11-27-1957

Test 609: McCormick Farmall 350 Diesel

Tractor Test & Power Museum
University of Nebraska, jsteele4@unl.edu

The Experiment Station
University of Nebraska College of Agriculture
W. V. Lambert, Director, Lincoln, Nebraska

Department of Agricultural Engineering
Dates of test: March 18, 1957 to April 5, 1957
Manufacturer: INTERNATIONAL HARVESTER COMPANY, CHICAGO 1, ILLINOIS
Manufacturer's rating: Not Rated

NEBRASKA TRACTOR TEST NO. 609

McCORMICK FARMALL 350 DIESEL

BELT HORSEPOWER TESTS

Hp	Crank shaft speed rpm	Fuel Consumption: Gal per hr	Fuel Consumption: Hp-hr per gal	Fuel Consumption: Lb per hp-hr	Temp. Deg. F.: Cooling medium	Temp. Deg. F.: Air wet bulb	Temp. Deg. F.: Air dry bulb	Barometer inches of mercury
TESTS B & C—100% MAXIMUM LOAD—TWO HOURS								
38.65	1750	2.613	14.79	0.474	162	48	62	28.797
TEST D—RATED LOAD—ONE HOUR								
34.28	1750	2.367	14.48	0.484	151	48	61	28.773
TEST E—VARYING LOAD—TWO HOURS (20 minute runs; last line average)								
33.78	1749	2.373	14.24	0.492	152	50	62	.....
1.27	1887	0.865	1.47	4.772	135	50	61	.....
18.01	1835	1.602	11.24	0.623	142	50	62	.....
35.56	1657	2.394	14.85	0.472	163	50	64	.....
9.12	1857	1.182	7.72	0.908	140	51	64	.....
26.33	1793	2.000	13.17	0.532	145	50	64	.....
20.68	1796	1.736	11.91	0.588	146	50	63	28.768

TEST L—OPERATING MAXIMUM TORQUE

% of rated rpm (engine)	100	94	90	85	79	74	70	65	60	54
% of rated-speed torque	100	105	112	116	118	123	123	121	119	115

DRAWBAR HORSEPOWER TESTS

Hp	Draw bar pull lbs	Speed miles per hr	Crank shaft speed rpm	Slip of drive wheels %	Fuel Consumption: Gal per hr	Fuel Consumption: Hp-hr per gal	Fuel Consumption: Lb per hp-hr	Temp. Deg. F.: Cooling med	Temp. Deg. F.: Air wet bulb	Temp. Deg. F.: Air dry bulb	Barometer inches of mercury
TEST H—RATED LOAD—TEN HOURS—3rd Gear											
27.76	2006	5.19	1750	4.00	2.175	12.76	0.549	141	44	45	28.649
TESTS F & G—100% MAXIMUM LOAD											
33.45	5476	2.29	1749	12.30	1st gear.....			145	37	42	28.960
36.13	3627	3.74	1752	6.76	2nd gear.....			142	34	42	29.070
36.26	2648	5.14	1749	4.80	3rd gear.....			145	36	44	29.050
36.06	2034	6.65	1748	3.82	4th gear.....			145	36	43	29.040
28.65	642	16.74	1750	0.69	5th gear.....			148	35	38	29.040
24.28	6039	1.51	1749	14.53	1st gear TA (prt-thrtl)			142	37	42	28.960
33.58	5307	2.37	1751	12.30	2nd gear torc amplifier.			143	34	42	29.075
34.75	3866	3.37	1748	7.35	3rd gear torc amplifier.			143	34	42	29.070
35.46	3016	4.41	1749	5.41	4th gear torc amplifier.			147	36	43	29.040
32.41	1091	11.14	1750	1.88	5th gear torc amplifier.			144	35	38	29.040
TEST J—OPERATING MAXIMUM LOAD											
34.85	2591	5.04	1750	6.49	3rd gear.....			145	32	40	29.120
TEST K—OPERATING MAXIMUM LOAD											
35.24	2872	4.60	1749	7.35	3rd gear.....			130	34	35	28.785

