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Test 1191: John Deere 2040 Diesel

Nebraska Tractor Test Lab

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NEBRASKA TRACTOR TEST 1191 – JOHN DEERE 2040 DIESEL

POWER TAKE-OFF PERFORMANCE

Hp	Crank- shaft speed rpm	Fuel Consumption Gal per hr	Lb per hp-hr	Hp-hr per gal	Temperature Degrees F Cooling medium	Air wet bulb	Air dry bulb	Barometer inches of Mercury
MAXIMUM POWER AND FUEL CONSUMPTION								
Rated Engine Speed—Two Hours (PTO Speed—651 rpm)								
40.86	2500	2.822	0.477	14.48	182	59	75	28.823
Standard Power Take-off Speed (540 rpm)—One Hour								
37.62	2074	2.427	0.446	15.50	181	59	75	28.845
VARYING POWER AND FUEL CONSUMPTION—Two Hours								
36.11	2599	2.559	0.489	14.11	179	58	75	.....
0.00	2684	1.069	.....	.....	171	58	75	.....
18.35	2642	1.777	0.669	10.33	175	59	76	.....
41.14	2501	2.837	0.476	14.50	182	58	75	.....
9.24	2664	1.429	1.068	6.46	173	58	75	.....
27.28	2621	2.146	0.543	12.71	178	58	75	.....
Av 22.02	2618	1.970	0.618	11.18	176	58	75	28.820

DRAWBAR PERFORMANCE

Hp	Draw- bar pull lbs	Speed miles per hr	Crank- shaft speed rpm	Slip of drivers %	Fuel Consumption Gal per hr	Lb per hp-hr	Hp-hr per gal	Temp Degrees F Cool- ing med	Air wet bulb	Air dry bulb	Barometer inches of Mercury
VARYING DRAWBAR POWER AND FUEL CONSUMPTION WITH BALLAST											
Maximum Available Power—Two Hours 5th Gear											
32.87	2185	5.64	2502	5.78	2.770	0.582	11.87	184	54	69	28.870
75% of Pull at Maximum Power—Ten Hours 5th Gear											
26.79	1682	5.97	2608	4.35	2.404	0.620	11.15	184	47	56	29.036
50% of Pull at Maximum Power—Two Hours 5th Gear											
18.96	1166	6.09	2632	3.26	2.082	0.758	9.11	187	45	55	28.945
50% of Pull at Reduced Engine Speed—Two Hours 6th Gear											
19.20	1183	6.09	1839	3.26	1.575	0.566	12.19	185	51	65	28.905
MAXIMUM POWER WITH BALLAST											
23.86	4634	1.93	2602	14.81	2nd Gear			188	53	67	28.870
31.70	4197	2.83	2500	12.45	3rd Gear			183	53	68	28.870
33.08	2979	4.16	2502	7.78	4th Gear			183	54	70	28.870
34.15	2271	5.64	2500	5.66	5th Gear			183	54	70	28.870
32.62	1485	8.24	2502	3.69	6th Gear			183	54	69	28.870
VARYING DRAWBAR PULL AND TRAVEL SPEED WITH BALLAST—5th Gear											
Pounds Pull			2271	2448	2578	2660	2762	2813	2748		
Horsepower			34.15	32.96	30.64	27.74	24.45	20.69	16.23		
Crankshaft Speed rpm			2500	2251	1996	1756	1495	1268	1011		
Miles Per Hour			5.64	5.05	4.46	3.91	3.32	2.76	2.21		
Slip of Drivers %			5.66	6.36	6.71	6.94	7.16	7.28	7.28		

TRACTOR SOUND LEVEL WITHOUT CAB db(A)

Maximum Available Power 2 Hours	97.0
75% of Pull at Max. Power 10 Hours	96.5
50% of Pull at Max. Power 2 Hours	96.5
50% of Pull at Reduced Engine Speed 2 Hours	92.5
Bystander in 7th Gear	87.0

TIRES, BALLAST AND WEIGHT

		With Ballast	Without Ballast
Rear Tires	—No., size, ply & psi	Two 14.9-28; 6; 18	Two 14.9-28; 6; 18
Ballast	—Liquid	533 lb each	None
	Cast Iron	247 lb each	None
Front Tires	—No., size, ply & psi	Two 6.50-16; 6; 32	Two 6.50-16; 6; 32
Ballast	—Liquid	None	None
	Cast Iron	30 lb each	None
Height of drawbar		15 inches	15 inches
Static weight with operator—rear		4560 lb	3000 lb
front		1860 lb	1800 lb
total		6420 lb	4800 lb

Department of Agricultural Engineering

Dates of Test: October 9 to 20, 1975

Manufacturer: JOHN DEERE WERKE MANN-HEIM, MANNHEIM, GERMANY

FUEL, OIL AND TIME Fuel No 2 Diesel Cetane No 51.7 (rating taken from oil company's typical inspection data) Specific gravity converted to 60°/60° 0.8293 Weight per gallon 5.905 lb Oil SAE 30 API service classification CD-SD To motor 1.251 gal Drained from motor 0.984 gal Transmission and final drive lubricant John Deere Hy-GARD Total time engine was operated 40.5 hours.

