NIAE

OECD Approval No. 619

Report No. 658

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

Report on test of Massey-Ferguson 565 Tractor.



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

Test No. R78/2/7021/O.E.C.D.

Date December, 1978.

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
OPTIONAL TESTS	
9 Performance at engine crankshaft	15
REPAIRS AND ADJUSTMENTS DURING TESTS	19
REMARKS	19

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:	68 hours

Tractor

Make:	Massey-Ferguson
Model:	M.F.565
Type:	Four wheel, rear wheel driven, unit construction
Serial No.:	651539

Engine

Make:	Perkins
Model:	A4.236
Type:	4-stroke, direct injection diesel
Serial No.:	236 UA 119192L
Cylinders:	4 cylinders, vertical, in-line, 98.4 mm (3.9 in) dia bore x 127 mm (5.0 in) stroke, capacity 3863 cm^3 (236 in^3), compression ratio 16:1 (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 79.6 l (17.5 UK gal); C.A.V. distributor type DPA 3241 F350 injection pump, Serial No. R33901T, manufacturer's production setting 12.84 - 13.52 l/h (22.6 - 23.8 pt/h) at 2000 rev/min engine speed and 63 °C (145 °F) cambox temperature; C.A.V. type BDLL 150S 6561 injector nozzles, injection pressure 17.73 MPa (175 atm), pump delivery starts 23° before T.D.C.

Governor:	C.A.V. mechanical, incorporated in fuel injection pump, governed range of engine speed 700 to 2200 rev/min, rated engine speed 2000 rev/min
Air cleaner:	A.C. Delco, 3-stage paper element filter, situated forward of radiator, centrifugal pre-cleaner above bonnet
Lubrication system:	Forced feed from gear pump with metal strainer in sump; full flow replaceable element filter; total oil capacity 7.1 l (12.5 pt), recommended oil S.A.E. 20W/30, viscosity 54 cSt at 50 °C (122 °F), oil and filter change period 250 hours
Cooling system:	Water cooled, pressurised at 50 kPa (7 lb/in^2), thermosyphon assisted by centrifugal pump, 413 mm (16.3 in) dia 4-blade belt-driven fan, thermostat for temperature control, cooling water capacity 14.2 l (25.0 pt)
Starting system:	Electrical, Lucas M50G solenoid-engaged starter motor, operable only when high-low gear selector lever is in neutral position, C.A.V. 357-5 Thermostart manifold flame-type cold starting aid
Exhaust	Vertical on right-hand side above bonnet.

Electrical system

Voltage:	12, negative earth
Generator:	Lucas type 23 ACR alternator
Battery:	Lucas AV70T, lead acid, 90 Ah at 20-hour rating

Transmission

Clutch:	Laycock, single plate, dry, 305 mm (12.0 in) dia, pedal-operated
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 and epicyclic reduction gear final drives, pedal-operated differential lock
Oil capacities:	Gearbox and transmission housing 32.4 l (57.0 pt), recommended oil S.A.E. 20W/30, viscosity 54 cSt at 50 °C (122 °F); final drives 1.7 l (3.0 pt) each, recommended oil S.A.E. 90, viscosity 115 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 2000 rev/min rated engine speed,* km/h	(mile/h)
Forward				
Low	1	244.29	2.14	(1.33)
	2	166.56	3.15	(1.96)
	3	121.94	4.30	(2.67)
	4	90.85	5.77	(3.59)
High	1	59.71	8.78	(5.46)
	2	40.71	12.87	(8.00)
	3	29.81	17.58	(10.93)
	4	22.21	23.59	(14.66)
Reverse				
	1	179.37	2.92	(1.81)
	2	43.85	11.95	(7.43)

*Calculated with a tyre rolling radius of 695 mm (27.4 in)

Power take-off

At rear of tractor in vertical centre plane, height above ground 550 mm (21.7 in), distance behind rear axle centre 295 mm (11.6 in), 6-spline, 34.9 mm ($1\frac{3}{8}$ in) dia to I.S.O. Standard, independent of main clutch, engaged by hand lever and hydraulically operated multi-plate clutch, proportional engine speed giving 641 rev/min at 2000 rev/min rated engine speed, 540 rev/min (standard p.t.o. speed) at 1684 rev/min engine speed, direction of rotation clockwise viewed facing driving end

Power lift

Own make, live hydraulic, 4-cylinder piston pump with suction side control, driven from forward end of p.t.o. shaft; 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 322 mm (12.7 in) and 473 mm (18.6 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 432 mm (17.0 in) and 505 mm (19.9 in), pivot position 130 mm (5.1 in) forward of rear wheel centre, drawbar pin hole 26 mm (1.0 in) dia

