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Test 563: Allis-Chalmers WD-45 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 4 to October 11, 1955
Manufacturer: ALLIS-CHALMERS MANUFACTURING COMPANY, MILWAUKEE, WISCONSIN
Manufacturer's rating: Not rated

NEBRASKA TRACTOR TEST NO. 563

ALLIS-CHALMERS WD-45 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										
43.29	1625	3.084	14.04	0.500	0.00	185	77	28.975		
TEST D—RATED LOAD—ONE HOUR										
38.86	1627	2.751	14.13	0.497	0.00	178	76	28.975		
TEST E—VARYING LOAD—TWO HOURS (20 minute runs; last line average)										
39.01	1627	2.761	14.13	0.497	...	178	77		
1.86	1710	0.893	2.08	3.371	...	159	74		
19.77	1657	1.752	11.28	0.622	...	164	75		
41.30	1533	2.897	14.26	0.492	...	182	78		
12.41	1676	1.355	9.16	0.766	...	162	78		
29.35	1652	2.252	13.03	0.539	...	171	79		
23.95	1642	1.985	12.07	0.582	0.00	169	77	29.025		
TORQUE (At Dynamometer)										
Eng rpm	1628	1543	1467	1397	1317	1250	1169	1096	1021	940
Lb-ft	243.3	249.4	254.1	254.6	255.5	256.9	259.0	255.5	253.8	250.3
Dyn rpm	941	890	847	807	760	722	675	633	590	543

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—3rd Gear											
30.48	2311	4.95	1623	4.47	2.434	12.52	0.561	0.00	172	64	29.058
TESTS F & G—100% MAXIMUM LOAD											
32.49	5908	2.06	1621	16.34	1st gear (part throttle)				170	60	29.090
39.30	4122	3.58	1629	8.21	2nd gear				179	74	28.940
39.50	3045	4.87	1628	6.40	3rd gear				172	55	29.100
37.73	1265	11.19	1626	2.12	4th gear				178	75	28.940
TEST J—OPERATING MAXIMUM LOAD											
32.78	2725	4.51	1626	14.94	3rd gear (part throttle)				172	73	28.900
TEST K—OPERATING MAXIMUM LOAD											
29.32	2657	4.14	1633	17.58	3rd gear (part throttle)				175	79	28.750

TIRES, WHEELS AND WEIGHT

	Tests F, G & H	Test J	Test K
Rear wheels			
Type	Pressed steel	Pressed steel	Pressed steel
Liquid ballast	511 lb each	None	None
Added cast iron	1379 lb each	None	None
Rear tires			
No. and size	Two 13-28	Two 13-28	Two 12-28
Ply	6	6	4
Air pressure	18 lb	12 lb	12 lb
Front wheels			
Type	Pressed steel	Pressed steel	Pressed steel
Liquid ballast	30 lb each	None	None
Added cast iron	90 lb each	None	None
Front tires			
No. and size	Two 5.50-16	Two 5.50-16	Two 5.50-16
Ply	4	4	4
Air pressure	32 lb	28 lb	28 lb
Height of drawbar	21½ inches	23 inches	21½ inches
Static weight			
Rear end	6420 lb	2640 lb	2555 lb
Front end	1710 lb	1470 lb	1468 lb
Total weight as tested with operator	8305 lb	4285 lb	4198 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 20 To motor 1.716 gal Drained from motor 1.015 gal Total time motor was operated 41 hours.

CHASSIS Type Tricycle Serial No. WD199022D Tread width rear 55 9/16" to 90 1/8" Front 8 7/8" and 15 1/2" Wheel base 88 1/8" Hydraulic control system direct engine drive when transmission clutch is used Advertised speeds mph first 2 1/2 second 4 third 5 2/5 fourth 12 reverse 3 2/5 Belt pulley diam. 9" Face 6 1/2" rpm 1463 Belt speed 3450 fpm Engine clutch single dry disc operated by foot pedal Transmission clutch over center wet multiple disc clutch operated by hand lever Seat pressed steel on coil spring with hydraulic shock absorber Brakes external contracting operated by individual foot pedals Equalized by foot action Power take-off continuous running when transmission clutch is used.

ENGINE Make ALLIS-CHALMERS DIESEL Type 6 cylinder vertical Serial No. 73928 Crankshaft mounted lengthwise Head I Lubrication pressure Bore and stroke 3 7/16" x 4 1/8" Rated rpm 1625 Compression ratio 15.5 to 1 Displacement 230 cu. in. Port diameter valves inlet 1 1/4" Exhaust 1 7/32" Governor variable speed centrifugal Starting system 12 volt (two 6 volt batteries) Air cleaner oil washed wire mesh Muffler was used Oil filter two replaceable waste packed filters Fuel filter sediment bowl with wire mesh screen, two replaceable filter elements and one replaceable filter 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 fuel pump set to develop approximately 45 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, and 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)	40.42	45.42
2. Observed maximum horsepower (tests F and B)	39.50	43.29
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)	30.32	38.61

We, the undersigned, certify that this is a true and correct report of official tractor test No. 563.

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.

