OECD Approval No. 555

Report No. 649

Report of test in accordance with O.E.C.D. Test

Code for Agricultural Tractors

Ford 2600 Tractor



Manufactured by Ford Motor Company Limited,
Basildon,
Essex.

Test No R77/7928/O.E.C.D.

Date April, 1977.

THE BRITISH SOCIETY FOR RESEARCH IN AGRICULTURAL ENGINEERING

National Institute of Agricultural Engineering

WREST PARK · SILSOE · BEDFORD MK45 4HS

BSRAE Copyright

TABLE OF CONTENTS

	Page No.
SPECIFICATION OF TRACTOR	1
FUEL AND LUBRICANTS USED IN TESTS	6
COMPULSORY TESTS	
(1) Main power take-off performance	7
(2) Drawbar performance	10
(3) Turning space and turning circle	11
(4) Location of centre of gravity	11
(5) Braking	11
(6) Measurement of ambient noise emitted by the tractor	12
(7) Noise measurement at the driver's ear level	12
(8) Power lift and hydraulic pump performance	12
REPAIRS AND ADJUSTMENTS DURING TESTS	15
REMARKS	15

SPECIFICATION OF TRACTOR

Manufacturer:	Ford Motor Company Limited, Basildon, Essex
Submitted for test by:	The manufacturer
Selected for test by:	The manufacturer with the agreement of the testing station
Place of running-in:	Basildon
Duration of running-in:	130 hours

Tractor

Make:	Ford
Model:	2600
Type:	Four-wheel, rear wheel driven, unit construction
Serial No.:	B279100

Engine

Make:	Ford
Model:	2600
Type:	4-stroke, direct injection diesel
Cylinders:	3-cylinders, vertical, in-line, 106.7 mm (4.2 in) dia bore x 96.5 mm (3.8 in) stroke, capacity 2589 cm^3 (158 in^3), compression ratio 17.3:1 (nominal), monobloc construction, overhead valves
Fuel system:	Gravity feed, C.A.V. twin paper element fuel filters with sediment bowl and water-trap between tank and injection pump; fuel tank capacity 49.1 l (10.8 U.K.gal); C.A.V. distributor injection pump Serial No. R289 20RT, manufacturer's production setting: 10.30-10.86 cm^3 for 200 injections at 900 rev/min pump speed (test bench figures); C.A.V. type BDLL 150S6698 injector nozzles, injection pressure 22.1-22.6 MPa (218-223 atm), injectors open 16° before T.D.C.
Governor:	C.A.V., mechanical, incorporated in fuel injection pump, governed range of engine speed 600-2275 rev/min, rated engine speed 2000 rev/min

Air cleaner:	Burgess, oil bath, oil capacity 1.14 l (2.0 pt), situated forward of radiator, centrifugal pre-cleaner above bonnet
Lubrication system:	Forced feed from eccentric rotor pump with metal strainer in sump; full-flow replaceable element filter; total oil capacity 6.6 l (11.7 pt), recommended oil Series 3 quality, viscosity 65 cSt at 50 °C (122 °F), change period 300 hours
Cooling system:	Water cooled, pressurised at 50 kPa (7 lb/in^2), impeller assisted with 406 mm (16.0 in) dia belt-driven 2-blade fan, thermostat for temperature control, coolant capacity 10.4 l (18.3 pt)
Starting system:	Electrical, 12V Lucas M45G solenoid-engaged starter motor, operable only when high-low gear selector lever is in neutral position; C.A.V. Thermostart cold starting aid
Electrical system:	Voltage: 12, negative earth Generator: Lucas type 15 ACR alternator Battery: Ford type C5NN 10655G lead acid capacity 120-80 Ah at 20 hour rating

Transmission

Clutch:	Borg and Beck single-plate dry clutch, pedal-operated, 279 mm (11.0 in) dia
Gearbox:	Ford, constant mesh, 6 forward and 2 reverse speeds, comprising 3 forward and 1 reverse speed gearbox with high-low range selector
Rear axle and final drive:	Ford, crown wheel and pinion with differential on rear axle, pedal-operated differential lock.
Oil capacities:	Gearbox 13.6 l (23.9 pt), final drive 23.3 l (41.0 pt), recommended oil Mild E.P. S.A.E. 80, viscosity 54 cSt at 50 °C (122 °F), change period 1200 hours

