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## Test 866: Zetor 2011 (Diesel)

Nebraska Tractor Test Lab

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# NEBRASKA TRACTOR TEST 866 - ZETOR 2011 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									
21.20	2000	1.476	0.487	14.36	191	53	75	29.122	
VARYING POWER AND FUEL CONSUMPTION—TWO HOURS									
18.53	2057	1.288	0.486	14.39	177	53	75	.....	
0.00	2179	0.511	.....	.....	139	52	74	.....	
9.62	2137	0.863	0.627	11.15	153	53	76	.....	
21.52	2001	1.485	0.482	14.49	189	53	74	.....	
4.86	2155	0.678	0.975	7.17	147	53	74	.....	
14.27	2112	1.086	0.532	13.14	164	53	74	.....	
Av	11.47	2106	0.985	0.600	11.64	161	53	75	29.071

## 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

<b>Maximum Available Power—Two Hours—2nd Gear High Range</b>											
18.42	2035	3.39	2003	7.60	1.493	0.567	12.34	193	53	61	29.040
<b>75% of Pull at Maximum Power—Ten Hours—2nd Gear High Range</b>											
15.03	1568	3.60	2076	5.54	1.240	0.577	12.12	189	55	64	29.036
<b>50% of Pull at Maximum Power—Two Hours—2nd Gear High Range</b>											
10.82	1083	3.75	2135	4.32	1.055	0.682	10.26	180	42	43	29.095

### MAXIMUM POWER WITH BALLAST

14.34	3137	1.71	2061	14.82	4th	Gear Low Range	180	55	67	29.030
17.67	3022	2.19	2001	13.19	1st	Gear High Range	193	55	67	29.030
18.59	2410	2.89	2001	8.53	5th	Gear Low Range	180	55	67	29.030
19.04	2094	3.41	2004	7.20	2nd	Gear High Range	185	54	64	29.050
18.46	1462	4.74	2003	5.45	3rd	Gear High Range	207	55	67	29.030
17.72	861	7.72	2001	3.54	4th	Gear High Range	193	55	67	29.030
15.52	460	12.65	1998	2.06	5th	Gear High Range	190	55	66	29.030

### MAXIMUM POWER WITHOUT BALLAST

19.16	2162	3.32	2000	9.47	2nd	Gear High Range	208	49	57	28.900
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### VARYING DRAWBAR PULL AND TRAVEL SPEED WITH BALLAST 2nd Gear High Range

Pounds pull	2094	2222	2338	2368	2333	2201
Horsepower	19.04	18.01	16.76	14.88	12.57	9.90
Crankshaft Speed, rpm	2004	1796	1600	1401	1200	995
Miles per hour	3.41	3.04	2.69	2.36	2.02	1.69
Slip of drivers, %	7.20	7.65	8.36	8.36	8.36	7.65

### TIRES, BALLAST and WEIGHT

		With Ballast	Without Ballast
Rear tires	—No, size, ply & psi	Two 10-24; 6; 14	Two 10-24; 6; 12
Ballast	—Liquid	218 lb each	None
	—Cast iron	249 lb each	None
Front tires	—No, size, ply & psi	Two 5.50-16; 6; 28	Two 5.50-16; 6; 20
Ballast	—Liquid	None	None
	—Cast iron	183 lb each	None
Height of drawbar		17½ inches	17½ inches
Static weight	—Rear	3045 lb	2110 lb
	—Front	1555 lb	1190 lb
Total weight with operator		4775 lb	3475 lb

Department of Agricultural Engineering

Dates of Test: October 9 to October 19, 1964

Manufacturer: ZKL-BRNO, BRNO, CZECHO-SLOVAKIA

**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° 0.8394 Weight per gallon 6.990 lb Oil SAE 20-20W API service classification DS To motor 1.245 gal Drained from motor 1.212 gal Transmission and final-drive lubricant SAE 40 Total time engine was operated 45 hours.

**ENGINE** Make Zetor Diesel Type 2 cylinder vertical Serial No 2190 Crankshaft mounted lengthwise Rated rpm 2000 Bore and stroke 3.74" x 4.33" Compression ratio 17.9 to 1 Displacement 95.3 cu in Cranking system 12 volt electric Lubrication pressure Air cleaner oil washed 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 1621 Tread width rear 50.2" to 70.8" front 50.2" to 68" Wheel base 68.7" 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 22.4" Vertical distance above roadway 24.5" 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 0.63 second 0.92 third 1.26 fourth 2.01 fifth 3.26 reverse 0.9 (High Range) first 2.61 second 3.8 third 5.18 fourth 8.28 fifth 13.4 reverse 3.71 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 102.36" left 102.36" (on concrete surface without brake) right 125.98" left 125.98" Turning space diameter (on concrete surface with brake applied) right 212.59" left 212.59" (on concrete surface without brake) right 259.84" left 259.84" Belt pulley 975 rpm at 2000 engine rpm diam 12.3" face 4.72" Belt speed 3030 fpm Power take-off 545 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.

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

We, the undersigned, certify that this is a true and correct report of official Tractor Test 866.

L. F. LARSEN

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 2011 Diesel