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Test 794: Allis-Chalmers HD3 (Diesel)

Nebraska Tractor Test Lab

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NEBRASKA TRACTOR TEST 794 - ALLIS-CHALMERS HD3 DIESEL

The University of Nebraska Agricultural Experiment Station

E. F. Frolik, Dean; A. W. Epp, Acting Director, Lincoln, Nebraska

POWER TAKE-OFF PERFORMANCE

Hp	Crank shaft speed rpm	Fuel Consumption		Hp-hr per gal	Temp. Degrees F			Barometer inches of mercury
		Gal per hr	Lb per hp-hr		Cool- ing med	Air wet bulb	Air dry bulb	
MAXIMUM POWER AND FUEL CONSUMPTION								
Rated Engine Speed—Two Hours								
32.53	1650	2.565	0.544	12.68	180	61	75	29.042
VARYING POWER AND FUEL CONSUMPTION—TWO HOURS								
28.84	1722	2.175	0.520	13.26	175	62	75	.....
0.00	1903	0.792	....	....	168	62	73	.....
15.29	1825	1.453	0.655	10.52	170	62	74	.....
32.46	1650	2.523	0.536	12.87	180	63	75	.....
7.81	1866	1.118	0.987	6.99	165	63	74	.....
22.33	1777	1.801	0.556	12.40	170	63	75	.....
Av 17.79	1790	1.644	0.637	10.82	171	62	74	29.025

DRAWBAR PERFORMANCE

Hp	Draw-bar pull lbs	Speed miles per hr	Crank shaft speed rpm	Slip of drivers %	Fuel Consumption		Hp-hr per gal	Temperature Degrees F			Barometer inches of mercury
					Gal per hr	Lb per hp-hr		Cooling medium	Air wet bulb	Air dry bulb	
VARYING DRAWBAR POWER AND FUEL CONSUMPTION WITH BALLAST											
Maximum Available Power—Two Hours—2nd Gear High Range											
26.17	5262	1.86	1652	3.67	2.561	0.675	10.22	175	55	67	28.950
75% of Pull at Maximum Power—Ten Hours—2nd Gear High Range											
22.17	4169	1.99	1751	3.22	2.116	0.658	10.48	173	52	63	29.179
50% of Pull at Maximum Power—Two Hours—2nd Gear High Range											
15.68	2764	2.13	1821	0.90	1.721	0.757	9.11	173	53	61	28.983
MAXIMUM POWER WITH BALLAST											
25.29	8207	1.16	1714	5.96	1st Gear	Low Range	175	56	68	29.030	
27.46	7297	1.41	1644	4.59	1st Gear	High Range	175	56	68	29.030	
26.96	6807	1.49	1651	4.30	2nd Gear	Low Range	175	54	66	29.030	
27.76	5518	1.89	1647	3.02	2nd Gear	High Range	175	52	64	29.030	
26.37	4495	2.20	1652	2.46	3rd Gear	Low Range	173	58	70	28.955	
27.10	3661	2.78	1648	1.65	3rd Gear	High Range	175	58	70	28.955	
25.23	2544	3.72	1648	0.98	4th Gear	Low Range	175	58	70	28.955	
23.49	1879	4.69	1650	0.86	4th Gear	High Range	175	58	70	28.955	
VARYING DRAWBAR PULL AND TRAVEL SPEED WITH BALLAST—											
2nd Gear High Range											
Pounds pull		5500		5700	5600	5400		4900	4350		
Horsepower		27.8		25.8	22.4	18.7		14.4	10.4		
Miles per hour		1.9		1.7	1.5	1.3		1.1	0.9		

Department of Agricultural Engineering

Dates of Test: May 12 to May 26, 1961

Manufacturer: ALLIS-CHALMERS MANUFACTURING COMPANY, MILWAUKEE, WISCONSIN

Manufacturer's Power Rating: Not Rated

FUEL, OIL and TIME Fuel No. 2 Diesel Cetane No 54 (rating taken from oil company's typical inspection data) Specific gravity converted to 60°/60° 0.8283 Weight per gallon 6.896 lb Oil SAE 10W-30 API service classification MS, DM To motor 1.232 gal Drained from motor 0.672 gal Transmission and final-drive lubricant SAE 20-20W Type engine oil Total time engine was operated 39½ hours.

ENGINE Make Allis-Chalmers Diesel Type 4 cylinder vertical Serial No 114658 Crankshaft mounted lengthwise Rated rpm 1650 Bore and stroke 3⅞" x 4⅜" Compression ratio 15.5 to 1 Displacement 175 cu in Cranking system 12 volt electric (two 6 volt batteries) Lubrication pressure Air cleaner oil washed wire screen Fuel filter primary filter with cotton waste replaceable element and secondary filter with replaceable pleated paper element Muffler was used Cooling medium temperature control thermostat. Oil filter replaceable pleated paper element.

