

Tractor Test and Power Museum, The Lester F. Larsen

UNL Larsen Tractor Museum Archives

University of Nebraska - Lincoln

Year 1969

Test 1023: John Deere 4000

NEBRASKA TRACTOR TEST 1023 - JOHN DEERE 4000 DIESEL

POWER TAKE-OFF PERFORMANCE

Hp	Crankshaft speed rpm	Fuel Consumption			Temperature Degrees F				Barometer inches of Mercury
		Gal per hr	Lb per hp-hr	Hp-hr per gal	Cooling medium	Air wet bulb	Air dry bulb		
MAXIMUM POWER AND FUEL CONSUMPTION									
Rated Engine Speed—Two Hours									
96.89	2200	6.190	0.444	15.65	190	73	75	28.962	
Standard Power Take-off Speed (1000 rpm)—One Hour									
88.88	1894	5.543	0.434	16.03	197	73	75	28.960	
VARYING POWER AND FUEL CONSUMPTION—TWO HOURS									
86.38	2306	5.593	0.450	15.44	183	74	76	.....
0.00	2409	1.803	.....	.....	169	73	75	.....
44.24	2362	3.639	0.572	12.16	175	73	75	.....
97.62	2200	6.218	0.443	15.70	192	59	77	.....
22.19	2387	2.730	0.856	8.13	171	57	75	.....
65.81	2349	4.610	0.487	14.28	178	55	74	.....
Av 52.71	2335	4.099	0.541	12.86	178	65	75	28.933	

DRAWBAR PERFORMANCE

Hp	Drawbar pull lbs	Speed miles per hr	Crankshaft speed rpm	Slip of drivers %	Fuel Consumption			Temp Degrees F			Barometer inches of Mercury
					Gal per hr	Lb per hp-hr	Hp-hr per gal	Cooling med	Air wet bulb	Air dry bulb	
VARYING DRAWBAR POWER AND FUEL CONSUMPTION WITH BALLAST											
Maximum Available Power—Two Hours—5th Gear											
82.59	5464	5.67	2201	8.24	6.168	0.520	13.39	169	54	72	28.920
75% of Pull at Maximum Power—Ten Hours—5th Gear											
69.32	4215	6.17	2339	6.08	5.281	0.530	13.13	159	50	57	28.605
50% of Pull at Maximum Power—Two Hours—5th Gear											
48.62	2856	6.38	2374	4.14	4.247	0.608	11.45	156	36	40	29.190
MAXIMUM POWER WITH BALLAST											
75.95	8215	3.47	2322	14.88	3rd Gear	.....	158	58	65	28.970	
83.73	7134	4.40	2201	11.31	4th Gear	.....	170	54	70	28.940	
84.82	5623	5.66	2201	8.50	5th Gear	.....	168	54	70	28.940	
85.25	4209	7.60	2201	6.17	6th Gear	.....	165	54	71	28.940	
84.00	3146	10.01	2204	4.69	7th Gear	.....	165	54	71	29.060	
MAXIMUM PULL WITHOUT BALLAST											
80.50	6817	4.43	2300	14.94	4th Gear	.....	160	38	40	29.160	

VARYING DRAWBAR PULL AND TRAVEL SPEED WITH BALLAST—5th Gear

Pounds Pull	5623	5919	6166	6320	6330	6082
Horsepower	84.82	79.30	73.92	66.03	56.68	45.28
Crankshaft speed rpm	2201	1966	1767	1545	1325	1096
Miles per hour	5.66	5.02	4.50	3.92	3.36	2.79
Slip of drivers, %	8.50	8.87	9.49	9.74	9.74	9.25

TIRES, BALLAST and WEIGHT		With Ballast	Without Ballast
Rear tires	—No, size, ply & psi	Two 16.9-34; 6; 16	Two 16.9-34; 6; 16
Ballast	—Liquid	695 lb each	None
	—Cast iron	420 lb each	None
Front tires	—No, size, ply & psi	Two 9.5L-15; 6; 32	Two 9.5L-15; 6; 32
Ballast	—Liquid	None	None
	—Cast iron	18 lb each	None
Height of drawbar		17½ inches	18 inches
Static weight with operator—Rear		8255 lb	6025 lb
Front		2615 lb	2580 lb
Total		10870 lb	8605 lb.

