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Test 514: John Deere 70 LPG

Nebraska Tractor Test Lab
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The Experiment Station
University of Nebraska College of Agriculture
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Department of Agricultural Engineering
Dates of test: November 6 to November 12, 1953
Manufacturer: JOHN DEERE WATERLOO TRACTOR WORKS OF DEERE MANUFACTURING COMPANY, WATERLOO, IOWA
Manufacturer's rating: Not rated.

NEBRASKA TRACTOR TEST NO. 514

JOHN DEERE 70 LP

FUEL, OIL and TIME Commercial Propane octane No 100 (rating taken from oil company's typical inspection data); **weight per gallon** 4.170 lb **OIL** SAE 20; **to motor** 2.331 gal; **drained from motor** 1.734 gal **Total time motor was operated** 41 hours.

CHASSIS TYPE Tricycle **Serial No** 7003465 **Tread width** rear 60" to 88" front 8 5/16" and 12 1/16" **Wheel Base** 91" **Hydraulic control system** direct engine drive with throwout lever **Advertised speeds mph** first 2.5 second 3.5 third 4.5 fourth 6.5 fifth 8.75 sixth 12.5 reverse 3.25 **Belt pulley** diam 12⅞" face 7⅜" **rpm** 975 **Belt speed** 3285 fpm **Clutch** dry multiple 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.

ENGINE Make John Deere **Type** 2 cylinder horizontal **Serial No** 7003465 **Crankshaft mounted** crosswise **Head I Lubrication** pressure **Bore and Stroke** 5⅞" x 7" **Rated rpm** 975 **Compression ratio** 7.3 to 1 **Displacement** 379.5 cu in **Port Diameter Valves** Inlet 1 15/16" Exhaust 1¾" **Governor** Variable speed centrifugal **Carburetor size** 1½" **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 & K were made with an operating setting of the carburetor (selected by the manufacturer) of 94.6% of maximum belt horsepower.

BELT HORSEPOWER TESTS

Hp	Crank shaft speed rpm	Fuel Consumption: Gal per hour	Fuel Consumption: Hp-hr per gal	Fuel Consumption: Lb per hp-hour	Water used gal per hour	Temp Deg F: Cooling med	Temp Deg F: Air	Barometer inches of mercury
TEST B—100% MAXIMUM LOAD—TWO HOURS								
50.86	975	5.761	8.83	0.472	0.00	162	59	29.250
TEST C—OPERATING MAXIMUM LOAD—ONE HOUR								
48.18	975	5.036	9.57	0.436	0.00	158	58	29.280
TEST D—RATED LOAD—ONE HOUR								
44.20	976	4.643	9.52	0.438	0.00	156	58	29.280
TEST E—VARYING LOAD—TWO HOURS (20 minute runs; last line average)								
44.34	979	4.655	9.53	0.438	...	156	60	.....
2.12	1110	1.640	1.29	3.226	...	155	64	.....
23.86	1043	3.137	7.61	0.548	...	162	61	.....
47.51	951	4.914	9.67	0.431	...	159	56	.....
12.19	1064	2.237	5.45	0.765	...	155	62	.....
34.95	1024	4.000	8.74	0.477	...	164	59	.....
27.50	1028	3.430	8.02	0.520	0.00	158	60	29.280

TORQUE (At Dynamometer)

Eng rpm	992	944	889	843	796	747	704	654	601	552
Lb-ft	284.6	294.2	298.7	297.2	296.3	290.0	287.7	279.3	275.8	266.5

DRAWBAR HORSEPOWER TESTS

Hp	Draw bar pull lb	Speed miles per hr	Crank shaft speed rpm	Slip of drive wheels %	Fuel Consumption: Gal per hour	Fuel Consumption: Hp-hr per gal	Fuel Consumption: Lb per hp-hr	Water used gal per hour	Temp Deg F: Cooling med	Temp Deg F: Air	Barometer inches of mercury
TEST F—100% MAXIMUM LOAD—3rd Gear											
45.60	3819	4.48	975	6.57	..... Not Recorded				160	46	29.190
TEST G—OPERATING MAXIMUM LOAD											
35.33	6127	2.16	976	16.67	..... Not Recorded				152	31	29.210
43.67	4919	3.33	976	9.54	..... Not Recorded				150	31	29.210
43.64	3632	4.51	978	6.36	..... Not Recorded				152	33	29.210
43.13	2485	6.51	978	4.48	..... Not Recorded				163	48	29.210
40.18	1693	8.90	973	3.03	..... Not Recorded				154	47	29.120
38.69	1130	12.84	979	1.23	..... Not Recorded				150	40	29.200
TEST H—RATED LOAD—TEN HOURS—3rd Gear											
34.95	2878	4.55	975	4.99	4.190	8.34	0.500	0.00	151	46	29.227
TEST J—OPERATING MAXIMUM LOAD—3rd Gear											
42.69	3646	4.39	976	9.15	..... Not Recorded				158	37	29.170
TEST K—OPERATING MAXIMUM LOAD—3rd Gear											
38.56	3780	3.83	975	17.12	..... Not Recorded				156	40	29.160

TIRES, WHEELS AND WEIGHT

	Tests F, G & H	Test J	Test K
Rear wheels Type	Cast iron	Cast iron	Cast iron
Liquid ballast	551 lb each	None	None
Added cast iron	435 lb each	None	None
Rear tires No. and size	Two 13-38	Two 13-38	Two 12-38
Ply	6	6	6
Air pressure	14 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 6.00-16	Two 6.00-16	Two 6.00-16
Ply	4	4	4
Air pressure	28 lb	28 lb	28 lb
Height of drawbar	18 inches	19 inches	18 inches
Static weight Rear end	6624 lb	4653 lb	4581 lb
Front end	1969 lb	1952 lb	1953 lb
Total weight as tested with operator	8768 lb	6780 lb	6709 lb

HORSEPOWER SUMMARY

	Drawbar	Belt
1. Sea level (calculated) maximum horsepower (based on 60° F and 29.92" HG)	46.11	51.97
2. Observed maximum horsepower (tests F & B)	45.60	50.86
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)	34.58	44.17

We, the undersigned, certify that this is a true and correct report of official tractor test No. 514.

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, 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.

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.