OECD Approval No. 590

Report No. 653

Report on test in accordance with O.E.C.D. Test Code for Agricultural Tractors

Massey-Ferguson 248S Tractor



Manufactured by

Massey-Ferguson Manufacturing Co.,
Banner Lane,
Coventry,
Warwickshire.

Test No.

R78/2/7330/O.E.C.D.

Date

February, 1978.

THE BRITISH SOCIETY FOR RESEARCH IN AGRICULTURAL ENGINEERING

National Institute of Agricultural Engineering

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SPECIFICATION OF TRACTOR

Manufacturer:	Massey-Ferguson Manufacturing Company, Banner Lane, Coventry, Warwickshire.
Submitted for test by:	The manufacturer
Selected for test by:	The manufacturer with the agreement of the testing station
Place of running-in:	Coventry
Duration of running-in:	50 hours

Tractor

Make:	Massey-Ferguson
Model:	M.F. 248S
Type:	Four wheel, rear wheel driven, unit construction
Serial No.:	475003

Engine

Make:	Perkins
Model:	AD3 152 DSL
Type:	4-stroke, direct injection diesel
Serial No.:	AD3-152 UA 43854
Cylinders:	3 cylinders, vertical, in-line, 91.4 mm (3.6 in) dia bore x 127 mm (5.0 in) stroke, capacity 2500 cm^3 (153 in^3), compression ratio 16.5:1 (nominal), replaceable dry cylinder liners, overhead valves
Fuel system:	A.C. Delco mechanical fuel feed pump with hand-primer, C.A.V. paper element filter with sediment bowl on pressure side of feed pump; fuel tank capacity 47.7 l (10.5 U.K. gal); C.A.V. distributor type DPA 3233 F 521 injection pump, Serial No. R33947TU, manufacturer's production setting 9.89-10.40 l/h (17.4-18.3 pt/h) at 2250 rev/min engine speed and 63 °C (145 °F) cambox temperature; C.A.V.

Fuel system continued	type BDLL 150S6602 injector nozzles, injection pressure 17.73 MPa (175 atm), pump delivery starts 17° before T.D.C.
Governor:	C.A.V. mechanical, incorporated in fuel injection pump, governed range of engine speed 700 to 2470 rev/min, rated engine speed 2250 rev/min
Air cleaner:	A.C., oil bath, oil capacity 0.47 l (0.83 pt) situated forward of radiator, Lautrette type CR5100-2 centrifugal pre-cleaner above bonnet
Lubrication system:	Forced feed from rotor type pump with metal strainer in sump; full flow replaceable element filter; total oil capacity 6.8 l (12.0 pt), recommended oil S.A.E. 20/30, viscosity 54 cSt at 50 °C (122 °F), change period 250 hours
Cooling system:	Water cooled, pressurised at 50 kPa (7 lb/in^2) thermosyphon assisted by centrifugal pump, 394 mm (15.5 in) dia 4-blade belt driven fan, thermostat for temperature control, cooling water capacity 10.2 l (18.0 pt)
Starting system:	Electrical, Lucas M45G solenoid-engaged starter motor, operable only when high-low gear selector lever is in neutral position, C.A.V. Thermostart MK IIIC manifold flame-type cold starting aid

Electrical system

Voltage:	12, negative earth
Generator:	Lucas alternator type 16 ACR
Battery:	Exide Supreme 253, lead-acid, 95 Ah at 20-hour rating

Transmission

Clutch:	Laycock, dual, dry, pedal-operated, 254 mm (10.0 in) dia plate for p.t.o. drive, and 305 mm (12.0 in) dia plate for gearbox drive
Gearbox:	Own make, sliding gear, 8 forward and 2 reverse speeds, comprising 4 forward and 1 reverse speed gearbox with high-low range epicyclic gear
Rear axle and final drives:	Own make, crown wheel and pinion and differential, pedal-operated differential lock

Oil capacities:

Common transmission and final drives 25.0 l (44.0 pt), recommended oil S.A.E. 20W/30, viscosity 54 cSt at 50 °C (122 °F), change period 500 hours

Gear	Number of engine revolutions for one revolution of driving wheel	Nominal travelling speed for 2250 rev/min rated engine speed,* km/h	(mile/h)
Forward			
Low 1	221.32	2.26	(1.40)
2	150.90	3.32	(2.06)
3	110.48	4.53	(2.81)
4	82.31	6.08	(3.78)
High 1	55.33	9.04	(5.62)
2	37.73	13.26	(8.24)
3	27.62	18.12	(11.26)
4	20.58	24.32	(15.11)
Reverse			
1	162.51	3.08	(1.92)
2	40.63	12.32	(7.66)

*Calculated with a tyre rolling radius of 590 mm (23.2 in)

Power take-off

At rear of tractor in vertical centre plane, height above ground 454 mm (17.9 in), 6-spline, 34.9 mm (1⅜ in) dia to I.S.O. Standard, engaged by hand lever and second plate of clutch, proportional engine speed giving 545 rev/min at 2250 rev/min rated engine speed, 540 rev/min (standard p.t.o. speed) at 2230 rev/min engine speed, direction of rotation clockwise viewed facing driving end

Belt pulley

Attachable to rear of tractor in two alternative horizontal positions, p.t.o.-driven, 260 mm (10.25 in) dia x 165 mm (6.5 in) face width, 993 rev/min giving 812 m/min (2665 ft/min) at 2250 rev/min rated engine speed, the standard belt speed of 945 m/min (3100 ft/min) could not be attained, direction of rotation related to position of unit

Power lift	Massey-Ferguson, hydraulic, 4 cylinder piston pump driven through second plate of clutch, oil supplied from transmission housing to ram cylinder and external tapping; Category 1 or 2 implement linkage, top link sensing, draught, position and pressure control, selective response on drop
Drawbar	Swinging drawbar, vertical height to centre of clevis 234 mm (9.2 in) and 386 mm (15.2 in), changed by inverting drawbar, distance behind rear axle centre 537 mm (21.1 in) and 651 mm (25.6 in), distance behind p.t.o. 241 mm (9.5 in) and 356 mm (14.0 in), lateral adjustment 451 mm (17.8 in) and 518 mm (20.4 in), pivot position 130 mm (5.1 in) forward of rear wheel centre, drawbar pin hole 26 mm (1.0 in) dia
Steering	Worm and nut type with recirculating balls, double drag links and drop arms
Brakes	Girling, internal expanding with drums on differential half-shafts; independent or combined pedal-operated, hand lever with ratchet operating both brakes for parking
Wheels	
Steering wheels:	Two at front, Goodyear Super Rib 6.00-16 cross-ply tyres, 6-ply rating, maximum permissible mass on each tyre 560 kg (1235 lb) at 330 kPa (48 lb/in^2), track width 1232 mm (48.5 in) by 102 mm (4.0 in) steps to 1844 mm (72.5 in), changed by extending axle
Driving wheels:	Two at rear, Goodyear Traction Sure Grip 12.4/11-28 cross-ply tyres, 6-ply rating, maximum permissible mass on each tyre 1275 kg (2810 lb) at 170 kPa (25 lb/in^2), track width 1330 mm (52.4 in) by 102 mm (4.0 in) steps to 1942 mm (76.5 in), changed by reversing wheels and offset lug rims
Wheelbase:	1892 mm (74.5in)

