SILSOE RESEARCH INSTITUTE
Wrest Park, Silsoe,
Bedford MK45 4HS

Report No: R92/71461/OECD
OECD Approval No: 1437 Restricted Code
Approval Date: 1 April 1993

Test in accordance with the OECD Restricted Standard Code for the Official Testing of Agricultural Tractors

Ford New Holland 7840 (FE61) Four-Wheel Drive Tractor with 16-speed Power Shift Transmission



Manufactured by: Ford New Holland Ltd
Basildon
Essex
England

Submitted for test by: The manufacturer

Report No: 758

Date: September 1992

An Institute of the Agricultural and Food Research Council
A Company limited by guarantee Registered in England No 473317 Registered Charity No 223365

R92/71461/OECD

TABLE OF CONTENTS

		Page No
I.	SPECIFICATION OF TRACTOR	1
II.	TEST CONDITIONS	16
III.	TEST RESULTS	20
A.	Compulsory tests	
1.	Main power take-off performance	20
2.	Hydraulic power and lifting force	22
3.	Drawbar performance (Power and fuel consumption)	24
B.	Supplementary tests	
1.	Main power take-off (optional 540 rev/min shaft)	25
2.	Hydraulic power and lifting force	27
2.1.	Hydraulic power test	27
2.2.	Power lift test (To ISO 730-1:1990; alternative tyre size 13.6 R34)	28
2.3.	Power lift test (To ISO 730-1:1990; To manufacturers lift rod settings and original tyres)	29
3.	Drawbar power and fuel consumption (ballasted tractor, 4 wheel drive)	30
	Repairs and adjustments	31
	Remarks	31
ANNEX I	Main power take-off curves	32
ANNEX II	Supplementary power take-off curves	35

Tractor manufacturer's name and address:	Ford New Holland Ltd Basildon, Essex, England
Location of tractor assembly:	Basildon, Essex
Submitted for test by:	The manufacturer
Selected for test by:	The manufacturer
Place of running in:	Basildon, Essex
Duration of running in:	107 hours
Location of test:	Silsoe Research Institute Wrest Park, Silsoe, Bedford, England

I. SPECIFICATION OF TRACTOR

Tractor

Make:	Ford New Holland
Model:	7840 (FE61)
Type:	Four wheel drive
Serial No:	BD08016
1st Serial No:	BC80986

Engine

Make:	Ford New Holland (PowerStar™)
Model:	GA 401 CID NA
Type:	4 stroke naturally aspirated direct injection diesel
Serial No:	GA340273

Cylinders

Number/disposition:	6 vertical Inline
Bore/stroke:	111.8 mm/111.8 mm
Capacity:	6585 cm^3
Compression ratio:	17.5:1
Arrangement of valves:	Overhead
Cylinder liners:	None, monobloc construction

Supercharging

Make:	Not fitted

Fuel system

Fuel feed system:	Gravity
Make, type and model of fuel filter:	Plastic strainer in tank and CAV paper element filter with sediment bowl and water trap between tank and injection pump
Capacity of fuel tank:	227.1 ℓ
Make, type and model of injection pump:	Lucas CAV DPS-DSA 998
Serial No:	24422 AKG
Manufacturer's production setting of injection pump:	
. Flow rate:	64.0 - 68.0 mm^3 per stroke at 750 rev/min pump speed and full load
. Timing:	Delivery starts 10° before T.D.C.
Make, type and model of injectors:	CAV multihole JB 6801135 nozzle
Injection pressure:	292 - 300 Bar

Governor

Make:	CAV
Model:	None
Type:	Mechanical incorporated in fuel injection pump
Governed range of engine speed:	700 rev/min to 2245 rev/min
Rated engine speed:	2100 rev/min
	2070 rev/min in EEC and EFTA countries to comply with road speed requirements

Air cleaner

Pre-cleaner:	None
Main cleaner:	
. Make:	Locker Air Maze
. Type:	Dry paper element (Exhaust Aspirated)
. Model:	3 stage
. Location of air intake:	Under bonnet above and forward of radiator
Maintenance indicator:	Warning light on instrument panel

Lubrication system

Type of feed pump:	Forced feed from eccentric rotor pump
Type of filter:	Metal mesh strainer in sump and full flow replaceable paper element filter
Number:	1

Cooling system

Type of coolant:	Water and antifreeze 50% solution
Type of pump:	Centrifugal impeller
Specification of fan:	Thermal Controlled with viscous clutch
Number of fan blades:	5
Fan diameter:	510 mm
Coolant capacity:	19,5 ℓ
Type of temperature control:	Thermostat
System pressure:	90 kPa

Starting system

Make:	Bosch
Model:	JF
Type:	Electrical, positive engagement, solenoid operated
Starter motor power rating:	3.1 kW
Cold starting aid:	CAV Thermostart
Safety device:	Only operable when all gear levers in neutral and pto switch is in 'off' position

Electrical system

Voltage:	12 V
Generator:	
. Make:	Magnetti Marelli
. Model:	A 127 I
. Type:	Belt driven alternator
. Power:	100 amps at 6000 rev/min
Batteries:	Lucas lead acid
. Rating:	107 Ah at 20 hours rating

Exhaust system

Make:	Nelson Burgess
Model:	None
Type:	Horizontal silencer under bonnet with vertical stack pipe
Location:	Under left-hand front bonnet
Height of outlet above ground:	2903 mm

Transmission to wheels

Clutch

Make:	Transmission only
Model:	Ford New Holland
Type:	None
Number of plates:	Multiplate - located within the gearbox
Diameter of plates:	7
Method of operation:	159 mm
	Mechanical/Electro-Hydraulic pedal operated

Gear box

Make:	Ford New Holland (Electroshift™)
Model:	16 x 16 Synchromesh
Type:	Mechanical/Electrical manual synchromesh operation, 4-Powershift speeds and 4 ranges selected with two side mounted levers. A third side mounted lever selects forward or reverse for each combination
Number of gears:	16 forward, 16 reverse
Available options:	12 x 12 Synchroshift™

Rear axle and final drives

Make:	Ford New Holland
Model:	None
Type:	Crown wheel and pinion with differential and epicyclic reduction gear final drive

Differential lock:

. Type:	Mechanical
. Method of engagement:	Electro-hydraulic actuation in response to signal from switch on right hand control panel
. Method of disengagement:	Via panel switch or in response to electric signal from brakes on application

Front axle and final drives

Make:	Carraro
Model:	709/S
Type:	Crown wheel and pinion with differential and epicyclic reduction gear final drive

Differential lock:

. Type:	Limited slip
. Method of engagement:	Automatic
. Method of disengagement:	Automatic

Total ratios and travelling speeds

Gear	Group No	Number of engine revolutions for one revolution of the driving wheels	Nominal travelling speed at rated engine speed:*	
			2100 rev/min km/h	2070 rev/minϕ km/h
Forward				
1	L	287.21	2.26	2.23
2	L	235.08	2.76	2.72
3	L	192.18	3.38	3.33
4	L	157.29	4.13	4.07
5	L	121.64	5.34	5.26
6	L	99.56	6.52	6.43
7	L	81.39	7.98	7.86
8	L	66.62	9.74	9.61
1	H	92.61	7.01	6.91
2	H	75.80	8.56	8.44
3	H	61.97	10.48	10.33
4	H	50.72	12.80	12.62
5	H	39.22	16.55	16.31
6	H	32.10	20.22	19.93
7	H	26.24	24.74	24.38
8	H	21.48	30.22	29.79
Reverse				
1	L	289.82	2.24	2.21
2	L	237.22	2.74	2.70
3	L	193.92	3.35	3.30
4	L	158.72	4.09	4.03
5	L	122.75	5.29	5.21
6	L	100.47	6.46	6.37
7	L	82.13	7.90	7.79
8	L	67.22	9.66	9.52
1	H	93.45	6.95	6.85
2	H	76.49	8.49	8.37
3	H	62.53	10.38	10.23
4	H	51.18	12.68	12.50
5	H	39.58	16.40	16.17
6	H	32.40	20.04	19.75
7	H	26.48	24.51	24.16
8	H	21.68	29.95	29.52

L = Low range H = High range

(*) Calculated with a tyre dynamic radius index of 820mm (ISO 4251/1-1984)

Number of revolutions of front wheels for one revolution of rear wheels: 1.3415

(ϕ) Restricted to 2070 rev/min in EEC and EFTA countries.

