COTTEC

CHINA
OFFICIAL TRACTOR
TEST AND
EVALUATION CENTRE

Address:
Luoyang tractor
research institute
Luoyang, Henan, China
Tel: 21001
Cable: 4282
Telex: 47004 LOTRA CN

OECD TEST REPORT OF JM—160 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. 1238

Date Feb. 26, 1990

Tested Tractor
Make: Yancheng Tractor Works
Model: Jin Ma-160
Type: Standard

Submitted for test by
Name: Yancheng Tractor Works
Address: Yancheng, Jiangsu, China
Tel: 22432 Cable: 6639

This report includes 23 pages and may only be duplicated as a whole

JM—160 COTTEC Test No. 891435 OECD No. 1238

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This report has been approved by the OECD Co-ordinating Centre in Paris (CEMAGREF) on Feb. 26, 1990 Approved No. 1238

JM—160 COTTEC Test No. 891435 OECD No. 1238

Tractor manufacturer's name and address:	Yancheng Tractor Works Yancheng, Jiangsu, 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:	31 hours
Location of test:	COTTEC, Luoyang, Henan, China

SPECIFICATIONS OF TRACTOR

TRACTOR

—Make:	Yancheng Tractor Works
—Model:	Jin Ma-160
—Type:	Standard
—Number of driving wheels:	2
—Serial No.:	174
—1st Serial No.:	174

ENGINE

—Make:	Nanyang Diesel Engine Works
—Model:	TY1100
—Type:	4 stroke, direct injection diesel
—Serial No.:	192

Cylinders

—Number:	1	
—Disposition:	Vertical	
—Bore/Stroke:	100/115	mm
—Capacity:	903	cm^3
—Compression ratio:	18/1	
—Arrangement of valves:	Overhead	
—Cylinder liners:	Wet type	

Fuel system

—Fuel feed system:	Fuel feed by gravity

—Fuel filter:		
. Make:	Huangchan Automobile Accessory Works	
. Model /type:	C0506, replaceable cartridge	
—Capacity of fuel tank:	21	dm^3
—Injection pump		
. Make:	Shaoguan Pump and Injector Works	
. Model/type:	A type single plunger	
. Serial No. :	1032	
—Manufacturer' s production setting of injection pump:		
. Flow rate (Rated engine speed and full load):	3. 7	dm^3/h
. Timing:	23° before T. D. C.	
—Injectors:		
. Make:	Shaoguan Pump and Injector Works	
. Model/Type:	TS4100, multihole	
. Injection pressure:	18. 6±1	MPa

Governor

—Make:	Nanyang Diesel Engine Works	
—Model/type:	Mechanical, incorporated into fuel injection pump	
—Governed range of engine speed:	600～2480	rev/min
—Rated engine speed:	2300	rev/min

Air cleaner

—Pre-cleaner:	
. Make:	Hezhe Mechanical Accessory Works
. Model/Type:	Centrifugal stack cap
. Location of air intake:	Below bonnet
—Main cleaner:	
. Make:	Hezhe Mechanical Accessory Works
. Model/Type:	K1112, Oil bath with mesh screen
—Maintenance indicator:	None

Lubrication system

—Type of feed pump:	JZ×1011, Rotor
—Type & Number of filter(s):	J0706, 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 blads:	2	
—Fan diameter:	260	mm
—Coolant capacity:	6	dm^3
—Type of temperature control:	Thermostat	
—Superpressure system	None	

Starting system

—Make:	Wujing Motor Works	
—Model/Type:	QD126A5 Electrical, solenoid pre-engaged	
—Starter motor power rating:	1.1	kW
—Cold starting aid:	None	
—Safety device:	Main shift lever in neutral position	

Electrical system

—Voltage:	12 (Negative earth)	V
—Generator:		
. Make:	Shanghai 2nd Automobile Motor Works	
. Model/Type:	JF1114 Alternator, belt driven	
. Power:	0.14	kW
—Battery (number of accumulators):		
. Model/Type:	6—Q(A)—60, Lead acid	
. Number:	1	
. Rating:	60	Ah at 20 hours rating

Exhaust system

—Make:	Nanyang Diesel Engine Works	
—Model/Type:	Expension type silencer	
—Location:	Left-hand side of engine, vertical	

