OECD Approval No. 688

Test in accordance with the OECD standard code for the official testing of agricultural tractors

Report on test of Massey-Ferguson 240 Tractor

Manufactured by	Massey-Ferguson Manufacturing Company, Banner Lane, Coventry, Warwicks.
Test No.	R80/2/7579/OECD
Report No.	668
Date	April 1980

THE BRITISH SOCIETY FOR RESEARCH IN AGRICULTURAL ENGINEERING

National Institute of Agricultural Engineering
Wrest Park Silsoe Bedford MK45 4HS

Schlepper wird auch in der BRD angeboten 2 81

TABLE OF CONTENTS

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. 240
Type:	Four wheel, rear wheel driven, unit construction
Serial No.:	500087

Engine

Make:	Perkins
Model:	AD3 152
Type:	4-stroke, direct injection diesel
Serial No.:	CE 22488 U566141E
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 18.5:1 (nominal), replaceable dry cylinder liners, overhead valves
Fuel system:	A.C. Delco mechanical fuel feed pump with hand-primer, C.A.V. dual paper element filters, one with transparent 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 3230 F 350 injection pump, Serial No. 153 CYU, manufacturer's production setting 9.54 - 9.94 l/h (16.8 - 17.5 pt/h) at 2250 rev/min engine speed and 63 °C (145 °F) cambox temperature; C.A.V. type BDLL 150S6554 injector nozzles, injection pressure 18.75 MPa (185 atm), pump delivery starts 24° 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 under bonnet to rear of engine, Lautrette type CR 5100-2 centrifugal pre-cleaner above bonnet
Lubrication system:	Forced feed from rotor type pump with metal strainer in sump; full flow disposable cannister filter; total oil capacity 6.8 l (12.0 pt), recommended oil S.A.E. 20W/30, viscosity 54 cSt at 50 °C (122 °F), MIL-L-2104C, oil and filter change period 250 hours
Cooling system:	Water cooled, pressurised at 69 kPa (10 lb/in^2), thermosyphon assisted by centrifugal pump, 394 mm (15.5 in) dia 2-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, power 2.05 kW at 4100 rev/min, operable only when high-low gear selector lever is in neutral position; C.A.V. Mk IIIC Thermostart manifold flame-type cold starting aid
Exhaust system:	Cheswick and Wright, expansion chamber 77.8 mm (3.1 in) dia x 422 mm (16.6 in) long, vertical outside bonnet on left-hand side

Electrical system

Voltage:	12, negative earth
Generator:	Lucas alternator type 16 ACR, 32 A output at 6000 rev/min
Battery:	Fulmen FC246S; lead-acid, 105 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 self-disengaging 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), MIL-L-2104C, 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	200.99	2.49	(1.55)
	2	137.04	3.65	(2.27)
	3	100.33	4.99	(3.10)
	4	74.75	6.70	(4.16)
High	1	50.25	9.96	(6.19)
	2	34.26	14.61	(9.08)
	3	25.08	19.95	(12.40)
	4	18.69	26.78	(16.64)
Reverse				
	1	147.58	3.39	(2.11)
	2	36.90	13.56	(8.43)

*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), distance behind rear axle 296 mm (11.7 in), 6-spline, 34.9 mm (1⅜ in) dia to I.S.O. Standard, selected by hand-lever and engaged by the pedal operated second plate of the clutch, proportional engine speed giving 679 rev/min at 2250 rev/min rated engine speed, 540 rev/min (standard p.t.o. speed) at 1789 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, 229 mm (9.0 in) dia x 165 mm (6.5 in) face width, 1314 rev/min giving 945 m/min (3100 ft/min) standard belt speed at 2387 rev/min engine speed, 1238 rev/min giving 891 m/min (2923 ft/min) belt speed at 2250 rev/min rated engine speed; 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, Firestone Rib Tractor 6.00-16 cross-ply tyres, 6-ply rating, maximum permissible mass on each tyre 560 kg (1235 lb) at 324 kPa (47.0 lb/in^2), track width 1245 mm (49.0 in) by 102 mm (4.0 in) steps to 1857 mm (73.1 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 165 kPa (24.0 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 (74.5 in)
Seat	Sankey, pan type, with cushion and back rest, range of adjustment 51 mm (2.0 in) forwards and backwards, no vertical adjustment

Lighting

Unrestricted beam angle of headlight in plan view 180°

	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	988	(38.9)	124	(4.9)dia	645	(25.4)
Side lights	1294	(50.9)	110 40	(4.3)x (1.6)	287	(11.3)
Rear lights	1294	(50.9)	110 40	(4.3)x (1.6)	292	(11.5)
Reflectors	1324	(52.1)	55	(2.2)dia	223	(8.8)

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	660	(1455)	937	(2066)	1597	(3521)
With ballast	889	(1960)	2404	(5300)	3293	(7260)

Ballast

	Number of weights	Total mass, kg	(lb)	Water, kg	(lb)
Front wheels	Nil	Nil		Nil	
Rear wheels	22	1190	(2623)	316	(697)
Additional	6	190	(419)	Front frame and weights	

Track setting during tests

Front - 1347 mm (53.0 in)
Rear - 1330 mm (52.4 in)

Overall dimensions

	Length,		Width,		Height, To top of exhaust pipe,		To top of steering wheel,	
	m	(in)	m	(in)	m	(in)	m	(in)
With ballast	3.35	(131.9)	2.52	(99.2)	2.16	(85.0)	1.40	(55.1)
Without ballast	3.15	(124.0)	1.61	(63.4)	2.16	(85.0)	1.40	(55.1)

Minimum ground clearance 221 mm (8.7 in) to underside of drawbar frame.