Steering	Danfoss hydrostatic, incorporating manual control for emergency, oil supplied from D.B.A. gear pump with integral reservoir
Brakes	Girling, oil-immersed, multi-disc on inner high speed axle shafts, independent or combined pedal-operated, hand lever with ratchet operating both brakes for parking
Wheels	
Steering wheels:	Two at front, Goodyear Super Rib 7.50-16 cross-ply tyres, 6-ply rating, maximum permissible mass on each tyre 745 kg (1640 lb) at 280 kPa (41 lb/in^2), track width 1218 mm (48.0 in) by 102 mm (4.0 in) steps to 1830 mm (72.0 in), changed by extending axle
Driving wheels:	Two at rear, Goodyear Traction Sure Grip 16.9/14-30 cross-ply tyres, 6-ply rating, maximum permissible mass on each tyre 1900 kg (4190 lb) at 130 kPa (19 lb/in^2), track width 1421 mm (56.0 in) by 102 mm (4.0 in) steps to 2135 mm (84.0 in), changed by reversing wheels and offset lug rims
Wheelbase:	2223 mm (87.5 in)
Seat	Bostrom Argus XH, upholstered pan, adjustable torsion bar suspension with hydraulic damping, range of adjustment 140 mm (5.5 in) forwards and backwards
Safety Cab (CS 1205)	Massey-Ferguson, welded pressed plate and sheet steel, anti-vibration mounts, door and mounting step on left-hand side, heating, ventilating and demisting system in roof

Lighting

Unrestricted beam angle of headlight in plan view 131°

	Height above ground of centre, mm (in)	Size, mm (in)	Distance from outside edge of tractor at 1523 mm (60.0 in) wheel track, to centre, mm (in)
Headlight	830 (32.7)	124 (4.9) dia	809 (31.9)
Side lights	1450 (57.1)	100 (3.9) x 32 (1.3)	403 (15.9)
Rear lights	1500 (59.1)	90 (3.5) x 70 (2.8)	416 (16.4)
Reflectors	1440 (56.7)	70 (2.8) x 32 (1.3)	373 (14.7)

Number of grease points

Whole tractor: 9

CONDITIONS DURING TEST

Masses

Tractor (without driver but with tanks full)

	Front, kg (lb)	Rear, kg (lb)	Total, kg (lb)
Without ballast	1061 (2339)	1662 (3664)	2723 (6003)
With ballast	1436 (3166)	3700 (8157)	5136 (11323)

Ballast

	Number of weights	Total mass, kg (lb)	Water, kg (lb)
Front wheels	Nil	Nil	Nil
Rear wheels	28	1472 (3245)	639 (1409)
Additional	8	302 (666)	Front frame and weights

Track setting during tests

Front - 1218 mm (48.0 in)
Rear - 1523 mm (60.0 in)

Overall dimensions

	Length, m (in)	Width, m (in)	Height, m (in) To top of exhaust pipe	Height, m (in) To top of cab
With ballast	4.05 (159.4)	3.06 (120.5)	2.50 (98.4)	2.43 (95.7)
Without ballast	3.77 (148.4)	1.95 (76.8)	2.50 (98.4)	2.43 (95.7)

Minimum ground clearance 322 mm (12.7 in) to underside of drawbar frame

FUEL AND LUBRICANTS USED IN TESTS

Fuel

Laboratory tests:	Diesel oil to Class A2 British Standard 2869:1970, specific gravity 0.837 at 15 °C (59 °F), viscosity 2.34 cSt at 50 °C (122 °F), Cetane No. 52.7
Track tests:	Diesel oil to Class A2 British Standard 2869:1970, specific gravity 0.845 at 15 °C (59 °F), viscosity 2.31 cSt at 50 °C (122 °F), Cetane No. 52.1

Oil

Engine:	Agricastrol M.P. S.A.E. 20W/30, viscosity 54 cSt at 50 °C (122 °F)
Transmission:	Agricastrol M.P. S.A.E. 20W/30, viscosity 54 cSt at 50 °C (122 °F)
Final drives:	Mobilube GX S.A.E. 90, viscosity 115 cSt at 50 °C (122 °F)

