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Test 585: International TD-14

Nebraska Tractor Test Lab
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The Experiment Station
University of Nebraska College of Agriculture
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Department of Agricultural Engineering

Dates of test: August 11, 1956 to August 17, 1956
Manufacturer: INTERNATIONAL HARVESTER COMPANY, MELROSE PARK, ILLINOIS
Manufacturer's rating: 78.5 maximum drawbar horsepower and 89.5 maximum belt horsepower (corrected to standard conditions)

NEBRASKA TRACTOR TEST NO. 585

INTERNATIONAL TD-14

FUEL, OIL, WATER and TIME **Fuel** Diesel **Cetane No.** 50 (rating taken from oil company's typical inspection data) **Weight per gallon** 7.028 lb **Oil** SAE 20 **To motor** 3.023 gal **Drained from motor** 2.235 gal **Water used** none **Total time motor was operated** 38 hours.

CHASSIS TYPE Tracklayer **Serial No.** TD-14242394 **Tread width** 74" **Wheel base** 88 15/16" **Measured length of track** 273" **Cleats** integral with shoe **Cleats per track** 39 **Size of cleats** 20" x 2¼" **Advertised speeds mph** first 1.6 second 2.1 third 2.7 fourth 3.5 fifth 4.5 sixth 5.8 first reverse 1.6 second reverse 3.5 **Belt pulley diam** 11¾" **Face** 11" **rpm 1031 Belt speed** 3172 fpm **Belt flat Length** 74' **Width** 10" **Thickness** 0.180" **Maximum slip** 0.82% **Clutch** single plate over center operated by hand lever **Seat** upholstered **Brakes** contracting bands operated by two foot pedals which can be locked **Steering** two hand levers with hydraulic boosters controlling multiple disc clutches **Drawbar height** 13½".

ENGINE **Make** International **Type** 4 cylinder vertical Diesel **Serial No.** UDFM-39513 **Crankshaft mounted** lengthwise **Head** I **Lubrication** pressure **Bore and stroke** 4¾" x 6½" **Rated rpm** 1650 **Compression ratio** 15.04 to 1 **Displacement** 460.7 cu. in. **Port diameter valves** inlet 1 25/32" exhaust 1 17/32" **Governor** variable speed centrifugal **Carburetor size** ¾" (for starting only) **Ignition system** 12 volt battery (for starting only) **Starting system** 12 volt **Air cleaner** oil bath wire pack **Muffler** was used **Oil filter** two replaceable radial fin paper elements **Fuel filter** replaceable radial fin paper element in both auxiliary and final filters **Cooling medium temperature control** thermostat and shutter.

TOTAL WEIGHT AS TESTED (with operator) 23345 lbs.

REPAIRS AND ADJUSTMENTS No repairs or adjustments.

REMARKS All test results were determined from observed data and without allowances, additions or deductions. Tests B and F were made with fuel pump set by manufacturer to develop approximately 81 corrected maximum drawbar horsepower and data from these tests were used in determining the horsepower to be developed in tests D and H, respectively. Tests C, D, E, G, H and L were made with the same setting.

BELT HORSEPOWER TESTS

Hp	Crank shaft speed rpm	Fuel Consumption			Temp. Deg. F.			Barometer inches of mercury
		Gal per hr	Hp-hr per gal	Lb per hp-hr	Cooling medium	Air wet bulb	Air dry bulb	
TESTS B & C—100% MAXIMUM LOAD—TWO HOURS								
91.33	1650	6.711	13.61	0.516	189	73	79	28.727
TEST D—RATED LOAD—ONE HOUR								
82.51	1650	6.010	13.73	0.512	181	74	82	28.758
TEST E—VARYING LOAD—TWO HOURS (20 minute runs; last line average)								
83.98	1650	6.070	13.84	0.508	172	74	81	.....
1.75	1725	2.015	0.87	8.091	175	73	80	.....
42.39	1690	3.838	11.04	0.636	179	72	79	.....
91.13	1588	6.633	13.74	0.512	188	71	78	.....
21.56	1716	3.018	7.14	0.984	148	71	78	.....
62.93	1676	4.883	12.89	0.545	165	71	79	.....
50.62	1674	4.410	11.48	0.612	171	72	79	28.775

TEST L—OPERATING MAXIMUM TORQUE										
% of rated rpm (engine)	100	95	90	85	80	75	70	65	60	55
% of rated-speed torque	100	106	107	109	109	109	110	112	113	110

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	Cooling med	Air wet bulb	Air dry bulb	
TEST H—RATED LOAD—TEN HOURS—2nd Gear											
61.13	10994	2.09	1649	1.52	5.348	11.43	0.615	185	73	87	28.963
TESTS F & G—100% MAXIMUM LOAD											
73.69	17762	1.56	1646	4.04	1st Gear.....			177	72	87	28.890
76.92	13893	2.08	1652	2.16	2nd Gear.....			188	70	80	28.940
76.91	10641	2.71	1651	1.03	3rd Gear.....			173	72	83	28.940
76.24	8282	3.45	1651	0.51	4th Gear			186	72	84	28.930
72.78	6057	4.51	1649	0.37	5th Gear.....			180	72	85	28.920
65.51	4200	5.85	1652	0.00	6th Gear			170	75	86	28.910

HORSEPOWER SUMMARY

	Drawbar	Belt
1. Sea level (calculated) maximum horsepower (based on 60°F and 29.92" Hg)	81.04	96.85
2. Observed maximum horsepower (tests F and B)	76.92	91.33
3. Seventy-five per cent of calculated maximum drawbar horsepower and eighty-five per cent of calculated maximum belt horsepower (ASAE and SAE ratings)	60.78	82.32

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. 585.

L. F. LARSEN
Engineer-in-Charge

L. W. HURLBUT
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 permissable 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 throttle valve is 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 econonmy 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 throttle control lever is set so that the governor will maintain rated engine speed when rated load is applied. Rated load is 85% of 100% maximum, as obtained in test B, corrected to standard conditions.

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, ½ rated load, maximum load at wide open throttle valve, ¼ and ¾ 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.

TEST L: This torque test is run with wide open throttle. Loads are applied to reduce engine speed in approximately ten 5% increments. Rated speed equals 100%. The corresponding dynamometer torque is recorded as a per cent of torque at rated speed.

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. All crawler type tractors are tested on a dirt test course which is maintained by grading, sprinkling and rolling so that it remains very nearly the same throughout the season. The same tires, wheels and weights are used for all tests except J and K.

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 this 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 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 16%. 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 load the throttle control lever is set to maintain rated engine speed. 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: Similar to test J except that the smallest tires and lighest wheels offered by the manufacturer are used.