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Test 540: John Deere 50 LPG

Nebraska Tractor Test Lab

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Department of Agricultural Engineering
Dates of test: May 9 to May 13, 1955
Manufacturer: JOHN DEERE WATERLOO TRACTOR WORKS OF DEERE MANUFACTURING COMPANY, WATERLOO, IOWA
Manufacturer's rating: Not rated

NEBRASKA TRACTOR TEST NO. 540

JOHN DEERE 50 LP

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										
31.20	1250	3.620	8.62	0.493	0.00	165	65	29.050		
TEST C—OPERATING MAXIMUM LOAD—ONE HOUR										
30.18	1250	3.306	9.13	0.466	0.00	162	60	29.030		
TEST D—RATED LOAD—ONE HOUR										
27.61	1250	3.056	9.03	0.470	0.00	161	60	29.030		
TEST E—VARYING LOAD—TWO HOURS (20 minute runs; last line average)										
27.69	1252	3.064	9.04	0.470	...	161	60	.....	
1.53	1309	1.186	1.29	3.294	...	144	60	.....	
14.21	1283	2.061	6.89	0.616	...	150	60	.....	
28.94	1201	3.198	9.05	0.470	...	161	60	.....	
7.02	1293	1.504	4.67	0.910	...	149	59	.....	
21.05	1269	2.513	8.38	0.507	...	158	64	.....	
16.74	1268	2.254	7.43	0.572	0.00	154	60	29.020		
TORQUE (At Dynamometer)										
Eng rpm	1248	1181	1117	1048	982	916	852	779	726	660
Lb-ft	185.5	184.8	188.5	194.3	198.6	199.9	199.3	189.0	178.5	166.8
Dyn rpm	853	808	764	717	669	624	579	538	491	449

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—4th Gear											
22.13	1858	4.47	1251	5.12	2.828	7.83	0.543	0.00	161	65	28.903
TEST F—100% MAXIMUM LOAD											
28.11	2389	4.41	1250	6.07	4th gear	.....	.....	.....	165	69	29.050
TEST G—OPERATING MAXIMUM LOAD											
12.59	3466	1.36	1253	16.30	1st gear (Part Throttle)	.....	.....	.....	157	75	29.000
20.44	3480	2.20	1253	16.96	2nd gear (Part Throttle)	.....	.....	.....	160	74	29.000
27.10	3068	3.31	1251	9.43	3rd gear	.....	.....	.....	164	70	29.030
26.90	2274	4.44	1252	5.81	4th gear	.....	.....	.....	161	71	29.030
27.55	1819	5.68	1250	4.50	5th gear	.....	.....	.....	163	70	29.020
26.34	956	10.33	1250	2.39	6th gear	.....	.....	.....	161	70	29.020
TEST J—OPERATING MAXIMUM LOAD											
26.15	2223	4.41	1252	6.57	4th gear	.....	.....	.....	160	72	28.850
TEST K—OPERATING MAXIMUM LOAD											
26.31	2324	4.25	1253	7.12	4th gear	.....	.....	.....	158	70	28.830

TIRES, WHEELS AND WEIGHT

	Tests F, G, & H	Test J	Test K
Rear wheels			
Type	Cast iron	Cast iron	Cast iron
Liquid ballast	187 lb each	None	None
Added cast iron	None	None	None
Rear tires			
No. and size	Two 11-38	Two 11-38	Two 10-38
Ply	4	4	4
Air pressure	12 lb	12 lb	12 lb
Front wheels			
Type	Pressed steel	Pressed steel	Pressed steel
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	28 lb	28 lb	28 lb
Height of drawbar	18 inches	18½ inches	17 inches
Static weight			
Rear end	4010 lb	3636 lb	3584 lb
Front end	1460 lb	1478 lb	1460 lb
Total weight as tested with operator	5645 lb	5289 lb	5219 lb

FUEL, OIL and TIME Commercial Propane Octane No. 100 (rating taken from oil company's typical inspection data): weight per gallon 4.25 lb OIL SAE 20; to motor 1.476 gal drained from motor 1.026 gal Total time motor was operated 39 hours.

CHASSIS Type Tricycle Serial No. 5024461 Tread width rear 56" to 88" front 75/16" and 11 3/16" Wheel base 90" Hydraulic control system direct engine drive with throw out lever Advertised speeds mph first 1½ second 2½ third 3½ fourth 4½ fifth 5¾ sixth 10 reverse 2½ Belt pulley diam 9 11/16" face 7¼" rpm 1250 Belt speed 3170 fpm Clutch dry double disc operated by hand lever Seat upholstered seat with back rest Brakes internal expanding shoe operated by two foot pedals Equalized no Power take-off direct engine drive with independent clutch Steering aided by hydraulic power steering.

ENGINE Make John Deere Type 2-cylinder horizontal Serial No. 5024461 Crankshaft mounted crosswise Head I Lubrication pressure Bore and stroke 4 11/16" x 5½" Rated rpm 1250 Compression ratio 8 to 1 Displacement 190.4 cu. in. Port diameter valves inlet 1 9/16" exhaust 1 3/8" Governor variable speed centrifugal Carburetor size 1 3/8" Ignition system battery Starting system 2-6 volt batteries Air cleaner Oil washed wire mesh Muffler was used Oil filter replaceable impregnated 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 96.3% of maximum belt horsepower.

HORSEPOWER SUMMARY

	Drawbar	Belt
1. Sea level (calculated) maximum horsepower (based on 60° F. and 29.92" HG)	29.20	32.29
2. Observed maximum horsepower (Tests F and B)	28.11	31.20
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)	21.90	27.45

We, the undersigned, certify that this is a true and correct report of official tractor test No. 540.

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.