Gear	Number of engine revolutions for one revolution of driving wheel	Nominal travelling speed for 2000 rev/min rated speed of engine,* km/h	(mile/ h)
Forward			
Low 1	188.3	2.30	(1.43)
2	105.0	4.12	(2.56)
High 1	63.3	6.84	(4.25)
Low 3	46.5	9.31	(5.78)
High 2	35.3	12.26	(7.62)
3	15.6	27.74	(17.24)
Reverse			
1	115.3	3.75	(2.33)
2	38.8	11.15	(6.93)

*Calculated with tyre rolling radius of 574 mm (22.6 in)

Power take-off

At rear of tractor in vertical centre plane, 6-spline 34.9 mm ($1\frac{3}{8}$ in) dia, to I.S.O. Standard, manually engaged by hand lever, driven through main clutch, height above ground 478 mm (18.8 in), proportional engine speed giving 596 rev/min at 2000 rev/min rated engine speed, 540 rev/min (standard p.t.o. speed) at 1811 rev/min engine speed, direction of rotation clockwise viewed facing driving end

Power lift

Ford, hydraulic, engine-driven piston pump, independent of main and p.t.o. clutches, oil supplied from rear axle housing to ram cylinder and external tapping; Category 1 implement linkage with top-link sensing, draught or position control with auxiliary service control and flow control device

Drawbar

Swinging drawbar, vertical height to centre of clevis 346 mm (13.6 in) and 378 mm (14.9 in) changed by inverting clevis, distance from rear axle centre 508 mm (20.0 in) and 560 mm (26.0 in) to rear, position relative to p.t.o. 206 mm (8.1 in) and 359 mm (14.1 in) to

Drawbar continued ... rear, lateral adjustment 356 mm (14.0 in) and 451 mm (17.8 in), pivot position relative to rear wheel centre 51 mm (2.0 in) forward, drawbar pin hole 27 mm (1.1 in) dia

Steering — Cam Gears, recirculating ball type with double drop arms and drag links

Brakes — Girling, internal expanding shoe with drum mounted on rear axle, independent or combined pedal-operated, hand-lever with ratchet operating both brakes for parking

Wheels

Steering wheels: Two at front, Firestone Ribbed Tractor 6.00-16 cross-ply tyres, 6-ply rating, maximum permissible mass on each tyre 620 kg (1370 lb) at 290 kPa (42 lb/in^2), track width 1327 mm (52.2 in) by 102 mm (4.0in)steps to 2041 mm (80.4 in), changed by extending axle and reversing wheels

Driving wheels: Two at rear, Goodyear Traction Sure Grip 12.4/11-28 cross-ply tyres, 4-ply rating, maximum permissible mass on each tyre 940 kg (2070 lb) at 100 kPa (14.5 lb/in^2), track width 1340 mm (52.8 in) by 102 mm (4.0 in) steps to 1952 mm (76.9 in), changed by reversing wheels and offset lug rims

Wheelbase: 1925 mm (75.8 in)

Lighting

Unrestricted beam angle of headlights in plan view 130°

	Height above ground of centre, mm	(in)	Size, mm	(in)	Distance from outside edge of tractor at 1340 mm (52.8 in) wheel track, to centre mm	(in)
Headlights	845	(33.3)	127	(5.0) dia	476	(18.7)
Side lights	1334	(52.5)	70 x 70	(2.8) x (2.8)	191	(7.5)
Rear lights	1308	(51.5)	70 x 70	(2.8) x (2.8)	178	(7.0)
Reflectors	1308	(51.5)	70 x 57	(2.8) x (2.2)	251	(9.9)

Number of grease points

Whole tractor: 11

CONDITIONS DURING TEST

Masses

Tractor (without driver but with tanks full)

	Front, kg (lb)	Rear, kg (lb)	Total, kg (lb)
Without ballast	723 (1594)	1008 (2222)	1731 (3816)
With ballast	723 (1594)	1852 (4083)	2575 (5677)

Ballast

	Number of weights	Total weight, kg (lb)	Water, kg (lb)
Front wheels	Nil	Nil	Nil
Rear wheels	16	534 (1177)	310 (683)
Additional	Nil	Nil	Nil

Track setting during tests

Front - 1327 mm (52.2 in)
Rear - 1340 mm (52.8 in)

Overall dimensions

	Length	Width	Height
With ballast	3.226 m (127.0 in)	2.235 m (88.0 in)	2.248 m (88.5 in)
Without ballast	3.226 m (127.0 in)	1.664 m (65.5 in)	2.248 m (88.5 in)

