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## Test 1010: John Deere 3020 Power Shift

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# NEBRASKA TRACTOR TEST 1010 – JOHN DEERE 3020 POWER SHIFT GASOLINE

## POWER TAKE-OFF PERFORMANCE

Hp	Crankshaft speed rpm	Fuel Consumption		Hp-hr per gal	Temperature Degrees F			Barometer inches of Mercury
		Gal per hr	Lb per hp-hr		Cooling medium	Air wet bulb	Air dry bulb	
<b>MAXIMUM POWER AND FUEL CONSUMPTION</b>								
<b>Rated Engine Speed—Two Hours</b>								
67.13	2500	6.868	0.621	9.77	193	61	75	29.100
<b>Standard Power Take-off Speed (1000 rpm)—One Hour</b>								
62.63	2066	6.001	0.581	10.44	194	62	75	29.090
<b>VARYING POWER AND FUEL CONSUMPTION—TWO HOURS</b>								
59.76	2619	6.483	0.658	9.22	192	62	75	.....
0.00	2693	3.021	.....	.....	172	61	74	.....
30.21	2645	4.777	0.959	6.32	177	62	74	.....
66.85	2501	6.844	0.621	9.77	192	62	75	.....
15.27	2674	3.956	1.572	3.86	175	62	75	.....
44.99	2629	5.647	0.762	7.97	184	63	75	.....
Av 36.18	2627	5.121	0.859	7.07	182	62	75	29.087

## DRAWBAR PERFORMANCE

Hp	Drawbar pull lbs	Speed miles per hr	Crankshaft speed rpm	Slip of drivers %	Fuel Consumption		Hp-hr per gal	Temp Degrees F			Barometer inches of Mercury
					Gal per hr	Lb per hp-hr		Cooling med	Air wet bulb	Air dry bulb	

### VARYING DRAWBAR POWER AND FUEL CONSUMPTION WITH BALLAST

<b>Maximum Available Power—Two Hours—4th Gear</b>											
55.79	4125	5.07	2504	5.64	6.838	0.744	8.16	196	72	85	28.815
<b>75% of Pull at Maximum Power—Ten Hours—4th Gear</b>											
45.87	3215	5.35	2607	4.33	6.126	0.810	7.49	193	73	86	28.874
<b>50% of Pull at Maximum Power—Two Hours—4th Gear</b>											
30.81	2081	5.55	2659	2.73	5.237	1.031	5.88	186	73	89	28.830

### MAXIMUM POWER WITH BALLAST

50.61	8107	2.34	2582	14.94	2nd Gear	.....	170	69	74	28.890
56.96	5573	3.83	2501	7.52	3rd Gear	.....	197	70	84	28.850
58.06	4304	5.06	2500	5.61	4th Gear	.....	198	70	84	28.850
55.84	3162	6.62	2499	3.96	5th Gear	.....	194	71	83	28.850
54.48	2355	8.68	2501	2.91	6th Gear	.....	192	70	81	28.850
53.60	1744	11.53	2495	2.19	7th Gear	.....	193	70	81	28.850

### MAXIMUM PULL WITHOUT BALLAST

40.82	6517	2.35	2638	14.84	2nd Gear	.....	180	66	75	28.810
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### VARYING DRAWBAR PULL AND TRAVEL SPEED WITH BALLAST—4th Gear

Pounds Pull	4304	4595	4923	5227	5397	5281
Horsepower	58.06	55.78	52.80	48.50	42.88	34.89
Crankshaft speed rpm	2500	2259	2004	1743	1498	1243
Miles per hour	5.06	4.55	4.02	3.48	2.98	2.48
Slip of drivers, %	5.61	5.94	6.47	7.00	7.13	7.13

### TIRES, BALLAST and WEIGHT

		With Ballast	Without Ballast
Rear tires	—No, size, ply & psi	Two 15.5-38; 8; 22	Two 15.5-38; 8; 14
Ballast	—Liquid	530 lb each	None
	Cast iron	435 lb each	None
Front tires	—No, size, ply & psi	Two 6.00-16; 6; 40	Two 6.00-16; 6; 40
Ballast	—Liquid	None	None
	Cast iron	20 lb each	None
Height of drawbar		18½ inches	18 inches
Static weight with operator—Rear		8100 lb	6170 lb
	Front	2220 lb	2180 lb
	Total	10320 lb	8350 lb

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

Department of Agricultural Engineering

Date of Test: May 13 to June 2, 1969

Manufacturer: JOHN DEERE WATERLOO TRACTOR WORKS, WATERLOO, IOWA

**FUEL, OIL and TIME** Fuel regular gasoline Octane No Motor 85.0 Research 93.0 (rating taken from oil company's typical inspection data) Specific gravity converted to 60°/60° 0.7288 Weight per gallon 6.067 lb Oil SAE 30 API service classification MS-DM To motor 1.679 gal Drained from motor 1.431 gal Transmission and final-drive lubricant John Deere Special 303 oil Total time engine was operated 42 hours.

**ENGINE** Make John Deere gasoline Type 4 cylinder vertical Serial No M11R0128256R Crankshaft mounted lengthwise Rated rpm 2500 Bore and stroke 4¼" x 4¼" Compression ratio 7.5 to 1 Displacement 241 cu in Carburetor size 1½"/16" Ignition system battery Cranking system 12 volt electric Lubrication pressure Air cleaner dry type with replaceable treated paper element Oil filter full flow replaceable paper element Oil cooler engine coolant heat exchanger for crankcase oil and radiator for transmission and hydraulic system Fuel filter sediment bowl and screen Muffler was used Cooling medium temperature control thermostat.

**CHASSIS** Type standard Serial No T111P126-364R Tread width rear 60" to 91" front 48½" to 82¼" 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 23.8" Vertical distance above roadway 35.7" Horizontal distance from center of rear wheel tread 0.183" to the left Hydraulic control system direct engine drive Transmission fixed ratio operator controlled full range power shifting Advertised speeds mph first 1.9 second 2.6 third 4.1 fourth 5.3 fifth 6.8 sixth 8.8 seventh 11.7 eighth 19.5 reverse 1.8, 2.6, 4.0 and 5.2 Clutch multiple disc wet clutches within transmission hydraulically operated Brakes wet disc hydraulically power actuated operated by two foot pedals which can be locked together Steering hydrostatic power Turning radius (on concrete surface with brake applied) right 116½" left 116½" (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 978 rpm at 2100 engine rpm diam 12" face 8½" Belt speed 3074 fpm Power take-off 1014 rpm at 2100 engine rpm.

**REPAIRS and ADJUSTMENTS:** During preliminary PTO run it was necessary to make a correction in foot throttle to maintain high idle speed. During the no load PTO run and during 10 hour drawbar run, oil leaked from the PTO clutch valve.

**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 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 1010.

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 3020 POWER SHIFT GASOLINE