2.

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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 618115(TS 90)Four-Wheel Drive Tractor with 24-speed Synchromesh Transmission (40 km/h)



Manufactured by: New Holland UK Ltd
Basildon
Essex
United Kingdom

Submitted for test by: The manufacturer

Report No: 806

Date: May 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:	66 hours
Location of test:	Silsoe Research Institute Wrest Park, Silsoe, United Kingdom

1. SPECIFICATION OF TRACTOR

1.1 Identification

Make:	New Holland
Model:	618115 (TS 90) with 24-speed Synchromesh Transmission
Type:	Four wheel drive unit construction
Serial No:	085739B
1st Serial No:	082846B

1.2 Engine

Make:	New Holland
Model:	450T/PF
Type:	4 stroke direct injection naturally aspirated diesel
Serial No:	NE736234

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:	None
Model:	----
Type:	----
Pressure:	----

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 separator plus secondary disposable canister filter between tank and injection pump
Capacity of fuel tank:	160 litres
Make, type and model of injection pump:	Lucas/CAV Rotary, DP203, DSA 1259
Serial No:	30286 GRG
Manufacturer's production setting of injection pump:	
Flow rate:	68.0+/-2.7 mm^3 per stroke at 2170 rev/min speed and full load
Timing:	Delivery starts 3° before T.D.C (dynamic)
Make, type and model of injectors:	Lucas/CAV, multihole, LP054B
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 2345 rev/min
Rated engine speed:	2170 rev/min

1.2.5 Air cleaner

Pre-cleaner	Optional (Fitted for test)
Make:	Donaldson
Location of air intake:	By roof on RH A- pillar of cab
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
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:	16.0 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:	2 x 800 cca lead acid, mounted on right-hand side under cab (1 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:	2865 mm

1.3 Transmission

1.3.1 Main clutch (Travel alone)

Make:	New Holland
Model:	None
Type:	Wet multiplate - located within clutch housing
Number of plates:	5
Diameter of plates:	155 mm
Method of operation:	Electro-hydraulic, pedal button operation

1.3.2 Gear box

Make:	New Holland (Synchroshift™)
Model:	24 x 24 Synchromesh
Type:	Mechanical /Hydraulic manual synchromesh operation, 4 forward and reverse speeds, 3 mechanical range changes Forward and reverse shuttle 3 selection levers are mounted on the right hand side. Additional electro/hydraulic drive / underdrive is available in all gears
Number of gears:	24 forward, 24 reverse (40 km/h)
Available options:	12 x 12 Synchroshift™ 16 x 16 Electroshift™

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:	Electro-hydraulic actuation in response to signal from switch on right-hand control panel
Method of disengagement:	Via panel switch or in response to electrical signal from brakes on application

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 RH control panel
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 electrical signal from brakes on application

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:* 2170 rev/min km/h
Forward			
1	1Ll	396.84	1.59
2	1Lh	324.45	1.94
3	2Ll	270.88	2.33
4	2Lh	221.47	2.84
5	3Ll	189.69	3.32
6	1Ml	157.98	3.99
7	3Lh	155.09	4.06
8	4Ll	130.36	4.83
9	1Mh	129.16	4.88
10	2Ml	107.84	5.84
11	4Lh	106.58	5.91
12	2Mh	88.17	7.14
13	3Ml	75.51	8.34
14	1Hl	65.25	9.65
15	3Mh	61.74	10.20
16	1Hh	53.35	11.81
17	4Ml	51.90	12.14
18	2Hl	44.54	14.14
19	4Mh	42.43	14.84
20	2Hh	36.41	17.30
21	3Hl	31.19	20.19
22	3Hh	25.50	24.71
23	4Hl	21.43	29.40
24	4Hh	17.52	35.95
Reverse			
1	1Ll	383.76	1.64
2	1Lh	313.75	2.01
3	2Ll	261.95	2.40
4	2Lh	214.17	2.94
5	3Ll	183.44	3.43
6	1Ml	152.77	4.12
7	3Lh	149.97	4.20
8	4Ll	126.06	5.00
9	1Mh	124.90	5.04
10	2Ml	104.28	6.04
11	4Lh	103.07	6.11
12	2Mh	85.26	7.39
13	3Ml	73.03	8.63
14	1Hl	63.10	9.98
15	3Mh	59.70	10.55
16	1Hh	51.59	12.21
17	4Ml	50.18	12.55
18	2Hl	43.07	14.63
19	4Mh	41.03	15.35
20	2Hh	35.21	17.89
21	3Hl	30.16	20.89
22	3Hh	24.66	25.54
23	4Hl	20.73	30.39
24	4Hh	16.95	37.16

