COTTEC

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TEST AND
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OECD TEST REPORT OF SN—254 (4WD) AGRICULTURAL TRACTOR (CODE I)

Report on test in accordance with the OECD standard code for the official testing of agricultural tractor performance (C(87)53(Final), Code I)



OECD Approval
No. 1316 Full Code
Date Jun. 6, 1991

Tested Tractor
Make: Hubei Tractor Works
Model: Shen Niu 254
Type: 4 Wheel Drive

Submitted for test by
Name: Hubei Tractor Works
Address: Huangshi, Hubei, P. R. China
Tel: (0714)2691 Cable: 6593

This report includes 25 pages and may only be duplicated as a whole

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This report has been approved by the OECD co-ordinating centre (CEMAGREF) in Antony (France) on Jun. 6, 1991 Approved No. 1316 Full Code.

SN—254 COTTEC Test No. 911519 OECD No. 1316

Tractor manufacturer's name and address:	Hubei Tractor Works Huangshi, Hubei, China
Location of tractor assembly:	The manufacturer
Submitted for test by:	The manufacturer
Selected for test by:	The manufacturer with the agreement of the COTTEC
Place of running-in:	HBTW, Huangshi, Hubei, China
Duration of running-in:	48 hours
Location of test:	COTTEC, Luoyang, Henan, China

SPECIFICATIONS OF TRACTOR

TRACTOR

—Make:	Hubei Tractor Works
—Model:	Shen Niu—254
—Type:	4 Wheel Drive
—Number of driving wheels:	4
—Serial No.:	1566
—1st Serial No.:	73584

ENGINE

—Make:	Hubei Engine Works
—Model:	295T
—Type:	4 stroke, indirect injection diesel, water cooling
—Serial No.:	101903

Cylinders

—Number:	2	
—Disposition:	Vertical, in line	
—Bore/Stroke:	95/115	mm
—Capacity:	1630	cm^3
—Compression ratio:	(18～20)/1	
—Arrangement of valves:	Over head, in line	
—Cylinder liners:	Wet	

Fuel system

—Fuel feed system:	Plunger transfer pump

—Fuel filter:		
. Make:	Hubei Filter Works	
. Model /type:	C0506A, paper catridge, replaceable	
—Capacity of fuel tank:	36	dm^3
—Injection pump		
. Make:	Hubei Pump and Injector Works	
. Model/type:	18—1000C, 2—cylinder Plunger	
. Serial No. :	2691	
—Manufacturer' s production setting of injection pump:		
. Flow rate (at rated engine speed and full load):	5. 6	dm^3/h
. Timing:	15—19° before T. D. C.	
—Injectors:		
. Make:	Hubei Pump and Injector Works	
. Model/Type:	ZS 481 A Single-hole nozzle	
. Injection pressure:	11. 77±0. 98	MPa

Governor

—Make:	Hubei Pump and Injector Works	
—Model/type:	Mechanical, centrifugal	
—Governed range of engine speed:	600～2200	rev/min
—Rated engine speed:	2000	rev/min

Air cleaner

. Make:	Hubei Air – cleaner Works	
. Model/Type:	K1112B, oil bath with mesh screen	
. Location of air intake:	Front of the radiator	
—Maintenance indicator:	None	

Lubrication system

—Type of feed pump:	Rotor	
—Type &. Number of filter(s):	J0708C, paper, replaceable, 1	

Cooling system

—Type of coolant:	Water	
—Type of pump:	Centrifugal, belt driven	
—Description of fan:	Axial flow type, belt driven	
—Number of fan blades:	4	
—Fan diameter:	310	mm

—Coolant capacity:	7	dm^3
—Type of temperature control:	Thermostat	
—Superpressure system:	None	

Starting system

—Make:	Liaocheng Electrical Machinery Factory	
—Model/Type:	QD12 or QD121, solenoid engaged	
—Starter motor power rating:	1.5	kW
—Cold starting aid:	Preheater	
—Safety device:	Main shift lever in neutral position	

Electrical system

—Voltage:	12 (Negative earth)	V
—Generator:		
. Make:	Liaocheng Electrical Machinery Factory	
. Model/Type:	JF01C, Alternator, belt driven	
. Power:	0.18	kW
—Battery (number of accumulators):		
. Model/Type:	3—Q—105 or 3—Q(A)—105, Lead acid	
. Number:	2	
. Rating:	105	Ah at 20 hours

