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Test 664: Allis-Chalmers HD-21A (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: August 26 to September 3, 1958
Manufacturer: ALLIS-CHALMERS MANUFACTURING COMPANY, SPRINGFIELD, ILLINOIS
Manufacturer's rating: Not Rated

NEBRASKA TRACTOR TEST NO. 664

ALLIS-CHALMERS HD-21A DIESEL

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—100% OBSERVED MAXIMUM HORSEPOWER—TEN HOURS—1st Gear													
144.01	36224	1.49	1842	4.45	12.586	11.44	0.614	141	81	86	28.661		
TEST H—75% PULL AT OBSERVED MAXIMUM H. P.—TWO HOURS—1st Gear													
141.88	27525	1.93	1848	0.69	12.452	11.39	0.617	136	70	79	28.710		
TEST H—50% PULL AT OBSERVED MAXIMUM H. P.—TWO HOURS—1st Gear													
121.94	18392	2.49	1853	1.16	12.164	10.02	0.701	141	73	83	28.735		
TESTS F & G—100% MAXIMUM POWER													
147.19	36140	1.53	1848	3.08	Low Gear Range. . . .			135	66	78	28.620		
138.36	13836	3.75	1846	0.86	High Gear Range. . . .			140	66	78	28.620		
TEST K—SPEED-PULL CHARACTERISTIC													
Pounds Pull			27525		36140			39400			41050		43250
Horsepower			141.88		147.19			147.1			145.6		145.3
Miles Per Hour			1.93		1.53			1.40			1.33		1.26

FUEL, OIL, WATER and TIME Fuel Diesel Cetane No. ASTM 52 (rating taken from oil company's typical inspection data) Weight per gallon 7.030 lb Oil SAE 30 To motor 5.846 gal Drained from motor 4.276 gal Water used 0.591 gal Total time motor was operated 40 hours.

CHASSIS Type tracklayer Serial No. HD-21-A-1002 Tread width 84" Wheel base 120 1/4" Measured length of track 30 ft. Cleats integral with shoes Cleats per track 40 Size of cleats 26" x 2 3/4" Advertised speeds mph first 0 to 3.1 second 0 to 8.0 reverse 0 to 6.0 Clutch twin disc over center operated by hand lever Seat upholstered Brakes contracting bands operated by two foot pedals Steering hydraulically controlled multiple disc clutches Drawbar height 20".

ENGINE Make Allis-Chalmers AC-21000 Diesel Type 6 cylinder vertical with turbocharger Serial No. 21-2474 Crankshaft mounted lengthwise Head I Lubrication pressure Bore and stroke 5 1/4" x 6 1/2" Rated rpm 1825 Compression ratio 14.5 to 1 Displacement 844.3 cu. in. Valves port diameter Inlet 1.375" Exhaust 1.625" Governor variable speed centrifugal Starting system 24 volt (two-12 volt batteries) Air cleaner oil washed wire mesh Muffler not used Oil filter three replaceable pleated paper elements Fuel filter two full flow replaceable wound cotton yarn elements Cooling medium temperature control thermostat.

TOTAL WEIGHT AS TESTED (with operator) 47,455 pounds.

REPAIRS AND ADJUSTMENTS Adjusted tracks by loosening during Tests F and G.

REMARKS All test results were determined from observed data and without allowances, additions or deductions. Tests F, G, H, and K were made with fuel pump as set by the manufacturer.

This tractor is equipped with a 3 stage hydraulic torque converter which automatically loads the engine by controlling the forward travel speed or the belt pulley speed of the tractor according to the load applied. No belt tests were made on this tractor due to the limited capacity of the dynamometer used for belt testing.

HORSEPOWER SUMMARY

	Drawbar
1. Sea level (calculated) maximum horsepower (based on 60°F and 29.92" Hg)	156.46
2. Observed maximum horsepower (test F)	147.18

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. 664.

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.



