa	1.8
Engine Oil, In, °C	2.4
Engine Coolant Out, °C	2.4
Engine Coolant Flow, L/min	17.0
RAC Coolant, In, °C	2.4
Rocker Cover Flow, L/min	2.0
Intake, Air, °C	2.4
Intake Air Press, kPa	2.6
Exhaust Back Pressure, kPa	1.7
Engine Coolant Pressure	2.0



CALIBRATION GASES

A3.19.1 A typical exhaust gas analysis system is shown above. The condenser may use an ice bath or mechanical refrigeration. Ice bath condensers should use a coil fabricated from 0.25 in. (0.64 cm) stainless steel tubing and provide sufficient cooling to condense moisture at a dew point of 34 °F (1 °C). Mechanical refrigeration should provide control of the bath temperature to 34 ± 2 °F (1 ± 1 °C). The flow rate of engine exhaust and calibration gases should be identical and within the specifications of the instrumentation. An air conditioned chamber for instrumentation is required if ambient temperatures are above the maximum recommended for the particular instrumentation used.

Stainless steel fittings are preferred throughout the analysis system. Brass fittings should not be used in the analysis system.

The porosity of the particulate filter should be between 2 and 10 microns. A diaphragm type pump is recommended to reduce pump "hang up."

Note A2 - Warning Safety precautions are necessary concerning venting CO, NO, and ozone gases from the analyzer instruments.

A3.19.2 Require Calibration Gases

Nominal 8.5% CO, balance N_2
Nominal 0.5% CO, balance N_2
Nominal 1.0% O_2, balance N_2
Nominal 14.5% CO_2, balance N_2

Optional Zero Standard Gas
N_2 for O_2, CO, and CO_2 analyzers

A3.19.3 If the optional zero standard gases are not used to "zero" the analyzers, the CO calibration gases may be used to "zero" the O_2 analyzer, the O_2 calibration gases may be used to "zero" the CO and CO_2 analyzers.

Fig A3.19 Exhaust Gas Analysis