Exhaust system

—Make:	Hubei Engine Works	
—Model/Type:	SN—25	
—Location:	Right-hand side of engine, vertical	

TRANSMISSION TO WHEELS

Clutch

—Make:	Own make	
—Model/Type:	SN—25, dry, single plate, constant engaging	
—Number of plate(s):	1	
—Diameter of plate(s):	228.6	mm
—Method of operation:	By pedal	

Gear box

—Make:	Own make	
—Model/Type:	SN—254, Spur gear	

—Arrangment: Gear box with 4 forwards and 1 reverse speed, GROUP GEAR with 2 ranges(low and high)

—Number of gears: 8 forwards and 2 reverses

—Available options: None

Rear axle and final drives

—Make: Own make

—Model/Type: Crown wheel and pinion bevel gear differential, spur gear final drives

—Differential lock: None

Front axle and final drives

—Make: Own make

—Model/Type: Bevel gear differential and bevel gear final drives without differential lock

Total ratios and travelling speeds

Gear No.	Group or range	Number of engine revolutions for one revolution of the driving wheels	Nominal travelling speed * at rated engine speed of 2000 rev/min km/h
1	L	227.42	1.64
2	L	180.13	2.07
3	L	110.66	3.37
4	L	69.78	5.35
5	H	58.04	6.43
6	H	45.97	8.12
7	H	28.23	13.22
8	H	17.80	20.96
R_1	L	243.73	1.53
R_2	H	62.21	6.00

* Calculated with a tyre dynamic radius index of 495 mm (ISO 4251/1—1984)
Number of revolutions of front wheels for one revolution of rear wheels: 1.437

POWER TAKE-OFF

Main power take-off

—Type:	Not independent	
—Method of engagement:	By hand level, driven by the main clutch	
—Number of shafts:	1	
—Method of changing power take—off shaft ends and speeds:	Changing speeds by level	

Power take—off proportional to engine speed

540 rev/min

—Location:	At rear of the tractor	
—Diameter of power take-off shaft end:	35	mm
—Number of splines:	6, in conformity with ISO 500/1979	
—Height above ground:	557	mm
—Distance from the median plane of the tractor:	0	mm
—Distance behind rear wheel axis:	194	mm
—PTO speed at rated engine speed:	596	rev/min
—Engine speed at standard power take-off speed:	1812	rev/min
—Ratio of rotation speeds (engine speed/p. t. o. speed):	3. 357	
—Power restriction and maximum torque: (Manufacturers recomendation)	17 kW 270 N • m	
—Direction of rotation (viewed from behind tractor):	Clockwise	

1000 rev/min

—Location:	At rear of tractor	
—Diameter of power take-off shaft end:	35	mm
—Number of splines:	6, not in conformity with ISO 500/1979	
—Height above ground:	557	mm
—Distance from the median plane of the tractor:	0	mm
—Distance behind rear wheel axis:	194	mm
—PTO speed at rated engine speed:	1128	rev/min

—Engine speed at standard power take-off speed:	1773	rev/min
—Ratio of rotation speeds (engine speed/p. t. o. speed):	1.773	
—Direction of rotation (viewed from behind tractor):	Clockwise	
Power take-off proportional to ground speed:	None	

POWER LIFT

—Make:	Wuhan Hydraulic Machinery Works	
—Type of hydraulic system:	Partial separated units, open centre system	
—Type and number of cylinders:	Single acting, 1	
—Type of linkage lock for transport:	Mechanical lock	
—Relief valve pressure setting:	15.7	MPa
—Life pump type:	CBN—E 306, gear pump	
—Transmission between pump and engine:	Gear driven from gear box	
—Type and number of filter(s):	1	
—Site of oil reservior:	In the hydraulic power lift housing	
—Tapping point(s)		
• Type:	Thread	
• Number:	1	
• Location:	Left side of hydraulic power lift housing	
—Maximum volume of oil available to external cylinders:	5.5	dm^3

