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Test 816: Farmall 504 (Diesel)

Nebraska Tractor Test Lab

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NEBRASKA TRACTOR TEST 816 - FARMALL 504 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								
45.99	2200	3.088	0.466	14.89	187	64	75	28.918
Standard Power Take-off Speed (540 rpm)—One Hour								
44.94	1970	3.068	0.474	14.65	192	64	75	28.915
VARYING POWER AND FUEL CONSUMPTION—TWO HOURS								
40.59	2283	2.773	0.474	14.64	176	63	75	.....
0.00	2396	1.017	.....	.....	173	64	75	.....
20.85	2346	1.826	0.607	11.42	175	63	75	.....
46.53	2201	3.102	0.462	15.00	180	63	75	.....
10.53	2373	1.402	0.923	7.51	174	62	73	.....
30.88	2316	2.267	0.509	13.62	178	63	74	.....
Av	24.90	2.064	0.575	12.06	176	63	74	28.930

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											
Maximum Available Power—Two Hours—3rd Gear											
38.90	2671	5.46	2196	4.69	3.002	0.535	12.96	181	62	66	28.830
75% of Pull at Maximum Power—Ten Hours—3rd Gear											
31.95	2076	5.77	2295	3.59	2.598	0.564	12.30	180	73	85	28.596
50% of Pull at Maximum Power—Two Hours—3rd Gear											
21.89	1379	5.95	2343	2.51	2.053	0.651	10.66	175	74	92	28.615
MAXIMUM POWER WITH BALLAST											
29.97	6271	1.79	2290	13.76	1st Gear			179	60	64	28.875
40.17	3778	3.99	2204	6.48	2nd Gear			181	59	64	28.900
40.39	2768	5.47	2201	4.66	3rd Gear			182	57	60	28.910
39.96	1903	7.88	2202	3.19	4th Gear			180	61	65	28.865
37.61	5501	2.56	2199	10.60	2nd Gear Torq. Amp.			179	59	64	28.900
39.13	4070	3.61	2204	7.01	3rd Gear Torq. Amp.			181	59	64	28.900
39.73	2853	5.22	2201	4.93	4th Gear Torq. Amp.			182	58	62	28.905
38.98	1231	11.87	2205	1.97	5th Gear Torq. Amp.			180	61	66	28.865
MAXIMUM POWER WITHOUT BALLAST											
38.79	2691	5.41	2204	7.48	3rd Gear			188	70	85	28.750
VARYING DRAWBAR PULL AND TRAVEL SPEED WITH BALLAST—3rd Gear											
Pounds pull				2768	3122	3282	3376	3409	3166		
Horsepower				40.39	40.78	37.67	33.92	29.15	22.66		
Miles per hour				5.47	4.90	4.30	3.77	3.21	2.68		
Slip of Drivers, %				4.66	5.34	5.61	6.02	5.75	5.61		

TIRES, BALLAST and WEIGHT

		With Ballast	Without Ballast
Rear tires	—No, size, ply & psi	Two 13.6-38; 6; 18	Two 13.6-38; 6; 14
Ballast	—Liquid	802 lb each	None
	—Cast iron	288 lb each	None
Front tires	—No, size, ply & psi	Two 6.00-16; 4; 28	Two 6.00-16; 4; 20
Ballast	—Liquid	None	None
	—Cast iron	145 lb each	None
Height of drawbar		19½ inches	20½ inches
Static weight	—Rear	6110 lb	3930 lb
	—Front	1790 lb	1500 lb
Total weight with operator		8075 lb	5605 lb

Department of Agricultural Engineering

Dates of Test: May 3 to May 16, 1962

Manufacturer: INTERNATIONAL HARVESTER COMPANY, CHICAGO, ILLINOIS

Manufacturer's Power Rating: Not Rated

FUEL, OIL and TIME Fuel No 2 Diesel Cetane No 54.2 (rating taken from oil company's typical inspection data) Specific gravity converted to 60°/60° 0.8328 Weight per gallon 6.935 Oil SAE 10W-30 API service classification MS, DM To motor 1.724 gal Drained from motor 1.250 gal Transmission and final-drive lubricant I.H. Hy-Tran Fluid Total time engine was operated 49 hours.

ENGINE Make International Diesel Type 4 cylinder vertical Serial No D188 740 Crankshaft mounted lengthwise Rated rpm 2200 Bore and stroke 3 11/16" x 4.390" Compression ratio 18.7 to 1 Displacement 187.5 cu in Cranking system 12 volt electric Lubrication pressure Air cleaner oil washed wire mesh Oil filter replaceable treated paper element Oil cooler engine coolant heat exchanger for crankcase oil Fuel filter one radial fin treated paper element Muffler was used Cooling medium temperature control thermostat.

CHASSIS Type tricycle Serial No 1353 S-Y Tread width rear 52" to 84" front 8" and 14" Wheel base 89.00" Center of gravity (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from centerline of rear wheels 25.8" Vertical distance above roadway 33.7" Horizontal distance from center of rear wheel tread 0" to the right/left Hydraulic control system direct engine drive Transmission selective gear fixed ratio plus operator controlled partial range power shifting Advertised speeds mph first 1.96 second 4.18 third 5.64 fourth 7.99 fifth 17.64 reverse 2.42 (Using T. A.) first 1.32 second 2.82 third 3.81 fourth 5.39 fifth 11.90 reverse 1.64 Clutch single plate dry disc operated by foot pedal Brakes double disc operated by two foot pedals which can be locked together Steering power assisted Turning radius (on concrete surface with brake applied) right 98.5" left 98.5" (on concrete surface without brake) right 100" left 100" Turning space diameter (on concrete surface with brake applied) right 206" left 206" (on concrete surface without brake) right 209½" left 209½" Belt pulley 1168 rpm at 2200 engine rpm diam 11" face 7.5" Belt speed 3363 fpm Power take-off 548 rpm at 2000 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 torque amplifier was not run as it was necessary to limit the pull in first gear direct drive to avoid excessive wheel slippage. Fifth gear direct drive was not run as it exceeded 15 mph.

We, the undersigned, certify that this is a true and correct report of official Tractor Test 816.

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-

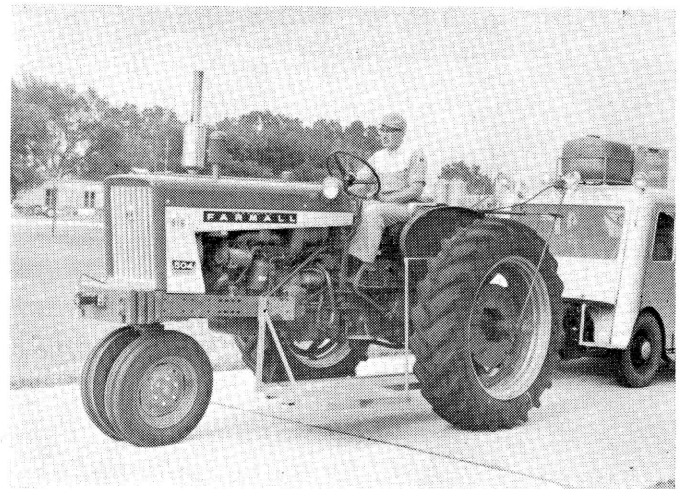
mission, etc.) on horsepower, speed and fuel consumption. These runs are made around the entire test course which has two 180 degree turns with a minimum radius of 50 feet. The drawbar pull is set at 3 different levels as follows: (1) as near to the pull at maximum power as possible and still have the 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.



Farmall 504 Diesel