FUEL AND LUBRICANTS USED IN TESTS

Fuel:	Diesel oil to Class A2 British Standard 2869: 1970, specific gravity 0.848 at 15°C (59°F), viscosity 2.43 cSt at 50°C (122°F), Cetane No. 56.0.
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: 1st October 1979, 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						
32.8 (44.0)	2360	712	10.37 (2.28)	8.79 (19.38)	0.268 (0.441)	3.16 (19.3)
The speed recommended by the manufacturer for drawbar work						
32.0 (42.9)	2250	679	9.93 (2.18)	8.42 (18.56)	0.263 (0.432)	3.22 (19.6)
Part loads						
(1) 85% of the torque obtained at maximum power						
28.2 (37.8)	2380	718	9.08 (2.00)	7.70 (16.98)	0.273 (0.449)	3.11 (19.0)
(2) Unloaded						
0	2452	740	2.77 (0.61)	2.35 (5.18)	-	-
(3) 50% of the torque defined in (1)						
14.2 (19.0)	2401	725	5.50 (1.21)	4.66 (10.27)	0.329 (0.541)	2.58 (15.7)
(4) Maximum power						
32.8 (44.0)	2360	712	10.37 (2.28)	8.79 (19.38)	0.268 (0.441)	3.16 (19.3)
(5) 25% of the torque defined in (1)						
7.1 (9.5)	2415	729	4.12 (0.91)	3.49 (7.69)	0.490 (0.806)	1.72 (10.5)
(6) 75% of the torque defined in (1)						
21.2 (28.4)	2390	721	7.04 (1.55)	5.97 (13.16)	0.282 (0.464)	3.01 (18.3)

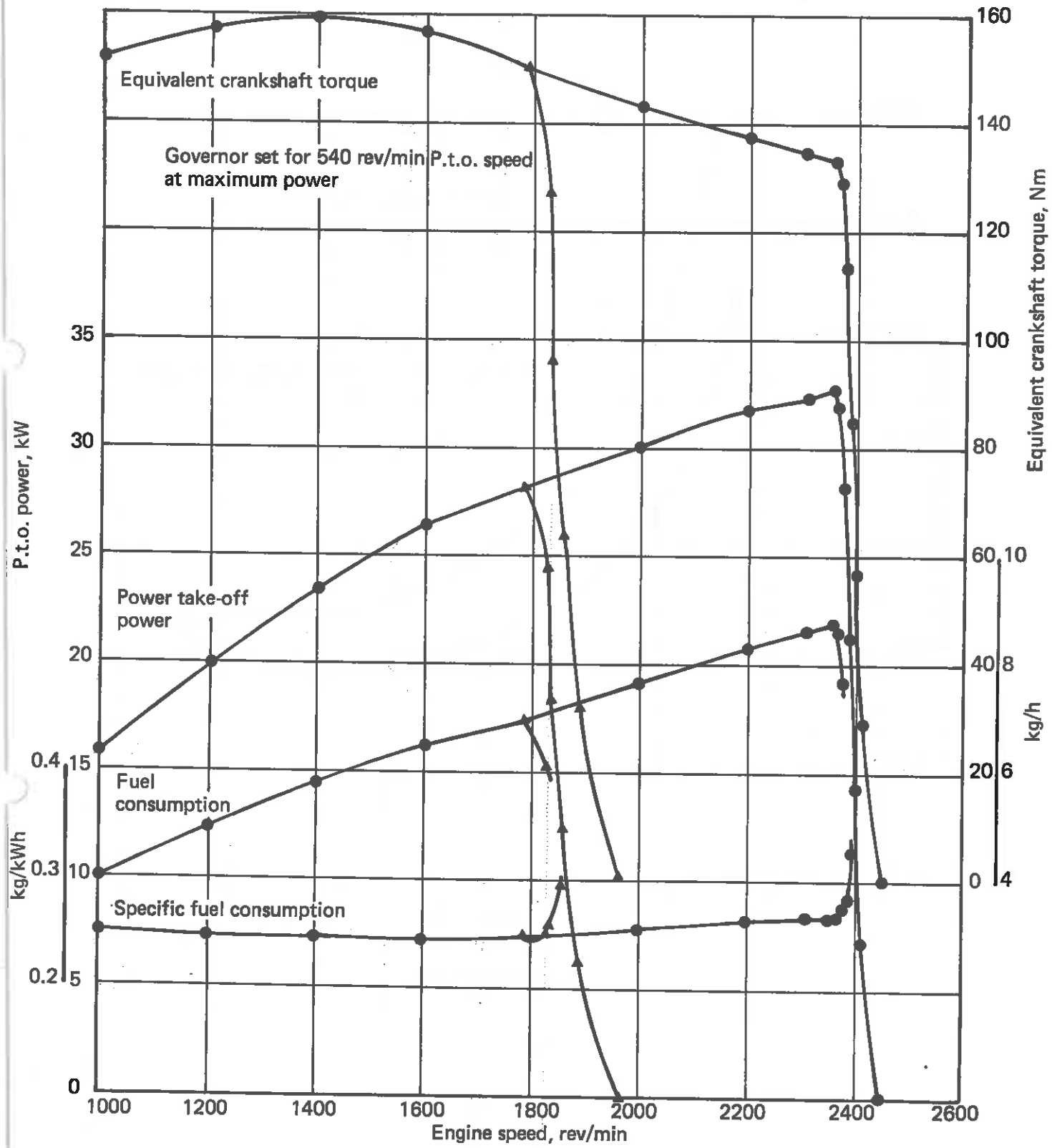
Power, kW (hp)	Speed, rev/min		Fuel consumption			
	Engine	P.t.o.	l/h (UKgal/h)	kg/h (lb/h)	kg/kWh (lb/hph)	kWh/l (hph/UKgal)
Part loads, the governor hand lever in the position corresponding to the standard p.t.o. speed at full load (540 rev/min)						
(1) 85% of the torque obtained at maximum power						
24.5 (32.9)	1835	554	7.18 (1.58)	6.09 (13.43)	0.249 (0.409)	3.41 (20.8)
(2) Unloaded						
0	1971	595	1.90 (0.42)	1.61 (3.55)	-	-
(3) 50% of the torque defined in (1)						
12.4 (16.6)	1862	562	4.29 (0.94)	3.64 (8.02)	0.294 (0.483)	2.89 (17.6)
(4) Maximum power						
28.1 (37.7)	1789	540	8.16 (1.79)	6.92 (15.26)	0.247 (0.406)	3.44 (21.0)
(5) 25% of the torque defined in (1)						
6.3 (8.4)	1892	571	3.07 (0.68)	2.60 (5.73)	0.413 (0.679)	2.05 (12.5)
(6) 75% of the torque defined in (1)						
18.4 (24.7)	1838	555	5.60 (1.23)	4.75 (10.47)	0.259 (0.426)	3.29 (20.0)