COMPULSORY TESTS

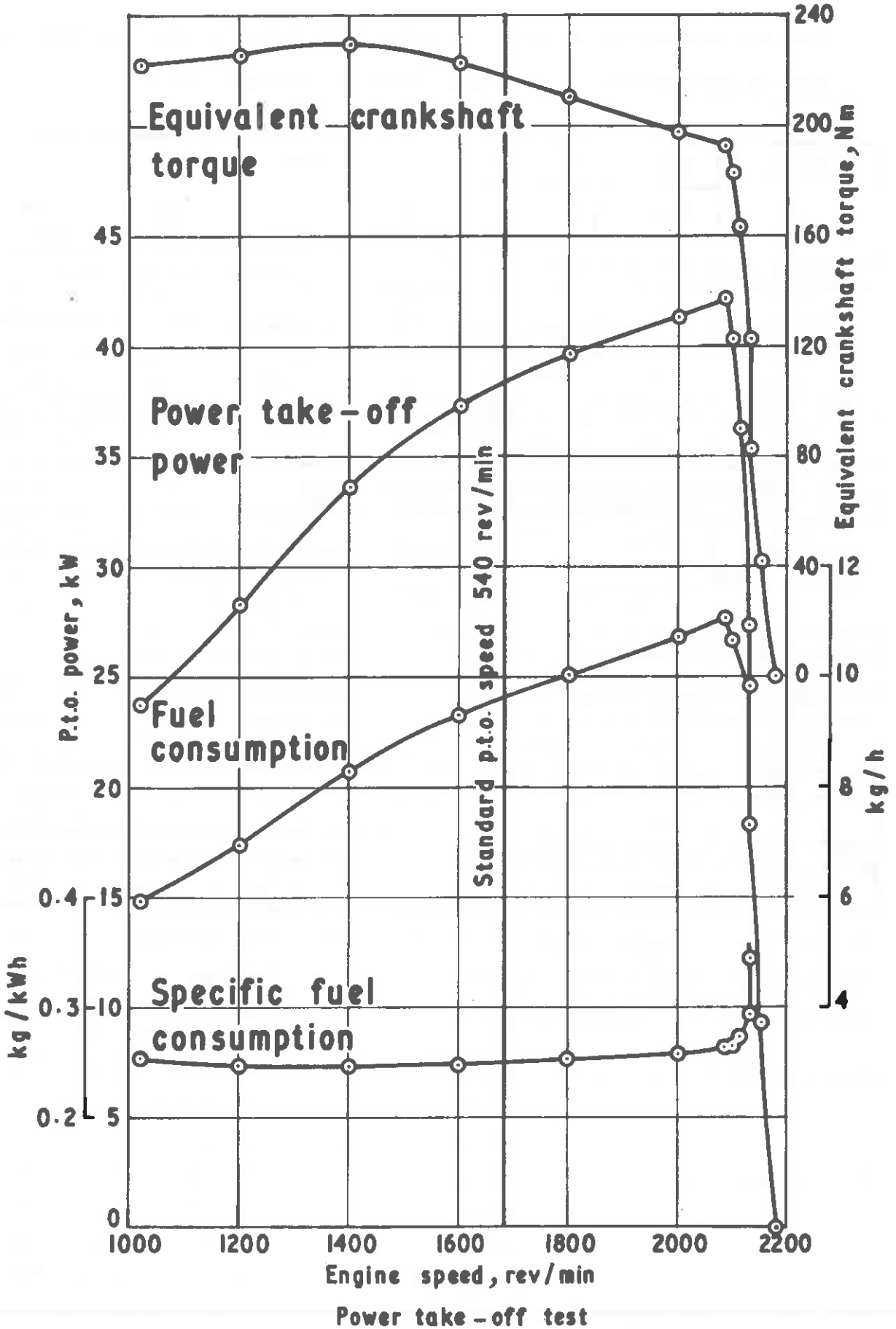
1. MAIN POWER TAKE-OFF PERFORMANCE

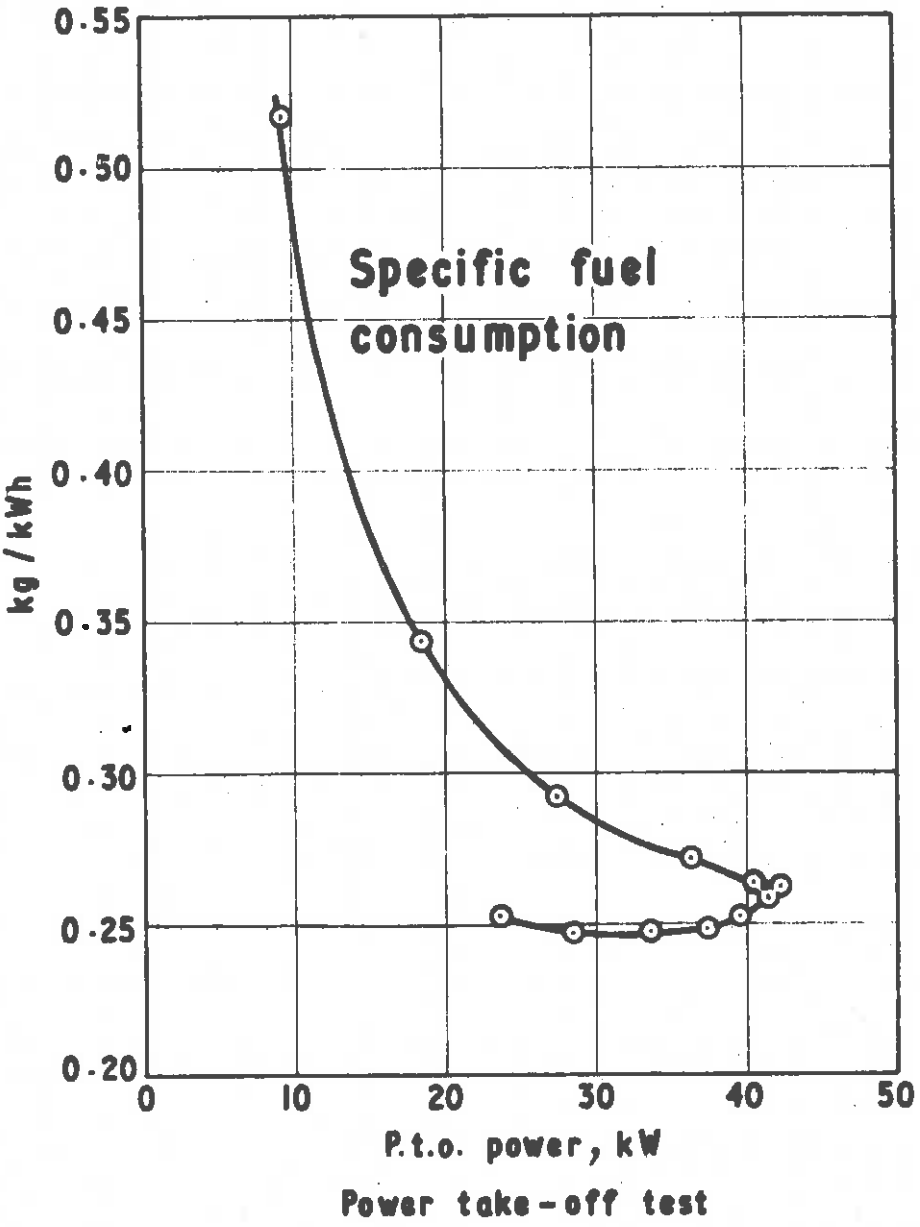
Date and location of tests: 27th April 1977, N.I.A.E., Silsoe, Bedford, U.K.

