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Test 638: Volvo Model T55 (Diesel)

Nebraska Tractor Test Lab

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Department of Agricultural Engineering
Dates of test: February 27 to March 12, 1958
Manufacturer: A-B. BOLINDER-MUNKTELL,
ESKILSTUNA, SWEDEN

Manufacturer's rating: 59 maximum drawbar horsepower and 60 maximum belt horsepower (corrected to standard conditions)

NEBRASKA TRACTOR TEST NO. 638

VOLVO T55 DIESEL

FUEL, OIL, WATER and TIME Fuel Diesel Cetane No. ASTM 52 (rating taken from oil company's typical inspection data) Weight per gallon 6.978 lb Oil SAE 20-20W To motor 2.813 gal Drained from motor 2.366 gal Water used 0.194 gal Total time motor was operated 47 hours.

CHASSIS Type Standard Serial No. 1928 Tread width rear 59½" front 52⅝" Wheel base 85.5" Hydraulic control system driven by belt from crankshaft Advertised speeds mph first 2.46 second 3.96 third 4.92 fourth 9.02 fifth 17.2 reverse 2.98 Belt pulley diam. 14 3/16" face 8½" rpm 1020 Belt speed 3794 fpm Belt flat Length 75' Width 8" Thickness 0.216" Maximum slip 0.90% Clutch single plate dry disc clutch operated by foot pedal Seat pressed steel on conical spring with shock absorber Brakes internal expanding shoe operated by two foot pedals and a hand lever Equalized by locking pedals together Power take-off conventional type Steering power steering not available.

ENGINE Make Bolinder-Munktel 1054 Diesel Type 4 cylinder vertical Serial No. 11800-4488 Crankshaft mounted lengthwise Head I Lubrication pressure Bore and stroke 4⅛" x 5⅛" Rated rpm 1800 Compression ratio 16.5 to 1 Displacement 273.6 cu. in. Valves port diameter Inlet 1.417" Exhaust 1.339" Governor pneumatic type Starting system 12 volt battery Air cleaner oil washed wire screen Muffler was used Oil filter replaceable treated paper element Fuel filter one wire screen filter and two filters with replaceable paper elements Cooling medium temperature control thermostat and curtain.

REPAIRS AND ADJUSTMENTS No repairs or adjustments.

Remarks All test results were determined from observed data and without allowances, additions or deductions. Tests B and F were made with fuel pump set to develop approximately 66 corrected maximum belt horsepower and data from these tests were used in determining the horsepower to be developed in tests D and H, respectively. Tests C, D, E, G, H, J and L were made with the same setting.

BELT HORSEPOWER TESTS

Hp	Crank shaft speed rpm	Fuel Consumption			Temp. Deg. F.			Barometer inches of mercury
		Gal per hr	Hp-hr per gal	Lb per hp-hr	Cooling medium	Air wet bulb	Air dry bulb	

TESTS B & C—100% MAXIMUM POWER—TWO HOURS

63.86	1800	3.858	16.55	0.422	165	51	67	28.957
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TEST D—RATED POWER—ONE HOUR

56.56	1801	3.372	16.77	0.416	162	49	63	28.953
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TEST E—VARYING POWER—TWO HOURS (20 minute runs; last line average)

56.49	1799	3.353	16.85	0.414	162	49	63
2.26	1891	1.032	2.19	3.186	152	48	63
29.18	1851	2.072	14.08	0.496	162	49	64
62.83	1739	3.745	16.78	0.416	167	50	65
14.87	1881	1.483	10.03	0.696	166	49	62
42.94	1819	2.653	16.19	0.431	164	49	63
34.76	1830	2.390	14.54	0.480	162	49	63	28.943

TEST L—OPERATING MAXIMUM TORQUE

% of rated rpm (engine)	100	95	90	85	80	74	70	65	60	55	49
% of rated-speed torque	100	103	104	104	106	107	108	109	109	109	108

DRAWBAR HORSEPOWER TESTS

Hp	Draw bar pull lbs	Speed miles per hr	Crank shaft speed rpm	Slip of drive wheels %	Fuel Consumption			Temp. Deg. F.			Barometer inches of mercury
					Gal per hr	Hp-hr per gal	Lb per hp-hr	Cooling med	Air wet bulb	Air dry bulb	

TEST H—RATED POWER—TEN HOURS—3rd Gear

44.58	3455	4.84	1801	4.09	2.932	15.20	0.459	174	30	32	29.183
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TESTS F & G—OPERATING MAXIMUM POWER

47.01	8022	2.20	1798	13.88	1st Gear (part throttle)			162	32	33	29.170
58.82	5850	3.77	1800	6.87	2nd Gear			160	29	32	29.030
59.35	4661	4.78	1800	5.36	3rd Gear			164	29	32	29.030
56.63	2364	8.98	1809	3.24	4th Gear			163	29	31	29.040
50.40	1091	17.32	1808	1.02	5th Gear			161	29	31	29.040

TEST J—OPERATING MAXIMUM POWER

56.65	4638	4.58	1797	10.55	3rd Gear			170	29	31	29.130
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TIRES, WHEELS AND WEIGHT

