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Test 646: Case Model 511B

Nebraska Tractor Test Lab

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The Experiment Station
University of Nebraska College of Agriculture
W. V. Lambert, Director, Lincoln, Nebraska

Department of Agricultural Engineering
Dates of test: April 14 to 18, 1958
Manufacturer: J. I. CASE COMPANY, RACINE,
WISCONSIN
Manufacturer's rating: Not Rated

NEBRASKA TRACTOR TEST NO. 646

CASE 511B

BELT HORSEPOWER TESTS

Hp	Crank shaft speed rpm	Fuel Consumption			Temp. Deg. F.			Barometer inches of mercury
		Gal per hr	Hp-hr per gal	Lb per hp-hr	Cooling medium	Air wet bulb	Air dry bulb	
TEST B—100% MAXIMUM POWER —TWO HOURS								
45.10	1999	4.074	11.07	0.548	164	57	71	28.965
* TEST C—OPERATING MAXIMUM POWER—ONE HOUR								
44.34	2000	3.755	11.81	0.514	163	56	70	28.970
TEST D—RATED POWER—ONE HOUR								
40.04	2072	3.497	11.45	0.530	158	56	69	28.968
TEST E—VARYING POWER—TWO HOURS (20 minute runs; last line average)								
40.08	2074	3.497	11.46	0.529	159	56	70	.....
1.84	2248	1.513	1.22	4.989	139	56	68	....
20.82	2144	2.423	8.59	0.706	150	55	68	.....
44.15	1999	3.684	11.98	0.506	162	56	69	.....
10.71	2205	1.919	5.58	1.087	142	56	70	.....
30.43	2096	2.918	10.43	0.582	157	57	73	.....
24.67	2128	2.659	9.28	0.654	151	56	70	28.967

DRAWBAR HORSEPOWER TESTS

Hp	Draw bar pull lbs	Speed miles per hr	Crank shaft speed rpm	Slip of drive wheels %	Fuel Consumption			Temp. Deg. F.			Barometer inches of mercury
					Gal per hr	Hp-hr per gal	Lb per hp-hr	Cool- ing me l	Air wet bulb	Air dry bulb	
TEST H—RATED POWER—TEN HOURS—5th Gear											
30.74	2823	4.08	2098	5.18	3.201	9.60	0.632	165	62	76	28.849
TEST F—100% MAXIMUM POWER											
39.05	3859	3.79	2002	7.69	5th Gear	.....		171	63	80	28.940
TEST G—OPERATING MAXIMUM POWER											
21.53	5635	1.43	1997	14.44	1st Gear (part throttle)			161	63	80	28.940
31.07	5488	2.12	2003	13.96	2nd Gear (part throttle)			166	63	80	28.940
34.58	5372	2.41	1999	13.54	3rd Gear	.....		169	63	80	28.940
36.70	4710	2.92	1995	9.67	4th Gear	.....		166	63	80	28.940
38.49	3758	3.84	2000	6.39	5th Gear	.....		160	63	80	28.940
37.20	3162	4.41	1998	5.24	6th Gear	.....		156	60	73	29.000
39.76	2898	5.14	2000	4.79	7th Gear	.....		158	61	68	29.010
36.56	2075	6.61	2003	3.53	8th Gear	.....		155	61	68	29.010
36.65	1767	7.78	2003	3.00	9th Gear	.....		156	61	68	29.010
33.74	1442	8.78	2002	2.59	10th Gear	.....		153	61	68	29.010
32.37	924	13.14	2002	1.63	11th Gear	.....		158	60	73	29.000
TEST J—OPERATING MAXIMUM POWER											
32.34	3422	3.54	2004	14.59	5th Gear	.....		159	58	59	28.780
TEST K—SPEED-PULL CHARACTERISTIC											
Pounds Pull		2823	3758	3650	3500	3650	3950	3900			
Horsepower		30.74	38.49	34.1	28.9	26.3	24.2	19.8			
Miles Per Hour		4.08	3.84	3.5	3.1	2.7	2.3	1.9			

