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Larsen

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9-5-1956

## Test 590: John Deere 520/530 LPG

Nebraska Tractor Test Lab

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Department of Agricultural Engineering

Dates of test: September 5, 1956 to September 11, 1956

Manufacturer: JOHN DEERE WATERLOO

TRACTOR WORKS OF DEERE MANUFACTURING CO., WATERLOO, IOWA

Manufacturer's rating: Not rated

NEBRASKA TRACTOR TEST NO. 590

JOHN DEERE 520 LP

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			
<b>TEST B—100% MAXIMUM LOAD—TWO HOURS</b>										
37.24	1325	3.878	9.60	0.443	166	52	60	29.250		
<b>TEST C—OPERATING MAXIMUM LOAD—ONE HOUR</b>										
35.75	1325	3.482	10.27	0.414	164	52	59	29.250		
<b>TEST D—RATED LOAD—ONE HOUR</b>										
32.46	1325	3.205	10.13	0.420	162	52	60	29.255		
<b>TEST E—VARYING LOAD—TWO HOURS (20 minute runs; last line average)</b>										
32.49	1325	3.226	10.07	0.422	163	53	61	.....		
1.58	1385	1.179	1.34	3.171	150	54	64	.....		
16.78	1365	2.118	7.92	0.536	159	52	60	.....		
34.76	1287	3.332	10.43	0.407	165	52	59	.....		
8.50	1378	1.581	5.38	0.791	152	52	60	.....		
24.91	1355	2.668	9.34	0.455	161	52	60	.....		
13.84	1349	2.351	8.44	0.504	158	52	60	29.251		
<b>TEST L—OPERATING MAXIMUM TORQUE</b>										
% of rated rpm (engine)	100	95	90	85	80	75	70	65	60	56
% of rated-speed torque	100	100	100	100	102	105	106	103	100	96

DRAWBAR HORSEPOWER TESTS

Hp	Crank shaft speed rpm	Speed miles per hr	Slip of drive wheels %	Fuel Consumption			Temp. Deg. F.			Barometer inches of mercury	
				Gal per hr	Hp-hr per gal	Lb per hp-hr	Cooling med	Air wet bulb	Air dry bulb		
<b>TEST H—RATED LOAD—TEN HOURS—4th Gear</b>											
26.10	2229	4.39	1325	3.95	2.941	8.87	0.479	164	54	67	29.282
<b>TEST F—100% MAXIMUM LOAD</b>											
33.30	2891	4.32	1324	5.42	4th Gear	.....	.....	164	50	64	29.270
<b>TEST G—OPERATING MAXIMUM LOAD</b>											
16.49	4659	1.33	1325	15.80	1st gear (part throttle)	.....	.....	154	49	55	29.250
27.19	4585	2.22	1326	13.68	2nd gear (part throttle)	.....	.....	160	51	57	29.240
32.75	3754	3.27	1324	7.72	3rd gear	.....	.....	165	51	60	29.230
32.30	2792	4.34	1326	5.23	4th gear	.....	.....	165	52	64	29.240
33.25	2243	5.56	1324	3.80	5th gear	.....	.....	166	51	63	29.240
31.41	1165	10.11	1326	1.71	6th gear	.....	.....	164	51	62	29.220
<b>TEST J—OPERATING MAXIMUM LOAD</b>											
31.06	2671	4.36	1328	4.83	4th gear	.....	.....	166	60	68	28.750
<b>TEST K—OPERATING MAXIMUM LOAD</b>											
30.12	2702	4.18	1326	7.31	4th gear	.....	.....	165	62	76	28.780

TIRES, WHEELS AND WEIGHT

	Tests F, G, & H	Test J	Test K
<b>Rear wheels</b>			
Type	Cast iron	Cast iron	Cast iron
Liquid ballast	355 lb each	None	None
Added cast iron	None	None	None
<b>Rear tires</b>			
No. and size	Two 13.9 - 36	Two 13.9 - 36	Two 12.4 - 36
Ply	4	4	4
Air pressure	14 lb	14 lb	14 lb
<b>Front wheels</b>			
Type	Pressed steel	Pressed steel	Pressed steel
Liquid ballast	None	None	None
Added cast iron	None	None	None
<b>Front tires</b>			
No. and size	Two 5.50 - 16	Two 5.50 - 16	Two 5.50 - 16
Ply	4	4	4
Air pressure	32 lb	32 lb	32 lb
<b>Height of drawbar</b>	17½ inches	17½ inches	17½ inches
<b>Static weight</b>			
Rear end	5070 lb	4360 lb	4285 lb
Front end	1360 lb	1360 lb	1360 lb
<b>Total weight as tested with operator</b>	6605 lb	5895 lb	5820 lb

FUEL OIL, WATER and TIME Fuel Commercial Propane Weight per gallon 4.25 lb Oil SAE 10W To motor 1.472 gal Drained from motor 0.975 gal Water used none Total time motor was operated 43½ hours.

CHASSIS TYPE Tricycle Serial No. 5200017 Tread width rear 56" to 88" front 7 5/16" 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 7/4" rpm 1325 Belt speed 3360 fpm Belt flat Length 72" Width 7" Thickness 0.216" Maximum slip 0.83% Clutch double disc dry type operated by hand lever Seat upholstered seat cushioned by rubber in torsion 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. 5200017 Crankshaft mounted crosswise Head I Lubrication pressure Bore and stroke 4 11/16" x 5 1/2" Rated rpm 1325 Compression ratio 8.75 to 1 Displacement 189.8 cu. in. Port diameter valves inlet 1½" exhaust 1¼" Governor variable speed centrifugal Carburetor size 1¾" Ignition system battery Starting system 12 volt (two-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, & L were made with an operating setting of the carburetor (selected by the manufacturer) of 95.9% of maximum belt horsepower.

HORSEPOWER SUMMARY

	Drawbar	Belt
1. Sea level (calculated) maximum horsepower (based on 60°F and 29.92" Hg)	34.17	38.09
2. Observed maximum horsepower (tests F and B)	33.30	37.24
3. Seventy-five per cent of calculated maximum drawbar horsepower and eighty-five per cent of calculated maximum belt horsepower (ASAE and SAE ratings)	25.63	32.38

We, the undersigned certify that this is a true and correct report of official Tractor Test No. 590.

L. F. LARSEN,  
Engineer-in-Charge

L. W. HURLBUT  
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 throttle valve is 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 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.

**TEST L:** This torque test is run with wide open throttle. Loads are applied to reduce engine speed in approximately ten 5% increments. Rated speed equals 100%. The corresponding dynamometer torque is recorded as a per cent of torque at rated speed.

### DRAWBAR HORSEPOWER TESTS

In all drawbar tests the pull exerted by the tractor is transmitted by a hydraulic pressure cylinder to a recording instru-

ment in the test car. When rubber tires are used, all tests are made on the concrete test course. All crawler type tractors are tested on a 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.

