



OIL, ENGINE, ILSAC GF-4, INITIAL FILL AND SERVICE FILL

SAE 5W-30

WSS-M2C929-A

SAE 5W-20

WSS-M2C930-A

1. SCOPE

This material specification defines the minimum acceptable performance requirements and physical/chemical properties of engine oils to be used by Ford Motor Company in its engine/vehicle manufacturing and service operations.

2. APPLICATION

This specification is released for initial fill and service fill engine oils used for lubrication of spark ignition engines using gasoline. The Documentation, Performance Requirements and Quality Control subsections of the QUALIFICATION PROCEDURE apply only to engine oils supplied directly to Ford Motor Company

3. REQUIREMENTS

3.1 STANDARD REQUIREMENTS FOR PRODUCTION MATERIALS

Material suppliers and part producers must conform to the Company's Standard Requirements For Production Materials (WSS-M99P1111-A).

3.2 PERFORMANCE

Shall meet all the requirements of the "ILSAC GF-4 Minimum Performance Standard for Passenger Car Engine Oils" plus the following:

3.2.1 ASTM Sequence VG Test

Follower Pin Wear, average (Cyl #8 intake and exhaust) 30 µm, max.

Ring Gap Increase, average (Cyl #1 and #8) 225 µm, max

The following photographs of the VG test engine are required:

- Rocker arm cover and camshaft baffle
• Oil pan and baffle
• Oil pick-up screen
• Cylinder block underside
• Cylinder head valve decks
• Cylinder block front
• Timing chain cover
• Average and worst piston skirts, thrust sides
• Rear seal housing

Table with 3 columns: Date, Action, Revisions. Row 1: 2003 10 02, Activated, M. Riley



All required engine tests shall be conducted in accordance with the most recently approved procedures as described in ASTM Standards and the applicable ASTM Standards Research Reports and Information Letters. All tests under surveillance by ASTM must be conducted using test equipment monitored by and calibrated to the requirements of the ASTM Test Monitoring Center.

3.3 PHYSICAL/CHEMICAL PROPERTIES

- | | | |
|-------|--|-------------------------|
| 3.3.1 | Copper Corrosion
(ASTM D 130 or ISO 2160, 3 h at 100 °C) | 1b max
(Dark Orange) |
| 3.3.2 | High Temperature Deposits, mg
(TEOST MHT-4) | 30 max |
| 3.3.3 | Physical Appearance and Odor

Shall be clear and bright with no objectionable odor. | |
| 3.3.4 | Contaminants

Shall be free of carcinogens, toxins, metals not removed in refining or from previous use. | |

3.4 QUALIFICATION PROCEDURE

3.4.1 Documentation

Supplier must furnish to Fuels and Lubricants Engineering a completed and certified copy of the attached Supplement A, test reports demonstrating full compliance with all the requirements of this specification and a copy of the final ACC Monitoring Agency summary, if available. The need for ACC registration of tests will be determined by Fuels and Lubricants Engineering. The copy of the ACC Monitoring Agency summary should be sent directly from Registration Systems Inc. to Fuels and Lubricants Engineering.

The test reports must include results on both the candidate oil and the appropriate ASTM reference oils. The standard photographs of the test components are considered an essential part of the required test documentation. The oil sample code used for identification in each test document must be consistent. Any deviation in sample code uniformity must be explained and shown on the cover of each test report.

All tests must be certified by a qualified and authorized representative of the test facility.

The supplier shall identify all the formulation changes and modifications that occurred in the test program that coincide with the tests listed in the ACC Monitoring Agency summary. Individual formulations should be listed in Supplement A, and for ACC registered tests, identified by the line item number and the formulation code.

3.4.2 "Read Across" Guidelines

It is required that all performance tests be conducted on the final formulation. However, exceptions may be permitted with supportive supplementary data on similar formulations to allow for final approval in the absence of complete testing.



3.4.3 Fleet Testing

Materials which constitute a significant departure from conventional formulations, whether in base stocks, refining processes or additive packages, must be fleet tested, in addition to the requirements outlined herein. These tests must include the type(s) of service judged to be affected by the difference in formulation technology. Fuels and Lubricants Engineering should be consulted prior to testing.

