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Test 511: Allis-Chalmers WD-45 (Distillate)

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 26 to October 31, 1953
Manufacturer: ALLIS-CHALMERS MANUFACTURING COMPANY, MILWAUKEE, WISCONSIN
Manufacturer's rating: Not rated.

NEBRASKA TRACTOR TEST NO. 511

ALLIS-CHALMERS WD-45 DISTILLATE

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			
TEST B—100% MAXIMUM LOAD—TWO HOURS										
33.01	1401	3.290	10.03	0.661	0.00	175	53	28.900		
TEST C—OPERATING MAXIMUM LOAD—ONE HOUR										
32.24	14.01	2.928	11.01	0.603	0.00	175	48	28.905		
TEST D—RATED LOAD—ONE HOUR										
28.89	1400	2,703	10.69	0.621	0.00	170	54	28.910		
TEST E—VARYING LOAD—TWO HOURS (20 minute runs; last line average)										
28.90	1400	2.703	10.69	0.621	...	171	54	.....	
1.78	1598	1.356	1.31	5.056	...	142	52	.....	
15.92	1540	2.043	7.79	0.852	...	161	54	.....	
31.25	1334	2.812	11.11	0.597	...	177	49	.....	
8.13	1571	1.668	4.87	1.362	...	148	54	.....	
22.99	1485	2.382	9.65	0.688	...	166	56	.....	
18.16	1488	2.161	8.40	0.790	0.00	161	53	28.910		
TORQUE (At Dynamometer)										
Eng rpm	1401	1320	1249	1173	1088	1009	943	867	789	722
Lb-ft	211.8	215.3	217.9	220.5	224.0	224.4	228.6	229.3	231.7	228.4

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 F—100% MAXIMUM LOAD—3rd Gear											
29.49	2204	5.02	1399	4.52	.....	Not Recorded	.....	184	63	28.930
TEST G—OPERATING MAXIMUM LOAD											
27.26	4634	2.21	1399	11.94	.....	Not Recorded	.....	185	67	28.950
28.85	2921	3.70	1400	5.88	.....	Not Recorded	.....	185	84	28.940
28.98	2165	5.02	1397	4.28	.....	Not Recorded	.....	185	64	28.940
26.50	870	11.42	1405	1.61	.....	Not Recorded	.....	185	65	28.940
TEST H—RATED LOAD—TEN HOURS—3rd Gear											
23.22	1715	5.08	1403	3.61	2.517	9.23	0.719	0.00	179	57	28.996
TEST J—OPERATING MAXIMUM LOAD—3rd Gear											
28.26	2127	4.98	1401	6.78	.....	Not Recorded	.....	185	66	28.790
TEST K—OPERATING MAXIMUM LOAD—3rd Gear											
27.52	2260	4.57	1400	10.08	.....	Not Recorded	.....	185	69	28.790

TIRES, WHEELS AND WEIGHT

	Tests F, G & H	Test J	Test K
Rear wheels			
Type	Pressed steel	Pressed steel	Pressed steel
Liquid ballast	482 lb each	None	None
Added cast iron	1000 lb each	None	None
Rear tires			
No. and size	Two 13-28	Two 13-28	Two 12-28
Ply	6	6	4
Air pressure	14 lb	12 lb	12 lb
Front wheels			
Type	Pressed steel	Pressed steel	Pressed steel
Liquid ballast	43 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	28 lb	28 lb	28 lb
Height of drawbar	22 inches	23 inches	21 inches
Static weight			
Rear end	5500 lb	2536 lb	2454 lb
Front end	1510 lb	1244 lb	1236 lb
Total weight as tested with operator	7185 lb	3955 lb	3865 lb

FUEL, OIL and TIME Tractor Fuel octane No ASTM 40 (rating taken from oil company's typical inspection data); weight per gallon 6.636 lb OIL SAE 20; to motor 1.502 gal; drained from motor 1.618 gal Total time motor was operated 41 hours.

CHASSIS TYPE Tricycle Serial No WD-149901 Tread width rear 55 9/16" to 90 1/8" front 8 7/8" and 15 1/2" Wheel Base 88 1/2" Hydraulic control system direct engine drive when hand clutch is used Advertised speeds mph first 2 1/2 second 3 3/4 third 5 fourth 11 1/4 reverse 3 3/4 Belt pulley diam 9" face 6 1/2" rpm 1260 Belt speed 2970 fpm Engine Clutch single dry disc operated by foot pedal Transmission Clutch over center multiple disc operated by hand lever Seat pressed steel on coil spring with hydraulic shock absorber Brakes external contracting shoes operated by individual foot pedals Equalized by foot Power take-off direct engine drive when hand clutch is used.

ENGINE Make Allis-Chalmers Type 4 cylinder vertical Serial No 45-5449K Crankshaft mounted lengthwise Head I Lubrication pressure Bore and Stroke 4" x 4 1/2" Rated rpm 1400 Compression ratio 4.75 to 1 Displacement 226 cu in Port Diameter Valves Inlet 1 1/2" Exhaust 1 1/4" Governor Variable speed centrifugal Carburetor Size 1" Ignition System battery Starting System 6 volt battery Air Cleaner oil washed wire mesh Muffler was used Oil Filter replaceable cotton waste 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 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 & K were made with an operating setting of the carburetor (selected by the manufacturer) of 97.7% of maximum belt horsepower.

HORSEPOWER SUMMARY

	Draw-bar	Belt
1. Sea level (calculated) maximum horsepower (based on 60° F and 29.92" HG)	30.59	33.94
2. Observed maximum horsepower (tests F & B)	29.49	33.01
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)	22.94	28.85

We, the undersigned, certify that this is a true and correct report of official tractor test No. 511.

L. F. LARSEN
Engineer-in-Charge

C. W. SMITH
L. W. HURLBUT
F. D. YUNG
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.