Standard specific fuel consumption, kg/kWh (lb/hph)

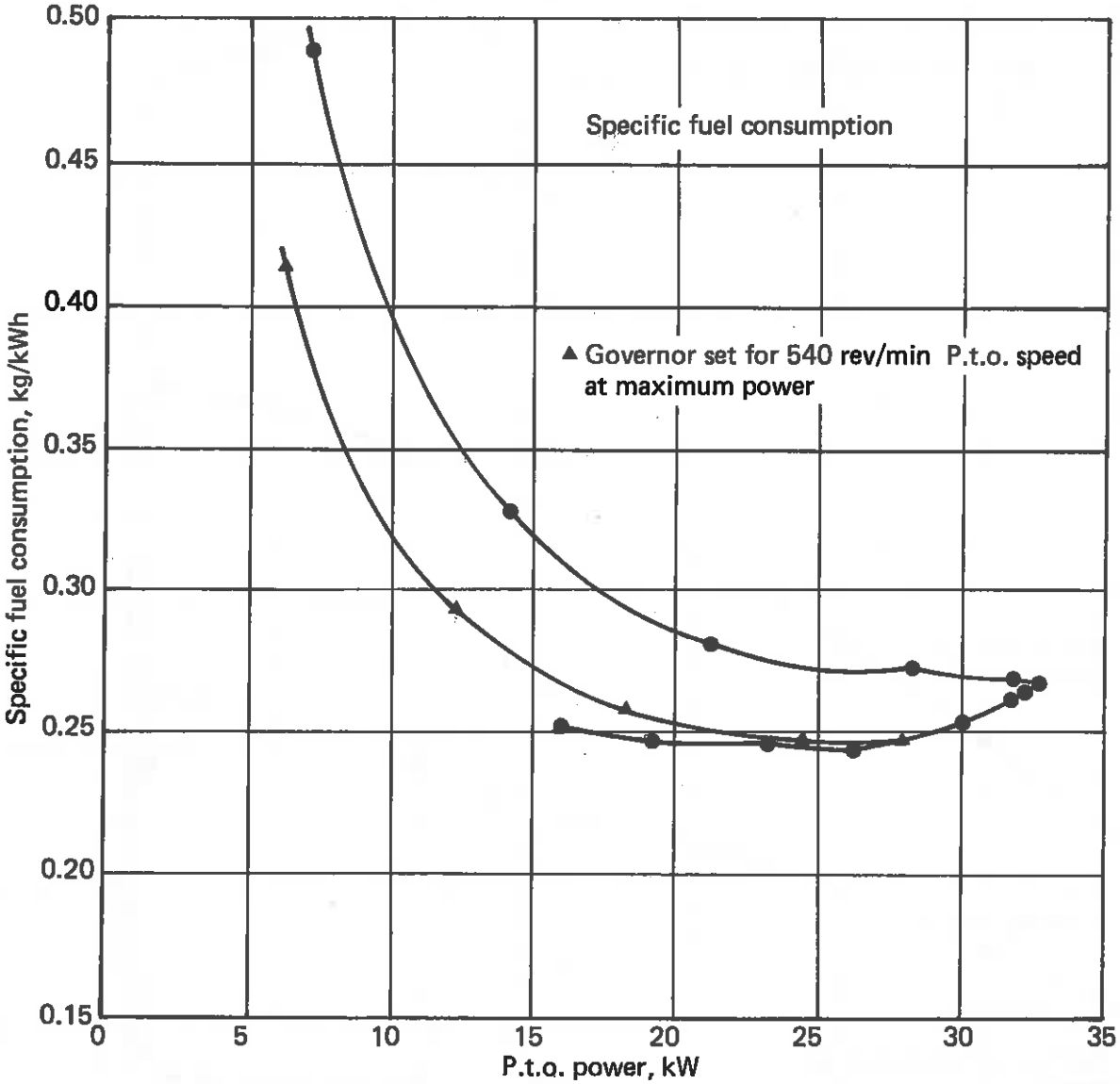
(a) 0.273 (0.449) (b) 0.329 (0.541) (c) 0.249 (0.409)

(d) 0.294 (0.483)

No load, maximum engine speed		2452 rev/min	
Equivalent crankshaft torque at maximum power		132.9 Nm	(98.0 lb ft)
Maximum equivalent crankshaft torque		159.5 Nm	(117.6 lb ft) at 1400 rev/min engine speed
Mean atmospheric conditions	temperature	21 °C	(68 °F)
	pressure	1015 m bar	(29.97 in Hg)
	relative humidity	67%	
Maximum temperature	coolant	93 °C	(199 °F)
	engine oil	117 °C	(243 °F)
	fuel	33 °C	(91 °F)
	air intake	28 °C	(82 °F)



