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## Test 751: International TD-9 (Diesel)

Nebraska Tractor Test Lab

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# NEBRASKA TRACTOR TEST 751 - INTERNATIONAL TD-9 DIESEL

The University of Nebraska Agricultural Experiment Station

E. F. Frolik, Dean and 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								
69.11*	1699	4.664	0.473	14.82	203	78	90	28.967
Standard Power Take-off Speed (1000 rpm)—One Hour								
66.36	1499	4.652	0.491	14.26	219	78	93	28.953
VARYING POWER AND FUEL CONSUMPTION—TWO HOURS								
60.42	1746	4.215	0.489	14.33	196	80	95	.....
0.00	1854	1.138	.....	.....	160	78	91	.....
31.37	1814	2.512	0.561	12.49	168	77	92	.....
68.89	1699	4.660	0.474	14.78	199	78	91	.....
15.85	1833	1.797	0.795	8.82	165	78	92	.....
46.17	1780	3.364	0.511	13.72	175	78	94	.....
Av 37.12	1788	2.948	0.557	12.59	177	78	92	28.955

## 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											
56.26	8647	2.44	1706	1.78	4.531	0.565	12.42	188	66	77	28.993
75% of Pull at Maximum Power—Ten Hours—2nd Gear											
44.21	6581	2.52	1755	1.45	3.750	0.595	11.79	177	72	84	28.934
50% of Pull at Maximum Power—Two Hours—2nd Gear											
30.23	4353	2.60	1799	0.66	2.923	0.678	10.34	164	66	78	28.973
MAXIMUM POWER WITH BALLAST											
57.93	13156	1.65	1703	5.86	1st Gear.....		184	62	71		29.010
57.63	8866	2.44	1701	1.70	2nd Gear.....		180	62	71		29.015
56.85	6310	3.38	1698	0.94	3rd Gear.....		180	64	74		29.000
53.25	4600	4.34	1699	0.63	4th Gear.....		182	64	74		29.000
49.42	3118	5.94	1701	0.27	5th Gear.....		181	64	74		29.000
VARYING DRAWBAR PULL AND TRAVEL SPEED WITH BALLAST—2nd Gear											
Pounds pull			8850	10150	10200	9500	8750	7850			
Horsepower			57.6	59.5	54.4	43.1	35.0	25.1			
Miles per hour			2.4	2.2	2.0	1.7	1.5	1.2			

Department of Agricultural Engineering

Dates of Test: August 2 to August 17, 1960

Manufacturer: INTERNATIONAL HARVESTER COMPANY, CHICAGO, ILLINOIS

Manufacturer's Power Rating: 55.7 Drawbar Horsepower

**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 2.023 gal Drained from motor 1.526 gal Transmission and final-drive lubricant SAE 90 Type multi-purpose gear lubricant Total time engine was operated 46 hours.

**ENGINE** Make International Harvester Diesel Type 6 cylinder vertical with turbocharger Serial No TD92M 3241 Crankshaft mounted lengthwise Rated rpm 1700 Bore and stroke 3<sup>11</sup>/<sub>16</sub>" x 4.39" Compression ratio 18.08 to 1 Displacement 282 cu in Cranking system 12 volt electric (two 6 volt batteries) Lubrication pressure Air cleaner oil washed wire pack Oil filter one replaceable paper element Oil cooler engine coolant heat exchanger for crankcase oil Fuel filter one primary and one final with replaceable paper elements Muffler was not used Cooling medium temperature control thermostat.

**CHASSIS** Type tracklayer Serial No TD-92 3033 Tread width 60" Wheel base 73" Drawbar height 15" Measured length of track 19.5 ft Cleats integral with shoes Cleats per track 36 Size of cleats 18" x 2<sup>1</sup>/<sub>2</sub>" 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 33<sup>9</sup>/<sub>16</sub>" Vertical distance above roadway 24<sup>1</sup>/<sub>16</sub>" Horizontal distance from center of rear wheel tread 0" to the right/left Hydraulic control system direct engine drive Transmission selective gear fixed-ratio Advertised speeds mph first 1.7 second 2.5 third 3.4 fourth 4.4 fifth 6.0 reverse 2.0 Clutch dry single plate operated by hand lever Brakes contracting bands operated by two foot pedals which can be locked Steering hand levers controlling multiple disc clutches Turning space diameter (with brake applied) right 186" left 186" Belt pulley 1067 rpm at 1700 engine rpm diam 11" face 8<sup>1</sup>/<sub>2</sub>" Belt speed 3073 fpm Power take-off 1133 rpm at 1700 engine rpm.

**TOTAL WEIGHT WITH OPERATOR** 13,645 lbs including belt pulley 172 lb, crankcase guard 143 lb, track roller guard 228 lb, radiator guard 230 lb, and hydraulic control attachment 165 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 751.

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.



International TD-9 Diesel