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Test 791: Minneapolis-Moline Gvi (LPG)

Nebraska Tractor Test Lab
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NEBRASKA TRACTOR TEST 791 - MINNEAPOLIS - MOLINE Gvi LPG

The University of Nebraska Agricultural Experiment Station

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POWER TAKE-OFF PERFORMANCE

Hp	Crank shaft speed rpm	Fuel Consumption Gal per hr	Fuel Consumption Lb per hp-hr	Hp-hr per gal	Temp. Degrees F Cooling med	Temp. Degrees F Air wet bulb	Temp. Degrees F Air dry bulb	Barometer inches of mercury
MAXIMUM POWER AND FUEL CONSUMPTION								
Rated Engine Speed—Two Hours								
78.44	1500	8.554	0.463	9.17	180	57	75	28.987
Standard Power Take-off Speed (540 rpm)—One Hour								
66.58	1200	7.325	0.468	9.09	180	58	76	28.973
VARYING POWER AND FUEL CONSUMPTION—TWO HOURS								
70.67	1588	7.835	0.471	9.02	176	58	76	.....
0.00	1740	2.845	....	....	166	58	75	.....
36.65	1650	5.449	0.632	6.73	175	58	76	.....
78.28	1501	8.612	0.468	9.09	181	59	76	.....
18.78	1690	4.129	0.935	4.55	170	58	76	.....
53.66	1610	6.529	0.517	8.22	175	58	77	.....
Av 43.01	**1630**	**5.900**	**0.583**	**7.29**	**174**	**58**	**76**	**28.932**

DRAWBAR PERFORMANCE

Hp	Draw-bar pull lbs	Speed miles per hr	Crank shaft speed rpm	Slip of driv-ers %	Fuel Consumption Gal per hr	Fuel Consumption Lb per hp-hr	Hp-hr per gal	Temperature Degrees F Cooling medium	Temperature Degrees F Air wet bulb	Temperature Degrees F Air dry bulb	Barometer inches of mercury
VARYING DRAWBAR POWER AND FUEL CONSUMPTION WITH BALLAST											
Maximum Available Power—Two Hours—3rd Gear											
69.92	5406	4.85	1496	6.09	8.618	0.524	8.11	173	46	54	29.083
75% of Pull at Maximum Power—Ten Hours—3rd Gear											
58.77	4058	5.43	1654	4.92	7.688	0.556	7.64	171	47	58	29.012
50% of Pull at Maximum Power—Two Hours—3rd Gear											
41.48	2729	5.70	1702	3.03	6.265	0.642	6.62	167	45	52	29.083
MAXIMUM POWER WITH BALLAST											
67.18	9296	2.71	1502	13.60	1st Gear.....			173	44	56	29.135
70.73	6542	4.05	1501	8.47	2nd Gear.....			174	46	59	29.135
71.15	5496	4.85	1497	6.09	3rd Gear.....			173	46	54	29.083
69.50	3665	7.11	1501	4.82	4th Gear.....			171	48	60	29.135
MAXIMUM POWER WITHOUT BALLAST											
65.92	5208	4.75	1501	9.84	3rd Gear.....			173	59	62	28.560

VARYING DRAWBAR PULL AND TRAVEL SPEED WITH BALLAST—3rd Gear						
Pounds pull	5500	5650	5800	5950	6050	5950
Horsepower	71.2	64.8	60.3	52.4	45.2	38.1
Miles per hour	4.9	4.3	3.9	3.3	2.8	2.4

TIRES, BALLAST and WEIGHT		With Ballast	Without Ballast
Rear tires	—No, size, ply & psi	Two 18.4-34;6;16	Two 18.4-34;6;16
Ballast	—Liquid	1090 lb each	None
	—cast iron	1140 lb each	None
Front tires	—No, size, ply & psi	Two 7.50-18;4;24	Two 7.50-18;4;24
Ballast	—Liquid	None	None
	—cast iron	None	None
Height of drawbar		15½ inches	17 inches
Static weight	—Rear	9870 lb	5410 lb
	—Front	2570 lb	2570 lb
Total weight with operator		12,615 lb	8155 lb

Department of Agricultural Engineering
Dates of Test: April 24 to May 9, 1961
Manufacturer: MOTEC INDUSTRIES INC., HOPKINS, MINNESOTA
Manufacturer's Power Rating: Not Rated

FUEL, OIL and TIME Fuel commercial propane **Specific gravity converted to 60°/60°** 0.5103 **Weight per gallon** 4.25 lb **Oil** SAE 10W-30 **API service classification** MS, DM **To motor** 3.698 gal **Drained from motor** 2.234 gal **Transmission and final-drive lubricant** SAE 90 **Type** E.P. gear lubricant **Total time engine was operated** 42½ hours.

ENGINE Make Minneapolis-Moline LPG **Type** 6 cylinder vertical **Serial No** 16101549 **Crankshaft mounted** lengthwise **Rated rpm** 1500 **Bore and stroke** 4¼" x 5" **Compression ratio** 8.3 to 1 **Displacement** 425.5 cu in **Carburetor size** 1¼" **Ignition system** battery **Cranking system** 12 volt electric **Lubrication** pressure **Air cleaner** oil washed wire screen **Oil filter** replaceable paper element **Fuel filter** screen **Muffler** was used **Cooling medium temperature control** thermostat.

