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Test 818: Farmall 404 (Gasoline)

Nebraska Tractor Test Lab

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NEBRASKA TRACTOR TEST 818 - FARMALL 404 GASOLINE

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									
36.70	2000	2.974	0.496	12.34	202	61	75	28.870	
VARYING POWER AND FUEL CONSUMPTION—TWO HOURS									
33.27	2133	2.888	0.531	11.52	195	62	75	.....
0.00	2337	1.137	.....	.....	174	61	76	.....
17.31	2218	2.069	0.731	8.37	181	59	75	.....
37.03	2001	2.971	0.491	12.46	201	60	77	.....
8.88	2277	1.603	1.105	5.54	177	60	76	.....
25.43	2174	2.476	0.596	10.27	185	60	77	.....
Av	20.32	2190	2.191	0.660	9.27	186	60	76	28.865

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 Low Range											
32.97	2356	5.25	2002	5.31	3.044	0.565	10.83	189	58	64	28.945
75% of Pull at Maximum Power—Ten Hours—3rd Gear Low Range											
27.50	1795	5.74	2114	2.99	2.723	0.606	10.10	183	65	72	28.777
50% of Pull at Maximum Power—Two Hours—3rd Gear Low Range											
19.01	1189	5.99	2191	1.29	2.244	0.722	8.47	180	73	84	28.715
MAXIMUM POWER WITH BALLAST											
26.87	4999	2.02	2134	14.96	1st	Gear Low Range		180	56	61	29.020
30.51	4047	2.83	1999	11.25	1st	Gear High Range		183	56	62	29.020
32.54	3150	3.87	2001	7.95	2nd	Gear Low Range		180	56	62	29.020
33.47	2390	5.25	2001	5.19	3rd	Gear Low Range		186	58	64	28.940
32.41	2122	5.73	2002	5.07	2nd	Gear High Range		180	58	65	28.995
31.82	1558	7.66	2001	3.65	3rd	Gear High Range		180	58	65	28.995
29.92	775	14.48	2013	1.42	4th	Gear Low Range		177	58	65	28.980
MAXIMUM POWER WITHOUT BALLAST											
31.92	2338	5.12	2004	9.72	3rd	Gear Low Range		186	67	71	28.820
VARYING DRAWBAR PULL AND TRAVEL SPEED WITH BALLAST											
3rd Gear Low Range											
Pounds pull			2390	2393	2342	2454	2430	2459	2196		
Horsepower			33.47	29.94	26.13	23.70	20.29	16.91	12.17		
Miles per hour			5.25	4.69	4.18	3.62	3.13	2.58	2.08		
Slip of drivers, %			5.19	5.85	5.97	6.21	6.09	6.21	5.61		

TIRES, BALLAST and WEIGHT

		With Ballast	Without Ballast
Rear tires	—No, size, ply & psi	Two 11.2-36; 6; 22	Two 11.2-36; 6; 12
	—Liquid	465 lb each	None
	—Cast iron	580 lb each	None
Front tires	—No, size, ply & psi	Two 5.50-16; 4; 32	Two 5.50-16; 4; 30
	—Liquid	None	None
	—Cast iron	220 lb each	None
Height of drawbar		21 1/2 inches	22 1/2 inches
Static weight	—Rear	4860 lb	2770 lb
	—Front	1610 lb	1170 lb
Total weight with operator		6645 lb	4115 lb

Department of Agricultural Engineering
 Dates of Test: May 21 to June 4, 1962
 Manufacturer: INTERNATIONAL HARVESTER COMPANY, CHICAGO, ILLINOIS
 Manufacturer's Power Rating: Not Rated

FUEL, OIL and TIME Fuel regular gasoline Octane No Motor 84.6 Research 92.2 (rating taken from oil company's typical inspection data) Specific gravity converted to 60°/60° 0.7351 Weight per gallon 6.119 lb Oil SAE 10W-30 API service classification MS To motor 1.717 gal. Drained from motor 0.983 gal. Transmission and final-drive lubricant I.H. Hy-Tran Fluid Total time engine was operated 46 1/2 hours.

ENGINE Make International gasoline Type 4 cylinder vertical Serial No 103164 Crankshaft mounted lengthwise Rated rpm 2000 Bore and stroke 3 1/4" x 4 1/16" Compression ratio 7.7 to 1 Displacement 134.8 cu. in. Carburetor size 7/8" Ignition system battery Cranking system 12 volt electric Lubrication pressure Air cleaner oil washed wire mesh Oil filter replaceable treated paper element Oil cooler radiator for hydraulic and transmission oil Muffler was used Cooling medium temperature control thermostat.

CHASSIS Type tricycle Serial No 1169 Tread width rear 48" to 80" front 50" to 74" Wheel base 87.6" 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 22.7" Vertical distance above roadway 32.9" Horizontal distance from center of rear wheel tread 0.0" to the right/left Hydraulic control system direct engine drive Transmission selective gear fixed ratio Advertised speeds mph (low range) 1st 2.23 2nd 4.22 3rd 5.55 4th 14.67 reverse 3.5 (high range) 1st 3.19 2nd 6.04 3rd 7.96 4th 21.03 reverse 5.01 Clutch 9 inch single plate dry disc operated by foot pedal Brakes disc brakes operated by two foot pedals which can be locked together Steering power assisted Turning radius (on concrete surface with brake applied) right 128" left 128" (on concrete surface without brake) right 142 1/2" left 142 1/2" Turning space diameter (on concrete surface with brake applied) right 262 1/2" left 262 1/2" (on concrete surface without brake) right 291" left 291" Belt pulley 948 rpm at 2000 engine rpm diam 77" face 5 3/4" Belt speed 2730 fpm Power take-off 542 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.

Fourth Gear High Range was not run as it exceeded 15 mph.

We, the undersigned, certify that this is a true and correct report of official Tractor Test 818.

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 404 Gasoline