Power take-off

Main power take-off

Type:	Independent
Method of engagement:	Electro - hydraulically operated multi-plate clutch in response to signal from switch on right hand control panel
Number of shafts:	1 (can be exchanged to give either 6 or 21 splines)
Method of changing power take-off speeds: Two speed Shiftable (fitted)	Manually by hand lever in cab

Clutch

Make:	Ford New Holland
Model:	None
Type:	Multiplate, wet
Number of plates:	5
Diameter of plates:	148.6 mm

Two speed shiftable power take-off
(Fitted for test)

	540 rev/min	1000 rev/min
Location:	Rear of tractor	Rear of tractor
Diameter of power take-off shaft:	34.9 mm	34.9 mm
Number of splines:	6 or 21	6 or 21
Height above ground:	773 mm	773 mm
Distance from the median plane of the tractor:	Central	Central
Distance behind rear wheel axis:	457 mm	457 mm
Pto speed at rated engine speed:	600 rev/min at 2100 591 rev/min at 2070	999 rev/min at 2100 985 rev/min at 2070
Engine speed at standard power take-off speed:	1890 rev/min	2103 rev/min
Ratio of rotation speeds:	3.50:1	2.103:1
Power restriction and maximum torque:	None	None
Direction of rotation (viewed from behind tractor):	Clockwise	Clockwise

* (also provides Economy 540 rpm pto speed at 1135 engine rpm)

Optional PTO systems available (not fitted for test)

Two speed power take-off proportional to engine speed - changeable shafts

540 rev/min

Location:	Rear of tractor
Diameter of power take-off shaft:	34.9 mm
Number of splines:	6
Height above ground:	773 mm
Distance from the median plane of the tractor:	Central
Distance behind rear wheel axis:	457 mm
Pto speed at rated engine speed:	600 rev/min at 2100 591 rev/min at 2070
Engine speed at standard power take-off speed:	1890 rev/min
Ratio of rotation speeds:	3.50:1
Power restriction and maximum torque:	None
Direction of rotation (viewed from behind tractor):	Clockwise

1000 rev/min

Location:	Rear of tractor
Diameter of power take-off shaft:	34.9 mm
Number of splines:	21
Height above ground:	773 mm
Distance from the median plane of the tractor:	Central
Distance behind rear wheel axis:	457 mm
Pto speed at rated engine speed:	1025 rev/min at 2100 1010 rev/min at 2070
Engine speed at standard power take-off speed:	2049 rev/min
Ratio of rotation speeds:	2.049:1
Power restriction and maximum torque:	None
Direction of rotation (viewed from behind tractor):	Clockwise

Power lift

Make:	Sauer Sundstrand
Model:	None
Type:	Piston type, variable displacement closed centre load sensing system
Type and number of cylinders:	1 located inside of transmission housing and 1 externally mounted plus the option of an additional externally mounted, single acting (optional external cylinder fitted for test)
Type of linkage lock for transport:	Hydraulic
Relief valve pressure setting:	19.0 - 19.7 MPa
Opening pressure of cylinder safety valve:	19.7 MPa
Lift pump type:	None
Transmission between pump and engine:	Gear driven from pto shaft, independent of main and pto clutches
Type and number of filters:	3, replaceable paper element filter canisters
Site of oil reservoir:	Rear axle housing
Type, number and location of tapping points:	1, Front face of hydraulic top cover
Maximum volume of oil available to external cylinders:	18.2 ℓ

Auxiliary Hydraulic System

Make:	Sauer Sundstrand
Model	None
Type:	Gear type
Relief valve pressure setting:	18.0 - 18.7 MPa
Lift pump type:	None
Transmission between pump and engine:	Direct drive from camshaft gear
Type and number of filters:	1, replaceable paper element canister
Site of oil reservoir:	Rear axle housing

Alternative power lift system available (not fitted for test)

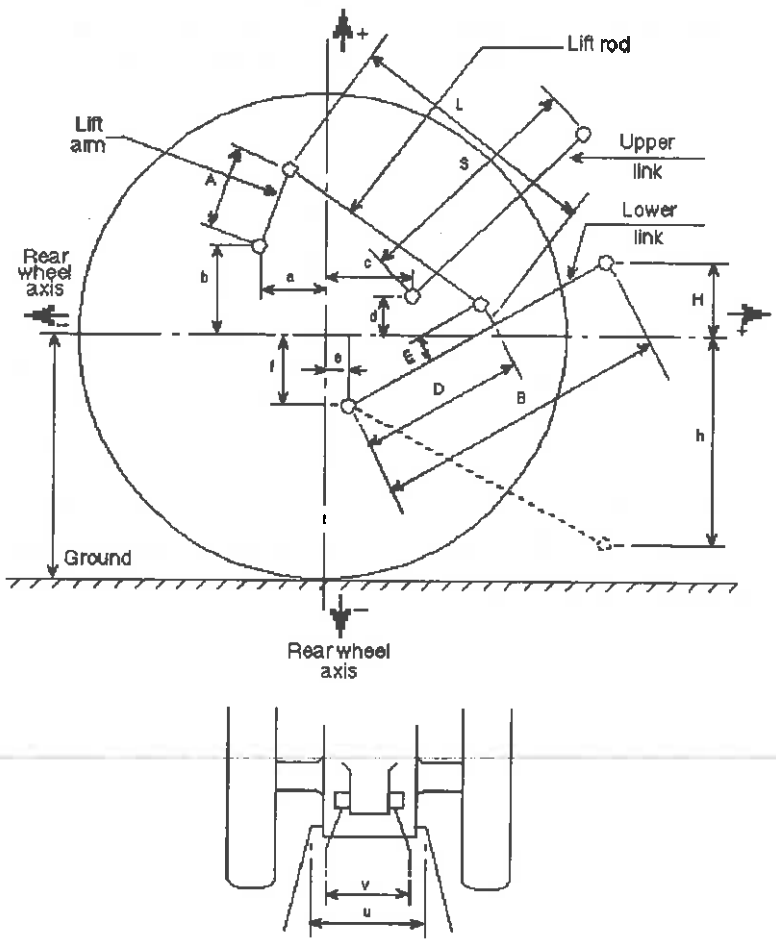
Make:	Sauer Sundstrand
Model:	None
Type:	Gear type, fixed displacement closed centre load sensing system
Type and number of cylinders:	1 located inside of transmission housing and 1 externally mounted plus the option of an additional externally mounted, single acting
Type of linkage lock for transport:	Hydraulic
Relief valve pressure setting:	18.0 - 18.7 MPa
Opening pressure of cylinder safety valve:	19.7 MPa
Lift pump type:	None
Transmission between pump and engine:	Gear driven from pto shaft, independent of main and pto clutches
Type and number of filters:	1, replaceable paper element filter canister
Site of oil reservoir:	Rear axle housing
Type, number and location of tapping points:	1, Front face of hydraulic top cover
Maximum volume of oil available to external cylinders:	18.2 ℓ

