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Test 1003: John Deere 2520 Syncro Range

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NEBRASKA TRACTOR TEST 1003—JOHN DEERE 2520 SYNCRO-RANGE GASOLINE

POWER TAKE-OFF PERFORMANCE

Hp	Crankshaft speed rpm	Fuel Consumption		Temperature Degrees F				
		Gal per hr	Lb per hp-hr	Hp-hr per gal	Cooling medium	Air wet bulb	Air dry bulb	Barometer inches of Mercury
MAXIMUM POWER AND FUEL CONSUMPTION								
Rated Engine Speed—Two Hours								
60.16	2500	5.754	0.579	10.46	194	57	75	28.947
Standard Power Take-Off Speed (1000 rpm)—One Hour								
53.21	2071	5.050	0.574	10.54	193	56	74	28.950
VARYING POWER AND FUEL CONSUMPTION—TWO HOURS								
52.49	2567	5.681	0.655	9.24	190	58	76	.....
0.00	2711	2.196	.....	.....	186	57	75	.....
27.07	2650	3.852	0.861	7.03	189	58	75	.....
59.85	2500	5.795	0.586	10.33	194	57	76	.....
13.73	2683	3.049	1.344	4.50	186	54	70	.....
40.09	2614	4.779	0.721	8.39	190	53	71	.....
Av 32.21	2621	4.225	0.794	7.62	189	56	73	28.965

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—4th Gear											
54.45	4654	4.39	2503	7.09	5.596	0.622	9.73	198	38	46	28.950
75% of Pull at Maximum Power—Ten Hours—4th Gear											
44.42	3597	4.63	2581	4.87	5.302	0.722	8.38	194	39	45	28.895
50% of Pull at Maximum Power—Two Hours—4th Gear											
31.11	2434	4.79	2632	3.42	4.323	0.841	7.20	190	39	47	28.905
MAXIMUM POWER WITH BALLAST											
46.48	7151	2.44	2549	14.91	2nd Gear	.....	195	32	35	29.050	
53.45	6105	3.28	2502	10.46	3rd Gear	.....	195	32	38	29.050	
55.84	4789	4.37	2500	7.28	4th Gear	.....	195	32	38	29.050	
55.07	3795	5.44	2500	5.64	5th Gear	.....	195	33	40	29.030	
55.02	2787	7.40	2499	4.22	6th Gear	.....	195	35	41	29.030	
54.47	2184	9.35	2500	3.25	7th Gear	.....	195	37	41	29.030	
MAXIMUM PULL WITHOUT BALLAST											
38.15	5725	2.50	2609	14.79	2nd Gear	.....	200	44	52	28.720	

VARYING DRAWBAR PULL AND TRAVEL SPEED WITH BALLAST—4th Gear

Pounds Pull	4789	4998	5161	5297	5478	5509	5104
Horsepower	55.84	52.19	48.00	42.94	37.85	31.77	23.80
Crankshaft speed rpm	2500	2251	2006	1758	1503	1258	1097
Miles per hour	4.37	3.92	3.49	3.04	2.59	2.16	1.75
Slip of drivers, %	7.28	7.86	7.99	8.24	8.49	8.86	7.99

TIRES, BALLAST and WEIGHT

		With Ballast	Without Ballast
Rear tires	—No, size, ply & psi	Two 13.6-38; 6; 20	Two 13.6-38; 6; 16
Ballast	—Liquid	None	None
	Cast iron	867 lb each	None
Front tires	—No, size, ply & psi	Two 6.00-16; 6; 36	Two 6.00-16; 6; 36
Ballast	—Liquid	None	None
	Cast iron	42 lb each	None
Height of drawbar		17½ inches	18 inches
Static weight with operator—Rear		6920 lb	5185 lb
Front		2035 lb	1950 lb
Total		8955 lb	7130 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: March 13 to March 28, 1969

Manufacturer: JOHN DEERE WATERLOO TRACTOR WORKS, WATERLOO, IOWA

FUEL, OIL and TIME Fuel regular gasoline Octane No Motor 85.2 Research 92.6 (rating taken from oil company's typical inspection data) Specific gravity converted to 60°/60° 0.7270 Weight per gallon 6.052 lb Oil SAE 30 API service classification MS, DM To motor 1.606 gal Drained from motor 1.032 gal Transmission and final-drive lubricant John Deere Special 303 oil Total time engine was operated 57 hours.

ENGINE Make John Deere Gasoline Type 4 cylinder vertical Serial No. M51RC115531T Crankshaft mounted lengthwise Rated rpm 2500 Bore and stroke 3.86" x 4.33" Compression ratio 7.6 to 1 Displacement 202.7 cu in Carburetor size 1" Ignition system battery Cranking system 12 volt electric Lubrication pressure Air cleaner dry type with replaceable pleated paper element Oil filter full flow replaceable pleated paper cartridge Fuel filter screens in carburetor and fuel pump Muffler was used Cooling medium temperature control thermostat.

CHASSIS Type standard Serial No T711RO-17112R Tread width rear 56" to 88" front 48.5" to 82.5" Wheel base 92.75" 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 24.6" Vertical distance above roadway 36.4" Horizontal distance from center of rear wheel tread 0.08" to the right Hydraulic control system direct engine drive Transmission selective gear fixed ratio with partial range Syncro-mesh Advertised speeds mph first 1.78 second 2.80 third 3.65 fourth 4.69 fifth 5.73 sixth 7.69 seventh 9.62 eighth 15.76 reverse 3.55 and 5.58 Clutch single plate dry disc operated by foot pedal Brakes wet disc hydraulically power actuated operated by two foot pedals that can be locked together Steering hydrostatic power Turning radius (on concrete surface with brake applied) right 116¾" left 116¾" (on concrete surface without brake) right 139" left 139" Turning space diameter (on concrete surface with brake applied) right 243½" left 243½" (on concrete surface without brake) right 287" left 287" Belt pulley 976 rpm at 2100 engine rpm diam 12" face 8½" Belt speed 3063 fpm Power takeoff 547 or 1014 rpm at 2100 engine rpm.

REPAIRS and ADJUSTMENTS: A new air cleaner element was installed during preliminary PTO run.

REMARKS: All test results were determined from observed data obtained in accordance with the SAE and ASAE test code. First gear was not run as it was necessary to limit the pull in second gear to avoid excessive slippage. Eighth gear was not run as it exceeded fifteen miles per hour.

We, the undersigned, certify that this is a true and correct report of official Tractor Test 1003.

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 2320 SYNCRO-RANGE GASOLINE