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AUSTRALIAN TRACTOR TESTS



REPORT ON TEST No. 29

(Farmers' Edition)

ZETOR 25A DIESEL

(Tested for Motokov, Czechoslovak Export Corporation)

THIS Report is taken from the full Technical Report No. 29 of this test; test results are shown here in briefer form; fuller explanations are added. Values quoted here may be rounded out to two instead of three significant figures; to this extent the values quoted may differ slightly but not significantly from those shown in the Technical Report. Graphs of belt test performance, shown in the Technical Report, are not shown here. The Technical Report is not available in large numbers, but may be seen at the offices of the State Departments of Agriculture, the Bureau of Sugar Experiment Stations (Queensland), and the Commonwealth Department of Primary Industry.

1. THE TESTS

(1) After 12 hours of running-in, two types of tests were carried out, in order to measure the performance of the engine, as measured by the power in the belt driven by the belt pulley, and the performance of the tractor as a whole, as measured by drawbar pull, tractor speed, wheel slip, and drawbar horse-power (d.b.h.p.), with the tractor running on a bitumen test track.

The main results of these tests are given in Sections 2, 3, and 4. Other measurements and observations were made of

various features of the tractor; these are given in Section 5.

(2) *Fuel Mixture Settings.*—The engine of this tractor has only one fuel-mixture setting, at which all the tests were carried out.

(3) *Governor Control.*—The engine was under the control of the governor set to give maximum power and full throttle at rated engine speed.

(4) *Fuel.*—Distillate, Diesel Index 56, Specific Gravity 0.842; weight per Imperial gallon 8.42 lb.

The Australian Tractor Testing Committee is a joint body established by agreement between the Commonwealth, the States, and the University of Melbourne; under this agreement, the tests are carried out by the University of Melbourne. The address of the Tractor Testing Committee is: C/o. Department of Primary Industry, 301 Flinders-lane, Melbourne.

(5) *Specification*.—Engine No. 125-46071. For a brief specification of this tractor see Section 6 at the end of this report.

2. SUMMARY OF POWER OUTPUT

Table A

	At the Belt	At the Drawbar
Rated engine speed, r.p.m.	1,800	1,800
Corrected maximum power(a)	24½	22½
Rated power (b)	21 (b1)	17 (b2)

(a) Corrected maximum h.p. is calculated by a suitable formula from observed maximum h.p. corrected to 60° F. and 29.92" (sea level) barometric pressure. No correction is applied to diesel engines because there is no suitable formula; the values shown above are therefore the observed maximum powers.

(b) Engines are not expected to run indefinitely at full or maximum power output. But they can be expected to run continuously for some hours at rated output, which is less than maximum, defined as follows:—

(b1) Rated b.h.p. is defined as 85 per cent. of corrected maximum b.h.p.

(b2) Rated d.b.h.p. is defined as 75 per cent. of corrected maximum d.b.h.p.

3. BELT TESTS

The belt tests show the power (belt horse-power, b.h.p.) that the tractor may be expected to deliver when driving a machine by the belt.

Table B—Belt Test Results

As there is only one fuel setting, no mention will be made of mixture settings in this table.

	B.H.P.	En- gine Speed	Fuel	
			Gall./ hr. (c)	lb./ b.h.p. hr. (d)
1. Rated engine speed, 1,800 r.p.m.				
2. Fast idling speed about 2,140 r.p.m.				
3. Observed maximum b.h.p. rated speed	24.5	1,800	1.73	0.62
4. Corrected maximum b.h.p. rated speed (a)	24.5	No correction made for diesel engines		
5. Calculated rated load (b1)	21			
6. Test at approximately rated load	20.5	1,890	1.03	0.60
7. Average loading under governor (e)	14½	1,608	0.84	0.82
8. Equivalent engine torque at full throttle	71 ft. lb. at maximum power and rated speed			
	78 ft. lb. (maximum) at 1,100 r.p.m.			
9. Repeat of (3) above after 41 hours	23 h.p.			

(c) Fuel consumption in gallons/hour may be a simple unit, but it has no meaning unless we also quote the corresponding h.p. output.