Seat

Sankey, pan type, with cushion and back rest, adjustment 102 mm (4.0 in) forwards and backwards

Lighting

Unrestricted beam angle of headlight in plan view 144°

	Height above ground of centre, mm	(in)	Size, mm	(in)	Distance from outside edge of tractor at 1330 mm (52.4 in) wheel track, to centre, mm	(in)
Headlights	692	(27.2)	124	(4.9)dia	673	(26.5)
Side lights	1287	(50.7)	100 32	(3.9)x (1.3)	118	(4.6)
Rear lights	1251	(49.3)	76 40	(3.0)x (1.6)	200	(7.9)
Reflectors	1181	(46.5)	70 32	(2.8)x (1.3)	163	(6.4)

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	649	(1431)	958	(2112)	1607	(3543)
With ballast	1067	(2352)	2399	(5289)	3466	(7641)

Ballast

	Number of weights	Total weight, kg (lb)	Water, kg (lb)
Front wheels	Nil	Nil	Nil
Rear wheels	22	1219 (2687)	293 (646)
Additional	8	347 (765)	Front frame and weights

Track setting during tests

Front - 1232 mm (48.5 in)

Rear - 1330 mm (52.4 in)

Overall dimensions

	Length, m (in)	Width, m (in)	Height, m (in)
With ballast	3.58 (140.9)	2.59 (102.0)	2.16 (85.0)
Without ballast	3.14 (123.6)	1.62 (63.8)	2.16 (85.0)

Overall height measured to top of exhaust pipe

FUEL AND LUBRICANTS USED IN TESTS

Fuel: Laboratory and track tests:	Diesel oil to Class A2 British Standard 2869: 1970, specific gravity 0.837 at 15.6 °C (60 °F), viscosity 2.34 cSt at 50 °C (122 °F), Cetane No. 52.7
Engine oil:	Agricastrol M.P. S.A.E. 20W/30, viscosity 54 cSt at 50 °C (122 °F)
Transmission oil:	Agricastrol M.P. S.A.E. 20W/30, viscosity 54 cSt at 50 °C (122 °F)

COMPULSORY TESTS

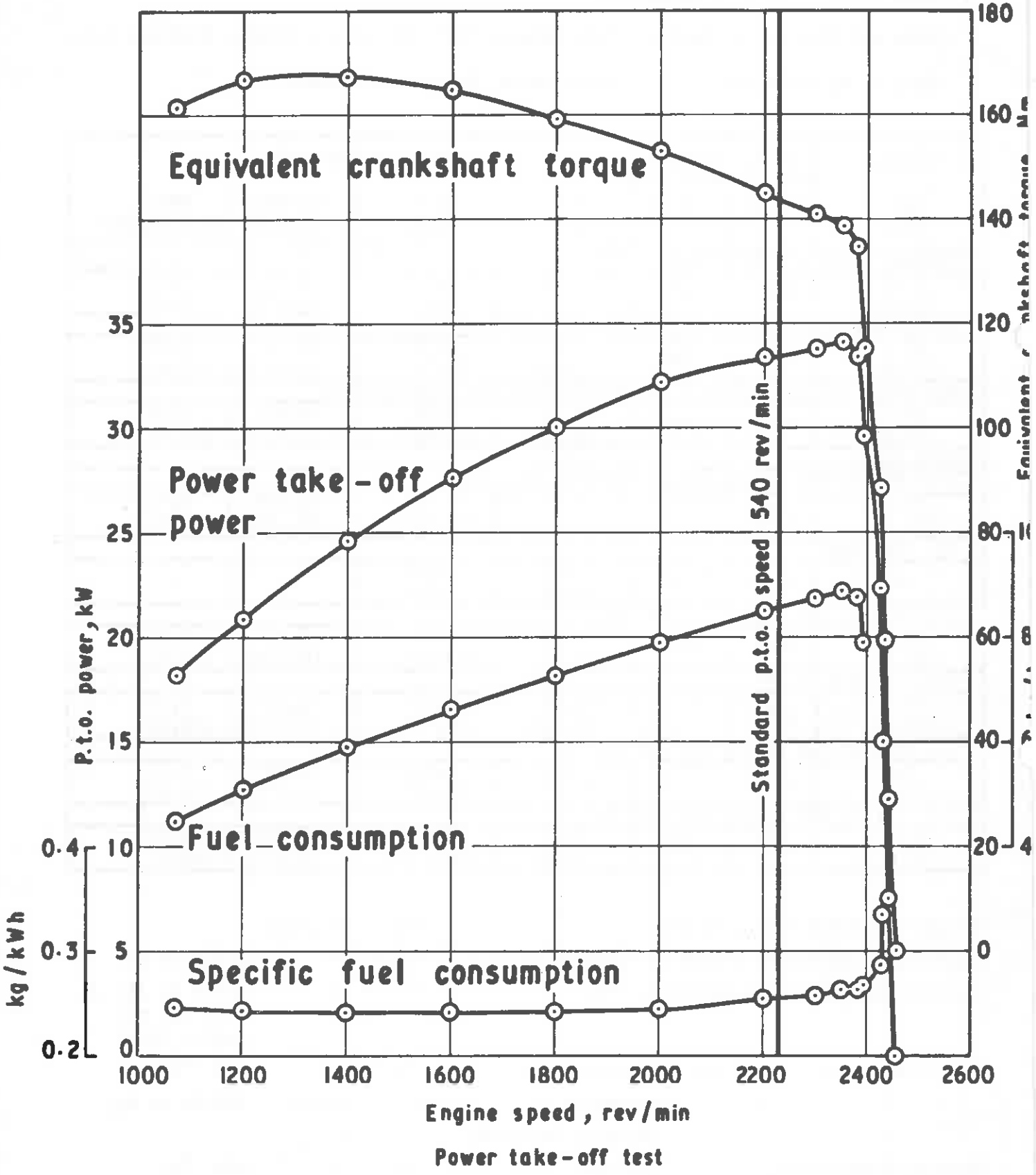
1. MAIN POWER TAKE-OFF PERFORMANCE

Date and location of tests: 13th October 1977, N.I.A.E., Silsoe, Bedford, U.K.

