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Test 669: McCormick-Farmall 560 (Diesel)

Nebraska Tractor Test Lab
University of Nebraska-Lincoln, tractortestlab@unl.edu

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

Department of Agricultural Engineering
Dates of test: September 18, 1958 to September 25, 1958
Manufacturer: INTERNATIONAL HARVESTER COMPANY, CHICAGO, ILLINOIS
Manufacturer's rating: Not Rated

NEBRASKA TRACTOR TEST NO. 669

MC CORMICK FARMALL 560 DIESEL

FUEL, OIL, WATER and TIME Fuel Diesel **Cetane No.** ASTM 50.8 (rating taken from oil company's typical inspection data)) **Weight per gallon** 7.030 lb **Oil** SAE 10W-30 **To motor** 2.054 gal **Drained from motor** 1.773 gal **Water used** 0.213 gal **Total time motor was operated** 43 hours.

CHASSIS Type tricycle **Serial No.** 734 S **Tread width rear** 50" to 94" **front** 9" and 16" **Wheel base** 95.7" **Hydraulic control system** direct engine drive **Advertised speeds mph** first 2.2 second 3.8 third 5.4 fourth 7.5 fifth 16.6 reverse 2.8 (Using Torque Amplifier) first 1.5 second 2.6 third 3.6 fourth 5.0 fifth 11.2 reverse 1.9 **Belt pulley diam** 11" **Face** 7½" **rpm** 1115 **Belt speed** 3212 fpm **Belt** flat **Length** 72' **Width** 7" **Thickness** 0.216" **Maximum slip** 0.96% **Clutch** single plate dry disc operated by foot pedal **Seat** upholstered seat with back rest on conical spring with shock absorber **Brakes** double disc brakes operated by two foot pedals **Equalized** by locking together **Power take-off** direct engine drive with independent clutch **Steering** aided by hydraulic power steering.

ENGINE Make International Diesel **Type** 6 cylinder vertical **Serial No.** D 282678 **Crankshaft mounted** lengthwise **Head** I **Lubrication** pressure **Bore and stroke** $3\ ^{11}/_{16}$" x $4\ ^{25}/_{64}$" **Rated rpm** 1800 **Compression ratio** 18.2 to 1 **Displacement** 281 cu. in. **Valves port diameter Inlet** $1\ ^{19}/_{64}$" **Exhaust** 1" **Governor** variable speed centrifugal **Starting system** 12 volt (two-6 volt batteries) **Air cleaner** oil washed wire mesh **Muffler** was used **Oil filter** replaceable treated paper element **Fuel filter** one first stage metal screen and water trap, one primary filter with replaceable pleated paper element, and one final stage replaceable pleated paper element **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 deductions. Tests B and F were made with fuel pump set to develop approximately 62.5 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, and K were made with the same setting.

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 POWER—TWO HOURS								
59.48	1800	4.114	14.46	0.486	165	65	74	28.807
TEST D—RATED POWER—ONE HOUR								
53.21	1866	3.599	14.78	0.475	156	67	74	28.795
TEST E—VARYING POWER—TWO HOURS (20 minute runs; last line average)								
53.25	1865	3.619	14.71	0.478	157	67	75	.....
1.50	1970	1.203	1.25	5.640	137	67	73	.....
27.57	1927	2.228	12.37	0.568	144	67	72	.....
59.51	1800	4.114	14.47	0.486	165	68	75	.....
13.96	1950	1.673	8.34	0.842	142	68	74	.....
40.72	1901	2.855	14.26	0.493	149	68	74	.....
32.75	1902	2.615	12.52	0.561	149	67	74	28.797

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 POWER—TEN HOURS—3rd Gear											
44.38	3036	5.48	1866	3.57	3.271	13.57	0.518	159	75	83	28.512
TESTS F & G—100% MAXIMUM POWER											
37.51	7347	1.91	1806	13.75	1st Gear (part throttle)			143	52	56	28.985
54.17	5627	3.61	1803	7.89	2nd Gear			169	76	80	28.510
54.86	3967	5.19	1800	5.44	3rd Gear			168	76	80	28.510
54.20	2767	7.35	1804	3.85	4th Gear			167	76	80	28.500
51.03	1145	16.71	1802	1.39	5th Gear			161	76	80	28.500
24.99	7259	1.29	1793	13.18	1st Gear T.A.(prt thrtl)			141	52	56	28.985
44.09	7264	2.28	1798	13.69	2nd Gear T.A.(prt thrtl)			148	52	56	28.985
52.56	5793	3.40	1806	8.34	3rd Gear Torq-Amp.			171	76	80	28.510
53.71	4144	4.86	1802	5.64	4th Gear Torq-Amp.			169	76	80	28.510
53.15	1789	11.14	1796	2.49	5th Gear Torq-Amp.			165	76	80	28.500
TEST J—OPERATING MAXIMUM POWER											
53.12	4004	4.98	1805	9.87	3rd Gear			157	64	68	28.910

TEST K—SPEED-PULL CHARACTERISTIC

Pounds Pull	3036	3967	4050	4100	4000	3900	3700
Horsepower	44.38	54.86	50.8	45.9	38.4	32.2	25.7
Miles Per Hour	5.48	5.19	4.7	4.2	3.6	3.1	2.6

TIRES, WHEELS AND WEIGHT

	Tests F, G, H & K	Test J
Rear wheels		
Type	Cast Iron	Cast Iron
Liquid ballast	768 lb each	None
Added cast iron	435 lb each	None
Rear tires		
No. and size	Two 15.5-38	Two 15.5-38
Ply	6	6
Air pressure	18 lb	14 lb
Front wheels		
Type	Pressed Steel	Pressed Steel
Liquid ballast	None	None
Added cast iron	135 lb each	None
Front tires		
No. and size	Two 6.50-16	Two 6.50-16
Ply	6	6
Air pressure	32 lb	32 lb
Height of drawbar	21 inches	22½ inches
Static weight		
Rear end	7015 lb	4610 lb
Front end	2270 lb	2000 lb
Total weight as tested with operator	9460 lb	6785 lb

HORSEPOWER SUMMARY

	Drawbar	Belt
1. Sea level (calculated) maximum horsepower (based on 60°F and 29.92" Hg)	58.67	62.60
2. Observed maximum horsepower (tests F and B)	54.86	59.48
3. Seventy-five per cent of calculated maximum drawbar horsepower and eighty-five per cent of calculated maximum belt horsepower (ASAE and SAE ratings)	44.00	53.21

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. 669.

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 manual throttle control lever is set so that the throttle valve is held 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 economy 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 manual throttle control lever is set the same as for tests B and C allowing the governor to control engine speed at part throttle. Load is applied until 85% of maximum corrected horsepower found in test B is obtained.

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.

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. The same tires, wheels and weights are used for all tests except J. All crawler type tractors are tested on an earthen test course which is maintained by grading, sprinkling and rolling so that it remains very nearly the same for each test.

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 the 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 manual throttle control lever is set so that 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 15%. 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 horsepower the manual throttle control lever is set the same as in tests F and G allowing the governor to maintain engine speed at part throttle. 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: This is intended to show the pull, horsepower, and travel speed of the tractor at rated horsepower (taken from test H); maximum horsepower (taken from test G); and at least four other conditions obtained by reducing travel speed in 10% increments by overload.