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

(*) Calculated with a tyre dynamic radius index of 770mm (ISO 421/1-1992)
Number of revolutions of front wheels for one revolution of rear wheels: 1.344

1.4 Power take-off

1.4.1 Main power take-off

Type:	Independent
Method of engagement:	Electro - hydraulically operated multi-plate clutch in response to a signal from switch on the right-hand control panel
Number of shafts:	1, 6 spline to ISO 500/1991
Method of changing power take-off speeds:	None
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

Single speed power take-off	
(Fitted for test)	*540 rev/min*
Location:	Rear of tractor
Diameter of power take-off shaft:	34.9 mm
Number of splines:	6
Height above ground:	723 mm
Distance from the median plane of the tractor:	Central
Distance behind rear wheel axis:	457 mm
Pto speed at rated engine speed:	616 rev/min at 2170
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

1.4.2 Optional PTO system available (not fitted for test)

Two speed power take-off shiftable via lever in cab

540 rev/min

Location:	Rear of tractor
Diameter of power take-off shaft:	34.9 mm
Number of splines:	6 or 21
Height above ground:	723 mm
Distance from the median plane of the tractor:	Central
Distance behind rear wheel axis:	457 mm
PTO speed at rated engine speed:	620 rev/min at 2170
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:	6 or 21
Height above ground:	723 mm
Distance from the median place of the tractor:	Central
Distance behind rear wheel axis:	457 mm
PTO speed at rated engine speed:	1032 rev/min at 2170
Engine speed at standard power take-off speed:	2103 rev/min
Ratio of rotation speeds:	2.103:1
Power restriction and maximum torque:	None
Direction of rotation (viewed from behind tractor):	Clockwise

1.5 Hydraulic power lift - standard

Pump - standard

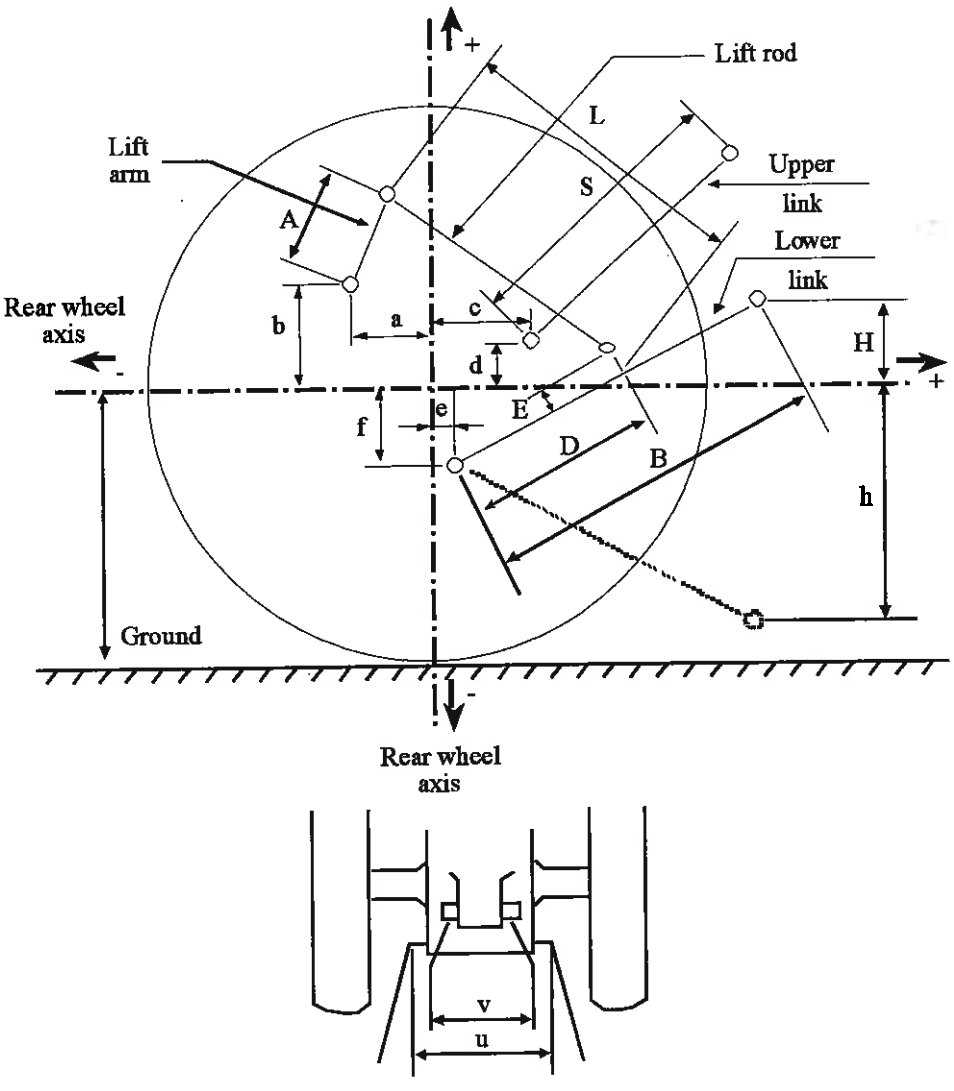
Make:	Sauer Sundstrand
Model:	None
Type:	Gear driven fixed displacement closed centre load sensing system
Type and number of cylinders:	1 located inside transmission housing plus the option of 1 or 2 single acting, externally mounted assistor rams (1 fitted for test)
Type of linkage lock for transport:	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:	2 replaceable paper element filter canisters
Site of oil reservoir:	Rear axle housing
Type, number and position of tapping points:	1 front face of hydraulic top cover if no remote valves are fitted,(4 remote valves fitted to test tractor
Maximum volume of oil available to external cylinders:	18.2 litres