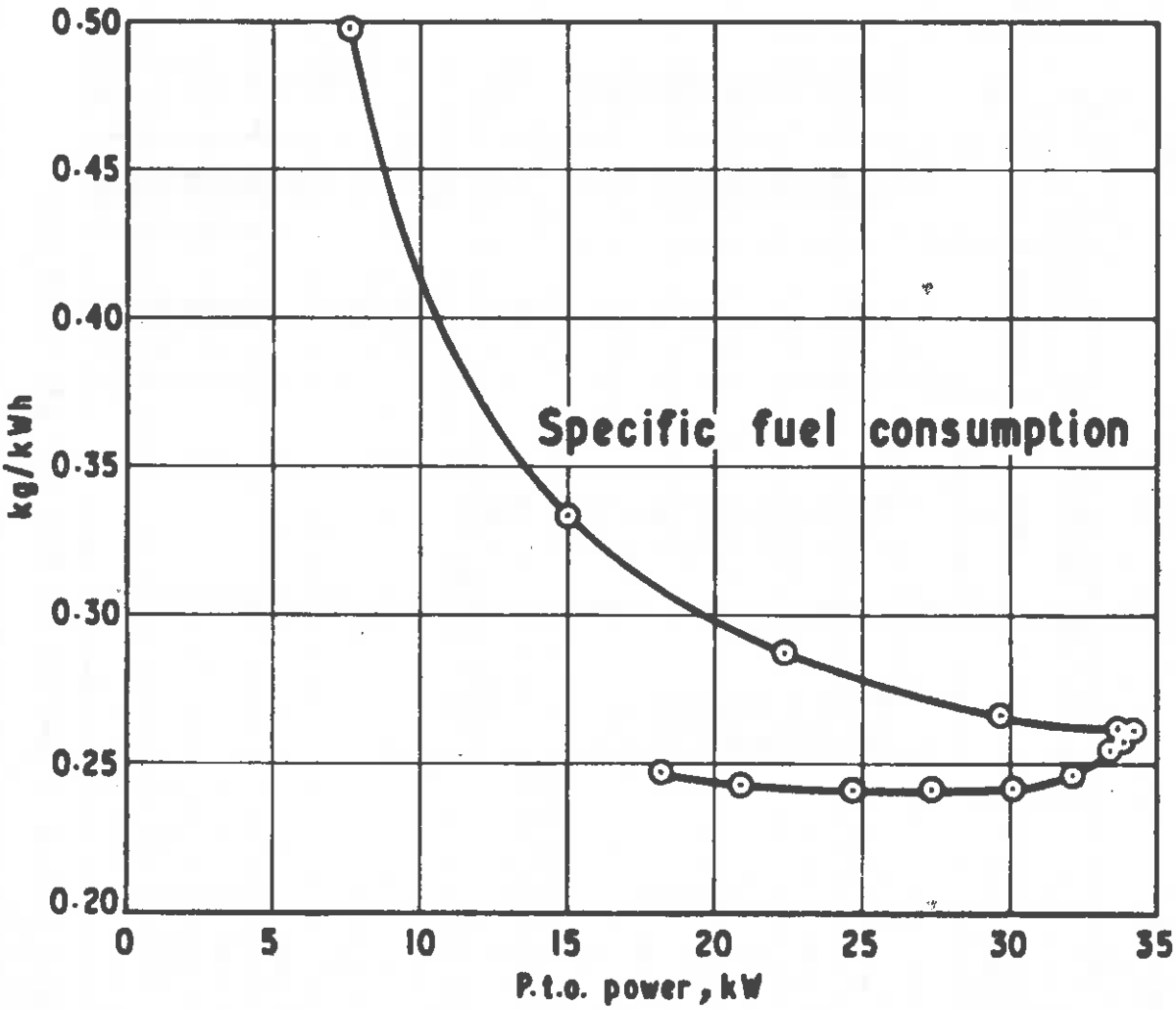
Type of dynamometer: Water brake, Heenan and Froude

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						
34.1 (45.7)	2350	569	10.64 (2.34)	8.90 (19.62)	0.261 (0.429)	3.21 (19.6)
Standard p.t.o. speed (540 rev/min)						
33.5 (44.9)	2230	540	10.25 (2.26)	8.58 (18.92)	0.256 (0.421)	3.27 (19.9)
The speed recommended by the manufacturer for drawbar work						
33.5 (44.9)	2250	545	10.25 (2.26)	8.58 (18.92)	0.256 (0.421)	3.27 (19.9)
Part loads						
(1) 85% of the torque obtained at maximum power						
29.5 (39.6)	2394	580	9.41 (2.07)	7.88 (17.37)	0.267 (0.439)	3.13 (19.1)
(2) Unloaded						
0	2456	595	3.14 (0.69)	2.63 (5.80)	-	-
(3) 50% of the torque defined in (1)						
15.0 (20.1)	2433	589	5.99 (1.32)	5.01 (11.04)	0.334 (0.549)	2.50 (15.2)
(4) Maximum power						
34.1 (45.7)	2350	569	10.64 (2.34)	8.90 (19.62)	0.261 (0.429)	3.21 (19.6)
(5) 25% of the torque defined in (1)						
7.5 (10.1)	2440	591	4.46 (0.98)	3.73 (8.22)	0.497 (0.817)	1.68 (10.2)
(6) 75% of the torque defined in (1)						
22.4 (30.0)	2422	586	7.71 (1.70)	6.45 (14.22)	0.288 (0.473)	2.91 (17.7)

No load, maximum engine speed		2456	rev/min	
Equivalent crankshaft torque at maximum power		138.6	Nm	(102.2 lb ft)
Maximum equivalent crankshaft torque		167.6	Nm	(123.6 lb ft) at 1400 rev/min engine speed
Mean atmospheric conditions	temperature	19	°C	(66 °F)
	pressure	1014	m bar	(29.94 in Hg)
	relative humidity	57	%	
Maximum temperature	coolant	87	°C	(189 °F)
	engine oil	105	°C	(221 °F)
	fuel	38	°C	(100 °F)
	air intake	21	°C	(70 °F)



Power take-off test



Power take-off test

2, DRAWBAR PERFORMANCE Date of tests: 16th to 30th November, 1977 Type of track: Concrete Height of drawbar above ground: 343 mm (13.5 in)

