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SILSOE RESEARCH INSTITUTE
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Report on test in accordance with the OECD STANDARD CODE II (RESTRICTED CODE) for the Official Testing of Agricultural and Forestry Tractors

New Holland 618635 (TS110) Four-Wheel Drive Tractor with 16-speed Manual Transmission (30 km/h)



Manufactured by: New Holland UK Ltd
Basildon
Essex
United Kingdom

Submitted for test by: The manufacturer

Report No: 799

Date: February 1999

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Tractor manufacturer's name and address:	New Holland UK Ltd Basildon, Essex, United Kingdom
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:	78 hours
Location of test:	Silsoe Research Institute Wrest Park, Silsoe, United Kingdom

1. SPECIFICATION OF TRACTOR

1.1 Identification

Make:	New Holland
Model:	618635 (TS 110) with 16-speed Manual Transmission
Type:	Four wheel drive unit construction
Serial No:	086482B
1st Serial No:	082947B

1.2 Engine

Make:	New Holland
Model:	450T/PD
Type:	4 stroke direct injection turbo charged diesel
Serial No:	PD736876

1.2.1 Cylinders

Number/disposition:	4 vertical in-line
Bore/stroke:	111.8 mm/127.0 mm
Capacity:	4987 cm^3
Compression ratio:	17.5 :1
Arrangement of valves:	Overhead
Cylinder liners:	None, monobloc construction

1.2.2 Supercharging

Make:	Garrett
Model:	T250
Type:	Exhaust driven
Pressure:	95 kPa at 2070 rpm and 100% load

1.2.3 Fuel system

Fuel feed system:	Stanadyne electric
Make, type and model of fuel filter:	Plastic strainer in tank and one disposable canister filter with sediment bowl and water seperator plus secondary disposable canister filter between tank and injection pump
Capacity of fuel tank:	130 litres
Make, type and model of injection pump:	Lucas/CAV Rotary, DP203, DSA 1261
Serial No:	48343 JPG
Manufacturer's production setting of injection pump:	
Flow rate:	89.0+/-2.7 mm^3 per stroke at 2070 rev/min speed and full load
Timing:	Delivery starts 3° before T.D.C (dynamic)
Make, type and model of injectors:	Lucas/CAV, multihole, L067PBA
Injection pressure:	292-300 bar

1.2.4 Governor

Make:	Lucas
Model:	None
Type:	Mechanical incorporated in fuel injection pump
Governed range of engine speed:	700 rev/min to 2245 rev/min
Rated engine speed:	2070 rev/min

1.2.5 Air cleaner

Pre-cleaner	Optional
Main cleaner	
Make: Locker Air Maze or Donaldson	
Type:	3 stage dry paper element with replaceable cartridge
Model:	None
Location:	Under engine bonnet above engine
Location of air intake:	By side of engine outside bonnet above battery housing
Maintenance indicator:	Warning light on instrument panel

1.2.6 Lubrication system

Type of feed pump:	Forced feed from eccentric rotor pump
Type of filter:	Metal mesh strainer in sump on suction line and full flow disposable canister on pressure line to engine
Number:	1

1.2.7 Cooling system

Type of coolant:	Water or water and antifreeze (50% solution)
Type of pump:	Belt driven centrifugal impeller
Specification of fan:	Thermal controlled with viscous clutch
Number of fan blades:	5
Fan diameter:	480 mm
Coolant capacity:	14.0 litres
Type of temperature control:	Thermostat with full flow bypass
System pressure:	90 kPa

1.2.8 Starting system

Make:	Bosch JF
Model:	JF
Type:	Electrical, positive engagement, solenoid operated
Starter motor power rating:	3.1/3.6 kW
Cold starting aid:	CAV Thermostart - Lucas 357-33 or Iskra 11-720-375
Safety device:	Starting operable when all gear levers are in neutral

1.2.9 Electrical system

Voltage:	12 V
Generator:	Alternator
Make:	Magneti Marrelli
Model:	MME A 127
Type:	Belt driven
Power:	55/100 amps at 6000 rev/min
Batteries:	1 x 800 cca lead acid, mounted on right-hand side under footplate (2 x 800 option)
Rating:	107 AH at 20 hours rating

1.2.10 Exhaust system

Make:	Nelson Burgess
Model:	None
Type:	Underhood horizontal silencer with vertical stack pipe
Location:	Left-hand side of engine, under bonnet
Height of outlet above ground:	2890 mm

1.3 Transmission

1.3.1 Main clutch (Travel alone)

Make:	AP
Model:	None
Type:	Dry single plate
Number of plates:	1
Diameter of plates:	330 mm
Method of operation:	Mechanical pedal rod operation

1.3.2 Gear box

Make:	New Holland (Econoshift™ with Dual Command)
Model:	16 x 4 Non -Synchromesh
Type:	Mechanical non synchromesh operation 4 forward speeds, 1 reverse 2 ranges mechanical, 2 ranges electrical Selected in combination with two centrally mounted levers and electric switch on instrument panel
Number of gears:	16 forward, 4 reverse (30 km/h)
Available options:	8 x 2 Econoshift 12 x 12 with 24 x 24 Synchroshift™

1.3.3 Rear axle final drives

Make:	New Holland
Model:	None
Type:	Crown wheel and pinion with differential and inboard epicyclic reduction gear final drive
Differential lock:	
Type:	Mechanical
Method of engagement:	Foot operated " button " via rod on right hand side of floor
Method of disengagement:	Self disengaging / spring return

1.3.4 Front axle and final drives

Make:	New Holland
Model:	None
Type:	Crown wheel and pinion with differential and outboard epicyclic reduction gear final drives
Drive engagement:	
Type:	Multiplate clutch - located within the gearbox
Method of operation:	Electro-hydraulic actuation in response to signal from switch on the LH side of instrument panel
Differential lock:	
Type:	Limited slip
Method of engagement:	Automatic
Method of disengagement:	Automatic

1.3.5 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:* 2070 rev/min km/h
Forward			
1	1Ll	279.25	2.30
2	2Ll	223.75	2.85
3	1Lh	217.19	2.95
4	2Lh	174.03	3.68
5	3Ll	127.48	5.01
6	3Lh	99.15	6.45
7	4Ll	93.66	6.84
8	1Hl	78.16	8.20
9	4Lh	72.85	8.79
10	2Hl	62.62	10.23
11	1Hh	60.79	10.53
12	2Hh	48.71	13.15
13	3Hl	35.68	17.95
14	3Hh	27.75	23.08
15	4Hl	26.21	24.42
16	4Hh	20.39	31.40
Reverse			
1	Ll	194.26	3.30
2	Lh	151.09	4.24
3	Hl	54.37	11.77
4	Hh	42.29	15.14

L = Low range H = High range l = Low h = High

(*) Calculated with a tyre dynamic radius index of 820mm (ISO 421/1-1992)

Number of revolutions of front wheels for one revolution of rear wheels: 1.332

1.4 Power take-off

1.4.1 Main power take-off

Type:	Independent
Method of engagement:	Mechanical lever operates multi - plate clutch
Number of shafts:	1 interchangeable shaft, 6 or 21 spline to ISO 500/1991
Method of changing power take-off speeds:	Manually by exchanging shafts via circlip
Clutch	
Make:	New Holland
Model:	None
Type:	Multiplate, wet
Number of plates:	5
Diameter of plates:	148.6 mm