Three point linkage

—Category: I to ISO 730/1—1979

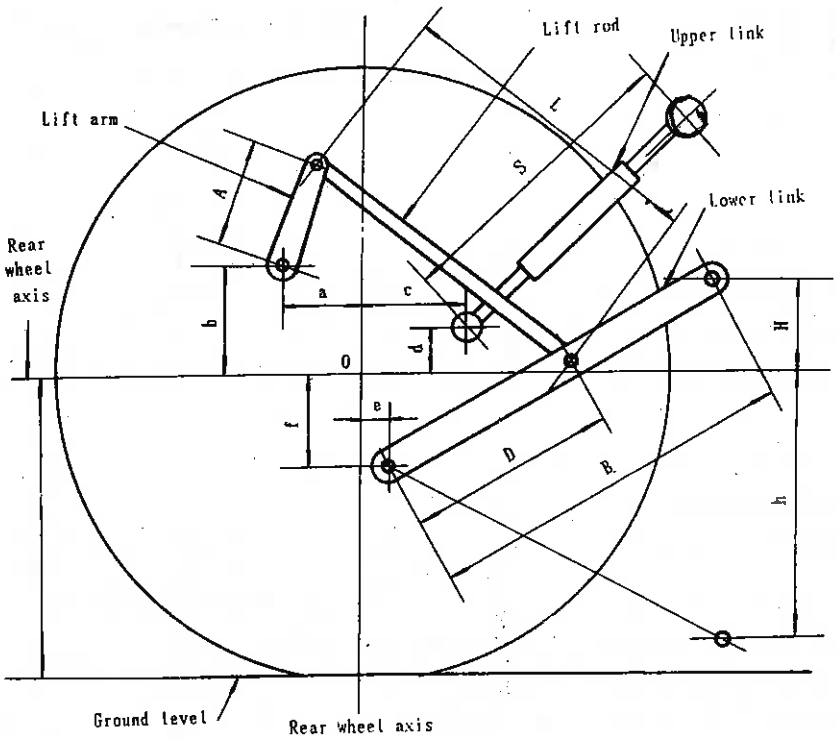
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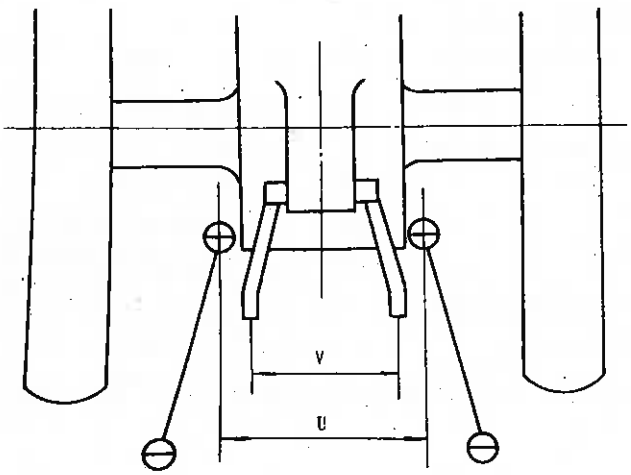
—Linkage geometry: See next page and following table

		Dimension or range * mm	Setting used in test mm
Length of lift arms	(A)	200	
Length of lower links	(B)	750	750
Distance of lift arm pivot point from rear wheel axis; Horizontally	(a)	16	
Vertically	(b)	352.5	
Horizontal distance between the 2 lower link points;	(u)	402	
Horizontal distance between the 2 lift arm end points	(v)	430	
Length of upper link	(S)	from 470 to 620	535
Distance of upper link pivot point from rear wheel axis; Horizontally	(c)	230	
Vertically	(d)	343.5	
Distance of lower link pivot point from rear wheel axis; Horizontally	(e)	12	
Vertically	(f)	43	
Distance of lower link pivot points to lift rod pivot points on lower links	(D)	350	
Length of lift rods	(L)	from 365 to 485	485
Height of lower hitch points relative to the rear wheel axis;			
in low position	(h)	from 5 to 313	313
in high position	(H)	from 487 to 277	277
Height above ground of lower hitch points when locked in transport position		842	

* Assuming (r) with a tyre dynamic radius index of 495 mm (ISO 4251/1—1984)

Linkage geometry





TRAILER HITCH

—Type:	Fixed	
—Hole diameter:	31	mm
—Height above ground:	422	mm
—Distance of hitch point from rear wheel axis, horizontally:	474	mm
—Distance of hitch point from power take-off shaft end:		
. Vertically:	135	mm
. Horizontally:	280	mm
—Maximum vertical permissible load:	10.0	kN

STEERING

—Make:	Huangshi Steering Works
—Model/Type:	Spherical worm and roller
—Method of operation:	Manual operated

BRAKES

—Make:	Own make
—Model/Type	Shoe type
—Method of operation:	Operated by pedals, coupled or independent
—Trailer braking take-off:	Air brake, operated by tractor pedals

