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Test 796: Allis-Chalmers D15 (Diesel)

Nebraska Tractor Test Lab

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NEBRASKA TRACTOR TEST 796 - ALLIS-CHALMERS D15 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 | | | | | | | | | |
| 36.51 | 2000 | 2.871 | 0.542 | 12.72 | 179 | 63 | 75 | 28.963 | |
| Standard Power Take-off Speed (540 rpm)—One Hour | | | | | | | | | |
| 34.36 | 1623 | 2.494 | 0.501 | 13.78 | 180 | 62 | 75 | 28.950 | |
| VARYING POWER AND FUEL CONSUMPTION—TWO HOURS | | | | | | | | | |
| 32.41 | 2088 | 2.719 | 0.579 | 11.92 | 174 | 63 | 75 | | |
| 0.00 | 2251 | 1.105 | | | 165 | 62 | 74 | | |
| 16.95 | 2186 | 1.884 | 0.766 | 9.00 | 170 | 62 | 74 | | |
| 35.95 | 2000 | 2.854 | 0.547 | 12.60 | 180 | 62 | 75 | | |
| 8.62 | 2222 | 1.510 | 1.208 | 5.71 | 168 | 62 | 74 | | |
| 24.91 | 2140 | 2.240 | 0.620 | 11.12 | 175 | 62 | 74 | | |
| Av | 19.81 | 2.148 | 2.052 | 0.714 | 9.65 | 172 | 62 | 74 | 28.917 |

DRAWBAR PERFORMANCE

| Hp | Draw-bar pull lbs | Speed miles per hr | Crank shaft speed rpm | Slip of driv- ers % | 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—3rd Gear Low Range | | | | | | | | | | | |
| 33.32 | 2942 | 4.25 | 2006 | 5.29 | 3.047 | 0.631 | 10.94 | 177 | 54 | 60 | 28.980 |
| 75% of Pull at Maximum Power—Ten Hours—3rd Gear Low Range | | | | | | | | | | | |
| 26.53 | 2196 | 4.53 | 2112 | 4.00 | 2.690 | 0.699 | 9.86 | 174 | 60 | 63 | 29.023 |
| 50% of Pull at Maximum Power—Two Hours—3rd Gear Low Range | | | | | | | | | | | |
| 18.51 | 1475 | 4.71 | 2166 | 2.77 | 2.203 | 0.821 | 8.40 | 171 | 55 | 58 | 28.943 |
| MAXIMUM POWER WITH BALLAST | | | | | | | | | | | |
| 27.19 | 5737 | 1.78 | 2089 | 14.35 | 1st Gear Low Range | | | 170 | 56 | 58 | 29.100 |
| 32.36 | 4754 | 2.55 | 2008 | 9.98 | 1st Gear High Range | | | 170 | 56 | 58 | 29.100 |
| 32.77 | 3793 | 3.24 | 2005 | 7.63 | 2nd Gear Low Range | | | 170 | 56 | 58 | 29.100 |
| 32.99 | 2936 | 4.21 | 2000 | 5.76 | 3rd Gear Low Range | | | 170 | 56 | 58 | 29.100 |
| 32.68 | 2588 | 4.74 | 2005 | 4.92 | 2nd Gear High Range | | | 175 | 56 | 58 | 29.100 |
| 32.26 | 1978 | 6.12 | 2006 | 4.06 | 3rd Gear High Range | | | 175 | 57 | 59 | 29.100 |
| 29.45 | 1005 | 10.99 | 1997 | 2.47 | 4th Gear Low Range | | | 170 | 57 | 59 | 29.100 |
| MAXIMUM POWER WITHOUT BALLAST | | | | | | | | | | | |
| 30.18 | 2871 | 3.94 | 2028 | 14.93 | 3rd Gear Low Range | | | 170 | 53 | 64 | 28.960 |
| VARYING DRAWBAR PULL AND TRAVEL SPEED WITH BALLAST— | | | | | | | | | | | |
| 3rd Gear Low Range | | | | | | | | | | | |
| Pounds pull | | 2950 | | 3250 | | 3400 | | 3400 | | 3300 | 2900 |
| Horsepower | | 33.0 | | 32.9 | | 29.9 | | 26.3 | | 22.0 | 16.2 |
| Miles per hour | | 4.2 | | 3.8 | | 3.3 | | 2.9 | | 2.5 | 2.1 |

TIRES, BALLAST and WEIGHT

| | |
|----------------------------|----------------------|
| Rear tires | —No, size, ply & psi |
| Ballast | —Liquid |
| | —Cast iron |
| Front tires | —No, size, ply & psi |
| Ballast | —Liquid |
| | —Cast iron |
| Height of drawbar | |
| Static weight | —Rear |
| | —Front |
| Total weight with operator | |

With Ballast

| |
|------------------|
| Two 14.9-26;6;14 |
| 566 lb each |
| 1000 lb each |
| Two 6.00-16;6;28 |
| 22 lb each |
| 90 lb each |
| 22 inches |
| 5565 lb |
| 1835 lb |
| 7575 lb |

Without Ballast

| |
|------------------|
| Two 14.9-26;6;14 |
| None |
| None |
| Two 6.00-16;6;28 |
| None |
| None |
| 23½ inches |
| 2433 lb |
| 1612 lb |
| 4220 lb |

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 1.217 gal Drained from motor 0.846 gal Transmission lubricant SAE 80 E.P. Final drive lubricant SAE 20W engine oil Total time engine was operated 39½ hours.

ENGINE Make Allis-Chalmers Diesel Type 4 cylinder vertical Serial No 113992 Crankshaft mounted lengthwise Rated rpm 2000 Bore and stroke 3⅞" x 4⅜" Compression ratio 15.5 to 1 Displacement 175-cu in Cranking system 12 volt electric (two 12 volt batteries) Lubrication pressure Air cleaner oil washed wire screen and centrifugal pre-cleaner Oil filter replaceable pleated paper element 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.

CHASSIS Type standard Serial No D15-2984D Tread width rear 54" to 80" front 51" to 78" Wheel base 87" 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 28¾" Vertical distance above roadway 28⅞" 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 2.7 second 4.7 third 6.1 fourth 15.3 reverse 4.7 (low range) first 1.9 second 3.3 third 4.3 fourth 10.9 reverse 3.3 Clutch single plate dry disc operated by foot pedal Power director clutch two multi-disc wet clutches operated by hand lever Brakes internal expanding shoe operated by two foot pedals Steering power assisted Turning radius (on concrete surface with brake applied) right 111" left 111" (on concrete surface without brake) right 119" left 119" Turning space diameter (on concrete surface with brake applied) right 232" left 232" (on concrete surface without brake) right 248" left 248" Belt pulley 1678 rpm at 2000 engine rpm diam 9" face 6⅞" Belt speed 3956 fpm Power take-off 549 rpm at 1650 engine rpm.

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.

Fourth gear high range was not run as it exceeded 15 mph.

We, the undersigned, certify that this is a true and correct report of official Tractor Test 796.

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 D15 Diesel