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Test 1031: Case 870 Manual Diesel

Nebraska Tractor Test Lab

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NEBRASKA TRACTOR TEST 1031 - CASE 870 MANUAL DIESEL

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								
70.67	1900	4.509	0.442	15.67	192	56	74	28.700

VARYING POWER AND FUEL CONSUMPTION—TWO HOURS

62.44	1974	3.983	0.442	15.68	187	55	74	.....
0.00	2091	1.234	.....	.....	181	55	72	.....
32.09	2029	2.490	0.538	12.89	184	54	71	.....
70.84	1900	4.537	0.444	15.61	191	55	73	.....
16.21	2058	1.840	0.787	8.81	182	55	73	.....
47.42	2001	3.178	0.464	14.92	185	56	76	.....
Av 38.17	2009	2.877	0.522	13.27	185	55	73	28.697

DRAWBAR PERFORMANCE

Hp	Drawbar pull lbs	Speed miles per hr	Crankshaft speed rpm	Slip of drivers %	Fuel Consumption		Hp-hr per gal	Temp Degrees F			Barometer inches of Mercury
					Gal per hr	Lb per hp-hr		Cooling med	Air wet bulb	Air dry bulb	

VARYING DRAWBAR POWER AND FUEL CONSUMPTION WITH BALLAST

Maximum Available Power—Two Hours—4th Gear (4-Lo)											
61.77	4886	4.74	1898	6.17	4.280	0.480	14.43	186	38	44	28.725
75% of Pull at Maximum Power—Ten Hours—4th Gear (4 Lo)											
50.18	3751	5.02	1976	4.63	3.754	0.518	13.37	192	33	34	28.698
50% of Pull at Maximum Power—Two Hours—4th Gear (4 Lo)											
35.00	2536	5.18	2007	3.16	3.176	0.629	11.02	192	33	37	28.665

MAXIMUM POWER WITH BALLAST

57.23	8934	2.40	1940	14.98	2nd Gear 2 Lo		186	28	27	28.960
62.91	6603	3.57	1904	8.34	3rd Gear 3 Lo		190	40	50	28.740
63.51	5015	4.75	1899	6.03	4th Gear 4 Lo		190	40	49	28.740
63.23	4092	5.79	1900	4.91	5th Gear 1 Hi		189	41	50	28.740
60.85	2757	8.28	1899	3.61	6th Gear 2 Hi		190	41	51	28.740
58.08	1840	11.84	1908	2.34	7th Gear 3 Hi		180	40	50	28.740

MAXIMUM PULL WITHOUT BALLAST

47.15	7157	2.47	1979	14.86	2nd Gear 2 Lo		185	28	32	29.190
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VARYING DRAWBAR PULL AND TRAVEL SPEED WITH BALLAST 4th Gear (4-Lo)

Pounds Pull	5015	5481	5757	5768	5655	5519
Horsepower	63.51	61.70	57.73	50.76	42.57	34.64
Crankshaft speed rpm	1899	1701	1521	1334	1140	949
Miles per hour	4.75	4.22	3.76	3.30	2.82	2.35
Slip of drivers, %	6.03	6.72	7.13	7.00	7.00	6.86

TIRES, BALLAST and WEIGHT

		With Ballast	Without Ballast
Rear tires	—No, size, ply & psi	Two 18.4-34; 8; 16	Two 18.4-34; 8; 16
	—Liquid	1038 lb each	None
	Cast iron	280 lb each	None
Front tires	—No, size, ply & psi	Two 7.50-16; 6; 36	Two 7.50-16; 6; 36
	—Liquid	None	None
	Cast iron	35 lb each	None
Height of drawbar		16½ inches	17½ inches
Static weight with operator—	Rear	9215 lb	6580 lb
	Front	2695 lb	2625 lb
	Total	11910 lb	9205 lb

Department of Agricultural Engineering

Date of Test: November 10 to November 20, 1969

Manufacturer: J. I. CASE COMPANY, RACINE, WISCONSIN

FUEL, OIL and TIME Fuel No 2 diesel Cetane 52.2 (rating taken from oil company's typical inspection data) Specific gravity converted to 60°/60° 0.8323 Weight per gallon 6.929 lb Oil SAE 20-20W API service classification MS DS To motor 2.068 gal Drained from motor 1.876 gal Transmission and final-drive lubricant Case TCH oil Total time engine was operated 42½ hours.

ENGINE Make Case Diesel Type 4 cylinder vertical Serial No 2307175 Crankshaft mounted lengthwise Rated rpm 1900 Bore and stroke 4½" x 5" Compression ratio 16.5 to 1 Displacement 336 cu in Cranking system 12 volt electric (two 12-volt batteries) Lubrication pressure Air cleaner dry type with replaceable treated paper element with pre-cleaner Fuel filter replaceable primary and secondary filter cartridges Muffler was used Cooling medium temperature control Thermostat.

CHASSIS Type Standard Serial No 8652382 Tread width rear 60" to 88" front 60" to 88" Wheel base 102" Center of gravity (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from centerline of rear wheels 29.3" Vertical distance above roadway 37.1" Horizontal distance from center of rear wheel tread 0" to the right/left Hydraulic control system direct engine drive Transmission Selective gear fixed ratio Advertised speeds mph first 1.9 second 2.8 third 3.9 fourth 4.8 fifth 6.0 sixth 8.5 seventh 12.0 eighth 15 reverse 2.4 and 7.6 Clutch single plate dry disc operated by foot pedal Brakes dry double disc hydraulically power actuated by two foot pedals which can be locked together Steering hydrostatic Turning radius (on concrete surface with brake applied) right 137" left 137" (on concrete surface without brake) right 177" left 177" Turning space diameter (on concrete surface with brake applied) right 286" left 286" (on concrete surface without brake) right 356" left 356" Belt pulley 1108 rpm at 1900 engine rpm diam 10.5" face 7.25" Belt speed 3045 fpm Power take-off 538 rpm at 1900 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. 1st gear was not run as it was necessary to limit the pull in 2nd gear to avoid excessive wheel slippage. 8th gear was not run as it exceeded 15 mph.

We, the undersigned, certify that this is a true and correct report of official Tractor Test 1031.

L. F. LARSEN

Engineer-In-Charge

G. W. STEINBRUEGGE, Chairman

W. E. SPLINTER

D. E. LANE

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, $\frac{1}{2}$ 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.



CASE 870 MANUAL DIESEL