Parking brake

—Type:	Mechanical
—Method of operation:	Pedals locked by ratchet

WHEELS

—Number		
. Front:	2, steering and driving	
. Rear:	2, driving	
—Wheelbase:	1610	mm

—Track width adjustment:

	Minimum mm	Maximum mm	Adjustment method
Front	1160	1160	None
Rear	1100	1400	Reversing wheels and off-set lug rims

DRIVER'S SEAT

—Make: Own make

—Model/Type: SN—25

—Type of suspension: Spring

—Type of damping None

—Range of adjustment:

. Longitudinal: 65 mm

. Vertical: 0 mm

MISCELLANEOUS

—Additional seat: On the left and right fender

—Number of places: 2

LIGHTING

	Height above ground of center mm	Size mm	Distance from outside edge of lights to median plane of tractor mm
Headlight	1035	140×85	125
Sidelight	1060	135×50	460
Rearlight	1260	D135	460
Brakelight	1035	D75	460

TEST CONDITIONS

OVERALL DIMENSIONS

	Length mm	Width		Height at top of	
		Minimum mm	Maximum mm	protective structure mm	exhaust silencer mm
Ballasted	2912	1470	1650	—	2170
Unballasted	2912	1350	1650	—	2175

GROUND CLEARANCE (unballasted tractor): 280 mm

—Clearance limiting part: Under the front axle

TRACTOR MASS

Without protective structure:

	Ballasted		Unballasted	
	Without driver kg	With driver kg	Without driver kg	With driver kg
Front	646	654	650	654
Rear	926	993	738	809
Total	1572	1647	1388	1463

BALLAST

	Weights		Water kg
	Number	Total mass kg	
Front	0	0	0
Rear	6	184	0
Optional	—	—	—

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TYRE SPECIFICATIONS

	Front	Rear
Tyres:		
Dimensions	6.00—16	9.5—24
Ply rating	6	6
Type	Cross ply	Cross ply
Maximum load (tyre manufacturer's)	4.51 kN	6.08 kN
Inflation pressure (tyre manufacturer's)	230—250 kPa	100—120 kPa
Dynamic radius index	350 mm	495 mm
Chosen track width:	1160 mm	1100 mm

OILS AND LUBRICATION

Capacity and change interval:

	Capacity dm^3	Oil change h	Filter change h
Engine	7	200	250
Gear box	9.8	1000	—
Rear axle	Common with gear box		—
Final drive (rear)	1.7×2	1000	—
Hydraulic system	7	1000	—
Steering	0.5	—	—
Final drive(front)	6	1000	—

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Specifications:

	Recommended	Used during test
Engine oil		
Type:	SAE 10W/30	CA30
Viscosity:	11.4 cSt at 100℃	10 cSt at 100℃
Classification:	API CC	GB 5323—85
Transmission oil		
Type:	SAE 80	HQB—10
Viscosity:	9.3 cSt at 100℃	11 cSt at 100℃
Classification:	API GL—4	GB 485—84
Hydraulic fluid		
Type:	Same as trans. oil	Same as trans. oil
Viscosity:		
Classification:		
Steering oil		
Type:	Complex calcium base grease	Complex calcium base grease
Viscosity:		
Classification:		

Grease

—Type: ZFG—12 complex calcium base grease
ZBE 36003—88(China standard)

