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Test 676: McCormick-Farmall Model 460 (LPG)

Nebraska Tractor Test Lab

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

Department of Agricultural Engineering
Dates of test: October 20, 1958 to October 25, 1958
Manufacturer: INTERNATIONAL HARVESTER COMPANY, CHICAGO, ILLINOIS
Manufacturer's rating: Not Rated

NEBRASKA TRACTOR TEST NO. 676

MC CORMICK FARMALL 460 LPG

BELT HORSEPOWER TESTS

Hp	Crank shaft speed rpm	Fuel Consumption			Temp. Deg. F.			Barometer inches of mercury
		Gal per hr	Hp-hr per gal	Lb per hp-hr	Cooling medium	Air wet bulb	Air dry bulb	
TEST B—100% MAXIMUM POWER—TWO HOURS								
49.85	1800	5.607	8.89	0.478	167	55	72	29.030
TEST C—OPERATING MAXIMUM POWER—ONE HOUR								
46.86	1800	5.045	9.29	0.458	159	55	71	29.020
TEST D—RATED POWER—ONE HOUR								
44.21	1861	4.873	9.07	0.468	152	54	70	29.020
TEST E—VARYING POWER—TWO HOURS (20 minute runs; last line average)								
44.26	1866	4.934	8.97	0.474	151	53	68	.....
1.47	1936	1.800	0.82	5.204	138	53	67	.....
22.31	1872	3.282	6.80	0.625	142	53	67	.....
47.05	1806	5.139	9.16	0.464	159	54	70	.....
11.44	1913	2.428	4.71	0.902	141	54	68	.....
33.41	1872	4.080	8.19	0.519	148	56	73	.....
26.66	1878	3.611	7.38	0.576	146	54	69	29.023

DRAWBAR HORSEPOWER TESTS

Hp	Draw bar pull lbs	Speed miles per hr	Crank shaft speed rpm	Slip of drive wheels %	Fuel Consumption			Temp. Deg. F.			Barometer inches of mercury
					Gal per hr	Hp-hr per gal	Lb per hp-hr	Cool- ing med	Air wet bulb	Air dry bulb	
TEST H—RATED POWER—TEN HOURS—3rd Gear											
36.17	2461	5.51	1869	2.89	4.479	8.08	0.526	146	48	58	28.820
TEST F—100% MAXIMUM POWER											
46.11	3290	5.26	1801	3.84	3rd Gear	.....	.....	160	51	64	28.755
TEST G—OPERATING MAXIMUM POWER											
40.96	6394	2.40	1801	9.33	1st Gear	.....	.....	154	51	66	28.750
43.03	4180	3.86	1807	5.14	2nd Gear	.....	.....	153	51	66	28.740
43.33	3080	5.28	1803	3.71	3rd Gear	.....	.....	154	51	64	28.755
42.37	2103	7.56	1800	2.58	4th Gear	.....	.....	154	50	63	28.745
38.81	858	16.96	1798	0.47	5th Gear	.....	.....	152	51	65	28.740
29.10	6903	1.58	1808	12.03	1st Gear TA (prt thrtl)	.....	.....	142	44	52	28.760
40.41	6065	2.50	1799	8.59	2nd Gear Torq. Amp.	.....	.....	159	51	66	28.740
41.84	4496	3.49	1807	5.68	3rd Gear Torq. Amp.	.....	.....	158	51	66	28.740
42.72	3190	5.02	1799	3.84	4th Gear Torq. Amp.	.....	.....	152	51	66	28.740
38.91	1284	11.36	1800	1.43	5th Gear Torq. Amp.	.....	.....	146	50	63	28.745
TEST J—OPERATING MAXIMUM POWER											
43.01	3137	5.14	1798	6.49	3rd Gear	.....	.....	127	42	44	29.220
TEST K—SPEED-PULL CHARACTERISTIC											
Pounds Pull	2461	3080	3150	3200	3250	3200	3000				
Horsepower	36.17	43.33	39.5	35.8	32.1	27.3	20.8				
Miles Per Hour	5.51	5.28	4.7	4.2	3.7	3.2	2.6				

FUEL, OIL, WATER and TIME Fuel commercial propane Weight per gallon 4.25 lb Oil SAE 20-20W To motor 2.190 gal Drained from motor 1.648 gal Water used 0.379 gal Total time motor was operated 44 hours.

CHASSIS Type tricycle Serial No. 1075 S Tread width rear 48" to 93" front 8" and 16" Wheel base 94.9" Hydraulic control system direct engine drive Advertised speeds mph first 2.6 second 3.9 third 5.3 fourth 7.5 fifth 16.6 reverse 3.2 (Using Torque Amplifier) first 1.7 second 2.7 third 3.6 fourth 5.1 fifth 11.2 reverse 2.2 Belt pulley diam. 11" Face 6.5" rpm 1112 Belt speed 3202 fpm Belt flat Length 72" Width 7" Thickness 0.216" Maximum slip 0.61% Clutch single plate dry disc operated by foot pedal Seat upholstered seat and back rest on conical spring with shock absorber Brakes double disc 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 LPG Type 6 cylinder vertical Serial No. C221 1613 Crankshaft mounted lengthwise Head I Lubrication pressure Bore and stroke 3¹¹/₁₆" x 3¹¹/₁₆" Rated rpm 1800 Compression ratio 8.75 to 1 Displacement 221 cu. in. Valves port diameter Inlet 1¹/₈" Exhaust 1⁵/₁₆" Governor variable speed centrifugal Carburetor size 1¹/₄" Ignition system battery Starting system 12 volt battery Air cleaner oil washed wire screen Muffler was used Oil filter replaceable treated 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 carburetor set for 100% 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 an operating setting of the carburetor (selected by the manufacturer) of 94.0% of maximum belt horsepower.

TIRES, WHEELS AND WEIGHT

	Tests F, G, H & K	Test J
Rear wheels		
Type	Cast Iron	Cast Iron
Liquid ballast	690 lb each	None
Added cast iron	725 lb each	None
Rear tires		
No. and size	Two 13.6-38	Two 13.6-38
Ply	6	6
Air pressure	20 lb	14 lb
Front wheels		
Type	Pressed Steel	Pressed Steel
Liquid ballast	None	None
Added cast iron	138 lb each	None
Front tires		
No. and size	Two 6.00-16	Two 6.00-16
Ply	6	6
Air pressure	36 lb	36 lb
Height of drawbar	21 inches	22 inches
Static weight		
Rear end	6785 lb	3955 lb
Front end	2055 lb	1780 lb
Total weight as tested with operator	9015 lb	5910 lb

HORSEPOWER SUMMARY

	Drawbar	Belt
1. Sea level (calculated) maximum horsepower (based on 60° F and 29.92" Hg)	48.16	51.96
2. Observed maximum horsepower (tests F and B)	46.11	49.85
3. Seventy-five per cent of calculated maximum drawbar horsepower and eighty-five per cent of calculated maximum belt horsepower (ASAE and SAE ratings)	36.12	44.17

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. 676.

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 permissible 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, $\frac{1}{2}$ rated load, maximum load at wide open throttle valve, $\frac{1}{4}$ and $\frac{3}{4}$ 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.