3.4.4 Verification

Fuels and Lubricants Engineering reserves the right to conduct verification testing. If the test results do not support the originally submitted data, the supplier must re-test the product in coordination with Fuels and Lubricants Engineering. This re-test must be conducted and certified by a mutually agreed upon test facility.

3.4.5 Chemical and Physical Properties

Supplier shall furnish appropriate chemical and physical properties as required on Supplement A along with the manufacturing limits that apply to the material as requested.

3.4.6 Performance Requirements

Conformance to the engine test requirements listed in Supplement A will be determined by using Multiple Test Acceptance Criteria (MTAC). All data and reports from the tests used for MTAC must be provided by the supplier. Identify the engine tests on Supplement A that have been used to determine the MTAC results by the corresponding line item number on the ACC Monitoring Agency summary. Fuels and Lubricants Engineering reserves the right to use all tests when averaging in place of MTAC.

3.4.7 Quality Control

Upon engineering approval supplier and Fuels and Lubricants Engineering shall establish mutually agreed upon quality control limits to be listed in Supplement B. These will be used for ongoing product verifications at mutually agreed upon frequencies. The infrared absorption spectra of the approved material shall constitute the reference standard and shall be kept on file. All samples shall produce infrared curves that correspond to the reference standard when tested under the same conditions as those specified on the master curve.



ENGINEERING MATERIAL SPECIFICATION

WSS-M2C929-A
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(Supplement A, page 2 of 4)

Oil Company _____ Date _____
Product Name _____ Viscosity Grade _____
Product Code _____

Performance Requirements	Test # / Date	Specification	(MTAC) Test Results
ASTM Ball Rust (ASTM D 6557)	_____		
Average Gray Value		100 min	_____
Sequence III G	_____		
Viscosity Increase @ 40 C		150% max.	_____
Low Temp. Viscosity		See Note *	_____
Weighted Piston Deposits		3.5 min	_____
Hot Stuck Piston Rings		0	_____
Cam Plus Lifter Wear, Average		60 µm max	_____
* Note: Evaluate the drain oil sample with Test Method ASTM D 4684 (MRV TP-1). The viscosity of the drain oil must meet the requirements of its original grade or the next highest grade.			
Sequence IVA (ASTM D 6891)	_____		
Average Cam Wear (7 position average)		90 µm, max	_____
Sequence VG (ASTM D 6593)	_____		
Average Engine Sludge		7.8 min	_____
Rocker Arm Cover Sludge		8.0 min	_____
Average Engine Varnish		8.9 min	_____
Piston Skirt Varnish		7.5 min	_____
Oil Screen Clogging		20% max	_____
Hot Stuck Compression Rings		0	_____
Cold Stuck Rings		0	_____
Average Cam Follower Pin Wear (Cyl #8)		30 µm, max	_____
Average Ring Wear Gap Increase (Cyl #1 & #8)		225 µm, max	_____
Oil Ring Clogging		Report	_____
Sequence VIB (ASTM D 6837)	_____		
<u>SAE 5W-20</u>			
FEI @ 16 Hours		2.3% min	_____
FEI @ 96 Hours		2.0% min	_____
<u>SAE 5W-30</u>			
FEI @ 16 Hours		1.8% min	_____
FEI @ 96 Hours		1.5% min	_____
Sequence VIII (ASTM D 6709)	_____		
Bearing Weight Loss		26 mg, max	_____
TEOST MHT-4	_____		
Deposit Weight		30 mg, max	_____

Signature _____

Title _____



ENGINEERING MATERIAL SPECIFICATION

WSS-M2C929-A
WSS-M2C930-A

(Supplement A, page 3 of 4)