(d) This is the "specific fuel consumption," the weight of fuel consumed per unit of energy developed by the engine; the unit of energy here is the h.p.-hour, similar to the electrical "unit," the kilowatt-hour. When this figure is least the engine is giving its best economy or efficiency. It is easy to change from column (c) to column (d) in Table B, e.g., in line 3 as follows:—

1.73 galls./hr. while developing 24.5 h.p. means $1.73 \div 24.5$ galls./b.h.p./hr. = 0.071 gall./b.h.p./hr.

0.071 gall./b.h.p./hr. x 8.42 lb./gallon for this fuel =

0.61 lb./b.h.p./hr., as shown in column (d).

(e) Line 7, Table B, represents the average performance one might expect from the engine while driving a variety of belt loads, from light to heavy. In terms of average fuel consumption, it means about 6-7 pints an hour.

4. DRAWBAR TESTS

(1) The following tables C, D, and E, show the drawbar performance of the tractor, on the bitumen test track, wearing rear tyres 11.25 x 24, carrying standard weight (1,480 lb. front, 3,650 lb. rear; total 5,130 lb.), working in the gears named in the tables. Height of drawbar 15 inches.

Drawbar tests, using reduced weight, were carried out, but are not reported here.

As there is only one fuel setting, no mention will be made of mixture settings in the following tables.

Table C.—Maximum Power, Rated (3rd) Gear

	DBHP (f)	Pull lb.	Speed m.p.h.	Wheel Slip % (g)
1. Rated engine speed, 1,800 r.p.m.				
2. Observed maximum d.b.h.p. at rated engine speed	22.6	1,700	5.0	4
3. Corrected maximum d.b.h.p. at rated engine speed (a)	22½	No correction made for diesel engines		
4. Calculated rated load (b2)	17			

Table D—Pull at Maximum d.b.h.p.

All gears, rated engine speed. See note (h).

Gear	D.B.H.P.	Pull lb.	Speed m.p.h.	Wheel Slip %
1	16	3,300	1.8	20
2	20	2,400	3.2	8
3	22½	1,700	5.0	4
4	22½	1,200	7.1	3½
5	22½	750	11.4	1½
6	Road gear, not tested			

(f) D.B.H.P. is the product of pull (lb.) and speed (m.p.h.) divided by 375.

(g) Wheel slip can be measured by noting that, in travelling a given distance, the back wheels make more turns when working under load than when running with no load on the drawbar. The difference in these revolution counts divided by the former count gives the slip as a ratio, which can be written as a percentage.

(h) These are not the maximum pulls available in the gears (i.e., not the maximum sustained pulls), but the pulls at maximum d.b. power, i.e., at full-throttle at rated engine speed.

Table E—Fuel Consumption, Various Loads, Rated (3rd) Gear

Pull lb.	Speed m.p.h.	DBHP	Per cent. of Maximum d.b.h.p.	Slip %	Fuel	
					Gall./hr.	lb./b.d.h.p. hr.
750	5.7	11	48	3	0.7	0.72
950	5.5	14	61	4	0.8	0.70
1,200†	5.3	17†	75†	5	0.9	0.66
1,500	5.2	21	92	5	1.1	0.61

† The rated drawbar load.

(2) Interpretation of Drawbar Tests.—

(i) Drawbar tests are carried out on a hard prepared surface. Most field conditions present higher resistance to the tractor's motion, so that, in the field, the maximum drawbar pulls available in any gear will usually be less than those shown in the tables.

(ii) Wheel slip may also be greater in the field; to that extent tractor speeds in miles per hour in the field will be less than those shown in the tables.

(iii) Because of (i) and (ii) above, the drawbar horse-power available in any gear in the field will usually be less than those shown in the tables.

5. OTHER OBSERVATIONS

(1) *Duration of Test.*—41 hours including running-in.

(2) *Repairs and Adjustments.*—The test tractor had been idle some six months in transit. Evidence of slight damage due to rust was noted on some parts of the injection equipment and among the stock of spares shipped with the tractor.

Before the belt tests it was found necessary to reset the sealed fuel pump to obtain optimum performance with local distillate fuel.