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
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:	(a)	102	102	102	102
	vertically:	(b)	341	341	341	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	715	710	685
Distance of upper link pivot point from rear wheel centre line:	horizontally:	(c)	325	325	325	325
	vertically:	(d)	149 - 205	149	149	205
Distance of lower link pivot point from rear wheel centre line:	horizontally:	(e)	102	102	102	102
	vertically:	(f)	229	229	229	229
Distance of lower link points to lift rod pivot points 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
Length of lift rods:		(L)	743 - 879	810	795	743
ISO mast height			-	610	610	510
Height of lower hitch points (*) relative to the rear wheel centre line, situated 770 mm above the ground level:						
- in low position		(h)	308 to 794	577	546	288
- in high position		(H)	-77 to 224	64	90	223
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 770 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:	530 mm		
minimum:	420 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:	193 mm	303 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:	New Holland
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. On 40 km/h (4WD) models when the service brakes are actuated the front wheel drive is automatically engaged providing 4-wheel braking
Trailer braking take-off:	Hydraulic connector fitted to ISO 5676-1983

1.11.2 Parking brake

Make:	New Holland
Type:	Mechanical linkage coupled to service brakes via cables
Method of operation:	Hand lever with 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	1525	2028	Reversing wheels and offset lug rims

1.13 Protective structure

Make:	New Holland
Model:	New Holland 582 MK SK 90
Type:	Safety cab
Manufacturer's name and address:	Airflow Streamlines PLC, Northampton
Protective device:	
Rollguard:	Safety cab
Tiltable/Not tiltable:	Non tiltable
OECD approval	
Approval number:	CSD-1329/113-130
Date of approval:	1 September 1997

Nos. of minor modification certificates, if any:
The Certificates for minor modifications established by and under the responsibility of the National Authority of DENMARK

1.14 Seat

1.14.1 Drivers seat

Make/Model/Type:	Grammer MSG93/20
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	1328	150 x 90	210
Sidelights	--	--	--
Rear lights	1715	60 x 60	840
Rear axle reflectors	773	100 x 35	600
Rear fender reflectors	1715	60 x 60	840

2. TEST CONDITIONS

2.1 Overall dimensions

Length mm	Width		Height at top of	
	Minimum mm	Maximum mm	Protective structure mm	Exhaust pipe mm
4047	2092	2527	2726	2865

2.2 Ground clearance (unballasted tractor) 365 mm

Clearance-limiting part: Drawbar clevis in lowest position

2.3 Tractor mass (with safety cab)

	Unballasted		Ballasted	
	Without driver kg	With driver kg	Without driver kg	With driver kg
Front	1740	1750	--	--
Rear	2573	2638	--	--
Total	4313	4388	--	--

2.5 Tyres and track width specification

	Front	Rear
Tyres dimensions ply rating type	 14.9 R 24 126A8 Radial	 18.4 R 34 144A8 Radial
Maximum load (tyre manufacturer's), kg 30 km/h (40 km/h)	1820 (1550)	2995 (2575)
Maximum load (tractor manufacturer's), kg	1820 (1550)	2995 (2575)
Inflation pressure (tyre manufacturer's), Bar	1.6	1.6
Dynamic radius index, mm	590	770
Chosen track width (manufacturer's nominal), mm	1710	1630

