



M/s CHANGYANG POWER MACHINERY CO. LTD, FORTUNE FAI-15 DLX POWER TILLER



भारत सरकार

GOVERNMENT OF INDIA

कृषि मंत्रालय (कृषि एवं सहकारिता विभाग, मशीनीकरण एवं प्रोद्योगिकी प्रभाग)

Ministry of Agriculture (Deptt. of Agri. & Co-op, Mechanization & Technology Division)

केन्द्रीय कृषि मशीनरी प्रशिक्षण एवं परीक्षण संस्थान

CENTRAL FARM MACHINERY TRAINING & TESTING INSTITUTE

(An ISO : 9001-2008 Certified Institute)

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PT-96/1396/2013

M/s Changyang Power Machinery Co. Ltd Fortune FAI-15DLX
Commercial (Initial)

Manufacturer : M/s. Changyang Power Machinery Co. Ltd, Taishan Road, Changzhou Jiangsu, China

Test requested by : M/s. Fortune Agro Impex No.9, ITI Layout, 1st Main Road, Mallathahalli, Bangalore (India)- 560056

Place of running-in : At applicant's work

Period of running-in (h) -Engine : 20
-Transmission : 10

Method of selection : The power tiller was directly submitted for test by the applicant at the Institute. Therefore, the method of selection is not known.

1. SPECIFICATION

- 1.1 Walking Tractor(Power Tiller)**
- Make : M/s Changyang Power Machinery Co. Ltd
Model : Fortune FAI- 15DLX
Indian trade name : Fortune Agro
Type : General purpose, single axle walking tractor
Year of manufacture : 2012
Serial Number : B 17604334
Country or origin : Peoples Republic of China
- 1.2 Engine:**
- Make : Changyang
Model : FAI 14000E
Type : Four stroke, water cooled direct injection, diesel Engine
Serial number : 23765
Country of origin : Peoples Republic of China
- Engine speed (Manufacturer's recommended setting):**
- Maximum speed at no load(rpm) : 2150 ± 25
- Low idle speed, (rpm) : 900 ± 50
- Rated speed, (rpm) : 2000
- Speed at max. torque,(rpm) : 1400 to 1600
- 1.3 Cylinder & Cylinder Head:**
- Number : One
Disposition : Horizontal
Bore/stroke, (mm) : 100/120
Capacity as specified by the applicant,(cc) : 942
Compression ratio : 20:1
Type of combustion chamber : Direct Injection, open cavity on piston crown
Type of cylinder liners : Wet, replaceable
Arrangement of valves : Overhead
- Valve clearance (cold / hot):**
- Inlet valve, (mm) : 0.30/0.40
- Exhaust valve, (mm) : 0.40/0.45



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- 1.4 Fuel System:**
- Type of fuel feed system : Gravity feed
- Fuel tank:**
- Capacity, (l) : 14.4
Location : Above the engine
Provision for draining of sediments/ water : Not provided
- Fuel filters:**
- Make : Not Available
Model : Not Available
Type of element : paper
Number(s) : One
Capacity of filter, (l) : 0.3
- Injection pump:**
- Make : Not Available
Model : Not Available
Type : Plunger
Serial number : Not Available
Method of drive : Through camshaft
- Fuel injector:**
- Make : Not Available
Model : KBAL-P145J
Type : Multihole (05 holes)
Manufacturer's production pressure : 25 ± 0.49
setting,(MPa) : 14 ± 2 degree before TDC
Injection timing
- 1.5 Governor:**
- Make : Not Available
Model : Not Available
Type : Mechanical, centrifugal steel ball type
Governed range of Engine speed, (rpm) : 900 to 2175
Rated engine speed, (rpm) : 2000
- 1.6 Pre-cleaner**
- Make : Not Available
Type : Mechanical, centrifugal
Location : On the top of the air cleaner inlet tube
- 1.7 Air cleaner:**
- Make : Not Available
Type : Oil bath
Location : On RHS of the engine
Oil capacity (l) : 0.15 lit
Range of suction pressure, (kPa) : 2.0 to 2.27
Oil change period : After every 100 hours of operation in normal working condition, whereas after every 40 hours in dusty condition (apa).
- 1.8 Exhaust:**
- Type of silencer : Vertical, up-draught
Location : On LHS of engine
Range of exhaust gas pressure, (kPa) : 4.27 to 5.07
Provision of spark arresting device : None