Overall height measured to top of exhaust pipe

Seat

Sifra, upholstered pan, torsion coupling suspension and rubber plug damping, adjustable for driver's weight, range of adjustment 38 mm (1.50 in) forwards and backwards

FUEL AND LUBRICANTS USED IN TESTS

Fuel:	Diesel oil to class A2 British Standard 2869:1970, specific gravity 0.843 at 15.6 °C (60 °F), viscosity 2.36 cSt at 50 °C (122 °F), Cetane No. 54
Engine oil:	Ford ESEN/M2C 88A
Transmission oil:	Ford ESEN/M2C 85A

COMPULSORY TESTS

(1) MAIN POWER TAKE-OFF PERFORMANCE

Date and location of tests: 28th October 1976, NIAE., Silsoe, Bedford, U.K.

Type of dynamometer: Water brake, Heenan and Froude

Power, kW (hp)	Speed, rev/min		Fuel consumption,			
	Engine	P.t.o.	l/h (UKgal/h)	kg/h (lb/h)	kg/kWh (lb/hph)	kWh/l (hph/UKgal)
Maximum power - 2 hour test						
24.5 (32.9)	2080	620	8.34 (1.83)	7.03 (15.50)	0.287 (0.472)	2.94 (17.92)
Standard p.t.o. speed (540 rev/min)						
22.8 (30.6)	1811	540	7.56 (1.66)	6.37 (14.04)	0.279 (0.459)	3.02 (18.41)
The speed recommended by the manufacturer for drawbar work						
24.2 (32.5)	2000	596	8.17 (1.80)	6.89 (15.17)	0.285 (0.469)	2.96 (18.05)
Part loads						
(i) 85% of the torque at maximum power						
21.1 (28.3)	2110	629	7.50 (1.65)	6.32 (13.91)	0.300 (0.493)	2.81 (17.13)
(ii) Unloaded						
0	2247	670	2.72 (0.60)	2.29 (5.03)	-	-
(iii) Half the load defined in (i)						
10.9 (14.6)	2169	647	4.96 (1.09)	4.18 (9.22)	0.383 (0.630)	2.20 (13.41)
(iv) Maximum power						
24.5 (32.9)	2080	620	8.34 (1.83)	7.03 (15.50)	0.287 (0.472)	2.94 (17.92)
(v) One quarter of the load defined in (i)						
6.0 (8.0)	2197	655	3.87 (0.85)	3.26 (7.05)	0.543 (0.893)	1.55 (9.45)
(vi) Three-quarters of the load defined in (i)						
16.1 (21.6)	2138	638	6.17 (1.36)	5.20 (11.44)	0.323 (0.531)	2.61 (15.91)

No load, maximum engine speed		2247 rev/min	
Equivalent crankshaft torque at maximum power		112.5 Nm	(83.0 lb ft)
Maximum equivalent crankshaft torque		128.3 Nm	(94.6 lb ft) at 1400 rev/min engine speed
Mean atmospheric conditions	temperature	16 °C	(61 °F)
	pressure	1003 m bar	(29.62 in Hg)
	relative humidity	68 %	
Maximum temperature	coolant	90 °C	(194 °F)
	engine oil	96 °C	(205 °F)
	fuel	38 °C	(100 °F)
	air intake	21 °C	(70 °F)