CHASSIS Type standard **Serial No** 16001544 **Tread width** rear 64½" front 54¼" **Wheel base** 96 3/16" **Center of gravity** (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 31.5" Vertical distance above roadway 37.3" Horizontal distance from center of rear wheel tread 0 to the right/left **Hydraulic control system** direct engine drive **Transmission** selective gear fixed ratio **Advertised speeds mph** first 3.1 second 4.4 third 5.1 fourth 7.4 fifth 17.1 reverse 2.4 **Clutch** double disc over center operated by hand lever **Brakes** double disc operated by two foot pedals **Steering** power assisted **Turning radius** (on concrete surface with brake applied) right 196" left 196" (on concrete surface without brake) right 229" left 229" **Turning space diameter** (on concrete surface with brake applied) right 408" left 408" (on concrete surface without brake) right 474" left 474" **Belt pulley** 741 rpm at 1300 engine rpm diam 16" face 7" **Belt speed** 3110 fpm **Power take-off** 675 rpm at 1500 engine rpm.

REPAIRS and ADJUSTMENTS No repairs or adjustments.

REMARKS All test results were determined from observed data obtained in accordance with the SAE and ASAE test code.

Fifth gear was not run as it exceeded 15 mph.

We, the undersigned, certify that this is a true and correct report of official Tractor Test 791.

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

GENERAL CONDITIONS

Each tractor is a production model equipped for common usage. Power consuming accessories can be disconnected only when it is convenient for the operator to do so in practice. Additional weight can be added as ballast if the manufacturer regularly supplies it for sale. The static tire loads and the inflation pressures must conform to recommendations in the Tire Standards published by the Society of Automotive Engineers.

PREPARATION FOR PERFORMANCE RUNS

The engine crankcase is drained and refilled with a measured amount of new oil conforming to specifications in the operators manual. The fuel used and the maintenance operations must also conform to the published information delivered with the tractor. The tractor is then limbered-up for 12 hours on drawbar work in accordance with the manufacturer's published recommendations. The manufacturer's representative is present to make appropriate decisions regarding mechanical adjustments.

The tractor is equipped with approximately the amount of added ballast that is used during maximum drawbar tests. The tire tread-bar height must be at least 65% of new tread height prior to the maximum power run.

BELT OR POWER TAKE-OFF PERFORMANCE

Maximum Power and Fuel Consumption. The manufacturer's representative makes carburetor, fuel pump, ignition and governor control settings which remain unchanged throughout all subsequent runs. The governor and the manually operated governor control lever is set to provide the high-idle speed specified by the manufacturer for maximum power. Maximum power is measured by connecting the belt pulley or the power take-off to a dynamometer. The dynamometer load is then gradually increased until the engine is operating at the rated speed specified by the manufacturer for maximum power. The corresponding fuel consumption is measured.

Varying Power and Fuel Consumption. Six different horsepower levels are used to show corresponding fuel consumption rates and how the governor causes the engine to react to the following changes in dynamometer load: 85% of the dynamometer torque at maximum power; minimum dynamometer torque, ½ the 85% torque; maximum power, ¼ and ¾ of the 85% torque. Since a tractor is generally subjected to varying loads the average of the results in this test serve well for predicting the fuel consumption of a tractor in general usage.

DRAWBAR PERFORMANCE

All engine adjustments are the same as those used in the belt or power take-off tests. If the manufacturer specifies a different rated crankshaft speed for drawbar operations, then the position of the manually operated governor control is changed to provide the high-idle speed specified by the manufacturer in the operating instructions.

Varying Power and Fuel Consumption With Ballast. The varying power runs are made to show the effect of speed-control devices (engine governor, automatic transmissions, etc.) on horsepower, speed and fuel consumption. These runs are made around the entire test course which has two 180 degree turns with a minimum radius of 50 feet. The drawbar pull is set at 3 different levels as follows: (1) as near to the pull at maximum power as possible and still have the tractor maintain the travel speed at maximum horsepower on the straight sections of the test course; (2) 75% of the pull at maximum power; and (3) 50% of the pull at maximum power. Prior to 1958, fuel consumption data (10 hour test) were shown only for the pull obtained at maximum power for tractors having torque converters and at 75% of the pull obtained at maximum power for gear-type tractors.

Maximum Power with Ballast. Maximum power is measured on straight level sections of the test course. Data are shown for not more than 12 different gears or travel speeds. Some gears or travel speeds may be omitted because of high slippage of the traction members or because the travel speed may exceed the safe-limit for the test course. The maximum safe speed for the Nebraska Test Course has been set at 15 miles per hour. The slippage limits have been set at 15% and 7% for pneumatic tires and steel tracks or lugs, respectively. Higher slippage gives widely varying results.

Maximum Power Without Ballast. All added ballast is removed from the tractor. The maximum drawbar power of the tractor is determined by the same procedure used for getting maximum power with ballast. The gear (or travel speed) is the same as that used in the 10-hour test.

Varying Power and Travel Speed with Ballast. Travel speeds corresponding to drawbar pulls beyond the maximum power range are obtained to show the "lugging ability" of the tractor. The run starts with the pull at maximum power; then additional drawbar pull is applied to cause decreasing speeds. The run is ended by one of three conditions: (1) maximum pull is obtained, (2) the maximum slippage limit is reached, or (3) some other operating limit is reached.

For additional information about the **Nebraska Tractor Tests** write to the **Department of Agricultural Engineering, University of Nebraska, Lincoln, Nebraska.**

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