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Test 1149: Case 870 Manual Diesel

Nebraska Tractor Test Lab

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NEBRASKA TRACTOR TEST 1149 – CASE 870 MANUAL DIESEL

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—1123 rpm)								
80.20	2100	5.681	0.490	14.12	193	62	75	28.917
Standard Power Take-off Speed (1000 rpm)—One Hour								
77.93	1870	5.367	0.477	14.52	196	62	75	28.890
VARYING POWER AND FUEL CONSUMPTION—Two Hours								
70.65	2178	4.860	0.476	14.54	187	62	74	.....
0.00	2305	1.617	.....	.....	176	62	75	.....
36.37	2243	2.996	0.570	12.14	181	62	75	.....
79.70	2099	5.662	0.492	14.08	194	62	75	.....
18.42	2271	2.319	0.871	7.94	176	61	74	.....
54.01	2219	3.919	0.502	13.78	183	63	76	.....
Av 43.19	2219	3.562	0.571	12.13	183	62	75	28.873

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—4th Gear (4 Lo)											
69.53	4980	5.24	2098	6.18	5.600	0.557	12.42	184	51	55	28.975
75% of Pull at Maximum Power—Ten Hours—4th Gear (4 Lo)											
57.30	3842	5.59	2203	4.66	4.574	0.552	12.53	181	44	50	29.020
50% of Pull at Maximum Power—Two Hours—4th Gear (4 Lo)											
39.69	2590	5.75	2234	3.35	3.649	0.636	10.88	178	42	46	28.960
50% of Pull at Reduced Engine Speed—Two Hours—8th Gear (4 Lo)											
39.50	2578	5.74	1849	3.21	3.270	0.573	12.08	181	46	56	28.840
MAXIMUM POWER WITH BALLAST											
51.79	10047	1.93	2192	14.75	1st Gear (1 Lo)			181	48	55	28.730
66.58	9443	2.64	2100	13.53	2nd Gear (2 Lo)			185	48	55	28.730
70.34	6727	3.92	2101	8.94	3rd Gear (3 Lo)			184	53	60	28.970
71.09	5095	5.23	2100	6.32	4th Gear (4 Lo)			184	53	60	28.970
69.88	4093	6.40	2100	4.91	5th Gear (1 Hi)			185	54	59	28.970
68.51	2808	9.15	2100	3.39	6th Gear (2 Hi)			185	54	59	28.970

VARYING DRAWBAR PULL AND TRAVEL SPEED WITH BALLAST 4th Gear (4 Lo)

Pounds Pull	5095	5654	5980	6215	6259	6161
Horsepower	71.09	70.21	66.04	59.83	51.65	41.84
Crankshaft Speed rpm	2100	1884	1685	1476	1206	1041
Miles Per Hour	5.23	4.66	4.14	3.61	3.09	2.55
Slip of Drivers %	6.32	7.28	7.81	8.08	8.08	8.08

TRACTOR SOUND LEVEL

	dB (A)
Maximum Available Power 2 Hours	83.0
75% of Pull at Max. Power 10 Hours	84.0
50% of Pull at Max. Power 2 Hours	85.0
50% of Pull at Reduced Engine Speed 2 Hours	84.0
Bystander 8th Gear (4-Hi)	87.0

TIRES, BALLAST AND WEIGHT

	With Ballast	Without Ballast
Rear Tires	—No., size, ply & psi	Two 18.4-34; 8; 20
Ballast	—Liquid	1004 lb each
	Cast Iron	634 lb each
Front Tires	—No., size, ply & psi	Two 10.00-16; 6; 28
Ballast	—Liquid	None
	Cast Iron	80 lb each
Height of drawbar	20½ inches	21½ inches
Static weight with operator—rear	10450 lb	7175 lb
front	3060 lb	2900 lb
total	13510 lb	10075 lb

Department of Agricultural Engineering

Dates of Test: October 22 to October 31, 1973

Manufacturer: J. I. CASE COMPANY, RACINE, WISCONSIN

FUEL, OIL AND TIME Fuel No 2 Diesel Cetane No 50.1 (rating taken from oil company's typical inspection data) Specific gravity converted to 60°/60° 0.8311 Weight per gallon 6.920 lb Oil SAE 30 API service classification (Case HDM Oil) To motor 1.923 gal Drained from motor 1.702 gal Transmission and final drive lubricant Case TFD Oil Total time engine was operated 49½ hours

ENGINE Make J. I. Case Diesel Type 4 cylinder vertical Serial No 2531543 Crankshaft Mounted lengthwise Rated rpm 2100 Bore and stroke 4⅝" x 5" Compression ratio 16.5 to 1 Displacement 336 cu in Cranking system 12 volt electric Lubrication pressure Air cleaner dry type with replaceable pleated paper element and precleaner Oil filter full flow replaceable cartridge Oil cooler engine coolant heat exchanger for engine oil Fuel filter replaceable primary and secondary filter Muffler was used Cooling medium temperature control thermostat

CHASSIS Type standard Serial No 8728086 Tread width rear 62" to 88" front 62" to 90" Wheel base 101" 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 29.7" Vertical distance above roadway 40.5" Horizontal distance from center of rear wheel tread 0" to the right/left Hydraulic control system direct engine drive Transmission selective gear fixed ratio Advertised speeds mph first 2.0 second 2.9 third 4.1 fourth 5.0 fifth 6.3 sixth 8.9 seventh 12.6 eighth 15.8 reverse 2.6 and 8.0 Clutch single plate dry disc operated by foot pedal Brakes dry double disc hydraulically power actuated by two foot pedals which can be locked together Steering hydrostatic Turning radius (on concrete surface with brake applied) right 156" left 156" (on concrete surface without brake) right 182" left 182" Turning space diameter (on concrete surface with brake applied) right 320" left 320" (on concrete surface without brake) right 373" left 373" Belt pulley 1107 rpm at 1900 engine rpm diam 10.5" face 7.25" Belt speed fpm 3045 Power take-off 538 rpm at 1900 engine rpm and 1016 rpm at 1900 engine rpm.

REPAIR 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.

Seventh and eighth 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 1149.

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
H. W. Ottosen, Director & Acting Dean; 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.



CASE 870 MANUAL DIESEL