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						
42.1 (56.5)	2085	669	13.17 (2.90)	11.02 (24.29)	0.262 (0.431)	3.20 (19.5)
Standard p.t.o. speed (540 rev/min)						
38.3 (51.4)	1684	540	11.43 (2.51)	9.57 (21.10)	0.250 (0.411)	3.35 (20.4)
The speed recommended by the manufacturer for drawbar work						
41.4 (55.5)	2000	641	12.77 (2.81)	10.69 (23.57)	0.258 (0.424)	3.24 (19.8)
Part loads						
(1) 85% of the torque obtained at maximum power						
36.2 (48.5)	2114	678	11.72 (2.58)	9.81 (21.63)	0.271 (0.446)	3.09 (18.8)
(2) Unloaded						
0	2179	699	4.00 (0.88)	3.35 (7.39)	-	-
(3) 50% of the torque defined in (1)						
18.3 (24.5)	2133	684	7.53 (1.65)	6.30 (13.89)	0.344 (0.566)	2.43 (14.8)
(4) Maximum power						
42.1 (56.5)	2085	669	13.17 (2.90)	11.02 (24.29)	0.262 (0.431)	3.20 (19.5)
(5) 25% of the torque defined in (1)						
9.2 (12.3)	2155	691	5.68 (1.25)	4.75 (10.47)	0.516 (0.848)	1.62 (9.9)
(6) 75% of the torque defined in (1)						
27.4 (36.7)	2133	684	9.56 (2.10)	8.00 (17.64)	0.292 (0.480)	2.87 (17.5)

No load, maximum engine speed		2179 rev/min	
Equivalent crankshaft torque at maximum power		192.6 Nm	(142.1 lb ft)
Maximum equivalent crankshaft torque		229.2 Nm	(169.0 lb ft) at 1370 rev/min engine speed
Mean atmospheric conditions	temperature	19 °C	(66 °F)
	pressure	1011 m bar	(29.85 in Hg)
	relative humidity	36 %	
Maximum temperature	coolant	91 °C	(196 °F)
	engine oil	114 °C	(237 °F)
	fuel	38 °C	(100 °F)
	air intake	23 °C	(73 °F)


Equivalent crankshaft torque
Power take-off power
Fuel consumption
Specific fuel consumption
Standard p.t.o. speed 540 rev/min
P.t.o. power, kW
Equivalent crankshaft torque, Nm
kg/kWh
kg/h
Engine speed, rev/min
Power take-off test
240
200
160
120
80
40
0
45
40
35
30
25
20
15
10
5
0
0.4
0.3
0.2
12
10
8
6
4
1000
1200
1400
1600
1800
2000
2200



Power take-off test

2. DRAWBAR PERFORMANCE Date of tests: 12th June - 17th August 1978 Type of track: Tarmacadam Height of drawbar above ground: 350 mm (13.8 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	19.7* (26.4)	38.7 (8700)	1.83 (1.14)	2109	15.0	0.414 (0.681)	2.04 (12.4)	69 (156)	23 (73)	79 (174)	14 (57)	65	1012 (29.88)
L2	28.4* (38.1)	38.7 (8700)	2.64 (1.64)	2082	15.0	0.369 (0.607)	2.29 (14.0)	70 (158)	25 (77)	87 (189)	14 (57)	65	1012 (29.88)
L3	33.6 (45.1)	31.8 (7150)	3.80 (2.36)	2049	9.6	0.340 (0.559)	2.48 (15.1)	75 (167)	21 (70)	80 (176)	13 (55)	52	1006 (29.71)
L4	34.6 (46.4)	23.4 (5260)	5.32 (3.31)	2073	6.8	0.330 (0.543)	2.56 (15.6)	70 (158)	23 (73)	71 (160)	13 (55)	50	982 (29.00)
H1	36.0 (48.3)	15.7 (3530)	8.25 (5.13)	2071	4.4	0.313 (0.515)	2.70 (16.5)	70 (158)	20 (68)	78 (172)	13 (55)	50	982 (29.00)
H2	33.6 (45.1)	9.8 (2200)	12.34 (7.67)	2079	2.7	0.334 (0.549)	2.53 (15.4)	77 (171)	18 (64)	78 (172)	16 (61)	68	1002 (29.59)
(ii) FIVE HOUR TEST AT 75% OF PULL AT MAXIMUM POWER													
L4	27.1 (36.3)	17.6 (3960)	5.54 (3.44)	2105	5.0	0.330 (0.543)	2.56 (15.6)	70 (158)	29 (84)	93 (199)	13 (55)	72	1004 (29.65)
(iii) FIVE HOUR TEST AT PULL CORRESPONDING TO 15% WHEELSLIP IN TEST (i)													
L2	-	38.7 (8700)	2.77 (1.72)	-	-	-	-	67 (153)	33 (91)	92 (198)	17 (63)	70	1005 (29.68)
(iv) MAXIMUM POWER (unballasted)													
L2	16.7* (22.4)	21.0 (4720)	2.86 (1.78)	2122	15.0	-	-	71 (160)	24 (75)	84 (183)	21 (70)	50	979 (28.91)
L3	22.4* (30.0)	21.0 (4720)	3.84 (2.39)	2126	15.0	-	-	69 (156)	24 (75)	70 (158)	21 (70)	50	979 (28.91)
L4	30.4* (40.8)	21.0 (4720)	5.21 (3.24)	2081	15.0	-	-	73 (163)	23 (73)	84 (183)	19 (66)	48	1006 (29.71)
H1	35.6 (47.7)	15.8 (3550)	8.11 (5.04)	2023	7.6	-	-	76 (169)	23 (73)	82 (180)	19 (66)	48	1006 (29.71)
H2	38.7 (51.9)	11.1 (2500)	12.55 (7.80)	2044	4.8	-	-	72 (162)	24 (75)	74 (165)	19 (66)	48	1006 (29.71)
H3	38.5 (51.6)	8.6 (1930)	16.12 (10.02)	1913	3.6	-	-	75 (167)	22 (72)	77 (171)	19 (66)	48	1006 (29.71)

