1-1-1990

Test 1638: Belarus 420A and 400A Diesel 11-Speed

Nebraska Tractor Test Lab
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NEBRASKA TRACTOR TEST 1638—BELARUS 420A DIESEL (ALSO BELARUS 400A DIESEL) 11 SPEED

POWER TAKE-OFF PERFORMANCE

Power Hp (kW)	Crank shaft speed rpm	Fuel Consumption gal/hr (l/h)	lb/hp.hr (kg/kW.h)	Hp.hr/gal (kW.h/l)	Temperature °F (°C) Cooling medium	Air wet bulb	Air dry bulb	Barometer inch Hg (kPa)
MAXIMUM POWER AND FUEL CONSUMPTION								
Rated Engine Speed — Two hours (PTO Speed — 540 rpm)								
50.68	1800	3.110	0.429	16.30	185	62	74	28.83
(37.79)		*(11.772)*	*(0.261)*	*(3.21)*	*(85)*	*(17)*	*(24)*	*(97.63)*
VARYING POWER AND FUEL CONSUMPTION — Two Hours								
44.10	1843	2.725	0.432	16.18	177	62	75	.....
(32.88)		*(10.315)*	*(0.263)*	*(3.19)*	*(81)*	*(17)*	*(24)*	.....
.....	1898	1.038	.....	.....	143	62	74	.....
.....		*(3.931)*	.....	.....	*(61)*	*(17)*	*(23)*	.....
22.41	1872	1.592	0.497	14.08	151	62	75	.....
(16.71)		*(6.027)*	*(0.302)*	*(2.77)*	*(66)*	*(17)*	*(24)*	.....
51.15	1800	3.098	0.423	16.51	178	62	75	.....
(38.14)		*(11.728)*	*(0.258)*	*(3.25)*	*(81)*	*(17)*	*(24)*	.....
11.28	1888	1.395	0.864	8.09	152	62	75	.....
(8.41)		*(5.279)*	*(0.526)*	*(1.59)*	*(67)*	*(17)*	*(24)*	.....
33.37	1860	2.111	0.442	15.80	158	62	75	.....
(24.88)		*(7.992)*	*(0.269)*	*(3.11)*	*(70)*	*(17)*	*(24)*	.....
Av 27.15	**1860**	**1.993**	**0.513**	**13.62**	**160**	**62**	**75**	**28.83**
Av (20.25)		***(7.545)***	***(0.312)***	***(2.68)***	***(71)***	***(17)***	***(24)***	***(97.64)***

DRAWBAR PERFORMANCE (Front Wheel Drive Engaged)

Power Hp (kW)	Drawbar pull lbs (kN)	Speed mph (km/h)	Crank-shaft speed rpm	Slip %	Fuel Consumption gal/hr (l/h)	lb/hp.hr (kg/kW.h)	Hp.hr/gal (kW.h/l)	Temp. °F (°C) Cool-ing med	Air wet bulb	Air dry bulb	Barom. inch Hg (kPa)
Maximum Available Power — Two Hours 6th (1) Gear											
43.73	4303	3.81	1798	5.20	3.111	0.497	14.06	196	60	73	28.83
(32.61)	*(19.14)*	*(6.13)*			*(11.777)*	*(0.303)*	*(2.77)*	*(91)*	*(15)*	*(23)*	*(97.63)*
75% of Pull at Maximum Power — Ten Hours 6th (1) Gear											
34.92	3299	3.97	1845	3.76	2.575	0.515	13.56	165	51	65	29.00
(26.04)	*(14.67)*	*(6.39)*			*(9.746)*	*(0.314)*	*(2.67)*	*(74)*	*(10)*	*(18)*	*(98.20)*
50% of Pull at Maximum Power — Two Hours 6th (1) Gear											
23.75	2200	4.05	1864	2.92	2.017	0.594	11.77	146	53	60	28.78
(17.71)	*(9.79)*	*(6.52)*			*(7.635)*	*(0.361)*	*(2.32)*	*(63)*	*(12)*	*(16)*	*(97.44)*
50% of Pull at Reduced Engine Speed — Two Hours 8th (3) Gear											
23.78	2199	4.06	1212	2.88	1.674	0.492	14.21	185	64	79	28.77
(17.74)	*(9.78)*	*(6.53)*			*(6.335)*	*(0.299)*	*(2.80)*	*(85)*	*(18)*	*(26)*	*(97.43)*
MAXIMUM POWER IN SELECTED GEARS											
37.66	7435	1.90	1828	14.37	3rd (RR) Gear			164	55	64	28.85
(28.09)	*(33.07)*	*(3.06)*						*(73)*	*(13)*	*(18)*	*(97.70)*
12.31	2018	2.29	1877	2.67	4th (3R) Gear			148	57	67	28.85
(9.18)	*(8.98)*	*(3.68)*						*(64)*	*(14)*	*(19)*	*(97.70)*
14.32	2012	2.67	1874	2.67	5th (4R) Gear			147	58	69	28.84
(10.68)	*(8.95)*	*(4.30)*						*(64)*	*(14)*	*(21)*	*(97.66)*
44.91	4399	3.83	1800	4.79	6th (1) Gear			172	53	61	28.75
(33.49)	*(19.57)*	*(6.16)*						*(78)*	*(12)*	*(16)*	*(97.36)*
44.51	3288	5.08	1801	3.46	7th (2) Gear			169	53	61	28.74
(33.19)	*(14.62)*	*(8.17)*						*(76)*	*(12)*	*(16)*	*(97.33)*
43.71	2729	6.01	1800	3.03	8th (3) Gear			171	52	60	28.73
(32.60)	*(12.14)*	*(9.67)*						*(77)*	*(11)*	*(16)*	*(97.29)*
43.31	2306	7.05	1798	2.52	9th (4) Gear			170	51	59	28.72
(32.30)	*(10.26)*	*(11.34)*						*(76)*	*(11)*	*(15)*	*(97.26)*

