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10-7-1965

## Test 917: Case 831 CK (Diesel)

Nebraska Tractor Test Lab

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# NEBRASKA TRACTOR TEST 917 - CASE 831 CK DIESEL

## (ALSO CASE 830 CK DIESEL) - (ALSO CASE 832 CK DIESEL)

### POWER TAKE-OFF PERFORMANCE

Hp	Crank- shaft speed rpm	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	
MAXIMUM POWER AND FUEL CONSUMPTION								
* Rated Engine Speed—Two Hours								
64.26	1900	4.773	0.514	13.46	183	57	75	28.783
Standard Power Take-off Speed (540 rpm)—One Hour								
60.05	1683	4.315	0.497	13.92	184	56	75	28.765
VARYING POWER AND FUEL CONSUMPTION—TWO HOURS								
56.43	1965	4.084	0.501	13.82	180	57	76	.....
0.00	2095	1.301	.....	.....	175	58	77	.....
29.34	2040	2.627	0.620	11.17	180	57	75	.....
64.68	1900	4.747	0.508	13.63	185	58	77	.....
14.85	2067	2.012	0.937	7.38	178	58	76	.....
43.32	2009	3.308	0.528	13.10	181	58	76	.....
Av 34.77	2012	3.013	0.600	11.54	180	58	76	28.743

### DRAWBAR PERFORMANCE

Hp	Draw- bar pull lbs	Speed miles per hr	Crank- shaft speed rpm	Slip of drivers %	Fuel Consumption			Temp Degrees F			Barom- eter inches of Mercury
					Gal per hr	Lb per hp-hr	Hp-hr per gal	Cool- ing med	Air wet bulb	Air dry bulb	
VARYING DRAWBAR POWER AND FUEL CONSUMPTION WITH BALLAST											
Maximum Available Power—Two Hours—4th Gear											
57.69	4708	4.60	1898	5.13	4.835	0.580	11.93	193	48	57	29.180
75% of Pull at Maximum Power—Ten Hours—4th Gear											
46.93	3598	4.89	1994	3.89	3.837	0.566	12.23	188	46	56	29.192
50% of Pull at Maximum Power—Two Hours—4th Gear											
33.08	2452	5.06	2035	2.58	3.201	0.670	10.33	187	35	39	28.990
MAXIMUM POWER WITH BALLAST											
47.65	8271	2.16	1967	14.74	2nd Gear .....			187	56	67	28.730
56.59	7002	3.03	1897	9.48	3rd Gear .....			191	56	67	28.730
58.68	4798	4.59	1901	5.40	4th Gear .....			191	55	66	28.720
57.73	3568	6.07	1902	3.96	5th Gear .....			190	55	66	28.720
57.41	2465	8.73	1900	2.83	6th Gear .....			190	56	66	28.720
55.52	1724	12.08	1902	1.96	7th Gear .....			189	55	66	28.720
MAXIMUM POWER WITHOUT BALLAST											
57.86	4819	4.50	1903	6.74	4th Gear .....			188	68	69	28.790
VARYING DRAWBAR PULL AND TRAVEL SPEED WITH BALLAST—4th Gear											
Pounds pull				4798	5077	5221	5345	5409	5204		
Horsepower				58.68	55.46	50.77	45.00	39.34	31.59		
Crankshaft speed, rpm				1901	1705	1519	1319	1141	950		
Miles per hour				4.59	4.10	3.65	3.16	2.73	2.28		
Slip of drivers, %				5.40	5.74	6.01	6.41	6.41	6.14		

### 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	753 lb each	None
	—Cast iron	700 lb each	None
Front tires	—No, size, ply & psi	Two 7.50-16; 4; 24	Two 7.50-16; 4; 24
Ballast	—Liquid	None	None
	—Cast iron	40 lb each	None
Height of drawbar		15 inches	15 inches
Static weight	—Rear	8580 lb	5675 lb
	—Front	2300 lb	2220 lb
Total weight with operator		11055 lb	8070 lb

