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Test 978: Minneapolis-Moline G900 Diesel (Also G950 Diesel 10-Speed)

Nebraska Tractor Test Lab

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NEBRASKA TRACTOR TEST 978—MINNEAPOLIS-MOLINE G900 DIESEL ALSO MINNEAPOLIS-MOLINE G950 DIESEL 10 SPEED

POWER TAKE-OFF PERFORMANCE

Hp	Crank- shaft speed rpm	Fuel Consumption		Hp-hr per gal	Temperature Degrees F			Barometer inches of Mercury	
		Gal per hr	Lb per hp-hr		Cooling medium	Air wet bulb	Air dry bulb		
MAXIMUM POWER AND FUEL CONSUMPTION									
Rated Engine Speed—Two Hours									
97.78	1800	6.974	0.498	14.02	185	64	75	28.927	
VARYING POWER AND FUEL CONSUMPTION—TWO HOURS									
86.08	1865	6.174	0.500	13.94	173	63	74	.....
0.00	1956	2.021	.....	.....	162	62	71	.....
44.10	1916	3.938	0.623	11.20	169	63	73	.....
97.72	1801	7.046	0.503	13.87	185	64	75	.....
22.43	1938	2.902	0.903	7.73	164	63	73	.....
65.41	1891	4.979	0.531	13.14	173	63	74	.....
Av	52.62	1894	4.510	0.598	11.67	171	63	73	28.962

DRAWBAR PERFORMANCE

Hp	Draw- bar pull lbs	Speed miles per hr	Crank- shaft speed rpm	Slip of drivers %	Fuel Consumption			Temp Degrees F			Barom- eter inches of Mercury
					Gal per hr	Lb per hp-hr	Hp-hr per gal	Cool- ing med	Air wet bulb	Air dry bulb	
VARYING DRAWBAR POWER AND FUEL CONSUMPTION WITH BALLAST											
Maximum Available Power—Two Hours—5th Gear (2nd-DD)											
83.30	6206	5.03	1797	4.30	6.805	0.570	12.24	180	64	79	28.885
75% of Pull at Maximum Power—Ten Hours—5th Gear (2nd-DD)											
69.68	4945	5.29	1870	3.48	5.793	0.580	12.03	180	63	73	28.843
50% of Pull at Maximum Power—Two Hours—5th Gear (2nd-DD)											
47.17	3263	5.42	1896	2.41	4.614	0.682	10.22	175	76	94	28.620
MAXIMUM POWER WITH BALLAST											
66.47	11954	2.09	1865	14.67	1st Gear (1st—AT)			180	58	68	29.030
85.23	10202	3.13	1800	9.13	2nd Gear (1st—DD)			180	60	65	29.010
86.25	9764	3.31	1800	8.32	3rd Gear (2nd—AT)			179	60	65	29.010
87.25	7187	4.55	1803	5.51	4th Gear (3rd—AT)			180	60	65	29.010
88.09	6605	5.00	1800	5.15	5th Gear (2nd—DD)			179	58	62	29.000
87.67	5867	5.60	1801	4.55	6th Gear (4th—AT)			182	61	68	29.030
86.44	4798	6.76	1800	3.74	7th Gear (3rd—DD)			182	61	68	29.030
85.35	3847	8.32	1802	2.98	8th Gear (4th—DD)			181	61	68	29.030
79.95	2335	12.84	1803	1.90	9th Gear (5th—AT)			181	61	69	29.030
MAXIMUM PULL WITHOUT BALLAST											
66.03	7664	3.23	1861	14.69	3rd Gear (2nd—AT)			180	70	85	28.970

TIRES, BALLAST and WEIGHT			With Ballast	Without Ballast
Rear Tires	—No., size, ply & psi		Two 23.1-30; 8; 16	Two 23.1-30; 8; 16
Ballast	—Liquid		825 lb each	None
	—Cast iron		1575 lb each	None
Front Tires	—No., size, ply & psi		Two 7.50-16; 6; 36	Two 7.50-16; 6; 36
Ballast	—Liquid		None	None
	—Cast iron		8 lb each	None
Height of Drawbar			16 inches	17½ inches
Static weight with operator—Rear			11990 lb	7190 lb
	—Front		3155 lb	3140 lb
	—Total		15145 lb	10330 lb

Department of Agricultural Engineering

Dates of Test: June 4 to 20, 1968

Manufacturer: MINNEAPOLIS-MOLINE, INC., Hopkins, Minnesota

FUEL, OIL AND TIME: Fuel No 2 Diesel Cetane No 52.4 (rating taken from oil company's typical inspection data) **Specific gravity converted to 60°/60°** 0.8381 **Weight per gallon** 6.978 lb **Oil SAE 30 API service classification** DS **To motor** 2.685 gal **Drained from motor** 1.653 gal **Transmission and final-drive lubricant** EP 80 Gear Oil Mil-L-2105A **Total time engine was operated** 43½ hours.

ENGINE Make Minneapolis-Moline Diesel **Type** 6 cylinder vertical **Serial No** 32900282 **Crankshaft** lengthwise **Rated rpm** 1800 **Bore and stroke** 4.375" × 5.00" **Compression ratio** 15.4 to 1 **Displacement** 451 cu in **Cranking system** 12 volt electric **Lubrication** pressure **Air cleaner** dry type with replaceable paper element and precleaner **Oil filter** full flow replaceable pleated paper element **Fuel filter** two parallel flow replaceable pleated paper cartridges **Muffler** was used **Cooling medium temperature control** thermostat.

CHASSIS type standard **Serial No** 33100715 **Tread width** rear 64" to 96" front 56" to 80" **Wheel base** 103¼" **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 31.8" Vertical distance above roadway 35" Horizontal distance from center of rear wheel tread 0" to the right/left **Hydraulic control system** direct engine drive **Transmission** selective gear fixed ratio with partial (2) range operator controlled power shifting **Advertised speeds mph** first 2.4, second 3.5, third 3.6, fourth 4.8, fifth 5.3, sixth 5.9, seventh 7.0, eighth 8.6, ninth 13.1, tenth 19.1, reverse 3.6, 5.3 **Clutch** single plate dry disc operated by foot pedal **Brakes** dry dual disc operated by two foot pedals which can be locked **Steering** hydraulic with power assist **Turning radius** (on concrete surface with brake applied) right 129" left 129" (on concrete surface without brake) right 147" left 147" **Turning space diameter** (on concrete surface with brake applied) right 266" left 266" (on concrete surface without brake) right 302" left 302" **Power take-off** 995 rpm at 1800 engine rpm.

REPAIRS and ADJUSTMENTS During the maximum power drawbar runs the fan support bracket failed and was replaced. During the 10 hour run it was necessary to adjust the pressure regulating screw for transmission-differential lubrication system to turn off the red warning light.

REMARKS All test results were determined from observed data obtained in accordance with the SAE and ASAE test code. Tenth 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 978.

L. F. LARSEN

Engineer-in-Charge

G. W. STEINBRUEGGE, Chairman

J. J. SULEK

D. E. LANE

Board of Tractor Test Engineers

The University of Nebraska Agricultural Experiment Station
E. F. Frolik, Dean; H. W. Ottoson, Director, Lincoln, Nebraska

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, $\frac{1}{2}$ of the 85% torque; maximum power, $\frac{1}{4}$ and $\frac{3}{4}$ 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 transmission, 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 Pull without Ballast. All added ballast is removed from the tractor. The drawbar pull is determined at slip limits of 15% for pneumatic tires or 7% for steel tracks or lugs. The tractor is operated at the fastest possible travel speed.

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.



MINNEAPOLIS-MOLINE G900 DIESEL