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	0.5	Top-up	None

2.7.2 Specifications

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

2.7.3 Grease

Type: Classification:	82948889	Lithium based NLG1 2	As recommended

Number of lubrication points: 12

3. COMPULSORY TESTS RESULTS

3.1 Main power take-off (540)

Date and location of tests: 29 January 1999
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						
57.6	2174	617	14.51	17.29	252	3.33
3.1.2 POWER AT RATED ENGINE SPEED						
57.6	2174	617	14.51	17.29	252	3.33
3.1.3 STANDARD POWER TAKE-OFF SPEED (540 ± 10 rev/min)						
56.6	1902	540	13.95	16.62	246	3.41
3.1.4 PART LOADS 3.1.4.1 The torque corresponding to maximum power at rated engine speed						
57.6	2174	617	14.51	17.29	252	3.33
3.1.4.2 85% of the torque defined in 3.1.4.1						
50.8	2253	640	13.16	15.69	259	3.24
3.1.4.3 75% of the torque defined in 3.1.4.2						
38.4	2274	646	10.84	12.92	283	2.97
3.1.4.4 50% of the torque defined in 3.1.4.2						
25.8	2289	650	8.53	10.17	331	2.54
3.1.4.5 25% of the torque defined in 3.1.4.2						
12.9	2301	653	6.28	7.48	487	1.72
3.1.4.6 Unloaded						
0	2315	657	4.19	4.99	--	--

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 (540 ± 10 rev/min)						
3.1.5.1 The torque corresponding to maximum power						
56.6	1902	540	13.95	16.62	246	3.41
3.1.5.2 85% of the torque obtained in 3.1.5.1						
49.9	1975	561	12.29	14.65	246	3.41
3.1.5.3 75% of the torque obtained in 3.1.5.2						
37.9	1997	567	10.00	11.92	264	3.18
3.1.5.4 50% of the torque obtained in 3.1.5.2						
25.5	2019	573	7.71	9.19	303	2.77
3.1.5.5 25% of the torque obtained in 3.1.5.2						
13.0	2040	579	5.49	6.55	422	1.99
3.1.5.6 Unloaded						
0	2059	585	3.42	4.08	--	--

No load, maximum engine speed: 2315 rev/min

Torque (equivalent crankshaft) at maximum power: 253.1 Nm

Torque (equivalent crankshaft) at rated speed: 253.1 Nm

Maximum torque (equivalent crankshaft): 324.7 Nm
(engine speed 1304 rev/min)

Mean atmospheric conditions:

- Temperature 24°C
- Pressure 102.6 kPa
- Relative humidity 31%

Maximum temperatures:

- Coolant 86°C
- Engine oil 108°C
- Fuel 52°C
- Engine air intake 32°C

3.2 Hydraulic power and lifting force

Date of tests: 10 February 1999

3.2.1 Hydraulic power test

Sustained pressure with relief valve open: 18.4 MPa

Pump delivery rate at minimum pressure: 72.7 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	60.0	16.6	16.60
Flow rate and hydraulic pressure corresponding to maximum hydraulic power	59.6	16.8	16.69

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	193 mm	193 mm
Vertical movement	641 mm	868 mm
Maximum corrected force exerted through full range	29.9 kN	21.1 kN
Corresponding pressure of hydraulic fluid	16.6 MPa	16.6 MPa
Moment about rear-wheel axis	30.4 kNm	34.3 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	-444	-348	-300	-200	-100	0	100	200	250	293	424
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	--	29.9	30.2	31.5	32.5	33.1	33.4	33.4	33.6	33.6	--
Corresponding pressure: 16.6 MPa											
at the frame kN	23.8	24.4	24.5	25.0	24.9	24.7	24.3	23.3	22.6	21.8	21.1
Corresponding pressure: 16.6 MPa											

