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Test 704: Ford Model 681-L (LPG)

Nebraska Tractor Test Lab

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NEBRASKA TRACTOR TEST 704 – FORD 681-L (LPG)

University of Nebraska Agricultural Experiment Station

W. V. Lambert, 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	Temperature Degrees F Cooling medium	Air wet bulb	Air dry bulb	Barometer inches of Mercury
MAXIMUM POWER AND FUEL CONSUMPTION								
Rated Engine Speed—Two Hours								
32.57	2200	4.040	0.527	8.06	182	67	75	29.040
Standard Power Take-Off Speed (1000 rpm)—One Hour								
27.00	1730	3.228	0.508	8.36	164	66	74	29.033
VARYING POWER AND FUEL CONSUMPTION—TWO HOURS								
29.18	2319	3.904	0.569	7.47	175	66	75	.....
4.07	2401	2.068	2.160	1.97	155	66	73	.....
15.04	2387	2.774	0.784	5.42	163	66	74	.....
33.03	2198	4.101	0.528	8.05	179	67	77	.....
7.53	2395	2.231	1.259	3.38	155	66	75	.....
22.13	2345	3.296	0.633	6.71	167	66	76	.....
Av 18.50	2341	3.062	0.704	6.04	166	66	75	29.017

DRAWBAR PERFORMANCE

Hp	Draw- bar pull lbs	Speed miles per hr	Crank shaft speed rpm	% Slip of drive wheels	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
VARYING DRAWBAR POWER & FUEL CONSUMPTION WITH BALLAST											
Maximum Available Power—Two Hours—6th Gear											
25.52	2162	4.43	1995	5.71	3.553	0.592	7.18	184	70	87	28.910
75% of Pull at Maximum Power—Ten Hours—6th Gear											
21.26	1666	4.79	2126	4.37	3.265	0.653	6.51	167	60	69	28.914
50% of Pull at Maximum Power—Two Hours—6th Gear											
15.22	1155	4.94	2170	3.26	2.787	0.778	5.46	165	64	76	28.865
MAXIMUM POWER WITH BALLAST											
23.32	4189	2.09	2085	12.64	4th Gear	.....	170	67	77	28.980	
26.28	2926	3.37	2003	8.17	5th Gear	.....	169	67	77	28.980	
26.14	2222	4.41	1999	6.25	6th Gear	.....	169	67	79	28.980	
25.64	1874	5.13	1997	5.17	7th Gear	.....	168	69	83	28.970	
25.37	1418	6.71	2001	3.73	8th Gear	.....	174	68	83	28.960	
23.91	808	11.10	2006	1.96	9th Gear	.....	179	69	84	28.955	
MAXIMUM POWER WITHOUT BALLAST											
24.77	2130	4.36	2003	9.30	6th Gear	.....	172	75	91	28.650	
VARYING DRAWBAR PULL & TRAVEL SPEED WITH BALLAST—6th Gear											
Pounds pull			2200	2300	2300	2350	2400	2300			
Horsepower			26.1	24.5	21.5	19.4	17.3	13.5			
Miles per hour			4.4	4.0	3.5	3.1	2.7	2.2			

TIRES, BALLAST and WEIGHT

		With Ballast	Without Ballast
Rear tires	—No, size, ply & psi	Two 12.4-28;4;14	Two 12.4-28;4;14
Ballast	—Liquid	266 lb each	None
	—Cast iron	758 lb each	None
Front tires	—No, size, ply & psi	Two 5.50-16;4;28	Two 5.50-16;4;28
Ballast	—Liquid	None	None
	—Cast iron	None	None
Height of drawbar		19 inches	20½ inches
Static weight	—Rear	3968 lb	1920 lb
	—Front	1376 lb	1376 lb
Total weight with operator		5519 lb	3471 lb

Department of Agricultural Engineering

Dates of Test: June 18 to June 25, 1959

Manufacturer: FORD MOTOR COMPANY,
BIRMINGHAM, MICHIGAN

Manufacturer's Power Rating: Not Rated

FUEL, OIL and TIME Fuel commercial propane Specific gravity converted to 60°/60° 0.5103 Weight per gallon 4.25 lb Oil SAE 20-20W API service classification MS and DG To motor 1.191 gal Drained from motor 0.896 gal Transmission and final-drive lubricant Ford hydraulic oil M-2C-41 Total time motor was operated 40 hours.

ENGINE Make Ford LPG Type 4 cylinder vertical Serial No 71105 Crankshaft mounted lengthwise Rated rpm 2200 PTO and belt 2000 drawbar Lubrication pressure Bore and stroke 3.4375" x 3.60" Compression ratio 7.5 to 1 Displacement 134 cu in Carburetor size 1" Ignition system battery Cranking system 6 volt battery Air cleaner oil washed wire mesh Muffler was used Oil filter full flow with replaceable paper element Cooling medium temperature control thermostat.

CHASSIS Type standard Serial No 71105 Tread width rear 52" to 76" front 52" to 80" Wheel base 74.5" 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" Horizontal distance from center of rear wheel tread 0" to the right or left Hydraulic control system direct engine drive Transmission manually controlled hydraulically actuated planetary gear Advertised speeds mph first 1.01 second 1.57 third 1.63 fourth 2.32 fifth 3.70 sixth 4.77 seventh 5.49 eighth 7.06 ninth 11.43 tenth 16.94 reverse 3.27 and 4.84 Belt pulley diam 9" face 6½" rpm 1298 and 2382 Belt speed 3058 and 5613 fpm Clutch 3 multiple disc wet clutches hydraulically operated Brakes internal expanding shoes operated by two foot pedals on right side of tractor Power take-off 540 or 1000 rpm at 1750 engine rpm Steering power assisted Turning radius (on concrete surface with brake applied) right 107" left 107" (on concrete surface without brake) right 118" left 118" Turning space diameter (on concrete surface with brake applied) right 217" left 217" (on concrete surface without brake) right 246" left 246".

REPAIRS AND ADJUSTMENTS Voltage regulator failed and was replaced before starting PTO run. Right rear inner tube failed and was replaced following the ten hour run.

REMARKS All test results were determined from observed data obtained in accordance with SAE and ASAE test code. First, second, and third gears were not run as pull was limited in fourth gear by stability formula. Tenth gear was not run as it was over 15 mph. This tractor is equipped with an operator-controlled power-shifting full range fixed ratio transmission.

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. 704.

L. F. LARSEN

Engineer-in-Charge

L. W. HURLBUT, Chairman

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 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.



Ford 681-L (LPG) Test 704