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Test 773: Case 640 (Gasoline)

Nebraska Tractor Test Lab

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NEBRASKA TRACTOR TEST 773 - CASE 640 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 Cool- ing med	Degrees F Air wet bulb	Air dry bulb	Barometer inches of mercury
MAXIMUM POWER AND FUEL CONSUMPTION								
Rated Engine Speed—Two Hours								
50.61	2001	4.185	0.515	12.09	180	57	76	29.250
Standard Power Take-off Speed (540 rpm)—One Hour								
49.69	1950	4.080	0.511	12.18	180	56	75	29.255
VARYING POWER AND FUEL CONSUMPTION—TWO HOURS								
44.35	2062	3.823	0.536	11.60	178	58	79	.....
0.00	2274	1.504	.....	.....	175	57	79	.....
22.89	2129	2.598	0.706	8.81	176	56	75	.....
50.30	2003	4.180	0.517	12.03	180	57	77	.....
11.74	2181	2.001	1.060	5.87	175	56	76	.....
39.39	2082	3.220	0.509	12.23	177	57	77	.....
Av 28.11	2122	2.888	0.639	9.73	177	56	77	29.250

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 Cooling medium	Degrees F Air wet bulb	Air dry bulb	Barometer inches of mercury
VARYING DRAWBAR POWER AND FUEL CONSUMPTION WITH BALLAST											
Maximum Available Power—Two Hours—7th Gear											
41.93	2911	5.40	1998	4.07	3.956	0.587	10.60	182	53	58	28.685
75% of Pull at Maximum Power—Ten Hours—7th Gear											
33.91	2237	5.69	2085	3.23	3.403	0.624	9.96	181	54	61	28.780
50% of Pull at Maximum Power—Two Hours—7th Gear											
23.68	1523	5.83	2113	2.14	2.823	0.742	8.39	168	52	54	28.640
MAXIMUM POWER WITH BALLAST											
28.40	6872	1.55	2080	14.79	1st Gear	.....	.....	192	62	78	28.680
39.21	6519	2.26	2005	12.39	2nd Gear	.....	.....	190	62	78	28.680
40.95	5793	2.65	2005	9.29	3rd Gear	.....	.....	191	62	78	28.680
41.11	4919	3.13	1999	7.27	4th Gear	.....	.....	190	59	73	28.680
42.26	3912	4.05	2005	5.65	5th Gear	.....	.....	187	62	78	28.680
40.53	3285	4.63	1998	4.67	6th Gear	.....	.....	189	62	78	28.680
42.69	2964	5.40	1999	4.10	7th Gear	.....	.....	185	53	75	28.670
38.92	2104	6.94	2004	2.89	8th Gear	.....	.....	189	62	78	28.680
39.42	1815	8.15	2003	2.50	9th Gear	.....	.....	188	62	78	28.680
36.67	1491	9.22	2006	2.11	10th Gear	.....	.....	188	62	78	28.680
34.34	935	13.77	2007	1.25	11th Gear	.....	.....	188	62	78	28.680
MAXIMUM POWER WITHOUT BALLAST											
36.52	2726	5.02	2015	14.59	7th Gear	.....	.....	178	58	67	28.750
VARYING DRAWBAR PULL AND TRAVEL SPEED WITH BALLAST—7th Gear											
Pounds pull	2950	3000	3100	3250	3300	3250					
Horsepower	42.7	39.2	35.5	32.1	28.2	23.4					
Miles per hour	5.4	4.9	4.3	3.7	3.2	2.7					

TIRES, BALLAST and WEIGHT

		With Ballast	Without Ballast
Rear tires	—No, size, ply & psi	Two 16.9-28;6;16	Two 16.9-28;6;16
Ballast	—Liquid	710 lb each	None
	—Cast iron	1775 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	None	None
Height of drawbar		14½ inches	17 inches
Static weight	—Rear	7570 lb	2600 lb
	—Front	1740 lb	1720 lb
Total weight with operator		9485 lb	4495 lb

Department of Agricultural Engineering

Dates of Test: October 13 to October 27, 1960

Manufacturer: J. I. CASE COMPANY, RACINE WIS-CONSIN

Manufacturer's Power Rating: 52 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 0.991 gal Drained from motor 0.777 gal Transmission and final-drive lubricant SAE 90 Type multi-purpose gear lubricant (E.P.) Total time engine was operated 42 hours.

ENGINE Make Case gasoline Type 4 cylinder vertical Serial No 303-SO-4600 Crankshaft mounted lengthwise Rated rpm 2000 Bore and stroke 3⅜" x 4⅛" Compression ratio 7.34 to 1 Displacement 188.4 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 Fuel filter brass screen Muffler was used Cooling medium temperature control thermostat.

CHASSIS Type standard Serial No 6153368 Tread width rear 48" to 76" front 52" Wheel base 79¼" 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 31.5" Vertical distance above roadway 30.4" Horizontal distance from center of rear wheel tread 0" to the right/left Hydraulic control system direct engine drive with throw out lever Transmission selective gear fixed ratio Advertised speed mph first 1.52 second 2.24 third 2.54 fourth 2.94 fifth 3.73 sixth 4.23 seventh 4.91 eighth 6.22 ninth 7.28 tenth 8.18 eleventh 12.12 twelfth 20.20 reverse 1.81 and 3.02 Clutch single plate dry disc operated by foot pedal Brakes double disc operated by two foot pedals Steering power assisted Turning radius (on concrete surface with brake applied) right 118" left 122" (on concrete surface without brake) right 130" left 135" Turning space diameter (on concrete surface with brake applied) right 248" left 256" (on concrete surface without brake) right 273" left 281" Belt pulley 1360 rpm at 2000 engine rpm diam 9¼" face 6⅝" Belt speed 3290 fpm Power take-off 533 rpm at 1925 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.

Twelfth 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 773.

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 640 Gasoline