Total oil consumption during ten hours duration of tests (ii) and (iii) 23.0 g/h (0.051 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 - 1218 mm (48.0 in)
rear - 1523 mm (60.0 in)

	With brakes		Without brakes	
	Right-hand	Left-hand	Right-hand	Left-hand
Radius of turning space, m (in)	3.41 (134)	3.33 (131)	3.82 (150)	3.77 (148)
Radius of turning circle, m (in)	3.30 (130)	3.22 (127)	3.71 (146)	3.66 (144)

4. LOCATION OF CENTRE OF GRAVITY

Height above ground, mm (in)	846 (33.3)
Distance forward from the vertical plane containing the axis of the rear wheels, mm (in)	853 (33.6)
Distance from the median plane of the tractor, mm (in)	0

5. BRAKING

Date of tests: 20th-27th July and 5th October 1978

Type of track: Tarmacadam

Type of decelerometer: Moto Meter, recording type

Mass of ballasted tractor: 5136 kg (11323 lb)

Cold brakes

	Tractor without ballast		Tractor ballasted	
Travelling speed of tractor, km/h (mile/h)	25.0	(15.5)	24.5	(15.2)
Maximum deceleration, m/s^2 (ft/s^2)	4.0	(13.1)	5.0	(16.4)
Stopping distance, m (ft)	6.7	(22.0)	5.8	(19.0)
Force on brake pedal, N (lb)	320	(72)	458	(103)
Force exerted on the brake pedal to achieve a deceleration of 2.5 m/s^2 (8.2 ft/s^2), N (lb)	187	(42)	254	(57)

Brake fade characteristics (hot tests)

Maximum deceleration hot/cold, %	100	102
Stopping distance cold/hot, %	93	100
Force on pedal cold/hot, %	94	100

Parking brake

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

Pull on handbrake: 378 N (85 lb)

6. MEASUREMENT OF AMBIENT NOISE EMITTED BY THE TRACTOR

Date of tests:	18th August 1978
Type of sound level meter:	Bruel and Kjaer 2206
Type of track:	Tarmacadam
Results of tests:	
Gear:	H4
Travelling speed before acceleration:	19.1 km/h (11.9 mile/h)
Sound level:	89 dBA

7. NOISE MEASUREMENT AT THE DRIVER'S EAR LEVEL

Date of tests:	30th August 1978
Type of sound level meter:	Bruel and Kjaer 2206
Type of track:	Tarmacadam

Gear	Travelling speed,* km/h	(mile/h)	dBA
H1	7.1	(4.4)	83
L3	4.1	(2.5)	84

*The first gear tested corresponds to the travelling speed nearest to 7.5 km/h (4.7 mile/h)

8. POWER LIFT AND HYDRAULIC PUMP PERFORMANCE

Date of tests:	27th September 1978
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):	22.4 MPa (3250 lb/in^2)
Pump characteristics	
i) Opening pressure of relief valve:	18.0 MPa (2610 lb/in^2)
Sustained pressure of the open relief valve:	21.9 MPa (3180 lb/in^2)
ii) Pump delivery rate at minimum pressure and rated engine speed:	17.0 l/min (3.7 gal/min)
iii) Pump delivery rate at maximum hydraulic power:	15.5 l/min (3.4 gal/min)
Delivery pressure:	18.0 MPa (2610 lb/in^2)
Power:	4.7 kW (6.3 hp)