Power take-off test



Power take-off test

2 DRAWBAR PERFORMANCE Date of tests: 10th January to 21st February 1980 Type of track: Concrete Height of drawbar above ground: Ballasted: 350 mm (13.8 in) Unballasted: 330 mm (13.0 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, bar (in Hg)
(i) MAXIMUM POWER (ballasted)													
L1	*15.5 (20.8)	25.0 (5620)	2.23 (1.39)	2387	15.0	0.354 (0.582)	2.40 (14.6)	69 (156)	20 (68)	90 (194)	8 (46)	74	1008 (29.77)
L2	*22.4 (30.0)	25.0 (5620)	3.23 (2.01)	2372	15.0	0.346 (0.569)	2.45 (14.9)	71 (160)	23 (73)	88 (190)	8 (46)	74	1008 (29.77)
L3	28.3 (38.0)	22.2 (4990)	4.59 (2.85)	2360	11.8	0.311 (0.511)	2.72 (16.6)	77 (171)	19 (66)	91 (196)	6 (43)	86	1008 (29.77)
L4	28.9 (38.8)	16.4 (3690)	6.34 (3.94)	2360	8.0	0.295 (0.485)	2.87 (17.5)	82 (180)	20 (68)	95 (203)	6 (43)	86	1013 (29.91)
H1	29.8 (40.0)	11.0 (2470)	9.75 (6.06)	2360	5.3	0.292 (0.480)	2.91 (17.7)	81 (178)	20 (68)	100 (212)	7 (45)	74	1013 (29.91)
H2	29.0 (39.9)	7.1 (1600)	14.70 (9.14)	2360	3.5	0.292 (0.480)	2.91 (17.7)	80 (176)	22 (72)	98 (208)	8 (46)	74	1013 (29.91)
(ii) FIVE HOUR TEST AT 75% OF PULL AT MAXIMUM POWER													
L4	22.7 (30.4)	12.3 (2770)	6.64 (4.13)	2404	6.0	0.304 (0.500)	2.79 (17.0)	81 (178)	22 (72)	104 (219)	9 (48)	87	1011 (29.85)
(iii) + FIVE HOUR TEST AT PULL CORRESPONDING TO 15% WHEELSLIP IN TEST (i)													
L2	-	25.0 (5620)	3.46 (2.15)	-	-	-	-	83 (181)	27 (81)	107 (225)	11 (52)	77	1013 (29.91)
(iv) MAXIMUM POWER (unballasted)													
L3	*14.8 (19.8)	12.0 (2700)	4.44 (2.76)	2390	15.0	-	-	74 (165)	14 (57)	90 (194)	7 (45)	74	1027 (30.33)
L4	*19.5 (26.1)	12.0 (2700)	5.85 (3.64)	2378	15.0	-	-	74 (165)	14 (57)	95 (203)	7 (45)	74	1027 (30.33)
H1	28.1 (37.7)	11.4 (2560)	8.87 (5.51)	2360	13.5	-	-	81 (178)	14 (57)	95 (203)	7 (45)	74	1027 (30.33)
H2	28.9 (38.8)	7.6 (1710)	13.69 (8.51)	2360	8.6	-	-	78 (172)	14 (57)	91 (196)	7 (45)	74	1027 (30.33)

Total oil consumption during ten hours duration of tests (ii) and (iii) 25.2 g/h (0.056 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 - 1347 mm (53.0 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)	3.06 (120)	3.09 (122)	3.41 (134)	3.34 (131)
Radius of turning circle, m (in)	2.97 (117)	3.00 (118)	3.32 (131)	3.25 (128)

4. LOCATION OF CENTRE OF GRAVITY

Height above ground, mm (in)	623 (24.5)
Distance forward from the vertical plane containing the axis of the rear wheels, mm (in)	755 (29.7)
Distance from the median plane of the tractor, mm (in)	0

5. BRAKING

Date of tests: 28th February-3rd March 1980
Type of track: Concrete
Type of decelerometer: Moto Meter, recording type
Mass of ballasted tractor: 3293 kg (7260 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)	4.4 (14.4)	4.7 (15.4)
Stopping distance, m (ft)	6.0 (19.7)	5.8 (19.0)
Force on brake pedal, N (lb)	480 (108)	650 (146)
Force exerted on the brake pedal to achieve a deceleration of 2.5 m/s^2 (8.2 ft/s^2), N (lb)	270 (61)	377 (85)

Brake fade characteristics (hot tests)

		Tractor without ballast	Tractor ballasted
Maximum deceleration hot/cold,	%	100	102
Stopping distance cold/hot,	%	100	110
Force on pedal cold/hot,	%	120	108

Parking brake

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

Pull on handbrake: 294 N (66 lb)

6. MEASUREMENT OF AMBIENT NOISE EMITTED BY THE TRACTOR

Date of tests:	7th March 1980
Type of sound level meter:	Bruel and Kjaer 2209
Type of track:	Concrete
Results of tests:	
Gear:	H4
Travelling speed before acceleration:	21.5 km/h (13.4 mile/h)
Sound level:	87 dBA

7. NOISE MEASUREMENT AT THE DRIVER'S EAR LEVEL

Date of tests:	7th March 1980
Type of sound level meter:	Bruel and Kjaer 2209
Type of track:	Concrete

Gear	Travelling speed, km/h	(mile/h)	dBA
L4	5.8	(3.6)	99
H1	9.5	(5.9)	101

8. POWER LIFT AND HYDRAULIC PUMP PERFORMANCE

Date of tests:	7th-11th March 1980
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	None fitted
Opening pressure of the main relief valve	18.3-19.3 MPa (2650-2800 lb/in^2)

Pump characteristics

i)	Opening pressure of relief valve:	17.5 MPa	(2540 lb/in^2)
	Sustained pressure of the open relief valve:	18.8 MPa	(2730 lb/in^2)
ii)	Pump delivery rate at minimum pressure and rated engine speed:	19.8 l/min	(4.4 gal/min)
iii)	Pump delivery rate at maximum hydraulic power:	19.8 l/min	(4.4 gal/min)
	Delivery pressure:	17.5 MPa	(2540 lb/in^2)
	Power:	5.8 kW	(7.8 hp)

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

Projected length in side view	
Lower links	873 (34.4)
Lift arms	267 (10.5)
Lift rods	571 (22.5)
Top link	698 (27.5)
Distance of lift rod connection point from pivot point of lower link	448 (17.6)
The following dimensions are given relative to the rear wheel centre line, situated 590 mm (23.2 in) above the ground level	
Lower link pivot point	44 (1.7) forward, 114 (4.5) below
Top link pivot point	134 (5.3) behind, 273 (10.7) above
Lift arm pivot point	196 (7.7) forward, 233 (9.2) above
Maximum and minimum height of lower link hitch points	288 (11.3) above, 410 (16.1) below
Height of lower link hitch points when locked in transport position	Any height within lift range

Power lift performance

Lifting height in relation to a horizontal line through the lower link pivoting point		mm (in)	-300 (11.8)	-280 (11.0)	-200 (7.9)	-100 (3.9)	0	+100 (3.9)	+200 (7.9)	+300 (11.8)	+380 (15.0)	+400 (15.7)	+475 (18.7)
Lifting force with the pressure at maximum hydraulic power [17.5 MPa (2540 lb/in^2)] calculated from measurements made at maximum pressure [18.8 MPa (2730 lb/in^2)], kN (lb)	At the hitch points			*12.2 (2740)	13.0 (2920)	14.0 (3150)	14.7 (3300)	15.1 (3390)	15.5 (3480)	15.7 (3530)	16.1 (3620)		
	On the frame		11.8 (2650)	11.9 (2680)	12.4 (2790)	12.6 (2830)	12.9 (2900)	12.8 (2880)	12.5 (2810)	12.2 (2740)	11.8 (2650)	11.7 (2630)	*11.5 (2590)