1.4.1.1 Power take-off proportional to engine speed

Two speed power take-off via exchanging shafts

Fittted 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	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:	591 rev/min at 2070	1010 rev/min at 2070
Engine speed at standard power take-off speed:	1890 rev/min	2049 rev/min
Ratio of rotation speeds:	3.50:1	2.049:1
Power restriction and maximum torque:	None	None
Direction of rotation (viewed from behind tractor):	Clockwise	Clockwise

1.4.2 Optional power take-off (not fitted for test)

Single speed power take-off

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 place of the tractor:	Central
Distance behind rear wheel axis:	457 mm
PTO speed at rated engine speed:	587 rev/min at 2070
Engine speed at standard power take-off speed:	1902 rev/min
Ratio of rotation speeds:	3.522:1
Power restriction and maximum torque:	None
Direction of rotation (viewed from behind tractor):	Clockwise

1.5 Hydraulic power lift - standard

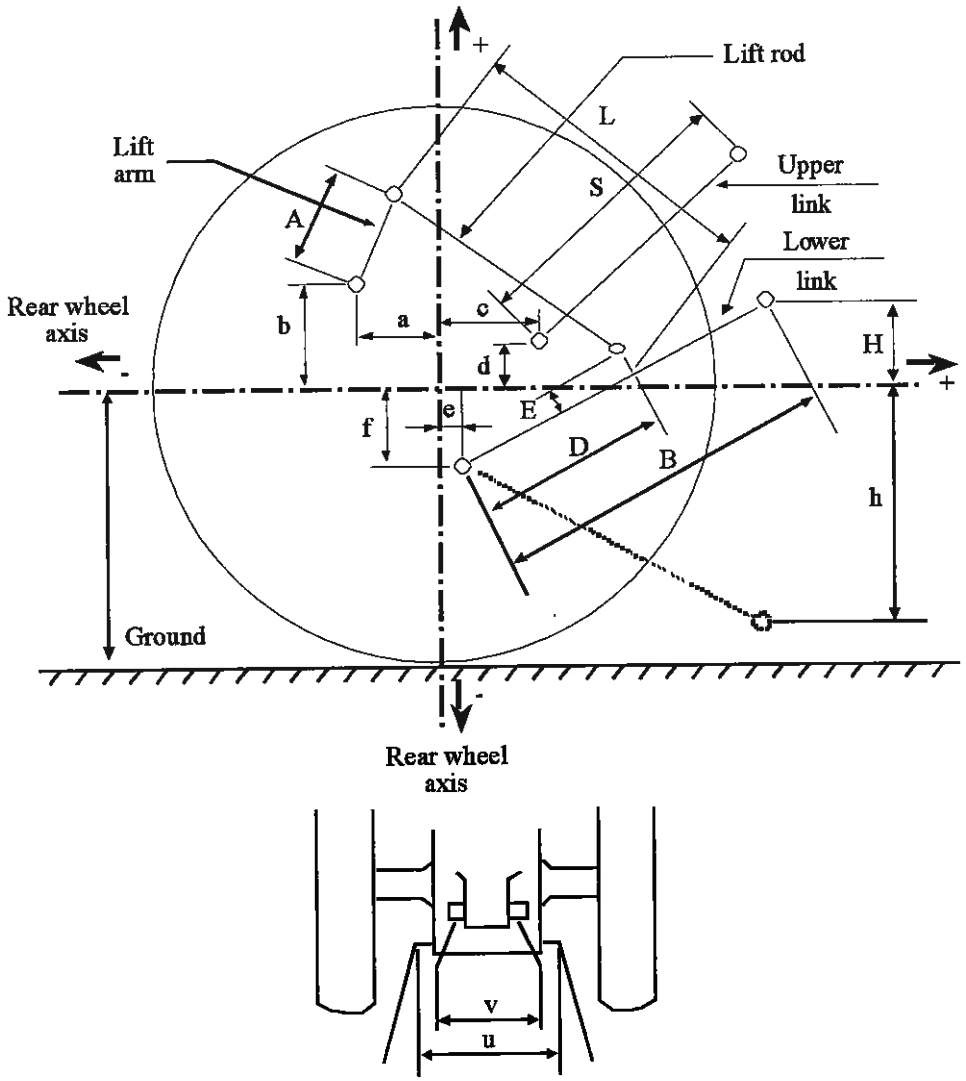
Pump - standard Make:	Sauer Sundstrand
Model:	None
Type:	Gear driven fixed displacement closed centre,load sensing system
Type and number of cylinders:	1 located inside transmission housing plus the option of 1 or 2 single acting, externally mounted assistor rams (None fitted for test)
Type of linkage lock for transport:	Hydraulic
Relief valve pressure setting:	17.6 - 18.3 MPa
Opening pressure of cylinder safety valve:	19.7 MPa
Lift pump type:	Gear
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 position of tapping points:	1 on front face of hydraulic top cover if no remote valves are fitted, (4 remote valve fitted to test tractor)
Maximum volume of oil available to external cylinders:	18.2 litres

1.5.1 Auxiliary hydraulic system

Make:	Sauer Sundstrand
Model:	None
Type:	Gear type
Relief valve pressure setting:	17.6 - 18.3 Mpa
Opening pressure of cylinder safety valve:	None
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

1.6 Three point linkage

Category:	2 to ISO standard 730-1:1994
Category adaptor:	None
Controls:	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 730-1:1994 CAT 2)
(B2.3 ISO mast height from 730/3-1982 CAT 2)

			Dimensions or range	Settings used test		
				Main test	B2.2	B2.3 / B2.4
ngth of lift arms		(A)	254	254	254	254
ngth of lower links		(B)	915	915	915	915
stance of lift arm pivot point from rear wheel ntre line:	horizontally:	(a)	102	102	102	102
	vertically:	(b)	341	341	341	341
rizontal distance between the two lower link ints:		(u)	527	527	527	527
rizontal distance between the two lift arm end ints:		(v)	610	610	610	610
ngth of upper link:		(S)	610 - 830	720	720	685 /670
stance of upper link pivot point from rear wheel ntre line:	horizontally:	(c)	325	325	325	325
	vertically:	(d)	149 - 205	149	149	205
istance of lower link pivot point from rear wheel ntre line:	horizontally:	(e)	102	102	102	102
	vertically:	(f)	229	229	229	229
istance of lower link points to lift rod pivot oints on lower link centre line:	horizontally:	(D)	412 - 520	466	466	520
	vertically:	(E)	on centre line	on centre line	on centre line	on centre line
ength of lift rods: O mast height		(L)	743 - 879	825 610	785 610	743 / 780 , 834 510 /483
leight of lower hitch points (*) relative to the rear heel centre line, situated 820 mm above the round level:						
- in low position		(h)	308 to 794	622	544	278 / 542, 377
- in high position		(H)	-77 to 224	47	91	222 / 50, 191
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 ISO 4251/1-1984
+ or 740 mm for supplementary test (B2.2)