16. SUMMARY OF OBSERVATIONS, COMMENTS & RECOMMENDATIONS

Sl. No.	Characteristics	Category (Evaluative/ Non Evaluative)	Require-ments as per IS 13539-2008	Value declared by the applicant(D)/ Requirement (R)	As observed	Whether within the tolerance limit (Yes/No)
1	2	3	4	5	6	7
16.1 Engine Performance:						
i)	Max. power under two hours test, (kW)	Evaluative	Declared value to be achieved with a tolerance of 7.5/+15% of the declared value	9.6 (D)	8.9	Yes
ii)	Power at rated engine speed, (kW)	Non Evaluative	±5%	9.6 (D)	8.9	No
iii)	Specific fuel consumption corresponding to max. power, (g/kWh)	Non Evaluative	±5%	275.6 (D)	253	No
iv)	Specific fuel consumption corresponding to rated power, (g/kWh)	Non Evaluative	±5%	275.6 (D)	250	No
v)	Max. equivalent crankshaft torque, (Nm)	Non Evaluative	±8%	55 (D)	43.5	No
vi)	Backup torque, (%)	--	--	12% (D)	6.36	No
vii)	Max. temperature :		To be declared by the manufacturer under high ambient conditions	125 (D)	91	Yes
	- Engine oil	Evaluative	-do-	118 (D)	87	Yes
	- Coolant, (water)	Evaluative		1% of SFC (D)	1.24	Yes
vi)	Lub. oil consumption, (g/kWh)	Evaluative	+10 %	2.58 (R)		
vii)	Maximum coolant, (water consumption), (% of total coolant capacity)	Non Evaluative	To be declared by the manufacturer under high ambient conditions	35 to 40%(D)	7.92	Yes



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1	2	3	4	5	6	7
viii)	Smoke level	Evaluative	Maximum light absorption coefficient of 3.25 per metre or equivalent BOSCH No. 5.2 or 75 Hatridge value (As per CMVR)	2.72(D)	0.18	Yes
ix)	Overheating tendency of the engine	Evaluative	Satisfactory completion of two hours test under high ambient condition	--	Satisfactory completed	Yes
16.2 Rotary shaft performance:						
i)	Max. power,(kW)	Evaluative	Minimum 75 % of observed maximum bhp for power tiller above 5 hp and 65 % for the power tiller below 5 hp	8.5 (D)	7.3	Yes
				6.7 (R)		
ii)	Power at rated engine speed,(kW)	Non Evaluative	-10 %	8.5 (D)	7.3	No
iii)	Specific fuel consumption corresponding to rated power,(g/kWh)	Non Evaluative	+10 %	340 (D)	291	Yes
iv)	Max. equivalent rotary shaft torque, Nm	Non Evaluative	± 8 %	42.8	34.8	No
v)	Max. operating temp. of rotary transmission oil, (°C)	Non Evaluative	To be declared by the manufacturer	100 (D)	73	Yes
vi)	Rotary shaft power rating, kW	Non Evaluative	To be declared by the manufacturer	8.5 (D)	7.3	No
16.3 Drawbar Performance :						
i)	Maximum drawbar pull corresponding to 15% wheel slip, (kN).	Evaluative	Minimum 60 % of static mass with ballast	3.5 (D)	3.38	Yes
ii)	Maximum drawbar power, (kW.)	Non Evaluative	-10 %	2.24 (R)		
iii)	Maximum transmission oil temperature, °C	Non Evaluative	To be declared by the manufacturer	4.5 (D)	4.5	Yes
				100 (D)	63	Yes