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

Date and Location of tests: 13 May 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
390 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												
1Ll	18.6	46.0	1.46	2285	14.9	456	1.83	43	84	101	17	53	100.2
1Lh	23.2	45.3	1.84	2279	12.0	403	2.08	47	84	102	17	48	100.3
2Ll	27.7	45.0	2.21	2274	11.4	371	2.26	48	84	104	16	51	100.3
2Lh	33.9	44.4	2.75	2268	9.7	338	2.48	49	85	106	16	55	100.3
3Ll	39.4	44.5	3.19	2252	9.7	327	2.56	49	85	106	15	53	100.3
1Ml	46.4	43.5	3.85	2206	7.4	311	2.69	48	85	105	15	56	100.3
3Lh	47.5	43.7	3.92	2202	7.3	306	2.74	47	86	106	15	56	100.3
4Ll	48.8	37.0	4.75	2171	4.0	299	2.80	48	85	105	16	53	100.3
1Mh	48.7	36.6	4.78	2164	4.0	293	2.85	49	85	105	15	57	100.3
2Ml	48.6	30.1	5.82	2177	3.1	299	2.80	45	86	101	16	53	100.2
4Lh	49.0	30.0	5.89	2170	2.9	295	2.83	46	85	105	14	63	100.3
2Mh	48.7	24.6	7.13	2166	2.5	296	2.83	47	86	105	16	51	100.2
3Ml	47.7	20.6	8.35	2165	2.2	303	2.77	48	85	106	16	54	100.2
1Hl	47.9	17.8	9.71	2166	1.8	304	2.75	45	85	105	13	63	100.3
3Mh	47.3	16.6	10.26	2166	1.7	308	2.72	45	85	106	14	62	100.3
1Hh	47.1	14.2	11.91	2167	1.5	310	2.70	46	86	107	13	63	100.3
4Ml	46.3	13.6	12.24	2166	1.5	312	2.68	48	85	107	13	64	100.3
2Hl	45.2	11.3	14.34	2175	1.3	321	2.61	48	85	108	14	64	100.3
4Mh	44.5	10.7	15.04	2170	1.3	324	2.58	48	85	107	14	63	100.3

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

Date and Location of tests: 13 May 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
390 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
3.3.2 FUEL CONSUMPTION													
3.3.2.1 In selected gear, at maximum power at rated speed													
4Lh	49.0	30.0	5.89	2170	2.9	295	2.83	46	85	105	14	63	100.3
3.3.2.1.1 75% of pull at maximum power at rated speed													
4Lh	38.5	22.5	6.17	2259	2.2	322	2.60	49	84	108	14	62	100.3
3.3.2.1.2 50% of pull at maximum power at rated speed													
4Lh	26.2	15.0	6.27	2278	1.5	376	2.23	49	84	107	14	61	100.3
3.3.2.1.3 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.3.2.1.1													
2Mh	38.5	22.5	6.16	1869	2.3	289	2.89	46	85	100	16	57	100.2
3.3.2.1.4 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.3.2.1.2													
2Mh	26.2	15.0	6.27	1890	1.7	326	2.57	46	83	100	16	54	100.2
3.3.2.2 In selected gear nearest to 7.5 km/h, at maximum power at rated speed													
2Mh	48.7	24.6	7.13	2166	2.5	296	2.83	47	86	105	16	51	100.2
3.3.2.2.1 75% of pull at maximum power at rated speed													
2Mh	38.4	18.5	7.46	2255	1.9	322	2.60	48	85	106	16	54	100.2
3.3.2.2.2 50% of pull at maximum power at rated speed													
2Mh	25.9	12.3	7.57	2275	1.5	380	2.20	48	84	106	16	52	100.2
3.3.2.2.3 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.3.2.2.1													
3Ml	38.4	18.5	7.49	1937	2.0	295	2.84	48	85	104	16	54	100.2
3.3.2.2.4 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.3.2.2.2													
3Ml	25.9	12.3	7.58	1950	1.5	336	2.49	46	84	101	16	56	100.2

SUPPLEMENTARY TESTS

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	194 mm	194 mm
Vertical movement	636 mm	857 mm
Maximum corrected force exerted through full range	30.8 kN	21.7 kN
Corresponding pressure of hydraulic fluid	16.6 MPa	16.6 MPa
Moment about rear-wheel axis	31.3 kNm	35.3 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	-400	-317	-250	-200	-100	0	100	200	250	319	457
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	--	30.8	31.4	32.1	33.6	34.0	34.6	34.6	34.6	34.7	--
Corresponding pressure:	16.6 MPa										
at the frame kN	25.5	25.6	25.7	25.9	25.7	25.1	24.9	24.0	23.4	22.6	21.7
Corresponding pressure:	16.6 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	482 mm	482 mm
Vertical movement	511 mm	637 mm
Maximum corrected force exerted through full range	39.4 kN	26.2 kN
Corresponding pressure of hydraulic fluid	16.6 MPa	16.6 MPa
Moment about rear-wheel axis	40.1 kNm	42.6 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	-68	-59	0	100	200	250	300	400	452	500	569
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	--	41.8	42.1	42.0	41.9	41.7	41.5	40.4	39.4	--	--
Corresponding pressure: 16.6 MPa											
at the frame kN	36.5	36.3	34.9	34.3	32.8	31.9	31.1	29.7	28.6	27.6	26.2
Corresponding pressure: 16.6 MPa											