Department of Biological Systems Engineering

Dates of Test: May 11-21, 1990

Manufacturer: LIPETSK TRACTOR PLANT, Lipetsk, USSR

FUEL, OIL AND TIME: Fuel No. 2 Diesel **Cetane No.** 53.9 (rating taken from oil company's inspection data) **Specific gravity converted to 60/60°F** *(15/15°C)* 0.8396 **Fuel weight** 6.991 lbs/gal *(0.838 kg/l)* **Oil SAE** 30 **API service classification** SE, SF, CC, CD **To motor** 2.427 gal *(9.188 l)* **Drained from motor** 1.974 gal *(7.472 l)* **Transmission and final drive lubricant** SAE 90 Gear Lube **Hydraulic lubricant** SAE 30 **Total time engine was operated** 41.5 hours.

ENGINE: Make Belarus Diesel **Model** D144-28 **Type** four cylinder vertical **Serial No.** 2593507 **Crankshaft** lengthwise **Rated rpm** 1800 **Bore and stroke** (as specified) 4.134″ × 4.724″ *(105 mm × 120 mm)* **Compression ratio** 16.5 to 1 **Displacement** 254 cu in *(4150 ml)* **Starting system** 12 volt **Lubrication** pressure **Air cleaner** oil bath and pre-cleaner **Oil filter** full flow centrifugal **Oil cooler** radiator for crankcase oil **Fuel filter** one cleanable screen and one paper element **Muffler** vertical **Cooling medium temperature control** air cooled.

ENGINE OPERATING PARAMETERS: Fuel rate maximum 22.7 lb/h *(10.3 kg/h)* **High idle** not to exceed 1950 rpm.

CHASSIS: Type front wheel assist **Serial No.** 441662 **Tread width** rear 54.1″ *(1375 mm)* to 72.4″ *(1840 mm)* front 53.1″ *(1350 mm)* to 71.1″ *(1805 mm)* **Wheel base** 88.6″ *(2250 mm)* **Center of gravity** (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from centerline of rear wheels 31.5″ *(800 mm)* Vertical distance above roadway 33.1″ *(840 mm)* Horizontal distance from center of rear wheel tread 0″ *(0 mm)* to the right/left **Hydraulic control system** direct engine drive with throwout lever (engaged during test) **Transmission** selective gear fixed ratio **Advertised speeds mph** ***(km/h)*** first 1.5 *(2.3)* second 1.9 *(3.1)* third 2.2 *(3.5)* fourth 2.3 *(3.6)* fifth 2.6 *(4.2)* sixth 4.0 *(6.4)* seventh 5.3 *(8.4)* eighth 6.2 *(9.9)* ninth 7.2 *(11.6)* tenth 10.9 *(17.5)* eleventh 15.4 *(24.8)* reverse 0.8 *(1.3)*, 2.2 *(3.5)*, 4.0*(6.4)*, 5.3 *(8.4)*, 6.2 *(9.9)*, 7.2 *(11.6)*, 10.9 *(17.5)*, 15.4 *(24.8)* **Clutch** single dry disc operated by foot pedal **Brakes** dry band operated by two foot pedals which can be locked together **Steering** power assist **Turning radius** (on concrete surface with brake applied) right 173″ *(4.39 m)* left 167″ *(4.24 m)*(on concrete surface without brake) right 211″ *(5.36 m)* left 198″ *(5.03 m)* **Turning space diameter** (on concrete surface