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16.4 a) Service Brake Performance at 15 kmph (AS per CMVR):						
i) Maximum stopping distance at a force, with the pedal effort not exceeding 600 N for the power tiller coupled to a trailer with gross combination weight not exceeding 1.5 tonnes (m):						
	Cold brake	Evaluative	7.5	7.5 (R)	5.3	Yes
ii)	Maximum force exerted to apply the brake, N	Evaluative	600 N	600 (R)	489	Yes
16.4 b) Parking brakes						
i)	Maximum force exerted to apply the brake, N	Evaluative	600 N	600 (R)	153 to 191	Yes
ii)	Observation on rotation of drive wheels at the slope of 12% with trailer having gross mass same as of power tiller or 1 tonne whichever is less.	Evaluative	No rotation of drive wheels	No rotation of drive wheels (R)	No rotation of drive wheels were observed	Yes
iii)	Observation on rotation of drive wheels(power tiller) at the slope of 12% with trailer having gross mass recommended for haulage on up and down slope.	Evaluative	No rotation of drive wheels	No rotation of drive wheels (R)	No rotation of drive wheels were observed	Yes
16.5	Air cleaner oil pull over, (mass basis) (%)	Evaluative	Maximum percentage of oil pull over 0.25 %	0.25 (D)	0.07 to 0.22	Yes
				0.25 (R)		
16.6 Noise level:						
i)	Maximum ambient noise emitted by the power tiller, dB(A) at bystander's level	Evaluative	As per CMVR	88 (R)	85	Yes
ii)	Maximum noise at operator's ear level, dB(A)	Evaluative	As per CMVR	98 (R)	94	Yes
16.7 Amplitude of mechanical vibration at (microns)						
i)	Steering handle grips	Non Evaluative	100 max.	100 (R)	300	No
ii)	Gear levers	-do-	100 max.		120	No
iii)	Clutch / brake lever(s)	-do-	100 max.		270	No
iv)	Rotary shaft speed change lever	-do-	100 max.		300	No
v)	Steering clutch levers	-do-	100 max.		280	No
vi)	Accelerator lever	-do-	100 max.		255	No
vi)	Operator's seat	-do-	100 max.		490	No
vii)	Foot rest	-do-	100 max.	280	No	



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1	2	3	4	5	6	7
16.8	Haulage Performance:					
i)	Gross load of trailer (tonne)	Non Evaluative	To be declared by the manufacture	1.0 (D)	1.0	Yes
ii)	Distance travelled / litre of fuel consumed, (km)	-do-	-do-	11 to 14 (D)	13.54 to 14.31	Yes
iii)	Fuel consumption, (cc/km/ tonne)	-do-	-do-	50 to 70 (D)	69.89 to 73.88	No
16.9	Wetland cultivation :					
	Effective Sealing for the following assemblies:	Evaluative	Effective sealing to be provided	There should be no ingress of water and/or mud (R)	No ingress of mud and / or water was observed	Yes
1)	Engine sump	-do-				
2)	Clutch assembly	-do-				
3)	Gear box	-do-				
4)	Chain case	-do-				
5)	Rotary shaft housing	-do-				
16.10	Stationary Operations	Evaluative	Should have the provisions for power outlet for stationary operations recommended agricultural appliances or	Provided	Provided	Yes
16.11	Discard limit for:					
(a)	Cylinder diameter, (mm) bore	Evaluative	To be specified by the manufacturer	102.5 (D)	100.06 to 100.16	Yes
(b)	Clearance between piston & cylinder liner at skirt, (mm)	Non Evaluative		0.40 (D)	0.348	Yes
(c)	Ring end gap (mm):					
	- Top comp. ring.	Evaluative	-do-	3.0 (D)	1.45 to 1.50	Yes
	- 2 nd comp. ring.		-do-	3.0 (D)	1.40	Yes
	- Oil ring.		-do-	3.0 (D)	0.95 to 1.10	Yes
(d)	Ring groove clearance (mm):					
	- Top comp. ring.	Evaluative	-do-	0.50 (D)	0.319	Yes
	- 2 nd comp. ring.		-do-	0.50 (D)	0.320	Yes
	- Oil ring.		-do-	0.50 (D)	0.092	Yes
(e)	Clearance of main bearings (mm):					
	- Diametrical clearance	Evaluative	To be specified by manufacturer	Not Applicable	Roller and ball bearing provided	Yes
	- Crankshaft float end			0.50 (D)	0.40	Yes
(f)	Clearance of big end bearings, (mm):					
	- Diametrical	Evaluative	-do-	0.45 (D)	0.106 to 0.112	Yes
	- Axial	Evaluative	-do-	0.90 (D)	0.70	Yes
(g)	Thickness (height) of clutch lining over rivet head	Evaluative	-do-	Up to rivet head	1.20 to 1.70	Yes