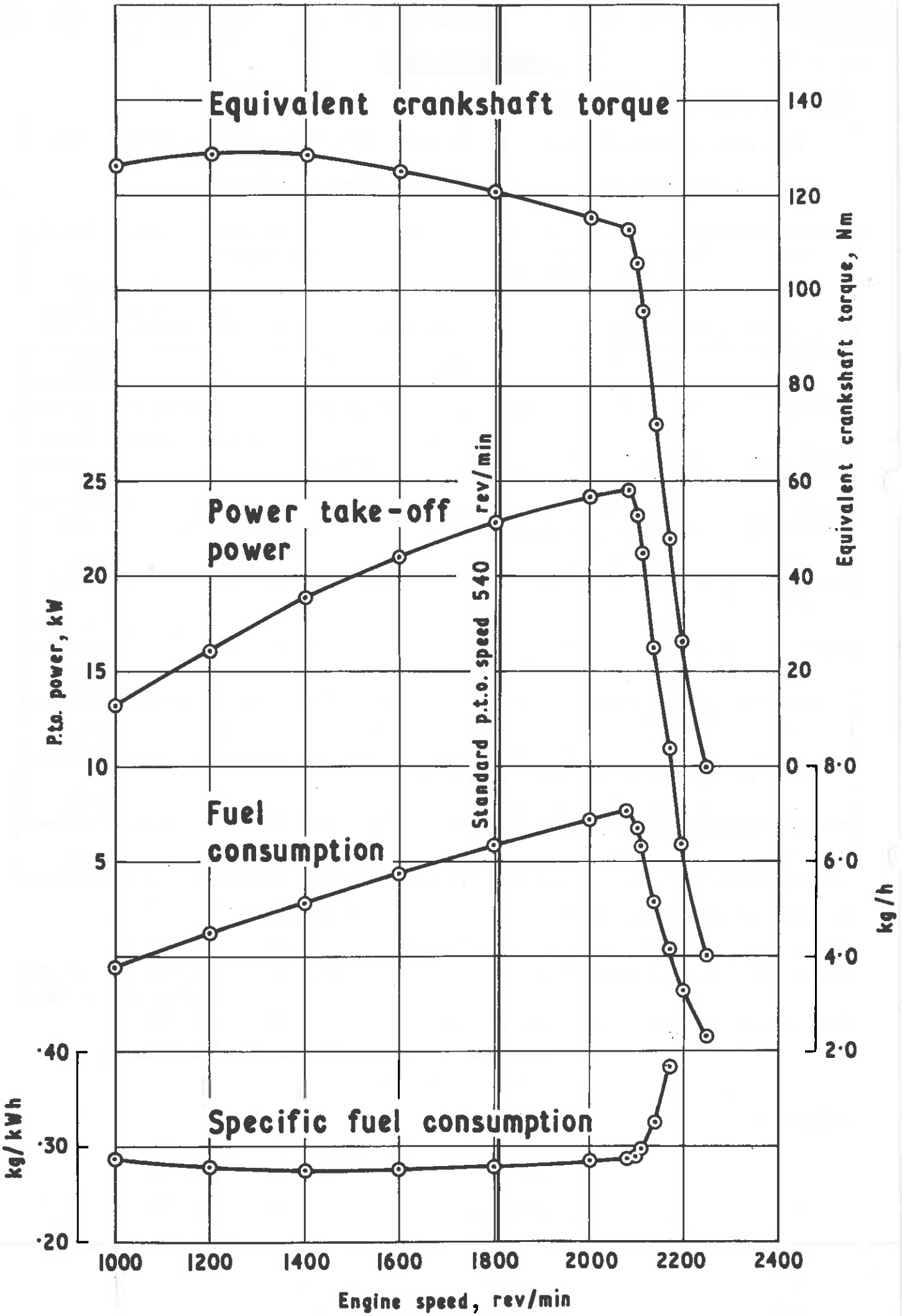


Fig 1 Power take-off test

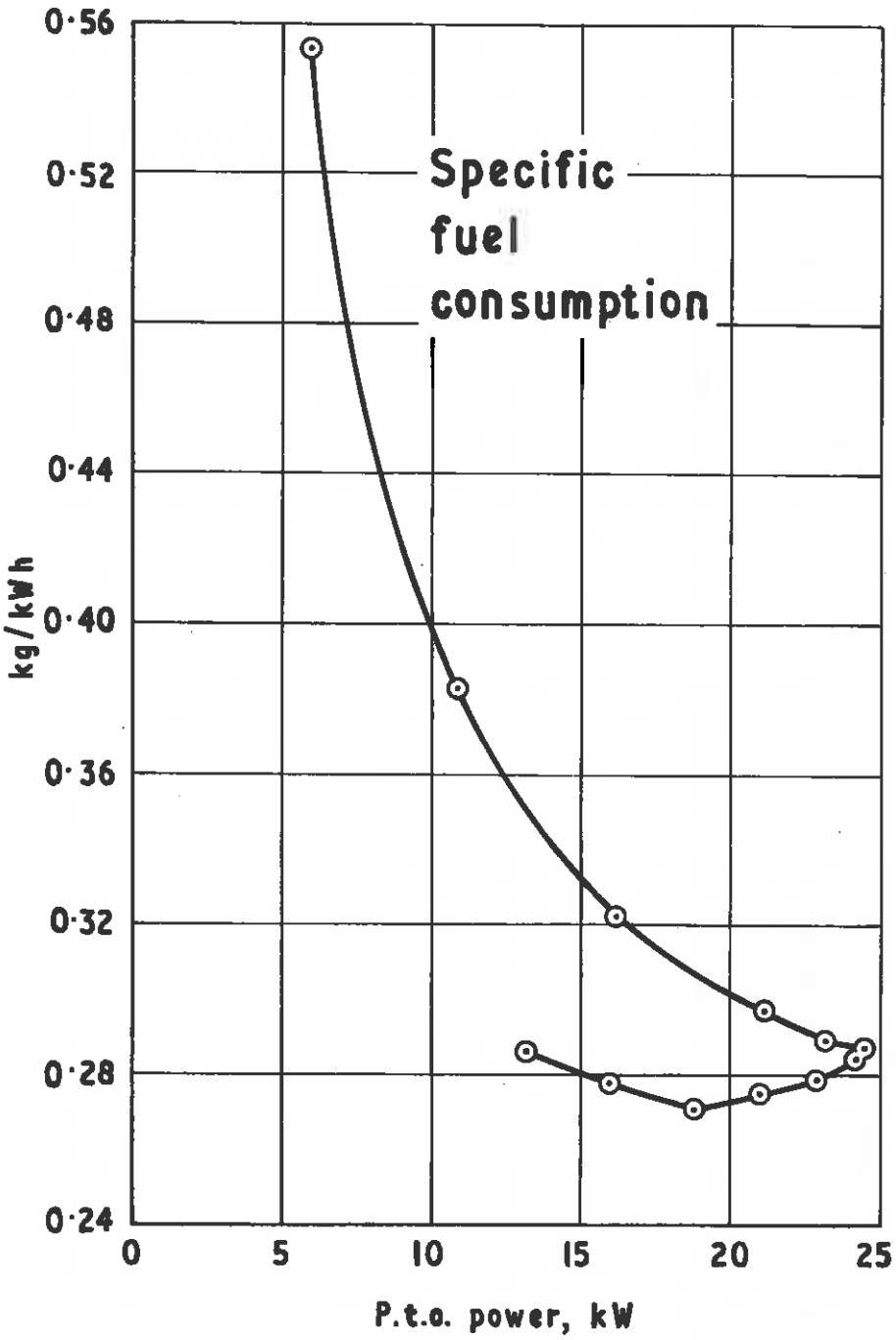


Fig. 2. Power take-off test

2. DRAWBAR PERFORMANCE Date of tests: 28th February - 11th March 1977 Type of track: Concrete Height of drawbar above ground: 305mm(12.0)

Gear	Power, kW (hp)	Drawbar pull, kN (lb)	Speed, km/h (mile/h)	Engine speed, rev/min	Wheel-slip, %	Specific fuel consumption, kg/kWh (lb/hph)	Specific fuel consumption, kWh/l (hph/UKgal)	Temperature, °C(°F) Coolant	Fuel	Engine oil	Atmospheric conditions Temperature, °C (°F)	Relative humidity, %	Pressure, mbar (in Hg)
(i) MAXIMUM POWER (ballasted)													
L1	11.9* (16.0)	20.0 (4500)	2.14 (1.33)	2176	15.0	0.426 (0.700)	1.98 (12.1)	75 (167)	18 (64)	86 (187)	6 (43)	70	1031 (30.45)
L2	20.2* (27.1)	20.0 (4500)	3.54 (2.26)	2108	15.0	0.353 (0.580)	2.39 (14.6)	76 (169)	19 (66)	90 (194)	6 (43)	70	1031 (30.45)
H1	22.4 (30.0)	12.2 (2740)	6.52 (4.11)	2080	7.3	0.318 (0.523)	2.65 (16.2)	77 (171)	22 (72)	90 (194)	7 (45)	71	1031 (30.45)
L3	22.0 (29.5)	8.5 (1930)	9.23 (5.74)	2080	4.9	0.324 (0.533)	2.60 (15.9)	77 (171)	22 (72)	87 (189)	7 (45)	71	1031 (30.45)
