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## Test 546: John Deere 40 S All-Fuel

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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: June 3 to June 10, 1955  
Manufacturer: JOHN DEERE DUBUQUE TRACTOR  
WORKS OF DEERE MANUFACTURING COM-  
PANY, DUBUQUE, IOWA  
Manufacturer's rating: Not rated

NEBRASKA TRACTOR TEST NO. 546

JOHN DEERE 40-S ALL FUEL

**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			
<b>TEST B—100% MAXIMUM LOAD—TWO HOURS</b>										
20.04	1850	2.003	10.00	0.664	0.00	194	68	28.920		
<b>TEST C—OPERATING MAXIMUM LOAD—ONE HOUR</b>										
19.13	1851	1.821	10.51	0.633	0.00	199	75	28.893		
<b>TEST D—RATED LOAD—ONE HOUR</b>										
17.80	1850	1.817	9.80	0.678	0.00	194	75	28.880		
<b>TEST E—VARYING LOAD—TWO HOURS (20 minute runs; last line average)</b>										
17.76	1850	1.815	9.79	0.679	...	195	74	.....		
0.44	1996	0.854	0.52	12.886	...	200	76	.....		
9.23	1914	1.264	7.30	0.910	...	197	75	.....		
18.61	1786	1.761	10.57	0.629	...	203	72	.....		
4.72	1955	1.021	4.62	1.436	...	200	74	.....		
13.70	1897	1.535	8.93	0.745	...	195	73	.....		
10.74	1899	1.375	7.81	0.851	0.00	198	74	28.870		
<b>TORQUE (At Dynamometer)</b>										
Eng rpm	1852	1760	1655	1545	1491	1391	1249	1148	1041	939
Lb-ft	119.0	121.8	124.2	127.2	130.4	132.6	131.9	130.1	125.6	119.4
Dyn rpm	842	800	752	702	655	609	567	521	472	426

**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	
<b>TEST H—RATED LOAD—TEN HOURS—3rd Gear</b>											
14.35	1329	4.05	1849	6.10	1.652	8.69	0.765	0.00	188	58	28.735
<b>TEST F—100% MAXIMUM LOAD</b>											
18.12	1707	3.98	1850	7.72	3rd gear	.....	.....	0.00	194	71	28.840
<b>TEST G—OPERATING MAXIMUM LOAD</b>											
9.28	2511	1.39	1848	15.78	1st gear (part throttle)	.....	.....	.....	181	64	28.730
16.68	2201	2.84	1848	11.86	2nd gear	.....	.....	.....	190	71	28.840
17.44	1638	3.99	1851	7.46	3rd gear	.....	.....	.....	195	71	28.840
15.04	543	10.39	1856	2.53	4th gear	.....	.....	.....	188	72	28.730
<b>TEST J—OPERATING MAXIMUM LOAD</b>											
16.12	1589	3.80	1851	12.64	3rd gear	.....	.....	.....	182	58	28.720

**TIRES, WHEELS AND WEIGHT Tests F, G, & H**

	Tests F, G, & H	Test J
<b>Rear wheels</b>		
Type	Pressed steel	Pressed steel
Liquid ballast	200 lb each	None
Added cast iron	381 lb each	None
<b>Rear tires</b>		
No. and size	Two 9-24	Two 9-24
Ply	4	4
Air pressure	18 lb	12 lb
<b>Front wheels</b>		
Type	Pressed steel	Pressed steel
Liquid ballast	None	None
Added cast iron	None	None
<b>Front tires</b>		
No. and size	Two 5.00-15	Two 5.00-15
Ply	4	4
Air pressure	28 lb	28 lb
<b>Height of drawbar</b>	13½ inches	14 inches
<b>Static weight</b>		
Rear end	2994 lb	1832 lb
Front end	990 lb	1000 lb
<b>Total weight as tested with operator</b>	4159 lb	3007 lb

FUEL, OIL and TIME Tractor Fuel Octane No. ASTM 42 (rating taken from oil company's typical inspection data): weight per gallon 6.643 lb Oil SAE 20 to motor 1.037 gal drained from motor 1.103 gal Total time motor was operated 47½ hours.

CHASSIS Type Standard Serial No. 40S-69114 Tread width rear 38¼" to 54¼" front 39½" to 55" Wheel base 70½" Hydraulic control system direct engine drive Advertised speeds mph first 1½ second 3½ third 4¼ fourth 12 reverse 2½ Belt pulley diam 9 1/16" face 6 3/8" rpm 1267 Belt speed 3006 fpm Clutch single plate dry disc operated by foot pedal Seat upholstered seat cushion with back rest Brakes double disc brakes operated by two foot pedals side by side Equalized by foot action Power take-off standard type.

ENGINE Make John Deere Type two cylinder vertical Serial No. 69114 Crankshaft mounted lengthwise Head 1 Lubrication pressure Bore and stroke 4" x 4" Rated rpm 1850 Compression ratio 5.2 to 1 Displacement 101 cu in Port diameter valves inlet 1 31/64" exhaust 1 23/64" Governor variable speed centrifugal Carburetor size 1" Ignition system battery Starting system 6-volt battery Air cleaner oil washed wire mesh Muffler was used Oil filter replaceable paper element Cooling medium temperature control thermosiphon with 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, and J were made with an operating setting of the carburetor (selected by the manufacturer) of 96% of maximum belt horsepower.

**HORSEPOWER SUMMARY**

	Drawbar	Belt
1. Sea level (calculated) maximum horsepower (based on 60° F and 29.92" HG)	19.00	20.89
2. Observed maximum horsepower (tests F and B)	18.12	20.94
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)	14.25	17.76

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. 546.

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.