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1	2	3	4	5	6	7
16.12	Safety features :					
(a)	Provision of guards on moving parts other than rotavator.	Evaluative	Provided	--	Provided	Yes
(b)	Location and direction of exhaust emission to be away from the operator and machine for stationary operation.	Evaluative	Provided	--	Provided	Yes
(c)	Covers on hot parts	Evaluative	Provided	--	Provided	Yes
(d)	Locking of parking stand lever	Evaluative	Provided	--	Provided	Yes
(e)	Protective shield for rotavator to prevent flying of mud and stones	Evaluative	Provided	--	Provided	Yes
(f)	Accidental engaging of reverse speed gear when rotary is in operation.	Evaluative	Provided	--	Provided	Yes
(g)	Provision of light(s)	Evaluative	Provided	--	Provided	Yes
16.13	CATEGORY OF BREAKDOWNS / DEFECTS :					
S. No.	Category of breakdowns	Category (Evaluative / Non Evaluative)	Requirements as per 13539-2008	As observed	Whether meets the requirements (Yes/No.)	
1.	Critical	Evaluative	No critical breakdown	None	Yes	
2.	Major	Evaluative	Not more than two and neither of them should be repetitive in nature	None	Yes	
3.	Minor	Evaluative	Not more than five and frequency of each should not be more than two.	None	Yes	
4.	Total breakdowns	Evaluative	In no case, the total number of breakdowns should exceed five, that is, (2 major + 3 minor) or 5 minor breakdowns.	Four breakdowns occurred during test which are not under category as per IS:13539-2008	Yes	
16.14	Labelling of tractors (Provision of labelling plate As per CMVR):					
1)	Make	Should conform to the requirements of CMVR	--	M/s Changyang Power Machinery Co., Ltd.	Yes	
2)	Model		--	Fortune FAI-15 DLX	Yes	
3)	Year of manufacture		--	August, 2012	Yes	
4)	Engine number		--	23765	Yes	
5)	Chassis number		--	B 17604334	Yes	
6)	Declaration of engine power, (kW)		--	9.6	Yes	
7)	Engine specific fuel consumption, (g/kWh)		--	275.6	Yes	



