COTTEC

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OECD TEST REPORT OF BY—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. 1297 Full Code

Date Jan. 31, 1991

Tested Tractor
Make: Ningbo Tractor Works
Model: Ben Ye 254
Type: 4 Wheel Drive

Submitted for test by
Name: Ningbo Tractor Works
Address: Ningbo, Zhejiang, China
Tel: 356177 Cable: 2384

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

BY—254 COTTEC Test No. 891464 OECD No. 1297

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This report has been approved by the OECD Co-ordinating Centre (CEMA—GREF) in Antony (France) on Jan. 31, 1991 Approved No. 1297 Full Code.

BY—254 COTTEC Test No. 891464 OECD No. 1297

Tractor manufacturer' s name and address:	Ningbo Tractor Works Ningbo, Zhejiang, 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:	COTTEC, Luoyang, Henan, China
Duration of running-in:	48 hours
Location of test:	COTTEC, Luoyang, Henan, China

SPECIFICATIONS OF TRACTOR

TRACTOR

—Make:	Ningbo Tractor Works
—Model:	Ben Ye-254
—Type:	4 Wheel Drive
—Number of driving wheels:	4
—Serial No. :	0116
—1st Serial No. :	0116

ENGINE

—Make:	Ningbo Engine Works
—Model:	295
—Type:	4 stroke, indirect injection diesel, water cooling
—Serial No. :	15604

Cylinders

—Number:	2	
—Disposition:	Vertical, in line	
—Bore/Stroke:	95/115	mm
—Capacity:	1630	cm^3
—Compression ratio:	(19～20)/1	
—Arrangement of valves:	Over head, in line	
—Cylinder liners:	Wet	

Fuel system

—Fuel feed system:	Plunger transfer pump

—Fuel filter:		
. Make:	Zhejiang Linhai Filter Works	
. Model /type:	C0506A, paper catridge, replaceable	
—Capacity of fuel tank:	33	dm^3
—Injection pump:		
. Make:	Wuxi Pump and Injector Works	
. Model/type:	2 I 21—8 Left 1000, 2—cylinder plunger	
. Serial No. :	0241	
—Manufacturer' s production setting of injection pump:		
. Flow rate (at rated engine speed and full load):	6.6	dm^3/h
. Timing:	15—19° before T. D. C.	
—Injectors:		
. Make:	Wuxi Pump and Injector Works	
. Model/Type:	4S1, Single-hole nozzle	
. Injection pressure:	12.5±0.5	MPa

Governor

—Make:	Wuxi 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:	Yangzhou Air—cleaner Works	
. Model/Type:	K1317, paper cartridge, horizontal	
. Location of air intake:	Left side of engine	
—Maintenance indicator:	None	

Lubrication system

—Type of feed pump:	Rotor	
—Type & Number of filter(s):	J0810H, paper, filter cartridge, 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:	7.2	dm^3

—Type of temperature control:	Thermostat	
—Superpressure system	None	

Starting system

—Make:	Shanghai Automobile Electrical Machinery Factory	
—Model/Type:	QD12D, 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:	Shanghai 2nd Automobile Electrical Machinery Factory	
. Model/Type:	2JF200, Alternator, belt driven	
. Power:	0.20	kW
—Battery (number of accumulators):		
. Model/Type:	3—Q(A)—105, Lead acid	
. Number:	2	
. Rating:	105	Ah at 20 hours

Exhaust system

—Make:	Ningbo Engine Works	
—Model/Type:	BY-250	
—Location:	Right-hand side of engine, vertical	

TRANSMISSION TO WHEELS

Clutch

—Make:	Own make	
—Model/Type:	Dry, constant engaging	
—Number of plate(s):	1	
—Diameter of plate(s):	228	mm
—Method of operation:	by pedal	

Gear box

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

—Arrangement: 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 spur 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	241.27	1.55
2	L	190.87	1.96
3	L	117.24	3.18
4	L	74.07	5.04
5	H	56.77	6.57
6	H	44.92	8.31
7	H	27.61	13.52
8	H	17.31	21.56
R_1	L	258.58	1.44
R_2	H	60.70	6.15

* 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: 1.454

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, the 2nd speed is 720 rev/min.	