The University of Nebraska Agricultural Experiment Station
E. F. Frolik, Dean; H. W. Ottoson, Director; Lincoln, Nebraska

Department of Agricultural Engineering

Dates of Test: September 30, 1969 to October 14, 1969

Manufacturer: JOHN DEERE WATERLOO TRACTOR WORKS, WATERLOO, IOWA

FUEL, OIL and TIME Fuel diesel Cetane 52.2 (rating taken from oil company's typical inspection data) Specific gravity converted to 60°/60° 0.8355 Weight per gallon 6.957 lb Oil SAE 30 API service classification MS-DS To motor 2.773 gal Drained from motor 2.510 gal Transmission and final-drive lubricant John Deere Special 303 oil Total time engine was operated 41 hours.

ENGINE Make John Deere Diesel Type 6 cylinder vertical Serial No M23R0245582R Crankshaft mounted lengthwise Rated rpm 2200 Bore and stroke 4.25" x 4.75" Compression ratio 16.5 to 1 Displacement 404 cu in Cranking system 12 volt electric (two 6-volt batteries) Lubrication pressure Air cleaner dry type with replaceable paper element Oil filter replaceable paper element Oil cooler engine coolant heat exchanger for crankcase oil and radiator for transmission and hydraulic oil Fuel filter screen in fuel pump, replaceable paper elements for 1st and 2nd stage Muffler was used Cooling medium temperature control thermostat.

CHASSIS Type standard Serial No 213R-222097R Tread width rear 61.2" to 89.6" front 58.8" to 87.9" Wheel base 100.25" Center of gravity (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 29.34" Vertical distance above roadway 28.04" Horizontal distance from center of rear wheel tread 0.035" to the right Hydraulic control system direct engine drive Transmission selective gear fixed ratio with partial range synchro mesh Advertised speeds mph first 1.8 second 2.9 third 3.8 fourth 4.9 fifth 6.1 sixth 7.9 seventh 10.3 eighth 16.8 reverse 3.7 and 5.9 Clutch single plate dry disc operated by foot pedal Brakes wet disc hydraulically power actuated operated by two foot pedals which can be locked together Steering hydrostatic Turning radius (on concrete surface with brake applied) right 128" left 128" (on concrete surface without brake) right 150" left 150" Turning space diameter (on concrete surface with brake applied) right 256" left 256" (on concrete surface without brake) right 335" left 335" Belt pulley 966 rpm at 1900 engine rpm diam 12" face 8.5" Belt speed 3035 fpm Power take-off 1003 rpm at 1900 engine rpm.

REPAIRS and ADJUSTMENTS: No repairs or adjustments.

REMARKS: All test results were determined from observed data obtained in accordance with the SAE and ASAE test code. First and second gears were not run as it was necessary to limit the pull in third gear to avoid excessive wheel slippage. Eighth gear was not run because it exceeded 15 mph.

We, the undersigned, certify that this is a true and correct report of official Tractor Test 1023.

L. F. LARSEN

Engineer-In-Charge

G. W. STEINBRUEGGE, Chairman

W. E. SPLINTER

D. E. LANE

Board of Tractor Test Engineers

EXPLANATION OF TEST REPORT

GENERAL CONDITIONS

Each tractor is a production model equipped for common usage. Power consuming accessories can be disconnected only when it is convenient for the operator to do so in practice. Additional weight can be added as ballast if the manufacturer regularly supplies it for sale. The static tire loads and the inflation pressures must conform to recommendations in the Tire Standards published by the Society of Automotive Engineers.