LUGGING ABILITY IN 6th (1) GEAR

Crankshaft Speed rpm	1800	1621	1433	1258	1072	899
Pull—lbs *(kN)*	4399 *(19.57)*	4693 *(20.88)*	5134 *(22.84)*	5195 *(23.11)*	5170 *(23.00)*	5019 *(22.33)*
Increase in Pull %	0	7	17	18	18	14
Power—Hp *(kW)*	44.91 *(33.49)*	42.94 *(32.02)*	41.24 *(30.75)*	36.57 *(27.27)*	31.05 *(23.15)*	25.31 *(18.87)*
Speed—Mph *(km/h)*	3.83 *(6.16)*	3.43 *(5.52)*	3.01 *(4.85)*	2.64 *(4.25)*	2.25 *(3.62)*	1.89 *(3.04)*
Slip %	4.79	5.34	5.88	6.02	6.02	5.75

TRACTOR SOUND LEVEL WITH OUT CAB	Front Wheel Drive Disengaged dB(A)	Engaged dB(A)
Maximum Available Power—Two Hours	98.0	98.0
75% of Pull at Maximum Power—Ten Hours		97.5
50% of Pull at Maximum Power—Two Hours		96.5
50% of Pull at Reduced Engine Speed—Two Hours		93.0
Bystander in 11th (6) gear		88.0

DRAWBAR PERFORMANCE
(Front Wheel Drive Disengaged)

Power Hp *(kW)*	Drawbar pull lbs *(kN)*	Speed mph *(km/h)*	Crank-shaft speed rpm	Slip %	Fuel Consumption gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Temp. °F *(°C)* Cool-ing med	Air wet bulb	Air dry bulb	Barom. inch Hg *(kPa)*
Maximum Available Power — Two hours 6th (1) Gear											
44.25 *(32.99)*	4345 *(19.33)*	3.82 *(6.15)*	1798	5.01	3.104 *(11.750)*	0.490 *(0.298)*	14.26 *(2.81)*	174 *(79)*	53 *(12)*	61 *(16)*	28.78 *(97.44)*
MAXIMUM POWER IN SELECTED GEARS											
32.48 *(24.22)*	6321 *(28.11)*	1.93 *(3.10)*	1841	13.75	3rd (RR) Gear			157 *(69)*	53 *(12)*	61 *(16)*	28.86 *(97.73)*
44.93 *(33.50)*	4413 *(19.63)*	3.82 *(6.14)*	1798	5.01	6th (1) Gear			179 *(81)*	52 *(11)*	60 *(16)*	28.78 *(97.46)*

OPTIONAL TESTS
(Hydraulic pump disengaged)

POWER TAKE-OFF PERFORMANCE

Power HP *(kW)*	Crank shaft speed rpm	Fuel Consumption gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Temperature °F *(C°)* Cooling medium	Air wet bulb	Air dry bulb	Barometer inch Hg *(kPa)*
MAXIMUM POWER AND FUEL CONSUMPTION								
Rated Engine Speed — Two Hours (PTO speed — 540 rpm)								
52.67 *(39.28)*	1800	3.148 *(11.918)*	0.418 *(0.254)*	16.73 *(3.30)*	187 *(86)*	61 *(16)*	75 *(24)*	28.83 *(97.62)*

TIRES, BALLAST AND WEIGHT		With Ballast	Without Ballast
Rear Tires	—No., size, ply & psi *(kPa)*	Two 13.6R38; 6; 18 *(125)*	Two 13.6R38; 6; 18 *(125)*
Ballast	—Liquid (each)	570 lb *(259 kg)*	None
	—Cast Iron (each)	None	None
Front Tires	—No., size, ply & psi *(kPa)*	Two 8.3-20; 8; 35 *(240)*	Two 8.3-20; 8; 35 *(240)*
Ballast	—Liquid (each)	None	None
	—Cast Iron (each)	None	None
Height of Drawbar		15.5 in *(395 mm)*	15.5 in *(395 mm)*
Static Weight with Operator	—Rear	5840 lb *(2649 kg)*	4700 lb *(2132 kg)*
	—Front	2825 lb *(1281 kg)*	2825 lb *(1281 kg)*
	—Total	8665 lb *(3930 kg)*	7525 lb *(3413 kg)**

with brake applied) right 354″ *(8.99 m)* left 342″ *(8.69 m)*(on concrete surface without brake) right 430″ *(10.92 m)* left 404″ *(10.26 m)* **Power take-off** 540 rpm at 1800 engine rpm **Unladen tractor mass** 6620 lb *(3003 kg)*.