TIRES, WHEELS AND WEIGHT

	Tests F, G, & H	Test J	Test K
Rear wheels			
Type	Cast Iron	Cast Iron	Cast Iron
Liquid ballast	622 lb each	None	None
Added cast iron	840 lb each	None	None
Rear tires			
No. and size	Two 13.6-38	Two 13.6-38	Two 10-38
Ply	6	6	4
Air Pressure	20 lb	14 lb	12 lb
Front wheels			
Type	Cast Iron	Cast Iron	Cast Iron
Liquid ballast	None	None	None
Added cast iron	None	None	None
Front tires			
No. and size	Two 5.50-16	Two 5.50-16	Two 5.50-16
Ply	4	4	4
Air pressure	20 lb	20 lb	20 lb
Height of drawbar	18½ inches	18½ inches	16 inches
Static weight			
Rear end	6734 lb	3810 lb	3650 lb
Front end	1380 lb	1380 lb	1370 lb
Total weight as tested with operator	8289 lb	5365 lb	5195 lb

FUEL, OIL, WATER and TIME Fuel Diesel **Cetane No.** ASTM 50 (rating taken from oil company's typical inspection data) **Weight per gallon** 7.005 lb **Oil SAE** 20-20W **To motor** 1.125 gal **Drained from motor** 0.861 gal **Water used** 0.068 gal **Total time motor was operated** 44½ hours.

CHASSIS TYPE Tricycle **Serial No.** 1003 S **Tread width rear** 48″ to 93″ **front** 8⅛″ to 16¾″ **Wheel base** 92¼″ **Hydraulic control system** direct engine drive **Advertised speeds mph** first 2.5 second 3.8 third 5.2 fourth 6.6 fifth 16.1 reverse 3.1 (using Torque amplifier) first 1.7 second 2.6 third 3.5 fourth 4.5 fifth 10.9 reverse 2.1 **Belt pulley diam.** 9¾″ **face** 7½″ **rpm** 1082 **Belt speed 2759** fpm **Belt** flat **Length** 72′ **Width** 7″ **Thickness** 0.216″ **Maximum slip** 0.82% **Clutch** single plate dry disc operated by foot pedal **Seat** upholstered seat on conical spring with shock absorber. **Brakes** double disc brakes operated by two foot pedals. **Equalized** by locking pedals together **Power take-off** direct engine drive with independent clutch **Steering** hydraulically aided.

ENGINE Make Continental **Type** 4 cylinder vertical diesel **Serial No.** D193-980 **Crankshaft** mounted lengthwise **Head** I **Lubrication** pressure **Bore and stroke** 3¾″ x 4⅜″ **Rated rpm** 1750 **Compression ratio** 16.87 to 1 **Displacement** 193 cu. in. **Port diameter valves Inlet** 1.331″ **Exhaust** 1.125″ **Governor** variable speed centrifugal **Starting system** 12 volt battery **Air cleaner** oil washed wire screen **Muffler** was used **Oil filter** replaceable treated paper element **Fuel filter** one first stage metal edge filter and water trap, one second stage filter with replaceable pleated paper element, and one final stage replaceable sealed filter **Cooling medium temperature control** thermostat.

REPAIRS AND ADJUSTMENTS No repairs or adjustments.

REMARKS All test results were determined from observed data and without allowances, additions or deduction. Tests B and F were made with a fuel pump setting selected by the manufacturer to develop approximately 40.2 corrected maximum belt horsepower and data from these tests were used in determining the horsepower to be developed in tests D and H, respectively. Tests C, D, E, G, H, J, K and L were made with the same setting.

HORSEPOWER SUMMARY

	Drawbar	Belt
1. Sea level (calculated) maximum horsepower (based on 60° F and 29.92″ Hg)	36.76	40.23
2. Observed maximum horsepower (tests F and B)	36.26	38.65
3. Seventy-five per cent of calculated maximum drawbar horsepower and eighty-five per cent of calculated maximum belt horsepower (ASAE and SAE ratings)	27.57	34.20

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. 609.