1.7 Swinging drawbar
(Stand alone type)

Type:	Clevis		
Height above ground, unballasted maximum:	585 mm		
minimum:	460 mm		
Type of adjustment:	Inverting drawbar		
Distance of hitch point from rear-wheel axis, horizontally:	685 mm	800 mm	850 mm
Distance of hitch point from power take-off shaft ends:			
Vertically:	188 mm	313 mm	
Horizontally:	228 mm	343 mm	393 mm
Lateral adjustment from the (centre of clevis):			
Right-hand	210 mm	250 mm	260 mm
Left-hand	210 mm	250 mm	260 mm
Distance of pivot point from rear axles horizontally:	13 mm behind rear axle		
Width of clevis:	70 mm		
Diameter of pin hole:	29/33 mm		
Maximum vertical permissible load - Clevis uppermost:	1630 kg	1065 kg	910 kg
Clevis underneath:	1135 kg	1065 kg	910 kg

1.8 Trailer Hitch

Type: None fitted

1.9 Holed drawbar

Type: None fitted

Front Towing Hitch

Type None fitted

1.10 Steering

Make:	New Holland
Model:	None
Type:	Hydrostatic
Method of operation:	
Pump:	Sauer Sundstrand
Motor:	Danfoss OSPC-150-OR/160-OR
Ram:	2 double acting balanced cylinders, one operating on each steering arm
Filter:	Integral with hydraulic power lift system
Working pressure:	170 - 175 bar

1.11 Brakes

1.11.1 Service brake

Make:	New Holland
Model:	None
Type:	Oil-immersed multi plate discs
Method of operation:	Hydraulic, independent on rear wheels
Trailer braking take-off:	None

1.11.2 Parking brake

Make:	New Holland
Type:	Mechanical ratchet mounted on service brakes pedal, rod operation
Method of operation:	Hand lever to pedal ratchet

1.12 Wheels

Number: 4

Front: 2 steering and driving

Rear: 2 driving

Wheelbase: 2362 mm

Track width adjustment:

	Minimum mm	Maximum mm	Adjustment method
Front	1404	2115	Reversing wheels and offset lug rims
Rear	1528	2028	Reversing wheels and offset lug rims

1.13 Protective structure

Make:	New Holland
Model:	New Holland 618/A or B
Type:	Rear mounted - 2 post folding ROPS
Manufacturer's name and address:	New Holland UK Ltd Basildon
Protective device:	
Rollguard:	ROPS
Tiltable/Not tiltable:	Tiltable
OECD approval	
Approval number:	CSD-1414/1-36
Date of approval:	7 April 1997
Nos. of minor modification certificates, if any:	

1.14 Seat

1.14.1 Drivers seat

Make/Model/Type:	Grammer MSG 44/520
Seat and steering wheel reversible:	No
Type of suspension:	Low frequency, parallelogram suspension spring
Type of damping:	Double acting, hydraulic
Range of adjustment:	
Longitudinal:	± 75 mm
Vertical:	± 30 mm
Safety belt:	Yes

1.15 Lighting

In accordance with EEC Directive 78/933/EEC

Unrestricted beam angle of headlight in plan view: 140°

	Height above ground to centre mm	Size mm	Distance from outside edge to median plane of tractor mm
Headlight	1365	150 x 90	210
Sidelights	--	--	--
Rear lights	1755	125 x 80	689
Axle reflectors	--	--	--
Rear fender reflectors	1684	125 x 45	857

2. TEST CONDITIONS

2.1 Overall dimensions

Length mm	Width		Height at top of	
	Minimum mm	Maximum mm	Protective structure mm	Exhaust pipe mm
4090	2095	2531	2966	2890

2.2 Ground clearance (unballasted tractor) 395 mm

Clearance-limiting part: Drawbar clevis in lowest position

2.3 Tractor mass (with ROPS)

	Unballasted		Ballasted	
	Without driver kg	With driver kg	Without driver kg	With driver kg
Front	1498	1513	--	--
Rear	2395	2455	--	--
Total	3893	3968	--	--

2.5 Tyres and track width specification

	Front	Rear
Tyres dimensions ply rating type	 14.9 R 28 128A8 Radial	 18.4 R 38 146A8 Radial
Maximum load (tyre manufacturer's), kg 30 km/h (40 km/h)	1925	3210
Maximum load (tractor manufacturer's), kg	1925	3210
Inflation pressure (tyre manufacturer's), Bar	1.6	1.6
Dynamic radius index, mm	640	820
Chosen track width (manufacturer's nominal), mm	1725	1925

2.6 Fuel

Type: Diesel oil to Class D, 1.5 to 5.5 cSt
Density at 15° C: 0.8370 g/cm^3

2.7 Oils and lubricants

2.7.1 Capacity and change interval

	Capacity litre	Oil change hours	Filter change hours
Engine	11.4	300	300
Front axle differential	6.2	1200	None
Final drive (front) - per side	3.0	1200	None
Rear axle	60.6	1200	300
Gearbox } Hydraulic system } Final drives (rear) } Steering }	Integral with rear axle		
Brakes	---	None	None

2.7.2 Specifications

	NH spec	Recommended	Used during test
Engine oil			
Type:	82922933	SAE 10W/30	As recommended
Viscosity:		11.5 cSt at 100°C	
Classification:		API CE/SF	
Transmission oils			
Type:	85700812	Not specified	As recommended
Viscosity:		9 cSt at 100°C	
Classification:		API GL-4	
Rear final drives			
Type:	85700812	Not specified	As recommended
Viscosity:		9 cSt at 100°C	
Classification:		API GL-4	
Hydraulic fluid			
Type:	85700812	Not specified	As recommended
Viscosity:		9 cSt at 100°C	
Classification:		API GL-4	
Steering oil			
Type:	85700812	Not specified	As recommended
Viscosity:		9 cSt at 100°C	
Classification:		API GL-4	
Front differential and final drives			
Type:	85700812	Not specified	As recommended
Viscosity:		9 cSt at 100°C	
Classification:		API GL-4	
Hydraulic brakes			
Type:	82865344	Not specified	As recommended
Viscosity:		6 cSt at 100°C	
Classification:		No equivalent	

2.7.3 Grease

Type:	82948889	Lithium based	As recommended
Classification:		NLG1 2	

Number of lubrication points: 12

3. COMPULSORY TESTS RESULTS

3.1 Main power take-off (1000)

Date and location of tests: 2 November 1998
Silsoe Research Institute,
Wrest Park, Silsoe, Bedford

Type of dynamometer: Eddy Current, Borghi and Saveri

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	
3.1.1 MAXIMUM POWER - TWO HOUR TEST						
73.9	2000	976	17.86	21.33	241	3.47
3.1.2 POWER AT RATED ENGINE SPEED						
73.5	2070	1010	17.97	21.47	245	3.42
3.1.3 STANDARD POWER TAKE-OFF SPEED (1000 ± 25 rev/min)						
73.6	2048	999	17.88	21.36	243	3.45
3.1.4 PART LOADS 3.1.4.1 The torque corresponding to maximum power at rated engine speed						
73.5	2070	1010	17.97	21.47	245	3.42
3.1.4.2 85% of the torque defined in 3.1.4.1						
64.6	2141	1045	16.38	19.57	253	3.30
3.1.4.3 75% of the torque defined in 3.1.4.2						
49.1	2169	1059	13.43	16.04	273	3.06
3.1.4.4 50% of the torque defined in 3.1.4.2						
33.0	2189	1068	10.56	12.61	319	2.62
3.1.4.5 25% of the torque defined in 3.1.4.2						
16.6	2205	1076	7.64	9.13	459	1.82
3.1.4.6 Unloaded						
0	2223	1085	4.89	5.85	--	--