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

Date and Location of tests: 17 May 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
495 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													
1Ll	14.3	36.0	1.43	2290	15.0	533	1.57	37	83	98	16	40	101.3
1Lh	17.7	36.2	1.75	2283	15.0	471	1.78	39	84	97	15	47	101.3
2Ll	21.9	36.3	2.17	2278	12.6	415	2.02	43	83	97	15	42	101.3
2Lh	26.5	36.0	2.65	2272	12.3	380	2.20	40	84	100	15	43	101.3
3Ll	31.4	36.3	3.12	2266	11.5	362	2.31	43	85	103	15	46	101.4
1Ml	37.5	35.7	3.78	2251	10.0	335	2.50	44	84	103	13	49	101.5
3Lh	37.3	34.8	3.85	2252	10.0	339	2.47	44	85	103	13	49	101.5
4Ll	44.8	34.9	4.62	2222	8.1	317	2.64	45	85	103	12	49	101.5
1Mh	45.1	34.6	4.69	2227	7.7	313	2.67	45	85	106	13	49	101.5
2Ml	47.9	30.5	5.65	2164	4.6	304	2.75	47	85	104	14	45	101.4
4Lh	48.1	30.2	5.74	2165	4.0	303	2.76	45	85	105	12	50	101.5
2Mh	48.3	24.7	7.04	2170	3.0	302	2.7	44	85	107	11	56	101.5
3Ml	47.4	20.7	8.26	2166	2.4	308	2.72	44	85	106	12	54	101.5
1Hl	48.1	18.0	9.60	2169	2.0	306	2.74	43	86	106	12	56	101.5
3Mh	47.8	16.9	10.16	2170	2.0	306	2.74	45	85	106	12	55	101.5
1Hh	47.3	14.5	11.75	2163	1.8	307	2.73	46	85	107	12	53	101.5
4Ml	46.1	13.7	12.16	2175	1.7	315	2.66	46	85	108	13	51	101.5
2Hl	45.2	11.5	14.21	2178	1.6	323	2.59	47	85	107	12	51	101.5
4Mh	44.2	10.7	14.85	2166	1.4	325	2.58	47	85	107	12	52	101.5

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

Date and Location of tests: 17 May 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
495 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
3.3.2 FUEL CONSUMPTION 3.3.2.1 In selected gear, at maximum power at rated speed													
2Mh	48.3	24.7	7.04	2170	3.0	302	2.7	44	85	107	11	56	101.5
3.3.2.1.1 75% of pull at maximum power at rated speed													
2Mh	38.0	18.5	7.39	2257	2.2	328	2.55	45	84	107	12	56	101.5
3.3.2.1.2 50% of pull at maximum power at rated speed													
2Mh	25.6	12.3	7.51	2277	1.5	385	2.18	43	84	106	12	57	101.5
3.3.2.1.3 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.3.2.1.1													
3Ml	37.9	18.5	7.39	1935	2.2	300	2.79	47	84	103	14	45	101.5
3.3.2.1.4 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.3.2.1.2													
3Ml	25.6	12.3	7.49	1948	1.5	339	2.47	45	84	102	14	48	101.5
3.3.2.2 In selected gear nearest to 7.5 km/h, at maximum power at rated speed													
2Mh	48.3	24.7	7.04	2170	3.0	302	2.7	44	85	107	11	56	101.5
3.3.2.2.1 75% of pull at maximum power at rated speed													
2Mh	38.0	18.5	7.39	2257	2.2	328	2.55	45	84	107	12	56	101.5
3.3.2.2.2 50% of pull at maximum power at rated speed													
2Mh	25.6	12.3	7.51	2277	1.5	385	2.18	43	84	106	12	57	101.5
3.3.2.2.3 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.3.2.2.1													
3Ml	37.9	18.5	7.39	1935	2.2	300	2.79	47	84	103	14	45	101.5
3.3.2.2.4 Next higher gear at reduced engine speed; same pull and travelling speed as in 3.3.2.2.2													
3Ml	25.6	12.3	7.49	1948	1.5	339	2.47	45	84	102	14	48	101.5