REPAIRS AND ADJUSTMENTS: No repairs or adjustments.

***NOTE:** Tractor is shipped with rear weights — 320 lb *(145 kg)* and front weight package — 405 lb *(184 kg)*.

REMARKS: All test results were determined from observed data obtained in accordance with official SAE and Nebraska test procedures. For the maximum power tests, the fuel temperature at the injection pump inlet was maintained at 129 °F *(54°C)*. Seven gears were chosen between 15% slip and 10 mph *(16.1 km/h)*. The drawbar pull with the speed reducer engaged is limited by manufacturer to 2020 lb *(900 N)*. The cooling air temperature was measured in the airstream of cylinder number 4.

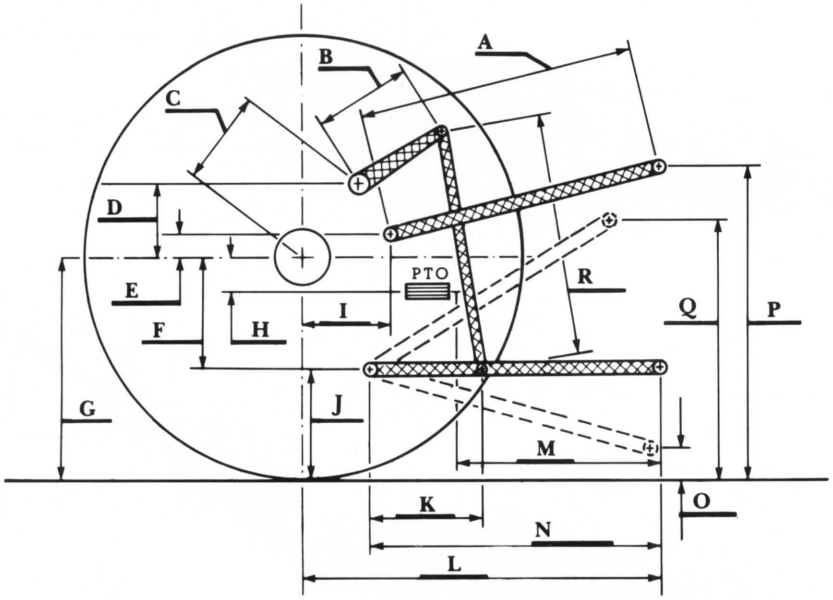
We, the undersigned, certify that this is as true and correct report of official Tractor Test No. **1638,** July, 30, 1990.

LOUIS I. LEVITICUS
Engineer-in-Charge

K. VON BARGEN
R.D. GRISSO
G.J. HOFFMAN
Board of Tractor Test Engineers

THREE POINT HITCH PERFORMANCE

Observed Maximum Pressure psi *(kPa)*	2050	*(14130)*
Location	remote outlet	
Hydraulic oil temperature °F *(°C)*	135	*(57)*
Location	hydraulic reservoir	
	Maximum Lift Capacity	
QUICK ATTACH	No	
CATEGORY	II	
LOAD lbs *(kg)*	2992	*(1357)*
TIME sec	4.92	
HITCH POINT MOVEMENT in *(mm)*		
Lowest position	12.0	*(305)*
Top of timed range	36.0	*(914)*
Highest position	36.0	*(914)*
LOAD CG MOVEMENT in *(mm)*		
Lowest position	11.0	*(279)*
Top of timed range	41.6	*(1057)*
Highest position	41.4	*(1052)*



HITCH DIMENSIONS AS TESTED—NO LOAD

	inch	*mm*
A	29.3	*743*
B	11.8	*300*
C	12.6	*320*
D	11.0	*279*
E	6.1	*156*
F	9.2	*234*
G	28.1	*714*
H	2.8	*72*
I	11.3	*287*
J	18.9	*480*
K	21.5	*547*
L	40.7	*1033*
M	21.8	*552*
N	45.0	*1143*
O	8.0	*203*
P	37.9	*963*
Q	36.3	*922*
R	20.5	*521*

Belarus 420A Diesel

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