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Test 870: Oliver 1850 Diesel

Nebraska Tractor Test Lab

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NEBRASKA TRACTOR TEST 870 - OLIVER 1850 DIESEL

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									
*	92.94	2400	6.304	0.474	14.74	176	59	76	28.987
VARYING POWER AND FUEL CONSUMPTION—TWO HOURS									
	80.78	2455	5.532	0.479	14.60	174	59	75	.....
	0.00	2558	2.017	.....	.....	167	59	75	.....
	41.47	2519	3.644	0.614	11.38	168	60	76	.....
	93.81	2400	6.309	0.470	14.87	176	59	75	.....
	20.85	2535	2.820	0.945	7.39	168	60	75	.....
	61.47	2490	4.459	0.507	13.79	170	60	75	.....
Av	49.73	2493	4.130	0.581	12.04	170	59	75	28.973

DRAWBAR PERFORMANCE

Hp	Draw-bar pull lbs	Speed miles per hr	Crank- shaft speed rpm	Slip of drivers %	Fuel Consumption		Hp-hr per gal	Temp Degrees F			
					Gal per hr	Lb per hp-hr		Cool- ing med	Air wet bulb	Air dry bulb	Barom- eter inches of Mercury
VARYING DRAWBAR POWER AND FUEL CONSUMPTION WITH BALLAST											
Maximum Available Power—Two Hours—4th Gear Hydra-Power											
80.04	8188	3.67	2402	8.93	6.116	0.534	13.09	180	62	64	28.620
75% of Pull at Maximum Power—Ten Hours—4th Gear Hydra-Power											
65.58	6361	3.87	2476	6.69	5.210	0.555	12.59	179	65	71	28.832
50% of Pull at Maximum Power—Two Hours—4th Gear Hydra-Power											
46.40	4332	4.02	2523	4.81	4.180	0.630	11.10	177	59	63	28.795

MAXIMUM POWER WITH BALLAST

58.86	10773	2.05	2490	15.00	2nd Gear Hydra-Power	175	45	49	28.910
77.14	10674	2.71	2403	14.49	2nd Gear	177	47	51	28.910
78.60	10467	2.82	2399	13.43	3rd Gear Hydra-Power	175	47	51	28.910
81.76	8426	3.64	2405	9.80	4th Gear Hydra-Power	173	54	59	28.860
80.23	7398	4.07	2407	8.36	3rd Gear	177	54	59	28.860
80.67	5913	5.12	2402	6.53	4th Gear	178	62	70	28.840
81.67	5185	5.91	2404	5.70	5th Gear Hydra-Power	178	62	70	28.840
79.15	3620	8.20	2408	4.13	5th Gear	183	68	76	28.765
79.35	2841	10.47	2407	3.32	6th Gear Hydra-Power	182	69	79	28.705
73.83	1915	14.46	2415	2.28	6th Gear	185	69	79	28.705

MAXIMUM POWER WITHOUT BALLAST

71.60	7632	3.52	2467	14.63	4th Gear Hydra-Power	183	45	48	29.240
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VARYING DRAWBAR PULL AND TRAVEL SPEED WITH BALLAST 4th Gear Hydra-Power

Pounds pull	8426	8540	9078	9240	9339	9300	9183
Horsepower	81.76	74.19	69.02	61.40	53.43	44.02	34.73
Crankshaft Speed, rpm	2405	2165	1907	1677	1448	1199	955
Miles per hour	3.64	3.26	2.85	2.49	2.15	1.78	1.42
Slip of drivers, %	9.80	10.05	10.69	11.31	11.56	11.56	11.19

TIRES, BALLAST and WEIGHT

		With Ballast	Without Ballast
Rear tires	—No, size, ply & psi	Two 18.4-34; 8; 20	Two 18.4-34; 8; 16
Ballast	—Liquid	1240 lb each	None
	Cast iron	1120 lb each	None
Front tires	—No, size, ply & psi	Two 7.50-15; 8; 40	Two 7.50-15; 8; 32
Ballast	—Liquid	None	None
	Cast iron	160 lb each	None
Height of drawbar		21 inches	21½ inches
Static weight	—Rear	11110 lb	6390 lb
	Front	3020 lb	2700 lb
Total weight with operator		14305 lb	9265 lb

Department of Agricultural Engineering

Dates of Test: October 26 to November 5, 1964

Manufacturer: OLIVER CORPORATION,
CHARLES CITY, IOWA

FUEL, OIL and TIME Fuel No. 2 Diesel Cetane No 57.0 (rating taken from oil company's typical inspection data) Specific gravity converted to 60°/60° 0.8394 Weight per gallon 6.990 lb Oil SAE 20-20W API service classification MS, DM To motor 3.412 gal Drained from motor 2.268 gal Transmission and final-drive lubricant SAE 80 Total time engine was operated 44½ hours.

ENGINE Make Perkins Diesel Type 6 cylinder vertical Serial No 8064111 Crankshaft mounted lengthwise Rated rpm 2400 Bore and stroke 3⅞" x 5" Compression ratio 16.5 to 1 Displacement 352 cu in Cranking system 12 volt electric (two 6-volt batteries) Lubrication pressure Air cleaner dry type with built-in pre-cleaner and automatic dust unloader using replaceable paper element Oil filter full-flow replaceable treated paper element Oil cooler engine coolant heat exchangers for crankcase and Hydra-Power oil and radiator for hydraulic oil Fuel filter primary filter with replaceable cotton element and final filter with replaceable paper cartridge Muffler was used Cooling medium temperature control thermostat.

CHASSIS Type Standard Serial No 147 584-099 Tread width rear 68" to 89½" front 60" to 84" Wheel base 109¼" 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 31.3" Vertical distance above roadway 35.4" Horizontal distance from center of rear wheel tread 0" to the right/left Hydraulic control system direct engine drive Transmission selective gear fixed ratio with partial range operator controlled power shifting Advertised speeds mph first 1.61 second 3.10 third 4.34 fourth 5.37 fifth 8.36 sixth 14.45 reverse 1.82 and 4.89 (using Hydra-Power drive) first 1.18 second 2.28 third 3.18 fourth 3.94 fifth 6.13 sixth 10.60 reverse 1.33 and 3.59 Clutch single plate dry disc operated by foot pedal Brakes triple disc operated by two foot pedals which can be locked Steering hydraulic with power assist Turning radius (on concrete surface with brake applied) right 155" left 155" (on concrete surface without brake) right 170" left 170" Turning space diameter (on concrete surface with brake applied) right 310" left 310" (on concrete surface without brake) right 350" left 350" Belt pulley 1035 rpm at 2400 engine rpm diam 11⅞" face 8¾" Belt Speed 3049 fpm Power take-off 549 or 984 rpm at 2400 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.

First gear Hydra-Power drive and first gear direct drive were not run as it was necessary to limit the pull in second gear Hydra-Power drive to avoid excessive wheel slippage.

We, the undersigned, certify that this is a true and correct report of official Tractor Test 870.

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 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.



Oliver 1850 Diesel