

व्यावसायिक परीक्षण रिपोर्ट
COMMERCIAL TEST REPORT (Initial)

संख्या / No. : T-992/1516/2015

माह / Month : November, 2015

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SWARAJ 744 XM FXDCPS540 TRACTOR



सत्यमेव जयते

भारत सरकार

कृषि एवं किसान कल्याण मंत्रालय
(कृषि, सहकारिता एवं किसान कल्याण विभाग)

GOVERNMENT OF INDIA

MINISTRY OF AGRICULTURE AND FARMERS WELFARE

(DEPARTMENT OF AGRICULTURE, CO-OPERATION AND FARMERS WELFARE)

केन्द्रीय कृषि मशीनरी प्रशिक्षण एवं परीक्षण संस्थान

ट्रैक्टर नगर, बुदनी (म.प्र.) ४६६ ४४५

CENTRAL FARM MACHINERY TRAINING & TESTING INSTITUTE

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Manufacturer	: M/s. Mahindra & Mahindra Limited, Farm Equipment Sector, Swaraj Division, Phase-IV, Industrial Area, S.A.S. Nagar, Mohali Punjab-160 055
Test requested by (applicant)	: M/s. Mahindra & Mahindra Limited, Farm Equipment Sector, Swaraj Division, Phase-IV, Industrial Area, S.A.S. Nagar, Mohali Punjab-160 055
Place of running-in	: At Applicant's works
Duration of said running-in, (h):	
- Engine	: 28
- Transmission	: 32
Method of Selection	: The tractor was submitted directly by the applicant for test. Hence, method of selection is not known.

1. SPECIFICATIONS

1.1 Tractor:	
Make	: Swaraj
Model	: 744 XM FXDCPS540
Type	: Four wheeled, rear-wheel driven, unit construction general purpose, agricultural tractor
Year of manufacture	: 2014
Chassis number	: WXCL 49906107624
Country of origin	: India
1.2 Engine:	
Make	: Swaraj engines Ltd & Kirloskar oil engines Ltd.
Model	: RB 30 XM
Type	: Four stroke, water cooled, naturally aspirated, ,direct injection, diesel engine
Serial number	: 43.3019 / STL 18732S
1.2.1 Engine speed(Manufacturer's recommended production setting), (rpm):	
- Maximum speed at no load	: 1900 to 2000
- Low idle speed	: 580 to 700
- Speed at maximum torque	: 1000 to 1400
Rated speed, (rpm):	
- For PTO use	: 1800
- For drawbar use	: 1800
1.3 Cylinder & Cylinder Head:	
Number	: Three
Disposition	: Vertical, Inline
Bore/stroke, (mm)	: 100/116
Capacity as specified by the applicant, (cc)	: 3307
Compression ratio	: 19.5 (± 0.5) : 1
Type of cylinder head	: Integral. C.I.
Type of cylinder liners	: Wet, replaceable
Type of combustion chamber	: Re-entrant
Arrangement of valves	: Overhead, inline



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16. ADJUSTMENTS, DEFECTS, BREAKDOWNS AND REPAIRS

S. No.	Adjustments/Defects/Breakdowns and repairs	Tractor run hours
1.	Nil	

17. SUMMARY OF OBSERVATIONS, COMMENTS & RECOMMENDATIONS

17.1 Evaluative (mandatory) / Non-evaluation (Non-mandatory) parameter applicable for qualifying Minimum Performance criteria as per Clause-4 (Table-1) of IS: 12207-2014 for acceptance of the tractor for the purpose of subsidies/NABARD financing are summarized as under:

Sl. No.	Characteristic	Category (Evaluative / Non Evaluative)	Requirements as per IS: 12207-2014	Values declared by the applicant/ (D) Requirement (R)	As observed	Whether meets the requirements (Yes/No)
1	2	3	4	5	6	7
17.1.1 PTO Performance :						
a)	Maximum power under 2 h test, (kW) ambient (Natural condition)	Evaluative	Declared value to be achieved with a tolerance of: -5 / +10% for PTO power >26 kW, -7.5/+10% for PTO power ≤ 26 kW or -5 / +10% for Engine power >26 kW, -7.5/+10% for Engine power ≤ 26 kW	28.0	28.3	Yes
b)	Power at rated engine speed, (kW)	Non Evaluative	-do-	28.0	28.3	Yes
c)	Specific fuel consumption corresponding to maximum power, (g/kWh)	Non Evaluative	± 5%	258 (D)	250	Yes
d)	Maximum equivalent crankshaft torque, (Nm)	Non Evaluative	± 8%	188 (D)	181.7	Yes
e)	Back-up torque, percent	Non Evaluative	10 percent, min.	10 % min. (D)	21.1	Yes
f) Maximum operating temperature, (°C)						
	1) Engine oil	Non Evaluative	The declared value should not exceed the max. value specified by the oil company and the observed value under high ambient condition should not exceed the declaration.	130 (D)	99	Yes
	2) Coolant (water)	Evaluative	The declared value should not exceed the boiling temperature of coolant under the pressurized or otherwise and the observed value under high ambient condition should not exceed the declaration.	115 (D)	85	Yes
g)	3) Engine oil consumption, (g/kWh)	Evaluative	Not exceeding 1% of SFC at max. power under High ambient conditions	2.51 (R)	0.172	Yes
h)	4) 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)	3.25 per metre (R)	0.21	Yes



