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11-27-1957

## Test 636: Allis-Chalmers D-17 Diesel

Nebraska Tractor Test Lab

University of Nebraska-Lincoln, tractortestlab@unl.edu

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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: November 14, 1957 to November 26,  
1957  
Manufacturer: ALLIS-CHALMERS MANUFACTUR-  
ING COMPANY, MILWAUKEE, WISCONSIN  
Manufacturer's rating: Not rated

NEBRASKA TRACTOR TEST NO. 636

ALLIS-CHALMERS D17 DIESEL

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			
<b>TESTS B &amp; C—100% MAXIMUM LOAD—TWO HOURS</b>										
51.14	1650	3.724	13.73	0.509	177	48	61	28.665		
<b>TEST D—RATED LOAD—ONE HOUR</b>										
45.52	1649	3.257	13.98	0.500	155	48	60	28.640		
<b>TEST E—VARYING LOAD—TWO HOURS (20 minute runs; last line average)</b>										
45.76	1647	3.273	13.98	0.500	156	48	60	.....		
1.92	1797	1.377	1.39	5.016	137	47	59	.....		
23.89	1727	2.149	11.12	0.629	146	49	62	.....		
49.17	1549	3.595	13.68	0.511	180	49	62	.....		
12.24	1774	1.716	7.13	0.980	139	48	60	.....		
34.68	1685	2.659	13.04	0.536	150	50	62	.....		
27.94	1696	2.461	11.35	0.616	151	48	61	28.638		
<b>TEST L—OPERATING MAXIMUM TORQUE</b>										
% of rated rpm (engine)	100	95	90	85	80	75	70	65	60	54
% of rated-speed torque	100	103	106	107	107	107	106	102	100	93

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	Cooling me.!	Air wet bulb	Air dry bulb	
<b>TEST H—RATED LOAD—TEN HOURS—3rd Gear High Range</b>											
35.87	2529	5.32	1649	4.25	2.985	12.02	0.582	149	39	43	28.799
<b>TESTS F &amp; G—100% MAXIMUM LOAD</b>											
42.84	7126	2.25	1656	15.32	1st Gear High Range			154	42	47	28.750
46.16	4475	3.87	1651	7.24	2nd Gear High Range			151	35	39	28.775
46.20	3287	5.27	1650	5.04	3rd Gear High Range			158	35	39	28.775
41.16	1293	11.94	1653	2.73	4th Gear High Range			155	39	44	28.750
30.16	7156	1.58	1653	15.32	1st Gear LR (prt-thrtl)			145	42	47	28.750
43.75	6346	2.59	1649	11.79	2nd Gear Low Range			153	39	43	28.760
44.97	4658	3.62	1655	7.60	3rd Gear Low Range			156	37	40	28.760
44.92	2022	8.33	1654	3.64	4th Gear Low Range			163	38	42	28.750
<b>TEST J—OPERATING MAXIMUM LOAD</b>											
44.87	3308	5.09	1649	10.52	3rd Gear High Range			153	47	52	28.645
<b>TEST K—OPERATING MAXIMUM LOAD</b>											
41.16	3325	4.64	1652	14.07	3rd Gear HR (prt-thrtl)			150	47	51	28.650

TIRES, WHEELS AND WEIGHT

	Tests F, G, & H	Test J	Test K
<b>Rear wheels</b>			
Type	Pressed steel	Pressed steel	Pressed steel
Liquid ballast	690 lb each	None	None
Added cast iron	1560 lb each	None	None
<b>Rear tires</b>			
No. and size	Two 14-28	Two 14-28	Two 13-28
Ply	6	6	6
Air pressure	16 lb	16 lb	14 lb
<b>Front wheels</b>			
Type	Pressed steel	Pressed steel	Pressed steel
Liquid ballast	44 lb each	None	None
Added cast iron	None	None	None
<b>Front tires</b>			
No. and size	Two 6.00-16	Two 6.00-16	Two 6.00-16
Ply	4	4	4
Air pressure	28 lb	28 lb	28 lb
<b>Height of drawbar</b>	23 inches	24 inches	23 inches
<b>Static weight</b>			
Rear end	7570 lb	3070 lb	3010 lb
Front end	1710 lb	1622 lb	1620 lb
<b>Total weight as tested with operator</b>	9455 lb	4867 lb	4805 lb

FUEL, OIL, WATER and TIME Fuel Diesel Cetane No. ASTM 50 (rating taken from oil company's typical inspection data) Weight per gallon 6.994 lb Oil SAE 20-20W To motor 1.661 gal Drained from motor 1.250 gal Water used 0.031 gal Total time motor was operated 39½ hours.

CHASSIS Type Tricycle Serial No. D17-1001D Tread width rear 58" to 92" front 10" and 18" Wheel base 95¾" 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 9/16" rpm 1384 Belt speed 3260 fpm Belt flat Length 71' Width 6" Thickness 0.215" Maximum slip 0.89% Clutch single plate dry disc operated by foot pedal Seat upholstered seat on coil spring with shock absorber Brakes external contracting band 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 Diesel Type 6 cylinder vertical Serial No. 100274 Crankshaft mounted lengthwise Head I Lubrication pressure Bore and stroke 3 9/16" x 4 3/8" Rated rpm 1650 Compression ratio 15.7 to 1 Displacement 262 cu. in. Valves port diameter Inlet 1¼" Exhaust 1 7/32" Governor variable speed centrifugal Starting system 12 volt battery Air cleaner oil washed wire mesh Muffler was used Oil filter replaceable pleated paper element Fuel filter one replaceable cotton waste element and one replaceable pleated 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 fuel pump set to develop approximately 53 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, K and L were made with the same setting.

HORSEPOWER SUMMARY

	Drawbar	Belt
1. Sea level (calculated) maximum horsepower (based on 60°F and 29.92" Hg)	47.06	53.43
2. Observed maximum horsepower (tests F and B)	46.20	51.14
3. Seventy-five per cent of calculated maximum drawbar horsepower and eighty-five per cent of calculated maximum belt horsepower (ASAE and SAE ratings)	35.30	45.42

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. 636.

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 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 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.

**TEST L:** This torque test is run with wide open throttle. Loads are applied to reduce engine speed in approximately ten 5% increments. Rated speed equals 100%. The corresponding dynamometer torque is recorded as a per cent of torque at rated speed.

### 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. All crawler type tractors are tested on a 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.