H2	21.5 (29.0)	6.3 (1420)	12.32 (7.66)	2078	3.5	0.336 (0.552)	2.51 (15.3)	77 (171)	22 (72)	84 (183)	7 (45)	71	1031 (30.45)
(ii) FIVE HOUR TEST AT 75% OF PULL AT MAXIMUM POWER													
H1	17.9 (24.0)	9.2 (2070)	7.00 (4.35)	2140	4.4	0.336 (0.552)	2.51 (15.3)	77 (171)	29 (84)	94 (201)	13 (55)	82	1015 (29.97)
(iii) +FIVE HOUR TEST AT PULL CORRESPONDING TO 15% WHEELSLIP IN TEST (i)													
L1	-	20.0 (4500)	2.18 (1.35)	-	-	-	-	76 (169)	31 (88)	95 (203)	17 (63)	69	1018 (30.06)
(iv) MAXIMUM POWER (unballasted)													
L1	8.7* (11.7)	14.2 (3190)	2.20 (1.37)	2209	15.0	-	-	75 (167)	22 (72)	83 (181)	12 (54)	76	996 (29.41)
L2	15.4* (20.7)	14.2 (3190)	3.90 (2.42)	2156	15.0	-	-	77 (171)	25 (77)	89 (192)	12 (54)	76	996 (29.41)
H1	21.7 (29.1)	12.0 (2700)	6.52 (4.05)	2080	10.0	-	-	79 (174)	23 (73)	84 (183)	13 (55)	82	996 (29.41)
L3	21.9 (29.4)	8.5 (1910)	9.26 (5.75)	2080	6.0	-	-	80 (176)	24 (75)	91 (196)	11 (52)	75	996 (29.41)
H2	22.1 (29.6)	6.4 (1440)	12.44 (7.73)	2078	4.1	-	-	79 (174)	20 (68)	89 (192)	11 (52)	75	996 (29.41)