Power kW	Speed		Fuel consumption			Specific energy kWh/l
	Engine rev/min	P.T.O.	Hourly kg/h	l/h	Specific g/kWh	
3.1.5 PART LOADS AT STANDARD POWER TAKE-OFF SPEED (1000 ± 25 rev/min)						
3.1.5.1 The torque corresponding to maximum power						
73.6	2048	999	17.88	21.36	243	3.45
3.1.5.2 85% of the torque obtained in 3.1.5.1						
64.6	2115	1032	16.00	19.12	247	3.38
3.1.5.3 75% of the torque obtained in 3.1.5.2						
49.1	2142	1045	13.30	15.89	271	3.09
3.1.5.4 50% of the torque obtained in 3.1.5.2						
33.0	2163	1056	10.50	12.55	319	2.63
3.1.5.5 25% of the torque obtained in 3.1.5.2						
16.6	2181	1064	7.59	9.07	456	1.83
3.1.5.6 Unloaded						
0	2200	1074	4.82	5.76	–	--

No load, maximum engine speed: 2223 rev/min

Torque (equivalent crankshaft) at maximum power: 353.1 Nm

Torque (equivalent crankshaft) at rated speed: 339.0 Nm

Maximum torque (equivalent crankshaft): 428.3 Nm
(engine speed 1412 rev/min)

Mean atmospheric conditions:

- Temperature 25°C
- Pressure 99.0 kPa
- Relative humidity 34%

Maximum temperatures:

- Coolant 84°C
- Engine oil 107°C
- Fuel 51°C
- Engine air intake 30°C

3.2 Hydraulic power and lifting force

Date of tests: 4 December 1998

3.2.1 Hydraulic power test

Sustained pressure with relief valve open: 17.8 MPa

Pump delivery rate at minimum pressure: 69.5 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	61.2	16.0	16.32
Flow rate and hydraulic pressure corresponding to maximum hydraulic power	60.6	16.2	16.36

Sustained pressure with relief valve open: 17.8 MPa

Pump delivery rate at minimum pressure: 37.2 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	30.9	16.0	8.24
Flow rate and hydraulic pressure corresponding to maximum hydraulic power	30.8	16.2	8.32

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

3.2.2 Power lift test - (To ISO 730-1:1994)

	At the hitch point	On the frame
Height of lower hitch points above ground in down position	198 mm	198 mm
Vertical movement	669 mm	880 mm
Maximum corrected force exerted through full range	18.3 kN	14.4 kN
Corresponding pressure of hydraulic fluid	16.0 MPa	16.0 MPa
Moment about rear-wheel axis	18.6 kNm	23.4 kNm
Maximum tilt angle of mast from vertical	--	12 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	-498	-393	-300	-200	-100	0	100	200	250	276	382
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	--	18.3	18.9	19.9	21.1	21.5	22.0	22.2	22.3	22.4	--
Corresponding pressure: 16.0 MPa											
at the frame kN	15.1	15.6	16.3	16.3	16.0	15.9	15.6	15.4	15.2	15.0	14.4
Corresponding pressure: 16.0 MPa											

3.3 Drawbar power test (unballasted tractor), 4 wheel drive

Date and Location of tests: 8 January 1999
Silsoe Research Institute
Wrest Park
Silsoe
Bedford MK45 4HS

Type of track: Concrete

Height of drawbar above ground	Tyre inflation pressure (kPa)	
	Front	Rear
430 mm	103	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
3.3.1 MAXIMUM POWER IN TESTED GEARS													
1LI	24.4	41.8	2.11	2185	15.0	420	1.99	44	82	101	16	52	99.9
2LI	30.3	40.6	2.69	2177	12.5	378	2.21	47	82	101	16	52	99.9
1Lh	31.0	39.9	2.80	2177	11.5	377	2.22	49	82	101	16	51	100.0
2Lh	38.0	38.7	3.54	2165	10.1	348	2.40	46	83	104	16	53	100.0
3LI	51.4	38.1	4.85	2142	8.7	309	2.71	50	83	106	16	54	100.0
3Lh	61.6	36.0	6.17	2079	6.9	291	2.88	48	84	106	16	55	99.9
4LI	63.5	36.0	6.35	2021	6.8	278	3.01	49	83	105	16	54	99.9
1HI	64.3	30.1	7.68	2003	5.1	275	3.05	45	84	104	15	57	100.0
4Lh	63.7	27.6	8.30	2006	4.5	277	3.02	48	84	106	14	52	100.1
2HI	65.1	24.2	9.67	2001	4.1	274	3.06	49	83	106	14	52	100.1
1Hh	64.9	23.4	9.98	1999	3.9	274	3.06	48	83	106	14	55	100.1
2Hh	64.4	18.6	12.49	1990	3.3	273	3.06	45	83	106	14	55	100.0
3HI	61.6	12.8	17.35	2015	2.8	288	2.90	44	83	102	15	57	99.9
3.3.2 FUEL CONSUMPTION													
3.3.2.1 in selected gear, at maximum power at rated speed													
2HI	64.6	23.2	10.02	2073	4.1	278	3.01	47	83	103	15	46	99.9
3.3.2.1.1 75% of pull at maximum power at rated speed													
2HI	50.7	17.4	10.48	2151	3.3	301	2.78	47	83	105	15	57	99.9
3.3.2.1.2 50% of pull at maximum power at rated speed													
2HI	34.7	11.6	10.71	2178	2.5	351	2.38	47	82	105	15	56	99.9
3.3.2.1.3 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.2.1.1													
2Hh	50.8	17.4	10.51	1676	3.4	274	3.06	44	83	101	15	56	99.9
3.3.2.1.4 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.2.1.2													
2Hh	34.5	11.6	10.72	1694	2.5	302	2.77	46	81	100	15	57	99.9
3.3.2.2 In selected gear nearest to 7.5 km/h, at maximum power at rated speed													
4LI	63.3	34.7	6.56	2076	6.2	283	2.96	48	84	106	15	57	100.0
3.3.2.2.1 75% of pull at maximum power at rated speed													
4LI	50.0	26.0	6.93	2153	4.7	302	2.77	48	83	106	16	54	99.9
3.3.2.2.2 50% of pull at maximum power at rated speed													
4LI	34.2	17.4	7.10	2178	3.4	353	2.37	49	83	106	15	55	99.9
3.3.2.2.3 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.2.2.1													
1HI	50.1	26.0	6.94	1801	4.6	272	3.08	47	82	102	15	55	99.9
3.3.2.2.4 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.2.2.2													
1HI	34.3	17.4	7.10	1818	3.4	302	2.77	46	81	101	15	56	99.9

SUPPLEMENTARY TESTS

3.1 Main power take-off (540)

Date and location of tests: 2 November 1998
Silsoe Research Institute,
Wrest Park, Silsoe, Bedford

Type of dynamometer: Eddy Current, Borghi and Saveri

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	
3.1.1 MAXIMUM POWER						
73.7	1999	571	17.79	21.25	241	3.47
3.1.2 POWER AT RATED ENGINE SPEED						
73.2	2069	591	17.88	21.36	244	3.43
3.1.3 STANDARD POWER TAKE-OFF SPEED (540 ± 10 rev/min)						
72.9	1892	541	17.24	20.60	237	3.54
3.1.4 PART LOADS 3.1.4.1 The torque corresponding to maximum power at rated engine speed						
73.2	2069	591	17.88	21.36	244	3.43
3.1.4.2 85% of the torque defined in 3.1.4.1						
64.4	2143	612	16.26	19.43	252	3.32
3.1.4.3 75% of the torque defined in 3.1.4.2						
48.9	2169	620	13.45	16.07	275	3.04
3.1.4.4 50% of the torque defined in 3.1.4.2						
32.9	2188	625	10.64	12.71	324	2.58
3.1.4.5 25% of the torque defined in 3.1.4.2						
16.6	2207	630	7.65	9.14	461	1.81
3.1.4.6 Unloaded						
0	2225	636	4.86	5.80	–	–

