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Test 1138: David Brown 1212 Diesel (Also Case 1210 Power Shift Diesel) 12-Speed

Nebraska Tractor Test Lab

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NEBRASKA TRACTOR TEST 1138 – DAVID BROWN 1212 DIESEL ALSO CASE 1210 POWER SHIFT DIESEL 12 SPEED

POWER TAKE-OFF PERFORMANCE

Hp	Crank- shaft speed rpm	Fuel Consumption Gal per hr	Lb per hp-hr	Hp-hr per gal	Temperature Cooling medium	Degrees F Air wet bulb	Air dry bulb	Barometer inches of Mercury
MAXIMUM POWER AND FUEL CONSUMPTION								
Rated Engine Speed—Two Hours (PTO Speed—680 rpm)								
65.36	2300	4.293	0.457	15.22	201	67	75	28.770
Standard Power Take-off Speed (1000 rpm)—One Hour								
58.25	1999	3.796	0.454	15.35	205	69	76	28.813
Standard Power Take-off Speed (540 rpm)—One Hour								
53.98	1828	3.558	0.459	15.17	206	69	75	28.793
VARYING POWER AND FUEL CONSUMPTION—Two Hours								
56.83	2352	3.542	0.434	16.04	190	71	78	.....
0.00	2442	0.982	.....	.....	173	71	78	.....
29.03	2404	2.086	0.500	13.92	181	72	79	.....
64.34	2301	4.206	0.455	15.30	204	72	80	.....
14.61	2421	1.512	0.721	9.66	177	73	80	.....
42.99	2371	2.689	0.435	15.99	184	73	80	.....
Av	34.63	2381	2.503	0.503	13.84	185	72	28.823

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 Cool- ing med	Degrees F Air wet bulb	Air dry bulb	Barometer inches of Mercury
VARYING DRAWBAR POWER AND FUEL CONSUMPTION WITH BALLAST											
Maximum Available Power—Two Hours—7th Gear (M-3)											
53.20	3795	5.26	2300	5.47	4.237	0.555	12.56	193	71	74	28.935
75% of Pull at Maximum Power—Ten Hours—7th Gear (M-3)											
42.94	2897	5.56	2394	3.97	3.235	0.524	13.27	188	79	88	28.899
50% of Pull at Maximum Power—Two Hours—7th Gear (M-3)											
29.00	1928	5.64	2400	2.86	2.454	0.588	11.82	184	71	86	28.805
50% of Pull at Reduced Engine Speed—Two Hours—9th Gear (M-4)											
28.81	1909	5.66	1766	3.04	2.172	0.524	13.26	185	74	82	28.895
MAXIMUM POWER WITH BALLAST											
40.14	8137	1.85	2362	13.11	3rd Gear (L-3)		182	61	66		28.840
52.86	5117	3.87	2299	7.29	6th Gear (M-2)		205	63	70		28.850
53.88	3838	5.26	2301	5.41	7th Gear (M-3)		192	65	73		28.860
54.10	2933	6.92	2300	4.07	8th Gear (H-1)		194	67	75		28.860
51.52	2638	7.32	2300	3.73	9th Gear (M-4)		198	69	77		28.860
51.86	2028	9.59	2300	2.69	10th Gear (H-2)		198	72	80		28.850

VARYING DRAWBAR PULL AND TRAVEL SPEED WITH BALLAST 7th Gear (M-3)

Pounds Pull	3838	3933	4029	4095	4091	3995
Horsepower	53.88	49.58	45.09	40.16	34.28	28.02
Crankshaft Speed rpm	2301	2069	1839	1614	1379	1153
Miles Per Hour	5.26	4.73	4.20	3.68	3.14	2.63
Slip of Drivers %	5.41	5.67	5.80	5.80	5.93	5.67

TRACTOR SOUND LEVEL (Without Cab)

	dB(A)
Maximum Available Power 2 Hours	98.0
75% of Pull at Max. Power 10 Hours	97.5
50% of Pull at Max. Power 2 Hours	97.0
50% of Pull at Reduced Engine Speed 2 Hours	94.5
Bystander 12th Gear (H-4)	89.0

