

University of Nebraska - Lincoln

DigitalCommons@University of Nebraska - Lincoln

Nebraska Tractor Tests

Tractor Test and Power Museum, The Lester F. Larsen

7-5-1960

Test 748: Zetor 50 Super (Diesel)

Nebraska Tractor Test Lab

University of Nebraska-Lincoln, tractortestlab@unl.edu

Follow this and additional works at: <https://digitalcommons.unl.edu/tractormuseumlit>



Part of the [Energy Systems Commons](#), [History of Science, Technology, and Medicine Commons](#), [Other Mechanical Engineering Commons](#), [Physical Sciences and Mathematics Commons](#), [Science and Mathematics Education Commons](#), and the [United States History Commons](#)

Nebraska Tractor Test Lab, "Test 748: Zetor 50 Super (Diesel)" (1960). *Nebraska Tractor Tests*. 1169.
<https://digitalcommons.unl.edu/tractormuseumlit/1169>

This Article is brought to you for free and open access by the Tractor Test and Power Museum, The Lester F. Larsen at DigitalCommons@University of Nebraska - Lincoln. It has been accepted for inclusion in Nebraska Tractor Tests by an authorized administrator of DigitalCommons@University of Nebraska - Lincoln.

NEBRASKA TRACTOR TEST 748 - ZETOR 50 SUPER DIESEL

The University of Nebraska Agricultural Experiment Station

E. F. Frolik, Director; Lincoln, Nebraska

POWER TAKE-OFF PERFORMANCE

Hp	Crank shaft speed rpm	Fuel Consumption		Hp-hr per gal	Temp Degrees F			Barometer inches of mercury
		Gal per hr	Lb per hp-hr		Cool- ing med	Air wet bulb	Air dry bulb	
MAXIMUM POWER AND FUEL CONSUMPTION								
Rated Engine Speed—Two Hours								
49.47	1650	3.147	0.446	15.72	199	65	75	29.257
Standard Power Take-off Speed (540 rpm)—One Hour								
47.80	1555	2.979	0.437	16.05	200	67	78	29.265
VARYING POWER AND FUEL CONSUMPTION—TWO HOURS								
43.60	1713	2.692	0.433	16.20	179	67	78	.....
0.00	1799	0.835	.....	.....	160	68	78	.....
22.42	1762	1.720	0.538	13.03	165	68	80	.....
50.60	1650	3.150	0.436	16.06	199	67	80	.....
11.35	1780	1.267	0.782	8.96	159	68	81	.....
33.26	1739	2.178	0.459	15.27	173	68	82	.....
Av 26.87	1740	1.974	0.515	13.61	172	68	80	29.265

DRAWBAR PERFORMANCE

Hp	Draw-bar pull lbs	Speed miles per hr	Crank shaft speed rpm	Slip of drivers %	Fuel Consumption		Hp-hr per gal	Temperature Degrees F			Barometer inches of mercury
					Gal per hr	Lb hp hr		Cooling medium	Air wet bulb	Air dry bulb	
VARYING DRAWBAR POWER AND FUEL CONSUMPTION WITH BALLAST											
Maximum Available Power—Two Hours—5th Gear											
43.98	4361	3.78	1651	7.60	3.265	0.520	13.47	197	74	83	28.915
75% of Pull at Maximum Power—Ten Hours—5th Gear											
35.07	3278	4.01	1710	5.35	2.454	0.491	14.29	197	68	79	29.056
50% of Pull at Maximum Power—Two Hours—5th Gear											
24.20	2177	4.17	1746	3.70	1.826	0.529	13.25	193	63	69	29.153
MAXIMUM POWER WITH BALLAST											
37.55	6723	2.09	1696	14.69	3rd Gear	.....	.....	193	65	76	29.145
42.08	6125	2.58	1647	12.48	4th Gear	.....	.....	198	73	80	28.910
44.25	4389	3.78	1649	7.45	5th Gear	.....	.....	197	72	79	28.900
44.76	3139	5.35	1650	5.34	6th Gear	.....	.....	201	72	79	28.900
43.58	1726	9.47	1652	3.38	7th Gear	.....	.....	195	73	80	28.910
MAXIMUM POWER WITHOUT BALLAST											
40.36	4165	3.63	1700	14.76	5th Gear	.....	.....	194	68	86	29.040
VARYING DRAWBAR PULL AND TRAVEL SPEED WITH BALLAST—5th Gear											
Pounds pull			4400	4500	4700	4700	4650	4450			
Horsepower			44.3	40.8	37.6	32.6	28.5	22.5			
Miles per hour			3.8	3.4	3.0	2.6	2.3	1.9			