Three-point linkage

Category: 2 to ISO standard 730-1:1990

Category adaptor: None

Controls: Electronic draught/position control sensed through lower link
Optional - Draught or position control sensed through top link



LIFT TEST
Linkage geometry

Fig 2.1

Table 2.1

Dimensions of linkage when attached to the standard frame (ISO 730/1-1990 CAT 2, 610 mast height)

(B2.3 ISO mast height from 730/3-1982 CAT 2)

			Dimensions or range	Setting used in test		
				Main test	B2.2	B2.3
Length of lift arms:		(A)	254	254	254	254
Length of lower links:		(B)	915	915	915	915
Distance of lift arm pivot point from rear wheel centre line:	horizontally: vertically:	(a) (b)	102 341	102 341	102 341	102 341
Horizontal distance between the two lower link points:		(u)	527	527	527	527
Horizontal distance between the two lift arm end points:		(v)	610	610	610	610
Length of upper link:		(S)	610 - 830	690	690	655
Distance of upper link pivot point from rear wheel centre line:	horizontally: vertically:	(c) (d)	353 158 - 215	353 158	353 158	353 215
Distance of lower link pivot point from rear wheel centre line:	horizontally: vertically:	(e) (f)	102 229	102 229	102 229	102 229
Distance of lower link points to lift rod pivot points on lower link centre line:	horizontally: vertically:	(D) (E)	412 - 520 on centre line	466 on centre line	466 on centre line	520 on centre line
Length of lift rods:		(L)	743-879	830	810	743
ISO mast height:			-	610	610	510
Height of lower hitch points (*) relative to the rear wheel centre line, situated 820 mm(+) above the ground level:						
- in low position		(h)	308 to 794	620	595	300
- in high position		(H)	-77 to 224	45	65	215
Height of lower hitch points when locked in transport position (*):		Any height within lift range (Hydraulic Transport Lock)				

* Assuming r = tyre dynamic radius index of 820 mm to ISO 4251/1-1984

+ or 795 mm for supplementary test (B2.2)

Swinging drawbar (Incorporated in automatic pick-up hitch with hook on opposite end and selectable by reversing drawbar)	**Drawbar as tested**	**Pick up hitch**
Type:	Clevis	Hook
Height above ground, unballasted maximum:	543 mm	517 mm
minimum:	488 mm	--
Type of adjustment:	Inverting drawbar	None
Distance of hitch point from rear-wheel axis,horizontally:	714 mm - 865 mm	482 mm
Distance of hitch point from power take-off shaft ends:		
. Vertically:	230 mm - 285 mm	256 mm
. Horizontally:	257 mm - 408 mm	25 mm
Lateral adjustment (centre of clevis):		
. Right-hand:	130 mm - 255 mm	None
. Left-hand:	130 mm - 255 mm	None
Distance of pivot point from rear axles horizontally:	176 mm - 376 mm	--
Width of clevis:	66 mm	--
Diameter of drawbar pin hole:	27 mm	--
Maximum vertical permissible load - swing back type:	2400 kg	3000 kg

Trailer Hitch

Type: Not fitted

Linkage Drawbar

Type: Not fitted

Front Towing Hitch

Type:	Clevis in front weight frame
Height above ground:	918 mm
Width of clevis:	60 mm
Diameter of pin hole:	34 mm

Steering

Make:	Ford New Holland
Model:	None
Type:	Hydrostatic
Method of operation:	
. Pump:	Sauer Sunstrand
. Motor:	Danfoss OSPC-150-OR
. Ram:	Double acting balanced cylinder acting on both steering arms
. Filter:	Replaceable paper element filter, integral with pump
Working pressure:	17.0 - 17.8 MPa

Brakes

Service brake

. Make:	Girling
. Model:	None
. Type:	Oil-immersed multiplate discs
Method of operation:	Independent or combined pedal, hydraulically actuated
Trailer braking take-off:	Hydraulic connector to ISO 5676

Parking brake

Type:	Mechanical linkage coupled to service brakes via cables
Method of operation:	Hand lever with ratchet

Wheels

Number: 4

. Front: 2 steering and driving

. Rear: 2 driving

Wheelbase: 2623 mm

Track width adjustment:

	Minimum, mm	Maximum, mm	Adjustment method
Front	1392	2142	Reversing wheels and offset lug rims
Rear	1628	2028	Reversing wheels and offset lug rims

PROTECTIVE STRUCTURE

Make: Ford New Holland

Model: 582 Mk SK90

Type: Cab safety frame

Manufacturer's name and address: Sicurcab SRL, Torino, Italy

Protective device:

. Rollguard: Safety Cab

. Tiltable/Not tiltable: Non tiltable

OECD approval number: CSS 1329/17

DRIVER'S SEAT

Make/Model/Type: Grammer LS95H1/90A

Type of suspension: Low frequency, air spring

Type of damping: Double acting, hydraulic

Range of adjustment:

. Longitudinal: ± 75 mm

. Vertical: ± 30 mm

LIGHTING

Unrestricted beam angle of headlight in plan view: 140°

	Height above ground of centre, mm	Size, mm	Distance from outside edge to median plane of tractor, mm
Headlight	1228	150 x 100	227
Sidelights	1755	115 x 30	769
Rear lights	1743	165 x 35	984
Axle reflectors	825	120 x 40	591
Cab reflectors	1643	165 x 30	984

II. TEST CONDITIONS

Overall dimensions (overall width at 1706 measured front track, 2194mm)

Length mm	Width		Height at top of	
	Minimum mm	Maximum mm	Protective structure mm	Exhaust pipe mm
4361	2095	2581	2766	2903

Ground clearance (unballasted tractor) 432 mm

Clearance-limiting part: Drawbar clevis in lowest position

Tractor mass (with safety cab)

	Unballasted		Ballasted*	
	Without driver kg	With driver kg	Without driver kg	With driver kg
Front	1880	1895	2323	2338
Rear	2908	2968	3090	3150
Total	4788	4863	5413	5488

* 3 weights per rear wheel and 8 front frame weights

Ballast

	Weights		Water, kg
	Number	Total mass, kg	
Front	8	323	None
Rear	6	302	None
Optional	None	None	None

Tyres and track width specification

	Front	Rear
Tyres		
. dimensions	14,9 R 28	18.4 R 38
. ply rating	128A8	146A8
. type	Radial	Radial
Maximum load (tyre manufacturer's), kg	1926	3210
maximum load (tractor manufacturer's), kg	1926	3210
inflation pressure (tyre manufacturer's), bar	1.6	1.6
dynamic radius index, mm	640	820
. Chosen track width (manufacturer's nominal), mm	1706	1727

Oils and lubrication

Capacity and change interval

	Capacity ℓ	Oil change h	Filter change h
Engine	20.9	300	300
Front axle	6.2	1200	None
Final drive (front)	3.0	1200	None
Rear axle	60.6	1200	300
Brakes	0.5	Top up	None
Gearbox Hydraulic system Final drives (rear) Steering	Integral with rear axle		

Fuels and lubricants used in tests

Fuel

Type: Diesel oil with cetane index of 54.5 and kinematic viscosity of 2.9 cSt at 40°C within the specification limits of Class A2 British Standard 2869/1983.

