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Test 822: Massey-Ferguson Super 90 (Diesel)

Nebraska Tractor Test Lab

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NEBRASKA TRACTOR TEST 822 - MASSEY-FERGUSON SUPER 90 DIESEL

The University of Nebraska Agricultural Experiment Station

E. F. Frolik, Dean; H. H. Kramer, Director, Lincoln, Nebraska

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									
68.53	2000	4.329	0.438	15.83	186	68	75	28.660	
Standard Power Take-off Speed (540 rpm)—One Hour									
57.71	1497	3.504	0.421	16.47	186	69	76	28.675	
VARYING POWER AND FUEL CONSUMPTION—TWO HOURS									
61.25	2106	3.950	0.447	15.51	168	70	78	.....
0.00	2168	1.397	.....	.....	170	70	78	.....
31.24	2146	2.656	0.590	11.76	186	71	79	.....
68.06	2000	4.326	0.441	15.73	183	72	81	.....
15.69	2156	2.025	0.895	7.75	167	72	82	.....
46.43	2126	3.253	0.486	14.27	189	72	82	.....
Av	37.11	2117	2.934	0.548	12.65	177	71	80	28.693

DRAWBAR PERFORMANCE

Hp	Draw-bar pull lbs	Speed miles per hr	Crank- shaft speed rpm	Slip of drivers %	Fuel Consumption			Temp Degrees F			Barometer 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											
59.80	5492	4.08	2002	6.77	4.326	0.502	13.82	182	69	74	28.818
48.45	4102	75% of Pull at Maximum Power—Ten Hours—3rd Gear									28.883
32.64	2700	50% of Pull at Maximum Power—Two Hours—3rd Gear									28.905
MAXIMUM POWER WITH BALLAST											
54.55	9322	2.19	2079	14.92	2nd Gear			184	63	67	28.950
61.54	5654	4.08	2002	6.77	3rd Gear			183	69	72	28.818
59.49	4201	5.31	2001	4.99	4th Gear			180	71	82	28.800
60.14	3336	6.76	2001	4.10	5th Gear			184	71	82	28.800
56.27	2180	9.68	2003	2.64	6th Gear			196	70	82	28.960
MAXIMUM POWER WITHOUT BALLAST											
55.68	5334	3.91	2079	14.88	3rd Gear			182	75	90	28.790
VARYING DRAWBAR PULL AND TRAVEL SPEED WITH BALLAST—3rd Gear											
Pounds pull				5654	5819	6078	6290	6247	6140		
Horsepower				61.54	57.06	52.60	46.98	40.55	32.75		
Miles per hour				4.08	3.68	3.25	2.80	2.43	2.00		
Slip of drivers, %				6.77	7.03	7.28	7.67	7.54	7.41		

TIRES, BALLAST and WEIGHT

		With Ballast	Without Ballast
Rear tires	—No, size, ply & psi	Two 18.4-30; 8; 18	Two 18.4-30; 8; 16
	—Liquid	1168 lb each	None
	—Cast iron	1452 lb each	None
Front tires	—No, size, ply & psi	Two 7.50-18; 4; 24	Two 7.50-18; 4; 24
	—Liquid	None	None
	—Cast iron	None	None
Height of drawbar		17½ inches	19 inches
Static weight	—Rear	9740 lb	4500 lb
	—Front	2660 lb	2570 lb
Total weight with operator		12575 lb	7245 lb

Department of Agricultural Engineering

Dates of Test: June 12 to June 21, 1962

Manufacturer: MASSEY-FERGUSON INCORPORATED, DETROIT, MICHIGAN
Manufacturer's Power Rating: Not Rated

FUEL, OIL and TIME Fuel No 2 diesel Cetane No 52.3 Specific gravity converted to 60°/60° 0.8328 Weight per gallon 6.935 lb Oil SAE 30 API service classification DG, MS To motor 3.465 gal Drained from motor 2.853 gal Transmission and final-drive lubricant type A transmission fluid Total time engine was operated 71 hrs.

ENGINE Make Perkins diesel Type 4 cylinder vertical Serial No CL6900273 Crankshaft mounted lengthwise Rated rpm 2000 Bore and stroke 4.500" x 4.750" Compression ratio 16.0 to 1 Displacement 302.2 cu in Cranking system 12 volt electric Lubrication pressure Air cleaner oil washed wire mesh Oil filter full flow replaceable disc element Fuel filter sediment bowl and two paper filters that are replaceable Muffler was used Cooling medium temperature control thermostat.

CHASSIS Type standard Serial No N885399 Tread width rear 64" front 56" Wheel base 88" 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 28.1" 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 1.70 second 2.40 third 4.22 fourth 5.40 fifth 6.80 sixth 9.59 seventh 16.89 eighth 21.59 reverse 1.04 and 5.57 Clutch 12" single dry disc operated by foot pedal Brakes double dry disc operated by independent foot pedals that can be latched Steering power assisted Turning radius (on concrete surface with brake applied) right 119" left 119" (on concrete surface without brake) right 139" left 139" Turning space diameter (on concrete surface with brake applied) right 241" left 241" (on concrete surface without brake) right 273" left 273" Belt pulley 1355 rpm at 2000 engine rpm diam 9" face 6½" Belt speed 3200 fpm Power take-off 540 rpm at 1497 engine rpm.

REPAIRS and ADJUSTMENTS During preliminary pto runs a loss of power occurred. A new fuel transfer pump, two new fuel filters, four new injectors and a new fuel injection pump were installed.

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

The engagement of pto drive was very severe. First gear was not run as it was necessary to limit the pull in second gear to avoid excessive wheel slippage. Seventh and eighth gears were not run as they exceeded 15 mph.

We, the undersigned, certify that this is a true and correct report of official Tractor Test 822.

L. F. LARSEN
Engineer-in-Charge

L. W. HURLBUT
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, $\frac{1}{2}$ 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 trans-

mission, 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.



Massey-Ferguson Super 90 Diesel