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	
3.1.5 PART LOADS AT STANDARD POWER TAKE-OFF SPEED (540 ± 10 rev/min)						
3.1.5.1 The torque corresponding to maximum power						
72.9	1892	541	17.24	20.60	237	3.54
3.1.5.2 85% of the torque obtained in 3.1.5.1						
64.6	1975	564	15.74	18.81	244	3.44
3.1.5.3 75% of the torque obtained in 3.1.5.2						
49.2	2007	574	12.79	15.28	260	3.22
3.1.5.4 50% of the torque obtained in 3.1.5.2						
33.3	2034	581	9.98	11.92	300	2.79
3.1.5.5 25% of the torque obtained in 3.1.5.2						
16.8	2055	587	7.02	8.38	418	2.00
3.1.5.6 Unloaded						
0	2079	594	4.22	5.05	--	--

No load, maximum engine speed: 2225 rev/min

Torque (equivalent crankshaft) at maximum power: 352.3 Nm

Torque (equivalent crankshaft) at rated speed: 338.0 Nm

Maximum torque (equivalent crankshaft): * Nm
(engine speed ---- rev/min)

Mean atmospheric conditions:

- Temperature 26°C
- Pressure 98.6 kPa
- Relative humidity 33%

Maximum temperatures:

- Coolant 84°C
- Engine oil 107°C
- Fuel 51°C
- Engine air intake 31°C

*Maximum torque not measurable within limits of test equipment. Speed for maximum torque measured on 1000 rev/min shaft was 1412 rev/min.

3.2 Hydraulic power and lifting force

3.2.2 Power lift test

I. B 2.2 Power lift test - (To ISO 730-1:1994, alternative rear tyre size 13.6 R38)

	At the hitch point	On the frame
Height of lower hitch points above ground in down position	196 mm	196 mm
Vertical movement	635 mm	868 mm
Maximum corrected force exerted through full range	19.0 kN	14.1 kN
Corresponding pressure of hydraulic fluid	16.0 MPa	16.0 MPa
Moment about rear-wheel axis	19.3 kNm	22.9 kNm
Maximum tilt angle of mast from vertical	--	15 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	-414	-315	-250	-150	-50	0	100	200	250	320	454
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	--	19.0	20.0	21.2	22.0	22.3	22.4	22.6	22.7	23.0	--
Corresponding pressure: 16.0 MPa											
at the frame kN	15.5	16.1	16.4	16.5	16.4	16.3	16.0	15.5	15.8	14.8	14.1
Corresponding pressure: 16.0 MPa											

II. B 2.3 Power lift test - (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	542 mm	542 mm
Vertical movement	500 mm	633 mm
Maximum corrected force exerted through full range	25.6 kN	17.1 kN
Corresponding pressure of hydraulic fluid	16.0 MPa	16.0 MPa
Moment about rear-wheel axis	26.0 kNm	27.8 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	-56	-49	0	100	200	250	300	400	451	500	577
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	--	25.6	26.3	27.1	27.5	27.3	27.2	27.1	27.0	--	--
Corresponding pressure: 16.0 MPa											
at the frame kN	23.4	23.4	23.5	23.1	22.1	21.5	20.9	19.4	18.8	18.1	17.1
Corresponding pressure: 16.0 MPa											

lil. B 2.4 Power lift test - (ASAE S349.2 / SAE J 283 with 13.6 R 38 tyres)

* Lift rods readjusted to 780 mm to allow for lift to be measured throughout the total lift range

Lifting heights relative to the horizontal plane including the lower link pivot points											
mm	-314	-200	-150	-100	0	100	150	200	280	--	--
mm*	--	--	-148	-100	0	100	150	200	280	350	420
ASAE S349.2											
mm	25.5	24.8	24.6	24.5	23.6	22.2	22.0	21.7	19.8	--	--
mm	--	--	24.9	25.3	26.0	24.7	24.7	24.2	22.3	20.5	19.7
Corresponding pressure:				17.6 MPa							

Lifting heights relative to the horizontal plane including the lower link pivot points											
mm	-314	-200	-150	-100	0	100	150	200	280	--	--
mm*	--	--	148	-100	0	100	150	200	280	350	420
SAE J283											
mm	22.9	22.3	22.1	22.0	21.2	19.9	19.7	19.5	17.8	--	--
mm	--	--	22.3	22.7	23.3	22.2	22.2	21.7	20.0	18.4	17.7
Corresponding pressure:				15.8 MPa							

3 Drawbar power test (unballasted tractor), 2 wheel drive

Date and Location of tests: 4 February 1999
Silsoe Research Institute
Wrest Park
Silsoe
Bedford MK45 4HS

Height of drawbar above ground	Tyre inflation pressure (kPa) Front	Rear
555 mm	103	83

Type of track: Concrete

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
3.3.1 MAXIMUM POWER IN TESTED GEARS													
1LI	20.3	35.3	2.07	2194	15.2	451	1.86	44	82	97	14	63	101.7
2LI	25.4	35.1	2.60	2188	14.3	411	2.03	47	82	99	12	64	101.7
1Lh	25.9	34.4	2.71	2187	13.2	409	2.04	45	82	101	13	65	101.7
2Lh	32.6	33.9	3.46	2180	10.9	365	2.29	45	83	102	12	67	101.8
3LI	44.3	33.9	4.71	2159	10.3	327	2.56	45	83	105	12	66	101.8
3Lh	55.7	33.6	5.97	2129	10.2	311	2.69	47	83	104	12	64	101.8
4LI*	58.5	32.9	6.39	2129	9.2	300	2.79	49	83	106	11	69	101.9
1HI	64.5	30.2	7.69	2071	6.4	278	3.01	51	84	108	11	70	101.9
4Lh	62.7	27.5	8.20	2028	4.9	283	2.95	48	85	107	10	72	102.0
2HI	65.4	24.8	9.47	1998	4.1	270	3.09	48	85	107	11	71	102.0
1Hh	64.2	23.5	9.83	2007	3.8	275	3.05	49	85	106	11	69	102.0
2Hh	63.8	18.6	12.35	2004	3.2	277	3.02	49	83	107	11	69	102.0
3HI	62.1	13.0	17.23	2004	2.7	287	2.92	48	83	106	10	70	102.0
3.3.2 FUEL CONSUMPTION													
3.3.2.1 in selected gear, at maximum power at rated speed													
2HI	64.4	23.6	9.84	2070	3.9	280	2.99	48	83	108	11	70	102.0
3.3.2.1.1 75% of pull at maximum power at rated speed													
2HI	51.0	17.7	10.36	2157	3.0	296	2.82	49	83	108	11	71	102.0
3.3.2.1.2 50% of pull at maximum power at rated speed													
2HI	34.7	11.8	10.56	2181	2.2	341	2.45	49	82	107	11	70	102.0
3.3.2.1.3 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.2.1.1													
2Hh	51.0	17.8	10.34	1679	3.2	269	3.11	45	82	99	14	62	101.5
3.3.2.1.4 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.2.1.2													
2Hh	34.6	11.8	10.52	1693	2.3	289	2.90	43	80	96	14	61	101.5
3.3.2.2 In selected gear nearest to 7.5 km/h, at maximum power at rated speed													
1HI	64.5	30.2	7.69	2071	6.4	278	3.01	51	84	108	11	70	101.9
3.3.2.2.1 75% of pull at maximum power at rated speed													
1HI	51.9	22.7	8.22	2156	3.8	292	2.86	50	83	108	11	69	101.9
3.3.2.2.2 50% of pull at maximum power at rated speed													
1HI	35.4	15.1	8.42	2181	2.6	337	2.49	51	83	108	11	69	101.9
3.3.2.2.3 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.2.2.1													
4Lh	51.8	22.7	8.22	2011	4.0	284	2.94	44	82	98	14	61	101.5
3.3.2.2.4 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.2.2.2													
4Lh	35.3	15.1	8.41	2032	2.8	324	2.59	45	83	100	14	61	101.5