Department of Agricultural Engineering

Dates of Test: July 5 to July 16, 1960

Manufacturer: ZAVODY JANA SVERMY, n.p., BRNO, CZECHOSLOVAKIA

Manufacturer's Power Rating: 48 Belt Horsepower

FUEL, OIL and TIME Fuel No 2 Diesel Cetane No 50 (ratings taken from oil company's typical inspection data) Specific gravity converted to 60°/60° 0.8419 Weight per gallon 7.010 lb Oil SAE 30 API service classification DS To motor 3.010 gal Drained from motor 2.694 gal Transmission and final-drive lubricant SAE 90 Type transmission oil Total time engine was operated 52 hours.

ENGINE Make Zetor Diesel Type 4 cylinder vertical Serial No 0-105-01917 Crankshaft mounted lengthwise Rated rpm 1650 Bore and stroke 4.134" x 4.724" Compression ratio 15.6 to 1 Displacement 254 cu in Cranking system 12 volt electrical Lubrication pressure Air cleaner oil bath with cyclone pre-filter Oil filter one strainer and one replaceable paper element Fuel filter strainer in fuel tank, two replaceable paper elements, sediment bowl and edge filter Muffler was used Cooling medium temperature control thermostat and radiator curtain.

CHASSIS Type standard Serial No 0-105-02188 Tread width rear 54.3" to 71.6" front 50.4" to 68.1" Wheel base 86.6" 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 33.4" Vertical distance above roadway 33" Horizontal distance from center of rear wheel tread 0" to the right/left Hydraulic control system constant running-transmission driven which can be disconnected Transmission selective gear fixed-ratio Advertised speeds mph first 0.73 second 1.40 third 2.44 fourth 2.90 fifth 4.18 sixth 5.54 seventh 9.63 eighth 16.5 reverse 0.73 and 2.90 Clutch double dry disc in combination with pto operated by single foot pedal Brakes external contracting bands operated by hand lever or independently by two foot pedals that can be locked together Steering no power assistance Turning radius (on concrete surface with brake applied) right 120" left 120" (on concrete surface without brake) right 156" left 156" Turning space diameter (on concrete surface with brake applied) right 240" left 240" (on concrete surface without brake) right 312" left 312" Belt pulley 1206 rpm at 1650 engine rpm diam 9.8" face 6.3" Belt speed 3100 fpm Power take-off 540 rpm at 1560 engine rpm.

REPAIRS AND ADJUSTMENTS During drawbar runs the valve stems in the rear tires failed. Repairs were made and test continued.

REMARKS All test results were determined from observed data obtained in accordance with the SAE and ASAE test code.

First and second gears were not run as it was necessary to limit the pull in third gear to avoid excessive slippage. Eighth gear was not run as it was over 15 mph.

We, the undersigned, certify that this is a true and correct report of official Tractor Test 748.

L. F. LARSEN
Engineer-in-Charge

L. W. HURLBUT, Chairman
G. W. STEINBRUEGGE
J. J. SULEK
Board of Tractor
Test Engineers

TIRES, BALLAST and WEIGHT

		With Ballast	Without Ballast
Rear tires	—No, size, ply & psi	Two 14-28;8;16	Two 14-28;8;16
	—Liquid	744 lb each	None
	—Cast iron	950 lb each	None
Front tires	—No, size, ply & psi	Two 6.50-20;6;28	Two 6.50-20;6;28
	—Liquid	None	None
	—Cast iron	None	None
Height of drawbar		22 1/2 inches	23 inches
Static weight	—Rear	7330 lb	3942 lb
	—Front	2300 lb	2304 lb
Total weight with operator		9805 lb	6421 lb

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 transmissions, 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 50 Super Diesel