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, millibar (in Hg)
(i) MAXIMUM POWER (ballasted)													
L1	*13.6 (18.2)	24.5 (5510)	2.00 (1.24)	2420	15.0	0.436 (0.717)	1.92 (11.7)	65 (149)	22 (72)	84 (183)	9 (48)	86	993 (29.32)
L2	*19.9 (26.7)	24.5 (5510)	2.92 (1.81)	2406	15.0	0.361 (0.593)	2.32 (14.1)	74 (165)	25 (77)	90 (194)	9 (48)	86	993 (29.32)
L3	*26.5 (35.5)	24.5 (5510)	3.89 (2.42)	2357	15.0	0.347 (0.570)	2.41 (14.7)	83 (181)	27 (81)	94 (201)	9 (48)	86	993 (29.32)
L4	28.0 (37.5)	18.2 (4090)	5.54 (3.44)	2350	9.8	0.329 (0.541)	2.54 (15.5)	84 (183)	25 (77)	91 (196)	9 (48)	79	993 (29.32)
H1	29.7 (39.8)	12.5 (2810)	8.55 (5.31)	2348	6.3	0.311 (0.511)	2.69 (16.4)	84 (183)	23 (73)	85 (185)	9 (48)	86	993 (29.32)
H2	29.0 (38.9)	8.5 (1910)	12.28 (7.63)	2350	4.1	0.307 (0.505)	2.72 (16.6)	84 (183)	22 (72)	85 (185)	8 (46)	79	993 (29.32)
(ii) FIVE HOUR TEST AT 75% OF PULL AT MAXIMUM POWER													
L4	22.1 (29.6)	13.7 (3080)	5.81 (3.61)	2401	7.0	0.307 (0.505)	2.73 (16.6)	78 (172)	22 (72)	93 (199)	7 (45)	71	1007 (29.74)
(iii) +FIVE HOUR TEST AT PULL CORRESPONDING TO 15% WHEELSLIP IN TEST (i)													
L3	-	24.5 (5510)	4.01 (2.49)	2378	-	-	-	84 (183)	26 (81)	101 (214)	7 (45)	86	1013 (29.91)
(iv) MAXIMUM POWER (unballasted)													
L2	*11.7 (15.7)	15.0 (3370)	2.81 (1.75)	2416	15.0	-	-	58 (136)	15 (59)	80 (176)	3 (37)	84	1025 (30.27)
L3	*16.4 (22.0)	15.0 (3370)	3.94 (2.45)	2404	15.0	-	-	60 (140)	16 (61)	78 (172)	3 (37)	84	1025 (30.27)
L4	*22.1 (29.6)	15.0 (3370)	5.30 (3.29)	2398	15.0	-	-	74 (165)	20 (68)	87 (189)	4 (39)	85	1015 (29.97)
H1	29.5 (39.6)	12.9 (2900)	8.23 (5.11)	2350	9.5	-	-	79 (174)	19 (66)	81 (178)	4 (39)	85	1015 (29.97)
H2	31.2 (41.8)	8.9 (2000)	12.62 (7.84)	2350	5.0	-	-	83 (181)	19 (66)	97 (207)	5 (41)	85	1015 (29.97)

Total oil consumption during ten hours duration of test (ii) and (iii) 19.4 g/h (0.0428 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

3. TURNING SPACE AND TURNING CIRCLE

Details of wheel equipment: As in specification, without ballast

Track of wheels: front - 1232 mm (48.5 in)
rear - 1330 mm (52.4 in)

	With brakes		Without brakes	
	Right hand	Left hand	Right hand	Left hand
Radius of turning space, m (in)	3.00 (118)	2.97 (117)	3.22 (127)	3.22 (127)
Radius of turning circle, m (in)	2.90 (114)	2.87 (113)	3.12 (123)	3.12 (123)

4. LOCATION OF CENTRE OF GRAVITY

Height above ground, mm (in)	714 (28.1)
Distance forward from the vertical plane containing the axis of the rear wheels, mm (in)	748 (29.4)
Distance from the median plane of the tractor	0

5. BRAKING

Date of tests: 25th November, 1977

Type of track: Concrete

Type of decelerometer: Moto Meter, recording type

Weight of ballasted tractor: 3466 kg (7641 lb)

Cold brakes

	Tractor without ballast		Tractor ballasted	
Travelling speed of tractor, km/h (mile/h)	25.0	(15.5)	24.6	(15.3)
Maximum deceleration, m/s^2 (ft/s^2)	4.6	(15.1)	4.6	(15.1)
Stopping distance, m (ft)	5.9	(19.4)	5.8	(19.0)
Force on brake pedal, N (lb)	356	(80)	534	(120)
Force exerted on the brake pedal to achieve a deceleration of 2.5 m/s^2 (8.2 ft/s^2), N (lb)	120	(27)	230	(52)

Brake fade characteristics (hot tests, ballasted tractor)

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

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

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

Efficacy of handbrake: Satisfactory facing up and down slope of 16%

Pull on handbrake: 138 N (31 lb)

6. MEASUREMENT OF AMBIENT NOISE EMITTED BY THE TRACTOR

Date of tests:	14th December, 1977
Type of sound level meter:	Bruel and Kjaer 2206
Type of track:	Concrete
Results of tests:	
Gear:	H4
Travelling speed before acceleration:	18.6 km/h (11.6 mile/h)
Sound level:	89 dBA

7. NOISE MEASUREMENT AT THE DRIVER'S EAR LEVEL

Date of tests:	29th November, 1977
Type of sound level meter:	Bruel and Kjaer 2206
Type of track:	Concrete

Gear	Travelling speed, km/h	(mile/h)	dBA
H1	8.3	5.2	101

8. POWER LIFT AND HYDRAULIC PUMP PERFORMANCE

Date of tests:	6th and 12th December, 1977	
Hydraulic fluid		
Make and type:	Agricastrol M.P. S.A.E. 20W/30	
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):	18.3-19.3 MPa	(2655-2800 lb/in^2)
Pump characteristics		
i) Opening pressure of relief valve:	16.5 MPa	(2395 lb/in^2)
Sustained pressure of the open relief valve:	19.0 MPa	(2755 lb/in^2)
ii) Pump delivery rate at minimum pressure and rated engine speed:	26.8 l/min	(5.9 gal/min)
iii) Pump delivery rate at maximum hydraulic power:	27.7 l/min	(6.1 gal/min)
Delivery pressure:	16.5 MPa	(2395 lb/in^2)
Power:	7.7 kW	(10.3 hp)

