Australian Tractor tests— Report on test No. 28 (Farmers' edition)
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AUSTRALIAN TRACTOR TESTS

REPORT ON TEST No. 28
(Farmers' Edition)
ZETOR SUPER DIESEL
(Tested for Motokov, Czechoslovak Export Corporation)

THIS report is taken from the full Technical Report No. 28 of this test; test results are shown herein 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 twelve 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.
2. SUMMARY OF POWER OUTPUT

Table A

<table>
<thead>
<tr>
<th>At the Belt</th>
<th>At the Drawbar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated engine speed, r.p.m.</td>
<td>1,500</td>
</tr>
<tr>
<td>Corrected maximum power(a)</td>
<td>41.2</td>
</tr>
<tr>
<td>Rated power (b)</td>
<td>35 (b1)</td>
</tr>
</tbody>
</table>

(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.

<table>
<thead>
<tr>
<th>Gear</th>
<th>B.H.P.</th>
<th>Engine Speed</th>
<th>Gall./hr. (c)</th>
<th>lb./b.h.p. hr. (d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1,500</td>
<td>2.25</td>
<td>0.46</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>1,500</td>
<td>2.25</td>
<td>0.46</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1,500</td>
<td>2.25</td>
<td>0.46</td>
<td></td>
</tr>
</tbody>
</table>

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 13 x 28, carrying maximum weight (2,490 lb. front, 5,560 lb. rear; total 8,050 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

<table>
<thead>
<tr>
<th>Gear</th>
<th>DBHP (f)</th>
<th>Pull lb.</th>
<th>Speed m.p.h.</th>
<th>Wheel Slip % (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>35</td>
<td>3,100</td>
<td>4.24</td>
<td>8.1</td>
</tr>
</tbody>
</table>

Table D.—Pull at Maximum d.b.h.p.

<table>
<thead>
<tr>
<th>Gear</th>
<th>D.B.H.P.</th>
<th>Pull lb.</th>
<th>Speed m.p.h.</th>
<th>Wheel Slip %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>22</td>
<td>4,850</td>
<td>2.0</td>
<td>20</td>
</tr>
<tr>
<td>2</td>
<td>32</td>
<td>4,650</td>
<td>2.6</td>
<td>16</td>
</tr>
<tr>
<td>3</td>
<td>35</td>
<td>3,100</td>
<td>4.2</td>
<td>8</td>
</tr>
<tr>
<td>4</td>
<td>35</td>
<td>1,850</td>
<td>7.1</td>
<td>5</td>
</tr>
</tbody>
</table>

(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 (quoted in these tables to the nearest whole number).

(b) 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

<table>
<thead>
<tr>
<th>Pull lb.</th>
<th>Speed m.p.h.</th>
<th>DBHP</th>
<th>Per cent. of Max. d.b.h.p.</th>
<th>Slip %</th>
<th>Fuel Gall./hr</th>
<th>lb./d.b.h.p. hr.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,250</td>
<td>4.4</td>
<td>15</td>
<td>42</td>
<td>4</td>
<td>1.0</td>
<td>0.59</td>
</tr>
<tr>
<td>1,800</td>
<td>4.6</td>
<td>22</td>
<td>63</td>
<td>5</td>
<td>1.4</td>
<td>0.52</td>
</tr>
<tr>
<td>2,300†</td>
<td>4.5</td>
<td>29†</td>
<td>79†</td>
<td>5</td>
<td>1.6</td>
<td>0.48</td>
</tr>
<tr>
<td>2,800</td>
<td>4.4</td>
<td>32</td>
<td>93</td>
<td>7</td>
<td>1.9</td>
<td>0.50</td>
</tr>
</tbody>
</table>

† Approximately 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.**—58½ 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 fit a new set of injector nozzles. One fuel line was replaced on account of a leaking union.

(3) **Engine.**

Radiators water used—negligible.

Lubricating oil—type used, S.A.E. 30. Weight to engine, 21.9 lb.; Weight from engine after tests, 19.5 lb.

