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Test 1155: International Hydro 666, 70 and 86 Diesel

Nebraska Tractor Test Lab
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NEBRASKA TRACTOR TEST 1155 – INTERNATIONAL HYDRO 70 DIESEL (ALSO INTERNATIONAL HYDRO 666 DIESEL AND HYDRO 86 DIESEL)

POWER TAKE-OFF PERFORMANCE

	Hp	Crank-shaft speed rpm	Fuel Consumption Gal per hr	Fuel Consumption 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 (PTO Speed—652 rpm)									
	69.51	2400	5.643	0.562	12.32	187	60	75	28.860
Standard Power Take-off Speed (540 rpm)—One Hour									
	65.41	1987	5.274	0.558	12.40	193	60	75	28.840
VARYING POWER AND FUEL CONSUMPTION—Two Hours									
	62.47	2538	5.242	0.581	11.92	180	60	75	.....
	0.00	2637	2.380	.....	.....	166	61	76	.....
	31.89	2591	3.707	0.804	8.60	174	61	76	.....
	69.41	2404	5.654	0.564	12.28	186	61	75	.....
	16.13	2621	3.061	1.313	5.27	170	61	75	.....
	47.41	2569	4.388	0.640	10.80	179	61	77	.....
Av	**37.89**	**2560**	**4.072**	**0.744**	**9.31**	**176**	**61**	**75**	**28.820**

DRAWBAR PERFORMANCE

Hp	Draw-bar pull lbs	Speed miles per hr	Crank-shaft speed rpm	Fuel Consumption Slip of drivers %	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 AND FUEL CONSUMPTION WITH BALLAST											
Maximum Available Power—Two Hours—4.0 MPH Lo Range											
53.10	4935	4.04	2401	6.56	5.619	0.732	9.45	174	41	50	29.050
75% of Pull at Maximum Power—Ten Hours—4.0 MPH Lo Range											
45.08	3781	4.47	2552	4.92	5.149	0.790	8.76	172	43	49	28.940
50% of Pull at Maximum Power—Two Hours—4.0 MPH Lo Range											
30.20	2458	4.61	2590	3.50	4.336	0.993	6.97	167	40	46	29.160
50% of Pull at Reduced Engine Speed—Two Hours—7.5 MPH Hi Range											
31.07	2527	4.61	1382	3.53	2.927	0.652	10.62	169	41	47	29.200
MAXIMUM POWER WITH BALLAST											
50.56	8310	2.28	2394	14.71	The infinitely	L. Rng.	171	39	42	29.140	
53.37	5651	3.54	2400	7.75	variable drive	L. Rng.	176	48	55	29.050	
53.49	4978	4.03	2401	6.66	control was set	L. Rng.	174	41	50	29.050	
53.13	4362	4.57	2398	5.76	to give the	L. Rng.	176	45	55	29.030	
52.21	3852	5.08	2399	4.77	travel speeds	L. Rng.	175	44	54	29.040	
54.11	2898	7.00	2401	3.61	shown by mfg.	H. Rng.	175	44	54	29.040	

VARYING DRAWBAR PULL AND TRAVEL SPEED WITH BALLAST
Speed 4.0 MPH—Lo Range

Pounds Pull	4978	5493	5950	6010	5994	5730
Horsepower	53.49	53.11	50.17	43.84	37.17	29.90
Crankshaft Speed rpm	2401	2156	1917	1680	1434	1200
Miles Per Hour	4.03	3.63	3.16	2.74	2.33	1.96
Slip of Drivers %	6.66	7.35	8.15	8.42	8.55	8.02

TRACTOR SOUND LEVEL WITHOUT CAB	**dB (A)**
Maximum Available Power 2 Hours	99.5
75% of Pull at Max. Power 10 Hours	97.0
50% of Pull at Max. Power 2 Hours	97.0
50% of Pull at Reduced Engine Speed 2 Hours	92.0
Bystander (21.5 MPH Hi Range)	91.5

TIRES, BALLAST AND WEIGHT		**With Ballast**	**Without Ballast**
Rear Tires	—No, size, ply & psi	Two 18.4-34;6;16	Two 18.4-34;6;16
Ballast	—Liquid	985 lb each	None
	Cast Iron	None	None
Front Tires	—No, size, ply & psi	Two 9.5L-15;6;28	Two 9.5L-15;6;28
Ballast	—Liquid	None	None
	Cast Iron	None	None
Height of drawbar		18½ inches	19 inches
Static weight with operator—rear		7790 lb	5820 lb
	front	2640 lb	2620 lb
	total	10430 lb	8440 lb

Department of Agricultural Engineering
Dates of Test: November 14 to December 3, 1973
Manufacturer: INTERNATIONAL HARVESTER COMPANY, CHICAGO, ILLINOIS

FUEL, OIL AND TIME **Fuel** No 2 Diesel **Cetane No** 50.1 (rating taken from oil company's typical inspection data) **Specific gravity converted to 60°/60°** 0.8310 **Weight per gallon** 6.919 lb **Oil SAE** 30 **API service classification** I.H. No 1 engine oil SAE 30 recommended or series 3 (CD, CC, CB, CA, SE, SD, SC) (Formerly DS, DM, DG, MS) **To motor** 3.353 gal **Drained from motor** 1.744 gal **Transmission and final drive lubricant** I.H. Hy-Tran Fluid **Total time engine was operated** 51½ hours.