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

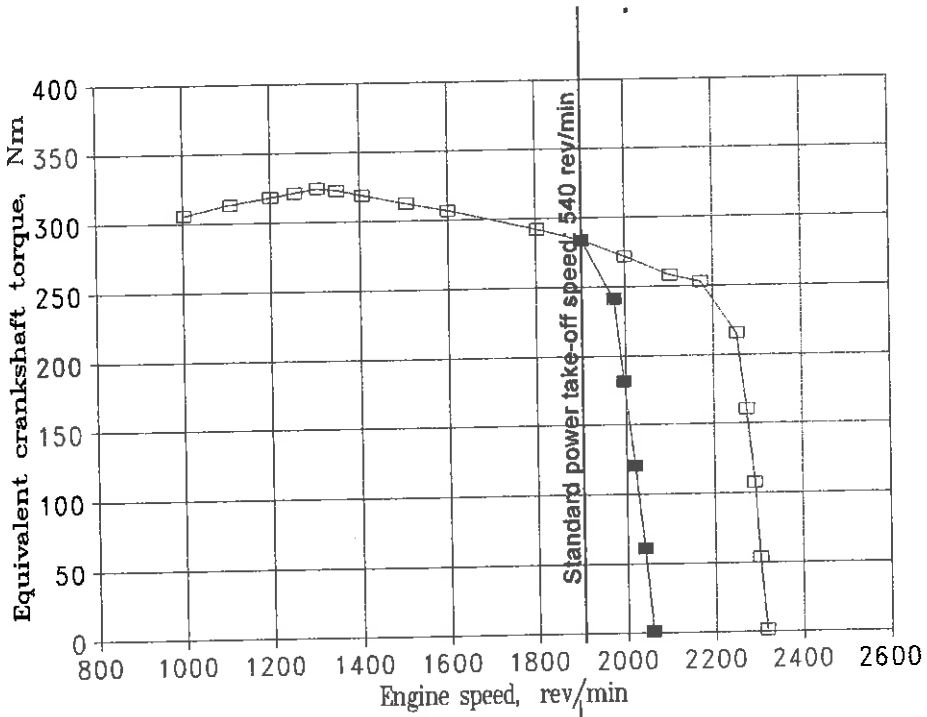
A G Douglass
Interim Manager - Test Engineering Group

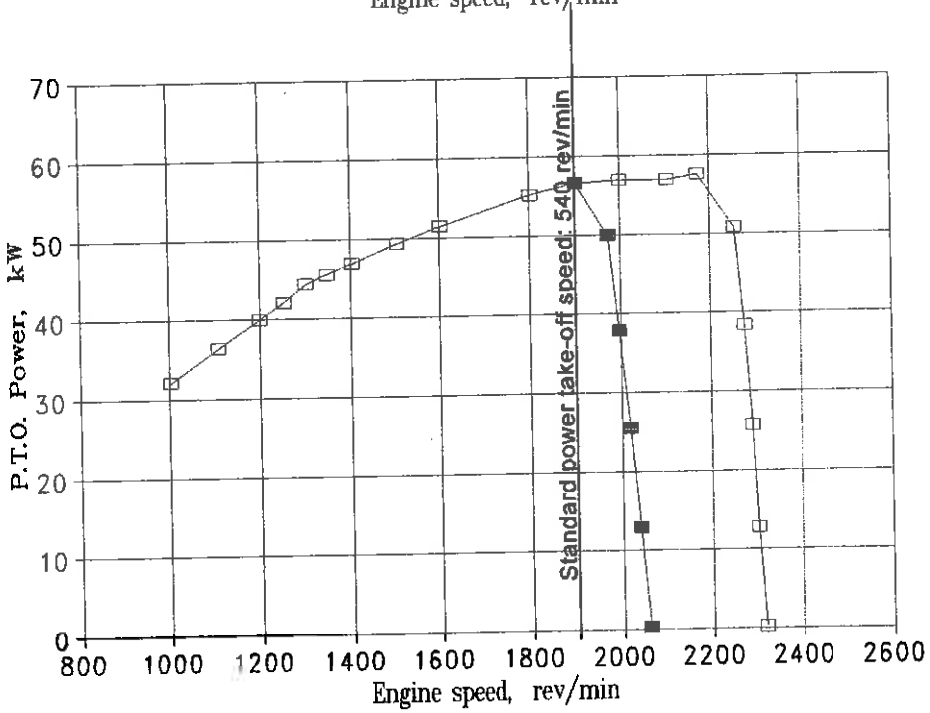
Date: 20/5/99

7. ANNEX 1 MAIN POWER TAKE-OFF CURVES

P.T.O. POWER TEST - NEW HOLLAND TS90 FOUR-WHEEL DRIVE (540 rev/min)