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

	Maximum mechanical advantage		Minimum mechanical advantage	
Projected length in side view				
Lower links	953	(37.5)	953	(37.5)
Lift arms	267	(10.5)	267	(10.5)
Lift rods	614	(24.2)	614	(24.2)
Top link	736	(29.0)	714	(28.1)
Distance of lift rod connection point from pivot point of lower link	427	(16.8)	427	(16.8)
The following dimensions are given relative to the rear wheel centre line, situated 695 mm (27.4 in) above the ground level				
Lower link pivot point	32 (1.3) forward,	212 (8.4) below	32 (1.3) forward,	212 (8.4) below
Top link pivot point	186 (7.3) behind,	205 (8.1) above	216 (8.5) behind,	132 (5.2) 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	254 (10.0) above,	493 (19.4) below	254 (10.0) above,	493 (19.4) 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)	-340 (13.4)	-300 (11.8)	-280 (11.0)	-160 (6.3)	-80 (3.1)	0	+80 (3.1)	+160 (6.3)	+240 (9.4)	+320 (12.6)	+400 (15.7)	+450 (17.7)	+520 (20.5)	+600 (23.6)
Lifting force with the pressure at maximum hydraulic power (18.0 MPa(2610 lb/in^2)) calculated from measurements made at maximum pressure (21.9 MPa(3180 lb/in^2)), kN (lb)	At the hitch points	max. mech. advantage			*13.3 (2990)	15.1 (3390)	15.8 (3550)	16.4 (3690)	16.9 (3800)	17.3 (3890)	17.6 (3960)	18.0 (4050)	18.4 (4140)	18.9 (4250)		
	On the frame	max. mech. advantage		14.1 (3170)	14.4 (3240)	14.9 (3350)	15.1 (3390)	15.2 (3420)	15.1 (3390)	15.0 (3370)	14.8 (3330)	14.5 (3260)	14.1 (3170)	13.7 (3080)	*12.9 (2900)	
		min. mech. advantage	12.4 (2790)	12.5 (2810)	12.6 (2830)	13.3 (2990)	13.4 (3010)	13.4 (3010)	13.4 (3010)	13.1 (2940)	13.0 (2920)	12.6 (2830)	12.4 (2790)	12.1 (2720)	11.8 (2650)	*11.1 (2500)

*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 TEST

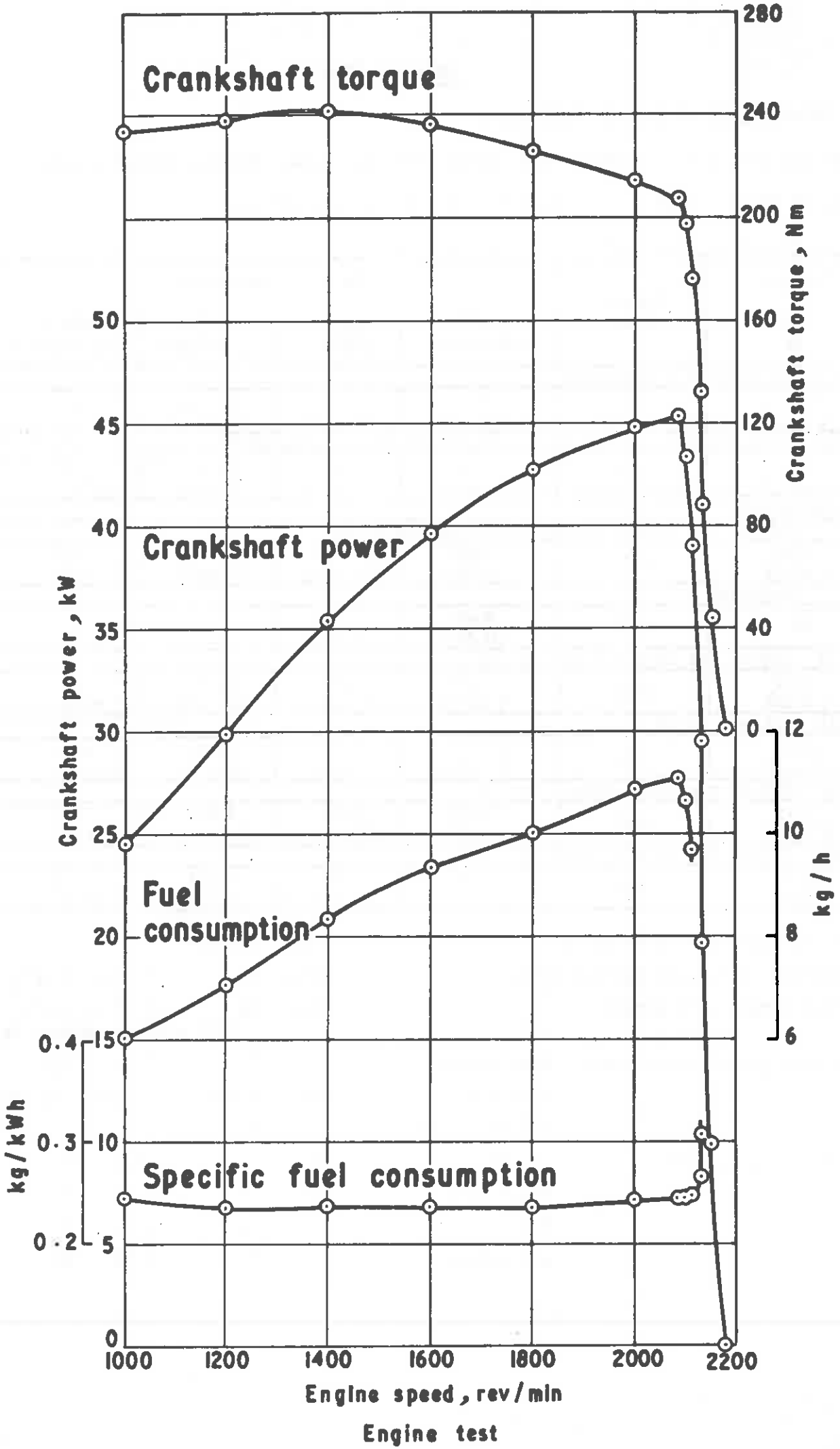
9. PERFORMANCE AT ENGINE CRANKSHAFT

Date and location of tests: 29th April 1977, N.I.A.E., Silsoe, Bedford, U.K.

