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Test 1214: Massey-Ferguson MF 230 Diesel

Nebraska Tractor Test Lab

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NEBRASKA TRACTOR TEST 1214 – MASSEY-FERGUSON MF 230 DIESEL

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								
34.53	Rated Engine Speed—Two Hours (PTO Speed—642 rpm)							
	2000	1.946	0.393	17.74	188	64	75	28.990
30.80	Standard Power Take-off Speed (540 rpm)—One Hour							
	1684	1.694	0.383	18.18	191	63	75	28.985
VARYING POWER AND FUEL CONSUMPTION—Two Hours								
30.00	2045	1.713	0.398	17.52	178	63	75	.....
0.00	2153	0.525	.....	.....	174	63	75	.....
15.39	2097	1.080	0.489	14.25	179	63	75	.....
34.84	2001	1.980	0.396	17.60	188	64	75	.....
7.79	2123	0.792	0.709	9.83	173	63	75	.....
22.83	2074	1.394	0.426	16.37	180	63	75	.....
Av 18.47	2082	1.247	0.471	14.81	179	63	75	28.980

DRAWBAR PERFORMANCE

Hp	Draw- bar pull lbs	Speed miles per hr	Crank- shaft speed rpm	Slip of drivers %	Fuel Consumption Gal per hr	Lb per hp-hr	Hp-hr per gal	Temp Cool- ing med	Degrees F Air wet bulb	Air dry bulb	Barometer inches of Mercury
VARYING DRAWBAR POWER AND FUEL CONSUMPTION WITH BALLAST											
Maximum Available Power—Two Hours—4th Gear (1-H)											
28.36	2093	5.08	2000	6.87	1.883	0.463	15.06	187	70	81	28.970
75% of Pull at Maximum Power—Ten Hours—4th Gear (1-H)											
23.32	1640	5.33	2058	5.06	1.582	0.473	14.74	178	60	77	29.062
50% of Pull at Maximum Power—Two Hours—4th Gear (1-H)											
16.15	1106	5.47	2085	3.79	1.255	0.542	12.87	175	67	78	29.065
50% of Pull at Reduced Engine Speed—Two Hours—5th Gear (2-H)											
16.37	1121	5.47	1418	3.60	1.076	0.458	15.21	179	67	84	29.010
MAXIMUM POWER WITH BALLAST											
19.32	4030	1.80	2085	13.77	2nd Gear (2-L)			173	63	70	29.060
27.86	3204	3.26	1999	11.09	3rd Gear (3-L)			185	69	80	29.000
29.62	2184	5.09	2001	6.90	4th Gear (1-H)			183	68	78	29.010
29.66	1456	7.64	1999	4.54	5th Gear (2-H)			185	70	81	29.000

VARYING DRAWBAR PULL AND TRAVEL SPEED WITH BALLAST—4th Gear (1-H)

Pounds Pull	2184	2292	2370	2409	2329	2290
Horsepower	29.62	27.82	25.50	22.63	18.85	15.49
Crankshaft Speed rpm	2001	1800	1600	1398	1202	1003
Miles Per Hour	5.09	4.55	4.04	3.52	3.04	2.54
Slip of Drivers %	6.90	7.62	7.62	7.62	7.62	7.42

TRACTOR SOUND LEVEL WITHOUT CAB dB(A)

Maximum Available Power 2 Hours	96.0
75% of Pull at Max. Power 10 Hours	95.0
50% of Pull at Max. Power 2 Hours	94.0
50% of Pull at Reduced Engine Speed 2 Hours	90.0
Bystander in 6th gear (3-H)	84.5

TIRES, BALLAST AND WEIGHT

		With Ballast	Without Ballast
Rear Tires	—No., size, ply & psi	Two 12.4-28; 4; 16	Two 12.4-28; 4; 16
	—Liquid	500 lb each	None
	Cast Iron	35 lb each	None
Front Tires	—No., size, ply & psi	Two 5.50-16; 4; 36	Two 5.50-16; 4; 36
	—Liquid	None	None
	Cast Iron	20 lb each	None
Height of drawbar		22.5 inches	22.5 inches
Static weight with operator—rear		3500 lb	2430 lb
	front	1610 lb	1570 lb
	total	5110 lb	4000 lb

Department of Agricultural Engineering

Dates of Test: June 1 to 9, 1976

Manufacturer: MASSEY-FERGUSON, INC., 1901 Bell Avenue, Des Moines, Iowa 50315

FUEL, OIL AND TIME Fuel No 2 Diesel Cetane No 51.8 (rating taken from oil company's typical inspection data) Specific gravity converted to 60°/60° 0.8372 Weight per gallon 6.971 lb Oil SAE 20-20W API service classification SB/SE-CA/CC To motor 1.944 gal Drained from motor 1.328 gal Transmission and final drive lubricant Massey-Ferguson Permatran Oil Total time engine was operated 43.5 hours.

