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Test 737: Case 831 (Diesel)

Nebraska Tractor Test Lab

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NEBRASKA TRACTOR TEST 737 - CASE 831 DIESEL

University of Nebraska Agricultural Experiment Station

W. V. Lambert, Director, Lincoln, Nebraska

POWER TAKE-OFF PERFORMANCE

Hp	Crank shaft speed rpm	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
MAXIMUM POWER AND FUEL CONSUMPTION								
Rated Engine Speed—Two Hours								
63.76	1700	4.255	0.468	14.98	196	60	75	29.002
VARYING POWER AND FUEL CONSUMPTION—TWO HOURS								
55.56	1745	3.573	0.451	15.55	189	59	75	.....
0.00	1866	0.971	.....	.....	162	59	75	.....
28.71	1802	2.195	0.536	13.08	178	60	77	.....
64.03	1700	4.258	0.466	15.04	200	61	77	.....
14.60	1832	1.622	0.779	9.00	170	60	76	.....
42.37	1774	2.820	0.467	15.02	181	60	77	.....
Av 34.21	1786	2.573	0.527	13.30	180	60	76	28.978

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	Temperature Degrees F Cooling medium	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											
54.27	4997	4.07	1704	6.93	4.200	0.542	12.92	200	59	75	28.813
75% of Pull at Maximum Power—Ten Hours—4th Gear											
44.30	3857	4.31	1755	4.55	3.256	0.515	13.61	186	58	69	28.745
50% of Pull at Maximum Power—Two Hours—4th Gear											
30.60	2581	4.45	1794	3.58	2.551	0.584	12.00	189	56	70	28.860
MAXIMUM POWER WITH BALLAST											
40.95	7861	1.95	1764	14.62	2nd Gear	.....	190	48	55	28.900	
52.59	7615	2.59	1702	14.34	3rd Gear	.....	190	48	55	28.900	
55.46	5163	4.03	1704	7.97	4th Gear	.....	194	49	57	28.900	
54.94	3838	5.37	1700	5.52	5th Gear	.....	194	52	60	28.895	
55.54	2656	7.84	1713	3.72	6th Gear	.....	195	52	62	28.900	
53.15	1838	10.84	1706	2.51	7th Gear	.....	195	52	62	28.900	
MAXIMUM POWER WITHOUT BALLAST											
53.71	5169	3.90	1705	10.88	4th Gear	.....	200	68	82	28.600	
VARYING DRAWBAR PULL AND TRAVEL SPEED WITH BALLAST—4th Gear											
Pounds pull			5150	5500	5550	5650	5550	5500			
Horsepower			55.5	52.8	47.4	40.7	34.0	29.3			
Miles per hour			4.0	3.6	3.2	2.7	2.3	2.0			

Department of Agricultural Engineering

Dates of test: April 5 to April 23, 1960

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

Manufacturer's Power Rating: Not Rated

FUEL, OIL and TIME Fuel No 2 Diesel Cetane No 50 (rating taken from oil company's typical inspection data) Specific gravity converted to 60°/60° 0.8419 Weight per gallon 7.010 lb Oil SAE 10W API service classification MS, DG To motor 2.239 gal Drained from motor 1.823 gal Transmission and final-drive lubricant SAE 10W Type engine oil Total time engine was operated 42 hours.

ENGINE Make Case Diesel Type 4 cylinder vertical Serial No 8161054 Crankshaft mounted lengthwise Rated rpm 1700 Bore and stroke 4 1/8" x 5" Compression ratio 15.3 to 1 Displacement 301 cu in Cranking system 12 volt electric (two 6 volt batteries) Lubrication pressure Air cleaner oil washed wire mesh Oil filter replaceable pleated paper element Fuel filter two replaceable cotton thread elements, one replaceable sealed cartridge Muffler was used Cooling medium temperature control thermostat.

CHASSIS Type standard Serial No 8161054 Tread width rear 52" to 88" front 53" to 82" Wheel base 101 3/4" 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 3/8" Vertical distance above roadway 35 3/4" 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 1.5 second 2.1 third 2.9 fourth 4.3 fifth 5.6 sixth 8.0 seventh 10.7 eighth 15.7 reverse 2.0 and 7.2 Clutch single plate operated by foot pedal Brakes double disc operated independently by foot pedals which can be locked together Steering power assisted Turning radius (on concrete surface with brake applied) right 143" left 124" (on concrete surface without brake) right 200" left 196" Turning space diameter (on concrete surface with brake applied) right 298" left 260" (on concrete surface without brake) right 412" left 403" Belt pulley 1322 rpm at 1700 engine rpm diam 10 1/2" face 7 1/4" Belt speed 3634 fpm Power take-off 545 rpm at 1700 engine rpm.

REPAIRS AND ADJUSTMENTS During the limber-up run the rain cap on the muffler came apart.

REMARKS All test results were determined from observed data obtained in accordance with the 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. Eighth 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 737.

L. F. LARSEN

Engineer-in-Charge

TIRES, BALLAST and WEIGHT

		With Ballast	Without Ballast
Rear tires	—No, size, ply & psi	Two 15.5-38;8;24	Two 15.5-38;8;14
Ballast	—Liquid	630 lb each	None
	—Cast iron	1265 lb each	None
Front tires	—No, size, ply & psi	Two 6.00-16;6;36	Two 6.00-16;6;36
Ballast	—Liquid	None	None
	—Cast iron	None	None
Height of drawbar		19 1/2 inches	19 1/2 inches
Static weight	—Rear	8660 lb	4870 lb
	—Front	2085 lb	2100 lb
Total weight with operator		10,920 lb	7145 lb

L. W. HURLBUT, Chairman

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 831 Diesel