* Gear nearest 7.5 km/h is a slip gear

5. REPAIRS AND ADJUSTMENTS DURING TESTS: None

6. REMARKS: None

Test carried out by: S J Devonshire

Signed: Officer in charge of tests

J P Evans

Signed: for the Director

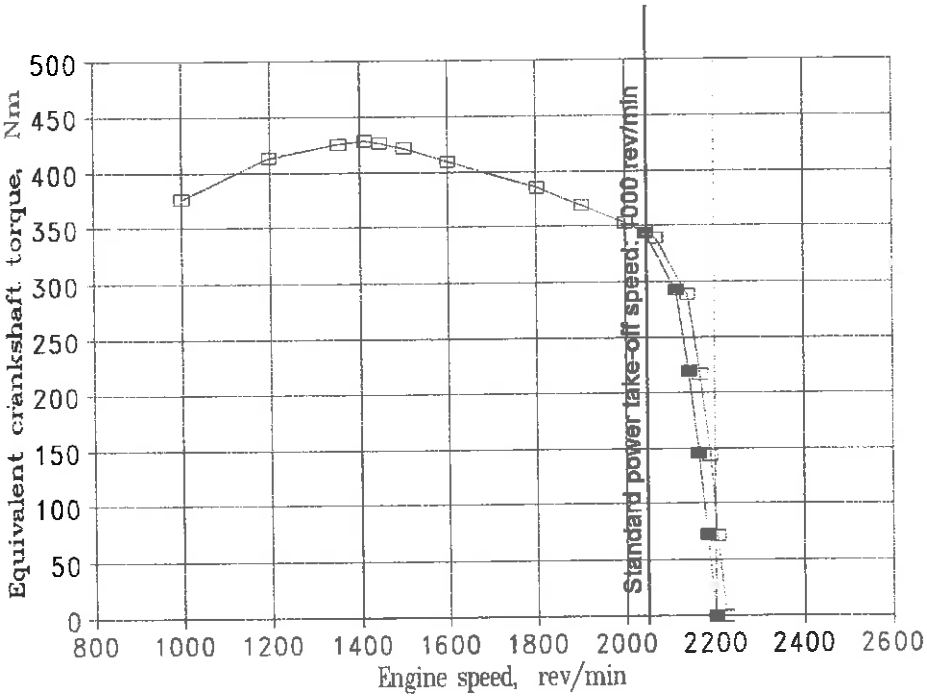
A G Douglass
Interim Manager - Test Engineering Group

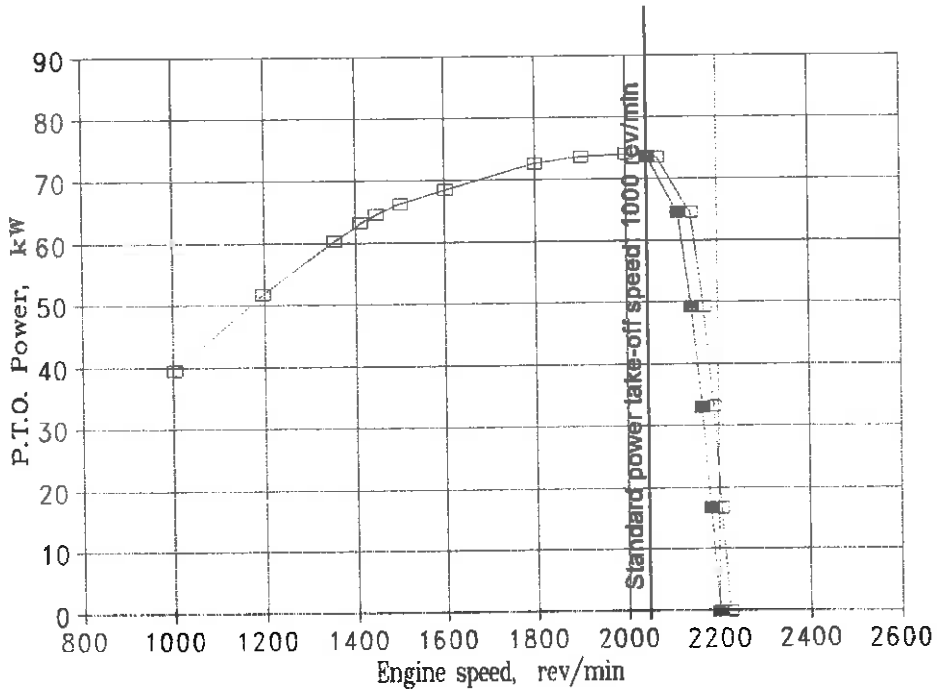
Date: 5/3/99

7. ANNEX 1 MAIN POWER TAKE-OFF CURVES

P.T.O. POWER TEST - NEW HOLLAND TS110 FOUR-WHEEL DRIVE (1000 rev/min)

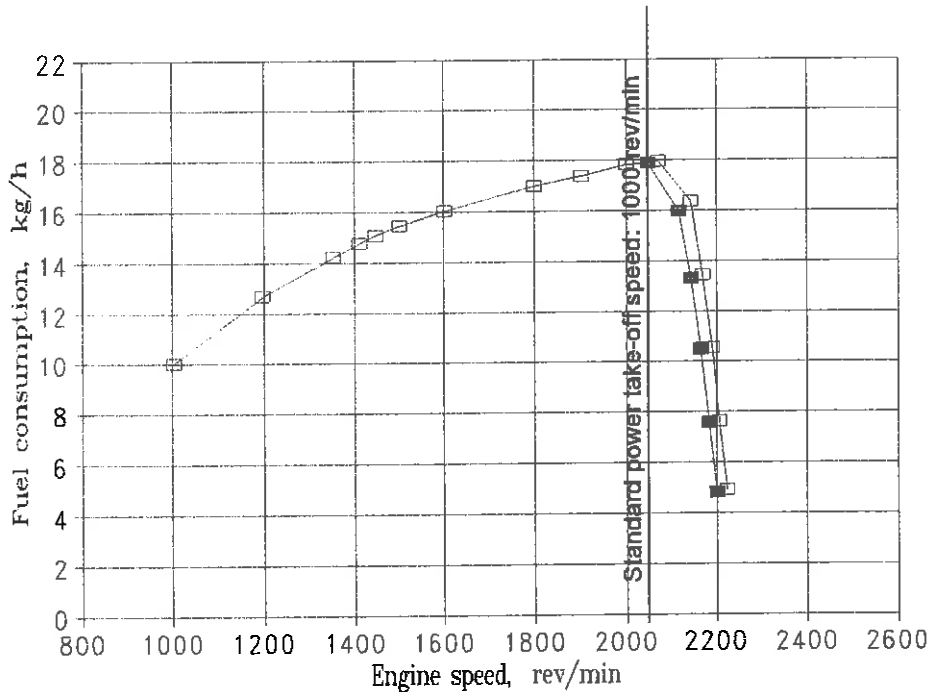
Governor set for maximum power at rated speed □
Governor set for maximum power at pto speed ■

