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Test 902: David Brown 880 (Diesel)

Nebraska Tractor Test Lab

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NEBRASKA TRACTOR TEST 902 - DAVID BROWN 880 DIESEL

POWER TAKE-OFF PERFORMANCE

Hp	Crank- shaft 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	
MAXIMUM POWER AND FUEL CONSUMPTION								
Rated Engine Speed—Two Hours								
* 40.42	2200	2.648	0.454	15.26	178	62	75	29.097
Standard Power Take-off Speed (540 rpm)—One Hour								
35.91	1828	2.159	0.417	16.63	181	63	77	29.120
Standard Power Take-off Speed (1000 rpm)—One Hour								
38.60	2000	2.380	0.428	16.22	180	63	76	29.110
VARYING POWER AND FUEL CONSUMPTION—TWO HOURS								
35.48	2272	2.288	0.447	15.51	178	63	79	.....
0.00	2354	0.644	.....	.....	170	63	78	.....
18.14	2326	1.371	0.524	13.23	174	64	79	.....
40.46	2201	2.621	0.449	15.44	180	63	78	.....
9.14	2344	0.973	0.739	9.39	171	64	78	.....
26.92	2297	1.816	0.468	14.82	176	64	79	.....
Av 21.69	2299	1.619	0.518	13.40	175	64	78	29.110

DRAWBAR PERFORMANCE

Hp	Draw-bar pull lbs	Speed miles per hr	Crank-shaft 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—3rd Gear												
34.55	2619	4.95	2199	5.56	2.579	0.518	13.40	180	62	74	29.155	
75% of Pull at Maximum Power—Ten Hours—3rd Gear												
28.15	2033	5.19	2273	4.20	2.112	0.520	13.33	179	64	75	29.103	
50% of Pull at Maximum Power—Two Hours—3rd Gear												
19.50	1365	5.36	2304	2.49	1.651	0.587	11.81	179	66	80	28.998	
MAXIMUM POWER WITH BALLAST												
27.60	5018	2.06	2272	14.84	1st Gear			178	69	77	28.900	
35.42	3730	3.56	2201	8.35	2nd Gear			180	61	72	29.220	
35.77	2717	4.94	2202	5.89	3rd Gear			181	61	72	29.220	
35.42	1952	6.80	2201	4.35	4th Gear			179	61	73	29.190	
34.95	1563	8.39	2199	3.47	5th Gear			181	61	73	29.190	
MAXIMUM POWER WITHOUT BALLAST												
34.34	2640	4.88	2200	8.14	3rd Gear			183	74	86	28.820	
VARYING DRAWBAR PULL AND TRAVEL SPEED WITH BALLAST—3rd Gear												
Pounds pull				2717	2864	2894	2950	2947	2944	2731		
Horsepower				35.77	33.69	30.28	26.96	23.04	19.22	14.33		
Crankshaft speed, rpm				2202	1976	1760	1538	1315	1098	878		
Miles per hour				4.94	4.41	3.92	3.43	2.93	2.45	1.97		
Slip of drivers, %				5.89	6.28	6.51	6.51	6.40	6.51	5.95		

TIRES, BALLAST and WEIGHT

		With Ballast	Without Ballast
Rear tires	—No, size, ply & psi	Two 13.6-28; 4; 14	Two 13.6-28; 4; 14
Ballast	—Liquid	468 lb each	None
	Cast iron	630 lb each	None
Front tires	—No, size, ply & psi	Two 6.00-16; 4; 28	Two 6.00-16; 4; 28
Ballast	—Liquid	None	None
	Cast iron	68 lb	None
Height of drawbar		20½ inches	22 inches
Static weight	—Rear	4840 lb	2645 lb
	Front	1630 lb	1495 lb
Total weight with operator		6645 lb	4315 lb

Department of Agricultural Engineering

Dates of Test: JUNE 14 to JUNE 19, 1965

Manufacturer: DAVID BROWN TRACTORS LTD., MELTHAM, HUDDERSFIELD, YORKSHIRE, ENGLAND

FUEL, OIL and TIME Fuel No 2 diesel Cetane No 57.0 (rating taken from oil company's typical inspection data) Specific gravity converted to 60°/60° 0.8331 Weight per gallon 6.937 lb Oil SAE 20-20W API service classification MS, DG, DM To motor 1.763 gal Drained from motor 1.714 gal Transmission lubricant SAE 50 Final drive lubricant SAE 140 Total time engine was operated 45½ hours.

ENGINE Make David Brown diesel Type 3 cylinder vertical Serial No AD340A-2854 Crankshaft mounted lengthwise Rated rpm 2200 Bore and stroke 3⅜" x 4½" Compression ratio 17 to 1 Displacement 154 cu in Cranking system 12 volt electric Lubrication pressure Air cleaner oil washed wire mesh Oil filter replaceable treated paper element Fuel filter primary and secondary filters with replaceable paper elements and sediment bowl Muffler was used Cooling medium temperature control thermostat.

CHASSIS Type standard Serial No 880/UE-523375 Tread width rear 52" to 76" front 52" to 72" Wheel base 79¾" Center of gravity (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from centerline of rear wheels 28" Vertical distance above roadway 28¼" Horizontal distance from center of rear wheel tread 0" to the right/left Hydraulic control system direct engine drive except when PTO foot clutch is disengaged Transmission selective gear fixed ratio Advertised speeds mph first 2.27 second 3.76 third 5.08 fourth 6.90 fifth 8.43 sixth 15.4 reverse 3.74 and 8.37 Clutch single plate dry disc in combination with PTO clutch operated by single foot pedal Brakes internal expanding shoe operated by hand lever or independently by two foot pedals which may be locked together Steering no power assist Turning radius (on concrete surface with brake applied) right 124" left 124" (on concrete surface without brake) right 138" left 138" Turning space diameter (on concrete surface with brake applied) right 255" left 255" (on concrete surface without brake) right 282" left 282" Belt pulley 1412 rpm at 2000 engine rpm diam 8½" face 5¾" Belt speed 3140 fpm Power take-off 540 rpm at 1828 engine rpm and 1000 rpm at 2000 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.

Sixth gear was not run as it exceeded 15 mph.

We, the undersigned, certify that this is a true and correct report of official Tractor Test 902.

L. F. LARSEN

Engineer-in-Charge

G. W. STEINBRUEGGE, Chairman

J. J. SULEK

D. E. LANE

Board of Tractor Test Engineers

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

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 trans-

mission, 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 Power Without Ballast. All added ballast is removed from the tractor. The maximum drawbar power of the tractor is determined by the same procedure used for getting maximum power with ballast. The gear (or travel speed) is the same as that used in the 10-hour test.

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.



David Brown 880 Diesel