TRANSMISSION TO WHEELS

Clutch

—Make:	Own make	
—Model/Type:	Dry, single disk	
—Number of plate(s):	1	
—Diameter of plate(s):	200	mm
—Method of operation:	Mechanically by pedal	

Gear box

—Make: Own make
—Model/Type: JM—160, Spur gear
—Arrangment: (3+1)×2 compound gear
—Number of gears: 6 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:
. Type: Mechanical
. Method of engagement: Manual by lever
. Method of disengagement: Self-disengaging

Front axle

—Make: Dafeng General Machinery Works
—Model/Type: Balanced arm type

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 2300 rev/min km/h
1	L	183.05	1.99
2	L	92.67	3.93
3	L	63.24	5.76
4	H	45.69	7.97
5	H	23.13	15.74
6	H	15.78	23.08
R_1	L	230.81	1.58
R_2	H	57.60	6.33

* Calculated with a type dynamic radius index of 420 mm(GB2979—82 or JIS B 9202—1982)

POWER TAKE-OFF

Main power take-off

—Type:	Not independend	
—Method of engagement:	By hand level	
—Number of shaft:	2	
—Method of changing power take-off shaft ends and speeds:	Individual, by level	

Power take-off proportional to engine speed

540 rev/min

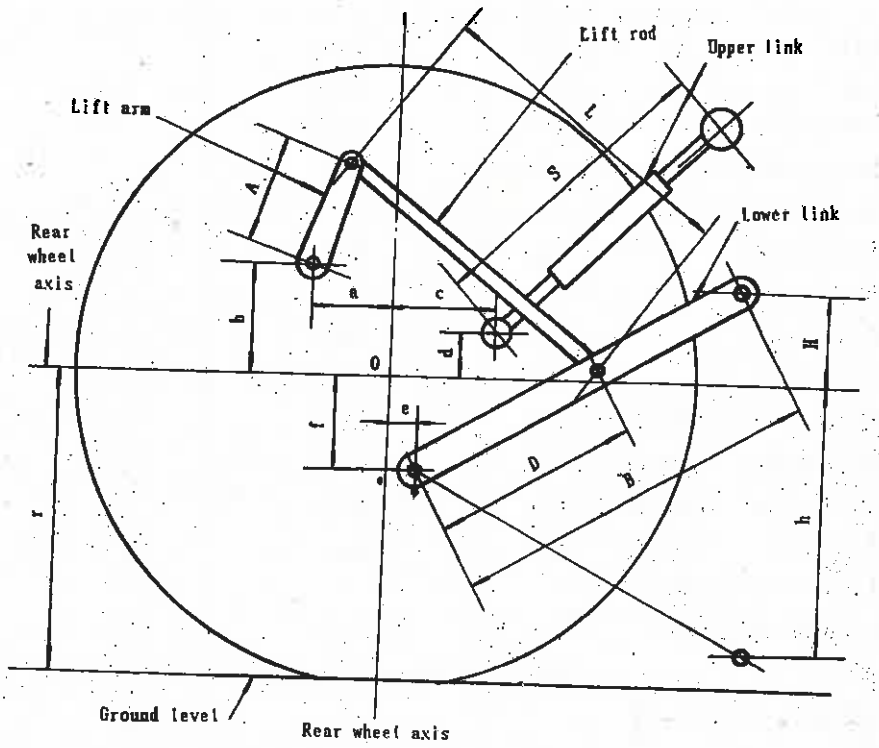
—Location:	At rear of the tractor	
—Diameter of power take-off shaft end:	35	mm
—Number of splines:	6, in conformity with ISO 500/1979	
—Height above ground:	420	mm
—Distance from the median plane of the tractor:	0	mm
—Distance behind rear wheel axis:	281	mm
—PTO speed at rated engine speed:	598	rev/min
—Engine speed at standard power take-off speed:	2077	rev/min
—Ratio of rotation speeds (engine speed/p. t. o. speed):	3.846	
—Power restriction and maximum torque:	12 kW 194 N • m (Manufacturers recomendation)	
—Direction of rotation (viewed from behind tractor):	Clockwise	