Oil Company _____ Date _____

Product Name _____

Product Code _____

	<u>Final</u>		<u>Reblends/Reformulations</u>		
Formulation Code	_____	_____	_____	_____	_____
Viscosity Grade	_____	_____	_____	_____	_____
Line Item Number	_____	_____	_____	_____	_____
<u>I. Base Stock(s), vol %</u>					
1)	_____	_____	_____	_____	_____
2)	_____	_____	_____	_____	_____
3)	_____	_____	_____	_____	_____
4)	_____	_____	_____	_____	_____
<u>II. Additive Treatment, mass %</u>					
A)	_____	_____	_____	_____	_____
B)	_____	_____	_____	_____	_____
C)	_____	_____	_____	_____	_____
D)	_____	_____	_____	_____	_____
E)	_____	_____	_____	_____	_____
<u>III. New Oil Inspection</u>					
Viscosity, cSt:					
100 °C	_____	_____	_____	_____	_____
40 °C	_____	_____	_____	_____	_____
VI	_____	_____	_____	_____	_____
Vis mPa.s @ °C	_____	_____	_____	_____	_____
NOACK(D 5800)	_____	_____	_____	_____	_____
GC (D 5480)	_____	_____	_____	_____	_____
TBN (D 2896)	_____	_____	_____	_____	_____
Elemental, mass % (report numerical values; "NiL" or Trace" are not permissible)					
S	_____	_____	_____	_____	_____
P	_____	_____	_____	_____	_____
Zn	_____	_____	_____	_____	_____
Ba	_____	_____	_____	_____	_____
Ca	_____	_____	_____	_____	_____
Mg	_____	_____	_____	_____	_____
Na	_____	_____	_____	_____	_____
N	_____	_____	_____	_____	_____
B	_____	_____	_____	_____	_____
Cu	_____	_____	_____	_____	_____
Cl	_____	_____	_____	_____	_____
Sulfated Ash	_____	_____	_____	_____	_____
<u>IV. Tests Conducted</u>					
Comments:	_____	_____	_____	_____	_____
Comments:	_____	_____	_____	_____	_____
Comments:	_____	_____	_____	_____	_____

Signature _____

Title _____



ENGINEERING MATERIAL SPECIFICATION

WSS-M2C929-A
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(Supplement A, page 4 of 4)

Oil Company _____ Date _____
Product Name _____
Product Code _____

<u>Physical/Chemical Property Requirements</u>	<u>Specification</u>	<u>Test Results</u>	<u>Mfg. Limits</u>
Viscosity @ 150 °C (ASTM D 445), mm ² /s		_____	_____
Viscosity @ 100 °C (ASTM D 445), mm ² /s, 5W-20	5.6 - <9.3	_____	_____
Viscosity @ 100 °C (ASTM D 445), mm ² /s, 5W-30	9.3 - <12.5	_____	_____
Viscosity @ 40 °C (ASTM D 445), mm ² /s		_____	_____
Density (ASTM D 1298), kg/L		_____	_____
Dry vapor pressure equivalence (D 4953 or D 5191), kPa		_____	_____
Viscosity at - 25 °C (ASTM D 5293), mPa.s	3,500 max	_____	_____
Viscosity at - 30 °C (ASTM D 5293), mPa.s		_____	_____
Low Temp. Pumping Viscosity at -30 °C, mPa.s	30,000 max	_____	_____
(ASTM D 4684) at -35 °C, mPa.s	60,000 max	_____	_____
Pour Point (ASTM D 97), °C		_____	_____
Stable Pour Point (SAE J300 App. B), °C		_____	_____
Gelation Index (ASTM D 5133)	12.0 max	_____	_____
Volatility		_____	_____
Evap. Loss, 1 h at 250 °C (ASTM D 5800), %	15.0 max	_____	_____
Dist. by GC at 371 °C (ASTM D 6417), %	10.0 max	_____	_____
Shear Stability (ASTM D 445), mm ² /s at 100 °C		_____	_____
After ASTM D 3945 or CEC L-14A-78		_____	_____
After 10 hr in "L-38" Test 5W-20	5.6 - <9.3	_____	_____
After 10 hr in "L-38" Test 5W-30	9.3 - <12.5	_____	_____
HTHS Viscosity, mPa-sec @ 150°C & 10 ⁶ 1/sec (ASTM D 4683 or CEC L-36T-84)		_____	_____
New 5W-20 Oil	2.6 min	_____	_____
New 5W-30 Oil	2.9 min	_____	_____
After ASTM D 3945 or CEC L-14A-78		_____	_____
Copper Corrosion (ASTM D 130, 3 h @ 100 °C)	1b max	_____	_____
Filterability with short heating (ASTM D 6795), %	50 max	_____	_____
Filterability with long heating (ASTM D 6794), %	50 max	_____	_____
Foaming (ASTM D 892) Sequence I, mL	10/0 max	_____	_____
Sequence II, mL	50/0 max	_____	_____
Sequence III, mL	10/0 max	_____	_____
High Temperature Foaming (ASTM D 6082), mL	100/0 max	_____	_____
Phosphorus, (ASTM D 4951), % mass	0.08% max	_____	_____
Sulfur, (ASTM D 4951 or D 5453), % mass	0.50% max	_____	_____
Total Acid Number (ASTM D 664), mg KOH/g		_____	_____
Total Base Number (ASTM D 2896), mg KOH/g		_____	_____
Sulfated Ash (ASTM D 874), %		_____	_____

