

University of Nebraska - Lincoln

DigitalCommons@University of Nebraska - Lincoln

Nebraska Tractor Tests

Tractor Test and Power Museum, The Lester F. Larsen

1-1-1973

Test 1139: Belarus MTZ 80 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 1139: Belarus MTZ 80 Diesel" (1973). *Nebraska Tractor Tests*. 1462.
<https://digitalcommons.unl.edu/tractormuseumlit/1462>

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 1139 – BELARUS MTZ 80 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								
74.79	Rated Engine Speed—Two Hours (PTO Speed—1020 rpm)							
	2200	4.875	0.453	15.34	200	74	82	28.873
73.88	Standard Power Take-off Speed (1000 rpm)—One Hour							
	2157	4.828	0.454	15.30	200	74	82	28.880
VARYING POWER AND FUEL CONSUMPTION—Two Hours								
66.31	2292	4.328	0.453	15.32	194	78	88	.....
0.00	2356	1.326	.....	.....	140	77	86	.....
33.90	2344	2.670	0.547	12.70	153	78	88	.....
73.71	2201	4.864	0.458	15.15	203	79	91	.....
16.90	2356	1.810	0.744	9.34	167	80	94	.....
50.26	2324	3.447	0.476	14.58	185	81	97	.....
Av 40.18	2312	3.074	0.531	13.07	175	79	90	28.853

DRAWBAR PERFORMANCE

Hp	Draw- bar pull lbs	Speed miles per hr	Crank- shaft speed rpm	Slip of drivers %	Fuel Consumption		Hp-hr per gal	Temp Cool- ing med	Degrees F		Barometer inches of Mercury
					Gal per hr	Lb per hp-hr			Air wet bulb	Air dry bulb	
VARYING DRAWBAR POWER AND FUEL CONSUMPTION WITH BALLAST											
Maximum Available Power—Two Hours 9th Gear (4H)											
62.34	4592	5.09	2202	5.61	4.752	0.529	13.12	202	76	83	28.660
75% of Pull at Maximum Power—Ten Hours 9th Gear (4H)											
52.70	3670	5.39	2299	4.39	4.017	0.529	13.12	180	74	80	28.730
50% of Pull at Maximum Power—Two Hours 9th Gear (4H)											
34.83	2353	5.55	2342	3.20	3.078	0.614	11.32	166	72	76	28.740
50% of Pull at Reduced Engine Speed—Two Hours 14th Gear (8L)											
34.72	2353	5.53	1529	3.13	2.538	0.508	13.68	170	66	74	28.900

MAXIMUM POWER WITH BALLAST

52.28	8141	2.41	2315	11.27	4th Gear (2H)	178	77	85	28.670
63.40	5825	4.08	2202	7.02	7th Gear (3H)	201	77	85	28.700
55.64	4843	5.08	2203	5.80	9th Gear (4H)	187	72	78	28.780
64.60	3983	6.08	2200	4.69	11th Gear (5H)	199	77	85	28.700
65.49	3421	7.18	2202	4.02	13th Gear (6H)	198	77	86	28.690
64.34	2716	8.88	2200	3.06	15th Gear (7H)	192	77	86	28.690

VARYING DRAWBAR PULL AND TRAVEL SPEED WITH BALLAST 9th Gear (4H)

Pounds Pull	4843	5096	5247	5306	5281	5110
Horsepower	65.64	61.67	56.70	50.60	42.27	34.77
Crankshaft Speed rpm	2203	1974	1767	1560	1311	1111
Miles Per Hour	5.08	4.54	4.05	3.58	3.00	2.55
Slip of Drivers %	5.80	6.19	6.45	6.45	6.58	6.32

TRACTOR SOUND LEVEL (with cab)

	dB (A)
Maximum Available Power 2 Hours	86.5
75% of Pull at Max. Power 10 Hours	86.5
50% of Pull at Max. Power 2 Hours	86.5
50% of Pull at Reduced Engine Speed 2 Hours	84.5
Bystander 18th Gear (9H)	88.0

TIRES, BALLAST AND WEIGHT

	With Ballast	Without Ballast
Rear Tires	—No., size, ply & psi	Two 15-30;6;16
Ballast	—Liquid	865 lb each
	—Cast Iron	708 lb each
Front Tires	—No., size, ply & psi	Two 7.50-20;6;28
Ballast	—Liquid	None
	—Cast Iron	295 lb each
Height of drawbar	24 inches	24½ inches
Static weight with operator—Rear	8525 lb	5380 lb
	Front	2460 lb
	Total	11575 lb
		7840 lb

G. W. STEINBRUEGGE, Chairman, W. E. SPLINTER, D. E. LANE, Board of Tractor Test Engineers

Department of Agricultural Engineering

Dates of Test: August 28th to September 4, 1973

Manufacturer: MINSK TRACTOR PLANT, MINSK, USSR

FUEL, OIL AND TIME Fuel No 2 Diesel Cetane No 50.1 (rating taken from oil company's typical inspection data) Specific gravity converted to 60°/60° 0.8341 Weight per gallon 6.945 lb Oil SAE 30 API service classification CC and SC To motor 3.488 gal Drained from motor 2.700 gal Transmission and final drive lubricant SAE 40 Total time engine was operated 50½ hours.