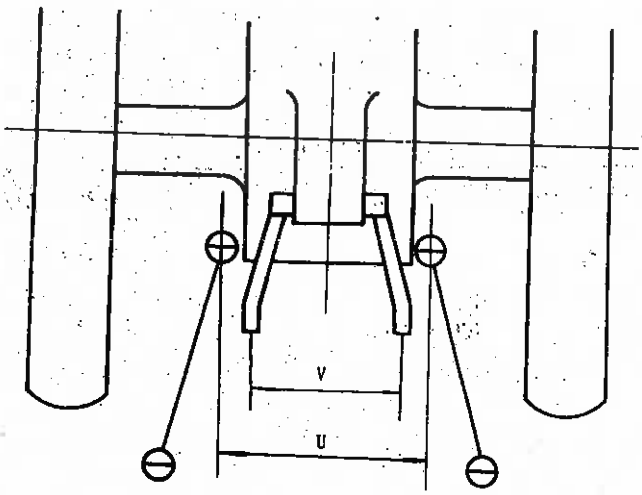
1000 rev/min

—Location:	At front of the engine	
—Diameter of power take-off shaft end:	35	mm
—Number of splines:	21, in conformity with ISO 500/1979	
—Height above ground:	450	mm
—Distance from the median plane of the tractor:	0	mm
—Distance behind rear wheel axis:	—1840	mm
—PTO speed at rated engine speed:	1150	rev/min
—Engine speed at standard power take-off speed:	2000	rev/min

—Ratio of rotation speeds (engine speed/p. t. o. speed):	2.000
—Direction of rotation (viewed from behind tractor):	Clockwise
Power take-off proportional to ground speed:	None
POWER LIFT	
—Make:	Laizhou 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:	Hydraulic lock
—Relief valve pressure setting:	12.5+0.5 MPa
—Opening pressure of cylinder safety valve:	None
—Life pump type:	CB306, gear pump
—Transmission between pump and engine:	Gear, driven from engine
—Type and number of filter(s):	Screen filter, 1
—Site of oil reservior:	In the trans. housing
—Tapping point(s)	None
—Maximum volume of oil available to external cylinders:	None
Three point linkage	
—Category:	I N to ISO 730/2—1979
—Category adapter:	None
—Linkage geometry:	See next page and following table

Linkage geomery:





			Dimension or range * mm	Setting used in test mm
Length of lift arms		(A)	190	
Length of lower links		(B)	500	500
Distance of lift arm pivot	Horizontally	(a)	—30	
point from rear wheel axis:	Vertically	(b)	299	
Horizontal distance between the 2 lower link points:		(u)	304	
Horizontal distance between the 2 lift arm end points		(v)	332	
Length of upper link		(S)	from 438 to 550	455
Distance of upper link pivot	Horizontally	(c)	230	
point from rear wheel axis:	Vertically	(d)	215	
Distance of lower link pivot	Horizontally	(e)	155	
point from rear wheel axis:	Vertically	(f)	109	
Distance of lower link pivot points to lift rod pivot points on lower links		(D)	250	
Length of lift rods		(L)	from 370 to 500	435
Height of lower hitch points relative to the rear wheel axis:				
in low position		(h)	from 60 to 390	210
in high position		(H)	from 110 to 318	225
Height above ground of lower hitch points when locked in transport position			Any height within lift range	

* Assuming (r) with a tyre dynamic index of 420 mm(GB 2979—82 or JIS B 9202—1982)

TRAILER HITCH

—Type:	Fixed	
—Hole diameter:	20	mm
—Height above ground:	420	mm
—Distance of hitch point from rear wheel axis, horizontally:	483	mm

—Distance of hitch point from power take-off shaft end:
. Vertically: 0 mm
. Horizontally: 202 mm
—Maximum vertical permissible load: 5.0 kN

HOLED DRAWBAR None

STEERING
—Make: Shitouhe Agricultural Machinery Works
—Model/Type: Worm and roller
—Method of operation: Manual operated

BRAKES

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

Parking brake
—Type: Mechanical
—Methed of operation: Foot pedals, locked by ratchet

WHEELS
—Number 4
. Front: 2, steering
. Rear: 2, driving
—Wheelbase: 1400 mm
—Track width adjustment:

	Minimum mm	Maximum mm	Adjustment method
Front	920	920	None
Rear	900	1020	Reversing wheels and off-set lug rims

