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Test 788: Case 630 (Diesel)

Nebraska Tractor Test Lab

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NEBRASKA TRACTOR TEST 788 - CASE 630 DIESEL

The University of Nebraska Agricultural Experiment Station

E. F. Frolik, Dean; A. W. Epp, Acting Director, Lincoln, Nebraska

POWER TAKE-OFF PERFORMANCE

Hp	Crank shaft speed rpm	Fuel Consumption		Hp-hr per gal	Temp. Degrees F			Barometer inches of mercury
		Gal per hr	Lb per hp-hr		Cool- ing med	Air wet bulb	Air dry bulb	
MAXIMUM POWER AND FUEL CONSUMPTION								
Rated Engine Speed—Two Hours								
48.24	2000	3.290	0.471	14.66	189	58	75	28.835
Standard Power Take-off Speed (540 rpm)—One Hour								
47.40	1951	3.214	0.468	14.75	189	58	76	28.823
VARYING POWER AND FUEL CONSUMPTION—TWO HOURS								
42.70	2083	2.758	0.446	15.48	182	59	77	.....
0.00	2171	0.721	.....	.....	136	58	75	.....
21.78	2124	1.672	0.530	13.03	158	58	75	.....
48.39	2000	3.292	0.470	14.70	188	58	76	.....
11.01	2148	1.177	0.738	9.35	167	57	74	.....
32.32	2103	2.180	0.466	14.83	180	58	76	.....
Av 26.03	2105	1.967	0.522	13.23	168	58	75	28.800

DRAWBAR PERFORMANCE

Hp	Draw-bar pull lbs	Speed miles per hr	Crank shaft speed rpm	Slip of drivers %	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	
VARYING DRAWBAR POWER AND FUEL CONSUMPTION WITH BALLAST											
Maximum Available Power—Two Hours—7th Gear											
40.68	2836	5.38	2005	4.21	3.180	0.540	12.79	187	68	76	28.405
75% of Pull at Maximum Power—Ten Hours—7th Gear											
32.24	2125	5.69	2096	3.00	2.508	0.537	12.85	177	51	61	28.926
50% of Pull at Maximum Power—Two Hours—7th Gear											
22.21	1450	5.74	2099	2.22	1.946	0.605	11.41	175	65	69	28.408
MAXIMUM POWER WITH BALLAST											
28.63	6987	1.54	2074	14.70	1st Gear	.....	181	66	75	28.635	
37.90	6433	2.21	1999	13.39	2nd Gear	.....	185	68	83	28.560	
39.76	5772	2.58	1998	10.66	3rd Gear	.....	184	68	83	28.560	
39.72	4839	3.08	2000	8.37	4th Gear	.....	183	68	83	28.560	
40.00	3759	3.99	2002	6.27	5th Gear	.....	183	68	83	28.560	
39.55	3239	4.58	2001	5.25	6th Gear	.....	184	68	82	28.550	
40.67	2856	5.34	2001	4.63	7th Gear	.....	184	68	82	28.550	
38.21	2091	6.85	1999	3.25	8th Gear	.....	184	68	82	28.550	
38.58	1789	8.09	2006	2.67	9th Gear	.....	185	68	82	28.550	
36.77	1512	9.12	2002	2.29	10th Gear	.....	182	67	80	28.545	
34.98	964	13.61	2000	1.50	11th Gear	.....	180	67	80	28.545	
MAXIMUM POWER WITHOUT BALLAST											
37.32	2725	5.14	2070	14.81	7th Gear	.....	182	47	51	28.970	
VARYING DRAWBAR PULL AND TRAVEL SPEED WITH BALLAST—7th Gear											
Pounds pull			2850	2950	3000	3050	3000	2950			
Horsepower			40.7	37.8	34.4	30.1	25.6	20.5			
Miles per hour			5.3	4.8	4.3	3.7	3.2	2.6			

TIRES, BALLAST and WEIGHT

		With Ballast	Without Ballast
Rear tires	—No, size, ply & psi	Two 16.9-28;6;16	Two 16.9-28;6;16
Ballast	—Liquid	676 lb each	None
	—Cast iron	1800 lb each	None
Front tires	—No, size, ply & psi	Two 7.50-16;4;28	Two 7.50-16;4;28
Ballast	—Liquid	None	None
	—Cast iron	None	None
Height of Drawbar		14½ inches	17 inches
Static weight	—Rear	7590 lb	2638 lb
	—Front	1850 lb	1824 lb
Total weight with operator		9615 lb	4637 lb

Department of Agricultural Engineering

Dates of Test: April 10 to April 22, 1961

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

Manufacturer's Power Rating: 50 Belt Horsepower (corrected to Standard Conditions)

FUEL, OIL and TIME Fuel No 2 Diesel Cetane No 54 (Rating taken from oil company's typical inspection data) Specific gravity converted to 60°/60° 0.8297 Weight per gallon 6.908 lb Oil SAE 20-20W API service classification DS To motor 1.045 gal Drained from motor 0.904 gal Transmission and final-drive lubricant SAE 90 Type multi-purpose gear lube (E. P.) Total time engine was operated 40 hours.

ENGINE Make Case Diesel Type 4 cylinder vertical Serial No 503-S0-3899 Crankshaft mounted lengthwise Rated rpm 2000 Bore and stroke 3¹³/₁₆" x 4½" Compression ratio 17.5 to 1 Displacement 188.4 cu in Cranking system 12 volt electric (two 6 volt batteries) Lubrication pressure Air cleaner oil washed wire mesh Oil filter replaceable treated paper element Fuel filter replaceable treated paper element Muffler was used Cooling medium temperature control thermostat.

CHASSIS Type standard Serial No 6153216 Tread width rear 48" to 76" front 52" Wheel base 79¼" 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 31.8" Vertical distance above roadway 31" Horizontal distance from center of rear wheel tread 0" to the right/left Hydraulic control system direct engine drive with throwout lever Transmission selective gear fixed ratio Advertised speeds mph first 1.52 second 2.24 third 2.54 fourth 2.94 fifth 3.73 sixth 4.23 seventh 4.91 eighth 6.22 ninth 7.28 tenth 8.18 eleventh 12.12 twelfth 20.20 reverse 1.81 and 3.02 Clutch single plate dry disc operated by foot pedal Brakes double disc operated by foot pedals Steering power assisted Turning radius (on concrete surface with brake applied) right 118" left 122" (on concrete surface without brake) right 130" left 135" Turning space diameter (on concrete surface with brake applied) right 248" left 256" (on concrete surface without brake) right 273" left 281" Belt pulley 1360 rpm at 2000 engine rpm diam 9¼" face 6½" Belt speed 3290 fpm Power take-off 533 rpm at 1925 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.

Twelfth 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 788.

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 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 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.



Case 630 Diesel