TIRES, WHEELS AND WEIGHT

Tests F, G, H & K			Test J	
Rear wheels				
Type	Cast iron		Cast iron	
Liquid ballast	418 lb each		None	
Added cast iron	936 lb each		None	
Rear tires				
No. and size	Two 13.9-36		Two 13.9-36	
Ply	6		6	
Air pressure	18 lb		14 lb	
Front wheels				
Type	Cast iron		Cast iron	
Liquid ballast	None		None	
Added cast iron	None		None	
Front tires				
No. and size	Two 6:00-16		Two 6:00-16	
Ply	4		4	
Air pressure	28 lb		28 lb	
Height of drawbar	16 inches		17 1/2 inches	
Static weight				
Rear end	5840 lb		3132 lb	
Front end	1448 lb		1414 lb	
Total weight as tested with operator	7463 lb		4721 lb	

FUEL, OIL, WATER and TIME Fuel Gasoline Octane No. ASTM 83.6 Research 90.4 (rating taken from oil company's typical inspection data) Weight per gallon 6.066 lb Oil SAE 20W-30 To motor 0.987 gal Drained from motor 0.924 gal Water used 0.606 gal Total time motor was operated 47 1/2 hours.

CHASSIS Type Tricycle Serial No. 6096141 Tread width rear 52" to 88" front 9 1/8" and 15 1/8" Wheel base 87" Hydraulic control system direct engine drive with throw out lever Advertised speeds mph first 1.6 second 2.4 third 2.7 fourth 3.2 fifth 4.0 sixth 4.5 seventh 5.3 eighth 6.7 ninth 7.8 tenth 8.8 eleventh 13.0 twelfth 21.7 Reverse first 1.9 second 3.2 third 5.4 Belt pulley diam. 9 1/4" face 6 3/8" rpm 1360 Belt speed 3293 fpm Belt flat Length 71' Width 6" Thickness 0.215" Maximum slip 0.94% Clutch single plate dry disc operated by foot pedal Seat pressed steel cushioned by rubber in torsion Brakes double disc brakes operated by two foot pedals Equalized by locking pedals together Power take-off conventional type Steering Power steering not available.

ENGINE Make Case Type 4-cylinder vertical Serial No. 171P01970 Crankshaft mounted lengthwise Head 1 Lubrication pressure Bore and stroke 3 9/16" x 4 1/8" Rated rpm 2000 Compression ratio 7.26 to 1 Displacement 164.5 cu. in. Valves port diameter Inlet 1 3/16" Exhaust 1 3/32" Governor variable speed centrifugal Carburetor size 1 1/4" Ignition system battery Starting system 12-volt battery Air cleaner oil washed wire mesh Muffler was used Oil filter none Cooling medium temperature control thermostat.

REPAIRS AND ADJUSTMENTS No repairs or adjustments.

REMARKS All test results were determined from observed data and without allowances, additions or deductions. Tests B and F were made with carburetor set for 100% maximum belt horsepower and data from these tests were used in determining the horsepower to be developed in tests D and H, respectively. Tests C, D, E, G, H, J, and K were made with an operating setting of the carburetor (selected by the manufacturer) of 98.2% of maximum belt horsepower.

No data was taken in the 12th gear due to high speed.

HORSEPOWER SUMMARY

	Drawbar	Belt
1. Sea level (calculated) maximum horsepower (based on 60° F and 29.92" Hg)	41.14	47.08
2. Observed maximum horsepower (tests F and B)	39.05	45.10
3. Seventy-five per cent of calculated maximum drawbar horsepower and eighty-five per cent of calculated maximum belt horsepower (ASAE and SAE ratings)	30.86	40.02

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. 646.

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

TEST A: The manufacturer's representative operates the tractor for a minimum of 12 hours using light to heavy drawbar loads in each gear.

