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Test 677: International Model 460 Utility (LPG)

Nebraska Tractor Test Lab

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The Experiment Station
University of Nebraska College of Agriculture
W. V. Lambert, Director, Lincoln, Nebraska

Department of Agricultural Engineering
Dates of test: October 17, 1958 to October 25, 1958
Manufacturer: INTERNATIONAL HARVESTER COMPANY, CHICAGO, ILLINOIS
Manufacturer's rating: Not Rated

NEBRASKA TRACTOR TEST NO. 677

INTERNATIONAL 460 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 POWER—TWO HOURS								
48.15	1800	5.519	8.72	0.487	171	52	70	28.685
TEST C—OPERATING MAXIMUM POWER—ONE HOUR								
45.34	1800	4.962	9.14	0.465	167	52	70	28.673
TEST D—RATED POWER—ONE HOUR								
43.08	1888	4.812	8.95	0.475	165	52	71	28.675
TEST E—VARYING POWER—TWO HOURS (20 minute runs; last line average)								
43.12	1894	4.856	8.88	0.479	165	52	71	
1.15	1983	1.849	0.62	6.835	152	52	65	
21.65	1891	3.226	6.71	0.633	158	53	68	
45.21	1801	4.899	9.23	0.461	171	57	75	
11.32	1964	2.513	4.50	0.943	157	55	70	
31.92	1866	3.995	7.99	0.532	162	56	71	
25.73	1900	3.557	7.23	0.587	161	54	70	28.735

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 POWER—TEN HOURS—3rd Gear											
35.77	2333	5.75	1911	3.02	4.424	8.09	0.526	160	45	51	29.128
TEST F—100% MAXIMUM POWER											
40.35	3180	5.35	1800	4.21	3rd Gear			168	49	58	28.875
TEST G—OPERATING MAXIMUM POWER											
28.72	6457	1.67	1796	13.84	1st Gear (prt thrtl)			162	53	63	28.835
42.41	4070	3.91	1802	5.68	2nd Gear			162	53	63	28.835
42.69	2988	5.36	1801	4.09	3rd Gear			168	53	63	28.835
42.29	2057	7.71	1802	2.69	4th Gear			165	48	56	28.875
39.02	842	17.38	1801	0.42	5th Gear			168	49	58	29.100
19.72	6560	1.13	1799	13.98	1st Gear TA (prt thrtl)			160	53	63	28.835
39.89	5948	2.51	1795	9.73	2nd Gear Torq. Amp.			168	53	63	28.835
41.49	4403	3.53	1801	6.20	3rd Gear Torq. Amp.			168	53	63	28.835
42.05	3079	5.12	1799	4.03	4th Gear Torq. Amp.			167	50	60	28.875
41.55	1337	11.65	1803	1.06	5th Gear Torq. Amp.			165	49	58	29.100
TEST J—OPERATING MAXIMUM POWER											
40.95	2971	5.17	1799	9.65	3rd Gear			162	44	48	29.235
TEST K—SPEED-PULL CHARACTERISTIC											
Pounds Pull		2333		2988		3100		3100		3050	3000
Horsepower		35.77		42.69		39.7		35.5		30.6	20.8
Miles Per Hours		5.75		5.36		4.8		4.3		3.7	2.6

TIRES, WHEELS AND WEIGHT

	Tests F, G, H & K	Test J
Rear wheels	Pressed Steel	Pressed Steel
	Liquid ballast	None
	Added cast iron	None
Rear tires	Two 14.9-28	Two 14.9-28
	Ply	6
	Air pressure	16 lb
Front wheels	Pressed Steel	Pressed Steel
	Liquid ballast	None
	Added cast iron	None
Front tires	Two 6.00-16	Two 6.00-16
	Ply	6
	Air pressure	44 lb
Height of drawbar	21 inches	22 inches
Static weight	5980 lb	3060 lb
	2390 lb	1970 lb
Total weight as tested with operator	8545 lb	5205 lb

HORSEPOWER SUMMARY

	Drawbar	Belt
1. Sea level (calculated) maximum horsepower (based on 60° F and 29.92" Hg)	46.90	50.71
2. Observed maximum horsepower (tests F and B)	45.35	48.15
3. Seventy-five per cent of calculated maximum drawbar horsepower and eighty-five per cent of calculated maximum belt horsepower (ASAE and SAE ratings)	35.18	43.10

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. 677.

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 manual throttle control lever is set so that the throttle valve is held 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 manual throttle control lever is set the same as for tests B and C allowing the governor to control engine speed at part throttle. Load is applied until 85% of maximum corrected horsepower found in test B is obtained.

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.

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

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 the 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 manual throttle control lever is set so that 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 15%. 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 horsepower the manual throttle control lever is set the same as in tests F and G allowing the governor to maintain engine speed at part throttle. 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: This is intended to show the pull, horsepower, and travel speed of the tractor at rated horsepower (taken from test H); maximum horsepower (taken from test G); and at least four other conditions obtained by reducing travel speed in 10% increments by **overload**.



