Australian tractor tests : Fordson farm major : report on test no. 33

G H. Vasey
W. F. Baillie

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1. THE TESTS

(1) After twelve hours of running-in, two types of test 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 Settings.—The engine of this tractor has only one fuel setting, at which all the tests were carried out.

(3) Governor Control.—The engine was under the control of the governor set to give full fuel delivery, and so full power rated engine speed. (See note 2, paragraph 5, Other Observations, below.)

(4) Fuel.—Distillate, Diesel Index 54, Specific Gravity 0.84; weight per Imperial gallon 8.41 lb.


For a brief specification of this tractor see Section 6 at the end of this report.

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.
2. SUMMARY OF POWER OUTPUT

Table A

<table>
<thead>
<tr>
<th></th>
<th>At the Belt</th>
<th>At the Drawbar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated engine speed, r.p.m.</td>
<td>1,600</td>
<td>1,600</td>
</tr>
<tr>
<td>Maximum power (a)</td>
<td>39·8</td>
<td>34·3</td>
</tr>
<tr>
<td>Rated power (b)</td>
<td>34·(b1)</td>
<td>26(b2)</td>
</tr>
</tbody>
</table>

Maximum shaft horse-power at 1,600 r.p.m.: 43.4. Note.—Letters in brackets refer to explanatory footnotes.

(a) No atmospheric corrections are 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:
1. Rated b.h.p. is defined as 85 per cent. of corrected maximum b.h.p.;
2. 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

<table>
<thead>
<tr>
<th>Gear</th>
<th>Belt Test Results</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B.H.P.</td>
</tr>
<tr>
<td>1</td>
<td>22(1)</td>
</tr>
<tr>
<td>2</td>
<td>34(1)</td>
</tr>
<tr>
<td>3</td>
<td>34</td>
</tr>
<tr>
<td>4</td>
<td>36</td>
</tr>
<tr>
<td>5</td>
<td>37</td>
</tr>
<tr>
<td>6</td>
<td>6 Road gear not tested</td>
</tr>
</tbody>
</table>

1. Rated engine speed, 1,600 r.p.m.
2. Fast idling speed, 1,790 r.p.m.
3. Observed maximum b.h.p. at rated speed
4. Corrected maximum b.h.p. at rated speed
5. Calculated rated load (b1)
6. Test at approximately rated load
7. Average loading under governor (e)
8. Measured engine torque at full fuel delivery
9. Repeat of (3) above after 57 hours

* See note 2, paragraph 5, Other Observations.

(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., as follows:

2.1 galls./hr. when developing 39·3 b.h.p. means 2.1 + 39·3 galls./b.h.p./hr. = 0.053 galls./b.h.p./hr.

(1) D.B.H.P. is the product of pull (lb.) and speed (m.p.h.) divided by 375.
(2) 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.)

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 12 x 28, carrying maximum weight (1,930 lb. front, 4,980 lb. rear; total 6,910 lb.), working in the gears named in the tables. Height of drawbar 15 inches.

Drawbar tests, using standard weight of tractor (5,400 lb.), were carried out, but are not reported here.

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

<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(1)</td>
<td>4,350</td>
<td>1-7</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>34(1)</td>
<td>4,800</td>
<td>2-6</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>34</td>
<td>4,350</td>
<td>3-0</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>36</td>
<td>4,350</td>
<td>4-3</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>37</td>
<td>2,550</td>
<td>6-2</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>6 Road gear not tested</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Rated engine speed, 1,600 r.p.m.
2. Observed maximum d.b.h.p. at rated engine speed
3. Corrected maximum d.b.h.p. at rated engine speed
4. Calculated rated load (b2)

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(1)</td>
<td>4,350</td>
<td>1-7</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>34(1)</td>
<td>4,800</td>
<td>2-6</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>34</td>
<td>4,350</td>
<td>3-0</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>36</td>
<td>4,350</td>
<td>4-3</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>37</td>
<td>2,550</td>
<td>6-2</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>6 Road gear not tested</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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.)

(1) Part throttle, maximum d.b.h.p. in first and second gears limited by wheel slip.

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

<table>
<thead>
<tr>
<th>Fuel</th>
<th>Pull lb.</th>
<th>Speed m.p.h.</th>
<th>DBHP</th>
<th>Percentage of Maximum d.b.h.p.</th>
<th>Slip %</th>
<th>Gall./hr.</th>
<th>lb./b.h.p. hr.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,700</td>
<td>3-54</td>
<td>16</td>
<td>47</td>
<td>3</td>
<td>1-2</td>
<td>0-60</td>
<td></td>
</tr>
<tr>
<td>2,300</td>
<td>3-45</td>
<td>21</td>
<td>62</td>
<td>5</td>
<td>1-4</td>
<td>0-56</td>
<td></td>
</tr>
<tr>
<td>2,800</td>
<td>3-35</td>
<td>28</td>
<td>87</td>
<td>6</td>
<td>1-6</td>
<td>0-50</td>
<td></td>
</tr>
<tr>
<td>3,650</td>
<td>3-25</td>
<td>32</td>
<td>92</td>
<td>8</td>
<td>1-8</td>
<td>0-47</td>
<td></td>
</tr>
</tbody>
</table>

† Approximately rated drawbar load.
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-powers available in any gear in the field will usually be less than those shown in the tables.

