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Test 765: Massey-Ferguson 88 (Diesel)

Nebraska Tractor Test Lab

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NEBRASKA TRACTOR TEST 765 - MASSEY-FERGUSON 88 DIESEL

The University of Nebraska Agricultural Experiment Station

E. F. Frolik, Dean and Acting Director, Lincoln, Nebraska

POWER TAKE-OFF PERFORMANCE

Hp	Crank shaft speed rpm	Fuel Consumption Gal per hr	Lb per hp-hr	Hp-hr per gal	Temp Degrees F Cool- ing med	Air wet bulb	Air dry bulb	Barometer inches of mercury
MAXIMUM POWER AND FUEL CONSUMPTION								
Rated Engine Speed—Two Hours								
63.34	2000	4.496	0.504	14.08	199	59	75	28.820
Standard Power Take-off Speed (540 rpm)—One Hour								
51.86	1478	3.552	0.486	14.60	210	58	74	28.825
VARYING POWER AND FUEL CONSUMPTION—TWO HOURS								
55.86	2077	4.009	0.510	13.93	192	59	77	.....
0.00	2203	1.534	.....	.....	127	58	74	.....
29.04	2159	2.695	0.659	10.78	150	59	75	.....
63.90	2001	4.529	0.503	14.11	201	60	77	.....
14.69	2183	2.079	1.005	7.07	140	59	75	.....
42.89	2126	3.304	0.547	12.98	162	60	76	.....
Av 34.40	2125	3.025	0.624	11.37	162	59	75	28.793

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	Temperature Degrees F Cooling medium	Air wet bulb	Air dry bulb	Barometer inches of mercury
VARYING DRAWBAR POWER AND FUEL CONSUMPTION WITH BALLAST											
Maximum Available Power—Two Hours—3rd Gear											
53.25	4921	4.06	2005	5.94	4.346	0.580	12.25	189	66	76	28.680
75% of Pull at Maximum Power—Ten Hours—3rd Gear											
43.81	3787	4.34	2105	4.30	3.650	0.592	12.00	163	58	65	29.049
50% of Pull at Maximum Power—Two Hours—3rd Gear											
30.15	2522	4.48	2141	2.79	2.959	0.697	10.19	155	63	72	28.715
MAXIMUM POWER WITH BALLAST											
50.66	8973	2.12	2018	14.13	2nd Gear.....	.....	186	59	69	28.670	
55.54	5153	4.04	2005	6.33	3rd Gear.....	.....	196	59	69	28.670	
54.04	3861	5.25	2001	4.63	4th Gear.....	.....	178	62	74	28.673	
55.19	3100	6.68	1999	3.68	5th Gear.....	.....	176	62	74	28.673	
54.18	2126	9.56	2005	2.44	6th Gear.....	.....	167	62	74	28.673	
MAXIMUM POWER WITHOUT BALLAST											
54.16	5318	3.82	2004	13.39	3rd Gear.....	.....	178	62	66	28.945	
VARYING DRAWBAR PULL AND TRAVEL SPEED WITH BALLAST—3rd Gear											
Pounds pull		5150	5550	5650	5850	5950	6000				
Horsepower		55.5	53.3	48.2	43.7	38.1	32.0				
Miles per hour		4.0	3.6	3.2	2.8	2.4	2.0				

Department of Agricultural Engineering

Dates of Test: September 29 to October 4, 1960

Manufacturer: MASSEY-FERGUSON INCORPORATED, DETROIT, MICHIGAN

Manufacturer's Power Rating: Not Rated

FUEL, OIL and TIME Fuel No 2 diesel Cetane No 47 (rating taken from oil company's typical inspection data) Specific gravity converted to 60°/60° 0.8528 Weight per gallon 7.101 lb Oil SAE 20 API service classification DS To motor 2.427 gal Drained from motor 1.900 gal Transmission and final-drive lubricant Type A transmission fluid Total time engine was operated 41 hours.

ENGINE Make Continental Type 4 cylinder vertical Serial No 4694 Crankshaft mounted lengthwise Rated rpm 2000 Bore and stroke 4" x 5.5" Compression ratio 15.2 to 1 Displacement 276.5 cu in Cranking system 12 volt electric (two 6 volt batteries) Lubrication pressure Air cleaner oil washed wire mesh Oil filter full flow replaceable paper element Oil cooler radiator for transmission and hydraulic oil Fuel filter stacked disc filter in sediment bowl, primary and main filters with replaceable paper elements Muffler was used Cooling medium temperature control thermostat.

CHASSIS Type Standard Serial No D-381746 Tread width rear 70" front 60" 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 2.36 third 4.22 fourth 5.35 fifth 6.78 sixth 9.46 seventh 16.88 eighth 21.45 reverse first 1.37 second 5.48 Clutch single plate dry disc operated by foot pedal Brakes double dry disc operated by foot pedals which can be locked together Steering power assisted Turning radius (on concrete surface with brake applied) right 120" left 120" (on concrete surface without brake) right 140" left 140" Turning space diameter (on concrete surface with brake applied) right 244" left 244" (on concrete surface without brake) right 276" left 276" Belt pulley 1355 rpm at 2000 engine rpm diam 9" face 6 1/2" Belt speed 3200 fpm Power take-off 541 rpm at 1478 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.

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 765.

L. F. LARSEN
Engineer-in-Charge

L. W. HURLBUT, Chairman
G. W. STEINBRUEGGE
J. J. SULEK
Board of Tractor
Test Engineers

TIRES, BALLAST and WEIGHT

	With Ballast	Without Ballast
Rear tires	—No, size, ply & psi	Two 18.4-30;8;16
Ballast	—Liquid	819 lb each
	—Cast iron	1540 lb each
Front tires	—No, size, ply & psi	Two 7.50-18;6;28
Ballast	—Liquid	125 lb each
	—Cast iron	None
Height of drawbar	17 1/2 inches	18 1/2 inches
Static weight	—Rear	9213 lb
	—Front	2745 lb
Total weight with operator	12133 lb	7165 lb

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 transmissions, etc.) on horsepower, speed and fuel consumption. These runs are made around the entire test course which has two 180 degree

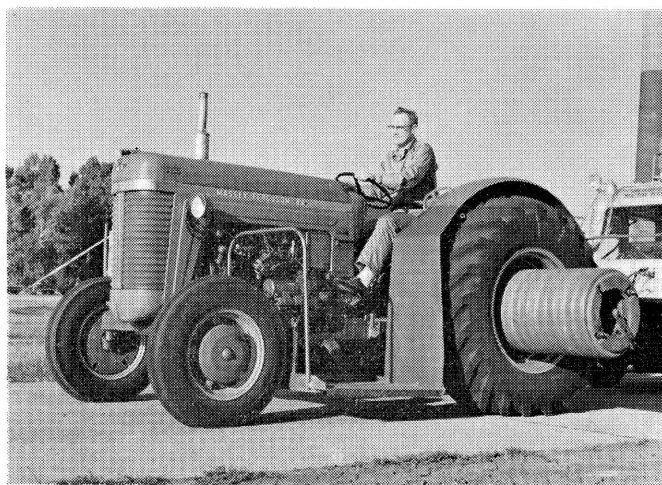
turns with a minimum radius of 50 feet. The drawbar pull is set at 3 different levels as follows: (1) as near to the pull at maximum power as possible and still have the tractor maintain the travel speed at maximum horsepower on the straight sections of the test course; (2) 75% of the pull at maximum 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.



Massey-Ferguson 88 Diesel