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Test 691: David Brown Model 950 (Diesel)

Nebraska Tractor Test Lab

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NEBRASKA TRACTOR TEST 691 - DAVID BROWN 950 DIESEL

The University of Nebraska Agricultural Experiment Station

W. V. Lambert, Director; Lincoln, Nebraska

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								
39.85	2200	2.786	0.490	14.30	179	55	77	28.987
Standard Power Take-off Speed (540 rpm)—One Hour								
36.65	1800	2.221	0.425	16.50	179	55	75	28.958
VARYING POWER AND FUEL CONSUMPTION—TWO HOURS								
34.91	2268	2.346	0.471	14.88	176	57	78	.....
1.06	2344	0.779	5.151	1.36	164	57	79	.....
17.77	2308	1.404	0.554	12.66	170	56	76	.....
40.03	2201	2.791	0.489	14.34	179	57	77	.....
8.99	2334	1.083	0.844	8.30	167	56	77	.....
26.41	2286	1.823	0.484	14.49	174	57	77	.....
Av 21.53	2290	1.704	0.555	12.63	172	57	77	28.918

DRAWBAR PERFORMANCE

Hp	Draw-bar pull lbs	Speed miles per hr	Crank shaft speed rpm	% Slip of drive wheels	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—4th Gear											
35.28	2624	5.04	1990	6.92	2.685	0.533	13.14	174	51	52	28.700
75% of Pull at Maximum Power—Ten Hours—4th Gear											
26.95	1888	5.35	2073	5.10	2.013	0.524	13.39	175	56	64	28.570
50% of Pull at Maximum Power—Two Hours—4th Gear											
18.86	1281	5.52	2112	3.93	1.492	0.554	12.64	165	50	50	28.695
MAXIMUM POWER WITH BALLAST											
33.53	4757	2.64	2055	13.71	2nd Gear	.....	175	42	46		28.945
36.40	3722	3.67	2008	9.16	3rd Gear	.....	180	42	46		28.945
36.26	2676	5.08	2004	6.84	4th Gear	.....	171	42	46		28.945
36.50	2178	6.29	2007	5.97	5th Gear	.....	170	42	46		28.945
34.25	1093	11.75	2004	3.49	6th Gear	.....	172	42	46		28.945
MAXIMUM POWER WITHOUT BALLAST											
34.36	2633	4.89	1999	9.97	4th Gear	.....	174	51	55		28.780
VARYING DRAWBAR PULL AND TRAVEL SPEED WITH BALLAST—4th Gear											
Pounds pull	2700		2800		2850	2850	2903		2800		2700
Horsepower	36.3		33.6		31.2	27.4	24.0		19.4		14.4
Miles per hour	5.1		4.5		4.1	3.6	3.1		2.6		2.0

TIRES, BALLAST and WEIGHT

		With Ballast	Without Ballast
Rear tires	—No, size, ply & psi	Two 13-28;6;14	Two 13-28;6;14
Ballast	—Liquid	438 lb each	None
	—Cast iron	570 lb each	None
Front tires	—No, size, ply & psi	Two 6.00-16;4;32	Two 6.00-16;4;32
Ballast	—Liquid	None	None
	—Cast iron	96 lb each	None
Height of drawbar		20 inches	21 inches
Static weight	—Rear	4790 lb	2774 lb
	—Front	1850 lb	1668 lb
Total weight with operator		6725 lb	4617 lb

Department of Agricultural Engineering

Dates of Test: March 10 to March 18, 1959

Manufacturer: DAVID BROWN INDUSTRIES LTD,
MELTHAM, HUDDERSFIELD, YORKSHIRE,
ENGLAND

Manufacturer's Power Rating: Not Rated

FUEL, OIL and TIME Fuel No 2 Diesel Cetane No 51 (rating taken from oil company's typical inspection data) Specific gravity converted to 60°/60° 0.8418 Weight per gallon 7.009 lb Oil SAE 20-20W API service classification MS and DG To motor 2.364 gal Drained from motor 2.283 gal Transmission and final-drive lubricant SAE No 50 Type tractor oil Total time motor was operated 49 hours.

ENGINE Make David Brown AD4/40T Diesel Type 4 cylinder vertical Serial No AD 4/40T489 Crank-shaft mounted lengthwise Rated rpm 2200 PTO 2000 drawbar Lubrication pressure Bore and stroke 3 3/8" x 4" Compression ratio 17 to 1 Displacement 165 cu in Cranking system 12 volts (2-6 volt batteries) Air cleaner oil washed wire mesh Muffler was used Oil filter replaceable treated paper element Fuel filter two replaceable paper elements Cooling medium temperature control thermostat.

CHASSIS Type Standard Serial No T950D57529 Tread width rear 52" to 76" front 52" to 76" Wheel base 76" 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 28.8" Vertical distance above roadway 28" Horizontal distance from center of rear wheel tread 0" to the right or left Hydraulic control system direct engine drive Advertised speeds mph first 1.58 second 2.69 third 3.53 fourth 4.79 fifth 6.01 sixth 10.70 reverse 2.65 and 5.93 Belt pulley diam 8 1/2" face 5 3/4" rpm 1436 Belt speed 3195 fpm Clutch single plate dry disc operated by foot pedal Brakes internal expanding shoe operated by two foot pedals Power take-off 540 rpm at 1800 engine rpm Steering no power assistance Turning radius (on concrete surface with brake applied) right 121" left 121" (on concrete surface without brake) right 138" left 138" Turning space diameter (on concrete surface with brake applied) right 250" left 250" (on concrete surface without brake) right 284" left 284".

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. First gear was not run as it was necessary to limit the pull in second gear to avoid excessive wheel slippage.

We, the undersigned, certify that this is a true and correct report of official Tractor Test No 691.

L. F. LARSEN

Engineer-in-Charge

L. W. HURLBUT
G. W. STEINBRUEGGE
J. J. SULEK
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, $\frac{1}{2}$ 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 useage.

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 transmissions, 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 950 Diesel