5. OTHER OBSERVATIONS

(i) Duration of Test.—57 hours, including running-in.

(2) Repairs and Adjustments.—High idle speed was reduced from recommended 1,900 r.p.m. to 1,790 r.p.m. to give maximum power at rated speed.

(3) Engine—
Fuel Settings—one, fuel pump calibration checked in accordance with specification.
Heat controls—radiator and 4-blade fan, thermostat.
Radiator water used—none.
Lubricating oil—S.A.E. 20.
Weight to engine, 16.8 lb.; Weight from engine after tests, 14.0 lb.

(4) Tractor Weights (lb.).

<table>
<thead>
<tr>
<th>Weight Condition</th>
<th>Front</th>
<th>Rear</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard, unballasted</td>
<td>1,930</td>
<td>3,470</td>
<td>5,400</td>
</tr>
<tr>
<td>Maximum weight, heaviest recommended</td>
<td>1,930</td>
<td>4,380</td>
<td>6,910</td>
</tr>
<tr>
<td>Includes—</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water ballast (lb./wheel)</td>
<td>325</td>
<td>325</td>
<td>325</td>
</tr>
<tr>
<td>Solid ballast (lb./wheel)</td>
<td>430</td>
<td>430</td>
<td>430</td>
</tr>
</tbody>
</table>

*This weight, including driver and fuel, was used in finding centre of gravity.
†Weight of tractor in drawbar tests quoted in this report.

(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 16, 6-ply</td>
<td>12 x 28, 6-ply</td>
</tr>
<tr>
<td>Pressure</td>
<td>28 psi</td>
<td>12 psi</td>
</tr>
</tbody>
</table>

6. BRIEF SPECIFICATIONS
Fordson Farm Major. (Based on Information Supplied by Manufacturers)

(1) Engine—No 1506121.
4-stroke; 4 cylinders, vertical; crankshaft along tractor; direct injection diesel.
Bore, 3.937"; stroke, 4.524"; compression ratio, 16 : 1.
Rated speeds: Belt and drawbar work, 1,600 r.p.m.
Fuel type: Distillate.
Fuel system: Simms 4-cyl. in-line pump, 4-hole spray type injectors. Two replaceable-element filters in series. Tank capacity, 15 gallons.
Air Cleaner: Oil bath, perforated metal and fibre pre-cleaner.
Governor: Pneumatic, incorporated in fuel pump.
Electrical system: 12-volt battery and generator.
Starting: Electric, cold starting.

Power Take-off—Centre rear; clockwise; guarded.
Speed (at rated engine speed) 540 r.p.m.; in accordance with overseas standards (namely, 536 ± 10 r.p.m.).
Dimensions: 6 spline, 1⅜" diameter.

Governor: Pneumatic, incorporated in fuel pump.

Electrical system: 12-volt battery and generator.
Starting: Electric, cold starting.

Cooling: Water (pressure system) fan, pump, and thermostat.
Exhaust: Vertical ahead of operator.
Standard Fordson Major Spark arrester.
Lubrication: Replaceable element filter.

(2) Chassis—
4-wheel; pneumatic tyres.
Wheel base 80".
Track widths: Front 50⅓" x 4" steps to 74⅔"; rear 58" x 4" steps to 72".
Tyre sizes: Front 6.00 x 16; rear 12 x 28.
Steering: Recirculatory ball drive.
Weight: Maximum, 6,910 lb.

(3) Belt Pulley—
R.H. side, forward working, clockwise rotation. Diameter 9½"; face width 6½". 2 speeds (at rated engine speed), high, 1,600 r.p.m.; low, 890 r.p.m.
Belt speed (at rated engine speed), high 3,560 ft./min., not in accordance with overseas standards (namely, 3,100 ± 100 f.p.m.). At 1,400 r.p.m. engine speed, belt speed would be 3,115 ft./min.

(4) Drawbar—Swinging—9 positions across. Height, adjustable, 13", 11", 9".
Linkage mounted drawbar also available.

(5) Transmission—Conventional gears.
Clutch: Single dry plate; 11" diameter.
Gear ratios and road speeds (assuming no wheel slip) on 12 x 28 tyres, at rated engine speed, as advertised.

<table>
<thead>
<tr>
<th>Gear</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>L</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ratio</td>
<td>123.0</td>
<td>87.3</td>
<td>68.4</td>
<td>48.6</td>
<td>34.8</td>
<td>10.3</td>
<td>91.1</td>
<td>50.7</td>
</tr>
<tr>
<td>Speed m.p.h.</td>
<td>1.8</td>
<td>2.6</td>
<td>3.3</td>
<td>4.6</td>
<td>6.5</td>
<td>11.6</td>
<td>2.5</td>
<td>4.4</td>
</tr>
</tbody>
</table>

(7) Hydraulics—Built-in, gear pump in rear axle.

(8) Three-point Linkage—Generally conforms to BS1841-1951, Category 2.

G. H. VASEY, Officer in Charge Tractor Testing.
W. F. BAILLIE, Tractor Testing Officer.

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- AIRMIST spraying by the concentrate method give faster, more effective coverage without waste.
- Produces more first grade fruit. Uses only 125 gallons of water instead of 500 gallons by the old method for the same area.
- Saves 75% labour, 30% spray material and covers approximately two acres per hour.
- All components and controls are easily accessible.
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