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Test 968: International Farmall 656 Hydrostatic (Gasoline)

Nebraska Tractor Test Lab

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NEBRASKA TRACTOR TEST 968

INTERNATIONAL FARMALL 656 HYDROSTATIC GASOLINE

POWER TAKE-OFF PERFORMANCE

Hp	Crank- shaft speed rpm	Fuel Consumption		Temperature Degrees F					
		Gal per hr	Lb per hp-hr	Hp-hr per gal	Cooling medium	Air wet bulb	Air dry bulb	Barometer inches of Mercury	
MAXIMUM POWER AND FUEL CONSUMPTION									
Rated Engine Speed—Two Hours									
65.80	2301	6.321	0.593	10.41	187	52	75	29.233	
Standard Power Take-off Speed (540 rpm)—One Hour									
60.81	1989	5.590	0.568	10.88	188	52	75	29.215	
VARYING POWER AND FUEL CONSUMPTION—TWO HOURS									
58.98	2429	6.316	0.661	9.34	185	53	76	.....
0.00	2538	2.910	.....	.....	179	52	74	.....
30.28	2494	4.450	0.908	6.80	184	52	75	.....
66.16	2302	6.306	0.589	10.49	188	53	76	.....
15.32	2522	3.707	1.494	4.13	179	53	75	.....
45.00	2469	5.402	0.741	8.33	186	53	76	.....
Av	35.96	2459	4.849	0.833	7.42	183	53	75	29.215

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	Cooling med	Air wet bulb	Air dry bulb		
VARYING DRAWBAR POWER AND FUEL CONSUMPTION WITH BALLAST												
Maximum Available Power—Two Hours—Speed Setting 4.0 MPH—Lo Range												
50.09	4697	4.00	2304	6.11	6.383	0.787	7.85	169	35	40	28.865	
75% of Pull at Maximum Power—Ten Hours—Speed Setting 4.0 MPH—Lo Range												
42.55	3569	4.47	2458	4.44	6.180	0.897	6.89	173	37	41	28.784	
50% of Pull at Maximum Power—Two Hours—Speed Setting 4.0 MPH—Lo Range												
29.11	2388	4.57	2494	3.36	5.228	1.109	5.57	173	41	48	28.775	

MAXIMUM POWER WITH BALLAST

47.27	7587	2.34	2305	11.30	The infinitely variable drive control was set to give the travel speeds shown as selected by the manufacturer	Lo Range	169	52	57	28.910
50.50	6964	2.72	2302	9.46		Lo Range	170	39	47	29.140
51.12	5795	3.31	2300	7.73		Lo Range	168	39	47	29.140
51.88	5320	3.66	2301	6.81		Lo Range	173	31	37	29.180
50.78	4742	4.02	2303	6.28		Lo Range	172	39	47	29.140
50.64	4412	4.30	2301	5.80		Lo Range	175	37	45	29.110
49.94	3865	4.85	2303	5.26		Lo Range	178	37	45	29.110
49.21	3402	5.42	2302	4.57		Lo Range	175	37	45	29.110
50.80	3197	5.96	2301	4.21		Hi Range	179	37	45	29.110
51.27	2886	6.66	2258	4.21		Hi Range	179	37	45	29.110
51.34	2504	7.69	2297	3.36		Hi Range	178	37	45	29.110
44.28	1137	14.61	2299	1.32		Hi Range	181	40	47	28.750

MAXIMUM PULL WITHOUT BALLAST

46.38	5819	2.99	2400	14.35	Speed Setting 2.99 MPH Lo Range		167	40	45	28.855
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VARYING DRAWBAR PULL AND TRAVEL SPEED WITH BALLAST Speed Setting 4.0 MPH—Lo Range

Pounds pull	4742	5110	5360	5587	5702	5720	5429
Horsepower	50.78	48.45	44.85	39.89	34.38	28.70	21.73
Crankshaft speed rpm	2303	2065	1845	1595	1362	1144	915
Miles per hour	4.02	3.56	3.14	2.68	2.26	1.88	1.50
Slip of drivers, %	6.28	6.68	6.94	7.47	7.60	7.73	7.34

TIRES, BALLAST and WEIGHT

		With Ballast	Without Ballast
Rear tires	—No, size, ply & psi	Two 14.9-38; 6; 18	Two 14.9-38; 6; 14
Ballast	—Liquid	855 lb each	None
	Cast iron	420 lb each	None
Front tire	—No, size, ply & psi	Two 6.00-16; 6; 48	Two 6.00-16; 6; 36
Ballast	—Liquid	None	None
	Cast iron	115 lb each	None
Height of drawbar		23 inches	24 inches
Static weight with operator—Rear		7720 lb	5170 lb
Front		2275 lb	2045 lb
Total		9995 lb	7215 lb

