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## Test 805: Case 310E (Diesel)

Nebraska Tractor Test Lab

University of Nebraska-Lincoln, [tractortestlab@unl.edu](mailto:tractortestlab@unl.edu)

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# NEBRASKA TRACTOR TEST 805 - CASE 310E DIESEL

The University of Nebraska Agricultural Experiment Station

E. F. Frolik, Dean; H. H. Kramer, 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								
36.89	1850	2.459	0.460	15.00	188	72	76	29.033
Standard Power Take-off Speed (540 rpm)—One Hour								
34.96	1727	2.309	0.455	15.14	186	75	79	29.055
VARYING POWER AND FUEL CONSUMPTION—TWO HOURS								
32.93	1942	2.110	0.442	15.61	184	77	83	....
0.00	2022	0.622	....	....	156	77	83	....
16.77	1979	1.301	0.535	12.89	175	77	84	....
36.11	1851	2.432	0.464	14.85	190	78	88	....
8.49	2001	0.944	0.767	8.99	177	78	86	....
24.91	1958	1.679	0.465	14.84	185	79	88	....
Av 19.87	1959	1.515	0.526	13.12	178	78	85	29.060

## DRAWBAR PERFORMANCE

Hp	Draw-bar pull lbs	Speed miles per hr	Crank shaft speed rpm	Slip of drivers %	Fuel Consumption			Temperature Degrees F			Barometer inches of mercury
					Gal per hr	Lb per hp-hr	Hp-hr per gal	Cooling medium	Air wet bulb	Air dry bulb	
VARYING DRAWBAR POWER AND FUEL CONSUMPTION WITH BALLAST											
Maximum Available Power—Two Hours—2nd Gear											
29.56	4058	2.73	1857	1.41	2.362	0.551	12.51	181	75	87	28.905
75% of Pull at Maximum Power—Ten Hours—2nd Gear											
25.12	3286	2.87	1940	1.06	2.069	0.568	12.14	181	75	85	28.750
50% of Pull at Maximum Power—Two Hours—2nd Gear											
17.16	2209	2.91	1966	0.77	1.607	0.646	10.68	179	71	86	29.063
MAXIMUM POWER WITH BALLAST											
31.45	7061	1.67	1855	4.51	1st Gear	.....		177	70	86	29.040
31.58	4370	2.71	1849	1.86	2nd Gear	.....		183	72	78	28.905
28.58	2364	4.53	1855	0.48	3rd Gear	.....		184	74	82	28.920
VARYING DRAWBAR PULL AND TRAVEL SPEED WITH BALLAST—2nd Gear											
Pounds pull	4350		4500		4750	4800		4850	4900		4550
Horsepower		31.6		30.0		27.9	24.3		20.7	17.0	13.3
Miles per hour		2.7		2.5		2.2	1.9		1.6	1.3	1.1

Department of Agricultural Engineering

Dates of Test: July 25 to August 16, 1961

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

Manufacturer's Power Rating: 35 PTO Horsepower and 30 Drawbar 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°** 0.8283 **Weight per gallon** 6.896 lb **Oil SAE 20 API service classification** DS **To motor** 2.082 gal **Drained from motor** 0.902 gal **Transmission and final-drive lubricant** SAE 90 **Type** straight mineral oil **Total time engine was operated** 53½ hours.

**ENGINE** Make Case Diesel **Type** 4 cylinder vertical **Serial No** 613 106616 **Crankshaft mounted lengthwise** **Rated rpm** 1850 **Bore and stroke** 3 13/16" x 4 1/8" **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 screen **Oil filter** replaceable treated paper cartridge **Fuel filter** first and final stage filters with replaceable elements and moisture traps **Muffler** was used **Cooling medium temperature control** thermostat.

**CHASSIS** **Type** tracklayer **Serial No** 301 6364 **Tread width** 50" **Wheel base** 57" **Drawbar height** 13" **Measured length of track** 15.2 ft **Cleats integral with shoes** **Cleats per track** 31 **Size of cleats** 14" x 1 9/16" **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** 28" **Vertical distance above roadway** 21½" **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 1.74 second 2.75 third 4.52 reverse 2.01 **Clutch** single plate dry disc operated by foot pedal **Brakes** contracting bands operated by two hand levers which can be locked by latches **Steering** hand levers controlling brakes **Turning space diameter** (with brake applied) right 235.2" left 235.2" **Belt pulley** 1160 rpm at 1800 engine rpm diam 8½" face 6½" **Belt speed** 2581 fpm **Power take-off** 540 rpm at 1727 engine rpm.

**TOTAL WEIGHT** with Operator 7545 lbs including front counterweight 1175 lbs, trunnions 35 lbs, rub shoes 45 lbs, lift brackets 60 lbs, rock guards 214 lbs, transmission guard 66 lbs, PTO 57 lbs and mounting steps 100 lbs.

**REPAIRS and ADJUSTMENTS** Steering brakes were adjusted during 10 hour run.

**REMARKS** All test results were determined from observed data obtained in accordance with the SAE and ASAE test code.

We, the undersigned, certify that this is a true and correct report of official Tractor Test 805.

L. F. LARSEN

Engineer-in-Charge

L. W. HURLBUT, Chairman

G. W. STEINBRUEGGE

J. J. SULEK

Board of Tractor

Test Engineers

## EXPLANATION OF TEST REPORT

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

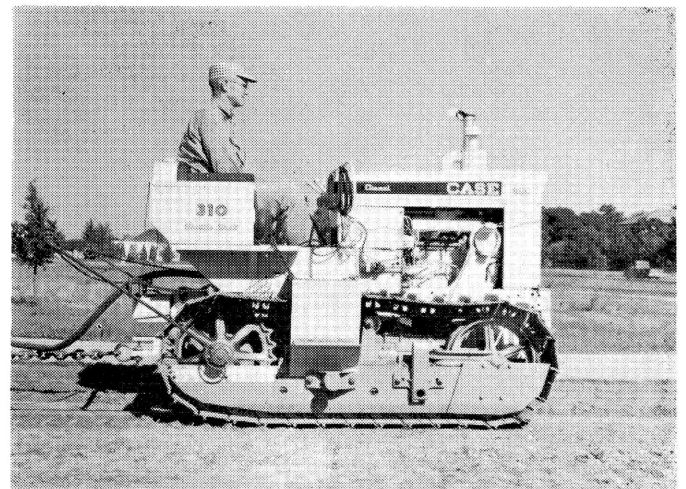
turns with a minimum radius of 50 feet. The drawbar pull is set at 3 different levels as follows: (1) as near to the pull at maximum power as possible and still have the tractor maintain the travel speed at maximum horsepower on the straight sections of the test course; (2) 75% of the pull at maximum 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 310E Diesel