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:	492	mm
—Distance from the median plane of the tractor:	0	mm
—Distance behind rear wheel axis:	285	mm
—PTO speed at rated engine speed:	540	rev/min
—Engine speed at standard power take-off speed:	2000	rev/min
—Ratio of rotation speeds (engine speed/p. t. o. speed):	3.7037	
—Power restriction and maximum torque: (Manufacturers recomendation)	17 kW 270 N • m	
—Direction of rotation (viewed from behind tractor):	Clockwise	

POWER LIFT

—Make:	Own make	
—Type of hydraulic system:	Partial separated units, open centre system	
—Type and number of cylinders:	Single acting, 1	
—Type of linkage lock for transport:	Hydraulic lock	
—Relief valve pressure setting:	16.6	MPa
—Lift pump type:	306, gear pump	
—Transmission between pump and engine:	Gear driven from gear box	
—Type and number of filter(s):	1	
—Site of oil reservoir:	In the hydraulic power lift housing	
—Tapping point(s)		
• Type:	Thread	
• Number:	1	
• Location:	Right side of hydraulic power lift housing	
—Maximum volume of oil available to external cylinders:	5	dm^3

Three point linkage

—Category: I to ISO 730/1—1979

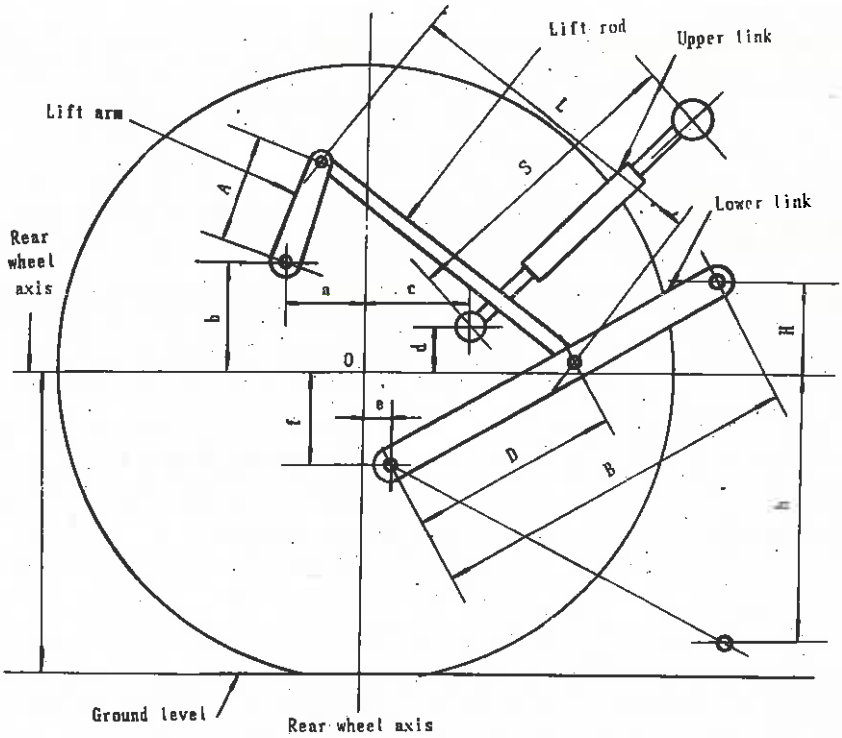
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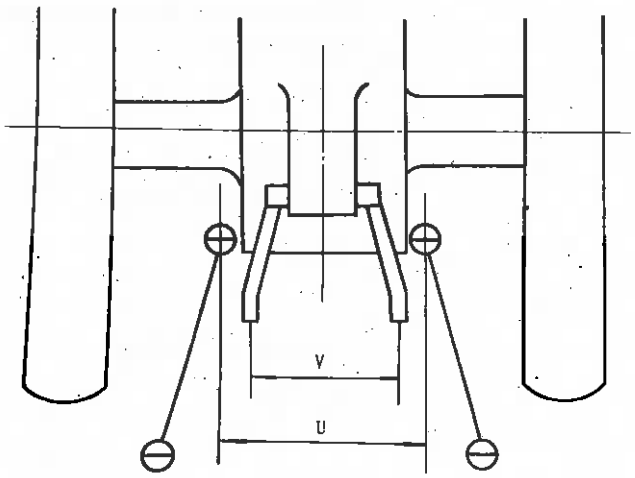
—Linkage geometry: See next page and following table

