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Test 715: International Model 660 (Diesel)

Nebraska Tractor Test Lab

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NEBRASKA TRACTOR TEST NO. 715 - INTERNATIONAL 660 DIESEL

The University of Nebraska Agricultural Experiment Station

W. V. Lambert, 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									
78.78	2400	5.538	0.493	14.23	172	67	77	28.910	
VARYING POWER AND FUEL CONSUMPTION—TWO HOURS									
70.11	2510	4.820	0.482	14.55	158	66	76	
0.94	2633	1.725	12.862	0.54	117	65	75	
36.06	2584	3.107	0.604	11.61	131	65	75	
80.20	2401	5.663	0.495	14.16	172	66	77	
18.20	2608	2.367	0.912	7.69	126	65	74	
53.30	2546	3.904	0.513	13.65	139	65	75	
Av	43.14	2544	3.598	0.584	11.99	142	65	75	28.917

DRAWBAR PERFORMANCE

Hp	Draw- bar pull lbs	Speed miles per hr	Crank shaft speed rpm	% Slip of drive wheels	Fuel Consumption		Hp-hr per gal	Temp. Degrees F			Barometer inches of mercury
					Gal per hr	Lb per hp-hr		Cool- ing med	Air wet bulb	Air dry bulb	
VARYING DRAWBAR POWER AND FUEL CONSUMPTION WITH BALLAST											
Maximum Available Power—Two Hours—3rd Gear											
69.43	5254	4.96	2391	4.52	5.624	0.568	12.35	180	63	79	28.943
75% of Pull at Maximum Power—Ten Hours—3rd Gear											
56.88	4033	5.29	2513	3.15	4.473	0.551	12.72	158	68	82	28.878
50% of Pull at Maximum Power—Two Hours—3rd Gear											
39.31	2704	5.45	2567	2.21	3.496	0.623	11.24	148	66	83	28.910
MAXIMUM POWER WITH BALLAST											
69.16	7473	3.47	2404	6.83	2nd Gear.....			157	58	70	28.950
71.38	5394	4.96	2401	4.90	3rd Gear.....			154	58	68	28.950
69.29	3709	7.01	2397	3.17	4th Gear.....			159	60	74	28.960
64.97	11046	2.21	2470	14.60	2nd Gear Torq-Amp..			138	63	69	28.895
69.05	7973	3.25	2397	7.54	3rd Gear Torq-Amp..			144	56	63	28.950
69.06	5569	4.65	2403	5.03	4th Gear Torq-Amp..			156	58	68	28.950
66.80	2350	10.66	2400	2.10	5th Gear Torq-Amp..			160	60	74	28.960
MAXIMUM POWER WITHOUT BALLAST											
68.30	5209	4.92	2402	8.89	3rd Gear.....			184	69	86	28.780
VARYING DRAWBAR PULL AND TRAVEL SPEED WITH BALLAST—3rd Gear											
Pounds pull		5400	5700	5900	5900	5800	5650				
Horsepower		71.4	66.9	62.9	55.1	46.4	37.7				
Miles per hour		5.0	4.4	4.0	3.5	3.0	2.5				

Department of Agricultural Engineering

Dates of Test: August 31 to September 5, 1959

Manufacturer: INTERNATIONAL HARVESTER

COMPANY, CHICAGO, ILLINOIS

Manufacturer's Power Rating: Not Rated

FUEL, OIL and TIME Fuel No 2 Diesel Cetane No 51 (rating taken from oil company's typical inspection data) Specific gravity converted to 60°/60° 0.8418 Weight per gallon 7.009 lb Oil SAE 10W-30 API service classification MS and DM To motor 2.397 gal Drained from motor 1.612 gal Transmission and final-drive lubricant type IH Hy-Fluid Total time motor was operated 45½ hours.

ENGINE Make International Diesel Type 6 cylinder vertical Serial No 13577 Crankshaft mounted lengthwise Rated rpm 2400 Lubrication pressure Bore and stroke 3¹¹/₁₆" x 4²⁵/₆₄" Compression ratio 18.2 to 1 Displacement 281 cu in Cranking system 12 volts (two 6 volt batteries) Air cleaner oil washed wire screen Muffler was used Oil filter replaceable radial fin paper element Fuel filter two replaceable radial fin treated paper elements Cooling medium temperature control thermostat.

CHASSIS Type standard Serial No 1042 Tread width rear 64" or 72" front 51" Wheel base 85.5" 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 29.2" Vertical distance above roadway 31.5" Horizontal distance from center of rear wheel tread 0" to the right or left Hydraulic control system direct engine drive Transmission fixed ratio operator controlled partial range power shifting Advertised speeds mph first 2.01 second 3.55 third 4.97 fourth 6.91 fifth 15.39 reverse 2.61 (Using Torque Amplifier) first 1.35 second 2.39 third 3.35 fourth 4.66 fifth 10.39 reverse 1.76 Belt pulley diam 11" face 7½" rpm 1054 Belt speed 3034 fpm Clutch single plate dry disc over center operated by hand lever Brakes double disc brakes operated by two foot pedals which can be locked together Power take-off 544 rpm at 2400 engine rpm Steering power assisted Turning radius (on concrete surface with brake applied) right 150" left 150" (on concrete surface without brake) right 170" left 170" Turning space diameter (on concrete surface with brake applied) right 320" left 320" (on concrete surface without brake) right 360" left 360".

REPAIRS AND ADJUSTMENTS No repairs or adjustments.

REMARKS All test results were determined from observed data obtained in accordance with SAE and ASAE test code. First gear direct drive and first gear torque amplifier drive were not run as it was necessary to limit the pull in second gear torque amplifier drive to avoid excessive wheel slippage. Fifth gear direct drive was not run as it was over 15 mph.

We, the Undersigned, certify that this is a true and correct report of official Tractor Test No 715.

L. F. LARSEN
Engineer-in-Charge

L. W. HURLBUT
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 18-26;8;16	Two 18-26;8;16
	—Liquid	1395 lb each	None
	—Cast iron	1015 lb each	None
Front tires	—No, size, ply & psi	Two 7.50-18;6;32	Two 7.50-18;6;32
	—Liquid	None	None
	—Cast iron	280 lb each	None
Height of drawbar		18 inches	19½ inches
Static weight	—Rear	11,680 lb	6,860 lb
	—Front	3,400 lb	2,840 lb
Total weight with operator		15,255 lb	9,875 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.



International 660 Diesel