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Test 521: Minneapolis-Moline Model U

Nebraska Tractor Test Lab

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Department of Agricultural Engineering
Dates of test: May 27, to June 7, 1954
Manufacturer: MINNEAPOLIS-MOLINE COMPANY,
MINNEAPOLIS, MINNESOTA
Manufacturer's rating: Not Rated

NEBRASKA TRACTOR TEST NO. 521

MINNEAPOLIS-MOLINE U

BELT HORSEPOWER TESTS

Hp	Crank shaft speed rpm	Fuel Consumption			Water used gal per hour	Temp Deg F		Barometer inches of mercury		
		Gal per hour	Hp-hr per gal	Lb per hp-hour		Cooling med	Air			
TEST B—100% MAXIMUM LOAD—TWO HOURS										
37.23	1300	4.290	8.68	0.765	0.00	196	75	28.635		
TEST C—OPERATING MAXIMUM LOAD—ONE HOUR										
36.05	1300	3.525	10.23	0.649	0.00	203	79	28.615		
TEST D—RATED LOAD—ONE HOUR										
33.46	1299	3.278	10.21	0.650	0.00	202	79	28.615		
TEST E—VARYING LOAD—TWO HOURS (20 minute runs; last line average)										
33.45	1299	3.283	10.19	0.651	...	202	78	.....	
1.88	1413	1.637	1.15	5.777	...	188	79	.....	
17.79	1375	2.473	7.19	0.922	...	190	78	.....	
35.25	1239	3.409	10.34	0.642	...	203	78	.....	
9.15	1410	2.044	4.48	1.482	...	189	73	.....	
26.03	1341	2.894	8.99	0.738	...	192	69	.....	
20.59	1346	2.623	7.85	0.845	0.00	194	76	28.633		
TORQUE (At Dynamometer)										
Eng. RPM	1292	1245	1199	1145	1098	1048	998	949	894	851
Lb.-Ft.	227.3	232.6	236.1	240.3	242.4	244.5	245.7	246.6	246.6	244.5
Dyn. RPM	829	800	770	735	704	672	640	609	574	547

DRAWBAR HORSEPOWER TESTS

Hp	Draw bar pull lb	Speed miles per hr	Crank shaft speed rpm	Slip of drive wheels %	Fuel Consumption			Water used gal per hour	Temp Deg F		Barometer inches of mercury
					Gal per hour	Hp-hr per gal	Lb per hp-hr		Cooling med	Air	
TEST F—100% MAXIMUM LOAD—3rd Gear											
33.51	3099	4.05	1300	7.10	.....	Not Recorded	.....	184	72	28.730
TEST G—OPERATING MAXIMUM LOAD											
30.12	4953	2.28	1300	13.56	.....	Not Recorded	.....	184	68	28.670
31.71	3439	3.46	1298	7.10	.....	Not Recorded	.....	184	68	28.650
31.62	2920	4.06	1297	6.79	.....	Not Recorded	.....	185	72	28.720
30.86	1929	6.00	1300	4.56	.....	Not Recorded	.....	184	70	28.720
23.27	602	14.49	1305	1.04	.....	Not Recorded	.....	180	64	28.680
TEST H—RATED LOAD—TEN HOURS—3rd Gear											
26.83	2436	4.13	1300	5.31	3.097	8.66	0.766	0.00	182	59	28.957
TEST J—OPERATING MAXIMUM LOAD—3rd Gear											
30.20	2818	4.02	1305	8.78	.....	Not Recorded	.....	190	76	28.640
TEST K—OPERATING MAXIMUM LOAD—3rd Gear											
30.40	2660	4.29	1302	7.92	.....	Not Recorded	.....	192	76	28.760

TIRES, WHEELS, and WEIGHT

	Tests F, G, & H	Test J	Test K
Rear wheels			
Type	Cast iron	Cast iron	Cast iron
Liquid ballast	510 lb each	None	None
Added cast iron	650 lb each	None	None
Rear tires			
No. and size	Two 14-30	Two 14-30	Two 12-38
Ply	6	6	6
Air pressure	14 lb	12 lb	12 lb
Front wheels			
Type	Pressed steel	Pressed steel	Pressed steel
Liquid ballast	None	None	None
Added cast iron	60 lb each	None	None
Front tires			
No. and size	Two 7.50-16	Two 7.50-16	Two 7.50-16
Ply	4	4	4
Air pressure	28 lb	28 lb	28 lb
Height of drawbar	14½ inches	15 inches	18 inches
Static weight			
Rear end	6174 lb	3854 lb	3894 lb
Front end	1996 lb	1876 lb	1880 lb
Total weight as tested with operator	8345 lb	5905 lb	5949 lb

FUEL, OIL and TIME Tractor Fuel Octane No. ASTM 42 (rating taken from oil company's typical inspection data); weight per gallon 6.635 lb. OIL SAE 30; to motor 2.206 gal; drained from motor 2.478 gal. Total time motor was operated 42 hours.

CHASSIS Type standard Serial No. 01212648 Tread width rear 57" to 62½" front 50½" Wheel Base 80" Hydraulic control system direct engine drive Advertised speeds mph first 2.5 second 3.6 third 4.2 fourth 6.0 fifth 14.0 reverse 2.0 Belt pulley diam 16" face 7" rpm 741 Belt speed 3110 fpm Clutch twin disc clutch operated by hand lever Seat pressed steel mounted on coil spring with snubber Brakes disc brakes operated by two foot pedals Equalized no Power take-off live power take-off.

ENGINE Make Minneapolis-Moline Type 4 cylinder vertical Serial No. 06105961 Crankshaft mounted lengthwise Head I Lubrication pressure Bore and Stroke 4¼" x 5" Rated rpm 1300 Compression ratio 4.4 to 1 Displacement 283 cu. in. Port Diameter Valves inlet 1½" exhaust 1½" Governor variable speed centrifugal Carburetor Size 1¼" Ignition System battery Starting System 12 volt battery Air Cleaner oil washed wire mesh Muffler was used Oil Filter replaceable waste cartridge 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 were made with an operating setting of the carburetor (selected by the manufacturer) of 96.8% of maximum belt horsepower.

HORSEPOWER SUMMARY

- | | Drawbar | Belt |
|--|---------|-------|
| 1. Sea level (calculated) maximum horsepower (based on 60° F. and 29.92" HG) | 35.30 | 39.46 |
| 2. Observed maximum horsepower (tests F and B) | 33.51 | 37.23 |
| 3. Seventy-five per cent of calculated maximum drawbar horsepower and eighty-five per cent of calculated maximum belt horsepower (formerly ASAE and SAE ratings) | 26.48 | 33.54 |

We, the undersigned, certify that this is a true and correct report of official tractor test No. 521.

L. F. LARSEN
Engineer-in-charge

C. W. SMITH
L. W. HURLBUT
F. D. YUNG
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 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 held 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.

Torque, lb-ft at dynamometer, is obtained with wide open throttle and sufficient load is applied to give several readings.

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. All tests are made on the same 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.