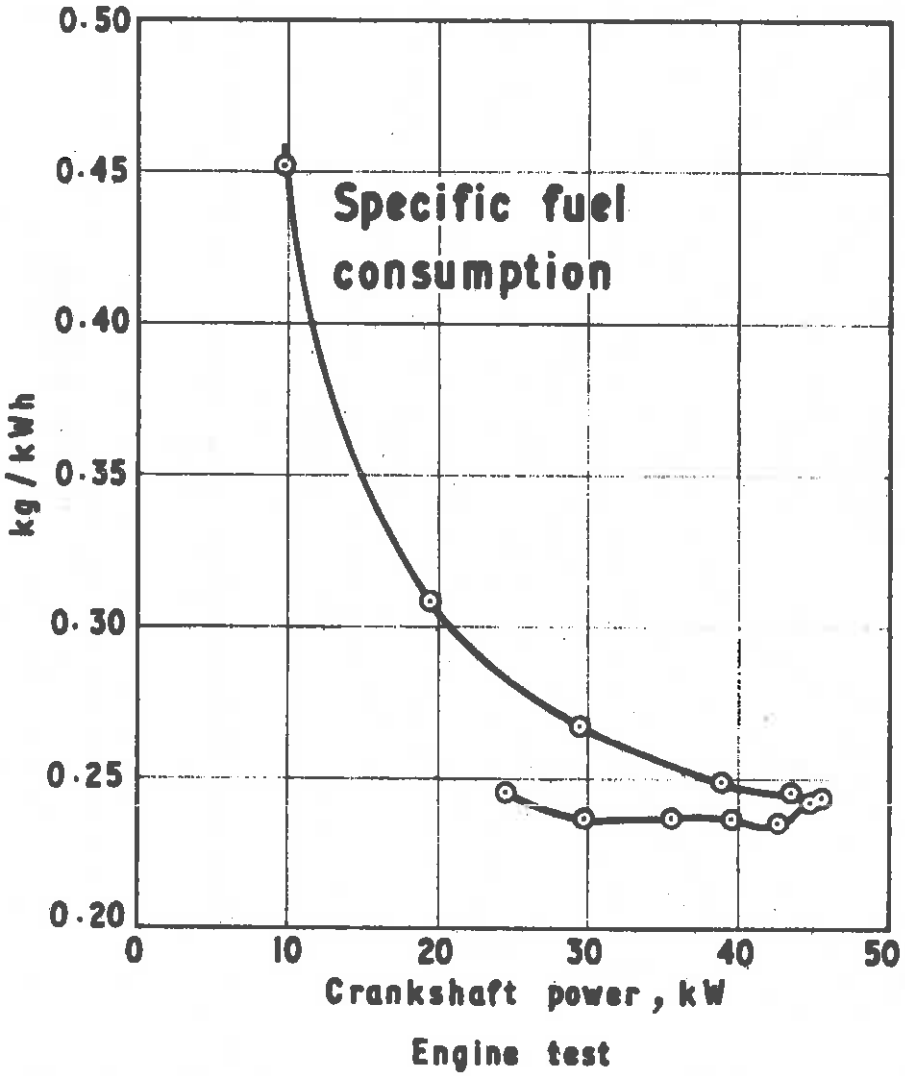
Type of dynamometer: Water brake, Heenan and Froude