CHASSIS Type tracklayer Serial No HD3-1440 Tread width 48" Wheel base 64" Drawbar height 12" Measured length of track 17 ft. Cleats integral with shoes Cleats per track 34 Size of cleats 14" x 2" Center of gravity (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation Horizontal distance forward from center-line of rear wheels 29" Vertical distance above roadway 20¾" Horizontal distance from center of rear wheel tread 0" to the right/left Hydraulic control system direct engine drive Transmission selective gear fixed ratio plus operator controlled partial range power shifting Advertised speeds mph (High range) first 1.5 second 2.0 third 2.9 fourth 4.8 reverse 2.2 (Low range) first 1.2 second 1.6 third 2.3 fourth 3.8 reverse 1.8 Clutch single plate dry disc operated by foot pedal Power director clutch two multi-disc wet clutches operated by hand lever Brakes contracting band operated by two foot pedals Steering two hand levers controlling dry multi-disc clutches Turning space diameter (with brake applied right 155" left 155" Power take-off 538 rpm at 1650 engine rpm.

TOTAL WEIGHT with operator 7645 lb including hydraulic system 128 lb, heavy duty grill 62 lb, and track roller and idler guards 197 lb.

REPAIRS and ADJUSTMENTS No repairs or adjustments.

REMARKS All test results were determined from observed data obtained in accordance with the SAE and ASAE test code.

We, the undersigned, certify that this is a true and correct report of official Tractor Test 794.

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

Each tractor is a production model equipped for common usage. Power consuming accessories can be disconnected only when it is convenient for the operator to do so in practice. Additional weight can be added as ballast if the manufacturer regularly supplies it for sale. The static tire loads and the inflation pressures must conform to recommendations in the Tire Standards published by the Society of Automotive Engineers.

PREPARATION FOR PERFORMANCE RUNS

The engine crankcase is drained and refilled with a measured amount of new oil conforming to specifications in the operators manual. The fuel used and the maintenance operations must also conform to the published information delivered with the tractor. The tractor is then limbered-up for 12 hours on drawbar work in accordance with the manufacturer's published recommendations. The manufacturer's representative is present to make appropriate decisions regarding mechanical adjustments.

The tractor is equipped with approximately the amount of added ballast that is used during maximum drawbar tests. The tire tread-bar height must be at least 65% of new tread height prior to the maximum power run.

BELT OR POWER TAKE-OFF PERFORMANCE

Maximum Power and Fuel Consumption. The manufacturer's representative makes carburetor, fuel pump, ignition and governor control settings which remain unchanged throughout all subsequent runs. The governor and the manually operated governor control lever is set to provide the high-idle speed specified by the manufacturer for maximum power. Maximum power is measured by connecting the belt pulley or the power take-off to a dynamometer. The dynamometer load is then gradually increased until the engine is operating at the rated speed specified by the manufacturer for maximum power. The corresponding fuel consumption is measured.

Varying Power and Fuel Consumption. Six different horsepower levels are used to show corresponding fuel consumption rates and how the governor causes the engine to react to the following changes in dynamometer load: 85% of the dynamometer torque at maximum power; minimum dynamometer torque, $\frac{1}{2}$ the 85% torque; maximum power, $\frac{1}{4}$ and $\frac{3}{4}$ of the 85% torque. Since a tractor is generally subjected to varying loads the average of the results in this test serve well for predicting the fuel consumption of a tractor in general usage.

DRAWBAR PERFORMANCE

All engine adjustments are the same as those used in the belt or power take-off tests. If the manufacturer specifies a different rated crankshaft speed for drawbar operations, then the position of the manually operated governor control is changed to provide the high-idle speed specified by the manufacturer in the operating instructions.

Varying Power and Fuel Consumption With Ballast. The varying power runs are made to show the effect of speed-control devices (engine governor, automatic transmissions, etc.) on horsepower, speed and fuel consumption. These runs are made around the entire test course which has two 180 degree

turns with a minimum radius of 50 feet. The drawbar pull is set at 3 different levels as follows: (1) as near to the pull at maximum power as possible and still have the tractor maintain the travel speed at maximum horsepower on the straight sections of the test course; (2) 75% of the pull at maximum power; and (3) 50% of the pull at maximum power. Prior to 1958, fuel consumption data (10 hour test) were shown only for the pull obtained at maximum power for tractors having torque converters and at 75% of the pull obtained at maximum power for gear-type tractors.

Maximum Power with Ballast. Maximum power is measured on straight level sections of the test course. Data are shown for not more than 12 different gears or travel speeds. Some gears or travel speeds may be omitted because of high slippage of the traction members or because the travel speed may exceed the safe-limit for the test course. The maximum safe speed for the Nebraska Test Course has been set at 15 miles per hour. The slippage limits have been set at 15% and 7% for pneumatic tires and steel tracks or lugs, respectively. Higher slippage gives widely varying results.

Maximum Power Without Ballast. All added ballast is removed from the tractor. The maximum drawbar power of the tractor is determined by the same procedure used for getting maximum power with ballast. The gear (or travel speed) is the same as that used in the 10-hour test.

Varying Power and Travel Speed with Ballast. Travel speeds corresponding to drawbar pulls beyond the maximum power range are obtained to show the "lugging ability" of the tractor. The run starts with the pull at maximum power; then additional drawbar pull is applied to cause decreasing speeds. The run is ended by one of three conditions: (1) maximum pull is obtained, (2) the maximum slippage limit is reached, or (3) some other operating limit is reached.

For additional information about the **Nebraska Tractor Tests** write to the Department of Agricultural Engineering, University of Nebraska, Lincoln, Nebraska.



Allis-Chalmers HD3 Diesel