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Test 1034: Case 970 Manual Diesel

Nebraska Tractor Test Lab

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NEBRASKA TRACTOR TEST 1034—CASE 970 MANUAL DIESEL

POWER TAKE-OFF PERFORMANCE

Hp	Crank- shaft speed rpm	Fuel Consumption Gal per hr	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—538 RPM)								
85.70	1900	5.481	0.443	15.64	198	56	75	28.980
VARYING POWER AND FUEL CONSUMPTION—TWO HOURS								
74.65	1951	4.853	0.450	15.38	194	56	75	.....
0.00	2077	1.629	.....	.....	167	57	76	.....
38.64	2018	3.189	0.571	12.12	189	56	75	.....
83.39	1901	5.326	0.442	15.66	200	56	75	.....
19.53	2041	2.396	0.849	8.15	178	56	75	.....
56.95	1984	3.965	0.482	14.36	194	56	75	.....
Av 45.53	1995	3.560	0.541	12.79	187	56	75	28.953

DRAWBAR PERFORMANCE

Hp	Draw- bar pull lbs	Speed miles per hr	Crank- shaft speed rpm	Slip of drivers %	Fuel Consumption 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—4th Gear (4th Lo)											
69.63	5557	4.70	1899	5.52	5.446	0.542	12.79	185	55	66	28.605
75% of Pull at Maximum Power—Ten Hours—4th Gear (4th Lo)											
57.45	4362	4.94	1965	3.97	4.442	0.535	12.93	181	47	58	29.023
50% of Pull at Maximum Power—Two Hours—4th Gear (4th Lo)											
40.58	2980	5.11	2004	2.69	3.535	0.603	11.48	171	49	62	29.085
MAXIMUM POWER WITH BALLAST											
52.09	10604	1.84	1973	14.73	1st Gear (1st LO)	161	41	46	28.970		
68.17	10021	2.55	1900	12.93	2nd Gear (2nd LO)	183	38	45	28.970		
73.28	7216	3.81	1902	7.71	3rd Gear (3rd LO)	177	42	50	28.970		
72.61	5810	4.69	1902	5.97	4th Gear (4th LO)	183	42	49	28.910		
69.01	4183	6.19	1901	4.24	5th Gear (1st HI)	185	45	52	28.910		
67.29	2860	8.82	1902	2.84	6th Gear (2nd HI)	184	45	54	28.910		
MAXIMUM PULL WITHOUT BALLAST											
53.68	7794	2.58	1949	14.82	2nd Gear (2nd LO)	189	66	88	28.295		
VARYING DRAWBAR PULL AND TRAVEL SPEED WITH BALLAST—4th Gear (4th LO)											
Pounds Pull				5810	6457	6847	6899	6968	6780		
Horsepower				72.61	71.93	67.49	58.91	51.54	41.44		
Crankshaft Speed rpm				1902	1709	1520	1318	1145	942		
Miles per hour				4.69	4.18	3.70	3.20	2.77	2.29		
Slip of drivers %				5.97	6.63	7.21	7.21	7.49	7.21		

TIRES, BALLAST and WEIGHT

		With Ballast	Without Ballast
Rear tires	—No, size, ply & psi	Two 18.4-38; 8; 18	Two 18.4-38; 8; 16
Ballast	—Liquid	1160 lb each	None
	Cast iron	580 lb each	None
Front tires	—No, size, ply & psi	Two 10.00-16; 8; 40	Two 10.00-16; 8; 40
Ballast	—Liquid	None	None
	Cast iron	18 lb each	None
Height of drawbar		19 inches	19½ inches
Static weight with operator—Rear		10570 lb	7090 lb
Front		3130 lb	3095 lb
Total		13700 lb	10185 lb

Department of Agricultural Engineering

Dates of Test: April 7, 1970 to April 27, 1970

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

FUEL, OIL and TIME Fuel No 2 Diesel Cetane No 50.8 (rating taken from oil company's typical inspection data) Specific gravity converted to 60°/60° 0.8319 Weight per gallon 6.926 lb Oil SAE 30 API service classification MS-DS To motor 3.368 gal Drained from motor 3.127 gal Transmission and final-drive lubricant Case TCH oil Total time engine was operated 56½ hours.

ENGINE Make Case Diesel Type 6 cylinder vertical Serial No 2312599 Crankshaft mounted lengthwise Rated rpm 1900 Bore and stroke 4½" x 5" Compression ratio 16.5 to 1 Displacement 401 cu in Cranking system 12 volt electric (two 12 volt batteries) Lubrication pressure Air cleaner dry type with replaceable pleated paper element Oil filter full flow replaceable cartridge Oil cooler radiator for transmission and hydraulic oil Fuel filter replaceable primary and secondary filter cartridges Muffler was used Cooling medium temperature control thermostat.

CHASSIS Type standard Serial No 8659024 Tread width rear 62" to 88" front 62" to 90" Wheel base 108" 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 38.4" Horizontal distance from center of rear wheel tread 0" to the right/left Hydraulic control system direct engine drive Transmission selective gear fixed ratio 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 15.0 reverse 3.4 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 163" left 163" (on concrete surface without brake) right 182" left 182" Turning space diameter (on concrete surface with brake applied) right 338" left 338" (on concrete surface without brake) right 378" left 378" 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. Seventh and eighth gears were not run as new test procedure permits only one gear above eight MPH.

We, the undersigned, certify that this is a true and correct report of official Tractor Test 1034.

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

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.

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-

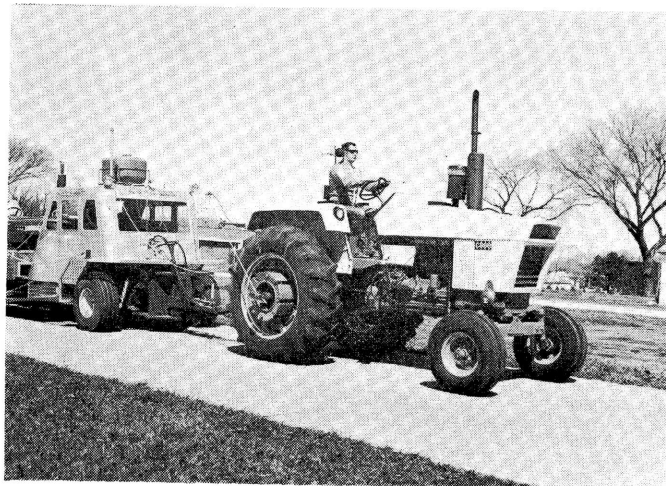
mission, etc.) on horsepower, speed and fuel consumption. These runs are made around the entire test course which has two 180 degree turns with a minimum radius of 50 feet. The drawbar pull is set at 3 different levels as follows: (1) as near to the pull at maximum power as possible and still have the 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.

Maximum Power with Ballast. Maximum power is measured on straight level sections of the test course. Data are shown for not more than 8 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.

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 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.

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



CASE 970 MANUAL DIESEL