*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

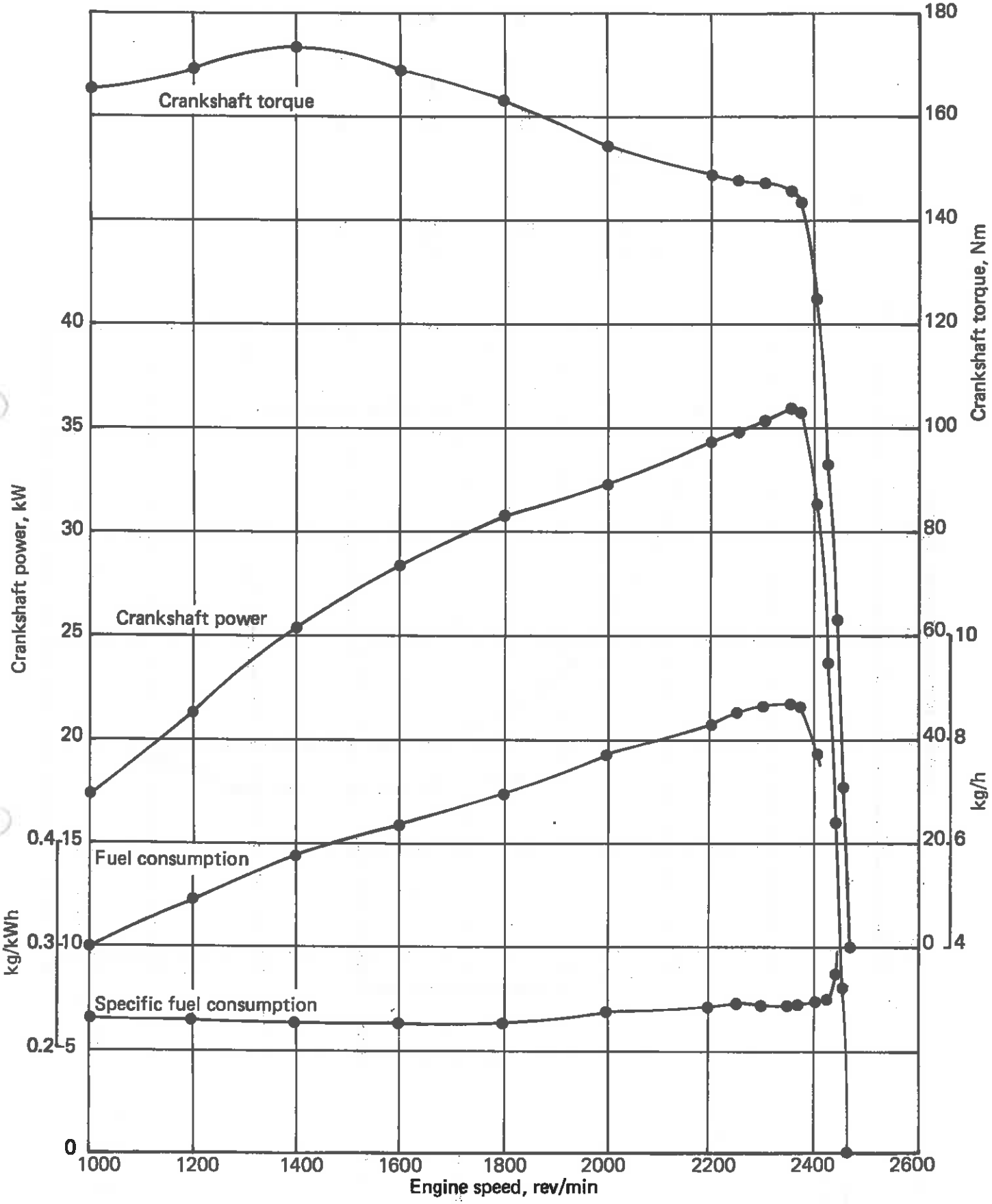
9. PERFORMANCE AT ENGINE CRANKSHAFT

Date and location of tests: 5th September 1979, N.I.A.E., Silsoe, Bedford, U.K.

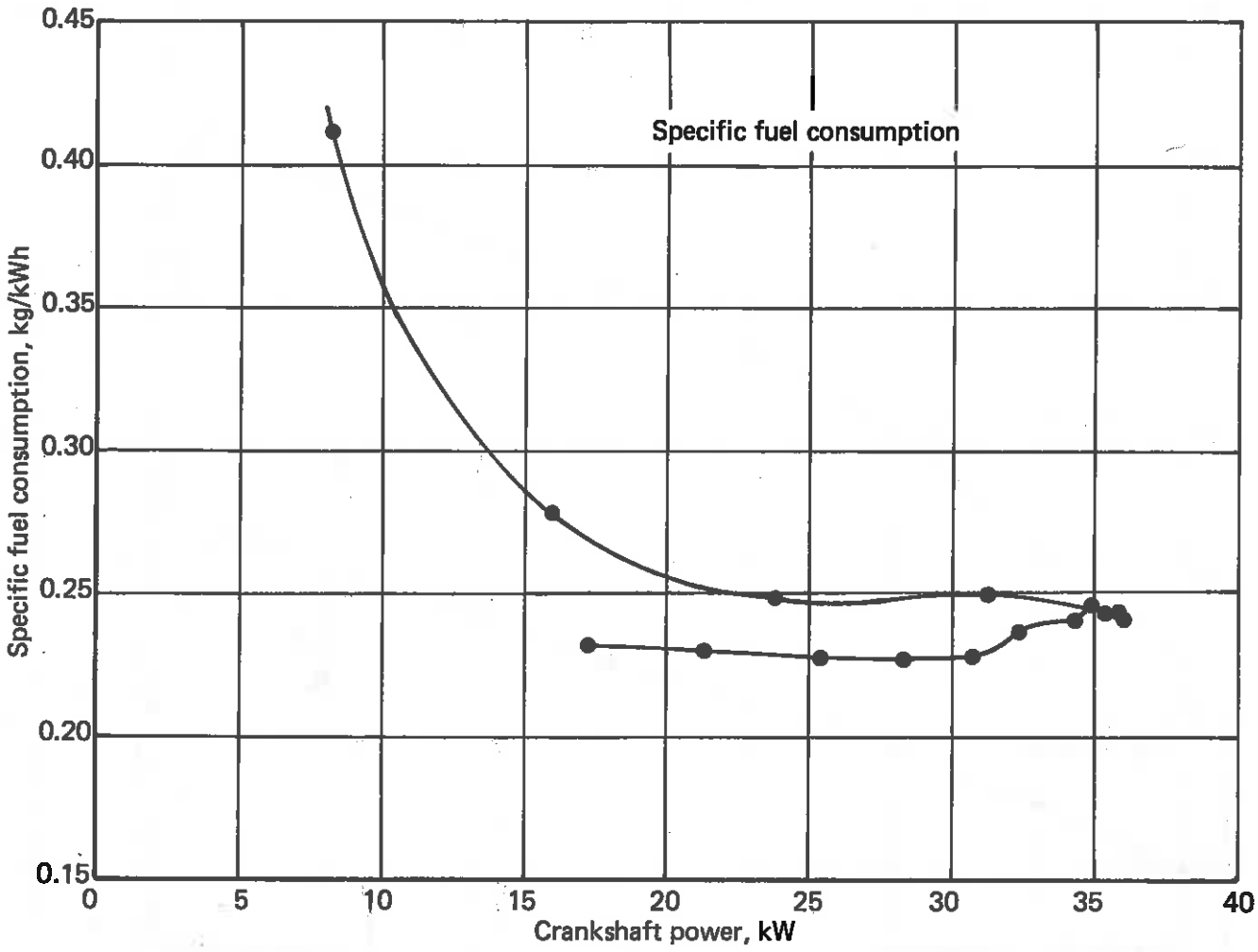
Type of dynamometer: Water brake, Heenan and Froude

