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Test 565: Case Model 401 (Diesel)

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: October 17 to October 25, 1955
Manufacturer: J. I. CASE COMPANY, RACINE,
WISCONSIN
Manufacturer's rating: Not rated

NEBRASKA TRACTOR TEST NO. 565

CASE 401 DIESEL

BELT HORSEPOWER TESTS

Hp	Crank shaft speed rpm	Fuel Consumption			Water used gal per hour	Temp Deg F		Barometer inches of mercury		
		Gal per hour	Hp-hr per gal	Lb per hp-hour		Cooling med	Air			
TESTS B & C—100% MAXIMUM LOAD—TWO HOURS										
49.40	15.01	3.095	15.96	0.440	0.00	176	55	28.900		
TEST D—RATED LOAD—ONE HOUR										
43.55	1501	2.694	16.17	0.434	0.00	173	55	28.900		
TEST E—VARYING LOAD—TWO HOURS (20 minute runs; last line average)										
43.61	1501	2.705	16.12	0.435	...	174	56		
1.69	1602	0.756	2.24	3.142	...	169	62		
22.60	1557	1.697	13.32	0.527	...	172	59		
47.84	1459	3.000	15.95	0.440	...	179	59		
11.42	1575	1.214	9.41	0.746	...	170	60		
33.19	1530	2.132	15.57	0.451	...	174	66		
26.73	1537	1.917	13.94	0.504	0.00	173	60	28.900		
TORQUE (At Dynamometer)										
Eng rpm	1504	1418	1340	1264	1184	1106	1016	938	861	773
Lb-ft	305.2	308.0	317.6	323.8	327.4	328.5	323.8	322.0	313.3	307.1
Dyn rpm	860	810	766	722	676	632	580	536	492	443

DRAWBAR HORSEPOWER TESTS

Hp	Draw bar pull lb	Speed miles per hr	Crank shaft speed rpm	Slip of drive wheels %	Fuel Consumption			Water used gal per hour	Temp Deg F		Barometer inches of mercury
					Gal per hour	Hp-hr per gal	Lb per hp-hr		Cool- ing med	Air	
TEST H—RATED LOAD—TEN HOURS—5th Gear											
33.47	2578	4.87	1501	4.10	2.407	13.91	0.505	0.00	180	64	28.826
TESTS F & G—100% MAXIMUM LOAD											
19.18	6018	1.20	1502	16.53	1st gear (part throttle)				178	72	29.150
27.14	6003	1.70	1498	16.59	2nd gear (part throttle)				178	66	29.180
37.20	5982	2.33	1503	16.53	3rd gear (part throttle)				180	62	29.190
43.98	4418	3.73	1500	7.43	4th gear				181	57	29.220
43.82	3439	4.78	1498	5.65	5th gear				180	54	29.220
42.31	2287	6.94	1498	4.01	6th gear				180	57	29.220
38.25	1483	9.67	1500	2.40	7th gear				180	76	28.800
33.82	895	14.17	1505	1.41	8th gear				182	75	28.800
TEST J—OPERATING MAXIMUM LOAD											
39.95	3264	4.59	1503	9.08	5th gear				177	74	28.770
TEST K—OPERATING MAXIMUM LOAD											
40.66	3458	4.41	1505	10.82	5th gear				177	74	28.780

TIRES, WHEELS AND WEIGHT

	Tests F, G & H	Test J	Test K
Rear wheels			
Type	Cast iron	Cast iron	Cast iron
Liquid ballast	764 lb each	None	None
Added cast iron	875 lb each	None	None
Rear tires			
No. and size	Two 13-38	Two 13-38	Two 12-38
Ply	6	6	6
Air pressure	18 lb	14 lb	14 lb
Front wheels			
Type	Cast iron	Cast iron	Cast iron
Liquid ballast	None	None	None
Added cast iron	None	None	None
Front tires			
No. and size	Two 6.00-16	Two 6.00-16	Two 6.00-16
Ply	4	4	4
Air pressure	28 lb	28 lb	28 lb
Height of drawbar	21½ inches	22 inches	21½ inches
Static weight			
Rear end	7720 lb	4442 lb	4245 lb
Front end	1970 lb	1965 lb	1970 lb
Total weight as tested with operator	9865 lb	6582 lb	6390 lb

FUEL, OIL and TIME Diesel Fuel Cetane No. 50 (rating taken from oil company's typical inspection data) Weight per gallon 7.020 lb OIL SAE 10 To motor 1.951 gal Drained from motor 1.534 gal Total time motor was operated 44 hours.

CHASSIS Type Tricycle Serial No. 8067411 Tread width rear 52" to 88" front 9⅞" to 15½" Wheel base 91½" Hydraulic control system direct engine drive with independent throw out lever Advertised speeds mph first 1.36 second 1.94 third 2.66 fourth 3.85 fifth 4.84 sixth 6.89 seventh 9.44 eighth 13.66 reverse 1.75 & 6.22 Belt pulley diam 10½" face 7¼" rpm 1166 Belt speed 3205 fpm Clutch single plate dry disc operated by foot pedal Seat weather proof cushion seat which can tilt upward, suspended on adjustable rubber in torsion Brakes double disc on differential shaft operated by two foot pedals Equalized brake pedals can be locked together Power take-off continuous running with independent clutch.

ENGINE Make J. I. Case Diesel Type 4 cylinder vertical Serial No. 8067411 Crankshaft mounted lengthwise Head I Lubrication pressure Bore and stroke 4" x 5" Rated rpm 1500 Compression ratio 15 to 1 Displacement 251 cu in Port Diameter valves inlet 1⅜" exhaust 1 7/32" Governor variable speed centrifugal Starting system 12 volt (2 six volt batteries) Air cleaner oil washed wire mesh Muffler was used Oil filter replaceable treated paper element Fuel filter one fuel tank breather filter, one fine mesh filter screen, one fuel tank water trap, one edge wound metal filter removeable for cleaning, one filter with replaceable element and one replaceable sealed filter Cooling medium temperature control thermo-stat.

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 fuel pump set to develop approximately 51 corrected 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, & K were made with the same setting.

HORSEPOWER SUMMARY

	Drawbar	Belt
1. Sea level (calculated) maximum horsepower (based on 60° F. and 29.92" Hg)	44.84	50.90
2. Observed maximum horsepower (tests F and B)	43.82	49.40
3. Seventy-five per cent of calculated maximum drawbar horsepower and eighty-five per cent of calculated maximum belt horsepower (formerly ASAE and SAE ratings)	33.63	43.27

We, the undersigned, certify that this is a true and correct report of official tractor test No. 565.

L. F. LARSEN
Engineer-In-Charge

L. W. HURLBUT
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 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 held 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 throttle control lever is set so that the governor will maintain rated engine speed when rated load is applied. Rated load is 85% of 100% maximum, as obtained in test B, corrected to standard conditions.

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.

Torque, lb-ft at dynamometer, is obtained with wide open throttle and sufficient load is applied to give several readings.

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. All tests are made on the same dirt test course which is maintained by grading, sprinkling and rolling

so that it remains very nearly the same throughout the season. The same tires, wheels and weights are used for all tests except J and K.

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 this 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 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 16%. 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 load the throttle control lever is set to maintain rated engine speed. 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: Similar to test J except that the smallest tires and lightest wheels offered by the manufacturer are used.

