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Test 528: John Deere 70 Diesel

Nebraska Tractor Test Lab

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Department of Agricultural Engineering
Dates of test: October 19 to October 22, 1954
Manufacturer: JOHN DEERE WATERLOO TRACT-
OR WORKS OF DEERE MANUFACTURING
COMPANY, WATERLOO, IOWA
Manufacturer's rating: Not rated

NEBRASKA TRACTOR TEST NO. 528

JOHN DEERE 70 DIESEL

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	
TESTS B & C—100% MAXIMUM LOAD—TWO HOURS								
* 50.40	1125	2.841	17.74	0.397	0.00	155	50	29.003
TEST D—RATED LOAD—ONE HOUR								
44.14	1126	2.491	17.72	0.398	0.00	153	49	28.975
TEST E—VARYING LOAD—TWO HOURS (20 minute runs; last line average)								
44.06	1125	2.487	17.72	0.398	...	154	49	.....
3.03	1242	0.830	3.65	1.931	...	143	49	.....
23.14	1182	1.559	14.84	0.475	...	148	49	.....
49.73	1114	2.823	17.62	0.400	...	160	48	.....
11.84	1209	1.120	10.57	0.666	...	146	48	.....
33.82	1157	2.010	16.83	0.419	...	152	49	.....
27.60	1171	1.805	15.29	0.461	0.00	151	49	28.975
TORQUE (At Dynamometer)								
Eng rpm.	1123	1073	1019	970	916	867	816	770 716 668
Lb-ft.	259.4	295.1	302.8	309.8	313.3	314.1	314.1	318.5 319.4 316.8
Dyn rpm.	1019	969	918	871	820	772	724	680 630 584

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		Cool- ing med	Air	
TESTS F & G—100% MAXIMUM LOAD											
36.08	6189	2.19	1125	15.85	.....	Not Recorded	.....	.....	135	56	29.150
44.50	4941	3.38	1125	8.35	.....	Not Recorded	.....	.....	160	53	29.005
44.57	3687	4.53	1125	5.86	.....	Not Recorded	.....	.....	160	53	29.005
45.09	2589	6.53	1124	4.30	.....	Not Recorded	.....	.....	158	53	29.005
44.04	1840	8.98	1126	3.05	.....	Not Recorded	.....	.....	156	50	28.990
42.71	1243	12.88	1126	1.55	.....	Not Recorded	.....	.....	158	53	28.990
TEST H—RATED LOAD—TEN HOURS—3rd Gear											
34.79	2831	4.61	1125	4.33	2.204	15.78	0.446	0.00	154	61	28.991
TEST J—OPERATING MAXIMUM LOAD—3rd Gear											
42.42	3584	4.44	1126	7.50	.....	Not Recorded	.....	.....	158	55	29.180
TEST K—OPERATING MAXIMUM LOAD—3rd Gear											
41.15	3745	4.12	1125	11.56	.....	Not Recorded	.....	.....	157	60	29.180

TIRES, WHEELS AND WEIGHT

	Tests F, G, & H	Test J	Test K
Rear wheels			
Type	Cast iron	Cast iron	Cast iron
Liquid ballast	800 lb each	None	None
Added cast iron	140 lb each	None	None
Rear tires			
No. and size	Two 13-38	Two 13-38	Two 12-38
Ply	6	6	6
Air pressure	16 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	18½ inches	19 inches	18 inches
Static weight			
Rear end	6683 lb	4803 lb	4754 lb
Front end	2170 lb	2159 lb	2150 lb
Total weight as tested with operator	9028 lb	7137 lb	7079 lb

FUEL, OIL and TIME Diesel Fuel Cetane No. 50 (rating taken from oil company's typical inspection data): Weight per gallon 7.045 lb OIL SAE 20; to motor 2.434 gal; drained from motor 2.311 gal Total time motor was operated 44 hours.

CHASSIS Type Tricycle Serial No. 7017500 Tread width rear 60" to 88" front 8 5/16" and 12 1/16" Wheel base 91" Hydraulic control system direct engine drive with throw out 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. 12 7/8" face 7 3/8" rpm 1125 Belt speed 3792 fpm Clutch multiple dry 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 Diesel Type 2 cylinder horizontal Serial No. 7017500 Crankshaft mounted crosswise Head 1 Lubrication pressure Bore and stroke 6 1/8" x 6 3/8" Rated rpm 1125 Compression ratio 16 to 1 Displacement 376 cu. in. Port diameter valves inlet 2.062 exhaust 1.653 Governor variable speed centrifugal Ignition system battery Starting system 6 volt battery Air cleaner oil washed wire mesh Muffler was used Oil filter replaceable impregnated paper element Cooling medium temperature control thermostat Fuel filter brass wire screen in sediment bowl and 2 replaceable impregnated paper elements.

STARTING ENGINE Make John Deere Type 4 cylinder "V" Bore and stroke 2" x 1 1/2" Displacement 18.85 cu in Rated rpm 5500 Ignition battery Starter 6 volt-battery.

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 fuel pumps as set by the manufacturer 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 the same setting.

HORSEPOWER SUMMARY

	Drawbar	Belt
1. Sea level (calculated) maximum horsepower (based on 60°F and 29.92" HG)	45.66	51.49
2. Observed maximum horsepower (tests F and B)	44.57	50.40
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)	34.25	43.77

We, the undersigned, certify that this is a true and correct report of official tractor test No. 528.

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.