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	10.24 (2.25)	8.68 (19.14)	0.241 (0.396)	3.52 (21.5)
The speed recommended by the manufacturer for drawbar work					
34.7 (46.5)	2250	10.11 (2.22)	8.57 (18.89)	0.247 (0.406)	3.43 (20.9)
Part loads					
(1) 85% of the torque obtained at maximum power					
31.2 (41.8)	2402	9.19 (2.02)	7.79 (17.17)	0.250 (0.411)	3.39 (20.7)
(2) Unloaded					
0	2468	2.59 (0.57)	2.20 (4.85)	-	-
(3) 50% of the torque defined in (1)					
15.9 (21.3)	2440	5.19 (1.14)	4.40 (9.70)	0.278 (0.457)	3.06 (18.7)
(4) Maximum power					
36.0 (48.3)	2350	10.24 (2.25)	8.68 (19.14)	0.241 (0.396)	3.52 (21.5)
(5) 25% of the torque defined in (1)					
8.1 (10.9)	2453	3.92 (0.86)	3.32 (7.32)	0.412 (0.677)	2.07 (12.6)
(6) 75% of the torque defined in (1)					
23.7 (31.8)	2424	6.95 (1.53)	5.89 (12.99)	0.249 (0.409)	3.41 (20.8)

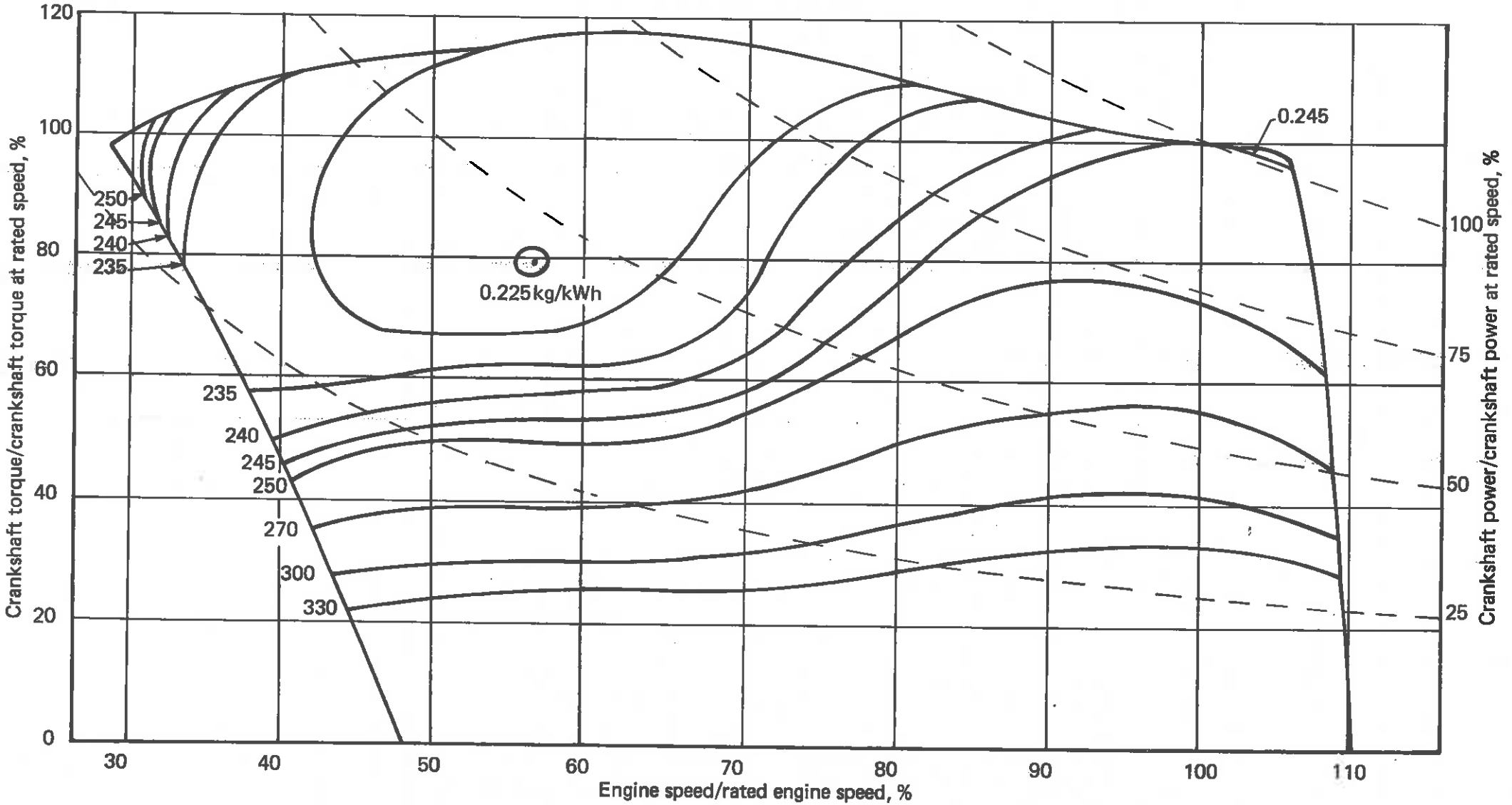
No load, maximum engine speed		2468 rev/min	
Crankshaft torque at maximum power		146.1 Nm	(107.8 lb ft)
Maximum crankshaft torque		173.4 Nm	(127.9 lb ft) at 1400 rev/min engine speed
Mean atmospheric conditions	temperature	25 °C	(77 °F)
	pressure	1017 m bar	(30.03 in Hg)
	relative humidity	50%	
Maximum temperature	coolant	95 °C	(203 °F)
	engine oil	121 °C	(250 °F)
	fuel	36 °C	(97 °F)
	air intake	31 °C	(88 °F)


