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Test 555: Caterpillar D-6

Nebraska Tractor Test Lab

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Department of Agricultural Engineering
Dates of test: July 25 to August 12, 1955
Manufacturer: CATERPILLAR TRACTOR COMPANY, PEORIA, ILLINOIS
Manufacturer's rating: 75 maximum drawbar horsepower (Corrected to standard conditions)

CATERPILLAR D-6

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 AND C—100% MAXIMUM LOAD—TWO HOURS										
92.52	1600	6.731	13.75	0.511	0.00	154	70	29.000		
TEST D—RATED LOAD—ONE HOUR										
81.56	1600	5.771	14.13	0.497	0.00	163	82	29.030		
TEST E—VARYING LOAD—TWO HOURS (20 minute runs; last line average)										
81.49	1603	5.769	14.13	0.497	...	163	82		
2.17	1696	2.081	1.04	6.733	...	139	83		
42.79	1665	3.611	11.85	0.592	...	143	83		
82.59	1395	5.868	14.07	0.499	...	164	83		
21.58	1662	2.739	7.88	0.891	...	144	84		
63.13	1632	4.590	13.75	0.510	...	143	84		
48.96	1608	4.110	11.91	0.589	0.00	149	83	28.980		
TORQUE (At Dynamometer)										
Eng rpm	1603	1526	1443	1353	1282	1203	1119	1036	951	863
Lb-ft	474.0	484.6	498.4	509.6	519.2	529.0	533.4	534.5	530.8	522.7
Dyn rpm	985	936	885	830	786	738	686	635	583	529

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		Cooling med	Air	
TEST H—RATED LOAD—TEN HOURS—2nd Gear											
59.33	8663	2.57	1600	1.20	5.211	11.39	0.617	0.00	155	82	29.060
TESTS F & G—100% MAXIMUM LOAD											
72.65	17486	1.56	1603	6.30	1st gear.....			165	88	28.850	
73.34	10907	2.52	1596	2.70	2nd gear.....			179	92	28.960	
72.34	7554	3.59	1602	0.70	3rd gear.....			165	87	28.850	
68.29	5150	4.97	1593	0.38	4th gear.....			165	87	28.830	
65.01	3722	6.55	1596	0.21	5th gear.....			170	87	28.830	



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 30 to motor 4.251 gal drained from motor 3.027 gal Total time motor was operated 48½ hours.

CHASSIS Type Tracklayer Serial No. 9U19169 Tread width 74" Wheel Base 85¾" Measured length of track 286" Cleats integral with shoes Cleats per track 39 Size of cleats 24" x 2½" Advertised speeds mph first 1.7 second 2.6 third 3.6 fourth 5.0 fifth 6.6 reverse first 2.0 second 3.2 third 4.5 fourth 6.2 Belt pulley diam 13½" face 13" rpm 1041 Belt speed 3587 fpm Clutch oil type two plate over center operated by hand lever Seat upholstered Brakes contracting bands operated by two foot pedals one of which can be locked by latch Steering hand levers controlling multiple disc clutch with hydraulic booster.

ENGINE Make Caterpillar Diesel Type 6 cylinder vertical Serial No. 9U19169 Crankshaft mounted lengthwise Head I Lubrication pressure Bore and stroke 4½" x 5½" Rated rpm 1600 Compression ratio 18 to 1 Displacement 525 cu in Port diameter valves inlet 1.750" exhaust 1 3/16" Governor variable speed centrifugal Air cleaner oil washed wire mesh with precleaner Muffler not used Oil Filter two replaceable paper elements Fuel filter four cotton wound replaceable elements Cooling medium temperature control thermostat.

STARTING ENGINE Make Caterpillar Type 2 cylinder horizontal opposed Mounted behind diesel engine Mfg. rating 15 Hp at 3000 rpm Bore & stroke 3½" x 3½" Ignition system magneto Air cleaner oil washed wire mesh Starting system rope.

TOTAL WEIGHT AS TESTED (with operator) 20,765 lbs.

REPAIRS AND ADJUSTMENTS Following test A track roller guards and radiator grill were installed; the 16" track shoes were removed and 24" shoes were installed.

REMARKS All test results were determined from observed data and without allowances, additions or deductions. Test F was made with a fuel pump setting, selected by the manufacturer to develop approximately 75 corrected maximum drawbar horsepower and data from this test were used in determining the horsepower to be developed in tests D and H, respectively. Tests B, C, D, E, G & H were made with the same setting.

HORSEPOWER SUMMARY

	Drawbar	Belt
1. Sea level (calculated) maximum horsepower (based on 60° F and 29.92" Hg)	77.92	96.37
2. Observed maximum horsepower (tests F and B)	73.34	92.52
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)	58.44	81.91

We, the undersigned, certify that this is a true and correct report of official tractor test No. 555.

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.