			Dimension or range * mm	Setting used in test mm
Length of lift arms		(A)	240	
Length of lower links		(B)	816	816
Distance of lift arm pivot point from rear wheel axis:	Horizontally	(a)	—68	
	Vertically	(b)	304.5	
Horizontal distance between the 2 lower link points:		(u)	478	
Horizontal distance between the 2 lift arm end points		(v)	460	
Length of upper link		(S)	from 450 to 550	520
Distance of upper link pivot point from rear wheel axis:	Horizontally	(c)	286	
	Vertically	(d)	342	
Distance of lower link pivot point from rear wheel axis:	Horizontally	(e)	—25	
	Vertically	(f)	97	
Distance of lower link pivot points to lift rod pivot points on lower links		(D)	445	
Length of lift rods		(L)	from 380 to 480	430
Height of lower hitch points relative to the rear wheel axis:				
in low position		(h)	from 218 to 309	305
in high position		(H)	from 353 to 198	278
Height above ground of lower hitch points when locked in transport position			Any height within lift range	

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

Linkage geometry:





TRAILER HITCH		
—Type:	Fixed	
—Hole diameter:	25	mm
—Height above ground:	335	mm
—Distance of hitch point from rear wheel axis, horizontally:	318	mm
—Distance of hitch point from power take-off shaft end:		
. Vertically:	122.5	mm
. Horizontally:	33	mm
—Maximum vertical permissible load:	10.0	kN
STEERING		
—Make:	Ningbo 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:	Hydraulic brake or air brake, operated by tractor pedals	
Parking brake		
—Type:	Mechanical	
—Methed of operation:	Pedals locked by ratchet	
WHEELS		
—Number		
. Front:	2, steering and driving	
. Rear:	2, driving	
—Wheelbase:	1607	mm

—Track width adjustment:

	Minimum mm	Maximum mm	Adjustment method
Front	1200	—	None
Rear	1100	1400	Reversing wheels and off-set lug rims

DRIVER'S SEAT

—Make: Own make

—Model/Type: BY-250

—Type of suspension: Spring

—Type of damping None

—Range of adjustment:

. Longitudinal: 50 mm

. Vertical: 0 mm

MISCELLANEOUS

—Additional seat: None

LIGHTING

	Height above ground of center mm	Size mm	Distance from outside edge of lights to median plane of tractor mm
Headlight	1100	140×90	120
Sidelight	940	130×50	268
Rearlight	1275	D135	460
Brakelight	1110	D75	460

TEST CONDITIONS

OVERALL DIMENSIONS

	Length	Width		Height at top of	
		Minimum	Maximum	protective structure	exhaust silencer
	mm	mm	mm	mm	mm
Ballasted	2750	1360	1420	—	1880
Unballasted	2750	1360	1420	—	1910

GROUND CLEARANCE(unballasted tractor): 270 **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	669.5	673.5	668	672
Rear	871.5	942.5	723	794
Total	1541	1616	1391	1466

BALLAST

	Weights		Water kg
	Number	Total mass kg	
Front	—	—	0
Rear	1	150	0
Optional	—	—	—

TYRE SPECIFICATIONS

	Front	Rear
Tyres:		
Dimensions	6.00—16	9.5—24
Ply rating	4	6
Type	Cross ply	Cross ply
Maximum load (tyre manufacturer's)	4.51 kN	6.08 kN
Inflation pressure (tyre manufacturer's)	260—280 kPa	80—120 kPa
Dynamic radius index	350 mm	495 mm
Chosen track width:	1200 mm	1100 mm

OILS AND LUBRICATION

Capacity and change interval:

	Capacity dm^3	Oil change h	Filter change h
Engine	6	250	250
Gear box	18.5	500	—
Rear axle	Common with gear box		—
Final drive (rear)	Common with gear box		—
Hydraulic system	8.8	500	—
Steering	0.9	—	—
Final drive (front)	6	500	—

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Specifications:

	Recommended	Used during test
Engine oil		
Type:	SAE 10W/30	HC—11
Viscosity:	11.4 cSt at 100℃	11 cSt at 100℃
Classification:	API CC	SY 1152—79
Transmission oil		
Type:	SAE 80	HQ—10
Viscosity:	9.3 cSt at 100℃	10 cSt at 100℃
Classification:	API GL—4	GB 485—81
Hydraulic fluid		
Type:		
Viscosity:	Same as trans. oil	Same as trans. oil
Classification:		
Steering oil		
Type:		
Viscosity:	Same as trans. oil	Same as trans. oil
Classification:		

Grease

—Type: Calcium base grease GB 491-65 (China standard)

—Number of lubrication points: 27

Fuel

—Type: No. 0 diesel fuel in conformity with GB 252-81

—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: Nov. 2, 1989, 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 l/h	Specific g/kW • h	
1.1 MAXIMUM POWER—TWO HOURS TEST						
16.38	1900	513	4.50	5.31	275	3.08
1.2 POWER AT RATED ENGINE SPEED						
15.94	2000	540	4.38	5.17	275	3.08
1.3 STANDARD POWER TAKE-OFF SPEED (540±10 rev/min)						
15.94	2000	540	4.38	5.17	275	3.08
1.4 PART LOADS						
1.4.1 The torque corresponding to max. power at rated engine speed						
15.94	2000	540	4.38	5.17	275	3.08
1.4.2 85% of the torque obtained in 1.4.1						
14.28	2104	568	4.01	4.73	281	3.02
1.4.3 75% of the torque defined in 1.4.2						
10.85	2131	575	3.26	3.84	300	2.82
1.4.4 50% of the torque defined in 1.4.2						
7.26	2141	578	2.60	3.07	358	2.37
1.4.5 25% of the torque defined in 1.4.2						
3.68	2170	586	2.05	2.42	557	1.52
1.4.6 Unloaded						
0.74	2183	589	1.59	1.88	—	—

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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. 94	2000	540	4. 38	5. 17	275	3. 08
1. 5. 2 85% of the torque obtained in 1. 5. 1						
14. 28	2104	568	4. 01	4. 73	281	3. 02
1. 5. 3 75% of the torque defined in 1. 5. 2						
10. 85	2131	575	3. 26	3. 84	300	2. 82
1. 5. 4 50% of the torque defined in 1. 5. 2						
7. 26	2141	578	2. 60	3. 07	358	2. 37
1. 5. 5 25% of the torque defined in 1. 5. 2						
3. 68	2170	586	2. 05	2. 42	557	1. 52
1. 5. 6 Unloaded						
0. 74	2183	589	1. 59	1. 88	—	—

—No load maximum engine speed:	2183	rev/min
—Equivalent crankshaft torque at maximum power at rated engine speed:	76. 11	N • m
—Maximum Equivalent crankshaft torque: (Engine speed: 1400 rev/min)	90. 01	N • m
—Mean atmospheric conditions		
. Temperature:	20	℃
. Pressure:	99. 3	kPa
. Relative humidity:	50	%
—Maximum temperatures		
. Coolant:	98	℃
. Fuel:	52	℃
. Engine air intake:	34	℃
. Engine oil:	108	℃

2. HYDRAULIC POWER AND LIFTING FORCE

—Date of test: Nov. 9, 1989

2.1 HYDRAULIC POWER TEST

—Sustained pressure with relief valve open: 16.6 MPa

—Pump delivery rate at minimum pressure: 12.00 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	14.9	3.08
Flow rate and hydyaulic pressure corresponding to max. hydraulic power	12.84	14.7	3.15

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

—Temperature of hydraulic fluid: 60 ℃

—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	200	147
Vertical movement	mm	563	797
Maximum corrected force exerted throught full range	kN	7.69	4.35
Corresponding pressure of hydraulic fluid	MPa	14.7	14.7
Moment about rear wheel axle	kN • m	6.08	6.09
Maximum tilt angle of mast from vertical	degrees	—	19.89

—Linkage setting for test: see above table and figures

Lifting heights relative to the horizontal plane inculding the lower link pivot points										
mm	—263	—200	—100	0	100	200	300	350	450	507
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		7.69	8.38	8.64	8.71	8.53	8.34	8.35		
Corresponding pressure: 14.7 MPa										
At the frame kN	7.66	7.76	7.43	6.96	6.40	5.83	5.26	5.00	4.55	4.35
Corresponding pressure: 14.7 MPa										