Specific gravity: 0.8380 g/cm^3 at 15°C

Oils	Recommended	Used during test
Engine oil		
Type:	SAE 15W/40	As recommended
Viscosity:	11.5 cSt at 100°C	
Classification:	L-2104-C	
Transmission oils		
Type:	SAE 80W	As recommended
Viscosity:	9 cSt at 100°C	
Classification:	L-2105	
Rear final drives		
Type:	SAE 80W	As recommended
Viscosity:	9 cSt at 100°C	
Classification:	L-2105	
Front differential and final drives		
Type:	SAE 80W	As recommended
Viscosity:	9 cSt at 100°C	
Classification:	L-2105	
Hydraulic brakes	Ford ESN-M6C59-A	
Type:	No equivalent	As recommended
Viscosity:	6 cSt at 100°C	
Classification:	No equivalent	
Hydraulic fluid		
Type:	SAE 80W	As recommended
Viscosity:	9 cSt at 100°C	
Classification:	L-2105	
Steering oil		
Type:	SAE 80W	As recommended
Viscosity:	9 cSt at 100°C	
Classification:	L-2105	
Recommended grease:	Lithium based	As recommended
Number of lubrication points:	12	

III. TEST RESULTS

A. COMPULSORY TEST RESULTS

1. MAIN POWER TAKE-OFF

Date and location of tests: 18 August 1992
Silsoe Research Institute,
Wrest Park, Silsoe, Bedford

Type of dynamometer: Water brake, Heenan & Froude

Power kW	Speed		Fuel consumption			Specific energy kWh/l
	Engine rev/min	P.T.O. rev/min	Hourly kg/h	Hourly l/h	Specific g/kWh	
1.1 MAXIMUM POWER - TWO HOUR TEST						
67.4	2070	985	16.79	20.04	249	3.37
1.2 POWER AT RATED ENGINE SPEED						
67.4	2070	985	16.79	20.04	249	3.37
1.3 STANDARD POWER TAKE-OFF SPEED (1000 ± 10 rev/min)						
--	--	--	--	--	--	--
1.4 PART LOADS 1.4.1 The torque corresponding to maximum power at rated engine speed						
67.4	2070	985	16.79	20.04	249	3.37
1.4.2 85% of the torque defined in 1.4.1						
59.1	2147	1018	15.38	18.35	260	3.22
1.4.3 75% of the torque defined in 1.4.2						
44.7	2154	1024	12.48	14.89	279	3.00
1.4.4 50% of the torque defined in 1.4.2						
29.9	2171	1033	9.81	11.71	329	2.55
1.4.5 25% of the torque defined in 1.4.2						
14.8	2185	1039	7.21	8.61	488	1.72
1.4.6 Unloaded						
0	2219	1055	5.17	6.17	--	--

No load, maximum engine speed:	2219 rev/min
Torque (equivalent crankshaft) at maximum power:	311.0 Nm
Maximum torque (equivalent crankshaft) (engine speed 1197 rev/min):	377.9 Nm
Mean atmospheric conditions:	
• Temperature	24°C
• Pressure	1015 m bar
• Relative humidity	35%
Maximum temperatures:	
• Coolant	90°C
• Engine oil	109°C
• Fuel	49°C
• Engine air intake	27°C

2. HYDRAULIC POWER AND LIFTING FORCE

Date of tests: 19 September 1992

2.1 Hydraulic power test

Sustained pressure with relief valve open: 19.6 MPa

Pump delivery rate at minimum pressure: 62.2 l/min

	Flow rate l/min	Pressure MPa	Power kW
Flow rate corresponding to a hydraulic pressure equivalent to 90% of the actual relief valve pressure setting and corresponding hydraulic power	36.0	17.6	10.6
Flow rate and hydraulic pressure corresponding to maximum hydraulic power	57.4	15.0	14.4

Tapping point used for test: Auxiliary service connection

Temperature of hydraulic fluid if different from 65 ± 5°C -- °C

Opening pressure of the unloading valve: -- MPa

Closing pressure of the unloading valve: -- MPa

2.2 Power lift test - (To ISO 730-1:1990)

	At the hitch point	On the frame
Height of lower hitch points above ground in down position	200 mm	200 mm
Vertical movement	665 mm	870 mm
Maximum corrected force exerted through full range	43.0 kN	29.4 kN
Corresponding pressure of hydraulic fluid	17.6 MPa	17.6 MPa
Moment about rear-wheel axis	43.7 kNm	47.8 kNm
Maximum tilt angle of mast from vertical	--	13 degrees

- Linkage settings for test - see Table 2.1 and Figure 2.1

Lifting heights relative to the horizontal plane including the lower link pivot points											
mm	-461	-391	-341	-191	-91	0	59	109	209	274	409
Lifting forces (the values measured are corrected to correspond to a hydraulic pressure equivalent to 90% of the actual relief valve pressure delivered by the hydraulic system)											
at the hitch points kN	--	43.6	43.0	44.6	45.6	45.9	45.9	46.2	46.9	45.2	--
Corresponding pressure: 17.6 MPa											
at the frame kN	36.9	34.7	34.8	34.7	34.2	33.9	33.2	32.7	31.6	31.3	29.4
Corresponding pressure: 17.6 MPa											

3. DRAWBAR POWER AND FUEL CONSUMPTION TEST (UNBALLASTED TRACTOR, 4 WHEEL DRIVE)

Date and location of tests: 26 August 1992
Silsoe Research Institute
Wrest Park
Silsoe

Type of track: Concrete

	Tyre inflation pressure (kPa)	
Height of drawbar above ground	Front	Rear
475 mm	83	83

Gear and Range	Power	Drawbar Pull	Speed	Engine Speed	Slip of wheels or track	Spec fuel cons	Spec energy	Temperature			Atmospheric conditions		
								Fuel	Coolant	Eng oil	Temp	Rel Humidity	Pressure
	kW	kN	km/h	rev/min	%	g/kwh	kWh/l	Deg.C	Deg.C	Deg.C	Deg.C	%	kPa
3.1 MAXIMUM POWER IN TESTED GEARS													
3L*	38.9	46.0	3.04	2151	14.9	387	2.17	50	86	104	18	68	100.0
4L*	46.8	46.3	3.64	2111	15.0	369	2.27	48	87	106	18	69	100.2
5L	54.3	39.0	5.01	2066	7.1	317	2.65	48	87	106	18	69	100.2
6L	56.1	32.4	6.23	2068	5.5	307	2.73	45	87	106	16	76	100.3
1H	55.2	29.3	6.78	2067	5.0	312	2.69	46	87	107	17	73	100.3
7L	52.8	24.5	7.74	2072	4.4	327	2.56	47	87	106	17	71	100.3
2H	54.4	23.4	8.37	2068	4.2	316	2.65	46	87	105	17	70	100.3
3.2 FUEL CONSUMPTION 3.2.1 In selected gear, at maximum power at rated speed													
6L	56.1	32.4	6.23	2068	5.5	307	2.73	45	87	106	16	76	100.3
3.2.1.1 75% of pull at maximum power at rated speed													
6L	44.7	24.5	6.55	2150	4.5	334	2.51	47	84	102	19	66	100.1
3.2.1.2 50% of pull at maximum power at rated speed													
6L	30.1	16.2	6.70	2168	3.2	401	2.09	46	85	103	19	67	100.1
3.2.1.3 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.2.1.1													
1H	45.2	24.6	6.62	2004	4.4	318	2.64	42	86	101	18	72	100.0
3.2.1.4 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.2.1.2													
1H	30.5	16.3	6.71	2010	3.3	360	2.33	47	85	101	18	74	100.0
3.2.2 In selected gear nearest to 7.5 km/h, at maximum power at rated engine speed													
7L	52.8	24.5	7.74	2072	4.4	327	2.56	47	86	106	17	71	100.3
3.2.2.1 75% of pull at maximum power at rated speed													
7L	41.1	18.3	8.09	2150	3.5	364	2.30	47	87	103	18	69	100.1
3.2.2.2 50% of pull at maximum power at rated speed													
7L	27.7	12.1	8.26	2171	2.6	425	1.97	47	85	104	18	70	100.1
3.2.2.3 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.2.2.1													
2H	41.0	18.1	8.16	2006	3.6	328	2.56	40	85	101	17	76	100.0
3.2.2.4 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.2.2.2													
2H	27.7	12.0	8.32	2028	2.8	384	2.18	41	85	101	17	78	100.0