Elemental, mass %

Barium	_____	_____	Nitrogen	_____	_____
Boron	_____	_____	Potassium	_____	_____
Calcium	_____	_____	Sodium	_____	_____
Chlorine	_____	_____	Copper	_____	_____
Zinc	_____	_____	Magnesium	_____	_____
Other	_____	_____			

Signature _____

Title _____



ENGINEERING MATERIAL SPECIFICATION

WSS-M2C929-A
WSS-M2C930-A

(Supplement B, page 1 of 1)

Oil Company _____ Date _____
Product Name _____
Product Code _____
Blend Plant Location _____

Quality Control Certification

Physical/Chemical Properties

Limits

Frequency

Viscosity at 150 °C (ASTM D 445), mm ² /s	_____	_____
Viscosity at 100 °C (ASTM D 445), mm ² /s	_____	_____
Viscosity at 40 °C (ASTM D 445), mm ² /s	_____	_____
Density (ASTM D 1298), kg/L	_____	_____
Viscosity at -25 °C (ASTM D 5293), mPa.s	_____	_____
Viscosity at -30 °C (ASTM D 5293), mPa.s	_____	_____
Low Temp. Pumping Viscosity at -30 °C, mPa.s (ASTM D 4684) at -35 °C, mPa.s	_____	_____
Pour Point (ASTM D 97), °C	_____	_____
Stable Pour Point (SAE J300 App. B), °C	_____	_____
Gelation Index (ASTM D 5133)	_____	_____
Flash Point (ASTM D 93), °C	_____	_____
Volatility		
Evap. Loss, 1 h at 250 °C (ASTM D 5800), %	_____	_____
Dist. by GC at 371 °C (ASTM D 5480), %	_____	_____
Dist. by GC at 371 °C (ASTM D 6417), %	_____	_____
Shear Stability (ASTM D 445), mm ² /s at 100 °C		
After ASTM D 3945 or CEC L-14A-78	_____	_____
After 10 h in "L-38" test	_____	_____
HTHS Viscosity, mPa-sec @ 150 °C & 10 ⁶ 1/sec (ASTM D4683 or CEC L-36T-84)		
New Oil		
After ASTM D3945 or CEC L-14A-78	_____	_____
Copper Corrosion (ASTM D 130, 3 h at 100 °C)	_____	_____
Filterability with short heating (ASTM D 6795), %	_____	_____
Filterability with long heating (ASTM D 6794), %	_____	_____
Foaming Sequence I, mL	_____	_____
Sequence II, mL	_____	_____
Sequence III, mL	_____	_____
High Temperature Foaming (ASTM D 6082), mL	_____	_____
TEOST MHT, mg	_____	_____
Total Acid Number (ASTM D 664), mg KOH/g	_____	_____
Total Base Number (ASTM D 2896), mg KOH/g	_____	_____
Sulfated Ash (ASTM D 874), %	_____	_____

Elemental, mass %

Barium	_____	_____	Phosphorus	_____	_____
Boron	_____	_____	Nitrogen	_____	_____
Calcium	_____	_____	Potassium	_____	_____
Chlorine	_____	_____	Sodium	_____	_____
Copper	_____	_____	Sulfur	_____	_____
Magnesium	_____	_____	Zinc	_____	_____
			Other	_____	_____

Signature _____

Title _____

Fuels and Lubricants Engineering concurrence _____