ENGINE Make John Deere France Type 3 cylinder Serial No 3164DL-227781CD Crankshaft Mounted lengthwise Rated rpm 2500 Bore and stroke 4.02" x 4.33" Compression ratio 17.1 to 1 Displacement 164 cu. in. Lubrication pressure Cranking system 12 volt Air cleaner dry type with replaceable pleated paper element and dust evacuator Oil filter one full flow pleated paper screw-on cartridge Fuel filter two stage paper cartridge Muffler vertical Cooling medium temperature control thermostat.

CHASSIS Type standard Serial No. 2040A-180458L Tread width rear 53.5" to 73.2" front 49" to 79" Wheel base 74.37" 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 28.2" Vertical distance above roadway 30.9" Horizontal distance from center of rear wheel tread 0" to the right/left Hydraulic control system direct engine drive Transmission selective gear fixed ratio Advertised speeds mph first 1.5 second 2.2 third 3.2 fourth 4.5 fifth 6.0 sixth 8.5 seventh 12.6 eighth 17.6 reverse 1.8; 2.5; 3.7; 5.2 Clutch single plate dry disc operated by foot pedal (in combination with PTO clutch) Brakes wet disc hydraulically operated by two foot pedals which can be locked together Steering mechanical with power assist Turning radius (on concrete surface with brake applied) right 110" left 110" (on concrete surface without brake) right 122" left 122" Turning space diameter (on concrete surface with brake applied) right 244" left 244" (on concrete surface without brake) right 268" left 268" Belt pulley 967 rpm at 2100 engine rpm diam 12" face 8.5" Belt speed 3038 fpm Power take-off 540 rpm at 2074 engine rpm.

REPAIRS AND ADJUSTMENTS: No repairs or adjustments.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test code or official Nebraska test procedure. Fuel temperature at injection pump return was 140°F. Five gears were chosen between 15% slip and 15 MPH (only one gear permitted over 8 MPH).

We, the undersigned, certify that this is a true and correct report of official Tractor Test 1191.

LOUIS I. LEVITICUS
Engineer-in-Charge

G. W. STEINBRUEGGE, Chairman
W. E. SPLINTER
D. E. LANE
Board of Tractor Test Engineers

The Agricultural Experiment Station
Institute of Agriculture and Natural Resources
University of Nebraska-Lincoln
H. W. Ottoson, Director

EXPLANATION OF TEST REPORT

GENERAL CONDITIONS

Each tractor is a production model equipped for common usage. Power consuming accessories may be disconnected only when the means for disconnecting can be reached from the operator station. 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. Prior to the maximum power run the tire tread-bar height must be at least 65% of new tread height.

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 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 use.

DRAWBAR PERFORMANCE

All engine adjustments are the same as those used in the belt or power take-off tests.

Varying Power and Fuel Consumption With Ballast. The varying power runs are made to show the effects 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 4 different runs 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; (3) 50% of the pull at maximum power; and (4) maintaining the same load and travel speed as in (3) by shifting to a higher gear and reducing the engine rpm.

Maximum Power with Ballast. Maximum power is measured on straight level sections of the test course. Data are shown for not more than 6 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 manufacturer's representative has the option of selecting one gear or speed over eight miles per hour. The maximum safe speed for the Nebraska Test Course has been set at 15 mph. The slip limits have been set at 15% and 7% for pneumatic tires and steel tracks or lugs, respectively. Higher slippage gives widely varying results.

Varying Drawbar Pull 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.

SOUND MEASUREMENT

Sound is recorded during each of the Varying Power and Fuel Consumption runs as the tractor travels on a straight section of the test course. The dB(A) sound level is obtained with the microphone located near the right ear of the operator. Bystander sound readings are taken with the microphone placed 25 feet from the line of travel of the tractor.

An increase of 10 dB(A) will approximately double the loudness to the human ear.

For additional information about the Nebraska Tractor Tests write to the Department of Agricultural Engineering, University of Nebraska, Lincoln, Nebraska 68583.



JOHN DEERE 2040 DIESEL