—Number of lubrication points: 16

Fuel

—Type: Standard diesel fuel in conformity with GB 10327-89

—Density at 15°C: 0.848 g/cm³

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TEST RESULTS

COMPULSORY TESTS RESULTS

1. MAIN POWER TAKE-OFF

—Date and location of tests: 12th March, 1991, COTTEC

—Type of dynamometer: LPA—Bedienpult 250 elec. dynamometer

Power kW	Speed		Fuel consumption			Specific energy kW • h/l
	Engine rev/min	P. T. O. rev/min	Hourly kg/h	Hourly 1/h	Specific g/kW • h	
1. 1 MAXIMUM POWER—TWO HOURS TEST						
17. 15	2000	596	4. 67	5. 51	272	3. 12
1. 2 POWER AT RATED ENGINE SPEED						
17. 15	2000	596	4. 67	5. 51	272	3. 12
1. 3 STANDARD POWER TAKE-OFF SPEED (540±10 rev/min)						
15. 83	1812	540	4. 33	5. 11	273	3. 11
1. 4 PART LOADS						
1. 4. 1 The torque corresponding to max. power at rated engine speed						
17. 15	2000	596	4. 67	5. 51	272	3. 12
1. 4. 2 85% of the torque obtained in 1. 4. 1						
15. 31	2097	625	4. 29	5. 06	280	3. 03
1. 4. 3 75% of the torque defined in 1. 4. 2						
11. 58	2121	632	3. 40	4. 01	294	2. 89
1. 4. 4 50% of the torque defined in 1. 4. 2						
7. 82	2141	638	2. 66	3. 14	340	2. 49
1. 4. 5 25% of the torque defined in 1. 4. 2						
3. 97	2158	643	2. 01	2. 37	506	1. 68
1. 4. 6 Unloaded						
0	2181	650	1. 32	1. 56	—	—

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Power kW	Speed		Fuel consumption			Specific energy kW • h/l
	Engine rev/min	P. T. O. rev/min	Hourly kg/h	Hourly l/h	Specific g/kW • h	
1. 5 PART LOADS AT STANDARD POWER TAKE-OFF SPEED						
1. 5. 1 The torque corresponding to maximum power						
15. 83	1812	540	4. 33	5. 11	273	3. 10
1. 5. 2 85% of the torque obtained in 1. 5. 1						
14. 10	1906	568	3. 90	4. 60	277	3. 06
1. 5. 3 75% of the torque defined in 1. 5. 2						
10. 74	1932	576	3. 07	3. 62	286	2. 97
1. 5. 4 50% of the torque defined in 1. 5. 2						
7. 15	1943	579	2. 33	2. 75	326	2. 60
1. 5. 5 25% of the torque defined in 1. 5. 2						
3. 62	1966	586	1. 73	2. 04	478	1. 77
1. 5. 6 Unloaded						
0	1997	595	1. 15	0. 61	—	—

—No load maximum engine speed:	2181	rev/min
—Equivalent crankshaft torque at maximum power at raded engine speed	81. 9	N • m
—Maximum Equivalent crankshaft torque: (Engine speed: 1444 rev/min)	91. 7	N • m
—Mean atmospheric conditions		
. Temperature:	19	℃
. Pressure:	101. 0	kPa
. Relative humidity:	68	%
—Maximum temperatures		
. Coolant:	84	℃
. Fuel:	33	℃
. Engine air intake:	35	℃
. Engine oil:	77	℃

2. HYDRAULIC POWER AND LIFTING FORCE

—Date of test: 18th March, 1991

2.1 HYDRAULIC POWER TEST

—Sustained pressure with relief valve open: 16.0 MPa

—Pump delivery rate at minimum pressure: 13.51 l/min

	Flow rate l/min	Pressure MPa	Power kW
Flow rate corresponding to a hydraulic pressure equivalent to 90 per cent of the actual relief valve pressure setting and corresponding hydraulic power	12.40	14.6	3.02
Flow rate and hydyaulic pressure corresponding to max. hydraulic power	12.74	14.3	3.04

—Tapping point used for test: Left side of hydraulic power lift housing

—Temperature of hydraulic fluid: 65 ℃

—Opening pressure of the unloading valve: None

—Closing pressure of the unloading valve: None

2.2 POWER LIFT TEST

		At the hitch point	On the frame
Height of lower hitch points above ground in down position	mm	182	142
Vertical movement	mm	590	810
Maximum corrected force exerted through full range	kN	8.76	4.19
Corresponding pressure of hydraulic fluid	MPa	14.4	14.4
Moment about rear wheel axle	kN • m	6.68	5.75
Maximum tilt angle of mast from vertical	degrees	—	12.9

—Linkage setting for test; see above table and figures on page 9.

Lifting heights relative to the horizontal plane including the lower link pivot points										
mm	—310	—270	—170	—100	0	100	200	300	400	500
Lifting forces (the values measured are corrected to correspond to a hydraulic pressure equivalent to 90% of the actual relief valve pressure setting or to maximum power delivered by the hydraulic system, which is lower)										
At the hitch point kN		8.76	9.05	9.24	9.29	9.17	8.95	9.27		
Corresponding pressure: 14.4 MPa										
At the frame kN	7.15	7.15	6.93	6.71	6.28	5.75	5.27	4.77	4.32	4.19
Corresponding pressure: 14.4 MPa										

