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5-28-1957

## Test 619: International 350 Utility LPG

Nebraska Tractor Test Lab

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Department of Agricultural Engineering  
Dates of test: May 7, 1957 to May 28, 1957  
Manufacturer: INTERNATIONAL HARVESTER COMPANY, CHICAGO, ILLINOIS  
Manufacturer's rating: Not Rated

NEBRASKA TRACTOR TEST NO. 619

INTERNATIONAL 350 UTILITY LPG

#### 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										
45.24	2000	5.042	8.97	0.474	165	53	56	28.887		
TEST C—OPERATING MAXIMUM LOAD—ONE HOUR										
41.98	2000	4.400	9.54	0.445	168	56	65	28.945		
TEST D—RATED LOAD—ONE HOUR										
39.68	2000	4.219	9.41	0.452	162	55	63	28.950		
TEST E—VARYING LOAD—TWO HOURS (20 minute runs; last line average)										
39.56	2002	4.165	9.50	0.447	162	55	63	.....		
1.40	2198	1.553	0.90	4.714	154	53	60	.....		
20.99	2105	2.979	7.05	0.603	158	55	62	.....		
37.75	1767	3.896	9.69	0.439	163	54	62	.....		
10.86	2175	2.259	4.81	0.884	154	54	61	.....		
30.98	2073	3.692	8.39	0.506	157	55	63	.....		
23.59	2053	3.091	7.63	0.557	158	54	62	28.950		
TEST L—OPERATING MAXIMUM TORQUE										
% of rated rpm (engine)	100	95	90	85	80	75	71	66	61	55
% of rated-speed torque	100	101	102	103	104	105	105	105	104	100

#### 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											
32.74	2263	5.43	1999	3.42	3.928	8.34	0.510	153	58	62	28.293
TEST F—100% MAXIMUM LOAD											
41.55	2900	5.37	2000	4.37	3rd gear . . . . .			154	49	55	28.860
TEST G—OPERATING MAXIMUM LOAD											
36.48	5558	2.46	1997	9.60	1st gear . . . . .			151	50	53	28.880
37.37	3559	3.94	2000	5.60	2nd gear . . . . .			149	49	54	28.860
37.58	2612	5.40	2000	4.01	3rd gear . . . . .			150	49	54	28.860
36.10	1930	7.01	1999	2.61	4th gear . . . . .			154	55	67	28.960
31.66	677	17.54	2000	0.00	5th gear . . . . .			162	55	67	28.960
26.76	6357	1.58	1998	14.01	1st gear TA (prt-thrtl)			148	50	53	28.880
35.88	5253	2.56	1996	8.85	2nd gear torc-ampli			150	51	54	28.860
36.69	3854	3.57	2002	6.01	3rd gear torc-ampli			151	49	54	28.860
36.95	2990	4.63	1998	4.55	4th gear torc-ampli			152	49	55	28.860
34.68	1110	11.71	2000	1.04	5th gear torc-ampli			155	55	67	28.960
TEST J—OPERATING MAXIMUM LOAD											
34.36	2449	5.26	1997	8.62	3rd gear . . . . .			157	57	71	28.940
TEST K—OPERATING MAXIMUM LOAD											
28.09	2534	4.16	1994	15.60	3rd gear (prt-thrtl) .			155	57	71	28.940

#### TIRES, WHEELS AND WEIGHT

	Tests F, G, & H	Test J	Test K
<b>Rear wheels</b>			
Type	Pressed steel	Pressed steel	Pressed steel
Liquid ballast	722 lb each	None	None
Added cast iron	828 lb each	None	None
<b>Rear tires</b>			
No. and size	Two 13-28	Two 13-28	Two 10-28
Ply	6	6	4
Air pressure	16 lb	14 lb	12 lb
<b>Front wheels</b>			
Type	Pressed steel	Pressed steel	Pressed steel
Liquid ballast	None	None	None
Added cast iron	None	None	None
<b>Front tires</b>			
No. and size	Two 6.00-16	Two 6.00-16	Two 6.00-16
Ply	6	6	6
Air pressure	28 lb	28 lb	28 lb
<b>Height of drawbar</b>	18½ inches	20 inches	15 inches
<b>Static weight</b>			
Rear end	6030 lb	2930 lb	2794 lb
Front end	1700 lb	1720 lb	1680 lb
<b>Total weight as tested with operator</b>	7905 lb	4825 lb	4649 lb

**FUEL, OIL, WATER and TIME** Fuel Commercial Propane Weight per gallon 4.25 lb Oil SAE 20-20W To motor 1.478 gal Drained from motor 0.994 gal Water used 0.422 gal Total time motor was operated 50½ hours.

**CHASSIS** Type Standard Serial No. 615CS 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 0.89% 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 LPG Type 4 cylinder vertical Serial No. C 175-654C Crankshaft mounted lengthwise Head I Lubrication pressure Bore and stroke 3⅜" x 4¼" Rated rpm 2000 Compression ratio 9.0 to 1 Displacement 175 cu. in. Valve port diameter Inlet 1 23/64" Exhaust 1 7/32" Governor variable speed centrifugal Carburetor size 1¼" Ignition system battery Starting system 12 volt battery Air cleaner oil washed wire screen Muffler was used Oil filter replaceable treated paper element Cooling medium temperature control thermostat.

**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 93.4% of maximum belt horsepower.

#### HORSEPOWER SUMMARY

	Drawbar	Belt
1. Sea level (calculated) maximum horsepower (based on 60° F. and 29.92" Hg)	42.87	46.68
2. Observed maximum horsepower (tests F and B)	41.55	45.24
3. Seventy-five per cent of calculated maximum drawbar horsepower and eighty-five per cent of calculated maximum belt horsepower (ASAE and SAE ratings)	32.15	39.68

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. 619.

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.