* Maximum power limited by wheelslip

TEST RESULTS

B. SUPPLEMENTARY TEST RESULTS

B.1. MAIN POWER TAKE-OFF (Optional 540 rev/min shaft)

Date and location of tests: 19 August 1992
Silsoe Research Institute,
Wrest Park, Silsoe, Bedford

Type of dynamometer: Water brake, Heenan & Froude

Power kW	Speed		Fuel consumption			Specific energy kWh/l
	Engine rev/min	P.T.O. rev/min	Hourly kg/h	Hourly l/h	Specific g/kWh	
1.1 MAXIMUM POWER						
67.1	2065	590	16.86	20.12	251	3.34
1.2 POWER AT RATED ENGINE SPEED						
67.1	2065	590	16.86	20.12	251	3.34
1.3 STANDARD POWER TAKE-OFF SPEED (540 ± 10 rev/min)						
65.3	1892	541	16.24	19.38	249	3.37
1.4 PART LOADS 1.4.1 The torque corresponding to maximum power at rated engine speed						
67.1	2065	590	16.86	20.12	251	3.34
1.4.2 85% of the torque defined in 1.4.1						
58.7	2120	606	15.29	18.25	260	3.22
1.4.3 75% of the torque defined in 1.4.2						
44.2	2136	610	12.46	14.87	282	2.97
1.4.4 50% of the torque defined in 1.4.2						
30.0	2155	616	9.91	11.82	330	2.54
1.4.5 25% of the torque defined in 1.4.2						
14.9	2176	622	7.34	8.75	492	1.70
1.4.6 Unloaded						
0	2219	634	5.12	6.11	--	--

Power kW	Speed		Fuel consumption			Specific energy kWh/l
	Engine rev/min	P.T.O. rev/min	Hourly kg/h	l/h	Specific g/kWh	
1.5 PART LOADS AT STANDARD POWER TAKE-OFF SPEEDS (540 ± 10 rev/min)						
1.5.1 The torque corresponding to maximum power						
65.3	1892	541	16.24	19.38	249	3.37
1.5.2 85% of the torque obtained in 1.5.1						
57.5	1963	561	14.46	17.25	251	3.34
1.5.3 75% of the torque obtained in 1.5.2						
43.5	1975	564	11.65	13.90	268	3.13
1.5.4 50% of the torque obtained in 1.5.2						
29.3	1992	569	9.09	10.84	310	2.70
1.5.5 25% of the torque obtained in 1.5.2						
14.9	2015	576	6.69	7.98	449	1.87
1.5.6 Unloaded						
0	2080	594	4.43	5.28	--	--

No load, maximum engine speed: 2219 rev/min

Torque (equivalent crankshaft) at maximum power: 310.1 Nm

Maximum torque (equivalent crankshaft) * Nm

Mean atmospheric conditions:

- Temperature 23°C
- Pressure 1014 m bar
- Relative humidity 43%

Maximum temperatures:

- Coolant 89°C
- Engine oil 109°C
- Fuel 50°C
- Engine air intake 25°C

* Maximum torque of 365.6 Nm measurable within limits of test equipment. Speed for maximum torque measured on 1000 rev/min shaft was 1197 rev/min.

B.2. HYDRAULIC POWER AND LIFTING FORCE

Date of tests: 19 September 1992

B.2.1. Hydraulic power test

Sustained pressure with relief valve open: 19.6 MPa

Pump delivery rate at minimum pressure: 80.9 l/min

	Flow rate l/min	Pressure MPa	Power kW
Flow rate corresponding to a hydraulic pressure equivalent to 90% of the actual relief valve pressure setting and corresponding hydraulic power	62.9	17.6	18.5
Flow rate and hydraulic pressure corresponding to maximum hydraulic power	76.1	16.0	20.3

Tapping point used for test: Remote hydraulic port

Temperature of hydraulic fluid if different from 65 ± 5°C -- °C

Opening pressure of the unloading valve: -- MPa

Closing pressure of the unloading valve: -- MPa

B.2.2. POWER LIFT TESTS - (To ISO 730-1:1990, alternative rear tyre size 16.9 R38)

	At the hitch point	On the frame
Height of lower hitch points above ground in down position	200 mm	200 mm
Vertical movement	660 mm	885 mm
Maximum corrected force exerted through full range	43.2 kN	29.0 kN
Corresponding pressure of hydraulic fluid	17.6 MPa	17.6 MPa
Moment about rear-wheel axis	43.9 kNm	47.2 kNm
Maximum tilt angle of mast from vertical	--	14 degrees

- Linkage settings for test - see Table 2.1 and Figure 2.1

Lifting heights relative to the horizontal plane including the lower link pivot points											
mm	-451	-366	-291	-191	-91	0	109	159	209	294	434
Lifting forces (the values measured are corrected to correspond to a hydraulic pressure equivalent to 90% of the actual relief valve pressure delivered by the hydraulic system)											
at the hitch points kN	--	43.7	43.2	43.7	44.7	45.2	45.2	45.2	45.1	45.1	--
Corresponding pressure: 17.6 MPa											
at the frame kN	34.6	34.9	35.0	35.0	34.7	34.1	33.2	32.6	32.0	31.1	29.0
Corresponding pressure: 17.6 MPa											

B.2.3. POWER LIFT TESTS - (To manufacturers lift rod setting and original tyres)

	At the hitch point	On the frame
Height of lower hitch points above ground in down position	520 mm	520 mm
Vertical movement	515 mm	665 mm
Maximum corrected force exerted through full range	53.2 kN	34.3 kN
Corresponding pressure of hydraulic fluid	17.6 MPa	17.6 MPa
Moment about rear-wheel axis	54.1 kNm	55.8 kNm
Maximum tilt angle of mast from vertical	--	14 degrees