Department of Agricultural Engineering

Dates of Test: October 31 to November 29, 1967

Manufacturer: INTERNATIONAL HARVESTER COMPANY, CHICAGO, ILLINOIS

FUEL, OIL and TIME Fuel regular gasoline Octane No Motor 84.2 Recasch 93.3 (rating taken from oil company's typical inspection data) Specific gravity converted to 60°/60° 0.7417 Weight per gallon 6.175 lb Oil SAE 30 API service classification MM-MS-DG-DM To motor 2.145 gal Drained from motor 1.829 gal Transmission and final-drive lubricant IH Hy-Tran Fluid Total time engine was operated 85½ hours.

ENGINE Make International Type 6 cylinder vertical Serial No 81741 Crankshaft mounted lengthwise Rated rpm 2300 Bore and stroke 3⁹/₁₆" x 4.390" Compression ratio 7.60 to 1 Displacement 263 cu in Carburetor size 1½" Ignition system battery Cranking system 12 volt electric Lubrication pressure Air cleaner dry type with replaceable pleated paper element and automatic dust unloader Oil filter full flow replaceable treated paper Oil cooler radiator for hydraulic system and hydrostatic drive Fuel filter sediment bowl with strainer Muffler was used Cooling medium temperature control thermostat.

CHASSIS Type Tricycle Serial No 29487 Tread width rear 54" to 96" front 8" to 16" Wheel base 96.3" 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 28.8" Vertical distance above roadway 34.5" Horizontal distance from center of rear wheel tread 0" to the right/left Hydraulic control system direct engine drive Transmission infinitely variable hydrostatic using a variable displacement hydraulic pump and motor Sliding gears give high and low ranges Advertised speeds mph forward 0-7¾ low range 0-21 high range reverse 0-3½ low range 0-9½ high range Drive Clutch none—hydrostatic drive pressure can be controlled by foot pedal Brakes double disc operated by two foot pedals which can be locked together Steering hydraulic with power assist Turning radius (on concrete surface with brake applied) right 109" left 109" (on concrete surface without brake) right 114" left 114" Turning space diameter (on concrete surface with brake applied) right 218" left 218" (on concrete surface without brake) right 233" left 233" Belt pulley 1210 rpm at 2300 engine rpm diam 11" face 7½" Belt speed 3485 fpm Power take-off 543 rpm at 2000 engine rpm.

REPAIRS and ADJUSTMENTS During the limber-up run, normal engine temperature could not be maintained due to a defective thermostat. A new thermostat was installed and the test continued.

REMARKS All test results were determined from observed data obtained in accordance with the SAE and ASAE test code. The slower travel speeds were not run because maximum drawbar pull was limited by the stability formula. Travel speeds above 15 mph were not run.

We, the undersigned, certify that this is a true and correct report of official Tractor Test 968.

L. F. LARSEN

Engineer in Charge

G. W. STEINBRUEGGE

J. J. SULEK

D. E. LANE

Board of Tractor Test Engineers

The University of Nebraska Agricultural Experiment Station

E. F. Frolik, Dean; H. W. Ottoson, Director; Lincoln, Nebraska

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, $\frac{1}{2}$ 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 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

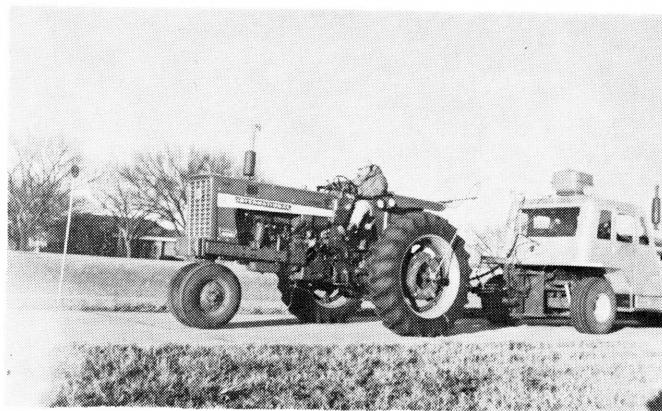
speed-control devices (engine, governor, automatic transmission, etc.) on horsepower, speed and fuel consumption. These runs are made around the entire test course which has two 180 degree turns with a minimum radius of 50 feet. The drawbar pull is set at 3 different levels as follows: (1) as near to 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 Pull without Ballast. All added ballast is removed from the tractor. The drawbar pull is determined at slip limits of 15% for pneumatic tires or 7% for steel tracks or lugs. The tractor is operated at the fastest possible travel speed.

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.**



INTERNATIONAL FARMALL 656 HYDROSTATIC GASOLINE