L. F. LARSEN
Engineer-in-Charge

L. W. HURLBUT (Chairman)
G. W. STEINBRUEGGE
J. J. SULEK
Board of Tractor Test Engineers

EXPLANATION OF TEST REPORT

TEST A: The manufacturer's representative operates the tractor for a minimum of 12 hours using light to heavy drawbar loads in each gear.

This serves as a period for limber up, general observation and adjustments. Adjustments that are permissable include valve tappet clearance, breaker point gap, spark plug gaps, clutch and others of a similar nature. No new parts or accessories can be installed without having mention made of it in the report.

No data are recorded during this preliminary run except the time that the engine is operated.

BELT HORSEPOWER TESTS

TEST B: The throttle valve is wide open and the belt load on the dynamometer is adjusted so that the engine is at the rated speed recommended by the manufacturer. Carburetor, ignition timing and manifold adjustments are all set for maximum engine power.

This test is designed to determine maximum belt horsepower of the tractor at rated speed and to measure fuel consumption at the maximum power on the belt.

TEST C: For tractors with carburetors the best fuel econonmy does not always occur when the engine develops maximum power at rated speed. Test C is intended to allow the manufacturer's representative to select a more economical fuel setting even though there is a slight loss of power. *This more practical carburetor setting is used in all later tests except test F.* The throttle valve is wide open and load adjusted to give rated rpm. Tests B and C are the same for diesel tractors which have an altogether different fuel system.

TEST D: The throttle control lever is set so that the governor will maintain rated engine speed when rated load is applied. Rated load is 85% of 100% maximum, as obtained in test B, corrected to standard conditions.

This rating is somewhat less than the maximum belt horsepower in order that the operator may have a certain amount of reserve.

TEST E:

Varying load serves to show the range of engine speeds when the engine is controlled by the governor during the following varied loads, of 20 minutes each; rated load, no load, ½ rated load, maximum load at wide open throttle valve, ¼ and ¾ rated load.

The average result of this test shows the average power and fuel consumption. Since the average tractor is subjected to varying loads, these data serve well in predicting fuel consumption and efficiency of a tractor in general use.

TEST L: This torque test is run with wide open throttle. Loads are applied to reduce engine speed in approximately ten 5% increments. Rated speed equals 100%. The corresponding dynamometer torque is recorded as a per cent of torque at rated speed.

DRAWBAR HORSEPOWER TESTS

In all drawbar tests the pull exerted by the tractor is transmitted by a hydraulic pressure cylinder to a recording instrument in the test car. When rubber tires are used, all tests are made on the concrete test course. All crawler type tractors are tested on a dirt test course which is maintained by grading, sprinkling and rolling so that it remains very nearly the same throughout the season. The same tires, wheels and weights are used for all tests except J and K.

TEST F: A drawbar test, the results of which are used to determine the rated drawbar horsepower in test H. The carburetor is set to develop maximum power as in test B. The rated gear recommended by manufacturer as plow gear is used in this test. The drawbar load is adjusted to give rated engine speed.

TEST G: Maximum drawbar horsepower is determined in each gear when the carburetor is set for fuel economy as in test C. The throttle valve is held wide open and the load is applied so that the engine runs at rated engine speed.

When operating in low gear it is not uncommon for the tractor to develop less drawbar horsepower than in rated gear because of excessive wheel slippage. When excessive wheel slippage occurs the load is reduced until slippage approaches 16%. When the load is reduced it is necessary to operate the tractor engine at part throttle and control engine speed by governor action.

TEST H: Intended to test the ability of the tractor to run continuously for 10 hours at rated drawbar horsepower and to determine the fuel consumption during that time. Rated drawbar horsepower is 75% of 100% maximum drawbar horsepower (Test F), corrected to standard conditions.

When operating at rated load the throttle control lever is set to maintain rated engine speed. This rating is less than maximum drawbar horsepower in order that the operator may have a certain amount of reserve.

TEST J: The tractor is operated in rated gear with all added weight removed. This test shows the effect of the removal of added weight on the performance of the tractor when compared with test G.

Removal of wheel weights generally increases wheel slippage and decreases drawbar horsepower.

TEST K: Similar to test J except that the smallest tires and lighest wheels offered by the manufacturer are used.