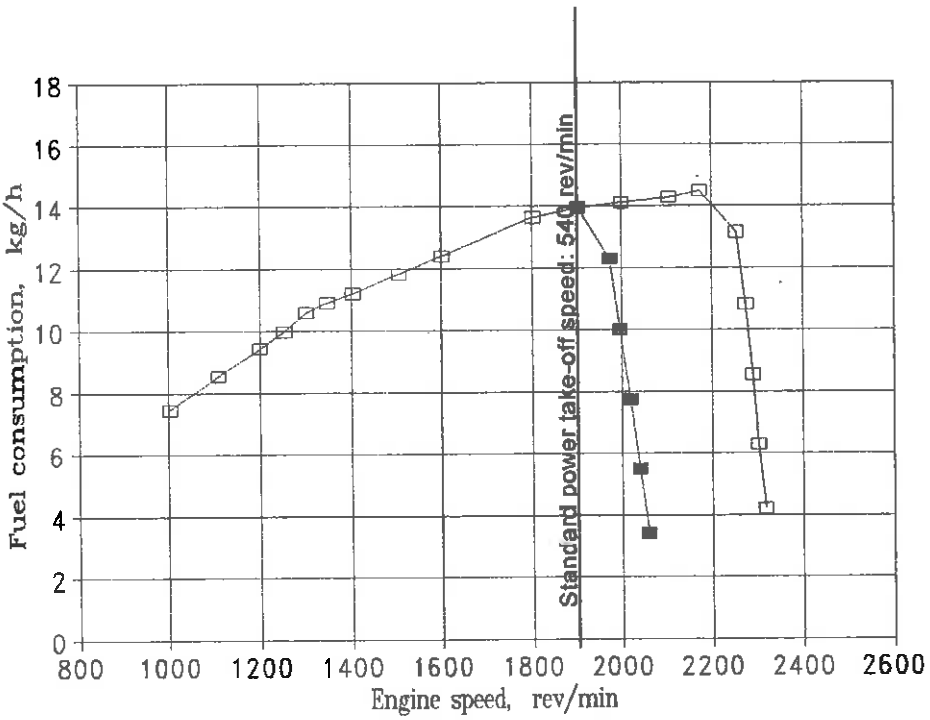
Governor set for maximum power at rated speed □
Governor set for maximum power at pto speed ■

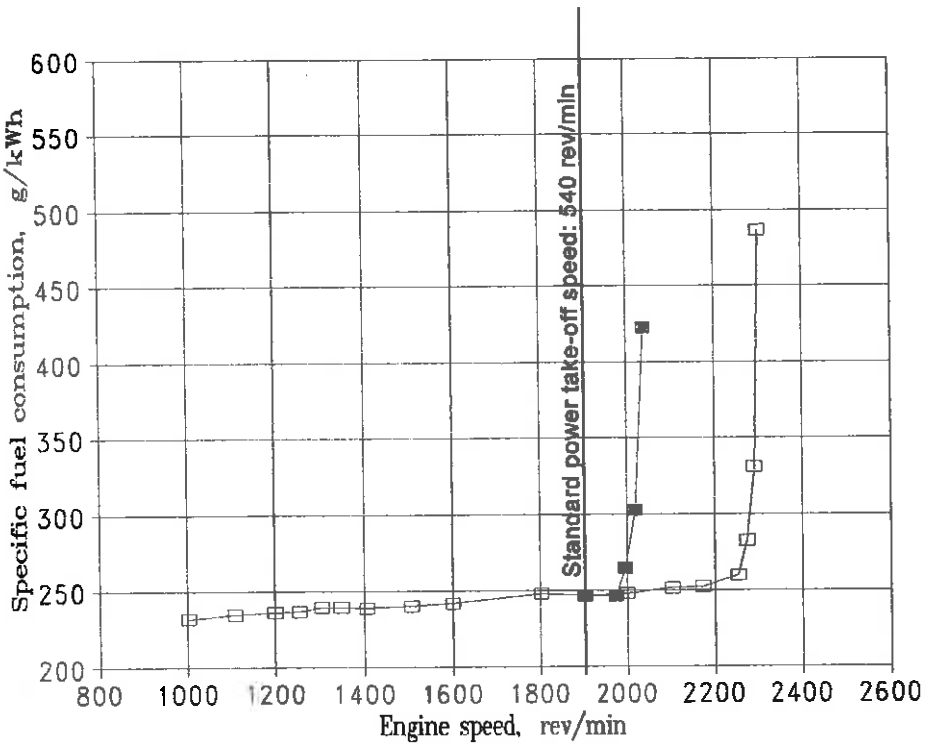




P.T.O. POWER TEST - NEW HOLLAND TS90 FOUR-WHEEL DRIVE (540 rev/min)

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





P.T.O. POWER TEST - NEW HOLLAND TS90 FOUR-WHEEL DRIVE (540 rev/min)

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

