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Test 615: International 350 Utility Gasoline

Nebraska Tractor Test Lab

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Department of Agricultural Engineering
Dates of test: April 24, 1957 to May 1, 1957
Manufacturer: INTERNATIONAL HARVESTER COMPANY, CHICAGO, ILLINOIS
Manufacturer's rating: Not Rated

NEBRASKA TRACTOR TEST NO. 615

INTERNATIONAL 350 UTILITY

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				
TEST B—100% MAXIMUM LOAD—TWO HOURS											
43.32	2000	3.883	11.16	0.546	180	54	64	28.952			
* TEST C—OPERATING MAXIMUM LOAD—ONE HOUR											
41.11	1999	3.535	11.63	0.524	184	52	64	28.942			
TEST D—RATED LOAD—ONE HOUR											
38.32	2000	3.377	11.35	0.537	181	53	62	28.960			
TEST E—VARYING LOAD—TWO HOURS (20 minute runs; last line average)											
38.33	2001	3.377	11.35	0.537	181	52	62			
1.25	2163	1.378	0.91	6.720	184	51	62			
20.14	2104	2.447	8.23	0.740	191	52	61			
40.21	1907	3.416	11.77	0.518	173	51	60			
10.29	2144	1.861	5.53	1.102	187	51	59			
29.76	2071	3.028	9.83	0.620	165	51	59			
23.33	2065	2.585	9.03	0.675	180	51	60	28.968			
TEST L—OPERATING MAXIMUM TORQUE											
% of rated rpm (engine)		100	95	90	85	80	75	70	65	60	55
% of rated-speed torque		100	103	105	107	111	115	118	120	120	119

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—3rd Gear											
31.24	2157	5.43	1999	2.92	3.277	9.53	0.639	179	57	69	29.125
TEST F—100% MAXIMUM LOAD											
39.53	2771	5.35	2001	4.50	3rd gear			171	49	58	29.095
TEST G—OPERATING MAXIMUM LOAD											
36.09	5576	2.43	1998	10.32	1st gear			154	48	54	29.125
37.75	3617	3.91	2004	5.89	2nd gear			167	50	59	29.090
38.31	2679	5.36	2001	4.20	3rd gear			160	49	58	29.095
37.93	2044	6.96	2000	3.00	4th gear			168	51	61	29.080
33.24	714	17.46	2000	0.00	5th gear			160	52	63	29.070
25.91	6029	1.61	1994	11.71	1st gear TA (prt-thrtl)			152	46	51	29.125
35.79	5317	2.52	2000	9.91	2nd gear torc-ampli...			187	49	57	29.100
36.94	3918	3.54	2001	6.52	3rd gear torc-ampli...			170	50	59	29.090
37.46	3053	4.60	1997	4.67	4th gear torc-ampli...			171	51	61	29.090
36.36	1170	11.65	2002	1.26	5th gear torc-ampli...			160	52	63	29.070
TEST J—OPERATING MAXIMUM LOAD											
36.31	2588	5.26	2004	8.98	3rd gear			177	67	77	29.000
TEST K—OPERATING MAXIMUM LOAD											
27.93	2488	4.21	2001	14.72	3rd gear (prt-thrtl)...			165	62	71	29.050

TIRES, WHEELS AND WEIGHT

	Tests F, G, & H	Test J	Test K
Rear wheels			
Type	Pressed steel	Pressed steel	Pressed steel
Liquid ballast	722 lb each	None	None
Added cast iron	828 lb each	None	None
Rear tires			
No. and size	Two 13-28	Two 13-28	Two 10-28
Ply	6	6	4
Air pressure	16 lb	14 lb	12 lb
Front wheels			
Type	Pressed steel	Pressed steel	Pressed steel
Liquid ballast	None	None	None
Added cast iron	None	None	None
Front tires			
No. and size	Two 5.50-16	Two 5.50-16	Two 5.50-16
Ply	4	4	4
Air pressure	28 lb	28 lb	28 lb
Height of drawbar	17½ inches	19½ inches	14 inches
Static weight			
Rear end	5960 lb	2860 lb	2730 lb
Front end	1552 lb	1560 lb	1564 lb
Total weight as tested with operator	7687 lb	4595 lb	4469 lb

FUEL, OIL, WATER and TIME Fuel Gasoline Octane No. ASTM 82 Research 88 (rating taken from oil company's typical inspection data) Weight per gallon 6.094 lb Oil SAE 20-20W To motor 1.449 gal Drained from motor 1.248 gal Water used 0.228 gal Total time motor was operated 44 hours.

CHASSIS TYPE Standard Serial No. 1909S Tread width rear 48" to 76" front 48" to 76" Wheel base 75" Hydraulic control system direct engine drive Advertised speeds mph First 2.6 second 4.0 third 5.4 fourth 6.9 fifth 16.7 reverse 3.2 (Using torque amplifier) First 1.8 second 2.7 third 3.6 fourth 4.6 fifth 11.3 reverse 2.2 Belt pulley diam. 11" face 7½" rpm 1082 Belt speed 3115 fpm Belt flat Length 72' Width 7" Thickness 0.216" Maximum slip 0.88% Clutch single plate dry disc operated by foot pedal Seat upholstered seat with back rest Brakes double disc operated by two foot pedals Equalized by locking together Power take-off direct engine drive with independent clutch Steering hydraulically aided.

ENGINE Make International Type 4 cylinder vertical Serial No. C-175-513 Crankshaft mounted lengthwise Head I Lubrication pressure Bore and stroke 3½" x 4¼" Rated rpm 2000 Compression ratio 7.0 to 1 Displacement 175 cu. in. Port diameter valves Inlet 1 23/64" Exhaust 1 7/32" Governor variable speed centrifugal Carburetor size 1¼" Ignition system battery Starting system 6 volt battery Air cleaner oil washed wire screen Muffler was used Oil filter replaceable treated paper element Cooling medium temperature control thermostat and radiator shutter.

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 carburetor set for 100% maximum belt 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, J, K and L were made with an operating setting of the carburetor (selected by the manufacturer) of 94.9% of maximum belt horsepower.

HORSEPOWER SUMMARY

	Drawbar	Belt
1. Sea level (calculated) maximum horsepower (based on 60° F and 29.92" Hg)	40.57	44.94
2. Observed maximum horsepower (tests F and B)	39.53	43.32
3. Seventy-five per cent of calculated maximum drawbar horsepower and eighty-five per cent of calculated maximum belt horsepower (ASAE and SAE ratings)	30.43	38.20

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. 615.

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

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 permissible 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 economy 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, $\frac{1}{2}$ rated load, maximum load at wide open throttle valve, $\frac{1}{4}$ and $\frac{3}{4}$ 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 instru-

ment 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 lightest wheels offered by the manufacturer are used.