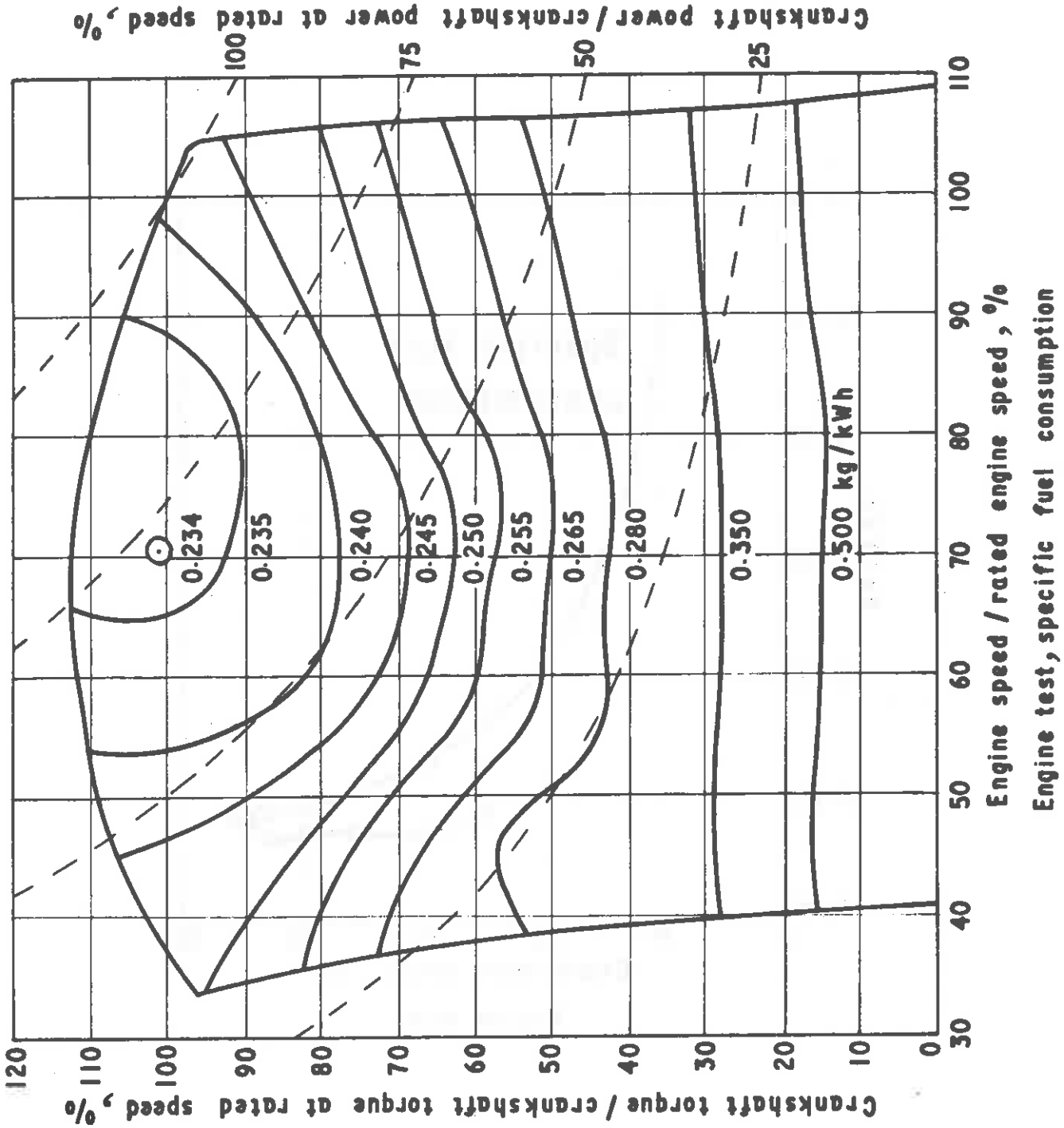
Power, kW (hp)	Speed, rev/min	Fuel consumption, l/h (UKgal/h)	kg/h (lb/h)	kg/kWh (lb/hph)	kWh/l (hph/UKgal)
Maximum power - 2 hour test					
45.3 (60.7)	2085	13.19 (2.90)	11.04 (24.34)	0.244 (0.401)	3.43 (20.9)
The speed recommended by the manufacturer for drawbar work					
44.8 (60.1)	2000	12.96 (2.85)	10.85 (23.92)	0.242 (0.398)	3.46 (21.1)
Part loads					
(1) 85% of the torque obtained at maximum power					
39.0 (52.3)	2112	11.60 (2.55)	9.71 (21.41)	0.249 (0.410)	3.36 (20.5)
(2) Unloaded					
0	2180	4.00 (0.88)	3.35 (7.39)	-	-
(3) 50% of the load defined in (1)					
19.7 (26.4)	2135	7.25 (1.59)	6.07 (13.38)	0.308 (0.507)	2.72 (16.6)
(4) Maximum power					
45.3 (60.7)	2085	13.19 (2.90)	11.04 (24.34)	0.244 (0.401)	3.43 (20.9)
(5) 25% of the load defined in (1)					
9.9 (13.3)	2151	5.33 (1.17)	4.46 (9.83)	0.451 (0.742)	1.86 (11.3)
(6) 75% of the load defined in (1)					
29.5 (39.6)	2129	9.38 (2.06)	7.85 (17.31)	0.266 (0.438)	3.14 (19.1)

No load, maximum engine speed		2180	rev/min	
Crankshaft torque at maximum power		207.4	Nm	(153.0 lb ft)
Maximum crankshaft torque		241.9	Nm	(178.4 lb ft) at 1370 rev/min engine speed
Mean atmospheric conditions	temperature	17	°C	(63 °F)
	pressure	1003	m bar	(29.62 in Hg)
	relative humidity	55	%	
Maximum temperature	coolant	91	°C	(196 °F)
	engine oil	110	°C	(230 °F)
	fuel	35	°C	(95 °F)
	air intake	21	°C	(70 °F)


Crankshaft torque
Crankshaft power
Fuel consumption
Specific fuel consumption
Crankshaft power, kW
Crankshaft torque, Nm
kg/h
kg/kWh
Engine speed, rev/min
1000
1200
1400
1600
1800
2000
2200
0
5
10
15
20
25
30
35
40
45
50
0
40
80
120
160
200
240
280
6
8
10
12
0.2
0.3
0.4

Engine test


0.50
0.45
0.40
0.35
0.30
0.25
0.20
kg / kWh
Specific fuel consumption
0
10
20
30
40
50
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 , %
Engine test, specific fuel consumption
0.234
0.235
0.240
0.245
0.250
0.255
0.265
0.280
0.350
0.500 kg/kWh
120
110
100
90
80
70
60
50
40
30
20
10
0
Crankshaft torque / crankshaft torque at rated speed , %

REPAIRS AND ADJUSTMENTS DURING TESTS: None

REMARKS: None

Test carried out by: F. Thistlethwaite and R. Salter

Officer in charge: D.W. Smith

Signed: Head of Tractor Department

for the Director

Date: 15/12/78