

PERFORMANCE TESTS

Introduction

See the following pages for specifics on the various established performance tests:

Performance Characteristic	Established Test
Engine Rusting	Ball Rust Test (BRT)
Viscosity Control	Sequence IIIG
Low Temperature Sludge	Sequence VG
Low Temperature Wear	Sequence IVA
High Temperature Wear	Sequence IIIG
High Temperature Deposits	Sequence IIIG and MHT #4 TEOST
Bearing Corrosion	Sequence VIII
Low Temperature Viscosity	Sequence IIIGA
Shear Stability	Sequence VIII
Oil Consumption	NOACK and GCD distillation
Foaming/Oil Aeration	ASTM D892/ASTM 6082
Filterability	EOFT and EOWTT

PERFORMANCE TESTS

Sequence IIIG

SCOPE

The Sequence IIIG is a replacement for the Sequence IIIF but is expected to use the same basic engine hardware as the IIIF. Test operating conditions and special test hardware modifications are under evaluation by General Motors. The IIIG test development objectives are:

- ▶ Increase oxidation severity to 2xIIIF level
- ▶ Improve wear discrimination relative to IIIF
- ▶ Directionally increase piston deposit severity relative to IIIF

The Sequence IIIG procedure is designed to evaluate an oil's resistance to oxidation and wear in high speed and high temperature vehicle operation.

RATED PARAMETERS

- ▶ High temperature viscosity increase (KV@40C)
- ▶ Weighted Piston Deposits (WPD)
- ▶ Average Cam Wear & Lifter Wear (AC&LW)
- ▶ Hot Stuck Piston Rings

PERFORMANCE TESTS

Sequence III G

TEST CONDITIONS

Engine	GM 3.8L V-6 (3800cc)
Engine Speed (RPM)	3600
Engine load (Nm)	250
Oil temperature (°C)	150
Coolant temperature (°C)	115
Intake air (°C)	35
Valve Spring Load (lbs)	205 @ 0.375 inch deflection
Test Length (hours)	100
Fuel	Haltermann fuel unleaded
Air/Fuel Ratio	15:1
Piston Ring Gap	
Top Ring (IN)	0.025
2nd Ring (IN)	0.042
Initial Oil Charge (ml)	5500
Oil Checks (hr)	20
Cam Bushings Material	Babbit
Lifter Material	ACI (same as IIIF)
Camshaft	Phosphated IIIF
Cam Thrust Plate (IN)	0.1530

PERFORMANCE TESTS

Sequence IIIGA

SCOPE

The Sequence IIIGA is the same procedure as the Sequence IIIG but is used only to measure low temperature used oil viscosity (MRV) performance. Test operating conditions and special test hardware modifications are the same as for the IIIG test.

Rated Parameter:

- ▶ Low Temperature Viscosity (MRV)

The Sequence IIIGA test is separate from the IIIG and thus both are treated as individual procedures by ILSAC, ASTM and API. The ACC Code of Practice rules are applied separately to each of the IIIG and IIIGA tests. This means that repeat testing can be run with the IIIG and/or IIIGA as required for Multiple Test Acceptance (MTAC) and minor formulation modification of each test type. MTAC does not apply to used oil pumpability measured by the MRV-TP1 test.

PERFORMANCE TESTS

BRT (ASTM D 6557)

SCOPE

The BRT (Ball Rust Test) is an 18-hour bench test procedure in which a hydraulic lifter ball in test oil is subjected to acids and air. The ball is rated automatically for reflectance intensity as a measure of surface area corrosion. The test performance parameter is gray value rating.

The BRT is designed to evaluate an oil's ability to inhibit rust of internal engine parts in cyclic cold and hot operation where significant water and acid buildup can occur.

TEST CONDITIONS

Equipment	Hydraulic lifter ball in 20 cc syringe with 10 cc of test oil on shaker table
Acid Solution	Acetic acid/HBr/HCl/deionized water
Acid Addition	0.19 ml/hr.
Air Flow	40 cc/minute
Temperature	48°C
Shaker Speed	300 RPM
Test Length	18 hours

PERFORMANCE TESTS

Sequence VG

SCOPE

The Sequence VG is designed to evaluate an oil's ability to prevent excessive sludge and varnish deposits in short trip/low temperature driving conditions. The Sequence VG cycles between cold and hot operation to promote the generation of acid and fuel in the oil.

The test performance parameters are Avg. engine sludge, Rocker arm cover sludge, Avg. engine varnish, Piston skirt varnish, Oil screen clogging, and ring sticking. For GF-4, the test developer (Ford) is investigating the addition of a valve lifter roller pin wear performance requirement.

TEST CONDITIONS

Engine	Ford 4.6L SOHC V-8
Operation	Three stage cycle each 4 hours
Time (minutes)	120/75/45
Speed (RPM)	1200/2900/700
Manifold pressure (KPa absolute)	69/66/record
Oil temperature (°C)	68/100/45
Rocker cover coolant temp. (°C)	29/85/29
Engine coolant temp. (°C)	57/85/45
Test length (hours)	216
Fuel	Haltermann fuel unleaded (Clear)

PERFORMANCE TESTS

Sequence IVA

SCOPE

The Sequence IVA is a JASO (KA24E) test modified to conform to ASTM requirements. The test evaluates valve train wear under low temperature and low speed operation. The test performance parameter is avg. cam lobe wear measured at seven locations on each lobe.

The Sequence IVA is designed to evaluate an oil's ability to prevent cam lobe wear in slider valve train design engines operated at low temperature, short trip, "stop and go" conditions.

TEST CONDITIONS

Engine	Nissan 2.4L inline 4 cylinder
Engine speed	800 and 1500 RPM cycles
Engine torque (N-m)	25
Oil temperature (°C)	50 and 60 cycle
Coolant temperature (°C)	50 and 55 cycle
Cycle duration (min)	50 low speed/10 high speed
Test Length	100 hours
Fuel	Haltermann fuel unleaded (dyed green)

PERFORMANCE TESTS

Sequence VIII

SCOPE

The Sequence VIII test evaluates the ability of an oil to minimize copper/lead bearing corrosion and its resistance to permanent viscosity loss due to mechanical shear. The test performance parameters are bearing weight loss and 10-hour stripped viscosity.

TEST CONDITIONS

Engine	Labeco single cylinder
Engine speed (RPM)	3150
Fuel consumption (lb/hr)	4.96
Oil temperature (°C)	143 (135 for 10 grade)
Coolant temperature (°C)	93
Test length (hours)	40
Fuel	Haltermann fuel unleaded (Dyed green)
Air/Fuel	13.43/1

PERFORMANCE TESTS

MHT-4 TEOST

SCOPE

The MHT-4 TEOST is a bench test developed to correlate with piston deposit performance experienced when engines are run under high power/high temperature conditions. The test performance parameter is weight of deposit in mg.

TEST CONDITIONS

Equipment	Savant TEOST
Test length	24 hours
Depositor oil flow	0.25 g/min.
Oil volume	8.50 g
Depositor rod temp.	285°C
Air flow	10 ML/min
Catalyst concentration	0.114 g/g oil
Catalyst	Pb/Fe/Sn