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Test 747: Caterpillar D-6 (Diesel)

Nebraska Tractor Test Lab

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NEBRASKA TRACTOR TEST 747 - CATERPILLAR D6 DIESEL

The University of Nebraska Agricultural Experiment Station

E. F. Frolik, Director; Lincoln, Nebraska

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											
74.82	10925	2.57	1604	1.26	6.139	0.575	12.19	165	64	79	28.983
75% of Pull at Maximum Power—Ten Hours—2nd Gear											
59.30	8097	2.75	1705	0.62	5.319	0.629	11.15	158	65	79	28.969
50% of Pull at Maximum Power—Two Hours—2nd Gear											
41.25	5473	2.83	1749	0.36	4.469	0.760	9.23	161	70	75	28.905
MAXIMUM POWER WITH BALLAST											
73.48	17687	1.56	1599	6.01	1st Gear.....		168	63	79	28.970	
75.14	11030	2.55	1599	1.46	2nd Gear.....		160	58	69	29.050	
73.34	7673	3.58	1600	0.95	3rd Gear.....		165	72	79	28.780	
65.91	4966	4.98	1599	0.71	4th Gear.....		165	67	71	28.870	
60.06	3441	6.55	1598	0.76	5th Gear.....		162	67	71	28.870	
VARYING DRAWBAR PULL AND TRAVEL SPEED WITH BALLAST—2nd Gear											
Pounds pull			11050	12600	13450		13850	14000		13550	
Horsepower			75.1	77.3	71.7		66.5	56.0		47.0	
Miles per hour			2.6	2.3	2.0		1.8	1.5		1.3	

Department of Agricultural Engineering

Dates of Test: June 14 to June 29, 1960

Manufacturer: CATERPILLAR TRACTOR COMPANY, PEORIA, ILLINOIS

Manufacturer's Power Rating 75 Drawbar Horsepower (Corrected to standard conditions)

FUEL, OIL and TIME Fuel No 2 Diesel Cetane No 50 (rating taken from oil company's typical inspection data) Specific gravity converted to 60°/60° 0.8419 Weight per gallon 7.010 lb Oil SAE 30 API service classification DS To motor 4.737 gal Drained from motor 4.566 gal Transmission and final-drive lubricant SAE 30 Type engine oil Total time engine was operated 41½ hours.

ENGINE Make Caterpillar Diesel Type 6 cylinder vertical Serial No 44A1018 Crankshaft mounted lengthwise Rated rpm 1600 Bore and stroke 4½" x 5½" Compression ratio 18 to 1 Displacement 525 cu in Lubrication pressure Air cleaner dry type, 2 replaceable paper elements Oil filter 2 replaceable paper elements Oil cooler engine coolant heat exchanger for crankcase oil Fuel filter one edge type filter and one replaceable paper element Muffler was used Cooling medium temperature control thermostat.

STARTING ENGINE Make Caterpillar Type 2 cylinder vertical Mounted right side of diesel engine Mfg rating 15 hp at 6000 rpm Bore and stroke 2½" x 2½" Ignition system magneto Air cleaner dry type replaceable paper element Starting system 12 volt electric and hand operated recoil starter.

CHASSIS Type tracklayer Serial No 44A1018 Tread width 74" Wheel base 86¾" Drawbar height 16" Measured length of track 22.45 ft Cleats integral with shoes Cleats per track 40 Size of cleats 16" x 2½" 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 sprockets 43¾" Vertical distance above roadway 26¾" Horizontal distance from center of tread 0" to the right/left Hydraulic control system direct engine drive Transmission selective gear fixed-ratio Advertised speeds mph first 1.7 second 2.6 third 3.6 fourth 5.0 fifth 6.6 reverse first 2.0 second 3.2 third 4.4 fourth 6.2 Clutch multiple disc operated by hand lever Brakes contracting bands operated by two foot pedals, one of which can be locked Steering hand levers with hydraulic booster controlling multiple disc clutches Turning space diameter (with brake applied) right 216" left 216".

TOTAL WEIGHT WITH OPERATOR 20,670 pounds including hydraulic control unit 540 pounds and bulldozer trunions and hydraulic cylinders 42½ pounds.

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.

A large 25.34" O.D. front idler, for bulldozer application, was used during this test.

We, the undersigned, certify that this is a true and correct report of official Tractor Test 747.

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

GENERAL CONDITIONS

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.**



Caterpillar D6 Diesel