

University of Nebraska - Lincoln

DigitalCommons@University of Nebraska - Lincoln

Nebraska Tractor Tests

Tractor Test and Power Museum, The Lester F. Larsen

1-1-1973

Test 1148: Case 1370 Diesel

Nebraska Tractor Test Lab

University of Nebraska-Lincoln, tractortestlab@unl.edu

Follow this and additional works at: <https://digitalcommons.unl.edu/tractormuseumlit>



Part of the [Energy Systems Commons](#), [History of Science, Technology, and Medicine Commons](#), [Other Mechanical Engineering Commons](#), [Physical Sciences and Mathematics Commons](#), [Science and Mathematics Education Commons](#), and the [United States History Commons](#)

Nebraska Tractor Test Lab, "Test 1148: Case 1370 Diesel" (1973). *Nebraska Tractor Tests*. 1471.
<https://digitalcommons.unl.edu/tractormuseumlit/1471>

This Article is brought to you for free and open access by the Tractor Test and Power Museum, The Lester F. Larsen at DigitalCommons@University of Nebraska - Lincoln. It has been accepted for inclusion in Nebraska Tractor Tests by an authorized administrator of DigitalCommons@University of Nebraska - Lincoln.

NEBRASKA TRACTOR TEST 1148 – CASE 1370 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—1100 rpm)								
155.56	2200	11.053	0.492	14.07	200	65	74	28.740
Standard Power Take-off Speed (1000 rpm)—One Hour								
156.32	2001	10.413	0.461	15.01	195	69	75	29.000
VARYING POWER AND FUEL CONSUMPTION—Two Hours								
137.76	2287	10.27	0.516	13.41	191	70	76	.....
0.00	2367	3.772	.....	.....	179	70	75	.....
69.96	2332	6.876	0.680	10.17	187	70	76	.....
156.23	2200	11.116	0.492	14.05	197	70	75	.....
35.25	2351	5.319	1.044	6.63	181	72	76	.....
104.13	2309	8.623	0.573	12.08	188	71	75	.....
Av 83.89	2308	7.663	0.632	10.95	187	70	75	29.007

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—6th Gear (3 Lo)											
130.93	9847	4.99	2200	6.42	10.874	0.574	12.04	186	48	54	28.980
75% of Pull at Maximum Power—Ten Hours—6th Gear (3 Lo)											
107.76	7568	5.34	2312	4.71	9.880	0.634	10.91	183	33	38	29.334
50% of Pull at Maximum Power—Two Hours—6th Gear (3 Lo)											
71.91	4914	5.49	2335	3.09	7.893	0.759	9.11	185	35	39	29.255
50% of Pull at Reduced Engine Speed—Two Hours—9th Gear (3 Hi)											
70.71	4837	5.48	1399	2.93	5.328	0.521	13.27	182	35	42	29.235
MAXIMUM POWER WITH BALLAST											
105.80	16480	2.41	2293	14.93	2nd Gear (1 Int)		184	40	40		28.990
131.78	11411	4.33	2201	7.65	5th Gear (2 Int)		187	41	48		28.990
134.25	10066	5.00	2200	6.27	6th Gear (3 Lo)		187	38	43		28.850
131.31	8913	5.52	2201	5.68	7th Gear (2 Hi)		187	41	46		28.990
131.26	7255	6.78	2201	4.63	8th Gear (3 Int)		187	41	46		28.990
130.51	5720	8.56	2201	3.71	9th Gear (3 Hi)		187	41	47		28.990

VARYING DRAWBAR PULL AND TRAVEL SPEED WITH BALLAST 6th Gear (3 Lo)

Pounds Pull	10366	11118	12131	12626	12035	10747
Horsepower	134.25	131.30	126.85	115.45	94.53	70.89
Crankshaft Speed rpm	2200	1973	1760	1547	1322	1100
Miles Per Hour	5.00	4.43	3.92	3.43	2.95	2.47
Slip of Drivers %	6.27	7.28	8.14	8.42	8.14	7.00

TRACTOR SOUND LEVEL (with cab)

	dB (A)
Maximum Available Power 2 Hours	81.0
75% of Pull at Max. Power 10 Hours	81.5
50% of Pull at Max. Power 2 Hours	84.5
50% of Pull at Reduced Engine Speed 2 Hours	79.5
Bystander 12th Gear (4 Hi)	88.5

TIRES, BALLAST AND WEIGHT

	With Ballast	Without Ballast
Rear Tires	—No., size, ply & psi	Four 18.4-38;8;18
Ballast	—Liquid	1064 lb each
	Cast Iron	87 lb each
Front Tires	—No., size, ply & psi	Two 10.00-16;6;28
Ballast	—Liquid	None
	Cast Iron	170 lb each
Height of drawbar	19 inches	20 inches
Static weight with operator—rear	16150 lb	11545 lb
front	4140 lb	3800 lb
total	20290 lb	15345 lb

Department of Agricultural Engineering

Dates of Test: October 31 to November 7, 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 inspection data) Specific gravity converted to 60°/60° 0.8311 Weight per gallon 6.920 lb Oil SAE 30 API service classification SB/SE CA/CD (MS DS) To motor 4.775 gal Drained from motor 4.167 gal Transmission and final drive lubricant CASE TFD fluid Total time engine was operated 49 hours.

ENGINE Make J. I. Case Diesel Type 6 cylinder with turbo-charger Serial No 2530115 Crankshaft Mounted lengthwise Rated rpm 2200 Bore and stroke 4 3/4" x 5" Compression ratio 15.8 to 1 Displacement 504 cu in Cranking system 12 volt electric Lubrication pressure Air cleaner dry type two stage with replaceable pleated paper elements and pre-cleaner Oil filter two parallel full flow replaceable cartridges Oil cooler engine coolant heat exchanger for crankcase oil and radiator for transmission and hydraulic fluid Fuel filter replaceable primary and secondary filter cartridges Muffler was used Cooling medium temperature control two thermostats.

CHASSIS Type standard Serial No 8731352 Tread width rear 62" to 108" front 60" to 88" Wheel base 104" 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 39.2" 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 partial range operator controlled power shifting Advertised speeds mph first 2.0 second 2.7 third 3.4 fourth 3.5 fifth 4.6 sixth 5.2 seventh 5.8 eighth 7.0 ninth 8.8 tenth 11.2 eleventh 14.9 twelfth 18.5 reverse 3.4, 5.8 and 8.8 Clutch multiple disc wet clutches within transmission actuated hydraulically Brakes wet multiple disc hydraulically power actuated by two foot pedals that can be locked together Steering hydrostatic Turning radius (on concrete surface with brake applied) right 148" left 148" (on concrete surface without brake) right 172" left 172" Turning space diameter (on concrete surface with brake applied) right 307" left 307" (on concrete surface without brake) right 356" left 356" Power take-off 1000 rpm at 2000 engine rpm.

REPAIRS and ADJUSTMENTS: The intake manifold cup plug came out during the PTO run causing a loss in power. The plug was replaced and 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 gear was not run as it was necessary to limit the pull in second gear because of excessive wheel slippage. Third, fourth, tenth, 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 1148.

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. Ottoson, 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 1370 DIESEL