Crankshaft torque
Crankshaft power
Fuel consumption
Specific fuel consumption
Crankshaft power, kW
Crankshaft torque, Nm
kg/kWh
kg/h
Engine speed, rev/min
0
0.2
0.3
0.4
5
10
15
20
25
30
35
40
0
20
40
60
80
100
120
140
160
180
0
4
6
8
10
1000
1200
1400
1600
1800
2000
2200
2400
2600

Engine test


Specific fuel consumption
Specific fuel consumption, kg/kWh
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0
5
10
15
20
25
30
35
40
Crankshaft power, kW

Engine test



Engine test, specific fuel consumption

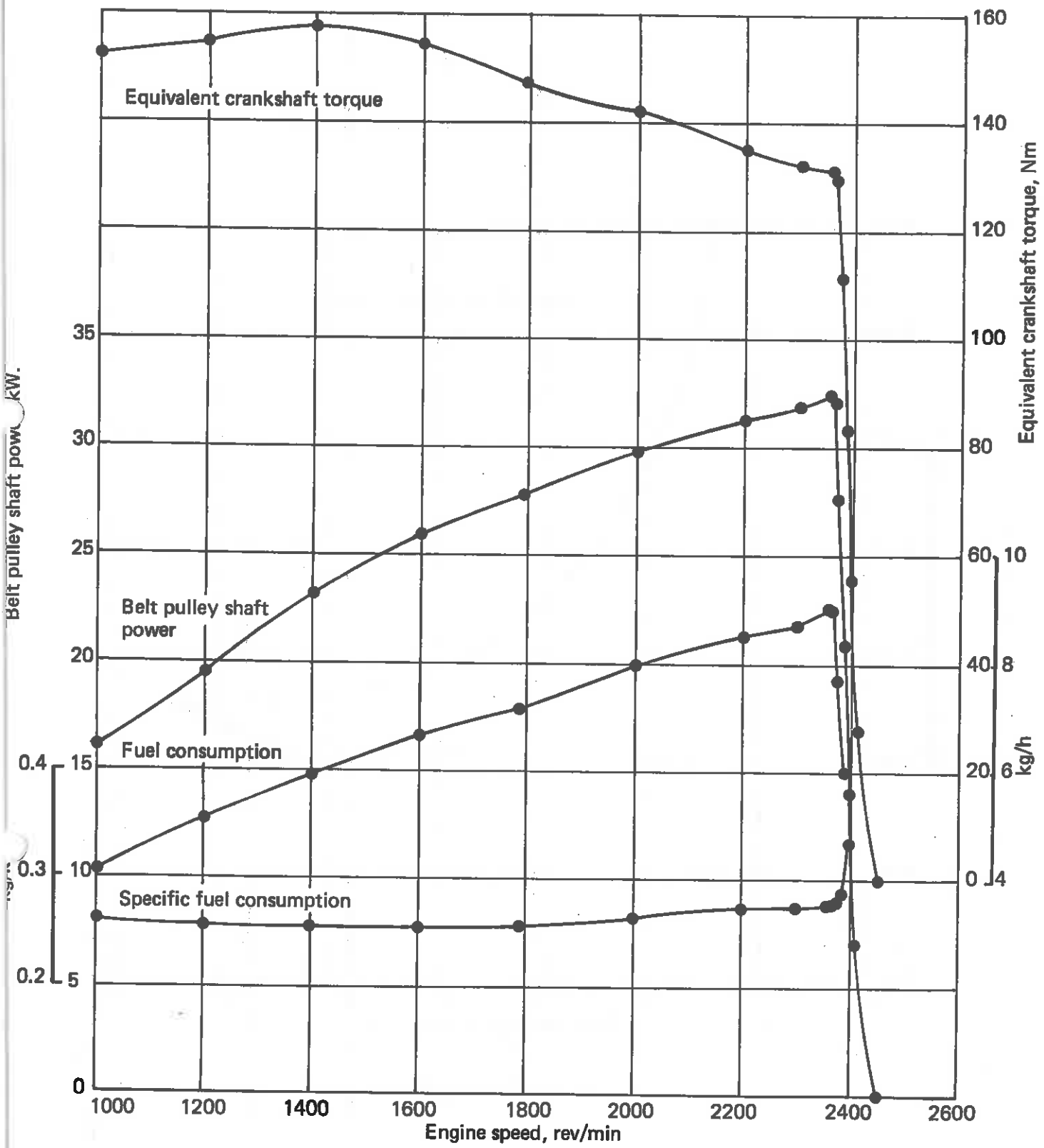
10. PERFORMANCE AT BELT PULLEY SHAFT

Date and location of tests: 5th November 1979, N.I.A.E., Silsoe, Bedford, U.K.