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

	Maximum mechanical advantage	Minimum mechanical advantage
Projected length in side view		
Lower links	873 (34.4)	873 (34.4)
Lift arms	267 (10.5)	267 (10.5)
Lift rods	572 (22.5)	572 (22.5)
Top link	639 (25.1)	639 (25.1)
Distance of lift rod connection point from pivot point of lower link	448 (17.6)	448 (17.6)
The following dimensions are given relative to the rear wheel centre line, situated 577 mm (22.7 in) above the ground level		
Lower link pivot point	44 (1.7) forward, 114 (4.5) below	44 (1.7) forward, 114 (4.5) below
Top link pivot point	194 (7.6) behind, 277 (10.9) above	201 (7.9) behind, 228 (9.0) above
Lift arm pivot point	196 (7.7) forward, 233 (9.2) above	196 (7.7) forward, 233 (9.2) above
Maximum and minimum height of lower link hitch points	230 (9.1) above, 504 (19.8) below	230 (9.1) above, 504 (19.8) 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		mm (in)	-440 (-17.3)	-400 (-15.7)	-390 (-15.4)	-360 (-14.2)	-240 (-9.4)	-160 (-6.3)	-80 (-3.1)	0	+80 (+3.1)	+160 (+6.3)	+240 (+9.4)	+320 (+14.2)	+400 (+15.7)	+440 (+17.3)
Lifting force with the pressure at maximum hydraulic power (16.5 MPa (2395 lb/in^2)) calculated from measurements made at maximum pressure (19.0 MPa (2755 lb/in^2)), kN (lb)	At the hitch points				11.2* (2520)	11.6 (2610)	13.0 (2920)	13.8 (3100)	14.3 (3210)	14.7 (3300)	15.0 (3370)	15.3 (3440)	15.6 (3510)	15.9 (3570)		
	On the frame	max. mech. advantage		12.8 (2880)		12.8 (2880)	12.9 (2900)	12.9 (2900)	12.8 (2880)	12.6 (2830)	12.3 (2770)	11.9 (2680)	11.5 (2590)	11.1 (2500)	10.7* (2410)	
		min. mech advantage	11.1 (2500)	11.3 (2540)		11.4 (2560)	11.7 (2630)	11.7 (2630)	11.6 (2610)	11.4 (2560)	11.2 (2520)	10.9 (2450)	10.6 (2380)	10.3 (2320)	9.9 (2230)	9.7* (2180)

* 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 measured values.

OPTIONAL TESTS

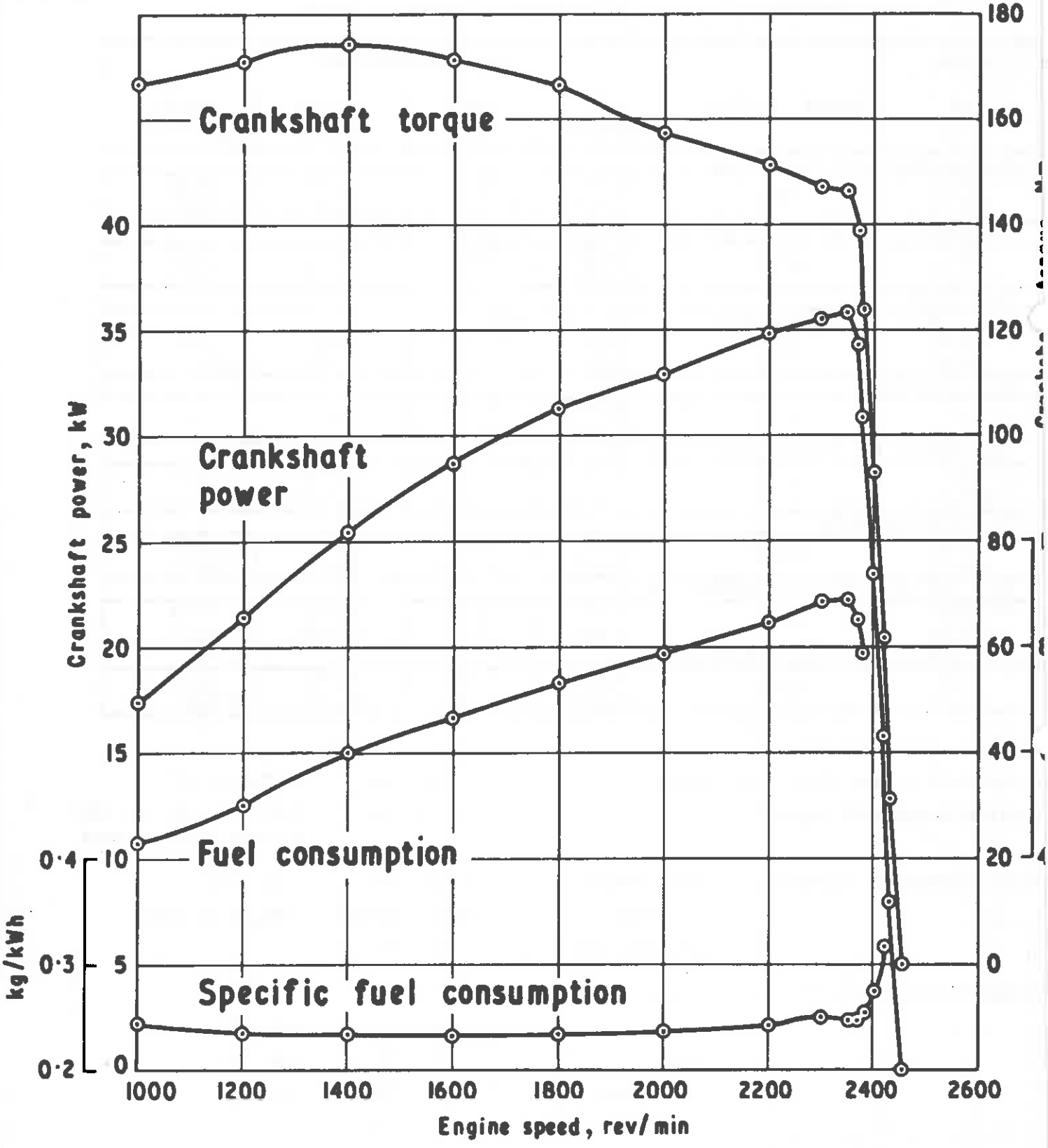
9. PERFORMANCE AT THE ENGINE CRANKSHAFT

Date and location of tests: 13th October 1977, N.I.A.E., Silsoe, Bedford, U.K.

