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Test 537: McCormick Farmall Model 100

Nebraska Tractor Test Lab

University of Nebraska-Lincoln, tractortestlab@unl.edu

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Department of Agricultural Engineering
Dates of test: April 18 to April 29, 1955
Manufacturer: INTERNATIONAL HARVESTER
COMPANY, CHICAGO, ILLINOIS
Manufacturer's rating: Drawbar 18.5 Hp, Belt 21.0 Hp
(Corrected to standard conditions)

NEBRASKA TRACTOR TEST NO. 537

McCORMICK FARMALL 100

BELT HORSEPOWER TESTS

Hp	Crank shaft speed rpm	Fuel Consumption			Water used gal per hour	Temp Deg F		Barometer inches of mercury		
		Gal per hour	Hp-hr per gal	Lb per hp-hour		Cooling med	Air			
TEST B—100% MAXIMUM LOAD—TWO HOURS										
20.13	1401	2.057	9.79	0.618	0.00	175	67	28.773		
TEST C—OPERATING MAXIMUM LOAD—ONE HOUR										
1834	1401	1.675	10.95	0.553	0.00	174	73	28.520		
TEST D—RATED LOAD—ONE HOUR										
17.95	1400	1.720	10.44	0.580	0.00	174	71	28.500		
TEST E—VARYING LOAD—TWO HOURS (20 minute runs; last line average)										
17.96	1400	1.720	10.44	0.580	...	173	71		
1.48	1583	0.853	1.74	3.486	...	185	70		
9.62	1491	1.309	7.35	0.823	...	180	70		
17.18	1299	1.557	11.03	0.548	...	175	69		
5.01	1549	1.046	4.79	1.263	...	184	69		
14.03	1453	1.581	8.87	0.682	...	183	70		
10.88	1462	1.344	8.10	0.748	0.00	180	70	28.490		
TORQUE (At Dynamometer)										
Eng rpm	1396	1319	1246	1176	1104	1025	949	872	795	727
Lb-ft	137.4	138.1	140.9	143.2	145.4	146.7	146.5	144.6	142.6	140.9
Dyn rpm	696	657	621	586	549	510	472	434	396	361

DRAWBAR HORSEPOWER TESTS

Hp	Draw bar pull lb	Speed miles per hr	Crank shaft speed rpm	Slip of drive wheels %	Fuel Consumption			Water used gal per hour	Temp Deg F		Barometer inches of mercury
					Gal per hour	Hp-hr per gal	Lb per hp-hr		Cooling med	Air	
TEST H—RATED LOAD—TEN HOURS—2nd Gear											
14.52	1376	3.96	1400	4.41	1.603	9.06	0.668	0.00	178	75	28.449
TEST F—100% MAXIMUM LOAD											
17.83	1719	3.89	1400	5.95	2nd Gear.....				176	79	28.600
TEST G—OPERATING MAXIMUM LOAD											
15.76	2503	2.36	1400	9.47	1st Gear.....				171	84	28.380
16.45	1564	3.94	1401	4.79	2nd Gear.....				172	83	28.390
16.01	1142	5.26	1399	34.1	3rd Gear.....				173	84	28.400
14.53	488	11.16	1401	1.38	4th Gear.....				180	79	28.620
TEST J—OPERATING MAXIMUM LOAD											
16.19	1594	3.81	1404	9.45	2nd Gear.....				170	69	29.180
TEST K—OPERATING MAXIMUM LOAD											
13.33	1593	3.14	1402	16.64	2nd Gear (Part Throttle)...				170	75	29.150

TIRES, WHEELS AND WEIGHT

	Tests F, G, & H	Test J	Test K
Rear wheels	Pressed steel & cast iron	Pressed steel & cast iron	Pressed steel & cast iron
Liquid ballast	370 lb each	None	None
Added cast iron	280 lb each	None	None
Rear tires			
No. and size	Two 11-24	Two 11-24	Two 9-24
Ply	4	4	4
Air pressure	12 lb	12 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 5.00-15	Two 5.00-15	Two 5.00-15
Ply	4	4	4
Air pressure	28 lb	28 lb	28 lb
Height of drawbar	19 inches	21 inches	17½ inches
Static weight			
Rear end	3166 lb	1867 lb	1800 lb
Front end	992 lb	996 lb	988 lb
Total weight as tested with operator	4333 lb	3038 lb	2963 lb

FUEL, OIL and TIME Gasoline Octane No. ASTM 80.8 Research 85.9 (rating taken from oil company's typical inspection data); weight per gallon 6.052 lb OIL SAE 20; to motor 1.101 gal; drained from motor 0.864 gal; Total time motor was operated 46 hours.

CHASSIS Type Standard Serial No. 2643 Tread width rear 40" to 68" front 44" to 70" Wheel base 71" Hydraulic control system direct engine drive Advertised speeds mph first 2.32 second 3.68 third 4.84 fourth 10.05 reverse 2.90 Belt pulley diam 8½" face 6" rpm 1157 Belt speed 2574 fpm Clutch single plate dry disc operated by foot pedal Seat upholstered seat on leaf springs. Brakes contracting band Equalized by locking pedals together Power take-off conventional type.

ENGINE Make International Harvester Type 4 cylinder vertical Serial No. ECM204711 Crankshaft mounted lengthwise Head I Lubrication pressure Bore and stroke 3½" x 4" Rated rpm 1400 Compression ratio 6.5 to 1 Displacement 123 cu. in. Port diameter valves inlet 1 3/16" exhaust 1" Governor variable speed centrifugal Carburetor size ¾" Ignition system battery Starting system 6 volt battery Air cleaner oil washed wire screen Muffler was used Oil filter replaceable radial fin treated paper element Cooling medium temperature control thermostat and shutter.

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 & K were made with an operating setting of the carburetor (selected by the manufacturer) of 92.5% of maximum belt horsepower.

HORSEPOWER SUMMARY

	Drawbar	Belt
1. Sea level (calculated) maximum horsepower (based on 60°F and 29.92" HG)	18.99	21.07
2. Observed maximum horsepower (tests F and B)	17.83	20.13
3. Seventy-five per cent of calculated maximum drawbar horsepower and eighty-five per cent of calculated maximum belt horsepower (formerly ASAE and SAE ratings)	14.24	17.91

We, the undersigned, certify that this is a true and correct report of official tractor test No. 537.

L. F. LARSEN
Engineer-in-Charge

C. W. SMITH
L. W. HURLBUT
F. D. YUNG
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 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 held 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, $\frac{1}{2}$ 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.

Torque, lb-ft at dynamometer, is obtained with wide open throttle and sufficient load is applied to give several readings.

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. All tests are made on the same 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 lightest wheels offered by the manufacturer are used.