3. DRAWBAR PERFORMANCE

—Date of tests: Nov. 4～5, 1989

—Type of track: Concrete

Height of drawbar above ground:
Unballasted: 420 mm
Ballasted: 415 mm

Tyre inflation pressure:
Front: 264.8 kPa
Rear: 98.1 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, 2WD)													
3(L3)	6.60	7.89	3.01	2133	15.1	471	1.80	42	80	86	28	54	99.7
4(L4)	9.90	7.78	4.58	2092	15.0	412	2.06	43	84	89	28	54	99.7
5(H1)	12.16	7.42	5.90	1980	11.6	366	2.32	45	86	90	30	53	99.7
6(H2)	12.82	6.13	7.53	1944	8.8	351	2.42	46	87	91	30	52	99.7
3.2 MAXIMUM POWER IN TESTED GEARS (ballasted tractor, 4WD)													
1(L1)	5.50	13.37	1.48	2161	15.0	546	1.55	40	78	86	29	50	100.4
2(L2)	6.94	13.43	1.86	2151	15.1	478	1.77	43	81	87	29	50	100.4
3(L3)	10.81	12.93	3.01	2104	15.1	406	2.09	43	84	89	30	50	100.4
4(L4)	12.65	9.86	4.62	1930	8.4	356	2.38	45	88	90	31	50	100.4
5(H1)	12.83	7.98	5.79	1818	7.0	351	2.42	46	88	92	32	50	100.4
6(H2)	13.22	6.40	7.44	1815	6.0	340	2.49	47	88	92	32	50	100.4
3.3 TEN—HOUR TEST (ballasted tractor, 4WD)													
3.3.1 FIVE-HOUR TEST at 75% of pull at maximum power													
5(H1)	11.40	6.01	6.83	2108	3.0	404	2.10	43	84	90	30	50	100.4
3.3.2 FIVE-HOUR TEST at pull corresponding to 15% wheelslip without additional ballast.													
3(L3)	10.71	13.07	2.95	2085	—	—	—	46	87	91	32	50	100.4

Oil consumption during ten hours duration of tests 3.3.1 and 3.3.2 : 43.5 g/h

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4. TURNING AREA AND TURNING CIRCLE

Details of wheel equipment:

	Tyre size	Track mm
Front	6.00—16	1200
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	2.87	2.86	3.42	3.35
Radius of turning area	2.79	2.78	3.34	3.27

5. LOCATION OF CENTRE OF GRAVITY

—Height above ground:	608	mm
—Distance forward from the vertical plane containing the axle of the rear wheels:	737	mm
—Distance from the median plane of the tractor:	From right 4.7	mm

6. BRAKING

—Date of tests:	Nov 6, 1989	
—Type of track:	Concrete	
—Speed before application of brakes:	21.0	km/h

6.1 COLD SERVICE BRAKING DEVICE TEST

Ballasted tractor	Braking device control force N	266	304	319	380	440	490
	Mean deceleration m/s^2	3.18	3.25	3.27	3.33	3.42	3.43
Unballasted tractor	Braking device control force N	160	198	274	315	395	418
	Mean deceleration m/s^2	2.13	2.99	3.05	3.43	3.44	3.47

6.2 FADE TEST

Ballasted tractor	Braking device control force N	203	245	311	348	392	464
	Mean deceleration m/s^2	2.09	2.24	2.94	3.08	3.27	3.32

—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	249	274

7. MEASUREMENT OF EXTERNAL NOISE LEVEL

—Date of tests: Nov. 5,1989
—Sound level meter, Make/Model/Type: B&K 2209
—Type of track: Concrete
—Gear number: 8
—Travelling speed before acceleration: 16.1 km/h
—Sound level: 81.5 dB(A)

OPTIONAL TEST RESULTS

8. PERFORMANCE IN A HOT ATMOSPHERE

—Date of test: Nov. 10,1989
—Limiting temperatures specified by manufacturer:
• Collant: 98 ℃
• Engine oil: 110 ℃
—Special equipment fitted for the test: None
—Fuel:
• Type: NO. 0 (GB 252—81, China standard)
• Density at 15℃: 0.848 g/cm^3
• Octane or cetane number: >50

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—Engine oil:

- Type: HC—11 (SY 1152—79, China standard)
- Viscosity: 11 cSt at 100℃

—Results of test:

Ambient temperature ℃	Loss of power at the P. T. O. %	P. T. O. speed rev/min	Temperature		Atmospheric pressure kPa
			Coolant ℃	Engine oil ℃	
36	0	574	93	107	99.3
38	0.79	574	94	108	99.3
40	0.93	574	96	109	99.3
42	2.31	574	97	112	99.3
At the standard P. T. O speed					
37	0	540	93	105	99.3
39	0.40	540	98	108	99.3
41	0.60	540	98	110	99.3

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

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朱荫梧

Zhu Yinwu

Responsible engineer for these tests:
Senior engineer

钱进

Qian Jin

Members of the tractor test board:
Xie Zhiqiao, Wang Danling
Shi Guoquan, Chen Zhiqiang

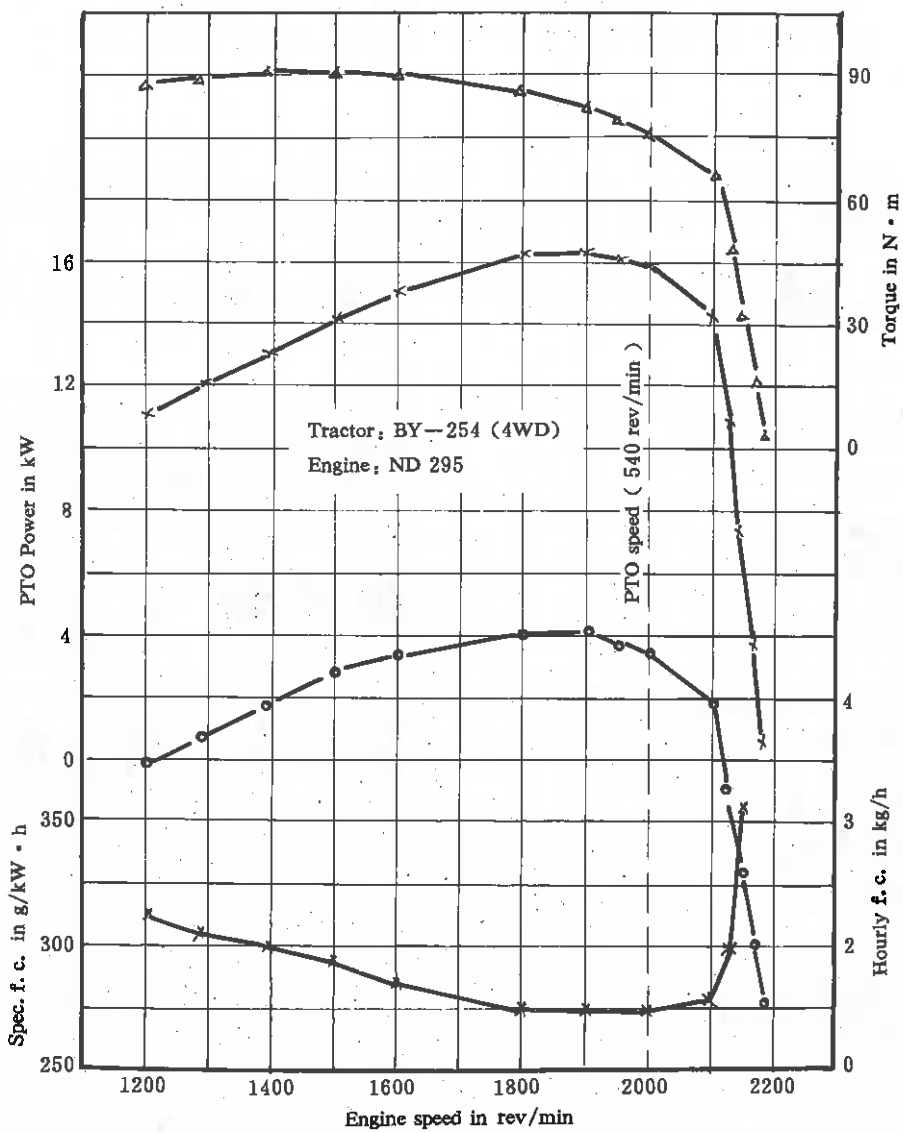
解志樵 王丹玲

石国权 陈志强

Date: 1989.12.28

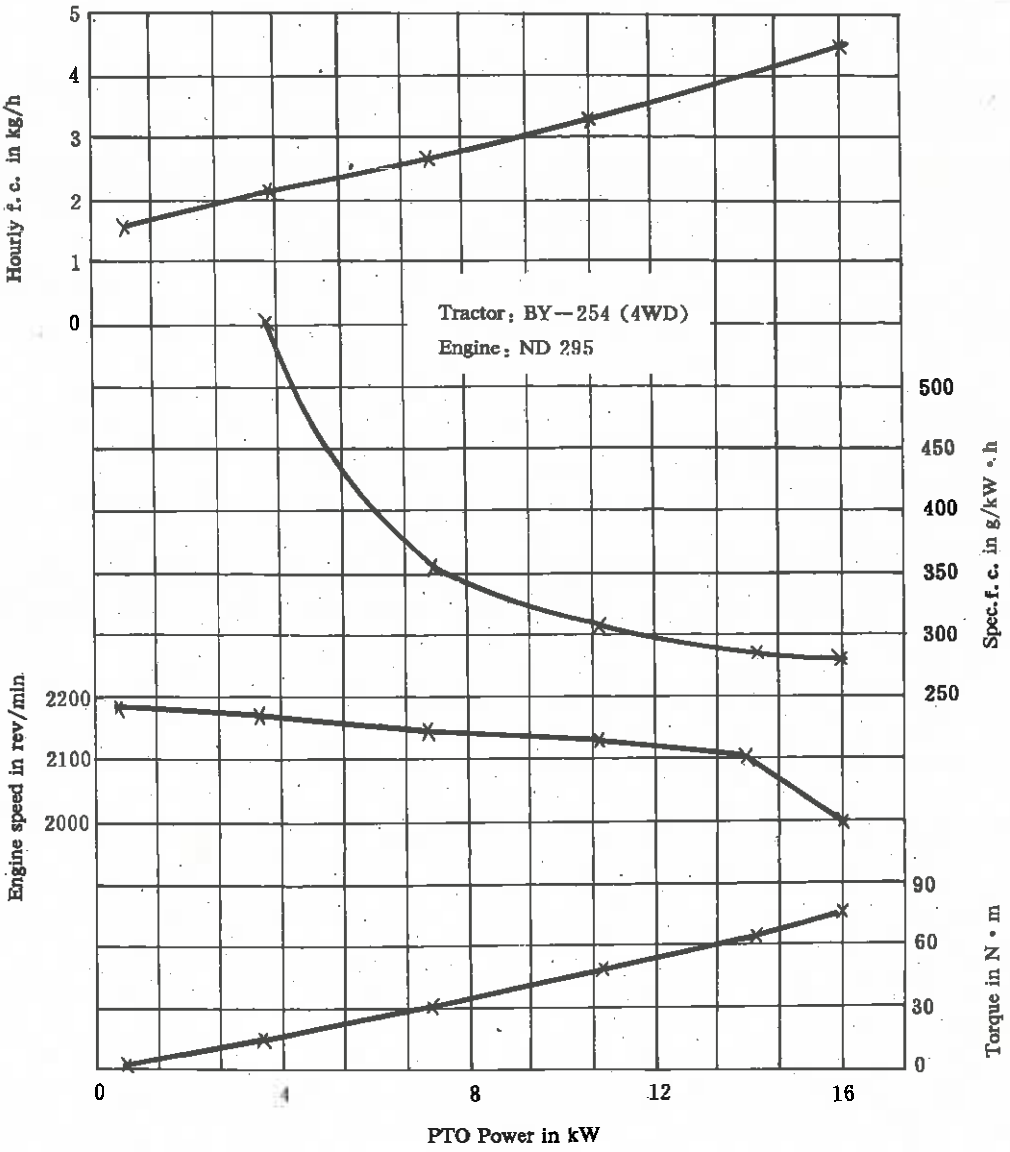
ANNEX I

MAIN POWER TAKE-OFF TEST CURVES



BY—254 COTTEC Test No. 891464 OECD No. 1297

MAIN POWER TAKE-OFF TEST CURVES



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