- Linkage settings for test - see Table 2.1 and Figure 2.1

Lifting heights relative to the horizontal plane including the lower link pivot points											
mm	-76	-71	-41	0	59	109	209	309	409	444	589
Lifting forces (the values measured are corrected to correspond to a hydraulic pressure equivalent to 90% of the actual relief valve pressure delivered by the hydraulic system)											
at the hitch points kN	--	56.6	56.3	56.8	56.6	56.2	55.8	54.8	53.5	53.2	–
Corresponding pressure: 17.6 MPa											
at the frame kN	51.3	51.0	50.6	50.2	49.0	48.2	45.6	42.8	39.8	38.6	34.3
Corresponding pressure: 17.6 MPa											

B.3. DRAWBAR POWER AND FUEL CONSUMPTION TEST (BALLASTED TRACTOR, 4 WHEEL DRIVE)

Date and location of tests: 4 September 1992
Silsoe Research Institute
Wrest Park
Silsoe

Type of track: Concrete

Height of drawbar above ground	Tyre inflation pressure (kPa)	
	Front	Rear
475 mm	83	83

Gear and Range	Power	Drawbar Pull	Speed	Engine Speed	Slip of wheels or track	Spec fuel cons	Spec energy	Temperature			Atmospheric conditions		
								Fuel	Coolant	Eng oil	Temp	Rel Humidity	Pressure
	kW	kN	km/h	rev/min	%	g/kwh	kWh/l	Deg.C	Deg.C	Deg.C	Deg.C	%	kPa
3.1 MAXIMUM POWER IN TESTED GEARS													
1L*	31.5	56.0	2.03	2154	14.9	405	2.07	49	86	103	16	56	101.2
2L*	37.7	55.1	2.46	2151	15.1	380	2.20	49	86	103	14	65	101.1
3L*	45.0	54.3	2.98	2133	15.2	373	2.25	44	86	103	14	61	101.2
4L	51.8	48.8	3.82	2071	8.5	330	2.54	50	87	106	17	56	100.6
5L	55.1	39.1	5.08	2072	5.4	311	2.69	47	87	106	17	58	100.6
6L	56.0	32.1	6.29	2074	4.4	308	2.72	45	87	106	16	59	100.3
1H	55.3	29.2	6.81	2068	3.9	311	2.69	46	87	107	16	62	100.6
7L	52.6	24.5	7.75	2069	3.5	326	2.57	49	88	106	15	64	100.6
2H	54.7	23.5	8.38	2068	3.3	314	2.67	47	88	106	16	61	100.6
3.2 FUEL CONSUMPTION 3.2.1 In selected gear, at maximum power at rated speed													
6L	56.0	32.1	6.29	2074	4.4	308	2.72	45	87	106	16	59	100.6
3.2.1.1 75% of pull at maximum power at rated speed													
6L	44.0	24.2	6.55	2146	3.6	340	2.47	49	85	103	15	62	101.1
3.2.1.2 50% of pull at maximum power at rated speed													
6L	29.8	16.0	6.70	2168	2.5	387	2.16	48	85	103	15	63	101.1
3.2.1.3 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.2.1.1													
1H	44.4	24.3	6.58	1989	3.6	316	2.65	48	85	103	14	60	101.1
3.2.1.4 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.2.1.2													
1H	29.9	16.0	6.73	2012	2.5	361	2.32	49	85	102	14	62	101.1
3.2.2 In selected gear nearest to 7.5 km/h, at maximum power at rated engine speed													
7L	52.6	24.5	7.75	2069	3.5	326	2.57	49	88	106	15	64	100.6
3.2.2.1 75% of pull at maximum power at rated speed													
7L	41.0	18.2	8.09	2149	2.9	362	2.31	49	85	103	15	60	101.1
3.2.2.2 50% of pull at maximum power at rated speed													
7L	27.9	12.2	8.23	2167	2.0	422	1.99	47	85	103	14	61	101.1
3.2.2.3 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.2.2.1													
2H	41.0	18.1	8.17	2006	2.9	325	2.58	48	85	102	14	62	101.2
3.2.2.4 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.2.2.2													
2H	28.1	12.2	8.30	2024	2.1	379	2.21	50	85	102	14	62	101.2

* Maximum power limited by wheelslip

REPAIRS AND ADJUSTMENTS DURING TESTS: None

REMARKS: None

Test carried out by: E Nigro

Officer in charge: P C Seward

Signed: H M R Proctor — Head of Test Engineering Group

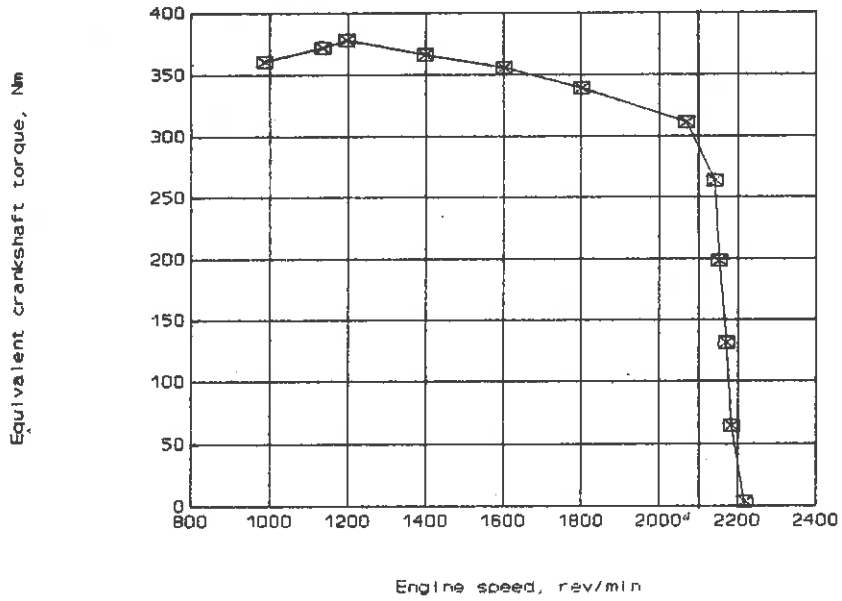
H M R Proctor — for the Director

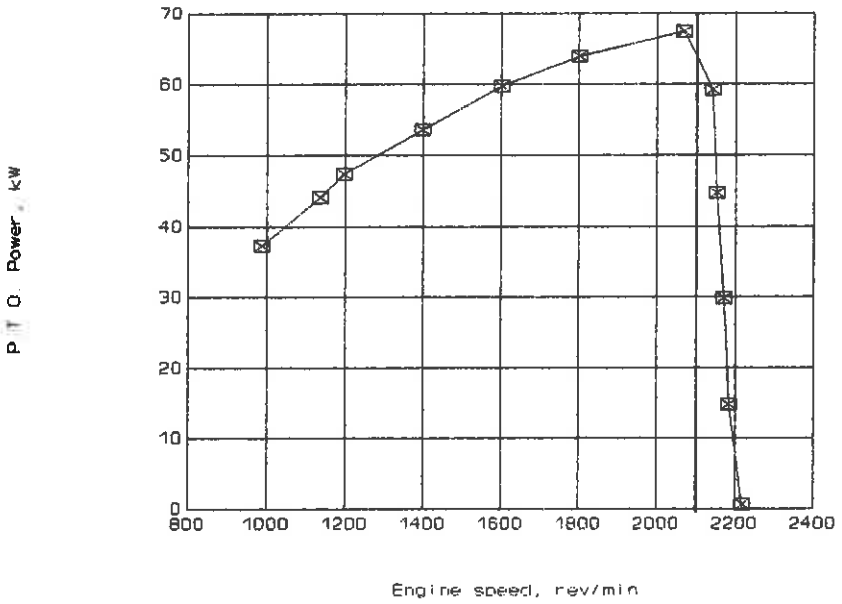
Date: 2/10/92

ANNEX I MAIN POWER TAKE OFF CURVES

PTO. POWER TEST - FORD 7840, 4 WHEEL DRIVE (1000 REV/MIN)