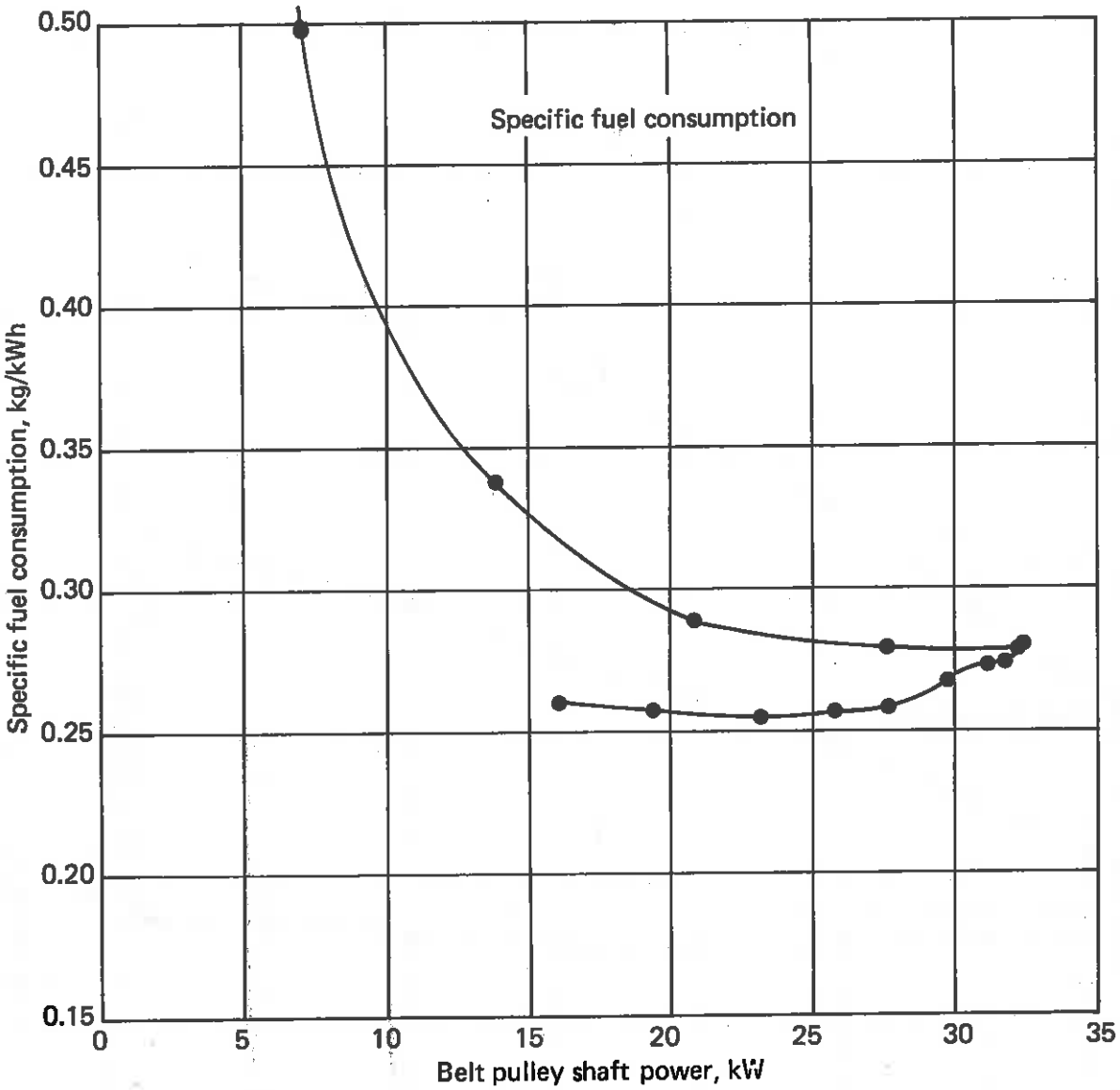
Type of dynamometer: Water brake, Heenan and Froude

Power, kW (hp)	Speed, rev/min		Fuel consumption,			
	Engine	Belt pulley shaft	l/h (UKgal/h)	kg/h (lb/h)	kg/kWh (lb/hph)	kWh/l (hph/UKgal)
Maximum power - 2 hour test						
32.3 (43.3)	2360	1299	10.65 (2.34)	9.03 (19.91)	0.279 (0.459)	3.03 (18.5)
Standard belt speed 945 m/min (3100 ft/min)						
22.5 (30.2)	2387	1314	7.56 (1.66)	6.41 (14.13)	0.285 (0.469)	2.98 (18.2)
The speed recommended by the manufacturer for drawbar work						
31.5 (42.2)	2250	1238	10.17 (2.24)	8.62 (19.00)	0.274 (0.450)	3.10 (18.9)
Part loads						
(1) 85% of the torque obtained at maximum power						
27.7 (37.1)	2377	1308	9.10 (2.00)	7.72 (17.02)	0.279 (0.459)	3.04 (18.5)
(2) Unloaded						
0	2452	1349	2.89 (0.64)	2.45 (5.40)	-	-
(3) 50% of the torque defined in (1)						
13.9 (18.7)	2400	1321	5.56 (1.22)	4.71 (10.39)	0.338 (0.556)	2.51 (15.3)
(4) Maximum power						
32.3 (43.3)	2360	1299	10.65 (2.34)	9.03 (19.91)	0.279 (0.459)	3.03 (18.5)
(5) 25% of the torque defined in (1)						
7.1 (9.5)	2416	1330	4.15 (0.91)	3.52 (7.76)	0.496 (0.815)	1.70 (10.4)
(6) 75% of the torque defined in (1)						
20.9 (28.0)	2390	1315	7.11 (1.56)	6.03 (13.29)	0.289 (0.475)	2.94 (17.9)

No load, maximum engine speed		2452 rev/min
Equivalent crankshaft torque at maximum power		130.7 Nm (96.4 lb ft)
Maximum equivalent crankshaft torque		157.5 Nm (116.2 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	45%
Maximum temperature	coolant	89 °C (192 °F)
	engine oil	116 °C (241 °F)
	fuel	23 °C (73 °F)
	air intake	26 °C (79 °F)



Belt pulley shaft test



Belt pulley shaft test

REPAIRS AND ADJUSTMENTS DURING TESTS: None

REMARKS: None

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

Officer in charge: D.W. Smith

Signed:  Head of Tractor Department

for the Director

Date: 19/5/80