PREPARATION FOR PERFORMANCE RUNS

The engine crankcase is drained and refilled with a measured amount of new oil conforming to specifications in the operators manual. The fuel used and the maintenance operations must also conform to the published information delivered with the tractor. The tractor is then limbered-up for 12 hours on drawbar work in accordance with the manufacturer's published recommendations. The manufacturer's representative is present to make appropriate decisions regarding mechanical adjustments.

The tractor is equipped with approximately the amount of added ballast that is used during maximum drawbar tests. The tire tread-bar height must be at least 65% of new tread height prior to the maximum power run.

BELT OR POWER TAKE-OFF PERFORMANCE

Maximum Power and Fuel Consumption. The manufacturer's representative makes carburetor, fuel pump, ignition and governor control settings which remain unchanged throughout all subsequent runs. The governor and the manually operated governor control lever is set to provide the high-idle speed specified by the manufacturer for maximum power. Maximum power is measured by connecting the belt pulley or the power take-off to a dynamometer. The dynamometer load is then gradually increased until the engine is operating at the rated speed specified by the manufacturer for maximum power. The corresponding fuel consumption is measured.

Varying Power and Fuel Consumption. Six different horsepower levels are used to show corresponding fuel consumption rates and how the governor causes the engine to react to the following changes in dynamometer load: 85% of the dynamometer torque at maximum power; minimum dynamometer torque, $\frac{1}{2}$ of the 85% torque; maximum power, $\frac{1}{4}$ and $\frac{3}{4}$ of the 85% torque. Since a tractor is generally subjected to varying loads the average of the results in this test serve well for predicting the fuel consumption of a tractor in general usage.

DRAWBAR PERFORMANCE

All engine adjustments are the same as those used in the belt or power take-off tests. If the manufacturer specifies a different rated crankshaft speed for drawbar operations, then the position of the manually operated governor control is changed to provide the high-idle speed specified by the manufacturer in the operating instructions.

Varying Power and Fuel Consumption With Ballast. The varying power runs are made to show the effect of

speed-control devices (engine, governor, automatic transmission, etc.) on horsepower, speed and fuel consumption. These runs are made around the entire test course which has two 180 degree turns with a minimum radius of 50 feet. The drawbar pull is set at 3 different levels as follows: (1) as near to the pull at maximum power as possible and still have the tractor maintain the travel speed at maximum horsepower on the straight sections of the test course; (2) 75% of the pull at maximum power; and (3) 50% of the pull at maximum power. Prior to 1958, fuel consumption data (10 hour test) were shown only for the pull obtained at maximum power for tractors having torque converters and at 75% of the pull obtained at maximum power for gear-type tractors.

Maximum Power with Ballast. Maximum power is measured on straight level sections of the test course. Data are shown for not more than 12 different gears or travel speeds. Some gears or travel speeds may be omitted because of high slippage of the traction members or because the travel speed may exceed the safe-limit for the test course. The maximum safe speed for the Nebraska Test Course has been set at 15 miles per hour. The slippage limits have been set at 15% and 7% for pneumatic tires and steel tracks or lugs, respectively. Higher slippage gives widely varying results.

Maximum Pull without Ballast. All added ballast is removed from the tractor. The drawbar pull is determined at slip limits of 15% for pneumatic tires or 7% for steel tracks or lugs. The tractor is operated at the fastest possible travel speed.

Varying Power and Travel Speed with Ballast. Travel speeds corresponding to drawbar pulls beyond the maximum power range are obtained to show the "lugging ability" of the tractor. The run starts with the pull at maximum power; then additional drawbar pull is applied to cause decreasing speeds. The run is ended by one of three conditions: (1) maximum pull is obtained, (2) the maximum slippage limit is reached, or (3) some other operating limit is reached.

For additional information about the Nebraska Tractor Tests write to the Department of Agricultural Engineering, University of Nebraska, Lincoln, Nebraska.



JOHN DEERE 4000 DIESEL