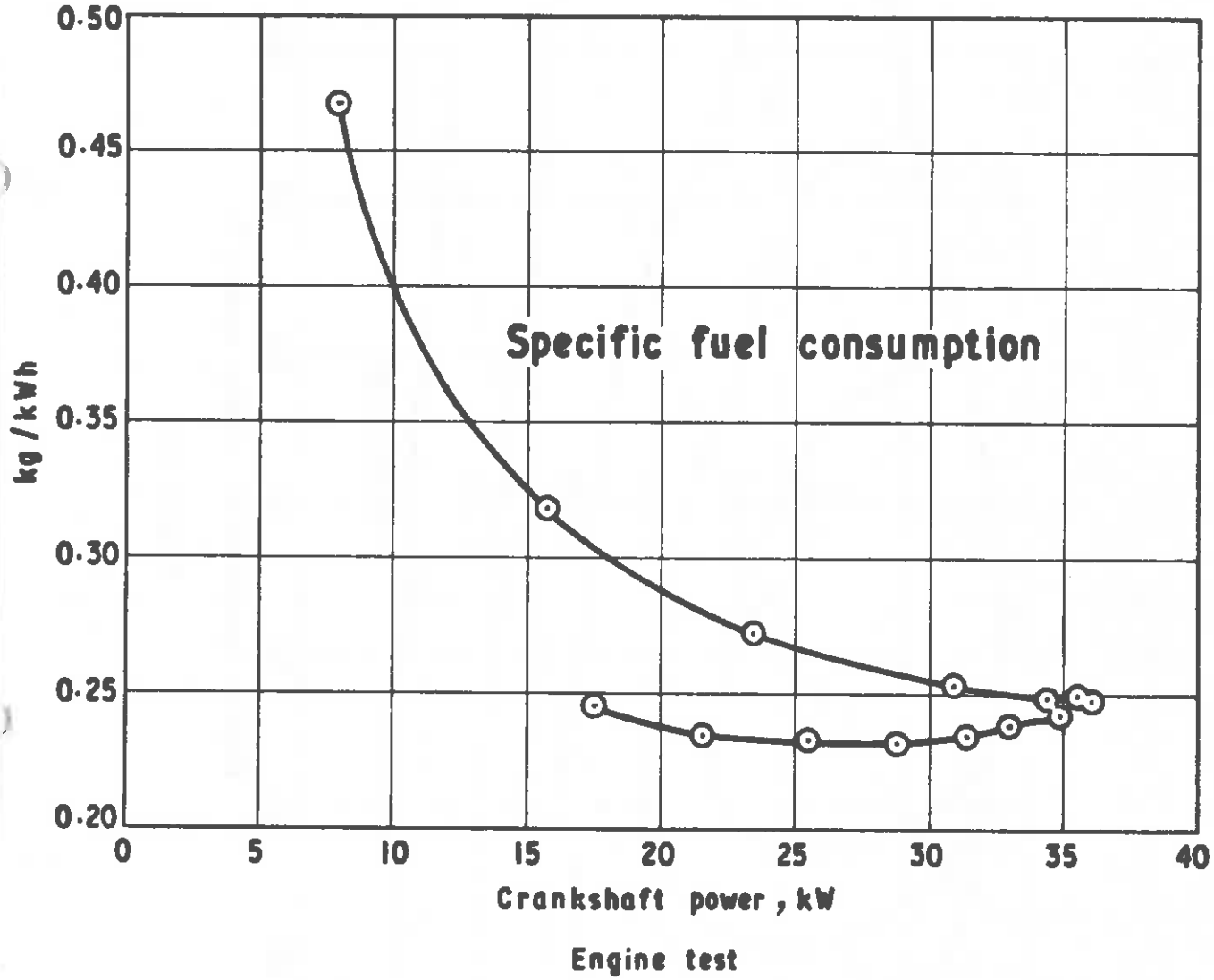
Type of dynamometer: Water brake, Heenan and Froude

Power, kW (hp)	Speed, rev/min	Fuel consumption, l/h (UKgal/h)	kg/h (lb/h)	kg/kWh (lb/hph)	kWh/l (hph/UKgal)
Maximum power - 2 hour test					
36.0 (48.3)	2350	10.66 (2.35)	8.93 (19.69)	0.248 (0.408)	3.38 (20.6)
The speed recommended by the manufacturer for drawbar work					
35.1 (47.1)	2250	10.35 (2.28)	8.67 (19.11)	0.247 (0.406)	3.39 (20.7)
Part loads					
(1) 85% of the torque obtained at maximum power					
30.9 (41.4)	2380	9.38 (2.06)	7.85 (17.31)	0.254 (0.418)	3.29 (20.1)
(2) Unloaded					
0	2456	3.14 (0.69)	2.63 (5.80)	-	-
(3) 50% of the torque defined in (1)					
15.7 (21.1)	2419	5.96 (1.31)	4.99 (11.00)	0.318 (0.523)	2.63 (16.0)
(4) Maximum power					
36.0 (48.3)	2350	10.66 (2.35)	8.93 (19.69)	0.248 (0.408)	3.38 (20.6)
(5) 25% of the torque defined in (1)					
7.9 (10.6)	2430	4.41 (0.97)	3.69 (8.13)	0.467 (0.768)	1.79 (10.9)
(6) 75% of the torque defined in (1)					
23.4 (31.4)	2400	7.60 (1.67)	6.36 (14.02)	0.272 (0.447)	3.08 (18.8)

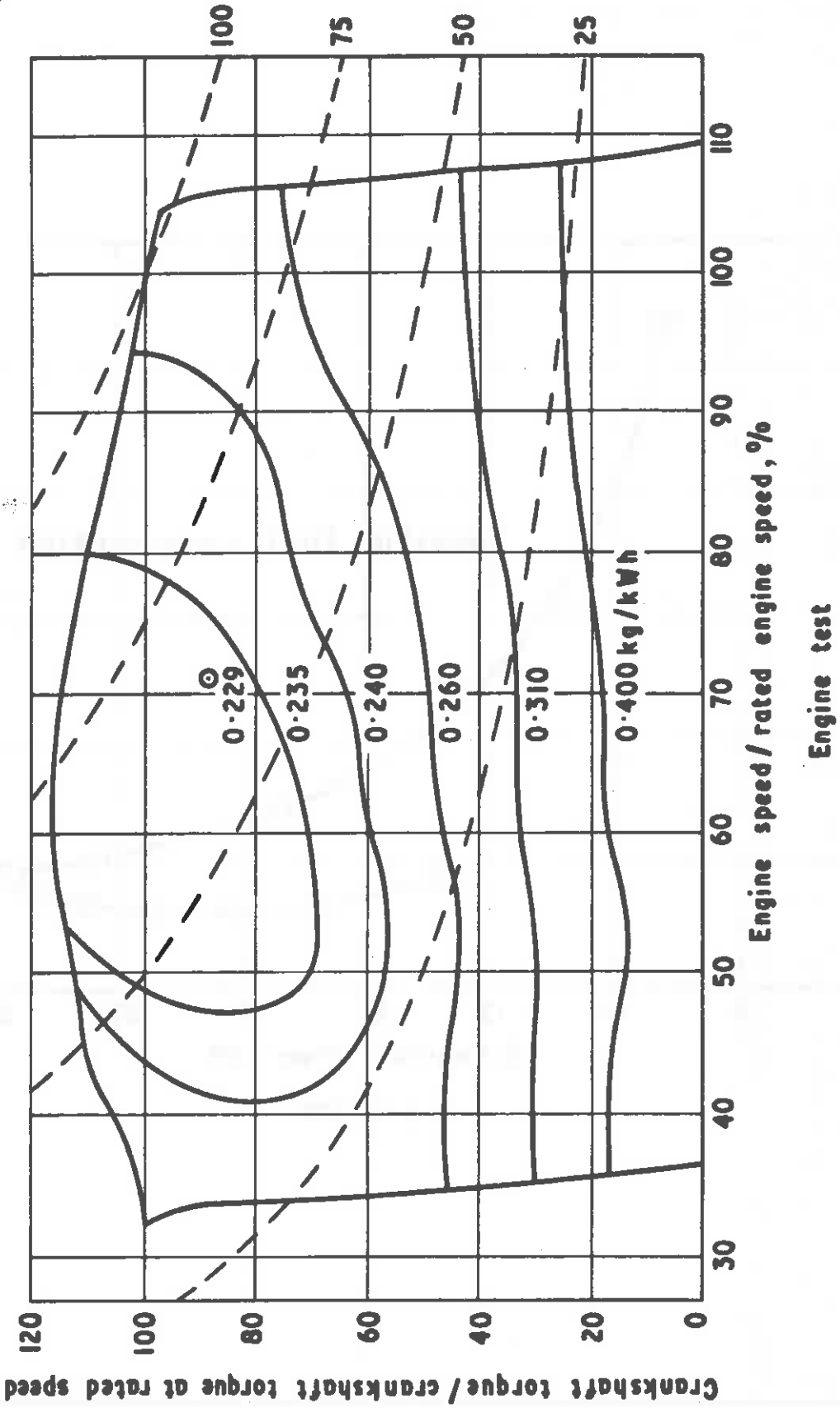
No load, maximum engine speed		2456	rev/min	
Crankshaft torque at maximum power		146.1	Nm	(107.8 lb ft)
Maximum crankshaft torque		174.0	Nm	(128.3 lb ft) at 1400 rev/min engine speed
Mean atmospheric conditions	temperature	17	°C	(63 °F)
	pressure	1020	m bar	(30.12 in Hg)
	relative humidity	60	%	
Maximum temperature	coolant	85	°C	(185 °F)
	engine oil	102	°C	(216 °F)
	fuel	38	°C	(100 °F)
	air intake	21	°C	(70 °F)