Governor set for maximum power at rated speed ⊠
Governor set for maximum power at pto speed ■

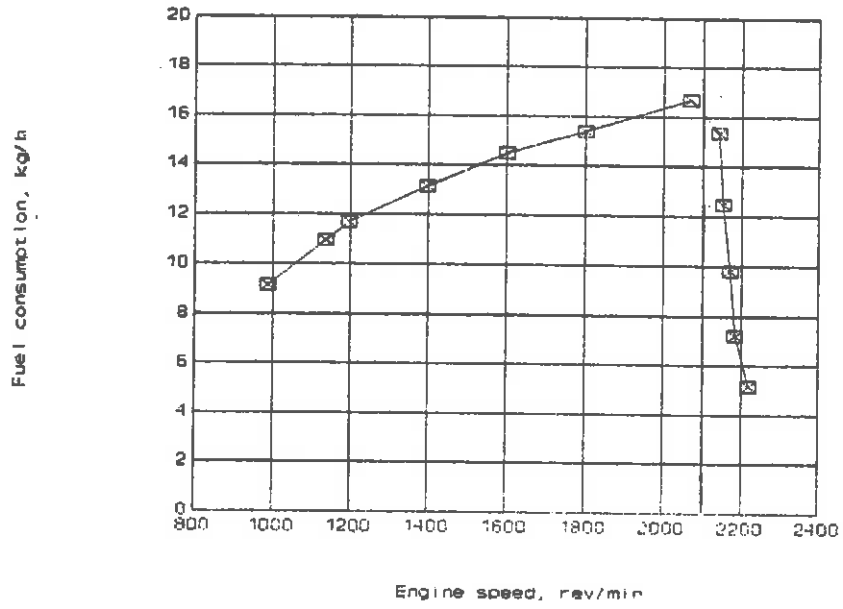


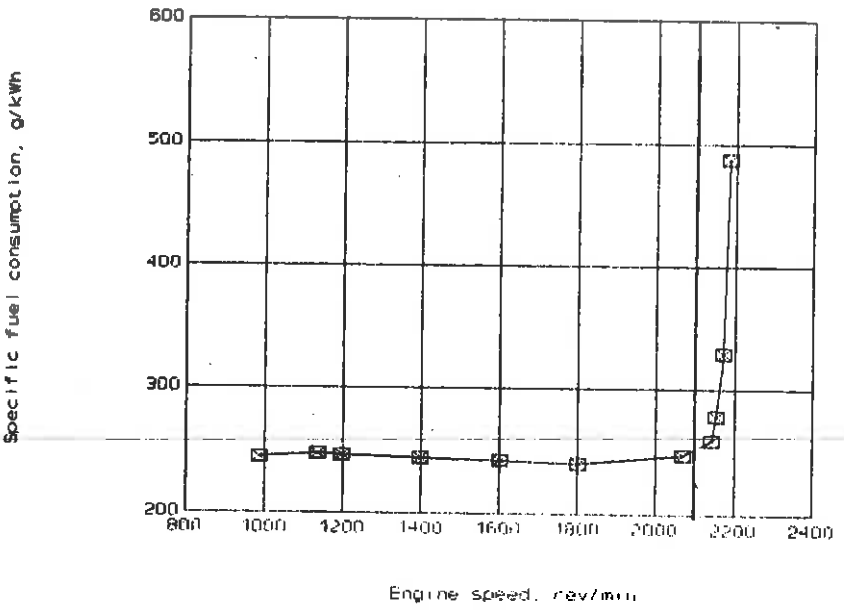


ANNEX I MAIN POWER TAKE OFF CURVES

PTO. POWER TEST - FORD 7840, 4 WHEEL DRIVE (1000 REV/MIN)

Governor set for maximum power at rated speed ⊠
Governor set for maximum power at pto speed ■

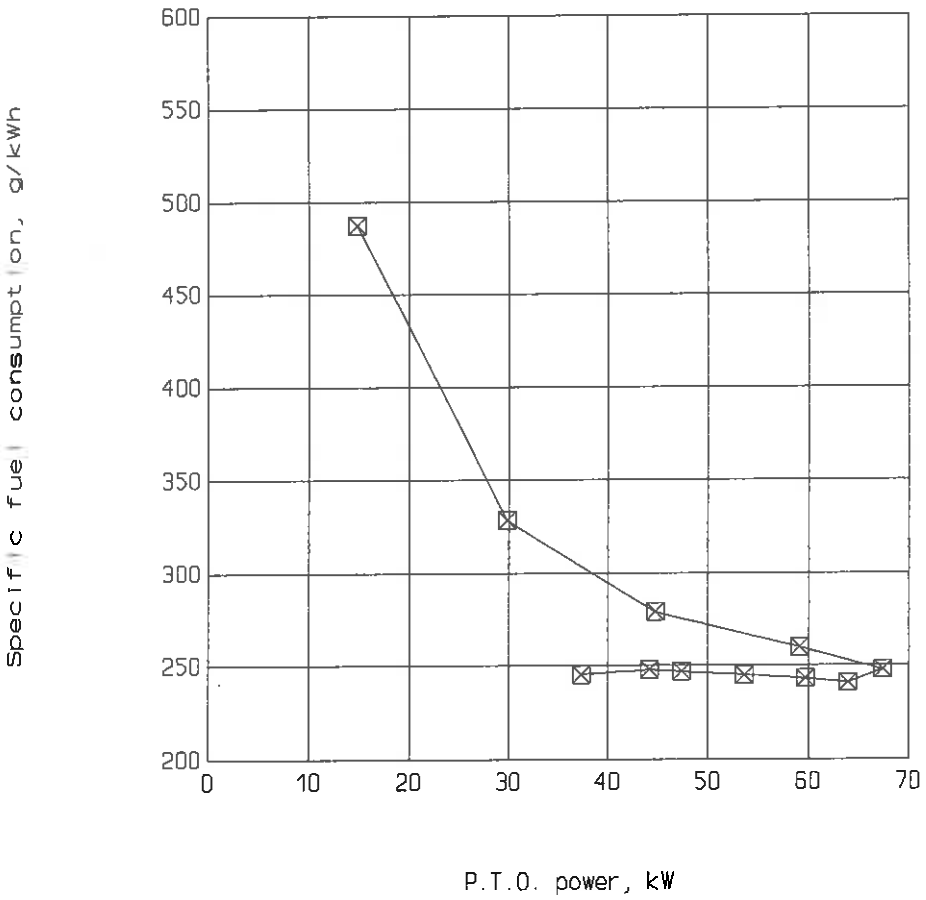




ANNEX I MAIN POWER TAKE OFF CURVES

PTO. POWER TEST - FORD 7840, 4 WHEEL DRIVE (1000 REV/MIN)