This serves as a period for limber up, general observation and adjustments. Adjustments that are permissible include valve tappet clearance, breaker point gap, spark plug gaps, clutch and others of a similar nature. No new parts or accessories can be installed without having mention made of it in the report.

No data are recorded during this preliminary run except the time that the engine is operated.

BELT HORSEPOWER TESTS

TEST B: The manual throttle control lever is set so that the throttle valve is held wide open and the belt load on the dynamometer is adjusted so that the engine is at the rated speed recommended by the manufacturer. Carburetor, ignition timing and manifold adjustments are all set for maximum engine power.

This test is designed to determine maximum belt horsepower of the tractor at rated speed and to measure fuel consumption at the maximum power on the belt.

TEST C: For tractors with carburetors the best fuel economy does not always occur when the engine develops maximum power at rated speed. Test C is intended to allow the manufacturer's representative to select a more economical fuel setting even though there is a slight loss of power. *This more practical carburetor setting is used in all later tests except test F.* The throttle valve is wide open and load adjusted to give rated rpm. Tests B and C are the same for diesel tractors which have an altogether different fuel system.

TEST D: The manual throttle control lever is set the same as for tests B and C allowing the governor to control engine speed at part throttle. Load is applied until 85% of maximum corrected horsepower found in test B is obtained.

This rating is somewhat less than the maximum belt horsepower in order that the operator may have a certain amount of reserve.

TEST E: Varying load serves to show the range of engine speeds when the engine is controlled by the governor during the following varied loads, of 20 minutes each; rated load, no load, $\frac{1}{2}$ rated load, maximum load at wide open throttle valve, $\frac{1}{4}$ and $\frac{3}{4}$ rated load.

The average result of this test shows the average power and fuel consumption. Since the average tractor is subjected to varying loads, these data serve well in predicting fuel consumption and efficiency of a tractor in general use.

DRAWBAR HORSEPOWER TESTS

In all drawbar tests the pull exerted by the tractor is transmitted by a hydraulic pressure cylinder to a recording instrument in the test car. When rubber tires are used, all tests are made on the concrete test course. The same tires, wheels and weights are used for all tests except J. All crawler type tractors are tested on an earthen test course which is maintained by grading, sprinkling and rolling so that it remains very nearly the same for each test.

TEST F: A drawbar test, the results of which are used to determine the rated drawbar horsepower in test H. The carburetor is set to develop maximum power as in test B. The rated gear recommended by manufacturer as plow gear is used in the test. The drawbar load is adjusted to give rated engine speed.

TEST G: Maximum drawbar horsepower is determined in each gear when the carburetor is set for fuel economy as in test C. The manual throttle control lever is set so that the throttle valve is held wide open and the load is applied so that the engine runs at rated engine speed.

When operating in low gear it is not uncommon for the tractor to develop less drawbar horsepower than in rated gear because of excessive wheel slippage. When excessive wheel slippage occurs the load is reduced until slippage approaches 15%. When the load is reduced it is necessary to operate the tractor engine at part throttle and control engine speed by governor action.

TEST H: Intended to test the ability of the tractor to run continuously for 10 hours at rated drawbar horsepower and to determine the fuel consumption during that time. Rated drawbar horsepower is 75% of 100% maximum drawbar horsepower (Test F), corrected to standard conditions.

When operating at rated horsepower the manual throttle control lever is set the same as in tests F and G allowing the governor to maintain engine speed at part throttle. This rating is less than maximum drawbar horsepower in order that the operator may have a certain amount of reserve.

TEST J: The tractor is operated in rated gear with all added weight removed. This test shows the effect of the removal of added weight on the performance of the tractor when compared with test G.

Removal of wheel weights generally increases wheel slippage and decreases drawbar horsepower.

TEST K: This is intended to show the pull, horsepower, and travel speed of the tractor at rated horsepower (taken from test H); maximum horsepower (taken from test G); and at least four other conditions obtained by reducing travel speed in 10% increments by overload.

