

University of Nebraska - Lincoln

DigitalCommons@University of Nebraska - Lincoln

Nebraska Tractor Tests

Tractor Test and Power Museum, The Lester F. Larsen

11-10-1969

Test 1032: Case 770 Power Shift Gasoline

Nebraska Tractor Test Lab

University of Nebraska-Lincoln, tractortestlab@unl.edu

Follow this and additional works at: <https://digitalcommons.unl.edu/tractormuseumlit>



Part of the [Energy Systems Commons](#), [History of Science, Technology, and Medicine Commons](#), [Other Mechanical Engineering Commons](#), [Physical Sciences and Mathematics Commons](#), [Science and Mathematics Education Commons](#), and the [United States History Commons](#)

Nebraska Tractor Test Lab, "Test 1032: Case 770 Power Shift Gasoline" (1969). *Nebraska Tractor Tests*. 1369.

<https://digitalcommons.unl.edu/tractormuseumlit/1369>

This Article is brought to you for free and open access by the Tractor Test and Power Museum, The Lester F. Larsen at DigitalCommons@University of Nebraska - Lincoln. It has been accepted for inclusion in Nebraska Tractor Tests by an authorized administrator of DigitalCommons@University of Nebraska - Lincoln.

NEBRASKA TRACTOR TEST 1032 – CASE 770 POWER SHIFT GASOLINE

POWER TAKE-OFF PERFORMANCE

Hp *	Crank- shaft speed rpm	Fuel Consumption			Temperature Degrees F				
		Gal per hr	Lb per hp-hr	Hp-hr per gal	Cooling medium	Air wet bulb	Air dry bulb	Barometer inches of Mercury	
MAXIMUM POWER AND FUEL CONSUMPTION									
Rated Engine Speed—Two Hours									
53.53	1900	5.024	0.580	10.65	195	52	75	29.223	
VARYING POWER AND FUEL CONSUMPTION—TWO HOURS									
46.77	1952	4.951	0.654	9.45	194	52	76	.....
0.00	2075	2.332	.....	.....	189	53	77	.....
24.17	2019	3.649	0.932	6.62	195	53	75	.....
53.38	1902	5.062	0.586	10.55	195	53	75	.....
12.30	2055	2.930	1.471	4.20	192	53	76	.....
35.74	1989	4.353	0.752	8.21	195	53	75	.....
Av	28.73	1998	3.879	0.834	7.41	193	53	76	29.213

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—2nd Range High												
46.30	4005	4.34	1905	5.83	5.179	0.691	8.94	186	40	50	29.130	
75% of Pull at Maximum Power—Ten Hours—2nd Range High												
37.78	3118	4.54	1966	4.36	4.986	0.815	7.58	192	34	40	29.147	
50% of Pull at Maximum Power—Two Hours—2nd Range High												
27.21	2178	4.68	2001	3.25	4.336	0.984	6.28	191	40	48	29.120	
MAXIMUM POWER WITH BALLAST												
44.51	7103	2.35	1897	14.55	2nd Range Low			186	33	44	29.200	
44.21	6840	2.42	1902	13.16	1st Range High			186	33	47	29.190	
48.12	5339	3.38	1904	8.23	2nd Range Intermed			186	36	47	29.185	
46.99	4553	3.87	1901	6.56	3rd Range Low			186	37	45	29.185	
47.99	4170	4.32	1900	5.96	2nd Range High			188	38	48	29.150	
47.94	3422	5.25	1899	4.88	3rd Range Intermed			192	38	48	29.150	
44.00	2477	6.66	1900	3.57	3rd Range High			191	39	49	29.150	
43.72	1841	8.91	1898	2.72	4th Range Low			191	40	50	29.150	
40.80	1279	11.96	1901	2.08	4th Range Intermed			190	38	47	29.130	
36.70	912	15.09	1899	1.71	4th Range High			190	38	48	29.120	
MAXIMUM PULL WITHOUT BALLAST												
39.62	6129	2.42	1934	14.84	1st Range High			195	38	44	28.750	

VARYING DRAWBAR PULL AND TRAVEL SPEED WITH BALLAST 2nd Range High

Pounds Pull	4170	4662	4971	5007	5009	4973
Horsepower	47.99	47.99	45.24	39.90	34.26	28.35
Crankshaft speed rpm	1900	1713	1526	1337	1149	955
Miles per hour	4.32	3.86	3.41	2.99	2.56	2.14
Slip of drivers, %	5.96	6.88	7.40	7.40	7.66	7.40