DRIVER'S SEAT
—Make: Anhu Automobile Accessory Works

—Model/Type: Operator's sofa
—Type of suspension: None
—Type of damping None
—Range of adjustment:
. Longitudinal: 60 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 of tractor mm
Headlight	965	115×80	90
Sidelight	1050	D132	460
Rearlight	1010	D136	360
Brakelight	—	—	—

TEST CONDITIONS

OVERALL DIMENSIONS

	Length mm	Width		Height at top of	
		Minimum mm	Maximum mm	protective structure mm	exhaust silencer mm
Ballasted	2470	1100	1270	—	1946
Unballasted	2470	1100	1235	—	1950

GROUND CLEARANCE(unballasted tractor): 280 mm
—Clearance limiting part: Under the rear axle

TRACTOR MASS

Without protective structure:

	Ballasted		Unballasted	
	Without driver kg	With driver kg	Without driver kg	With driver kg
Front	414	422	414	422
Rear	645	712	495	562
Total	1059	1134	909	984

BALLAST

	Weights		Water kg
	Number	Total mass kg	
Front	—	—	—
Rear	6	150	—
Optional	—	—	—

TYRE SPECIFICATIONS

	Front	Rear
Tyres:		
Dimensions	4.00—14	8.3—20
Ply rating	4	4
Type	Cross ply	Cross ply
Maximum load (tyre manufacturer's)	2.60 kN	5.19 kN
Inflation pressure (tyre manufacturer's)	200—250 kPa	100—120 kPa
Dynamic radius index	277 mm	420 mm
Chosen track width:	920 mm	950 mm

OILS AND LUBRICATION

Capacity and change interval:

	Capacity dm³	Oil change h	Filter change h
Engine	4	250	500
Gear box	11	500	—
Rear axle	Common with gear box	—	—
Final drive (rear)	Common with gear box	—	—
Hydraulic system	9	1000	500
Steering	0.4	1000	—

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—77
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:	Same as trans. oil	Same as engine oil
Viscosity:		
Classification:		
Steering oil		
Type:	Same as trans. oil	Same as trans. oil
Viscosity:		
Classification:		

Grease

—Type: Multi-purpose grease

—Number of lubrication points: 15

Fuel

—Type: No. 0 diesel fuel in conformity with GB 252-81 (China standard)

—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: Sep. 13, 1989, COTTEC

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

Power	Speed		Fuel consumption			Specific energy
			Hourly		Specific	
kW	Engine rev/min	P. T. O. rev/min	kg/h	l/h	g/kW • h	kW • h/l
1. 1 MAXIMUM POWER—TWO HOURS TEST						
11. 5	2250	585	3. 22	3. 79	281	3. 02
1. 2 POWER AT RATED ENGINE SPEED						
11. 4	2300	598	3. 31	3. 90	290	2. 92
1. 3 STANDARD POWER TAKE-OFF SPEED (540±10 rev/min)						
10. 9	2077	540	2. 93	3. 45	268	3. 16
1. 4 PART LOADS						
1. 4. 1 The torque corresponding to max. power at rated engine speed						
11. 4	2300	598	3. 31	3. 90	290	2. 92
1. 4. 2 85% of the torque obtained in 1. 4. 1						
9. 9	2338	608	2. 75	3. 24	278	3. 05
1. 4. 3 75% of the torque defined in 1. 4. 2						
7. 5	2380	619	2. 11	2. 49	280	3. 03
1. 4. 4 50% of the torque defined in 1. 4. 2						
5. 1	2408	629	1. 63	1. 92	320	2. 65
1. 4. 5 25% of the torque defined in 1. 4. 2						
2. 6	2442	635	1. 22	1. 44	469	1. 81
1. 4. 6 Unloaded						
0. 7	2461	640	0. 95	1. 12	—	—