Crankshaft torque
Crankshaft power
Fuel consumption
Specific fuel consumption
Crankshaft power, kW
kg/kWh
Engine speed, rev/min
1000
1200
1400
1600
1800
2000
2200
2400
2600
0·2
0·3
0·4
0
5
10
15
20
25
30
35
40
0
20
40
60
80
100
120
140
160
180

Engine test


0·50
0·45
0·40
0·35
0·30
0·25
0·20
kg/kWh
Specific fuel consumption
0
5
10
15
20
25
30
35
40
Crankshaft power, kW

Engine test


Crankshaft power / crankshaft power at rated speed, %
100
75
50
25
110
100
90
80
70
60
50
40
30
Engine speed / rated engine speed, %
0·229
0·235
0·240
0·260
0·310
0·400 kg/kWh
120
100
80
60
40
20
0
Crankshaft torque / crankshaft torque at rated speed, %

Engine test

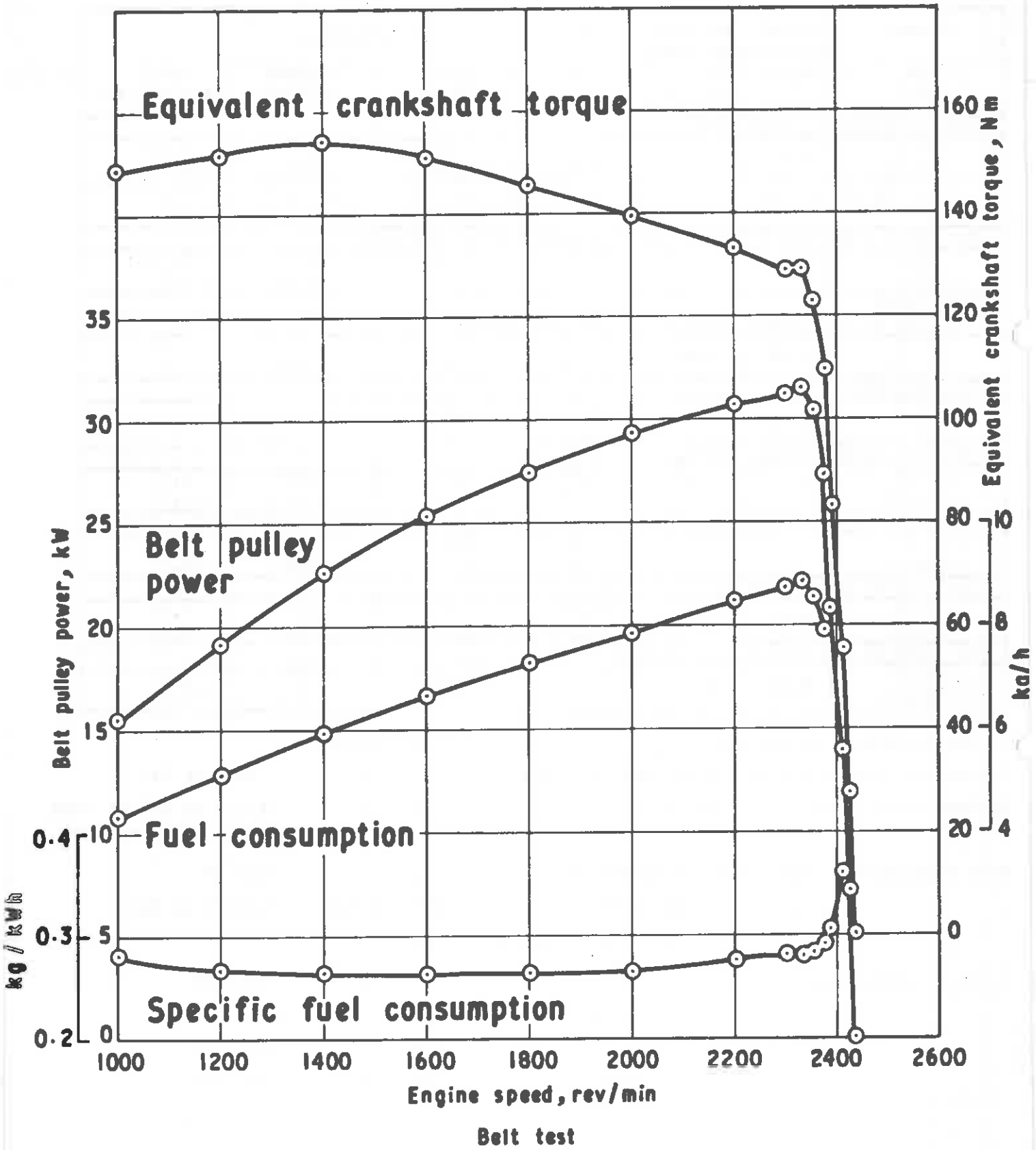
10. PERFORMANCE AT THE BELT PULLEY

Date and location of tests: 19th October 1977, N.I.A.E., Silsoe, Bedford, U.K.