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1	2	3	4	5	6	7	
17.1.2 Drawbar performance :							
a)	Maximum drawbar pull with ballast corresponding to 15 percent wheel slip. (kN)	Non Evaluative	Minimum 65% of static mass with ballast	18.87 (R) min.	22.40	Yes	
				21, min (D)			
b)	Max. drawbar pull without ballast corresponding to 15 percent wheel slip. (kN)	Evaluative	Minimum 65% of static mass of tractor without ballast	13.70 (R) min.	16.48	Yes	
				15, min (D)			
c)	Maximum drawbar power without ballast. (kW).	Evaluative	Minimum 80 % of PTO power as referred in SI No. i) a) of PTO performance in case of tractors having total static mass > 1500 kg Minimum 75 % of PTO power as referred in SI No. i) a) of PTO performance in case of light weight tractors having 1500 kg total static mass of tractor Minimum 75 % of the engine power as referred in SI No. i) a) of engine performance in case of tractors which do not have a PTO shaft.	22.6 (R) Minimum 25 (D) min.	25.5	Yes	
d)	Maximum transmission oil temperature (°C)	Non Evaluative	The declared value should not exceed the maximum value specified by oil company	110 (D)	78	Yes	
17.1.3 Power lift and hydraulic pump performance :							
a)	Maximum lifting capacity throughout the range of lift, (kN):						
	1)	At hitch points	Non Evaluative	[Tolerance of minus 10%]	14.71 (D)	20.86	Yes
	2)	With the standard frame	Evaluative	The lift capacity should at least be 24 kg/PTO kW. and it should be 21.5 kg/engine kW where the tractor is not provided with a PTO shaft	6.66 (R) Minimum 10.78 (D)	14.68	Yes
17.1.4 Brake performance at 25 kmph:							
a)	Maximum stopping distance at a force, equal to or less than 600 N on brake pedal with road ballast (m):						
	1)	Cold brake	Evaluative	10	10 (R)	8.87	Yes
	2)	Hot brake	Evaluative	10	10 (R)	9.00	Yes
b)	Maximum force exerted on the brake pedal to achieve a deceleration of 2.5 m/s ² (N)	Evaluative	600	600 (R)	406 to 437	Yes	
c)	Whether parking brake is effective at a force of 600 N at foot pedal(s) or 400 N at hand lever	Evaluative	Yes / No	Yes (R)	Yes	Yes	



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1	2	3	4	5	6		
17.1.10	Labelling of tractors (Provision of labelling plate):						
	1) Make	Evaluative	Should conform to the requirements of CMVR along-with declared value of PTO HP	--	Swaraj	Ye	
	2) Model	Evaluative		--	744 XM FXDCPS540	Ye	
	3) Year of manufacture	Evaluative		--	WX	Ye	
	4) Engine number	Evaluative		--	43.3019 / STL 18732S	Ye	
	5) Chassis number	Evaluative		--	WXCL49906107 624	Ye	
	6) Declaration of PTO power, (kW)	Evaluative		--	28.0	Ye	
17.1.11	Discard limit for:						
(a)	Cylinder bore diameter, (mm)	Evaluative	To be specified by the manufacturer	110.225	110.00 to 110.02	Ye	
(b)	Clearance between piston & cylinder liner at skirt, (mm)	Non Evaluative		0.60	0.154 to 0.165	Ye	
(c)	Ring end gap (mm):						
	- Top comp. ring.	Evaluative	-do-	1.75	0.55	Ye	
	- 2 nd comp. ring.		-do-	1.75	0.50 to 0.55	Ye	
	- Oil ring.		-do-	1.75	0.50 to 0.55	Ye	
(d)	Ring groove clearance (mm):						
	- Top comp. ring.	Evaluative	-do-	--	Taper rings	-	
	- 2 nd comp. ring.		-do-	0.25	0.060 to 0.065	Ye	
	- Oil ring.		-do-	0.25	0.055 to 0.066	Ye	
(e)	Clearance of main bearings (mm):						
	- Diametrical clearance	Evaluative	To be specified by the manufacturer	0.30	0.030 to 0.70	Ye	
	- Crankshaft end float	Evaluative		0.50	0.20	Ye	
(f)	Clearance of big end bearings, (mm):						
	- Diametrical	Evaluative	-do-	0.30	0.030 to 0.052	Ye	
	- Axial	Evaluative	-do-	0.60	0.20	Ye	
(g)	Clearance between king pin and bush, (mm)	Non Evaluative	-do-	0.60	0.107 to 0.113	Ye	
(h)	Clearance between centre pin and bush, (mm)	Non Evaluative	-do-	0.80	0.147 to 0.156	Ye	
17.1.12	Literature (Submission to test agency)						
(a)	Operator manual	Evaluative	Provided/Not Provided	As per relevant IS Code (IS 8132)	Provided	Ye	
(b)	Parts Catalogue	Evaluative	Provided/Not Provided	As per relevant IS Code (IS 8132)	Provided	Ye	
(c)	Workshop/Service manual	Evaluative	Provided/Not Provided	As per relevant IS Code (IS 8132)	Provided	Ye	

