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Test 995: Ford 4000 Diesel Select-O-Speed (Also Ford 4000 Diesel Select-O-Speed Row Crop)

Nebraska Tractor Test Lab

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NEBRASKA TRACTOR TEST 995 - FORD 4000 DIESEL SELECT-O-SPEED (ALSO FORD 4000 DIESEL SELECT-O-SPEED ROW CROP)

POWER TAKE-OFF PERFORMANCE

POWER TAKE-OFF TEST									
Hp	Crank- shaft speed rpm	Fuel Consumption		Temperature Degrees F					
		Gal per hr	Lb per hp-hr	Hp-hr per gal	Cooling medium	Air wet bulb	Air dry bulb	Barometer inches of Mercury	
MAXIMUM POWER AND FUEL CONSUMPTION									
Rated Engine Speed—Two Hours									
51.00	2200	3.511	0.475	14.53	204	57	74	28.990	
Standard Power Take-off Speed (540 rpm)—One Hour									
44.52	1810	2.926	0.453	15.22	206	57	74	28.960	
VARYING POWER AND FUEL CONSUMPTION—TWO HOURS									
46.35	2352	3.258	0.485	14.23	196	57	74	.....
0.00	2439	1.135	.....	.....	152	57	73	.....
23.57	2392	2.088	0.611	11.29	165	56	73	.....
51.00	2200	3.537	0.478	14.42	202	57	73	.....
11.92	2416	1.566	0.906	7.61	158	56	72	.....
34.89	2362	2.632	0.520	13.26	175	56	72	.....
Av	27.96	2360	2.369	0.584	11.80	175	56	73	28.950

DRAWBAR PERFORMANCE

Hp	Draw-bar pull lbs	Speed miles per hr	Crank-shaft speed rpm	Slip of drivers %	Fuel Consumption			Temp Degrees F			Barom-eter inches of Mercury
					Gal per hr	Lb per hp-hr	Hp-hr per gal	Cool-ing med	Air wet bulb	Air dry bulb	
VARYING DRAWBAR POWER AND FUEL CONSUMPTION WITH BALLAST											
Maximum Available Power—Two Hours—6th Gear											
45.88	4035	4.26	2200	7.17	3.614	0.543	12.70	169	29	30	29.155
75% of Pull at Maximum Power—Ten Hours—6th Gear											
38.06	3030	4.71	2379	5.17	3.166	0.574	12.02	201	32	37	28.992
50% of Pull at Maximum Power—Two Hours—6th Gear											
26.35	2052	4.82	2389	3.47	2.493	0.653	10.57	204	36	39	28.863
MAXIMUM POWER WITH BALLAST											
34.06	6145	2.08	2335	12.32	4th Gear			150	30	32	29.195
45.53	5292	3.23	2200	9.60	5th Gear			170	28	29	29.190
46.22	4048	4.28	2201	6.77	6th Gear			165	30	32	29.180
44.78	3377	4.97	2200	5.84	7th Gear			167	30	31	29.185
43.88	2538	6.48	2200	4.59	8th Gear			165	30	37	29.175
41.17	1447	10.67	2195	2.76	9th Gear			158	30	32	29.170
MAXIMUM PULL WITHOUT BALLAST											
36.31	4163	3.27	2348	14.94	5th Gear			193	31	34	28.990

VARYING DRAWBAR PULL AND TRAVEL SPEED WITH BALLAST—6th Gear

Pounds pull	4048	4203	4314	4377	4406	4334
Horsepower	46.22	43.06	39.09	34.63	29.81	24.30
Crankshaft speed rpm	2201	1982	1760	1538	1316	1088
Miles per hour	4.28	3.84	3.40	2.97	2.54	2.10
Slip of drivers, %	6.77	7.17	7.39	7.62	7.62	7.39

TIRES, BALLAST and WEIGHT

		With Ballast	Without Ballast
Rear tires	—No, size, ply & psi	Two 14.9-30; 6; 16	Two 14.9-30; 6; 14
	—Liquid	lb each	None
	Cast iron	1016 lb each	None
Front tires	—No, size, ply & psi	Two 7.50-16; 4; 24	Two 7.50-16; 4; 24
	—Liquid	83 lb each	None
	Cast iron	72 lb each	None
Height of drawbar		22½ inches	23 inches
Static weight with operator—Rear		6200 lb	3145 lb
	Front	2050 lb	1740 lb
	Total	8250 lb	4885 lb

Department of Agricultural Engineering

Date of Test: October 30 to November 18, 1968

Manufacturer: FORD MOTOR COMPANY, FORD TRACTOR OPERATIONS, BIRMINGHAM, MICHIGAN

FUEL, OIL and TIME Fuel No 2 Diesel Cetane No 54.3 (rating taken from oil company's typical inspection data) Specific gravity converted to 60°/60° 0.8283 Weight per gallon 6.896 lb Oil SAE 10W API service classification MS DS To motor 1.855 gal Drained from motor 1.418 gal Transmission lubricant Ford oil ESN-M2C41-A or M2C41 Final-drive lubricant Ford oil ESN-M2C53-A or M-2C53-B Total time engine was operated 49½ hours.

ENGINE Make Ford Diesel Type 3 cylinder vertical Serial No D008031 Crankshaft mounted lengthwise Rated rpm 2200 Bore and stroke 4.4" x 4.4" Compression ratio 16½ to 1 Displacement 201 cu in Cranking system 12 volt electric Lubrication pressure Air cleaner oil washed wire mesh Oil filter full flow replaceable cotton blend element Oil cooler engine coolant heat exchanger in lower radiator tank for transmission oil Fuel filter one nylon gauze element in bottom of tank and dual replaceable paper elements with water traps Muffler was used Cooling medium temperature control thermostat.

CHASSIS Type standard Serial No C209848 Tread width rear 52" to 80" front 52" to 80" Wheel base 84.5" 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 30.7" Vertical distance above roadway 29.8" 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 operator controlled full range power shifting Advertised speeds mph first 1.1 second 1.5 third 1.8 fourth 2.4 fifth 4.0 sixth 5.1 seventh 5.7 eighth 7.5 ninth 12.1 tenth 17.6 reverse 3.4 and 5.1 Clutch oil cooled multiple disc clutches within transmission hydraulically operated Brakes oil cooled multiple disc mechanically operated by two foot pedals which can be locked Steering mechanical with power assist Turning radius (on concrete surface with brake applied) right 120" left 120" (on concrete surface without brake) right 138" left 138" Turning space diameter (on concrete surface with brake applied) right 252" left 252" (on concrete surface without brake) right 291" left 291" Belt pulley 1208 rpm at 2200 engine rpm diam 10.25" face 6.5" Belt speed 3241 fpm Power take-off 537 rpm at 1800 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, second, and third gears were not run as it was necessary to limit the pull in fourth gear because of the stability formula. Tenth gear was not run because it exceeded 15 mph.

We, the undersigned, certify that this is a true and correct report of official Tractor Test 995.

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. 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.



FORD 4000 DIESEL SELECT-O-SPEED