TIRES, BALLAST and WEIGHT

		With Ballast	Without Ballast
Rear tires	—No, size, ply & psi	Two 16.9-34; 8; 16	Two 16.9-34; 8; 16
	—Liquid	855 lb each	None
	Cast iron	None	None
Front tires	—No, size, ply & psi	Two 7.5L-15; 6; 36	Two 7.5L-15; 6; 36
	—Liquid	None	None
	Cast iron	40 lb each	None
Height of drawbar		15½ inches	15½ inches
Static weight with operator—Rear		8170 lb	6460 lb
	Front	2610 lb	2530 lb
	Total	10780 lb	8990 lb

Department of Agricultural Engineering

Date of Test: November 10 to November 22, 1969

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

FUEL, OIL and TIME Fuel regular gasoline Octane No Motor 85.0 Research 93.0 (rating taken from oil company's typical inspection data) Specific gravity converted to 60°/60° 0.7417 Weight per gallon 6.175 lb Oil SAE 20-20W API service classification MS, DM To motor 2.396 gal Drained from motor 2.259 gal Transmission and final-drive lubricant Case TCH oil Total time engine was operated 42½ hours.

ENGINE Make Case Gasoline Type 4 cylinder vertical Serial No 2307139 Crankshaft mounted lengthwise Rated rpm 1900 Bore and stroke 4" x 5" Compression ratio 7.5 to 1 Displacement 251 cu in Carburetor size 1¼" Ignition system battery Cranking system 12 volt electric Lubrication pressure Air cleaner dry type with replaceable treated paper element with pre-cleaner Oil filter full flow replaceable cartridge Fuel filter sediment bowl and screen Muffler was used Cooling medium temperature control Thermostat.

CHASSIS Type standard Serial No 865 2432 Tread width rear 60" to 88" front 60" to 88" 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 centerline of rear wheels 29" Vertical distance above roadway 36.8" Horizontal distance from center of rear wheel tread 0" to the right/left Hydraulic control system direct engine drive Transmission selective gear fixed ratio with partial range operator controlled power shifting Advertised speeds mph first 1.8 second 2.5 third 3.0 fourth 3.1 fifth 4.0 sixth 4.6 seventh 5.0 eighth 6.2 ninth 7.7 tenth 10.2 eleventh 13.7 twelfth 17 reverse 3.1, 5.0, 7.7 and 17.0 Clutch multiple disc wet clutches within transmission hydraulically actuated Brakes dry double disc hydraulically power actuated by two foot pedals which can be locked together Steering hydrostatic Turning radius (on concrete surface with brake applied) right 137" left 137" (on concrete surface without brake) right 177" left 177" Turning space diameter (on concrete surface with brake applied) right 286" left 286" (on concrete surface without brake) right 356" left 356" Belt pulley 1108 rpm at 1900 engine rpm diam 10.5" face 7.25" Belt speed 3045 fpm Power take-off 538 rpm at 1900 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. The lower two travel speeds were not run as it was necessary to limit the pull in the third travel speed to avoid excessive wheel slippage.

We, the undersigned, certify that this is a true and correct report of official Tractor Test 1032.

L. F. LARSEN

Engineer-In-Charge

G. W. STEINBRUEGGE, Chairman

W. E. SPLINTER

D. E. LANE

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, $\frac{1}{2}$ 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

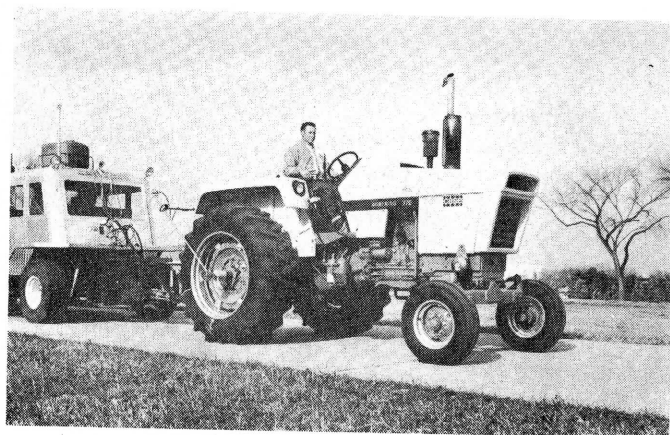
speed-control devices (engine, governor, automatic transmission, etc.) on horsepower, speed and fuel consumption. These runs are made around the entire test course which has two 180 degree turns with a minimum radius of 50 feet. The drawbar pull is set at 3 different levels as follows: (1) as near to 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 Pull without Ballast. All added ballast is removed from the tractor. The drawbar pull is determined at slip limits of 15% for pneumatic tires or 7% for steel tracks or lugs. The tractor is operated at the fastest possible travel speed.

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 770 POWER SHIFT GASOLINE