(3) Engine.—

Radiator water used—negligible.

Lubricating oil—type used, S.A.E. 30.

Weight to engine, 15.1 lb.

Weight from engine after tests, 13.7 lb.

(4) Tractor Weights (lb.).—

	Front	Rear	Total
Minimum weight, unballasted	1,480	3,380	4,860
Added weights	Nil	270	270
Weight, as usually supplied	1,480	3,650	5,130
Water ballast	Not recommended		
*Standard weight	1,480	3,650	5,730

* Weight used in drawbar tests. This weight less driver, was used in finding centre of gravity.

(5) Wheels and Tyres.—

Tyres	Front	Rear
Type	Rib	Open centre bar tread
Size	5.50 x 16 x 4 ply	11.25 x 24 x 6 ply
Pressure	26 p.s.i.	14 p.s.i.

(6) *Steering.*—With track widths, front 50", rear 60". Wheel base 75".

Turning circles: Without brakes, 20' L.H. 21' R.H.; with brakes, 17½' L.H., 17½' R.H.

Comment: Easy to steer under load, sensitive to steering wheel.

(7) *Centre of Gravity*, with tractor in standard weight condition with driver—1" above, 22½" forward of rear axle.

(8) *Driver's Accommodation.*—Access to seat: from back, and step at front of left rear wheel. Foot-room and support: adequate, flat floor. Comfort: spring seat, adjustable fore and aft, back rest. Accessibility to controls: clutch and brake pedals 19" apart, centre to centre, pedal treads approximately 9" below loaded seat. All controls conveniently placed and easy to operate. Foot throttle for use with road gear.

(9) *Instruments.*—Clearly marked (metric units). Indications were consistent throughout tests.

(10) *Inspection of Engine and Transmission after Test.*—After testing, the tractor was partly dismantled and inspected and found to be in a satisfactory condition.

(11) *Instruction Books.*—Owner's manual in English is adequate and well illustrated.

(12) *Tools and Spares.*—Standard accessories with each tractor include box of tools and set of spares.

G. H. VASEY,
Officer in Charge Tractor Testing.

W. F. BAILLIE,
Tractor Testing Officer.

University of Melbourne.

24th October, 1957.

6. BRIEF SPECIFICATIONS: Zetor 25A Diesel

(Based on Information Supplied by Manufacturers)

- (1) *Engine*—Zetor, Serial No. 125-46071.
4-stroke; 2 cylinders, vertical; crankshaft along tractor; indirect injection.
Bore, 4.134"; stroke, 4.724"; compression ratio, 18 : 1.
Rated speeds: Belt work 1,800 r.p.m.; drawbar work, 1,800 r.p.m.
Fuel type: Distillate.
Fuel system: 2-cylinder pump and injectors. Two filters with replaceable elements. Tank capacity, 10 gallons.
Air Cleaner: Oil bath, centrif. pre-cleaner.
Governor: Centrifugal.
Electrical system: 12-volt.
Starting: Electric glowplugs, decompressor on inlet valves.
Cooling: Water—fan, pump, thermostat, radiator blind.
Exhaust: Baffle-type muffler fitted.
Lubrication: Gauze and laminated paper filters.
- (2) *Chassis*—
4-wheel; frameless; pneumatic tyres. Wheel base, 75".
Track width: Front, 48"-60" x 6 steps; rear 47"-60" any width.
Tyre sizes: Front 5.50 x 16; rear 11.25 x 24.
Steering Gear: Single worm.
Weight: Maximum weight, 5,130 lb. (see Other Observations, part 5).
- (3) *Belt Pulley*—
Left side, rear working, anti-clockwise. Diameter 9.8"; face width 5.5". Speed (at rated engine speed), 1,230. r.p.m.