- 16.15 Salient Observations:**
- 16.15.1 a) Engine Performance:**
- i) The rated power was observed as 8.9 kW against the declared value of 9.6 kW, which is on lower side of requirement of IS. This should be looked into.
 - ii) The backup torque is 6.36 % only which is considered poor.
 - iii) The specific fuel consumption during two hours maximum power test and rated power test were measured as 253 and 250 g/kWh respectively against the declaration of 275 g/kWh, which not meets the requirement of IS. The declared value should be reviewed.
 - iv) Maximum equivalent crankshaft torque was measured as 43.5 Nm against the declaration of 55 Nm, which is on lower side of the requirement of IS 13539:2008.
- 16.15.1 b) Rotary shaft performance:**
- i) Power at rated engine speed at rotary shaft was observed as 7.3 kW against the declaration of 8.5 kW, which does not meet the requirement of IS 13539:2008. This should be looked into.
 - ii) Max. equivalent rotary shaft torque was observed as 34.8 Nm against the declaration of 42.8 Nm. The declared value should be reviewed
- 16.15.2 Mechanical Vibration:**
- The amplitude of mechanical vibration on various assemblies/components marked as per chapter 9 of this test report and on almost all major controls / measuring points of the power tiller exceeded the limit of 100 micron (Refer: Chapter-9). It should be looked into for necessary improvement.
- 16.15.3 Haulage Performance:**
- The specific fuel consumption during haulage performance was observed as 69.89 cc/km/ tone against the declarations of 50 to 70 cc/km/ tone, which is on higher side of the requirement of relevant IS. This should be looked into.
- 16.15.4 Noise measurement:**
- Max. noise at operator's ear level was observed as 94 dB (A) which is on higher side against warning and danger limit 85 dB(A) and 90 dB (A) respectively as specified by IS. This calls for bringing down the noise level to improve operational comforts.
- 16.15.5 Air cleaner oil pull over test:**
- Air cleaner oil pull over was observed to be 0.07 to 0.22 % against the maximum permissible limit of 0.25% as per volume declaration capacity which is under limit. However, the air cleaner oil level is not clearly marked on the air cleaner bowl of cleaner assembly. The air cleaner assembly should be provided with permanent oil level mark during production level for better understanding to users.
- 16.15.6 Field Test:**
- 16.15.6.1** The welding of three mounting brackets of rotavator blades uprooted from its rotary shaft. It was re-welded. In addition to it, three numbers of blades also got broken. All this calls for improvement in the quality of rotavator.
- 16.15.6.2** Rubber guard (Rear) got damaged completely, leaving the operator un safe from flying mud and stones. This, being safety requirement, must be looked into for improvement.
- 16.15.7 Rotavator blades:**
- i) The dimensions of the blades do not conform, in full, to IS: 6690-1981
 - ii) The hourly rate of wear of straight blade and Hatchet blade were observed to be 0.20 to 0.46 and 0.03 to 0.04 percent respectively.
 - iii) The hardness of hatchet blade and straight blades do not meet, the requirement of IS: 6690 - 1981 (Re-affirmed in 2002). This may be looked into.
 - iv) The chemical composition of straight and hatchet blades do not meet, the requirement of IS: 6690 - 1981 (Re-affirmed in 2002). This may be looked into.
- 16.15.8 Safety and Comfort:**
- 16.15.8.1** "Controls" are not provided with symbols as per IS: 6283 (Part 1 & 2) - 1988




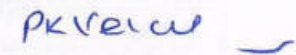
- 16.15.8.2** As per IS: 12239 (Part 3) - 1988, "maximum safe speed" with trailer is required to be specified by the manufacturer. Necessary action may be taken in this regard.
- 16.15.8.3** As per IS: 12239 (Part - 3) - 1988, balancing mass to be added to achieve correct weight balance of the power tiller with various attachments should be recommended by the manufacturer in the operator manual. This may be examined for compliance.
- 16.15.8.4** Provision of spark arresting device may be considered for incorporation in the exhaust system.
- 16.15.9 General observation :**
- The spring rate of inner spring of inlet and exhaust valve was observed as 6.77 to 7.16 N/mm, against declaration of 7.8 mm. The observed value discarded against the limit. Hence it is recommended that the springs should be provided of good quality.
- 16.16 Maintenance / Service problems:**
- No noticeable maintenance / service problem was observed during the test.
- 16.17 Adequacy of literature supplied with the machine:**
- The following revised literature was supplied during the testing of the test power tiller for reference during the test.
- i) **Maintenance manual and spare parts list**
- It is recommended that the operation Manual be revised/updated in accordance with IS: 8132-1999 and IS: 12239 (Part 3) - 1988 with inclusion of, interalia, the following:-
- Recommended matching implements.
 - Fuel saving tips.
 - Safe operating speed with trailer.
 - Maintenance chart given in revised manual varied/differ to given schedule in technical file. This should be examined and corrective action should taken.
- Also, operation manual may be brought out in Hindi as well as other regional languages.
- Further, following literature may also be brought for the guidance of the operation and service personnel.
- Service Manual

17. CITIZEN CHARTER

Time frame for Testing & Evaluation as per Citizen Charter	Duration of Test	Whether the Test Report is released within the time frame given in Citizen Charter	Remarks
10 Months	6 Months (February, 2013 to July, 2013)	Yes	None

TESTING AUTHORITY:


PRADIPKUMAR C. MESHAM
 AGRICULTURAL ENGINEER


P. K. VERMA
 SENIOR AGRICULTURAL ENGINEER


C. R. LOHI
 DIRECTOR