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Test 823: Zetor 3011 (Diesel)

Nebraska Tractor Test Lab

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NEBRASKA TRACTOR TEST 823 - ZETOR 3011 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								
33.66	2000	2.096	0.433	16.06	195	66	75	29.102
VARYING POWER AND FUEL CONSUMPTION—TWO HOURS								
30.47	2130	1.957	0.446	15.57	189	66	76	.....
0.00	2268	0.648	.....	.....	180	66	75	.....
15.76	2204	1.291	0.569	12.21	170	66	75	.....
33.48	2000	2.086	0.433	16.05	199	66	77	.....
7.99	2233	0.972	0.845	8.22	162	66	76	.....
23.28	2170	1.594	0.476	14.60	196	66	77	.....
Av 18.50	2167	1.425	0.535	12.98	183	66	76	29.093

DRAWBAR PERFORMANCE

Hp	Draw-bar pull lbs	Speed miles per hr	Crank- shaft speed rpm	Slip of drivers %	Fuel Consumption		Temp Degrees F				Barometer 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—2nd Gear High Range											
27.53	2632	3.92	2000	9.02	2.013	0.508	13.68	191	70	76	28.780
75% of Pull at Maximum Power—Ten Hours—2nd Gear High Range											
22.67	1960	4.34	2140	5.98	1.736	0.532	13.06	183	76	83	28.773
50% of Pull at Maximum Power—Two Hours—2nd Gear High Range											
15.87	1326	4.49	2181	4.47	1.389	0.608	11.43	170	74	81	28.760
MAXIMUM POWER WITH BALLAST											
23.49	3346	2.63	2133	14.80	1st	Gear High Range	183	70	86	29.100	
25.64	2991	3.21	1999	10.73	5th	Gear Low Range	193	70	82	29.000	
27.58	2614	3.96	2001	8.29	2nd	Gear High Range	198	70	82	29.000	
27.12	1799	5.65	1999	5.76	3rd	Gear High Range	193	70	82	29.070	
26.98	1138	8.89	2002	3.66	4th	Gear High Range	185	70	82	29.070	
MAXIMUM POWER WITHOUT BALLAST											
25.68	2540	3.79	2044	14.25	2nd	Gear High Range	195	69	87	28.950	
VARYING DRAWBAR PULL AND TRAVEL SPEED WITH BALLAST											
2nd Gear High Range											
Pounds pull			2614	2796	2812	2803	2641	2549			
Horsepower			27.58	26.46	23.43	20.50	16.72	13.24			
Miles per hour			3.96	3.55	3.13	2.74	2.37	1.95			
Slip of Drivers, %			8.29	9.15	9.55	9.25	8.75	8.13			

TIRES, BALLAST and WEIGHT

		With Ballast	Without Ballast
Rear tires	—No, size, ply & psi	Two 11-28; 6; 12	Two 11-28; 6; 12
Ballast	—Liquid	273 lb each	None
	—Cast iron	321 lb each	None
Front tires	—No, size, ply & psi	Two 6.00-16; 6; 28	Two 6.00-16; 6; 20
Ballast	—Liquid	None	None
	—Cast iron	225 lb each	None
Height of drawbar		15½ inches	15½ inches
Static weight	—Rear	3510 lb	2322 lb
	—Front	1805 lb	1354 lb
Total weight with operator		5490 lb	3851 lb

Department of Agricultural Engineering
Dates of Test: July 30 to August 7, 1962
Manufacturer: ZKL-BRNO, BRNO, CZECHOSLOVAKIA
Manufacturer's Power Rating: 30 PTO HORSE-POWER

FUEL, OIL and TIME Fuel No 2 Diesel Cetane No 53.2 (rating taken from oil company's typical inspection data) Specific gravity converted to 60°/60° 0.8342 Weight per gallon 6.946 lb Oil SAE 40 API service classification MS DG To motor 1.942 gal Drained from motor 1.380 gal Transmission and final-drive lubricant SAE 40 Type engine oil Total time engine was operated 45½ hours.

ENGINE Make Zetor Diesel Type 3 cylinder vertical Serial No 7488 Crankshaft mounted lengthwise Rated rpm 2000 Bore and Stroke 3.740" x 4.331" Compression ratio 17 to 1 Displacement 142.8 cu in Cranking system 12 volt electric (two 6-volt batteries) Lubrication pressure Air cleaner oil bath with centrifugal pre-cleaner Oil filter one full flow and one by-pass filters with fine mesh screens Fuel filter two replaceable cellulose elements Muffler was used Cooling medium temperature control thermostat and radiator curtain.

CHASSIS Type Standard Serial No 6591 Tread width rear 50.20" to 70.87" front 50.20" to 70.87" Wheel base 75.51" 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 30.51" Vertical distance above roadway 26.65" Horizontal distance from center of rear wheel tread 0" to the right/left Hydraulic control system direct engine drive or transmission drive with throwout lever Transmission selective gear fixed ratio Advertised speeds mph (Low Range) first 0.693 second 1.030 third 1.438 fourth 2.205 fifth 3.690 reverse 0.906 (High Range) first 2.965 second 4.410 third 6.150 fourth 9.430 fifth 15.750 reverse 3.880 Clutch double dry disc in combination with PTO clutch operated by single foot pedal Brakes contracting band operated by hand lever and internal expanding shoe operated hydraulically by single foot pedal for both wheels or independently by use of hydraulic valve controlled by hand lever Steering no power assistance Turning radius (on concrete surface with brake applied) right 106.30" left 106.30" (on concrete surface without brake) right 125.98" left 125.98" Turning space diameter (on concrete surface with brake applied) right 220.48" left 220.48" (on concrete surface without brake) right 259.84" left 259.84" Belt pulley 1153 rpm at 2000 engine rpm diam 9.843" face 5.906" Belt speed 2974.4 fpm Power take-off 542 rpm at 2000 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.

All runs were made with hydraulic pump in operation.

First, second, third, and fourth gears low range were not run as it was necessary to limit the pull in first gear high range to avoid excessive wheel slippage. Fifth gear high range was not run as it exceeded 15 mph.

We, the undersigned, certify that this is a true and correct report of official Tractor Test 823.

FRANK M. ZOZ
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-

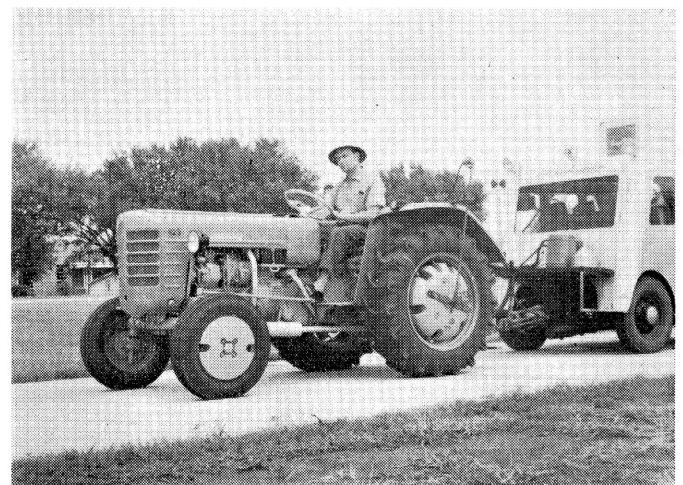
mission, etc.) on horsepower, speed and fuel consumption. These runs are made around the entire test course which has two 180 degree turns with a minimum radius of 50 feet. The drawbar pull is set at 3 different levels as follows: (1) as near to the pull at maximum power as possible and still have the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



Zetor 3011 Diesel