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## Test 769: Case 541C (Gasoline)

Nebraska Tractor Test Lab

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

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# NEBRASKA TRACTOR TEST 769 - CASE 541C GASOLINE

The University of Nebraska Agricultural Experiment Station

E. F. Frolik, Dean and Acting 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								
41.26	2100	3.744	0.565	11.02	180	60	75	29.005
Standard Power Take off Speed (540 rpm)—One Hour								
40.32	1969	3.558	0.549	11.33	180	60	74	29.040
* VARYING POWER AND FUEL CONSUMPTION—TWO HOURS								
36.13	2164	3.432	0.591	10.53	180	58	74	.....
0.00	2334	1.634	.....	.....	175	58	73	.....
18.57	2223	2.459	0.824	7.55	173	59	75	.....
41.24	2100	3.731	0.563	11.05	180	60	75	.....
9.42	2254	1.996	1.318	4.72	175	59	74	.....
27.25	2179	2.921	0.667	9.33	175	60	75	.....
Av 22.10	2209	2.696	0.759	8.20	176	59	74	29.057

## 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—5th Gear											
36.37	2819	4.84	2099	3.54	3.506	0.600	10.37	179	55	62	28.870
32.34	3543	3.42	2047	4.65	3.523	0.678	9.18	180	48	52	Torq. Conv.
75% of Pull at Maximum Power—Ten Hours and Two Hours—5th Gear											
29.35	2189	5.03	2164	2.79	3.210	0.681	9.14	177	42	47	28.981
28.85	2661	4.07	2161	3.81	3.408	0.735	8.47	175	37	44	Torq. Conv.
50% of Pull at Maximum Power—Two Hours—5th Gear											
20.09	1463	5.15	2204	2.21	2.796	0.866	7.19	175	30	32	29.135
20.22	1818	4.17	2186	2.58	2.975	0.916	6.80	170	36	37	Torq. Conv.
MAXIMUM POWER WITH BALLAST											
31.57	6302	1.88	2163	13.96	1st Gear.....	.....	175	28	30	.....	29.230
35.05	4552	2.89	2100	7.32	2nd Gear.....	.....	177	28	30	.....	29.230
35.68	4192	3.19	2100	6.58	3rd Gear.....	.....	180	28	30	.....	29.230
36.08	3474	3.89	2102	5.07	4th Gear.....	.....	176	34	36	.....	29.220
37.14	2893	4.81	2105	4.35	5th Gear.....	.....	176	34	36	.....	29.220
35.52	2084	6.39	2098	2.95	6th Gear.....	.....	176	34	36	.....	29.220
25.73	6300	1.53	2173	14.68	1st Gear Torq. Conv..	.....	178	34	36	.....	29.220
32.10	5159	2.33	2122	8.15	2nd Gear Torq. Conv..	.....	179	34	36	.....	29.220
32.00	4727	2.54	2100	7.26	3rd Gear Torq. Conv..	.....	179	34	36	.....	29.220
32.14	4121	2.93	2079	6.24	4th Gear Torq. Conv..	.....	181	34	36	.....	29.260
33.13	3535	3.51	2078	5.07	5th Gear Torq. Conv..	.....	183	34	36	.....	29.260
32.86	2723	4.53	2061	4.41	6th Gear Torq. Conv..	.....	177	34	36	.....	29.220
MAXIMUM POWER WITHOUT BALLAST											
33.50	2730	4.60	2100	11.26	5th Gear.....	.....	180	60	76	.....	28.685
27.64	2820	3.68	2129	14.80	5th Gear Torq. Conv..	.....	180	60	76	.....	28.685

VARYING DRAWBAR PULL AND TRAVEL SPEED WITH BALLAST—5th Gear											
Pounds pull	2900	3050	3050	3200	3400	3450					
Horsepower	37.1	35.0	30.9	28.2	26.3	22.1					
Miles per hour	4.8	4.3	3.8	3.3	2.9	2.4					
Pounds pull (Torq. Conv.)	3550	3800	4200	4600	5000	5400	5700				
Horsepower (Torq. Conv.)	33.1	32.4	31.4	30.7	28.0	24.5	21.3				
Miles per hour (Torq. Conv.)	3.5	3.2	2.8	2.5	2.1	1.7	1.4				

## TIRES, BALLAST and WEIGHT

		With Ballast	Without Ballast
Rear tires	—No, size, ply & psi	Two 14.9-28;6;18	Two 14.9-28;6;14
Ballast	—Liquid	551 lb each	None
	—Cast iron	1344 lb each	None
Front tires	—No, size, ply & psi	Two 5.50-16;4;28	Two 5.50-16;4;28
Ballast	—Liquid	None	None
	—Cast iron	None	None
Height of drawbar		14½ inches	16 inches
Static weight	—Rear	6620 lb	2830 lb
	—Front	1350 lb	1340 lb
Total weight with operator		8145 lb	4345 lb

Department of Agricultural Engineering

Dates of Test: October 11 to October 22, 1960

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

Manufacturer's Power Rating: 40 belt horsepower (corrected to standard conditions)

**FUEL. OIL and TIME** Fuel regular gasoline Octane No Motor 84 Research 92 (rating taken from oil company's typical inspection data) Specific gravity converted to 60°/60° 0.7475 Weight per gallon 6.223 lb Oil SAE 20-20W API service classification ML, MM, MS, DG To motor 0.859 gal Drained from motor 0.721 gal Transmission and final-drive lubricant SAE 90 Type multi-purpose lubricant (E.P.) Total time engine was operated 55 hours.

**ENGINE** Make Case gasoline Type 4 cylinder vertical Serial No 2918-01281 Crankshaft mounted lengthwise Rated rpm 2100 Bore and stroke 3½" x 4½" Compression ratio 7.42 to 1 Displacement 158.7 cu in Carburetor size 1¼" Ignition system battery Cranking system 12 volt electric Lubrication pressure Air cleaner oil washed wire mesh Oil filter replaceable treated paper element Oil cooler engine coolant heat exchanger for torque converter oil Fuel filter brass screen Muffler was used Cooling medium temperature control thermostat.

**CHASSIS** Type tricycle Serial No 6150864 Tread width rear 48" to 88" front 6½" to 11½" Wheel base 85" 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 33.1" Vertical distance above roadway 32.2" Horizontal distance from center of rear wheel tread 0" to the right/left Hydraulic control system direct engine drive Transmission selective gear fixed ratio plus torque converter with lockout Advertised speeds mph first 1.87 second 2.64 third 3.11 fourth 3.61 fifth 4.57 sixth 6.01 seventh 8.91 eighth 14.84 reverse 2.21 and 3.70 Clutch multiple disc main hydraulic power-clutch operated by piston thru foot pedal valve and single disc direct drive hydraulic clutch, locking turbine to engine thru hand operated control valve Brakes double disc operated by two foot pedals Steering power assisted Turning radius (on concrete surface with brake applied) right 94" left 94" (on concrete surface without brake) right 94" left 94" Turning space diameter (on concrete surface with brake applied) right 205" left 205" on concrete surface without brake) right 205" left 205" Belt pulley 1195 rpm at 2100 engine rpm diam diam 10¼" face 6" Belt speed 3210 fpm Power take-off 541 rpm at 1970 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.

Only 12 gears, as selected by manufacturers representative, were used in making the maximum power runs with ballast.

We, the undersigned, certify that this is a true and correct report of official Tractor Test 769.

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

## 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 541C Gasoline