Department of Agricultural Engineering

Dates of Test: OCTOBER 7 TO OCTOBER 16, 1965

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

**FUEL, OIL and TIME** Fuel No 2 diesel Cetane No 57.0 (rating taken from oil company's typical inspection data) Specific gravity converted to 60°/60° 0.8312 Weight per gallon 6.920 lb Oil SAE 20-20W API service classification MS, DS To motor 1.929 gal Drained from motor 1.710 gal Transmission and final drive lubricant SAE 10W Type Case TCH oil Total time engine was operated 42½ hours.

**ENGINE** Make Case diesel Type 4 cylinder vertical Serial No 2100046 Crankshaft mounted lengthwise Rated rpm 1900 Bore and stroke 4⅜" x 5" Compression ratio 15 to 1 Displacement 301 cu in Cranking system 12 volt electric (two 6 vole batteries). Lubrication pressure Air cleaner oil washed wire mesh Oil filter replaceable pleated paper element Fuel filter two replaceable cotton elements and one replaceable pleated paper cartridge Muffler was used Cooling medium temperature control thermostat.

**CHASSIS** Type standard Serial No 8257494 Tread width rear 56" to 88" front 53" to 82" Wheel base 102" 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 27.8" Vertical distance above roadway 36.4" 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 1.7 second 2.4 third 3.3 fourth 4.8 fifth 6.2 sixth 8.9 seventh 12.1 eighth 17.6 reverse 2.2 and 8.00 Clutch single plate dry disc operated by foot pedal Brakes double disc operated by two foot pedals which can be locked together Steering mechanical with power assist Turning radius (on concrete surface with brake applied) right 126" left 126" (on concrete surface without brake) right 142" left 142" Turning space diameter (on concrete surface with brake applied) right 259" left 259" (on concrete surface without brake) right 294" left 294" Belt pulley 920 rpm at 1700 engine rpm diam 10.5" face 7.25" Belt speed 2523 fpm Power take-off 545 rpm at 1700 engine rpm (1000 rpm Power take-off is also available).

**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.

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 917.

L. F. LARSEN

Engineer-in-Charge

G. W. STEINBRUEGGE, Chairman

J. J. SULEK

D. E. LANE

Board of Tractor Test Engineers

The University of Nebraska Agricultural Experiment Station  
E. F. Frolik, Dean; H. H. Kramer, 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. 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,  $\frac{1}{2}$  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. 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 trans-

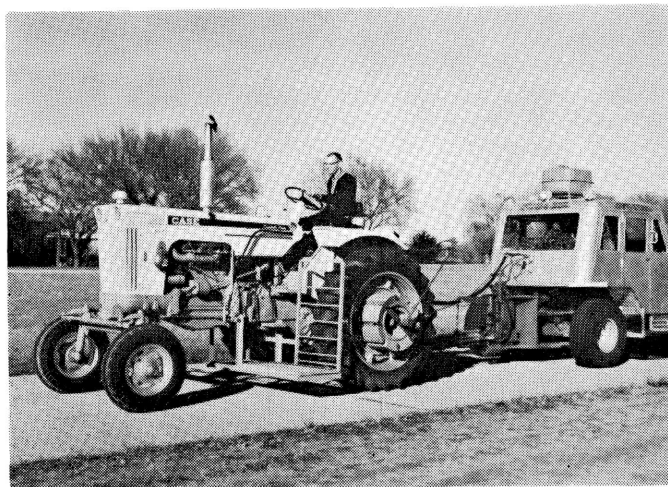
mission, etc.) on horsepower, speed and fuel consumption. These runs are made around the entire test course which has two 180 degree turns with a minimum radius of 50 feet. The drawbar pull is set at 3 different levels as follows: (1) as near to the pull at maximum power as possible and still have the 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 CK Diesel