ENGINE Make MTZ Type 4 cylinder vertical Serial No 390 Crankshaft Mounted lengthwise Rated rpm 2200 Bore and stroke 4.331" x 4.921" Compression ratio 16 to 1 Displacement 288.7 cu in Cranking system 12 volt electric Lubrication pressure Air cleaner oil washed nylon mesh with precleaner Air compressor direct engine drive with throwout lever (not engaged during test) Oil filter centrifugal Oil cooler radiator for crankcase oil Fuel filter three paper elements in parallel, sediment bowl and strainer Muffler was used Cooling medium temperature control thermostat and shutter.

CHASSIS Type standard Serial No 482 Tread width rear 53.2" to 73" front 47.7" to 71" Wheel base 93.5" 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 33.8" Vertical distance above roadway 34.1" Horizontal distance from center of rear wheel tread 0" to the right/left Hydraulic control system direct engine drive with throwout lever (engaged during test) Transmission selective gear fixed ratio Advertised speeds mph first 1.2 second 1.6 third 2.0 fourth 2.7 fifth 3.4 sixth 4.2 seventh 4.5 eighth 5.0 ninth 5.5 tenth 5.8 eleventh 6.6 twelfth 7.1 thirteenth 7.7 fourteenth 8.5 fifteenth 9.4 sixteenth 11.2 seventeenth 15.7 eighteenth 23.9 reverse 2.5, 3.3, 4.2 & 5.6 Clutch single plate dry disc operated by foot pedal Differential lock automatic hydraulic actuation (not engaged during test) Brakes double disc operated by two foot pedals which can be locked together Steering hydraulic power assist Turning radius (on concrete surface with brake applied) right 162.2" left 139.6" (on concrete surface without brake) right 224.0" left 177.4" Turning space diameter (on concrete surface with brake applied) right 334.4" left 288.5" (on concrete surface without brake) right 456.8" left 366.7" Belt pulley 935 rpm at 2200 engine rpm diam 11.81" face 7.9" Belt speed 2890 fpm Power take-off 548 rpm at 2100 engine rpm or 1013 at 2100 engine rpm.

REPAIRS and ADJUSTMENTS No repairs or adjustment were made.

REMARKS All test results were determined from observed data obtained in accordance with SAE and ASAE test code or official Nebraska test procedure

First, second and third gears were not run as it was necessary to limit the pull in fourth gear because of the tire tangential pull limit.

Fifth, sixth, eighth, tenth, twelfth, fourteenth, sixteenth, seventeenth and eighteenth gears were not run as test procedure requires only six travel speeds.

During the varying load run the power take-off became disengaged. After re-engagement the test continued.

We, the undersigned, certify that this is a true and correct report of official Tractor Test 1139.

L. F. LARSEN

Engineer-in-Charge

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. Prior to the maximum power run the tire tread-bar height must be at least 65% of new tread height.

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 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.

Varying Power and Fuel Consumption With Ballast. The varying power runs are made to show the effects 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 4 different runs 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; (3) 50% of the pull at maximum power; and (4) maintaining the same load and travel speed as in (3) by shifting to a higher gear and reducing the engine rpm.

Maximum Power with Ballast. Maximum power is measured on straight level sections of the test course. Data are shown for not more than 6 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 manufacturer's representative has the option of selecting one gear or speed over eight miles per hour. 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.

Varying Drawbar Pull 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.

SOUND MEASUREMENT

Sound is recorded during each of the Varying Power and Fuel Consumption runs as the tractor travels on a straight section of the test course. The dB(A) sound level is obtained with the microphone located near the right ear of the operator. Bystander sound readings are taken with the microphone placed 25 feet from the line of travel of the tractor.

An increase of 10 dB(A) will approximately double the loudness to the human ear.

For additional information about the **Nebraska Tractor Tests** write to the **Department of Agricultural Engineering, University of Nebraska, Lincoln, Nebraska 68503.**



BELARUS MTZ 80 DIESEL