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Power kW	Speed		Fuel consumption			Specific energy kW • h/l
	Engine rev/min	P. T. O. rev/min	Hourly		Specific g/kW • h	
			kg/h	l/h		
1. 5 PART LOADS AT STANDARD POWER TAKE-OFF SPEED						
1. 5. 1 The torque corresponding to maximum power						
10. 9	2077	540	2. 93	3. 45	268	3. 16
1. 5. 2 85% of the torque obtianed in 1. 5. 1						
9. 9	2242	583	2. 60	3. 06	263	3. 23
1. 5. 3 75% of the torque defined in 1. 5. 2						
7. 6	2273	591	2. 03	2. 39	269	3. 15
1. 5. 4 50% of the torque defined in 1. 5. 2						
5. 1	2296	597	1. 58	1. 86	311	2. 73
1. 5. 5 25% of the torque defined in 1. 5. 2						
2. 6	2327	605	1. 17	1. 38	449	1. 89
1. 5. 6 Unloaded						
0. 6	2358	610	0. 88	1. 04	—	—

—No load maximum engine speed:	2461	rev/min
—Equivalent crankshaft torque at maximum power:	48. 6	N • m
—Maximum Equivalent crankshaft torque: (Engine speed: 1535 rev/min)	53. 6	N • m
—Mean atmospheric conditions		
. Temperature:	28	℃
. Pressure:	99. 3	kPa
. Relative humidity:	71	%
—Maximum temperatures		
. Coolant:	97	℃
. Fuel:	51	℃
. Engine air intake:	46	℃
. Engine oil:	98	℃

2. HYDRAULIC POWER AND LIFTING FORCE

—Date of test: Sep. 15, 1989

2.1 HYDRAULIC POWER TEST

None

2.2 POWER LIFT TEST

—Sustained pressure with relief valve open: 12.5 MPa

—Temperature of hydraulic fluid: 65 ℃

		At the hitch point	On the frame
Height of lower hitch points above ground in down position	mm	210	182
Vertical movement	mm	435	698
Maximum corrected force exerted throught full range	kN	6.91	3.33
Corresponding pressure of hydraulic fluid	MPa	11.0	11.0
Moment about rear wheel axle	kN • m	4.52	4.21
Maximum tilt angle of mast from vertical	degrees	—	19.7

—Linkage setting for test: see above table and figures

Lifting heights relative to the horizontal plane inculding the lower link pivot points									
mm	—132	—100	0	100	200	218	288	400	510
Lifting forces (the valves 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	7.01	7.07	7.21	7.15	6.94	6.91	7.48		
Corresponding pressure: 11.0 MPa									
At the frame kN	5.53	5.51	5.44	5.11	4.71	4.63	4.31	3.85	3.33
Corresponding pressure: 11.0 MPa									

3. DRAWBAR PERFORMANCE

—Date of tests: Sep. 17～20, 1989

—Type of track: Concrete

Height of drawbar above ground:
Unballasted: 425 mm
Ballasted: 420 mm

Tyre inflation pressure:
Front: 200 kPa
Rear: 120 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)													
2(L2)	6.3	6.49	3.48	2390	14.9	395	2.15	40	79	62	22	62	99.5
3(L3)	9.0	6.54	4.98	2329	15.0	381	2.23	41	81	63	22	62	99.5
4(H1)	10.1	4.98	7.32	2316	9.9	343	2.47	42	84	64	23	62	99.5
3.2 MAXIMUM POWER IN TESTED GEARS (ballasted tractor)													
1(L1)	3.6	7.29	1.77	2398	14.9	484	1.75	40	79	62	20	62	99.5
2(L2)	6.9	7.29	3.42	2354	14.9	370	2.29	41	82	64	21	62	99.5
3(L3)	9.7	6.80	5.13	2308	12.0	359	2.36	44	82	65	22	60	99.5
4(H1)	10.2	5.00	7.32	2291	8.0	336	2.52	44	84	67	22	60	99.5
3.3 TEN-HOUR TEST (ballasted tractor)													
3.3.1 FIVE-HOUR TEST at 75% of pull at maximum power													
4(H1)	8.0	3.75	7.72	2363	6.0	343	2.47	37	79	63	20	61	99.5
3.3.2 FIVE-HOUR TEST at pull corresponding to 15% wheelslip without additional ballast.													
2(L2)	7.0	7.28	3.44	2358	—	—	—	40	82	65	22	60	99.5

Oil consumption during ten hours duration of tests 3.3.1 and 3.3.2 : 15 g/h

4. TURNING AREA AND TURNING CIRCLE

Details of wheel equipment:

	Tyre size	Track mm
Front	4.00—14	920
Rear	8.3—20	950

	With brakes		Without brakes	
	Right hand m	Left hand m	Right hand m	Left hand m
Radius of turning area	2.41	2.33	2.70	2.56
Radius of turning circle	2.32	2.24	2.61	2.47

5. LOCATION OF CENTRE OF GRAVITY

—Height above ground:	553	mm
—Distance forward from the vertical plane containing the axle of the rear wheels:	600	mm
—Distance from the median plane of the tractor:	L 2.4	mm

6. BRAKING

—Date of tests:	Sep. 23, 1989
—Type of track:	Concrete
—Speed before application of brakes:	24.2 km/h

6.1 COLD SERVICE BRAKING DEVICE TEST

Ballasted tractor	Braking device control force N	148	213	289	372	449	525
	Mean deceleration m/s^2	0.69	2.72	3.27	3.50	3.47	3.61
Unballasted tractor	Braking device control force N	212	289	365	456	532	616
	Mean deceleration m/s^2	2.67	3.26	3.28	3.43	3.51	3.86

6.2 FADE TEST

Ballasted tractor	Braking device control force N	205	296	372	460	521	593
	Mean deceleration m/s^2	1.60	3.42	3.47	3.50	3.59	3.80

—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	200	200

7. MEASUREMENT OF EXTERNAL NOISE LEVEL

—Date of tests: Sep. 23, 1989
—Sound level meter, Make/Model/Type: B&K 2209
—Type of track: Concrete
—Gear number: 6
—Travelling speed before acceleration: 18.37 km/h
—Sound level: 83.5 dB(A)

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REPAIRS AND ADJUSTMENTS DURING TESTS:

None

REMARKS:

1. There isn' t tapping point on the tested tractor. So we don' t make hydraulic power test.
2. In COTTEC the safety limit speed of drawbar 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:
Zhang Hui, Zhang Wanbao,
Yuan Wei, Xie Zhiqiao
Yan Xiaofang, Shi Guoquan,
Zhao Baodao

Vice-director of the COTTEC
Senior engineer

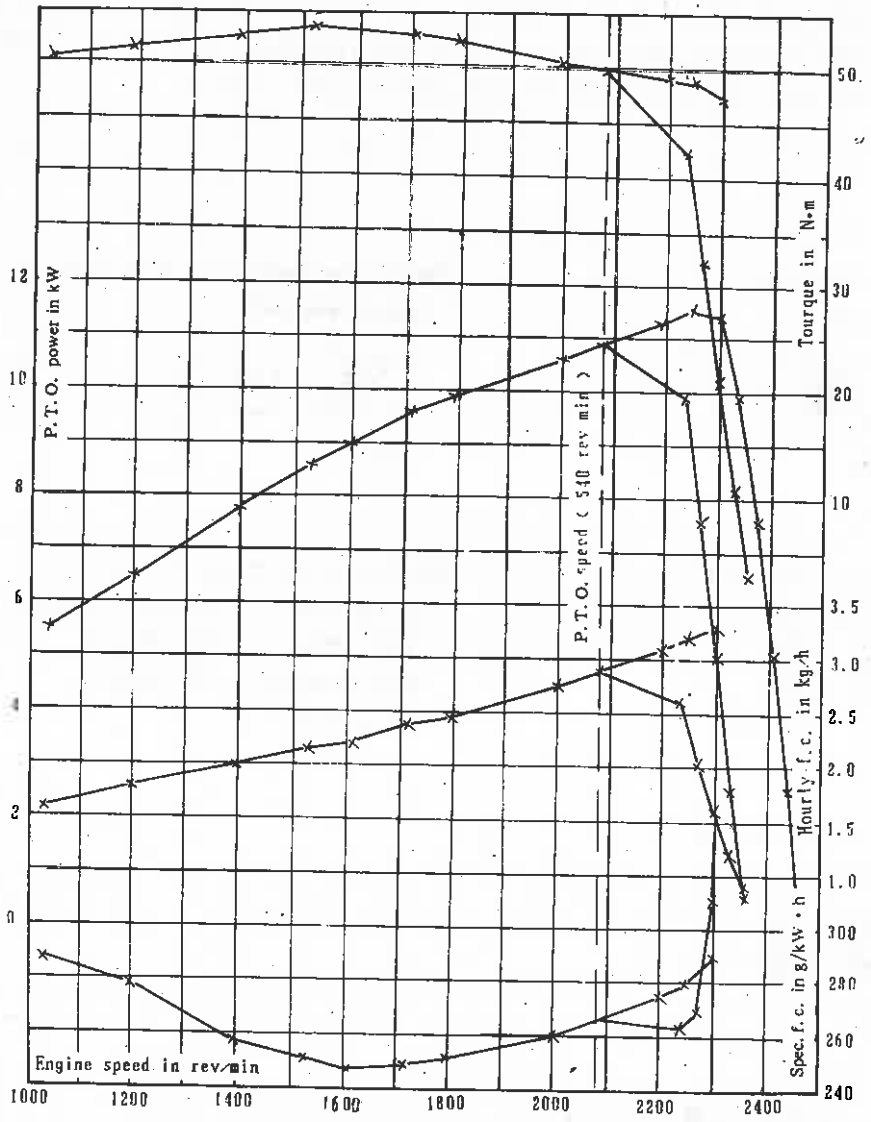
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Zhu Yinwu