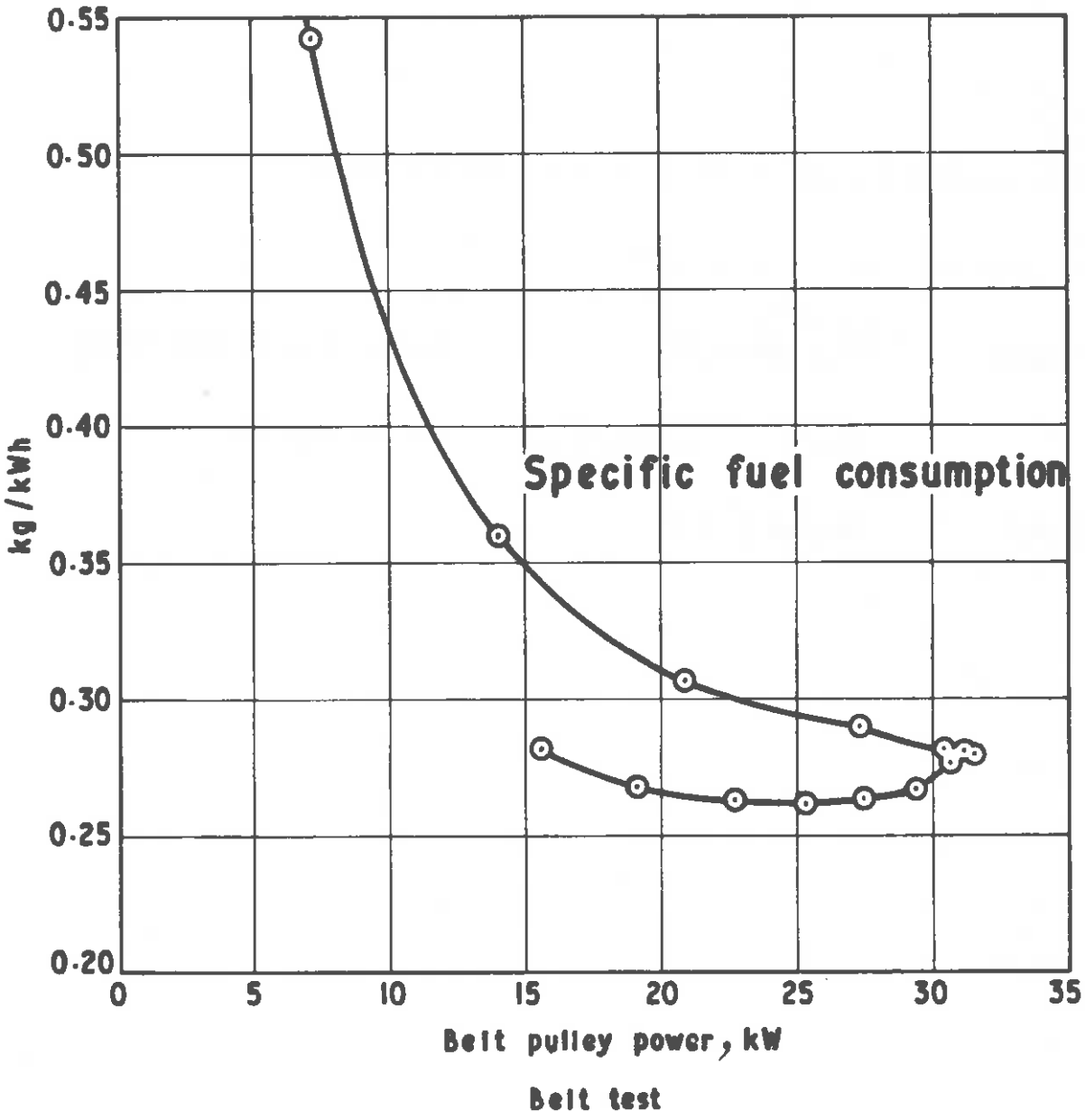
Type of dynamometer: Water brake, Heenan and Froude

Power, kW (hp)	Speed, rev/min		Fuel consumption,			
	Engine	Belt pulley	l/h (UKgal/h)	kg/h (lb/h)	kg/kWh (lb/hph)	kWh/l (hph/UKgal)
Maximum power - 2 hour test						
31.5 (42.2)	2333	1030	10.54 (2.32)	8.82 (19.44)	0.280 (0.460)	2.99 (18.2)
The standard belt speed of 945 m/min (3100 ft/min) could not be attained						
The speed recommended by the manufacturer for drawbar work						
31.0 (41.6)	2250	993	10.38 (2.28)	8.68 (19.14)	0.280 (0.460)	2.99 (18.2)
Part loads						
(1) 85% of the torque obtained at maximum power						
27.3 (36.6)	2378	1050	9.47 (2.08)	7.92 (17.46)	0.290 (0.477)	2.88 (17.6)
(2) Unloaded						
0	2433	1074	3.12 (0.69)	2.61 (5.75)	-	-
(3) 50% of the torque defined in (1)						
13.8 (18.5)	2410	1064	5.98 (1.32)	5.00 (11.02)	0.362 (0.595)	2.31 (14.1)
(4) Maximum power						
31.5 (42.2)	2333	1030	10.54 (2.32)	8.82 (19.44)	0.280 (0.460)	2.99 (18.2)
(5) 25% of the torque defined in (1)						
7.0 (9.4)	2423	1070	4.57 (1.01)	3.82 (8.42)	0.546 (0.898)	1.53 (9.3)
(6) 75% of the torque defined in (1)						
20.6 (27.6)	2392	1056	7.53 (1.66)	6.30 (13.89)	0.306 (0.503)	2.74 (16.7)

No load, maximum engine speed		2433	rev/min	
Equivalent crankshaft torque at maximum power		129.0	Nm	(95.1 lb ft)
Maximum equivalent crankshaft torque		154.0	Nm	(113.6 lb ft) at 1400 rev/min engine speed
Mean stmospheric conditions	temperature	22	°C	(72 °F)
	pressure	1011	m bar	(29.85 in Hg)
	relative humidity	65	%	
Maximum temperature	coolant	87	°C	(189 °F)
	engine oil	104	°C	(219 °F)
	fuel	44	°C	(111 °F)
	air intake	24	°C	(75 °F)


Equivalent crankshaft torque
Belt pulley power
Fuel consumption
Specific fuel consumption
Belt pulley power, kW
Equivalent crankshaft torque, Nm
kg / kWh
kg/h
Engine speed, rev/min
1000
1200
1400
1600
1800
2000
2200
2400
2600
160
140
120
100
80
60
40
20
0
35
30
25
20
15
10
5
0
0.4
0.3
0.2
10
8
6
4

Belt test


0·55
0·50
0·45
0·40
0·35
0·30
0·25
0·20
kg / kWh
Specific fuel consumption
0
5
10
15
20
25
30
35
Belt pulley power, kW
Belt test

REPAIRS AND ADJUSTMENTS DURING TESTS: None

REMARKS: None

Test carried out by: F. Thistlethwaite and P.C. Seward

Officer in charge: D.W. Smith

Signed: M J Dwyer Head of Tractor Department

John Trezise for the Director

Date: 3/4/78