3. DRAWBAR PERFORMANCE

—Date of tests: 27th～28th March, 1991

—Type of track: Concrete

Height of drawbar above ground:
Unballasted: 395 mm
Ballasted: 370 mm

Tyre inflation pressure:
Front: 200 kPa
Rear: 100 kPa

Gear and range	Power	Drawbar pull	Speed	Engine speed	Slip of wheels	Specific fuel consumption	Specific energy	Temperature			Atmospheric conditions		
								Fuel	Coolant	Engine oil	Temperature	Relative humidity	Pressure
	kW	kN	km/h	rev/min	%	g/kW • h	kW • h/l	℃	℃	℃	℃	%	kPa
3.1 MAXIMUM POWER IN TESTED GEARS (unballasted tractor, 4WD)													
3(L3)	8.61	9.66	3.21	2112	14.8	430	1.97	24	76	80	7	66	101.1
4(L4)	13.19	9.67	4.91	2015	14.6	352	2.41	29	80	84	11	57	101.1
5(H1)	14.59	8.74	6.01	1967	10.9	320	2.65	30	81	87	13	49	101.1
6(H2)	14.79	6.68	7.97	1934	8.4	311	2.73	30	82	88	14	47	101.1
3.2 MAXIMUM POWER IN TESTED GEARS (ballasted tractor, 4WD)													
1(L1)	5.09	11.67	1.57	2128	14.9	589	1.44	31	73	84	15	61	101.7
2(L2)	6.42	11.80	1.96	2120	14.9	522	1.62	32	75	86	14	60	101.7
3(L3)	10.46	11.81	3.19	2116	14.7	344	2.47	34	80	91	13	57	101.7
4(L4)	13.92	10.02	5.00	1986	9.9	388	2.51	36	84	92	13	57	101.7
5(H1)	14.90	8.81	6.09	1975	8.3	315	2.69	34	80	92	11	55	100.7
6(H2)	14.85	6.80	7.86	1963	6.4	317	2.68	34	80	92	10	51	101.7
3.3 TEN—HOUR TEST (ballasted tractor, 4WD)													
3.3.1 FIVE-HOUR TEST at 75% of pull at maximum power													
5(H1)	12.25	6.61	6.67	2109	6.0	310	2.74	35	80	85	14	60	101.5
3.3.2 FIVE-HOUR TEST at pull corresponding to 15% wheelslip without additional ballast 184kg.													
3(L3)	10.87	11.79	3.32	2123	—	—	—	33	75	82	12	57	101.5

Oil consumption during ten hours duration of tests 3.3.1 and 3.3.2 : 37 g/h

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4. TURNING AREA AND TURNING CIRCLE

Details of wheel equipment:

	Tyre size	Track mm
Front	6.00—16	1160
Rear	9.5—24	1100

	With brakes		Without brakes	
	Right hand m	Left hand m	Right hand m	Left hand m
Radius of turning area	2.94	2.94	3.35	3.34
Radius of turning circle	2.82	2.82	3.23	3.22

5. LOCATION OF CENTRE OF GRAVITY

—Height above ground:	607	mm
—Distance forward from the vertical plane containing the axle of the rear wheels:	720	mm
—Distance from the median plane of the tractor:	From left 5.8	mm

6. BRAKING

—Date of tests:	21th March, 1991	
—Type of track:	Concrete	
—Speed before application of brakes:	21.1	km/h

6.1 COLD SERVICE BRAKING DEVICE TEST

Ballasted tractor	Braking device control force N	99	152	220	296	357	464	551
	Mean deceleration m/s^2	0.75	1.67	2.71	3.19	3.33	3.33	3.33
Unballasted tractor	Braking device control force N	114	198	251	327	388	464	532
	Mean deceleration m/s^2	0.71	2.43	2.77	3.09	3.09	3.09	3.11

6.2 FADE TEST

Ballasted tractor	Braking device control force N	99	175	251	312	380	426	502
	Mean deceleration m/s^2	0.64	1.39	1.85	2.31	2.77	3.08	3.22

—Maximum deviation of tractor from its original course: 0 mm
—Abnormal vibration: None
—The brakes were heated by: Driving

6.3 PARKING BRAKING DEVICE TEST

	Up	Down
Braking device control force N	106	137

7. MEASUREMENT OF EXTERNAL NOISE LEVEL

—Date of tests: 20th March, 1991 COTTEC
—Sound level meter, Make/Model/Type: B&K 2209
—Type of track: Concrete
—Gear number: 8(H_4)
—Travelling speed before acceleration: 16.2 km/h
—Sound level: 80.5 dB(A)

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REPAIRS AND ADJUSTMENTS DURING TESTS:

None

REMARKS:

In COTTEC the safety limit speed of drawber testing equipment is 12 km/h, so we only do drawbar power test in the gears which the speed is below 12 km/h.