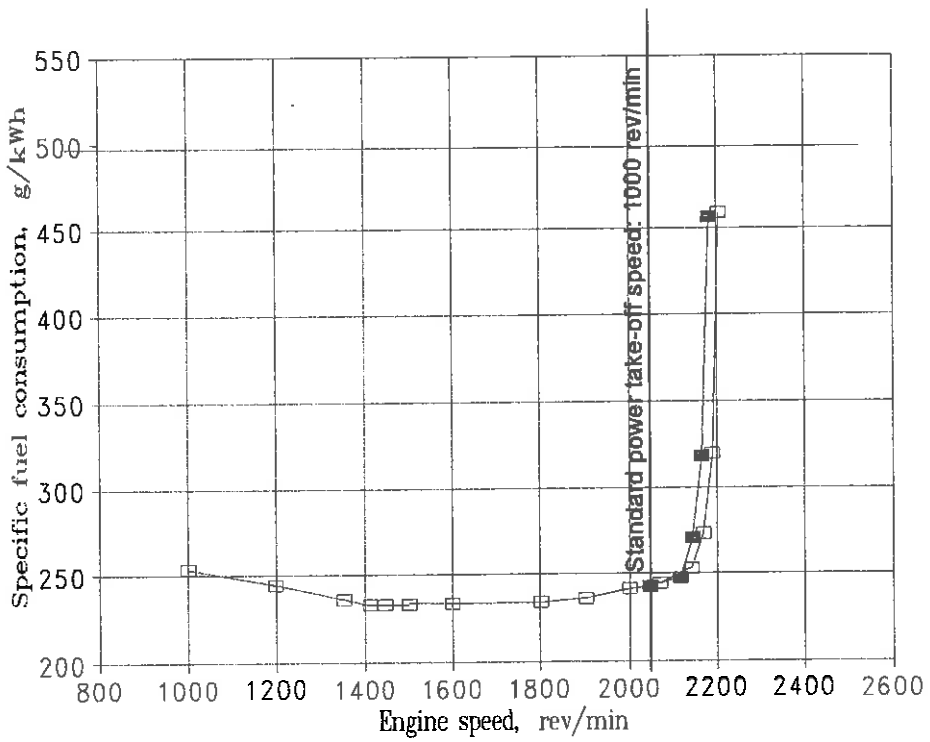




P.T.O. POWER TEST - NEW HOLLAND TS110 FOUR-WHEEL DRIVE (1000 rev/min)

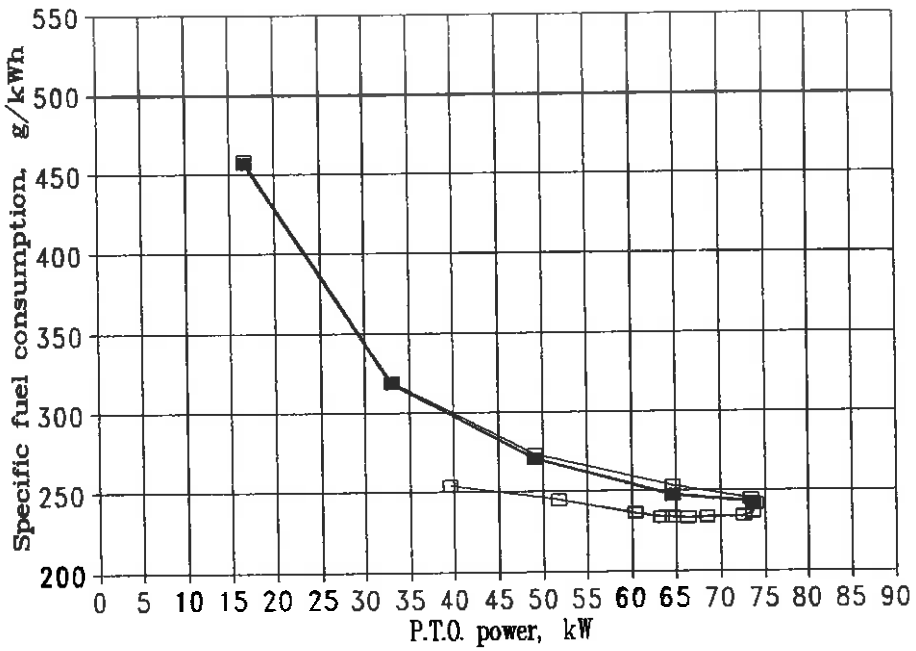
Governor set for maximum power at rated speed □
Governor set for maximum power at pto speed ■





P.T.O. POWER TEST - NEW HOLLAND TS110 FOUR-WHEEL DRIVE (1000 rev/min)

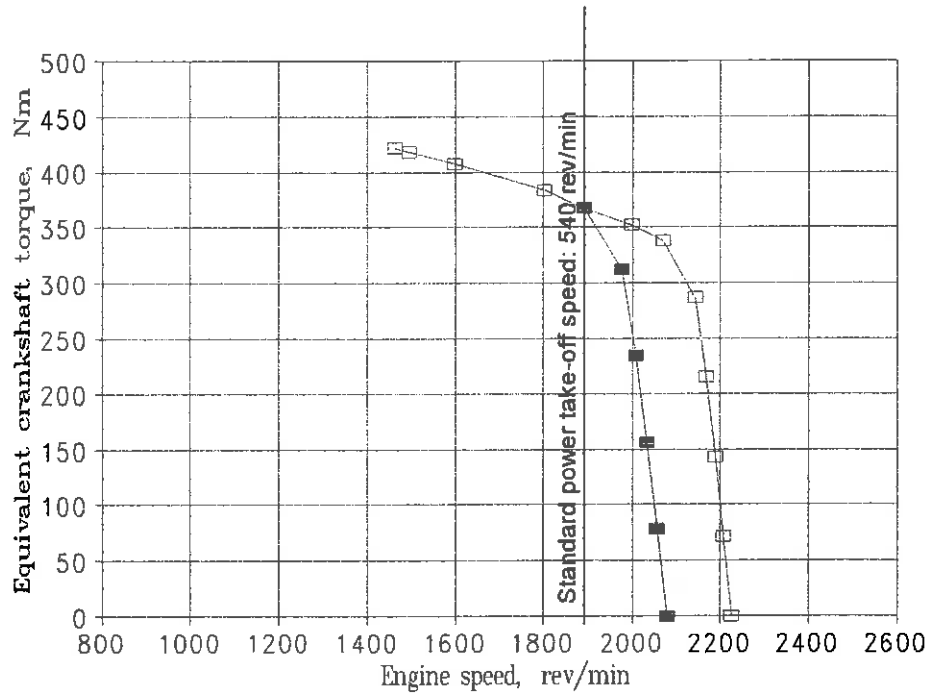
Governor set for maximum power at rated speed □
Governor set for maximum power at pto speed ■