	Tests F, G, & H	Test J
Rear wheels		
Type	Cast iron	Cast iron
Liquid ballast	840 lb each	None
Added cast iron	1015 lb each	None
Rear tires		
No. and size	Two 14-34	Two 14-34
Ply	6	6
Air pressure	16 lb	16 lb
Front wheels		
Type	Pressed steel	Pressed steel
Liquid ballast	None	None
Added cast iron	100 lb each	None
Front tires		
No. and size	Two 7.50-18	Two 7.50-18
Ply	4	4
Air pressure	28 lb	28 lb
Height of drawbar	21 inches	22½ inches
Static weight		
Rear end	8260 lb	4550 lb
Front end	2596 lb	2420 lb
Total weight as tested with operator	11031 lb	7145 lb

HORSEPOWER SUMMARY

	Drawbar	Belt
1. Sea level (calculated) maximum horsepower (based on 60°F and 29.92" Hg)	59.51	66.43
2. Observed maximum horsepower (tests F and B)	59.35	63.86
3. Seventy-five per cent of calculated maximum drawbar horsepower and eighty-five per cent of calculated maximum belt horsepower (ASAE and SAE ratings)	44.63	56.47

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. 638.

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

TEST A: The manufacturer's representative operates the tractor for a minimum of 12 hours using light to heavy drawbar loads in each gear.

This serves as a period for limber up, general observation and adjustments. Adjustments that are permissible include valve tappet clearance, breaker point gap, spark plug gaps, clutch and others of a similar nature. No new parts or accessories can be installed without having mention made of it in the report.

No data are recorded during this preliminary run except the time that the engine is operated.

BELT HORSEPOWER TESTS

TEST B: The throttle valve is wide open and the belt load on the dynamometer is adjusted so that the engine is at the rated speed recommended by the manufacturer. Carburetor, ignition timing and manifold adjustments are all set for maximum engine power.

This test is designed to determine maximum belt horsepower of the tractor at rated speed and to measure fuel consumption at the maximum power on the belt.

TEST C: For tractors with carburetors the best fuel economy does not always occur when the engine develops maximum power at rated speed. Test C is intended to allow the manufacturer's representative to select a more economical fuel setting even though there is a slight loss of power. *This more practical carburetor setting is used in all later tests except test F.* The throttle valve is wide open and load adjusted to give rated rpm. Tests B and C are the same for diesel tractors which have an altogether different fuel system.

TEST D: The throttle control lever is set so that the governor will maintain rated engine speed when rated load is applied. Rated load is 85% of 100% maximum, as obtained in test B, corrected to standard conditions.

This rating is somewhat less than the maximum belt horsepower in order that the operator may have a certain amount of reserve.

TEST E:

Varying load serves to show the range of engine speeds when the engine is controlled by the governor during the following varied loads, of 20 minutes each; rated load, no load, $\frac{1}{2}$ rated load, maximum load at wide open throttle valve, $\frac{1}{4}$ and $\frac{3}{4}$ rated load.

The average result of this test shows the average power and fuel consumption. Since the average tractor is subjected to varying loads, these data serve well in predicting fuel consumption and efficiency of a tractor in general use.

TEST L: This torque test is run with wide open throttle. Loads are applied to reduce engine speed in approximately ten 5% increments. Rated speed equals 100%. The corresponding dynamometer torque is recorded as a per cent of torque at rated speed.

DRAWBAR HORSEPOWER TESTS

In all drawbar tests the pull exerted by the tractor is transmitted by a hydraulic pressure cylinder to a recording instru-

ment in the test car. When rubber tires are used, all tests are made on the concrete test course. All crawler type tractors are tested on a dirt test course which is maintained by grading, sprinkling and rolling so that it remains very nearly the same throughout the season. The same tires, wheels and weights are used for all tests except J and K.

TEST F: A drawbar test, the results of which are used to determine the rated drawbar horsepower in test H. The carburetor is set to develop maximum power as in test B. The rated gear recommended by manufacturer as flow gear is used in this test. The drawbar load is adjusted to give rated engine speed.

TEST G: Maximum drawbar horsepower is determined in each gear when the carburetor is set for fuel economy as in test C. The throttle valve is held wide open and the load is applied so that the engine runs at rated engine speed.

When operating in low gear it is not uncommon for the tractor to develop less drawbar horsepower than in rated gear because of excessive wheel slippage. When excessive wheel slippage occurs the load is reduced until slippage approaches 16%. When the load is reduced it is necessary to operate the tractor engine at part throttle and control engine speed by governor action.

TEST H: Intended to test the ability of the tractor to run continuously for 10 hours at rated drawbar horsepower and to determine the fuel consumption during that time. Rated drawbar horsepower is 75% of 100% maximum drawbar horsepower (Test F), corrected to standard conditions.

When operating at rated load the throttle control lever is set to maintain rated engine speed. This rating is less than maximum drawbar horsepower in order that the operator may have a certain amount of reserve.

TEST J: The tractor is operated in rated gear with all added weight removed. This test shows the effect of the removal of added weight on the performance of the tractor when compared with test G.

Removal of wheel weights generally increases wheel slippage and decreases drawbar horsepower.

TEST K: Similar to test J except that the smallest tires and lightest wheels offered by the manufacturer are used.

