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Test 645: Allis-Chalmers D-14 LPG

Nebraska Tractor Test Lab
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The Experiment Station
University of Nebraska College of Agriculture
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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. 645

ALLIS-CHALMERS D-14 LPG

FUEL, OIL, WATER and TIME Fuel Commercial Propane (rating taken from oil company's typical inspection data) **Weight per gallon** 4.25 lb **Oil** SAE 20-20W **To motor** 1.000 gal **Drained from motor** 0.954 gal **Water used** 0.051 gal **Total time motor was operated** 39 hours.

CHASSIS Type Tricycle **Serial No.** D-14-9643 **Tread width rear** 54" to 80" **front** 8" or 15" **Wheel base** 85¾" **Hydraulic control system** direct engine drive **Advertised speeds mph** first 2½ second 3¾ third 4¾ fourth 12 reverse 3¾ (using power director) first 1½ second 2⅗ third 3⅗ fourth 8½ reverse 2⅗ **Belt pulley diam.** 9" **face** 6 9/16" **rpm** 1384 **Belt speed** 3260 fpm **Belt** flat **Length** 71' **Width** 6" **Thickness** 0.215" **Maximum slip** 0.66% **Clutch** single plate dry disc operated by foot pedal **Seat** pressed steel on coil spring with shock absorber **Brakes** internal expanding 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 (LPG) **Type** 4-cylinder vertical **Serial No.** 149-10033T **Crankshaft mounted** lengthwise **Head** I **Lubrication** pressure **Bore and stroke** 3½" x 3⅞" **Rated rpm** 1650 **Compression ratio** 8.5 to 1 **Displacement** 149 cu. in. **Valves port diameter Inlet** 1.25" **Exhaust** 1.125" **Governor** variable speed centrifugal **Carburetor size** 1" **Ignition system** battery **Starting system** 6-volts **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 97.3% of maximum belt horsepower.

BELT HORSEPOWER TESTS

Hp	Crank shaft speed rpm	Fuel Consumption: Gal per hr	Fuel Consumption: Hp-hr per gal	Fuel Consumption: Lb per hp-hr	Temp. Deg. F.: Cooling medium	Temp. Deg. F.: Air wet bulb	Temp. Deg. F.: Air dry bulb	Barometer inches of mercury
TEST B—100% MAXIMUM POWER —TWO HOURS								
31.86	1650	3.674	8.67	0.490	175	53	71	28.987
TEST C—OPERATING MAXIMUM POWER—ONE HOUR								
30.98	1650	3.428	9.04	0.470	175	53	71	28.983
TEST D—RATED POWER—ONE HOUR								
28.25	1735	3.249	8.69	0.489	170	54	72	28.983
TEST E—VARYING POWER—TWO HOURS (20 minute runs; last line average)								
28.24	1726	3.247	8.70	0.489	170	54	71	.....
2.10	1977	1.638	1.28	3.314	152	54	72	.....
15.17	1858	2.351	6.45	0.659	159	54	72	.....
31.04	1649	3.473	8.94	0.476	174	53	71	.....
7.91	1933	1.920	4.12	1.032	154	54	73	.....
21.75	1779	2.795	7.78	0.546	166	54	74	.....
17.70	1820	2.571	6.88	0.617	162	54	72	28.992

DRAWBAR HORSEPOWER TESTS

Hp	Draw bar pull lbs	Speed miles per hr	Crank shaft speed rpm	Slip of drive wheels %	Fuel Consumption: Gal per hr	Fuel Consumption: Hp-hr per gal	Fuel Consumption: Lb per hp-hr	Temp. Deg. F.: Cooling med	Temp. Deg. F.: Air wet bulb	Temp. Deg. F.: Air dry bulb	Barometer inches of mercury
TEST H—RATED POWER—TEN HOURS—3rd Gear High Range											
23.02	1648	5.24	1754	3.47	3.163	7.28	0.584	156	45	50	28.938
TEST F—100% MAXIMUM POWER											
28.67	2204	4.88	1653	4.68	3rd Gear High Range			165	46	58	28.910
TEST G—OPERATING MAXIMUM POWER											
26.39	5023	1.97	1649	13.06	1st Gear High Range			159	46	58	28.930
28.11	2805	3.76	1652	6.00	2nd Gear High Range			166	46	58	28.910
27.61	2126	4.87	1649	4.51	3rd Gear High Range			164	46	58	28.910
22.08	655	12.64	1647	1.45	4th Gear High Range			163	44	56	28.900
18.50	5017	1.38	1647	13.16	1st Gear l.r. (prt thrtle)			157	46	58	28.930
27.38	4020	2.55	1651	9.19	2nd Gear Low Range			165	46	58	28.930
27.72	3099	3.35	1651	6.70	3rd Gear Low Range			163	46	58	28.910
25.30	1072	8.85	1653	2.34	4th Gear Low Range			164	44	56	28.900
TEST J—OPERATING MAXIMUM POWER											
27.50	2162	4.77	1650	9.31	3rd Gear High Range			160	44	54	28.930
TEST K—SPEED-PULL CHARACTERISTIC											
Pounds Pull		1648	2126	2200	2250	2300	2250	2150			
Horsepower		23.02	27.61	25.8	23.4	20.9	17.4	13.8			
Miles Per Hour		5.24	4.87	4.4	3.9	3.4	2.9	2.4			

TIRES, WHEELS AND WEIGHT

	Tests F, G, H & K	Test J
Rear wheels Type	Pressed Steel	Pressed Steel
Liquid ballast	457 lb each	None
Added cast iron	1170 lb each	None
Rear tires No. and size	Two 12-26	Two 12-26
Ply	6	6
Air pressure	20 lb	14 lb
Front wheels Type	Pressed Steel	Pressed Steel
Liquid ballast	47 lb each	None
Added cast iron	157 lb each	None
Front tires No. and size	Two 5.50-16	Two 5.50-16
Ply	4	4
Air pressure	24 lb	24 lb
Height of drawbar	22½ inches	23½ inches
Static weight Rear end	5530 lb	2275 lb
Front end	1670 lb	1261 lb
Total weight as tested with operator	7375 lb	3711 lb

HORSEPOWER SUMMARY

	Drawbar	Belt
1. Sea level (calculated) maximum horsepower (based on 60° F and 29.92" Hg)	29.61	33.23
2. Observed maximum horsepower (tests F and B)	28.67	31.86
3. Seventy-five per cent of calculated maximum drawbar horsepower and eighty-five per cent of calculated maximum belt horsepower (ASAE and SAE ratings)	22.21	28.25

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. 645.

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 permissable 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, ½ rated load, maximum load at wide open throttle valve, ¼ and ¾ 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 tratcor 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.