

November 1957

Test 624: Minneapolis-Moline 335 Gasoline

Tractor Test & Power Museum
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Department of Agricultural Engineering
Dates of test: June 7, 1957 to June 17, 1957
Manufacturer: MINNEAPOLIS-MOLINE COMPANY, MINNEAPOLIS, MINNESOTA
Manufacturer's rating: Not rated

MINNEAPOLIS-MOLINE 335

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										
33.50	1600	3.338	10.04	0.610	161	60	67	28.775		
TEST C—OPERATING MAXIMUM LOAD—ONE HOUR										
31.76	1598	2.833	11.21	0.546	167	61	69	28.735		
TEST D—RATED LOAD—ONE HOUR										
29.87	1602	2.744	10.89	0.563	165	61	69	28.700		
TEST E—VARYING LOAD—TWO HOURS (20 minute runs; last line average)										
29.99	1602	2.753	10.89	0.562	161	61	68		
1.53	1714	1.200	1.28	4.804	143	61	68		
15.73	1683	2.013	7.81	0.784	143	62	71		
29.46	1475	2.571	11.46	0.535	174	62	72		
7.91	1688	1.464	5.40	1.134	155	62	72		
23.10	1648	2.327	9.93	0.617	164	62	72		
17.95	1635	2.055	8.73	0.701	156	62	70	28.700		
TEST L—OPERATING MAXIMUM TORQUE										
% of rated rpm (engine)	100	95	90	85	80	75	70	65	60	55
% of rated-speed torque	100	101	102	102	101	101	99	101	99	101

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											
24.08	2061	4.38	1604	6.26	2.411	9.99	0.613	167	69	80	28.452
TEST F—100% MAXIMUM LOAD											
29.84	2601	4.30	1601	7.72	2nd gear.....			160	64	70	28.700
TEST G—OPERATING MAXIMUM LOAD											
26.92	3776	2.67	1597	12.08	1st gear.....			163	67	74	28.530
28.34	2455	4.33	1599	6.97	2nd gear.....			157	65	70	28.500
28.64	1599	6.72	1599	5.37	3rd gear.....			165	68	77	28.600
24.42	859	10.66	1602	3.18	4th gear.....			156	69	79	28.520
20.85	474	16.49	1599	2.01	5th gear.....			160	69	79	28.520
14.67	3984	1.38	1600	13.77	1st gear AT(prt-thrtl)			157	67	76	28.530
22.46	3987	2.11	1602	13.77	2nd gear AT(prt-thrtl)			157	67	74	28.530
27.90	3128	3.34	1600	10.38	3rd gear Ampli-torc...			167	67	77	28.650
28.01	1942	5.41	1602	6.61	4th gear Ampli-torc...			168	68	77	28.600
27.09	1198	8.48	1600	4.15	5th gear Ampli-torc...			165	68	77	28.600
TEST J—OPERATING MAXIMUM LOAD											
25.81	2322	4.17	1599	11.11	2nd gear.....			166	64	78	28.610
TEST K—OPERATING MAXIMUM LOAD											
20.29	2067	3.68	1603	14.62	2nd gear (prt-thrtl)...			156	63	70	28.770

TIRES, WHEELS AND WEIGHT

	Tests F, G, & H	Test J	Test K
Rear wheels			
Type	Pressed steel	Pressed steel	Pressed steel
Liquid ballast	375 lb each	None	None
Added cast iron	700 lb each	None	None
Rear tires			
No. and size	Two 12-24	Two 12-24	Two 10-24
Ply	4	4	4
Air pressure	14 lb	14 lb	12 lb
Front wheels			
Type	Pressed steel	Pressed steel	Pressed steel
Liquid ballast	None	None	None
Added cast iron	120 lb each	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	17 inches	17½ inches	15 inches
Static weight			
Rear end	4378 lb	2228 lb	2186 lb
Front end	1542 lb	1304 lb	1292 lb
Total weight as tested with operator	6095 lb	3707 lb	3653 lb

FUEL, OIL, WATER and TIME Fuel Gasoline Octane No. ASTM 82.8 Research 89.4 (rating taken from oil company's typical inspection data) **Weight** per gallon 6.125 lb **Oil** SAE 30 **To motor** 1.470 gal **Drained from motor** 1.214 gal **Water used** 0.291 gal **Total time motor was operated** 50 hours.

CHASSIS TYPE Standard Serial No. 10401476 **Tread width rear** 48" to 76" **front** 48" to 76" **Wheel base** 79" **Hydraulic control system** direct engine drive **Advertised speeds mph** first 2.72 second 4.17 third 6.36 fourth 9.85 fifth 15.09 reverse 4.17 (Using ampli-torc) first 1.44 second 2.19 third 3.34 fourth 5.17 fifth 7.94 reverse 2.19 **Belt pulley diam.** 8½" **face** 6½" **rpm** 1516 **Belt speed** 3323 fpm **Belt flat Length** 71' **Width** 6" **Thickness** 0.215" **Maximum slip** 0.35% **Clutch** single plate dry disc operated by foot pedal **Seat** upholstered bucket seat **Brakes** double disc operated by two foot pedals **Equalized** by foot action **Power take-off** continuous running independently clutched **Steering** aided by hydraulic power steering.

ENGINE Make Minneapolis-Moline Type 4 cylinder vertical Serial No. 10301623 **Crankshaft** mounted lengthwise **Head I Lubrication** pressure **Bore and stroke** 3¾" x 4" **Rated rpm** 1600 **Compression ratio** 7.35 to 1 **Displacement** 165 cu. in. **Valves** port diameter **Inlet** 1¼" **Exhaust** 1 11/64" **Governor** variable speed centrifugal **Carburetor** size 1" **Ignition system** battery **Starting system** 6 volt battery **Air cleaner** oil washed rolled screen **Muffler** was used **Oil filter** replaceable 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 95.1% of maximum belt horsepower.

HORSEPOWER SUMMARY

	Drawbar	Belt
1. Sea level (calculated) maximum horsepower (based on 60° F and 29.92" Hg)	31.41	35.07
2. Observed maximum horsepower (tests F and B)	29.84	33.50
3. Seventy-five per cent of calculated maximum drawbar horsepower and eighty-five per cent of calculated maximum belt horsepower (ASAE and SAE ratings)	23.56	29.81

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. 624.

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.