Date: 1989.9.29

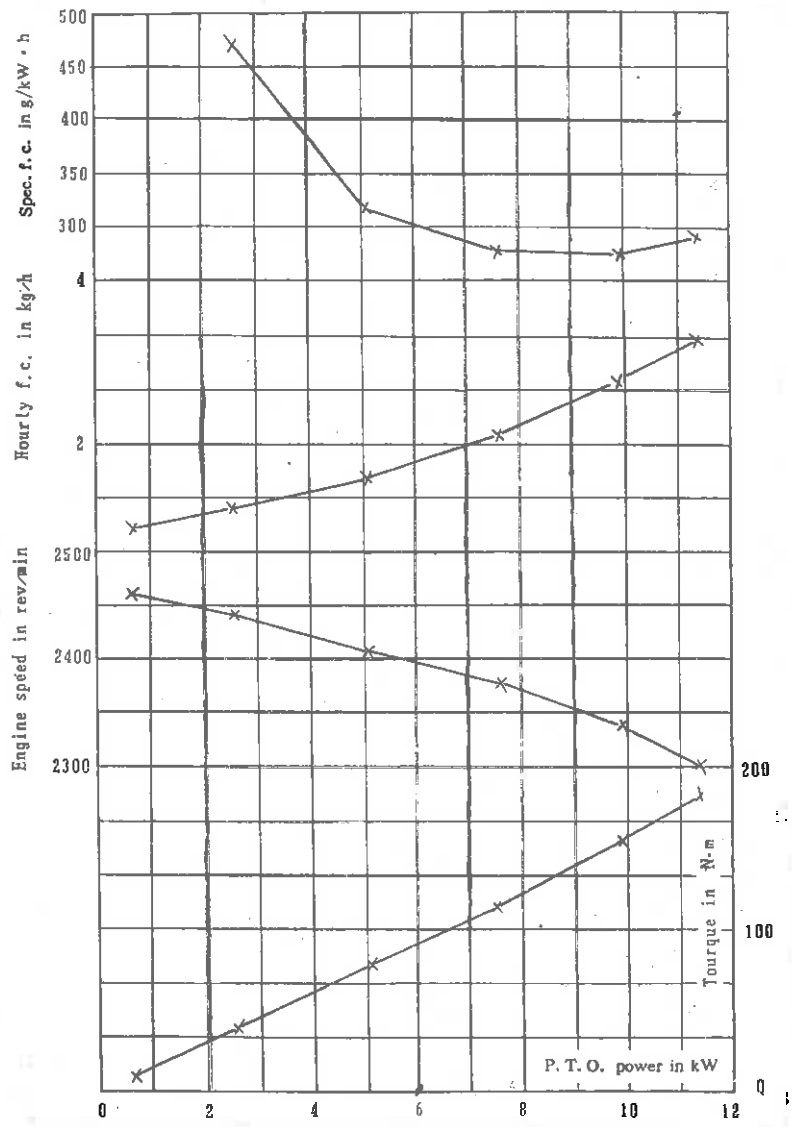
ANNEX I

MAIN POWER TAKE-OFF TEST CURVES



JM—160 COTTEC Test No. 891435 OECD No. 1238

MAIN POWER TAKE - OFF TEST CURVES



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