(4) **Tractor Weights (lb.)**

<table>
<thead>
<tr>
<th>Front</th>
<th>Rear</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum weight, unballasted</td>
<td>2,490</td>
<td>3,800</td>
</tr>
<tr>
<td>Added weights</td>
<td>Nil</td>
<td>1,760</td>
</tr>
<tr>
<td>Weight, as usually supplied</td>
<td>2,490</td>
<td>5,560</td>
</tr>
<tr>
<td>Water Ballast</td>
<td>Not recommended</td>
<td>2,490</td>
</tr>
</tbody>
</table>

*Standard weight | 2,490 | 5,560 | 8,050 |

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

(5) **Wheels and Tyres.**

<table>
<thead>
<tr>
<th>Tyres</th>
<th>Front</th>
<th>Rear</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Rib</td>
<td>Open centre bar tread</td>
</tr>
<tr>
<td>Size</td>
<td>6-00 x 20 x 6 ply</td>
<td>13 x 28 x 6 ply</td>
</tr>
<tr>
<td>Pressure</td>
<td>40 p.s.i.</td>
<td>14 p.s.i.</td>
</tr>
</tbody>
</table>

(6) **Steering.**—With track widths, front 50", rear 52". Wheel base 86".

Turning circles.—Without brakes, 29' L.H., 31' R.H.; with brakes, 23' L.H., 25' R.H.

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

(7) **Centre of Gravity.** With tractor in standard weight condition less driver—12" above, 2' 3" forward of rear axle.

(8) **Driver's Accommodation.**—Access to seat: from back, and step at front of each mudguard. Foot-room and support: adequate floor at two levels. Comfort: seat mounted on torsion bar with hydraulic damper, adjustable fore and aft, back rest. Accessibility to controls: clutch and brake pedals 23" apart, centre to centre, pedal treads approximately 12" 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, except that two injector needles showed slight surface blemishes—possibly rust mentioned in (2) above.

(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.

6. BRIEF SPECIFICATIONS: Zetor Super Diesel

(Based on Information Supplied by Manufacturers)

(1) **Engine**—Zetor, Serial No. 1701-6773.
   4-stroke; 4 cylinders, vertical; crankshaft along tractor; direct injection.
   Bore, 4.134"; stroke, 4.724"; compression ratio, 16.5:1.
   Rated speeds: Belt work, 1,500 r.p.m.; drawbar work, 1,500 r.p.m.
   Fuel type: Distillate.
   Fuel system: Motorpal pump and injectors. Two filters with replaceable elements. Tank capacity, 16 1/2 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: Dry sump, external oil tank, full-flow and by-pass filters.

(2) **Chassis**—
   4-wheel; frameless; pneumatic tyres.
   Wheel base, 86".
   Track width: Front, 50"-69" x 4 steps; rear 50"-69" any width.
   Tyre sizes: Front 6.00 x 20; rear 13 x 28.
   Steering Gear: Double worm.
   Weight: Maximum weight, 8,050 lb. (See Other Observations, part 5).

(3) **Belt Pulley**—
   Right side, forward working, clockwise.
   Diameter 11.8"; face width 7". Speed (at rated engine speed), 978 r.p.m.
   Belt speed (at rated engine speed), 3,030 ft./min., in accordance with overseas standards (namely, 3,100 ± 100 f.p.m.). Provision made for jockey pulley to raise belt clear of front mudguard if necessary.

(4) **Power Take-off**—
   Centre rear, clockwise rotation.
   Speed: 560 r.p.m., not in accordance with overseas standards (namely, 536 ± 10 r.p.m.). At engine speed 1,450 r.p.m. P.T.O. speed would be 543.
   Dimensions: 6 spline, 1¾" diameter.

(5) **Drawbar**—
   Swinging, 15" high, not adjustable.
   Trailer hitch fitted, adjustable 27", 29", 31" above ground.

(6) **Transmission**—
   Conventional gears, differential lock.
   Clutch: Single dry plate; 13.8" dia.
   Gear ratios and road speeds (assuming no wheel slip) on 13 x 28 tyres, at rated engine speed, as advertised:

<table>
<thead>
<tr>
<th>Gear</th>
<th>Forward</th>
<th>Reverse</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Ratio</td>
<td>94.4</td>
<td>71.8</td>
</tr>
<tr>
<td>Speed, m.p.h.</td>
<td>2.5</td>
<td>3.3</td>
</tr>
</tbody>
</table>

(7) **Hydraulics**—
   Built in, 4-cyl. pump, 2,000 p.s.i.

(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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