ENGINE **Make** International Diesel **Type** 6 cylinder vertical **Serial No** 312DT2U002341* **Crankshaft Mounted** lengthwise **Rated rpm** 2400 **Bore and stroke** 3.875″ x 4.410″ **Compression ratio** 17 to 1 **Displacement** 312 cu in **Cranking system** 12 volt electric **Lubrication** pressure **Air cleaner** dual stage dry type with replaceable pleated paper element and automatic dust unloader **Oil filter** two full flow pleated paper screw-on cartridges **Oil cooler** engine coolant heat exchanger for engine oil and radiator for transmission and hydraulic oil **Fuel filter** one primary and one final using replaceable pleated paper screw-on cartridges **Muffler** was used **Cooling medium temperature control** thermostat.

CHASSIS **Type** standard **Serial No** 2680002U007505* **Tread width** rear 60″ to 98″ front 58″ to 82″ **Wheel base** 103″ **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 32.4″ Vertical distance above roadway 36″ 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 pump and motor. A range transmission provides Hi and Lo range **Advertised speeds mph** Lo range—0 to 8; Hi range—0 to 21½; reverse Lo range 0 to 3½; reverse Hi range 0 to 9¾ **Clutch** none—hydrostatic drive can be controlled by foot pedal **Brakes** dry double disc actuated by two foot pedals that can be locked together **Steering** hydrostatic **Turning radius** (on concrete surface with brake applied) right 144″ left 144″ (on concrete surface without brake) right 165″ left 165″ **Turning space diameter** (on concrete surface with brake applied) right 298″ left 298″ (on concrete surface without brake) right 339″ left 339″ **Power take-off** 543 rpm at 2000 engine rpm.

REPAIRS and ADJUSTMENT: No repairs or adjustments.

REMARKS: All test results are determined from observed data obtained in accordance with SAE and ASAE test code or official Nebraska test procedure.

Six travel speeds were chosen between 15% slip and 15 mph.

We, the undersigned, certify that this is a true and correct report of official Tractor Test **1155.**

L. F. LARSEN
Engineer-in-Charge

G. W. STEINBRUEGGE, Chairman
W. E. SPLINTER
D. E. LANE
Board of Tractor Test Engineers

The University of Nebraska Agricultural Experiment Station
H. W. Ottoson, Director and Acting Dean

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. Prior to the maximum power run the tire tread-bar height must be at least 65% of new tread height.

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 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, ½ of the 85% torque; maximum power, ¼ and ¾ 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.

Varying Power and Fuel Consumption With Ballast. The varying power runs are made to show the effects 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 4 different runs 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; (3) 50% of the pull at maximum power; and (4) maintaining the same load and travel speed as in (3) by shifting to a higher gear and reducing the engine rpm.

Maximum Power with Ballast. Maximum power is measured on straight level sections of the test course. Data are shown for not more than 6 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 manufacturer's representative has the option of selecting one gear or speed over eight miles per hour. 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.

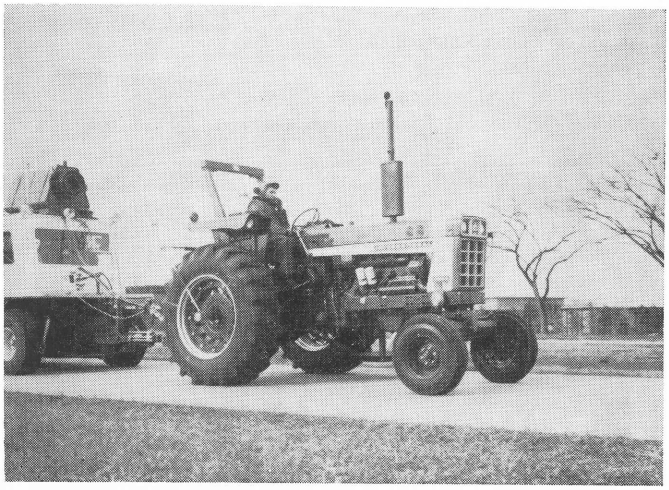
Varying Drawbar Pull and Travel Speed with Ballast. Travel speeds corresponding to drawbar pulls beyond the maximum power range are obtained to show the "lugging ability" of the tractor. The run starts with the pull at maximum power; then additional drawbar pull is applied to cause decreasing speeds. 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.

SOUND MEASUREMENT

Sound is recorded during each of the Varying Power and Fuel Consumption runs as the tractor travels on a straight section of the test course. The dB(A) sound level is obtained with the microphone located near the right ear of the operator. Bystander sound readings are taken with the microphone placed 25 feet from the line of travel of the tractor.

An increase of 10 dB(A) will approximately double the loudness to the human ear.

For additional information about the **Nebraska Tractor Tests** write to the **Department of Agricultural Engineering, University of Nebraska, Lincoln, Nebraska 68503.**



INTERNATIONAL HYDRO 70 DIESEL