TIRES, BALLAST AND WEIGHT

	With Ballast	Without Ballast
Rear Tires		
Ballast	—No., size, ply & psi	Two 18.4-30;6;16
	—Liquid	1280 lb each
	Cast Iron	700 lb each
Front Tires		
Ballast	—No., size, ply & psi	Two 7.50-16;6;28
	—Liquid	None
	Cast Iron	35 lb each
Height of drawbar	19½ inches	20 inches
Static weight with operator—rear	7985 lb	4025 lb
front	2450 lb	2380 lb
total	10435 lb	6405 lb

Department of Agricultural Engineering

Dates of Test: June 25 to July 3, 1973

Manufacturer: DAVID BROWN TRACTORS LTD., Meltham, Huddersfield, Yorkshire, England

FUEL, OIL AND TIME Fuel No 2 Diesel Cetane No 50.1 (rating taken from company's typical inspection data) Specific gravity converted to 60°/60° 0.8362 Weight per gallon 6.962 lb Oil SAE 20-20W API service classification (Case HDM oil) To motor 1.950 gal Drained from motor 1.158 gal Transmission lubricant SAE 20W-40 Final drive lubricant SAE 140 Total time engine was operated 50½ hours.

ENGINE Make David Brown Diesel Type 4 cylinder vertical Serial No 455031 15117 Crankshaft Mounted lengthwise Rated rpm 2300 Bore and stroke 3.939" x 4.5" Compression ratio 17 to 1 Displacement 219 cu in Cranking system 12 volt electric Lubrication pressure Air cleaner oil washed wire mesh with pleated paper precleaner Oil filter full flow replaceable pleated paper element Fuel filter primary and secondary replaceable pleated paper elements Muffler vertical Cooling medium temperature control thermostat.

CHASSIS Type standard Serial No 1212/1 1001080 Tread width rear 56" to 80" front 52" to 72" Wheel base 89" 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 34" Vertical distance above roadway 35.5" Horizontal distance from center of rear wheel tread 0" to the right/left Hydraulic control system direct engine drive Transmission selective gear fixed ratio with operator controlled power shifting in 4 ranges Advertised speeds mph first 1.0 second 1.4 third 1.8 fourth 2.5 fifth 2.7 sixth 3.7 seventh 5.0 eighth 6.4 ninth 6.8 tenth 8.8 eleventh 11.7 twelfth 16.0 reverse 2.8, 3.9, 5.1, and 7.0 Clutch single plate dry disc operated by foot pedal in combination with PTO clutch operated by foot pedal Brakes internal expanding shoe operated by hand lever or independently by two foot pedals Steering hydrostatic Turning radius (on concrete surface with brake applied) right 141" left 141" (on concrete surface without brake) right 158" left 158" Turning space diameter (on concrete surface with brake applied) right 292" left 292" (on concrete surface without brake) right 326" left 326" Power take-off 540 rpm at 1828 engine rpm or 1000 at 2000 engine rpm.

REPAIRS AND ADJUSTMENTS: During the two hour 50% drawbar run in 7th gear the engine timing gear train failed bending the fuel injection pump shaft. Four timing gears and the fuel injection pump were replaced. The valves were lapped and the test continued.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test code or official Nebraska test procedure.

First and second gears were not run as it was necessary to limit the pull in third gear because of the tire tangential pull limitation.

Fourth, fifth, eleventh and twelfth gears were not run as test procedure requires only six travel speeds.

We, the undersigned, certify that this is a true and correct report of official Tractor Test 1138.

L. F. LARSEN

Engineer-in-Charge

G. W. STEINBRUEGGE, Chairman

W. E. SPLINTER

D. E. LANE

Board of Tractor Test Engineers

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

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 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.

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 68503.



DAVID BROWN 1212 DIESEL