Total oil consumption during ten hours duration of tests (ii) and (iii) 4.5 g/h (0.010 lb/h)

*Maximum power available at 15% wheelslip

+Test (iii) was carried out with additional ballast and the results for power, slip and fuel consumption have no practical significance, the extra rolling resistance caused by the additional ballast resulted in insufficient power being available to carry out the test in L2 gear

3. TURNING SPACE AND TURNING CIRCLE

Details of wheel equipment: As in specification, without ballast

Track of wheels: front - 1327 mm (52.2 in)
rear - 1340 mm (52.8 in)

	With brakes		Without brakes	
	Right hand	Left hand	Right hand	Left hand
Radius of turning space, m (in)	2.93 (115)	3.07 (121)	3.20 (126)	3.35 (132)
Radius of turning circle, m (in)	2.83 (111)	2.97 (117)	3.10 (122)	3.25 (128)

4. LOCATION OF CENTRE OF GRAVITY

Height above ground	721 mm (28.4 in)
Distance forward from the vertical plane containing the axis of the rear wheels	785 mm (30.9 in)
Distance from the median plane of the tractor	0

5. BRAKING

Date of tests: 9th-10th March 1977

Type of track: Concrete

Type decelerometer: Moto Meter, recording type

Weight of ballasted tractor: 2575 kg (5677 lb)

Cold brakes

	Tractor without ballast	Tractor ballasted
Travelling speed of tractor, km/h (mile/h)	25.0 (15.5)	25.0 (15.5)
Maximum deceleration, m/s^2 (ft/s^2)	4.9 (16.1)	5.3 (17.4)
Stopping distance, m (ft)	5.8 (19)	5.3 (17)
Force on brake pedal, N (lb)	270 (61)	340 (76)
Force exerted on the brake pedal to achieve a deceleration of 2.5 m/s^2 (8.2 ft/s^2), N (lb)	110 (25)	170 (38)

Brake fade characteristics (hot tests, ballasted tractor)

Maximum deceleration hot/maximum deceleration cold x 100: 102%

Stopping distance cold/stopping distance hot x 100: 102%

Force on pedal cold/force on pedal hot x 100: 100%

Efficacy of handbrake: Satisfactory facing up and down slope

Pull on handbrake: 340 N (76 lb)

6. MEASUREMENT OF AMBIENT NOISE EMITTED BY THE TRACTOR

Date of tests:	15th March 1977
Type of sound level meter:	Bruel and Kjaer 2204
Type of track:	Concrete
Results of tests:	
Gear:	H3
Travelling speed before acceleration:	22.5 km/h (14.0 mile/h)
Sound level:	87 dBA

7. NOISE MEASUREMENT AT THE DRIVER'S EAR LEVEL

Date of tests:	15th March 1977
Type of sound level meter:	Bruel and Kjaer 2204
Type of track:	Concrete