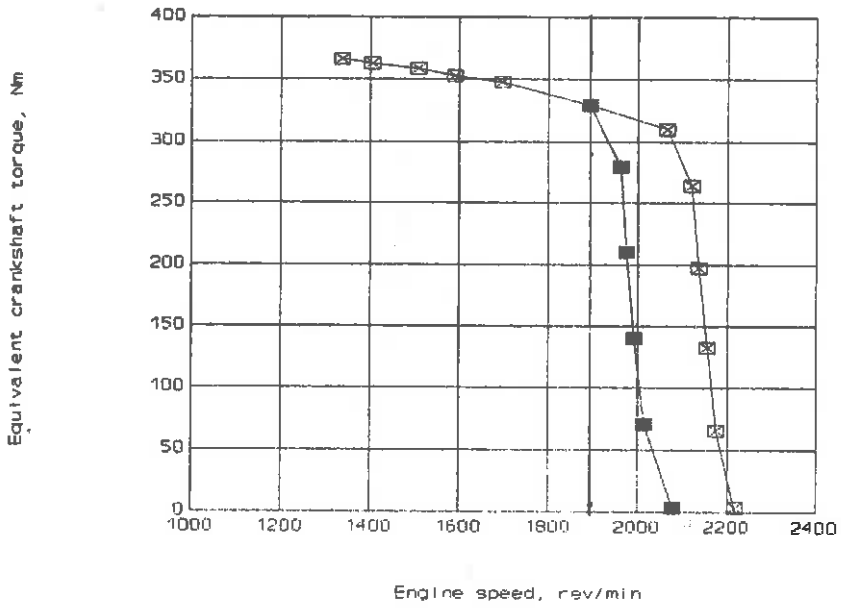
Governor set for maximum power at rated speed ⊠
Governor set for maximum power at pto speed ■

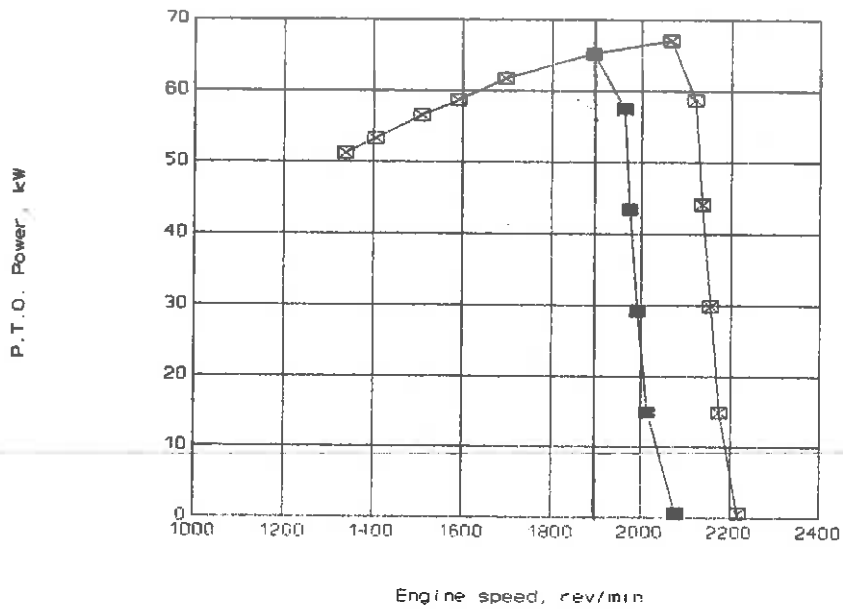


ANNEX II SUPPLEMENTARY POWER TAKE OFF CURVES

PTO. POWER TEST - FORD 7840, 4 WHEEL DRIVE (540 REV/MIN)

Governor set for maximum power at rated speed ⊠
Governor set for maximum power at pto speed ■

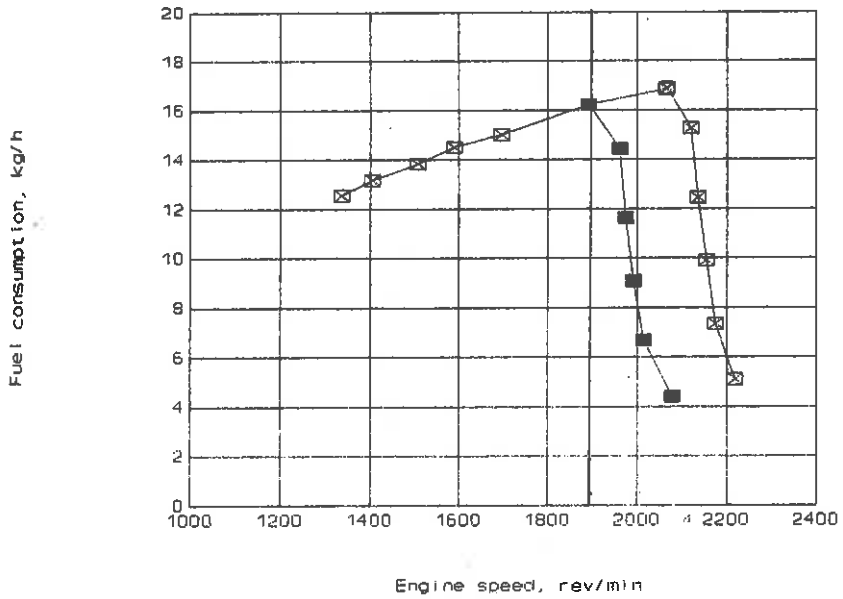


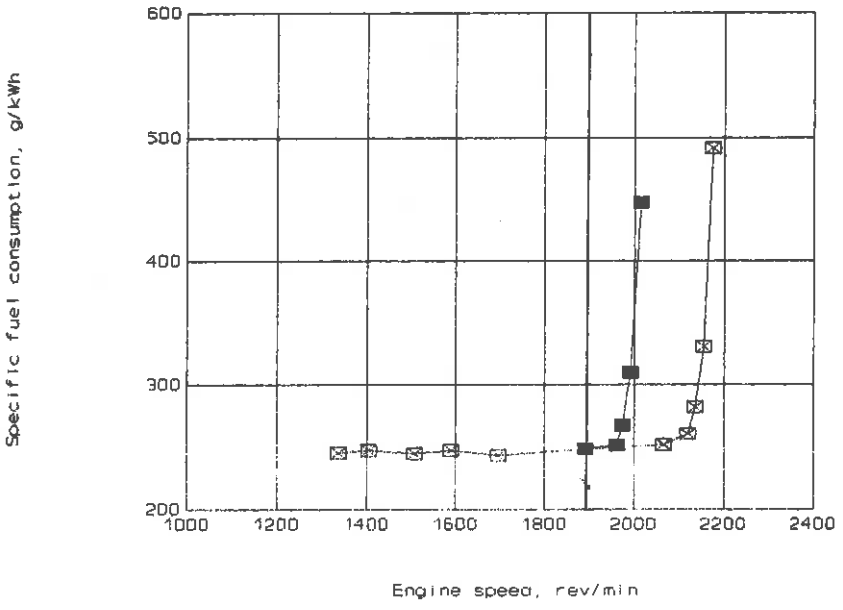


ANNEX II SUPPLEMENTARY POWER TAKE OFF CURVES

PTO. POWER TEST - FORD 7840, 4 WHEEL DRIVE (540 REV/MIN)

Governor set for maximum power at rated speed ⊠
Governor set for maximum power at pto speed ■





ANNEX II SUPPLEMENTARY POWER TAKE OFF CURVES

PTO. POWER TEST - FORD 7840, 4 WHEEL DRIVE (540 REV/MIN)

Governor set for maximum power at rated speed ⊠

Governor set for maximum power at pto speed ■