Director of the COTTEC
Senior engineer
罗光辉
Luo Guanghui

Responsible engineer for these tests:
Senior engineer
钱进
Qian Jin

Vice-director of the COTTEC
Senior engineer
孙殿俊
Sun Dianjun

Members of the tractor test board:
Qiu Zhenxiang, Zhang Hui,
Wang Danling, YuanWei
Xie Zhiqiao, Shi Guoquan

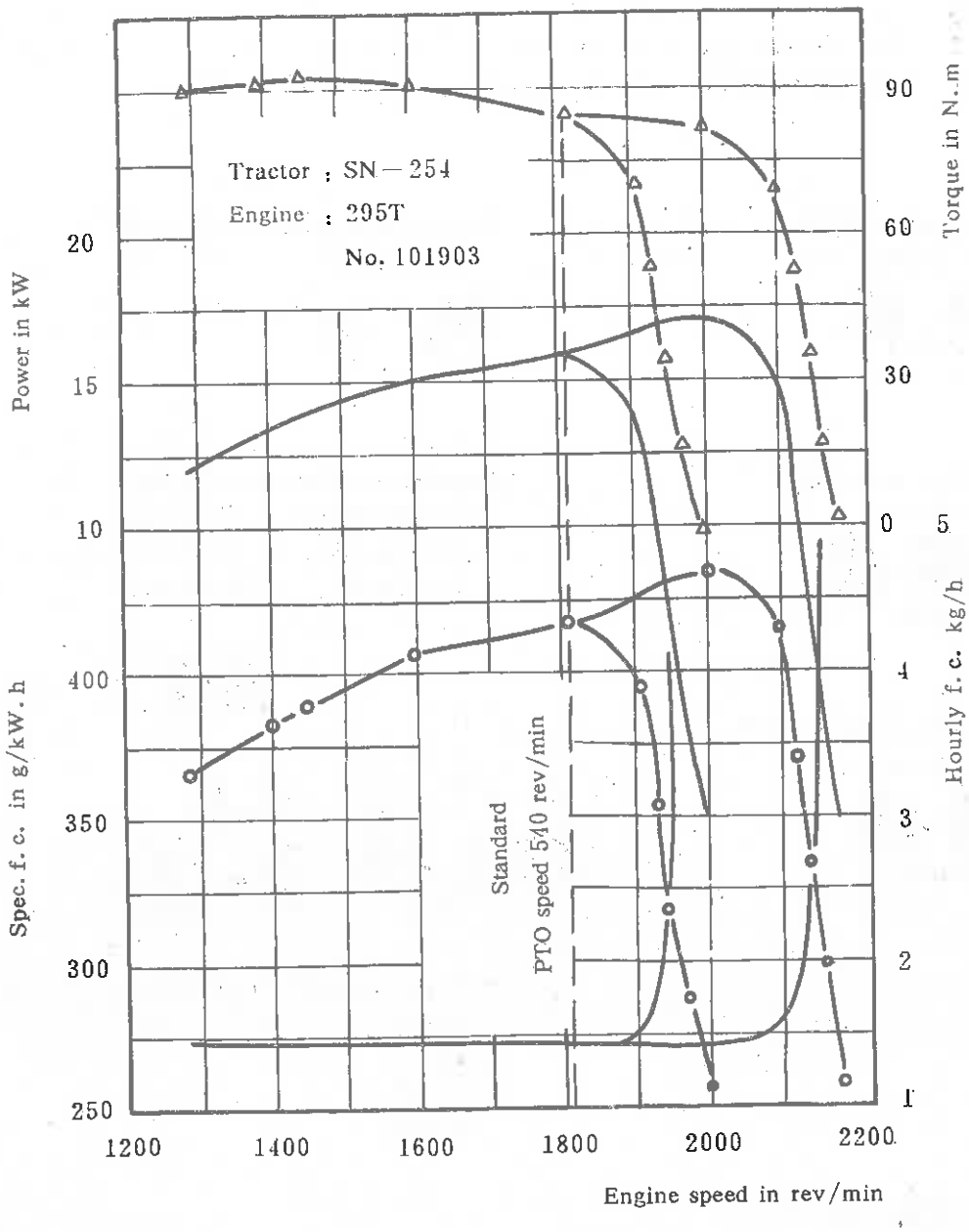
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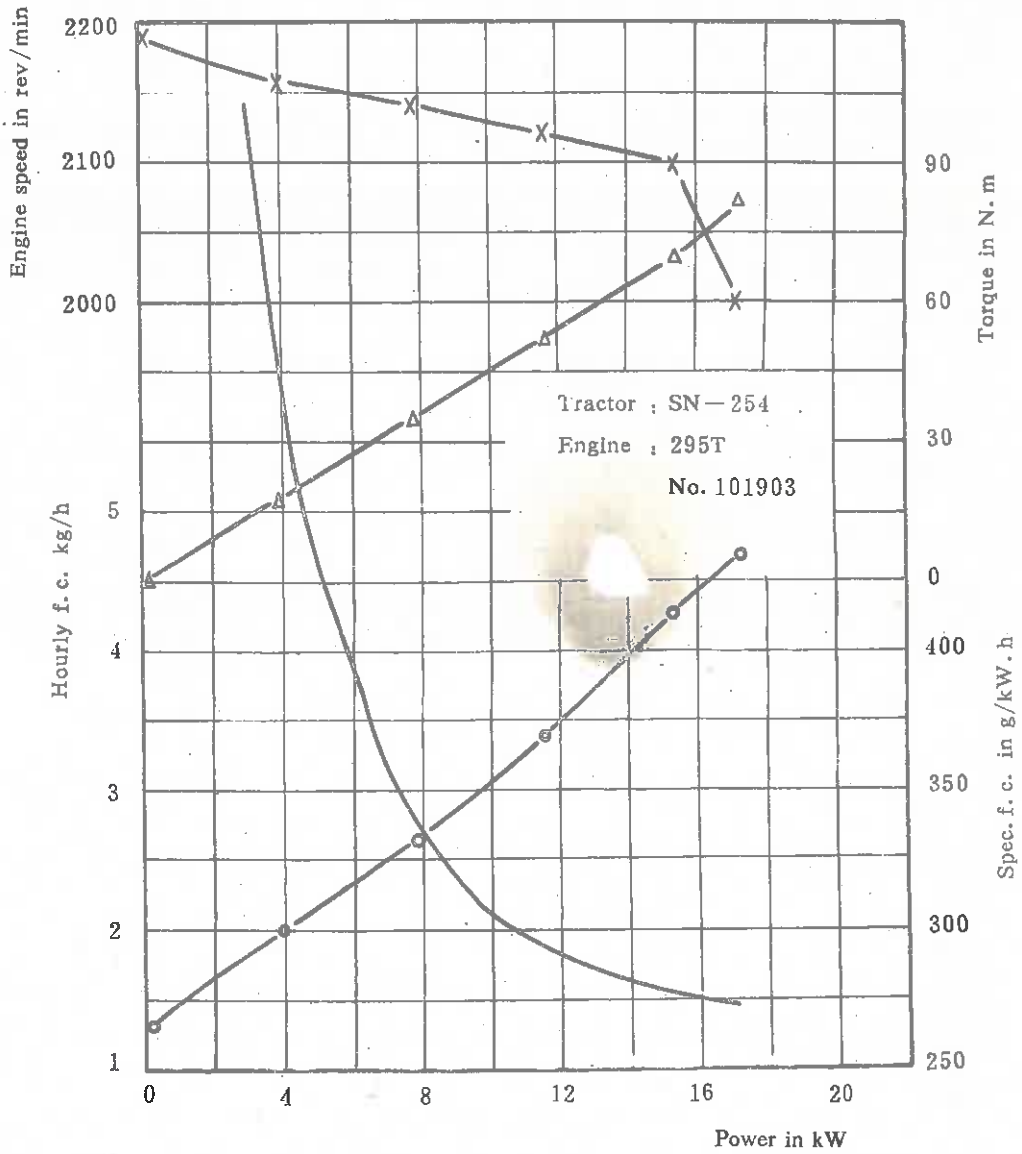
ANNEX I

MAIN POWER TAKE – OFF TEST CURVES



SN—254 COTTEC Test No. 911519 OECD No. 1316

MAIN POWER TAKE – OFF TEST CURVES





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