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Test 644: Allis-Chalmers D-17 LPG

Nebraska Tractor Test Lab

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Department of Agricultural Engineering

Dates of test: April 1 to 12, 1958

Manufacturer: ALLIS-CHALMERS MANUFACTURING COMPANY, MILWAUKEE, WISCONSIN

Manufacturer's rating: Not Rated

NEBRASKA TRACTOR TEST NO. 644

ALLIS-CHALMERS D-17 LPG

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								
50.79	1650	5.452	9.32	0.456	156	54	71	28.969
TEST C—OPERATING MAXIMUM POWER—ONE HOUR								
49.37	1650	5.120	9.64	0.441	155	54	71	29.000
TEST D—RATED POWER—ONE HOUR								
45.09	1753	4.925	9.16	0.464	153	67	70	29.033
TEST E—VARYING POWER—TWO HOURS (20 minute runs; last line average)								
45.09	1752	4.899	9.20	0.462	153	68	69
2.29	1988	2.047	1.12	3.799	125	69	71
24.18	1872	3.480	6.95	0.612	136	70	73
49.13	1652	5.118	9.60	0.443	157	69	70
12.57	1940	2.689	4.67	0.909	129	54	71
34.80	1800	4.179	8.33	0.510	141	54	70
28.01	1834	3.735	7.50	0.567	140	64	70	29.052

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 med	Air wet bulb	Air dry bulb	
TEST H—RATED POWER—TEN HOURS—3rd Gear High Range											
36.16	2367	5.73	1775	4.04	4.675	7.73	0.549	127	42	49	28.957
TEST F—100% MAXIMUM POWER											
46.23	3311	5.24	1651	5.67	3rd Gear High Range	132		41	52		29.050
TEST G—OPERATING MAXIMUM POWER											
41.67	6845	2.28	1650	13.80	1st Gear High Range	127		39	50		29.080
43.88	4270	3.85	1654	7.61	2nd Gear High Range	131		40	50		29.060
44.43	3169	5.26	1654	5.55	3rd Gear High Range	129		40	50		29.060
39.78	1247	11.96	1655	2.48	4th Gear High Range	137		44	54		29.020
29.36	6956	1.58	1649	14.97	1st Gear l.r. (prt thrtle)	123		39	50		29.080
42.14	6113	2.59	1650	11.74	2nd Gear Low Range	130		39	50		29.080
43.45	4523	3.60	1653	8.02	3rd Gear Low Range	128		39	50		29.080
43.16	1940	8.34	1655	3.39	4th Gear Low Range	130		44	54		29.020
TEST J—OPERATING MAXIMUM POWER											
41.99	3123	5.04	1649	11.26	3rd Gear High Range	136		44	56		29.060
TEST K—SPEED-PULL CHARACTERISTIC											
Pounds Pull		2367	3169	3200	3300	3400		3600			3300
Horsepower		36.16	44.43	40.1	37.0	32.6		28.8			22.9
Miles Per Hour		5.73	5.26	4.7	4.2	3.6		3.0			2.6

TIRES, WHEELS AND WEIGHT

	Tests F, G, H & K	Test J
Rear wheels		
Type	Pressed Steel	Pressed Steel
Liquid ballast	632 lb each	None
Added cast iron	1560 lb each	None
Rear tires		
No. and size	Two 14-28	Two 14-28
Ply	6	6
Air pressure	16 lb	16 lb
Front wheels		
Type	Pressed Steel	Pressed Steel
Liquid ballast	30 lb each	None
Added cast iron	270 lb each	None
Front tires		
No. and size	Two 6.00-16	Two 6.00-16
Ply	6	6
Air pressure	36 lb	36 lb
Height of drawbar	21½ inches	23½ inches
Static weight		
Rear end	7430 lb	3046 lb
Front end	2130 lb	1530 lb
Total weight as tested with operator	9735 lb	4751 lb

FUEL, OIL, WATER AND TIME Fuel Commercial Propane Weight per gallon 4.25 lb Oil SAE 20-20W To motor 1.488 gal Drained from motor 1.417 gal Water used 0.045 gal Total time motor was operated 45½ hours.

CHASSIS Type Tricycle Serial No. D-17-5773 Tread width rear 58" to 92" front 10" and 18" Wheel base 93" Hydraulic control system direct engine drive Advertised speeds mph first 2½ second 4 third 5½ fourth 12 reverse 3½ (Using power Director) first 1½ second 3 third 3½ fourth 8½ reverse 2½ Belt pulley diam. 9" face 6" rpm 1384 Belt speed 3260 fpm Belt flat Length 71' Width 6" Thickness 0.215" Maximum slip 0.82% Clutch single plate dry disc operated by foot pedal Seat pressed steel on coil spring with shock absorber Brakes external contracting shoe operated by two foot pedals Equalized by foot action Power take-off continuous running when power director is used Steering aided by hydraulic power steering.

ENGINE Make Allis-Chalmers Type 4-cylinder vertical Serial No. 17-5217V Crankshaft mounted lengthwise Head I Lubrication pressure Bore and stroke 4" x 4½" Rated rpm 1650 Compression ratio 8.25 to 1 Displacement 226 cu. in. Valves port diameter Inlet 1½" Exhaust 1¼" Governor variable speed centrifugal Carburetor size 1" Ignition system battery Starting system 12-volt battery Air cleaner oil washed wire mesh Muffler was used Oil filter replaceable waste packed cartridge Fuel filter one fuel filter with a replaceable paper element 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 97.1% of maximum belt horsepower.

HORSEPOWER SUMMARY

	Drawbar	Belt
1. Sea level (calculated) maximum horsepower (based on 60°F and 29.92" Hg)	47.24	53.00
2. Observed maximum horsepower (tests F and B)	46.23	50.79
3. Seventy-five per cent of calculated maximum drawbar horsepower and eighty-five per cent of calculated maximum belt horsepower (ASAE and SAE ratings)	35.43	45.05

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. 644.

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.