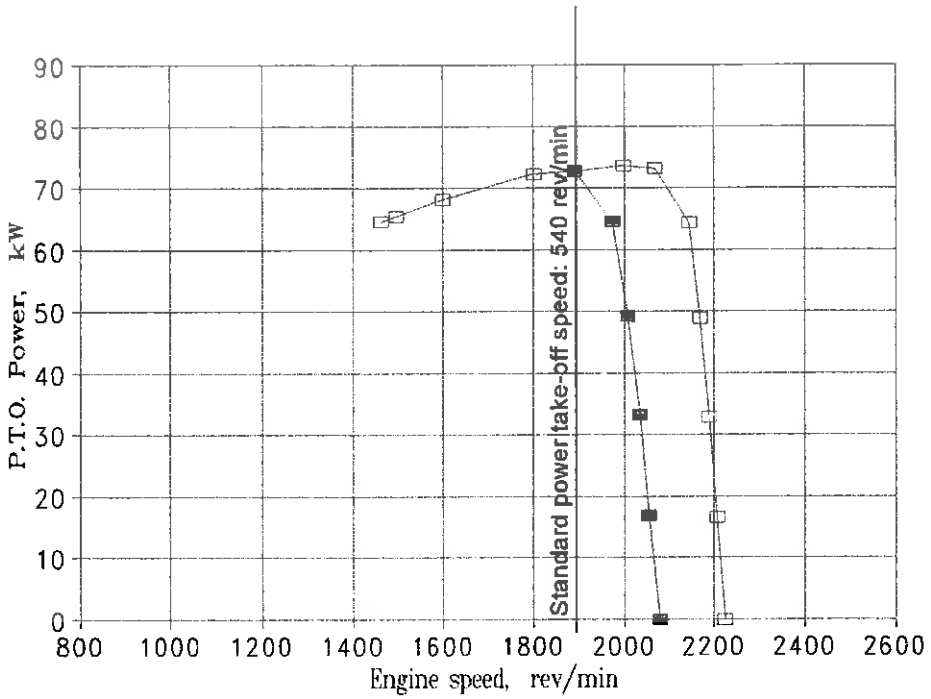


7. ANNEX 2 MAIN POWER TAKE-OFF CURVES

P.T.O. POWER TEST - NEW HOLLAND TS110 FOUR-WHEEL DRIVE (540 rev/min)

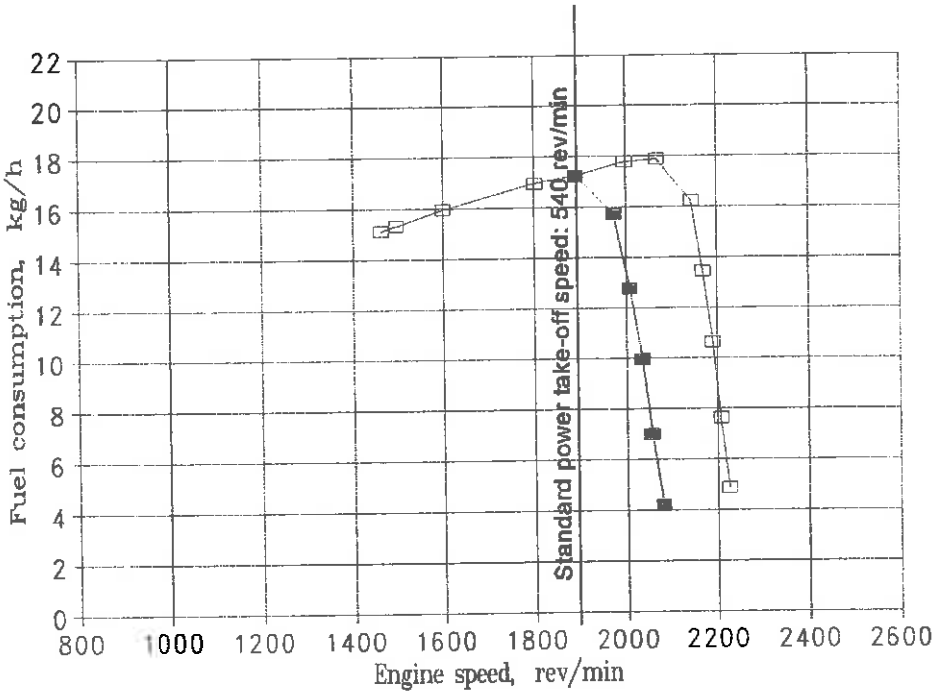
Governor set for maximum power at rated speed □
Governor set for maximum power at pto speed ■

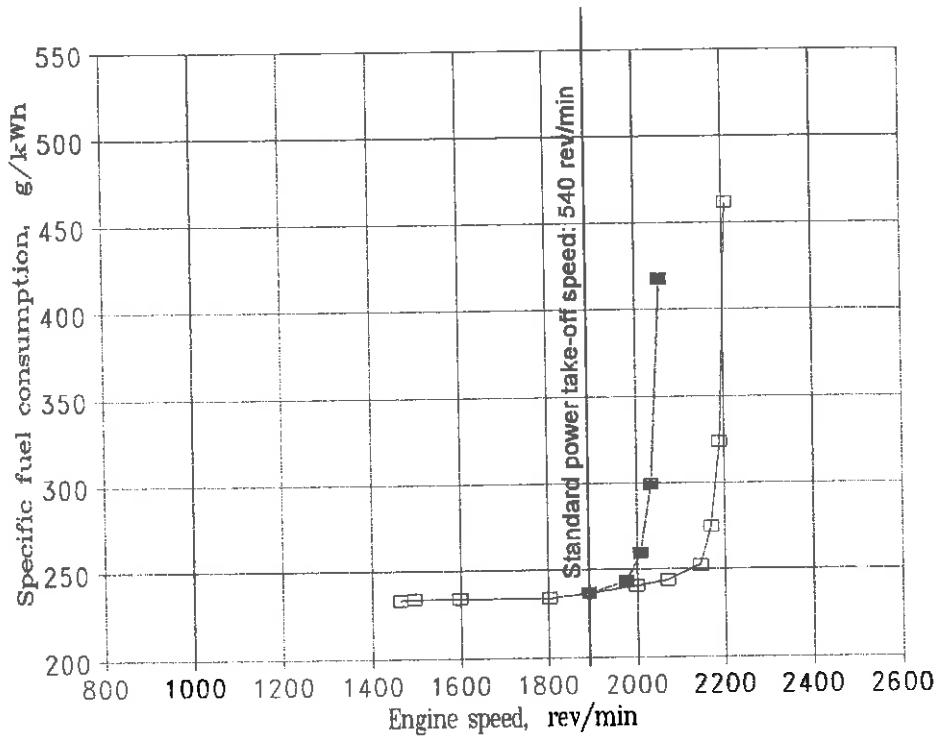




P.T.O. POWER TEST - NEW HOLLAND TS110 FOUR-WHEEL DRIVE (540 rev/min)

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





P.T.O. POWER TEST - NEW HOLLAND TS110 FOUR-WHEEL DRIVE (540 rev/min)

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