ENGINE Make Perkins Diesel Type 3 cylinder vertical Serial No 432754 DL Crankshaft mounted lengthwise Rated rpm 2000 Bore and stroke 3.6" x 5.0" Compression ratio 18.5 to 1 Displacement 153 cu in Cranking system 12 volt Lubrication pressure Air cleaner dry dual paper element Oil filter full flow paper cartridge Fuel filter paper element Muffler vertical Cooling medium temperature control thermostat.

CHASSIS Type standard Serial No 9A 236079 Tread width rear 50" to 76" front 48" to 72" Wheel base 72.375" 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 32" Vertical distance above roadway 27.3" Horizontal distance from center of rear wheel tread 0.06" to the left Hydraulic control system direct engine drive Transmission selective gear fixed ratio Advertised speeds mph first 1.4 second 2.0 third 3.6 fourth 5.4 fifth 7.9 sixth 14.5 reverse 1.8 and 7.4 Clutch single dry disc operated by a foot pedal Brakes drum and shoes operated by two foot pedals which can be locked together Steering mechanical Turning radius (on concrete surface with brake applied) right 108" left 108" (on concrete surface without brake) right 118" left 118" Turning space diameter (on concrete surface with brake applied) right 223" left 223" (on concrete surface without brake) right 241" left 241" Power take-off 540 rpm at 1684 engine rpm.

REPAIRS AND ADJUSTMENTS: No repairs or adjustments.

REMARKS: All test results were determined from observed data in accordance with SAE and ASAE test code or official Nebraska test procedure. Four gears were chosen between tangential pull limit of drive tires and 15 mph. Temperature at injection pump was 166°F. The fuel tank leaked by the fuel level sensing unit during drawbar runs.

We, the undersigned, certify that this is a true and correct report of official Tractor Test 1214.

LOUIS I. LEVITICUS
Engineer-in-Charge

G. W. STEINBRUEGGE, Chairman
W. E. SPLINTER
K. VON BARGEN
Board of Tractor Test Engineers

EXPLANATION OF TEST REPORT

GENERAL CONDITIONS

Each tractor is a production model equipped for common usage. Power consuming accessories may be disconnected only when the means for disconnecting can be reached from the operator station. 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. Prior to the maximum power run the tire tread-bar height must be at least 65% of new tread height.

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 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 use.

DRAWBAR PERFORMANCE

All engine adjustments are the same as those used in the belt or power take-off tests.

Varying Power and Fuel Consumption With Ballast. The varying power runs are made to show the effects 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 4 different runs 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; (3) 50% of the pull at maximum power; and (4) maintaining the same load and travel speed as in (3) by shifting to a higher gear and reducing the engine rpm.

Maximum Power with Ballast. Maximum power is measured on straight level sections of the test course. Data are shown for not more than 6 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 manufacturer's representative has the option of selecting one gear or speed over eight miles per hour. The maximum safe speed for the Nebraska Test Course has been set at 15 mph. The slip limits have been set at 15% and 7% for pneumatic tires and steel tracks or lugs, respectively. Higher slippage gives widely varying results.

Varying Drawbar Pull 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.

SOUND MEASUREMENT

Sound is recorded during each of the Varying Power and Fuel Consumption runs as the tractor travels on a straight section of the test course. The dB(A) sound level is obtained with the microphone located near the right ear of the operator. Bystander sound readings are taken with the microphone placed 25 feet from the line of travel of the tractor.

An increase of 10 dB(A) will approximately double the loudness to the human ear.

For additional information about the Nebraska Tractor Tests write to the Department of Agricultural Engineering, University of Nebraska, Lincoln, Nebraska 68583.



MASSEY-FERGUSON MF 230 DIESEL