

MOTORED REAR AXLE TEST
TEST PROCEDURE NO. 1APPLICATION

This procedure is used to evaluate gear oil oxidation resistance, thermal stability, corrosion resistance, bearing wear and pinion seal performance, using current production rear axle assemblies.

APPARATUS REQUIRED

The following equipment is required: a rear axle carrier assembly, an electric motor, an insulated plywood box, heat lamps, temperature recording apparatus, and a measuring graduate.

Axle

A current production Ford axle is used in this procedure. No axle shafts are used. The axle housing tube is cut off approximately 10 in. from each side of the center line. Steel plates, 6 in. by 6 in. by 1/2 in., are welded at the sectioned ends of the housing tube. The "stub" axle section is mounted between two vertical plates which are securely anchored to a bed plate.

Provision is made at the bottom of the center section of the housing for a 1/4 in. pipe sampling valve and a 1/4 in. by 6 in. vertical vent tube in one of the housing arms.

Drive

A 10 hp electric motor is used for the prime mover. Provision is made either to drive the axle directly through the universal joint flange and/or by adequate pillow block and pulley arrangement to eliminate side thrust forces on the pinion bearings. Normal test speed is 3600 rpm of the pinion shaft.

Temperature Control and Instrumentation

A 1/2 in. plywood box 20 in. by 21 in. by 33 in. (5 sides) internally insulated with 1 in. fiberglass, having a hinged vertical door 19 in. by 30 in. covers the axle housing and mounting plates. Temperature control is achieved by regulating amount of door opening. At 275 F little, if any, opening

is required and temperature control within ± 2 F can be maintained. (Higher than standard temperature (275 F) will require auxiliary heat lamps placed within the box.)

A thermocouple is placed in the center of the axle sump and readings are recorded at 60 min. intervals.

Venting

Some of the gear lubricants give off noxious odors at elevated temperatures. An optional external venting system may be connected to the plywood box to prevent those odors from entering the laboratory.

PROCEDURE

1. Install the recommended charge of test lubricant for the particular axle (5.0 pints for Ford passenger car). Start motor and bring up pinion speed in slow increments to 3600 rpm (standard test speed). Maintain standard test temperature, 275 F ± 2 F, by regulating door opening on insulation box.
2. The test is run continuously without shutdown, except for weekends. The test should be completed within two weeks. Two-ounce oil samples are taken at 50 hr. intervals, with fresh fluid replacing the samples taken.
3. Oil leakage past the pinion seal is collected and the amount recorded and recharged into the axle daily.
4. The test axle is removed at the end of 150 hr. of running and stored in laboratory ambient for 168 hr. (Average conditions: 72 F Dry bulb, 40-50% relative humidity.)

ASSEMBLY AND DISASSEMBLY OF UNIT

A new axle carrier assembly, with factory preloaded carrier and pinion bearings is required for each test. The housing is cleaned with Stanasol solvent. Pinion and carrier bearing preload is measured on each new carrier before installation. Preloads at the pinion driving flange including differential bearing adjustment, range about 35 ± 10 inch lbs. Carrier bearing spread ranges 8 to 12 thousandths.

INSPECTION OF TEST PARTS

1. At the end of the test period (standard test 150 hr.) plus storage period of 168 hrs., the remaining preload on carrier and pinion bearings is measured and loss of measured pinion and carrier bearing preload is reported in inch lbs, and carrier bearing spread in thousandths of inches. Then the axle components are disassembled and the following parts visually examined:
 - a. Bearings for corrosion and surface distress.
 - b. Pinion shaft seal for hardness, cracks and deterioration.
 - c. Gear surfaces for corrosion and distress.
 - d. Axle assembly for deposits.
2. Oil samples are analyzed according to ASTM methods for the following:
 - a. Viscosity at 100 F and 210 F SUS.
 - b. Pentane insolubles - % by weight.
 - c. Benzene insolubles - % by weight.
3. The following photographs (preferably color) are required:
 - a. Carrier assembly prior to teardown.
 - b. Pinion gear and bearings.
 - c. Pinion shaft oil seal.

VEHICLE REAR AXLE SCORE TEST
TEST PROCEDURE NO. 2

OBJECTIVE To determine anti-score capabilities of various lubricants in performance vehicles.

TEST DURATION 100 Cycles, or until gear set scoring (Noise) or failure.

SAMPLE LOT SIZE A minimum of three (3) samples.

SAMPLE SPECIFICATIONS Test samples must meet design specifications.

INSTRUMENTATION Thermocouples (dipstick)
Tachometer

TEST FACILITY Any suitable test track of 2-1/2 mile straightaway.

VEHICLE

Use current model 4 door Ford Galaxie equipped with Roll Bar. Engine required is 427 cu. in. with solid lifters. Axle specified is 9.0" diameter, 3.5 Ratio, Number C7TW-4200T. Car equipped with 4-speed manual transmission¹. Car weight is standard vehicle plus one driver. Tires (9.15 X 15) must withstand² 120 mph. Equipped with roll bar and other safety equipment.

PROCEDURE FOR TESTING

Install new carrier and test lubricant in test vehicle.

Conduct a fifty (50) mile rear axle break-in at speed of 40-50 mph using light to medium throttle pressure.

Evaluate rear axle for noise rating.

¹Standard ratios are: 2.32 low, 1.69 second, 1.29 thrid.

²For similar friction characteristics use Firestone Deluxe Champion Tires.

PROCEDURE FOR TESTING (Continued)

Proceed to designated test area; and proceed as follows:

1. With car standing still in first gear, speed engine up to 3000 rpm, then drop in clutch. Proceed WOT to 4500 rpm.
2. Quickly shift into second, run WOT to 4500 rpm.
3. Quickly shift into third, run WOT to 4500 rpm.
4. Quickly shift into 4th, run WOT to 4500 rpm.
5. Decelerate to 0.0 mph using some braking. Make two of the above accelerations in the 2-1/2 mile straightaway, followed by return cooling run to original starting point at 45 mph.

Engine oil temperature is not to exceed 260 F. Approximately 8 hours required to obtain 100 drag starts. A total of one hundred (100) acceleration cycles constitute a complete test. Should axle become noisy before completing 100 drags, test is discontinued. At the completion of the test, the rear axle is again evaluated for noise characteristics. A passing gear lubricant produces a commercially quiet axle upon completion of 100 drags.