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Test 880: Ford 5000 Select-O-Speed (Diesel)

Nebraska Tractor Test Lab

University of Nebraska-Lincoln, tractortestlab@unl.edu

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NEBRASKA TRACTOR TEST 880 - FORD 5000 SELECT-O-SPEED 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									
54.17	2100	3.537	0.451	15.32	194	55	74	28.898	
Standard Power Take-off Speed (540 rpm)—One Hour									
51.49	1901	3.224	0.433	15.97	195	56	76	28.890	
VARYING POWER AND FUEL CONSUMPTION—TWO HOURS									
48.27	2201	3.192	0.457	15.12	192	55	75	.....
0.00	2304	1.064	.....	.....	178	54	73	.....
24.74	2257	2.085	0.582	11.87	185	55	74	.....
54.34	2101	3.553	0.452	15.29	196	56	76	.....
12.47	2277	1.555	0.861	8.02	180	53	69	.....
36.79	2235	2.602	0.488	14.14	189	54	74	.....
Av	29.44	2229	2.342	0.549	12.57	187	54	73	28.897

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												
45.32	3963	4.29	2100	5.91	3.512	0.535	12.90	193	53	63	28.785	
75% of Pull at Maximum Power—Ten Hours—6th Gear												
37.28	3023	4.63	2223	4.11	2.987	0.553	12.48	182	47	52	28.806	
50% of Pull at Maximum Power—Two Hours—6th Gear												
26.30	2064	4.78	2267	2.84	2.422	0.636	10.86	180	40	41	28.825	
MAXIMUM POWER WITH BALLAST												
36.98	6973	1.99	2208	14.75	4th Gear		178	48	54	28.800		
45.70	5273	3.25	2102	8.54	5th Gear		184	50	59	28.790		
45.98	4026	4.28	2104	6.18	6th Gear		190	50	59	28.790		
44.36	3344	4.98	2099	5.11	7th Gear		189	50	59	28.790		
43.41	2514	6.48	2098	3.76	8th Gear		188	52	62	28.780		
40.61	1426	10.68	2102	2.23	9th Gear		188	52	62	28.780		
MAXIMUM POWER WITHOUT BALLAST												
44.50	4037	4.13	2103	10.73	6th Gear		183	61	68	28.360		
VARYING DRAWBAR PULL AND TRAVEL SPEED WITH BALLAST—6th Gear												
Pounds pull				4026	4240	4306	4318	4235	4149			
Horsepower				45.98	43.35	38.88	34.11	28.63	23.35			
Crankshaft Speed, rpm				2104	1889	1671	1463	1250	1039			
Miles per hour				4.28	3.83	3.39	2.96	2.54	2.11			
Slip of Drivers, %				6.18	6.49	6.61	6.73	6.49	6.37			

TIRES, BALLAST and WEIGHT

		With Ballast	Without Ballast
Rear tires	—No, size, ply & psi	Two 16.9-30; 6; 16	Two 16.9-30; 6; 16
	—Liquid	858 lb each	None
Ballast	Cast iron	935 lb each	None
Front tires	—No, size, ply & psi	Two 7.50-16; 4; 24	Two 7.50-16; 4; 24
	—Liquid	20 lb each	None
Ballast	Cast iron	None	None
Height of drawbar		21 inches	22 inches
Static weight	—Rear	7175 lb	3590 lb
	—Front	2100 lb	2060 lb
Total weight with operator		9450 lb	5825 lb

Department of Agricultural Engineering

Dates of Test: MARCH 18 TO APRIL 10, 1965

Manufacturer: FORD MOTOR COMPANY, BIRMINGHAM, MICHIGAN

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° 0.8295 Weight per gallon 6.907 lb Oil SAE 10W API service classification DS To motor 1.634 gal Drained from motor 1.118 gal Transmission lubricant Ford oil ESNM2C41-A Final drive lubricant Ford Oil ESNM2C53-A Total time engine was operated 44 hours.

ENGINE Make Ford Diesel Type 4 cylinder vertical Serial No RD002352L4 Crankshaft mounted lengthwise Rated rpm 2100 Bore and stroke 4.2" x 4.2" Compression ratio 16.5 to 1 Displacement 233 cu in Cranking system 12 volt electric Lubrication pressure Air cleaner oil washed wire mesh with centrifugal precleaner Oil filter full flow replaceable paper element Oil cooler heat exchanger in lower radiator tank for transmission oil Fuel filter one filter with replaceable nylon gauze element and one filter with replaceable paper element Muffler was used Cooling medium temperature control thermostat.

CHASSIS Type standard Serial No C100736 Tread width rear 52" to 80" front 52" to 80" Wheel base 87.50" 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 27.30" Vertical distance above roadway 32.95" Horizontal distance from center of rear wheel tread .02" to the right Hydraulic control system direct engine drive Transmission fixed ratio operator controlled full range power shifting Advertised speeds mph first 1.0 second 1.5 third 1.7 fourth 2.3 fifth 3.6 sixth 4.6 seventh 5.3 eighth 6.9 ninth 11.1 tenth 16.4 reverse 3.1 and 4.6 Clutch multiple disc wet clutches within transmission hydraulically operated Brakes wet double disc operated by two foot pedals that can be locked Steering mechanical with hydraulic power assist Turning radius (on concrete surface with brake applied) right 111" left 111" (on concrete surface without brake) right 141" left 141" Turning space diameter (on concrete surface with brake applied) right 249" left 249" (on concrete surface without brake) right 294" left 294" Belt pulley 1072 rpm at 2050 engine rpm diam 11" face 6.5" Belt speed 3087 fpm Power take-off 540 rpm at 1900 engine rpm.

REPAIRS and ADJUSTMENTS Number four fuel injector was replaced prior to the PTO runs. The electrical wiring harness and starter safety switch on transmission were replaced before completion of drawbar runs due to failure of the safety switch.

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 to avoid excessive wheel slippage. Tenth 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 880.

L. F. LARSEN

Engineer-in-Charge

G. W. STEINBRUEGGE, Chairman

J. J. SULEK

D. E. LANE

Board of Tractor Test Engineers

The University of Nebraska Agricultural Experiment Station
E. F. Frolik, Dean; H. H. Kramer, 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, $\frac{1}{2}$ 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.



Ford 5000 Select-O-Speed Diesel