- 17.4 Salient Observations:**
- 17.4.1 Laboratory tests:**
- 17.4.1.1 Drawbar performance:**
During drawbar performance test, rear tyre creeping was observed as 40 & 25 mm LHS and RHS tyres respectively which is on higher side and calls for necessary corrective action.
- 17.4.1.2 Hydraulic performance test :**
The lifting capacity at hitch point & on standard frame was recorded as 14.68 kN & 20.86 kN respectively. The moment about rear axle was computed as 17.94 & 21.5 kN-m respectively, which is on higher side in compare to the moment about front axle i.e. 17.48 kN-m. Therefore, it is recommended that the lifting capacity should be reduced suitably or standard mass at front axle may be provided to avoid front lifting tractor.
- 17.4.1.3 Mechanical Vibration:**
The amplitude of mechanical vibration on various assemblies marked as (*) in Chapter 9 of this test report is on higher side. This calls for dampening down of vibrations to improve the operational comfort and service life of components.
- 17.4.1.4 Three point linkage:**
- The lateral distance from lower hitch point to center line of tractor does not meet the requirements of IS: 4468 (Part I)-1997. This should be looked into for necessary corrective action.
- 17.4.1.5 Operator's seat:**
- Vertical distance from SIP the centre of clutch & brake pedal does not meet the requirements of IS: 12343:1998 & call for necessary corrective action
 - Longitudinal distance from SIP to centre of steering control wheel does not meet the requirements of IS: 12343:1998 & call for necessary corrective action
- 17.4.1.6 Drawbar linkage:**
- Width of drawbar (dimension "B" & D \emptyset) does not meet the requirement of IS: 12953-1995 & call for necessary corrective action.
- 17.4.2 Field performance test:**
- Wet land cultivation (Puddling operation):**
No ingress of mud and / or water was noticed during puddling operation of the tractor and meet the requirements of IS: 11082-1984 (Technical requirements of agricultural tractors for wetland operation). Therefore, the tractor is recommended as suitable for wetland operation (Puddling).
- 17.5 Labelling plate details:**
The year of manufacture on labelling plate is given in the coded form in chassis no, this should be provided in the numerical form as per relevant IS for better understanding of users. The year of manufacture should be provided in specialized column on labelling plate.
- 17.6 Maintenance / Service Problems:**
No noticeable maintenance/ service problem was observed during the test.
- 17.7 Recommendation with regard to safety on tractor:**
The following requirements, inter alia, may be considered for incorporation on the tractor:
- Provision for spark arresting device in exhaust system.
 - Provision of differential lock.
 - Width of step.
 - Adequately gripable working clearance around the position control lever.

**17.8 Adequacy of Literature supplied with machine:**

- 17.8.1 i) Operator's Manual for Swaraj 744 XM FXDCPS540
 ii) Parts Catalogue for Swaraj 744 XM FXDCPS540
 iii) Service Manual for Swaraj 744 XM FXDCPS540

17.8.2 The literatures should also be brought out in national as well as other regional languages for the guidance of users and service personnel.

18. Citizen charter

Duration of Test	Test duration under citizen charter	Whether the report released within time frame given citizen charter	Remark, if any
10 Months	09 Months (February, 2015 to October 2015)	Yes	None

TESTING AUTHORITY:

P.C.MESHRAM
SENIOR AGRICULTURAL ENGINEER

C.R.LOHI
DIRECTOR

Test Report compiled by: - **Chanchlesh Singh Raghuwanshi**, Senior Technical Assistant.

19. Applicant's Comments

Para No.	Our Reference	Applicant's comments
19.1	1.20.4(i),(ii),1.20.5(i) & 17.7(i),(ii),(iii), & (iv)	These requirements are being revisited for necessary corrective action at our end.
19.2	17.3(iii),(iv),(v),(vi),(vii) & 17.4.1.1,17.4.1.2	Study and trails are under progress for necessary corrective action.
19.3	17.4.1.3,17.4.1.4 (i),17.4.1.5(i),(ii),17.4.1.6(i)	These requirements are being revisited for necessary corrective action at our end.
19.4	17.7 (i)(ii)(ii) & (iv)	Study and trails are under progress for necessary corrective action.
19.5	17.8.2	Literatures are already printed in all regional language for end user.