Gear	Travelling speed,* km/h	(mile/h)	dBA
H1	6.6	(4.1)	95
L3	8.7	(5.4)	96

*The first gear tested corresponds to the travelling speed nearest to 7.25 km/h (4.5 mile/h)

8. POWER LIFT AND HYDRAULIC PUMP PERFORMANCE

Date of tests: 16th March 1977

Hydraulic fluid

Make and type:	Ford S.A.E. 80 Mild E.P.
Viscosity:	54 cSt at 50 °C (122 °F)
Type of linkage lock for transport:	Hydraulic
Opening pressure of the cylinder over pressure relief valve (manufacturer's figures):	19.0 - 19.7 MPa (2760 - 2860 lb/in^2)

Pump characteristics

i)	Opening pressure of relief valve:	16.5 MPa	(2390 lb/in^2)
	Sustained pressure of the open relief valve:	18.3 MPa	(2650 lb/in^2)
ii)	Pump delivery rate at minimum pressure and rated engine speed:	16.5 l/min	(3.6 gal/min)
iii)	Pump delivery rate at maximum hydraulic power:	16.2 l/min	(3.6 gal/min)
	Delivery pressure:	16.5 MPa	(2390 lb/in^2)
	Power:	4.5 kW	(6.0 h.p)

Linkage geometry when connected to the standard frame, mm (in)

	Maximum mechanical advantage	Minimum mechanical advantage
Projected length in side view		
Lower links	800 (31.5)	800 (31.5)
Lift arms	229 (9.0)	229 (9.0)
Lift rods	562 (22.1)	562 (22.1)
Top link	629 (24.8)	634 (25.0)
Distance of lift rod connection point from pivot point of lower link	436 (17.2)	436 (17.2)
The following dimensions are given relative to the rear wheel centre line situated 574 mm (22.6 in) above the ground level		
Lower link pivot point	19 (0.7) forward, 106 (4.2) below	19 (0.8) forward, 106 (4.2) below
Top link pivot point	153 (6.0) behind, 314 (12.4) above	153 (6.0) behind, 270 (10.6) above
Lift arm pivot point	203 (8.0) forward, 228 (9.0) above	203 (8.0) forward, 228 (9.0) above
Maximum and minimum height of lower link hitch points	269(10.6) above, 331 (13.0) below	269 (10.6) above, 331 (13.0) below
Height of lower link hitch points when locked in transport position	Any height within lift range	Any height within lift range

Power lift performance

Lifting height in relation to a horizontal line through the lower link pivoting point			-254 (-10.0)	-229 (-9.0)	-200 (-7.9)	-100 (-3.9)	0	+100 (+3.9)	+200 (+7.9)	+300 (+11.8)	+330 (+13.0)	+400 (+15.7)	+432 (+17.0)	+483 (+19.0)
Lifting force with the pressure at maximum hydraulic power (16.5 MPa (2390 lb/in^2)) calculated from measurements made at maximum pressure (18.3 MPa (2650 lb/in^2)), kN (lb)	At the hitch points			*9.0 (2020)	9.7 (2180)	11.5 (2590)	12.5 (2810)	13.0 (2920)	13.4 (3010)	13.6 (3060)	13.5 (3030)			
	On the frame	max. mech. advantage		*10.0 (2250)	10.2 (2290)	11.3 (2540)	11.7 (2630)	11.7 (2630)	11.4 (2560)	10.9 (2450)		10.3 (2320)	10.1 (2270)	
		min. mech. advantage	*8.7 (1960)		9.3 (2090)	10.2 (2290)	10.7 (2410)	10.7 (2410)	10.5 (2360)	10.1 (2270)		9.5 (2140)		8.9 (2000)

*Maximum force exerted throughout whole range

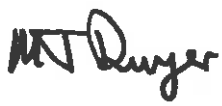
Force at which front of tractor is calculated to lift with maximum allowable front ballast is in excess of the measured values.

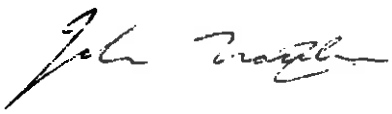
REPAIRS AND ADJUSTMENTS DURING TESTS — None

REMARKS — None

Test carried out by: F. Thistlethwaite

Officer in charge: D.W. Smith

Signed:  Head of Tractor Department

 for the Director

Date: 6/4/77