- Belt speed (at rated engine speed), 3,160 ft./min., in accordance with overseas standards (namely, 3,100 \pm 100 f.p.m.).
- (4) *Power Take-off*—
Rear, left of centre, clockwise.
Speed: 600 r.p.m., not in accordance with overseas standards (namely, 536 \pm 10 r.p.m.). At engine speed 1,600 r.p.m. P.T.O. speed would be 533.
Dimensions: 6 spline, 1 $\frac{3}{8}$ " diameter.
 - (5) *Drawbar*—
Swinging, 15", 16", 17" high, adjustable. Trailer hitch fitted 27" above ground. Linkage drawbar optional.
 - (6) *Transmission*—
Conventional gears, 3-speed and ratio change; differential lock.
Clutch: Single dry plate; 11" diam.
Gear ratios and road speeds (assuming no wheel slip) on 11.25 x 24 tyres, at rated engine speed, as advertised:—

Gear	1	2	3	4	5	6	R ₁	R ₂
Ratio	106.5	68.8	45.6	32.4	20.9	13.9	1.55	47
M.P.H.	2.3	3.5	5.3	7.5	11.7	17.6	1.6	5.2

- (7) *Hydraulics*—
Gear pump driven from P.T.O. shaft; 1,100 p.s.i. pressure.
- (8) *Three-point Linkage*—
Generally to B.S.S. 1841-1951, category 2.
- (9) *Spark Arrester*—
Muffler fitted as standard equipment.

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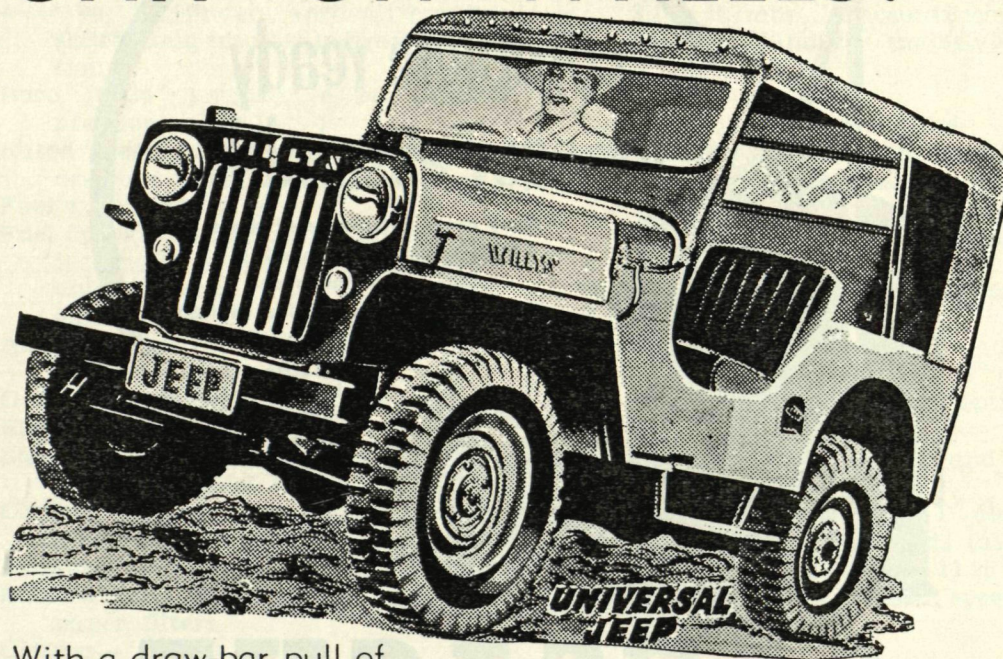
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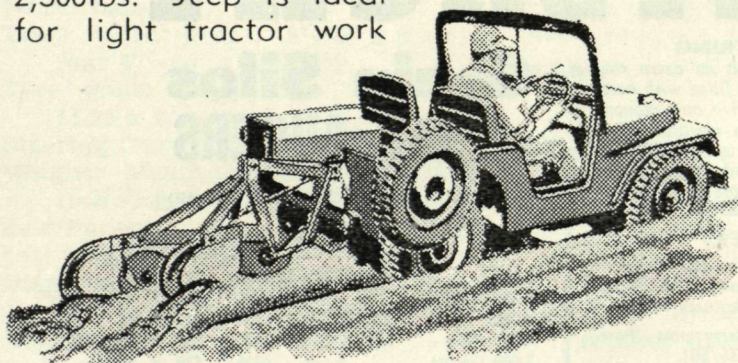
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